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ABSTRACT

The Resource Assessment and Conservation Engineering Division of the Northwest and Alaska Fisheries Center conducts annual summer bottom trawl surveys to monitor the demersal fish and crab stocks of the eastern Bering Sea continental shelf. The standard study area, surveyed each year since 1979, encompasses a major portion of the eastern Bering Sea shelf between the 20 m and the 200 m isobaths and from the Alaska Peninsula north to approximately the latitude of St. Matthew Island (60.5°N lat.). In 1987, a total area of 465,000 km^2 was surveyed using two chartered trawlers, the 30.8 m Alaska and the 30.5 m Pat San Marie, equipped with identical 83-112 eastern stern trawls.

Samples of demersal populations were obtained by trawling for 30 minutes at the center of each square of a 20 x 20 nautical mile grid covering the survey area. At each station, species composition of the catch was determined and commercially important species were sampled and measured to determine length distribution and otoliths were collected to determine age composition.

Survey results presented in this report include abundance estimates for major fish and invertebrate groups and economically important fish species, geographic distributions of major fish families and economically important fish species, relative abundance of fish species by depth zone, and size composition of principal fish species.

Detailed station data, listings of the analyses of abundance estimates, and biological characteristics of the sampled populations are provided in appendices.

CONTENTS

INTRODUCTION

The eastern Bering Sea continental shelf supports one of the most productive groundfish fisheries in the world. It encompasses an area of 1.2 million km^2, a size exceeded in the Northern Hemisphere only by the continental shelves of the Barents Sea and the Northwest Atlantic Sea (Bakkala 1988). Annual commercial catches of groundfish on the eastern Bering Sea shelf since 1970 have ranged from 1.2 to 2.2 million metric tons (Bakkala 1987); of the major Northern Hemisphere shelf grounds, only the North Sea shelf produced a higher mean annual catch for the period 1970-81 (Bakkala 1988). Commercial catches in the Bering Sea are heavily dominated by walleye pollock (Theragra chalcogramma), which supports the largest single-species fishery in the U.S. fishery conservation zone (Terry et al. 1984) and currently accounts for 73% of the total eastern Bering Sea groundfish catch (Bakkala 1987). Yellowfin sole (Limanda aspera) and Pacific cod (Gadus macrocephalus) follow in importance, contributing 13% and 8% of total groundfish catch, respectively. Other commercially important Bering Sea shelf species include several small flounders--rock sole (Lepidopsetta bilineata), Alaska plaice (Pleuronectes quadrituberculatus), flathead sole (Hippoglossoides elassodon) and its congener Bering flounder (H. robustus)--and the large flounders arrowtooth flounder (Atheresthes stomias), Kamchatka flounder (A. evermanni), Pacific halibut (Hippoglossus stenolepis) and Greenland turbot (Rheinhardtius hippoglossoides). Sablefish (Anaplopoma fimbria) and Pacific ocean perch (Sebastes alutus) have historically been taken in significant quantities, but have contributed relatively little to the catch in recent years.

The Resource Assessment and Conservation Engineering (RACE) Division of the Northwest and Alaska Fisheries Center (NWAFC) has conducted annual bottom trawl surveys to monitor the abundance, distributions, and population structures of eastern Bering Sea demersal fish and crab stocks since 1971. The information gathered is used to provide the North Pacific Fishery Management Council with annual fishery-independent estimates of abundance and biological condition of commercially exploited stocks, to provide distribution and abundance information to commercial fishermen, and to develop a time series data base contributing to our understanding of the population dynamics and interactions of groundfish species.

Early investigations of groundfish stocks in the eastern Bering Sea (1971-74) represented essentially an expansion of data collection during annual assessment surveys of red king crab (Paralithodes camtschatica) stocks in a limited area of the southeastern Bering Sea. The first large-scale NWAFC survey of the eastern Bering Sea shelf was conducted in 1975 under contract to the Bureau of Land Management in response to a need for baseline data to assess the potential impact of proposed offshore oil exploration and development on fishery resources (Pereyra et al. 1976). During this baseline survey, sampling was conducted over the Bering Sea shelf between the 20 m and 200 m isobaths and from the Alaska Peninsula north to approximately 62°N lat. (Fig. 1). The survey region was stratified into six subareas, with sampling density allocated on the basis of available information on the distribution patterns of economically important groundfish and invertebrates and on the locations of potential oil lease sites off Bristol Bay and the outer shelf region. Less extensive coverage of the shelf was obtained during annual surveys in succeeding years until 1979, when another comprehensive survey of the Bering Sea shelf was undertaken in cooperation with the Japan Fisheries

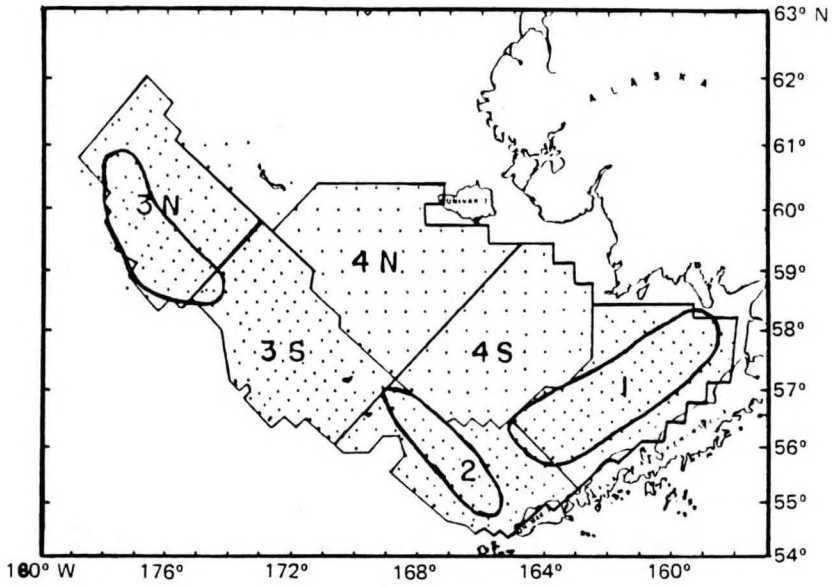


Figure 1.--Sampling stations and subareas of the 1975 baseline survey on the eastern Bering Sea shelf, with approximate locations of oil lease areas (from Pereyra et al. 1976).

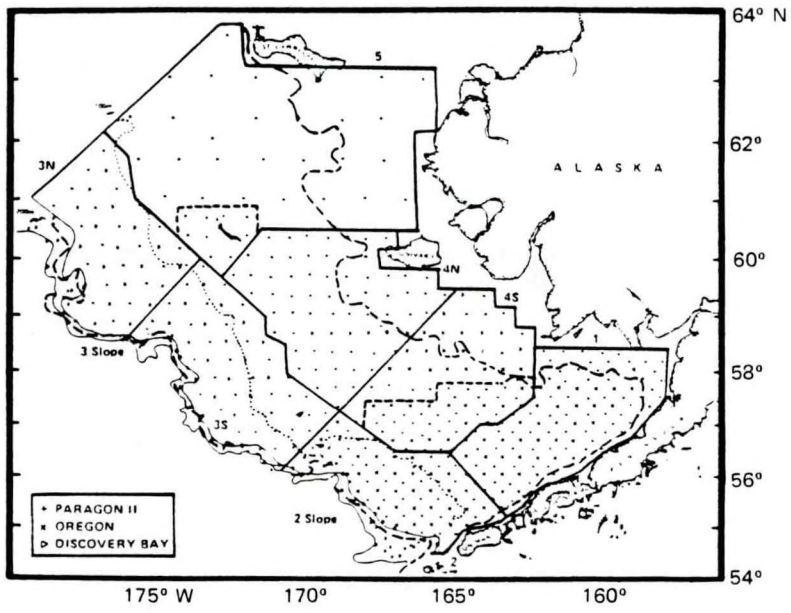


Figure 2.--Sampling stations and stratifications of the 1979 expanded triennial survey on the eastern Bering Sea shelf and slope (from Bakkala and Wakabayashi 1985).

Agency (Bakkala and Wakabayashi 1985). The 1979 survey encompassed the entire region sampled in the 1975 baseline study, along with additional sampling in continental slope waters between the Aleutian Islands and the U.S.-U.S.S.R. convention line, and in the region between St. Matthew and St. Lawrence Islands (Fig. 2). A hydroacoustic survey was also conducted in 1979 to assess the midwater component of the walleye pollock population. Each annual bottom trawl survey since 1979 has essentially repeated the sample grid established during the 1975 baseline survey, with slight modifications each year. This region has been found to encompass the major part of the distributions of economically important Bering Sea groundfish species, except those primarily located in continental slope waters. Every third year (1979, 1982, 1985) an extended survey has been conducted, including hydroacoustic assessment of midwater pollock, bottom trawl sampling of the continental slope through the cooperation of the Japan Fisheries Agency, and bottom trawl sampling in the region between St. Matthew and St. Lawrence Islands.

This report describes the methods used during the 1987 survey, in which only the baseline study area was sampled, and summarizes the information obtained for major groups of demersal fish and invertebrates and for individual species of economically important groundfish; data gathered on principal species of crabs are presented separately in a report by Stevens et al. (1987).

SURVEY METHODS

Survey Area and Sampling Design

The standard survey area, extending over the Bering Sea shelf from the 20-m isobath on the Alaskan coastline out to the 200-m isobath at the shelf break and north from the Alaska Peninsula to the St. Matthew Island area (Fig. 3), was sampled between 27 May and 7 August 1987. A systematic sampling scheme was used, based on a 20 x 20 nautical mile (nmi) grid superimposed on the study area. Samples of demersal fish and invertebrates were obtained by trawling for 30 minutes at or near the center of each grid block. In the Pribilof and St. Matthew Island regions, however, sampling density was doubled by adding stations at the grid block corners; this was done in order to increase coverage of blue king crab (Paralithodes platypus) stocks present in these areas. Two vessels fished alternate north/south lines of the station grid, proceeding from Bristol Bay westward to the shelf break (Fig. 3). The alternate-line fishing pattern facilitates comparison of fishing powers of the two vessels, while the progession from east to west prevents multiple encounters of the same fish for groundfish species which may be migrating to inshore feeding or spawning grounds (from west to east) during the course of the survey.

For reporting of biomass and population statistics, the survey region was divided into six subareas bounded by the 50-m, 100-m, and 200-m isobaths, and by a line separating the northwest and southeast portions of the study area (Fig. 3). This six-subarea stratification scheme is intended to minimize the variances of population and biomass estimates by conforming to oceanographic domains which reflect fish distributions. The presence of high-density sampling regions in subareas 3, 4, and 6 necessitated a further division of

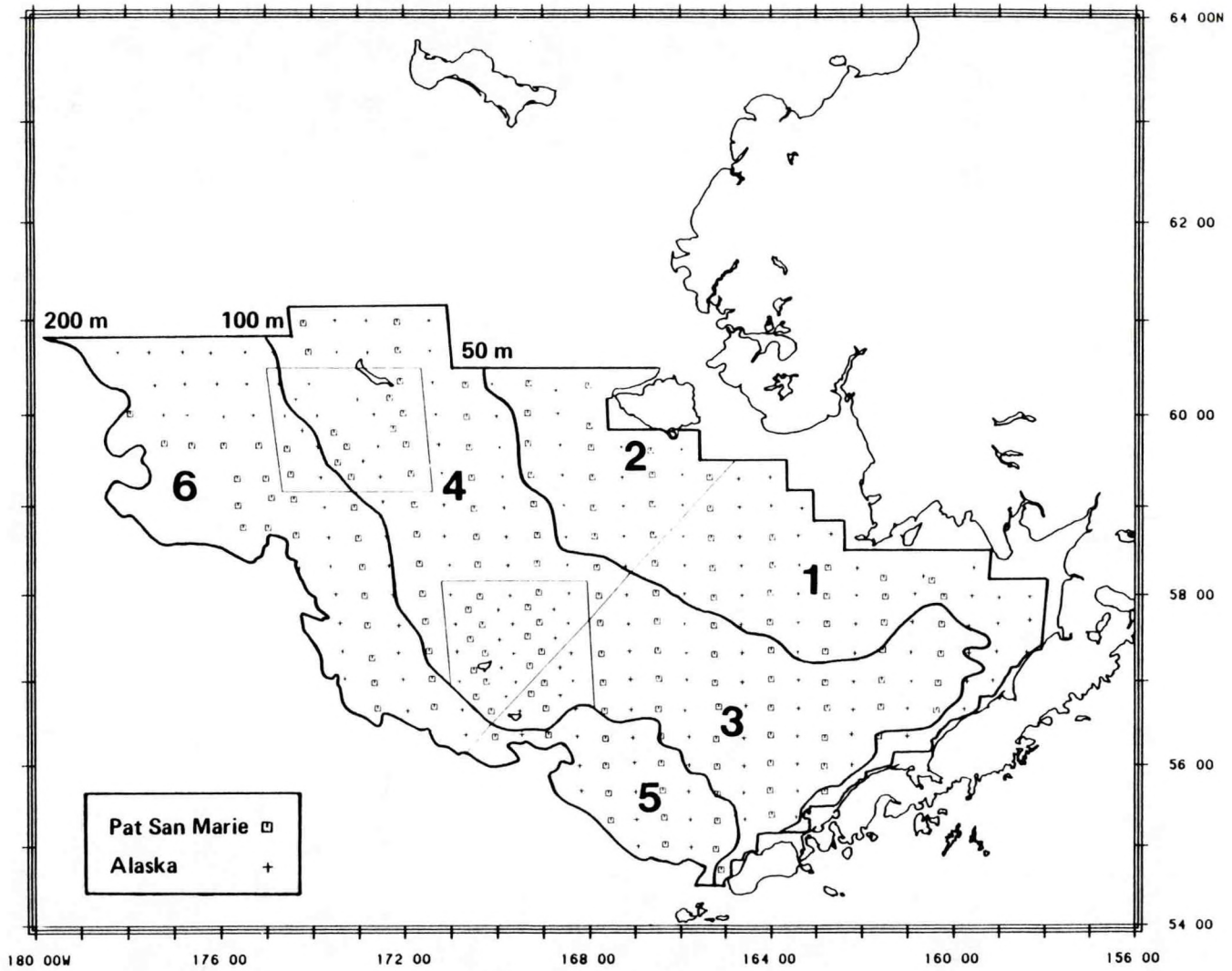


Figure 3.--Stations included in the 1987 eastern Bering Sea survey analysis.

these subareas into high-density and standard-density strata, resulting in a total of 10 geographic strata for statistical calculations.

A total of 342 of the 355 standard survey stations were successfully sampled in 1987, giving an overall average sampling density of one station per 1,360 km^2 (Table 1). However, due to the high-density sampling regions in subareas 3, 4, and 6 and the irregular boundaries of the survey area, actual sampling density varied considerably among subareas, ranging from one station per 1,156 km^2 in subarea 4 to one station per 1,602 km^2 in subarea 6.

Table 1.--Size of subareas and sampling densities by subarea during the 1987 bottom trawl survey (see also Fig. 3).

Subarea	Area (km^2)	No. stations allocated	No. stations successfully sampled	Sampling density (km^2/Stn)
1	77,873	58	58	1,343
2	41,029	31	30	1,368
3	103,302	76	76	1,359
4	107,538	97	93	1,156
5	39,180	26	25	1,567
6	96,113	67	60	1,602
Total Survey Area	465,035	355	342	1,360

Vessels and Fishing Gear

The 1987 survey was conducted aboard the 30.8-m chartered research vessel Alaska and the 30.5-m chartered fishing vessel Pat San Marie (Table 2). Identical 83-112 eastern otter trawls, equipped with double 30 fathom dandylines and 24-inch footrope chain extensions to improve the net's ability to tend bottom, were used by each vessel (Table 3, Appendix F). A SCANMAR net mensuration system was employed aboard the Pat San Marie to determine net dimensions while fishing. At depths of 100 m or less, the net was found to have a mean path width of 16.67 m and a mean vertical opening of 2.24 m; at depths greater than 100 m, mean path width increased to 17.80 m while the mean vertical opening was slightly reduced (2.17 m). It was not possible to obtain new measurements for the Alaska during the 1987 survey, and a mean path width of 16.41 m and mean vertical opening of 2.3 m, determined in 1983, were used for all Alaska tows.

Collection and Processing of Samples

Sampling procedures used in RACE eastern Bering Sea assessment surveys are described in detail by Wakabayashi et al. (1985). A brief summary will be given here.

Samples were collected by trawling at the center of each 20 x 20 nautical mile grid block (or corner station, in the case of high-density strata) for 30 minutes (timed after the net had settled on the bottom), towing at a speed of 3 knots. If the bottom appeared to be untrawlable at the specified location, the nearest trawlable site within the same grid square was used. If the net was ripped or "hung up" on some object on the bottom during the tow, the catch was discarded and a new sample obtained. In the event of a very large catch

Table 2.--Characteristics of vessels used during the 1987 bottom trawl survey.

Vessel	Overall length(m)	Gross tonnage	Horsepower	Survey period Start	Survey period Finish
Alaska	30.8	219	600	May 27	July 30
Pat San Marie	37.5	199	850	June 3	August 7

Table 3.--Characteristics and dimensions of the 83-112 eastern otter trawl used during the 1987 survey.

Characteristics	Dimensions
Mean path width	
Alaska	16.41 m
Pat San Marie (≤ 100 m)	16.67 m
Pat San Marie (> 100 m)	17.80 m
Vertical opening	
Alaska	2.30 m
Pat San Marie (≤ 100 m)	2.24 m
Pat San Marie (> 100 m)	2.17 m
Headrope length	25.30 m
Footrope length	34.10 m
Mesh size	
Wing and body	102 mm
Belly and codend	89 mm
Codend liner	38 mm
Accessory gear	
Door width	1.80 m
Door length	2.70 m
Dandyline length	54.90 m
Chain extension	61 cm

that could not safely be brought aboard the vessel, the catch was released and a new sample obtained by conducting a shorter tow, of 10 to 15 minutes.

Catches of less than approximately 2,500 lbs. (1,150 kg) were entirely processed; larger catches were weighed with a dynamometer and a subsample to be processed was taken from one side of the net--left or right as the net appears while fishing--in order to avoid any bias in the subsample that might result from vertical stratification of species within the codend (Hughes 1976). Pacific halibut and crab species of the genera Paralithodes (red and blue king crabs), Chionoecetes (snow (Tanner) crabs), and Erimacrus (hair crabs) were sampled at a rate of 100%, regardless of total catch size. Economically important fish and invertebrates in the catch (or subsample) were sorted to species with the exception of the two Atheresthes flounders, arrowtooth flounder and Kamchatka flounder, which were grouped as "arrowtooth flounder" due to the difficulty of differentiating these species in the field. A similar identification problem occurs with the two Bering Sea species of Hippoglossoides flounders, flathead sole and the less abundant Bering flounder. Although these species are readily distinguishable in some portions of their ranges, in areas of overlap they appear to hybridize and are difficult to differentiate. In previous years, these species have been combined as "flathead sole" in biomass and size-composition analyses. In 1987, however, all Hippoglossoides flounders were identified to species, using gillraker count as a determining factor for individuals with ambiguous appearance, and statistics are presented separately for flathead sole and Bering flounder in this report. Minor species of fish and invertebrates were sorted to the lowest taxonomic level practicable within time constraints of the survey. The catch of each species was entirely weighed and enumerated either by a complete count

or by counting a weighed subsample. Weights and numbers of individuals from a subsampled catch were then extrapolated for the total catch.

Size composition data were collected for each commercially important species. Walleye pollock, Pacific cod, and yellowfin sole were measured at every station, regardless of the number taken while other species were usually measured at every station except on some occasions when only a few specimens were caught (Table 4). All Pacific halibut encountered were measured alive, tagged if possible, and returned immediately to the sea. For other commercial species present, random subsamples of up to approximately 200 individuals (300 in the case of walleye pollock) were sexed and measured (to the nearest centimeter) from the tip of the snout to the end of the mid-caudal fin rays. Viable Pacific cod not sacrificed for length-frequency data were removed to a live-tank, tagged, measured, and returned to the sea as quickly as possible.

Age-structure samples, stratified by sex and length, were collected from selected commercially important species in both the northwestern and southeastern divisions of the survey area (Table 5). Both scale scrapes and dorsal fin rays were taken from Pacific cod; otoliths were used for age determination in all other species. Ten structures per sex/centimeter interval were collected for walleye pollock and yellowfin sole, six for Pacific cod, and five for all other major species. In the case of the Hippoglossoides flounders, otoliths were collected only from individuals positively identified as flathead sole.

Stomach samples were collected from one or two of the most prevalent commercial species in each haul, and preserved in formalin for later identification of the contents in the laboratory by the Food Habits Program of the NWAFC (Table 6). Up to 20 stomachs per haul (to a maximum of 40 per day) were taken from walleye pollock, yellowfin sole, Pacific cod, and Atheresthes

Table 4.--Number of length measurements taken during the 1987 eastern Bering sea groundfish survey.

Species	Length measurements by subarea 1	2	3	4	5	6	Total
Walleye pollock	2,029	997	8,990	10,891	1,937	10,144	38,828*
Yellowfin sole	9,867	7,885	8,629	4,867	--	--	31,248
Rock sole	7,632	4,826	6,923	5,946	124	611	26,202*
Flathead sole	302	10	4,666	1,911	4,229	2,785	14,029*
Pacific cod	2,659	760	2,034	3,228	438	991	10,507*
Alaska plaice	1,050	2,252	1,378	3,727	--	128	8,542*
Arrowtooth flounder	84	--	2,243	1,280	2,208	2,031	8,119*
Bering flounder	--	7	--	1,490	--	53	2,570*
Pacific halibut	386	94	181	115	63	97	988*
Rex sole	2	--	39	6	364	114	525
Longhead dab	89	412	--	--	--	--	501
Greenland turbot	--	--	--	21	1	60	377*
Pacific herring	--	--	--	150	--	--	210*
Northern rockfish	--	--	--	--	102	--	102
Butter sole	39	--	58	--	--	--	97
Sablefish	--	--	1	--	17	2	83*
Starry flounder	25	2	16	--	--	--	43

*Some length measurements were made in hauls that fell outside the standard survey area; measurements taken in the six subareas therefore do not sum to the total.

Table 5.--Number of age structures collected, by species and subarea, during the 1987 eastern Bering Sea survey.

Species	Age structures collected by subarea						
	1	2	3	4	5	6	Total
Walleye pollock	242	37	542	560	0	166	1,656*
Pacific cod	264	72	189	343	15	91	1,012*
Yellowfin sole	354	420	43	42	0	0	859
Rock sole	195	0	60	125	0	54	434
Alaska plaice	91	28	48	111	0	9	287
Flathead sole	46	0	205	210	28	28	517
Arrowtooth flounder	0	0	202	98	163	153	616
Greenland turbot	0	0	0	12	0	37	164*

*Some age structures were collected outside the standard survey area, therefore the numbers collected for the six subareas do not sum to the total.

Table 6.--Biological data collected for special studies during the 1987 eastern Bering Sea survey.

Species	Stomach samples collected	Number tagged
Walleye pollock	1,323	--
Pacific cod	829	700
Yellowfin sole	918	--
Rock sole	227	--
Flathead sole	540	--
Alaska plaice	168	--
Arrowtooth flounder	332	--
Greenland turbot	77	5
Pacific halibut	--	258

flounders (mixed), and up to 5 per haul from rock sole and Alaska plaice. Stomachs were collected from the relatively scarce Greenland turbot whenever this fish was caught.

Bottom temperature was determined at each station with an expendable bathythermograph (XBT) cast, and surface temperature was taken by bucket thermometer.

Data Analysis

A brief description of the procedures used in analysis of RACE Bering Sea survey data follows. For a detailed description see Wakabayashi et al. (1985).

Field identification was uncertain for a number of species, for which catch and length data were combined into the following categories for all analyses: total skates, Atheresthes flounders, Gymnocanthus sculpins, Triglops sculpins, Icelus sculpins, Myoxocephalus sculpins, total snailfishes, total octopuses, and total squids.

Relative fishing powers of the two vessels were determined for each species by comparing the catch per unit effort (CPUE), in kilograms per hectare trawled, obtained by each vessel for an equal number of stations over the same general region of the survey area. The need for a fishing power correction factor was assessed for each species by determining whether the distributions of CPUE values obtained by the two vessels were statistically equivalent, based on a method described by Geisser and Eddy (1979). This procedure involves a "discrepancy" statistic, D, defined as the sum of squared deviations of the observed CPUEs from their predicted values. D_1 is calculated under the assumption that the CPUE distributions for the two vessels are indistinguishable, using a predicted value for each observation equal to the grand mean of all other CPUE values. D_2 is calculated under the assumption of

distinct CPUE distributions for each vessel; in this case, the predicted value of an observation is the mean of all other CPUE values obtained by that vessel. If D_1 exceeds D_2 for a given species, the CPUE distributions obtained by the two vessels are statistically distinct and a fishing power correction factor is applied. For such species, the vessel with the higher catch rate was assigned a fishing power of 1.0, and catch weights and numbers taken by the less efficient vessel were multiplied by a correction factor equal to the ratio of the CPUE value of the more efficient vessel to that of the less efficient vessel.

Mean catch rates for each species were calculated in kilograms per hectare and number per hectare for each of the 10 statistical strata. Mean catch rates by subarea and for the overall survey area were computed as weighted means of the component stratum means (weighted by stratum area). Biomass and population estimates were derived for each stratum by multiplying the stratum mean CPUE by the stratum area. Stratum totals were then added together to produce the estimates for each subarea and for the total area.

In estimating the size-composition of populations of principal commercial species, length-frequency data obtained at each station were extrapolated to produce an estimate of the number of fish per sex-centimeter interval per hectare trawled at each station. These values were combined for all stations within a given stratum to estimate relative length frequencies for the stratum population. The relative frequencies were then applied to the stratum population estimate to obtain estimates of the number of fish in each size category in the stratum. Finally, stratum estimates were summed to derive the estimated size composition by subarea and for the overall survey area.

RESULTS

Environmental Conditions

Sea surface temperatures recorded during the 1987 survey ranged from 0.0°C to 10.1°C. Surface temperature tended to increase from east to west across the shelf (Fig. 4), which may reflect warming of the surface water during the summer as the survey progressed. Bottom temperatures ranged from -1.0°C to 6.0°C, with the warmest temperatures (above 4°C) occurring in shallow waters along the coastline, in the vicinity of the Pribilof Islands, and in the southern portion of the outer shelf (Fig. 5). The coldest bottom temperatures observed were in the northern extreme of the central shelf, in the region surrounding St. Matthew Island. However, the mass of sub-zero bottom water that has been observed extending south and east from the vicinity of St. Matthew Island in previous years (Halliday and Umeda 1985, Halliday and Sassano 1988) was not present in 1987. The mean bottom water temperature for the total survey area in 1987 was 3.2°C (Fig. 6). This value falls near the middle of the range of mean summer bottom water temperatures observed in years in which the total standard area has been surveyed (2.3°C to 5.1°C). Mean bottom temperatures observed over a more limited region of the southeast Bering Sea, which has been sampled annually since 1972, have ranged from 1.2°C to 4.8°C; the 1987 value for this area was 3.9°C, somewhat warmer than average.

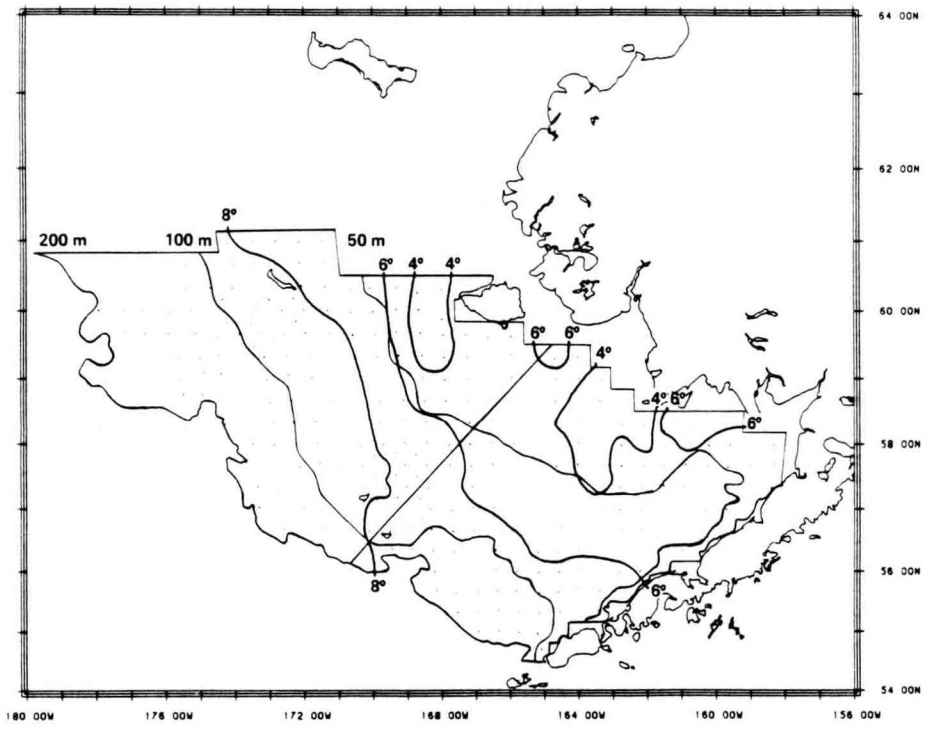


Figure 4.--Distribution of surface water temperatures (°C) observed during the 1987 eastern Bering Sea survey.

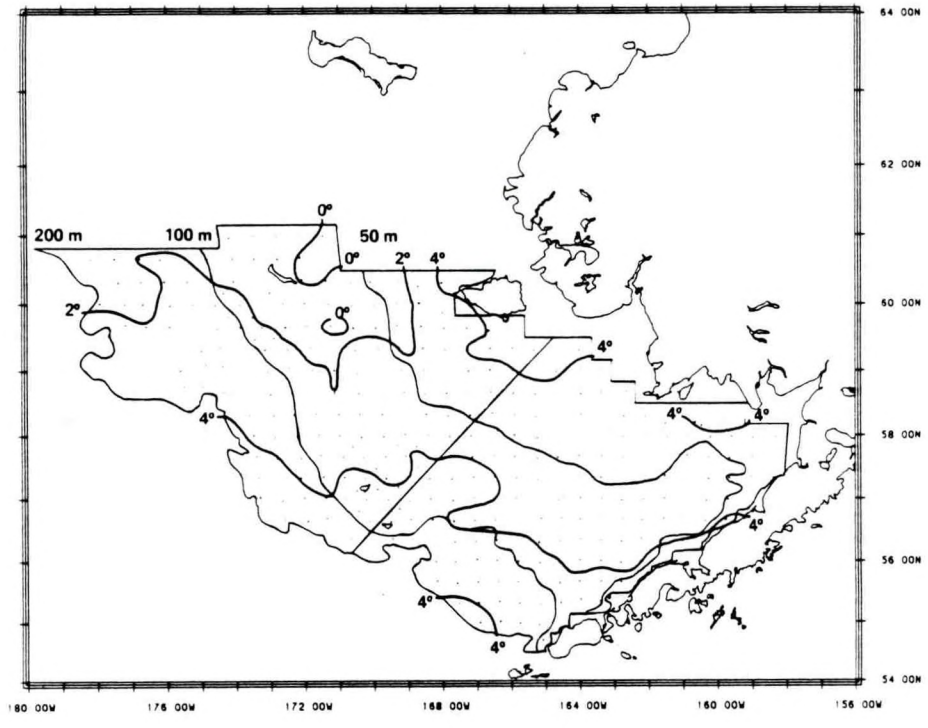


Figure 5.--Distribution of bottom water temperatures (°C) observed during the 1987 eastern Bering Sea survey.

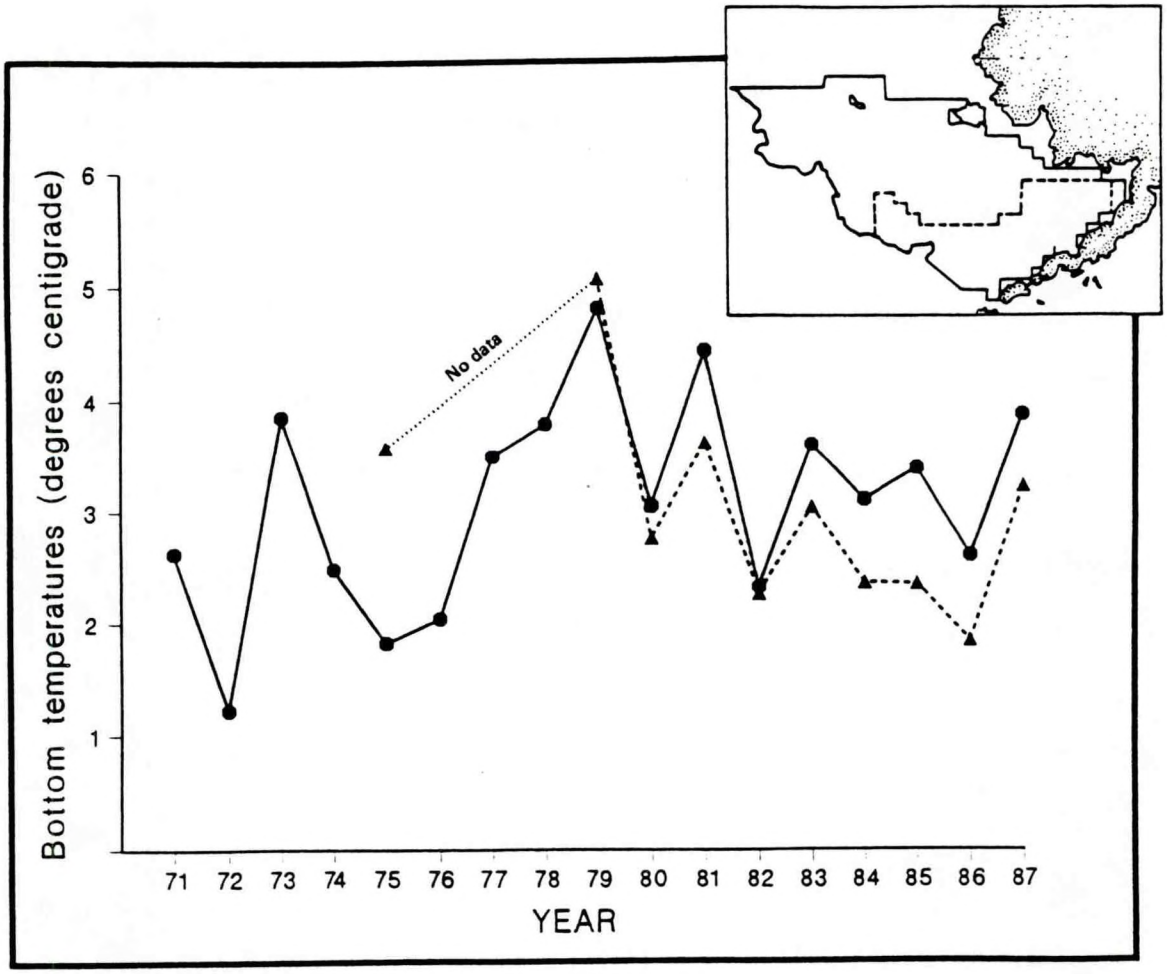


Figure 6.--Mean summer bottom water temperatures, based on bathythermograph casts made during Northwest and Alaska Fisheries Center groundfish surveys. The solid line represents data for the southeast Bering Sea only (see inset), 1971-87; the dashed line represents data for the entire survey area (1975, 1979-87).

Relative Fishing Powers of the Participating Vessels

A total of 284 tows, 142 for each vessel, were used in statistical comparison of mean catch rates for each species encountered and calculation of relative fishing power (Fig. 7). Comparison of discrepancy statistics (Geisser and Eddy 1979) indicated that the Pat San Marie was significantly more efficient at capturing Pacific cod than the Alaska (Table 7). Catches of cod were standardized to the catch rate of the more efficient vessel. D_1 also exceeded D_2 for catches of Pacific halibut; however, the difference was considered too small to justify the application of a fishing power correction for this species. No statistically significant differences in catch rate between the two vessels were found for the remaining commercially important species. Discrepancy statistics were not calculated for species groups; catch rates, however, are given in Table 7.

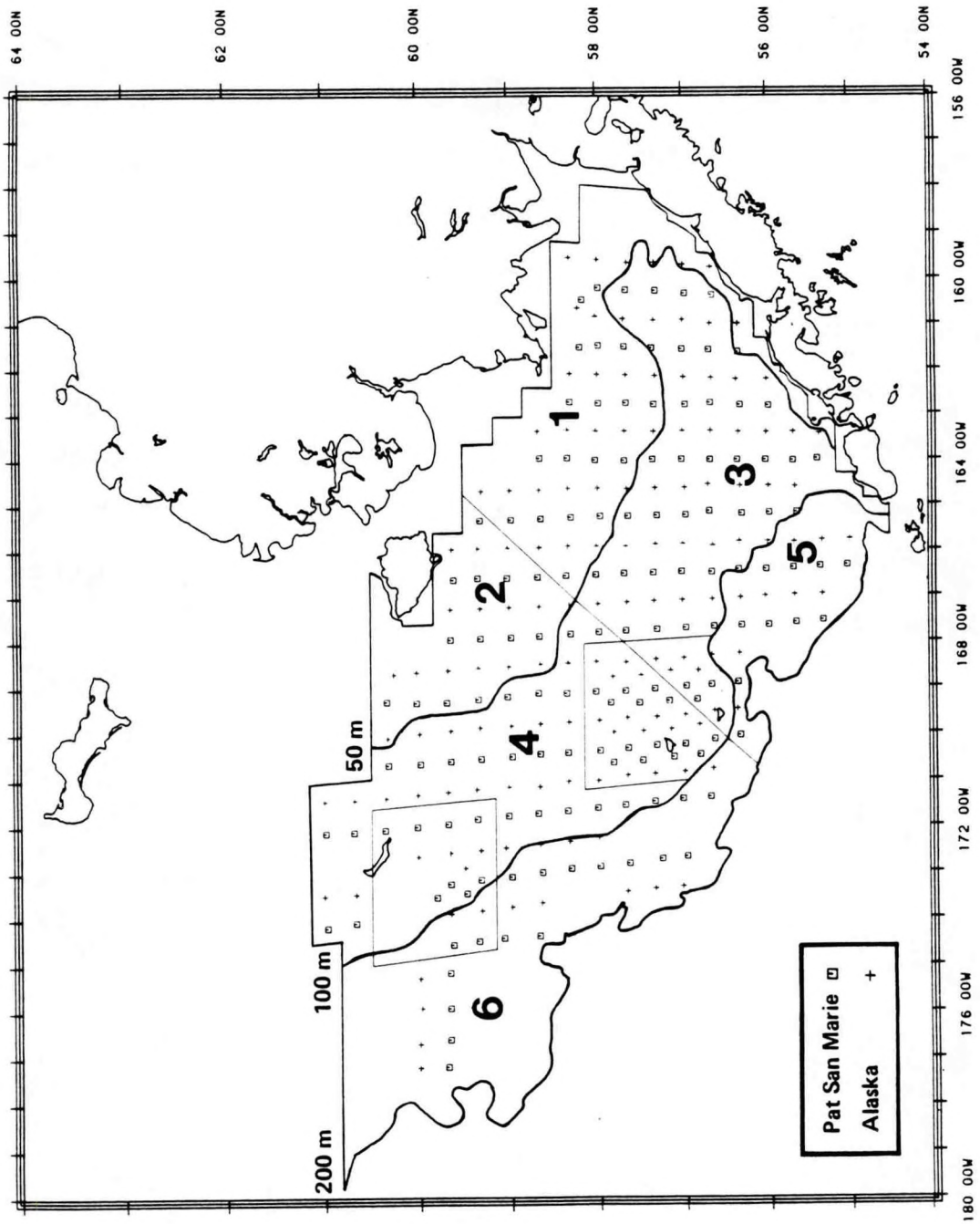


Figure 7.--1987 Survey stations included in fishing power analysis.

Table 7.--Mean catch rates obtained by the Alaska and the Pat San Marie for commercially important species and major taxonomic groups, with Geisser and Eddy discrepancy statistics, for alternate-row stations included in 1987 fishing power analysis.

Species	Stations with catch		Mean CPUE (kg/ha)		Ratio of catch rates	Geisser and Eddy statistics	
	Alaska	Pat San Marie	Alaska	Pat San Marie	Alaska/ Pat San Marie	D_1	D_2
Walleye pollock	133	139	88.872	98.355	0.9036	11257661	11322588
Pacific cod	139	140	18.418	22.165	0.8309	136952.2	136809.6[a]
Sablefish	4	5	0.019	0.046	0.3943	98.29004	98.66972
Pacific herring	16	13	0.134	0.206	0.6522	536.6486	540.0789
Yellowfin sole	110	102	54.546	59.936	0.9101	2672089	2687114
Rock sole	133	127	30.379	30.689	0.9899	784118.0	789676.9
Flathead sole	107	118	7.783	9.388	0.8290	70778.99	71087.61
Bering flounder	29	21	0.283	0.239	1.1845	207.1437	208.4993
Alaska plaice	112	112	13.971	14.343	0.9741	181426.7	182687.1
Arrowtooth flounder[b]	71	80	4.820	5.637	0.8551	23012.36	23117.84
Greenland turbot	5	13	0.010	0.134	0.7443	100.2787	100.9201
Pacific halibut	82	86	1.531	2.121	0.7217	3994.078	3994.019[c]
Smelts[d]	32	46	0.064	0.064	1.0018	--	--
Sculpins[d]	118	116	5.733	3.674	1.5606	--	--
Snailfishes[d]	16	19	0.067	0.086	0.7732	--	--
Poachers[d]	114	108	0.353	0.541	0.6535	--	--
Eelpouts[d]	56	68	0.546	0.549	0.9951	--	--
Skates[d]	115	102	6.769	7.272	0.9305	--	--
Bairdi tanner crab	101	109	1.554	1.746	0.8899	6495.182	6530.498
Opilio tanner crab	105	109	17.479	11.216	1.5584	267449.8	266542.0[a]
Hybrid tanner crab	39	24	0.115	0.081	1.4310	63.86384	64.23567
Red king crab	38	36	1.693	1.523	1.1119	10811.13	10887.92
Blue king crab	12	16	0.125	0.281	0.4448	417.8750	419.3302
Shrimp[d]	50	69	0.022	0.061	0.3582	--	--
Squid[d]	5	1	0.001	<0.001	8.8527	--	--
Octopus	9	6	0.291	0.095	3.0622	--	--

[a]Fishing power correction factor applied.

[b]Includes Kamchatka flounder.

[c]Use of a fishing power correction factor statistically indicated but not used due to the closeness of the discrepancy statistics or low sample size.

[d]Discrepancy statistics were not calculated for species groups.

Overall Abundance of Major Fish and Invertebrate Groups and Distribution of Fish Groups

Sixty-three species of fish, representing 19 families, were encountered during the 1987 survey. (A complete listing of fish and invertebrate species captured is given in Appendix B.) The estimated abundances of major fish and invertebrate taxa are summarized by subarea in Tables 8 and 9. Total demersal animal biomass for the overall survey area was estimated at 15.1 million metric tons (t), of which fish species accounted for 80% (12.1 million t), and invertebrates made up 20% (3.0 million t). The greatest concentrations of total demersal fish--made up primarily of cods (family Gadidae, estimated at 6.4 million t) and flatfishes (family Pleuronectidae, 5.1 million t)--were located in Bristol Bay, in the Pribilof Island area, and on the outer shelf (Fig. 8). Fish were relatively scarce in the northern inner and mid-shelf region.

Skates (family Rajidae) and sculpins (family Cottidae) were moderately abundant, with estimated biomasses of 351,000 t and 195,000 t, respectively. Skates were taken throughout the survey area, but were most abundant in the middle and outer shelf near the 100-m isobath (Fig. 9). The largest concentrations of sculpins were found in the vicinities of the Pribilof Islands and St. Matthew Island (Fig. 10).

Of the less abundant families, eelpouts (approximately 25,700 t total biomass) were rarely captured at depths less than 50 m and were most abundant in the northwest portion of the survey area, near the 100-m depth zone (Fig. 11). Poachers (15,600 t total estimated biomass) were taken consistently though in very low numbers over the inner and middle shelf, and in higher concentrations in the Pribilof area and in Bristol Bay near the 50 m depth

contour (Fig. 12). Clupeids, represented in the trawl samples only by Pacific herring, a semipelagic species poorly sampled by bottom trawls, were taken in low numbers in a few widely scattered tows. A few patches of high abundance were observed in Bristol Bay and near St. Matthew Island (Fig. 13). Total estimated abundance of Pacific herring was 8,000 t. Snailfishes and lumpsuckers (family Cyclopteridae), with a total estimated biomass of 3,800 t, were found primarily in the extreme northwest portion of the survey area at depths greater than 50 m (Fig. 14). Rockfish (family Scorpaenidae, 6,500 t), which inhabit continental slope waters (>200m) almost exclusively, were captured at only two stations, in deep water near the shelf break (Fig. 15). Smelts (family Osmeridae, 2,900 t), which may be more abundant pelagically, were encountered in small quantities throughout the inner shelf, and at somewhat higher levels in the southwestern outer shelf (Fig. 16). Sablefish (the only representative of the family Anaplopomatidae encountered, 2,900 t) and which also primarily inhabits continental slope waters, occurred at only a few stations in the outer shelf area (see Figure 25 in following section).

The most abundant invertebrate groups were crabs, accounting for 41% of the estimated invertebrate biomass, asteriod starfish (27%), and snails (12%).

Table 8.--Biomass estimates for major fish species and fish groups taken during the 1987 bottom trawl survey.

Taxon	Estimated total biomass (t)[a] and 95% confidence interval	Proportion of total animal biomass[b]	Estimated Biomass by Subarea (t) 1	2	3	4	5	6
Gadidae (cods)								
Walleye pollock	5,228,934 ± 24%	0.345	247,128	34,766	947,392	915,050	305,877	2,778,720
Pacific cod	1,145,522 ± 12%	0.076	196,150	58,621	235,204	222,566	93,225	339,756
Other cods	123 ± 120%	<.001	52	1	0	69	0	0
Total cods	6,374,579 ± 21%	0.421	443,331	93,389	1,182,596	1,137,685	399,102	3,118,476
Pleuronectidae (flatfishes)								
Yellowfin sole	2,469,082 ± 15%	0.163	1,210,025	263,251	848,800	146,903	103	0
Rock sole	1,249,361 ± 14%	0.083	563,123	83,831	355,542	198,298	5,294	43,273
Flathead sole	391,925 ± 20%	0.026	18,319	391	144,658	29,963	69,924	128,670
Bering flounder	14,473 ± 29%	0.001	0	574	0	12,495	0	1,404
Alaska plaice	552,470 ± 20%	0.036	62,593	75,158	127,003	250,476	0	37,241
Arrowtooth and Kamchatka flounder	290,698 ± 14%	0.019	1,655	0	65,464	18,787	90,510	114,282
Greenland turbot	10,669 ± 50%	0.001	0	0	0	780	221	9,668
Pacific halibut	84,869 ± 20%	0.006	14,274	5,104	22,326	10,698	12,200	20,267
Other flatfish	47,856 ± 58%	0.003	16,856	1,320	18,680	194	6,057	4,749
Total flatfish	5,111,406 ± 9%	0.338	1,886,844	429,629	1,582,473	668,596	184,310	359,553
Anoplopomatidae								
Sablefish	2,877 ± 119%	<.001	0	0	70	0	1,161	1,645
Clupeidae								
Pacific herring	7,903 ± 81%	0.001	2,069	11	391	5,406	0	27
Cottidae (sculpins)	194,988 ± 27%	0.013	29,955	17,722	41,674	72,737	4,769	28,130
Zoarcidae (eelpouts)	25,664 ± 25%	0.002	83	0	3,288	14,085	443	7,765
Osmeridae (smelts)	2,881 ± 42%	<.001	619	237	462	15	1,549	0
Agonidae (poachers)	15,645 ± 34%	0.001	2,879	1,575	6,030	4,701	195	265
Scorpaenidae (rockfish)								
Pacific ocean perch	220 ± 191%	<.001	0	0	0	0	203	18
Other rockfish	6,235 ± 206%	<.001	0	0	0	0	6,235	0
Total rockfish	6,455 ± 206%	<.001	0	0	0	0	6,437	18
Cyclopteridae (snailfish)	3,769 ± 46%	<.001	4	4	0	2,621	0	1,140
Rajidae (skates)	350,995 ± 17%	0.023	30,064	13,971	76,261	77,832	45,507	107,360
Other fish	6,726 ± 65%	<.001	266	1,543	334	466	2,403	1,714
Total fish	12,103,887 ± 12%	0.800	2,396,113	558,081	2,893,580	1,984,143	645,877	3,626,092

[a]Rounding accounts for minor discrepancies between sums of subareas and total survey area, and between sums of taxonomic subgroups and major groups.

[b]Proportion of total estimated biomass, fish and invertebrates combined, for the total survey area. Total estimated biomass = 15,136,936 t.

Table 9.--Biomass estimates for major invertebrate species and invertebrate groups taken during the 1987 bottom trawl survey.

Taxon	Estimated total biomass (t)[a] and 95% confidence interval	Proportion of total animal biomass[b]	Estimated Biomass by Subarea (t) 1	2	3	4	5	6
Porifera (sponges)	48,384 ± 60%	0.003	1,782	307	40,046	4,751	973	525
Coelenterata (coelenterates)	109,470 ± 39%	0.007	22,512	2,276	38,149	23,771	19,337	3,426
Mollusca								
Gastropoda (snails)	354,774 ± 15%	0.023	36,781	35,434	125,488	96,220	5,982	54,869
Pelecypoda (bivalves)	7,813 ± 50%	0.001	932	2,444	1,660	2,344	103	331
Squids	40 ± 90%	<.001	0	0	0	2	10	29
Octopuses	8,036 ± 103%	0.001	0	0	5,937	296	557	1,246
Other mollusks	5 ± 200%	<.001	0	0	0	5	0	0
Total mollusks	370,669 ± 15%	0.024	37,713	37,878	133,084	98,867	6,652	56,475
Crustacea								
Chionocetes sp. (snow crab)	758,904 ± 18%	0.050	13,189	9,463	113,819	475,412	4,841	142,179
Paralithodes sp. (king crab)	73,820 ± 36%	0.005	15,179	671	51,676	6,097	58	140
Erimacrus isenbeckii (hair crab)	1,951 ± 102%	<.001	71	255	361	1,248	17	0
Paguridae (hermit crabs)	383,311 ± 16%	0.025	39,538	31,658	150,275	108,378	7,108	46,354
Other crab	29,070 ± 45%	0.002	10,892	2,994	6,615	8,134	78	357
Total crab	1,247,056 ± 12%	0.082	78,870	45,041	322,745	599,269	12,102	189,029
Shrimps	2,252 ± 33%	<.001	113	133	186	591	27	1,202
Other crustaceans	3,838 ± 76%	<.001	225	1,478	802	1,224	109	0
Total crustaceans	1,253,147 ± 12%	0.083	79,208	46,652	323,734	601,085	12,237	190,231
Echinodermata								
Asteroidea (starfish)	836,613 ± 16%	0.055	393,473	117,100	187,974	100,756	744	36,567
Ophiuroidea (brittlestars)	159,536 ± 51%	0.011	3,532	402	37,743	18,141	42,029	57,689
Echinoidea (sea urchin)	8,834 ± 74%	0.001	129	2	6,299	600	1,066	737
Holothuroidea (sea cucumbers)	16,765 ± 90%	0.001	2,447	0	14,154	159	4	0
Total echinoderms	1,021,748 ± 15%	0.068	399,581	117,504	246,170	119,656	43,843	94,993
Ascidiacea	220,805 ± 46%	0.015	76,370	28,784	44,780	70,871	0	0
Other invertebrates	8,823 ± 89%	0.001	192	355	1,168	6,235	21	852
Total invertebrates	3,047,754 ± 9%	0.201	617,548	233,732	840,973	926,254	83,066	346,181

[a]Rounding accounts for minor discrepancies between sums by subareas and total survey area, and between sums of taxonomic subgroups and major groups.

[b]Proportion of total estimated biomass, fish and invertebrates combined, for the total survey area. Total estimated biomass = 15,136,936 t.

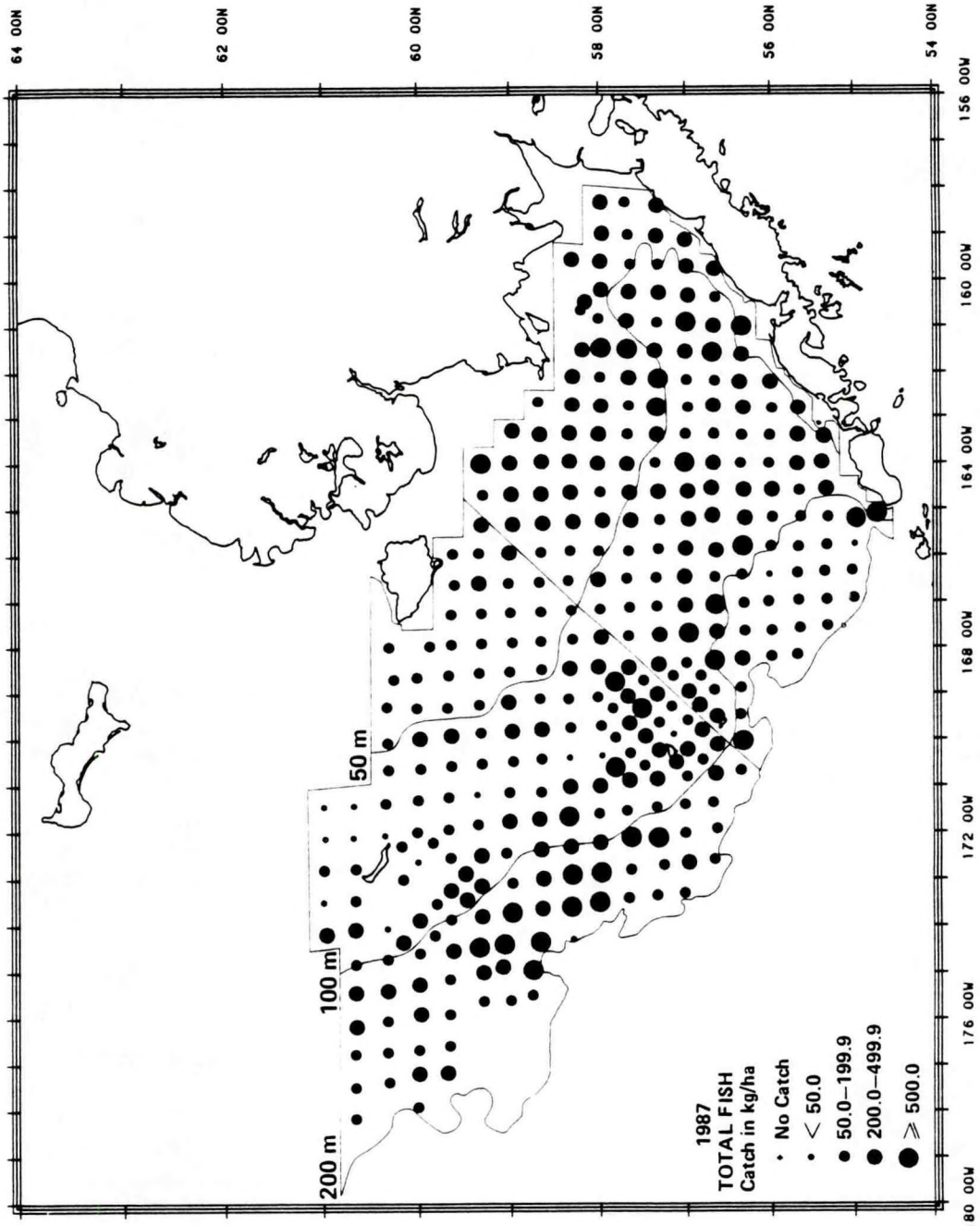


Figure 8.--Distribution and relative abundance in kg/ha of total fish, 1987 eastern Bering Sea groundfish survey.

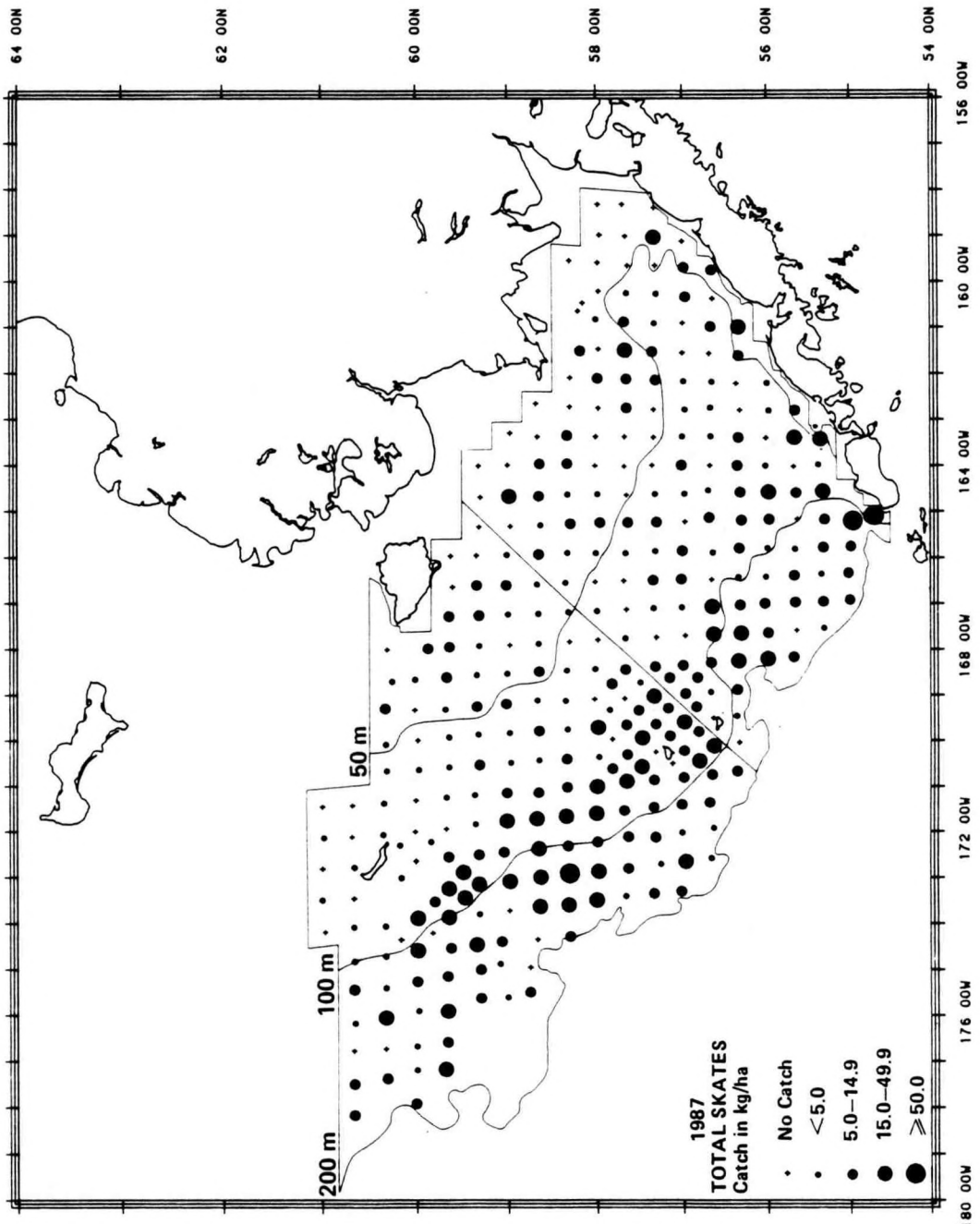


Figure 9.--Distribution and relative abundance in kg/ha of total skates, 1987 eastern Bering Sea groundfish survey.

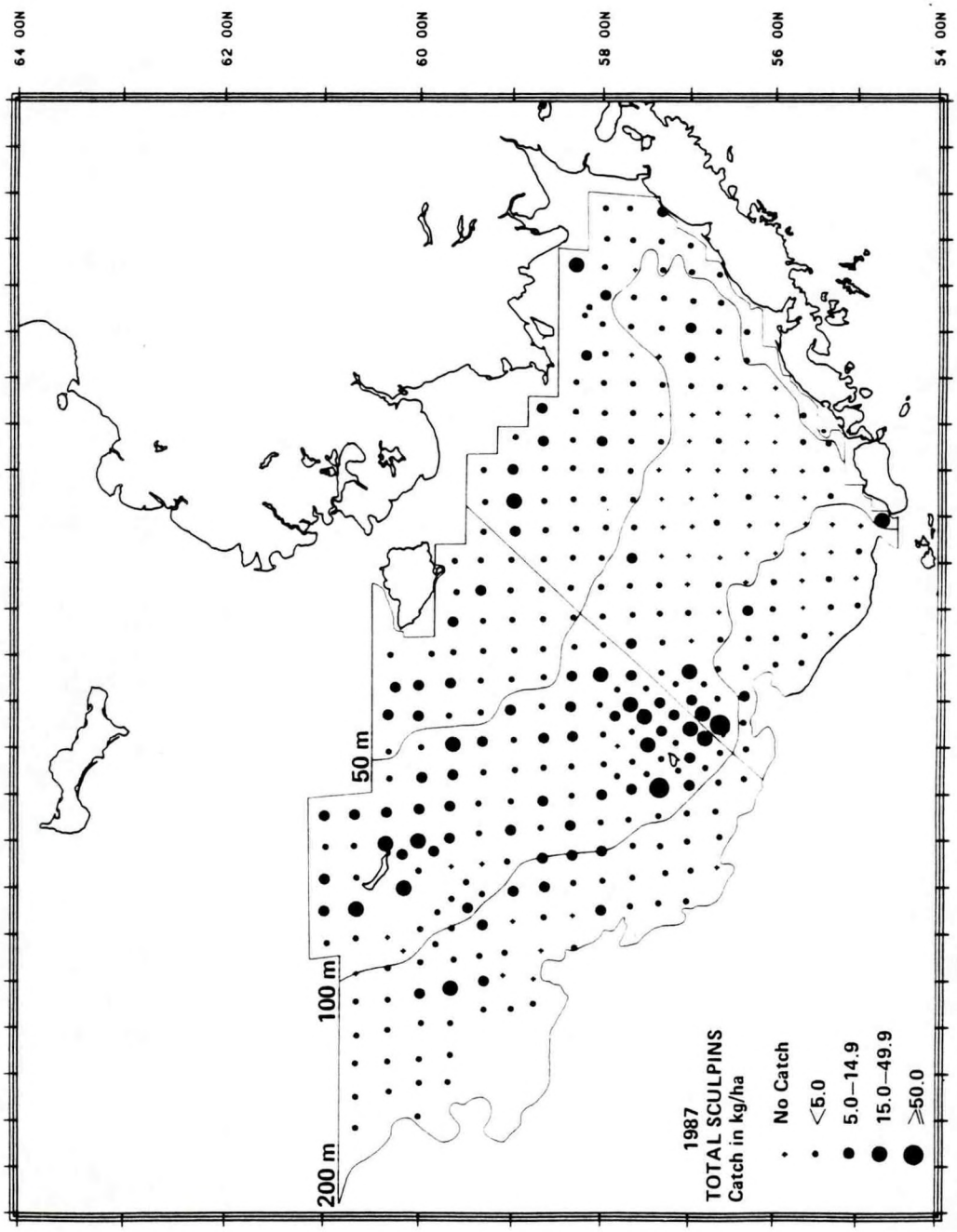


Figure 10.—Distribution and relative abundance in kg/ha of total sculpins, 1987 eastern Bering Sea groundfish survey.

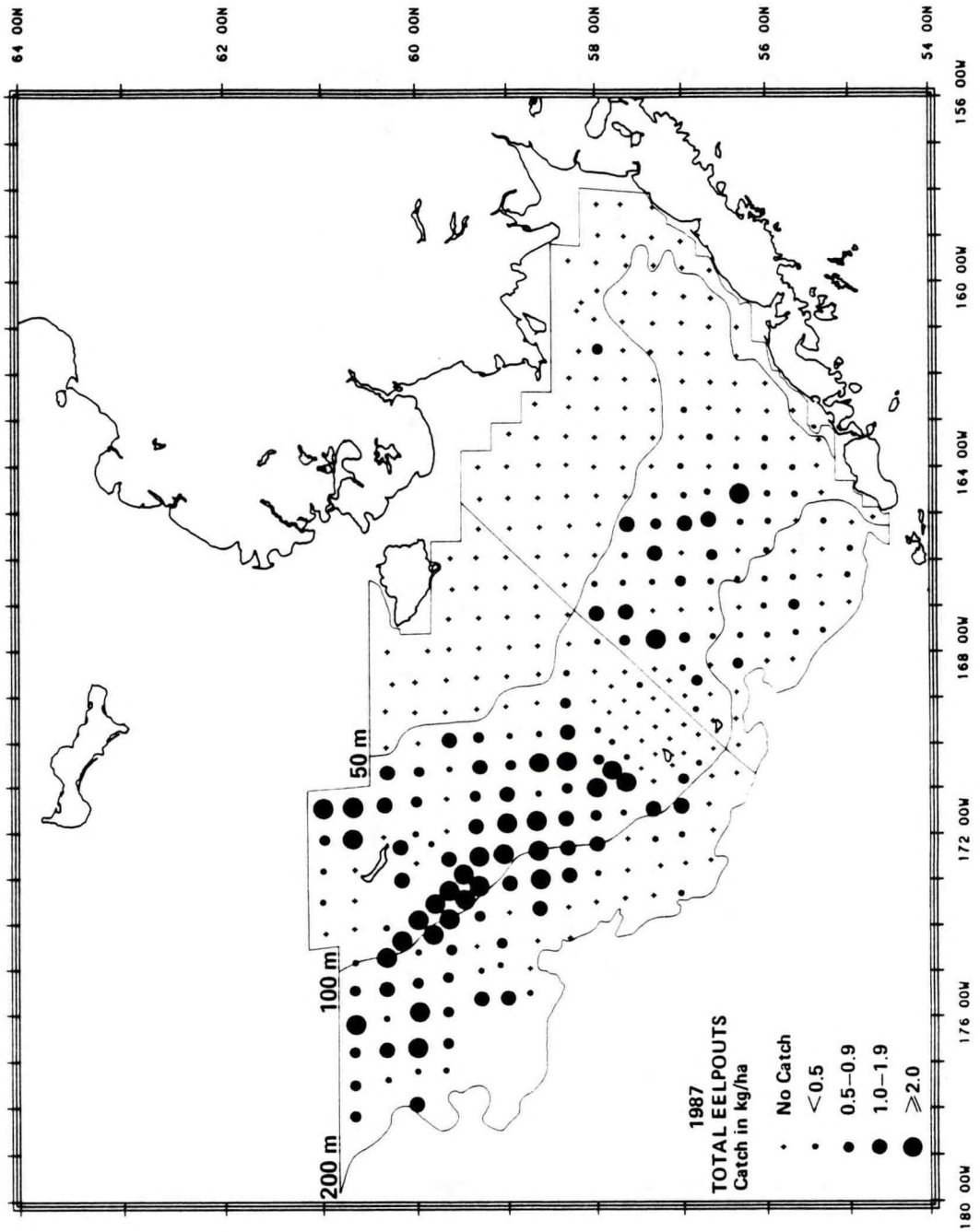


Figure 11.--Distribution and relative abundance in kg/ha of total eelpouts, 1987 eastern Bering Sea groundfish survey.

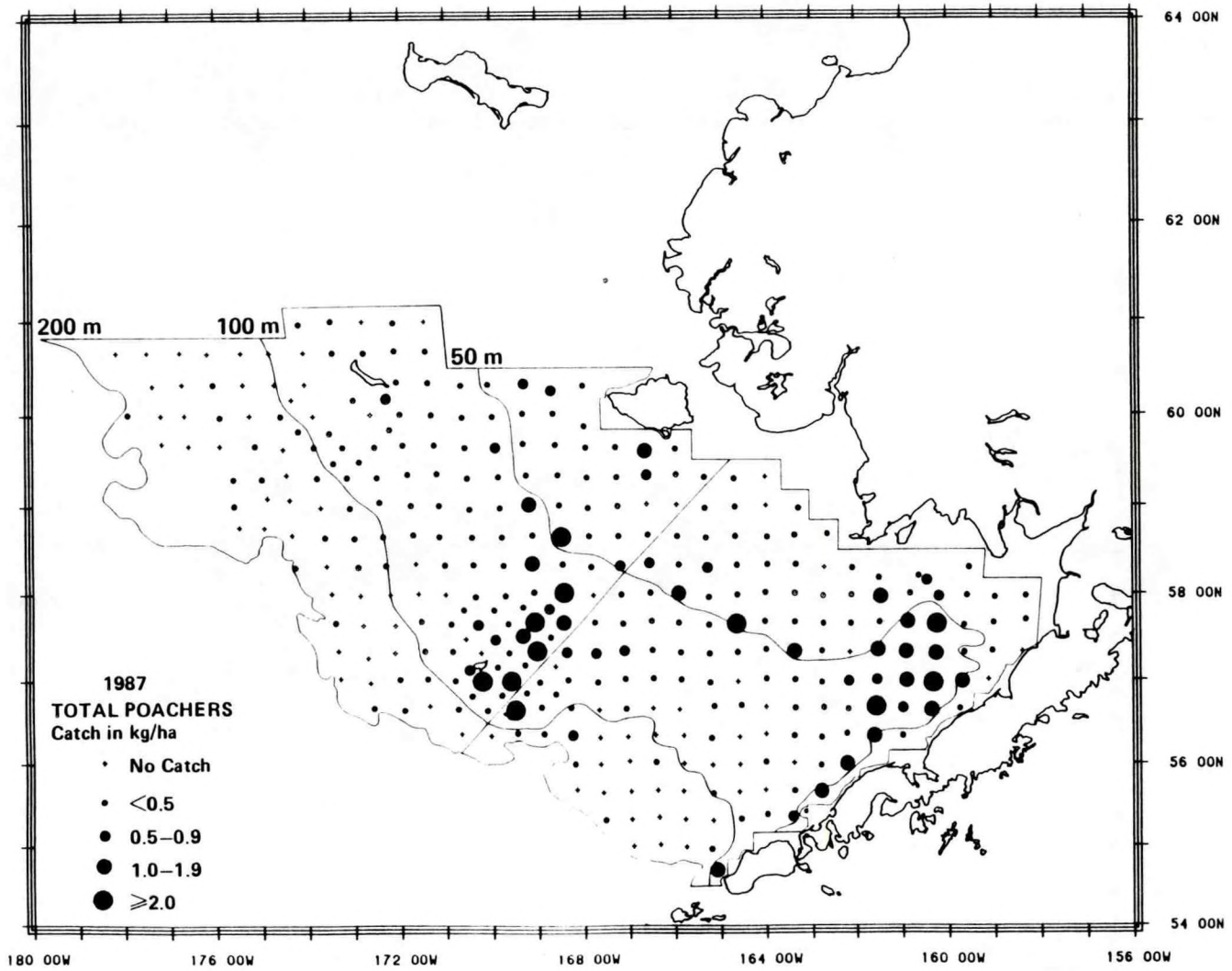


Figure 12.--Distribution and relative abundance in kg/ha of total poachers, 1987 eastern Bering Sea groundfish survey.

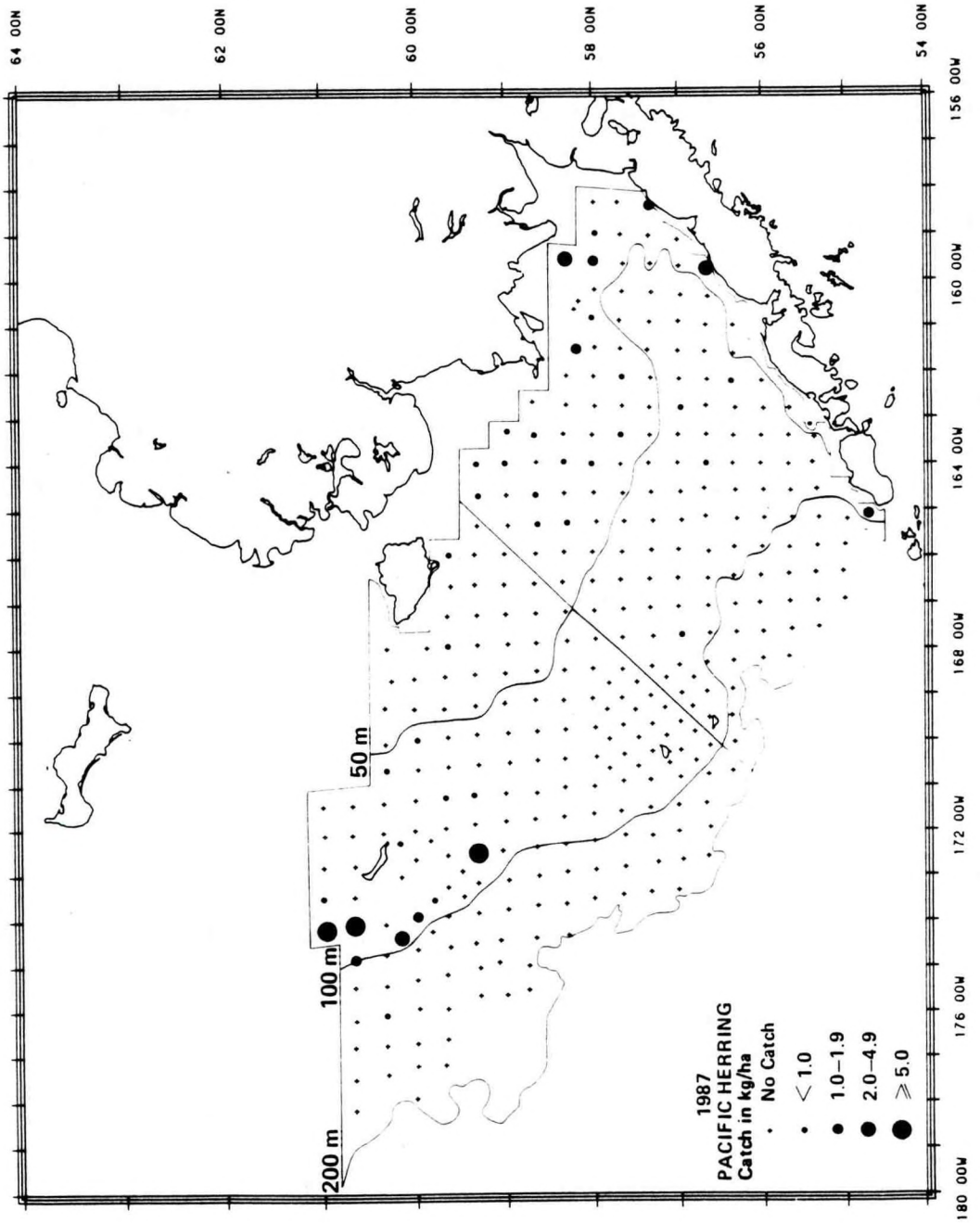


Figure 13.--Distribution and relative abundance in kg/ha of Pacific herring, 1987 eastern Bering Sea groundfish survey.

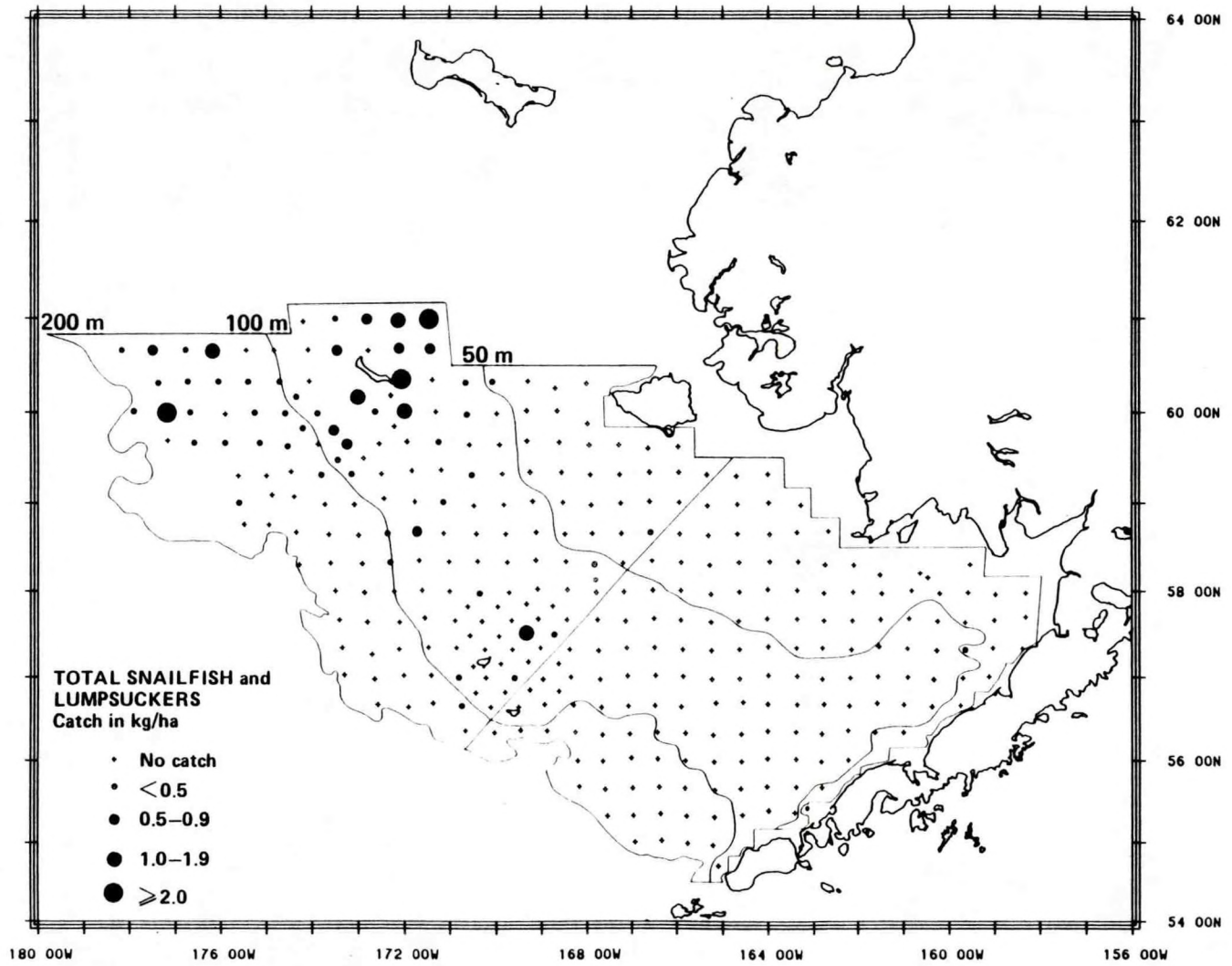


Figure 14.--Distribution and relative abundance in kg/ha of total snailfish and lumpsuckers, 1987 eastern Bering Sea groundfish survey.

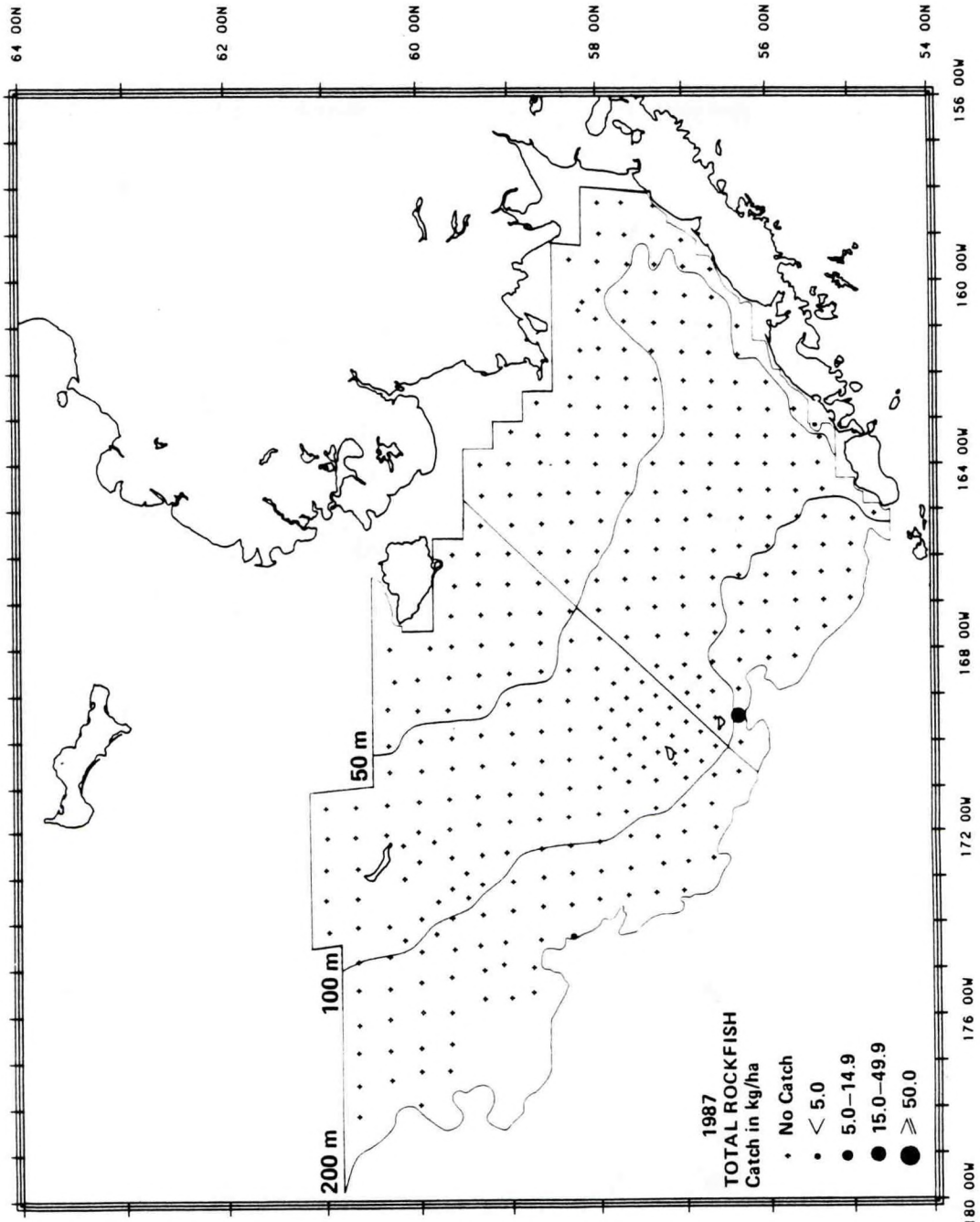


Figure 15.—Distribution and relative abundance in kg/ha of total rockfish, 1987 eastern Bering Sea groundfish survey.

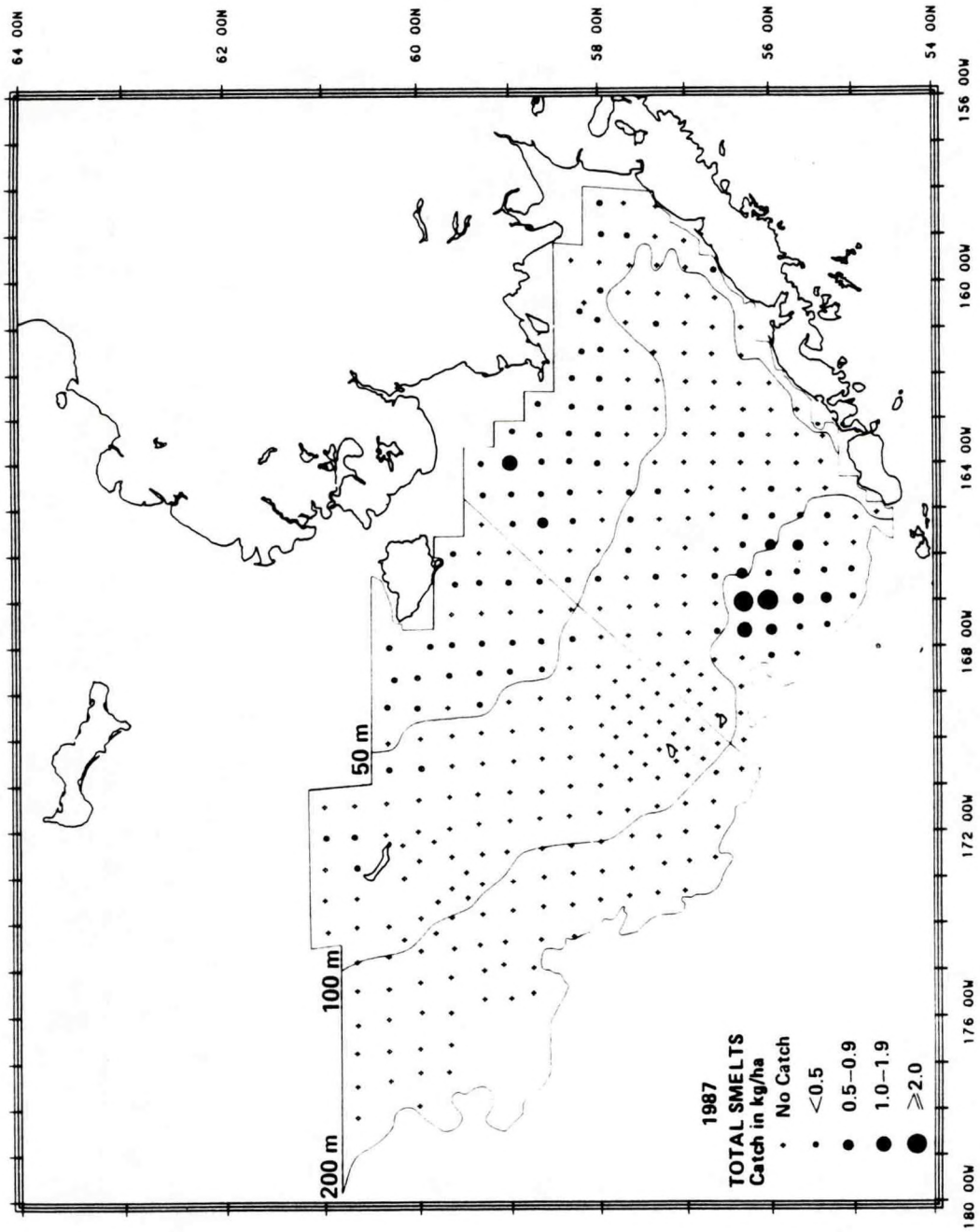


Figure 16.--Distribution and relative abundance in kg/ha of total smelts, 1987 eastern Bering Sea groundfish survey.

Relative Abundance of Individual Fish Species

The relative abundances of the 11 most abundant fish species (or species groups) are illustrated by depth zone and for the overall survey area in Figure 17. These are expressed as percentages of the CPUE that each species contributed to the combined CPUE of these species. (Appendix C lists mean CPUE values for the 100 most abundant fish and invertebrate species taken, in order of relative abundance.) These 11 species accounted for 79% of total animal mean CPUE (326 kg/ha) and for 98% of total fish mean CPUE (260 kg/ha). Yellowfin sole, with an overall mean catch rate of 53.1 kg/ha (20% of total fish CPUE), dominated catches in water less than 50 m deep, while walleye pollock, with an overall mean catch rate of 112.4 kg/ha (43% of total fish CPUE), was by far the most abundant species at depths greater than 50 m. Pacific cod made up a fairly constant 10% of the catch in each of the three depth zones. Rock sole and Alaska plaice were significant components of the catch at depths less than 100 m, while flathead sole and arrowtooth flounder made up larger proportions of catches in water over 100 m. Skates and Pacific halibut were present at low levels in all depth zones.

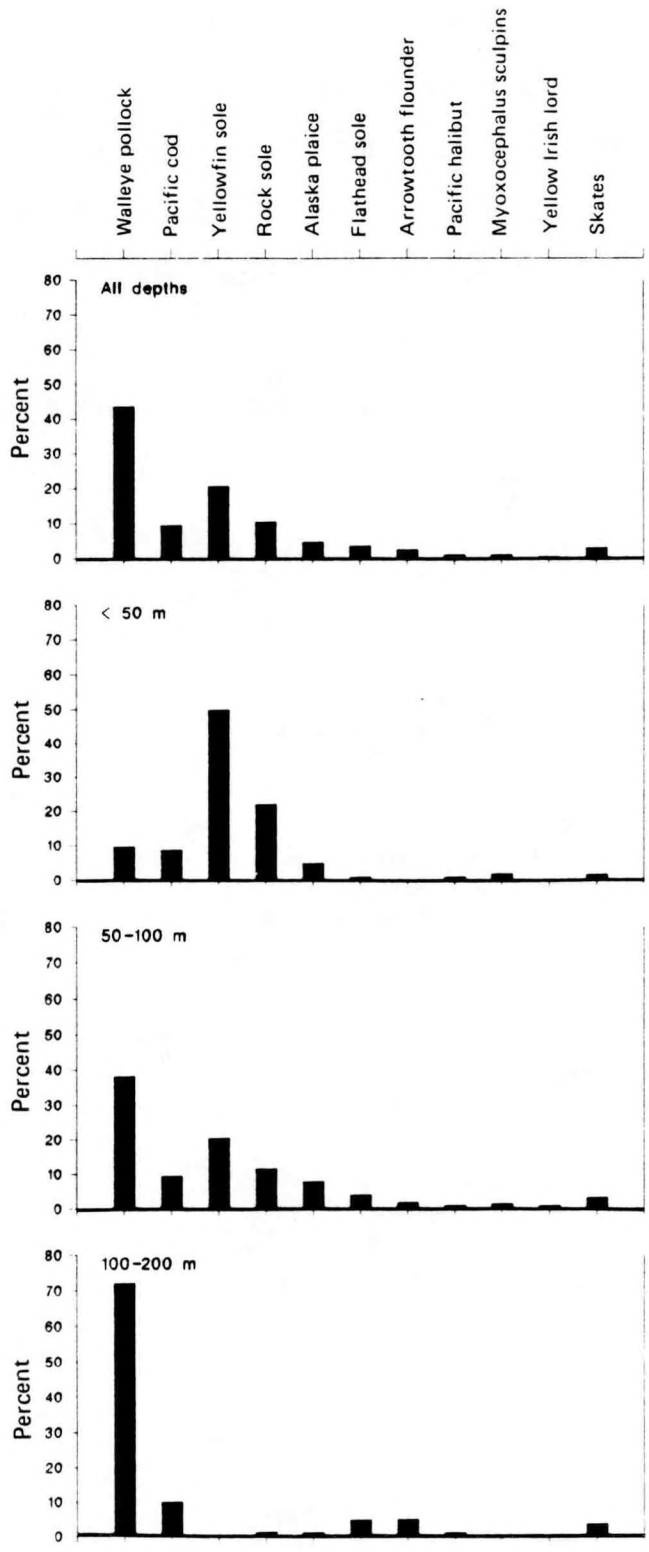


Figure 17.—Relative abundance (% CPUE in kg/ha) of principal groundfish species by depth zone and for all depths combined.

Abundance, Distribution, and Size and Age Composition of Principal Commercial Fish Species

In this section, geographical distribution, biomass and population estimates, and size composition are presented for each of the following economically important eastern Bering Sea groundfish populations: walleye pollock, Pacific cod, sablefish, yellowfin sole, rock sole, flathead sole, Bering flounder, Alaska plaice, Greenland turbot, arrowtooth and Kamchatka flounder, and Pacific halibut (Tables 10-19 and Figures 18-48). Distribution is mapped by CPUE in kilograms per hectare. Estimated biomass, population number, and mean size (by length and weight) are summarized by subarea and for the entire survey area. Size composition is illustrated with histograms of relative length composition by subarea, as well as histograms of estimated population by length interval for the total population.

Detailed computer listings of CPUE, population, and biomass estimates for each species are given by stratum in Appendix D. Population estimates by sex and size class (for the total survey area) are listed in Appendix E.

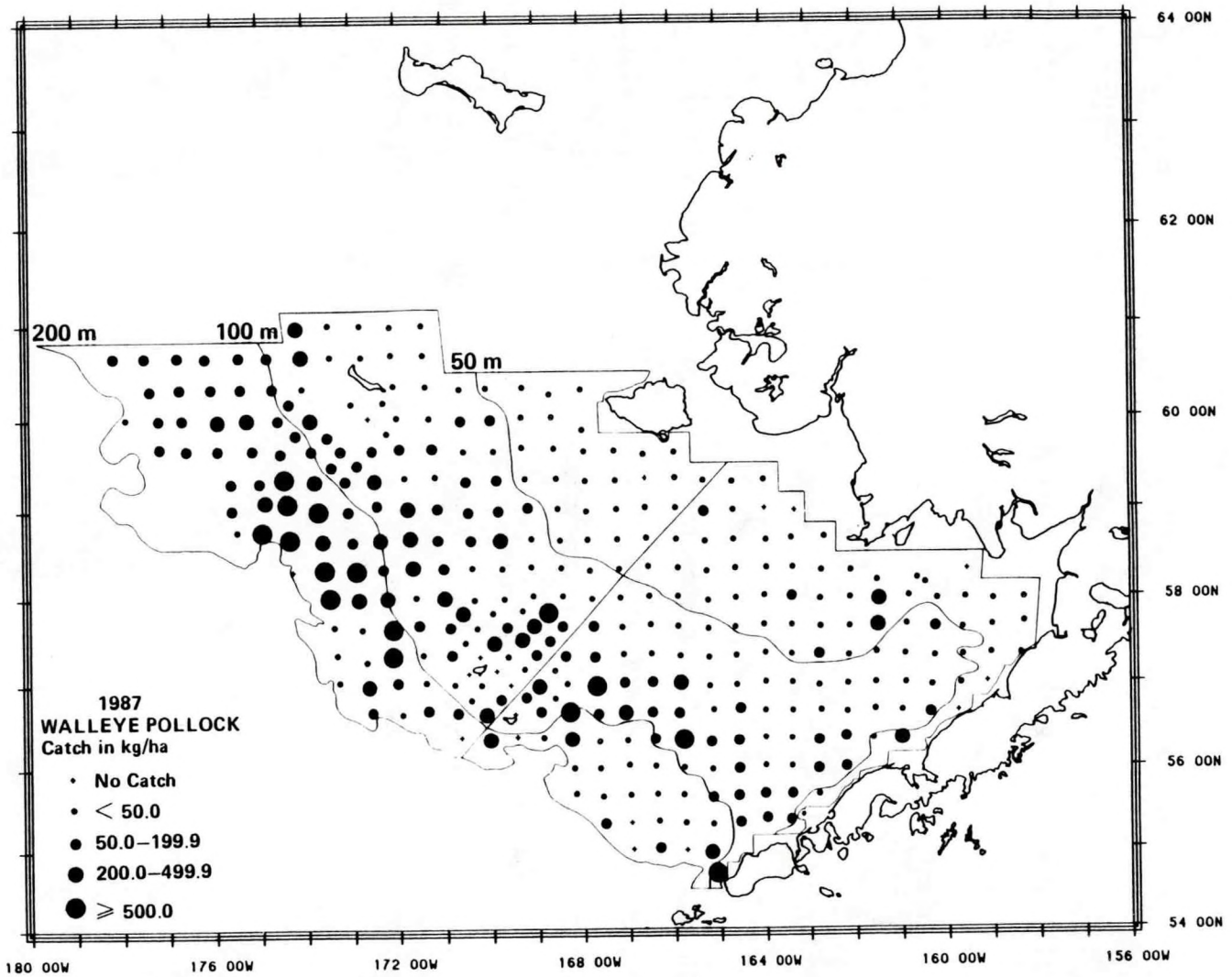


Figure 18.--Distribution and relative abundance in kg/ha of walleye pollock, 1987 eastern Bering Sea groundfish survey.

Table 10.--Abundance estimates and mean size of walleye pollock by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^6)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	31.74	247,128	0.047	216	0.025	1.145	51.5
2	8.47	34,766	0.007	45	0.005	0.768	33.8
3	91.72	947,392	0.181	1,560	0.179	0.607	41.7
4	85.09	915,050	0.175	1,479	0.170	0.619	41.1
5	78.07	305,877	0.058	451	0.052	0.679	43.5
6	289.11	2,778,720	0.531	4,948	0.569	0.562	41.5
All subareas combined[b]	112.44	5,228,934	1.000	8,699	1.000	0.601	41.8
95% confidence interval		± 1,241,097		± 2,297			

[a]Variances of abundance estimates are given in Appendix D-1.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

WALLEYE POLLOCK

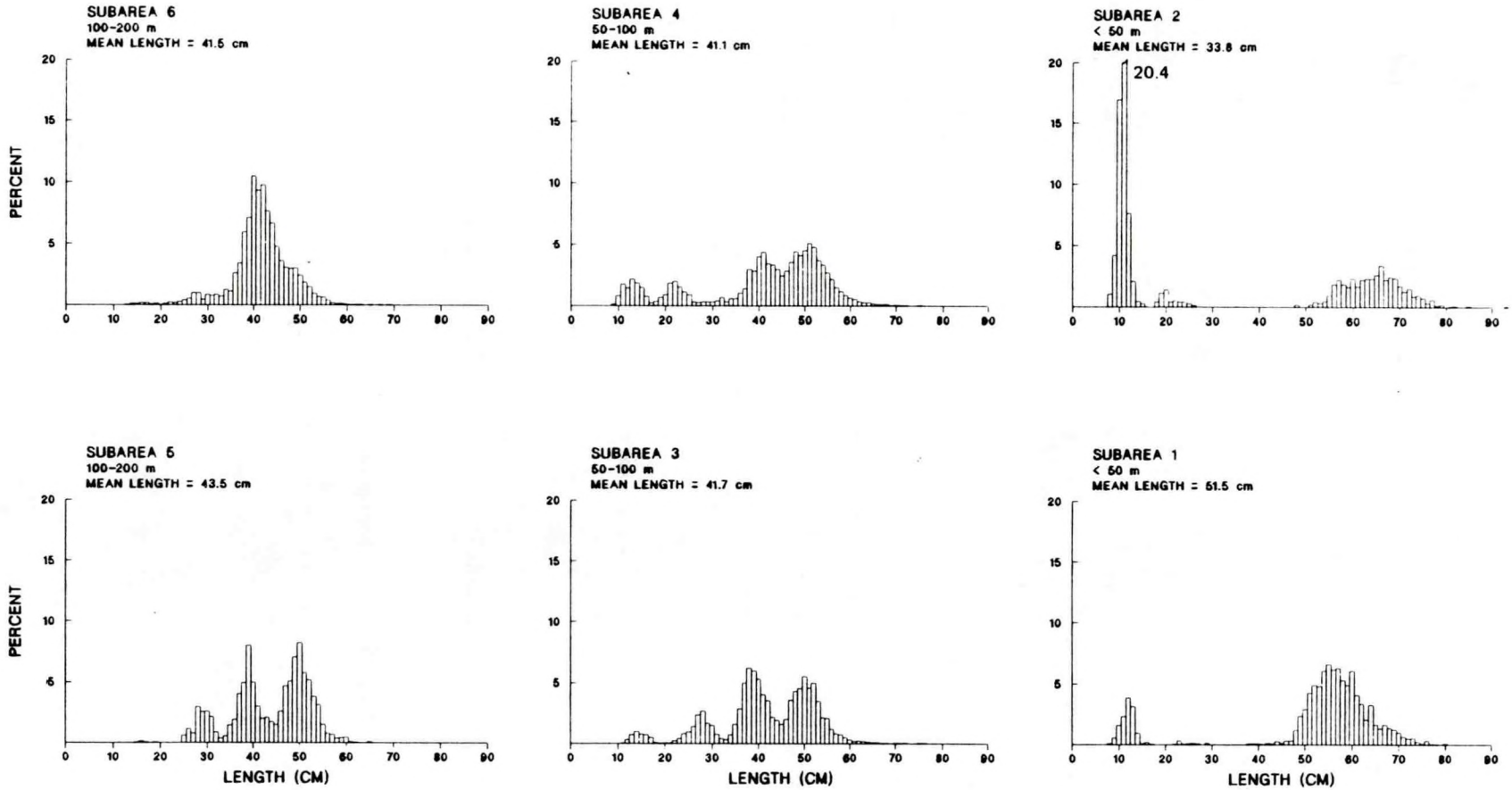


Figure 19.--Estimated relative size composition of walleye pollock (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

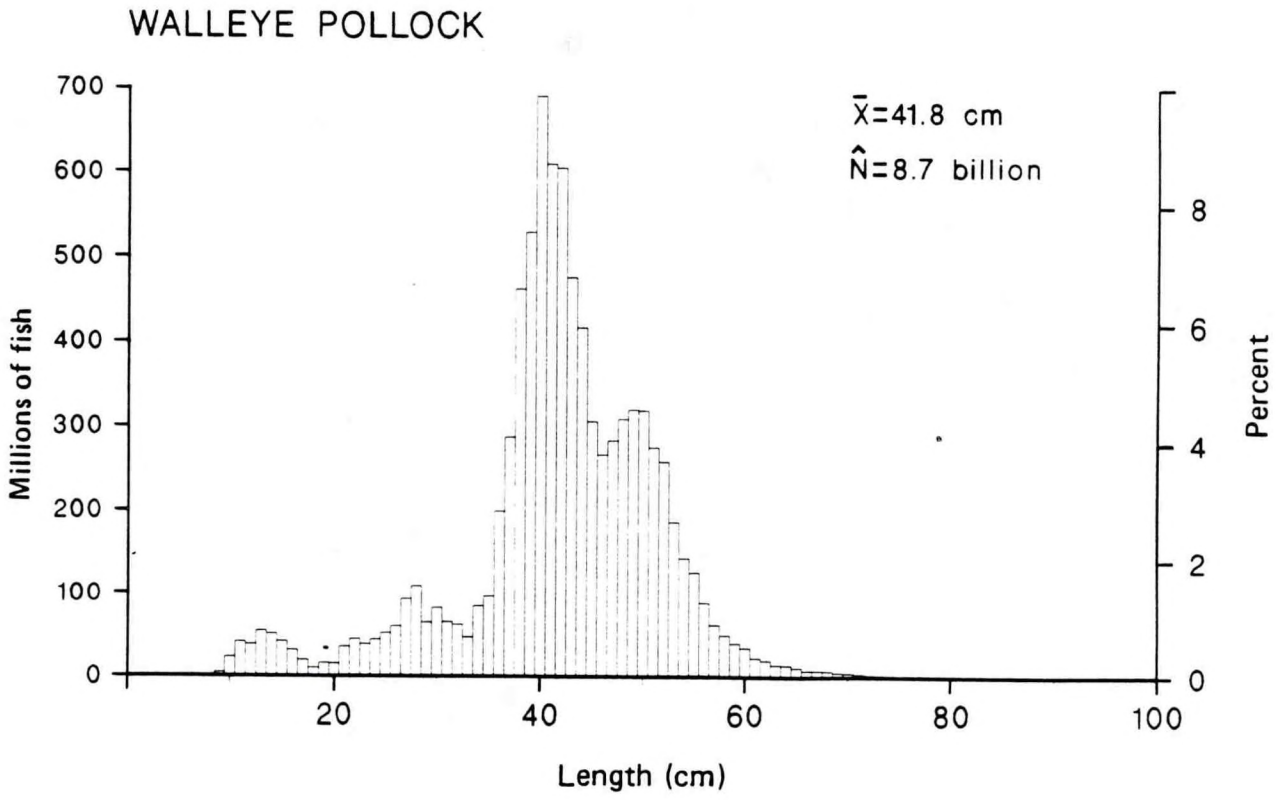


Figure 20.--Estimated size composition of walleye pollock (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

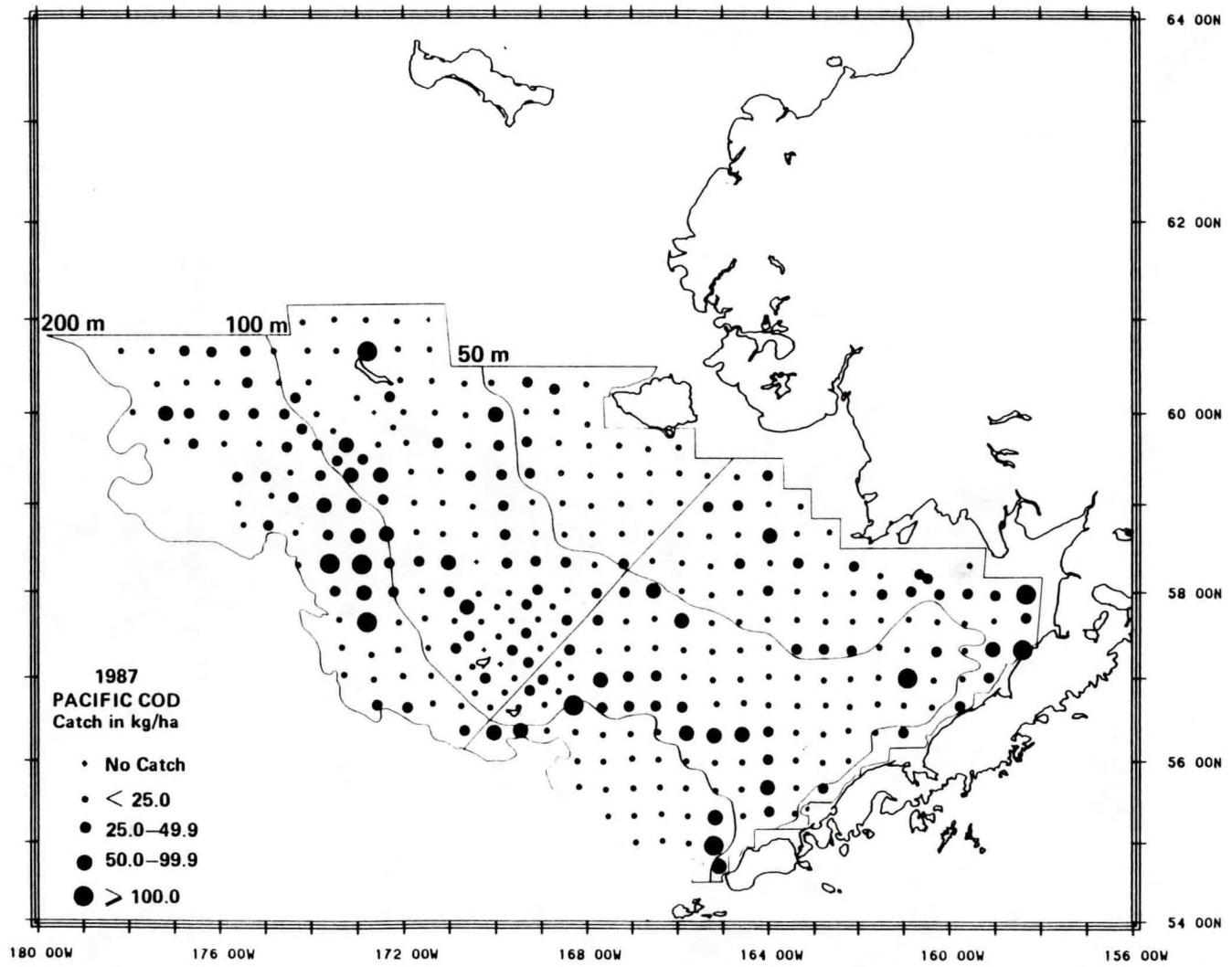


Figure 21.--Distribution and relative abundance in kg/ha of Pacific cod, 1987 eastern Bering Sea groundfish survey.

Table 11.--Abundance estimates and mean size of Pacific cod by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^6)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	25.19	196,150	0.171	178,611	0.237	1.098	38.7
2	14.29	58,621	0.051	42,654	0.057	1.374	43.8
3	22.77	235,204	0.205	203,204	0.269	1.157	42.9
4	20.70	222,566	0.194	193,863	0.257	1.148	43.1
5	23.79	93,225	0.081	25,452	0.034	3.663	62.7
6	35.35	339,756	0.297	110,484	0.146	3.075	60.2
All subareas combined[b]	24.63	1,145,522	1.000	754,269	1.000	1.519	45.2
95% confidence interval		± 140,228		± 99,784			

[a]Variances of abundance estimates are given in Appendix D-2.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

PACIFIC COD

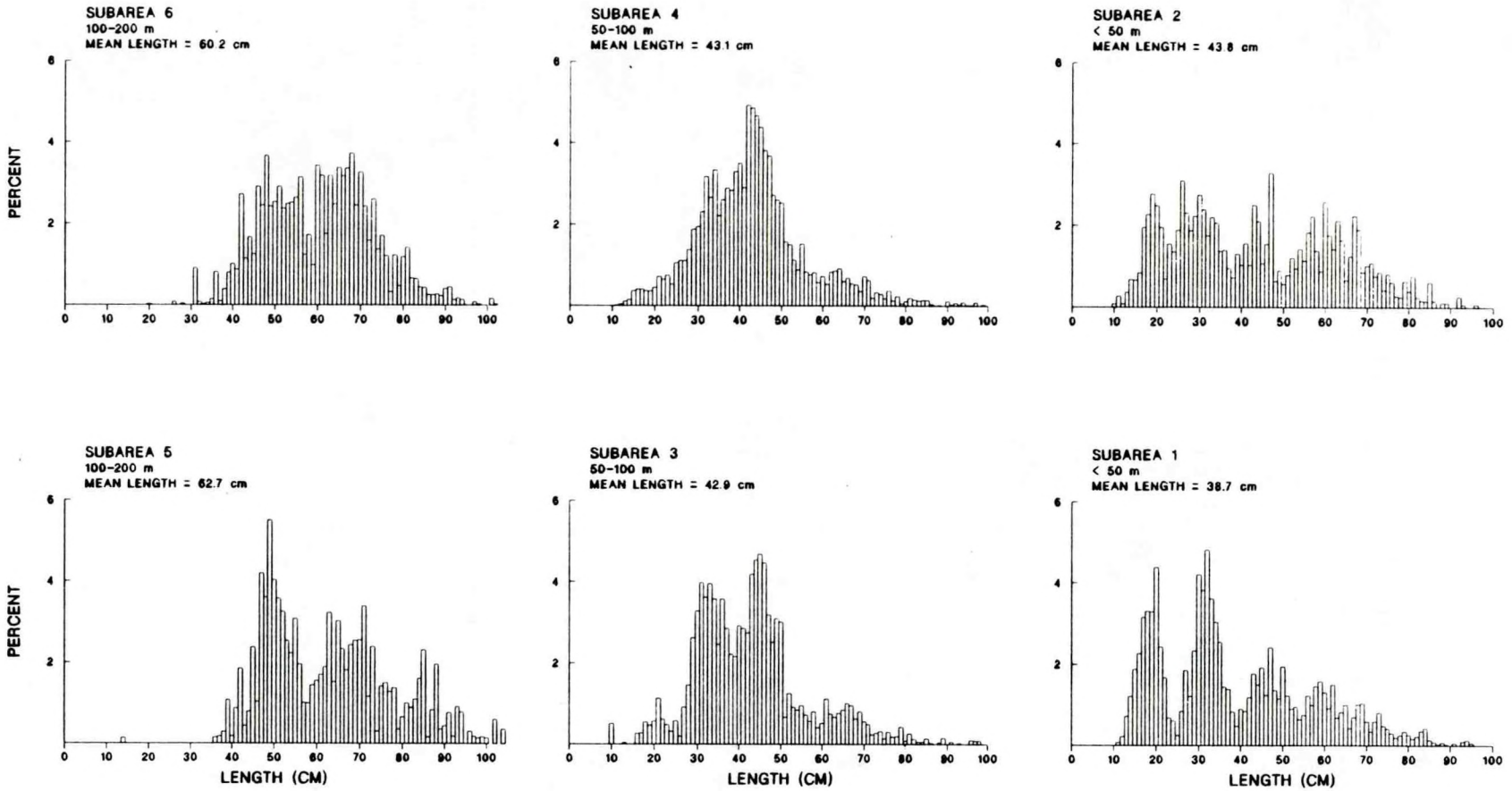


Figure 22.--Estimated relative size composition of Pacific cod (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

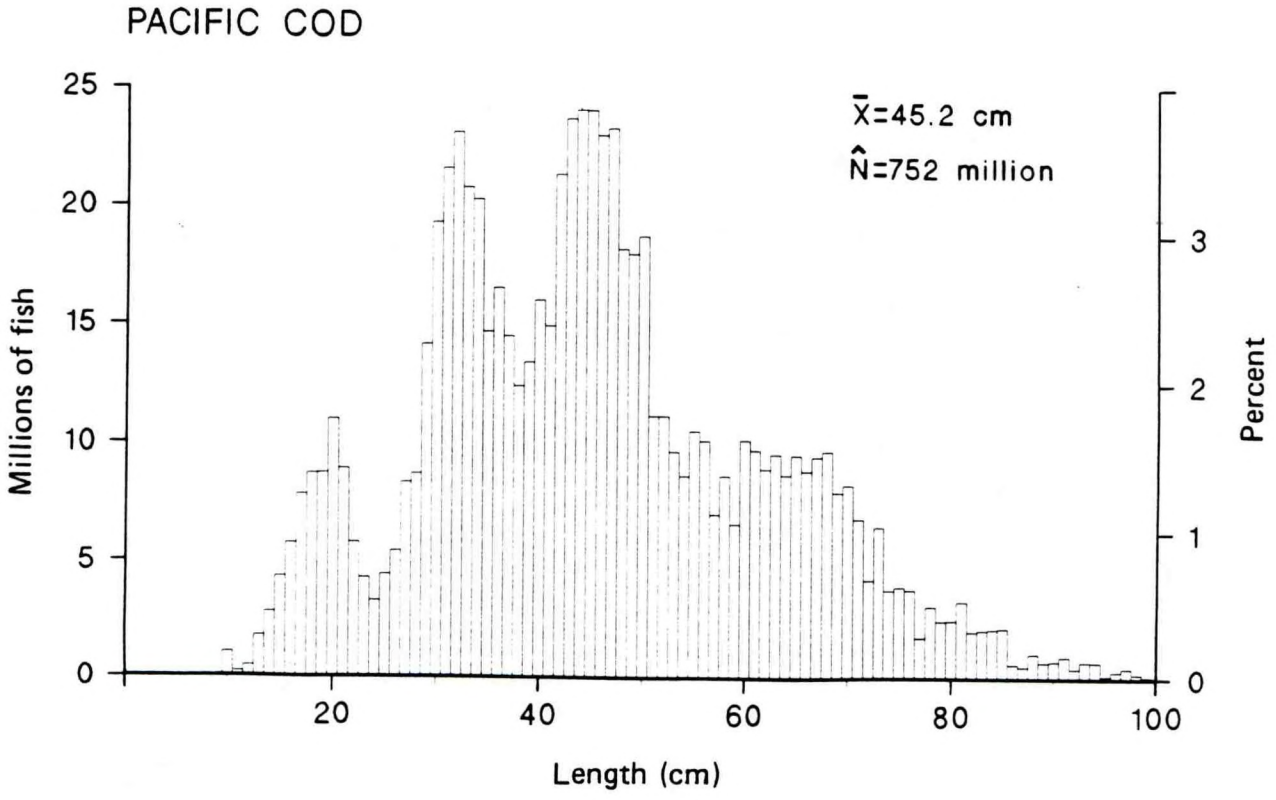


Figure 23.--Estimated size composition of Pacific cod (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

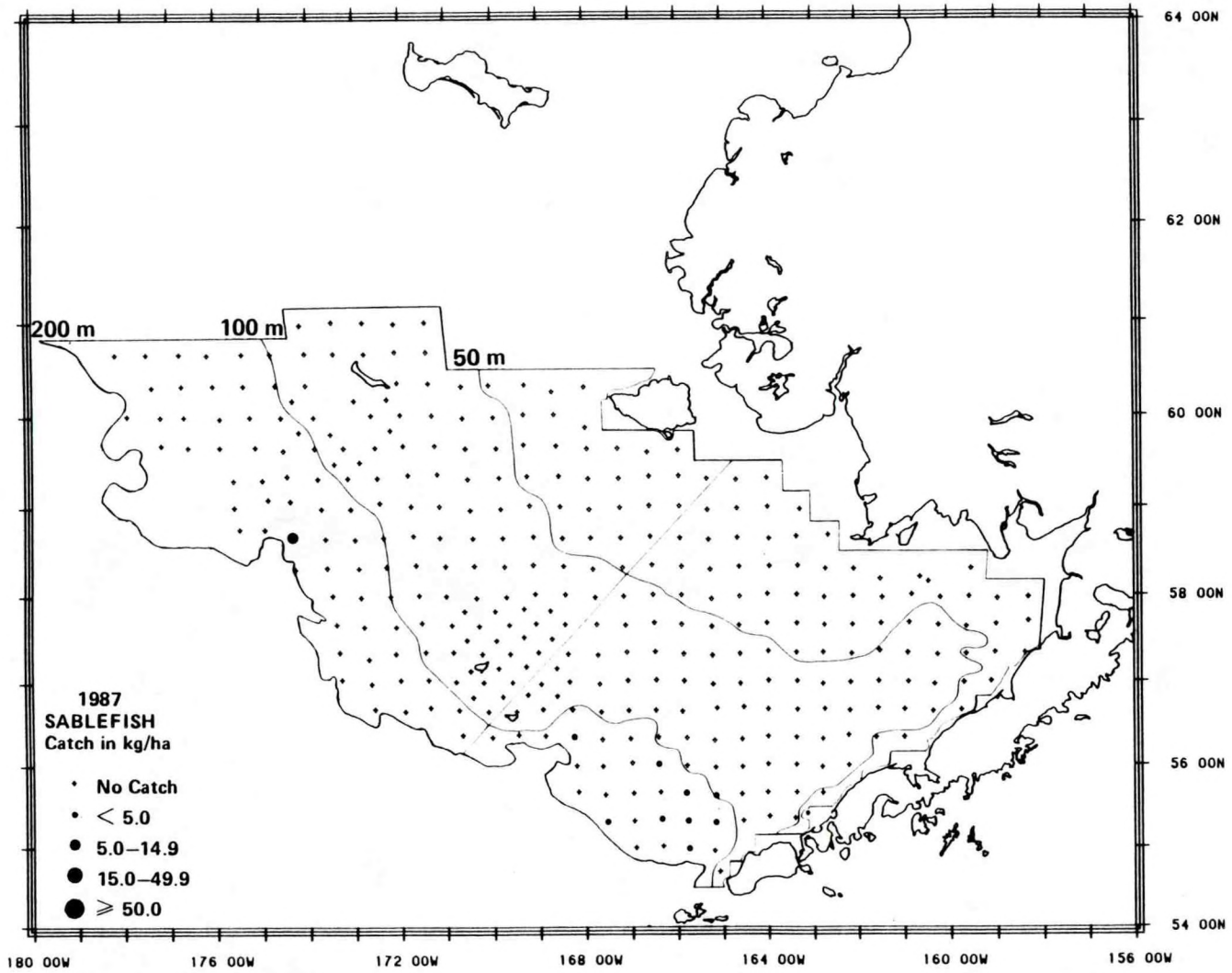


Figure 24.--Distribution and relative abundance in kg/ha of sablefish, 1987 eastern Bering Sea groundfish survey.

Table 12.--Abundance estimates and mean size of sablefish by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	0	0	0	0	0	--	--
2	0	0	0	0	0	--	--
3	0.01	70	0.024	31	0.020	2.268	52.0
4	0	0	0	0	0	--	--
5	0.30	1,161	0.404	755	0.489	1.539	51.5
6	0.17	1,645	0.572	757	0.491	2.172	59.5
All subareas combined[b]	0.06	2,877	1.000	1,543	1.000	1.864	55.5
95% confidence interval		± 3,438		± 1,652			

[a]Variances of abundance estimates are given in Appendix D-3.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

SABLEFISH

SUBAREA 6
100-200 m

Insufficient Data

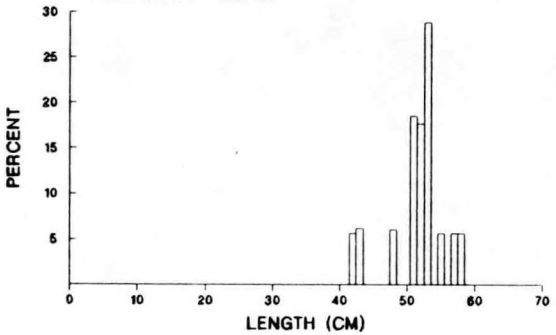
SUBAREA 4
50-100 m

Insufficient Data

SUBAREA 2
< 50 m

Insufficient Data

SUBAREA 5
100-200 m
MEAN LENGTH = 51.5 cm



SUBAREA 3
50-100 m

Insufficient Data

SUBAREA 1
< 50 m

Insufficient Data

Figure 25.--Estimated relative size composition of sablefish (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

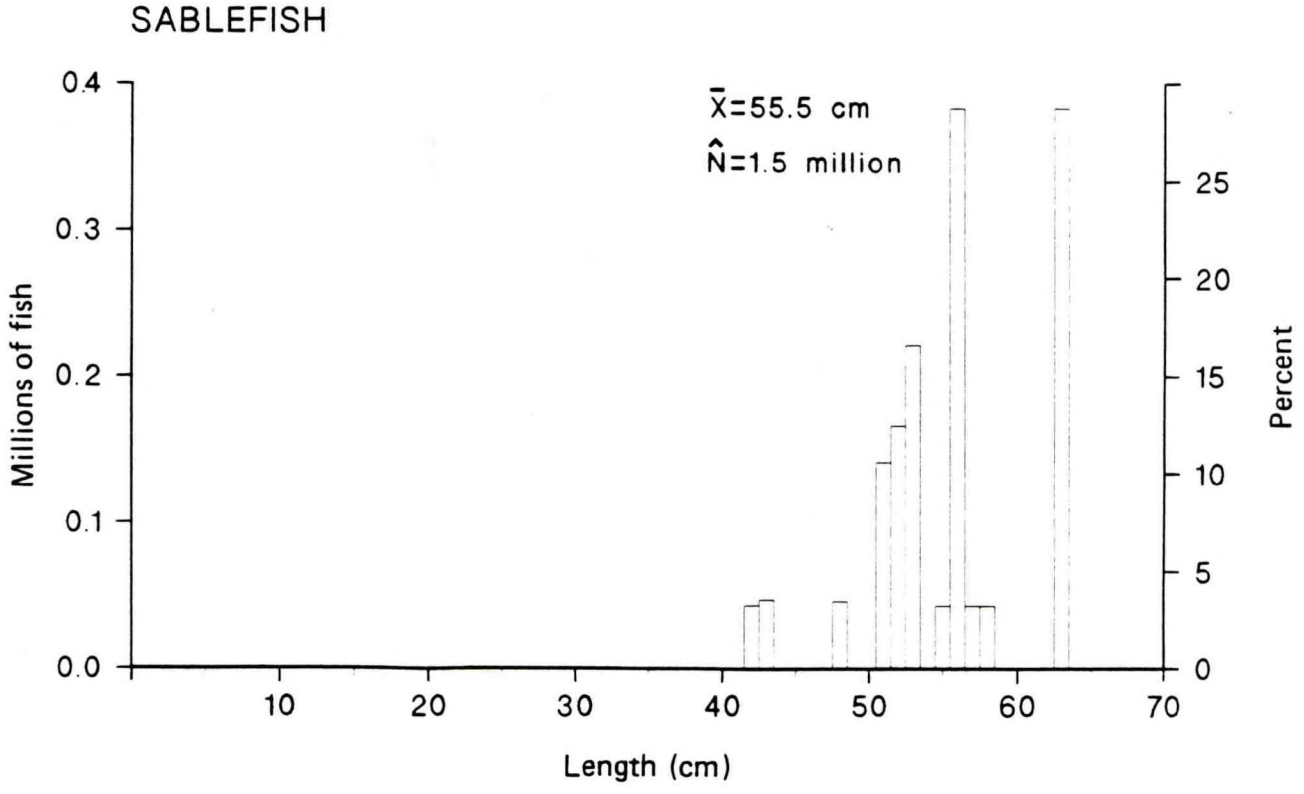


Figure 26.--Estimated size composition of sablefish (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

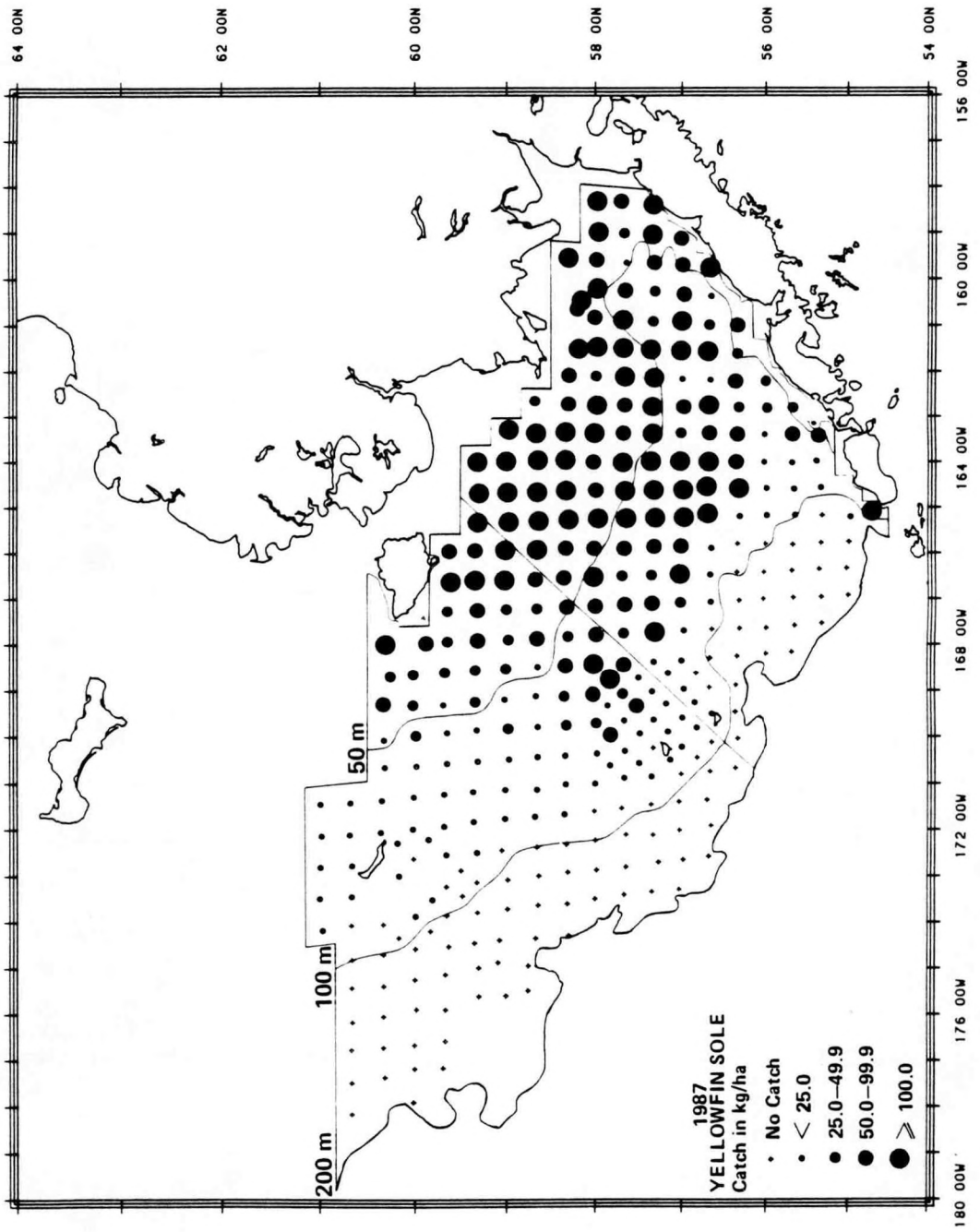


Figure 27.—Distribution and relative abundance in kg/ha of yellowfin sole, 1987 eastern Bering Sea groundfish survey.

Table 13.--Abundance estimates and mean size of yellowfin sole by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^6)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	155.39	1,210,025	0.490	4,959	0.505	0.244	25.8
2	64.17	263,251	0.107	1,528	0.156	0.172	21.4
3	82.17	848,800	0.344	2,850	0.290	0.298	28.4
4	13.66	146,903	0.059	475	0.048	0.309	28.7
5	0.03	103	<0.001	<1	<.001	0.617	36.0
6	0	0	0	0	0	--	--
All subareas combined[b]	53.10	2,469,087	1.000	9,814	1.000	0.252	26.1
95% confidence interval		± 374,746		± 1,617			

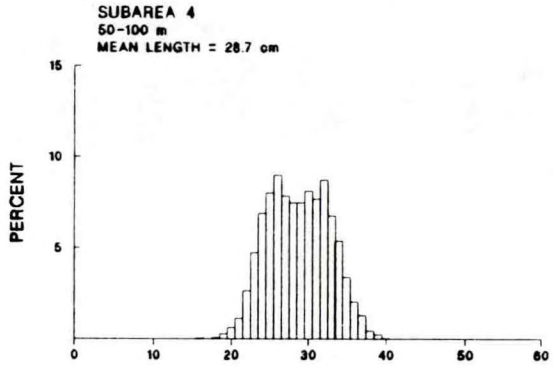
[a]Variances of abundance estimates are given in Appendix D-4.

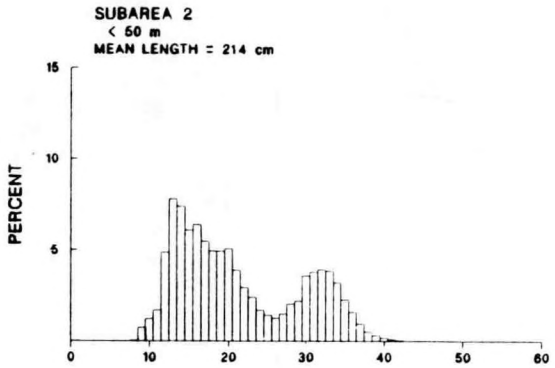
[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

YELLOWFIN SOLE

SUBAREA 6
100–200 m

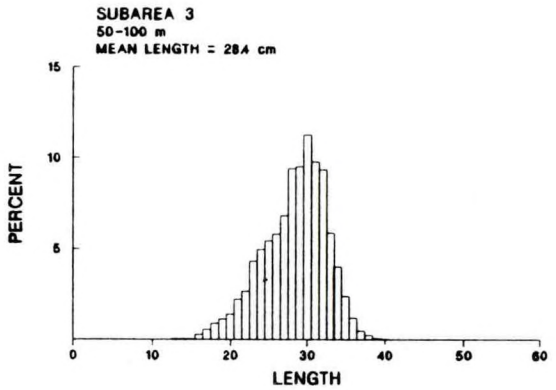
Insufficient Data





SUBAREA 5
100–200 m

Insufficient Data



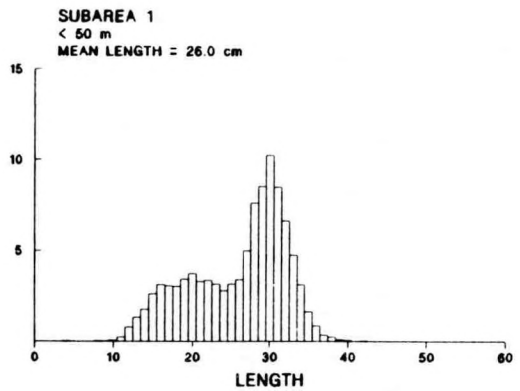


Figure 28.--Estimated relative size composition of yellowfin sole (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

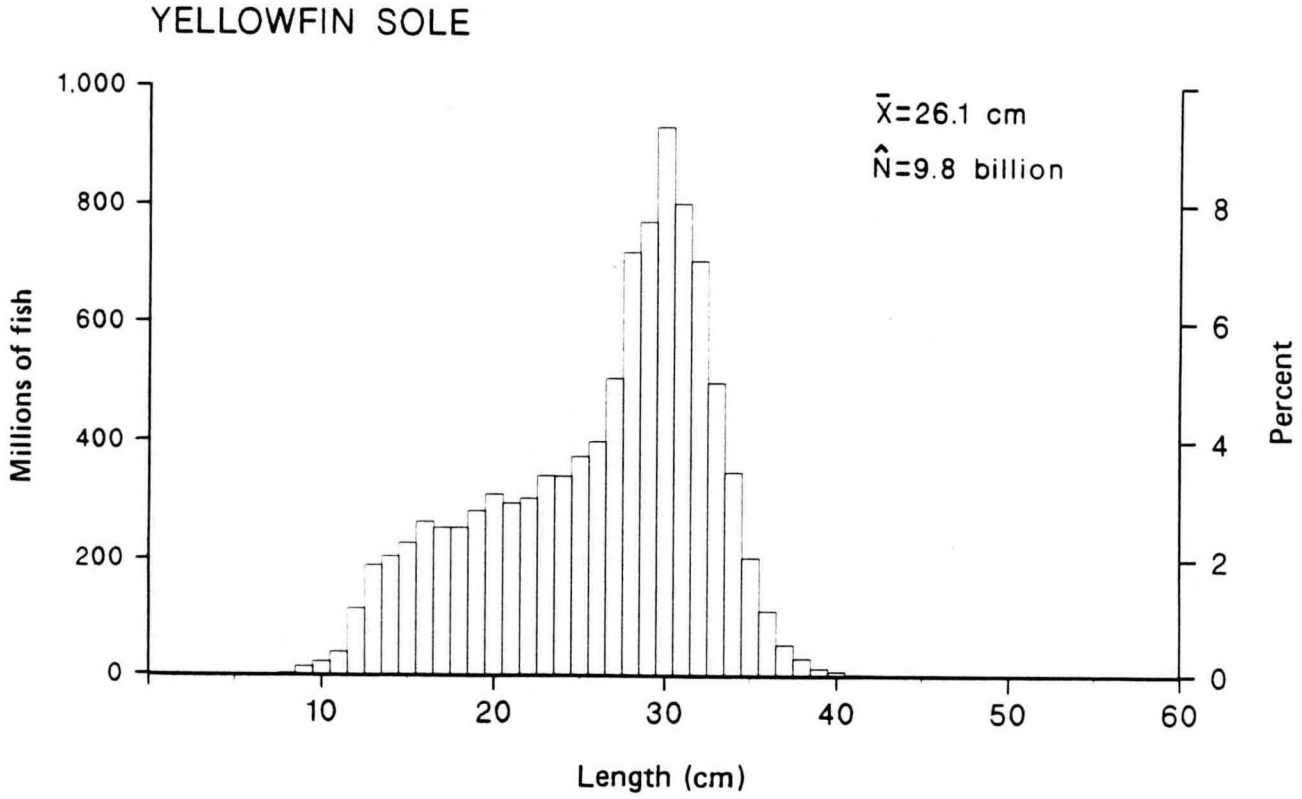


Figure 29.--Estimated size composition of yellowfin sole (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

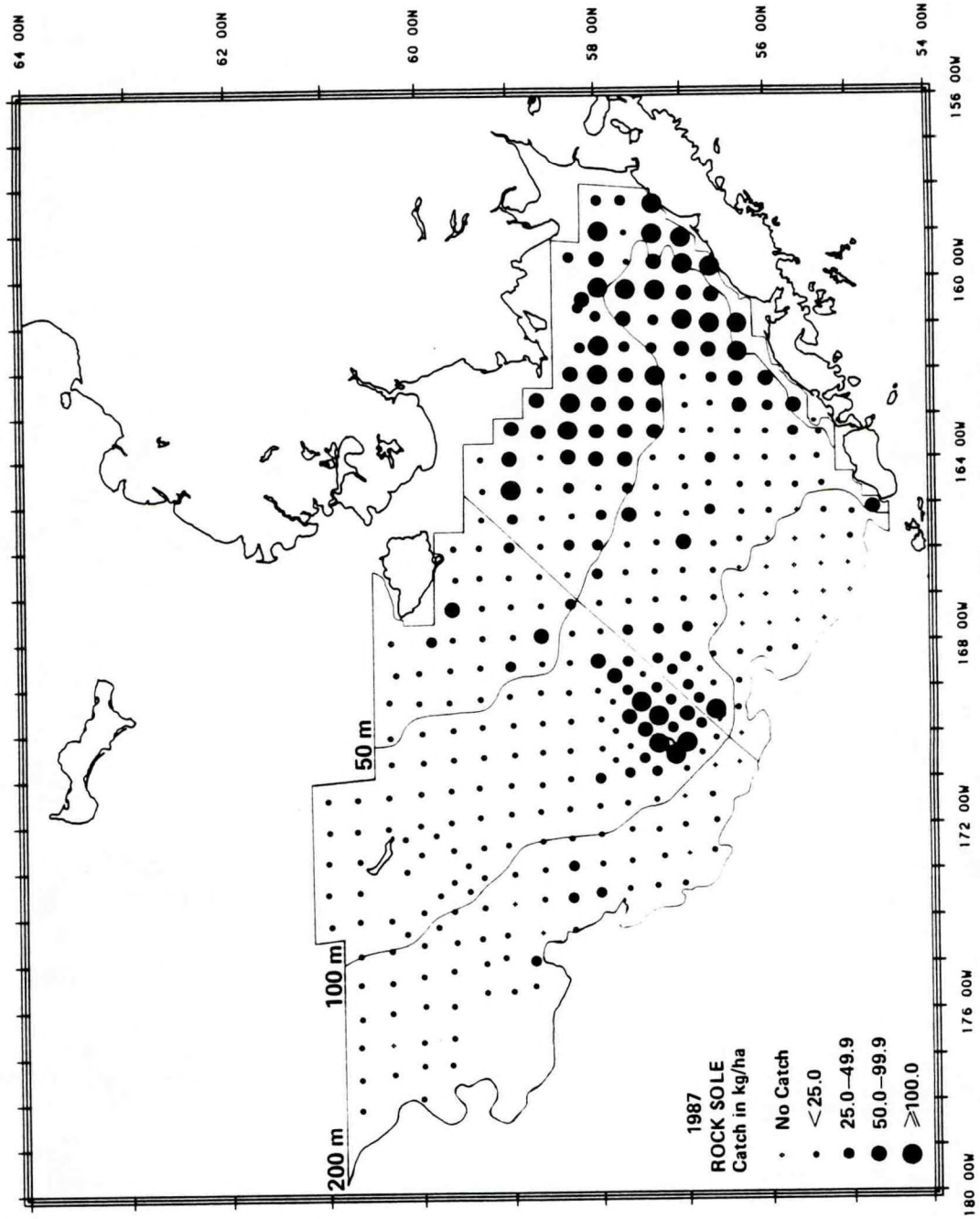


Figure 30.—Distribution and relative abundance in kg/ha of rock sole, 1987 eastern Bering Sea groundfish survey.

Table 14.--Abundance estimates and mean size of rock sole by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^6)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	72.31	563,123	0.451	2,825	0.487	0.199	23.5
2	20.43	83,831	0.067	476	0.082	0.176	21.1
3	34.42	355,542	0.285	1,699	0.293	0.209	24.6
4	18.44	198,298	0.159	705	0.122	0.281	27.3
5	1.35	5,294	0.004	10	0.002	0.552	33.9
6	4.50	43,273	0.035	84	0.014	0.515	32.6
All subareas combined[b]	26.87	1,249,361	1.000	5,799	1.000	0.215	24.2
95% confidence interval		± 176,578		± 804			

[a]Variances of abundance estimates are given in Appendix D-5.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

ROCK SOLE

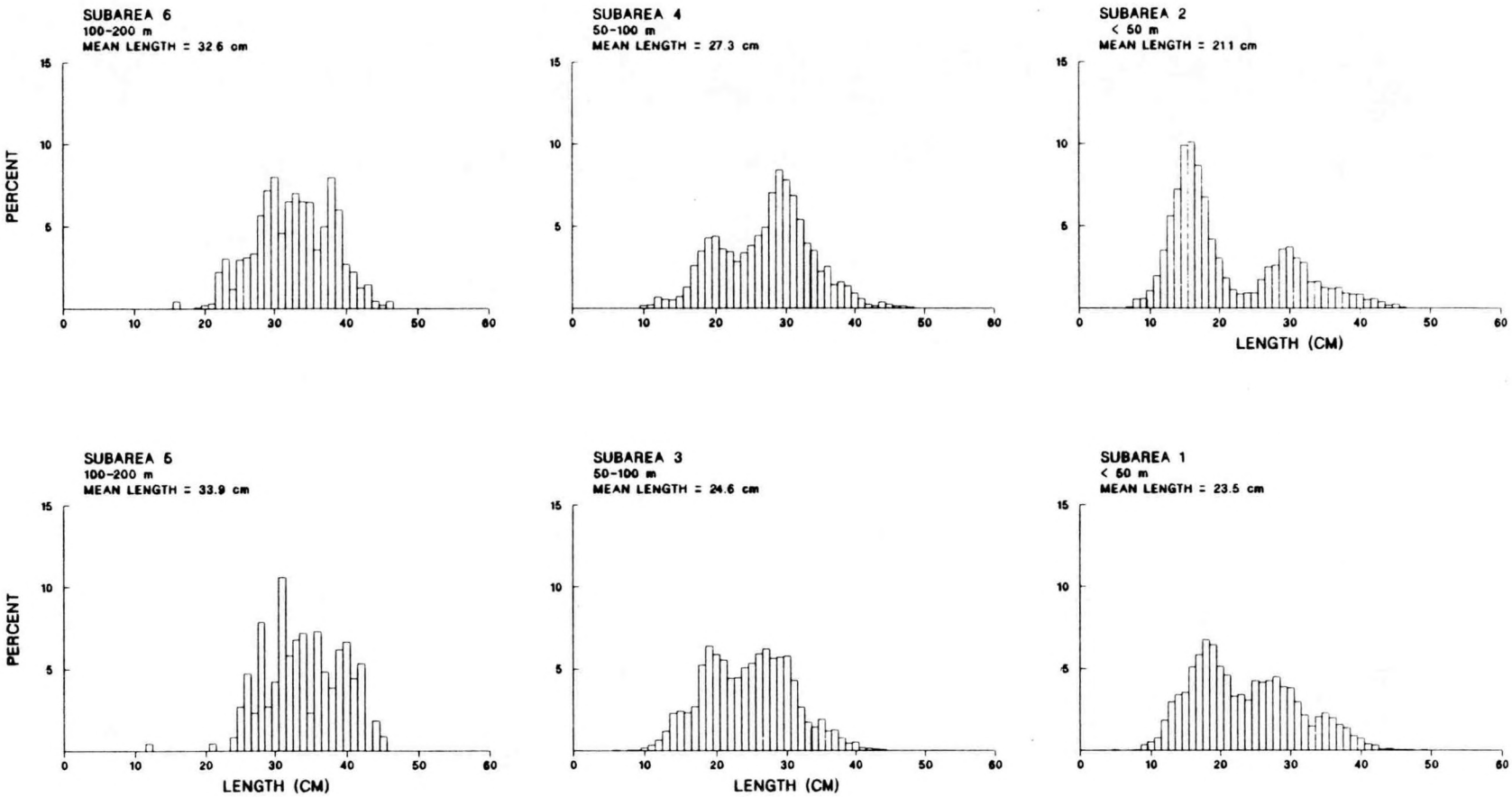


Figure 31.--Estimated relative size composition of rock sole (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

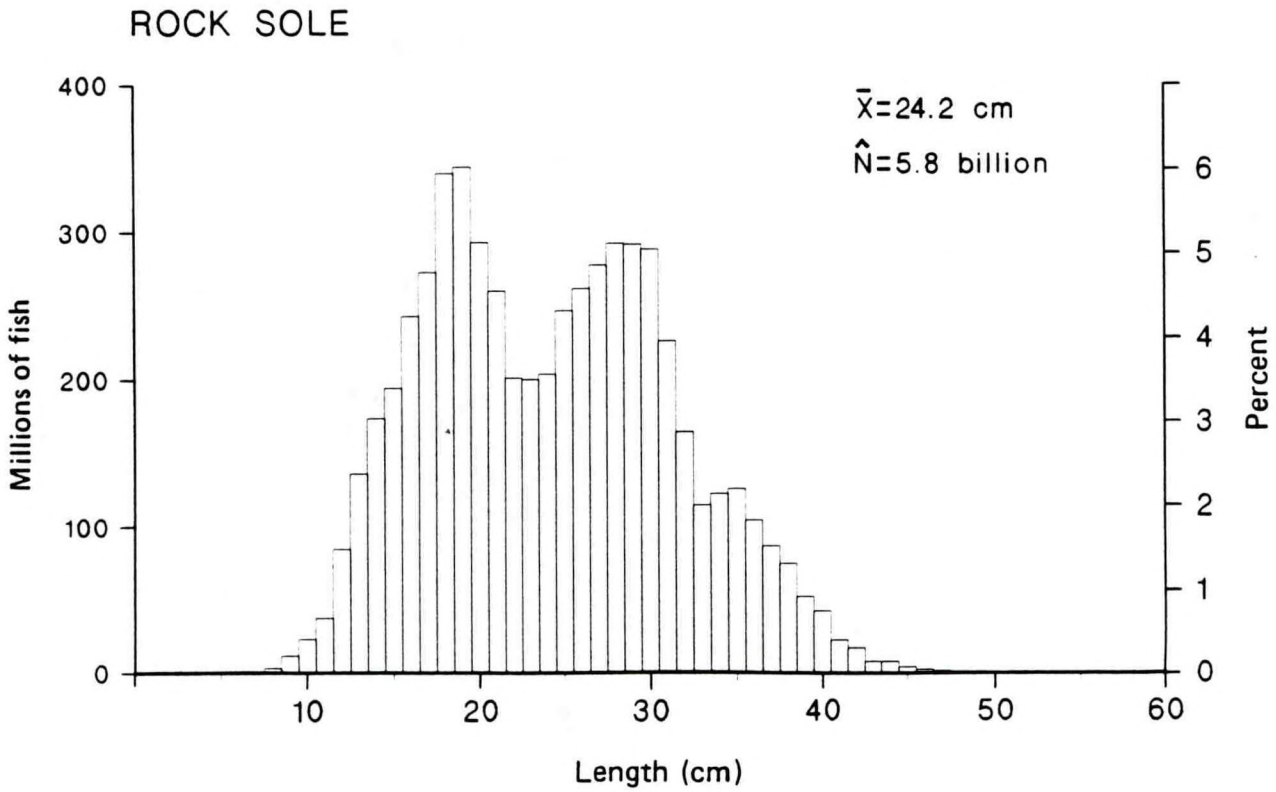


Figure 32.--Estimated size composition of rock sole (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

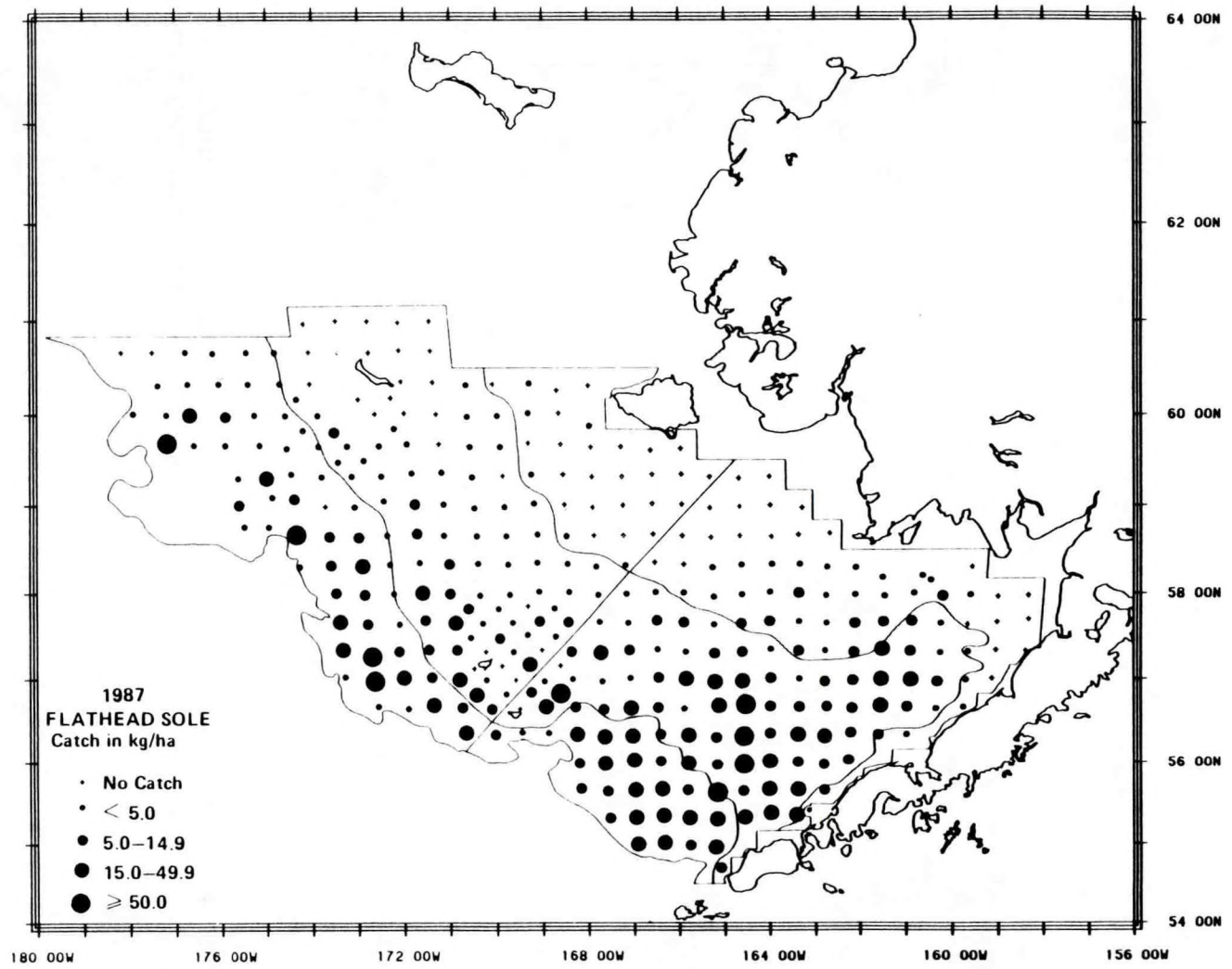


Figure 33.--Distribution and relative abundance in kg/ha of flathead sole, 1987 eastern Bering Sea groundfish survey.

Table 15.--Abundance estimates and mean size of flathead sole by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	2.35	18,319	0.047	62,838	0.039	0.292	28.8
2	0.10	391	0.001	1,478	0.001	0.265	29.5
3	14.00	144,658	0.369	514,371	0.322	0.281	29.3
4	2.79	29,963	0.076	139,434	0.087	0.215	26.3
5	17.85	69,924	0.178	447,301	0.280	0.156	24.1
6	13.39	128,670	0.328	431,682	0.270	0.298	28.4
All subareas combined[b]	8.43	391,925	1.000	1,597,104	1.000	0.245	27.3
95% confidence interval		± 78,233		± 231,180			

[a]Variances of abundance estimates are given in Appendix D-6.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

FLATHEAD SOLE

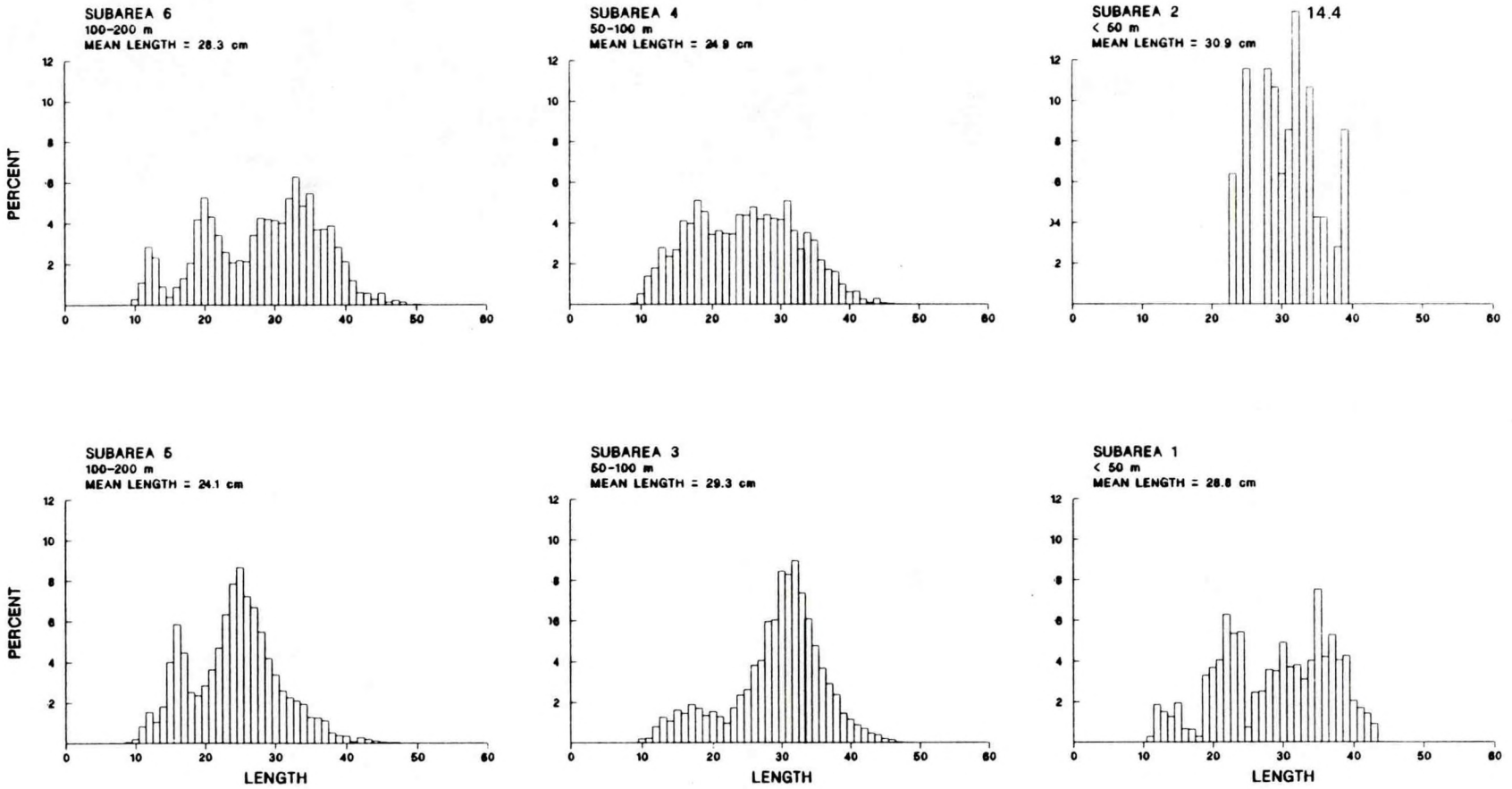


Figure 34.--Estimated relative size composition of flathead sole (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

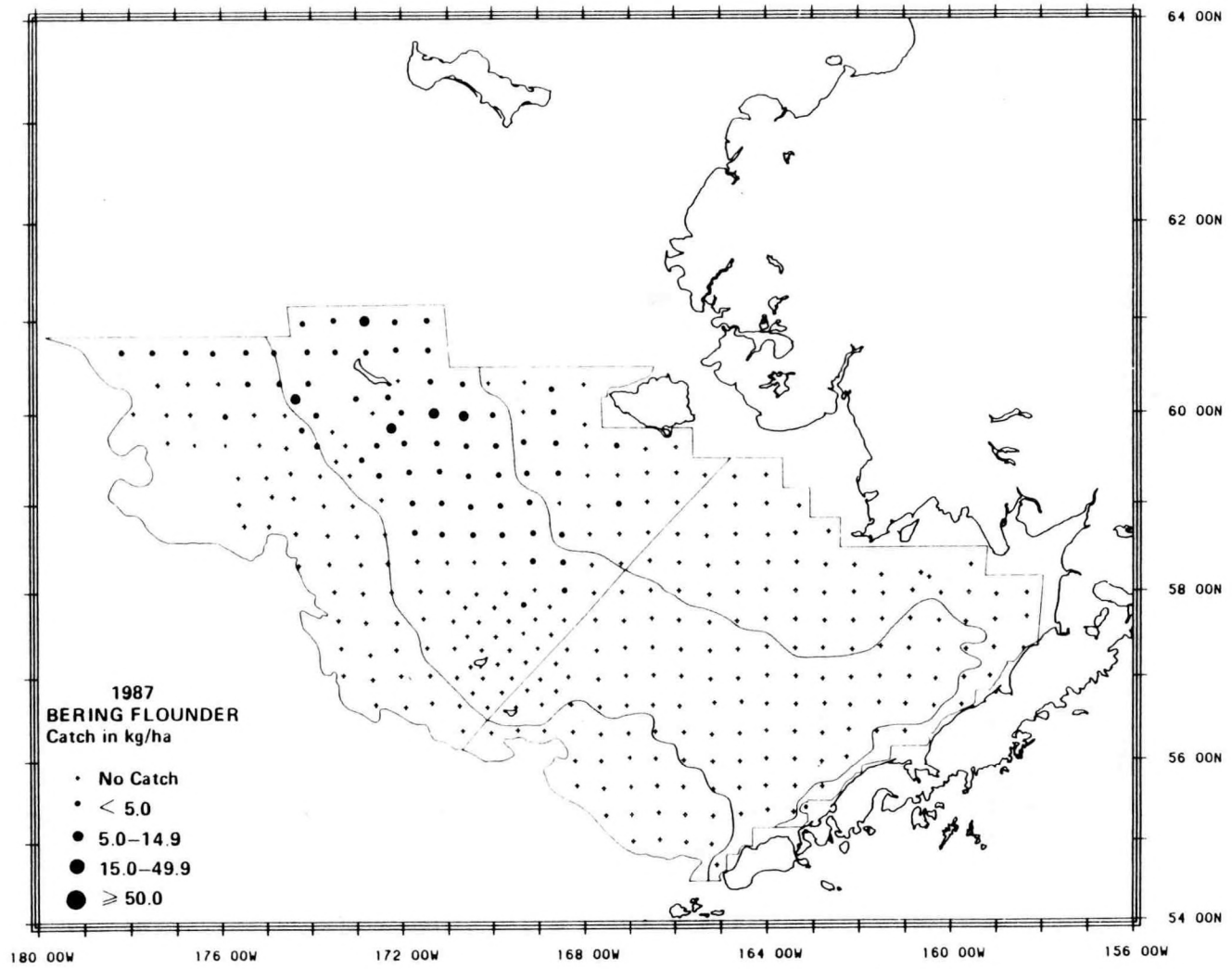


Figure 35.--Distribution and relative abundance in kg/ha of Bering flounder, 1987 eastern Bering Sea groundfish survey.

Table 16.--Abundance estimates and mean size of Bering flounder by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	0	0	0	0	0	--	--
2	0.14	574	0.040	1,137	0.013	0.505	34.5
3	0	0	0	0	0	--	--
4	1.16	12,495	0.863	74,803	0.880	0.167	26.3
5	0	0	0	0	0	--	--
6	0.15	1,404	0.097	9,048	0.106	0.155	20.5
All subareas combined[b]	0.31	14,473	1.000	84,987	1.000	0.170	22.4
95% confidence interval		± 4,159		± 28,573			

[a]Variances of abundance estimates are given in Appendix D-6.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

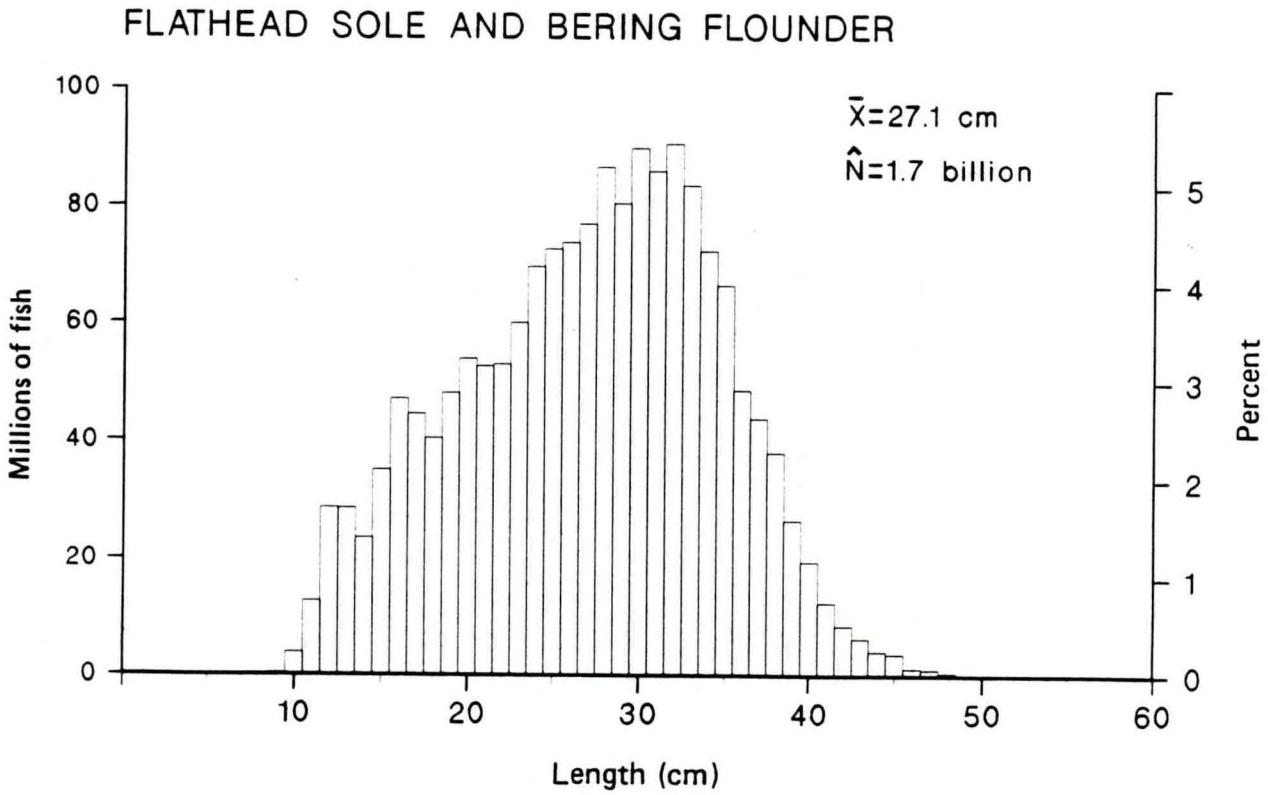


Figure 36.--Estimated size composition of flathead sole and Bering flounder (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

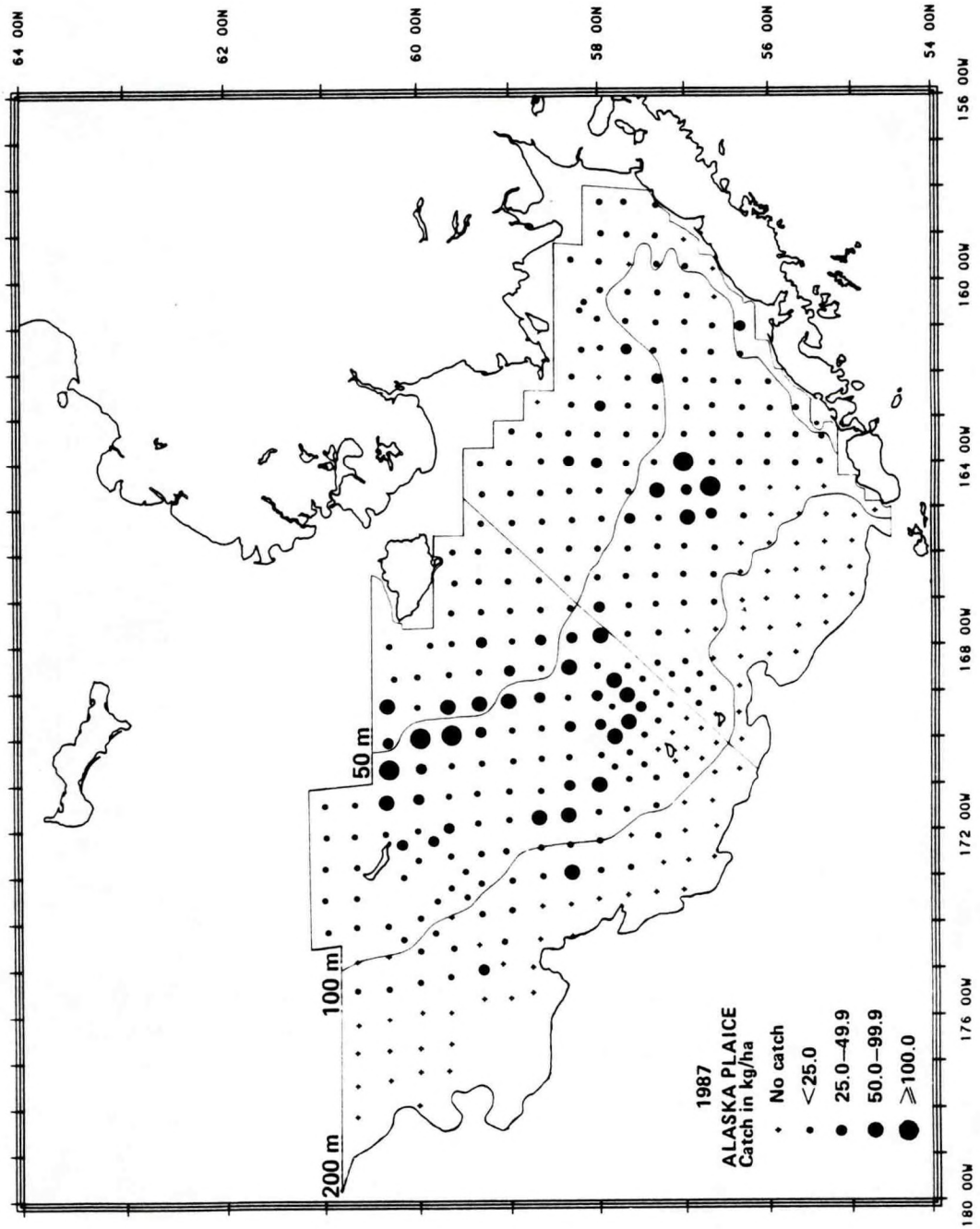


Figure 37.--Distribution and relative abundance in kg/ha of Alaska plaice, 1987 eastern Bering Sea groundfish survey.

Table 17.--Abundance estimates and mean size of Alaska plaice by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	8.04	62,593	0.113	147,197	0.169	0.425	32.2
2	18.32	75,158	0.136	159,035	0.182	0.473	33.2
3	12.29	127,003	0.230	189,664	0.217	0.670	36.1
4	23.29	250,476	0.453	353,049	0.405	0.709	36.7
5	0	0	0	0	0	--	--
6	3.87	37,241	0.067	23,340	0.027	1.596	46.8
All subareas combined[b]	11.88	552,470	1.000	872,285	1.000	0.633	35.4
95% confidence interval		± 111,363		± 168,121			

[a]Variances of abundance estimates are given in Appendix D-7.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

ALASKA PLAICE

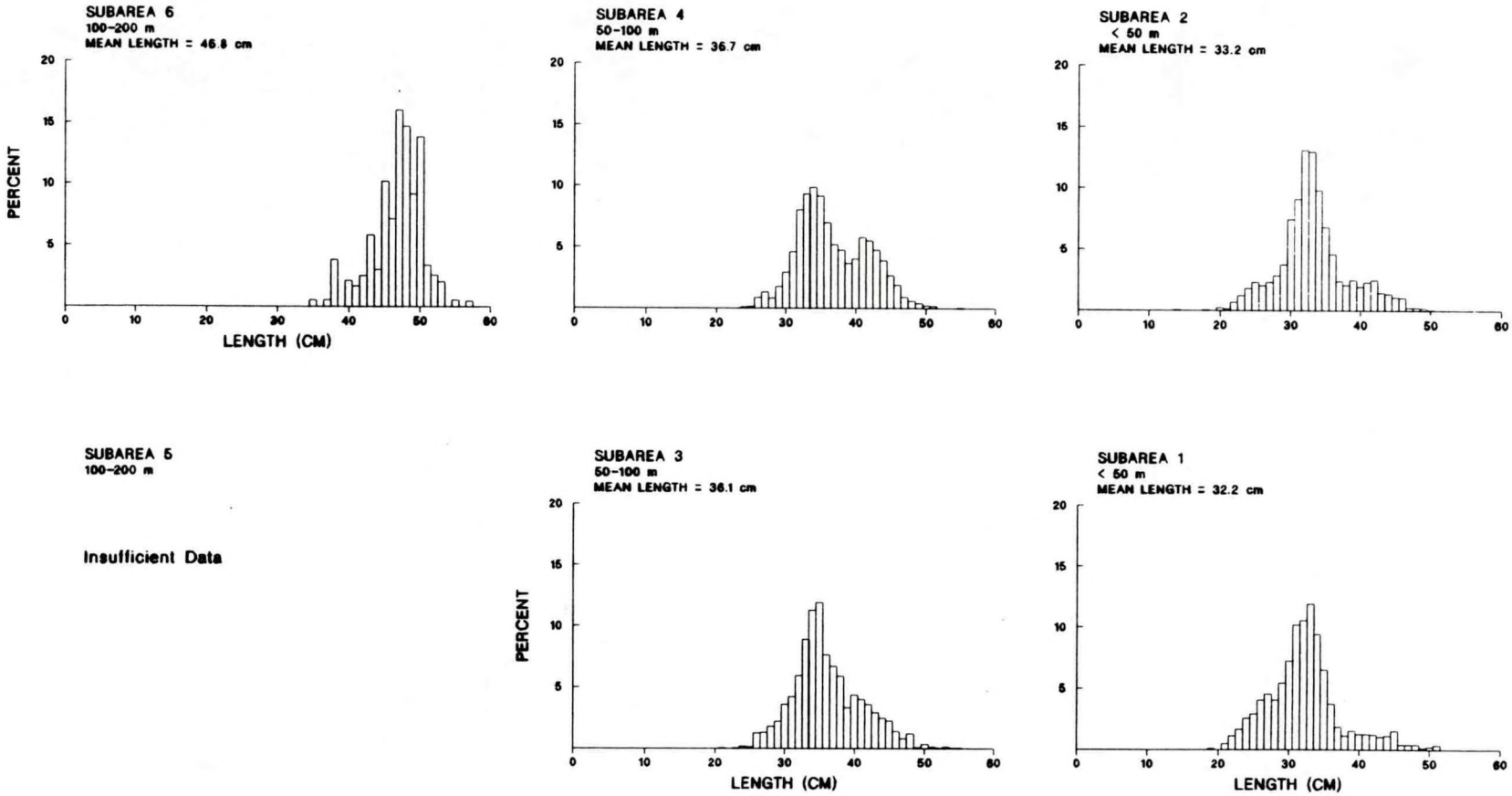


Figure 38.--Estimated relative size composition of Alaska plaice (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

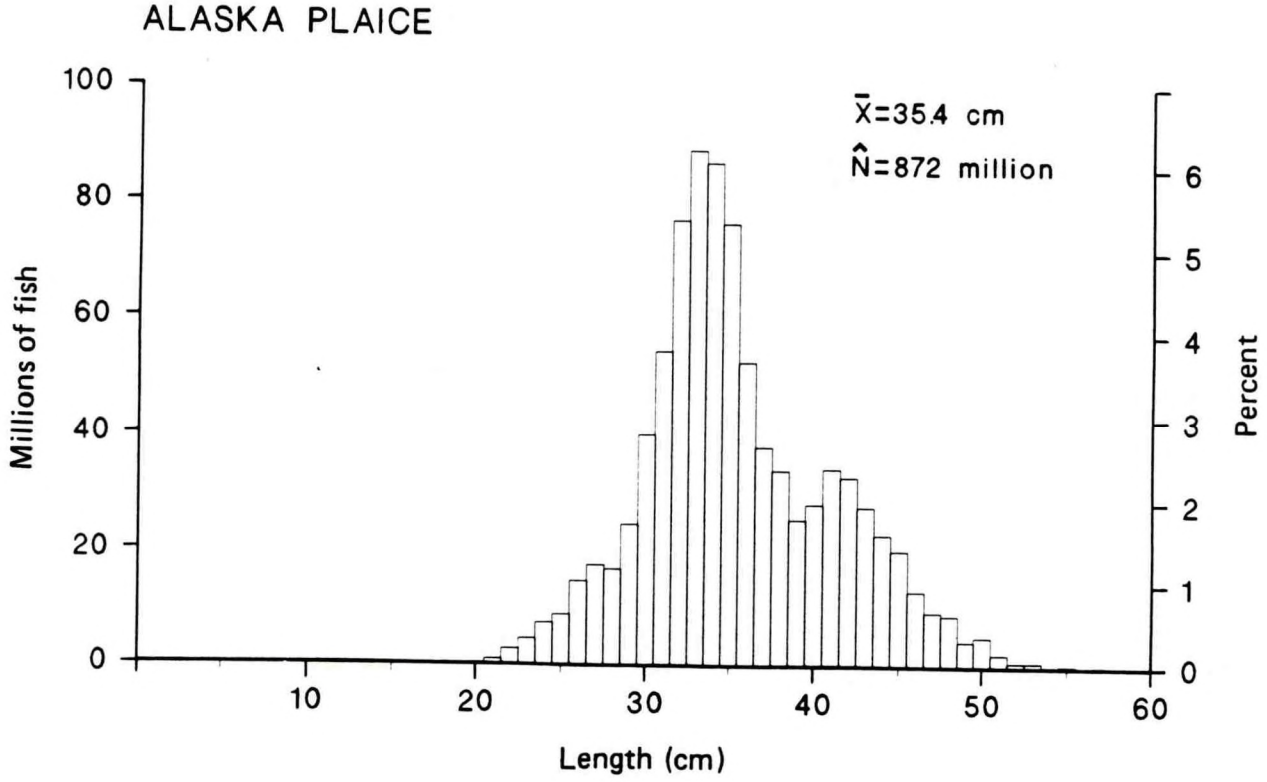


Figure 39.--Estimated size composition of Alaska plaice (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

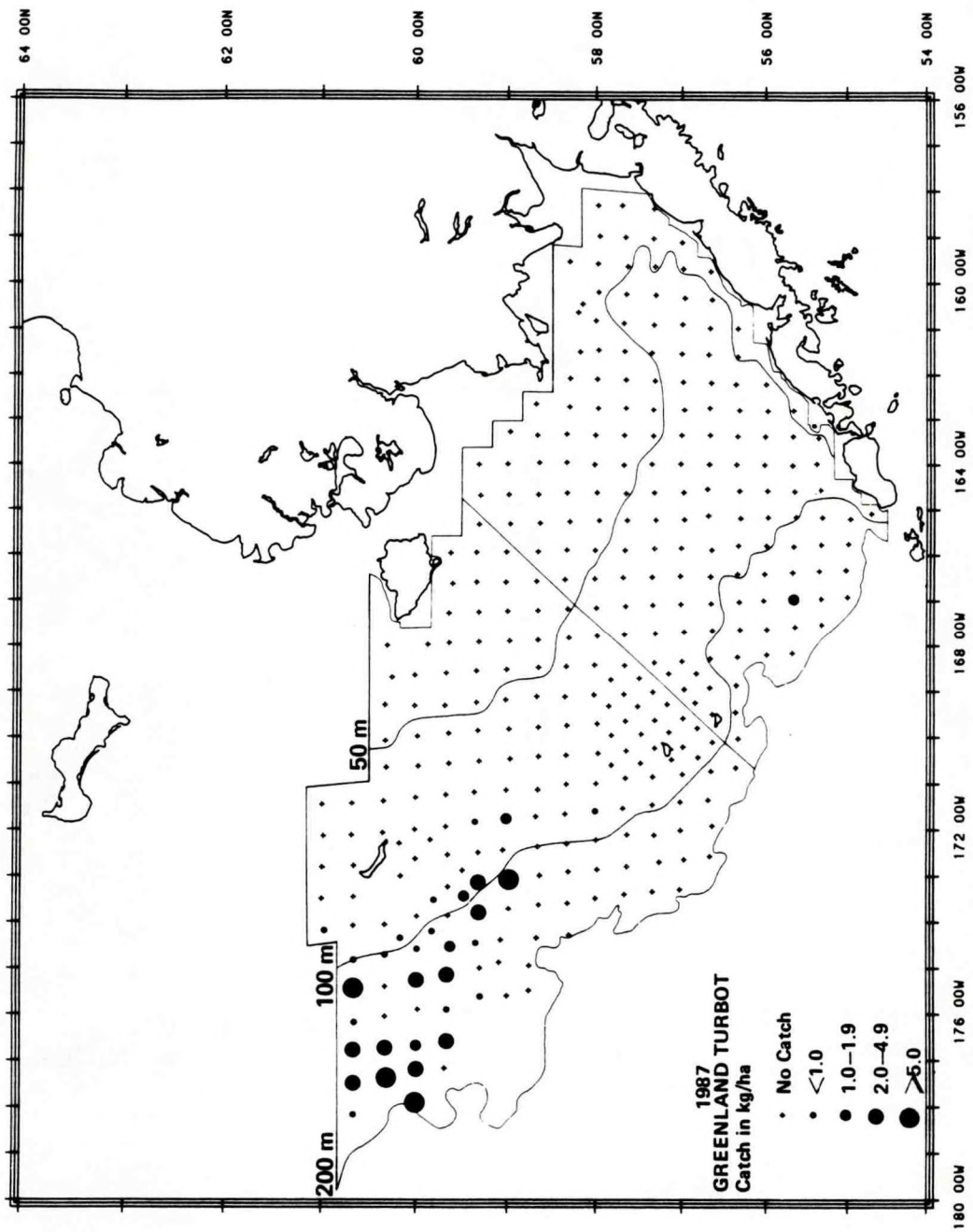


Figure 40.--Distribution and relative abundance in kg/ha of Greenland turbot, 1987 eastern Bering Sea groundfish survey.

Table 18.--Abundance estimates and mean size of Greenland turbot by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	0	0	0	0	0	--	--
2	0	0	0	0	0	--	--
3	0	0	0	0	0	--	--
4	0.07	780	0.073	1,190	0.134	0.656	31.9
5	0.06	221	0.021	34	0.004	6.441	78.0
6	1.01	9,668	0.906	7,626	0.862	1.268	43.2
All subareas combined[b]	0.23	10,669	1.000	8,850	1.000	1.206	41.8
95% confidence interval		± 5,361		± 3,786			

[a]Variances of abundance estimates are given in Appendix D-8.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

GREENLAND TURBOT

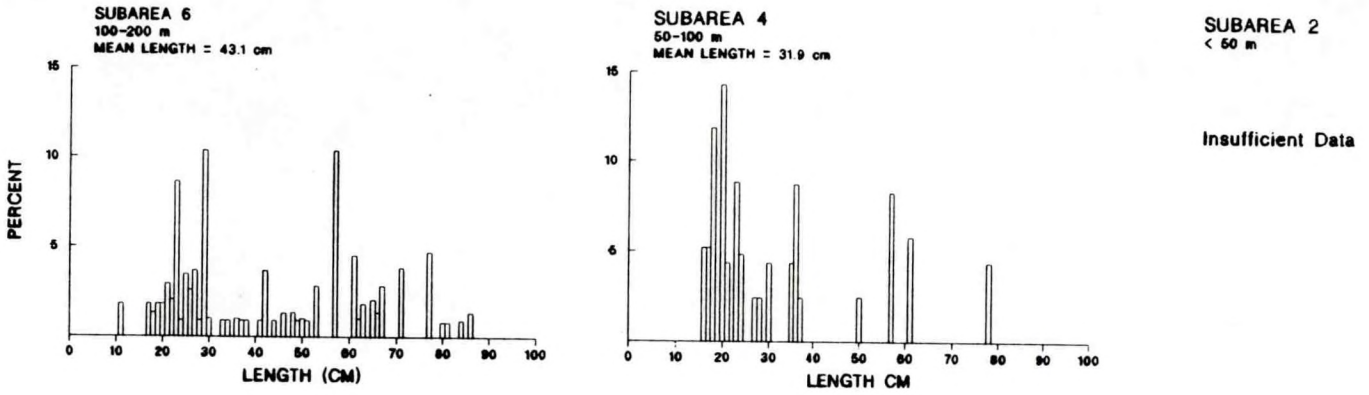


Figure 41.--Estimated relative size composition of Greenland turbot (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

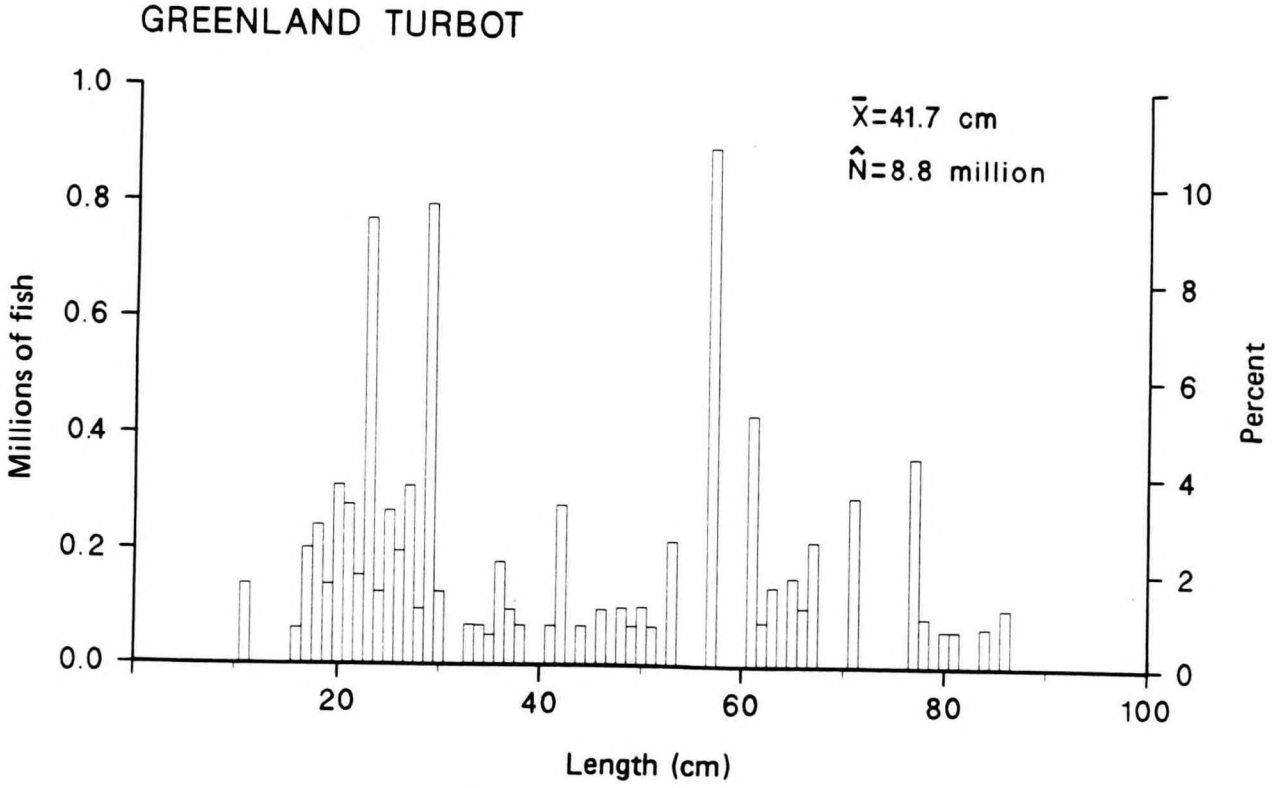


Figure 42.--Estimated size composition of Greenland turbot (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

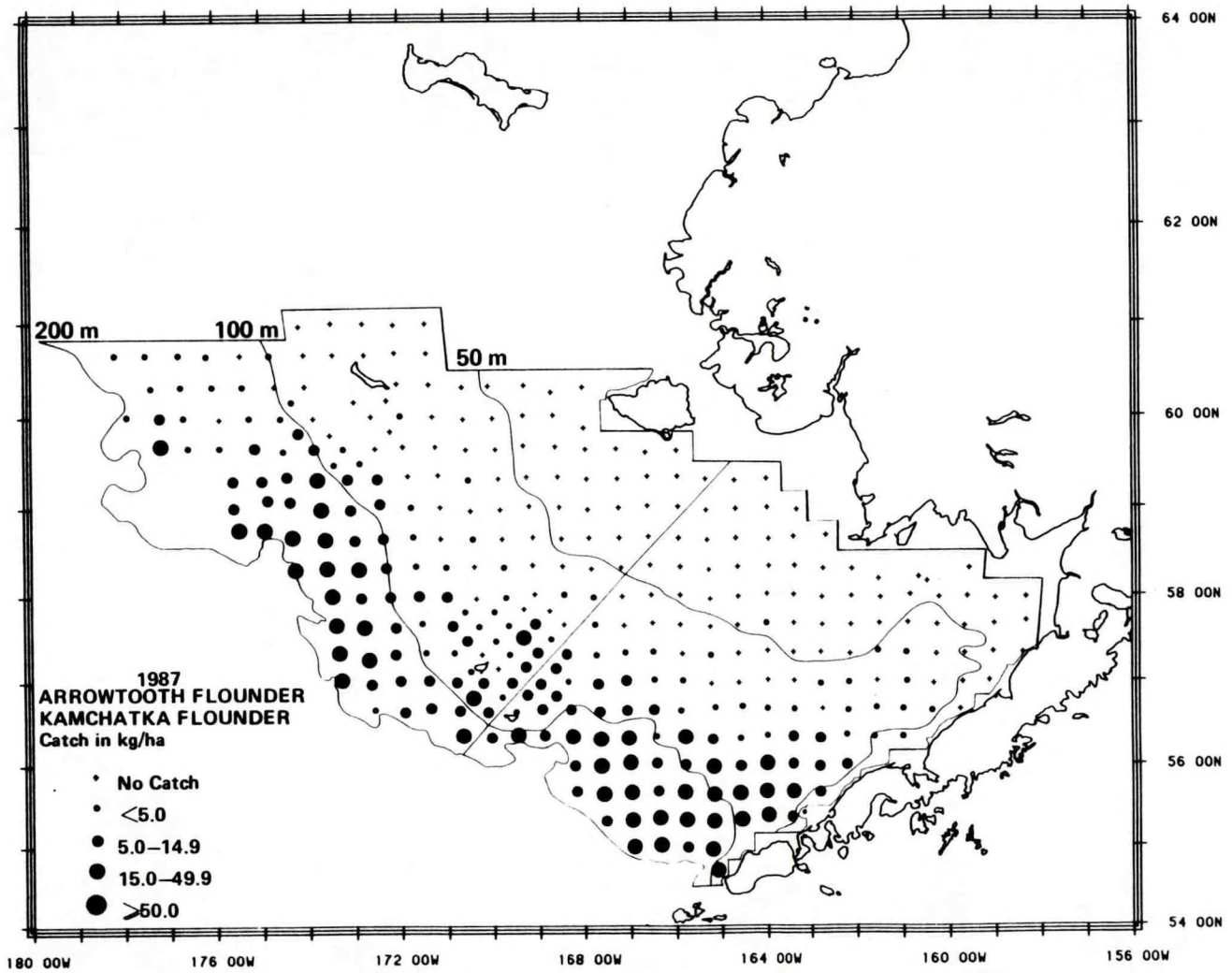


Figure 43.--Distribution and relative abundance in kg/ha of arrowtooth and Kamchatka flounder, 1987 eastern Bering Sea groundfish survey.

Table 19.--Abundance estimates and mean size of arrowtooth and Kamchatka flounder by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	0.21	1,655	0.006	8,402	0.013	0.197	26.2
2	0	0	0	0	0	--	--
3	6.34	65,464	0.225	200,204	0.305	0.327	30.6
4	1.75	18,787	0.065	57,875	0.088	0.325	30.6
5	23.10	90,510	0.311	177,709	0.271	0.509	35.3
6	11.89	114,282	0.393	212,272	0.323	0.538	36.1
All subareas combined[b]	6.25	290,698	1.000	656,461	1.000	0.443	33.6
95% confidence interval		± 41,229		± 100,251			

[a]Variances of abundance estimates are given in Appendix D-9.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

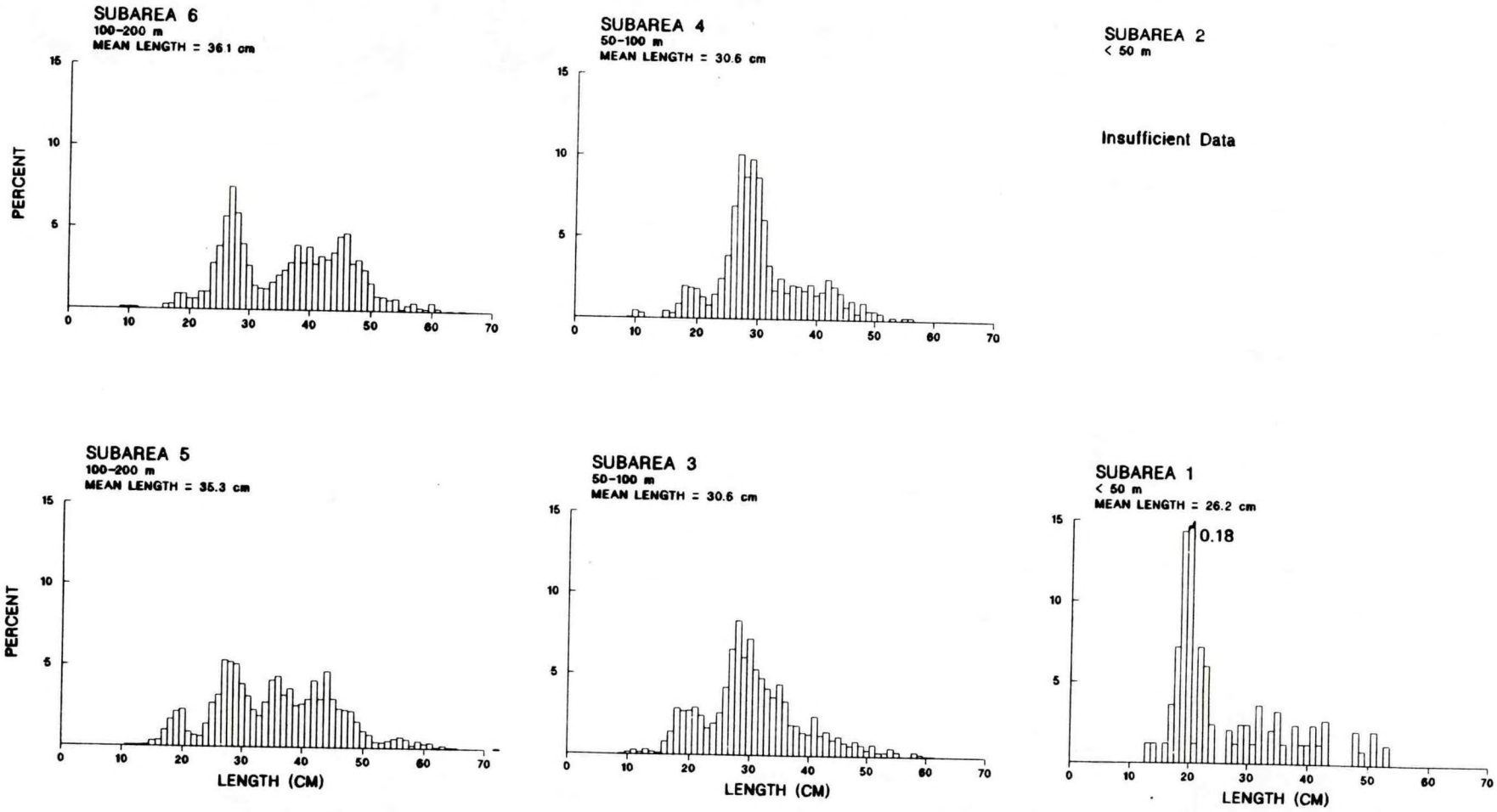


Figure 44.—Estimated relative size composition of arrowtooth and Kamchatka flounder (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

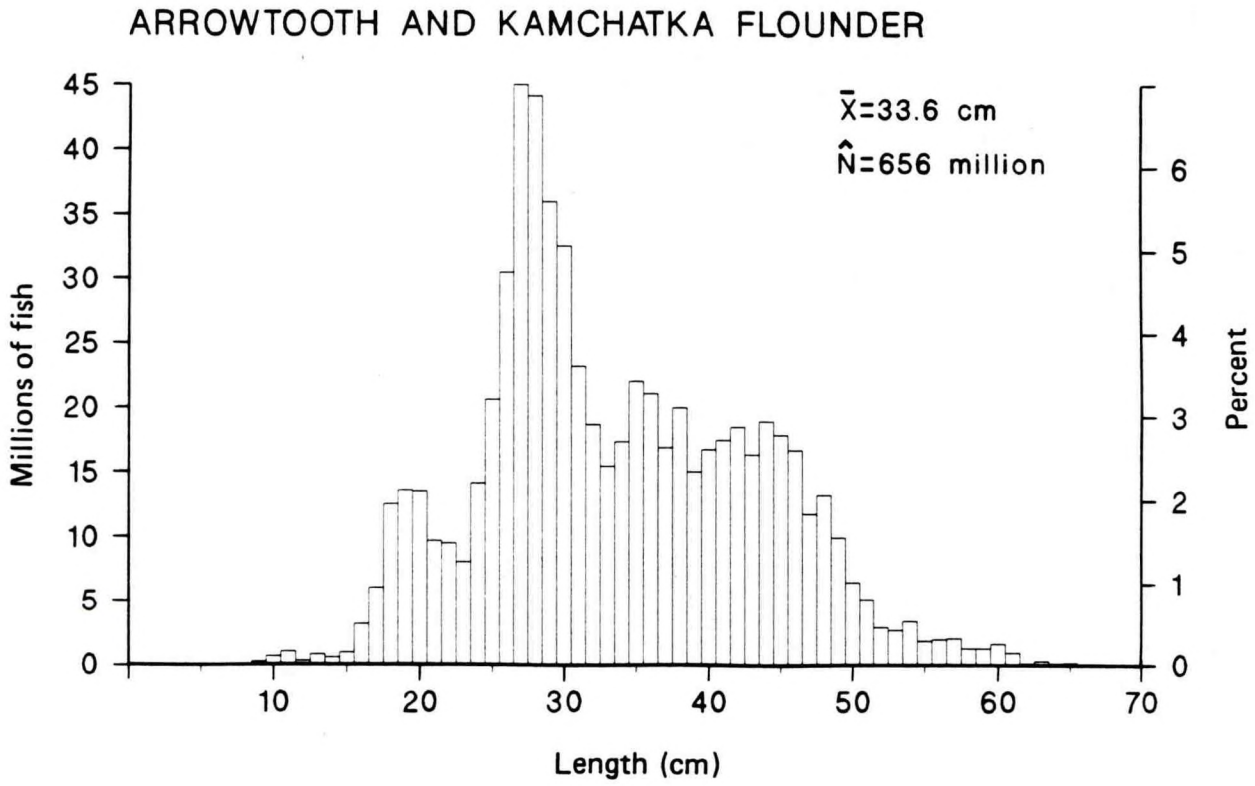


Figure 45.--Estimated size composition of arrowtooth and Kamchatka flounder (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

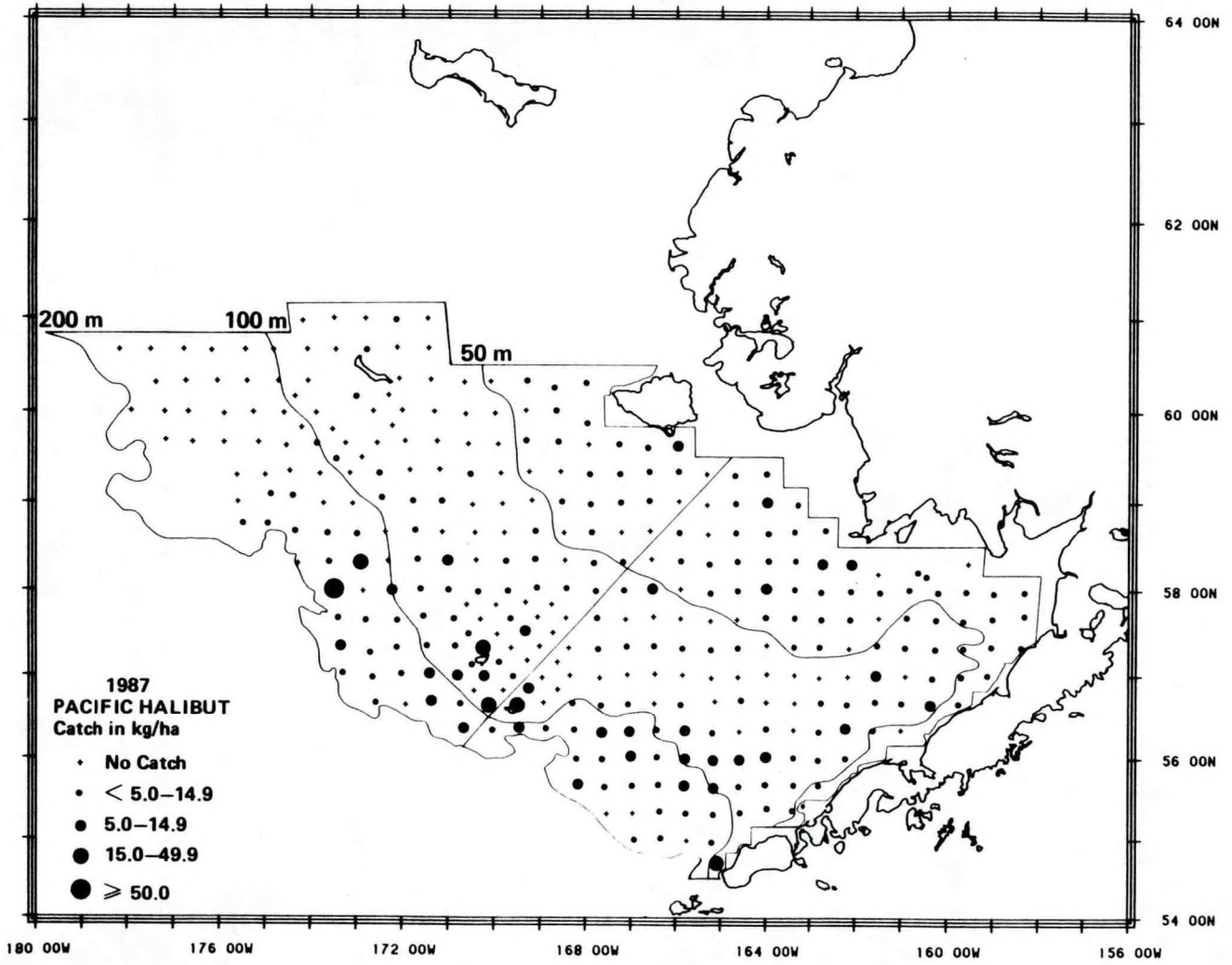


Figure 46.--Distribution and relative abundance in kg/ha of Pacific halibut, 1987 eastern Bering Sea groundfish survey.

Table 20.--Abundance estimates and mean size of Pacific halibut by subarea and for all subareas combined, 1987 bottom trawl survey.

Subarea	Mean CPUE[a] (kg/ha)	Estimated sampled biomass[a] (t)	Proportion of total estimated biomass	Estimated sampled population[a] (10^3)	Proportion of total estimated population	Mean size per individual	
						Weight (kg)	Length (cm)
1	1.83	14,274	0.168	7,891	0.297	1.809	45.3
2	1.24	5,104	0.060	2,588	0.097	1.973	51.3
3	2.16	22,326	0.263	5,809	0.219	3.843	62.6
4	0.99	10,698	0.126	2,409	0.091	4.441	62.6
5	3.11	12,200	0.144	2,121	0.080	5.751	74.8
6	2.11	20,267	0.239	5,758	0.216	3.520	68.1
All subareas combined[b]	1.83	84,869	1.000	26,576	1.000	3.193	58.5
95% confidence interval		± 17,207		± 6,030			

[a]Variances of abundance estimates are given in Appendix D-10.

[b]Minor discrepancies between sums over subareas and totals may occur due to rounding.

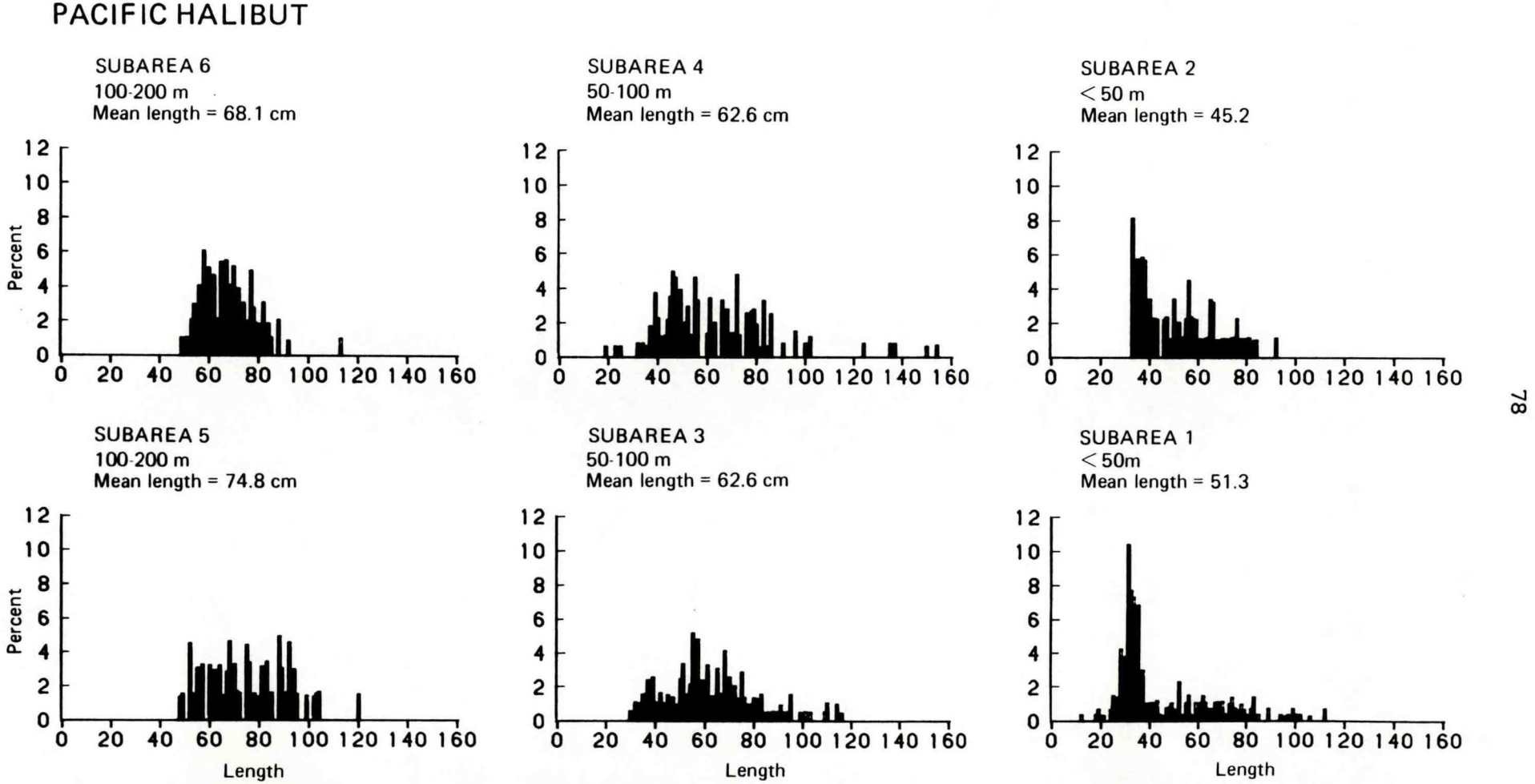


Figure 47.--Estimated relative size composition of Pacific halibut (sexes combined) by subarea, 1987 eastern Bering Sea groundfish survey.

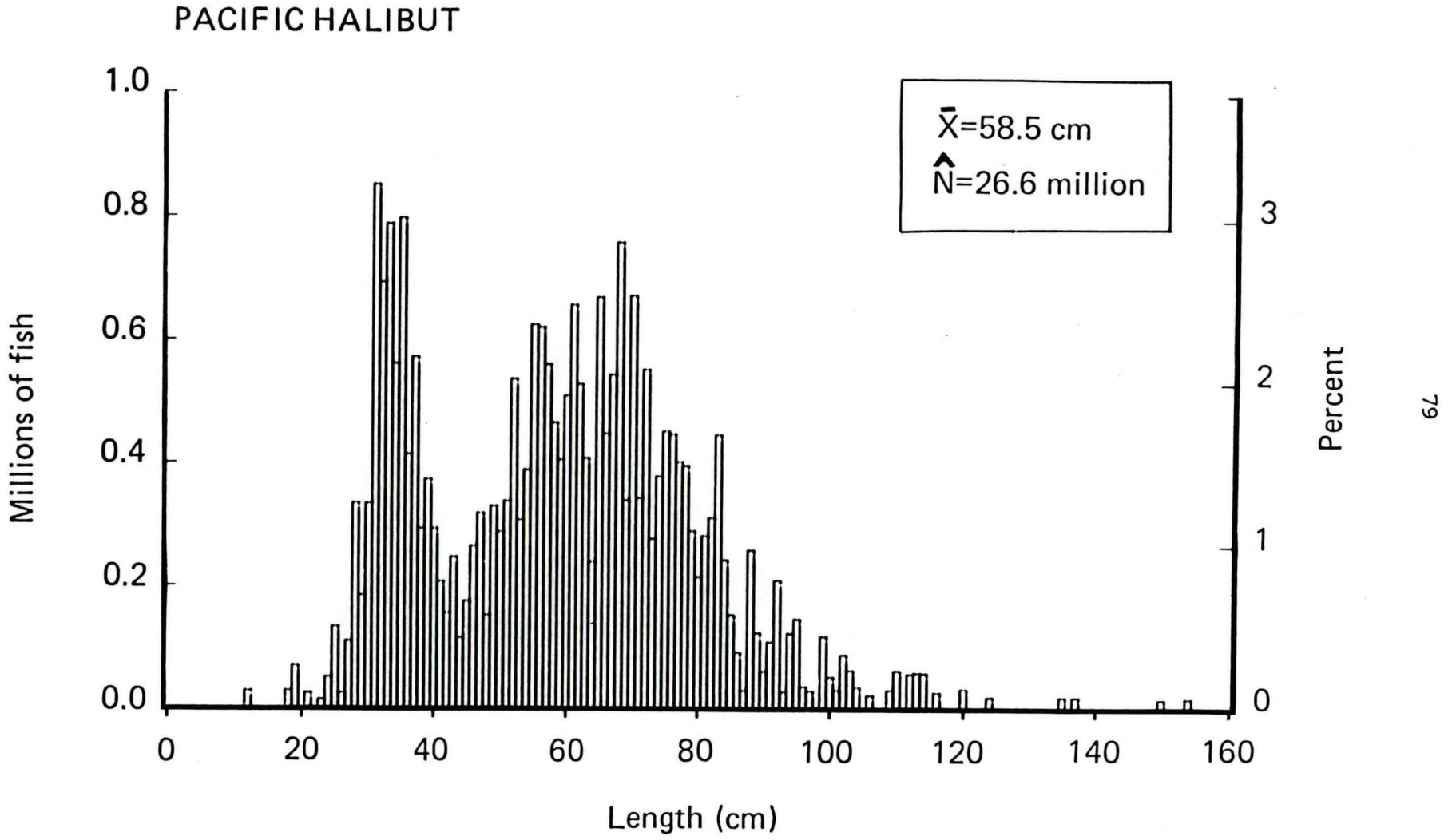


Figure 48.--Estimated relative size composition of Pacific halibut (sexes combined), all subareas combined, 1987 eastern Bering Sea groundfish survey.

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APPENDIX A

Station Data, 1987 Eastern Bering Sea Trawl Survey

Appendix A contains computer listings of station data (date, location, hour of tow, duration, distance and sea temperature) for all successfully completed standard grid stations used in the analysis of 1987 Bering Sea survey data. (Missing haul numbers indicate special-purpose or unsatisfactory tows.)

List of Tables

Table A-1.--Haul data for stations sampled by the Pat San Marie during the 1987 eastern Bering Sea groundfish survey.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
4	6	4	9	56	39	160	22	31	0.50	1.50	30	4.8	3.7
5	6	4	12	56	58	160	20	33	0.50	1.45	30	4.6	3.5
6	6	4	15	57	19	160	16	32	0.50	1.34	30	4.7	3.7
7	6	4	19	57	40	160	15	29	0.50	1.44	30	4.8	3.6
8	6	5	6	57	59	160	12	27	0.50	1.67	10	4.5	3.3
10	6	5	11	58	10	160	28	21	0.50	1.21	10	6.3	4.1
11	6	5	17	58	11	161	31	26	0.50	1.81	10	6.1	3.4
12	6	6	6	57	59	161	28	28	0.50	1.42	10	5.7	3.2
13	6	6	10	57	41	161	30	28	0.50	1.55	10	4.6	2.9
14	6	6	13	57	22	161	32	30	0.50	1.68	30	4.8	3.2
15	6	6	17	57	01	161	33	37	0.50	1.41	30	5.4	3.2
16	6	7	7	56	42	161	34	48	0.50	1.41	30	5.6	3.3
17	6	7	9	56	21	161	37	37	0.50	1.55	10	6.0	3.9
18	6	7	15	55	40	162	48	29	0.50	1.25	10	6.4	4.6
19	6	8	6	55	59	162	49	44	0.50	1.71	30	6.3	3.6
20	6	8	9	56	20	162	48	43	0.50	1.35	30	5.3	3.7
21	6	9	7	56	41	162	45	39	0.50	1.42	30	4.5	3.1
22	6	9	11	56	59	162	47	33	0.50	1.44	30	4.4	3.2
24	6	9	15	57	21	162	47	26	0.25	0.77	10	4.4	3.4
25	6	10	7	57	40	162	45	23	0.50	1.67	10	4.5	3.3
26	6	10	10	57	59	162	45	22	0.50	1.32	10	4.9	3.3
27	6	10	13	58	18	162	43	16	0.50	1.45	10	3.4	2.7
28	6	11	7	58	39	163	58	18	0.50	1.58	10	3.4	3.0
29	6	13	12	58	20	163	57	22	0.50	1.63	10	3.6	3.0
30	6	13	14	58	01	164	00	24	0.50	1.90	10	3.5	2.8
31	6	13	18	57	41	164	01	26	0.50	1.34	10	3.3	2.6
32	6	14	6	57	22	163	59	33	0.50	1.39	30	4.0	2.4
33	6	14	9	57	01	163	59	37	0.50	1.41	30	4.5	3.0
34	6	14	13	56	41	163	60	41	0.50	1.70	30	5.2	3.1
35	6	14	15	56	22	164	00	46	0.50	1.61	30	5.8	3.3
36	6	14	18	56	01	164	00	49	0.50	1.49	30	6.4	3.9
37	6	15	7	55	41	164	01	52	0.50	1.39	30	6.2	4.1
38	6	15	10	55	23	163	59	48	0.50	1.43	30	6.4	4.5
39	6	15	17	54	42	165	05	42	0.25	0.90	30	6.2	5.7
40	6	19	6	54	58	165	12	61	0.50	1.42	50	6.5	5.0
41	6	19	9	55	19	165	10	61	0.50	1.61	50	6.4	4.6
42	6	19	12	55	38	165	10	60	0.50	1.45	30	6.5	4.2
43	6	19	15	55	59	165	10	53	0.50	1.61	30	6.4	4.1
44	6	19	17	56	19	165	12	48	0.50	1.22	30	5.8	3.3
45	6	20	6	56	42	165	08	41	0.50	1.47	30	-9.0	3.5
46	6	20	9	56	58	165	13	39	0.50	1.47	30	-9.0	3.3
47	6	20	12	57	19	165	14	36	0.50	1.60	30	-9.0	3.5
48	6	20	15	57	39	165	14	33	0.50	1.53	30	-9.0	3.2
49	6	20	17	57	58	165	14	27	0.50	1.45	10	-9.0	3.4
50	6	21	6	58	18	165	16	24	0.50	1.46	10	-9.0	3.1
51	6	21	9	58	38	165	18	22	0.50	1.36	10	-9.0	3.5
52	6	21	12	58	58	165	19	14	0.50	1.44	10	-9.0	-9.0
53	6	21	14	59	19	165	20	10	0.50	1.61	20	-9.0	4.5
54	6	22	6	59	37	166	38	15	0.50	1.43	20	-9.0	4.0
55	6	22	9	59	21	166	36	15	0.50	1.64	20	-9.0	4.3
56	6	22	12	59	01	166	36	17	0.50	1.53	20	-9.0	3.7
57	6	22	15	58	41	166	35	22	0.50	1.23	20	-9.0	3.6
58	6	23	6	58	21	166	33	25	0.50	1.30	10	-9.0	3.3
59	6	23	9	58	01	166	32	33	0.50	1.53	30	-9.0	-9.0
60	6	23	12	57	42	166	30	36	0.50	1.63	30	-9.0	3.4
61	6	23	14	57	21	166	29	37	0.50	1.50	30	-9.0	4.0
62	6	23	17	57	01	166	28	40	0.50	1.27	30	-9.0	4.0
63	6	24	7	56	40	166	29	47	0.50	1.45	30	-9.0	3.7
64	6	24	9	56	21	166	25	56	0.50	1.52	30	-9.0	4.2
65	6	24	12	56	01	166	25	68	0.50	1.48	50	-9.0	4.3

Table A-1.--Continued.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
67	6	24	18	55	21	166	21	73	0.50	1.45	50	-9.0	4.4
68	6	25	8	55	01	166	20	79	0.50	1.48	50	-9.0	4.3
69	6	25	13	55	19	167	32	82	0.50	1.52	50	-9.0	3.4
70	6	25	16	55	39	167	35	74	0.50	1.54	50	-9.0	4.3
71	6	26	6	55	60	167	38	73	0.50	1.33	50	-9.0	4.3
72	6	26	9	56	19	167	39	72	0.50	1.44	50	-9.0	4.3
73	6	26	12	56	39	167	40	58	0.50	1.39	30	-9.0	3.9
74	6	26	15	56	59	167	42	42	0.50	1.60	30	-9.0	4.1
75	6	26	17	57	19	167	44	40	0.50	1.84	30	-9.0	3.9
76	6	27	6	57	40	167	45	37	0.50	1.46	30	-9.0	4.0
77	6	27	9	57	59	167	47	36	0.50	1.46	40	-9.0	3.6
78	6	27	11	58	19	167	50	33	0.50	1.58	40	-9.0	3.3
79	6	27	14	58	40	167	53	25	0.50	1.61	20	-9.0	3.1
80	6	27	17	58	59	167	54	22	0.50	1.67	20	-9.0	2.4
81	6	28	6	59	19	167	55	21	0.50	1.47	20	-9.0	2.4
82	6	28	9	59	39	167	57	19	0.50	1.59	20	-9.0	2.6
83	6	28	11	59	53	167	59	15	0.50	1.51	20	-9.0	2.8
84	6	28	14	60	19	168	00	16	0.50	1.51	20	-9.0	4.2
85	6	29	7	60	20	169	18	22	0.50	1.68	20	-9.0	1.6
86	6	29	9	60	01	169	19	24	0.50	1.45	20	-9.0	1.5
87	6	29	12	59	41	169	19	25	0.50	1.41	20	-9.0	1.7
88	6	29	14	59	21	169	15	27	0.50	1.47	20	-9.0	1.9
89	6	29	17	59	01	169	12	29	0.50	1.36	40	-9.0	2.3
90	6	30	7	58	41	169	07	33	0.50	1.43	40	-9.0	3.2
91	6	30	9	58	21	169	07	36	0.50	1.48	40	-9.0	3.5
92	6	30	12	58	02	169	05	38	0.50	1.34	41	-9.0	3.4
93	6	30	14	57	51	169	19	35	0.50	1.63	41	-9.0	3.5
94	6	30	16	57	41	169	04	37	0.50	1.35	41	-9.0	4.0
95	7	1	6	57	31	169	20	37	0.50	1.57	41	-9.0	3.2
96	7	1	10	57	21	169	01	39	0.50	1.32	41	-9.0	4.1
97	7	1	13	57	11	169	17	40	0.50	1.38	41	-9.0	4.3
98	7	2	7	56	59	168	58	44	0.50	1.58	31	-9.0	3.9
99	7	2	9	56	51	169	15	44	0.50	1.28	31	-9.0	4.0
100	7	2	11	56	41	168	56	53	0.50	1.41	31	-9.0	4.0
101	7	2	13	56	22	168	53	68	0.50	1.42	50	-9.0	4.2
102	7	3	8	56	20	170	02	60	0.50	1.52	50	-9.0	4.0
103	7	3	11	56	39	170	07	54	0.50	1.44	41	-9.0	4.2
104	7	3	13	56	49	170	26	54	0.50	1.39	41	-9.0	4.3
105	7	3	15	56	60	170	13	38	0.50	1.76	41	-9.0	5.2
106	7	5	7	57	08	170	29	28	0.50	1.59	41	-9.0	5.5
107	7	5	9	57	20	170	14	29	0.50	1.26	41	-9.0	6.0
108	7	5	12	57	29	170	34	40	0.50	1.59	41	-9.0	4.0
109	7	5	14	57	39	170	18	39	0.50	1.55	41	-9.0	2.4
110	7	5	16	57	50	170	36	42	0.50	1.34	41	-9.0	3.0
111	7	6	6	57	59	170	21	40	0.50	1.39	41	-9.0	2.3
112	7	6	12	58	21	170	24	40	0.50	1.60	40	-9.0	2.0
113	7	6	14	58	39	170	26	40	0.50	1.51	40	-9.0	2.7
114	7	6	17	58	58	170	29	39	0.50	1.49	40	-9.0	2.7
115	7	7	6	59	19	170	32	37	0.50	1.39	40	-9.0	2.4
116	7	7	9	59	39	170	34	36	0.50	1.40	40	-9.0	1.6
117	7	7	11	59	59	170	38	35	0.50	1.40	40	-9.0	0.9
118	7	7	15	60	19	170	39	33	0.50	1.71	40	-9.0	0.4
119	7	8	6	60	59	172	08	35	0.50	1.50	40	-9.0	0.9
120	7	8	9	60	41	172	07	33	0.50	1.47	40	-9.0	-0.5
121	7	8	11	60	22	172	04	32	0.50	1.45	42	-9.0	-0.1
122	7	9	6	60	11	172	18	31	0.50	1.45	42	-9.0	1.0
123	7	9	8	60	01	171	60	36	0.50	1.29	42	-9.0	0.4
124	7	9	10	59	51	172	13	40	0.50	1.61	42	-9.0	0.7
125	7	9	12	59	41	171	56	42	0.50	1.46	42	-9.0	1.0

Table A-1.--Continued.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
126	7	9	15	59	22	171	50	44	0.50	1.30	42	-9.0	1.1
127	7	10	6	59	01	171	46	47	0.50	1.40	40	-9.0	2.3
128	7	10	9	58	41	171	43	50	0.50	1.46	40	-9.0	2.9
129	7	10	11	58	21	171	40	52	0.50	1.42	40	-9.0	3.1
130	7	10	14	58	01	171	36	53	0.50	1.33	40	-9.0	3.6
131	7	10	16	57	42	171	32	54	0.50	1.35	40	-9.0	3.7
132	7	11	6	57	21	171	28	55	0.50	1.43	40	-9.0	3.7
133	7	11	9	57	01	171	24	59	0.50	1.62	60	-9.0	4.0
134	7	11	11	56	42	171	21	64	0.50	1.70	60	-9.0	4.0
135	7	19	6	56	41	172	35	80	0.50	1.66	60	8.0	4.4
136	7	19	9	56	59	172	39	68	0.50	1.47	60	8.6	4.3
137	7	19	11	57	16	172	42	62	0.50	1.66	60	8.3	4.1
138	7	19	14	57	39	172	48	66	0.50	1.43	60	9.0	4.0
139	7	19	17	57	59	172	52	60	0.50	1.32	60	9.3	3.7
140	7	20	6	58	19	172	54	59	0.50	1.26	60	8.8	3.5
141	7	20	10	58	39	172	59	61	0.50	1.50	60	8.9	3.5
142	7	20	12	58	59	173	05	58	0.50	1.40	60	8.7	3.3
143	7	20	15	59	20	173	09	55	0.50	1.46	42	8.9	2.8
144	7	20	17	59	29	173	26	56	0.50	1.47	42	8.7	2.5
145	7	21	6	59	39	173	14	53	0.50	1.41	42	8.7	2.3
146	7	21	8	59	48	173	31	51	0.50	1.50	42	8.6	2.0
149	7	22	10	60	40	174	05	47	0.50	1.39	40	8.2	1.5
150	7	22	12	60	58	174	11	45	0.50	1.49	40	8.2	0.5
166	7	28	6	60	01	177	55	78	0.50	1.32	60	8.1	1.7
167	7	28	10	59	42	177	10	91	0.50	1.45	60	8.4	3.0
168	7	28	12	59	40	176	35	74	0.50	1.53	60	8.6	2.0
169	7	28	15	59	40	175	54	75	0.50	1.43	60	8.9	2.5
170	7	28	18	59	40	175	09	69	0.50	1.37	60	9.3	2.8
171	7	29	6	59	38	174	33	64	0.50	1.37	61	9.1	2.9
172	7	29	9	59	21	174	27	67	0.50	1.33	61	8.8	3.2
173	7	29	12	59	05	174	23	68	0.50	1.39	60	9.0	3.5
174	7	29	15	59	06	174	52	70	0.50	1.58	60	9.0	2.9
175	7	29	17	59	18	174	60	72	0.50	1.65	60	8.8	3.0
176	7	30	7	59	18	175	37	76	0.50	1.45	60	8.6	2.8
177	7	30	9	59	00	175	36	74	0.50	1.34	60	8.9	2.6
178	7	30	12	58	46	175	29	73	0.50	1.62	60	9.4	3.4
179	7	30	14	58	46	174	56	77	0.25	0.79	60	9.7	3.4
180	7	30	16	58	41	174	20	87	0.25	0.61	60	9.6	3.9

Table A-2.--Haul data for stations sampled by the Alaska during the 1987 eastern Bering Sea groundfish survey.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
1	5	27	9	57	20	158	24	16	0.50	1.25	10	4.4	3.5
2	5	27	14	57	42	158	19	19	0.50	1.45	10	4.1	3.4
3	5	27	17	57	59	158	19	17	0.50	1.47	10	4.9	3.8
4	5	28	7	57	58	158	60	20	0.50	2.00	10	4.3	3.6
5	5	28	10	57	40	159	01	24	0.50	1.63	10	3.8	3.3
6	5	28	12	57	21	159	03	25	0.50	1.54	10	4.3	3.4
7	5	28	16	57	01	159	08	17	0.50	1.70	10	4.5	3.9
21	6	3	18	56	40	159	46	18	0.50	1.60	10	5.2	4.3
22	6	4	7	56	60	159	42	30	0.50	1.50	10	4.7	3.6
23	6	4	9	57	19	159	40	29	0.50	1.54	10	4.2	3.7
24	6	4	12	57	39	159	40	26	0.50	1.59	10	4.5	3.6
25	6	4	15	57	59	159	36	21	0.50	1.48	10	5.1	3.8
26	6	4	18	58	19	159	33	12	0.50	1.48	10	7.6	5.1
28	6	5	8	58	13	160	39	20	0.50	1.46	10	7.0	5.2
29	6	5	12	58	01	160	50	23	0.50	1.67	10	6.2	3.5
30	6	5	15	57	41	160	53	29	0.50	1.48	30	5.2	3.4
31	6	5	18	57	20	160	55	34	0.50	1.57	30	5.3	3.4
32	6	6	7	57	00	160	55	39	0.50	1.47	30	5.1	3.5
33	6	6	10	56	41	160	60	36	0.50	1.53	30	5.4	3.6
34	6	6	14	56	21	161	00	28	0.50	1.55	10	5.5	4.0
35	6	7	7	56	02	162	16	38	0.50	1.63	30	5.7	4.1
37	6	7	10	56	22	162	13	44	0.50	1.48	30	5.1	3.8
38	6	7	13	56	40	162	11	37	0.62	1.78	30	5.6	3.4
39	6	7	16	56	60	162	10	31	0.50	1.52	30	5.7	3.4
40	6	7	18	57	19	162	09	27	0.50	1.66	10	6.5	3.2
41	6	8	7	57	40	162	07	25	0.50	1.55	10	4.7	3.0
42	6	8	10	57	60	162	06	19	0.50	1.54	10	3.6	2.4
43	6	8	12	58	18	162	05	24	0.50	1.53	10	3.2	3.0
44	61	0	7	58	41	162	39	13	0.30	1.29	10	3.0	2.7
45	61	0	10	58	59	163	18	11	0.50	1.51	10	3.5	3.0
46	61	0	13	59	19	164	00	11	0.50	1.57	10	5.3	4.5
47	61	0	16	59	00	163	59	13	0.50	1.52	10	4.1	2.7
48	61	1	7	58	40	163	23	16	0.50	1.46	10	3.4	3.0
49	61	3	11	58	20	163	21	20	0.50	1.42	10	3.4	-9.0
50	61	3	13	58	01	163	22	22	0.50	1.52	10	3.6	3.1
51	61	3	16	57	41	163	22	24	0.50	1.66	10	3.8	3.3
52	61	3	19	57	20	163	23	27	0.50	1.39	10	3.8	3.2
53	61	4	7	57	01	163	22	35	0.50	1.55	30	4.5	3.1
54	61	4	10	56	40	163	22	40	0.50	1.48	30	5.2	3.0
55	61	4	12	56	21	163	24	46	0.50	1.49	30	5.7	3.6
56	61	4	15	56	01	163	24	47	0.50	1.64	30	6.7	3.9
57	61	4	17	55	41	163	24	43	0.50	1.62	30	7.1	4.2
58	61	5	7	55	22	163	26	29	0.50	1.47	30	6.3	5.0
59	61	5	12	55	20	164	34	55	0.50	1.47	30	6.4	5.2
60	61	9	12	55	40	164	36	52	0.50	1.52	30	6.3	4.4
61	61	9	14	55	59	164	35	50	0.50	1.67	30	5.9	4.0
62	61	9	17	56	20	164	35	47	0.50	1.48	30	5.6	3.2
63	62	0	6	56	42	164	33	40	0.50	1.48	30	5.9	3.4
64	62	0	9	56	59	164	37	37	0.50	1.54	30	4.9	3.3
65	62	0	12	57	20	164	37	34	0.50	1.57	30	4.6	2.9
66	62	0	15	57	39	164	38	28	0.50	1.57	10	4.9	3.1
67	62	0	17	57	60	164	37	23	0.50	1.62	10	5.1	3.1
68	62	1	6	58	20	164	38	23	0.50	1.54	10	4.0	3.5
69	62	1	9	58	40	164	40	19	0.50	1.57	10	4.2	3.8
70	62	1	12	58	59	164	40	13	0.50	1.61	10	4.7	4.1
71	62	1	14	59	18	164	41	10	0.50	1.59	10	7.0	5.7
72	62	2	6	59	38	165	58	13	0.50	1.47	20	4.3	5.0
73	62	2	11	59	21	165	57	12	0.50	1.60	20	5.6	4.5
74	62	2	14	59	01	165	56	15	0.50	1.45	20	4.7	4.0
75	62	2	17	58	40	165	56	19	0.50	1.58	10	4.3	3.3
76	62	3	6	58	20	165	54	23	0.50	1.41	10	4.1	3.4

Table A-2.--Continued.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
77	6	23	9	58	01	165	54	29	0.50	1.56	10	4.0	3.2
78	6	23	12	57	40	165	54	34	0.50	1.60	30	4.5	3.8
79	6	23	14	57	20	165	52	36	0.50	1.45	30	5.0	3.6
80	6	23	17	57	01	165	51	38	0.50	1.54	30	5.9	3.8
81	6	24	7	56	39	165	54	43	0.50	1.46	30	6.0	3.6
82	6	24	9	56	20	165	48	49	0.50	1.61	30	6.3	4.4
83	6	24	13	56	00	165	48	59	0.50	1.66	30	6.8	4.1
84	6	24	15	55	40	165	49	63	0.50	1.49	50	6.8	4.5
85	6	24	18	55	20	165	47	66	0.50	1.51	50	7.2	4.4
86	6	25	7	54	59	165	45	71	0.50	1.56	50	6.8	4.1
88	6	25	14	55	00	166	55	85	0.50	1.54	50	7.1	3.7
89	6	25	17	55	20	166	58	76	0.50	1.64	50	7.0	4.3
90	6	26	6	55	40	166	58	73	0.50	1.50	50	7.0	4.3
91	6	26	9	56	02	167	00	72	0.50	1.73	50	6.9	4.3
92	6	26	12	56	20	167	02	61	0.50	1.65	50	7.0	4.3
93	6	26	15	56	40	167	04	51	0.50	1.66	30	6.7	3.9
94	6	26	18	57	01	167	05	39	0.50	1.66	30	6.1	4.4
95	6	27	6	57	21	167	06	38	0.50	1.51	30	5.5	4.2
96	6	27	9	57	40	167	08	36	0.50	1.50	30	5.8	3.5
97	6	27	12	57	60	167	10	34	0.50	1.54	30	5.8	3.4
98	6	27	14	58	20	167	11	27	0.50	1.60	20	5.8	3.5
99	6	27	17	58	40	167	13	22	0.50	1.64	20	4.8	3.2
100	6	28	6	59	00	167	14	20	0.50	1.46	20	4.1	2.9
101	6	28	9	59	19	167	16	16	0.50	1.55	20	4.7	4.2
102	6	28	11	59	39	167	17	15	0.50	1.58	20	4.3	3.8
104	6	29	7	60	16	168	42	19	0.50	1.49	20	3.8	3.3
105	6	29	9	60	01	168	40	20	0.50	1.58	20	3.0	2.5
106	6	29	11	59	41	168	37	20	0.50	1.55	20	2.5	2.2
107	6	29	14	59	21	168	34	22	0.50	1.50	20	3.5	2.1
108	6	29	17	59	01	168	32	24	0.50	1.46	20	4.0	2.6
109	6	30	7	58	39	168	29	28	0.50	1.51	20	5.7	3.2
110	6	30	9	58	21	168	28	35	0.50	1.56	40	6.2	3.2
111	6	30	12	58	01	168	26	37	0.50	1.52	41	6.9	3.6
112	6	30	16	57	50	168	45	38	0.50	1.50	41	7.2	3.6
113	6	30	19	57	40	168	26	37	0.50	1.50	41	7.2	3.9
114	7	1	6	57	30	168	43	38	0.50	1.53	41	7.0	4.0
115	7	1	10	57	20	168	23	40	0.50	1.42	31	6.9	4.1
116	7	1	13	57	10	168	37	41	0.50	1.56	31	7.1	4.1
117	7	1	16	57	00	168	21	43	0.50	1.62	31	7.0	3.9
118	7	2	7	56	50	168	37	53	0.50	1.49	31	6.9	3.9
119	7	2	9	56	40	168	17	57	0.50	1.45	50	7.3	4.0
120	7	2	11	56	21	168	15	84	0.50	1.57	50	7.5	4.4
121	7	3	7	56	22	169	27	73	0.50	1.42	50	7.6	4.2
122	7	3	10	56	39	169	30	39	0.33	1.12	31	6.7	5.2
123	7	3	12	56	49	169	48	38	0.50	1.49	41	7.0	4.6
124	7	3	14	56	60	169	35	33	0.50	1.45	41	7.6	4.6
125	7	3	16	57	09	169	54	26	0.42	1.66	41	7.5	5.1
126	7	5	9	57	19	169	38	33	0.50	1.46	41	8.1	3.2
127	7	5	14	57	29	169	56	37	0.50	1.58	41	8.0	2.6
128	7	5	17	57	40	169	39	38	0.50	1.52	41	8.2	2.8
129	7	6	6	57	49	169	58	38	0.50	1.61	41	8.0	3.0
130	7	6	9	57	59	169	42	37	0.50	1.52	41	7.8	3.3
131	7	6	13	58	20	169	45	37	0.50	1.57	40	7.6	3.1
132	7	6	15	58	39	169	47	35	0.50	1.60	40	7.6	3.1
133	7	6	18	58	59	169	50	33	0.50	1.60	40	7.7	3.1
134	7	7	6	59	20	169	52	32	0.50	1.50	40	7.2	2.4
135	7	7	9	59	39	169	55	29	0.50	1.43	40	6.9	1.8
136	7	7	12	59	59	169	59	28	0.50	1.63	40	7.2	1.2
137	7	7	14	60	20	170	05	27	0.50	1.57	20	7.0	0.9
138	7	8	6	60	60	171	27	32	0.50	1.61	40	7.4	-1.0
139	7	8	9	60	41	171	26	33	0.50	1.58	40	7.6	-0.4

Table A-2.--Continued.

Haul	Mo.	Day	Hour	Latitude Deg.	Latitude Min.	Longitude Deg.	Longitude Min.	Depth (m)	Duration (hours)	Distance Fished (nm)	Stratum	Temperature (Deg. C) Surface	Temperature (Deg. C) Bottom
140	7	8	12	60	21	171	23	35	0.50	1.60	40	7.7	0.1
141	7	8	14	60	00	171	18	37	0.50	1.59	40	7.9	0.6
142	7	8	17	59	41	171	15	39	0.50	1.53	40	8.6	2.5
143	7	9	6	59	22	171	11	40	0.50	1.59	40	8.2	1.9
144	7	9	9	59	01	171	08	41	0.50	1.61	40	8.3	2.0
145	7	9	12	58	40	171	08	44	0.50	1.49	40	8.0	2.0
146	7	9	15	58	20	171	01	45	0.50	1.54	40	8.1	2.3
147	7	9	17	58	00	170	60	46	0.50	1.55	41	9.1	3.3
148	7	10	6	57	40	170	53	46	0.50	1.55	41	9.3	3.5
149	7	10	9	57	21	170	51	44	0.50	1.61	41	9.1	4.3
150	7	10	12	56	60	170	48	52	0.50	1.51	41	8.7	4.2
151	7	10	14	56	40	170	44	61	0.50	1.30	60	8.5	4.1
152	7	10	17	56	22	170	40	65	0.50	1.44	60	8.4	4.2
153	7	11	6	56	39	171	55	70	0.50	1.63	60	8.8	4.3
154	7	11	9	57	01	172	01	63	0.50	1.45	60	9.0	4.2
155	7	11	12	57	20	172	07	58	0.50	1.35	60	10.0	3.9
156	7	11	15	57	39	172	06	57	0.50	1.62	60	10.0	3.8
157	7	17	11	55	41	168	10	74	0.50	1.45	50	8.1	4.5
158	7	17	14	55	60	168	12	82	0.50	1.36	50	9.2	4.2
159	7	18	10	57	02	173	18	79	0.50	1.58	60	8.9	4.2
160	7	18	13	57	21	173	20	66	0.50	1.51	60	9.1	4.1
161	7	18	16	57	40	173	24	80	0.50	1.48	60	9.0	4.2
162	7	18	18	58	01	173	29	64	0.50	1.48	60	9.5	3.9
163	7	19	7	57	60	172	13	57	0.50	1.46	60	9.3	3.7
164	7	19	10	58	20	172	19	55	0.50	1.61	60	9.4	3.3
165	7	19	13	58	40	172	22	55	0.50	1.59	60	9.6	3.1
166	7	19	17	59	03	172	27	53	0.50	1.49	40	9.4	2.8
167	7	19	19	59	20	172	30	47	0.50	1.44	42	9.1	2.6
168	7	20	7	59	30	172	53	51	0.50	1.47	42	9.2	2.4
169	7	20	9	59	40	172	33	43	0.50	1.43	42	9.0	1.2
171	7	20	14	60	01	172	38	35	0.22	0.62	42	9.2	0.8
172	7	20	16	60	10	173	00	31	0.50	1.60	42	8.7	1.2
173	7	21	7	60	40	172	47	23	0.50	1.54	40	6.0	2.6
174	7	21	10	60	60	172	49	35	0.50	1.56	40	7.3	0.4
175	7	21	13	60	60	173	30	40	0.50	1.55	40	7.1	0.4
176	7	21	16	60	40	173	27	35	0.50	1.38	40	8.8	0.9
177	7	22	11	60	20	174	04	49	0.50	1.60	42	9.0	1.7
178	7	22	13	60	10	174	21	54	0.50	1.51	42	9.2	2.5
179	7	22	15	60	20	174	43	55	0.50	1.56	61	9.1	1.9
180	7	22	18	60	40	174	49	53	0.50	1.62	40	9.1	1.8
181	7	22	20	60	40	175	26	59	0.50	1.44	60	9.2	1.6
192	7	25	10	60	40	178	10	88	0.50	1.41	60	8.9	1.2
193	7	25	16	60	40	177	30	80	0.50	1.28	60	9.1	0.9
194	7	27	8	60	40	176	47	71	0.50	1.50	60	9.1	2.0
195	7	27	10	60	39	176	11	65	0.50	1.45	60	9.1	2.1
196	7	27	15	60	20	175	24	60	0.50	1.56	60	9.7	2.0
197	7	27	17	60	20	176	03	66	0.50	1.59	60	9.8	2.0
198	7	27	20	60	20	176	44	75	0.50	1.55	60	9.5	1.3
199	7	28	7	60	19	177	23	81	0.50	1.47	60	8.9	1.8
200	7	28	10	59	60	177	11	75	0.50	1.51	60	9.1	1.6
201	7	28	12	59	60	176	41	77	0.50	1.45	60	9.3	1.6
202	7	28	15	59	59	175	54	70	0.50	1.59	60	9.7	2.4
203	7	28	18	59	60	175	16	63	0.50	1.43	60	10.0	2.4
204	7	29	7	59	59	174	35	59	0.50	1.40	61	9.6	2.5
205	7	29	9	59	50	174	12	58	0.50	1.52	61	9.8	2.7
206	7	29	12	59	59	173	53	52	0.50	1.52	42	9.7	2.3
207	7	29	15	59	39	173	52	56	0.50	1.54	61	10.0	2.6
208	7	29	17	59	19	173	48	59	0.50	1.59	61	10.1	3.2
209	7	29	20	58	59	173	43	64	0.50	1.45	60	9.9	3.5
210	7	30	7	58	39	173	38	68	0.50	1.49	60	9.6	3.9
211	7	30	10	58	20	173	35	63	0.30	0.88	60	9.6	3.9
212	7	30	13	58	19	174	17	82	0.50	1.44	60	9.7	4.0

APPENDIX B

List of Species Encountered

Appendix B contains a computer listing of all fish and invertebrate species taken during the 1987 demersal trawl survey in order of relative abundance over the entire survey area. Mean CPUE in kilograms per hectare and percent of total biomass are given for each fish species.

List of Tables

Table B-1.--Fish species encountered during the 1987 eastern Bering Sea survey.

Species	Scientific name	Mean CPUE (kg/ha)	Percent of total biomass
Family Squalidae			
Spiny dogfish	Squalus acanthias	0.005	0.002
Family Rajidae			
Skate unid.	Rajidae unid.	7.548	2.319
Family Clupeidae			
Pacific herring	Clupea pallasii	0.170	0.052
Family Salmonidae			
Chinook salmon	Oncorhynchus tshawytscha	0.002	0.001
Chum salmon	Oncorhynchus keta	0.002	<0.001
Family Osmeridae			
Eulachon	Thaleichthys pacificus	0.033	0.010
Capelin	Mallotus villosus	0.029	0.009
Rainbow smelt	Osmerus mordax	<0.001	<0.001
Family Gadidae			
Walleye pollock	Theragra chalcogramma	112.443	34.544
Pacific cod	Gadus macrocephalus	24.633	7.568
Arctic cod	Boreogadus saida	0.001	<0.001
Saffron cod	Eleginus gracilis	0.001	<0.001
Family Zoarcidae			
Wattled eelpout	Lycodes palearis	0.373	0.115
Marbled eelpout	Lycodes raridens	0.119	0.037
Shortfin eelpout	Lycodes brevipes	0.058	0.018
Polar eelpout	Lycodes turneri	0.002	0.001
Family Scorpaenidae			
Northern rockfish	Sebastes polyspinis	0.131	0.040
Pacific ocean perch	Sebastes alutus	0.005	0.001
Rougheye rockfish	Sebastes aleutianus	0.002	0.001
Dusky rockfish	Sebastes ciliatus	0.001	<0.001
Family Hexagrammidae			
Whitespotted greenling	Hexagrammos stelleri	0.003	0.001
Family Anoplopomatidae			
Sablefish	Anoplopoma fimbria	0.062	0.019

Table B-1.--Continued.

Species	Scientific name	Mean CPUE (kg/ha)	Percent of total biomass
Family Cottidae			
Myoxocephalus unid.	Myoxocephalus sp.	2.454	0.754
Yellow irish lord	Hemilepidotus jordani	0.904	0.278
Bigmouth sculpin	Hemitripterus bolini	0.504	0.155
Butterfly sculpin	Hemilepidotus papilio	0.201	0.062
Gymnocanthus unid.	Gymnocanthus sp.	0.073	0.022
Icelus unid.	Icelus sp.	0.037	0.011
Triglops unid.	Triglops sp.	0.012	0.004
Spinyhead sculpin	Dasycottus setiger	0.006	0.002
Roughspine sculpin	Triglops macellus	0.001	<0.001
Crested sculpin	Blepsias bilobus	<0.001	<0.001
Antlered sculpin	Enophrys diceraus	<0.001	<0.001
Pacific hookear sculpin	Artediellus pacificus	<0.001	<0.001
Eyeshade sculpin	Nautichthys pribilovius	<0.001	<0.001
Darkfin sculpin	Malacocottus zonurus	<0.001	<0.001
Sculpin unid.	Cottidae unid.	<0.001	<0.001
Family Agonidae			
Sturgeon poacher	Podothecus acipenserinus	0.321	0.098
Sawback poacher	Sarritor frenatus	0.012	0.004
Aleutian alligatorfish	Aspidophoroides bartoni	0.002	0.001
Bering poacher	Occella dodecaedron	0.002	0.001
Poacher unid.	Agonidae unid.	<0.001	<0.001
Spinycheek starsnout	Bathyagonus infraspinatus	<0.001	<0.001
Family Cyclopteridae			
Snailfish unid.	Cyclopteridae unid.	0.081	0.025
Pacific spiny lumpsucker	Eumicrotremus orbis	<0.001	<0.001
Smooth lumpsucker	Aptocyclus ventricosus	<0.001	<0.001
Family Bathymasteridae			
Searcher	Bathymaster signatus	0.088	0.027
Family Anarhichadidae			
Bering wolffish	Anarhichas orientalis	0.034	0.010
Family Stichaeidae			
Daubed shanny	Lumpenus maculatus	0.002	0.001
Snake prickleback	Lumpenus sagitta	<0.001	<0.001
Prickleback unid.	Stichaeidae unid.	<0.001	<0.001
Family Zaproridae			
Prowfish	Zaprora silenus	0.009	0.003

Table B-1.--Continued.

Species	Scientific name	Mean CPUE (kg/ha)	Percent of total biomass
Family Ammodytidae			
Pacific sand lance	*Ammodytes hexapterus*	0.001	<0.001
Family Pleuronectidae			
Yellowfin sole	*Limanda aspera*	53.095	16.312
Rock sole	*Lepidopsetta bilineata*	26.866	8.254
Alaska plaice	*Pleuronectes quadrituberculatus*	11.880	3.650
Flathead sole	*Hippoglossoides elassodon*	8.739	2.685
Arrowtooth flounder	*Atheresthes stomias*	6.251	1.920
Pacific halibut	*Hippoglossus stenolepis*	1.825	0.561
Starry flounder	*Platichthys stellatus*	0.461	0.142
Rex sole	*Glyptocephalus zachirus*	0.282	0.087
Longhead dab	*Limanda proboscidea*	0.239	0.073
Greenland turbot	*Reinhardtius hippoglossoides*	0.229	0.070
Butter sole	*Isopsetta isolepis*	0.042	0.013
Sakhalin sole	*Limanda sakhalinensis*	0.002	0.001
Dover sole	*Microstomus pacificus*	0.002	0.001

Table B-2.--Invertebrate species encountered during the 1987 eastern Bering Sea survey.

Species	Scientific name
Phylum Porifera	
Sponge unid.	Porifera unid.
Barrel sponge	*Halichondria panicea*
Hermit sponge	*Suberites ficus*
Phylum Coelenterata	
Jellyfish unid.	Scyphozoa unid.
Sea anemone unid.	Sea anemone unid.
Metridium senile	*Metridium senile*
Sea raspberry	*Gersemia* sp.
Metridium sp.	*Metridium* sp.
Tealia sp.	*Tealia* sp.
Sea pen unid.	Sea pen unid.
Hydroid unid.	Hydroid unid.
Phylum Ctenophora	
Ctenophore unid.	Ctenophore unid.
Phylum Annelida	
Giant scale worm	*Eunoe nodosa*
Depressed scale worm	*Eunoe depressa*
Sea mouse	*Aphrodita negligens*
Hermit worm	*Cheilonereis cyclurus*
Striped sea leech	*Cheinobdella cyclostomum*
Polychaete worm unid.	Polychaete worm unid.
Scale worm unid.	*Eunoe* sp.
Phylum Arthropoda	
Shrimp	
Northern shrimp	*Pandalus borealis*
Arctic argid	*Argis dentata*
Crangon sp.	*Crangon* sp.
Argis sp.	*Argis* sp.
Ridged crangon	*Crangon dalli*
Common two-spined crangon	*Crangon communis*
Spirontocaris sp.	*Spirontocaris boreas*
Pandalus sp.	*Pandalus* sp.
Tank shrimp	*Sclerocrangon boreas*
Humpy shrimp	*Pandalus goniurus*
Northern argid	*Argis lar*
Pandalid shrimp unid.	Pandalidae unid.
Shrimp unid.	Shrimp unid.
Spiny lebbeid	*Lebbeus groenlandicus*

Table B-2.--Continued.

Species	Scientific name
Phylum Arthropoda (contd)	
Crab	
Narrow snow crab	Chionoecetes opilio
Longfinger hermit	Pagurus rathbuni
Fuzzy hermit crab	Pagurus trigonocheirus
Aleutian hermit	Pagurus aleuticus
Red king crab	Paralithodes camtschatica
Broad snow crab	Chionoecetes bairdi
Hairy hermit crab	Pagurus capillatus
Circumboreal toad crab	Hyas coarctatus
Knobbyhand hermit crab	Pagurus confragosus
Pagurus ochotensis	Pagurus ochotensis
Purple hermit crab	Elassochirus cavimanus
Blue king crab	Paralithodes platypus
Splendid hermit crab	Labidlochirus splendescens
Hermit crab unid.	Paguridae unid.
North pacific toad crab	Hyas lyratus
Tanner crab (hybrid)	Chionoecetes hybrid
Korean horsehair crab	Erimacrus isenbeckii
Widehand hermit crab	Elassochirus tenuimanus
Longhorned decorator crab	Oregonia gracilis
Telmessus crab	Telmessus cheiragonus
Sponge hermit crab	Pagurus brandti
Whiteknee hermit crab	Pagurus dalli
Oregon rock crab	Cancer oregonensis
Other Arthropods	
Barnacle unid.	Cirripedia unid.
Giant barnacle	Balanus evermanni
Isopod unid.	Isopod unid.
Gammarid amphipod unid.	Gammaridae unid.
Phylum Mollusca	
Chiton unid.	Chiton unid.
Nudibranchs	
Nudibranch unid.	Nudibranch unid.
Diomedes' triton	Tritonia diomedea
Orangepeel nudibranch	Tochuina tetraquetra
Dorid nudibranch	Dorid nudibranch unid.
Dentronotus sp.	Dendronotus sp.

Table B-2.--Continued.

Species	Scientific name
Phylum Mollusca (contd)	
Gastropods	
Northern neptune	Neptunea heros
Pribilof neptune	Neptunea pribiloffensis
Fat neptune	Neptunea ventricosa
Ribbed neptune	Neptunea lyrata
Hairy triton	Fusitriton oregonensis
Silky buccinum	Buccinum scalariforme
Angled buccinum	Buccinum angulosum
Smooth sinistral snail	Pyrulofusus deformis
Polar buccinum	Buccinum polare
Middendorff's melon snail	Volutopsius middendorffii
Snail (gastropod) eggs	Snail (gastropod) eggs
Stefansson's melon snail	Volutopsius stefanssoni
Little neptune	Neptunea borealis
Brown clinopegma	Clinopegma magna
Northern beringius	Beringius beringii
Lyre buccinum	Buccinum plectrum
Fragile melon snail	Volutopsius fragilis
Kroyer's plicifus	Plicifusus kroyeri
Thickribbed colus	Colus spitzbergensis
Aforia circinata	Aforia circinata
Volutopsius castaneus	Volutopsius castaneus
Snail unid.	Gastropod unid.
Northern moon snail	Polinices pallida
Thinribbed colus	Colus herendeenii
Large melon snail	Pyrulofusus melonis
Beringius sp.	Beringius sp.
Grand slipper shell	Crepidula grandis
Hall's colus	Colus halli
Oblique colus	Colus hypolispus
Rusty moon snail	Natica russa
Neptunea sp.	Neptunea sp.
Buccinum sp.	Buccinum sp.
Stimpson's beringius	Beringius stimpsoni
Arctic moon snail	Natica clausa
Kennicott's beringius	Beringius kennicotti
Friele's beringius	Beringius frielei
Velutina velutina	Velutina velutina
Buccinum solenum	Buccinum solenum
Stearn's volute snail	Arctomelon stearnsii
Colus sp.	Colus sp.
Slipper shell	Crepidula sp.
Dall's boreotrophon	Boreotrophon muriciformis

Table B-2.--Continued.

Species	Scientific name
Phylum Mollusca (contd)	
Gastropods (contd)	
Ribbed melon snail	Volutopsius filosus
Natica sp.	Natica sp.
Volutopsius sp.	Volutopsius sp.
Aleutian moon snail	Natica aleutica
Bivalves	
Discord mussel	Musculus discors
Iceland cockle	Clinocardium ciliatum
Greenland cockle	Serripes groenlandicus
Hinds' scallop	Chlamys rubida
Alaska surf clam	Spisula polynyma
Thickribbed cardita	Cyclocardia crebricostata
Weathervane scallop	Patinopecten caurinus
Rock jingles unid.	Anomidae unid.
Horse mussel	Modiolus modiolus
Northern astarte	Astarte borealis
Butter clam	Saxidomus giganteus
Cockle unid.	Cockle unid.
Rock jingle	Pododesmus macroschisma
Macoma sp.	Macoma sp.
Clinocardium sp.	Clinocardium sp.
Nuttals cockle	Clinocardium nuttalii
Northern razor clam	Siliqua alta
Bay mussel	Mytilus edulis
Clam unid.	Pelecypoda unid.
Arctic nestler	Hiatella arctica
Spisula sp.	Spisula sp.
Great alaskan tellin	Tellina lutea
Common macoma	Macoma nasuta
Chlamys sp.	Chlamys sp.
Serripes sp.	Serripes sp.
Frail macoma	Macoma brota
Oblique yoldia	Yoldia scissurata
Yoldia hyperborea	Yoldia hyperborea
Black mussel	Musculus niger
Nuculana sp.	Nuculana sp.
Siliqua sp.	Siliqua sp.
Yoldia sp.	Yoldia sp.
Tellina sp.	Tellina sp.
Scallop unid.	Pectinid unid.
Chalky macoma	Macoma calcarea

Table B-2.--Continued.

Species	Scientific name
Phylum Mollusca (contd)	
Cephalopods	
Octopus unid.	Octopus unid.
Squid unid.	Squid unid.
Phylum Echinodermata	
Asteroid starfish	
Purple-orange seastar	Asterias amurensis
Knobby six rayed seastar	Leptasterias polaris
Common mud star	Ctenodiscus crispatus
Giant seastar	Evasterias echinosoma
Evasterias sp.	Evasterias sp.
Black-spined seastar	Leptasterias nanimensis
Cushion seastar	Pteraster tesselatus
Greenland seastar	Leptasterias groenlandica
Leptasterias sp.	Leptasterias sp.
Obscure seastar	Pteraster obscurus
Starfish unid.	Asteroidea unid.
Rose sea star	Crossaster papposus
Pteraster sp.	Pteraster sp.
Solaster sp.	Solaster sp.
Mottled seastar	Evasterias troschelii
Scarlet seastar	Pseudarchaster parelii
Blood seastar	Henricia leviuscula
Arctic seastar	Leptasterias arctica
Red bat star	Ceramaster japonica
Ceramaster sp.	Ceramaster sp.
Majestic seastar	Pedicellaster magister
Henricia sp.	Henricia sp.
Tumid seastar	Henricia tumida
Echinoidea	
Sand dollar unid.	Sand dollar unid.
Green sea urchin	Strongylocentrotus droebachiensis
White sea urchin	Strongylocentrotus pallidus
Parma sand dollar	Echinarachnius parma
Sea urchin unid.	Sea urchin unid.
Red sea urchin	Strongylocentrotus franciscanus
Ophiuroid starfish	
Basket star	Gorgonocephalus caryi
Notched brittlestar	Ophiura sarsi
Brittlestarfish unid.	Ophiuroid unid.

Table B-2.--Continued.

Species	Scientific Name
Phylum Echinodermata (contd)	
Holothuroidea	
Sea football	Cucumaria fallax
Cucumaria sp.	Cucumaria sp.
Psolus sp.	Psolus sp.
Sea cucumber unid.	Holothuroidea unid.
Crescent sea cucumber	Pentamera lissoplaca
Molpadia sp.	Molpadia sp.
Phylum Sipunculida	
Sipunculid worm unid.	Sipunculid worm unid.
Phylum Echiurida	
Echiuroid worm unid.	Echiuroid worm unid.
Phylum Bryozoa	
Bryozoan unid.	Bryozoan unid.
Feathery bryozoan	Eucratea loricata
Coral bryozoan	Cellepora ventricosa
Leafy bryozoan	Flustra serrulata
Phylum Chordata	
Sea potato	Styela rustica
Sea onion	Boltenia ovifera
Sea peach	Halocynthia aurantium
Aplidium sp.	Aplidium sp.
Sea blob	Synoicum sp.
Tunicate unid.	Ascidian unid.
Compound ascidian unid.	Compound ascidian unid.
Sea grape	Molgula grifithsii
Other Invertebrates	
Invertebrate unid.	Invertebrate unid.

APPENDIX C

Rank Order of Relative Abundance of Fish and Invertebrates

Appendix C lists the 100 most abundant fish and invertebrate species taken during the 1987 groundfish survey, in order of relative abundance (kg/ha) for the overall survey area.

List of Tables

Table C-1.--Rank order of relative abundance of the 100 most abundant fish and invertebrate species.

Rank	Species name	Mean CPUE (kg/ha)	Variance	90% Confidence Limits Lower	90% Confidence Limits Upper	Proportion	Cumulative Proportion
1	Walleye pollock	112.44	179.50	90.23	134.65	0.3452	0.3454
2	Yellowfin sole	53.09	16.57	46.35	59.84	0.1631	0.5086
3	Rock sole	26.87	3.64	23.71	30.03	0.0825	0.5911
4	Pacific cod	24.63	2.32	22.11	27.16	0.0757	0.6668
5	Purple-orange seastar	15.33	1.74	13.14	17.51	0.0471	0.7139
6	Opilio tanner crab	14.89	2.26	12.40	17.38	0.0457	0.7596
7	Alaska plaice	11.88	1.46	9.88	13.89	0.0365	0.7961
8	Flathead sole	8.43	0.71	7.03	9.83	0.0259	0.8220
9	Skate unident	7.55	0.41	6.48	8.61	0.0232	0.8452
10	Arrowtooth flounder	6.25	0.20	5.51	6.99	0.0192	0.8644
11	Sea potato	3.16	1.11	1.42	4.91	0.0097	0.8741
12	Basket star	2.90	0.68	1.53	4.27	0.0089	0.8830
13	Northern neptune	2.63	0.09	2.14	3.12	0.0081	0.8911
14	Myoxocephalus sculpins	2.45	0.04	2.13	2.78	0.0075	0.8986
15	Longfinger hermit	2.09	0.10	1.56	2.62	0.0064	0.9050
16	Fuzzy hermit crab	2.03	0.11	1.48	2.58	0.0062	0.9113
17	Pacific halibut	1.83	0.04	1.52	2.13	0.0056	0.9169
18	Aleutian hermit	1.75	0.13	1.17	2.34	0.0054	0.9223
19	Pribiloff neptune	1.50	0.05	1.12	1.88	0.0046	0.9269
20	Red king crab	1.46	0.08	0.98	1.93	0.0045	0.9313
21	Bairdi tanner crab	1.37	0.05	1.02	1.73	0.0042	0.9356
22	Knobby six-rayed seastar	1.20	0.04	0.87	1.54	0.0037	0.9393
23	Fat neptune	1.11	0.03	0.83	1.39	0.0034	0.9427
24	Hairy hermit crab	1.05	0.04	0.72	1.38	0.0032	0.9459
25	Ribbed neptune	0.96	0.08	0.50	1.43	0.0030	0.9489
26	Yellow Irish lord	0.90	0.19	0.19	1.62	0.0028	0.9516
27	Jellyfish unident	0.75	0.13	0.15	1.36	0.0023	0.9540
28	Sea anemone unident	0.73	0.02	0.49	0.96	0.0022	0.9562
29	Sea onion	0.67	0.03	0.37	0.98	0.0021	0.9583
30	Sponge unident	0.62	0.06	0.21	1.03	0.0019	0.9601
31	Sea peach	0.61	0.05	0.23	0.98	0.0019	0.9620
32	Common mud star	0.59	0.02	0.36	0.82	0.0018	0.9638
33	Circumboreal toad crab	0.52	0.02	0.29	0.75	0.0016	0.9654
34	Notched brittlestar	0.52	0.03	0.23	0.81	0.0016	0.9670
35	Metridium senile	0.51	0.04	0.19	0.83	0.0016	0.9686
36	Bigmouth sculpin	0.50	0.01	0.35	0.66	0.0015	0.9702
37	Giant seastar	0.49	0.03	0.19	0.79	0.0015	0.9717
38	Starry flounder	0.46	0.09	0.00	0.94	0.0014	0.9731
39	Knobbyhand hermit crab	0.43	0.01	0.29	0.58	0.0013	0.9744
40	Barrel sponge	0.40	0.05	0.05	0.76	0.0012	0.9751
41	Wattled eelpout	0.37	0.00	0.30	0.45	0.0011	0.9768
42	Alaskan hermit crab	0.37	0.00	0.29	0.44	0.0011	0.9779
43	Sturgeon poacher	0.32	0.00	0.23	0.42	0.0010	0.9790
44	Bering flounder	0.31	0.00	0.24	0.39	0.0010	0.9799
45	Hairy triton	0.28	0.00	0.22	0.35	0.0009	0.9807
46	Rex sole	0.28	0.00	0.20	0.37	0.0009	0.9816
47	Cucumaria fallax	0.25	0.02	0.00	0.51	0.0008	0.9824
48	Aplidium sp	0.24	0.00	0.16	0.32	0.0007	0.9831
49	Longhead dab	0.24	0.00	0.17	0.31	0.0007	0.9839
50	Greenland turbot	0.23	0.00	0.13	0.33	0.0007	0.9846
51	Purple hermit crab	0.22	0.01	0.03	0.42	0.0007	0.9853
52	Silky whelk	0.22	0.00	0.13	0.30	0.0007	0.9859
53	Butterfly sculpin	0.20	0.01	0.06	0.35	0.0006	0.9865
54	Evasterias sp	0.19	0.02	0.00	0.43	0.0006	0.9871
55	Octopus unident	0.17	0.01	0.03	0.32	0.0005	0.9877
56	Pacific herring	0.17	0.01	0.06	0.28	0.0005	0.9882
57	Sea raspberry	0.16	0.00	0.09	0.22	0.0005	0.9887
58	Blue king crab	0.13	0.00	0.08	0.19	0.0004	0.9891
59	Northern rockfish	0.13	0.02	0.00	0.35	0.0004	0.9895
60	Metridium sp	0.13	0.00	0.04	0.22	0.0004	0.9899

Table C-1.--Continued.

Rank	Species name	Mean CPUE (kg/ha)	Variance	90% Confidence Limits Lower	90% Confidence Limits Upper	Proportion	Cumulative Proportion
61	Splendid hermit crab	0.13	0.00	0.10	0.16	0.0004	0.9903
62	Hermit crab unident	0.12	0.00	0.01	0.23	0.0004	0.9907
63	Sand dollar unident	0.12	0.00	0.01	0.23	0.0004	0.9910
64	Marbled eelpout	0.12	0.00	0.03	0.21	0.0004	0.9914
65	Invertebrate unident	0.11	0.01	0.00	0.25	0.0003	0.9917
66	Angled buccinum	0.11	0.00	0.08	0.13	0.0003	0.9921
67	Cucumaria sp	0.10	0.00	0.03	0.18	0.0003	0.9924
68	Smooth sinistral snail	0.10	0.00	0.05	0.16	0.0003	0.9927
69	Polar buccinum	0.10	0.00	0.07	0.13	0.0003	0.9930
70	Middendorff's melon snail	0.10	0.00	0.05	0.14	0.0003	0.9933
71	Searcher	0.09	0.00	0.02	0.15	0.0003	0.9936
72	Snail (gastropod) eggs	0.09	0.00	0.06	0.12	0.0003	0.9939
73	Stefansson's melon snail	0.08	0.00	0.03	0.13	0.0003	0.9941
74	Blackspined seastar	0.08	0.00	0.04	0.12	0.0003	0.9944
75	Snailfish unident	0.08	0.00	0.05	0.11	0.0002	0.9946
76	Barnacle unident	0.08	0.00	0.03	0.13	0.0002	0.9948
77	Gymnocanthus sculpins	0.07	0.00	0.04	0.11	0.0002	0.9951
78	North pacific toad crab	0.07	0.00	0.05	0.09	0.0002	0.9953
79	Sablefish	0.06	0.00	0.00	0.12	0.0002	0.9955
80	Discord mussel	0.06	0.00	0.00	0.12	0.0002	0.9956
81	Shortfin eelpout	0.06	0.00	0.04	0.08	0.0002	0.9958
82	Tanner crab (hybrid)	0.06	0.00	0.04	0.08	0.0002	0.9960
83	Little neptune	0.05	0.00	0.04	0.07	0.0002	0.9962
84	Brown clinopegma	0.05	0.00	0.04	0.07	0.0002	0.9963
85	Green sea urchin	0.05	0.00	0.02	0.08	0.0001	0.9965
86	Northern beringius	0.04	0.00	0.03	0.06	0.0001	0.9966
87	Lyre buccinum	0.04	0.00	0.02	0.06	0.0001	0.9967
88	Butter sole	0.04	0.00	0.02	0.07	0.0001	0.9969
89	Korean horsehair crab	0.04	0.00	0.02	0.06	0.0001	0.9970
90	Tealia sp	0.04	0.00	0.02	0.06	0.0001	0.9971
91	Giant scale worm	0.04	0.00	0.02	0.05	0.0001	0.9972
92	Icelus sculpins	0.04	0.00	0.03	0.05	0.0001	0.9973
93	Sea pen unident	0.04	0.00	0.00	0.08	0.0001	0.9975
94	Synoicum sp.	0.03	0.00	0.00	0.08	0.0001	0.9976
95	Bering wolffish	0.03	0.00	0.01	0.06	0.0001	0.9977
96	Eulachon	0.03	0.00	0.02	0.05	0.0001	0.9978
97	Fragile melon snail	0.03	0.00	0.01	0.05	0.0001	0.9979
98	Northern shrimp	0.03	0.00	0.02	0.04	0.0001	0.9979
99	Capelin	0.03	0.00	0.02	0.04	0.0001	0.9980
100	Cushion seastar	0.03	0.00	0.01	0.04	0.0001	0.9981

APPENDIX D

Abundance Estimates for Principal Fish Species

Appendix D contains tables of abundance estimates for each of the principal eastern Bering Sea groundfish species in terms of CPUE (in kilograms per hectare and numbers per hectare), population number, and biomass (in metric tons). Confidence intervals are based on variance estimates that ingore variation which was introduced to the data by using a fishing power correction factor. Error in the measure of effort was also ignored in formaulating confidence bounds. Estimates are given separately for each of the 10 geographic strata used in the analysis; estimates for each of the six standard subareas are presented as subtotals of the component strata, and the estimates for the overall survey area are shown as the total for all strata. Stratum codes correspond to subareas (illustrated in Fig. 3) as follows:

Stratum	Subarea
10	1
20	2
30	3
31	3 (Pribilof Island high-density area)
40	4
41	4 (Pribilof Island high-density area)
42	4 (St. Matthew high-density area)
50	5
60	6
61	6 (St.Matthew high-density area)

List of Tables

Table D-1.--CPUE, population, and biomass estimates for walleye pollock.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	53	53	51	31.74	0.663095E+02	27.73	0.470832E+02
20	30	29	29	28	8.47	0.189331E+01	11.03	0.951392E+01
30	68	68	68	67	93.65	0.370400E+03	152.40	0.132584E+04
31	8	7	7	6	70.83	0.793314E+03	136.58	0.312064E+04
Subtotal	76	75	75	73	91.71	0.315873E+03	151.06	0.113269E+04
40	44	44	44	44	74.70	0.201105E+03	124.30	0.170229E+04
41	31	27	27	26	110.12	0.660073E+03	153.96	0.127449E+04
42	18	17	17	17	87.35	0.364949E+03	157.87	0.144455E+04
Subtotal	93	88	88	87	85.09	0.114721E+03	137.51	0.692715E+03
50	25	21	21	19	78.07	0.941484E+03	115.05	0.308057E+04
60	53	51	51	49	294.52	0.399108E+04	525.57	0.133832E+05
61	7	7	7	7	213.60	0.408103E+04	364.64	0.898363E+04
Subtotal	60	58	58	56	289.11	0.349330E+04	514.81	0.116930E+05
Total	342	324	324	314	112.44	0.179502E+03	187.06	0.615686E+03

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	215,899,010	0.285508835E+16	57.00	108,808,538	322,989,482
20	45,241,227	0.160140270E+15	29.00	19,362,459	71,119,994
30	1,440,565,456	0.118466419E+18	67.00	752,989,544	2,128,141,368
31	119,837,001	0.240246024E+16	7.00	0	239,776,457
Subtotal	1,560,402,458	0.120868879E+18	69.47	866,121,406	2,254,683,509
40	775,895,916	0.663263285E+17	43.00	255,950,460	1,295,841,372
41	369,678,738	0.734782877E+16	30.00	194,382,407	544,975,069
42	333,228,628	0.643599465E+16	17.00	163,954,615	502,502,642
Subtotal	1,478,803,282	0.801101520E+17	60.24	912,728,545	2,044,878,019
50	450,770,277	0.472900637E+17	24.00	1,927,084	899,613,469
60	4,713,555,057	0.107644643E+19	52.00	2,629,801,170	6,797,308,945
61	234,413,511	0.371267285E+16	6.00	77,758,094	391,068,928
Subtotal	4,947,968,568	0.108015910E+19	52.35	2,860,624,331	7,035,312,805
Total	8,699,084,822	0.133144342E+19	78.11	6,398,244,326	10,999,925,317

Table D-1.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	247,128	0.402095540E+10	57.00	120,040	374,217
20	34,766	0.318685513E+08	29.00	23,205	46,327
30	885,246	0.330958523E+11	67.00	521,825	1,248,667
31	62,147	0.610741190E+09	7.00	1,673	122,620
Subtotal	947,392	0.337065935E+11	69.27	580,756	1,314,029
40	466,254	0.783562810E+10	43.00	287,543	644,965
41	264,421	0.380553205E+10	30.00	138,267	390,575
42	184,376	0.162597352E+10	17.00	99,293	269,458
Subtotal	915,050	0.132671337E+11	85.19	685,644	1,144,456
50	305,877	0.144527796E+11	24.00	57,143	554,612
60	2,641,403	0.321013448E+12	52.00	1,503,483	3,779,324
61	137,317	0.168657064E+10	6.00	36,824	237,810
Subtotal	2,778,720	0.322700019E+12	52.54	1,637,814	3,919,626
Total	5,228,934	0.388179349E+12	74.98	3,985,761	6,472,107

CONFIDENCE LIMITS

	Total biomass (t) Lower	Total biomass (t) Upper	Total population Lower	Total population Upper
80 Percent	4,422,491	6,035,377	7,206,077,040	10,192,092,603
90 Percent	4,189,723	6,268,145	6,775,448,317	10,622,721,326
95 Percent	3,985,761	6,472,107	6,398,244,326	10,999,925,317

Table D-2.--CPUE, population, and biomass estimates for Pacific cod.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	58	58	56	25.19	0.966442E+01	22.94	0.728851E+01
20	30	30	30	29	14.29	0.389439E+01	10.40	0.450126E+01
30	68	68	68	67	23.54	0.116272E+02	20.53	0.120342E+02
31	8	8	8	8	14.44	0.145088E+02	10.42	0.105450E+02
Subtotal	76	76	76	75	22.77	0.984058E+01	19.67	0.101528E+02
40	44	42	42	42	20.43	0.117728E+02	17.37	0.134522E+02
41	31	29	29	26	19.82	0.913171E+01	17.89	0.102922E+02
42	18	17	17	16	22.49	0.250766E+02	20.13	0.181293E+02
Subtotal	93	88	88	84	20.70	0.538776E+01	18.03	0.574379E+01
50	25	25	25	24	23.79	0.459948E+02	6.50	0.281741E+01
60	53	53	53	51	35.52	0.245444E+02	11.22	0.284469E+01
61	7	7	7	7	32.93	0.265232E+02	15.28	0.614768E+01
Subtotal	60	60	60	58	35.35	0.214895E+02	11.50	0.250438E+01
Total	342	337	337	326	24.63	0.231948E+01	16.22	0.117454E+01

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	178,611,249	.441969857E+15	57.00	136,498,868	220,723,630
20	42,654,088	.757660585E+14	29.00	24,827,538	60,480,638
30	194,059,804	.107527746E+16	67.00	128,542,540	259,577,068
31	9,144,343	.811814805E+13	7.00	2,405,899	15,882,787
Subtotal	203,204,147	.108339561E+16	67.98	137,450,998	268,957,297
40	108,424,625	.524138738E+15	43.00	62,227,813	154,621,437
41	42,945,828	.593381460E+14	30.00	27,192,936	58,698,720
42	42,492,738	.807724696E+14	17.00	23,529,429	61,456,048
Subtotal	193,863,191	.664249354E+15	64.04	142,351,484	245,374,898
50	25,451,969	.432503084E+14	24.00	11,845,198	39,058,741
60	100,664,585	.228806398E+15	52.00	70,284,828	131,044,342
61	9,819,791	.254065822E+13	6.00	5,919,409	13,720,172
Subtotal	110,484,376	.231347056E+15	53.10	79,952,387	141,016,364
Total	754,269,021	.253997824E+16	223.49	654,483,771	854,054,270

Table D-2.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	196,150	0.586043235E+09	57.00	147,657	244,643
20	58,621	0.655511812E+08	29.00	42,040	75,203
30	222,534	0.103891290E+10	67.00	158,145	286,924
31	12,670	0.111697307E+08	7.00	4,766	20,574
Subtotal	235,204	0.105008263E+10	68.37	170,481	299,928
40	127,496	0.458703997E+09	43.00	84,257	170,736
41	47,595	0.526472636E+08	30.00	32,757	62,433
42	47,474	0.111725029E+09	17.00	25,172	69,777
Subtotal	222,566	0.623076290E+09	67.87	172,701	272,430
50	93,225	0.706068713E+09	24.00	38,380	148,069
60	318,583	0.197417063E+10	52.00	229,347	407,820
61	21,172	0.109612679E+08	6.00	13,071	29,274
Subtotal	339,756	0.198513190E+10	52.57	250,272	429,240
Total	1,145,522	0.501595395E+10	203.29	1,005,296	1,285,749

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	1,054,232	1,236,812	689,306,858	819,231,183
90 Percent	1,028,099	1,262,945	670,710,877	837,827,164
95 Percent	1,005,296	1,285,749	654,483,771	854,054,270

Table D-3.--CPUE, population, and biomass estimates for sablefish.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	0	0	0	0.00	0.0	0.00	0.0
20	30	0	0	0	0.00	0.0	0.00	0.0
30	68	1	1	1	0.01	0.555088E-04	0.00	0.107918E-04
31	8	0	0	0	0.00	0.0	0.00	0.0
Subtotal	76	1	1	1	0.01	0.464796E-04	0.00	0.903636E-05
40	44	0	0	0	0.00	0.0	0.00	0.0
41	31	0	0	0	0.00	0.0	0.00	0.0
42	18	0	0	0	0.00	0.0	0.00	0.0
Subtotal	93	0	0	0	0.00	0.0	0.00	0.0
50	25	8	8	4	0.30	0.163984E-01	0.19	0.724778E-02
60	53	1	1	1	0.18	0.336473E-01	0.08	0.713102E-02
61	7	0	0	0	0.00	0.0	0.00	0.0
Subtotal	60	1	1	1	0.17	0.292967E-01	0.08	0.620899E-02
Total	342	10	10	6	0.06	0.137017E-02	0.03	0.317124E-03

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.0	0.00	0	0
20	0	0.0	0.00	0	0
30	31,053	0.964264380E+09	67.00	0	93,085
31	0	0.0	0.00	0	0
Subtotal	31,053	0.964264380E+09	67.00	0	93,085
40	0	0.0	0.00	0	0
41	0	0.0	0.00	0	0
42	0	0.0	0.00	0	0
Subtotal	0	0.0	0.00	0	0
50	754,677	0.111261092E+12	24.00	66,212	1,443,141
60	757,342	0.573567593E+12	52.00	0	2,278,309
61	0	0.0	0.00	0	0
Subtotal	757,342	0.573567593E+12	52.00	0	2,278,309
Total	1,543,072	0.685792949E+12	68.74	0	3,197,116

Table D-3.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.0	0.00	0	0
20	0	0.0	0.00	0	0
30	70	0.495980620E+04	67.00	0	211
31	0	0.0	0.00	0	0
Subtotal	70	0.495980620E+04	67.00	0	211
40	0	0.0	0.00	0	0
41	0	0.0	0.00	0	0
42	0	0.0	0.00	0	0
Subtotal	0	0.0	0.00	0	0
50	1,161	0.251732988E+06	24.00	126	2,197
60	1,645	0.270634215E+07	52.00	0	4,951
61	0	0.0	0.00	0	0
Subtotal	1,645	0.270634215E+07	52.00	0	4,951
Total	2,877	0.296303494E+07	61.18	0	6,319

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	646	5,107	470,593	2,615,550
90 Percent	1	5,753	160,708	2,925,435
95 Percent	0	6,319	0	3,197,116

Table D-4.--CPUE, population, and biomass estimates for yellowfin sole.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	58	58	58	155.39	0.347938E+03	636.85	0.616809E+04
20	30	30	30	30	64.17	0.718077E+02	372.55	0.751809E+04
30	68	64	64	63	89.24	0.142144E+03	300.07	0.175891E+04
31	8	6	6	4	5.96	0.107931E+02	16.08	0.876161E+02
Subtotal	76	70	70	67	82.17	0.119101E+03	275.95	0.147344E+04
40	44	38	38	34	12.22	0.765879E+01	38.32	0.797162E+02
41	31	27	27	25	27.76	0.875794E+02	93.37	0.112556E+04
42	18	11	11	9	1.89	0.396934E+00	5.73	0.463445E+01
Subtotal	93	76	76	68	13.66	0.696174E+01	44.21	0.831488E+02
50	25	1	1	1	0.03	0.694653E-03	0.04	0.182541E-02
60	53	0	0	0	0.00	0.00	0.00	0.00
61	7	0	0	0	0.00	0.00	0.00	0.00
Subtotal	60	0	0	0	0.00	0.00	0.00	0.00
Total	342	235	235	224	53.10	0.165646E+02	211.04	0.308628E+03

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	4,959,220,238	0.374028420E+18	57.00	3,734,136,506	6,184,303,970
20	1,528,467,181	0.126546044E+18	29.00	799,925,775	2,257,008,586
30	2,836,455,827	0.157162030E+18	67.00	2,044,507,513	3,628,404,140
31	14,106,815	0.674521676E+14	7.00	0	33,530,387
Subtotal	2,850,562,641	0.157229483E+18	67.06	2,058,444,398	3,642,680,884
40	239,175,398	0.310597994E+16	43.00	126,659,438	351,691,359
41	224,196,246	0.648923992E+16	30.00	59,701,264	388,691,228
42	12,092,618	0.206480723E+14	17.00	2,459,307	21,725,930
Subtotal	475,464,263	0.961586794E+16	56.79	278,931,345	671,997,181
50	167,398	0.280220397E+11	24.00	0	512,907
60	0	0.00	0.00	0	0
61	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
TOTAL	9,813,881,721	0.667419843E+18	131.91	8,196,311,029	11,431,452,413

Table D-4.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	1,210,025	0.210987010E+11	57.00	919,059	1,500,990
20	263,251	0.120868164E+10	29.00	192,155	334,348
30	843,573	0.127008463E+11	67.00	618,440	1,068,706
31	5,227	0.830918651E+07	7.00	0	12,044
Subtotal	848,800	0.127091555E+11	67.09	623,593	1,074,007
40	76,266	0.298408943E+09	43.00	41,408	111,123
41	66,653	0.504923529E+09	30.00	20,769	112,538
42	3,984	0.176847838E+07	17.00	1,178	6,790
Subtotal	146,903	0.805100951E+09	61.33	90,164	203,642
50	103	0.106636562E+05	24.00	0	316
60	0	0.00	0.00	0	0
61	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
TOTAL	2,469,082	0.358216498E+11	124.84	2,094,336	2,843,829

CONFIDENCE LIMITS

	Total biomass (t) Lower	Total biomass (t) Upper	Total population Lower	Total population Upper
80 Percent	2,225,118	2,713,046	8,760,825,204	10,866,938,237
90 Percent	2,155,279	2,782,885	8,459,369,474	11,168,393,968
95 Percent	2,094,336	2,843,829	8,196,311,029	11,431,452,413

Table D-5.--CPUE, population, and biomass estimates for rock sole.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with Nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	58	58	55	72.31	0.437255E+02	362.82	0.100142E+04
20	30	30	30	29	20.43	0.924554E+01	116.10	0.166822E+03
30	68	64	64	58	33.06	0.287767E+02	166.85	0.915061E+03
31	8	8	8	8	49.01	0.450186E+03	138.83	0.215117E+04
Subtotal	76	72	72	66	34.42	0.273437E+02	164.47	0.781735E+03
40	44	44	44	36	5.27	0.707468E+00	22.71	0.127876E+02
41	31	31	31	29	65.40	0.342053E+03	220.03	0.297137E+04
42	18	18	18	13	3.96	0.124768E+01	16.37	0.199628E+02
Subtotal	93	93	93	78	18.44	0.173388E+02	65.52	0.153209E+03
50	25	9	9	4	1.35	0.359502E+00	2.45	0.130691E+01
60	53	46	46	27	4.64	0.154933E+01	8.88	0.612818E+01
61	7	7	7	5	2.65	0.160555E+00	6.88	0.750935E+00
Subtotal	60	53	53	32	4.50	0.134972E+01	8.75	0.533917E+01
Total	342	315	315	264	26.87	0.363476E+01	124.70	0.763839E+02

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	2,825,302,592	0.607252167E+17	57.00	2,331,417,867	3,319,187,317
20	476,319,911	0.280798022E+16	29.00	367,795,616	584,844,207
30	1,577,206,552	0.817623410E+17	67.00	1,005,896,136	2,148,516,969
31	121,807,977	0.165609943E+16	7.00	25,563,826	218,052,129
Subtotal	1,699,014,530	0.834184404E+17	69.47	1,122,235,984	2,275,793,075
40	141,769,758	0.498244441E+15	43.00	96,705,104	186,834,412
41	528,305,685	0.171309030E+17	30.00	260,645,706	795,965,664
42	34,561,536	0.889412514E+14	17.00	14,662,406	54,460,665
Subtotal	704,636,979	0.177180887E+17	32.07	433,386,825	975,887,133
50	9,586,113	0.200624163E+14	24.00	341,233	18,830,994
60	79,647,443	0.492906100E+15	52.00	35,057,973	124,236,912
61	4,422,553	0.310339338E+12	6.00	3,059,376	5,785,731
Subtotal	84,069,996	0.493216440E+15	52.07	39,466,491	128,673,501
Total	5,798,930,120	0.165183005E+18	155.98	4,994,213,135	6,603,647,106

Table D-5.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	563,123	0.265148342E+10	57.00	459,921	666,324
20	83,831	0.155622853E+09	29.00	58,283	109,380
30	312,539	0.257124719E+10	67.00	211,243	413,836
31	43,003	0.346580866E+09	7.00	0	87,031
Subtotal	355,542	0.291782806E+10	73.50	247,742	463,342
40	32,906	0.275650240E+08	43.00	22,306	43,506
41	157,037	0.197204628E+10	30.00	66,356	247,718
42	8,355	0.555884793E+07	17.00	3,381	13,330
Subtotal	198,298	0.200517015E+10	31.01	106,953	289,643
50	5,294	0.551873459E+07	24.00	434	10,155
60	41,570	0.124616795E+09	52.00	19,138	64,001
61	1,703	0.663525066E+05	6.00	1,073	2,334
Subtotal	43,273	0.124683148E+09	52.06	20,847	65,699
TOTAL	1,249,361	0.786030637E+10	167.00	1,073,820	1,424,902

CONFIDENCE LIMITS

	Total biomass (t) Lower	Total biomass (t) Upper	Total population Lower	Total population Upper
80 Percent	1,135,081	1,363,641	5,275,048,611	6,322,811,629
90 Percent	1,102,367	1,396,355	5,125,079,618	6,472,780,623
95 Percent	1,073,820	1,424,902	4,994,213,135	6,603,647,106

Table D-6.--CPUE, population, and biomass estimates for flathead sole.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	35	35	16	2.35	0.214878E+00	8.07	.390735E+01
20	30	6	6	3	0.10	0.184439E-02	0.36	.318293E-01
30	68	68	68	60	13.93	0.256350E+01	50.31	.385155E+02
31	8	6	6	4	14.77	0.715381E+02	44.20	.609829E+03
Subtotal	76	74	74	64	14.00	0.266263E+01	49.79	.366501E+02
40	44	30	30	19	1.97	0.423933E+00	9.82	.100465E+02
41	31	25	25	16	6.30	0.228860E+01	24.84	.391787E+02
42	18	12	12	7	1.19	0.321339E+00	8.77	.237043E+02
Subtotal	93	67	67	42	2.79	0.269302E+00	12.97	.625120E+01
50	25	25	25	24	17.85	0.314767E+01	114.16	.168729E+03
60	53	50	50	39	14.25	0.144343E+02	47.67	.756076E+02
61	7	7	7	3	1.34	0.301964E+00	6.46	.660842E+01
Subtotal	60	57	57	42	13.39	0.125693E+02	44.91	.658612E+02
Total	342	264	264	191	8.43	0.711094E+00	34.34	.626372E+01

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	62,838,397	.236938542E+15	57.00	32,004,294	93,672,501
20	1,477,601	.535756770E+12	29.00	0	2,976,643
30	475,589,423	.344142656E+16	67.00	358,398,959	592,779,888
31	38,781,388	.469483601E+15	7.00	0	91,801,932
Subtotal	514,370,811	.391091016E+16	73.44	389,567,266	639,174,357
40	61,278,550	.391441020E+15	43.00	21,334,879	101,222,221
41	59,643,660	.225878114E+15	30.00	28,908,860	90,378,460
42	18,511,526	.105611112E+15	17.00	0	40,195,420
Subtotal	139,433,736	.722930246E+15	88.28	85,909,961	192,957,512
50	447,301,382	.259016345E+16	24.00	342,256,892	552,345,872
60	427,531,885	.608132471E+16	52.00	270,911,131	584,152,638
61	4,150,394	.273106575E+13	6.00	0	8,399,213
Subtotal	431,682,279	.608405578E+16	52.05	275,026,361	588,338,197
Total	1,597,104,207	.135455339E+17	152.15	1,366,663,630	1,827,544,784

Table D-6.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	18,319	0.130300188E+08	57.00	11,088	25,549
20	391	0.310451120E+05	29.00	31	752
30	131,699	0.229053094E+09	67.00	101,465	161,933
31	12,959	0.550743751E+08	7.00	0	30,510
Subtotal	144,658	0.284127469E+09	66.37	110,980	178,337
40	12,316	0.165176854E+08	43.00	4,111	20,521
41	15,128	0.131945065E+08	30.00	7,711	22,546
42	2,519	0.143167709E+07	17.00	0	5,044
Subtotal	29,963	0.311438690E+08	79.06	18,837	41,089
50	69,924	0.483201117E+08	24.00	55,576	84,271
60	127,810	0.116099123E+10	52.00	59,377	196,243
61	860	0.124792714E+06	6.00	0	1,724
Subtotal	128,670	0.116111602E+10	52.01	60,233	197,106
Total	391,925	0.153776853E+10	86.78	313,836	470,014

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	341,223	442,628	1,447,084,377	1,747,124,037
90 Percent	326,619	457,232	1,404,138,892	1,790,069,522
95 Percent	313,836	470,014	1,366,663,630	1,827,544,784

Table D-7.--CPUE, population, and biomass estimates for Bering flounder.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	0	0	0	0.00	0.00	0.00	0.00
20	30	9	9	2	0.14	0.327270E-02	0.28	0.124659E-01
30	68	0	0	0	0.00	0.00	0.00	0.00
31	8	0	0	0	0.00	0.00	0.00	0.00
Subtotal	76	0	0	0	0.00	0.00	0.00	0.00
40	44	34	34	22	1.50	0.773341E-01	9.24	0.386045E+01
41	31	2	2	1	0.06	0.191138E-02	0.15	0.105451E-01
42	18	12	12	6	1.41	0.196362E+00	7.96	0.674835E+01
Subtotal	93	48	48	29	1.16	0.337152E-01	6.96	0.156115E+01
50	25	0	0	0	0.00	0.00	0.00	0.00
60	53	7	7	0	0.10	0.264439E-02	0.52	0.534177E-01
61	7	3	3	1	0.75	0.388875E+00	6.85	0.373807E+02
Subtotal	60	10	10	1	0.15	0.404220E-02	0.94	0.213743E+00
Total	342	67	67	32	0.31	0.200114E-02	1.83	0.927135E-01

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.00	0.00	0	0
20	1,136,815	0.209827826E+12	29.00	198,688	2,074,941
30	0	0.00	0.00	0	0
31	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
40	57,659,287	0.150414624E+15	43.00	32,911,640	82,406,934
41	350,995	0.607956455E+11	30.00	0	855,226
42	16,792,340	0.300662615E+14	17.00	5,222,638	28,362,042
Subtotal	74,802,622	0.180541681E+15	56.26	47,873,029	101,732,216
50	0	0.00	0.00	0	0
60	4,642,236	0.429653545E+13	52.00	479,208	8,805,265
61	4,405,787	0.154483443E+14	6.00	0	14,023,569
Subtotal	9,048,023	0.197448798E+14	9.71	0	19,099,268
Total	84,987,460	0.200496389E+15	64.89	56,686,990	113,287,930

Table D-7.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.00	0.00	0	0
20	574	0.550868122E+05	29.00	93	1,054
30	0	0.00	0.00	0	0
31	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
40	9,380	0.301316596E+07	43.00	5,876	12,885
41	135	0.110197053E+05	30.00	0	349
42	2,980	0.874861860E+06	17.00	1,007	4,954
Subtotal	12,495	0.389904752E+07	59.35	8,544	16,446
50	0	0.00	0.00	0	0
60	922	0.212695816E+06	52.00	0	1,849
61	482	0.160710547E+06	6.00	0	1,463
Subtotal	1,404	0.373406363E+06	26.95	148	2,661
Total	14,473	0.432754070E+07	71.63	10,320	18,626

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	11,780	17,166	66,643,130	103,331,791
90 Percent	11,002	17,944	61,338,915	108,636,005
95 Percent	10,320	18,626	56,686,990	113,287,930

Table D-8.--CPUE, population, and biomass estimates for Alaska plaice.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	53	53	27	8.04	0.207912E+01	18.90	0.100355E+02
20	30	30	30	28	18.32	0.100667E+02	38.76	0.410429E+02
30	68	56	56	37	13.26	0.122401E+02	19.90	0.300602E+02
31	8	7	7	3	1.92	0.383118E+00	1.78	0.378970E+00
Subtotal	76	63	63	40	12.29	0.102519E+02	18.36	0.251733E+02
40	44	43	43	34	29.77	0.352133E+02	42.98	0.739782E+02
41	31	23	23	19	18.11	0.161190E+02	25.80	0.330456E+02
42	18	18	18	11	10.02	0.928471E+01	10.81	0.127578E+02
Subtotal	93	84	84	64	23.29	0.130251E+02	32.83	0.270632E+02
50	25	0	0	0	0.00	0.00	0.00	0.00
60	53	16	16	9	3.96	0.331063E+01	2.47	0.116859E+01
61	7	4	4	2	2.72	0.323809E+01	1.81	0.101515E+01
Subtotal	60	20	20	11	3.87	0.289706E+01	2.43	0.102203E+01
Total	342	250	250	170	11.88	0.146283E+01	18.76	0.333395E+01

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	147,196,913	0.608547974E+15	57.00	97,755,773	196,638,052
20	159,035,399	0.690842120E+15	29.00	105,206,022	212,864,777
30	188,104,242	0.268593204E+16	67.00	84,573,212	291,635,271
31	1,559,337	0.291754032E+12	7.00	281,900	2,836,774
Subtotal	189,663,579	0.268622379E+16	67.01	86,126,926	293,200,231
40	268,280,008	0.288240881E+16	43.00	159,945,536	376,614,479
41	61,951,598	0.190518702E+15	30.00	33,766,175	90,137,020
42	22,817,564	0.568405557E+14	17.00	6,834,316	38,800,811
Subtotal	353,049,169	0.312976807E+16	50.33	240,573,093	465,525,245
50	0	0.00	0.00	0	0
60	22,179,413	0.939926809E+14	52.00	2,708,010	41,650,815
61	1,160,545	0.419530610E+12	6.00	0	2,825,812
Subtotal	23,339,958	0.944122115E+14	52.46	3,825,149	42,854,767
Total	872,285,017	0.720979417E+16	159.74	704,164,242	1,040,405,792

Table D-8.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	95% Confidence limits Upper
10	62,593	0.126076176E+09	57.00	40,101	85,085
20	75,158	0.169445326E+09	29.00	48,538	101,778
30	125,317	0.109367830E+10	67.00	59,253	191,382
31	1,686	0.294947605E+06	7.00	357	3,015
Subtotal	127,003	0.109397325E+10	67.04	60,930	193,077
40	185,836	0.137201321E+10	43.00	111,093	260,578
41	43,491	0.929313620E+08	30.00	23,777	63,205
42	21,149	0.413666397E+08	17.00	7,579	34,720
Subtotal	250,476	0.150631121E+10	51.37	172,487	328,465
50	0	0.00	0.00	0	0
60	35,490	0.266283092E+09	52.00	2,716	68,263
61	1,751	0.133820933E+07	6.00	0	4,725
Subtotal	37,241	0.267621302E+09	52.51	4,385	70,096
Total	552,470	0.316342727E+10	154.79	441,108	663,833

CONFIDENCE LIMITS

	Total biomass (t) Lower	Total biomass (t) Upper	Total population Lower	Total population Upper
80 Percent	479,972	624,969	762,836,084	981,733,951
90 Percent	459,218	645,723	731,504,716	1,013,065,319
95 Percent	441,108	663,833	704,164,242	1,040,405,792

Table D-9.--CPUE, population, and biomass estimates for Greenland Turbot.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	0	0	0	0.00	0.00	0.00	0.00
20	30	0	0	0	0.00	0.00	0.00	0.00
30	68	0	0	0	0.00	0.00	0.00	0.00
31	8	0	0	0	0.00	0.00	0.00	0.00
Subtotal	76	0	0	0	0.00	0.00	0.00	0.00
40	44	4	4	4	0.05	0.996840E-03	0.08	0.170325E-02
41	31	0	0	0	0.00	0.00	0.00	0.00
4	18	5	5	5	0.22	0.183811E-01	0.33	0.266642E-01
Subtotal	93	9	9	9	0.07	0.104399E-02	0.11	0.160110E-02
5	25	1	1	1	0.06	0.319406E-02	0.01	0.769907E-04
6	53	16	16	9	1.02	0.865186E-01	0.70	0.404928E-01
6	7	6	6	3	0.86	0.144025E+00	2.11	0.320426E+00
Subtotal	60	22	22	12	1.01	0.759762E+01	0.79	0.366906E+01
TOTAL	342	32	32	22	0.23	0.332397E-02	0.19	0.165348E-02

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.00	0.00	0	0
20	0	0.00	0.00	0	0
30	0	0.00	0.00	0	0
31	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
40	492,626	0.663637140E+11	43.00	0	1,012,718
41	0	0.00	0.00	0	0
42	697,042	0.118798289E+12	17.00	0	1,424,299
Subtotal	1,189,668	0.185162003E+12	36.76	316,408	2,062,928
50	34,379	0.118188916E+10	24.00	0	105,336
60	6,270,727	0.325694734E+13	52.00	2,646,164	9,895,289
61	1,355,226	0.132422680E+12	6.00	464,764	2,245,687
Subtotal	7,625,952	0.338937002E+13	55.52	3,934,239	11,317,666
TOTAL	8,849,999	0.357571391E+13	61.51	5,068,717	12,631,280

Table D-9.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	0	0.00	0.00	0	0
20	0	0.00	0.00	0	0
30	0	0.00	0.00	0	0
31	0	0.00	0.00	0	0
Subtotal	0	0.00	0.00	0	0
40	322	0.388398077E+05	43.00	0	720
41	0	0.00	0.00	0	0
42	458	0.818942524E+05	17.00	0	1,062
Subtotal	780	0.120734060E+06	33.93	73	1,488
50	221	0.490322713E+05	24.00	0	680
60	9,112	0.695892772E+07	52.00	3,814	14,410
61	555	0.595214321E+05	6.00	0	1,152
Subtotal	9,668	0.701844916E+07	52.86	4,347	14,988
Total	10,669	0.718821549E+07	55.42	5,293	16,046

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	7,190	14,149	6,399,541	11,300,457
90 Percent	6,180	15,158	5,690,621	12,009,376
95 Percent	5,293	16,046	5,068,717	12,631,280

Table D-10.--CPUE, population and biomass estimates for arrowtooth and Kamchatka flounder.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	4	4	3	0.21	0.285237E-01	1.08	0.747446E+00
20	30	0	0	0	0.00	0.00	0.00	0.00
30	68	49	49	33	6.16	0.128694E+01	18.88	0.139352E+02
31	8	8	8	6	8.29	0.249733E+01	24.74	0.259847E+02
Subtotal	76	57	57	39	6.34	0.109562E+01	19.38	0.118560E+02
40	44	13	13	9	0.76	0.793902E-01	1.81	0.381174E+00
41	31	24	24	17	4.98	0.149599E+01	18.29	0.161339E+02
42	18	7	7	4	0.98	0.207938E+00	1.27	0.303482E+00
Subtotal	93	44	44	30	1.75	0.109338E+00	5.38	0.944438E+00
50	25	25	25	25	23.10	0.686506E+01	45.36	0.233098E+02
60	53	51	51	37	12.16	0.239339E+01	22.97	0.973123E+01
61	7	6	6	6	8.16	0.467079E+01	9.75	0.820642E+01
Subtotal	60	57	57	43	11.89	0.210482E+01	22.09	0.850972E+01
TOTAL	342	187	187	140	6.25	0.199354E+00	14.12	0.118547E+01

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% Confidence Limits Lower	Upper
10	8,401,536	0.453245247E+14	57.00	0	21,887,441
20	0	0.00	0.00	0	0
30	178,498,067	0.124513872E+16	67.00	108,007,356	248,988,778
31	21,705,565	0.200046291E+14	7.00	11,127,740	32,283,391
Subtotal	200,203,632	0.126514335E+16	69.00	129,160,775	271,246,489
40	11,267,913	0.148516665E+14	43.00	3,487,504	19,048,321
41	43,925,615	0.930172676E+14	30.00	24,231,452	63,619,778
42	2,681,830	0.135211873E+13	17.00	216,680	5,146,979
Subtotal	57,875,357	0.109221053E+15	40.62	36,754,113	78,996,601
50	177,709,155	0.357829576E+15	24.00	138,665,739	216,752,571
60	206,004,040	0.782710075E+15	52.00	149,815,121	262,192,959
61	6,267,515	0.339147424E+13	6.00	1,761,131	10,773,899
Subtotal	212,271,555	0.786101550E+15	52.44	155,961,035	268,582,075
TOTAL	656,461,236	0.256362005E+16	161.70	556,210,744	756,711,727

Table D-10.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	1,655	0.172965272E+07	57.00	0	4,290
20	0	0.00	0.00	0	0
30	58,188	0.114990625E+09	67.00	36,766	79,610
31	7,276	0.192259371E+07	7.00	3,997	10,555
Subtotal	65,464	0.116913218E+09	69.07	43,871	87,056
40	4,770	0.309327675E+07	43.00	1,221	8,319
41	11,957	0.862489287E+07	30.00	5,960	17,954
42	2,060	0.926438341E+06	17.00	29	4,091
Subtotal	18,787	0.126446080E+08	58.08	11,668	25,907
50	90,510	0.105385955E+09	24.00	69,322	111,699
60	109,034	0.192506819E+09	52.00	81,168	136,900
61	5,247	0.193029930E+07	6.00	1,675	8,819
Subtotal	114,282	0.194437118E+09	53.00	86,291	142,272
TOTAL	290,698	0.431110553E+09	135.00	249,587	331,809

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	263,935	317,462	591,196,770	721,725,701
90 Percent	256,273	325,124	572,513,869	740,408,603
95 Percent	249,587	331,809	556,210,744	756,711,727

Table D-11.--CPUE, population, and biomass estimates for Pacific halibut.

CPUE

Stratum	Total hauls	Hauls with catch	Hauls with nums.	Hauls with L-F	Mean CPUE (kg/ha)	Variance mean CPUE (kg/ha)	Mean CPUE (no/ha)	Variance mean CPUE (no/ha)
10	58	48	48	48	1.83	0.692114E-01	1.01	0.225932E-01
20	30	20	20	20	1.24	0.988355E-01	0.63	0.420444E-01
30	68	46	46	46	2.21	0.137206E+00	0.53	0.134475E-01
31	8	2	2	2	1.68	0.121676E+01	0.93	0.639527E+00
Subtotal	76	48	48	48	2.16	0.123666E+00	0.56	0.158740E-01
40	44	17	17	17	0.57	0.313770E-01	0.15	0.127807E-02
41	31	17	17	17	2.90	0.180804E+01	0.59	0.507742E-01
42	18	3	3	3	0.07	0.209357E-02	0.04	0.389736E-03
Subtotal	93	37	37	37	0.99	0.100788E+00	0.22	0.297686E-02
50	25	22	22	22	3.11	0.268383E+00	0.54	0.739316E-02
60	53	25	25	24	2.25	0.505780E+00	0.64	0.608878E-01
61	7	1	1	1	0.14	0.184096E-01	0.06	0.372669E-02
Subtotal	60	26	26	25	2.11	0.440466E+00	0.60	0.530318E-01
TOTAL	342	201	201	200	1.83	0.349226E-01	0.57	0.422111E-02

POPULATION

Stratum	Population	Variance population	Eff. deg. freedom	95% confidence limits Lower	95% confidence limits Upper
10	7,890,788	.137003350E+13	57.00	5,546,132	10,235,443
20	2,587,552	.707699645E+12	29.00	867,198	4,307,906
30	4,990,019	.120155614E+13	67.00	2,800,267	7,179,772
31	819,894	.492347082E+12	7.00	0	2,479,355
Subtotal	5,809,914	.169390322E+13	51.08	3,194,614	8,425,214
40	912,438	.497974974E+11	43.00	462,148	1,362,728
41	1,420,004	.292729920E+12	30.00	313,566	2,526,441
42	76,750	.173641062E+10	17.00	0	164,674
Subtotal	2,409,191	.344263828E+12	40.67	1,223,390	3,594,993
50	2,121,302	.113492856E+12	24.00	1,425,968	2,816,637
60	5,718,396	.489737279E+13	52.00	1,273,805	10,162,987
61	39,245	.154013247E+10	6.00	0	135,276
Subtotal	5,757,641	.489891292E+13	52.03	1,312,351	10,202,930
TOTAL	26,576,388	.912830597E+13	145.91	20,594,243	32,558,533

Table D-11.--Continued.

BIOMASS

Stratum	Biomass (t)	Variance biomass	Eff. deg. freedom	95% Confidence limits Lower	Upper
10	14,274	0.419692579E+07	57.00	10,170	18,378
20	5,104	0.166361854E+07	29.00	2,467	7,742
30	20,849	0.122595675E+08	67.00	13,854	27,843
31	1,477	0.936739238E+06	7.00	0	3,766
Subtotal	22,326	0.131963068E+08	73.52	15,076	29,575
40	3,579	0.122254147E+07	43.00	1,348	5,810
41	6,973	0.104239562E+08	30.00	381	13,566
42	146	0.932757317E+04	17.00	0	350
Subtotal	10,698	0.116558253E+08	37.15	3,777	17,620
50	12,200	0.411996532E+07	24.00	8,011	16,389
60	20,180	0.406812988E+08	52.00	7,370	32,990
61	87	0.760814553E+04	6.00	0	301
Subtotal	20,267	0.406889069E+08	52.02	7,456	33,078
Total	84,869	0.755215486E+08	146.38	67,663	102,076

CONFIDENCE LIMITS

	Total biomass (t) Lower	Upper	Total population Lower	Upper
80 Percent	73,668	96,071	22,681,937	30,470,838
90 Percent	70,461	99,278	21,567,088	31,585,687
95 Percent	67,663	102,076	20,594,243	32,558,533

APPENDIX E

Population Estimates by Sex and Size Groups for Principal Fish Species

Appendix E presents estimates of the numbers of individuals within the overall survey area by sex and size group for principal species of fish.

List of Tables

Table E-1.--Population estimates by sex and size group for walleye pollock, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
40	0	0	26,195	26,195	0.0000	0.0000
80	0	0	577,340	577,340	0.0001	0.0001
90	0	0	4,662,605	4,662,605	0.0005	0.0006
100	0	0	23,113,966	23,113,966	0.0027	0.0033
110	306,679	0	40,300,288	40,606,968	0.0047	0.0079
120	2,506,050	684,666	34,408,249	37,598,964	0.0043	0.0123
130	3,749,434	1,882,794	47,283,784	52,916,012	0.0061	0.0183
140	2,748,157	3,205,745	43,598,914	49,552,816	0.0057	0.0240
150	4,096,587	2,049,350	34,876,769	41,022,705	0.0047	0.0288
160	5,428,940	1,956,399	23,859,448	31,244,787	0.0036	0.0323
170	3,896,623	2,744,766	12,780,806	19,422,195	0.0022	0.0346
180	278,765	968,688	8,993,987	10,241,441	0.0012	0.0358
190	3,493,820	5,982,578	6,754,162	16,230,560	0.0019	0.0376
200	7,935,091	5,475,318	2,024,397	15,434,805	0.0018	0.0394
210	16,274,780	18,067,512	1,068,118	35,410,409	0.0041	0.0435
220	19,904,597	23,254,286	880,387	44,039,271	0.0051	0.0485
230	21,240,972	16,541,690	433,459	38,216,120	0.0044	0.0529
240	22,789,735	20,041,359	193,314	43,024,408	0.0050	0.0579
250	23,745,744	26,708,546	57,328	50,511,617	0.0058	0.0637
260	37,100,994	21,503,532	0	58,604,526	0.0067	0.0704
270	51,831,910	40,841,223	0	92,673,133	0.0107	0.0811
280	57,495,189	50,898,973	0	108,394,162	0.0125	0.0935
290	32,575,937	31,339,680	0	63,915,618	0.0074	0.1009
300	46,493,049	35,276,135	0	81,769,184	0.0094	0.1103
310	36,607,997	27,965,149	0	64,573,146	0.0074	0.1177
320	32,312,581	28,758,782	0	61,071,363	0.0070	0.1247
330	24,872,784	21,148,332	0	46,021,116	0.0053	0.1300
340	45,437,695	38,622,945	0	84,060,641	0.0097	0.1397
350	57,905,437	38,169,082	0	96,074,519	0.0110	0.1507
360	116,331,272	80,853,033	0	197,184,305	0.0227	0.1734
370	176,952,392	107,183,692	0	284,136,084	0.0327	0.2060
380	253,598,719	203,689,510	0	457,288,229	0.0526	0.2586
390	303,361,938	219,517,101	0	522,879,039	0.0601	0.3187
400	414,963,892	267,187,112	0	682,151,004	0.0784	0.3971
410	367,141,727	235,585,342	0	602,727,069	0.0693	0.4664
420	328,950,178	269,583,653	0	598,533,832	0.0688	0.5352
430	251,192,853	219,717,602	0	470,910,455	0.0541	0.5894
440	206,478,806	205,993,140	0	412,471,946	0.0474	0.6368
450	164,786,196	137,991,613	0	302,777,809	0.0348	0.6716
460	147,761,764	116,073,691	0	263,835,455	0.0303	0.7019
470	165,521,611	114,914,848	0	280,436,459	0.0322	0.7341
480	188,890,703	116,900,114	0	305,790,817	0.0352	0.7693
490	182,001,657	134,918,228	0	316,919,885	0.0364	0.8057
500	172,526,514	143,066,190	0	315,592,704	0.0363	0.8420
510	132,283,466	140,122,429	0	272,405,895	0.0313	0.8733
520	113,569,341	142,176,564	0	255,745,905	0.0294	0.9027
530	65,821,574	118,594,119	0	184,415,693	0.0212	0.9239
540	47,235,167	94,582,565	0	141,817,732	0.0163	0.9402
550	47,548,811	77,395,285	0	124,944,096	0.0144	0.9546
560	29,224,470	58,895,677	0	88,120,147	0.0101	0.9647
570	15,267,779	45,332,894	0	60,600,672	0.0070	0.9717
580	14,627,961	33,768,579	0	48,396,540	0.0056	0.9772
590	9,160,072	30,279,568	0	39,439,639	0.0045	0.9818
600	10,240,591	24,051,341	0	34,291,932	0.0039	0.9857
610	6,469,955	16,186,291	0	22,656,246	0.0026	0.9883
620	5,041,568	14,427,078	0	19,468,645	0.0022	0.9906
630	3,585,800	10,901,225	0	14,487,025	0.0017	0.9922
640	3,951,486	10,068,033	0	14,019,519	0.0016	0.9938
650	2,546,448	8,302,221	0	10,848,669	0.0013	0.9951
660	1,274,687	6,425,107	0	7,699,795	0.0009	0.9960
670	1,195,832	6,468,398	0	7,664,230	0.0009	0.9969

Table E-1.--Continued.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
680	1,849,804	4,844,110	0	6,693,913	0.0008	0.9976
690	1,089,724	4,041,952	0	5,131,676	0.0006	0.9982
700	340,576	4,171,861	0	4,512,438	0.0005	0.9987
710	480,823	2,730,311	0	3,211,134	0.0004	0.9991
720	394,083	1,999,745	0	2,393,827	0.0003	0.9994
730	126,578	1,618,183	0	1,744,761	0.0002	0.9996
740	100,766	883,704	0	984,470	0.0001	0.9997
750	34,281	826,062	0	860,342	0.0001	0.9998
760	33,890	829,263	0	863,152	0.0001	0.9999
770	30,996	319,359	0	350,355	0.0000	0.9999
780	0	283,538	0	283,538	0.0000	1.0000
790	0	84,537	0	84,537	0.0000	1.0000
800	0	157,654	0	157,654	0.0000	1.0000
810	0	54,693	0	54,693	0.0000	1.0000
820	0	30,219	0	30,219	0.0000	1.0000
850	0	30,996	0	30,996	0.0000	1.0000
930	0	29,049	0	29,049	0.0000	1.0000
Total	4,515,016,300	3,898,175,007	285,893,515	8,699,084,822		

Table E-2.--Population estimates by sex and size group for Pacific cod, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
100	1,018,312	33,759	0	1,052,071	0.0014	0.0014
110	72,219	168,852	0	241,071	0.0003	0.0017
120	327,362	60,021	107,648	495,031	0.0007	0.0024
130	642,383	867,950	220,755	1,731,089	0.0023	0.0047
140	1,215,327	1,234,034	328,403	2,777,764	0.0037	0.0084
150	1,868,505	2,123,957	328,403	4,320,866	0.0057	0.0141
160	2,508,751	2,757,972	438,252	5,704,975	0.0076	0.0216
170	3,855,097	2,941,691	988,511	7,785,299	0.0103	0.0320
180	3,999,621	3,969,683	694,171	8,663,475	0.0115	0.0435
190	3,322,883	4,745,818	620,585	8,689,286	0.0115	0.0550
200	4,727,151	5,734,521	438,252	10,899,924	0.0145	0.0694
210	5,339,058	3,500,601	0	8,839,659	0.0117	0.0811
220	2,534,945	3,012,495	217,497	5,764,937	0.0076	0.0888
230	2,374,928	1,912,244	0	4,287,172	0.0057	0.0945
240	1,350,765	1,916,799	0	3,267,564	0.0043	0.0988
250	2,188,944	2,114,280	108,748	4,411,972	0.0059	0.1047
260	3,170,825	2,234,916	0	5,405,741	0.0072	0.1118
270	4,210,814	3,949,197	120,671	8,280,681	0.0110	0.1228
280	4,295,329	4,232,095	116,858	8,644,282	0.0115	0.1343
290	6,265,924	7,737,921	0	14,003,845	0.0186	0.1528
300	9,585,608	9,473,150	62,242	19,121,001	0.0254	0.1782
310	10,601,839	10,791,475	0	21,393,315	0.0284	0.2065
320	11,610,640	11,231,886	79,518	22,922,044	0.0304	0.2369
330	12,027,852	8,349,098	233,784	20,610,734	0.0273	0.2643
340	10,718,237	9,226,473	137,947	20,082,656	0.0266	0.2909
350	7,520,348	6,955,493	87,933	14,563,774	0.0193	0.3102
360	8,419,397	7,972,965	0	16,392,362	0.0217	0.3319
370	8,232,816	6,129,090	30,447	14,392,353	0.0191	0.3510
380	6,178,213	6,141,087	0	12,319,300	0.0163	0.3673
390	6,127,795	7,093,031	79,518	13,300,344	0.0176	0.3850
400	7,612,994	8,068,239	188,559	15,869,792	0.0210	0.4060
410	7,110,846	7,566,762	87,933	14,765,541	0.0196	0.4256
420	11,485,695	9,409,800	240,377	21,135,872	0.0280	0.4536
430	10,624,458	12,335,722	532,080	23,492,260	0.0312	0.4847
440	11,783,605	11,807,399	331,403	23,922,407	0.0317	0.5165
450	12,083,838	11,356,129	379,636	23,819,603	0.0316	0.5480
460	11,210,264	11,356,141	209,607	22,776,012	0.0302	0.5782
470	11,323,470	11,367,306	395,153	23,085,929	0.0306	0.6088
480	9,199,386	8,548,977	293,476	18,041,839	0.0239	0.6328
490	8,408,696	9,126,401	302,366	17,837,463	0.0237	0.6564
500	9,799,452	8,445,864	298,818	18,544,134	0.0246	0.6810
510	5,527,591	5,304,449	211,708	11,043,748	0.0146	0.6956
520	6,121,442	4,779,012	152,444	11,052,898	0.0147	0.7103
530	5,820,517	3,295,842	441,127	9,557,487	0.0127	0.7230
540	4,716,590	3,596,155	230,024	8,542,769	0.0113	0.7343
550	5,625,190	4,563,406	229,281	10,417,877	0.0138	0.7481
560	4,887,920	4,818,944	338,519	10,045,383	0.0133	0.7614
570	4,315,397	2,456,801	161,282	6,933,481	0.0092	0.7706
580	4,618,302	3,748,869	219,599	8,586,771	0.0114	0.7820
590	3,132,411	3,207,591	214,374	6,554,376	0.0087	0.7907
600	5,584,256	4,181,289	266,541	10,032,086	0.0133	0.8040
610	4,947,394	4,472,256	218,525	9,638,175	0.0128	0.8168
620	4,880,787	3,721,987	235,873	8,838,648	0.0117	0.8285
630	5,158,414	4,193,718	102,058	9,454,191	0.0125	0.8410
640	4,558,797	3,715,480	339,236	8,613,513	0.0114	0.8524
650	5,771,707	3,419,749	228,334	9,419,790	0.0125	0.8649
660	4,677,330	3,884,559	190,417	8,752,307	0.0116	0.8765
670	4,890,937	4,334,500	148,357	9,373,793	0.0124	0.8890
680	3,487,699	5,929,382	156,303	9,573,384	0.0127	0.9017
690	3,011,169	4,836,207	36,724	7,884,099	0.0105	0.9121
700	3,672,055	4,344,247	185,752	8,202,055	0.0109	0.9230

Table E-2.--Continued.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
710	2,820,427	3,698,018	253,429	6,771,874	0.0090	0.9320
720	2,299,680	1,759,148	136,549	4,195,377	0.0056	0.9375
730	2,506,417	3,875,849	43,630	6,425,895	0.0085	0.9460
740	1,812,940	1,835,420	120,116	3,768,475	0.0050	0.9510
750	2,082,380	1,760,065	67,907	3,910,352	0.0052	0.9562
760	2,056,090	1,723,077	37,975	3,817,141	0.0051	0.9613
770	607,154	933,780	167,868	1,708,802	0.0023	0.9635
780	1,514,547	1,503,513	36,724	3,054,784	0.0041	0.9676
790	808,341	1,568,514	43,630	2,420,485	0.0032	0.9708
800	1,023,939	1,356,452	68,422	2,448,813	0.0033	0.9741
810	1,055,982	2,213,536	0	3,269,518	0.0043	0.9784
820	927,233	1,019,432	34,063	1,980,727	0.0026	0.9810
830	915,859	1,032,068	77,474	2,025,401	0.0027	0.9837
840	762,638	1,291,506	0	2,054,144	0.0027	0.9864
850	619,453	1,444,554	36,724	2,100,731	0.0028	0.9892
860	149,700	481,297	0	630,997	0.0008	0.9900
870	220,197	304,094	0	524,291	0.0007	0.9907
880	224,419	834,865	0	1,059,283	0.0014	0.9921
890	193,057	507,046	0	700,103	0.0009	0.9931
900	0	751,176	0	751,176	0.0010	0.9941
910	169,397	764,814	0	934,211	0.0012	0.9953
920	154,288	274,170	0	428,458	0.0006	0.9959
930	155,257	535,314	38,135	728,706	0.0010	0.9968
940	111,561	594,110	0	705,671	0.0009	0.9978
950	0	116,684	0	116,684	0.0002	0.9979
960	0	303,872	0	303,872	0.0004	0.9983
970	108,261	301,629	43,630	453,519	0.0006	0.9989
980	55,509	149,664	0	205,172	0.0003	0.9992
990	0	88,701	0	88,701	0.0001	0.9993
1000	0	33,519	0	33,519	0.0000	0.9994
1010	0	178,255	0	178,255	0.0002	0.9996
1020	0	183,466	0	183,466	0.0002	0.9998
1040	0	87,036	0	87,036	0.0001	1.0000
1100	0	31,107	0	31,107	0.0000	1.0000
Total	375,715,230	364,341,485	14,212,306	754,269,021		

Table E-3.--Population estimates by sex and size group for sablefish, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
420	42,858	0	0	42,858	0.0278	0.0278
430	0	46,623	0	46,623	0.0302	0.0580
480	0	45,396	0	45,396	0.0294	0.0874
510	93,245	46,623	0	139,868	0.0906	0.1781
520	47,587	116,769	0	164,356	0.1065	0.2846
530	175,197	42,858	0	218,055	0.1413	0.4259
550	42,858	0	0	42,858	0.0278	0.4537
560	0	378,671	0	378,671	0.2454	0.6991
570	0	42,858	0	42,858	0.0278	0.7268
580	42,858	0	0	42,858	0.0278	0.7546
630	378,671	0	0	378,671	0.2454	1.0000
Total	823,275	719,797	0	1,543,072		

Table E-4.--Population estimates by sex and size group for yellowfin sole, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
40	289,743	0	0	289,743	0.0000	0.0000
80	680,682	1,092,846	0	1,773,528	0.0002	0.0002
90	7,239,136	5,785,231	0	13,024,368	0.0013	0.0015
100	9,704,328	11,517,714	0	21,222,042	0.0022	0.0037
110	21,773,250	15,346,867	0	37,120,116	0.0038	0.0075
120	57,916,088	53,969,638	0	111,885,727	0.0114	0.0189
130	100,306,665	86,411,322	0	186,717,987	0.0190	0.0379
140	111,421,309	90,225,739	0	201,647,048	0.0206	0.0585
150	123,656,004	100,715,345	0	224,371,349	0.0229	0.0813
160	148,212,277	112,181,982	0	260,394,259	0.0265	0.1079
170	126,927,545	123,278,603	0	250,206,148	0.0255	0.1334
180	134,349,562	116,294,778	0	250,644,340	0.0255	0.1589
190	149,822,813	128,712,792	0	278,535,605	0.0284	0.1873
200	160,691,303	145,839,007	0	306,530,310	0.0312	0.2185
210	152,113,408	139,784,493	0	291,897,902	0.0297	0.2483
220	148,721,270	151,307,697	0	300,028,966	0.0306	0.2788
230	159,374,394	178,648,566	0	338,022,960	0.0344	0.3133
240	167,449,292	169,600,510	0	337,049,803	0.0343	0.3476
250	183,979,113	186,777,256	0	370,756,368	0.0378	0.3854
260	224,394,146	170,699,881	0	395,094,027	0.0403	0.4256
270	305,327,051	195,733,194	0	501,060,245	0.0511	0.4767
280	420,199,736	292,136,495	0	712,336,231	0.0726	0.5493
290	426,092,362	337,183,742	0	763,276,104	0.0778	0.6271
300	428,174,352	494,044,895	0	922,219,247	0.0940	0.7210
310	251,393,643	542,738,924	0	794,132,567	0.0809	0.8020
320	155,608,741	541,792,394	0	697,401,135	0.0711	0.8730
330	59,972,818	433,915,430	0	493,888,248	0.0503	0.9233
340	31,998,303	312,108,005	0	344,106,309	0.0351	0.9584
350	7,356,784	192,649,186	0	200,005,971	0.0204	0.9788
360	2,095,852	106,476,554	0	108,572,406	0.0111	0.9898
370	390,719	50,290,980	0	50,681,699	0.0052	0.9950
380	319,892	28,050,249	0	28,370,141	0.0029	0.9979
390	911,662	10,888,725	0	11,800,387	0.0012	0.9991
400	911,662	5,411,166	0	6,322,828	0.0006	0.9998
410	0	1,460,591	0	1,460,591	0.0002	0.9999
420	0	661,328	0	661,328	0.0001	1.0000
430	0	153,808	0	153,808	0.0000	1.0000
440	0	100,807	0	100,807	0.0000	1.0000
450	0	119,073	0	119,073	0.0000	1.0000
Total	4,279,775,905	5,534,105,816	0	9,813,881,721		

Table E-5.--Population estimates by sex and size group for rock sole, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
50	0	717,835	0	717,835	0.0001	0.0001
60	148,783	0	232,795	381,578	0.0001	0.0002
70	235,212	100,781	0	335,993	0.0001	0.0003
80	3,065,072	545,431	115,480	3,725,983	0.0006	0.0009
90	8,057,493	3,099,260	551,659	11,708,412	0.0020	0.0029
100	16,158,026	6,252,753	288,700	22,699,480	0.0039	0.0068
110	24,724,805	12,184,818	404,181	37,313,803	0.0064	0.0133
120	51,881,766	32,608,180	0	84,489,946	0.0146	0.0278
130	78,557,654	56,078,189	0	134,635,843	0.0232	0.0511
140	101,614,384	70,423,160	0	172,037,544	0.0297	0.0807
150	111,338,192	81,146,494	0	192,484,686	0.0332	0.1139
160	137,183,188	103,560,868	0	240,744,056	0.0415	0.1554
170	163,519,885	106,779,013	0	270,298,898	0.0466	0.2020
180	190,859,787	145,692,391	0	336,552,179	0.0580	0.2601
190	195,287,265	145,408,596	0	340,695,862	0.0588	0.3188
200	164,963,395	124,864,484	0	289,827,879	0.0500	0.3688
210	142,427,688	114,883,235	0	257,310,923	0.0444	0.4132
220	109,347,462	89,429,944	0	198,777,406	0.0343	0.4475
230	125,794,266	72,024,682	0	197,818,947	0.0341	0.4816
240	113,233,916	88,243,100	0	201,477,017	0.0347	0.5163
250	145,310,686	99,200,607	0	244,511,293	0.0422	0.5585
260	153,507,757	105,658,007	0	259,165,764	0.0447	0.6032
270	149,527,727	125,101,663	0	274,629,391	0.0474	0.6505
280	166,217,134	123,124,025	0	289,341,159	0.0499	0.7004
290	181,828,323	106,844,393	0	288,672,716	0.0498	0.7502
300	180,501,484	104,891,009	0	285,392,493	0.0492	0.7994
310	125,750,792	98,257,786	0	224,008,578	0.0386	0.8380
320	77,138,173	85,779,167	0	162,917,339	0.0281	0.8661
330	30,049,911	83,447,199	0	113,497,110	0.0196	0.8857
340	12,907,287	108,327,937	0	121,235,224	0.0209	0.9066
350	5,990,497	118,697,625	0	124,688,123	0.0215	0.9281
360	4,110,997	99,439,500	0	103,550,498	0.0179	0.9460
370	2,316,508	83,639,282	0	85,955,789	0.0148	0.9608
380	1,416,777	72,630,598	0	74,047,375	0.0128	0.9736
390	662,734	51,402,100	0	52,064,835	0.0090	0.9826
400	632,452	41,370,019	0	42,002,470	0.0072	0.9898
410	434,060	20,939,676	0	21,373,736	0.0037	0.9935
420	0	16,252,742	0	16,252,742	0.0028	0.9963
430	0	7,146,552	0	7,146,552	0.0012	0.9975
440	164,633	7,201,814	0	7,366,447	0.0013	0.9988
450	0	3,669,522	0	3,669,522	0.0006	0.9994
460	0	1,821,352	0	1,821,352	0.0003	0.9997
470	0	1,002,975	0	1,002,975	0.0002	0.9999
480	0	347,811	0	347,811	0.0001	1.0000
490	0	234,555	0	234,555	0.0000	1.0000
Total	2,976,866,171	2,820,471,134	1,592,815	5,798,930,120		

Table E-6.--Population estimates by sex and size group for flathead sole, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
60	54,811	0	0	54,811	0.0000	0.0000
80	0	0	36,884	36,884	0.0000	0.0001
90	214,305	0	84,215	298,520	0.0002	0.0002
100	2,003,573	806,193	486,287	3,296,054	0.0021	0.0023
110	4,230,106	2,677,655	3,797,463	10,705,225	0.0067	0.0090
120	10,830,060	7,387,712	8,203,677	26,421,449	0.0165	0.0256
130	10,910,363	8,674,990	5,001,852	24,587,204	0.0154	0.0410
140	8,148,439	10,060,144	1,626,238	19,834,821	0.0124	0.0534
150	16,058,531	13,630,133	689,957	30,378,620	0.0190	0.0724
160	20,351,621	18,788,539	1,966,742	41,106,903	0.0257	0.0981
170	21,339,311	16,343,049	1,268,407	38,950,766	0.0244	0.1225
180	18,127,160	15,717,794	442,291	34,287,244	0.0215	0.1440
190	23,323,782	18,525,913	73,769	41,923,464	0.0263	0.1702
200	27,683,844	21,024,759	194,868	48,903,472	0.0306	0.2009
210	24,615,912	22,712,366	0	47,328,278	0.0296	0.2305
220	27,639,269	21,136,657	0	48,775,927	0.0305	0.2610
230	35,110,251	21,828,825	69,832	57,008,907	0.0357	0.2967
240	41,619,776	25,093,058	0	66,712,834	0.0418	0.3385
250	39,226,153	30,836,629	0	70,062,782	0.0439	0.3824
260	38,596,916	33,037,481	0	71,634,396	0.0449	0.4272
270	40,686,690	33,957,596	0	74,644,286	0.0467	0.4740
280	48,943,301	35,171,758	0	84,115,059	0.0527	0.5266
290	42,583,029	35,433,721	0	78,016,750	0.0489	0.5755
300	50,587,486	37,039,619	0	87,627,105	0.0549	0.6303
310	49,333,433	34,414,047	0	83,747,479	0.0524	0.6828
320	51,594,967	36,404,338	0	87,999,304	0.0551	0.7379
330	48,339,847	32,218,562	0	80,558,409	0.0504	0.7883
340	29,969,749	39,593,746	0	69,563,495	0.0436	0.8319
350	26,531,849	36,829,904	0	63,361,753	0.0397	0.8715
360	16,367,770	29,707,471	0	46,075,242	0.0289	0.9004
370	13,364,202	27,868,111	0	41,232,313	0.0258	0.9262
380	9,132,626	26,877,583	0	36,010,210	0.0226	0.9488
390	6,614,420	18,949,399	0	25,563,819	0.0160	0.9648
400	2,941,010	15,769,429	0	18,710,439	0.0117	0.9765
410	820,717	11,358,873	0	12,179,590	0.0076	0.9841
420	236,959	8,328,306	0	8,565,264	0.0054	0.9895
430	0	6,259,982	0	6,259,982	0.0039	0.9934
440	0	3,986,984	0	3,986,984	0.0025	0.9959
450	0	3,681,077	0	3,681,077	0.0023	0.9982
460	0	1,212,757	0	1,212,757	0.0008	0.9990
470	0	1,070,816	0	1,070,816	0.0007	0.9996
480	0	508,083	0	508,083	0.0003	0.9999
500	0	105,429	0	105,429	0.0001	1.0000
Total	808,132,235	765,029,490	23,942,483	1,597,104,207		

Table E-7.--Population estimates by sex and size group for Bering flounder, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
100	226,675	403,522	0	630,196	0.0074	0.0074
110	1,389,760	553,348	0	1,943,108	0.0229	0.0303
120	873,129	949,196	0	1,822,325	0.0214	0.0517
130	1,984,353	1,788,746	0	3,773,099	0.0444	0.0961
140	1,643,823	1,989,003	0	3,632,825	0.0428	0.1389
150	2,188,285	2,447,638	0	4,635,923	0.0546	0.1934
160	2,512,390	2,818,370	0	5,330,760	0.0627	0.2561
170	1,722,218	3,386,693	0	5,108,911	0.0601	0.3163
180	1,919,972	3,689,866	0	5,609,838	0.0660	0.3823
190	1,946,718	3,821,562	0	5,768,280	0.0679	0.4501
200	1,489,697	2,755,840	0	4,245,537	0.0500	0.5001
210	1,064,421	3,360,460	0	4,424,880	0.0521	0.5522
220	1,033,795	2,223,165	0	3,256,960	0.0383	0.5905
230	823,691	1,141,800	0	1,965,492	0.0231	0.6136
240	853,330	1,064,510	0	1,917,840	0.0226	0.6362
250	601,538	865,640	0	1,467,178	0.0173	0.6534
260	557,482	590,743	0	1,148,225	0.0135	0.6669
270	678,323	831,072	0	1,509,395	0.0178	0.6847
280	398,677	1,155,709	0	1,554,387	0.0183	0.7030
290	1,206,773	683,608	0	1,890,381	0.0222	0.7252
300	573,449	742,761	0	1,316,210	0.0155	0.7407
310	343,409	926,525	0	1,269,934	0.0149	0.7557
320	318,370	1,202,824	0	1,521,194	0.0179	0.7736
330	90,117	1,903,676	0	1,993,793	0.0235	0.7970
340	40,277	2,199,054	0	2,239,331	0.0264	0.8234
350	37,844	2,500,034	0	2,537,878	0.0299	0.8532
360	0	2,004,409	0	2,004,409	0.0236	0.8768
370	0	2,166,955	0	2,166,955	0.0255	0.9023
380	0	1,696,641	0	1,696,641	0.0200	0.9223
390	0	872,499	0	872,499	0.0103	0.9325
400	0	626,729	0	626,729	0.0074	0.9399
410	0	207,213	0	207,213	0.0024	0.9424
420	0	40,277	0	40,277	0.0005	0.9428
430	0	78,926	0	78,926	0.0009	0.9438
440	0	137,694	0	137,694	0.0016	0.9454
Total	26,518,517	53,826,707	0	80,345,224		

*This total does not agree with total on Table D-7 because no fish were measured in strata 60.

Table E-8.--Population estimates by sex and size group for Alaska plaice, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
140	30,282	0	0	30,282	0.0000	0.0000
180	0	57,020	0	57,020	0.0001	0.0001
190	93,767	0	0	93,767	0.0001	0.0002
200	94,465	256,532	0	350,997	0.0004	0.0006
210	435,011	558,042	0	993,053	0.0011	0.0018
220	1,170,257	1,584,506	0	2,754,764	0.0032	0.0049
230	2,203,781	2,246,211	0	4,449,992	0.0051	0.0100
240	4,514,680	2,696,215	0	7,210,895	0.0083	0.0183
250	5,690,888	3,001,651	0	8,692,539	0.0100	0.0282
260	7,459,916	7,101,514	0	14,561,430	0.0167	0.0449
270	10,924,419	6,357,369	0	17,281,788	0.0198	0.0648
280	10,426,299	6,216,691	0	16,642,990	0.0191	0.0838
290	16,037,830	8,243,005	0	24,280,835	0.0278	0.1117
300	31,093,297	8,541,335	0	39,634,632	0.0454	0.1571
310	45,022,798	8,677,908	0	53,700,706	0.0616	0.2187
320	66,551,153	9,354,762	0	75,905,916	0.0870	0.3057
330	76,580,772	11,282,648	0	87,863,420	0.1007	0.4064
340	75,538,471	10,124,258	0	85,662,730	0.0982	0.5046
350	61,445,421	13,936,005	0	75,381,426	0.0864	0.5910
360	33,889,796	17,962,122	0	51,851,918	0.0594	0.6505
370	18,485,311	19,000,458	0	37,485,769	0.0430	0.6935
380	10,360,436	23,223,478	0	33,583,915	0.0385	0.7320
390	3,953,603	21,240,064	0	25,193,667	0.0289	0.7608
400	1,214,769	26,668,288	0	27,883,057	0.0320	0.7928
410	573,768	33,263,435	0	33,837,203	0.0388	0.8316
420	123,952	32,416,655	0	32,540,607	0.0373	0.8689
430	307,153	27,167,544	0	27,474,697	0.0315	0.9004
440	0	22,661,071	0	22,661,071	0.0260	0.9264
450	502,802	19,453,694	0	19,956,496	0.0229	0.9493
460	123,952	12,906,254	0	13,030,206	0.0149	0.9642
470	0	9,278,845	0	9,278,845	0.0106	0.9748
480	0	8,750,658	0	8,750,658	0.0100	0.9849
490	0	4,183,990	0	4,183,990	0.0048	0.9897
500	0	4,978,904	0	4,978,904	0.0057	0.9954
510	0	2,095,464	0	2,095,464	0.0024	0.9978
520	0	734,306	0	734,306	0.0008	0.9986
530	0	728,013	0	728,013	0.0008	0.9994
540	0	96,093	0	96,093	0.0001	0.9996
550	0	284,254	0	284,254	0.0003	0.9999
570	0	106,703	0	106,703	0.0001	1.0000
Total	484,849,051	387,435,966	0	872,285,017		

Table E-9.--Population estimates by sex and size group for Greenland turbot, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
110	137,237	0	0	137,237	0.0155	0.0155
160	61,679	0	0	61,679	0.0070	0.0225
170	137,237	61,679	0	198,916	0.0225	0.0450
180	140,541	99,639	0	240,181	0.0271	0.0721
190	137,237	0	0	137,237	0.0155	0.0876
200	169,356	137,237	0	306,592	0.0346	0.1222
210	276,098	0	0	276,098	0.0312	0.1534
220	155,085	0	0	155,085	0.0175	0.1710
230	620,877	137,237	0	758,113	0.0857	0.2566
240	97,505	28,814	0	126,319	0.0143	0.2709
250	0	262,899	0	262,899	0.0297	0.3006
260	134,200	62,085	0	196,285	0.0222	0.3228
270	0	307,057	0	307,057	0.0347	0.3575
280	69,335	28,814	0	98,150	0.0111	0.3686
290	787,075	0	0	787,075	0.0889	0.4575
300	0	136,238	0	136,238	0.0154	0.4729
330	0	69,335	0	69,335	0.0078	0.4807
340	68,690	0	0	68,690	0.0078	0.4885
350	0	51,678	0	51,678	0.0058	0.4943
360	188,270	0	0	188,270	0.0213	0.5156
370	28,814	69,335	0	98,150	0.0111	0.5267
380	0	69,335	0	69,335	0.0078	0.5345
410	0	69,335	0	69,335	0.0078	0.5424
420	216,158	62,085	0	278,243	0.0314	0.5738
440	69,335	0	0	69,335	0.0078	0.5816
460	0	99,639	0	99,639	0.0113	0.5929
480	102,802	0	0	102,802	0.0116	0.6045
490	0	69,335	0	69,335	0.0078	0.6124
500	113,779	0	0	113,779	0.0129	0.6252
510	68,690	0	0	68,690	0.0078	0.6330
530	0	216,158	0	216,158	0.0244	0.6574
570	98,467	787,075	0	885,542	0.1001	0.7575
610	172,138	241,237	0	413,375	0.0467	0.8042
620	0	84,561	0	84,561	0.0096	0.8137
630	0	138,025	0	138,025	0.0156	0.8293
650	0	155,085	0	155,085	0.0175	0.8468
660	0	102,802	0	102,802	0.0116	0.8585
670	216,158	0	0	216,158	0.0244	0.8829
710	69,335	224,420	0	293,755	0.0332	0.9161
770	0	360,689	0	360,689	0.0408	0.9568
780	0	52,032	34,379	86,410	0.0098	0.9666
800	0	62,085	0	62,085	0.0070	0.9736
810	0	62,085	0	62,085	0.0070	0.9806
840	0	68,690	0	68,690	0.0078	0.9884
860	0	102,802	0	102,802	0.0116	1.0000
Total	4,336,097	4,479,523	34,379	8,849,999		

Table E-10.--Population estimates by sex and size group for arrowtooth and Kamchatka flounder, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
90	57,792	198,670	0	256,462	0.0004	0.0004
100	541,267	133,534	0	674,801	0.0010	0.0014
110	603,308	323,933	111,612	1,038,853	0.0016	0.0030
120	247,919	66,959	0	314,878	0.0005	0.0035
130	254,725	545,662	0	800,387	0.0012	0.0047
140	533,305	52,097	0	585,402	0.0009	0.0056
150	254,815	726,864	0	981,678	0.0015	0.0071
160	1,777,911	1,324,186	0	3,102,097	0.0047	0.0118
170	3,503,634	2,549,639	0	6,053,273	0.0092	0.0210
180	6,494,215	5,986,226	0	12,480,441	0.0190	0.0401
190	5,778,658	7,726,148	0	13,504,806	0.0206	0.0606
200	6,026,472	7,375,063	0	13,401,535	0.0204	0.0810
210	3,961,417	5,695,506	0	9,656,923	0.0147	0.0957
220	4,331,978	5,120,390	0	9,452,368	0.0144	0.1101
230	4,288,076	3,742,890	0	8,030,966	0.0122	0.1224
240	7,269,704	6,748,802	0	14,018,506	0.0214	0.1437
250	10,245,760	10,176,967	0	20,422,727	0.0311	0.1748
260	15,258,803	14,904,007	0	30,162,811	0.0460	0.2208
270	18,014,611	26,529,372	0	44,543,983	0.0679	0.2886
280	16,287,298	27,375,373	0	43,662,671	0.0665	0.3552
290	11,096,377	24,475,772	0	35,572,149	0.0542	0.4093
300	8,315,413	23,839,796	0	32,155,209	0.0490	0.4583
310	6,369,070	16,548,611	0	22,917,680	0.0349	0.4932
320	6,832,968	11,644,727	0	18,477,695	0.0282	0.5214
330	5,729,086	9,553,103	0	15,282,188	0.0233	0.5447
340	5,823,605	11,328,758	0	17,152,363	0.0261	0.5708
350	7,488,602	14,278,973	0	21,767,575	0.0332	0.6040
360	6,647,149	14,191,436	0	20,838,585	0.0317	0.6357
370	4,975,526	11,724,655	0	16,700,181	0.0254	0.6611
380	5,375,642	14,399,468	0	19,775,111	0.0301	0.6913
390	4,985,797	9,873,448	0	14,859,245	0.0226	0.7139
400	5,895,617	10,694,431	0	16,590,048	0.0253	0.7392
410	6,827,018	10,459,503	0	17,286,521	0.0263	0.7655
420	8,780,376	9,495,705	0	18,276,081	0.0278	0.7933
430	7,010,884	9,148,891	0	16,159,776	0.0246	0.8180
440	6,777,189	11,910,412	0	18,687,601	0.0285	0.8464
450	3,589,668	14,067,715	0	17,657,383	0.0269	0.8733
460	1,401,034	15,091,537	0	16,492,571	0.0251	0.8984
470	1,086,349	10,611,135	0	11,697,484	0.0178	0.9163
480	1,505,551	11,634,895	0	13,140,446	0.0200	0.9363
490	504,262	9,342,943	0	9,847,205	0.0150	0.9513
500	354,889	6,094,273	0	6,449,162	0.0098	0.9611
510	523,863	4,540,664	0	5,064,527	0.0077	0.9688
520	96,918	2,773,637	0	2,870,555	0.0044	0.9732
530	131,570	2,516,888	0	2,648,458	0.0040	0.9772
540	47,789	3,296,973	0	3,344,762	0.0051	0.9823
550	0	1,834,818	0	1,834,818	0.0028	0.9851
560	0	1,937,485	0	1,937,485	0.0030	0.9881
570	0	1,999,895	0	1,999,895	0.0031	0.9911
580	47,010	1,199,942	0	1,246,952	0.0019	0.9930
590	0	1,270,054	0	1,270,054	0.0019	0.9950
600	0	1,605,337	0	1,605,337	0.0025	0.9974
610	0	923,409	0	923,409	0.0014	0.9988
620	0	105,185	0	105,185	0.0002	0.9990
630	0	314,541	0	314,541	0.0005	0.9994
640	0	109,458	0	109,458	0.0002	0.9996
650	0	148,516	0	148,516	0.0002	0.9998
720	0	109,458	0	109,458	0.0002	1.0000
Total	223,950,890	432,398,734	111,612	656,461,236		

Table E-11.--Population estimates by sex and size group for Pacific halibut, 1987 eastern Bering Sea survey.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
120	0	0	29,452	29,452	0.0011	0.0011
180	0	0	29,850	29,850	0.0011	0.0022
190	0	0	70,575	70,575	0.0027	0.0049
210	0	0	25,987	25,987	0.0010	0.0059
230	0	0	15,353	15,353	0.0006	0.0064
240	0	0	51,938	51,938	0.0020	0.0084
250	0	0	134,206	134,206	0.0051	0.0135
260	0	0	25,987	25,987	0.0010	0.0144
270	0	0	111,086	111,086	0.0042	0.0186
280	0	0	334,934	334,934	0.0126	0.0312
290	0	0	184,644	184,644	0.0070	0.0382
300	0	0	334,223	334,223	0.0126	0.0507
310	0	0	852,666	852,666	0.0321	0.0828
320	0	0	694,007	694,007	0.0261	0.1089
330	0	0	788,668	788,668	0.0297	0.1386
340	0	0	562,094	562,094	0.0212	0.1598
350	0	0	798,183	798,183	0.0300	0.1898
360	0	0	414,675	414,675	0.0156	0.2054
370	0	0	573,091	573,091	0.0216	0.2270
380	0	0	293,374	293,374	0.0110	0.2380
390	0	0	373,953	373,953	0.0141	0.2521
400	0	0	293,373	293,373	0.0110	0.2631
410	0	0	207,271	207,271	0.0078	0.2709
420	0	0	156,308	156,308	0.0059	0.2768
430	0	0	247,034	247,034	0.0093	0.2861
440	0	0	116,674	116,674	0.0044	0.2905
450	0	0	175,665	175,665	0.0066	0.2971
460	0	0	264,929	264,929	0.0100	0.3071
470	0	0	318,829	318,829	0.0120	0.3190
480	0	0	153,091	153,091	0.0058	0.3248
490	0	0	330,204	330,204	0.0124	0.3372
500	0	0	288,333	288,333	0.0109	0.3481
510	0	0	338,661	338,661	0.0127	0.3608
520	0	0	537,488	537,488	0.0202	0.3811
530	0	0	307,807	307,807	0.0116	0.3926
540	0	0	389,826	389,826	0.0147	0.4073
550	0	0	626,409	626,409	0.0236	0.4309
560	0	0	622,028	622,028	0.0234	0.4543
570	0	0	561,558	561,558	0.0211	0.4754
580	0	0	466,742	466,742	0.0176	0.4930
590	0	0	406,369	406,369	0.0153	0.5083
600	0	0	510,595	510,595	0.0192	0.5275
610	0	0	658,686	658,686	0.0248	0.5523
620	0	0	529,499	529,499	0.0199	0.5722
630	0	0	409,027	409,027	0.0154	0.5876
640	0	0	239,899	239,899	0.0090	0.5966
650	0	0	671,184	671,184	0.0253	0.6219
660	0	0	449,120	449,120	0.0169	0.6388
670	0	0	544,748	544,748	0.0205	0.6592
680	0	0	760,009	760,009	0.0286	0.6878
690	0	0	340,324	340,324	0.0128	0.7007
700	0	0	673,770	673,770	0.0254	0.7260
710	0	0	343,772	343,772	0.0129	0.7389
720	0	0	553,308	553,308	0.0208	0.7598
730	0	0	277,167	277,167	0.0104	0.7702
740	0	0	379,503	379,503	0.0143	0.7845
750	0	0	452,785	452,785	0.0170	0.8015
760	0	0	448,081	448,081	0.0169	0.8184
770	0	0	402,844	402,844	0.0152	0.8335
780	0	0	396,707	396,707	0.0149	0.8484

Table E-11.--Continued.

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative Proportion
790	0	0	289,931	289,931	0.0109	0.8594
800	0	0	215,205	215,205	0.0081	0.8675
810	0	0	281,892	281,892	0.0106	0.8781
820	0	0	311,538	311,538	0.0117	0.8898
830	0	0	446,926	446,926	0.0168	0.9066
840	0	0	242,336	242,336	0.0091	0.9157
850	0	0	152,686	152,686	0.0058	0.9215
860	0	0	92,412	92,412	0.0035	0.9249
870	0	0	30,291	30,291	0.0011	0.9261
880	0	0	258,967	258,967	0.0097	0.9358
890	0	0	124,429	124,429	0.0047	0.9405
900	0	0	61,295	61,295	0.0023	0.9428
910	0	0	109,464	109,464	0.0041	0.9469
920	0	0	209,390	209,390	0.0079	0.9548
930	0	0	28,141	28,141	0.0011	0.9559
940	0	0	124,002	124,002	0.0047	0.9605
950	0	0	147,132	147,132	0.0055	0.9661
960	0	0	36,790	36,790	0.0014	0.9675
970	0	0	29,786	29,786	0.0011	0.9686
990	0	0	119,166	119,166	0.0045	0.9731
1000	0	0	52,365	52,365	0.0020	0.9750
1010	0	0	31,268	31,268	0.0012	0.9762
1020	0	0	88,854	88,854	0.0033	0.9796
1030	0	0	63,108	63,108	0.0024	0.9819
1040	0	0	35,564	35,564	0.0013	0.9833
1060	0	0	22,889	22,889	0.0009	0.9841
1090	0	0	30,905	30,905	0.0012	0.9853
1100	0	0	62,385	62,385	0.0024	0.9876
1120	0	0	57,262	57,262	0.0022	0.9898
1130	0	0	59,242	59,242	0.0022	0.9920
1140	0	0	58,659	58,659	0.0022	0.9942
1160	0	0	27,389	27,389	0.0010	0.9953
1200	0	0	33,015	33,015	0.0012	0.9965
1240	0	0	19,911	19,911	0.0008	0.9972
1350	0	0	19,911	19,911	0.0008	0.9980
1370	0	0	19,911	19,911	0.0008	0.9987
1500	0	0	15,980	15,980	0.0006	0.9993
1540	0	0	17,423	17,423	0.0007	1.0000
Total	0	0	26,576,388	26,576,388		

APPENDIX F

Schematic Diagram of Trawl Gear

List of Figures

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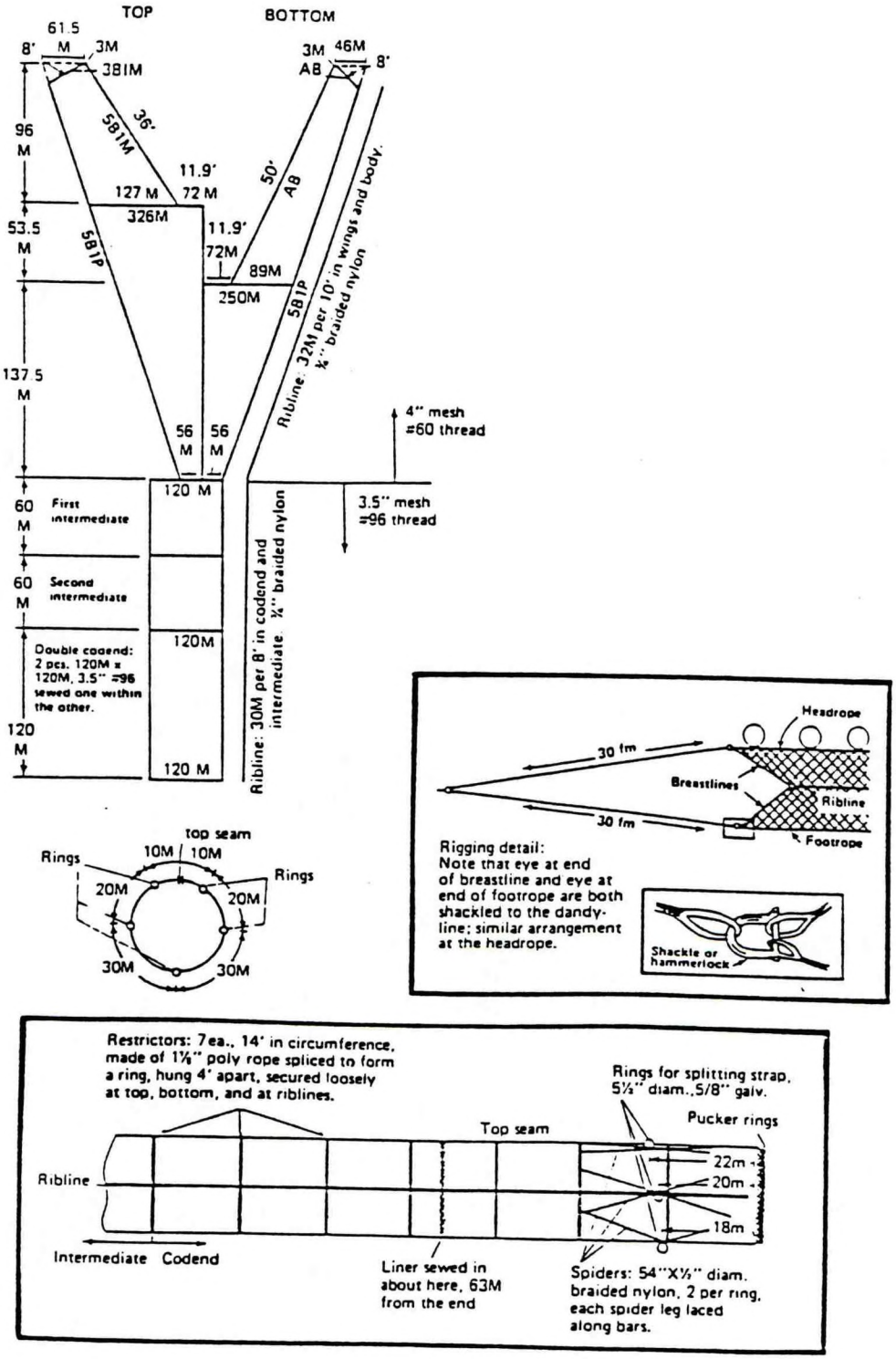

Figure F-1.- Schematic diagram of trawl used during the 1987 eastern Bering Sea bottom trawl survey.