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Results of the 1990 U.S.-U.S.S.R. Cooperative Bottom Trawl Survey of the Eastern and Northwestern Bering Sea Continental Shelf

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U.S. DEPARTMENT OF COMMERCE
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Alaska Fisheries Science Center

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ABSTRACT

The Alaska Fisheries Science Center (AFSC) of the United States and the Pacific Research Institute of Fisheries and. Oceanography (TINRO) of the Union of Soviet Socialist Republics (U.S.S.R.) conducted a cooperative bottom trawl survey of the Bering Sea aboard the Russian research vessel Novokotovsk during May-July 1990. The primary purpose of this survey was to assess the distribution, abundance, and biological condition of groundfish resources, in both the eastern and western Bering Sea continental shelf. A separate and completely {independent trawl survey of the central and southeastern Bering Sea continental shelf was also conducted. by the AFSC during this period aboard, two U.S. research vessels.

Results summarizing geographic distribution, abundance estimates, and size composition are, presented for the principal species of fish encountered. The distribution and relative abundance of the commercially important crab species-are also shown. Results of the cooperative survey are compared to the results of the separate 1990 U.S. survey from the areas commonly fished in the eastern Bering Sea. The appendices include station and catch information, detailed abundance, size, and age data.

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CONTENTS

INTRODUCTION

The Resource Assessment. and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC) and the Pacific Research Institute of Fisheries, and Oceanography (TINRO) of the Union of Soviet Socialist Republics (U.S.S.R.) conducted a cooperative bottom trawl survey of the Bering Sea during May-July' 1990 . In addition to this cooperative survey, which was conducted aboard a Russian research vessel. an independent U.S. bottom trawl survey was conducted aboard two U.S. chartered fishing vessels from June through August. The U.S. vessels sampled the central and southeastern Bering Sea continental shelf waters, whereas the Russian vessel surveyed the northwestern portion of the shelf and northern Bering Sea in addition to the area sampled by the U.S. vessels. Seven U.S. scientists participated in survey operations conducted aboard the Russian. vessel.

Systematic bottom trawl surveys of crab and fish species in the eastern portion of the Bering Sea have been conducted by the United' States annually since the early 1970s. The primary purpose of these surveys has been to provide informationon the abundance and biological conditionof the crab and groundfish resources for management purposes and the fishing industry, as well as for scientific studies. Initial surveys were limited in area to Bristol Bay and the central portion of the eastern Bering Sea. However, during 1975 and 1979-92 the survey region was expanded to cover the major portion of the eastern. Bering Sea.

Two agencies of the Soviet Union (now a part of the Russian Federation), TINRO and the All-Union Scientific Research Institute of Marine Fisheries and Oceanography (VINRO), have conducted fisheries research in the, Bering Sea since 1958 under a program called the "Bering Sea Comprehensive Scientific-Commercial Expedition" (Moiseev 1963). These surveys usually have had multiple objectives including bottom trawl sampling for groundfish, hydroacoustic-midwater trawl surveys of spawning concentrations of walleye pollock (Theragra chalcogramma), and ichthyoplankton surveys for pollock and other groundfish species.

The AFSC has participated in 8 of the 16 Russian groundfish surveys conducted between 1980 and 1990 by placing fisheries scientists aboard the Russian research vessels or in some cases by coordinating the survey activities of Russian and U.S. research vessels.

Coordination between U.S. and Russian survey activities have beenlimited primarily because U.S. scientists and Russian scientists have used different methods for collecting station data and processing and biological sampling of the survey catches. Differences in sampling methods between nations (Hirschberger 1985) have resulted in data sets that are not completely compatible. In addition, navigational equipment available on the Russian vessels has not always provided precise position and station data which are essential for calculating fishing area and deriving abundance estimates from average catch rates using area swept methods. Comparisons of data between U.S.

and Russian surveys conducted in recent years have shown. significant differences, primarily in abundance estimates and size distribution of many fish species. The biomass estimates for many groundfish species derived from Russian survey data have been consistently lower in comparison to estimates from U.S. surveys.

The design and configuration of the Russian bottom sampling trawls used during these surveys have varied between survey years and there has been little information available to assess their fishing efficiency and bottom-tending characteristics. Side-by-side comparative fishing experiments between U.S. and Russian research vessels in l982, 1988, and 1989, however, indicate that the Russian trawls were less efficient than the U.S. sampling trawl for some groundfish species closely associated with the sea floor.

Even though there are differences in sampling methods and Russian survey trawls over the years, these cooperative efforts are beneficial in assessing the relative distribution. of some groundfish species at other seasons of the year and in the western portion of the Bering Sea. The cooperative surveys conducted aboard Russian vessels during September and November 1980 and from January to May 1984 have provided data to describe the distribution of groundfish through the fall and spring months when survey activity by the AFSC has been limited (Raymore 1988). In the summer of 1982 the Russian, bottom trawl survey expanded the sampling area westward of the eastern Bering Sea shelf across

the U.S.-U.S.S.R. Convention Line of 1867 to the Siberian coast. Information collected during that survey has been valuable in understanding the distribution of groundfish populations that inhabit both U.S. and Russian waters.

An attempt was made to standardize U.S. and Russian data sets during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf. Prior to the beginning of the survey, the AFSC installed a Loran-C navigation system aboard the Russian vessel in an effort to standardize the collection of accurate position and distance-fished data. Net mensuration equipment was also provided to evaluate the configuration and fishing characteristics of the Russian trawl. Standard sampling methods used to collect station and catch data were consistent with those used aboard the U.S. vessels.

This report describes the survey and analytical methodology used and summarizes the results of the U.S.-Russian cooperative survey conducted during the summer of 1990. Complete results of the 1990 U.S. survey of the eastern Bering Sea are presented in Armistead and Nichol (1992).

The specific objectives of this report are to

1. Describe the geographical distribution of important living demersal resources in the eastern and western Bering Sea during the survey period;
2. Describe biological characteristics and relative abundance of commercially or ecologically important. species and;
3. Compare the results and findings of the cooperative survey with the results of the U.S. survey from the areas commonly sampled in the eastern Bering Sea.

SURVEY METHODS

Survey Area and Sampling Design

The survey area sampled by the Russian research vessel is shown in Figure l. This area was subdivided into three major regions for analytical, comparative, and reporting purposes. These included: the standard U.S. shelf which encompassed the combined areas of the central and southeastern Bering Sea continental shelf; the northern shelf; and the western shelf. The standard U.S. shelf, also sampled several weeks later by the two U.S. vessels, included eastern Bering Sea shelf waters from Bristol Bay west to the 200 m isobath and north to approximately St. Matthew Island. The north continental shelf area encompassed the waters between St. Matthew Island to St. Lawrence Island and from the Alaska mainland to the U.S.-U.S.S.R. Convention Line of 1867. The study region also extended into the western Bering Sea which included the shelf area from the Gulf of Anadyr west to Cape Olyutorski. These three regions were further divided into geographical subareas (Fig. 2) delineated by the 50 m, 100 m, and 200 m isobaths. These subareas define general oceanographic domains and characterize distributionpatterns of many bottom dwelling species. These subareas for the three main regions are numbered as follows: standard U.S. shelf (subareas l-6), northern shelf (subareas 7-9), and western shelf (subareas 14-16). Detailed bathymetric information was unavailable to accurately determine depth zones in the westernsubareas 14 and 16 (Gulf of Anadyr and Cape Navarin to Cape Olyutorski). Subsequently the

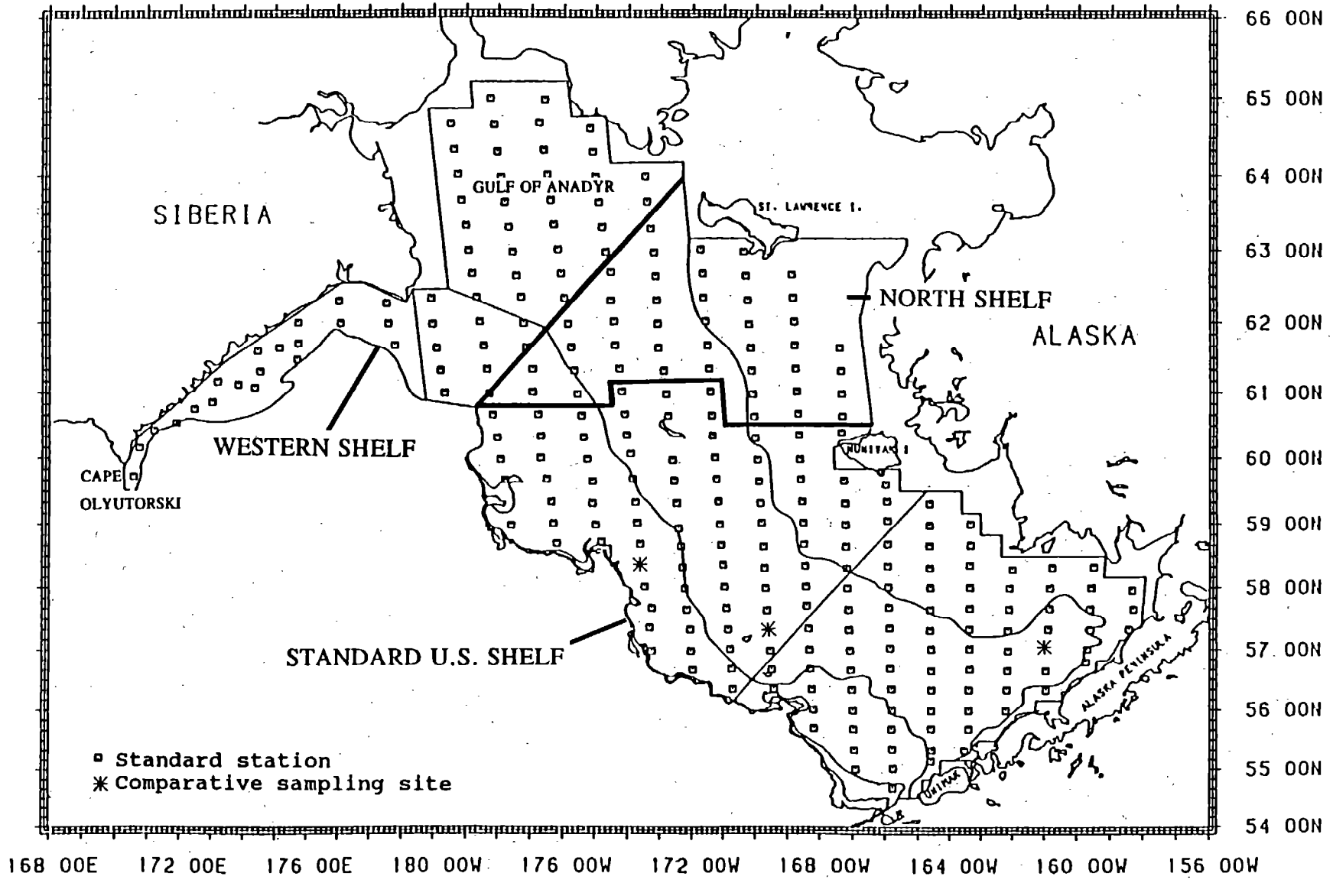


Figure 1. --Station locations sampled by the Novokotovsk during the 1990 cooperative U.S.-Russian bottom trawl-survey of the Bering Sea shelf.

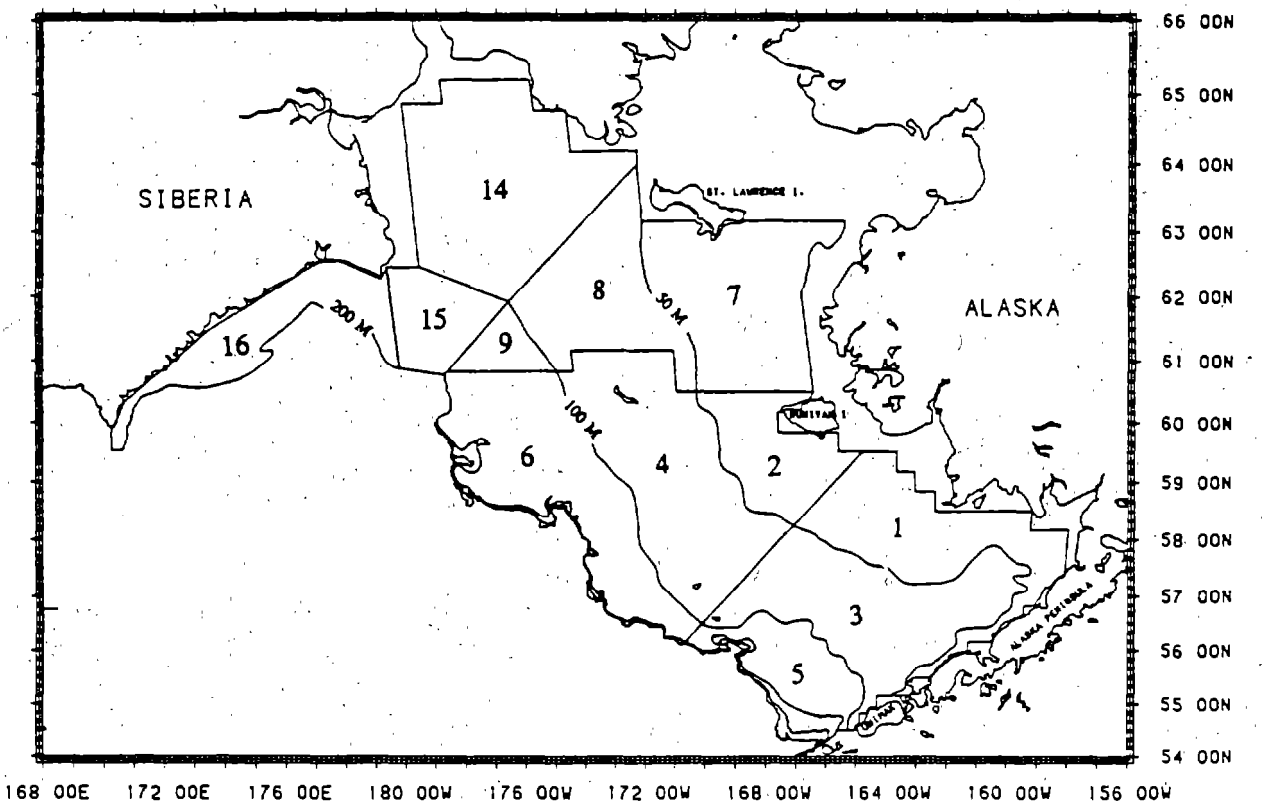


Figure 2. --Survey stratification used for the analysis of the 1990. cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

analysis and reporting of-data recorded from these strata combined all informationcollected at depths less than 100 m in subarea 14 and less than 200 m in subarea 16.

The overall survey area encompassed approximately 757,400 km^2, (Table l). The standard U.S. shelf accounted for 61% of the total area surveyed while the northern shelf (19%) and western shelf area (20%) were nearly equal in size.

The overall sampling intensity was one station sampled for every 2,744 km^2. (Table l). Sampling density was highest in the 'western shelf area at one sample Site for every 2,438 km^2 and

lowest in the northern shelf at one station completed for each 3,191 km^2.

Table l.-Size of subareas and sampling density during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea Shelf.

Subarea	Area (km^2)	Proportion of total area	Number of stations	Sampling density (km^2/station)
Standard U.S. shelf				
1	77,871	0.103	31	2,512
2	41,027	0.054	16	2,564
3	103,515	0.137	36	2,875
4	107,607	0.142	36	2,989
5	38,793	0.051	13	2,984
6	94,565	0.125	37	2,556
Total	463,390	0.612	169	2,742
North shelf				
7	72,829	0.096	23	3,167
8	56,020	0.074	17	3,295
9	11,568	0.015	4	2,892
Total	140,417	0.185	44	3,191
Western shelf				
14	87,610	0.116	34	2,577
15	25,648	0.034	10	2,565
16	40,360	0.053	19	2,124
Total	153,619	0.203	63	2,438
Total survey	757,423	1.000	276	2,744

Standard sampling site locations were based on a schematic 20 x 20 nautical mile grid system that was established during early U.S. bottom trawl surveys in the 1970s. One sampling station was identified in the center of each grid cell. Because of time limitations the Russian research vessel fished alternate

transects columns spaced 40 nmi apart. All transect column stations were later sampled by U.S. vessels in the standard U.S. survey area. Fishing operations began in Bristol: Bay and proceeded westward completing north/south transect columns.

A total of 6 days for comparative. fishing experiments were scheduled to evaluate fishing efficiencies between the Russian sampling net and the standard U.S. 83-112 bottom trawl. Three different sampling sites were identified in the survey area to assess trawl catchability differences for varied species assemblages (Fig. 1). A total of 10 parallel comparative trawl sets, approximately 0.1 nmi apart, were conducted by the Russian vessel at each of the three sampling sites. Two days were spent at each sampling location. The Russian net was fished along the transects the first day and the following day the U.S. 83-112 trawl was used. All tows were 30 minutes in duration. Each transect pair was sampled at approximately the same time of day with each net to reduce the effects of potential daytime variations in species availability. Catches at each location were sorted, weighed, and enumerated.

Vessel and Fishing Gear

Survey activities were conducted aboard the Russian-research vessel Novokotovsk, a 101.6 m stern trawler using the Russian 35/41 bottom trawl. The U.S. 83-112 bottom trawl (used by the AFSC during U.S. groundfish surveys of the eastern Bering Sea since 1982) was-also fished by the Novokotovsk during the

comparative fishing experiments. Attributes of these sampling trawls are described in Table 2. The Russian 35/41 trawl had a longer headrope (35.0m) and footrope (49.0 m) when compared to the U.S. net (25.3 m and 34.l m respectively). Approximately 17 m of anchor chain weighing 250 kg was used on the footrope of the Russian trawl. The U.S. net used 0.6 m chain extensions between the lower dandyline and footrope to enhance bottom-tending characteristics. Roller gear was not used on either bottom trawl.

Table 2. --Description of bottom trawl sampling equipment used by the research vessel Novokotovsk during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Trawl type	Headrope length (m)	Footrope length (m)	Opening		Mesh sizes				Accessory gear	
			horz. (m)	vert. (m)	Wing (mm)	Square (mm)	Belly (mm)	Codend (mm)	Doors (m)	Dandyline length(m)
Russian 35/41	35.0	49.0	17-20	4-6	100	70	50	30	6[2]	75
U.S. 83-112	25.3	34.1	14-16	2-3	102	102	89	89	1.8 x 2.7	50

Trawl configuration and variations in wing spread and headrope opening height were monitored using a SCANMAR[1] net mensurationsystem. Only 62 net measurements were obtained during the trawling operations because of mensuration equipment failure. These data indicated that the horizontal opening of the Russian net ranged between 17 and 20 m with a vertical opening of

[1]Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

4-6 m. The US. -83-112 net ranged from 14 to 16 m and from 2 to 3 m for horizontal and vertical openings, respectively. Position and distance fished information were collected using a Loran C navigational system. The haul began as soon as the net and trawl cable had been deployed and ended 30 minutes later when the retrieval of the net began. Beginning and ending haul positions were used to calculate distances fished at each sampling site.

Collection and Processing of Samples

An attempt was made to maintain a constant towing speed of 3.0 nmi/hr at each sampling site. Trawling operations were restricted to daylight hours to eliminate possible variation in catch rates for various species resulting from vertical diurnal migration or differential day/night net-avoidance behavior.

Sampling procedures used aboard the Novokotovsk were consistent with those established during U.S. groundfish surveys and are described in detail by Wakabayashi et al. (1985). A 30-minute bottom trawl was conducted at each designated sampling site. Catches weighing less than the capacity of the sampling table (approximately l,OOO kg) were completely processed. Catches over 1,800 kg were weighed with an electronic scale and released onto the deck. A random subsample was then transferred to the sorting table for processing. Species or species groups were sorted into baskets, weighed, then enumerated. Subsample weights and numbers were later expanded by the total catch to subsampled weight ratio.

The following fish species were further processed for size composition data:

1. Walleye pollock (Theragra chalcogramma)
2. Yellowfin sole (Pleuronectes asper)
3. Rock sole (Pleuronectes bilineatus)
4. Pacific cod (Gadus macrocephalus)
5. Flathead sole (Hippoglossoides elassodon)
6. Bering flounder (Hippoglossoides robustus)
7. Arrowtooth flounder (Atheresthes stomias)
8. Kamchatka flounder (Atheresthes evermanni)
9. Alaska plaice (Pleuronectes quadrituberculatus)
10. Pacific halibut (Hippoglossus stenolepis)

When possible, subsamples of approximately 150-200 individuals were randomly selected from the catches. Each subsample was first sorted by sex then measured to the nearest centimeter from the tip of the snout to the middle of the caudal ray fork of the tail. Pacific halibut were measured live and returned to the sea as soon as possible to ensure maximum survival rate. Halibut weights were later calculated using a length-weight relationship provided by the International Pacific Halibut Commission (IPHC). That relationship is

$$Weight_{(lbs)} = (9.204 * 10^{-6}) * L(cm).^{3.42}$$

The AFSC and TINRO methods for collecting length composition data differed. U.S. scientists routinely collect length data rounded to the nearest whole centimeter. As an example, fish measuring between 9.5 and 10.5 cm were recorded as 10 cm fish on U.S. vessels. TINRO scientists, however, recorded fish lengths between 10 and 11 cm as 11 cm fish. In order to make size

composition data comparable with those collected onboard the U.S. research vessels, length data from the Novokotovsk were-adjusted. Each, length was randomly assigned either the originally recorded length, or the original length decreased by 1 cm.

Age structures were collected from walleye pollock in the western shelf area to determine age composition. Five otoliths per sex-centimeter size category were, collected and stored in a 50% alcohol solution for subsequent evaluation by the Age and Growth Unit of the Resource Ecology and Fisheries Management Division at the AFSC. Otoliths were also collected in-the standard U.S. continental shelf aboard the U.S. vessels. Growth rates and age-length keys for walleye pollock from the standard U.S. shelf are presented in Armistead and Nichol (1992). Age-length keys were constructed separately for the western shelf and standard U.S. shelf otolith collections. Age structures were not collected for the north shelf area. Age composition was estimated by proportioning the computed population length-frequency distribution to ages using the respective western shelf or standard U.S. shelf age key.

Data Analysis

Methods -and procedures used in the analysis of the data collected during the 1990 survey are summarized below. A more complete description of the analytical methods used are provided in Wakabayashi et al. (1985).

During the sorting of the catch from each station, scientists attempted to identify (time permitting) all fish and invertebrates to the lowest possible taxon. However for some of the species encountered it was difficult to make positive identifications with the amount of time available between hauls. Arrowtooth flounder (Atheresthes stomias) and Kamchatka flounder (Atheresthes evennanni) are very similar in appearance and may not have been completely separated during the sorting. process, especially when the catch was subsampled. Catch and length data for these two species were subsequently grouped together and are reported here as Atheresthes spp. Similarly, flathead sole (Hippoglossoides elassodon) and the closely related Bering flounder (Hippoglossoides robustus) were also grouped and are presented in this report as Hippoglossoides spp.

Catch per unit effort (CPUE) was calculated in terms of weight (kg) and numbers caught per hectare (1 ha = 10,000 m^2) trawled as described by Alverson and Pereyra (1969). The mean CPUE value for the entire survey area was derived from the sum of the mean CPUE of each subarea weighted by the size of that subarea. Biomass and population numbers were calculated for each subarea as the product of the mean subarea CPUE and the area contained in that subarea. Total biomass and population numbers were calculated by summing the component subarea values.

The number of Individuals by size and sex category was estimated by expanding the length-frequency subsample to the total number of fish at each sampling site. These expanded

numbers were subsequently combined to represent the size composition in each subarea and then applied to the population estimate to produce population at size.

Age composition in terms of biomass for walleye pollock was estimated by first calculating biomass at length using the, equation: $B_L = P_L * \{A *-(L^B)\}$, where

B_L = biomass at length L in grams,
= population number at length L,
L = fork length in mm, and
A and B = constants based on regressions of previous species-specific length-weight data obtained from the RACE eastern Bering Sea database.

Values used for the constants A and B for walleye pollock are as follows:

	A	B
Male	0.0000081670	2.963988
Female	0.0000063161	3.010031
Unsexed	0.0000029701	3.167916

After converting weight in grams to metric tons (t), B_L was then apportioned to biomass at age using the age-length keys for each area.

Growth characteristics of walleye pollock were described with von Bertalanffy (1938) growth, curves fitted to age-length data.

The relative fishing efficiencies of the Russian bottom sampling net and the standard U.S. 83-112 sampling net were evaluated by comparing the CPUE trawled for each species caught.

One net was determined to have a different catchability coefficient than the other when the distribution of CPUE values were found to be statistically different-based on a Bayesian approach described by Geisser and Eddy (1979).

RESULTS OF THE SURVEY

The Novokotovsk completed 345 trawl hauls including 60 comparative trawl sets. In addition to standard haul, position, catch, and sea water temperature information, approximately 52,000 length measurements were recorded from fish species of interest (Table 3). Approximately 550 pollock otolith pairs were collected and preserved.

Table 3.--Number of length frequencies collected aboard the Novokotovsk by species and area during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Species	Region			Total
	Standard U.S. shelf	Northern shelf	Western shelf	
Walleye pollock	15,781	1,411	3,477	20,669
Pacific cod	1,812	205	954	2,971
Yellowfin sole	11,306	2,026	67	13,399
Hippoglossoides spp.	4,585	369	1,004	5,958
Pacific halibut	523	6	44	573
Alaska plaice	3,789	1,424	297	5,510
Atheresthes spp.	2,692	0	0	2,692
Misc. species[a]	116	180	0	296
Total	40,604	5,621	5,843	52,068

[a] Includes rex sole, northern rockfish, and saffron cod.

Environmental Conditions

During May-June, sea water surface temperatures ranged from 0.8° C to 10.1° C in the survey area. Surface temperatures were

generally lowest in the shallow waters of the Alaska mainland inshore area and increased westward as the survey proceeded (Fig 3). The warmest sea surface temperatures were observed off the southern waters of the Siberian coast during mid-July when the survey was completed.

Bottom temperatures ranged from -1.8° C to 4.8° C with the warmest waters located in Bristol Bay, the southeastern Bering Sea, and the far western area off the coast of Siberia (Fig. 4). A large mass of subzero water was encountered in the northern portion of the study region extending from the Gulf of Anadyr south through the central portion of the eastern Bering Sea. The overall mean bottom temperature was 1.0° C. The standard U.S. shelf had the warmest bottom temperaturesaveraging 1.7° C while the north shelf was coldest at -0.6" C. The combined western subareas were also relatively cold with a mean bottom temperature of 0.2° C primarily due to the cold water mass located in subareas 14 and 15.

Comparative Trawl Experiment

The Novokotovsk completed 30 paired comparative sets using the Russian sampling net and the standard U.S. 83-112 bottom trawl. Ten comparative sets were conducted at each of three sampling sites in the southeastern Bering Sea (Fig. 1).

Comparison of the catch rates (standardized to kg/ha trawled) between sampling nets indicated that the U.S. 83-112 sampling net was more effective in capturing Pacific cod

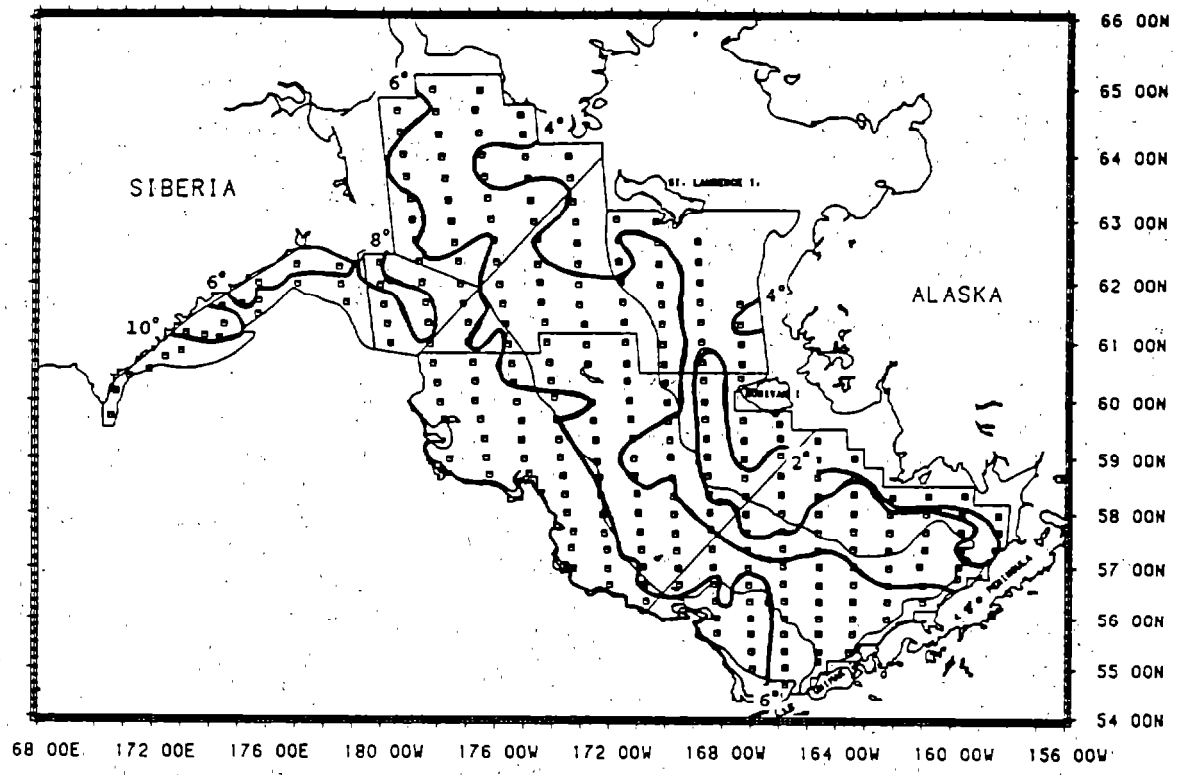


Figure 3. --Distribution of surface water temperatures (°C) observed during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

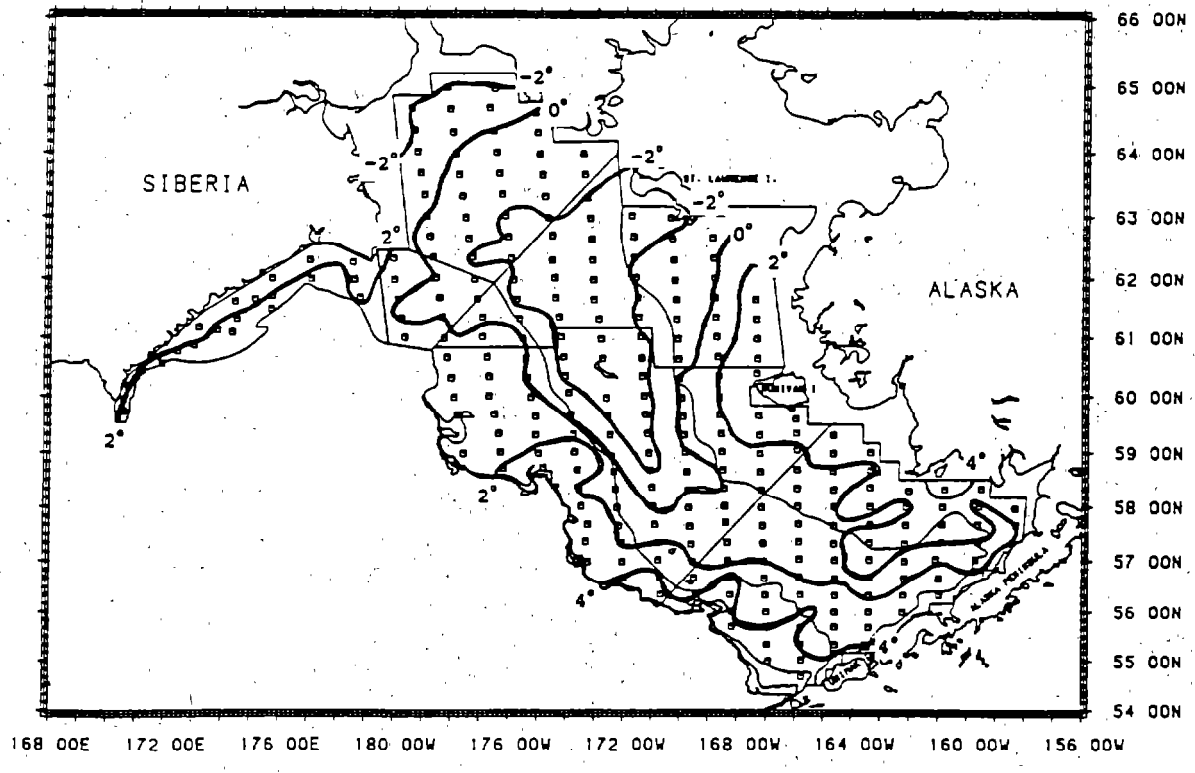


Figure 4. --Distribution of bottom water temperatures (°C) observed during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

(G. macrocephalus), Tanner crabs (Chionoecetes bairdi and c. opilio), blue king crab (Paralithodes platypus), starfish, and most other invertebrates. The catch efficiency for invertebrates was probably increased by the 0.61 m footrope chain extensions that enhanced the 83-112 trawl's ability to tend bottom and therefore improved the sampling efficiency for species situated directly on the seabed. The Russian net was not equipped with these extensions and apparently did not tend bottom as well. Although results showed similarities in catch efficiencies between these sampling nets for many species, adjustments to catches were not made primarily because of the relatively small number of comparative tows at each sampling site. They do, however, suggest strong similarities in fishing efficiencies between sampling nets when used aboard the Novokotovsk for some species as shown in Table 4. It should be noted that the R/V

Table 4. --Mean catch rates of the Russian trawl and the U.S. 83-112 trawl for principal species from the comparative trawling experiment conducted during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

	Hauls with catch		Mean CPUE (kg/ha)		Geisser and Eddy		
					Catch	Statistic	
Specie	Russian net	83-112	Russian net	83-112	ratio	D_1	D_2
Walleye pollock	30	30	98.773	127.516	.774599	1805828.0	1855374.0
Pacific cod*	30	30	27.188	43.560	.624143	101370.1	100592.8
Yellowfin sole	20	20	25.690	26.361	.974540	107566.9	111300.9
Rock sole	30	30	93.862	79.240	1.184530	633074.0	651660.3
Hippoglossoides spp.	29	27	15.776	16.406	.961599	19332.7	19998.7
Alaska plaice	18	17	2.430	2.670	.910086	1413.0	1461.2
Atheresthes spp.	15	18	4.213	5.279	.798090	3221.2	3315.0
Pacific halibut	18	18	2.359	2.190	1.076770	536.3	554.5
Tanner crab							
C. bairdi*	30	30	3.693	6.653	.555116	1699.4	1617.8
C. opilio*	21	20	3.840	6.393	.600764	2618.2	2604.7
Red king crab	15	18	2.165	3.195	.677694	1192.5	1217.0
Blue king crab*	7	8	.126	.423	.298112	31.4	31.1

*Geisser and Eddy (1979) test indicates a significant difference between sampling net CPUE.

Novokotovsk is over 3 times larger than the vessels used in the U.S. bottom trawl survey. Differences in fishing efficiencies using the 83-112 bottom trawl aboard the Novokotovsk and the smaller U.S. survey vessels is unknown. Vessel logistics and time limitations prevented conducting side-by-side trawling experiments between the U.S. and Russian vessels.

Relative Importance of Major Taxonomic Groups

During the 1990 cooperative survey, 95 fish species representing 20 families were consistently identified (Table 5). Forty-six invertebrate species were identified from the catches. Some invertebrate species were not completely sorted and identified during the sampling procedure because of time limitations. Many invertebrates were subsequently grouped in broader taxonomical categories such as family, order, and phylum or recorded as "other invertebrates." As a result, some of the more specific invertebrate categories may be underestimated.

The total biomass of fish and invertebrates combined in the overall survey area was estimated at 16.5 million t (Tables 6 and. 7). Of this, nearly 74% (12.3 million t) of the biomass occurred in the standard U.S. shelf, 8% (1.3 million t) in the north shelf area, and 18% (3.0 million t) in the western area.

Fish--The total biomass of all fish species sampled was estimated at 11.6 million t and accounted for 69.1% of the total catch of fish and invertebrates combined (Table 6). Total fish catch rates. frequently exceeded 400 kg/ha trawled in the standard

Table 5. --Mean CPUE (kg/ha) of fish species encountered during the 1990 U.S.-Russian cooperative groundfish survey of the Bering Sea.

Common Name	Scientific Name	Standard U.S. shelf	North shelf	Western shelf	All areas combined
Family Squalidae					
Spiny dogfish	Squalus acanthias	0.004	-	-	0.002
Family Rajidae					
Alaska skate	Bathyraja parmifera	4.669	0.225	1.356	3.173
Aleutian skate	Bathyraja aleutica	0.870	-	0.299	0.593
Skate unident.	Rajidae unident.	0.142	-	-	0.087
Bathyraja unident.	Bathyraja sp.	0.087	-	-	0.053
Okhotsk skate	Bathyraja violacea	0.044	-	0.079	0.043
Bering skate	Bathyraja interrupta	0.002	-	-	0.001
Family Clupeidae					
Pacific herring	Clupea pallasii	2.005	0.062	0.924	1.173
American shad	Alosa sapidissima	0.006	-	-	0.004
Family Osmeridae					
Capelin	Mallotus villosus	0.626	0.424	0.058	0.474
Eulachon	Thaleichthys pacificus	0.018	-	<0.001	0.011
Family Gadidae					
Walleye pollock	Theragra chalcogramma	68.050	24.196	42.930	54.820
Pacific cod	Gadus macrocephalus	14.167	2.074	20.717	13.253
Arctic cod	Boreogadus saida	0.146	1.230	0.658	0.451
Saffron cod	Eleginus gracilis	<0.001	0.119	<0.001	0.022
Family Zoarcidae					
Marbled eelpout	Lycodes raridens	0.515	0.357	0.271	0.436
Wattled eelpout	Lycodes palearis	0.276	0.148	0.337	0.264
Shortfin eelpout	Lycodes brevipes	0.202	0.020	0.068	0.141
Lycodes unident.	Lycodes sp.	0.009	0.008	0.003	0.008
Gymnelus unident.	Gymnelus sp.	-	<0.001	<0.001	<0.001
Eelpout unident.	Zoarcidae	-	0.004	-	<0.001
Saddled eelput	Lycodes mucosus	-	<0.001	0.002	<0.001
Fish doctor	Gymnelus viridis	-	<0.001	-	<0.001
Polor eelpout	Lycodes turneri	-	<0.001	0.004	0.001
Family Scorpaenidae					
Northern rockfish	Sebastes polyspinis	0.684	0.009	-	0.418
Dusky rockfish	Sebastes ciliatus	0.013	-	-	0.008
Pacific ocean perch	Sebastes alutus	0.009	0.001	-	0.005
Rougheye rockfish	Sebastes aleutianus	0.008	-	-	0.005
Rockfish unident.	Sebastes sp.	<0.001	-	0.001	<0.001
Family Hexagrammidae					
Whitespotted greenling	Hexagrammos stelleri	0.014	0.003	<0.001	0.009
Atka mackerel	Pleurogrammus monopterygius	<0.001	-	0.044	0.009
Hexagrammos unident.	Hexagrammos sp.	0.002	-	-	0.001
Kelp greenling	Hexagrammos decagrammus	<0.001	-	-	<0.001
Family Anoplopomatidae					
Sablefish	Anoplopoma fimbria	0.002	-	-	0.001
Family Cottidae					
Great Sculpin	Myoxocephalus polyacanthocephalus	0.405	0.596	2.598	0.885
Plain Sculpin	Myoxocephalus jaok	0.954	0.879	-	0.747
Yellow Irish Lord	Hemitripidotus jordani	0.577	-	0.548	0.464
Armorhead sculpin	Gymnocanthus galeatus	0.020	-	2.126	0.443
Myoxocephalus unident.	Myoxocephalus sp.	0.360	0.101	0.298	0.285
Warty sculpin	Myoxocephalus verrucosus	0.481	0.078	0.381	0.258

Table 5. --Continued.

Common Name	Scientific Name	Standard U.S. shelf	North shelf	Western shelf	All areas combined
Butterfly sculpin	Melletes papilio	0.173	0.211	0.066	0.159
Bigmouth sculpin	Hemitripterus bolini	0.185	-	0.200	0.154
Threaded sculpin	Gymnocanthus pistilliger	0.111	0.037	-	0.075
Thorny sculpin	Icelus spiniger	0.030	0.004	0.025	0.025
Scissortail sculpin	Triglops metopias	<0.001	-	0.094	0.019
Gymnocanthus unident.	Gymnocanthus sp.	0.026	-	-	0.016
Spinyhead sculpin	Dasycottus setiger	0.019	-	0.014	0.014
Ribbed sculpin	Triglops pingeli	0.004	0.010	0.036	0.011
Arctic staghorn sculpin	Gymnocanthus tricuspis	0.004	0.013	0.019	0.009
Darkfin sculpin	Malacocottus kincaidi	0.004	-	0.008	0.004
Speckled sculpin	Triglops scepticus	0.005	-	0.002	0.003
Pacific hookear sculpin	Artediellus pacificus	<0.001	-	0.016	0.003
Smoothcheek sculpin	Eurymen gyrinus	-	-	0.016	0.003
Irish Lord unident.	Hemilepidotus sp.	0.002	-	-	0.001
Triglops unident.	Triglops sp.	0.002	-	-	0.001
Sculpin unident.	Cottidae	0.002	-	-	0.001
Spatulate sculpin	Icelus euryops	0.001	-	0.005	0.001
Red Irish Lord	Hemilepidotus hemilepidotus	0.001	-	-	<0.001
Icelus unident.	Icelus sp.	<0.001	-	-	<0.001
Northern sculpin	Icelinus borealis	<0.001	-	-	<0.001
Blackfin sculpin	Malacocottus kincaidi	<0.001	-	-	<0.001
Crested sculpin	Blepsias bilobus	-	0.003	-	<0.001
Antlered sculpin	Enophrys diceraus	-	-	0.004	<0.001
Eyeshade sculpin	Nautichthys pribilovius	-	-	0.005	<0.001
Artediellus unident.	Artediellus sp.	-	-	0.002	<0.001
Family Agonidae					
Sturgeon poacher	Agonus acipenserinus	0.393	0.037	0.006	0.249
Sawback poacher	Sarritor frenatus	0.014	0.003	0.023	0.014
Poacher unident.	Agonidae	0.020	-	-	0.012
Aleutian alligatorfish	Aspidophoroides bartoni	0.005	0.003	0.022	0.008
Dragon poacher	Percis japonicus	-	<0.001	0.037	0.008
Bering poacher	Occella dodecaedron	0.003	0.002	-	0.002
Longnose poacher	Sarritor leptorhynchus	-	-	0.011	0.002
Arctic alligatorfish	Aspidophoroides olriki	-	0.001	0.005	0.001
Fourhorn poacher	Hypsagonus quadricornis	-	-	0.004	<0.001
Tubenose poacher	Pallasina barbata	0.001	-	-	<0.001
Family Cyclopteridae					
Dusky snailfish	Liparis gibbus	0.072	0.021	0.155	0.080
Liparis unident	Liparis sp.	0.020	0.062	0.226	0.069
Snailfish unident.	Cyclopteridae (Liparidinae)	0.015	0.092	-	0.026
Salmon snailfish	Careproctus rastrinus	0.016	0.010	0.014	0.015
Pacific spiny lumpsucker	Eumicrotremus orbis	-		0.012	0.002
Smooth lumpsucker	Aptocyclus ventricosus	0.002	-	-	0.001
Round lumpsucker	Eumicrotremus birulai	-	-	0.006	0.001
Forktail snailfish	Careproctus furcellus	-	-	0.006	0.001
Blotched snailfish	Crstallichthys cyclospilus	-	-	0.002	<0.001
Careproctus unident.	Careproctus sp.	<0.001	-	-	<0.001
Family Trichodontidae					
Pacific sandfish	Trichodon trichodon	0.036	-	-	0.022
Family Bathymasteridae					
Searcher	Bathymaster signatus	0.052	0.042	0.012	0.034
Family Anarhichadidae					
Bering wolffish	Anarhichas orientalis	0.013	0.046	-	0.017

Table 5. --Continued.

Common Name	Scientific Name	Standard U.S. shelf	North shelf	Western shelf	All areas combined
Family Stichaeidae					
Daubed shanny	Lumpenus maculatus	0.003	0.002	0.008	0.004
Slender eelblenny	Lumpenus fabricii	0.002	0.002	<0.001	0.002
Lumpenus unident.	Lumpenus sp.	0.001	<0.001	-	<0.001
Stout eelblenny	Lumpenus medius	0.001	0.020	0.038	0.012
Pighead prickleback	Acantholumpenus mackayi	<0.001	-	-	<0.001
Snake prickleback	Lumpenus sagitta	-	<0.001	-	<0.001
Fourline snakeblenny	Eumesogrammus praecisus	-	-	0.027	0.005
Arctic shanny	Stichaeus punctatus	-	-	0.002	<0.001
Chirolophis unident.	Chirolophis sp.	-	-	<0.001	<0.001
Family Cryptacanthodidae					
Dwarf wrymouth	Lyconectes aleutensis	<0.001	-	-	<0.001
Family Zaproridae					
Prowfish	Zaprora silenus	0.025	0.003	-	0.016
Family Ammodytidae					
Pacific sand lance	Ammodytes hexapterus	0.008	0.001	0.030	0.011
Family Pleuronectidae					
Yellowfin sole	Pleuronectes aspera	52.421	7.682	0.133	33.522
Rock sole	Pleuronectes bilineata	28.142	0.240	1.274	17.520
Alaska plaice	Pleuronectes quadrituberculatus	14.662	7.171	3.381	10.986
Flathead sole	Hippoglossoides elassodon	6.888	0.020	0.139	4.246
Arrowtooth flounder	Atheresthes stomias	4.865	-	0.017	2.980
Pacific halibut	Hippoglossus stenolepis	2.153	0.021	0.576	1.438
Bering flounder	Hippoglossoides robustus	0.300	0.542	1.838	0.657
Kamchatka flounder	Atheresthes stomias	0.656	-	0.137	0.429
Longhead dab	Pleuronectes proboscidea	0.499	0.157	0.004	0.335
Starry flounder	Platichthys stellatus	0.410	0.024	-	0.255
Greenland turbot	Reinhardtius hippoglossoides	0.068	0.040	0.225	0.095
Rex Sole	Glyptocephalus zachirus	0.117	-	-	0.071
Sakhalin sole	Pleuronectes sakhalinensis	0.004	0.022	0.181	0.043
Butter sole	Pleuronectes isolepis	0.007	-	-	0.004
Dover sole	Microstomus pacificus	0.002	-	-	0.001
Pleuronichthys unident.	Pleuronichthys sp.	<0.001	-	-	<0.001

Table 6.--Biomass estimates for major fish species and fish groups taken during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Taxon	Estimated total biomass (t)[a] and 95% confidence interval	Proportion of total animal biomass[b]	Estimated Biomass by Subarea (t)											
			Standard U.S. shelf						North shelf			Western shelf		
			1	2	3	4	5	6	7	8	9	14	15	16
Gadidae (cods)														
Walleye pollock	4,152,438 ± 27%	25.2%	121,223	52,661	468,900	336,263	56,906	2,117,351	24,270	5,106	310,367	87,836	125,943	445,613
Pacific cod	1,003,821 ± 25%	6.1%	62,959	25,947	171,928	109,084	51,378	235,153	3,071	3,579	22,477	49,840	84,019	184,386
Other cods	35,853 ± 41%	0.2%	5	22	0	6,758	0	0	4,914	14,036	4	9,865	0	249
Total cods	5,192,111 ± 23%	31.5%	184,187	78,630	640,827	452,105	108,284	2,352,504	32,254	22,720	332,848	147,541	209,962	630,248
Scorpaenidae (rockfish)														
Pacific ocean perch	403 ± 218%	<0.1%	0	0	0	0	403	0	0	0	0	0	0	0
Other rockfish	32,694 ± 213%	<0.1%	104	0	20	0	32,309	243	0	0	0	0	0	17
Total rockfish	33,096 ± 213%	<0.1%	104	0	20	0	32,712	243	0	0	0	0	0	17
Pleuronectidae (flatfish)														
Yellowfin sole	2,539,008 ± 23%	15.4%	1,152,022	470,576	642,252	164,104	0	144	107,290	574	0	93	0	1,954
Rock sole	1,327,016 ± 41%	8.0%	465,448	92,400	281,050	401,740	1,834	61,592	2,656	232	488	309	2,333	16,934
Hippoglossoides spp.	371,399 ± 29%	2.2%	11,998	1,136	157,412	27,070	50,380	85,126	515	4,114	3,269	23,925	6,069	386
Alaska plaice	832,069 ± 28%	5.0%	119,938	179,990	123,402	238,904	0	17,209	99,209	1,456	27	15,150	9,908	26,875
Atheresthes spp.	258,222 ± 29%	1.6%	142	0	34,843	2,406	123,565	94,899	0	0	0	0	1,981	386
Greenland turbot	7,175 ± 56%	<0.1%	0	0	0	432	0	2,724	0	156	406	297	3,061	99
Pacific halibut	108,899 ± 24%	0.7%	16,149	6,090	34,828	9,548	8,681	24,457	249	0	50	1,215	1,594	6,038
Other flatfish	53,833 ± 41%	0.3%	37,264	4,397	1,720	176	3,303	1,275	2,574	285	0	87	0	2,751
Total flatfish	5,497,622 ± 17%	33.2%	1,802,962	754,588	1,275,506	844,379	187,764	287,427	212,492	6,818	4,240	41,076	24,947	55,423
Clupeidae														
Pacific herring	88,816 ± 39%	0.5%	2,633	22,680	2,003	19,129	2	15	18,176	9,981	0	19	0	14,179
Cottidae (sculpins)	281,979 ± 24%	1.7%	44,896	10,543	14,569	66,910	2,848	16,286	20,689	5,007	1,481	13,428	23,249	62,073
Zoarcidae (eelpouts)	64,491 ± 22%	0.4%	33	0	3,249	27,692	1,060	14,355	323	5,370	1,887	5,134	5,319	70
Osmeridae (smelts)	36,715 ± 55%	0.2%	17,551	3,249	7,840	422	797	7	4,040	1,909	0	839	4	57
Agonidae (poachers)	22,599 ± 22%	0.1%	5,987	5,104	5,879	2,775	177	327	565	46	78	191	514	957
Cyclopteridae (snailfish)	14,889 ± 27%	<0.1%	30	76	42	5,100	6	578	251	2,331	17	5,055	614	789
Rajidae (skates)	299,365 ± 35%	1.8%	6,538	0	35,122	37,479	67,537	122,899	0	1,178	1,977	4,054	12,418	10,163
Other fish	11,375 ± 35%	<0.1%	2,808	768	439	226	2,159	1,487	760	276	21	670	434	1,406
Total fish	11,543,137 ± 14%	69.9%	2,067,728	875,638	1,985,499	1,456,217	403,345	2,796,129	289,549	55,635	342,550	218,006	277,461	775,380

[a]Rounding accounts for minor discrepancies between suns 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 = 16,539,353 t).

Table 7.--Biomass estimates for major invertebrate species and invertebrate groups taken during the 1990 dooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Taxon	Estimated total biomass (t)[a] and 95% confidence interval	Proportion of total animal biomass[b]	Estimated Biomass by Subarea (t)											
			Standard U.S. shelf						North shelf			Western shelf		
			1	2	3	4	5	6	7	8	9	14	15	16
Crustacea[c]														
Chionoecetes sp. (snow crab)	1,269,756 ± 21%	7.7%	16,549	11,496	94,936	427,660	33,273	248,837	117,900	104,942	22,719	107,282	66,970	17,192
Paralithodes sp. (king crab)	62,257 ± 50%	0.4%	8,919	53	35,953	2,138	0	0	46	32	0	3,510	560	11,045
Erimacrus isenbeckii (hair crab)	1,129 ± 85%	<0.1%	345	0	244	540	0	0	0	0	0	0	0	0
Paguridae (hermit crab)	3,513 ± 148%	<0.1%	1,095	2,416	-	-	-	-	-	-	-	-	-	-
Other crab	49,129 ± 28%	0.3%	10,425	8,532	6,253	5,011	269	394	1,423	202	119	6,783	631	9,086
Total crab	1,385,845 ± 19%	8.4%	37,361	22,498	137,414	435,349	33,542	249,232	119,376	105,167	22,837	117,577	68,161	37,323
Shrimps	24,439 ± 36%	0.1%	566	670	15	607	894	5,046	2,679	1,540	652	4,033	2,214	5,523
Other crustaceans	10,413 ± 197%	<0.1%	-	-	-	-	-	-	-	-	-	696	-	9,717
Total crustaceans	1,420,698 ± 19%	8.6%	37,927	23,168	137,429	435,956	34,436	254,278	122,055	106,716	23,489	122,306	70,375	52,563
Mollusca[c]														
Gastropoda (snails)	73,178 ± 56%	0.4%	703	2,786	29,054	5,062	2,982	20,065	11,310	482	0	695	39	0
Pelecypoda (bivalves)	2,326 ± 143%	<0.1%	0	0	621	0	121	52	0	1,532	0	0	0	0
Squids	1,547 ± 178%	<0.1%	0	0	0	0	147	87	0	0	0	0	0	1,314
Other molluscs	13,864 ± 79%	<0.1%	0	0	0	7,996	0	0	0	5,896	0	0	0	0
Octopuses	3,214 ± 70%	<0.1%	0	0	596	318	0	1,807	33	69	0	392	0	0
Total molluscs	94,130 ± 47%	0.6%	703	2,786	30,271	13,376	3,249	22,012	11,343	7,951	0	1,086	39	1,314
Echinodermata[c]														
Asteroidea (starfish)	1,386,500 ± 23%	8.4%	463,127	130,139	225,084	127,204	3,090	211,657	93,431	5,571	44,915	11,405	18,424	52,453
Ophiuroidea (brittlestars)	304,627 ± 55%	1.8%	219	1,035	16,575	10,396	29,215	57,080	2,623	85,731	1,502	91,949	1,669	6,632
Echinoidea (sea urchin)	620,208 ± 87%	3.8%	0	0	3,157	1,153	347	758	13	0	8	22,871	203,751	388,150
Holothuroidea (sea cucumbers)	49,923 ± 157%	0.3%	-	-	737	1,765	-	-	-	-	-	46,564	-	857
Total echinoderms	2,361,257 ± 27%	14.3%	463,346	131,174	245,553	140,518	32,652	269,495	96,067	91,303	46,425	172,789	223,844	448,091
Ascidiacea	160,453 ± 51%	1.0%	17,428	15,054	36,307	34,528	0	11	20,985	0	0	33,384	0	2,757
Coelenterata	118,240 ± 31%	0.7%	1,708	829	26,705	9,732	34,166	3,232	231	7,411	895	10,127	4,299	18,906
Other invertebrates	831,669 ± 39%	4.5%	31,712	14,082	114,396	55,686	959	27,335	42,672	27,741	607	121,102	8,400	386,976
Total invertebrates	4,986,447 ± 14%	30.2%	552,824	187,093	590,660	689,796	105,462	576,362	293,353	241,122	71,416	460,794	306,958	910,606

[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 = 16,539,353 t).
[c]Biomass for pagurids, crustaceans, gastropods, pelecypods, and echinoderms may be underestimated since some were classified as other invertebrates during the sampling procedures.

U.S. area and were generally less than 125 kg/ha in the north shelf area (Fig. 5) Fish were also found in relatively low levels of abundance in the Gulf of Anadyr region of the western shelf. About 83% (9.6 million t) of the total fish biomass was located in the standard U.S. shelf. Another 6% (0.7, million t) were present in the north shelf area and 11% (1.3 million t) in the western area. Six fish families including Pleuronectidae (47.6%), Gadidae (45.0%), Rajidae (2.6%), Cottidae (2.4%), Clupeidae (0.8%), and Zoarcidae (0.6%) contributed 99% of the total estimated fish biomass.

Invertebrates --The combined invertebrate biomass accounted for 30% or nearly 5.0 million t of the total estimated biomass of fish and invertebrates (Table 7). Members of the phylum Echinodermata were the most frequently encountered invertebrate category with an estimated biomass of approximately 2.4 million t or nearly-one-half of the overall invertebrate biomass and about 14% of the combined fish and invertebrate biomass. Starfish were the major component of the echinoderm assemblage. Sea urchins were the second most abundant echinoderm group with highest concentrations located in the western shelf area. Crustaceans, primarily represented by tanner crab, comprised 28.5% of the total estimated invertebrate biomass. The molluscs, ascidians, and coelenterates combined comprised about 2.3% of the total invertebrate biomass. Gastropods were the most often encountered members of the phylum Mollusca. Gastropods and other members of the phylum Mollusca were likely the most undersampled because many species in this phylum tend to burrow into the sea bottom below the effective path of the sampling trawl.

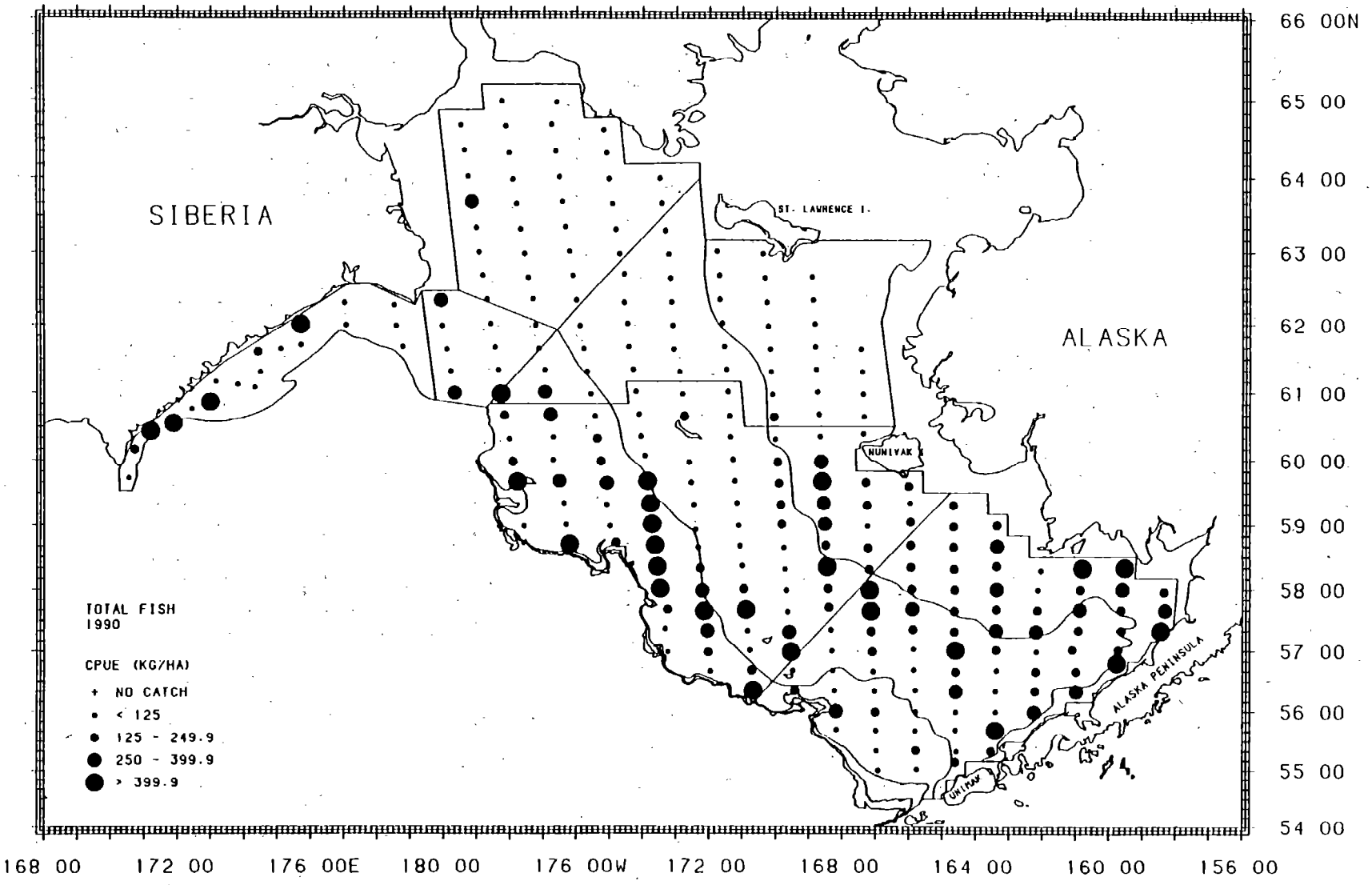


Figure 5.--Distribution and relative abundance in kg/ha of total fish sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Fish Groups

Pleuronectidae (flatfishes)

Fifteen species of flatfish were identified during the survey (Table 5). They accounted for 5.5 million t or 48% of the entire estimated fish biomass. Approximately 94% of the total flatfish biomass was located in the standard U.S. shelf area with 4% in the north shelf area and 2% in the western area (Table 6). Yellowfin sole was the major component of this group comprising 46% of the total flatfish biomass estimate. Yellowfin sole were primarily concentrated in the standard U.S. shelf area. Rock sole was the second most abundant species accounting for 24% of the flatfish biomass estimate followed by Alaska plaice (15%), Hippoglossoides spp. (7%), and Atheresthes spp. (5%).

Gadidae (codfishes)

The family Gadidae was represented by four species with a combined estimated biomass of 5.2 million t. This group was widely distributed throughout the survey area with approximately 73% (3.8 million t) located in the standard U.S. shelf area, 8% (0.4 million t) found in the north shelf area, and the remaining 19% (1 million t) located in the western shelf region (Table 6). Walleye pollock was by far the most abundant gadid species comprising 80% by weight of this family followed by Pacific cod (19%): Arctic cod (Boreogadus saida) and saffron cod (Eleginus gracilis) comprised the remaining 1% with highest catch rates encountered in the north shelf area (Table 5).

Rajidae (skates)

Four species of skates were identified during the survey (Table 5). The Alaska skate (Bathyraja parmifera) was the most commonly encountered skate species in the standard U.S. and western areas and was the only skate species recorded in the north shelf area. Skates were most abundant in subareas 5 and 6 at depths greater than 100 m (Fig. 6). Skates were the third most abundant fish group (following the gadids and pleuronectids) and had an estimated biomass of nearly 300,000 t. Ninety percent of the entire skate biomass was located in the standard U.S. shelf.

Cottidae (sculpins)

The family Cottidae was the most diverse fish group encountered with 24 species identified (Table 5). Sculpins were broadly distributed throughout the survey area and were encountered at most sampling sites (Fig. 7). This group accounted for approximately 2% (282,000 t) of the total estimated fish biomass. Members of the genus Myoxocephalus accounted for most (62%) of the sculpin biomass.

Other fishes

Sixteen additional families were encountered in the survey area (Table 5). Together these families accounted for 272,000 t or 2% of the entire estimated fish biomass (Table 6). The dominant families included the Clupeids (herring), Zoarcids (eelpouts), Osmerids (smelts), and Agonids (poachers) (Figs. 8-11).

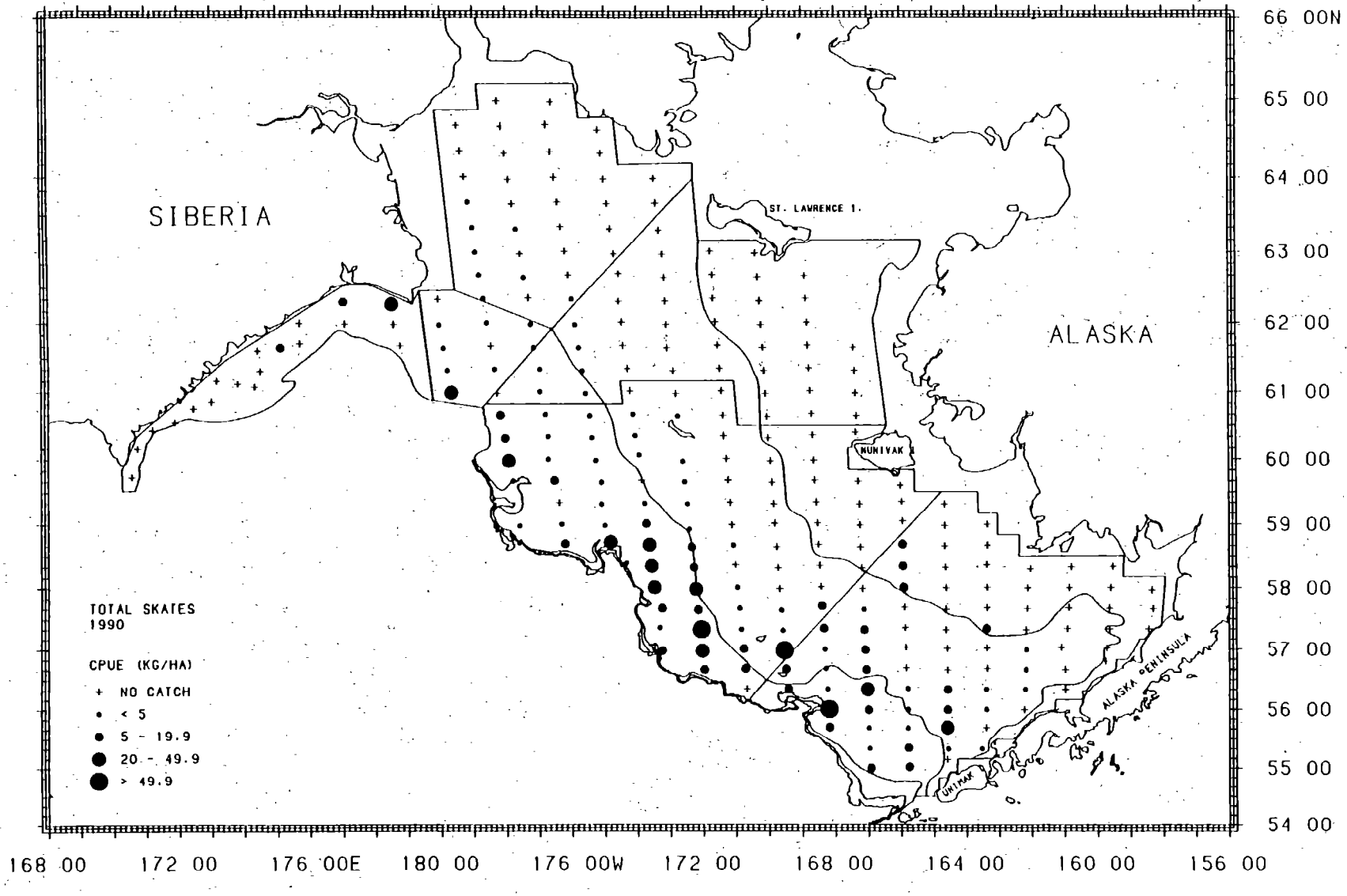


Figure. 6.--Distribution and relative. abundance in kg/ha of total skates sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

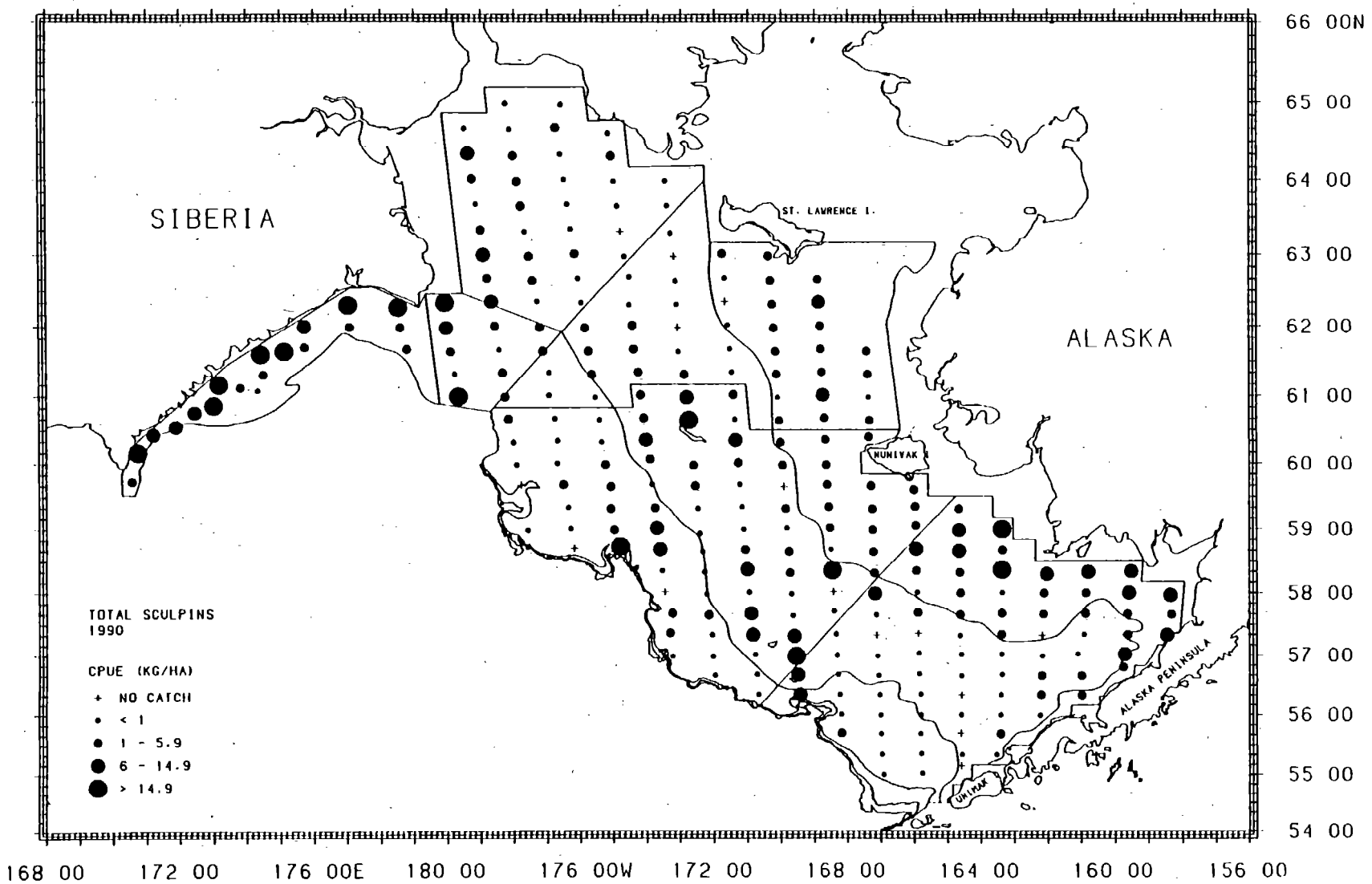
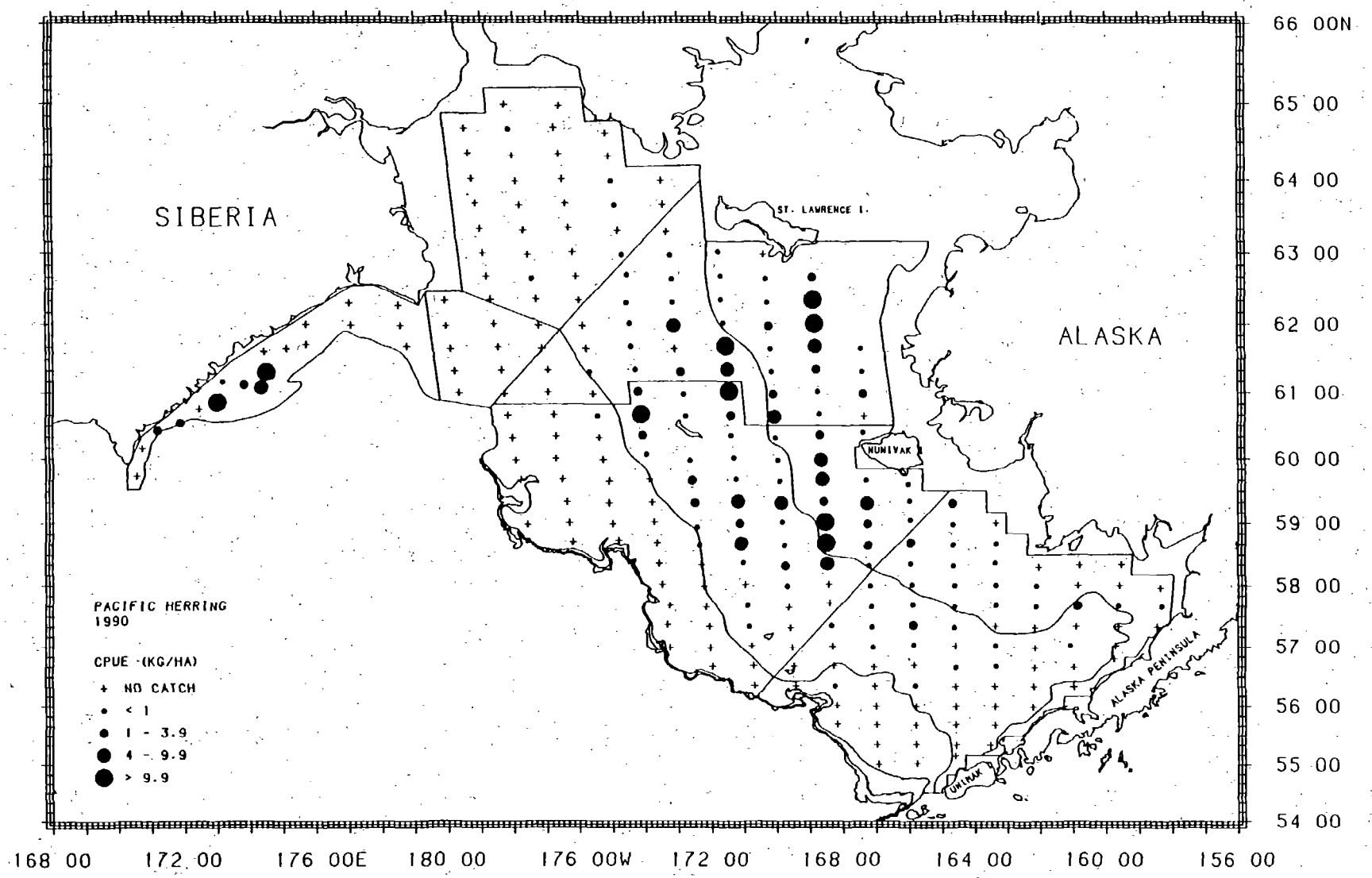


Figure 7. --Distribution and relative abundance in kg/ha of total sculpins sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.



'Figure 8.--Distribution and relative abundance in kg/ha of Pacific herring. sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

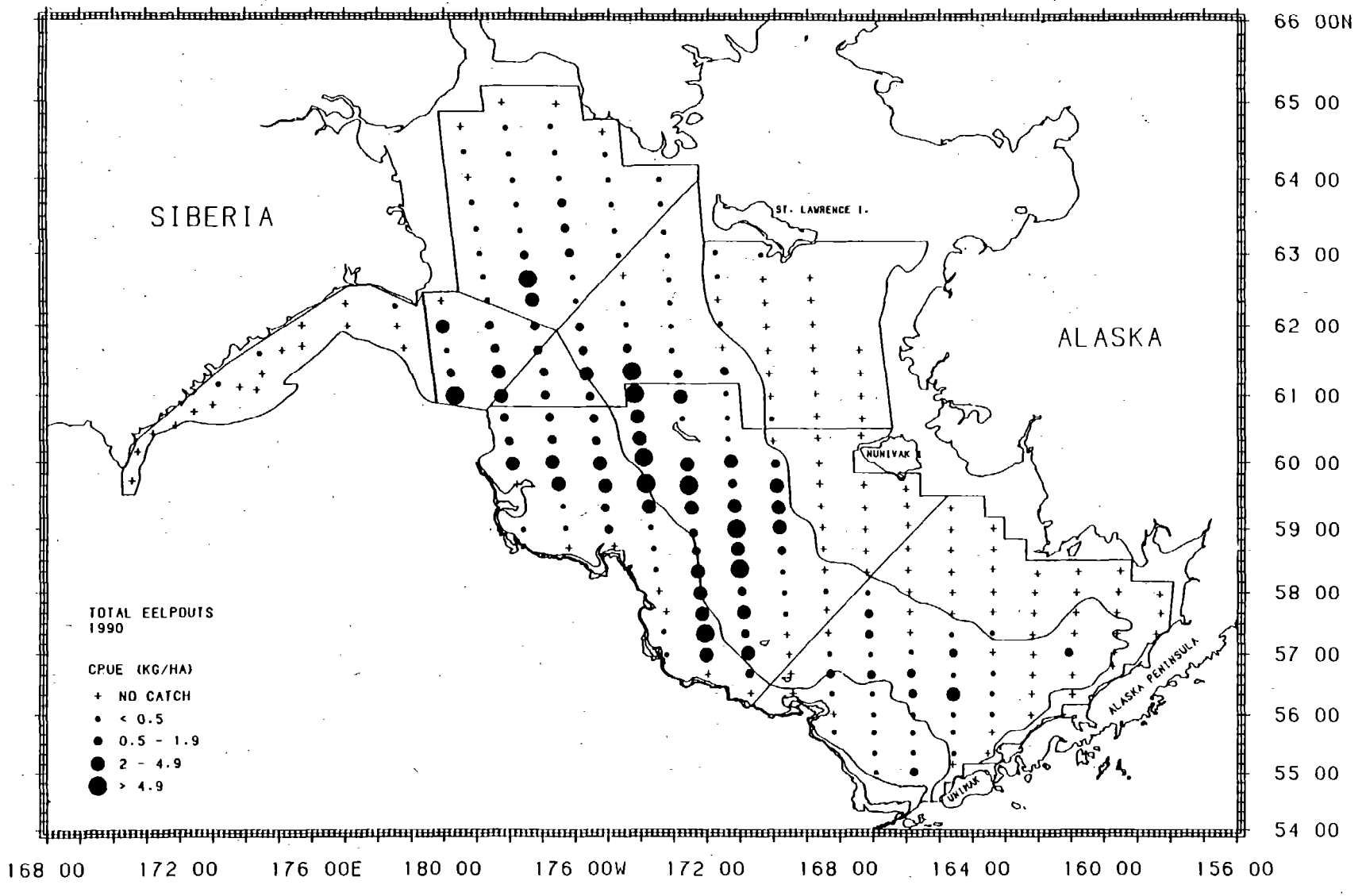


Figure 9. --Distribution and relative abundance in kg/ha-of total eelpouts sampled during the 1990 cooperative U.S. 'Russian bottom trawl survey of the Bering Sea shelf.

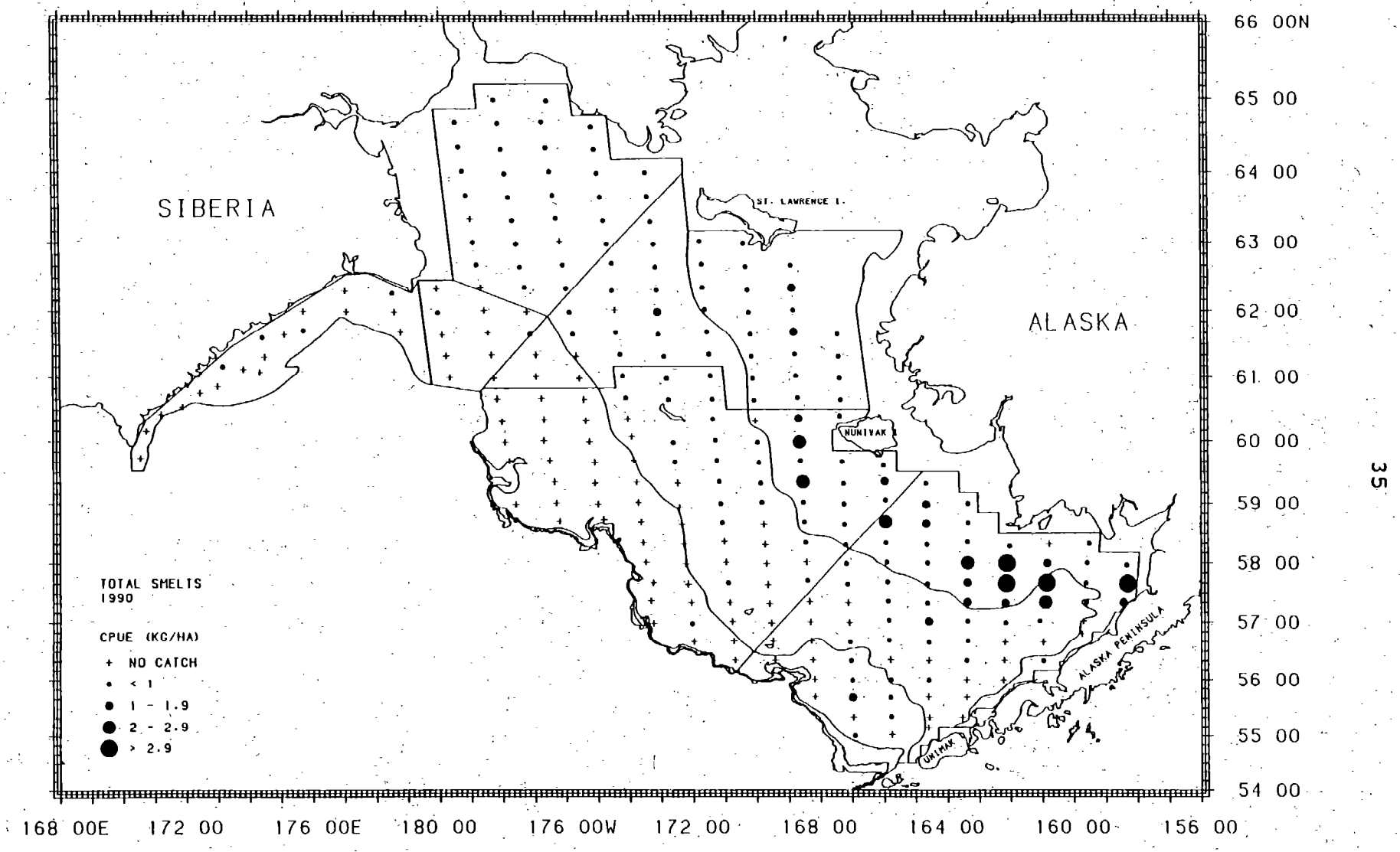


Figure 10.--Distribution and relative abundance in kg/ha of total smelts sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

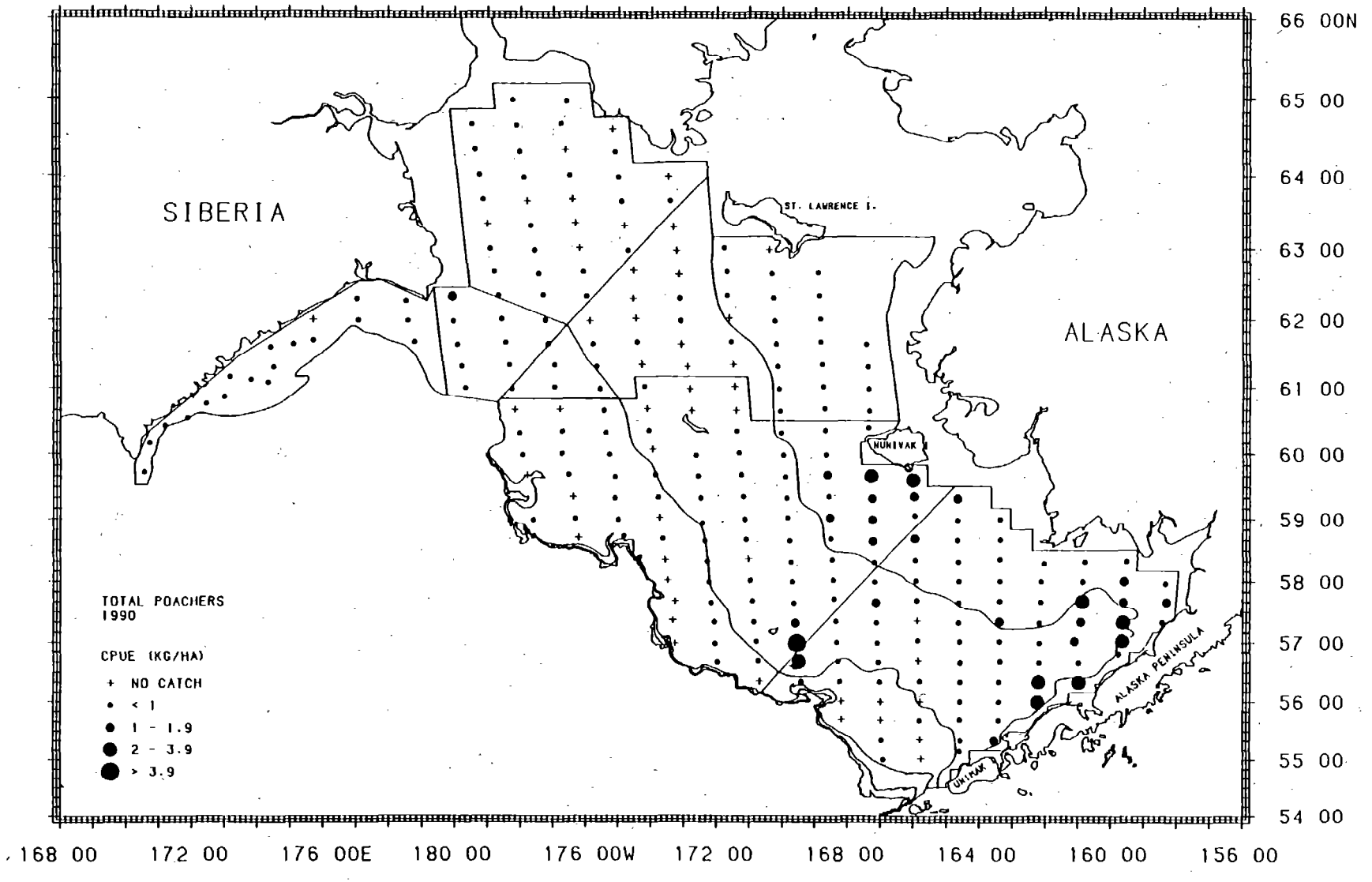


Figure 11. --Distribution and relative abundance in kg/ha of total poachers sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Abundance, Distribution, and Size Composition of Principal Fish Species

Walleye pollock

Distribution and abundance--Walleye pollock was the most abundant fish species encountered occurring at 269 (98%) of the stations sampled (Fig. 12). Walleye pollock comprised 25% of the total combined biomass estimate of fish and invertebrates and 36% of the total. fish biomass (Table 6). The overall mean catch rate was nearly 55.0 kg/ha trawled (Table 8). Concentrations were greatest in the 100-200 m depth zone in subareas 6 and 9 with mean CPUE values of 223.9 kg/ha and 268.3 kg/ha, respectively. Pollock were also encountered in relatively high abundance in western shelf subarea 16 at 110.4 kg/ha trawled. Catch rates were lowest in north shelf subareas 7 and 8, averaging 3.3 kg/ha and 0.9 kg/ha, respectively. Although juvenile walleye pollock (< 20 cm fork length) were encountered throughout the survey, they were most abundant in subarea 6 at water temperatures about 0° C with catches exceeding 100 kg/ha trawled (Fig,. 13).

The total biomass of walleye pollock was estimated at 4,162,000 t with population numbers exceeding 12.6 billion fish (Table 8). Approximately 3,153,000 t or 76% of the total biomass was located in the standard U.S. shelf region. Nearly 51% of the overall biomass was located in subarea 6. The north shelf area accounted for 340,000 t (8%) of the remaining biomass with the western shelf containing 669,000 t (16%).

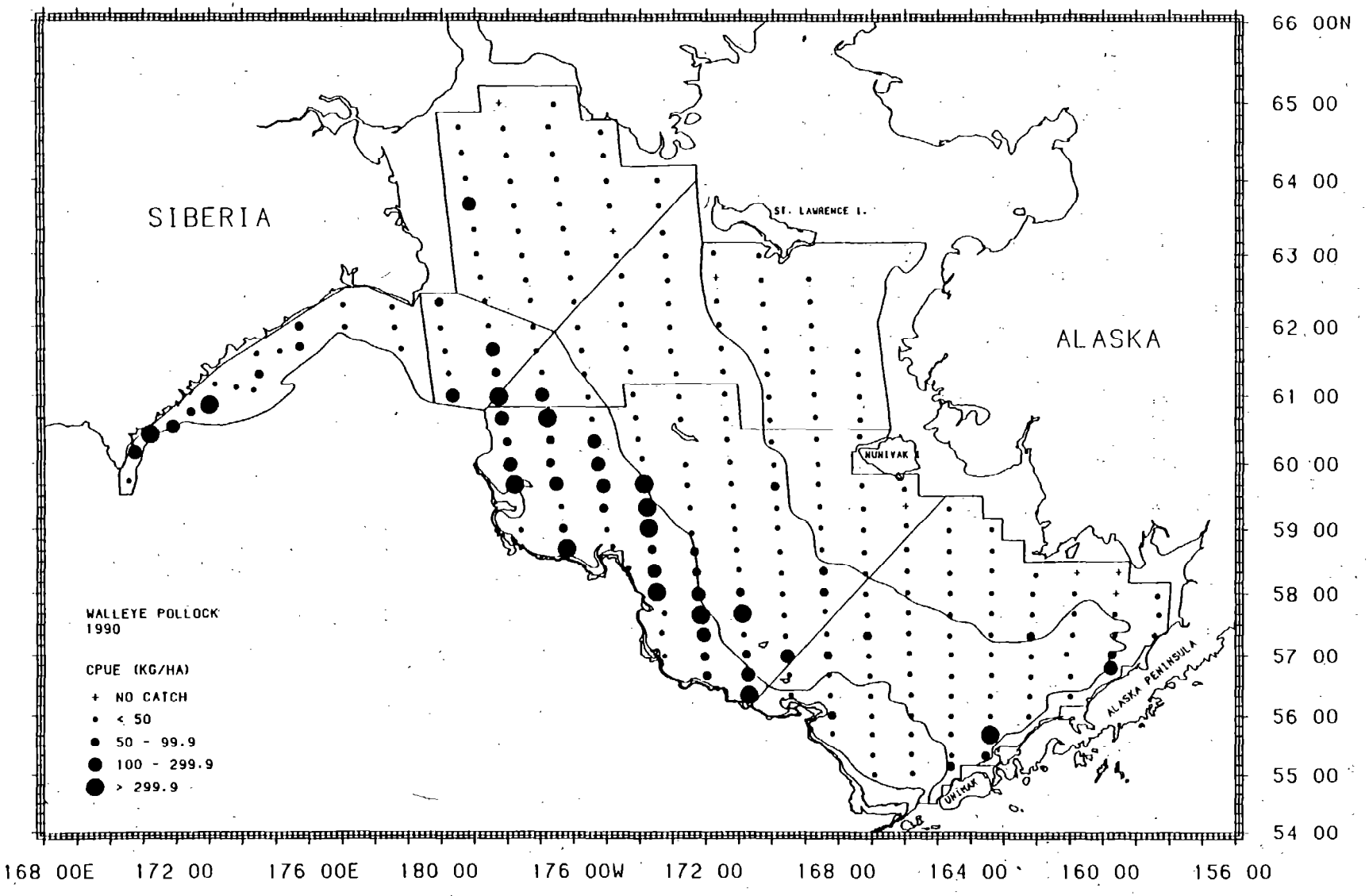


Figure 12.--Distribution and relative abundance in kg/ha of walleye pollock sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 8.--Abundance estimates and mean size of, walleye pollock by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey in the Bering Sea shelf.[a]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
U.S. standard shelf								
1	< 50	15.57	121,223	0.029	257,264,495	0.020	0.471	25.2
2	< 50	12.84	52,661	0.013	427,970,954	0.034	0.123	12.9
3	50 - 100	45.30	468,900	0.113	908,058,590	0.072	0.516	30.7
4	50 - 100	31.25	336,263	0.081	2,117,600,756	0.167	0.159	18.2
5	100 - 200	14.67	56,906	0.014	168,816,073	0.013	0.337	25.6
6	100 - 200	223.91	2,117,351	0.509	5,744,973,845	0.454	0.369	30.8
Subareas combined		68.05	3,153,303	0.758	9,624,684,713	0.761	0.328	27.0
North shelf								
7	< 50	3.33	24,270	0.006	228,963,698	0.018	0.106	12.1
8	50 - 100	0.91	5,106	0.001	537,427,861	0.042	0.010	8.6
9	100 - 200	268.30	310,367	0.075	462,741,394	0.037	0.671	44.2
Subareas combined		24.20	339,743	0.082	1,229,132,953	0.097	0.276	22.7
Western shelf								
14	< 100	10.03	87,836	0.021	276,685,514	0.022	0.317	24.9
15	100 - 200	49.11	125,943	0.033	693,607,192	0.051	0.182	28.5
16	< 200	110.41	445,613	0.107	823,859,705	0.065	0.541	41.6
Subareas combined		42.93	659,392	0.161	1,794,152,411	0.142	0.328	33.9
All areas combined		54.82	4,152,438	1.000	12,647,970,076	1.000	0.328	27.6

[a]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

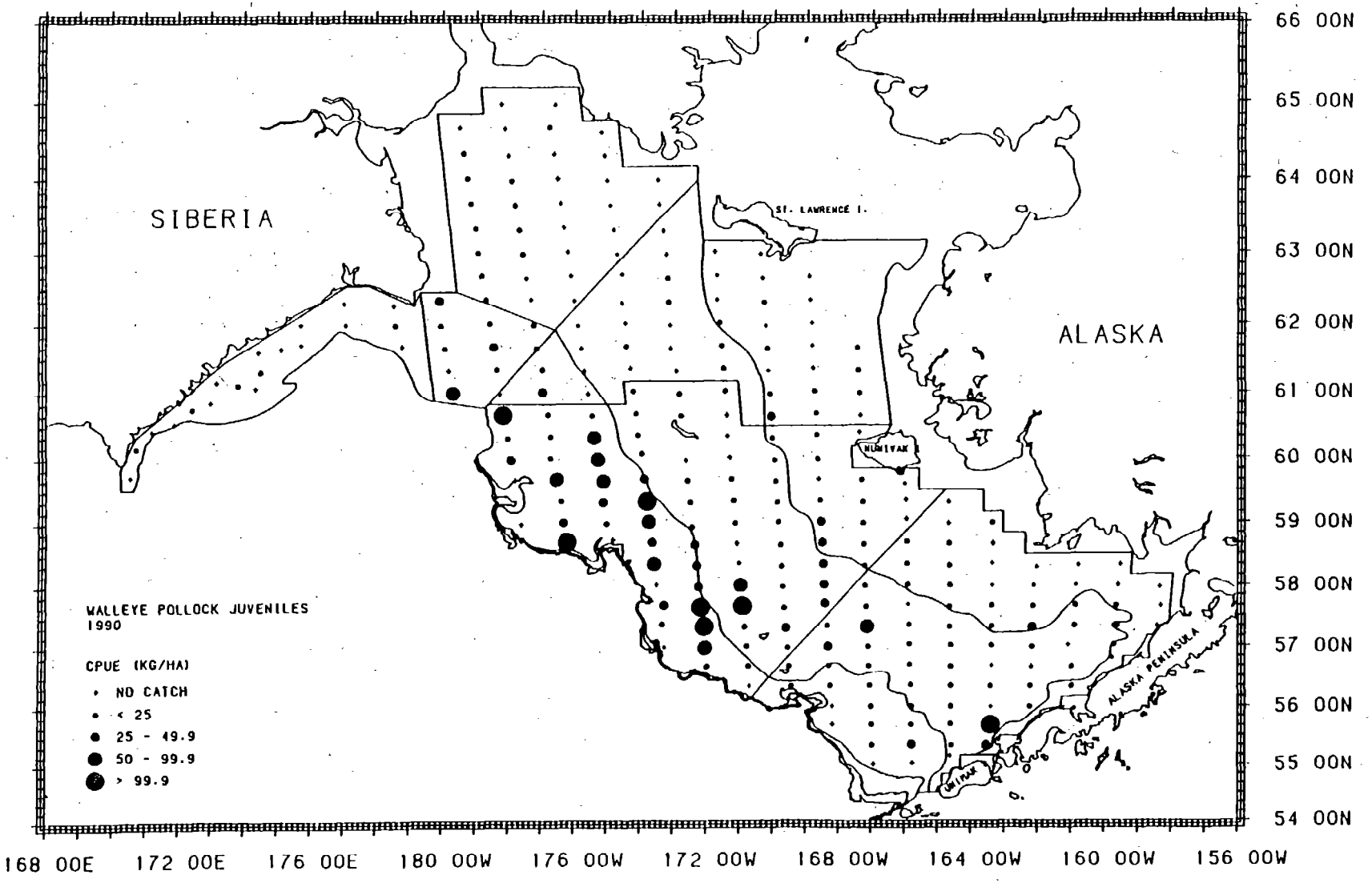


Figure 13. --Distribution and relative abundance in kg/ha of juvenile walleye pollock (<20 cm) sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Size composition--Walleye pollock measured during the survey ranged in size from 6 cm to 85 cm in length. The mean length of waileye pollock for the total survey area was 27.6 cm (Fig. 14). The standard U.S. area was characterized by a bimodal length distribution with a high proportion (51%) of young fish in the 9 cm to 15 cm size range. Most of the remaining population sampled in the standard U.S. shelf were composed of adults ranging from 40 cm to 55 cm in length. The portion of the population in the north shelf area was primarily composed of juveniles with an overall mean-size of 22.7 cm. Nearly 50% of the pollock sampled in the north shelf area were less than 10 cm in length. The overall mean size in the western shelf area was 33.9 cm with no pronounced modes. Relatively few juveniles were encountered in the combined western shelf subareas where approximately 70% of the fish measured were over 20 cm in length. Juvenile walleye pollock were abundant in subareas 2, 4, 7, and 8 accounting for over 80% of the estimated population in those areas (Fig. 15). Few juveniles were encountered in subareas 9 and 16 where they represented less than 6% of the estimated population.

Age composition--The mean age for pollock sampled in the standard U.S. shelf was 3.7 years compared to 4.5 years in the western shelf. Over 50% of the pollock population numbers in the standard U.S. shelf were comprised of fish aged 0-1 (Fig. 16). A high proportion (nearly 30%) of the fish in the western shelf

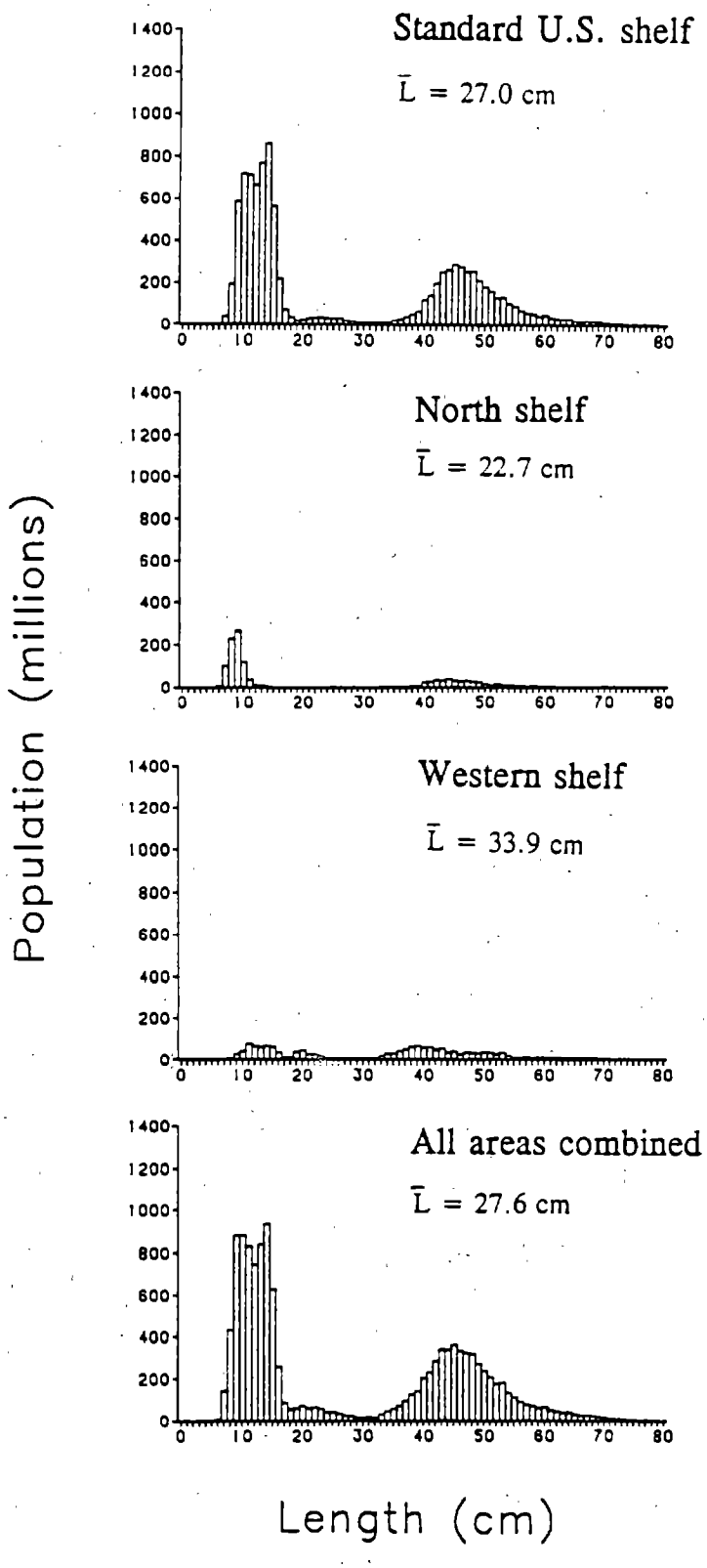


Figure 14.--Estimated size composition of walleye pollock by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

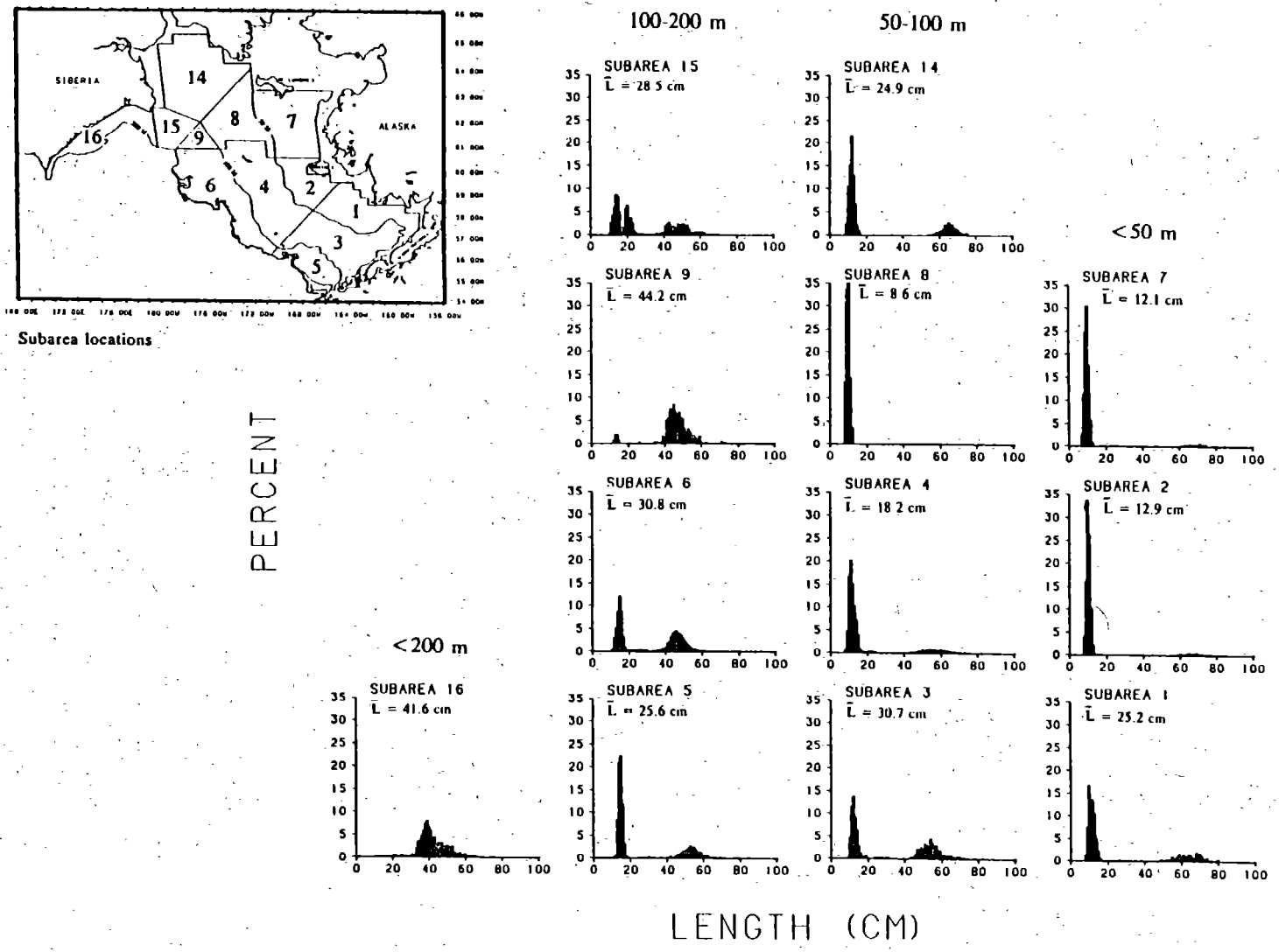


Figure 15.--Estimated relative size composition of walleye pollock (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

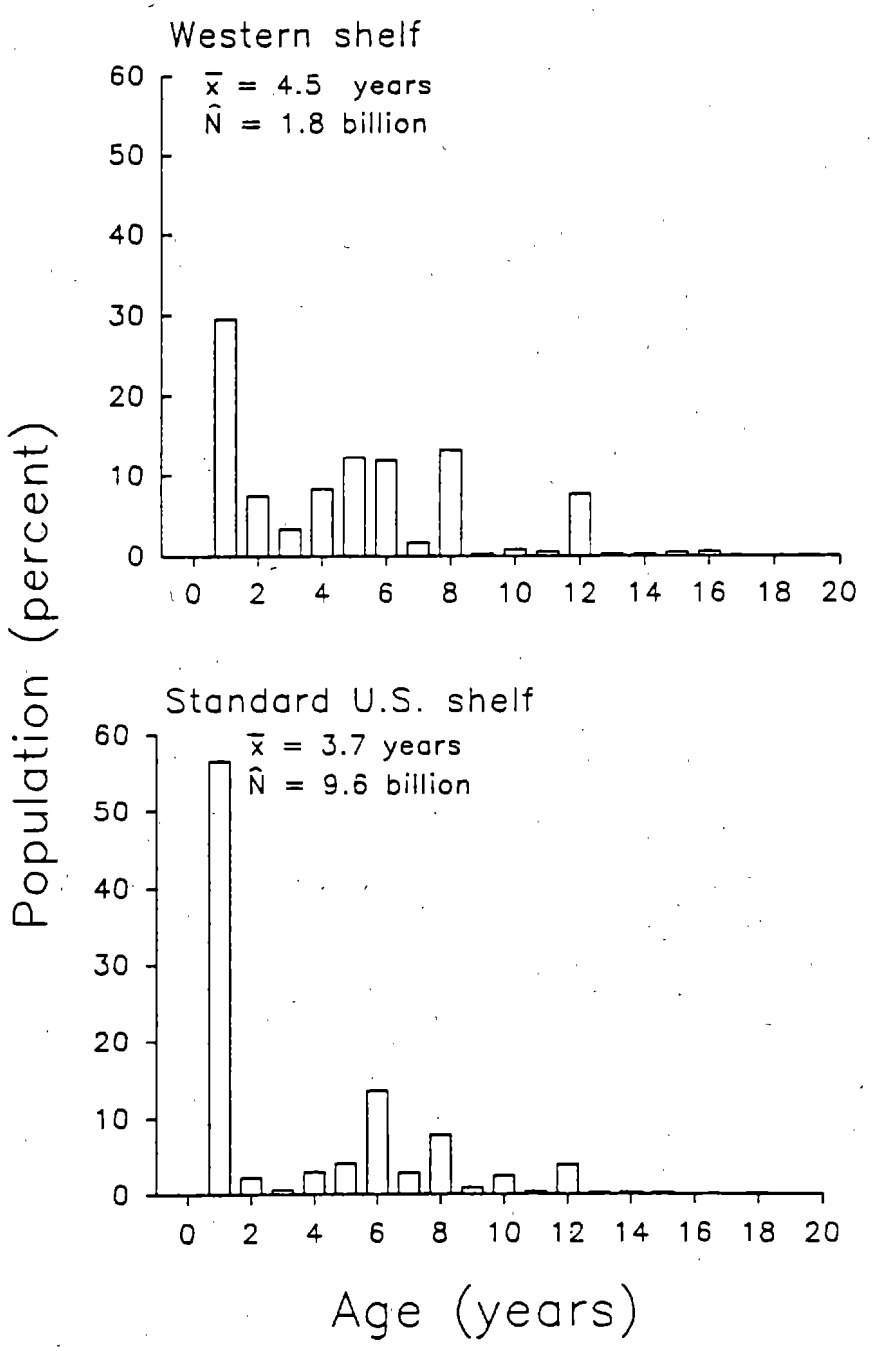


Figure 16.--Relative age composition of walleye pollock in the western shelf and standard U.S. shelf areas during the 1990 cooperative bottom trawl survey. Age-length keys were constructed from data collected by the Novokotovsk in the western shelf and AFSC age data collected in the standard U.S. shelf. These keys were applied to Novokotovsk length data from the respective areas.

area were also age 1 or less. Fish ages 6, 8, and 12 corresponding to the 1984, 1982, and 1978 year classes, respectively, were prominent on the standard U.S. shelf. These three year classes comprised 62% of the biomass of walleye pollock in this area (Fig. 17). These age classes were also prominant in the western shelf region in terms of biomass although fish 4 and 5. years old were also relatively abundant.

Growth--Von Bertalanffy growth curves fitted to age data for walleye pollock from the western shelf area indicated similar growth between sexes. Growth completion rates (K) were nearly equal although the asymptotic length was slightly higher for females (Fig. 18 and Table 9). Growth rates were similar between pollock. from the western shelf and the standard U.S. shelf.

Table 9. --Parameters of the von Bertalanffy growth curves for walleye pollock by sex from data collected in the western shelf area during the 1990 cooperative U.S.-Russian bottom trawl survey and from data collected during the independent 1990 AFSC bottom trawl survey of the standard U.S. shelf.

Sex	Number of age readings	Age range	Length range (cm)	Parameters L_∞	K	t_o
Western shelf						
Male	221	1-20	20-74	67.7	0.16	-0.47
Female	296	1-26	20-77	69.9	0.17	-0.20
Standard U.S. shelf						
Male	573	1-18	15-78	70.0	0.14	-1.04
Female	623	1-22	16-79	74.9	0.14	-0.86

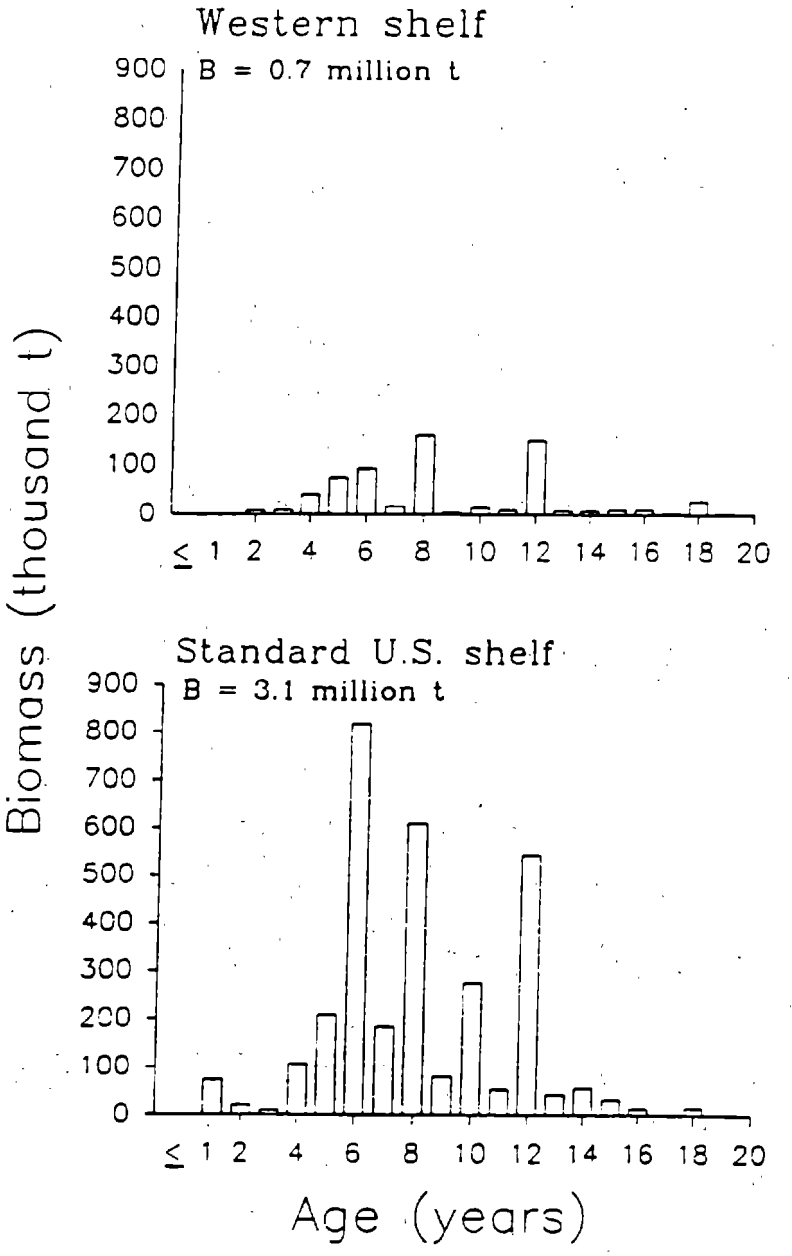


Figure 17.--Biomass estimates (metric tons) by age for walleye pollock as shown by age data collected from the western shelf area aboard the R/V Novokotovsk and AFSC age data from the standard U.S. shelf area.

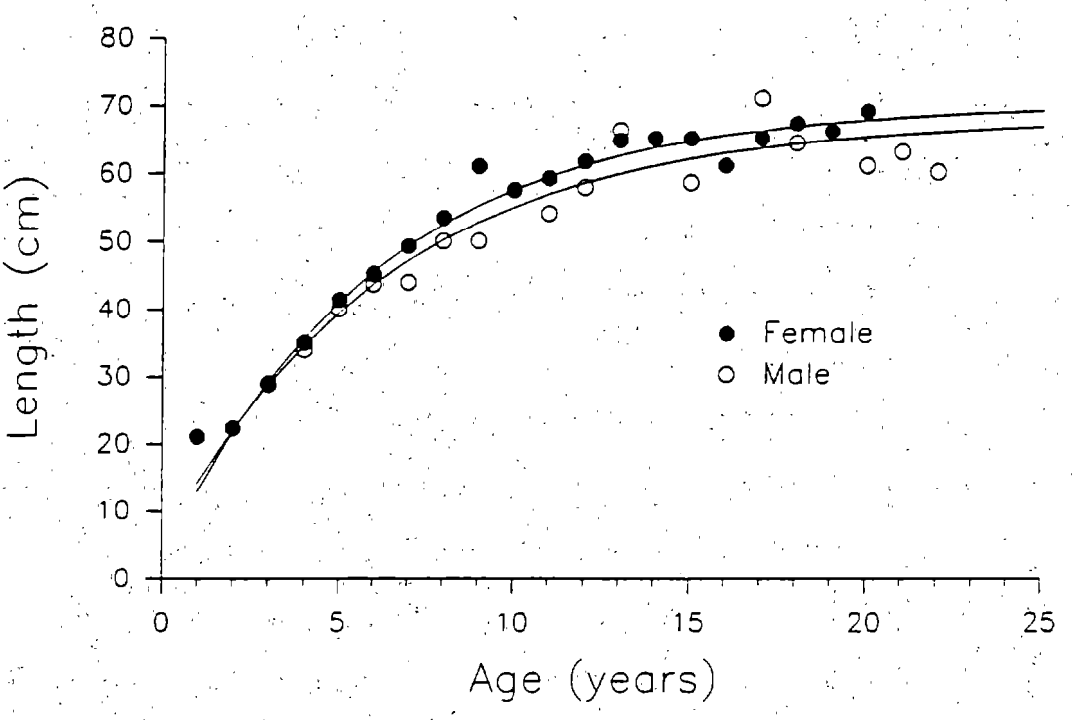


Figure 18. --Von Bertalanffy growth curves for male and female walleye pollock, in the western shelf area as shown by age data collected aboard the R/V Novokotovsk during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Pacific cod

Distribution and abundance--Pacific cod were recorded at 223 stations. Largest catches (>49.9 kg/ha trawled) primarily occurred at water depths greater than 50 m as shown in Figure 19. The overall mean catch rate was nearly 13.3 kg/ha trawled (Table 10). Greatest densities of Pacific cod were encountered in the western shelf area (20.7 kg/ha) followed by the standard U.S. shelf (14.2 kg/ha). Pacific cod were least abundant in the north shelf area with catch rates averaging 2.1 kg/ha.

The total Pacific cod biomass was estimated at l,000,000 t with 65% of the biomass located in the standard U.S. area and 32% in the western shelf. The north shelf area accounted for only about 3% of the total biomass. Approximately 515,000 (51%) of the total estimated biomass was located in subareas 3, 4, and 6 combined. The total population of Pacific cod was estimated at 655.7 billion fish.

Size composition --The mean size of Pacific cod sampled in the entire survey area was 43.7 cm (Fig. 20). A much higher percentage (23%) of young fish less than 20 cm were found in the standard U.S. shelf compared to the western Bering Sea (5%). Pacific cod averaged 44.5 cm in length in the north shelf area. The length composition of Pacific cod by depth zone and subarea are summarized in Figure 21. The mean size increased with increasing depth. In the standard U.S. shelf area, mean size increased from 35.2 cm at depths less than 50 m (subareas 1 and 2) to 40.5 cm between 50 and 100 m (subareas 3 and 4) and 56.1 cm at depths greater than 100 m (subareas 5 and 6).

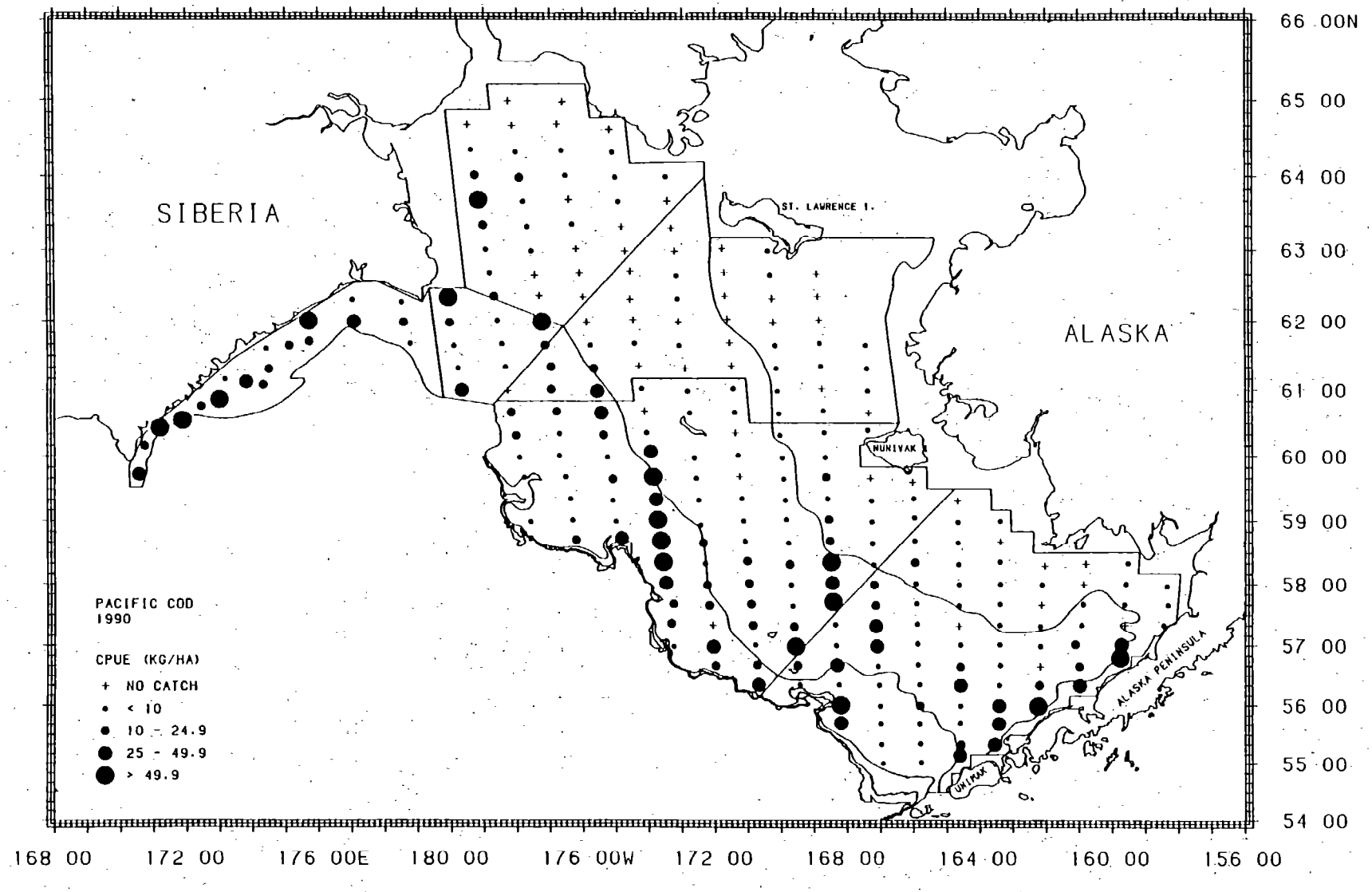


Figure 19.--Distribution and relative abundance in kg/ha of Pacific cod sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 10.--Abundance estimates and mean size of Pacific cod by subarea from the 1990 cooperative U.S.-U.S.S.R. bottom trawl survey of the Bering Sea shelf.[ab]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
Standard U.S. shelf								
1	< 50	8.09	62,959	0.063	48,879,959	0.075	1.288	36.5
2	< 50	6.32	25,947	0.026	31,445,275	0.048	0.825	33.1
3	50 - 100	16.61	171,928	0.171	116,954,242	0.178	1.470	40.1
4	50 - 100	10.14	109,084	0.109	88,346,090	0.247	1.235	41.1
5	100 - 200	13.24	51,378	0.051	13,965,970	0.021	3.679	63.1
6	100 - 200	24.87	235,153	0.234	84,564,584	0.129	2.781	54.9
Subareas combined		14.17	656,450	0.654	384,156,121	0.698	1.709	43.4
North shelf								
7	< 50	0.42	3,071	0.003	6,828,117	0.010	0.450	-
8	50 - 100	0.64	3,579	0.004	2,968,116	0.005	1.206	43.2
9	100 - 200	19.43	22,477	0.022	12,179,321	0.019	1.846	44.8
Subareas combined		2.07	29,127	0.029	21,975,554	0.034	1.325	44.5
Western shelf								
14	< 100	5.69	49,840	0.050	32,889,420	0.050	1.515	43.1
15	100 - 200	32.76	84,019	0.084	32,163,215	0.049	2.612	54.1
16	< 200	45.69	184,386	0.184	111,090,835	0.169	1.660	42.0
Subareas combined		20.72	318,245	0.317	176,143,470	0.269	1.807	44.4
All areas combined		13.25	1,003,821	1.000	655,658,142	1.000	1.531	43.8

[a] - indicates no sample or insufficient data

[b] - Differences in totals and sums of biomass and population numb&s by subarea are due to rounding.

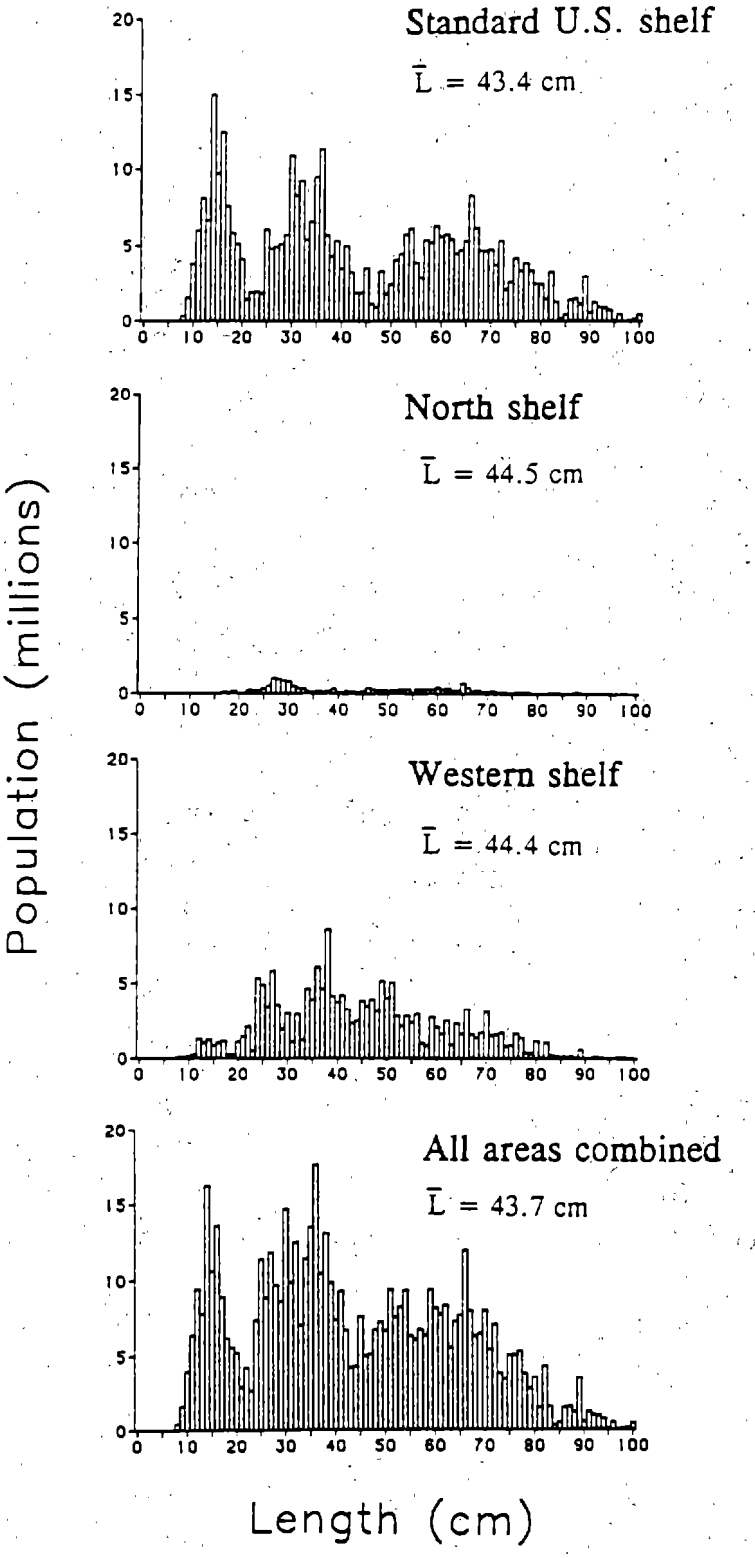


Figure 20. --Estimated size composition of Pacific cod by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

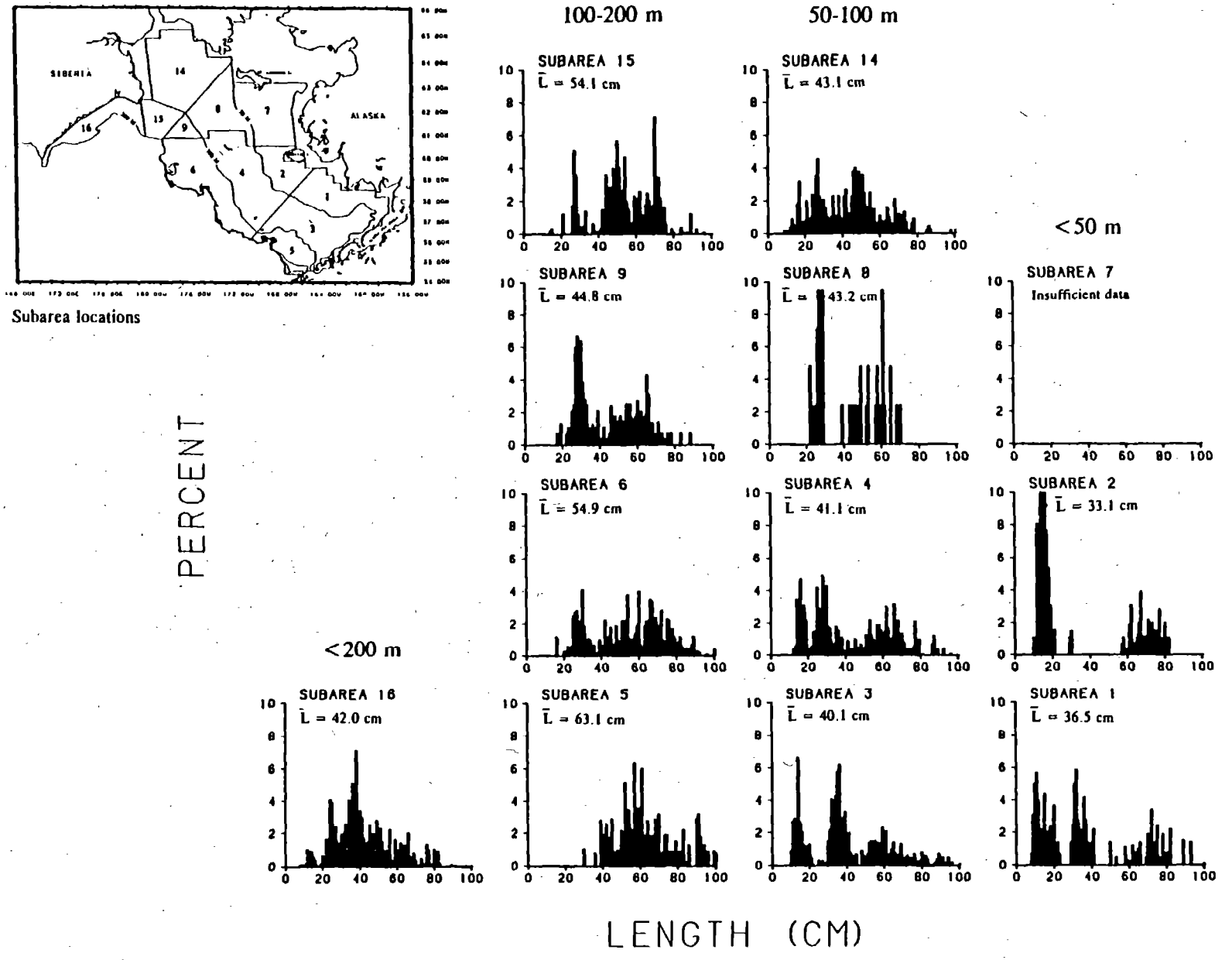


Figure 21.--Estimated relative size composition of Pacific cod (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Yellowfin sole

Distribution and abundance--Yellowfin sole were the second most abundant fish species caught during the survey and were encountered at 158 stations (Fig. 22). The major portion of the sampled population was located in the inner shelf waters of the standard U.S. shelf area. Relatively few yellowfin sole were taken in the north shelf and western area. The overall mean catch rate for this species was 33.5 kg/ha trawled (Table 11). Mean CPUE values varied considerably between the standard U.S. shelf (52.4 kg/ha), north shelf (7.68 kg/ha), and the western shelf area (0.13 kg/ha). Greatest concentrations were observed at depths less than 50 m in subarea 1 (147.9 kg/ha) and subarea 2 (114.7 kg/ha).

The yellowfin sole biomass for the entire survey area was estimated at 2,539,000 t. Nearly 96% of, this total estimated biomass or 2,429,000 t was located-in the standard U.S. shelf with 45% in subarea 1 alone. Approximately 4% of the biomass was located in the north shelf area with less than 1% of the biomass in the western area. The total population of yellowfin sole in the survey area was estimated, at l0.6 billion fish.

Size composition--Yellowfin sole measured during the survey had an overall mean length of 25.8 cm (Fig. 23). Yellowfin sole were largest in the western shelf area averaging 32.1 cm in length and smallest in the north shelf area with a mean size of 23.3 cm. Yellowfin sole averaged 25.9 cm in the standard U.S. shelf where most of the population occurred. Mean size increased

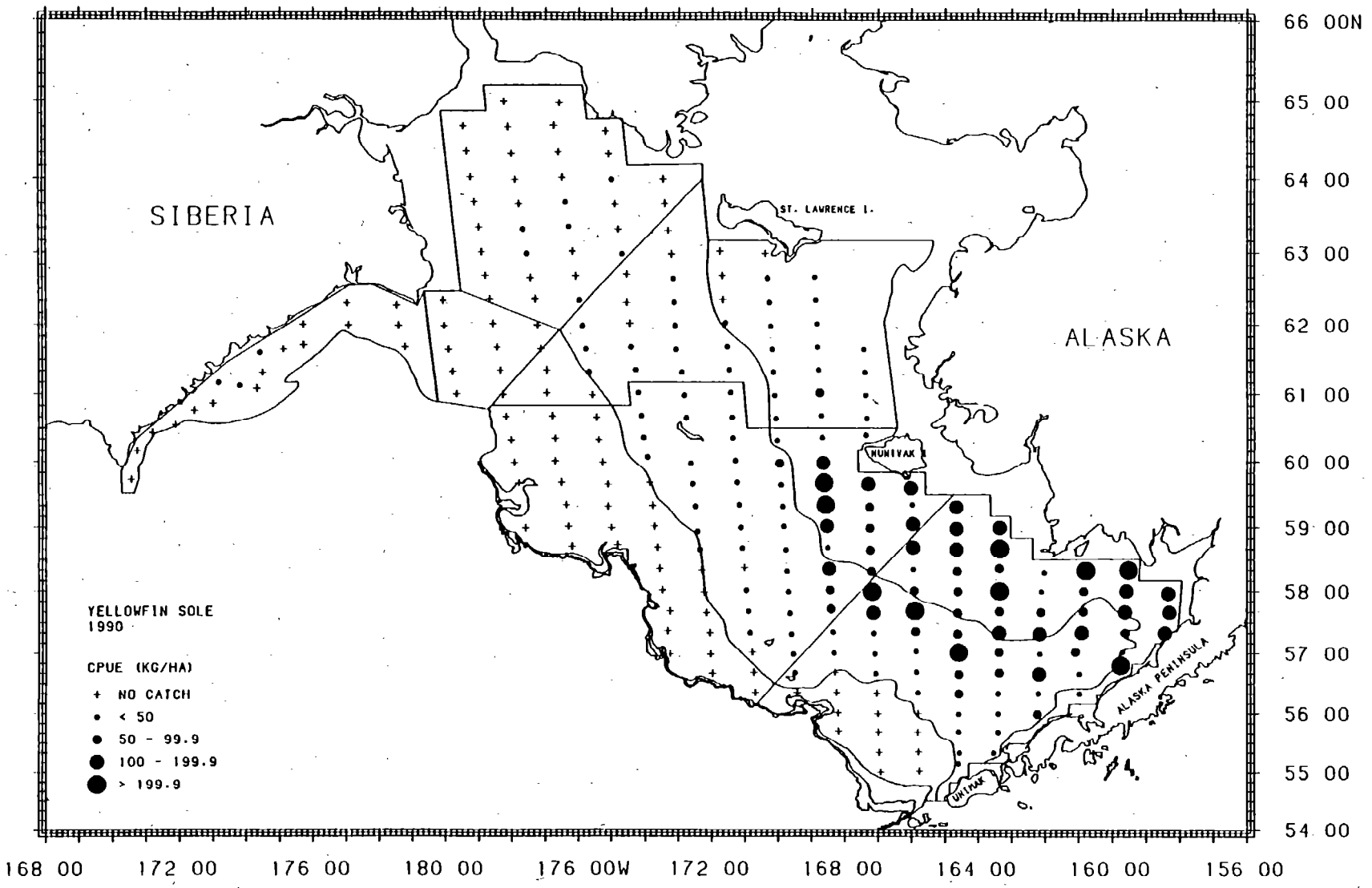


Figure 22.--Distribution and relative abundance in kg/ha of yellowfin sole sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 11.--Abundance estimates-and mean size of yellowfin sole by subarea from the l990 U.S.-Russian cooperative bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
Standard U.S. shelf								
1	< 50	147.94	1,152,002	0.454	5,078,690,402	0.478	0.227	25.4
2	< 50	114.70	470,576	0.185	2,298,018,285	0.216	0.205	24.0
3	50 - 100	62.04	642,252	0.253	2,177,661,186	0.205	0.295	28.8
4	50 - 100	15.25	164,104	0.065	549,014,387	0.052	0.299	28.0
5	100 - 200	0.00	0	0.000	0	0.000	-	-
6	100 - 200	0.02	144	<0.001	375,564	<0.001	0.383	-
Subareas combined		52.42	2,429,097	0.957	10,103,759,823	0.950	0.240	25.9
North shelf								
7	< 50	14.73	107,290	0.042	518,828,663	0.049	0.207	23.3
8	50 - 100	0.10	574	<0.001	2,722,029	<0.001	0.211	-
9	100 - 200	0.00	0	0.000	0	0.000	-	-
Subareas combined		7.68	107,864	0.042	521,550,692	0.049	0.207	23.3
Western shelf								
14	< 100	0.01	93	<0.001	375,671	<0.001	0.248	-
15	100 - 200	0.00	0	0.000	0	0.000	-	-
16	< 200	0.48	1,954	0.001	4,634,988	<0.001	0.422	32.1
Subareas combined		0.13	2,047	0.001	5,010,659	<0.001	0.409	32.1
All areas combined		33.52	2,539,008	1.000	10,630,321,175	1.000	0.239	25.8

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differencee in totals and sums of biomass and population numbers by subarea are due to rounding.

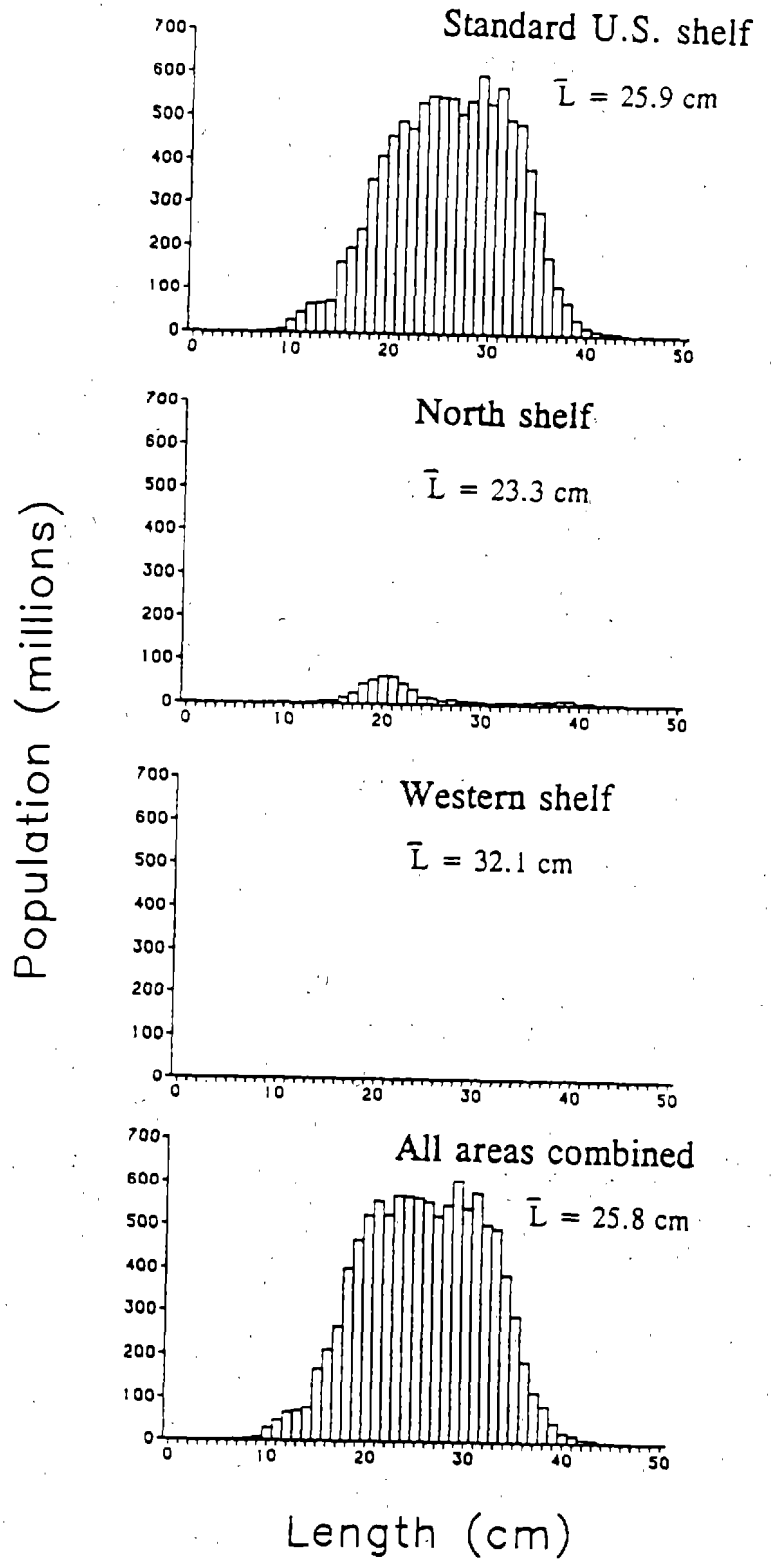


Figure 23 .--Estimated size composition of yellowfin sole by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

with increasing depth, ranging from 23.3 cm to 25.4 cm at depths less than 50 m (subareas 1, 2, and 7) to over 28.0 cm at depths of 50-100 m in subareas 3 and 4 (Fig. 24). Juveniles less than 20 cm were most abundant in subareas less than 50 m in the standard U.S. shelf while few juveniles were encountered in the western shelf.

Rock sole

Distribution and abundance--Rock sole were widely distributed throughout the survey area but were most highly. concentrated in the shallow portion of the standard U.S. shelf in Bristol Bay and around the Pribilof Islands (Fig. 25). The overall mean CPUE value was 17.5 kg/ha trawled (Table 12). Highest catch rates were observed in the standard U.S. shelf at 28.4 kg/ha with much lower catch rates occurring in the-north shelf area (0.2 kg/ha) and the western area (1.3 kg/h&). Major. concentrations were observed in the standard U.S. shelf at depths less than 100 m with CPUE values ranging from 59.8 kg/ha in subarea 1 to 22.5 kg in subarea 2. Rock sole abundance decreased sharply at depths over 100 m.

The biomass of rock sole for the entire survey area was estimated at 1,327,OOO t (Table 12). Nearly 98% of the estimated. biomass was located in the standard U.S. shelf, primarily in the combined subareas of 1, 3, and 4. The total rock sole population in the survey area was estimated at 6.8 billion fish.

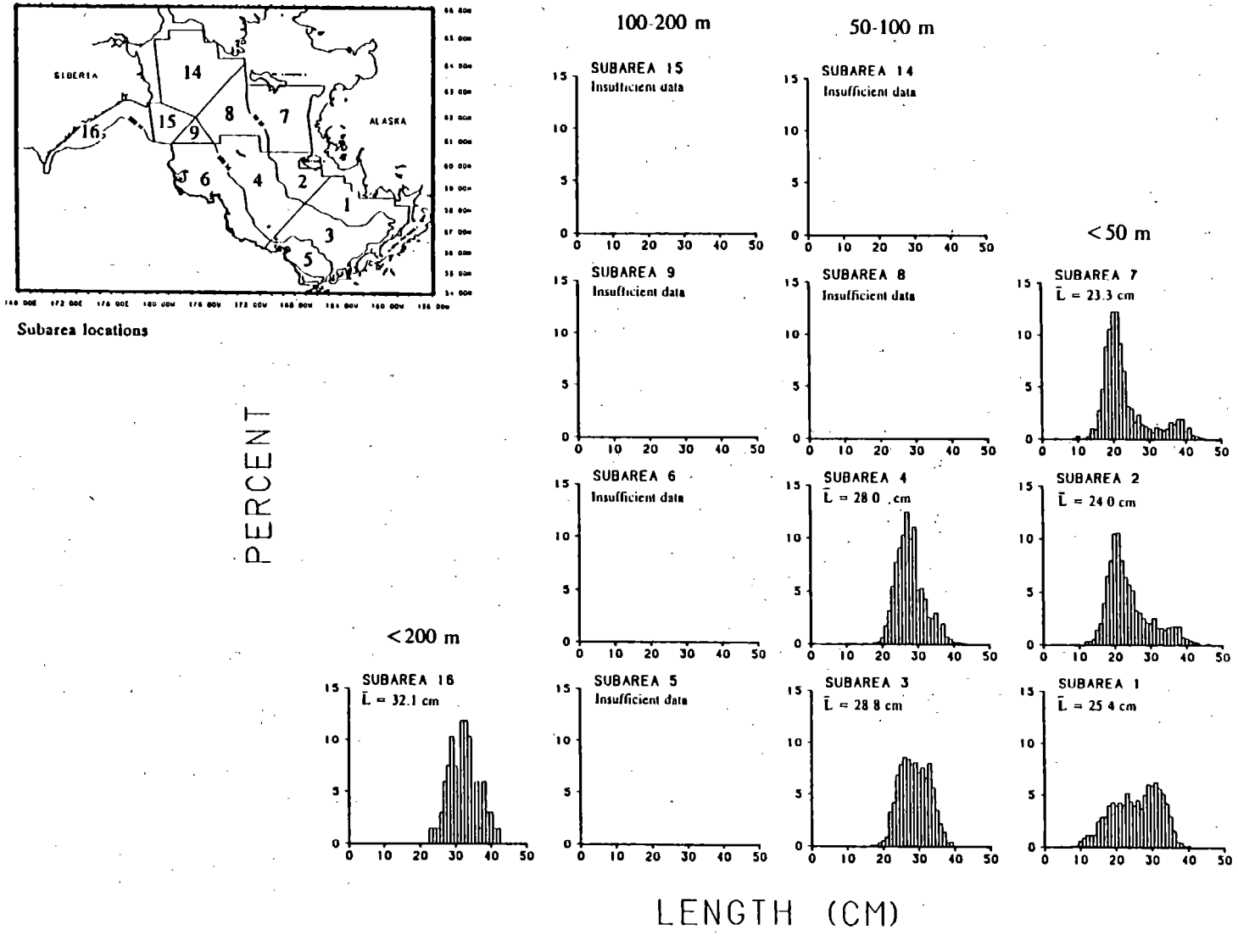


Figure 24.--Estimated relative size composition of yellowfin sole (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

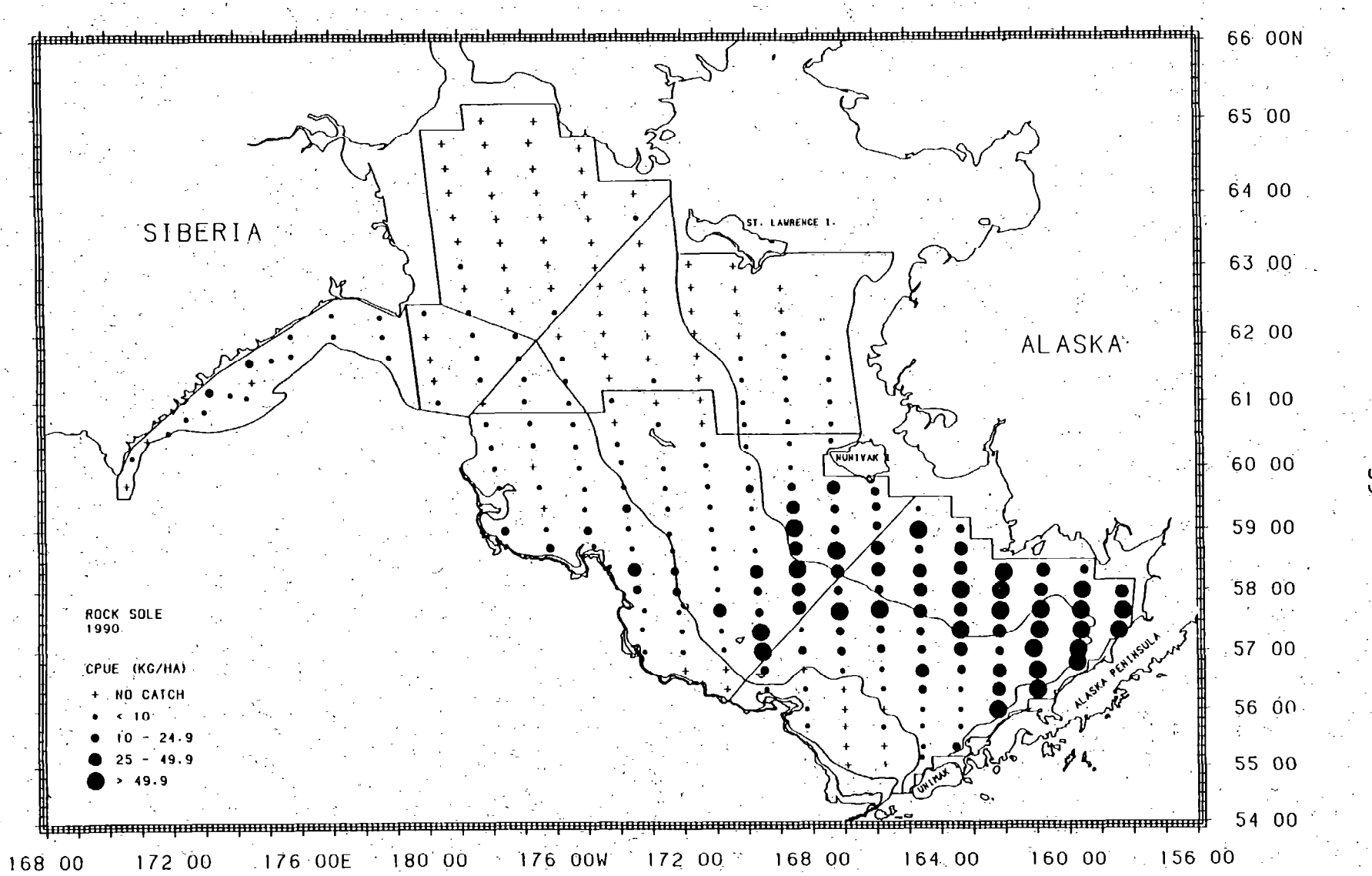


Figure 25.--Distribution and relative abundance in kg/ha of rock sole sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the B&ring Sea shelf.

Table 12.--Abundance estimates and mean size of rock sole by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
Standard U.S. shelf								
1	< 50	59.77	465,448	0.351	3,362,061,975	0.492	0.138	20.5
2	< 50	22.52	92,400	0.070	675,184,771	0.099	0.137	18.5
3	50 - 100	27.15	281,050	0.212	1,531,869,480	0.224	0.183	23.9
4	50 - 100	37.33	401,740	0.303	970,449,138	0.142	0.414	31.3
5	100 - 200	0.47	1,834	0.001	2,423,319	<0.001	0.757	-
6	100 - 200	6.51	61,592	0.046	125,613,743	0.018	0.490	32.8
Subareas combined		28.14	1,304,064	0.983	6,667,602,156	0.975	0.196	22.9
North shelf								
7	< 50	0.36	2,656	0.002	100,136,361	0.015	0.027	-
8	50 - 100	0.04	232	<0.001	865,296	<0.001	0.268	-
9	100 - 200	0.42	488	<0.001	1,326,928	<0.001	0.368	-
Subareas combined		0.24	3,377	0.003	102,328,585	0.015	0.033	-
Western shelf								
14	< 100	0.04	309	<0.001	767,073	<0.001	0.403	-
15	100 - 200	0.91	2,333	0.002	6,372,482	0.001	0.366	-
16	< 200	4.20	16,934	0.013	59,356,139	0.009	0.285	22.5
Subareas combined		1.27	19,576	0.015	66,495,694	0.010	0.294	22.5
All areas combined		17.52	1,327,016	1.000	6,836,426,436	1.000	0.194	22.7

[a] - indicates no sample or insufficient data.
[b] Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

Size composition--Rock sole ranged in size from 6 cm to 50 cm in length. The mean size of rock sole over all areas was 22.7 cm (Fig. 26). Two moderate length modes were observed in the standard U.S. shelf at approximately l4 cm and 29 cm. The largest percentages of juveniles were observed at depths less than 50 min the standard U.S. shelf (subarea 1 and 2) (Fig. 27).

Hippoglossoides spp.

Distribution and abundance--Two species of Hippoglossoides were broadly distributed throughout the survey area occurring at 79% of the stations sampled (Fig. 28). Flathead sole (H. elassodon) was predominant in the catches from the southern waters of the standard U.S. shelf through the central shelf waters, whereas Bering flounder (H. robustus) predominate in catches from the north shelf and western area. Largest concentrations of thisgenus were located in the southern portion of the standard U.S. area at depths greater than 50 m. Catch rates of Hippoglossoides averaged 4.9 kg/ha trawled over the entire survey area (Table 13). CPUE was greatest in the standard U.S. area averaging 7.2 kg/ha and was lowest in the north shelf area at 0-6 kg/ha. Subareas 3 and 5 contained the highest concentrations with mean catch rates of 15.2 kg/ha and 13.0 kg/ha, respectively.

The total biomass of Hippoglossoides spp. was estimated at 371,400 t (Table 13). Nearly 90% of the estimated biomass (333,000 t) was located in the, standard U.S. shelf. The western

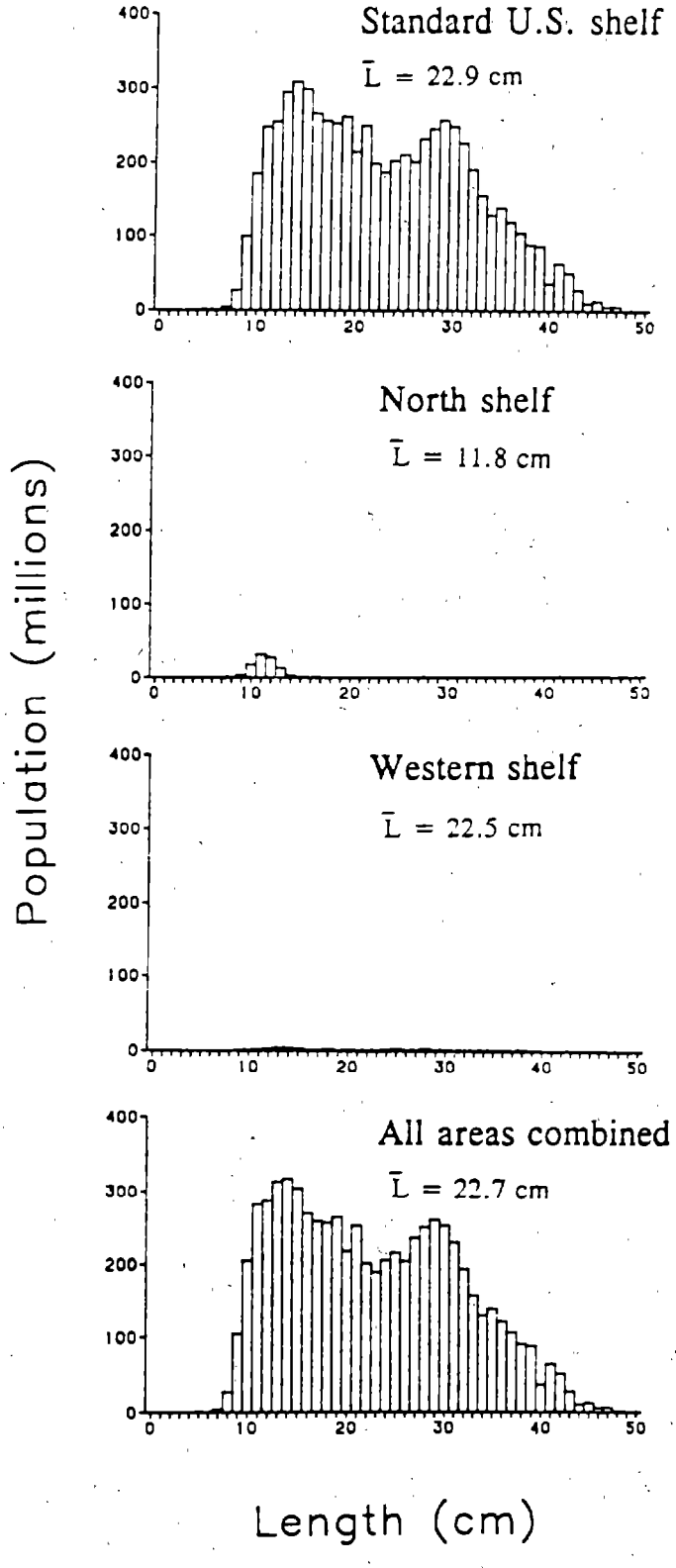


Figure 26. --Estimated size composition of rock sole by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

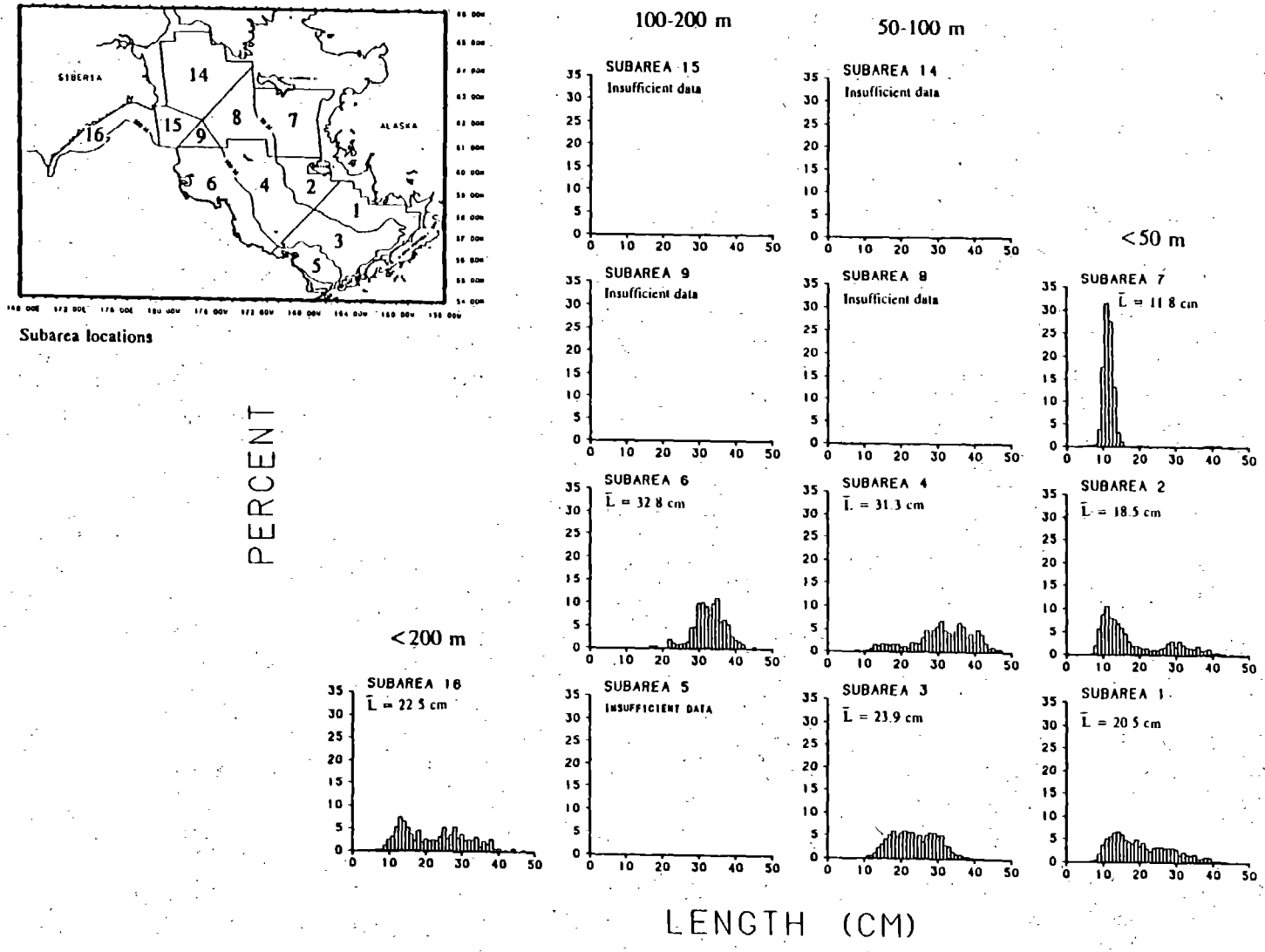


Figure 27.--Estimated relative size composition of rock sole (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

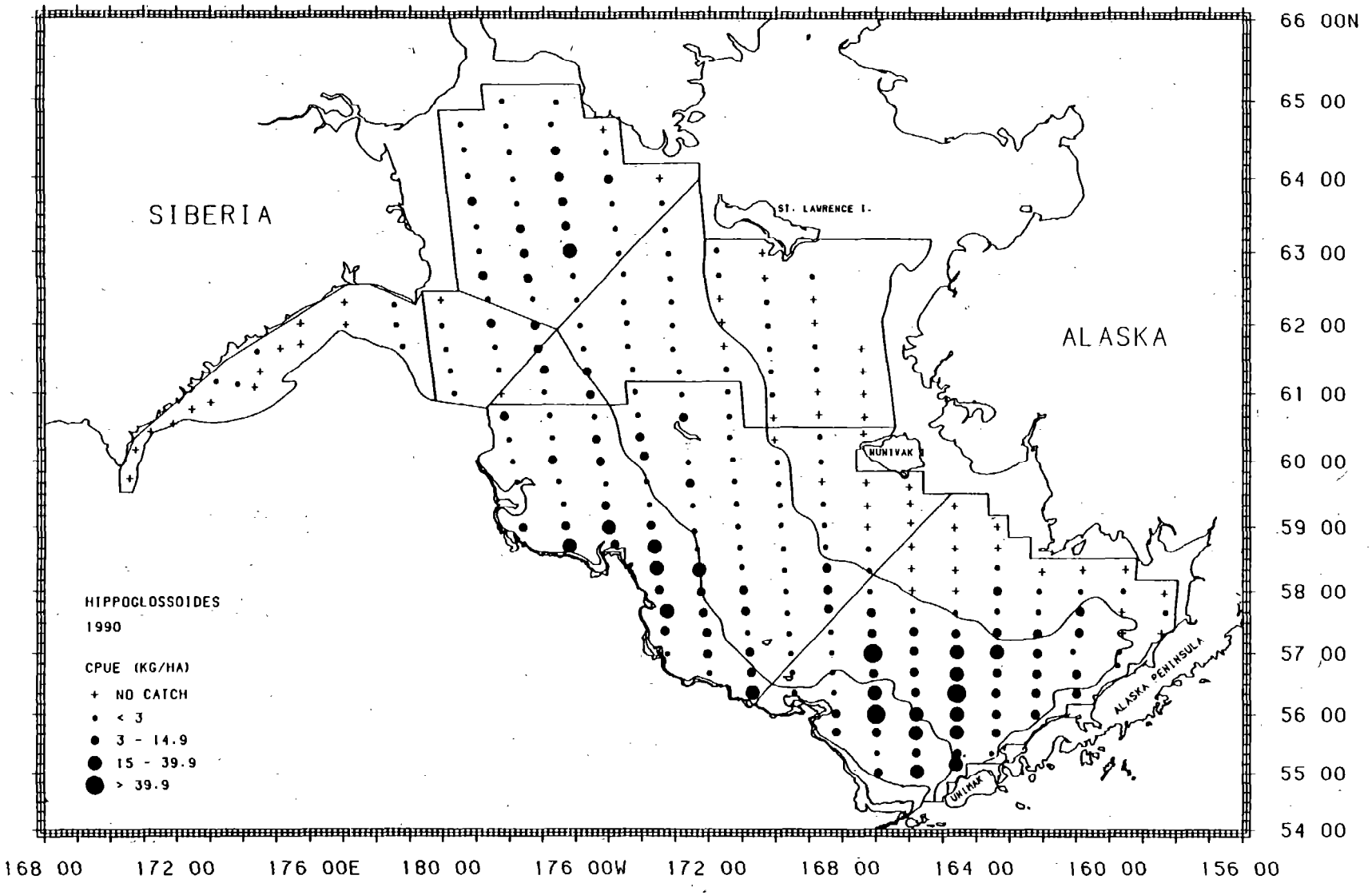


Figure 28. --Distribution and relative abundance in kg/ha of Hippoglossoides spp. sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Table 13. --Abundance estimates and mean size of Hippoglossoides spp. by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
Standard U.S. shelf								
1	< 50	1.54	11,998	0.032	41,706,006	0.024	0.288	19.8
2	< 50	0.28	1,136	0.003	1,589,928	0.001	0.714	-
3	50 - 100	15.21	157,412	0.424	427,386,603	0.247	0.368	33.2
4	50 - 100	2.52	27,070	0.073	105,211,385	0.061	0.257	28.0
5	100 - 200	12.99	50,380	0.136	315,395,416	0.182	0.160	24.7
6	100 - 200	9.00	85,126	0.229	356,875,926	0.206	0.239	26.1
Subareas combined		7.19	333,121	0.897	1,248,165,263	0.720	0.267	28.1
North shelf								
7	< 50	0.07	515	0.001	7,798,964	0.004	0.066	-
8	50 - 100	0.73	4,114	0.011	59,044,292	0.034	0.070	-
9	100 - 200	2.83	3,269	0.009	20,211,382	0.012	0.162	24.4
Subareas combined		0.56	7,898	0.021	87,054,638	0.050	0.091	24.4
Western shelf								
14	< 100	2.73	23,925	0.064	347,702,926	0.201	0.069	19.7
15	100 - 200	2.37	6,069	0.016	48,050,335	0.028	0.126	22.5
16	< 200	0.10	386	0.001	2,735,704	0.002	0.141	-
Subareas combined		1.98	30,381	0.082	398,488,966	0.230	0.076	20.0
All areas combined		4.90	371,399	1.000	1,733,708,867	1.000	0.214	26.1

[a] -indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

area accounted for 8% of the total biomass with only 2% (7,900 t) found in the north shelf area. The majorportion of the estimated biomass was located in subarea 3, which comprised a little over 42% of the entire survey area biomass estimate.

A total of 1.7 billion fish were estimated for the overall survey area. The population distribution differed from the biomass distribution. Approximately 72% of the population was located in the standard U.S. area compared to 90% of the biomass. The western region contained 23% of the total population number, yet only 8% of the estimated biomass.

Size composition--Lengths for Hippoglossoides spp. averaged 26.1 cm across the entire survey area (Fig. 29). Fish were largest in the standard U.S. shelf averaging 28.1 cm and smallest in the western shelf at 20.0 cm. Size distributions by subarea are shown in Figure 30. Members of this genus were largest in the 50-100 m depth zones of subareas 3 and 4 with mean lengths of 33.2 cm and 28.0 cm, respectively.

Alaska plaice

Distribution and abundance--Alaska plaice were frequently encountered throughout the survey, with the exception of subarea 5 (Fig. 31). The total area CPUE of Alaska plaice averaged 11.0 kg/ha (Table 14). Catch rates were highest in the standard U.S. shelf (14.7 kg/ha) followed by the north shelf area (7.2 kg/ha) and the western area (3.4 kg/ha). Alaska plaice were most abundant at depths less than 100 m.

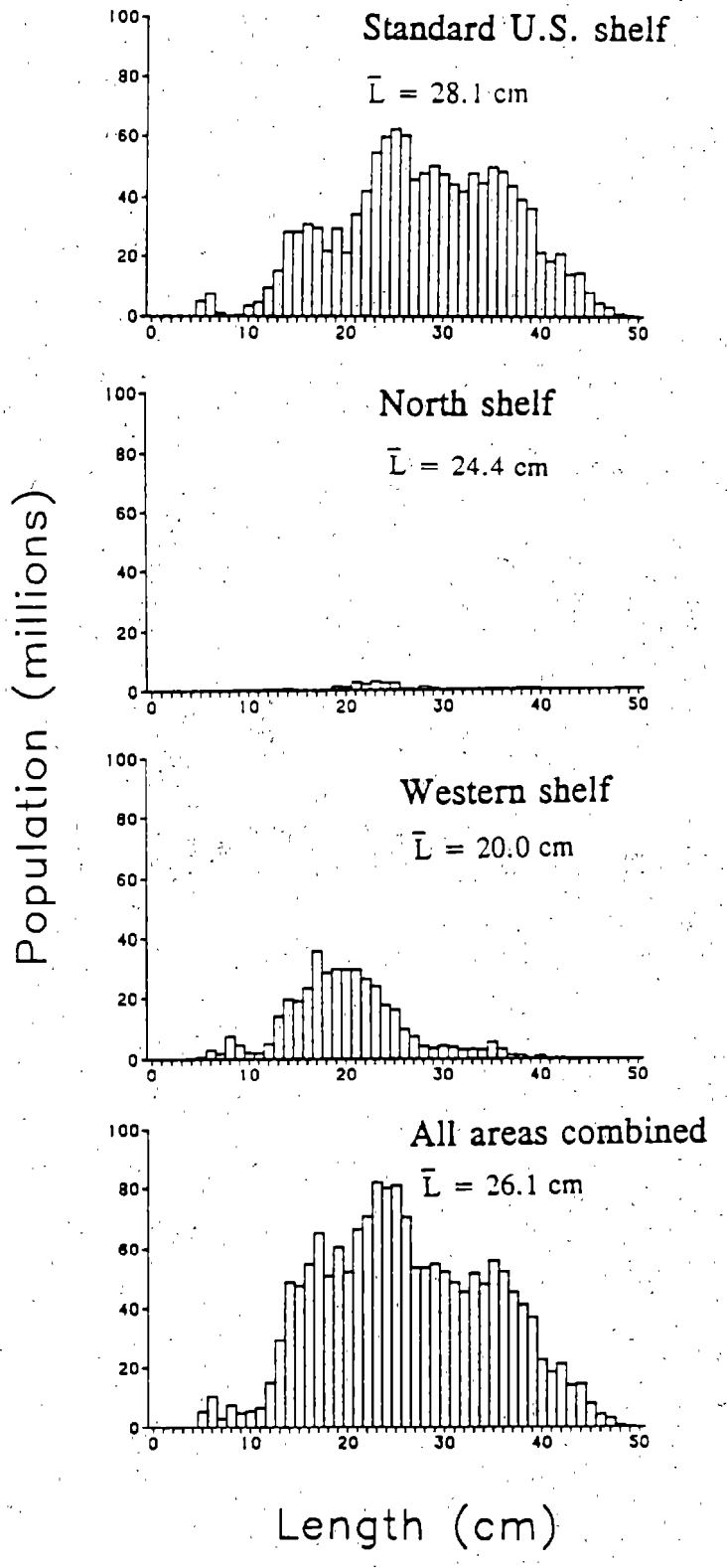


Figure 29.--Estimated size composition of Hippoglossoides spp. by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

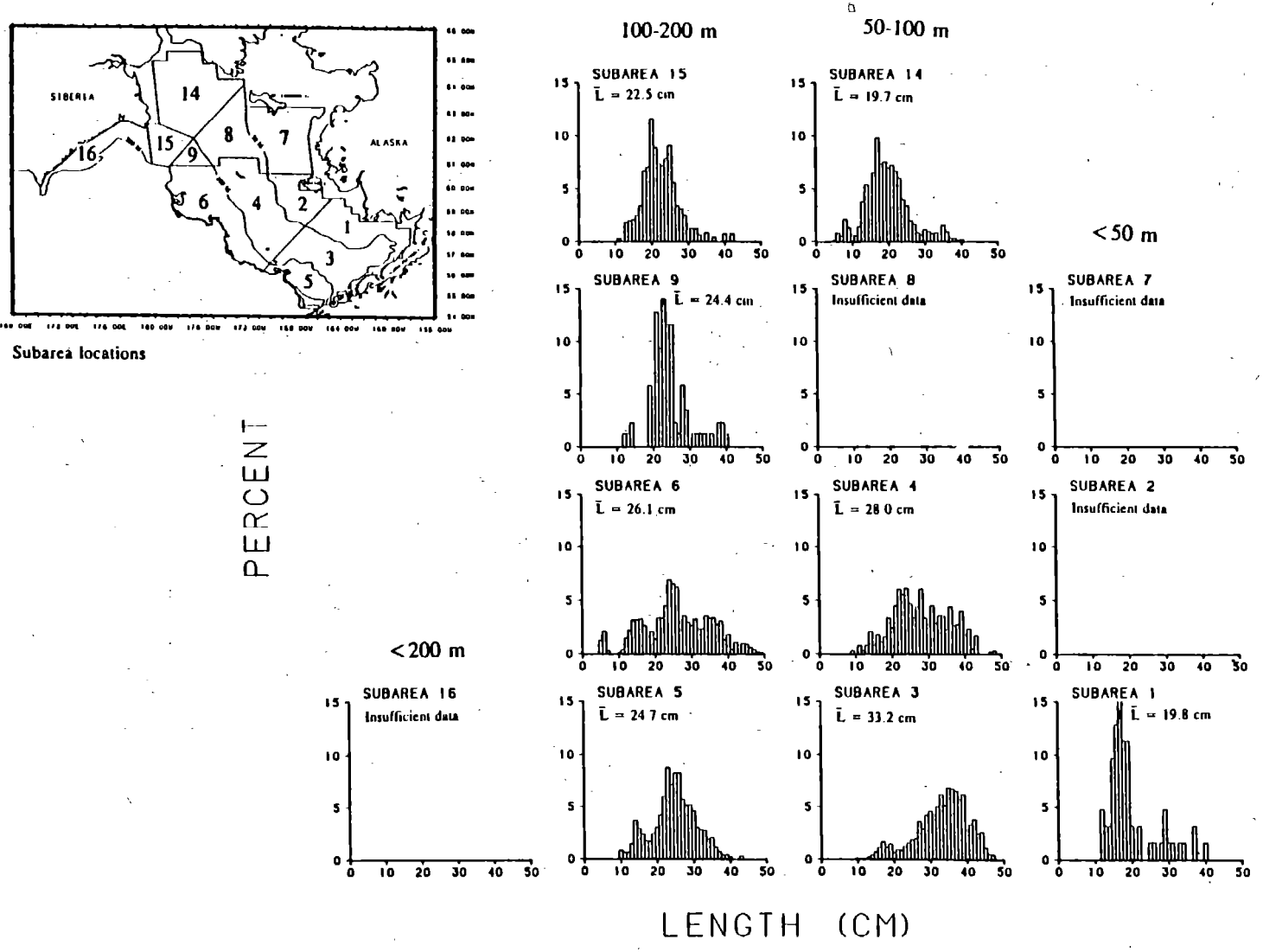
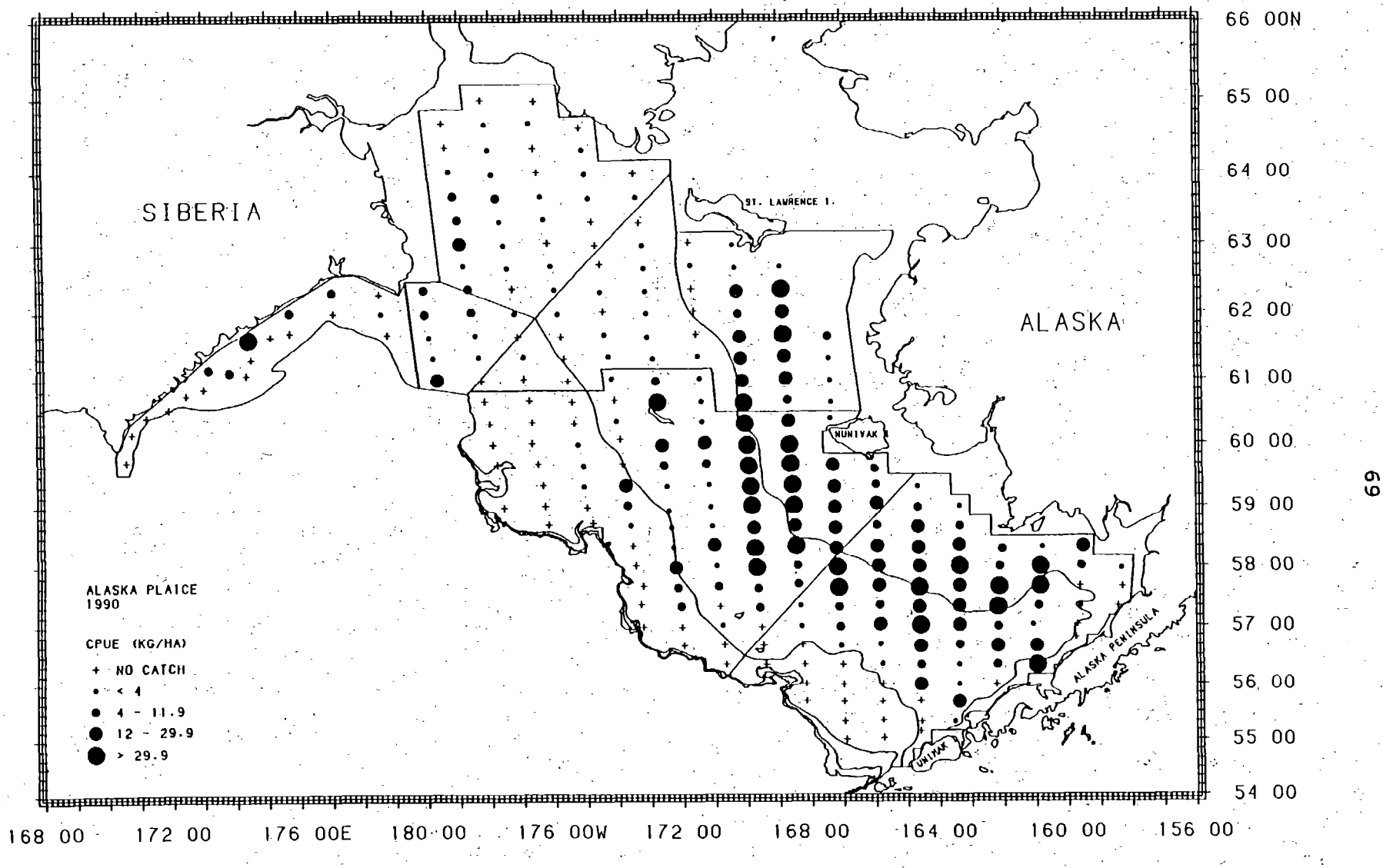


Figure 30. --Estimated relative size composition of Hippoglossoides sp. (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf;



during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 14.--Abundance estimates and mean size of Alaska plaice by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size: Weight (kg)	Mean size: Length (cm)
Standard U.S. shelf								
1	< 50	15.40	119,938	0.144	259,751,376	0.199	0.462	32.4
2	< 50	43.87	179,990	0.216	330,547,521	0.253	0.545	34.3
3	50 - 100	11.92	123,402	0.148	167,981,449	0.129	0.735	38.9
4	50 - 100	22.20	238,904	0.287	282,185,161	0.216	0.847	38.9
5	100 - 200	0.00	0	0.000	0	0.000	-	-
6	100 - 200	1.82	17,209	0.021	9,143,602	0.007	1.882	-
Subareas combined		14.66	679,443	0.817	1,049,609,109	0.805	0.647	35.8
North shelf								
7	< 50	13.62	99,209	0.119	180,448,861	0.138	0.550	31.9
8	50 - 100	0.26	1,456	0.002	2,995,922	0.002	0.486	-
9	100 - 200	0.02	27	<0.001	90,814	<0.001	0.295	-
Subareas combined		7.17	100,692	0.121	183,535,597	0.141	0.549	31.9
Western shelf								
14	< 100	1.73	15,150	0.018	20,136,618	0.015	0.752	40.0
15	100 - 200	3.86	9,908	0.012	5,761,983	0.004	1.720	-
16	< 200	6.66	26,875	0.032	45,582,534	0.035	0.590	31.6
Subareas combined		3.38	51,934	0.062	71,481,135	0.055	0.727	34.2
All areas combined		10.99	832,069	1.000	1,304,625,842	1.000	0.638	35.2

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

The estimated biomass for the entire survey area was 832,000 t (Table 14). The major portion of the estimated biomass was located in the standard U.S. area (82%). An additional 12% was found in the north shelf area, primarily in subarea 7, with the remaining 6% in the western shelf region. The population for the total survey area was estimated at 1.3 billion fish. The abundance distribution of the population was similar to the biomass distribution with 81% of the estimated population located in the standard U.S. shelf.

Size composition--Alaska plaice ranged in size from 9 cm to 61 cm with an overall mean size of 35.2 cm (Fig. 32). Two modes in the size composition were evident in the standard U.S. shelf with a prominent peak at about 35 cm and one peak less pronounced at about 43 cm. This variation was primarily due to the differences in mean length between males and females. Mean length was greatest (35.8 cm) in the standard U.S. shelf and lowest (31.9 cm) in the north shelf region. Juvenile Alaska plaice (< 20 cm) were most abundant at depths less than 50 m in subarea 1 but were also encountered in subarea 16 (Fig. 33). Few juveniles were found in waters greater than 50 m.

Atheresthes spp.

Distribution and abundance--The two species of Atheresthes, arrowtooth flounder (A. stomias) and Kamchatka flounder (A. evermanni) were primarily distributed in the standard U.S. shelf at depths greater than 100 m (Fig. 34). The overall CPUE

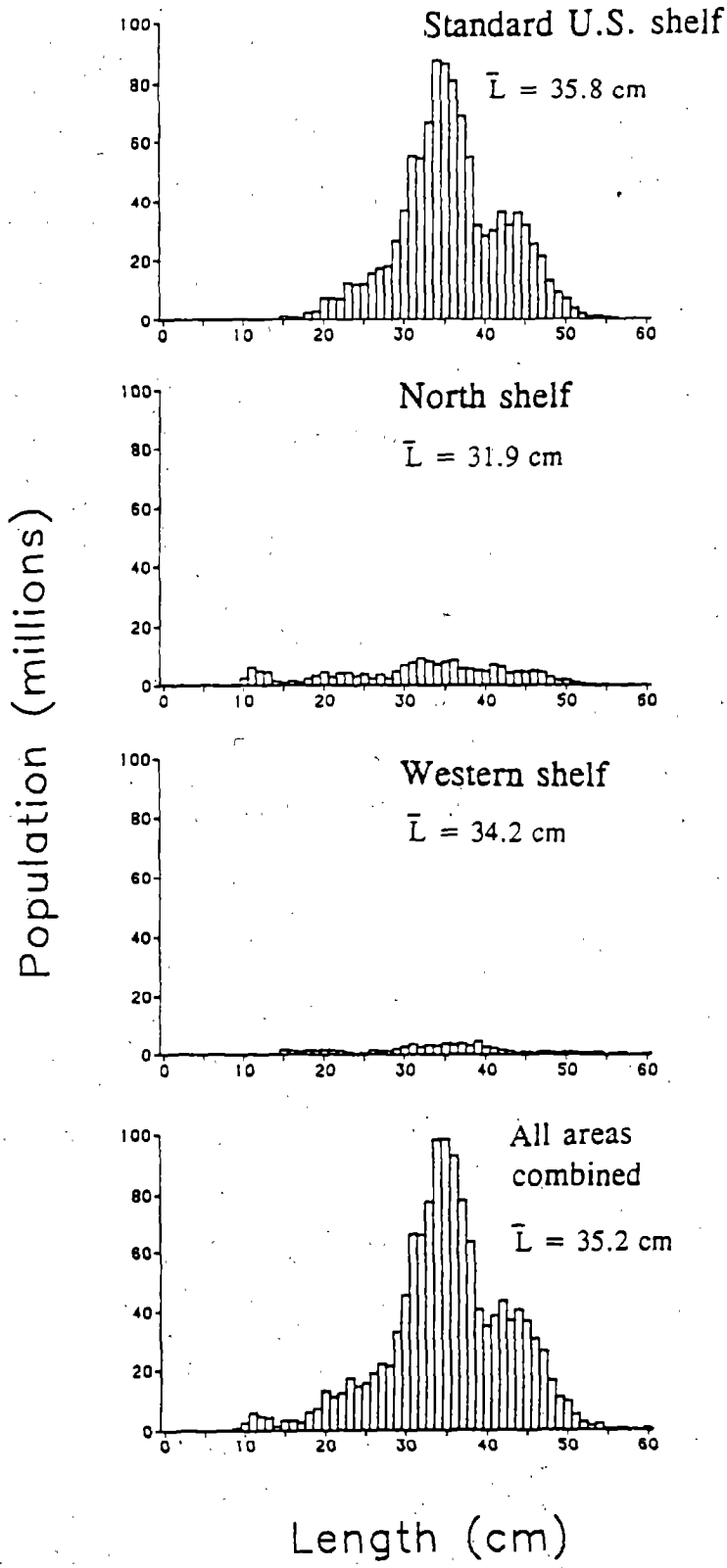


Figure 32.--Estimated size composition of Alaska- plaice by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

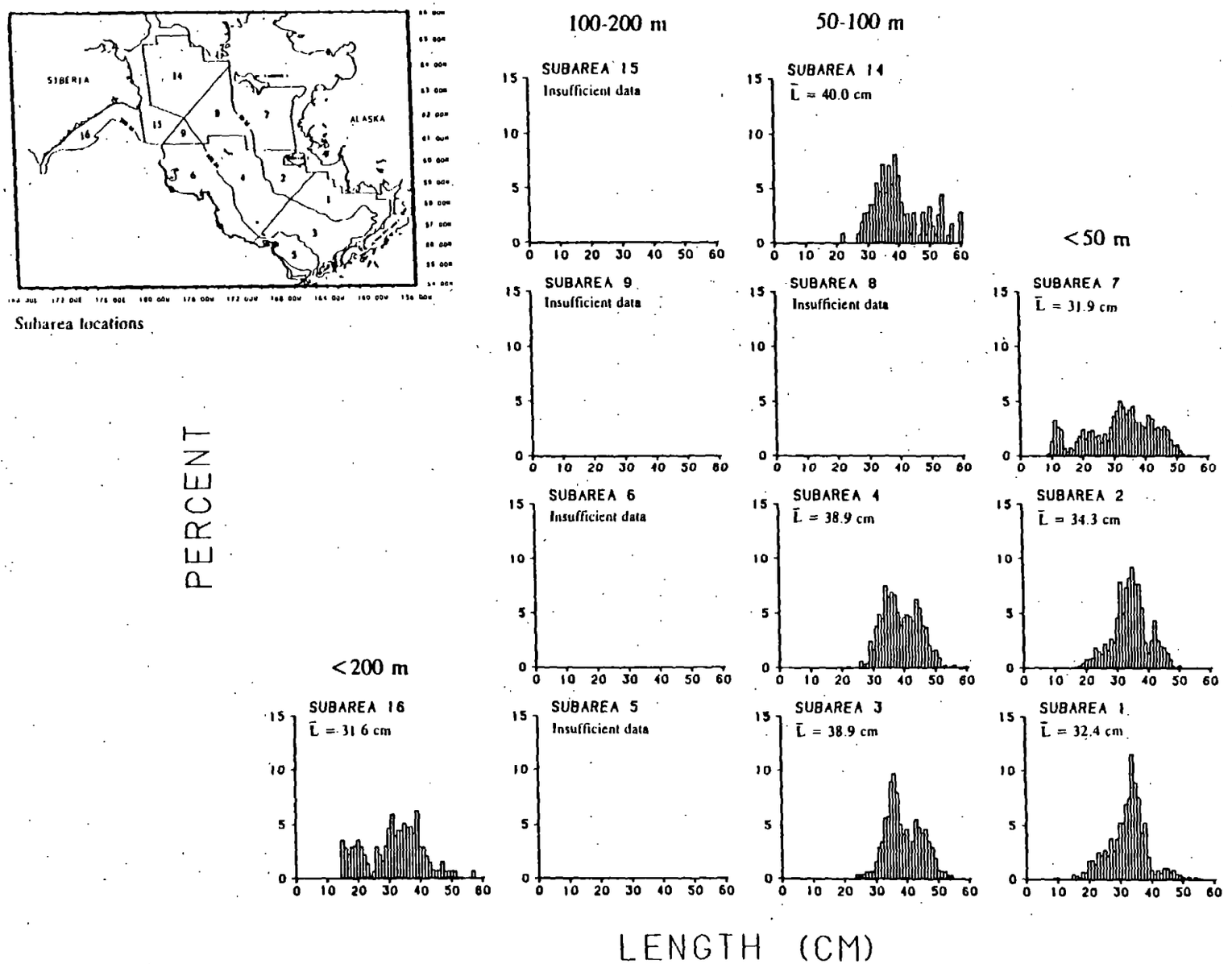


Figure 33.--Estimated relative size composition of Alaska plaice (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

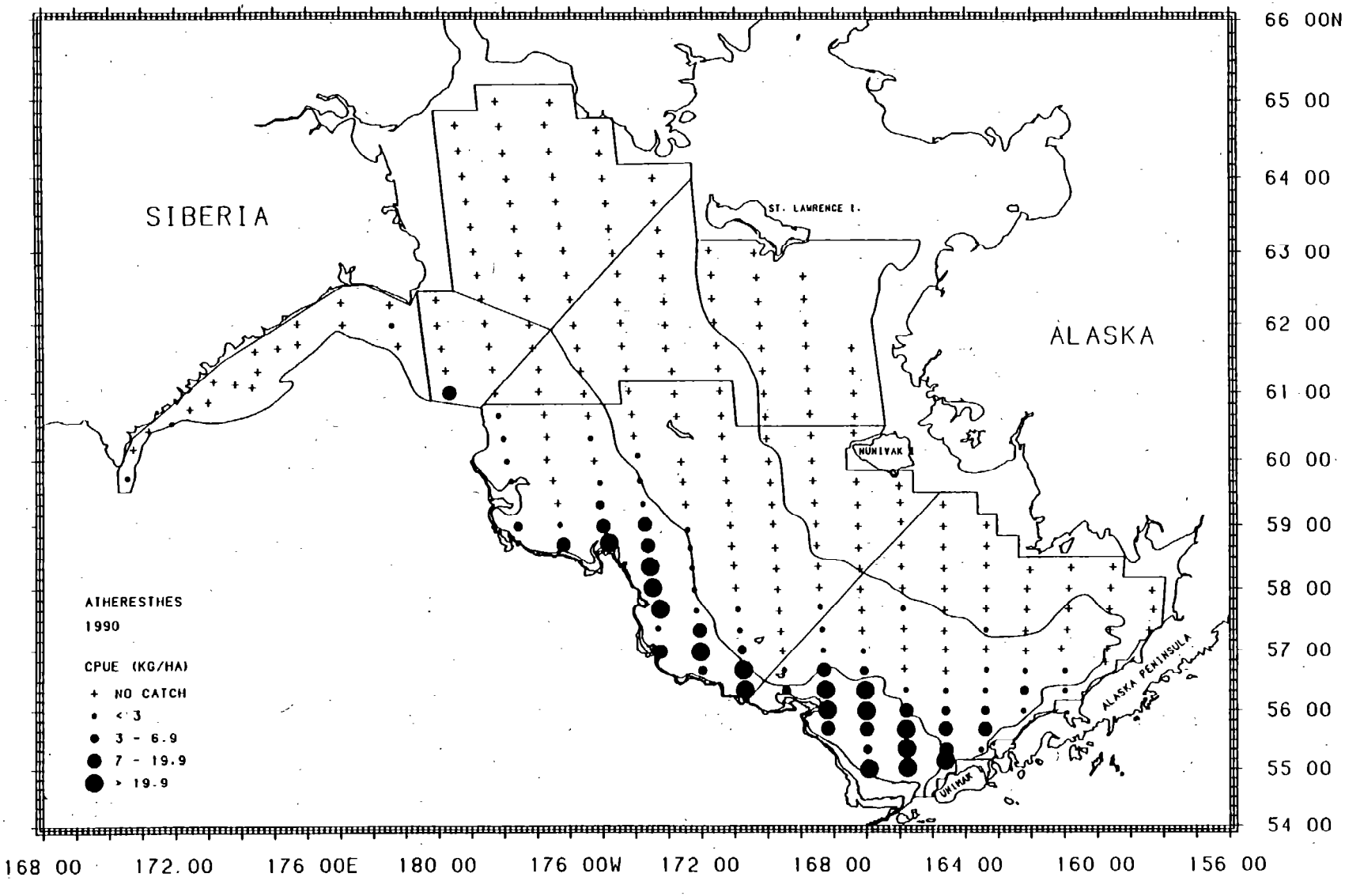


Figure 34.--Distribution and relative abundance in kg/ha of Atheresthes spp. sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

was 3.4 kg/ha with mean catch rates highest in subareas 5 (31.9 kg/ha) and 6 (10.0 kg/ha) (Table 15). Atheresthes spp. were not encountered in the north shelf area and only trace amounts were found on the western shelf.

The biomass of Atheresthes SPP. over the entire survey area was estimated at 258,000 t (Table 15). Over 99% of the estimated biomass was located in the standard U.S. shelf, primarily in the l00-200 depth zone of subareas 5 and 6. The remainder of the biomass (1%) was located in subareas 15 and 16 of the western shelf region. The total survey area population was estimated at 625.1 million fish (Table 15).

Size composition--Size compositiondata for Atheresthes spp. was limited to the standard U.S. shelf. The mean size of Atheresthes spp. measured in the standard U.S. shelf was 32.6 cm (Fig. 35). Mean size varied little between subareas and depth zones ranging from 31.8 cm in subarea 3 to 33.0 cm in subarea 6 (Fig. 36).

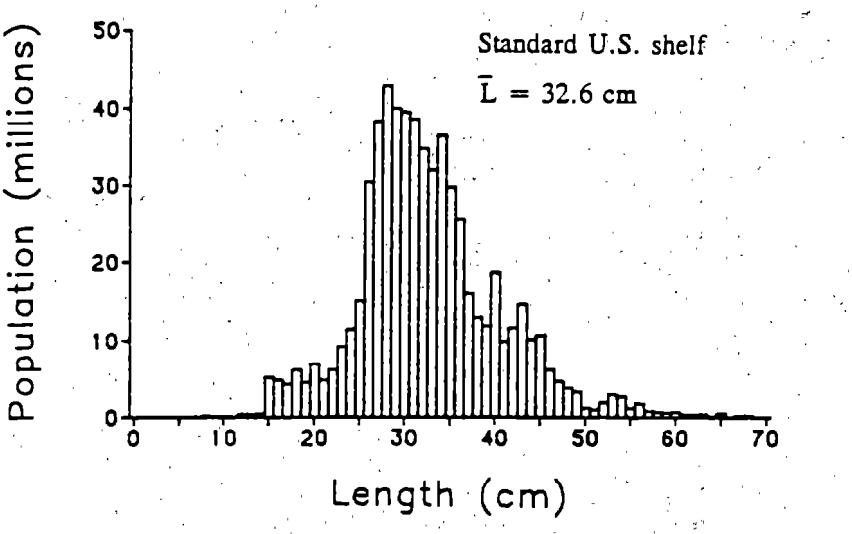


Figure 35.--Estimated-size composition of Atheresthes spp. for the standard U.S. shelf during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 15. --Abundance estimates and mean size of *Atheresthes* spp. by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey in Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size: Weight (kg)	Mean size: Length (cm)
Standard U.S. shelf								
1	< 50	0.02	142	0.001	2,881,564	0.005	0.049	-
2	< 50	0.00	0	0.000	0	0.000	0.000	-
3	50 - 100	3.37	34,843	0.135	108,937,669	0.170	0.320	31.8
4	50 - 100	0.22	2,406	0.009	9,419,137	0.015	0.255	32.4
5	100 - 200	31.85	123,565	0.479	295,268,820	0.472	0.418	32.5
6	100 - 200	10.04	94,899	0.368	206,138,305	0.330	0.460	33.0
Subareas combined		5.52	255,855	0.991	622,057,223	0.995	0.411	32.6
North shelf								
7	< 50	0.00	0	0.000	0	0.000	0.000	-
8	50 - 100	0.00	0	0.000	0	0.000	0.000	-
9	100 - 200	0.00	0	0.000	0	0.000	0.000	-
Subareas combined		0.00	0	0.000	0	0.000	0.000	-
Western shelf								
14	< 100	0.00	0	0.000	0	0.000	0.000	-
15	100 - 200	0.77	1,981	0.008	1,576,600	0.003	1.256	-
16	< 200	0.10	386	0.001	835,128	0.001	0.463	-
Subareas combined		0.15	2,367	0.009	2,411,728	0.004	0.982	-
All areas combined		3.41	258,222	1.000	625,075,223	1.000	0.413	32.6

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

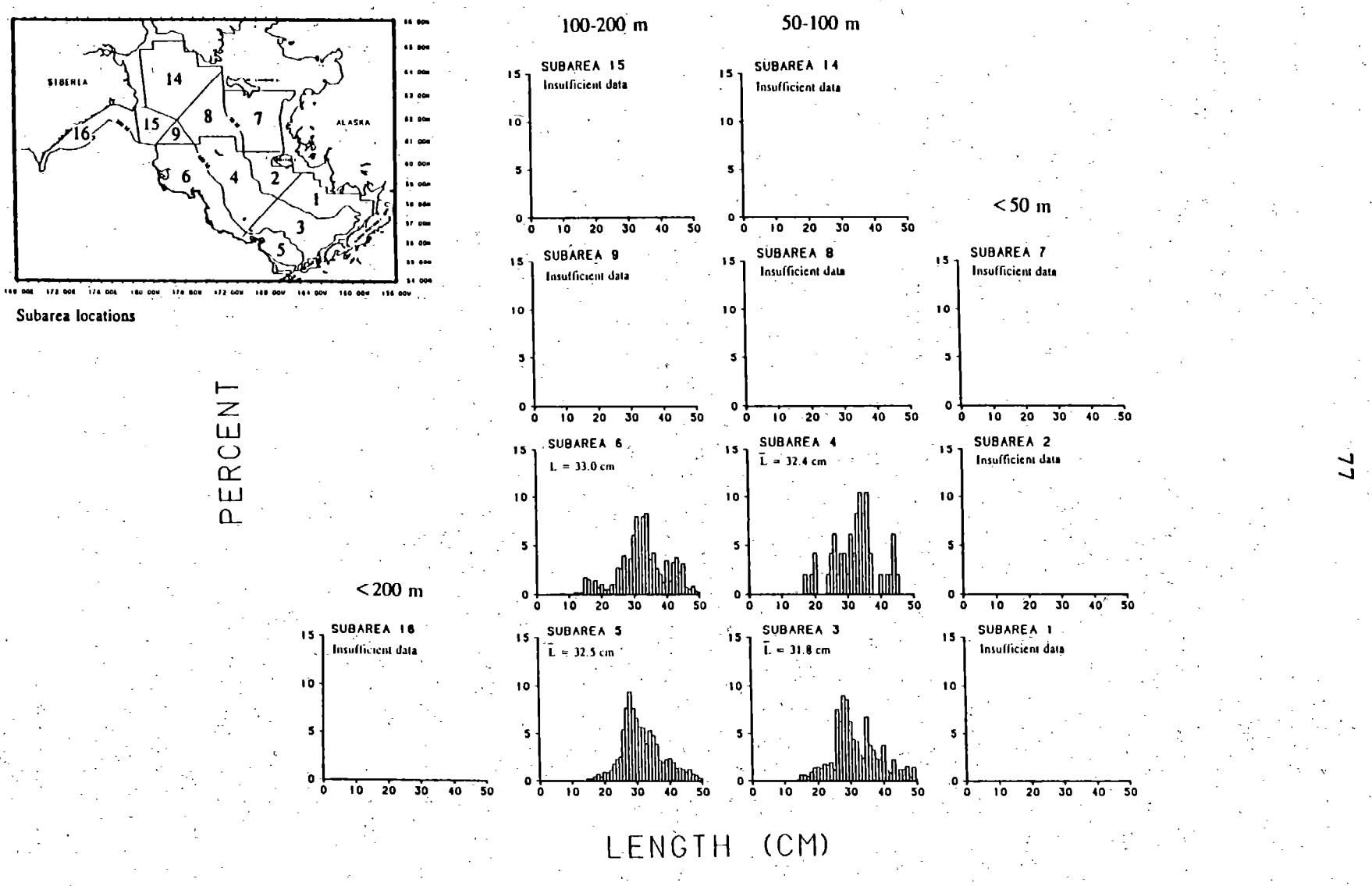


Figure 36.--Estimated relative size composition of <u>Atheresthes</u> sp. (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Pacific halibut

Distribution and abundance--Pacific halibut were encountered in all subareas with the exception of subarea 8 (Fig. 37). The mean CPUE for the entire survey area was 1.4 kg/ha trawled (Table 16). Mean catch rates ranged from 2.15 kg/ha in the standard U.S. shelf to 0.6 kg/ha in the western area and less than 0.1 in the north shelf area. Pacific halibut were most abundant in subarea 3 with catches averaging 3.4 kg/ha.

The biomass for Pacific halibut in the total survey area was estimated to be 109,000 t (Table 16). Almost 92% of the total biomass (99,800 t) was located in the standard U.S. shelf with most of the remaining biomass (8%) found in the western area. Less than 1% of the estimated biomass was located in the north shelf area. Population abundance totaled 89.3 million fish with 86.5 million (97%) located in the standard U.S. shelf.

Size composition--Pacific halibut averaged 39.4 cm in length over all areas (Fig. 38). They were largest in the western shelf area averaging 65.6 cm and smallest in the standard U.S. shelf (39.0 cm). A pronounced size mode was apparent at about 30 cm in the standard U.S. shelf. Mean length increased with increasing depth from 28.8 cm in subarea 2 (< 50 m depth zone) to 74.5 cm in subarea 6 (100-200 m depth zone) as shown in Figure 39.

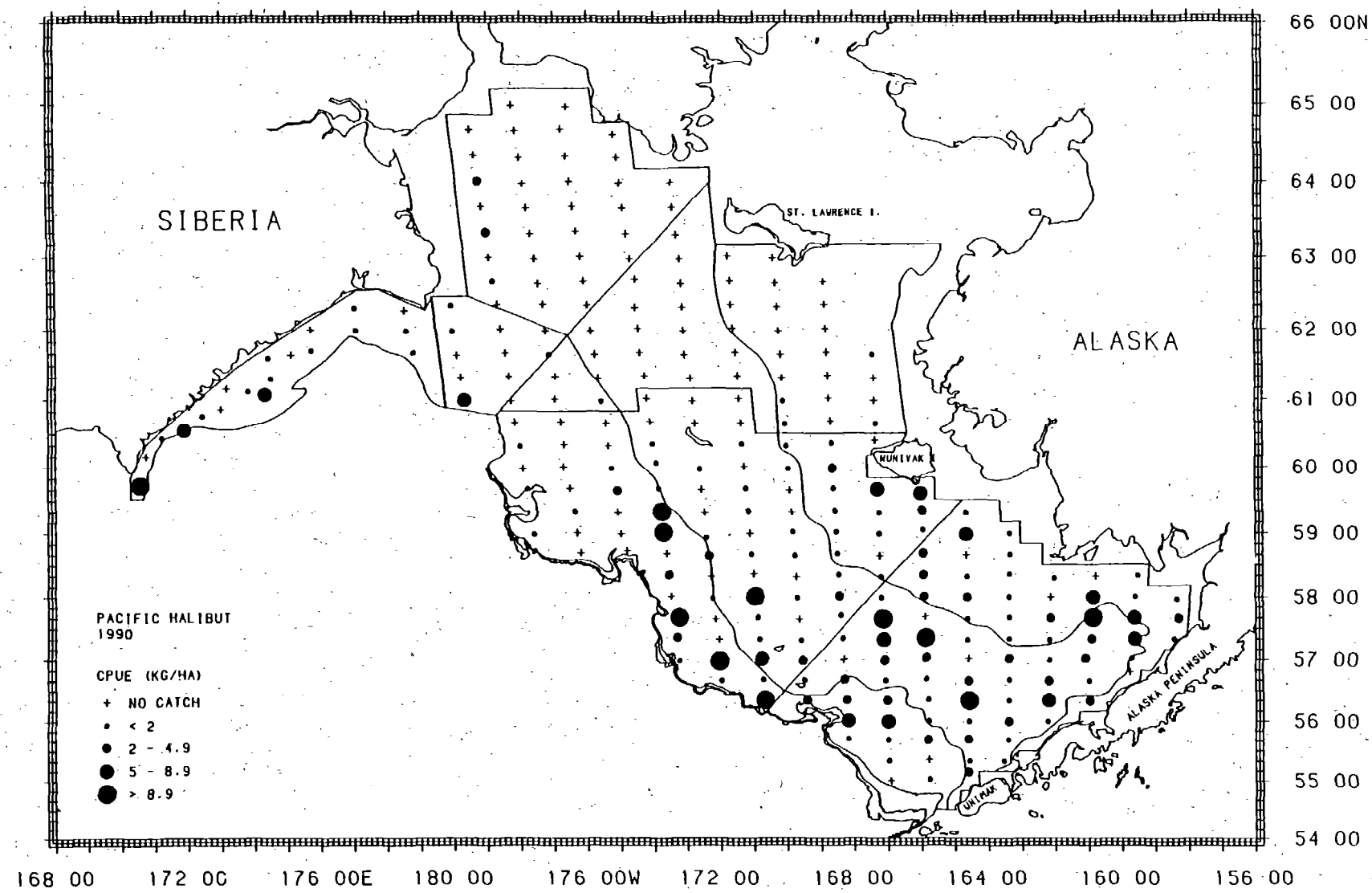


Figure 37. --Distribution and relative abundance in kg/ha of Pacific halibut sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Table 16.--Abundance estimates and mean size of Pacific halibut by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size	
							Weight (kg)	Length (cm)
Standard U.S. shelf								
1	< 50	2.07	16,149	0.148	36,974,614	0.414	0.437	31.8
2	< 50	1.48	6,090	0.056	17,442,420	0.195	0.349	28.8
3	50 - 100	3.36	34,828	0.320	19,495,396	0.218	1.786	49.1
4	50 - 100	0.89	9,548	0.088	5,818,456	0.065	1.641	43.2
5	100 - 200	2.24	8,681	0.080	3,061,369	0.034	2.836	66.8
6	100 - 200	2.59	24,457	0.225	3,732,210	0.042	6.553	74.5
Subareas combined		2.15	99,754	0.916	86,524,466	0.969	1.153	39.0
North shelf								
7	< 50	0.03	249	0.002	832,603	0.009	0.298	-
8	50 - 100	0.00	0	0.000	0	0.000	-	-
9	100 - 200	0.04	50	<0.001	49,731	0.001	0.998	-
Subareas combined		0.02	298	0.003	882,334	0.010	0.338	-
Western shelf								
14	< 100	0.14	1,215	0.011	146,862	0.002	8.275	97.3
15	100 - 200	0.62	1,594	0.015	432,488	0.005	3.685	60.3
16	< 200	1.50	6,038	0.055	1,310,770	0.015	4.606	63.8
Subareas combined		0.58	8,847	0.081	1,890,119	0.021	4.680	65.6
All areas combined		1.44	108,889	1.000	89,296,920	1.000	1.220	39.4

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

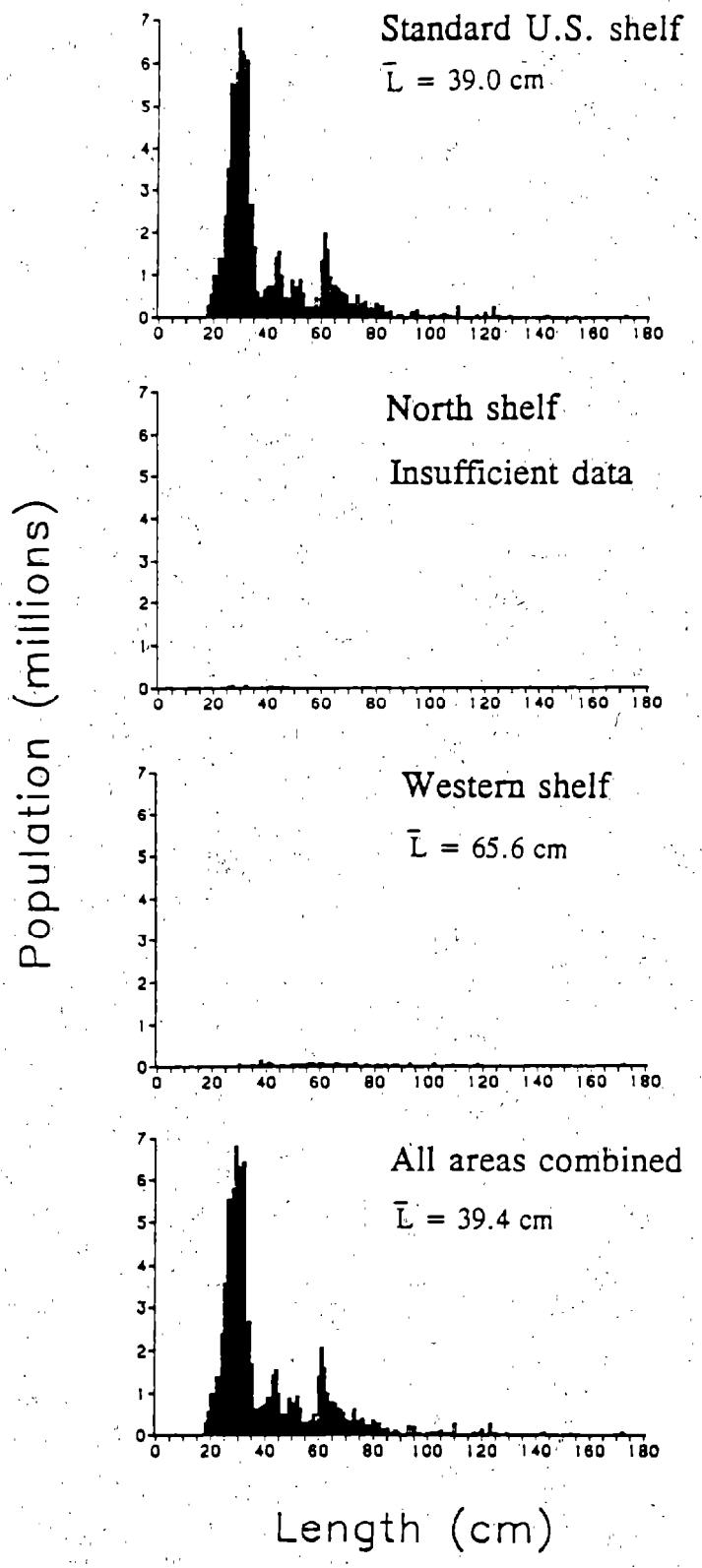


Figure 38. --Estimated size composition of Pacific halibut by region during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

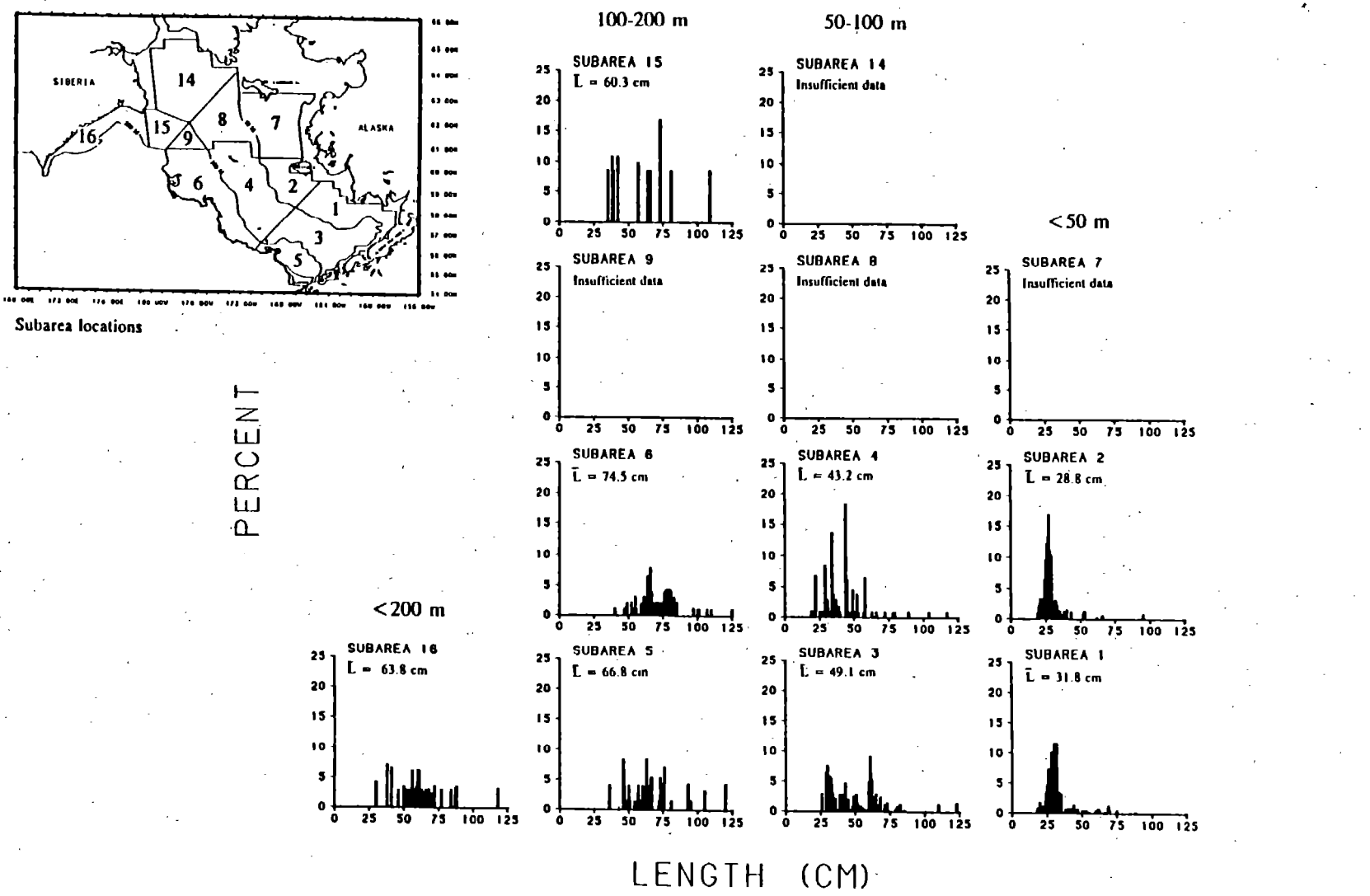


Figure 39.--Estimated relative size composition of Pacific halibut (sexes combined) by subarea during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Greenland turbot

Distribution and abundance--Greenland turbot (Reinhardtius hippoglossoides) were encountered at relatively low levels of abundance and occurred at only 20% of the stations (Fig. 40). The overall mean catch rate was less than 0.1 kg/ha (Table 17). They were most abundant at depths of 100-200 m in subareas 6, 9, and 15 with mean CPUE values of 0.29 kg/ha, 0.35 kg/ha, and 1.19 -kg/ha, respectively. Greenland turbot biomass over all areas was estimated at 7,200 t. Nearly 81% of the biomass was

therefore-size composition information is not available. However, based on mean weight data, the largest fish were found in the western shelf area, averaging 0.3-2 kg (Table 17). Greenland turbot were-smallest in the north shelf area with a mean weight of 0.15 kg.

Abundance and Distribution of Major Crab Species

The Russian bottom trawl appeared to have sampled invertebrates poorly based on the results of the comparative trawl experiment. However, since the survey data may provide some insight on the relative distribution and relative abundance of snow crab and king crab, it is summarized here. Snow crab. (C. opilio and C. bairdi combined) was the dominant commercial crab group comprising 7.7% of the total-biomassof fish and

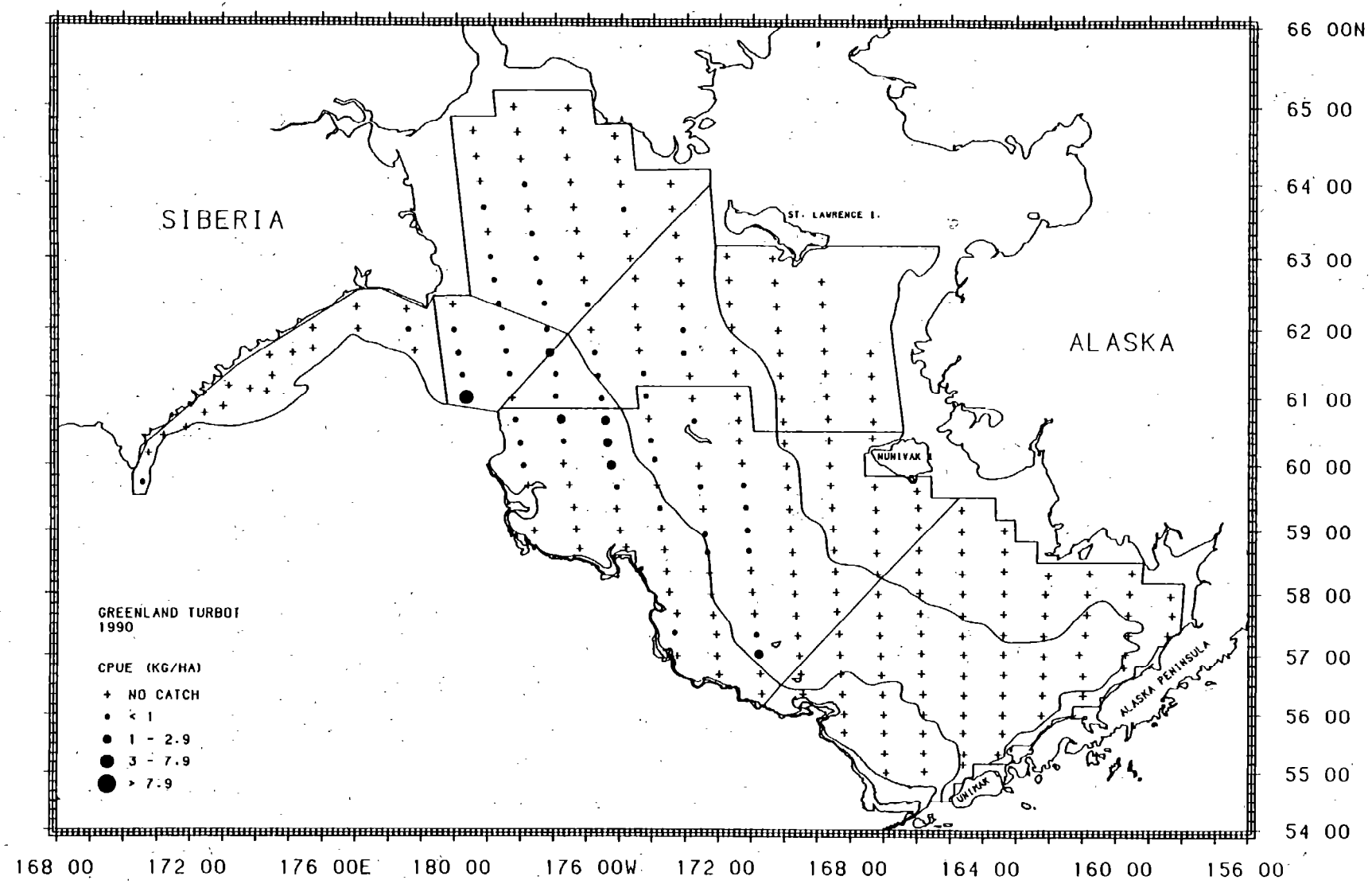


Figure 40.--Distribution and relative abundance in kg/ha of Greenland turbot sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 17.--Abundance estimates and mean size of Greenland turbot by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean size: Weight (kg)	Mean size: Length (cm)
Standard U.S. shelf								
1	< 50	0.00	0	0.000	0	0.000	0.000	-
2	< 50	0.00	0	0.000	0	0.000	0.000	-
3	50 - 100	0.00	0	0.000	0	0.000	0.000	-
4	50 - 100	0.04	423	0.059	1,962,432	0.078	0.220	-
5	100 - 200	0.00	0	0.000	0	0.000	0.000	-
6	100 - 200	0.29	2,724	0.380	8,849,208	0.350	0.308	-
Subareas combined		0.07	3,156	0.440	10,811,631	0.427	0.292	-
North shelf								
7	< 50	0.00	0	0.000	0	0.000	0.000	-
8	50 - 100	0.03	156	0.022	1,986,452	0.079	0.079	-
9	100 - 200	0.35	406	0.057	1,732,053	0.068	0.234	-
Subareas combined		0.04	562	0.078	3,718,505	0.147	0.151	-
Western shelf								
14	< 100	0.03	297	0.041	3,810,837	0.151	0.078	-
15	100 - 200	1.19	3,061	0.427	6,769,423	0.268	0.452	-
16	< 200	0.02	99	0.014	183,270	0.007	0.540	-
Subareas combined		0.23	3,457	0.482	10,763,531	0.426	0.321	-
All areas combined		0.09	7,175	1.000	25,293,667	1.000	0.284	-

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

invertebrates combined (Table 7). They were encountered in all subareas at an average catch rate of 16.7 kg/ha. Red and blue king crab were encountered less frequently and had a combined overall catch rate of 0.8 kg/ha trawled.

Tanner crab (Chionoecetes opilio)

Distribution and abundance --Opilio Tanner crab were broadly distributed throughout the survey region (Fig. 41). Largest catches (> 83 kg/ha trawled) generally occurred at bottom water temperatures of 1° C and colder in the northern and central portion of the Bering Sea. The overall mean CPUE for opilio Tanner crab was 14.7 kg/ha (Table 18). The north shelf area had the greatest mean catch rate at 17.5 kg/ha. Catch rates were lowest in the western shelf area at 11.4 kg/ha.

The total biomass and population number of opilio Tanner crab was estimated at 1.1 million t and 21.5 billion crabs, respectively. The distribution of population numbers was markedly different than the biomass distribution. Approximately 62% of the total estimated biomass and 35% of the population numbers were located in the standard U.S. shelf while 22% of the biomass and over one-half (52%) of the population were found in the north shelf region. This was due to the large number of small crab in north shelf subareas 7 and 8. The western shelf area accounted for 15% of the total biomass and nearly 13% of the population number.

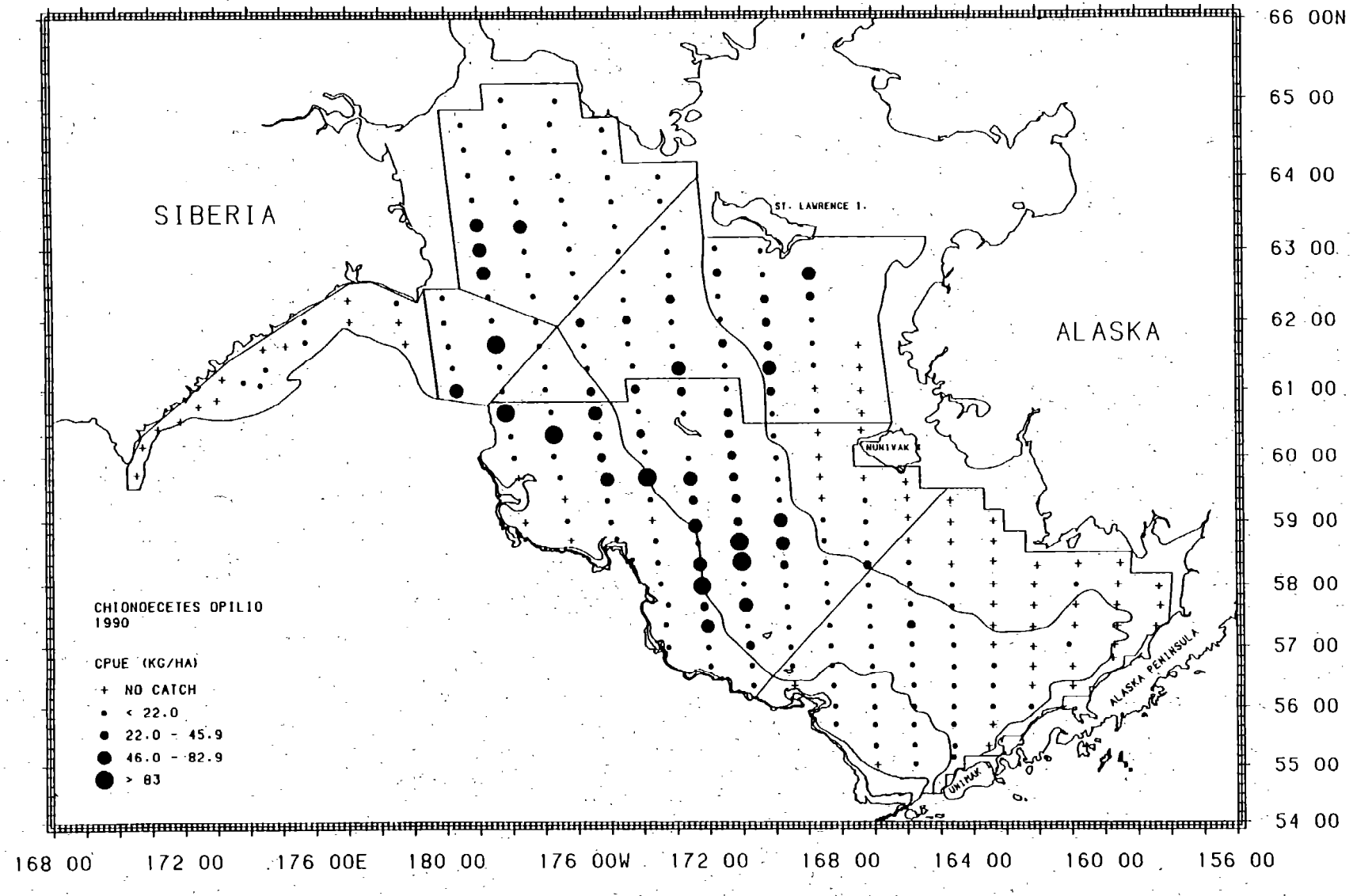


Figure 41.--Distribution and relative abundance in kg/ha of Tanner crab (C. opilio) sampled during the 1990 cooperative-U.S.-Russian bottom trawl-survey of the Bering Sea shelf.

Table 18.--Abundance estimates and mean size of Tanner crab (C. opilio) by subarea from the 1990 cooperative U.-S.-Russian bottom trawl of the Bering Sea shelf.[a]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean Weight (kg)
Standard U.S. shelf							
1	< 50	0.30	2,357	0.002	16,735,712	0.001	0.141
2	< 50	2.43	9,977	0.009	140,360,891	0.007	0.071
3	50 - 100	3.48	35,998	0.032	193,582,835	0.009	0.186
4	50 - 100	36.61	393,932	0.353	4,143,451,994	0.192	0.095
5	100 - 200	2.63	10,187	0.009	51,262,514	0.002	0.199
6	100 - 200	25.63	242,349	0.217	3,021,316,897	0.140	0.080
Subareas combined		14.99	694,800	0.623	7,566,710,843	0.351	0.092
North shelf							
7	< 50	16.19	117,900	0.106	7,891,568,815	0.366	0.015
8	50 - 100	18.73	104,942	0.094	3,207,346,796	0.149	0.033
9	100 - 200	19.64	22,719	0.020	169,904,659	0.008	0.134
Subareas combined		17.49	245,561	0.220	11,268,820,270	0.523	0.022
Western shelf							
14	< 100	12.25	107,282	0.096	1,755,385,518	0.081	0.061
15	100 - 200	25.70	65,916	0.059	941,915,556	0.044	0.070
16	< 200	0.58	2,352	0.002	41,561,844	0.002	0.057
Subareas combined		11.43	175,550	0.157	2,738,862,918	0.127	0.064
All areas combined		14.73	1,115,911	1.000	21,574,394,031	1.000	0.052

[a]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

Tanner crab (C. bairdi)

Distribution and abundance--Bairdi Tanner crab were primarily found in areas where-water temperatures was 2° C or warmer in the southern portion of the standard shelf and in western shelf subarea 16 (Fig. 42). This species was not encountered in the north shelf area or subarea 14 of the western shelf. The overall CPUE was 1.5 kg/ha with highest mean catch rates located in subarea 3 at 5.3 kg/ha (Table 19). Bairdi Tanner crab were least abundant in subareas 2 and 15 averaging 0.4 kg/ha.

The biomass of bairdi Tanner crab was estimated at 115,911 t with population numbers totaling 596 million crabs. Eighty-six percent of the biomass was located in the standard U.S. shelf with the remaining 14% in the western shelf region. Mean individual crab weights were highest in the western shelf region with an average weight of 0.36 kg compared to 0.18 kg in the standard U.S. shelf.

Red king crab

Distribution and abundance--Red king crab (Paralithodes camtschatica) occurred at 33 stations. Their distribution was limited to the southeastern portion of the survey area although they were observed in one haul in the western shelf area (Fig. 43). This species was not encountered at depths greater than 100 m. The overall average catch rate was 0.6 kg/ha (Table 20).

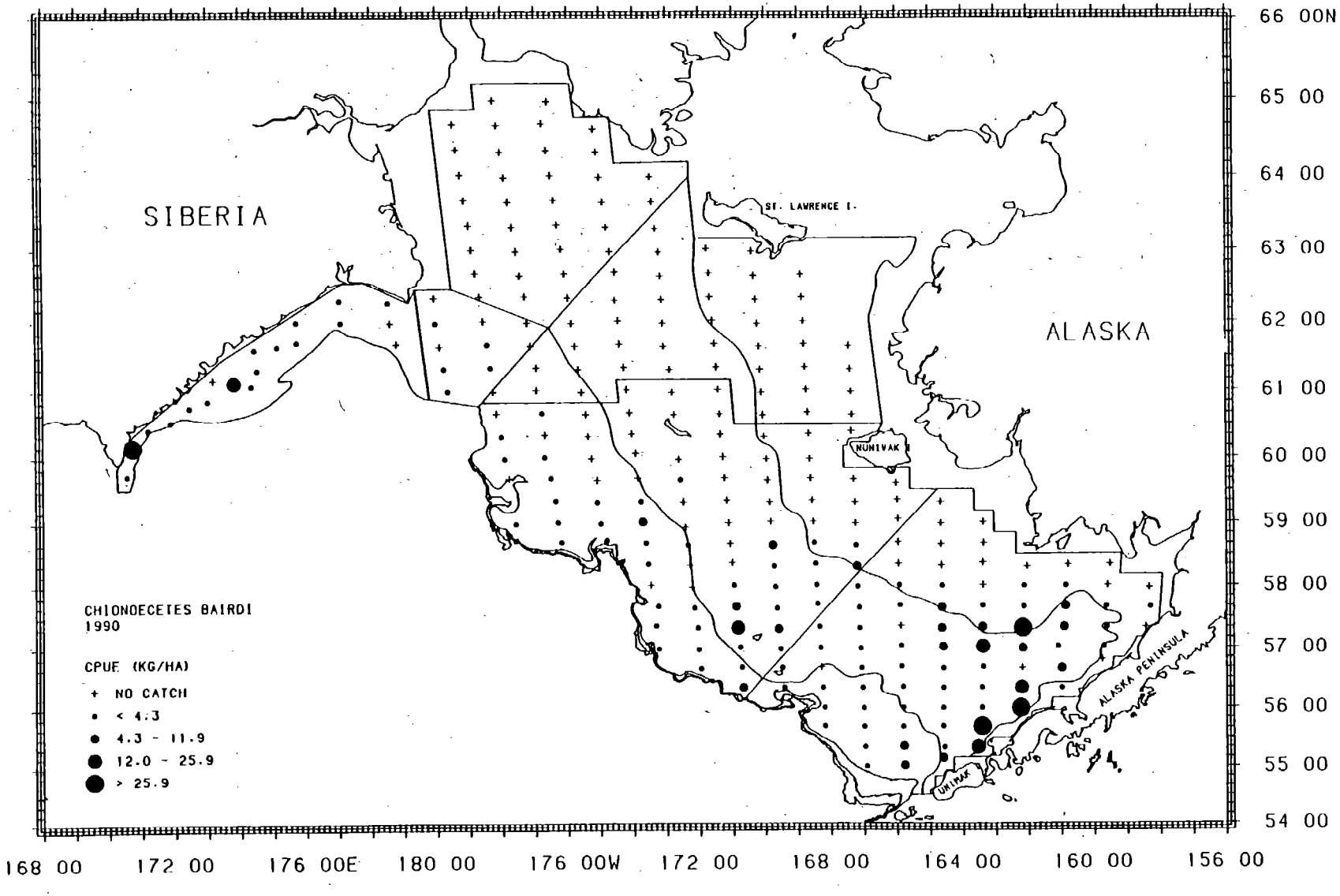


Figure 42. --Distribution and relative abundance in kg/ha of Tanner crab (C. bairdi) sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Table 19. --Abundance estimates and mean size of Tanner crab (C. bairdi) by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean Weight (kg)
Standard U.S. shelf							
1	< 50	1.82	14,193	0.122	45,455,170	0.076	0.312
2	< 50	0.37	1,519	0.013	7,302,795	0.012	0.208
3	50 - 100	5.28	54,609	0.469	243,583,138	0.408	0.224
4	50 - 100	1.44	15,496	0.133	88,172,564	0.148	0.176
5	100 - 200	2.14	8,302	0.071	81,015,843	0.136	0.102
6	100 - 200	0.68	6,461	0.055	86,629,467	0.145	0.075
Subareas combined		2.17	100,581	0.864	522,158,976	0.876	0.182
North shelf							
7	< 50	0.00	0	0.000	0	0.000	-
8	50 - 100	0.00	0	0.000	0	0.000	-
9	100 - 200	0.00	0	0.000	0	0.000	-
Subareas combined		0.00	0	0.000	0	0.000	-
Western shelf							
14	< 100	0.00	0	0.000	0	0.000	-
15	100 - 200	0.41	1,054	0.009	4,433,714	0.007	0.238
16	< 200	3.68	14,840	0.127	39,767,866	0.067	0.373
Subareas combined		1.03	15,894	0.136	44,201,581	0.074	0.360
All areas combined		1.54	116,475	1.000	596,360,557	1.000	0.195

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

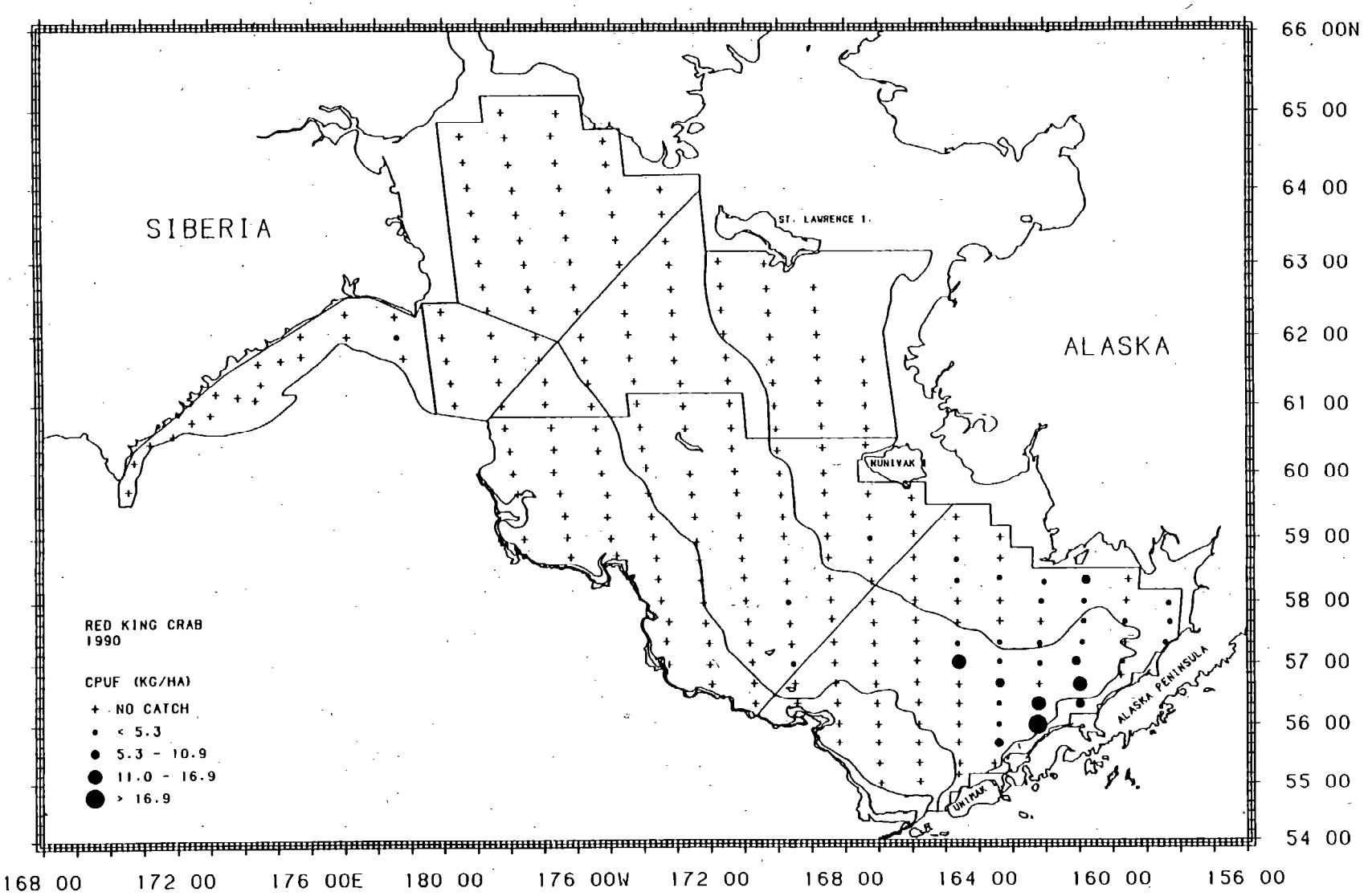


Figure 43.--Distribution and relative abundance in kg/ha of red king crab sampled during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table 20. --Abundance estimates and mean size of red king crab by subarea from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea Shelf.

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean Weight (kg)
Standard U.S. shelf							
1	< 50	1.15	8,919	0.197	6,454,143	0.176	1.382
2	< 50	0.01	53	0.001	111,928	0.003	0.476
3	50 - 100	3.47	35,953	0.793	29,043,622	0.794	1.238
4	50 - 100	0.03	328	0.007	922,266	0.025	0.355
5	100 - 200	0.00	0	0.000	0	0.000	-
6	100 - 200	0.00	0	0.000	0	0.000	-
Subareas combined		0.98	45,253	0.999	36,531,958	0.999	1.239
North shelf							
7	< 50	0.00	0	0.000	0	0.000	-
8	50 - 100	0.00	0	0.000	0	0.000	-
9	100 - 200	0.00	0	0.000	0	0.000	-
Subareas combined		0.00	0	0.000	0	0.000	-
Western shelf							
14	< 100	0.00	0	0.000	0	0.000	-
15	100 - 200	0.00	0	0.000	0	0.000	-
16	< 200	0.02	61	0.001	38,709	0.001	1.588
Subareas combined		<0.01	61	0.001	38,709	0.001	1.588
All areas combined		0.60	45,314	1.000	36,570,667	1.000	1.239

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

Red king crab were most abundant in standard U.S. shelf subarea 3 with a mean CPUE of 3.5 kg/ha.

Nearly 100% of the estimated biomass of 45,253 t was located in the standard U.S. shelf with 79% of the total biomass in subarea 3. Estimated population abundance totaled 36.6 million crab over the entire survey area.

Blue king crab

Distribution and abundance--Blue king crab, were infrequently encountered during the survey (Fig. 44). The overall CPUE value averaged 0.22 kg/ha with the highest mean catch rate occurring in the western shelf area at 0.98 kg/ha (Table 21). Catches were lowest in the north shelf region at 0.01 kg/ha. Blue king crab were most abundant in subarea 16 at 2.7 kg/ha. The total area biomass of blue king crab was/estimated at 16,943 t with 92% located in subarea 16. The standard U.S. shelf accounted for 6% of the total biomass while the north shelf area contributed the remaining 2%. Population numbers of blue king crab were estimated at 25.2 million crab for the total survey area.

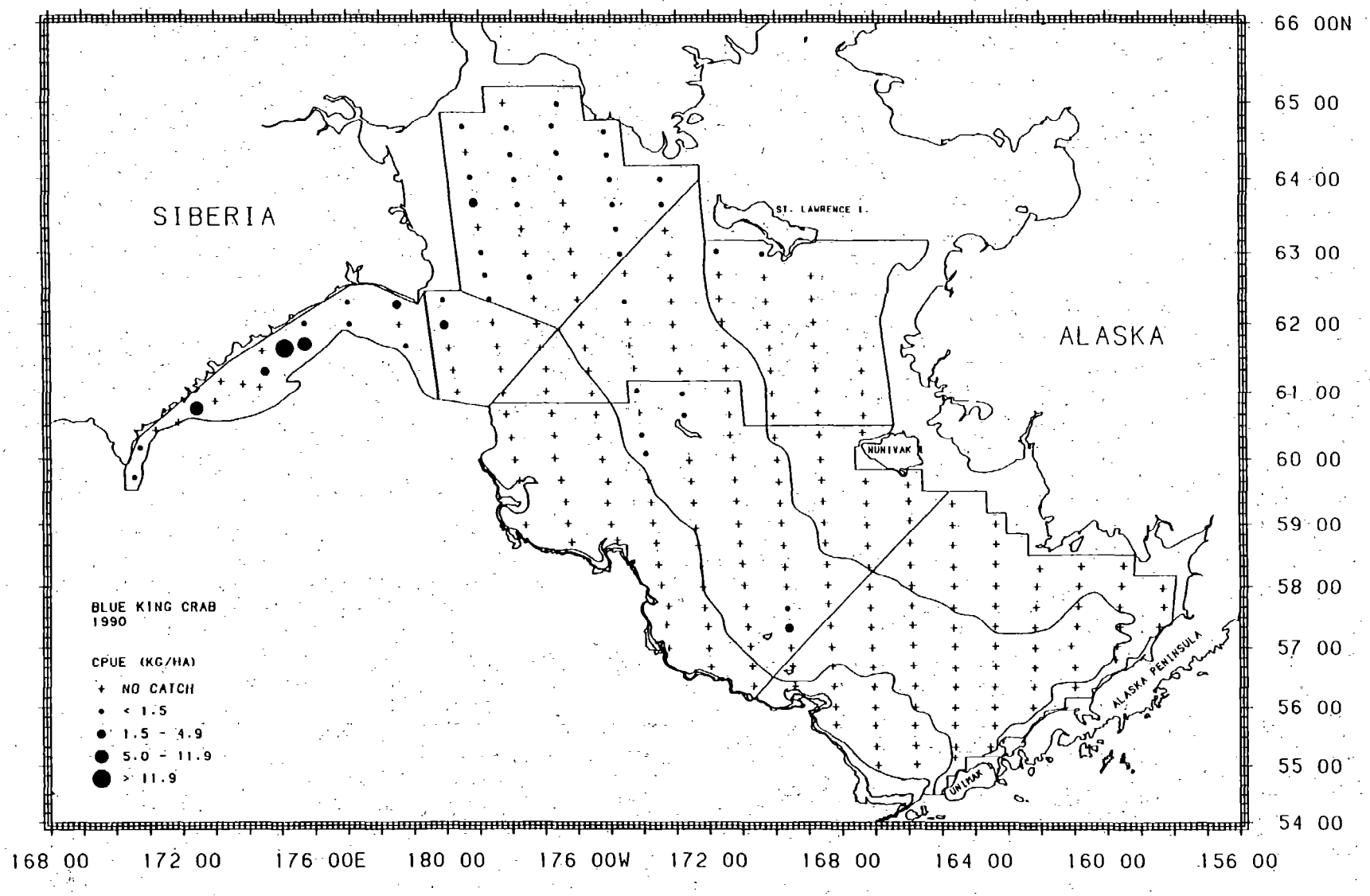


Figure 44. --Distribution and relative abundance in kg/ha of blue king crab sampled during the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.

Table 21. --Abundance estimates and mean size of blue king crab by subarea from the 1990 cooperative U.S. -Russian bottom trawl survey of the Bering Sea shelf.[a,b]

Subarea	Depth (m) interval	Mean CPUE (kg/ha)	Estimated biomass (t)	Proportion of estimated biomass	Estimated population numbers	Proportion of estimated population	Mean Weight (kg)
Standard U.S. shelf							
1	< 50	0.00	0	0.000	0	0.000	-
2	< 50	0.00	0	0.000	0	0.000	-
3	50 - 100	0.00	0	0.000	0	0.000	-
4	50 - 100	0.17	1,811	0.107	1,504,531	0.060	1.204
5	100 - 200	0.00	0	0.000	0	0.000	-
6	100 - 200	0.00	0	0.000	0	0.000	-
Subareas combined		0.04	1,811	0.107	1,504,531	0.060	1.204
North shelf							
7	< 50	0.01	46	0.003	409,593	0.002	0.113
8	50 - 100	0.01	32	0.002	64,443	0.003	0.499
9	100 - 200	0.00	0	0.000	0	0.000	-
Subareas combined		0.01	79	0.005	474,036	0.019	0.166
Western shelf							
14	< 100	0.40	3,150	0.186	12,986,318	0.515	0.270
15	100 - 200	0.22	560	0.033	536,858	0.021	1.044
16	< 200	2.72	10,984	0.648	9,729,786	0.386	1.129
Subareas combined		0.98	15,054	0.889	23,252,961	0.922	0.647
All areas combined		0.22	16,943	1.000	25,231,528	1.000	0.672

[a]0 indicates fishing but no catch; - indicates no sample or insufficient data.
[b]Differences in totals and sums of biomass and population numbers by subarea are due to rounding.

DISCUSSION

The comparison of results from past U.S. and U.S.-Russian cooperative bottom trawl surveys of the standard U.S. shelf have revealed major differences in abundance estimates. For example, biomass estimates derived from U.S. data for most major fish species sampled in both 1988 and 1989 were significantly greater than estimates derived from data collected aboard Russian research vessels (Table 22). Biomass estimates from the

Table 22. --Biomass estimates (t) for major fish species from the standard U.S. shelf commonly fished during separate U.S. and, cooperative U.S.-Russian bottom trawl surveys conducted during 1988, 1989, and 1990.

	1988		1989		1990	
Species	U.S.	Cooperative U.S.-Russian	U.S.	Cooperative U.S.-Russian	U.S.	Cooperative U.S.-Russian
Walleye pollock	6,922,000	2,052,455	5,921,600	2,922,284	7,656,972	3,153,303
Pacific cod	959,500	531,407	962,500	794,960	744,337	656,577
Yellowfin sole	2,854,600	1,230,268	2,831,800	1,431,121	2,182,822	2,492,097
Rock sole	1,903,500	742,108	1,318,200	988,743	1,410,582	1,304,064
Hippoglossoides spp.	557,500	194,020	523,200	266,947	652,488	333,121
Alaska plaice	936,800	434,279	599,400	369,183	529,387	679,443
Greenland turbot	11,600	3,963	8,900	5,431	14,371	3,156
Atheresthes spp.	306,400	105,841	410,700	170,760	467,522	255,855
Pacific halibut	138,200	50,413	77,100	85,518	89,936	99,754

1988 and 1989 U.S.-Russian cooperative survey data were over 60% lower for many flatfish species when compared to independent U.S. survey estimates. These results most likely reflect a greater fishing efficiency by the U.S. standard 83-112 bottom trawl for

many bottom species relative to the efficiency of the several different Russian trawls used in the cooperative surveys. The Russian sampling net used in 1988 had a 69 m headrope and 85 m footrope with a reported horizontal opening of 29 m and a vertical opening of 5 m. The net used during the 1989 cooperative survey had a 35 m headrope and a reported 22 m horizontal and 12 m vertical opening. There is little information available to fully evaluate these net's bottom-tending characteristics or fishing efficiencies.

Discrepancies in within-year biomass estimates between U.S. and U.S.-Russian cooperative surveys may have also resulted from bias created by navigational equipment. Starting and ending positions aboard the Russian vessels in 1988 and 1989 were generated through a Russian satellite navigation system. This system updated the ship's position at irregular intervals that did not necessarily correspond to the actual beginning and ending times of the haul and resulted in imprecise distance-fished information. Comparisons between survey results are further complicated because the U.S.-Russian cooperative trawl surveys in 1988-1990 started about 2 weeks earlier than the independent U.S. survey. This difference in sampling time may have allowed some portion of the groundfish assemblage to move into or out of the survey area. Such movement may have accounted for some of the differences observed in biomass estimates and population parameters between the two surveys although it is extremely

unlikely to have created the magnitude of differences observed for many species during 1988 and 1989.

The comparison of estimates between the two 1990 surveys showed greater within-year consistency relative to comparisons of the surveys conducted in 1988 and 1989 (Table, 22). Reasons- for such an improvement include: 1) the Russian bottom trawl used during 1990 appears to have tended bottom much better than those used during earlier surveys and 2) the use of the Loran-C navigational system improved the precision of the haul distance actually transected. Percent differences in biomass estimates from the two 1990 surveys were much smaller- for some fish species, including Pacific cod(± 12%), yellowfin sole (± 12%), rock sole (± 8%), and Alaska plaice (+ 22%) than differences seen in earlier years.

Overall mean lengths of flatfish sampled in the standard U.S. shelf during both surveys conducted in 1990 were nearly identical for yellowfin sole, Alaska plaice, and Pacific halibut (Fig. 45). The mean length of rock sole was somewhat smaller (19.5 cm) from the independent U.S. survey compared to the cooperative Russian survey (22.9 cm). The greatest differences in size composition for any species were observed with walleye pollock with a mean length of 41.9 cm using the U.S. survey data and 27.0 cm using the cooperative survey data (Fig. 46). The Russian trawl was apparently much more efficient in capturing juvenile walleye pollock while the U.S. 83-112 trawl appeared more effective in sampling the-adult portion of the population.

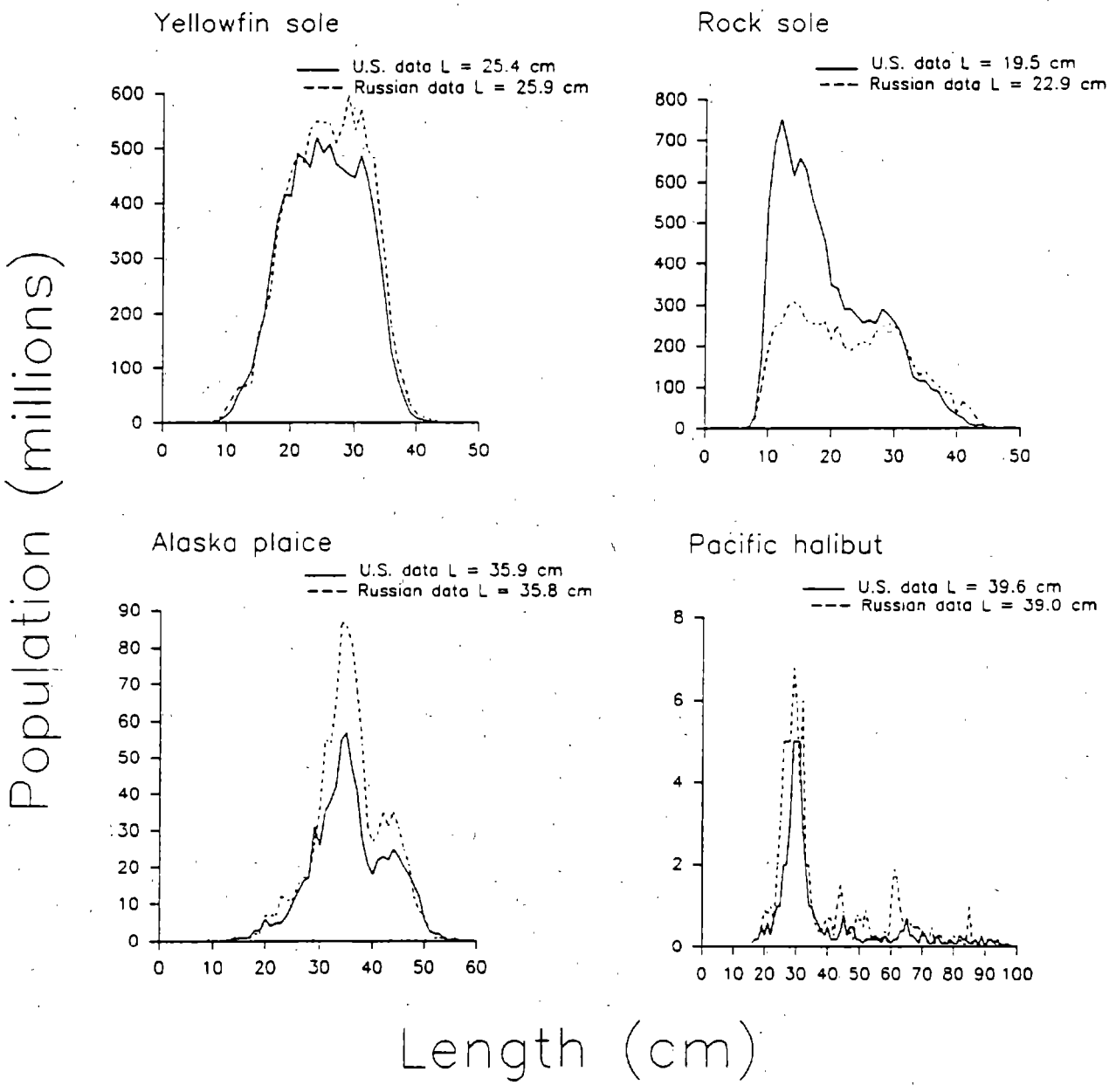


Figure 45. --Length composition of yellowfin sole, rock sole, Alaska plaice, and Pacific halibut during the 1990 independent US. bottom trawl survey and-the 1990 cooperative U.S.-Russian bottom trawl survey. Data is from the standard U.S. area commonly fished during both surveys.

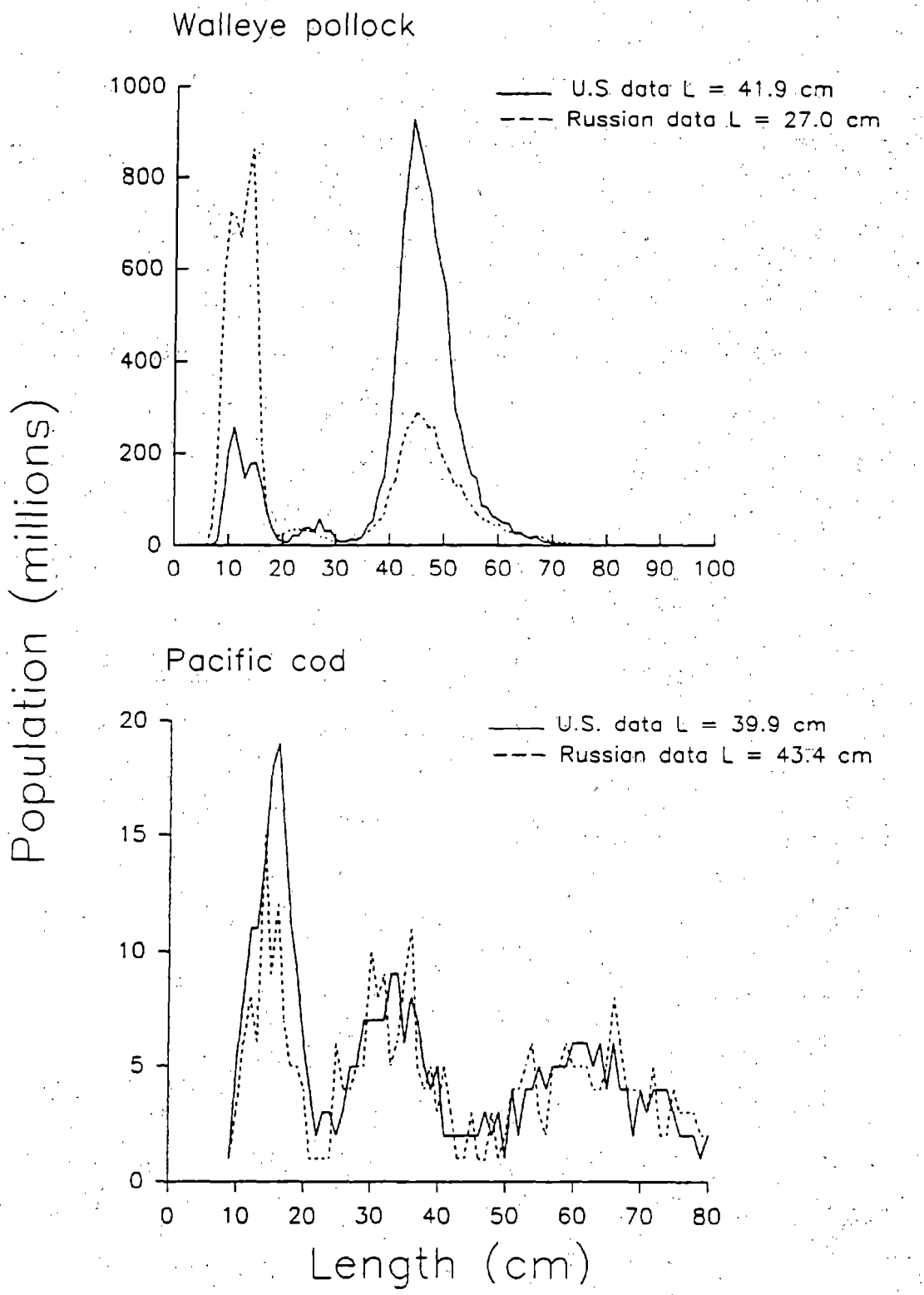


Figure 46.--Length composition of walleye pollock and Pacific cod during the 1990 independent U.S. -bottom trawl survey and the 1990 cooperative U.S.-Russian bottom trawl survey. Data is from the standard U.S. area commonly fished during both surveys.

The size distribution of Pacific cod was similar between data sets although the independent U.S. survey data indicated a somewhat smaller mean length of 39.9 cm compared to the cooperative survey estimate of 43.4 cm.

Information obtained during the 1990 cooperative U.S.-Russian survey has provided U.S. scientists the most complete set of contiguous data to assess the relative distribution, abundance, and biological characteristics of some groundfish and invertebrate species in both the eastern and western portions of the Bering Sea continental shelf. However, biomass and population estimates derived from the 1990 cooperative U.S.-Russian bottom trawl survey. should be considered in relative terms, not absolute terms. Potential bias due to survey timing, sampling density, differences in sampling trawls used between survey years, as well as bottom trawl efficiency can not be fully evaluated in the Russian data sets.

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APPENDIX A

Station, Haul, and Catch Data

Appendix A contains computer listings of stationand catch data for all successfully completed standard stations used in the analysis of the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf. The listing begins with haul number 51. Hauls 1 through 50 were made during an ichthyoplankton survey just prior to the beginning of the bottom trawl survey and are not listed here. Missing haul numbers indicate either unsatisfactory or comparative tows. Station locations by haul number are shown in Figure A-1.

Latitudes and logitudes are in degrees, minutes, and tenths of minutes. Gear depths are in fathoms and catch weights, are in kilograms. Tow duration is in tenths of hours. Distance fished is in nautical miles.

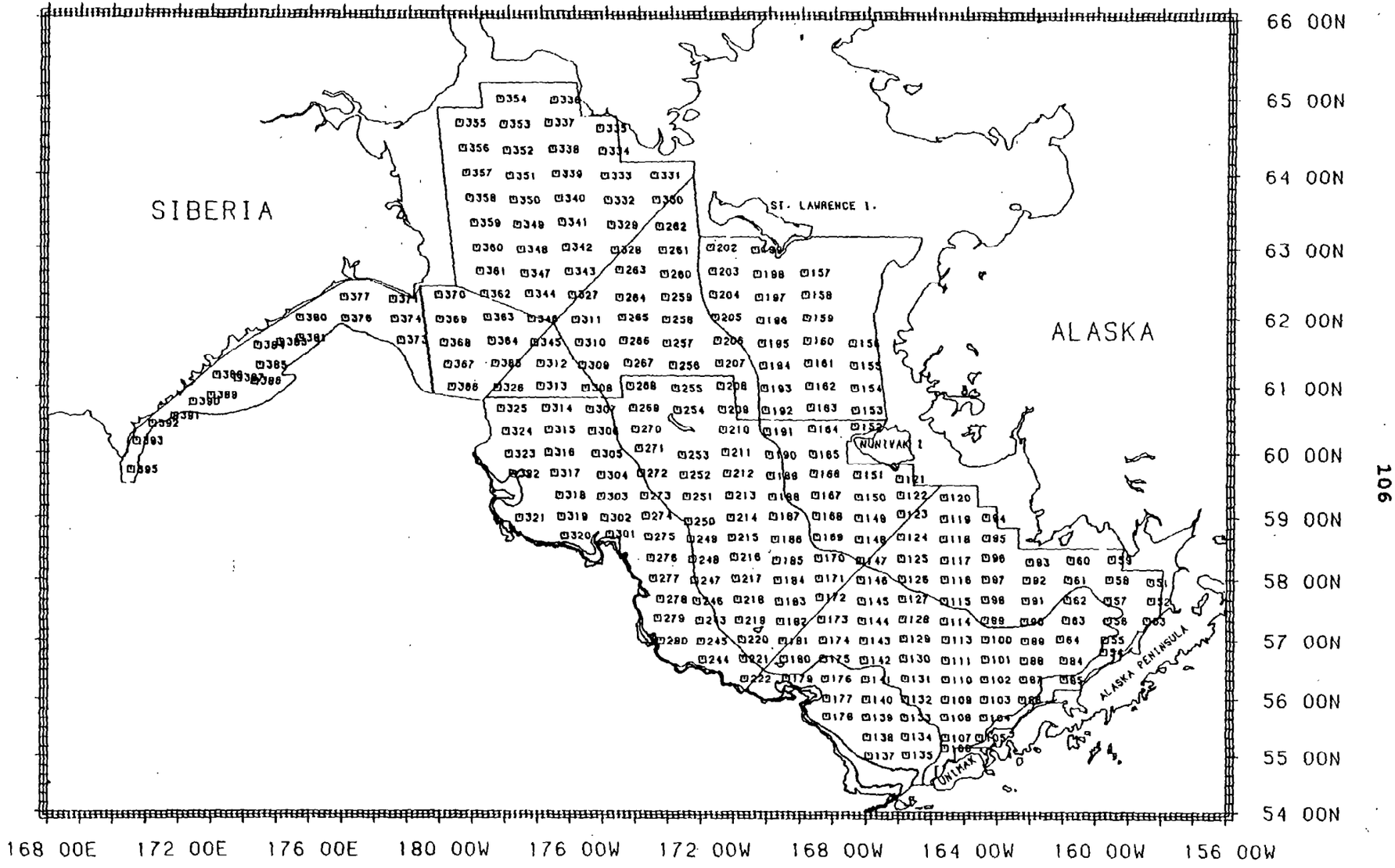

Figure A1.--Sampling sites by haul number from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Table A-l. --Continued.

HAUL No.	149	150	151	152	153	154	155	156	157	158	159
MONTH/DAY/YEAR	6/ 4/90	6/ 4/90	6/ 5/90	6/ 5/90	6/ 5/90	6/ 5/90	6/ 5/90	6/ 5/90	6/ 6/90	6/ 6/90	6/ 6/90
LATITUDE START	58 59.3	59 18.9	59 39.9	60 23.8	60 38.9	60 59.0	61 19.0	61 38.9	62 40.1	62 20.7	62 0.7
LONGITUDE START	167 14.7	167 15.3	167 17.5	167 22.1	167 20.6	167 22.5	167 24.0	167 26.1	168 54.7	168 52.8	168 50.2
LATITUDE END	59 0.8	59 20.4	59 40.8	60 24.6	60 40.4	61 0.5	61 20.5	61 40.6	62 38.7	62 19.2	61 59.2
LONGITUDE END	167 14.2	167 14.8	167 19.8	167 19.2	167 20.5	167 22.5	167 23.7	167 25.6	168 54.7	168 52.1	168 50.0
LORAN START	33495.00	33280.60	33049.00	32546.40	32366.60	32129.70	31892.90	31655.10	31016.40	31248.40	31488.00
LORAN START	48656.30	48578.30	48501.70	48341.00	48274.70	48204.50	48136.10	48071.90	48147.80	48212.10	48279.60
LORAN END	33477.70	33263.10	33042.70	32532.80	32348.70	32112.10	31874.80	31635.00	31034.10	31265.90	31506.10
LORAN END	48647.60	48569.40	48508.90	48325.40	48268.30	48198.90	48129.40	48064.60	48153.00	48215.70	48284.80
GEAR DEPTH	19	15	14	13	12	13	10	10	16	15	16
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.53	1.50	1.49	1.63	1.50	1.48	1.49	1.64	1.47	1.54	1.52
POLLOCK	83.8	196.4	56.4	29.3	26.5	21.4	1.1	29.1	26.5	67.5	139.8
PAC COD	80.0	217.2	0.0	0.7	0.0	0.7	31.1	41.9	0.0	0.0	0.0
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	32.2	99.0	13.4	0.9	0.0	71.7	14.3	20.9	33.1	232.1	450.0
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	34.8	43.2	81.6	55.8	86.0	19.0	39.5	47.8	61.7	223.1	109.6
EELPOUTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RNDFISH	47.0	62.0	68.1	59.3	50.9	58.4	45.4	87.3	16.5	120.6	43.4
TOT ROUNDFISH	277.8	617.7	219.6	145.9	163.4	171.1	131.4	227.1	137.8	643.3	742.7
YELLOW SOLE	1751.8	1984.4	2258.6	925.9	567.7	1032.9	582.0	378.1	23.1	398.8	132.1
ROCK SOLE	321.9	270.3	559.1	51.8	53.6	12.8	11.5	1.8	0.0	0.0	0.9
FLATHEAD SOLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALASKA PLAICE	271.2	289.7	565.0	95.5	63.9	33.1	68.3	104.7	55.1	944.5	518.1
GREENLAND TBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROWTOOTH FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HALIBUT	2.9	8.8	151.7	0.0	0.7	0.0	0.0	1.5	0.0	0.0	0.0
OTHER FLTFISH	11.5	7.3	48.5	4.4	55.1	24.3	28.7	11.0	0.2	4.6	1.3
TOT FLATFISH	2359.2	2560.5	3583.0	1077.6	741.0	1103.0	690.5	497.1	78.5	1347.9	652.4
SKATES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOT ELASMOBRH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RED KING CRAB	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, BAIRDI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, OPILIO	1.3	0.4	0.0	0.0	0.0	0.0	0.0	0.0	988.8	765.0	329.2
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	48.3	4.2	3.1	0.0	1.8	7.7	17.9	4.4	3.3	0.0	0.0
SNAILS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	326.3	0.0
SHRIMP	1.3	0.0	3.3	17.6	7.7	3.3	2.2	6.4	2.2	18.1	8.6
STARFISH	869.1	598.6	578.5	363.8	295.4	305.3	803.6	783.7	178.6	117.7	34.0
SQUID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCTOPUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER INVERTS	0.0	14.6	0.0	0.0	0.0	11.0	18.3	57.3	0.0	285.7	0.0
TOTAL INVERTS	924.6	617.7	584.9	381.4	304.9	327.4	841.9	851.9	1172.9	1512.8	371.7
EMPTY SHELLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	46.1	12.1	21.6	7.7	8.8	0.0	5.5	0.0	103.6	0.0	297.2
TOTAL CATCH	3607.7	3808.1	4409.0	1612.7	1218.1	1601.4	1669.3	1576.1	1492.8	3504.0	2064.0

Table A-1.--Continued.

Haul No.	160	161	162	163	164	165	166	167	168	169	170
MONTH/DAY/YEAR	6/ 6/90	6/ 6/90	6/ 6/90	6/ 6/90	6/ 6/90	6/ 7/90	6/ 7/90	6/ 7/90	6/ 7/90	6/ 7/90	6/ 7/90
LATITUDE START	61 40.9	61 21.1	61 1.1	60 41.1	60 21.5	59 59.0	59 40.9	59 20.9	59 1.2	58 41.3	58 21.2
LONGITUDE START	168 49.3	168 47.3	168 45.2	168 42.3	168 40.5	168 38.8	168 37.0	168 34.2	168 32.1	168 30.4	168 27.9
LATITUDE END	61 39.4	61 19.6	60 59.6	60 39.7	60 20.0	60 0.6	59 39.3	59 19.3	58 59.7	58 39.8	58 19.7
LONGITUDE END	168 49.2	168 47.2	168 45.3	168 42.0	168 39.9	168 39.4	168 36.7	168 34.1	168 32.0	168 30.2	168 27.6
LORAN START	31727.50	31966.20	32207.40	32446.20	32682.30	32951.50	33166.90	33401.90	33630.80	33858.20	34078.10
LORAN START	48354.50	48429.30	48507.80	18215.00	18276.10	18347.00	18406.10	18473.40	18538.00	18600.90	18660.70
LORAN END	31745.60	31984.40	32225.70	32463.80	32699.50	32934.10	33186.40	33420.90	33648.40	33874.90	34093.50
LORAN END	48360.30	48435.40	48514.80	18219.90	18281.60	18341.30	18411.70	18478.50	18542.80	18605.70	18664.90
GEAR DEPTH	20	19	16	17	17	18	19	20	25	29	33
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.30	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.50	1.51	1.50	1.49	1.51	1.54	1.67	1.61	1.52	1.52	1.49
POLLOCK	183.9	17.0	133.4	103.8	222.9	425.7	221.1	738.3	992.5	747.6	1890.9
PAC COD	0.4	0.4	0.0	107.8	144.4	82.5	363.1	203.5	466.3	300.3	1408.3
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	147.0	75.4	3.7	7.7	52.9	146.6	189.6	36.6	466.3	1013.2	122.4
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	118.4	101.0	145.5	61.1	89.5	50.5	108.5	55.6	32.6	23.1	684.8
EELPOUTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RNDFISH	52.2	21.8	15.7	20.1	44.8	82.2	33.5	69.0	55.6	25.6	6.4
TOT ROUNDFISH	502.0	215.6	298.3	300.5	554.5	787.5	915.8	1103.0	2013.3	2109.8	4112.7
YELLOW SOLE	160.5	598.1	1400.8	988.8	213.8	4276.8	11853.6	5201.8	3106.1	502.9	3952.9
ROCK SOLE	3.3	17.9	21.4	43.0	31.5	77.8	315.9	922.9	1202.0	852.1	2712.4
FLATHEAD SOLE	0.0	2.0	0.0	0.0	4.4	0.0	0.0	20.9	21.2	12.1	81.6
ALASKA PLAICE	862.9	524.5	331.1	249.8	463.0	1126.6	8152.5	1342.4	1033.8	363.3	3349.7
GREENLAND TBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROWTOOTH FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HALIBUT	0.0	0.0	0.0	0.0	15.7	70.5	25.6	20.9	6.6	27.8	21.2
OTHER FLTFISH	10.6	17.9	13.7	4.4	14.6	47.6	0.0	9.5	21.2	0.0	0.0
TOT FLATFISH	1037.3	1160.3	1767.0	1286.0	743.0	5599.3	20347.6	7518.4	5390.8	1758.2	10117.7
SKATES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOT ELASMOBRH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RED KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, BAIRDI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	1.5
TANNER, OPILIO	242.5	11.9	0.0	0.4	0.0	0.0	0.0	0.0	9.7	112.7	521.6
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	12.1	6.0	7.7	9.5	7.7	210.5	25.6	36.6	84.7	270.3	1515.9
SNAILS	0.0	63.5	0.0	0.0	0.0	0.0	0.0	0.0	28.9	0.0	0.0
SHRIMP	10.6	13.9	3.7	6.0	8.2	3.7	0.0	7.3	2.9	6.0	0.0
STARFISH	286.4	616.0	1876.6	982.6	293.2	714.3	858.7	534.8	567.5	446.7	57.1
SQUID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCTOPUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER INVERTS	923.5	302.0	0.9	220.7	77.2	0.0	0.0	0.0	0.0	776.9	559.3
TOTAL INVERTS	1475.1	1013.2	1888.9	1219.2	386.3	928.6	884.3	578.7	693.6	1623.7	2655.5
EMPTY SHELLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	547.6	270.3	205.5	0.0	0.0	0.0	98.8	419.5	19.2	120.2	0.0
TOTAL CATCH	3562.0	2659.4	4159.7	2805.6	1683.7	7315.4	22246.5	9619.7	8116.8	5611.9	16885.9

Table A-1. --Continued.

HAUL No.	182	183	184	185	186	187	188	189	190	191	192
MONTH/DAY/YEAR	6/11/90	6/11/90	6/11/90	6/11/90	6/13/90	6/13/90	6/13/90	6/13/90	6/13/90	6/13/90	6/13/90
LATITUDE START	57 18.9	57 38.6	57 59.4	58 18.9	58 39.1	59 1.1	59 19.4	59 39.1	59 58.6	60 18.9	60 38.6
LONGITUDE START	169 36.0	169 38.9	169 41.6	169 44.0	169 46.1	169 49.9	169 51.8	169 55.0	169 57.6	170 1.9	170 4.0
LATITUDE END	57 20.4	57 40.1	58 0.8	58 20.5	58 40.6	59 2.6	59 21.0	59 40.6	60 0.1	60 20.4	60 40.2
LONGITUDE END	169 35.9	169 39.0	169 41.6	169 43.8	169 46.6	169 49.8	169 51.7	169 55.0	169 58.1	170 2.1	170 4.0
LORAN START	34914.00	34720.10	34482.40	34250.50	34007.10	33743.00	33520.60	33283.00	33046.30	32802.70	32565.20
LORAN START	18749.40	18703.50	18626.90	18550.20	18471.60	18384.80	18317.80	18245.90	49063.00	48969.30	48876.50
LORAN END	34900.40	34703.50	34465.60	34230.50	33989.40	33724.20	33501.30	33264.70	33028.10	32784.80	32546.10
LORAN END	18748.10	18698.60	18621.80	18544.60	18465.00	18380.00	18312.80	49151.30	49055.50	48962.30	48868.80
GEAR DEPTH	33	37	36	36	34	32	31	32	27	26	25
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.49	1.50	1.41	1.64	1.52	1.53	1.57	1.50	1.53	1.51	1.57
POLLOCK	813.5	245.8	287.0	221.3	346.3	632.9	979.1	1401.7	611.8	277.3	645.7
PAC COD	259.3	130.1	181.4	323.2	7.7	132.3	72.1	81.6	80.0	119.9	34.8
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	0.0	0.0	4.9	39.5	18.5	9.9	159.0	11.0	6.2	13.7	142.0
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	164.5	6.8	17.4	43.0	32.8	15.2	26.7	0.0	36.4	40.3	93.0
EELPOUTS	0.0	1.5	0.4	0.7	20.1	65.7	117.9	63.9	33.3	0.0	12.1
OTHER RNDFISH	29.5	1.3	9.7	78.9	13.7	12.6	11.5	20.3	7.3	6.4	35.1
TOT ROUNDFISH	1266.8	385.6	500.9	706.6	439.2	868.6	1366.2	1578.5	774.9	457.7	962.8
YELLOW SOLE	286.2	191.8	423.3	729.3	210.5	626.1	987.7	972.2	1394.9	542.3	856.3
ROCK SOLE	4814.3	286.6	513.7	743.6	88.0	56.0	139.1	448.2	181.9	40.8	15.7
FLATHEAD SOLE	25.1	44.1	59.7	25.1	0.0	0.0	4.4	0.0	0.0	0.0	0.0
ALASKA PLAICE	102.7	116.4	1189.4	1052.7	403.9	1795.0	1308.4	2141.1	2947.4	1689.0	1426.2
GREENLAND TBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROWTOOTH FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HALIBUT	18.7	0.0	10.1	0.0	7.3	2.9	0.0	0.0	10.6	18.7	13.2
OTHER FLTFISH	0.0	0.0	0.0	0.0	17.2	8.6	20.9	30.2	9.0	1.8	6.2
TOT FLATFISH	5247.0	638.9	2196.3	2550.8	726.9	2488.6	2460.6	3591.8	4543.7	2292.6	2317.5
SKATES	17.9	48.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOT ELASMOBRH	17.9	48.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RED KING CRAB	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	91.3	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, BAIRDI	165.3	27.6	43.9	114.9	106.9	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, OPILIO	37.5	77.2	119.3	1105.0	1524.9	1674.2	89.7	20.3	6.6	7.3	105.2
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	163.6	19.4	17.4	0.0	0.0	0.7	0.0	0.7	3.1	0.9	4.9
SNAILS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHRIMP	0.0	0.0	0.0	0.0	0.0	2.0	1.8	0.7	1.8	0.9	1.5
STARFISH	536.4	1276.5	311.3	71.9	69.0	56.7	73.9	93.0	69.7	72.3	48.9
SQUID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCTOPUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER INVERTS	4.4	9.9	192.5	233.5	396.8	606.7	718.0	75.6	397.3	1187.0	1027.4
TOTAL INVERTS	998.5	1411.6	685.2	1525.2	2097.7	2340.2	883.4	190.3	478.4	1268.3	1187.9
EMPTY SHELLS	152.1	327.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	0.0	58.4	870.8	528.0	47.4	16.5	0.0	1152.6	321.4	0.0	0.0
TOTAL CATCH	7682.3	2870.9	4253.2	5310.5	3311.1	5714.0	4710.2	6513.1	6118.5	4018.6	4468.1

Table A-l. --Continued.

HAUL No.	217	218	219	220	221	222	243	244	245	246	247
MONTH/DAY/YEAR	6/17/90	6/17/90	6/17/90	6/17/90	6/17/90	6/17/90	6/19/90	6/20/90	6/20/90	6/20/90	6/20/90
LATITUDE START	58 0.9	57 40.5	57 20.0	57 0.9	56 40.9	56 20.8	57 20.0	56 40.0	56 58.8	57 39.0	57 59.1
LONGITUDE START	170 57.9	170 54.2	170 51.0	170 46.7	170 43.8	170 41.2	172 3.5	171 58.6	172 2.2	172 9.7	172 13.6
LATITUDE END	57 59.4	57 38.9	57 18.5	56 59.4	56 39.4	56 19.3	57 20.0	56 41.5	57 0.3	57 40.5	58 0.6
LONGITUDE END	170 57.8	170 54.2	170 51.2	170 46.7	170 43.7	170 41.2	172 6.3	171 58.2	172 2.0	172 9.7	172 13.3
LORAN START	49933.10	50049.20	50151.00	35089.50	50100.00	50015.10	50161.90	50167.10	50183.30	18030.00	17994.50
LORAN START	18376.90	18457.00	18518.40	18514.50	18405.60	18271.00	34781.40	34992.80	34910.50	34617.90	34426.40
LORAN END	49942.00	50058.40	50156.80	35094.20	50103.70	50008.60	50162.00	50169.30	50183.20	18030.00	17994.70
LORAN END	18382.20	18461.30	18518.40	18507.10	18395.70	18260.20	34774.80	34988.90	34903.40	34604.90	34412.50
GEAR DEPTH	46	45	44	50	61	65	59	69	63	57	56
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.49	1.59	1.55	1.51	1.50	1.46	1.51	1.52	1.55	1.52	1.50
POLLOCK	2377.5	9274.9	633.8	1636.7	3357.0	14709.7	4795.5	2442.3	2495.6	11196.9	6166.1
PAC COD	353.0	650.6	282.4	165.6	599.7	1179.5	0.0	766.1	1175.1	372.4	390.2
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	0.0	3.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	0.4	187.6	194.0	25.1	14.6	2.0	4.0	0.9	25.1	51.1	8.6
EELPOUTS	24.5	78.9	22.3	99.2	25.4	0.0	190.5	0.0	66.4	111.3	71.4
OTHER RNDFISH	9.5	7.7	6.6	11.2	17.4	0.0	48.5	1.8	4.0	3.3	3.3
TOT ROUNDFISH	2764.8	10203.0	1139.8	1937.9	4014.0	15891.2	5038.5	3211.0	3766.2	11735.0	6639.7
YELLOW SOLE	45.4	63.1	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROCK SOLE	177.3	765.4	73.4	36.4	0.0	0.0	189.2	0.0	34.8	254.6	340.6
FLATHEAD SOLE	131.0	147.5	81.8	163.1	378.5	646.8	275.6	71.9	290.8	275.8	334.0
ALASKA PLAICE	103.4	156.7	0.0	24.3	0.0	0.0	189.2	0.0	0.0	178.4	581.4
GREENLAND TBT	0.0	0.0	1.3	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROWTOOTH FL	0.0	27.3	16.5	173.7	882.3	654.8	348.6	105.4	620.4	79.6	39.9
PAC HALIBUT	258.8	26.5	10.8	212.5	19.4	517.6	0.0	8.8	561.7	0.0	41.4
OTHER FLTFISH	0.0	0.0	0.0	0.0	327.2	312.6	39.2	67.0	79.6	0.0	0.0
TOT FLATFISH	715.8	1186.5	186.1	646.4	1607.4	2131.9	1041.7	253.1	1587.3	788.4	1337.3
SKATES	114.6	11.7	104.7	209.4	455.0	0.0	2174.9	190.0	1424.2	376.6	863.8
TOT ELASMOBRH	114.6	11.7	104.7	209.4	455.0	0.0	2174.9	190.0	1424.2	376.6	863.8
RED KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, BAIRDI	31.1	181.0	460.5	65.3	27.1	135.6	94.6	30.6	19.8	23.4	0.0
TANNER, OPILIO	308.0	2237.0	541.5	1214.1	165.8	37.5	2342.4	33.1	265.9	1144.6	4913.7
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	0.0	15.9	6.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SNAILS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHRIMP	0.0	10.6	0.2	7.3	10.8	7.9	58.0	21.4	0.0	0.0	33.3
STARFISH	2605.9	733.7	681.7	685.4	346.6	424.6	20.3	161.4	1493.6	21.2	112.9
SQUID	0.0	0.0	0.0	0.0	0.0	4.0	0.0	2.9	0.0	0.0	0.0
OCTOPUS	0.0	15.9	0.0	12.1	0.0	0.0	0.0	51.6	0.0	0.0	0.0
OTHER INVERTS	176.8	1757.1	143.5	96.1	94.6	271.4	301.2	37.9	59.5	334.0	194.2
TOTAL INVERTS	3121.8	4951.2	1833.4	2090.0	644.9	881.0	2816.4	338.9	1838.9	1523.2	5254.1
EMPTY SHELLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	438.9	83.1	1590.6	1143.5	262.1	117.9	452.6	87.5	410.1	307.5	157.9

Table A-l. --Continued.

HAUL No.	312	313	314	315	316	317	318	319	320	321	322
MONTH/DAY/YEAR	6/28/90	6/28/90	6/29/90	6/29/90	6/29/90	6/29/90	6/29/90	6/29/90	6/29/90	6/30/90	6/30/90
LATITUDE START	61 20.6	61 0.8	60 40.6	60 20.6	60 0.5	59 41.2	59 20.7	59 0.6	58 42.2	58 59.1	59 40.6
LONGITUDE START	176 57.9	176 57.9	176 47.7	176 42.8	176 43.1	176 31.6	176 22.9	176 18.9	176 12.5	177 35.8	177 47.6
LATITUDE END	61 19.0	60 59.2	60 39.1	60 19.0	59 59.0	59 39.7	59 19.3	58 59.1	58 40.7	59 0.6	59 41.8
LONGITUDE END	176 57.9	176 57.9	176 47.7	176 42.8	176 43.0	176 31.5	176 22.8	176 18.8	176 12.1	177 36.0	177 44.6
LORAN START	16593.40	16584.50	16615.20	16624.30	16608.30	16645.00	16668.00	16664.70	16673.10	16261.50	16282.10
LORAN START	32276.70	32454.50	32637.20	32817.70	32995.10	33171.20	33354.10	33525.80	33681.10	33446.60	33114.50
LORAN END	16593.00	16583.70	16614.50	16623.10	16607.50	16644.20	16666.50	16663.30	16673.20	16264.00	16298.70
LORAN END	32290.90	32468.60	32650.30	32832.00	33008.40	33184.30	33366.60	33538.30	33693.40	33435.20	33107.60
GEAR DEPTH	63	66	70	74	77	74	74	74	75	73	104
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.59	1.58	1.46	1.61	1.52	1.51	1.48	1.52	1.51	1.51	1.96
POLLOCK	723.1	9429.2	9031.3	3002.0	3148.9	7835.5	1344.8	1599.0	16150.0	63.1	45864.0
PAC COD	571.9	763.9	583.3	210.3	227.5	281.5	47.4	77.2	775.6	267.9	83.3
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	32.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	28.7	26.0	13.9	23.4	11.9	36.2	0.2	6.4	0.0	21.6	0.0
EELPOUTS	43.0	60.0	44.1	50.5	95.2	135.6	4.4	0.4	0.0	2.4	0.0
OTHER RNDFISH	4.4	1.8	11.0	1.1	1.8	1.3	0.2	7.7	2.9	13.9	0.0
TOT ROUNDFISH	1371.1	10280.9	9683.6	3319.5	3485.3	8290.1	1397.1	1690.7	16928.5	368.8	45947.4
YELLOW SOLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROCK SOLE	12.1	10.1	17.6	9.7	0.0	6.4	0.0	3.1	679.5	401.2	8.8
FLATHEAD SOLE	0.0	0.0	31.3	22.5	107.8	55.6	3.3	298.1	960.3	98.1	13.9
ALASKA PLAICE	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GREENLAND TBT	7.3	19.8	70.1	26.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ARROWTOOTH FL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	459.4	95.5	38.6
PAC HALIBUT	0.0	0.0	0.0	0.0	0.0	0.0	15.9	0.0	0.0	15.2	15.2
OTHER FLTFISH	177.7	23.6	0.0	3.3	18.3	0.0	0.2	11.9	81.4	20.9	0.0
TOT FLATFISH	200.0	53.6	119.1	62.4	126.1	62.0	19.4	326.1	2180.6	631.0	76.5
SKATES	126.1	23.6	5.5	107.4	59.5	267.2	0.0	114.6	251.1	135.6	93.3
TOT ELASMOBRH	126.1	23.6	5.5	107.4	59.5	267.2	0.0	114.6	251.1	135.6	93.3
RED KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, BAIRDI	0.0	0.0	9.3	0.0	0.9	23.1	0.7	0.7	2.9	19.4	0.0
TANNER, OPILIO	656.8	370.8	225.8	3136.1	485.2	105.8	0.0	3.5	0.0	0.0	0.0
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	0.0	4.0	0.0	0.0	0.9	7.7	0.4	0.2	0.0	0.0	5.3
SNAILS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHRIMP	9.9	10.4	17.6	2.9	10.4	7.7	0.7	3.3	0.0	0.4	11.5
STARFISH	1543.7	2127.2	2539.7	233.2	6869.8	6867.0	187.0	54.9	73.9	0.0	0.0
SQUID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCTOPUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.4
OTHER INVERTS	12.6	47.4	0.0	7.5	0.0	0.0	0.0	3.3	29.5	32.2	11.5
TOTAL INVERTS	2222.9	2559.8	2792.4	3379.7	7367.2	7011.4	188.7	65.9	106.3	52.0	62.6
EMPTY SHELLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	147.0	410.3	327.2	546.3	286.4	202.8	2.2	47.2	375.2	70.5	1.3
TOTAL CATCH	4067.1	13328.1	12927.7	7415.3	11324.5	15833.4	1607.4	2244.5	19841.7	1258.0	46181.0

Table A-1.--Continued.

HAUL No.	323	324	325	326	327	328	329	330	331	332	333
MONTH/DAY/YEAR	6/30/90	6/30/90	6/30/90	6/30/90	7/ 1/90	7/ 1/90	7/ 1/90	7/ 1/90	7/ 1/90	7/ 2/90	7/ 2/90
LATITUDE START	59 59.0	60 19.0	60 40.1	60 59.2	62 20.4	62 58.9	63 19.2	63 39.8	63 59.6	63 39.4	63 59.2
LONGITUDE START	177 55.8	178 1.8	178 10.8	178 17.0	176 0.3	174 43.2	174 49.9	173 26.8	173 30.2	174 55.7	175 1.8
LATITUDE END	60 0.5	60 20.5	60 41.6	61 0.7	62 21.6	63 0.2	63 20.7	63 40.5	63 58.7	63 40.9	64 0.8
LONGITUDE END	177 55.9	178 1.8	178 10.9	178 16.7	175 58.5	174 41.2	174 49.9	173 23.7	173 33.2	174 56.1	175 2.0
LORAN START	16274.20	16277.90	16270.90	16268.40	16797.50	17009.00	16974.70	17169.40	17138.80	16944.60	16915.50
LORAN START	32960.90	32794.10	32614.80	32457.20	31705.90	31274.10	31094.20	30784.00	30610.70	30922.60	30763.40
LORAN END	16276.10	16280.00	16271.10	16271.40	16803.00	17013.60	16973.50	17176.00	17132.70	16942.60	16914.20
LORAN END	32948.70	32781.80	32604.60	32444.90	31694.30	31260.00	31080.50	30772.20	30623.70	30910.30	30751.10
GEAR DEPTH	77	83	89	87	47	41	43	33	30	45	42
DURATION IN HOURS	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
DISTANCE FISHED	1.51	1.50	1.50	1.50	1.40	1.55	1.52	1.55	1.59	1.49	1.52
POLLOCK	5995.9	1831.6	5375.8	24686.1	0.9	0.4	0.0	2.2	0.9	0.4	5.7
PAC COD	248.9	586.0	554.9	0.0	0.0	0.0	0.0	0.0	35.5	0.4	0.4
PAC OC PERCH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER RCKFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SABLEFISH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HERRING	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.2	0.2
ATKA MACKEREL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SCULPINS	15.2	3.3	84.4	110.5	15.7	16.8	0.0	8.4	6.8	0.4	6.6
EELPOUTS	67.7	43.2	49.8	69.4	6.2	7.1	5.7	4.6	2.2	11.2	7.1
OTHER RNDFISH	8.2	2.4	1.1	4.2	24.7	159.0	57.3	65.9	25.4	26.9	43.2
TOT ROUNDFISH	6335.9	2466.5	6066.0	24870.2	47.4	183.6	63.1	81.1	70.8	39.7	63.3
YELLOW SOLE	0.0	0.0	0.0	0.0	0.7	1.3	0.0	0.0	0.0	0.0	0.9
ROCK SOLE	52.5	130.1	110.9	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0
FLATHEAD SOLE	89.9	40.6	172.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALASKA PLAICE	0.0	0.0	0.0	0.0	3.3	0.0	0.0	2.0	0.0	0.7	5.5
GREENLAND TBT	17.2	15.4	27.8	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0
ARROWTOOTH FL	0.0	26.7	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PAC HALIBUT	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER FLTFISH	66.4	28.9	76.5	0.0	37.7	38.6	22.9	26.2	0.0	73.6	88.4
TOT FLATFISH	226.0	252.7	402.6	0.0	42.1	39.9	22.9	28.4	0.0	74.5	94.8
SKATES	760.2	586.0	214.1	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
TOT ELASMOBRH	760.2	586.0	214.1	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
RED KING CRAB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLUE KING CRAB	0.0	0.0	0.0	0.0	0.0	0.4	3.3	30.9	24.9	12.8	11.0
TANNER, BAIRDI	4.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TANNER, OPILIO	1.3	7.7	3094.2	625.2	491.2	379.6	285.3	199.5	9.9	141.3	145.9
TANNER, HYBRID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER CRAB	4.2	0.4	0.0	8.4	0.0	0.0	0.0	75.2	71.7	0.4	2.9
SNAILS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SHRIMP	37.3	24.5	44.3	53.1	0.7	7.9	11.5	9.0	15.0	0.0	1.8
STARFISH	4168.5	918.9	76.5	159.4	12.3	14.6	1460.3	1283.8	58.0	0.0	0.0
SQUID	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OCTOPUS	0.0	25.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER INVERTS	320.3	322.5	145.3	69.4	277.6	105.6	0.0	662.3	3872.4	308.9	145.3
TOTAL INVERTS	4537.1	1301.2	3360.3	915.6	781.8	508.2	1760.4	2260.6	4051.9	463.4	306.9
EMPTY SHELLS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OTHER	366.2	209.4	77.6	670.2	6.4	19.4	313.7	249.6	0.0	61.5	29.8
TOTAL CATCH	12225.3	4815.8	10120.6	26456.0	878.3	751.1	2160.1	2619.8	4122.7	639.1	494.7

APPENDIX B

Abundance Estimates for Principal Fish Species

Appendix B presents estimates of population size in terms of number of individuals and. biomass estimates in metric tons with confidence intervals for the principal species of fish sampled during the 1990 cooperative-survey. Estimates are given by subarea, standard U.S. area (SA), north shelf (NS), western shelf (WS), and for all areas combined.

List of Tables

Table B-1.-- CPUE, population, and biomass 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
1	31	28	28	22	15.57	.221474E+02	33.04	.786899E+02
2	16	15	15	11	12.84	.966964E+01	104.31	.117065E+04
3	36	36	36	34	45.30	.455943E+03	87.72	.833967E+03
4	36	36	36	30	31.25	.945094E+02	196.79	.260660E+04
5	13	13	13	10	14.67	.227048E+02	43.52	.372619E+03
6	37	37	37	34	223.91	.186936E+04	607.53	.113258E+05
7	23	22	22	14	3.33	.142808E+01	31.44	.207108E+03
8	17	17	17	5	0.91	.297069E+00	95.94	.338975E+04
9	4	4	4	3	268.30	.298991E+05	400.02	.688774E+05
14	34	32	32	16	10.03	.372108E+02	31.58	.732839E+02
15	10	10	10	9	49.11	.166656E+03	270.44	.306725E+05
16	19	19	19	10	110.41	.248124E+04	204.13	.870521E+04
SA	169	165	165	141	68.05	.106562E+03	207.71	.667869E+03
NS	44	43	43	22	24.20	.203365E+03	87.54	.106274E+04
WS	63	61	61	35	42.93	.188020E+03	116.80	.147973E+04
TOTAL	276	269	269	198	54.82	.546090E+02	166.99	.347372E+03

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	257,264,495	.477169517E+16	30.00	116,208,327	398,320,664
2	427,970,954	.197046335E+17	15.00	128,835,678	727,106,229
3	908,058,590	.893639593E+17	35.00	300,765,936	1,515,351,244
4	2,117,600,756	.301822710E+18	35.00	1,001,527,289	3,233,674,224
5	168,816,073	.560736443E+16	12.00	5,647,460	331,984,685
6	5,744,973,845	.101275659E+19	36.00	3,702,670,753	7,787,276,936
7	228,963,698	.109844829E+17	22.00	11,594,221	446,333,176
8	537,427,861	.106374047E+18	16.00	0	1,228,866,590
9	462,741,394	.921701735E+17	3.00	0	1,428,781,991
14	276,685,514	.562465794E+16	33.00	124,012,656	429,358,372
15	693,607,192	.201758564E+18	9.00	0	1,709,642,007
16	823,859,705	.141793476E+18	18.00	32,718,186	1,615,001,223
SA	9,624,684,713	.143402695E+19	65.59	7,232,062,443	12,017,306,982
NS	1,229,132,953	.209528703E+18	12.39	231,710,839	2,226,555,067
WS	1,794,152,411	.349176697E+18	21.61	568,601,439	3,019,703,382
TOTAL	12,647,970,076	.199273235E+19	97.96	9,842,567,427	15,453,372,725

Table B-1.--Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	121,223	.134300360E+10	30.00	46,389	196,056
2	52,661	.162761408E+09	15.00	25,474	79,848
3	468,900	.488566801E+11	35.00	19,866	917,933
4	336,263	.109434171E+11	35.00	123,747	548,780
5	56,906	.341674117E+09	12.00	16,628	97,183
6	2,117,351	.167159228E+12	36.00	1,287,629	2,947,073
7	24,270	.757417188E+08	22.00	6,220	42,320
8	5,106	.932233611E+07	16.00	0	11,579
9	310,367	.400103369E+11	3.00	0	946,849
14	87,836	.285599189E+10	33.00	0	196,627
15	125,943	.109623415E+10	9.00	51,049	200,836
16	445,613	.404153049E+11	18.00	23,237	867,989
SA	3,153,303	.228806764E+12	61.75	2,196,947	4,109,659
NS	339,743	.400954009E+11	3.01	0	976,901
WS	659,392	.443675309E+11	21.60	222,533	1,096,251
TOTAL	4,152,438	.313269696E+12	66.64	3,034,334	5,270,542

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	3,427,517	4,877,358	10,824,740,683	14,471,199,470
90.000 PERCENT	3,218,019	5,086,856	10,300,739,275	14,995,200,877
95.000 PERCENT	3,034,334	5,270,542	9,842,567,42 7	15,453,372,725

Table B-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
1	31	24	24	12	8.09	.128743E+02	6.28	.339944E+01
2	16	14	14	8	6.32	.205931E+01	7.66	.489417E+01
3	36	34	34	28	16.61	.132898E+02	11.30	.926279E+01
4	36	33	33	14	10.14	.740759E+01	8.21	.251714E+01
5	13	13	13	9	13.24	.230970E+02	3.60	.147062E+01
6	37	36	36	24	24.87	.370951E+02	8.94	.430413E+01
7	23	12	12	0	0.42	.549030E-01	0.94	.173558E+00
8	17	6	6	1	0.64	.344905E+00	0.53	.184832E+00
9	4	3	3	3	19.43	.536010E+02	10.53	.331143E+02
14	34	19	19	6	5.69	.857582E+01	3.75	.404237E+01
15	10	10	10	5	32.76	.248699E+03	12.54	.452326E+02
16	19	19	19	12	45.69	.380221E+03	27.53	.110761E+03
SA	169	154	154	95	14.17	.314917E+01	8.29	.921934E+00
NS	44	21	21	4	2.07	.433470E+00	1.57	.300863E+00
WS	63	48	48	23	20.72	.359672E+02	11.47	.102211E+02
TOTAL	276	223	223	122	13.25	.267311E+01	7.69	.775856E+00

STRATUM	POPULATION	VARIANCE POPULATION	EFF:DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATIGN LOWER	UPPER
1	48,879,959	.206139668E+15	30.00	19,561,812	78,198,107
2	31,445,275	.823796780E+14	15.00	12,103,626	50,786,924
3	116,954,242	.992557247E+15	35.00	52,952,086	180,956,399
4	88,346,090	.291464326E+15	35.00	53,663,659	123,028,521
5	13,965,970	.221306150E+14	12.00	3,715,259	24,216,680
6	84,564,584	.384876978E+15	36.00	44,751,243	124,377,925
7	6,828,117	.920510942E+13	22.00	535,617	13,120,617
8	2,968,116	.580021598E+13	16.00	0	8,073,847
9	12,179,321	.443128260E+14	3.00	0	33,361,220
14	32,889,420	.310258386E+15	33.00	0	68,746,551
15	32,163,215	.297532081E+15	9.00	0	71,180,721
16	111,090,835	.180411672E+16	18.00	21,851,080	200,330,590
SA	384,156,121	.197954851E+16	107.07	295,868,929	472,443,312
NS	21,975,554	.593181514E+14	5.33	2,174,155	41,776,954
WS	176,143,470	.241190719E+16	30.05	75,858,457	276,428,483
TOTAL	582,275,145	.445077385E+16	85.82	449,425,093	715,125,197

Table B-2. --Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	62,959	.780688420E+09	30.00	5,904	120,014
2	25,947	.346627362E+08	15.00	13,401	38,493
3	171,928	.142407295E+10	35.00	95,265	248,590
4	109,084	.857738569E+09	35.00	49,587	168,581
5	51,378	.347576639E+09	12.00	10,754	92,002
6	235,153	.331706004E+10	36.00	118,272	352,034
7	3,071	.291191653E+07	22.00	0	6,610
8	3,579	.108234729E+08	16.00	0	10,553
9	22,477	.717275717E+08	3.00	0	49,426
14	49,840	.658208139E+09	33.00	0	102,067
15	84,019	.163589464E+10	9.00	0	175,509
16	184,386	.619318023E+10	18.00	19,044	349,728
SA	656,450	.676179936E+10	110.16	493,360	819,539
NS	29,127	.854629612E+08	4.24	3,464	54,790
WS	318,245	.848728301E+10	29.51	130,122	506,367
TOTAL	1,003,821	.153345453E+11	82.27	757,064	1,250,579

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	843,652	1,163,991	496,016,011	668,534,279
90.000 PERCENT	797,487	1,210,155	471,171,673	693,378,617
95.000 PERCENT	757,064	1,250,579	449,425,093	715,125,197

Table B-3. --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
1	31	31	31	31	147.94	.801907E+03	652.19	.134792E+05
2	16	16	16	16	114.70	.829264E+03	560.12	.131832E+05
3	36	35	35	28	62.04	.205712E+03	210.37	.277119E+04
4	36	34	34	17	15.25	.247701E+02	51.02	.283803E+03
5	13	0	0	0	0.00	0.	0.00	0.
6	37	1	1	0	0.02	.231421E-03	0.04	.157736E-02
7	23	19	19	17	14.73	.149908E+02	71.24	.293149E+03
8	17	12	12	0	0.10	.126851E-02	0.49	.275251E-01
9	4	0	0	0	0.00	0.	0.00	0.
14	34	7	7	0	0.01	.161300E-04	0.04	.236763E-03
15	10	0	0	0	0.00	0.	0.00	0.
16	19	3	3	1	0.48	.112084E+00	1.15	.699229E+00
SA	169	117	117	92	52.42	.407498E+02	218.05	.637621E+03
NS	44	31	31	17	7.68	.403284E+01	37.14	.788636E+02
WS	63	10	10	1	0.13	.774197E-02	0.33	.483423E-01
TOTAL	276	158	158	110	33.52	.153913E+02	140.35	.241370E+03

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	5,078,690,402	.817367379E+18	30.00	3,232,551,438	6,924,829,365
2	2,298,018,285	.221901515E+18	15.00	1,294,180,396	3,301,856,174
3	2,177,661,186	.296948176E+18	35.00	1,070,636,878	3,284,685,495
4	549,014,387	.328620762E+17	35.00	180,746,096	917,282,677
5	0	0.	0.00	0	0
6	375,564	.141048196E+12	36.00	0	1,137,733
7	518,828,663	.155478776E+17	22.00	260,219,263	777,438,064
8	2,722,029	.863767226E+12	16.00	751,720	4,692,337
9	0	0.	0.00	0	0
14	375,671	.181719606E+11	33.00	101,252	650,091
15	0	0.	0.00	0	0
16	4,634,988	.113892907E+14	18.00	0	11,725,447
SA	10,103,759,823	.136907929E+19	66.70	7,766,336,770	12,441,182,877
NS	521,550,692	.155487413E+17	22.00	262,934,108	780,167,276
WS	5,010,659	.114074626E+14	18.06	0	12,106,773
TOTAL	10,630,321,175	.138463944E+19	68.20	8,280,044,998	12,980,597,351

Table B-3. --Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	1,152,022	.486269982E+11	30.00	701,730	1,602,314
2	470,576	.139583427E+11	15.00	218,808	722,343
3	642,252	.220430910E+11	35.00	340,637	943,867
4	164,104	.286817740E+10	35.00	55,306	272,901
5	0	0.	0.00	0	0
6	144	.206937060E+05	36.00	0	436
7	107,290	.795073478E+09	22.00	48,809	165,771
8	574	.398073296E+05	16.00	151	997
9	0	0.	0.00	0	0
14	93	.123800185E+04	33.00	22	165
15	0	0.	0.00	0	0
16	1,954	.182565699E+07	18.00	0	4,793
SA	2,429,097	.874966300E+11	72.27	1,838,684	3,019,510
NS	107,864	.795113285E+09	22.00	49,382	166,346
WS	2,047	.182689499E+07	18.02	0	4,887
TOTAL	2,539,008	.882935702E+11	73.58	1,946,110	3,131,906

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	2,154,397	2,923,619	9,106,407,122	12,154,235,227
90.000 PERCENT	2,043,385	3,034,632	8,666,083,351	12,594,558,998
95.000 PERCENT	1,946,110	3,131,906	8,280,044,998	12,980,597,351

Table B-4. --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
1	31	31	31	31	59.77	.718725E+02	431.75	.509307E+04
2	16	16	16	15	22.52	.242922E+02	164.57	.600761E+03
3	36	35	35	29	27.15	.356972E+02	147.98	.924848E+03
4	36	32	32	16	37.33	.541145E+03	90.18	.154159E+04
5	13	5	5	0	0.47	.830543E-01	0.62	.136784E+00
6	37	32	32	4	6.51	.224263E+01	13.28	.974797E+01
7	23	13	13	5	0.36	.188517E-01	13.75	.312714E+02
8	17	3	3	0	0.04	.852645E-03	0.15	.105251E-01
9	4	3	3	0	0.42	.412266E-01	1.15	.242575E+00
14	34	4	3	0	0.04	.590503E-03	0.00	0.
15	10	7	7	0	0.91	.135777E+00	2.48	.105188E+01
16	19	16	16	3	4.20	.107692E+01	14.71	.322232E+02
SA	169	151	151	95	28.14	.332784E+02	143.89	.278242E+03
NS	44	19	19	5	0.24	.548679E-02	7.29	.841557E+01
WS	63	27	26	3	1.27	.783130E-01	4.28	.225357E+01
TOTAL	276	197	196	103	17.52	.124593E+02	90.25	.104526E+03

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	3,362,061,975	.308839843E+18	30.00	2,227,253,948	4,496,870,002
2	675,184,771	.101121406E+17	15.00	460,893,243	889,476,298
3	1,531,869,480	.991023758E+17	35.00	892,342,517	2,171,396,443
4	970,449,138	.178503495E+18	35.00	112,147,012	1,828,751,263
5	2,423,319	.205839804E+13	12.00	0	5,549,556
6	125,613,473	.871667190E+15	36.00	65,697,447	185,529,500
7	100,136,361	.165855790E+16	22.00	15,671,890	184,600,833
8	865,296	.330289121E+12	16.00	0	2,083,676
9	1,326,928	.324607998E+12	3.00	0	3,139,853
14	767,073	0.	0.00	0	0
15	6,372,482	.691905665E+13	9.00	422,495	12,322,469
16	59,356,139	.524862886E+15	18.00	11,222,468	107,489,810
SA	6,667,602,156	.597431580E+18	81.54	5,127,396,395	8,207,807,917
NS	102,328,585	.165921279E+16	22.02	17,847,440	186,809,731
WS	66,495,694	.531781942E+15	18.47	18,045,799	114,945,590
TOTAL	6,836,426,436	.599622574E+18	82.14	5,293,399,017	8,379,453,855

Table B-4.--Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	465,448	.435829159E+10	30.00	330,640	600,255
2	92,400	.408890988E+09	15.00	49,309	135,491
3	281,050	.382514069E+10	35.00	155,406	406,693
4	401,740	.626601746E+11	35.00	0	910,266
5	1,834	.124984467E+07	12.00	0	4,270
6	61,592	.200537025E+09	36.00	32,854	90,331
7	2,656	.999848799E+06	22.00	582	4,730
8	232	.267568923E+05	16.00	0	579
9	488	.551684863E+05	3.00	0	1,236
14	309	.453220153E+05	33.00	0	742
15	2,333	.893118870E+06	9.00	196	4,471
16	16,934	.175413138E+08	18.00	8,134	25,733
SA	1,304,064	.714542847E+11	45.09	765,235	1,842,893
NS	3,377	.108177418E+07	25.17	1,234	5,519
WS	19,576	.184797547E+08	19.87	10,608	28,543
TOTAL	1,327,016	.714738462E+11	45.11	788,114	1,865,919

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	979,132	1,674,900	5,834,852,449	7,838,000,423
90.000 PERCENT	877,675	1,776,358	5,546,173,649	8,126,679,222
95.000 PERCENT	788,114	1,865,919	5,293,399,017	8,379,453,855

Table B-5. --CPUE, population, and biomass estimates for Alaska plaice.

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
1	31	26	26	18	15.40	.844330E+01	33.36	.322086E+02
2	16	16	16	13	43.87	.401799E+03	80.57	.867656E+03
3	36	30	30	15	11.92	.713946E+01	16.23	.162389E+02
4	36	32	32	15	22.20	.362976E+02	26.22	.616109E+02
5	13	0	0	0	0.00	0.	0.00	0.
6	37	11	11	0	1.82	.494807E+00	0.97	.152668E+00
7	23	20	20	16	13.62	.108997E+02	24.78	.357590E+02
8	17	11	11	0	0.26	.547614E-02	0.53	.294319E-01
9	4	1	1	0	0.02	.535734E-03	0.08	.616302E-02
14	34	22	22	2	1.73	.302493E+00	2.30	.578047E+00
15	10	9	9	0	3.86	.229709E+01	2.25	.596664E+00
16	19	6	6	2	6.66	.283856E+02	11.29	.981651E+02
SA	169	115	115	61	14.66	.572261E+01	22.65	.118507E+02
NS	44	32	32	16	7.17	.293298E+01	13.07	.962418E+01
WS	63	37	37	4	3.38	.212178E+01	4.65	.698063E+01
TOTAL	276	184	184	81	10.99	.233001E+01	17.22	.505355E+01

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	259,751,376	.195310283E+16	30.00	169,507,386	349,995,367
2	330,547,521	.146045669E+17	15.00	73,017,543	588,077,499
3	167,981,449	.174008819E+16	35.00	83,238,718	252,724,180
4	282,185,161	.713404807E+16	35.00	110,597,979	453,772,343
5	0	0.	0.00	0	0
6	9,143,602	.136515992E+14	36.00	1,645,361	16,641,844
7	180,448,861	.189657042E+16	22.00	90,126,925	270,770,797
8	2,995,922	.923602973E+12	16.00	958,512	5,033,333
9	90,814	.824721331E+10	3.00	0	379,785
14	20,136,618	.443660564E+14	33.00	6,577,258	33,695,978
15	5,761,983	.392474828E+13	9.00	1,280,740	10,243,226
16	45,582,534	.159894865E+16	18.00	0	129,594,918
SA	1,049,609,109	.254454576E+17	40.75	727,394,111	1,371,824,107
NS	183,535,597	.189750227E+16	22.02	93,191,475	273,879,720
WS	71,481,135	.164723946E+16	19.10	0	156,428,047
TOTAL	1,304,625,842	.289901993E+17	51.90	962,665,444	1,646,586,239

Table B-5.--Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	119,938	.511995279E+09	30.00	73,733	166,143
2	179,990	.676316017E+10	15.00	4,740	355,240
3	123,402	.765031293E+09	35.00	67,212	179,591
4	238,904	.420297206E+10	35.00	107,201	370,607
5	0	0.	0.00	0	0
6	17,209	.442457836E+08	36.00	3,710	30,708
7	99,209	.578092823E+09	22.00	49,343	149,075
8	1,456	.171847027E+06	16.00	577	2,335
9	27	.716906495E+03	3.00	0	112
14	15,150	.232168178E+08	33.00	5,341	24,959
15	9,908	.151098531E+08	9.00	1,116	18,701
16	26,875	.462355426E+09	18.00	0	72,052
SA	679,443	.122874046E+11	42.18	455,651	903,235
NS	100,692	.578265387E+09	22.01	50,818	150,565
WS	51,934	.500682097E+09	21.03	5,392	98,476
TOTAL	832,069	.133663521E+11	49.54	599,629	1,064,508

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	681,830	982,308	1,083,485,549	1,525,766,134
90.000 PERCENT	638,128	1,026,009	1,019,227,505	1,590,024,178
95.000 PERCENT	599,629	1,064,508	962,665,444	1,646,586,239

Table B-6.--CPUE, population, and biomass estimates for Hippoglossoides spp.

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
1	31	14	14	1	1.54	.335173E+00	5.36	.585746E+01
2	16	7	7	0	0.28	.995759E-02	0.39	.185625E-01
3	36	36	36	21	15.21	.219956E+02	41.29	.909121E+02
4	36	36	36	5	2.52	.190742E+00	9.78	.395319E+01
5	13	13	13	11	12.99	.116913E+02	81.30	.536901E+03
6	37	37	37	11	9.00	.255134E+01	37.74	.470820E+02
7	23	10	10	0	0.07	.108343E-02	1.07	.173588E+00
8	17	16	16	0	0.73	.923750E-01	10.54	.655746E+01
9	4	3	3	1	2.83	.206124E+01	17.47	.651478E+02
14	34	32	32	6	2.73	.346783E+00	39.69	.941226E+02
15	10	9	9	2	2.37	.674968E+00	18.74	.609327E+02
16	19	6	6	0	0.10	.657005E-02	0.68	.264556E+00
SA	169	143	143	49	7.19	.130572E+01	26.94	.106394E+02
NS	44	29	29	1	0.56	.289846E-01	6.20	.153259E+01
WS	63	47	47	8	1.98	.132062E+00	25.94	.323307E+02
TOTAL	276	219	219	58	4.90	.495150E+00	22.89	.536485E+01

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	41,706,006	.355191619E+15	30.00	3,221,395	80,190,616
2	1,589,928	.312447944E+12	15.00	398,762	2,781,094
3	427,386,603	.974170891E+16	35.00	226,877,358	627,895,848
4	105,211,385	.457747196E+15	35.00	61,747,387	148,675,383
5	315,395,416	.807957481E+16	12.00	119,532,831	511,258,002
6	356,875,926	.421008944E+16	36.00	225,197,897	488,553,954
7	7,798,964	.920666177E+13	22.00	1,505,934	14,091,995
8	59,044,292	.205779903E+15	16.00	28,632,827	89,455,756
9	20,211,382	.871792601E+14	3.00	0	49,921,663
14	347,702,926	.722405663E+16	33.00	174,679,723	520,726,129
15	48,050,335	.400804707E+15	9.00	2,764,852	93,335,819
16	2,735,704	.430918081E+13	18.00	0	7,097,079
SA	1,248,165,263	.228446244E+17	60.30	945,876,498	1,550,454,029
NS	87,054,638	.302165825E+15	17.61	50,533,128	123,576,148
WS	398,488,966	.762917051E+16	36.39	221,230,773	575,747,158
TOTAL	1,733,708,867	.307759608E+17	92.33	1 1,384,718,556	2,082,699,178

Table B-6.--Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	11,998	.203246370E+08	30.00	2,792	21,204
2	1,136	.167608236E+06	15.00	263	2,008
3	157,412	.235693998E+10	35.00	58,786	256,038
4	27,070	.220864155E+08	35.00	17,523	36,617
5	50,380	.175937368E+09	12.00	21,477	79,283
6	85,126	.228142014E+09	36.00	54,473	115,779
7	515	.574626189E+05	22.00	18	1,012
8	4,114	.289882344E+07	16.00	505	7,724
9	3,269	.275830838E+07	3.00	0	8,553
14	23,925	.266161658E+08	33.00	13,423	34,428
15	6,069	.443981932E+07	9.00	1,303	10,835
16	386	.107015270E+06	18.00	0	1,074
SA	333,121	.280359802E+10	48.29	226,555	439,686
NS	7,898	.571459444E+07	10.67	2,636	13,160
WS	30,381	.311630004E+08	41.05	19,104	41,657
TOTAL	371,399	.284047562E+10	49.56	264,247	478,551

	CONFIDENCE LIMITS			
	TOTAL BIOMASS (T)		TOTAL POPULATION	
	LOWER	UPPER	LOWER	UPPER
80.000 PERCENT	302,141	440,658	1,507,005,510	1,960,412,224
90.000 PERCENT	281,995	460,803	1,441,780,343	2,025,637,391
95.000 PERCENT	264,247	478,551	1,384,718,556	2,082,699,178

Table B-7. --CPUE, population, and biomass estimates for Atheresthes spp.

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
1	31	2	2	0	0.02	.300722E-03	0.37	.122464E+00
2	16	0	0	0	0.00	0.	0.00	0.
3	36	22	22	6	3.37	.210783E+01	10.52	.167193E+02
4	36	6	6	1	0.22	.292838E-01	0.88	.293904E+00
5	13	13	13	12	31.85	.411114E+02	76.12	.276498E+03
6	37	30	30	10	10.04	.602874E+01	21.80	.349952E+02
7	23	0	0	0	0.00	0.	0.00	0.
8	17	0	0	0	0.00	0.	0.00	0.
9	4	0	0	0	0.00	0.	0.00	0.
14	34	0	0	0	0.00	0.	0.00	0.
15	10	1	1	0	0.77	.596453E+00	0.61	.377886E+00
16	19	3	3	0	0.10	.408667E-02	0.21	.237272E-01
SA	169	73	73	29	5.52	.645982E+00	13.44	.424894E+01
NS	44	0	0	0	0.00	0.	0.00	0.
WS	63	4	4	0	0.15	.169084E-01	0.16	.121715E-01
TOTAL	276	77	77	29	3.41	.242482E+00	8.25	.159085E+01

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	2,881,564	.742615154E+13	30.00	0	8,446,211
2	0	0.	0.00	0	0
3	108,937,669	.179155747E+16	35.00	22,950,788	194,924,551
4	9,419,137	.340317168E+14	35.00	0	21,270,239
5	295,268,820	.416088562E+16	12.00	154,712,584	435,825,056
6	206,138,305	.312928419E+16	36.00	92,613,658	319,662,952
7	0	0.	0.00	0	0
8	0	0.	0.00	0	0
9	0	0.	0.00	0	0
14	0	0.	0.00	0	0
15	1,576,600	.248566783E+13	9.00	0	5,142,869
16	835,128	.386476404E+12	18.00	0	2,141,261
SA	622,645,495	.912318515E+16	46.07	430,210,687	815,080,303
NS	0	0.	0.00	0	0
WS	2,411,728	.287214423E+13	11.87	0	6,104,567
TOTAL	625,057,223	.912605729E+16	46.10	432,592,126	817,522,320

Table B-7. --Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	142	.182355531E+05	30.00	0	418
2	0	0.	0.00	0	0
3	34,843	.225865540E+09	35.00	4,312	65,374
4	2,406	.339082948E+07	35.00	0	6,146
5	123,565	.618665803E+09	12.00	69,367	177,763
6	94,899	.539092316E+09	36.00	47,780	142,019
7	0	0.	0.00	0	0
8	0	0.	0.00	0	0
9	0	0.	0.00	0	0
14	0	0.	0.00	0	0
15	1,981	.392336106E+07	9.00	0	6,461
16	386	.665650905E+05	18.00	0	929
SA	255,855	.138703272E+10	46.44	180,822	330,888
NS	0	0.	0.00	0	0
WS	2,367	.398992615E+07	9.31	0	6,886
TOTAL	258,222	.139102265E+10	46.71	183,120	333,324

CONFIDENCE LIMITS

	TOTAL BIOMASS (T) LOWER	TOTAL BIOMASS (T) UPPER	TOTAL POPULATION LOWER	TOTAL POPULATION UPPER
80.000 PERCENT	209,716	306,728	500,781,726	749,332,720
90.000 PERCENT	195,585	320,860	464,556,598	785,557,848
95.000 PERCENT	183,120	333,324	432,592,126	817,522,320

Table B-8. --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
1	31	27	27	25	.07	.152668E+00	4.75	.139706E+01
2	16	14	14	14	.48	.246141E+00	4.25	.258139E+01
3	36	33	33	30	.36	.617949E+00	1.88	.265751E+00
4	36	21	21	21	.89	.118952E+00	0.54	.177754E-01
5	13	11	11	11	.24	.229829E+00	0.79	.548346E-01
6	37	19	19	18	.59	.815250E+00	0.39	.216334E-01
7	23	4	4	4	.03	.577027E-03	0.11	.744755E-02
8	17	0	0	0	.00	0.	0.00	0.
9	4	1	1	1	.04	.184040E-02	0.04	.184816E-02
14	34	3	3	2	.14	.911047E-02	0.02	.886402E-04
15	10	4	4	4	.62	.293651E+00	0.17	.778980E-02
16	19	13	13	11	.50	.385188E+00	0.32	.102278E-01
SA	169	125	125	119	.15	.790573E-01	1.87	.751975E-01
NS	44	5	5	5	.02	.167716E-03	0.06	.201599E-02
WS	63	20	20	17	.58	.377370E-01	0.12	.951964E-03
TOTAL	276	150	150	141	.44	.311487E-01	1.18	.282543E-01

POPULATION

STRATUM	POPULATION	VARIANCE POPULATION	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - POPULATION LOWER	UPPER
1	36,974,614	.847165428E+14	30.00	18,179,721	55,769,507
2	17,442,420	.434505677E+14	15.00	3,395,498	31,489,342
3	19,495,396	.284766629E+14	35.00	8,654,595	30,336,197
4	5,818,456	.205824252E+13	35.00	2,903,949	8,732,963
5	3,061,369	.825180434E+12	12.00	1,081,978	5,040,761
6	3,732,210	.193446592E+13	36.00	909,618	6,554,803
7	832,603	.394999256E+12	22.00	0	2,136,091
8	0	0.	0.00	0	0
9	49,731	.247316044E+10	3.00	0	207,975
14	146,862	.680327773E+10	33.00	0	314,770
15	432,488	.512399214E+11	9.00	0	944,519
16	1,310,770	.166594481E+12	18.00	453,226	2,168,314
SA	86,524,466	.161461662E+15	67.10	61,140,602	111,908,330
NS	882,334	.397472417E+12	22.27	0	2,189,896
WS	1,890,119	.224637680E+12	27.50	917,554	2,862,684
TOTAL	89,296,920	.162083772E+15	67.61	63,868,444	114,725,395

Table B-8. --Continued.

BIOMASS

STRATUM	BIOMASS MT	VARIANCE BIOMASS	EFF. DEG. FREEDOM	95% CONFIDENCE LIMITS - BIOMASS LOWER	UPPER
1	16,149	.925767514E+07	30.00	9,936	22,362
2	6,090	.414308865E+07	15.00	1,752	10,428
3	34,828	.662164858E+08	35.00	18,297	51,359
4	9,548	.137736501E+08	35.00	2,009	17,088
5	8,681	.345858173E+07	12.00	4,629	12,734
6	24,457	.728999332E+08	36.00	7,130	41,785
7	249	.306040575E+05	22.00	0	611
8	0	0.	0.00	0	0
9	50	.246278346E+04	3.00	0	208
14	1,215	.699242837E+06	33.00	0	2,918
15	1,594	.193158588E+07	9.00	0	4,738
16	6,038	.627407333E+07	18.00	775	11,300
SA	99,754	.169749415E+09	101.71	73,879	125,630
NS	298	.330668410E+05	24.52	0	673
WS	8,847	.890490205E+07	30.31	2,753	14,940
TOTAL	108,899	.178687384E+09	111.67	82,396	135,402

CONFIDENCE LIMITS

	TOTAL BIOMASS (T) LOWER	TOTAL BIOMASS (T) UPPER	TOTAL POPULATION LOWER	TOTAL POPULATION UPPER
80.000 PERCENT	91,656	126,142	72,809,151	105,784,689
90.000 PERCENT	86,713	131,085	68,045,131	110,548,708
95.000 PERCENT	82,396	135,402	63,868,444	114,725,395

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APPENDIX C

Population Estimates by Sex and Size Groups for Principal Fish Species

Appendix C presents population estimates for principal fish species by sex-centimeter interval. Estimates are given for the standard U.S. shelf area, north shelf area and, western shelf area.

Table C-l. --Population estimates by sex and size groups for Walleye pollock from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
60.0	0	0	293,365	293,365	0.00003	0.00003
70.0	0	0	42,066,392	42,066,392	0.00437	0.00440
80.0	0	0	195,497,542	195,497,542	0.02031	0.02471
90.0	0	0	587,946,561	587,946,561	0.06109	0.08580
100.0	0	0	720,951,230	720,951,230	0.07491	0.16071
110.0	0	0	714,175,596	714,175,596	0.07420	0.23491
120.0	0	0	666,348,474	666,348,474	0.06923	0.30414
130.0	0	0	770,289,120	770,289,120	0.08003	0.38418
140.0	608,508	141,776	860,985,065	861,735,349	0.08953	0.47371
150.0	1,416,383	674,482	563,296,874	565,387,738	0.05874	0.53245
160.0	1,452,878	1,401,106	217,356,980	220,210,965	0.02288	0.55533
170.0	579,779	1,141,026	72,058,322	73,779,126	0.00767	0.56300
180.0	3,169,371	4,469,660	31,011,573	38,650,604	0.00402	0.56701
190.0	6,862,984	6,944,608	6,057,876	19,865,469	0.00206	0.56908
200.0	12,832,487	10,195,502	992,111	24,020,100	0.00250	0.57157
210.0	16,523,925	15,383,214	0	31,907,139	0.00332	0.57489
220.0	18,160,204	16,715,664	62,172	34,938,041	0.00363	0.57852
230.0	21,078,223	14,764,348	0	35,842,571	0.00372	0.58224
240.0	18,386,734	13,713,588	0	32,100,322	0.00334	0.58558
250.0	16,453,808	15,005,409	0	31,459,218	0.00327	0.58885
260.0	18,632,990	12,872,829	0	31,505,819	0.00327	0.59212
270.0	12,089,069	7,560,461	0	19,649,530	0.00204	0.59416
280.0	9,245,367	8,914,602	0	18,159,969	0.00189	0.59605
290.0	6,141,784	5,225,377	0	11,367,161	0.00118	0.59723
300.0	4,845,616	4,491,223	0	9,336,839	0.00097	0.59820
310.0	3,764,208	5,696,134	0	9,460,343	0.00098	0.59918
320.0	5,271,235	4,150,325	0	9,421,561	0.00098	0.60016
330.0	6,846,224	3,708,019	0	10,554,243	0.00110	0.60126
340.0	6,701,120	6,903,786	0	13,604,905	0.00141	0.60267
350.0	9,348,469	14,106,345	0	23,454,814	0.00244	0.60511
360.0	12,827,055	16,905,956	0	29,733,011	0.00309	0.60820
370.0	18,956,272	22,024,649	0	40,980,920	0.00426	0.61246
380.0	31,504,872	21,728,325	0	53,233,197	0.00553	0.61799
390.0	36,318,274	29,869,982	0	66,188,256	0.00688	0.62486
400.0	70,258,731	49,834,500	0	120,093,231	0.01248	0.63734
410.0	75,029,841	67,086,647	0	142,116,488	0.01477	0.65211
420.0	105,165,823	95,169,263	0	200,335,086	0.02081	0.67292
430.0	127,482,959	124,655,746	0	252,138,706	0.02620	0.69912
440.0	140,187,927	123,391,148	0	263,579,075	0.02739	0.72650
450.0	135,930,161	152,790,972	0	288,721,133	0.03000	0.75650
460.0	131,267,993	146,482,380	0	277,750,373	0.02886	0.78536
470.0	128,920,048	125,309,875	0	254,229,922	0.02641	0.81178
480.0	134,399,635	122,898,115	0	257,297,751	0.02673	0.83851
490.0	97,799,315	115,709,609	0	213,508,925	0.02218	0.86069
500.0	87,414,495	96,172,671	0	183,587,166	0.01907	0.87977
510.0	79,050,430	82,798,418	0	161,848,848	0.01682	0.89658
520.0	71,235,938	59,560,319	0	130,796,257	0.01359	0.91017
530.0	77,093,781	56,336,991	0	133,430,772	0.01386	0.92404
540.0	55,273,880	48,030,908	0	103,304,788	0.01073	0.93477
550.0	43,733,792	46,180,746	60,613	89,975,151	0.00935	0.94412
560.0	35,374,772	35,129,785	121,227	70,625,784	0.00734	0.95146
570.0	26,734,038	31,813,857	0	58,547,894	0.00608	0.95754
580.0	24,690,239	30,321,393	0	55,011,632	0.00572	0.96325
590.0	18,833,129	25,039,492	0	43,872,622	0.00456	0.96781
600.0	25,220,650	23,461,379	0	48,682,029	0.00506	0.97287
610.0	13,683,418	22,962,922	0	36,646,340	0.00381	0.97668

Table C-1. --Continued.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
620.0	9,727,360	20,560,442	0	30,287,802	0.00315	0.97982
630.0	12,627,085	16,628,241	0	29,255,326	0.00304	0.98286
640.0	10,456,022	19,981,204	0	30,437,226	0.00316	0.98603
650.0	6,562,834	13,511,128	0	20,073,962	0.00209	0.98811
660.0	6,784,419	9,798,717	0	16,583,136	0.00172	0.98984
670.0	5,671,159	14,398,340	0	20,069,499	0.00209	0.99192
680.0	4,028,261	14,637,442	0	18,665,703	0.00194	0.99386
690.0	3,857,262	10,443,162	0	14,300,423	0.00149	0.99535
700.0	1,686,072	8,273,691	0	9,959,763	0.00103	0.99638
710.0	1,725,397	5,892,651	0	7,618,048	0.00079	0.99717
720.0	647,015	5,708,015	0	6,355,030	0.00066	0.99783
730.0	61,874	4,942,574	0	5,004,448	0.00052	0.99835
740.0	65,524	2,065,297	0	2,130,821	0.00022	0.99857
750.0	214,731	3,424,820	0	3,639,551	0.00038	0.99895
760.0	0	1,117,435	0	1,117,435	0.00012	0.99907
770.0	0	3,289,785	0	3,289,785	0.00034	0.99941
780.0	0	1,854,866	0	1,854,866	0.00019	0.99960
790.0	0	1,579,514	0	1,579,514	0.00016	0.99977
800.0	0	314,802	0	314,802	0.00003	0.99980
810.0	0	1,110,822	0	1,110,822	0.00012	0.99991
830.0	0	554,182	0	554,182	0.00006	0.99997
840.0	0	267,107	0	267,107	0.00003	1.00000
TOTAL	2,068,913,852	2,106,199,768	5,449,571,093	9,624,684,713		

North Shelf Area

60.0	0	0	6,562,961	6,562,961	0.00534	0.00534
70.0	0	0	100,457,225	100,457,225	0.08173	0.08707
80.0	0	0	228,621,678	228,621,678	0.18600	0.27307
90.0	0	0	264,824,964	264,824,964	0.21546	0.48853
100.0	0	0	118,376,447	118,376,447	0.09631	0.58484
110.0	0	0	37,073,069	37,073,069	0.03016	0.61500
120.0	0	0	11,754,593	11,754,593	0.00956	0.62456
130.0	0	0	9,722,382	9,722,382	0.00791	0.63247
140.0	0	0	3,796,790	3,796,790	0.00309	0.63556
150.0	0	0	413,171	413,171	0.00034	0.63590
160.0	0	0	680,932	680,932	0.00055	0.63645
170.0	0	0	136,186	136,186	0.00011	0.63656
180.0	0	0	181,582	181,582	0.00015	0.63671
190.0	363,932	363,164	0	727,096	0.00059	0.63730
200.0	453,955	680,932	0	1,134,887	0.00092	0.63823
210.0	0	590,141	0	590,141	0.00048	0.63871
240.0	184,656	0	0	184,656	0.00015	0.63886
250.0	2,180,614	0	0	2,180,614	0.00177	0.64063
290.0	46,164	0	0	46,164	0.00004	0.64067
330.0	0	2,134,450	0	2,134,450	0.00174	0.64240
340.0	2,134,450	92,328	0	2,226,778	0.00181	0.64422
350.0	0	2,134,450	0	2,134,450	0.00174	0.64595
370.0	2,134,450	0	0	2,134,450	0.00174	0.64769
380.0	2,134,450	6,449,515	0	8,583,965	0.00698	0.65467
390.0	2,316,032	4,268,901	0	6,584,933	0.00536	0.66003
400.0	13,850,799	10,672,252	0	24,523,050	0.01995	0.67998
410.0	8,946,361	17,302,580	0	26,248,941	0.02136	0.70134
420.0	8,537,801	26,203,546	0	34,741,347	0.02826	0.72960
430.0	6,857,306	24,659,237	0	31,516,543	0.02564	0.75524

Table C-l.--Continued.

North Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
440.0	16,529,995	22,662,510	0	39,192,505	0.03189	0.78713
450.0	14,757,847	17,075,603	0	31,833,450	0.02590	0.81303
460.0	9,308,663	18,210,490	0	27,519,153	0.02239	0.83542
470.0	9,445,618	22,523,925	0	31,969,543	0.02601	0.86143
480.0	10,354,296	16,120,574	0	26,474,870	0.02154	0.88297
490.0	14,216,175	11,261,531	0	25,477,706	0.02073	0.90370
500.0	5,994,698	10,308,132	0	16,302,831	0.01326	0.91696
510.0	5,177,486	3,949,408	0	9,126,894	0.00743	0.92438
520.0	6,810,955	9,127,081	0	15,938,036	0.01297	0.93735
530.0	4,721,132	7,582,772	0	12,303,904	0.01001	0.94736
540.0	5,586,814	3,996,434	0	9,583,248	0.00780	0.95516
550.0	1,411,871	7,631,335	0	9,043,207	0.00736	0.96252
560.0	2,636,875	4,091,068	0	6,727,943	0.00547	0.96799
570.0	1,454,961	1,909,685	0	3,364,646	0.00274	0.97073
580.0	817,887	7,456,521	0	8,274,408	0.00673	0.97746
590.0	163,852	2,726,804	0	2,890,656	0.00235	0.97981
600.0	802,350	1,467,202	0	2,269,552	0.00185	0.98166
610.0	1,072,530	1,424,056	0	2,496,587	0.00203	0.98369
620.0	1,385,068	1,011,441	0	2,396,509	0.00195	0.98564
630.0	502,425	511,573	0	1,013,998	0.00082	0.98646
640.0	571,177	189,211	0	760,388	0.00062	0.98708
650.0	491,411	758,882	0	1,250,293	0.00102	0.98810
660.0	126,643	631,427	0	758,070	0.00062	0.98872
670.0	541,047	878,551	0	1,419,598	0.00115	0.98987
680.0	235,375	210,016	0	445,391	0.00036	0.99023
690.0	189,211	526,170	0	715,382	0.00058	0.99081
700.0	527,507	3,803,153	0	4,330,660	0.00352	0.99434
710.0	368,155	678,819	0	1,046,975	0.00085	0.99519
720.0	0	2,401,722	0	2,401,722	0.00195	0.99714
730.0	437,574	682,291	0	1,119,865	0.00091	0.99806
740.0	73,292	473,119	0	546,410	0.00044	0.99850
760.0	0	237,412	0	237,412	0.00019	0.99869
770.0	81,225	380,089	0	461,314	0.00038	0.99907
780.0	0	71,524	0	71,524	0.00006	0.99913
790.0	0	456,353	0	456,353	0.00037	0.99950
800.0	0	237,412	0	237,412	0.00019	0.99969
840.0	0	380,089	0	380,089	0.00031	1.00000
TOTAL	166,935,088	279,595,885	782,601,980	1,229,132,953		

Western Shelf Area

10.0	0	0	292,798	292,798	0.00016	0.00016
60.0	0	0	365,997	365,997	0.00020	0.00037
70.0	0	0	402,391	402,391	0.00022	0.00059
80.0	0	0	7,506,146	7,506,146	0.00418	0.00478
90.0	0	0	28,985,161	28,985,161	0.01616	0.02093
100.0	0	0	43,812,061	43,812,061	0.02442	0.04535
110.0	0	0	79,352,226	79,352,226	0.04423	0.08958
120.0	0	0	66,984,832	66,984,832	0.03734	0.12691
130.0	0	0	61,299,799	61,299,799	0.03417	0.16108
140.0	0	0	68,388,290	68,388,290	0.03812	0.19920
150.0	0	0	63,232,197	63,232,197	0.03524	0.23444
160.0	0	0	37,871,426	37,871,426	0.02111	0.25555
170.0	43,726	89,729	11,915,614	12,049,068	0.00672	0.26226
180.0	716,340	1,155,984	14,298,622	16,170,946	0.00901	0.27128

Table C-1. --Continued.

Western shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
190.0	28,895,727	4,042,385	6,800,191	39,738,303	0.02215	0.29343
200.0	37,032,881	10,345,195	67,908	47,445,984	0.02644	0.31987
210.0	14,392,566	13,144,045	0	27,536,611	0.01535	0.33522
220.0	16,733,929	13,719,043	0	30,452,972	0.01697	0.35219
230.0	15,367,074	6,744,318	0	22,111,391	0.01232	0.36452
240.0	6,452,776	2,371,094	0	8,823,869	0.00492	0.36943
250.0	6,327,796	3,334,801	0	9,662,597	0.00539	0.37482
260.0	2,109,312	1,392,757	0	3,502,068	0.00195	0.37677
270.0	3,881,920	1,982,286	0	5,864,205	0.00327	0.38004
280.0	2,829,902	2,141,437	0	4,971,338	0.00277	0.38281
290.0	2,550,225	1,277,181	0	3,827,405	0.00213	0.38495
300.0	4,746,016	1,470,414	0	6,216,430	0.00346	0.38841
310.0	1,268,837	6,696,271	0	7,965,108	0.00444	0.39285
320.0	3,732,748	1,123,964	0	4,856,712	0.00271	0.39556
330.0	9,949,711	8,679,075	0	18,628,787	0.01038	0.40594
340.0	13,014,597	17,842,441	0	30,857,038	0.01720	0.42314
350.0	18,136,685	13,828,252	0	31,964,937	0.01782	0.44095
360.0	22,893,172	20,196,419	0	43,089,592	0.02402	0.46497
370.0	26,111,637	26,491,691	0	52,603,328	0.02932	0.49429
380.0	34,031,275	30,484,740	0	64,516,015	0.03596	0.53025
390.0	28,503,268	40,274,257	0	68,777,524	0.03833	0.56858
400.0	29,860,973	30,202,985	0	60,063,958	0.03348	0.60206
410.0	30,516,200	33,178,417	0	63,694,618	0.03550	0.63756
420.0	19,541,069	30,136,216	0	49,677,285	0.02769	0.66525
430.0	27,868,622	28,672,161	0	56,540,783	0.03151	0.69676
440.0	14,092,747	21,616,287	0	35,709,034	0.01990	0.71667
450.0	17,364,504	24,642,336	0	42,006,840	0.02341	0.74008
460.0	15,146,890	12,719,364	0	27,866,254	0.01553	0.75561
470.0	16,024,348	21,362,195	0	37,386,544	0.02084	0.77645
480.0	16,042,591	19,764,676	0	35,807,267	0.01996	0.79641
490.0	9,858,941	23,455,394	0	33,314,336	0.01857	0.81498
500.0	17,022,934	21,738,537	0	38,761,471	0.02160	0.83658
510.0	13,772,281	23,561,655	0	37,333,936	0.02081	0.85739
520.0	7,424,029	22,288,847	0	29,712,876	0.01656	0.87395
530.0	11,698,550	24,791,145	0	36,489,696	0.02034	0.89429
540.0	5,497,162	15,550,582	0	21,047,743	0.01173	0.90602
550.0	4,164,304	8,110,690	0	12,274,994	0.00684	0.91286
560.0	5,188,381	8,053,077	0	13,241,458	0.00738	0.92024
570.0	3,042,298	12,841,954	0	15,884,252	0.00885	0.92910
580.0	1,855,772	6,764,037	0	8,619,809	0.00480	0.93390
590.0	2,381,523	12,125,234	0	14,506,757	0.00809	0.94199
600.0	5,188,524	9,816,839	0	15,005,363	0.00836	0.95035
610.0	2,019,927	9,469,648	0	11,489,575	0.00640	0.95675
620.0	958,447	11,280,299	0	12,238,747	0.00682	0.96357
630.0	1,274,159	8,354,980	0	9,629,139	0.00537	0.96894
640.0	1,032,024	9,224,390	0	10,256,413	0.00572	0.97466
650.0	1,387,096	8,231,874	0	9,618,970	0.00536	0.98002
660.0	1,532,828	7,150,308	0	8,683,137	0.00484	0.98486
670.0	696,353	5,233,916	0	5,930,269	0.00331	0.98816
680.0	576,802	4,821,935	0	5,398,737	0.00301	0.99117
690.0	264,350	3,917,210	0	4,181,560	0.00233	0.99350
700.0	216,071	2,693,738	0	2,909,808	0.00162	0.99513
710.0	142,953	2,117,187	0	2,260,140	0.00126	0.99639
720.0	77,880	1,339,254	0	1,417,134	0.00079	0.99718
730.0	41,404	1,371,199	0	1,412,603	0.00079	0.99796
740.0	0	1,718,222	0	1,718,222	0.00096	0.99892
750.0	0	1,090,959	0	1,090,959	0.00061	0.99953
760.0	0	133,454	0	133,454	0.00007	0.99960
770.0	0	200,624	0	200,624	0.00011	0.99971

Table C-l. --Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
780.0	0	126,213	0	126,213	0.00007	0.99978
790.0	0	126,213	0	126,213	0.00007	0.99986
800.0	0	82,487	0	82,487	0.00005	0.99990
810.0	0	177,180	0	177,180	0.00010	1.00000
TOTAL	583,495,058	719,081,696	491,575,657	1,794,152,411		

Table C-2.--Population estimates by sex and size groups for Pacific cod from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
80.0	0	353,672	0	353,672	0.00092	0.00092
90.0	0	0	1,534,325	1,534,325	0.00399	0.00491
100.0	0	0	3,849,103	3,849,103	0.01002	0.01493
110.0	0	0	6,094,635	6,094,635	0.01586	0.03080
120.0	841,397	964,420	6,359,187	8,165,004	0.02125	0.05205
130.0	367,098	1,056,384	5,315,489	6,738,971	0.01754	0.06960
140.0	359,188	964,420	13,699,687	15,023,294	0.03911	0.10870
150.0	1,567,006	974,973	7,225,033	9,767,012	0.02542	0.13413
160.0	3,128,002	2,292,655	7,142,756	12,563,413	0.03270	0.16683
170.0	1,191,677	1,906,925	4,543,174	7,641,776	0.01989	0.18672
180.0	1,767,962	1,447,655	2,702,965	5,918,582	0.01541	0.20213
190.0	2,237,582	1,164,426	1,772,622	5,174,629	0.01347	0.21560
200.0	1,191,413	862,552	2,089,006	4,142,971	0.01078	0.22639
210.0	101,592	808,813	532,406	1,442,811	0.00376	0.23014
220.0	944,762	274,044	692,622	1,911,429	0.00498	0.23512
230.0	820,869	556,108	561,408	1,938,385	0.00505	0.24016
240.0	456,839	715,181	645,291	1,817,311	0.00473	0.24489
250.0	3,534,056	1,621,611	1,003,785	6,159,452	0.01603	0.26093
260.0	2,787,066	1,713,771	358,495	4,859,332	0.01265	0.27358
270.0	2,067,293	2,485,527	430,194	4,983,014	0.01297	0.28655
280.0	2,598,894	2,363,758	215,097	5,177,749	0.01348	0.30003
290.0	1,887,008	3,691,687	215,097	5,793,792	0.01508	0.31511
300.0	5,998,409	4,839,045	71,699	10,909,153	0.02840	0.34351
310.0	5,625,329	2,689,973	0	8,315,301	0.02165	0.36515
320.0	5,038,779	4,206,272	0	9,245,050	0.02407	0.38922
330.0	2,408,838	3,049,705	0	5,458,543	0.01421	0.40343
340.0	3,643,049	3,009,465	0	6,652,514	0.01732	0.42074
350.0	4,927,008	4,494,900	71,699	9,493,608	0.02471	0.44546
360.0	6,975,094	4,416,409	0	11,391,502	0.02965	0.47511
370.0	2,702,011	3,059,323	0	5,761,334	0.01500	0.49011
380.0	2,353,768	1,975,371	0	4,329,139	0.01127	0.50138
390.0	3,064,186	2,294,812	0	5,358,998	0.01395	0.51533
400.0	1,132,473	2,379,251	0	3,511,725	0.00914	0.52447
410.0	1,335,455	3,684,595	0	5,020,049	0.01307	0.53754
420.0	1,544,307	1,721,025	0	3,265,333	0.00850	0.54604
430.0	458,244	1,372,554	0	1,830,798	0.00477	0.55080
440.0	493,007	1,350,605	0	1,843,612	0.00480	0.55560
450.0	1,535,703	2,012,957	0	3,548,660	0.00924	0.56484
460.0	967,674	174,324	0	1,141,997	0.00297	0.56781
470.0	234,921	596,187	71,699	902,807	0.00235	0.57016
480.0	2,049,046	1,278,961	0	3,328,008	0.00866	0.57882
490.0	629,136	1,164,414	0	1,793,550	0.00467	0.58349
500.0	1,299,709	1,097,466	0	2,397,175	0.00624	0.58973
510.0	2,281,152	1,796,498	0	4,077,650	0.01061	0.60035
520.0	2,281,422	2,177,556	0	4,458,978	0.01161	0.61195
530.0	3,417,378	2,359,441	0	5,776,819	0.01504	0.62699
540.0	2,886,602	3,283,466	0	6,170,067	0.01606	0.64305
550.0	1,446,482	2,433,045	0	3,879,527	0.01010	0.65315
560.0	2,256,438	551,520	0	2,807,958	0.00731	0.66046
570.0	4,339,701	1,073,428	0	5,413,128	0.01409	0.67455
580.0	3,182,774	2,036,132	0	5,218,906	0.01359	0.68814
590.0	4,057,279	2,288,204	0	6,345,483	0.01652	0.70466
600.0	4,108,627	1,533,023	0	5,641,650	0.01469	0.71934
610.0	4,634,743	1,163,856	0	5,798,599	0.01509	0.73444
620.0	3,849,712	1,605,690	0	5,455,402	0.01420	0.74864
630.0	2,729,829	1,752,317	0	4,482,146	0.01167	0.76031

Table C-2. --Continued.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
640.0	2,468,068	2,257,381	0	4,725,449	0.01230	0.77261
650.0	1,906,180	3,436,442	0	5,342,621	0.01391	0.78651
660.0	4,476,244	3,800,489	0	8,276,733	0.02155	0.80806
670.0	3,978,667	2,229,881	0	6,208,548	0.01616	0.82422
680.0	3,766,098	913,924	0	4,680,022	0.01218	0.83640
690.0	3,077,987	1,576,331	0	4,654,318	0.01212	0.84852
700.0	2,351,796	2,400,736	0	4,752,533	0.01237	0.86089
710.0	1,779,637	1,951,562	0	3,731,199	0.00971	0.87060
720.0	3,320,498	2,037,301	0	5,357,798	0.01395	0.88455
730.0	654,176	1,421,169	0	2,075,346	0.00540	0.88995
740.0	1,799,691	750,765	0	2,550,456	0.00664	0.89659
750.0	816,876	3,369,113	0	4,185,988	0.01090	0.90749
760.0	2,223,547	1,113,293	0	3,336,840	0.00869	0.91617
770.0	2,341,975	1,527,339	0	3,869,314	0.01007	0.92625
780.0	1,382,429	1,981,139	0	3,363,569	0.00876	0.93500
790.0	942,040	1,396,691	108,005	2,446,736	0.00637	0.94137
800.0	1,209,225	1,209,682	0	2,418,907	0.00630	0.94767
810.0	895,926	576,148	0	1,472,074	0.00383	0.95150
820.0	1,311,741	1,962,991	0	3,274,732	0.00852	0.96002
830.0	860,671	395,628	0	1,256,299	0.00327	0.96329
840.0	142,136	47,271	0	189,406	0.00049	0.96379
850.0	52,971	388,104	0	441,075	0.00115	0.96494
860.0	552,835	838,122	0	1,390,957	0.00362	0.96856
870.0	48,994	1,426,135	0	1,475,128	0.00384	0.97240
880.0	515,922	600,161	0	1,116,083	0.00291	0.97530
890.0	487,210	2,457,575	0	2,944,785	0.00767	0.98297
900.0	270,791	293,496	0	564,286	0.00147	0.98444
910.0	964,754	280,784	0	1,245,538	0.00324	0.98768
920.0	490,219	427,091	0	917,310	0.00239	0.99007
930.0	120,038	785,807	0	905,845	0.00236	0.99242
940.0	615,814	129,486	0	745,300	0.00194	0.99436
950.0	0	52,971	0	52,971	0.00014	0.99450
960.0	48,994	421,994	0	470,988	0.00123	0.99573
970.0	0	48,994	0	48,994	0.00013	0.99586
980.0	0	50,844	0	50,844	0.00013	0.99599
990.0	0	180,296	0	180,296	0.00047	0.99646
1000.0	0	370,696	108,005	478,701	0.00125	0.99770
1010.0	0	150,413	0	150,413	0.00039	0.99809
1020.0	282,455	0	0	282,455	0.00074	0.99883
1040.0	0	44,932	0	44,932	0.00012	0.99895
1050.0	0	404,497	0	404,497	0.00105	1.00000
TOTAL	169,894,591	146,848,046	67,413,484	384,156,121		

North Shelf Area

170.0	0	86,200	0	86,200	0.00569	0.00569
190.0	162,518	0	0	162,518	0.01073	0.01642
220.0	86,200	141,339	0	227,539	0.01502	0.03144
230.0	0	202,277	0	202,277	0.01335	0.04480
240.0	70,669	86,200	0	156,870	0.01036	0.05515
250.0	329,270	0	0	329,270	0.02174	0.07689
260.0	470,609	45,407	0	516,016	0.03407	0.11096
270.0	703,947	313,739	0	1,017,686	0.06719	0.17814
280.0	380,325	572,340	0	952,665	0.06289	0.24103
290.0	602,216	243,070	0	845,286	0.05580	0.29684
300.0	344,801	431,001	0	775,802	0.05122	0.34805

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Table C-2. --Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
80.0	0	0	87,305	87,305	0.00050	0.00050
90.0	0	0	66,330	66,330	0.00038	0.00087
100.0	70,619	0	87,305	157,924	0.00090	0.00177
110.0	0	0	261,916	261,916	0.00149	0.00326
120.0	0	62,396	1,201,300	1,263,695	0.00717	0.01043
130.0	0	245,448	764,773	1,010,221	0.00574	0.01617
140.0	76,944	70,619	1,093,019	1,240,582	0.00704	0.02321
150.0	133,015	94,080	611,138	838,232	0.00476	0.02797
160.0	466,091	124,791	436,527	1,027,409	0.00583	0.03380
170.0	940,450	124,791	87,305	1,152,546	0.00654	0.04034
180.0	66,330	191,121	0	257,451	0.00146	0.04180
190.0	66,330	0	174,611	240,941	0.00137	0.04317
200.0	700,188	383,988	0	1,084,176	0.00616	0.04933
210.0	195,056	1,248,362	0	1,443,417	0.00819	0.05752
220.0	773,286	1,330,025	0	2,103,311	0.01194	0.06946
230.0	219,965	282,361	0	502,326	0.00285	0.07231
240.0	3,818,170	1,543,664	0	5,361,834	0.03044	0.10275
250.0	3,142,477	1,775,531	0	4,918,008	0.02792	0.13068
260.0	2,370,353	1,095,660	0	3,466,013	0.01968	0.15035
270.0	3,792,117	2,053,905	0	5,846,022	0.03319	0.18354
280.0	2,614,034	957,421	0	3,571,455	0.02028	0.20382
290.0	1,725,096	207,428	0	1,932,525	0.01097	0.21479
300.0	1,155,414	1,844,316	0	2,999,730	0.01703	0.23182
310.0	332,340	755,929	0	1,088,269	0.00618	0.23800
320.0	572,318	2,351,902	0	2,924,220	0.01660	0.25460
330.0	797,910	425,149	0	1,223,060	0.00694	0.26154
340.0	3,326,075	1,325,213	0	4,651,288	0.02641	0.28795
350.0	2,375,103	1,545,968	0	3,921,071	0.02226	0.31021
360.0	4,814,310	1,282,084	0	6,096,395	0.03461	0.34482
370.0	241,911	4,385,815	0	4,627,726	0.02627	0.37109
380.0	6,393,663	2,209,332	0	8,602,995	0.04884	0.41993
390.0	1,679,328	2,477,877	0	4,157,204	0.02360	0.44353
400.0	2,555,959	1,203,293	0	3,759,252	0.02134	0.46488
410.0	3,443,927	761,383	0	4,205,310	0.02387	0.48875
420.0	475,586	2,769,275	0	3,244,862	0.01842	0.50717
430.0	1,719,252	571,286	0	2,290,538	0.01300	0.52018
440.0	1,462,667	1,021,290	0	2,483,957	0.01410	0.53428
450.0	2,571,315	1,290,326	0	3,861,641	0.02192	0.55620
460.0	1,783,781	1,713,634	0	3,497,415	0.01986	0.57606
470.0	2,609,855	1,332,183	0	3,942,038	0.02238	0.59844
480.0	1,662,681	1,479,420	0	3,142,101	0.01784	0.61627
490.0	3,409,441	1,770,233	0	5,179,674	0.02941	0.64568
500.0	2,052,021	1,987,364	0	4,039,386	0.02293	0.66861
510.0	2,922,842	2,149,476	0	5,072,318	0.02880	0.69741
520.0	1,557,364	1,239,426	0	2,796,790	0.01588	0.71329
530.0	585,450	1,540,346	0	2,125,796	0.01207	0.72536
540.0	1,488,826	1,316,810	0	2,805,636	0.01593	0.74128
550.0	1,781,884	572,075	0	2,353,958	0.01336	0.75465
560.0	998,381	1,925,734	0	2,924,115	0.01660	0.77125
570.0	483,057	504,034	0	987,091	0.00560	0.77685
580.0	299,895	509,460	0	809,355	0.00459	0.78145
590.0	1,292,566	1,415,189	0	2,707,755	0.01537	0.79682
600.0	928,239	1,139,183	0	2,067,421	0.01174	0.80856
610.0	993,306	603,254	0	1,596,560	0.00906	0.81762
620.0	261,935	2,235,212	0	2,497,148	0.01418	0.83180
630.0	642,605	236,084	0	878,688	0.00499	0.83679
640.0	855,906	1,442,458	0	2,298,364	0.01305	0.84983
650.0	1,068,068	547,358	0	1,615,426	0.00917	0.85901
660.0	848,419	2,421,106	0	3,269,525	0.01856	0.87757

Table C-2.--Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
670.0	598,617	980,215	0	1,578,832	0.00896	0.88653
680.0	644,482	686,351	0	1,330,833	0.00756	0.89409
690.0	1,098,678	601,357	0	1,700,035	0.00965	0.90374
700.0	1,989,777	1,081,979	0	3,071,756	0.01744	0.92118
710.0	1,283,560	207,385	0	1,490,945	0.00846	0.92964
720.0	1,177,040	388,814	0	1,565,853	0.00889	0.93853
730.0	832,987	859,842	0	1,692,829	0.00961	0.94814
740.0	560,200	241,911	0	802,111	0.00455	0.95269
750.0	231,422	627,041	0	858,462	0.00487	0.95757
760.0	434,803	1,198,298	0	1,633,101	0.00927	0.96684
770.0	1,282,084	52,846	0	1,334,930	0.00758	0.97442
780.0	126,494	255,396	0	381,890	0.00217	0.97659
790.0	82,989	249,818	0	332,807	0.00189	0.97848
800.0	0	1,134,513	0	1,134,513	0.00644	0.98492
810.0	0	52,846	0	52,846	0.00030	0.98522
820.0	0	1,048,191	0	1,048,191	0.00595	0.99117
830.0	178,750	52,846	0	231,596	0.00131	0.99248
840.0	0	135,574	0	135,574	0.00077	0.99325
850.0	97,236	0	0	97,236	0.00055	0.99380
860.0	70,619	55,742	0	126,361	0.00072	0.99452
870.0	0	107,824	0	107,824	0.00061	0.99513
890.0	0	557,321	0	557,321	0.00316	0.99830
920.0	0	94,080	0	94,080	0.00053	0.99883
930.0	0	52,846	0	52,846	0.00030	0.99913
960.0	0	41,494	0	41,494	0.00024	0.99937
980.0	55,742	0	0	55,742	0.00032	0.99968
1010.0	0	55,742	0	55,742	0.00032	1.00000
TOTAL	94,359,602	76,912,339	4,871,529	176,143,470		

Table C-3. --Population estimates by sex and size groups for Yellowfin sole spp. from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
70.0	0	1,805,128	0	1,805,128	0.00018	0.00018
80.0	1,805,128	1,805,128	0	3,610,257	0.00036	0.00054
90.0	2,631,824	4,480,188	0	7,112,011	0.00070	0.00124
100.0	17,110,669	9,793,930	0	26,904,599	0.00266	0.00390
110.0	32,941,009	13,067,636	0	46,008,645	0.00455	0.00846
120.0	35,292,056	29,586,874	0	64,878,930	0.00642	0.01488
130.0	33,679,124	33,452,363	0	67,131,488	0.00664	0.02152
140.0	35,228,819	35,974,635	0	71,203,454	0.00705	0.02857
150.0	92,067,296	69,953,404	0	162,020,700	0.01604	0.04461
160.0	100,809,528	95,812,030	0	196,621,558	0.01946	0.06407
170.0	121,918,257	117,913,100	0	239,831,357	0.02374	0.08781
180.0	189,320,025	165,521,530	0	354,841,555	0.03512	0.12293
190.0	217,606,247	193,233,079	0	410,839,326	0.04066	0.16359
200.0	234,375,962	223,819,845	0	458,195,807	0.04535	0.20894
210.0	252,549,269	239,706,105	0	492,255,374	0.04872	0.25766
220.0	267,101,359	208,798,342	0	475,899,701	0.04710	0.30477
230.0	265,956,133	268,210,331	0	534,166,464	0.05287	0.35764
240.0	289,897,754	259,828,506	0	549,726,260	0.05441	0.41205
250.0	283,098,395	264,662,522	0	547,760,917	0.05422	0.46626
260.0	321,540,831	224,428,833	0	545,969,664	0.05404	0.52030
270.0	274,561,690	234,482,188	0	509,043,878	0.05038	0.57068
280.0	285,151,287	253,983,501	0	539,134,788	0.05336	0.62404
290.0	348,940,234	249,212,325	0	598,152,559	0.05920	0.68325
300.0	332,255,390	201,146,149	0	533,401,539	0.05279	0.73604
310.0	313,631,660	259,051,697	0	572,683,358	0.05668	0.79272
320.0	202,100,742	295,497,072	0	497,597,814	0.04925	0.84198
330.0	133,283,654	354,286,805	0	487,570,459	0.04826	0.89023
340.0	50,879,410	332,808,767	0	383,688,176	0.03798	0.92821
350.0	31,539,698	253,510,216	0	285,049,915	0.02821	0.95642
360.0	9,305,297	169,708,608	0	179,013,905	0.01772	0.97414
370.0	5,076,631	105,471,204	0	110,547,835	0.01094	0.98508
380.0	1,956,503	71,390,885	0	73,347,387	0.00726	0.99234
390.0	0	34,595,033	0	34,595,033	0.00342	0.99577
400.0	0	18,039,529	0	18,039,529	0.00179	0.99755
410.0	0	11,030,786	0	11,030,786	0.00109	0.99864
420.0	0	6,504,553	0	6,504,553	0.00064	0.99929
430.0	0	5,504,651	0	5,504,651	0.00054	0.99983
460.0	0	1,694,899	0	1,694,899	0.00017	1.00000
TOTAL	4,783,611,882	5,319,772,378	0	10,103,384,260		

North Shelf Area

90.0	566,877	0	0	566,877	0.00109	0.00109
100.0	1,333,779	347,422	0	1,681,201	0.00324	0.00433
120.0	471,337	0	0	471,337	0.00091	0.00524
130.0	690,792	1,005,788	0	1,696,580	0.00327	0.00851
140.0	2,525,230	3,335,636	0	5,860,866	0.01130	0.01981
150.0	3,465,237	1,813,302	0	5,278,539	0.01017	0.02998
160.0	6,422,483	8,121,267	0	14,543,750	0.02803	0.05801
170.0	13,042,830	11,956,342	0	24,999,172	0.04818	0.10620
180.0	23,564,674	22,697,830	0	46,262,503	0.08917	0.19536
190.0	25,559,407	29,475,570	0	55,034,977	0.10608	0.30144
200.0	30,415,867	33,252,242	0	63,668,110	0.12272	0.42416

Table C-3. --Continued.

North Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
210.0	26,126,288	37,484,753	0	63,611,041	0.12261	0.54676
220.0	20,323,592	27,408,008	0	47,731,600	0.09200	0.63876
230.0	15,368,453	18,716,797	0	34,085,250	0.06570	0.70446
240.0	8,946,738	7,544,519	0	16,491,257	0.03179	0.73624
250.0	6,442,731	8,924,482	0	15,367,214	0.02962	0.76586
260.0	2,459,058	6,442,904	0	8,901,962	0.01716	0.78302
270.0	7,277,283	5,076,107	0	12,353,391	0.02381	0.80683
280.0	2,605,399	5,008,389	0	7,613,788	0.01467	0.82150
290.0	2,386,582	4,369,082	0	6,755,663	0.01302	0.83452
300.0	2,553,759	3,259,731	0	5,813,490	0.01121	0.84573
310.0	1,080,754	2,700,851	0	3,781,605	0.00729	0.85302
320.0	2,790,580	3,190,953	0	5,981,533	0.01153	0.86455
330.0	1,968,039	3,966,893	0	5,934,932	0.01144	0.87599
340.0	813,991	3,802,310	0	4,616,301	0.00890	0.88488
350.0	694,117	5,212,687	0	5,906,804	0.01138	0.89627
360.0	1,175,733	7,662,883	0	8,838,616	0.01704	0.91330
370.0	1,496,568	6,466,603	0	7,963,172	0.01535	0.92865
380.0	347,422	10,215,852	0	10,563,274	0.02036	0.94901
390.0	1,069,730	9,317,258	0	10,386,989	0.02002	0.96903
400.0	0	4,336,666	0	4,336,666	0.00836	0.97739
410.0	186,641	6,252,286	0	6,438,927	0.01241	0.98980
420.0	0	1,855,080	0	1,855,080	0.00358	0.99338
430.0	0	1,542,589	0	1,542,589	0.00297	0.99635
440.0	0	842,501	0	842,501	0.00162	0.99797
450.0	0	623,045	0	623,045	0.00120	0.99917
500.0	0	428,060	0	428,060	0.00083	1.00000
TOTAL	214,171,972	304,656,691	0	518,828,663		

Western shelf Area

230.0	69,179	0	0	69,179	0.01493	0.01493
240.0	0	69,179	0	69,179	0.01493	0.02985
250.0	0	69,179	0	69,179	0.01493	0.04478
260.0	138,358	0	0	138,358	0.02985	0.07463
270.0	276,716	0	0	276,716	0.05970	0.13433
280.0	345,895	0	0	345,895	0.07463	0.20896
290.0	345,895	138,358	0	484,252	0.10448	0.31343
300.0	138,358	207,537	0	345,895	0.07463	0.38806
310.0	138,358	69,179	0	207,537	0.04478	0.43284
320.0	484,252	69,179	0	553,431	0.11940	0.55224
330.0	276,716	276,716	0	553,431	0.11940	0.67164
340.0	345,895	138,358	0	484,252	0.10448	0.77612
360.0	207,537	69,179	0	276,716	0.05970	0.83582
370.0	69,179	0	0	69,179	0.01493	0.85075
380.0	207,537	69,179	0	276,716	0.05970	0.91045
390.0	69,179	69,179	0	138,358	0.02985	0.94030
400.0	0	138,358	0	138,358	0.02985	0.97015
410.0	0	69,179	0	69,179	0.01493	0.98507
420.0	0	69,179	0	69,179	0.01493	1.00000
TOTAL	3,113,052	1,521,936	0	4,634,988		

Table C-4. --Population estimates by sex and size groups for rock sole from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
50.0	679,709	0	0	679,709	0.00010	0.00010
70.0	2,849,614	182,179	668,758	3,700,551	0.00056	0.00066
80.0	6,348,070	7,041,578	13,402,390	26,792,038	0.00402	0.00468
90.0	52,585,194	13,721,825	33,812,848	100,119,867	0.01502	0.01970
100.0	97,637,601	37,257,661	50,640,539	185,535,800	0.02784	0.04753
110.0	130,051,365	57,221,096	60,415,386	247,687,848	0.03716	0.08470
120.0	141,589,242	52,774,635	60,374,575	254,738,452	0.03822	0.12292
130.0	156,329,730	78,107,873	60,669,714	295,107,317	0.04428	0.16719
140.0	153,255,988	91,839,396	64,707,257	309,802,640	0.04648	0.21367
150.0	144,690,447	109,057,011	45,829,841	299,577,299	0.04495	0.25862
160.0	123,428,445	117,030,856	25,479,773	265,939,074	0.03990	0.29852
170.0	120,229,263	127,764,475	8,041,358	256,035,096	0.03841	0.33693
180.0	135,763,805	114,999,760	1,761,213	252,524,778	0.03789	0.37482
190.0	156,363,046	104,784,379	693,877	261,841,302	0.03928	0.41410
200.0	113,805,432	101,496,837	0	215,302,270	0.03230	0.44641
210.0	130,614,285	119,055,313	0	249,669,598	0.03746	0.48387
220.0	100,553,355	98,564,954	0	199,118,309	0.02987	0.51374
230.0	107,409,204	80,166,365	0	187,575,569	0.02814	0.54188
240.0	102,019,355	100,725,819	0	202,745,174	0.03042	0.57230
250.0	97,019,329	114,208,864	0	211,228,193	0.03169	0.60399
260.0	102,578,053	98,213,219	923,481	201,714,753	0.03026	0.63426
270.0	129,744,513	101,897,783	461,741	232,104,036	0.03482	0.66908
280.0	153,749,972	91,550,496	0	245,300,468	0.03680	0.70588
290.0	161,789,855	94,735,994	461,741	256,987,589	0.03856	0.74444
300.0	157,027,298	91,854,467	0	248,881,765	0.03734	0.78178
310.0	134,201,985	92,589,301	0	226,791,286	0.03403	0.81581
320.0	93,222,085	98,005,111	0	191,227,196	0.02869	0.84450
330.0	47,272,435	108,592,895	0	155,865,330	0.02339	0.86788
340.0	31,946,071	95,942,492	461,741	128,350,303	0.01926	0.88714
350.0	9,686,510	127,857,647	923,481	138,467,639	0.02077	0.90791
360.0	4,176,586	114,615,173	461,741	119,253,500	0.01789	0.92581
370.0	5,975,961	98,421,443	461,741	104,859,144	0.01573	0.94154
380.0	1,815,255	86,823,716	693,877	89,332,848	0.01340	0.95494
390.0	0	87,036,073	461,741	87,497,814	0.01313	0.96807
400.0	150,576	36,422,925	0	36,573,500	0.00549	0.97356
410.0	728,130	63,098,807	232,136	64,059,073	0.00961	0.98317
420.0	0	51,044,381	0	51,044,381	0.00766	0.99083
430.0	675,528	26,530,856	461,741	27,668,125	0.00415	0.99498
440.0	0	9,666,389	0	9,666,389	0.00145	0.99643
450.0	0	12,333,892	0	12,333,892	0.00185	0.99828
460.0	0	5,567,081	0	5,567,081	0.00084	0.99911
470.0	0	5,802,322	0	5,802,322	0.00087	0.99998
480.0	0	109,519	0	109,519	0.00002	1.00000
TOTAL	3,107,963,290	3,124,712,858	432,502,689	6,665,178,837		

North Shelf Area

60.0	0	0	92,784	92,784	0.00093	0.00093
70.0	0	0	92,167	92,167	0.00092	0.00185
80.0	91,521	91,521	184,951	367,994	0.00367	0.00552
90.0	366,086	0	3,375,346	3,741,432	0.03736	0.04289
100.0	1,189,778	823,693	15,804,512	17,817,983	0.17794	0.22082
110.0	732,171	1,921,950	28,882,546	31,536,667	0.31494	0.53576

Table C-4.--Continued.

North Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
120.0	640,650	2,471,078	24,599,099	27,710,827	0.27673	0.81249
130.0	549,128	1,372,821	11,306,599	13,228,548	0.13211	0.94460
140.0	91,521	366,086	2,537,135	2,994,742	0.02991	0.97450
150.0	0	275,210	717,682	992,892	0.00992	0.98442
160.0	0	0	92,784	92,784	0.00093	0.98534
200.0	92,167	0	0	92,167	0.00092	0.98626
320.0	0	92,167	0	92,167	0.00092	0.98719
340.0	0	91,521	0	91,521	0.00091	0.98810
380.0	0	91,521	0	91,521	0.00091	0.98901
390.0	0	274,564	0	274,564	0.00274	0.99176
400.0	0	183,689	0	183,689	0.00183	0.99359
410.0	0	91,521	0	91,521	0.00091	0.99450
420.0	0	274,564	0	274,564	0.00274	0.99725
440.0	0	91,521	0	91,521	0.00091	0.99816
450.0	0	92,784	0	92,784	0.00093	0.99909
490.0	0	91,521	0	91,521	0.00091	1.00000
TOTAL	3,753,024	8,697,734	87,685,604	100,136,361		

Western Shelf Area

70.0	0	0	174,591	174,591	0.00294	0.00294
80.0	0	0	174,591	174,591	0.00294	0.00588
90.0	0	0	698,363	698,363	0.01177	0.01765
100.0	0	0	1,396,726	1,396,726	0.02353	0.04118
110.0	64,519	0	1,745,908	1,810,427	0.03050	0.07168
120.0	0	0	3,142,634	3,142,634	0.05295	0.12463
130.0	199,033	0	4,190,179	4,389,212	0.07395	0.19857
140.0	392,589	392,589	3,142,634	3,927,813	0.06617	0.26475
150.0	64,519	777,167	2,269,680	3,111,366	0.05242	0.31717
160.0	508,138	239,110	1,396,726	2,143,974	0.03612	0.35329
170.0	747,248	508,138	0	1,255,386	0.02115	0.37444
180.0	1,705,832	967,392	0	2,673,224	0.04504	0.41947
190.0	239,110	832,878	0	1,071,987	0.01806	0.43753
200.0	1,061,830	483,696	0	1,545,526	0.02604	0.46357
210.0	792,801	483,696	0	1,276,497	0.02151	0.48508
220.0	618,210	832,878	0	1,451,088	0.02445	0.50952
230.0	443,620	872,954	0	1,316,574	0.02218	0.53171
240.0	1,021,754	817,244	0	1,838,998	0.03098	0.56269
250.0	1,246,578	1,840,346	0	3,086,924	0.05201	0.61469
260.0	637,176	946,281	0	1,583,457	0.02668	0.64137
270.0	1,236,421	832,878	0	2,069,299	0.03486	0.67623
280.0	2,182,702	1,031,911	0	3,214,613	0.05416	0.73039
290.0	1,293,317	398,066	0	1,691,383	0.02850	0.75889
300.0	1,717,971	457,108	0	2,175,080	0.03664	0.79553
310.0	696,218	696,218	0	1,392,435	0.02346	0.81899
320.0	876,285	580,669	0	1,456,954	0.02455	0.84354
330.0	717,329	690,741	0	1,408,069	0.02372	0.86726
340.0	671,775	1,134,360	0	1,806,136	0.03043	0.89769
350.0	193,556	328,071	0	521,627	0.00879	0.90648
360.0	64,519	1,263,398	0	1,327,917	0.02237	0.92885
370.0	64,519	741,771	0	806,290	0.01358	0.94243
380.0	0	1,518,938	0	1,518,938	0.02559	0.96802
390.0	0	373,624	0	373,624	0.00629	0.97432
400.0	0	373,624	0	373,624	0.00629	0.98061
410.0	0	134,514	0	134,514	0.00227	0.98288
420.0	0	199,033	0	199,033	0.00335	0.98623
440.0	0	373,624	0	373,624	0.00629	0.99253
470.0	0	174,591	0	174,591	0.00294	0.99547
480.0	0	134,514	0	134,514	0.00227	0.99773
490.0	0	134,514	0	134,514	0.00227	1.00000
TOTAL	19,457,569	21,566,536	18,332,034	59,356,139		

Table C-5. --Population estimates by sex and size groups for Hippoglossoides spp. from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
50.0	0	0	4,804,022	4,804,022	0.00385	0.00385
60.0	67,073	0	7,390,802	7,457,876	0.00598	0.00984
70.0	0	0	1,108,620	1,108,620	0.00089	0.01073
90.0	276,155	0	0	276,155	0.00022	0.01095
100.0	1,994,109	1,421,902	0	3,416,011	0.00274	0.01369
110.0	2,914,410	1,678,499	0	4,592,909	0.00368	0.01737
120.0	6,157,166	3,332,365	258,832	9,748,362	0.00782	0.02519
130.0	8,683,592	6,203,974	387,980	15,275,545	0.01225	0.03745
140.0	19,336,424	8,684,489	388,248	28,409,161	0.02279	0.06024
150.0	18,170,582	9,004,739	1,163,673	28,338,994	0.02273	0.08297
160.0	18,360,793	11,377,568	1,162,336	30,900,697	0.02479	0.10776
170.0	17,395,065	10,814,694	1,420,632	29,630,392	0.02377	0.13153
180.0	11,394,308	8,567,733	1,808,078	21,770,119	0.01746	0.14899
190.0	14,872,573	13,804,378	774,890	29,451,841	0.02363	0.17262
200.0	13,449,624	7,643,844	0	21,093,469	0.01692	0.18954
210.0	19,966,821	14,183,658	0	34,150,480	0.02740	0.21693
220.0	22,640,965	19,467,198	0	42,108,163	0.03378	0.25071
230.0	27,138,622	27,554,373	0	54,692,995	0.04387	0.29459
240.0	32,195,975	27,683,442	0	59,879,417	0.04804	0.34262
250.0	34,003,061	28,447,351	0	62,450,412	0.05010	0.39272
260.0	33,598,357	26,815,598	0	60,413,954	0.04846	0.44118
270.0	26,620,034	19,256,792	0	45,876,826	0.03680	0.47799
280.0	30,894,405	17,117,527	0	48,011,932	0.03852	0.51650
290.0	24,964,541	25,530,256	0	50,494,797	0.04051	0.55701
300.0	25,573,911	22,079,453	0	47,653,364	0.03823	0.59524
310.0	27,463,230	16,914,953	0	44,378,183	0.03560	0.63084
320.0	23,294,444	18,808,270	0	42,102,715	0.03377	0.66461
330.0	28,538,803	19,489,601	0	48,028,404	0.03853	0.70314
340.0	26,038,833	18,700,188	0	44,739,021	0.03589	0.73903
350.0	30,590,262	19,503,288	0	50,093,550	0.04018	0.77921
360.0	22,866,543	25,691,408	0	48,557,951	0.03895	0.81817
370.0	13,768,959	30,241,628	0	44,010,587	0.03531	0.85347
380.0	6,903,278	32,663,350	0	39,566,628	0.03174	0.88521
390.0	2,641,805	33,731,876	0	36,373,681	0.02918	0.91439
400.0	971,287	20,427,458	0	21,398,746	0.01717	0.93156
410.0	237,965	18,277,112	0	18,515,077	0.01485	0.94641
420.0	441,435	20,562,388	0	21,003,824	0.01685	0.96326
430.0	485,073	13,680,724	0	14,165,797	0.01136	0.97462
440.0	0	14,596,290	0	14,596,290	0.01171	0.98633
450.0	0	8,004,792	0	8,004,792	0.00642	0.99275
460.0	304,283	4,122,181	0	4,426,464	0.00355	0.99630
470.0	0	3,189,239	0	3,189,239	0.00256	0.99886
480.0	0	962,577	0	962,577	0.00077	0.99963
490.0	0	455,301	0	455,301	0.00037	1.00000
TOTAL	595,214,765	630,692,457	20,668,113	1,246,575,335		

Table C-5. --Continued.

North Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
120.0	0	235,016	0	235,016	0.01163	0.01163
130.0	235,016	0	0	235,016	0.01163	0.02326
140.0	470,032	0	0	470,032	0.02326	0.04651
190.0	0	1,175,080	0	1,175,080	0.05814	0.10465
200.0	0	940,064	0	940,064	0.04651	0.15116
210.0	0	2,585,177	0	2,585,177	0.12791	0.27907
220.0	235,016	1,645,112	0	1,880,129	0.09302	0.37209
230.0	235,016	2,585,177	0	2,820,193	0.13953	0.51163
240.0	235,016	2,115,145	0	2,350,161	0.11628	0.62791
250.0	235,016	2,115,145	0	2,350,161	0.11628	0.74419
260.0	0	470,032	0	470,032	0.02326	0.76744
270.0	0	235,016	0	235,016	0.01163	0.77907
280.0	0	1,175,080	0	1,175,080	0.05814	0.83721
290.0	0	705,048	0	705,048	0.03488	0.87209
310.0	235,016	0	0	235,016	0.01163	0.88372
320.0	0	235,016	0	235,016	0.01163	0.89535
330.0	0	235,016	0	235,016	0.01163	0.90698
340.0	0	235,016	0	235,016	0.01163	0.91860
350.0	0	235,016	0	235,016	0.01163	0.93023
360.0	0	235,016	0	235,016	0.01163	0.94186
380.0	0	470,032	0	470,032	0.02326	0.96512
390.0	0	470,032	0	470,032	0.02326	0.98837
400.0	0	235,016	0	235,016	0.01163	1.00000
TOTAL	1,880,129	18,331,253	0	20,211,382		

Western Shelf Area

50.0	519,413	0	0	519,413	0.00131	0.00131
60.0	2,899,653	0	0	2,899,653	0.00733	0.00864
70.0	1,156,270	636,857	0	1,793,127	0.00453	0.01317
80.0	6,799,251	636,857	0	7,436,108	0.01879	0.03196
90.0	3,312,374	1,156,270	0	4,468,644	0.01129	0.04325
00.0	1,371,518	636,857	0	2,008,376	0.00507	0.04833
10.0	1,156,270	770,390	0	1,926,660	0.00487	0.05319
20.0	4,351,670	519,413	0	4,871,083	0.01231	0.06550
30.0	11,848,483	2,117,691	0	13,966,174	0.03529	0.10079
40.0	13,210,694	6,419,509	0	19,630,203	0.04960	0.15040
50.0	13,387,588	5,597,236	0	18,984,825	0.04797	0.19837
60.0	14,862,879	8,791,142	0	23,654,021	0.05977	0.25814
70.0	12,877,143	22,864,171	0	35,741,314	0.09031	0.34845
80.0	4,448,362	24,344,132	0	28,792,494	0.07275	0.42120
90.0	8,918,392	21,051,944	0	29,970,336	0.07573	0.49693
00.0	2,879,232	26,963,755	0	29,842,987	0.07541	0.57234
10.0	5,141,365	24,641,779	0	29,783,145	0.07526	0.64760
20.0	3,382,410	23,358,108	0	26,740,518	0.06757	0.71517
30.0	1,822,399	22,463,339	0	24,285,738	0.06137	0.77653
40.0	613,954	17,086,768	0	17,700,722	0.04473	0.82126
50.0	1,094,375	15,019,510	0	16,113,885	0.04072	0.86198
60.0	1,473,618	8,223,051	0	9,696,669	0.02450	0.88648
70.0	598,681	6,703,264	0	7,301,945	0.01845	0.90493
80.0	813,929	3,365,562	0	4,179,491	0.01056	0.91549
90.0	133,533	3,251,115	0	3,384,647	0.00855	0.92404
00.0	0	4,304,381	0	4,304,381	0.01088	0.93492
10.0	0	3,879,997	0	3,879,997	0.00980	0.94472

Table C-5. --Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
320.0	0	2,998,547	0	2,998,547	0.00758	0.95230
330.0	0	3,216,463	0	3,216,463	0.00813	0.96043
340.0	0	2,960,443	0	2,960,443	0.00748	0.96791
350.0	0	5,453,845	0	5,453,845	0.01378	0.98169
360.0	0	3,271,603	0	3,271,603	0.00827	0.98995
370.0	0	1,246,622	0	1,246,622	0.00315	0.99310
380.0	0	1,153,675	0	1,153,675	0.00292	0.99602
390.0	0	215,249	0	215,249	0.00054	0.99656
400.0	0	1,047,461	0	1,047,461	0.00265	0.99921
420.0	0	312,800	0	312,800	0.00079	1.00000
TOTAL	119,073,456	276,679,806	0	395,753,262		

Table C-6. --Population estimates by sex and size groups for Alaska plaice from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
90.0	369,335	53,246	0	422,581	0.00041	0.00041
100.0	369,335	0	0	369,335	0.00035	0.00076
150.0	1,108,006	0	0	1,108,006	0.00106	0.00183
160.0	845,162	53,246	0	898,408	0.00086	0.00269
170.0	475,827	266,229	0	742,056	0.00071	0.00340
180.0	1,097,680	1,364,661	0	2,462,341	0.00237	0.00577
190.0	1,554,458	1,201,299	0	2,755,758	0.00265	0.00842
200.0	2,918,901	4,321,708	0	7,240,608	0.00696	0.01538
210.0	3,907,271	3,316,524	0	7,223,796	0.00694	0.02232
220.0	3,810,410	3,329,981	0	7,140,391	0.00686	0.02918
230.0	7,106,344	5,287,591	0	12,393,935	0.01191	0.04109
240.0	4,927,180	6,606,304	0	11,533,483	0.01108	0.05218
250.0	7,544,917	4,240,982	0	11,785,899	0.01133	0.06351
260.0	6,690,249	8,708,542	0	15,398,792	0.01480	0.07831
270.0	11,610,713	5,478,014	0	17,088,728	0.01642	0.09473
280.0	11,357,204	6,508,862	0	17,866,066	0.01717	0.11190
290.0	15,307,419	10,729,739	0	26,037,158	0.02502	0.13693
300.0	26,719,439	9,543,688	0	36,263,127	0.03485	0.17178
310.0	40,064,729	15,060,003	0	55,124,732	0.05298	0.22476
320.0	40,865,921	13,465,069	0	54,330,990	0.05222	0.27698
330.0	50,401,152	15,928,770	0	66,329,922	0.06375	0.34073
340.0	67,555,553	20,436,704	0	87,992,257	0.08457	0.42530
350.0	71,502,947	15,263,103	0	86,766,050	0.08339	0.50869
360.0	58,280,367	22,822,840	0	81,103,207	0.07795	0.58664
370.0	52,202,734	16,490,239	0	68,692,973	0.06602	0.65266
380.0	32,419,077	22,335,426	0	54,754,503	0.05263	0.70529
390.0	12,696,578	18,411,632	0	31,108,210	0.02990	0.73518
400.0	3,452,583	24,229,714	0	27,682,297	0.02661	0.76179
410.0	4,992,687	24,566,931	0	29,559,618	0.02841	0.79020
420.0	381,489	35,428,716	0	35,810,205	0.03442	0.82462
430.0	632,099	30,822,710	0	31,454,810	0.03023	0.85485
440.0	406,888	34,965,364	0	35,372,252	0.03400	0.88884
450.0	610,141	30,765,164	0	31,375,304	0.03016	0.91900
460.0	0	25,107,222	0	25,107,222	0.02413	0.94313
470.0	376,429	20,630,554	0	21,006,983	0.02019	0.96332
480.0	385,131	12,543,249	0	12,928,380	0.01243	0.97575
490.0	0	8,986,977	0	8,986,977	0.00864	0.98438
500.0	0	7,085,973	0	7,085,973	0.00681	0.99119
510.0	0	3,740,249	0	3,740,249	0.00359	0.99479
520.0	0	1,979,540	0	1,979,540	0.00190	0.99669
530.0	0	909,649	0	909,649	0.00087	0.99757
540.0	0	1,060,984	0	1,060,984	0.00102	0.99859
550.0	0	571,714	0	571,714	0.00055	0.99913
560.0	0	450,019	0	450,019	0.00043	0.99957
580.0	0	225,009	0	225,009	0.00022	0.99978
600.0	0	225,009	0	225,009	0.00022	1.00000
TOTAL	544,946,357	495,519,150	0	1,040,465,507		

Table C-6. --Continued.

North Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
90.0	0	0	323,386	323,386	0.00179	0.00179
100.0	0	0	2,263,700	2,263,700	0.01254	0.01434
110.0	0	0	5,982,636	5,982,636	0.03315	0.04749
120.0	0	0	4,689,093	4,689,093	0.02599	0.07348
130.0	0	71,714	4,204,015	4,275,729	0.02369	0.09717
140.0	0	0	1,293,543	1,293,543	0.00717	0.10434
150.0	131,205	0	485,079	616,284	0.00342	0.10776
160.0	288,880	702,347	323,386	1,314,613	0.00729	0.11504
170.0	353,470	551,756	0	905,226	0.00502	0.12006
180.0	1,398,504	888,506	0	2,287,009	0.01267	0.13273
190.0	1,899,233	1,292,730	0	3,191,964	0.01769	0.15042
200.0	1,893,894	2,383,005	0	4,276,899	0.02370	0.17412
210.0	1,623,864	1,104,614	0	2,728,478	0.01512	0.18924
220.0	1,887,038	2,164,329	0	4,051,367	0.02245	0.21169
230.0	1,984,620	2,221,081	0	4,205,701	0.02331	0.23500
240.0	948,707	2,086,963	0	3,035,669	0.01682	0.25182
250.0	1,987,309	1,519,301	0	3,506,610	0.01943	0.27126
260.0	778,493	1,327,843	0	2,106,335	0.01167	0.28293
270.0	1,663,940	1,954,055	0	3,617,995	0.02005	0.30298
280.0	1,642,543	645,398	0	2,287,941	0.01268	0.31566
290.0	2,823,305	1,893,382	0	4,716,687	0.02614	0.34180
300.0	4,420,088	2,255,965	0	6,676,053	0.03700	0.37879
310.0	6,115,749	1,442,384	0	7,558,134	0.04189	0.42068
320.0	7,095,998	1,862,871	0	8,958,869	0.04965	0.47033
330.0	4,290,674	3,765,743	0	8,056,417	0.04465	0.51497
340.0	4,448,961	2,676,544	0	7,125,505	0.03949	0.55446
350.0	4,021,780	3,724,481	0	7,746,261	0.04293	0.59739
360.0	3,083,595	5,242,685	0	8,326,280	0.04614	0.64353
370.0	1,836,958	3,784,330	0	5,621,288	0.03115	0.67468
380.0	983,109	4,626,718	0	5,609,827	0.03109	0.70577
390.0	832,348	4,185,925	0	5,018,273	0.02781	0.73358
400.0	203,102	4,411,579	0	4,614,681	0.02557	0.75915
410.0	0	6,812,537	0	6,812,537	0.03775	0.79691
420.0	0	6,261,522	0	6,261,522	0.03470	0.83161
430.0	0	4,253,412	0	4,253,412	0.02357	0.85518
440.0	0	4,629,625	0	4,629,625	0.02566	0.88083
450.0	0	4,381,271	0	4,381,271	0.02428	0.90511
460.0	0	4,889,005	0	4,889,005	0.02709	0.93221
470.0	0	4,353,633	0	4,353,633	0.02413	0.95633
480.0	0	2,793,825	0	2,793,825	0.01548	0.97182
490.0	0	1,708,609	0	1,708,609	0.00947	0.98129
500.0	0	1,792,707	0	1,792,707	0.00993	0.99122
510.0	0	943,130	0	943,130	0.00523	0.99645
520.0	0	438,029	0	438,029	0.00243	0.99887
540.0	0	203,102	0	203,102	0.00113	1.00000
TOTAL	58,637,368	102,246,655	19,564,838	180,448,861		

Table C-6. --Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
150.0	989,892	628,250	0	1,618,141	0.02462	0.02462
160.0	628,250	628,250	0	1,256,499	0.01912	0.04374
170.0	628,250	361,642	0	989,892	0.01506	0.05880
180.0	942,374	361,642	0	1,304,016	0.01984	0.07865
190.0	675,767	675,767	0	1,351,534	0.02057	0.09921
200.0	1,256,499	361,642	0	1,618,141	0.02462	0.12383
210.0	675,767	628,250	0	1,304,016	0.01984	0.14368
220.0	361,642	816,212	0	1,177,854	0.01792	0.16160
230.0	314,125	314,125	0	628,250	0.00956	0.17116
240.0	0	95,035	0	95,035	0.00145	0.17260
250.0	314,125	0	0	314,125	0.00478	0.17738
260.0	314,125	989,892	0	1,304,016	0.01984	0.19723
270.0	1,130,336	47,517	0	1,177,854	0.01792	0.21515
280.0	690,049	409,160	0	1,099,209	0.01673	0.23187
290.0	690,049	1,201,906	0	1,891,955	0.02879	0.26066
300.0	2,089,100	597,122	0	2,686,222	0.04087	0.30154
310.0	2,425,170	982,816	0	3,407,986	0.05186	0.35339
320.0	2,206,080	259,532	0	2,465,611	0.03752	0.39091
330.0	1,553,778	1,577,830	0	3,131,609	0.04765	0.43856
340.0	1,491,979	1,451,668	0	2,943,646	0.04479	0.48335
350.0	2,211,179	1,587,013	0	3,798,192	0.05779	0.54115
360.0	2,448,635	666,584	0	3,115,219	0.04740	0.58855
370.0	2,299,007	1,333,168	0	3,632,175	0.05527	0.64382
380.0	1,923,083	1,042,508	0	2,965,591	0.04513	0.68894
390.0	3,303,181	1,145,205	0	4,448,387	0.06769	0.75663
400.0	666,584	1,882,772	0	2,549,356	0.03879	0.79542
410.0	1,506,261	549,604	0	2,055,865	0.03128	0.82671
420.0	792,746	666,584	0	1,459,330	0.02221	0.84891
430.0	502,087	714,101	0	1,216,188	0.01851	0.86742
440.0	314,125	235,480	0	549,604	0.00836	0.87578
450.0	187,962	690,049	0	878,011	0.01336	0.88914
460.0	314,125	47,517	0	361,642	0.00550	0.89464
470.0	0	887,781	0	887,781	0.01351	0.90815
480.0	0	878,011	0	878,011	0.01336	0.92151
490.0	0	478,622	0	478,622	0.00728	0.92879
500.0	0	972,112	0	972,112	0.01479	0.94359
510.0	0	643,118	0	643,118	0.00979	0.95337
520.0	0	212,014	0	212,014	0.00323	0.95660
530.0	0	564,473	0	564,473	0.00859	0.96519
540.0	0	892,880	0	892,880	0.01359	0.97877
560.0	0	164,497	0	164,497	0.00250	0.98128
570.0	0	666,584	0	666,584	0.01014	0.99142
600.0	0	563,887	0	563,887	0.00858	1.00000
TOTAL	35,846,331	29,872,821	0	65,719,152		

Table C-7. --Population estimates by sex and size groups for Atheresthes spp. from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
80.0	52,091	52,091	0	104,183	0.00017	0.00017
120.0	0	0	363,005	363,005	0.00059	0.00075
130.0	0	0	363,005	363,005	0.00059	0.00134
140.0	121,226	115,303	227,860	464,388	0.00075	0.00209
150.0	2,607,059	831,511	1,679,881	5,118,451	0.00826	0.01035
160.0	1,998,749	1,663,512	1,105,777	4,768,038	0.00769	0.01804
170.0	1,603,294	1,995,900	666,818	4,266,012	0.00688	0.02492
180.0	2,149,128	3,224,642	759,532	6,133,302	0.00990	0.03482
190.0	1,675,674	2,758,905	0	4,434,579	0.00716	0.04198
200.0	3,619,411	3,263,077	0	6,882,487	0.01111	0.05308
210.0	1,592,135	3,152,590	0	4,744,725	0.00766	0.06074
220.0	2,344,126	3,820,497	0	6,164,623	0.00995	0.07068
230.0	2,826,110	6,382,629	0	9,208,739	0.01486	0.08554
240.0	3,612,155	7,855,978	0	11,468,134	0.01850	0.10405
250.0	7,298,546	7,794,774	0	15,093,320	0.02435	0.12840
260.0	15,137,385	15,293,469	0	30,430,854	0.04910	0.17750
270.0	17,273,532	20,981,482	0	38,255,013	0.06173	0.23922
280.0	19,591,624	23,255,412	0	42,847,036	0.06913	0.30836
290.0	19,653,015	20,307,858	0	39,960,873	0.06448	0.37284
300.0	14,673,339	24,796,864	0	39,470,203	0.06369	0.43652
310.0	14,138,585	24,383,334	0	38,521,919	0.06216	0.49868
320.0	14,208,949	20,508,616	0	34,717,565	0.05602	0.55470
330.0	11,957,581	19,973,663	0	31,931,245	0.05152	0.60622
340.0	8,354,601	28,057,981	0	36,412,583	0.05875	0.66497
350.0	7,788,899	21,959,348	0	29,748,247	0.04800	0.71297
360.0	7,341,193	18,280,482	0	25,621,675	0.04134	0.75431
370.0	5,352,843	10,684,853	0	16,037,696	0.02588	0.78019
380.0	4,378,890	8,605,064	0	12,983,953	0.02095	0.80114
390.0	5,001,328	6,920,326	0	11,921,655	0.01924	0.82037
400.0	7,853,955	10,795,052	0	18,649,007	0.03009	0.85046
410.0	2,026,816	7,874,771	0	9,901,588	0.01598	0.86644
420.0	2,030,438	9,623,681	0	11,654,119	0.01880	0.88524
430.0	1,319,208	13,335,013	0	14,654,222	0.02364	0.90889
440.0	500,076	9,685,025	0	10,185,101	0.01643	0.92532
450.0	72,776	10,653,033	0	10,725,809	0.01731	0.94263
460.0	161,934	6,032,839	0	6,194,774	0.01000	0.95262
470.0	186,517	4,452,238	0	4,638,755	0.00748	0.96011
480.0	115,303	3,699,492	0	3,814,795	0.00616	0.96626
490.0	0	3,264,069	0	3,264,069	0.00527	0.97153
500.0	0	1,188,253	0	1,188,253	0.00192	0.97345
510.0	0	1,011,222	0	1,011,222	0.00163	0.97508
520.0	706,517	1,218,936	0	1,925,453	0.00311	0.97819
530.0	74,158	2,868,401	0	2,942,560	0.00475	0.98293
540.0	0	2,677,822	0	2,677,822	0.00432	0.98726
550.0	0	1,183,309	0	1,183,309	0.00191	0.98916
560.0	0	1,771,411	0	1,771,411	0.00286	0.99202
570.0	161,934	669,117	0	831,052	0.00134	0.99336
580.0	0	710,109	0	710,109	0.00115	0.99451
590.0	0	583,050	0	583,050	0.00094	0.99545
600.0	0	702,707	0	702,707	0.00113	0.99658
610.0	0	396,260	0	396,260	0.00064	0.99722
620.0	0	279,645	0	279,645	0.00045	0.99767
630.0	0	413,269	0	413,269	0.00067	0.99834
640.0	0	60,267	0	60,267	0.00010	0.99844
650.0	0	547,807	0	547,807	0.00088	0.99932
670.0	0	209,997	0	209,997	0.00034	0.99966
680.0	0	209,997	0	209,997	0.00034	1.00000
Total	211,561,099	403,036,954	5,165,878	619,763,931		

Table C-8. --Population estimates by sex and size group-for. Pacific halibut from the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering. Sea shelf.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
180.0	0	0	280,797	280,797	0.00325	0.00325
190.0	0	0	534,620	534,620	0.00618	0.00942
200.0	0	0	989,785	989,785	0.01144	0.02086
210.0	0	0	894,482	894,482	0.01034	0.03120
220.0	0	0	1,387,611	1,387,611	0.01604	0.04724
230.0	0	0	671,476	671,476	0.00776	0.05500
240.0	0	0	2,392,430	2,392,430	0.02765	0.08265
250.0	0	0	3,516,682	3,516,682	0.04064	0.12329
260.0	0	0	5,531,635	5,531,635	0.06393	0.18722
270.0	0	0	5,062,490	5,062,490	0.05851	0.24573
280.0	0	0	5,789,624	5,789,624	0.06691	0.31265
290.0	0	0	6,813,533	6,813,533	0.07875	0.39139
300.0	0	0	6,278,197	6,278,197	0.07256	0.46395
310.0	0	0	4,418,298	4,418,298	0.05106	0.51502
320.0	0	0	6,070,396	6,070,396	0.07016	0.58518
330.0	0	0	2,289,177	2,289,177	0.02646	0.61163
340.0	0	0	2,672,406	2,672,406	0.03089	0.64252
350.0	0	0	1,656,264	1,656,264	0.01914	0.66166
360.0	0	0	601,068	601,068	0.00695	0.66861
370.0	0	0	426,221	426,221	0.00493	0.67353
380.0	0	0	463,939	463,939	0.00536	0.67890
390.0	0	0	652,388	652,388	0.00754	0.68644
400.0	0	0	728,012	728,012	0.00841	0.69485
410.0	0	0	740,094	740,094	0.00855	0.70340
420.0	0	0	338,491	338,491	0.00391	0.70732
430.0	0	0	1,422,378	1,422,378	0.01644	0.72375
440.0	0	0	1,553,866	1,553,866	0.01796	0.74171
450.0	0	0	987,369	987,369	0.01141	0.75312
460.0	0	0	315,035	315,035	0.00364	0.75677
470.0	0	0	471,134	471,134	0.00545	0.76221
480.0	0	0	266,219	266,219	0.00308	0.76529
490.0	0	0	881,453	881,453	0.01019	0.77548
500.0	0	0	718,050	718,050	0.00830	0.78377
510.0	0	0	597,674	597,674	0.00691	0.79068
520.0	0	0	899,972	899,972	0.01040	0.80108
530.0	0	0	568,433	568,433	0.00657	0.80765
540.0	0	0	222,013	222,013	0.00257	0.81022
550.0	0	0	237,133	237,133	0.00274	0.81296
560.0	0	0	200,500	200,500	0.00232	0.81528
570.0	0	0	238,882	238,882	0.00276	0.81804
580.0	0	0	475,929	475,929	0.00550	0.82354
590.0	0	0	182,208	182,208	0.00211	0.82564
600.0	0	0	1,332,085	1,332,085	0.01540	0.84104
610.0	0	0	1,989,163	1,989,163	0.02299	0.86403
620.0	0	0	1,602,088	1,602,088	0.01852	0.88254
630.0	0	0	963,430	963,430	0.01113	0.89368
640.0	0	0	542,794	542,794	0.00627	0.89995
650.0	0	0	759,396	759,396	0.00878	0.90873
660.0	0	0	678,135	678,135	0.00784	0.91657
670.0	0	0	591,163	591,163	0.00683	0.92340
680.0	0	0	550,329	550,329	0.00636	0.92976
690.0	0	0	512,350	512,350	0.00592	0.93568
700.0	0	0	306,761	306,761	0.00355	0.93923
710.0	0	0	309,466	309,466	0.00358	0.94280
720.0	0	0	179,998	179,998	0.00208	0.94488
730.0	0	0	528,942	528,942	0.00611	0.95100

Table C-8. --Continued.

Standard U.S. Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
740.0	0	0	177,015	177,015	0.00205	0.95304
750.0	0	0	329,743	329,743	0.00381	0.95685
760.0	0	0	369,763	369,763	0.00427	0.96113
770.0	0	0	161,802	161,802	0.00187	0.96300
780.0	0	0	218,219	218,219	0.00252	0.96552
790.0	0	0	159,298	159,298	0.00184	0.96736
800.0	0	0	330,499	330,499	0.00382	0.97118
810.0	0	0	199,780	199,780	0.00231	0.97349
820.0	0	0	269,380	269,380	0.00311	0.97660
830.0	0	0	118,762	118,762	0.00137	0.97797
840.0	0	0	40,802	40,802	0.00047	0.97845
850.0	0	0	142,792	142,792	0.00165	0.98010
880.0	0	0	58,093	58,093	0.00067	0.98077
890.0	0	0	51,746	51,746	0.00060	0.98137
930.0	0	0	133,640	133,640	0.00154	0.98291
950.0	0	0	184,016	184,016	0.00213	0.98504
970.0	0	0	43,040	43,040	0.00050	0.98553
1000.0	0	0	42,011	42,011	0.00049	0.98602
1010.0	0	0	40,540	40,540	0.00047	0.98649
1040.0	0	0	51,059	51,059	0.00059	0.98708
1050.0	0	0	101,528	101,528	0.00117	0.98825
1070.0	0	0	40,995	40,995	0.00047	0.98873
1100.0	0	0	267,394	267,394	0.00309	0.99182
1170.0	0	0	51,059	51,059	0.00059	0.99241
1200.0	0	0	133,640	133,640	0.00154	0.99395
1230.0	0	0	266,609	266,609	0.00308	0.99703
1250.0	0	0	41,324	41,324	0.00048	0.99751
1290.0	0	0	40,802	40,802	0.00047	0.99798
1420.0	0	0	37,681	37,681	0.00044	0.99842
1430.0	0	0	54,841	54,841	0.00063	0.99905
1530.0	0	0	40,802	40,802	0.00047	0.99952
1720.0	0	0	41,324	41,324	0.00048	1.00000
TOTAL	0	0	86,524,466	86,524,466		

North Shelf Area

250.0	0	0	70,474	70,474	0.07987	0.07987
270.0	0	0	313,824	313,824	0.35567	0.43555
320.0	0	0	378,292	378,292	0.42874	0.86429
410.0	0	0	70,013	70,013	0.07935	0.94364
460.0	0	0	49,731	49,731	0.05636	1.00000
TOTAL	0	0	882,334	882,334		

Table C-8. --Continued.

Western Shelf Area

Length (mm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
300.0	0	0	56,801	56,801	0.03005	0.03005
350.0	0	0	37,662	37,662	0.01993	0.04998
380.0	0	0	141,011	141,011	0.07460	0.12458
390.0	0	0	37,662	37,662	0.01993	0.14451
410.0	0	0	87,977	87,977	0.04655	0.19105
420.0	0	0	47,248	47,248	0.02500	0.21605
460.0	0	0	39,430	39,430	0.02086	0.23691
500.0	0	0	46,603	46,603	0.02466	0.26157
520.0	0	0	40,817	40,817	0.02159	0.28316
530.0	0	0	40,817	40,817	0.02159	0.30476
550.0	0	0	40,817	40,817	0.02159	0.32635
560.0	0	0	81,634	81,634	0.04319	0.36954
570.0	0	0	83,493	83,493	0.04417	0.41372
590.0	0	0	47,095	47,095	0.02492	0.43863
600.0	0	0	82,336	82,336	0.04356	0.48219
610.0	0	0	81,411	81,411	0.04307	0.52527
630.0	0	0	40,817	40,817	0.02159	0.54686
640.0	0	0	36,665	36,665	0.01940	0.56626
650.0	0	0	34,808	34,808	0.01842	0.58467
660.0	0	0	77,482	77,482	0.04099	0.62567
670.0	0	0	40,817	40,817	0.02159	0.64726
680.0	0	0	40,817	40,817	0.02159	0.66886
700.0	0	0	33,265	33,265	0.01760	0.68646
720.0	0	0	49,070	49,070	0.02596	0.71242
730.0	0	0	73,330	73,330	0.03880	0.75122
770.0	0	0	40,411	40,411	0.02138	0.77260
810.0	0	0	36,665	36,665	0.01940	0.79199
840.0	0	0	40,817	40,817	0.02159	0.81359
870.0	0	0	43,423	43,423	0.02297	0.83656
880.0	0	0	47,160	47,160	0.02495	0.86151
930.0	0	0	76,857	76,857	0.04066	0.90218
1020.0	0	0	70,005	70,005	0.03704	0.93921
1090.0	0	0	36,665	36,665	0.01940	0.95861
1180.0	0	0	43,423	43,423	0.02297	0.98158
1720.0	0	0	34,808	34,808	0.01842	1.00000
TOTAL	0	0	1,890,119	1,890,119		

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APPENDIX D

Age-Length Keys for Walleye Pollock

Appendix D presents age length keys forwalleye pollock by sex and both sexes combined from the western shelf area collected during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf. Lengths are in millimeters. Asterisks indicated fish lengths for which ages have been interpolated.

List of Tables

Table D-1.--Age-length keys for walleye pollock from age and length data collected during the 1990 cooperative U.S.-Russian bottom trawl survey of the Bering Sea shelf.

MALE KEY

LEN-GTH	AVG AGE	STD. DEV.	FREQ-UENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
200	2.00	0.00	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	2.00	0.00	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220	2.00	0.00	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
230	2.20	0.45	5	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	2.40	0.55	5	0	0	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250	2.29	0.49	7	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	3.00	0.00	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	3.20	0.45	5	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	3.00	0.00	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	3.20	0.45	5	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
320	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
330	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
340	5.00	0.00	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
350	4.00	0.00	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
370	5.00	1.00	3	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	4.00	0.00	3	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	5.00	0.00	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	6.00	0.00	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
410	6.33	1.37	6	0	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
420	6.20	1.03	10	0	0	0	0	0	3	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	7.50	1.00	4	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
440	6.60	1.52	5	0	0	0	0	0	1	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
450	7.75	1.91	8	0	0	0	0	0	0	2	2	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	7.67	2.34	6	0	0	0	0	0	0	3	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
470	10.00	2.83	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	8.75	1.75	8	0	0	0	0	0	0	0	1	5	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	7.86	0.90	7	0	0	0	0	0	0	1	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	8.33	1.97	6	0	0	0	0	0	0	1	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	9.00	2.00	4	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
520	11.00	3.74	6	0	0	0	0	0	0	0	0	2	0	2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
530	9.75	2.66	8	0	0	0	0	0	0	0	0	5	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
540	10.67	1.73	9	0	0	0	0	0	0	0	0	2	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
550	9.71	1.80	7	0	0	0	0	0	0	0	0	3	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
560	10.40	2.19	5	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
570	9.60	1.82	5	0	0	0	0	0	0	0	0	2	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
580	15.00	9.64	3	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
590	12.29	0.76	7	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0
600	14.50	5.00	4	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0
610	12.44	3.13	9	0	0	0	0	0	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Table D-1. --Continued.

MALE KEY

LENGTH	AVG AGE	STD. DEV.	FREQUENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
620	12.25	0.50	4	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
630	13.67	3.83	6	0	0	0	0	0	0	0	0	0	0	1	0	2	1	1	0	0	0	0	0	0	1	0	0	0	0	0
640	12.75	1.50	4	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0
650	12.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
660	11.75	1.26	4	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
670	10.00	0.00	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
680	18.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
690	14.00	0.00	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
710	17.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
730	18.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
740	13.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	7.93	4.38	221	0	0	25	25	10	10	17	7	47	3	9	4	46	4	4	2	0	1	3	0	1	1	1	0	0	0	1

Table D-l. --Continued.

FEMALE KEY

LEN-GTH	AVG AGE	STD. DEV.	FREQ-UENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
200	2.00	0.00	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	1.75	0.50	4	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220	2.00	0.00	6	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
230	2.67	0.58	3	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	2.00	0.00	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250	2.00	0.00	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260	2.00	0.00	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	3.00	0.00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	3.50	0.71	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	3.00	0.00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	3.00	0.00	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	3.67	0.58	3	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
340	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
350	4.00	0.00	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
360	5.50	0.71	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
370	5.00	0.00	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	5.50	0.71	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	4.50	0.71	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	4.50	0.71	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
410	5.33	0.58	3	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
420	5.14	0.69	7	0	0	0	0	1	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	5.83	0.75	6	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
440	6.40	0.89	5	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
450	5.67	0.58	3	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	6.00	0.93	8	0	0	0	0	0	2	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
470	8.00	0.00	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	8.00	2.00	7	0	0	0	0	0	0	2	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	7.00	1.15	4	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	8.00	0.00	4	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	8.44	2.92	9	0	0	0	0	0	0	1	2	5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
520	8.60	1.95	5	0	0	0	0	0	0	0	1	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
530	10.78	3.46	9	0	0	0	0	0	0	1	0	3	0	0	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0
540	9.71	1.90	14	0	0	0	0	0	0	0	0	7	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
550	11.38	2.72	8	0	0	0	0	0	0	1	0	0	0	1	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0
560	12.50	2.39	8	0	0	0	0	0	0	0	0	0	0	1	1	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0
570	9.71	2.14	7	0	0	0	0	0	0	0	0	4	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
580	10.90	1.66	10	0	0	0	0	0	0	0	0	2	0	1	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
590	12.79	3.42	14	0	0	0	0	0	0	0	0	2	0	1	1	6	0	0	0	1	0	3	0	0	0	0	0	0	0	0
600	12.00	0.00	10	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
610	12.62	3.07	13	0	0	0	0	0	0	0	0	1	1	1	0	6	1	0	0	1	0	2	0	0	0	0	0	0	0	0
620	12.18	2.27	11	0	0	0	0	0	0	0	0	1	0	0	0	9	0	0	0	0	0	1	0	0	0	0	0	0	0	0
630	11.09	2.84	11	0	0	0	0	0	0	0	0	4	0	1	0	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0
640	12.00	1.79	11	0	0	0	0	0	0	0	0	1	0	0	0	9	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Table D-1.--Continued.

FEMALE KEY

LEN-GTH	AVG AGE	STD. DEV.	FREQ-UENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
650	14.00	2.65	7	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	1	0	1	1	0	0	0	0	0	0	0	0
660	13.80	2.70	10	0	0	0	0	0	0	0	0	0	0	0	0	6	0	1	1	0	0	1	1	0	0	0	0	0	0	0
670	14.00	2.49	10	0	0	0	0	0	0	0	0	0	0	0	0	5	0	2	0	1	0	2	0	0	0	0	0	0	0	0
680	12.86	2.27	7	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	1	0	0	0	0	0	0	0	0
690	15.00	3.35	6	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	1	0	0	1	0	1	0	0	0	0	0	0
700	15.71	2.50	7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	3	0	0	0	0	0	0	0	0
710	14.17	2.99	6	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	0	2	0	0	0	0	0	0	0	0
720	15.80	3.19	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0
740	16.00	3.46	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0
770	16.50	2.12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
TOTAL	9.93	4.43	296	0	1	16	12	8	16	26	4	48	1	8	6	95	7	6	7	8	1	24	1	1	0	0	0	0	0	0

Table D-1.--Continued.

UNSEXED KEY

LEN-GTH	AVG AGE	STD. DEV.	FREQ-UENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
200	2.00	0.00	9	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
210	1.86	0.38	7	0	1	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
220	2.00	0.00	9	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
230	2.38	0.52	8	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
240	2.29	0.49	7	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250	2.25	0.46	8	0	0	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
260	2.00	0.00	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	3.00	0.00	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
280	3.29	0.49	7	0	0	0	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
290	3.00	0.00	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	3.14	0.38	7	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
310	3.38	0.52	8	0	0	0	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
320	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
330	3.33	0.58	3	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
340	3.75	0.96	4	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
350	4.00	0.00	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
360	5.50	0.71	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
370	5.00	0.82	4	0	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
380	4.60	0.89	5	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
390	4.75	0.50	4	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
400	5.00	1.00	3	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
410	6.00	1.22	9	0	0	0	0	0	4	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
420	5.76	1.03	17	0	0	0	0	1	7	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
430	6.50	1.18	10	0	0	0	0	0	2	4	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
440	6.50	1.18	10	0	0	0	0	0	1	6	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
450	7.18	1.89	11	0	0	0	0	0	1	4	2	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
460	6.71	1.82	14	0	0	0	0	0	2	8	0	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
470	8.80	1.79	5	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
480	8.40	1.84	15	0	0	0	0	0	0	2	1	9	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
490	7.55	1.04	11	0	0	0	0	0	0	3	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
500	8.20	1.48	10	0	0	0	0	0	0	1	0	8	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
510	8.62	2.60	13	0	0	0	0	0	0	1	2	8	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
520	9.91	3.18	11	0	0	0	0	0	0	0	1	5	0	2	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0
530	10.29	3.06	17	0	0	0	0	0	0	1	0	8	0	0	1	4	0	0	2	1	0	0	0	0	0	0	0	0	0	0
540	10.09	1.86	23	0	0	0	0	0	0	0	0	9	0	4	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
550	10.60	2.41	15	0	0	0	0	0	0	1	0	3	0	3	2	4	0	1	1	0	0	0	0	0	0	0	0	0	0	0
560	11.69	2.46	13	0	0	0	0	0	0	0	0	2	0	1	1	7	1	0	0	0	0	1	0	0	0	0	0	0	0	0
570	9.67	1.92	12	0	0	0	0	0	0	0	0	6	1	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
580	11.85	4.56	13	0	0	0	0	0	0	0	0	3	0	1	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1
590	12.62	2.80	21	0	0	0	0	0	0	0	0	2	0	1	1	12	0	1	0	1	0	3	0	0	0	0	0	0	0	0
600	12.71	2.67	14	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	1	0	0	0	0
610	12.55	3.02	22	0	0	0	0	0	0	0	0	2	1	1	0	13	1	0	0	1	0	2	0	1	0	0	0	0	0	0
620	12.20	1.93	15	0	0	0	0	0	0	0	0	1	0	0	0	12	1	0	0	0	0	1	0	0	0	0	0	0	0	0

Table D-l.--Continued.

UNSEXED KEY

LEN-GTH	AVG AGE	STD. DEV.	FREQ-UENCY	AGE (IN YEARS) 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26+
630	12.00	3.35	17	0	0	0	0	0	0	0	0	4	0	2	0	4	3	2	0	1	0	0	0	0	1	0	0	0	0	0
640	12.20	1.70	15	0	0	0	0	0	0	0	0	1	0	0	0	12	0	0	1	1	0	0	0	0	0	0	0	0	0	0
650	13.75	2.55	8	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	1	0	1	1	0	0	0	0	0	0	0	0
660	13.21	2.52	14	0	0	0	0	0	0	0	0	0	0	1	0	8	1	1	1	0	0	1	1	0	0	0	0	0	0	0
670	13.64	2.66	11	0	0	0	0	0	0	0	0	0	0	1	0	5	0	2	0	1	0	2	0	0	0	0	0	0	0	0
680	13.50	2.78	8	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	2	0	0	0	0	0	0	0	0
690	14.75	2.87	8	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	1	0	0	1	0	1	0	0	0	0	0	0
700	15.71	2.50	7	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	3	0	0	0	0	0	0	0	0
710	14.57	2.94	7	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0	0	1	2	0	0	0	0	0	0	0	0
720	15.80	3.19	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0
730	18.00	0.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
740	15.25	3.20	4	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	0
770	16.50	2.12	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
TOTAL	9.08	4.52	517	0	1	41	37	18	26	43	11	95	4	17	10	141	11	10	9	8	2	27	1	2	1	1	0	0	0	1

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