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Data Report: 2002 Aleutian Islands Bottom Trawl Survey

by
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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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PREFACE

This data report is one of three types of standard documents presenting data from the 2002 Aleutian Islands bottom trawl survey conducted by the Alaska Fisheries Science Center (AFSC), National Marine Fisheries Service (NMFS). The three standard reports are:

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

2) **Report to Industry** is a fishing log consisting of raw haul and catch data for each haul made during the survey, catch summaries for the major species, catch per unit effort by haul, and gear specifications and diagrams.

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

ABSTRACT

Eighth in a series dating from 1980, the second biennial groundfish assessment survey of the Aleutian Islands region was conducted during the summer of 2002 by the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering (RACE) Division. The survey area covered the continental shelf and upper continental slope to 500 m in the Aleutian Archipelago from Islands of Four Mountains (170° W long.) to Stalemate Bank (170° E long.), including Petrel Bank and Petrel Spur (180° long.), and the northern side of the Aleutian Islands between Unimak Pass (165° W long.) and Islands of Four Mountains. The survey was conducted aboard three chartered trawlers, the FV *Morning Star*, FV *Sea Storm*, and FV *Vesteraalen*. Samples were collected successfully at 417 survey stations using standard RACE Division Poly Nor'Eastern high-opening bottom trawl nets with rubber bobbin roller gear.

The primary survey objectives were to define the distribution and estimate the relative abundance of principal groundfish and commercially or ecologically important invertebrate species that inhabit the Aleutian marine habitat and to collect data to define biological parameters useful to fisheries researchers and managers such as growth rates; length-weight relationships; feeding habits; and size, sex, and age compositions.

Over 120 species of fish and over 315 species or species groups of invertebrates were captured in survey tows. Atka mackerel (*Pleurogrammus monopterygius*), Pacific ocean perch (*Sebastes alutus*), northern rockfish (*S. polyspinus*), walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*), arrowtooth flounder (*Atheresthes stomias*), and giant grenadier (*Albatrossia pectoralis*) were the most abundant species captured within the survey area. Atka mackerel and Pacific ocean perch were most abundant in the Aleutian region west of Islands of Four Mountains. Walleye pollock and Atka mackerel were the most abundant species in the southern Bering Sea region, east of the Islands of Four Mountains. Survey results are presented as estimates of catch per unit of effort and biomass, species distribution and relative abundance, length frequency distribution, and length-weight relationships for commercially important species and for others of biological interest.

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INTRODUCTION

The second biennial bottom trawl survey of the Aleutian Islands region was conducted from 13 May through 15 August 2002 by the Resource Assessment and Conservation Engineering (RACE) Division of the Alaska Fisheries Science Center (AFSC), National Marine Fisheries Service (NMFS), Seattle, Washington. It was the eighth comprehensive NMFS bottom trawl survey conducted since 1980. Previous surveys occurred in 1980, 1983, 1986, 1991, 1994, 1997, and 2000. The surveys conducted prior to 1991 were cooperative efforts involving U.S. and Japanese scientists and vessels. From 1991 to 2000 the surveys were planned and conducted on a triennial basis by NMFS, employing chartered U.S. fishing vessels. Biennial surveys began in 2000. The primary focus of these ongoing surveys has been to build a standardized time series of data to assess, describe, and monitor the distribution, abundance, and biological condition of Aleutian groundfish and invertebrate stocks.

This report presents 2002 survey results for the principal fish species in each of four NPFMC regulatory areas: Southern Bering Sea, and Eastern, Central, and Western Aleutians. No detailed comparisons to previous surveys are made in this report.

The specific survey objectives were to:

1) define the distribution and relative abundance of the principal groundfish and commercially or ecologically important invertebrate species that inhabit the Aleutian region;
2) obtain data from which to estimate the abundance of principal groundfish species;
3) collect data to define selected biological parameters; that is, age, growth rates, length-weight relationships, feeding habits, and size and sex compositions;
4) collect accurate net mensuration data describing the performance of standard research trawls used by all of the vessels during the survey;
5) conduct special collections as requested by other researchers or research groups which involved: whole fish collections for studies on bioenergetics,

parasites, and fatty acids; rockfish larvae, snailfish, corals, snails, and chiton collections; pollock vertebrae and otoliths; whole juvenile halibut; and observations of short-tailed albatross and killer whales.

METHODS

Survey Area

The Aleutian region is an extensive archipelago of volcanic origin typified by a relatively narrow continental shelf and a steep continental slope that drops quickly into the Aleutian Trench on the south side and into the Aleutian Basin and Bowers Basin on the north side (Fig. 1). The islands are separated by numerous deep passes and relatively narrow channels. Strong currents flow through the passes and across the shelf, sometimes making productive sampling operations difficult. The continental shelf and upper continental slope are also typified by hard and sometimes irregular terrain necessitating the use of bobbin-style roller gear on the research trawls (Appendix A).

Extending over 900 nautical miles (nmi) from east to west, the survey area is composed of the continental shelf and upper slope from Islands of Four Mountains (170° W long.) to Stalemate Bank (170° E long.), including Petrel Bank and Petrel Spur (180° long.), and the northern side of the archipelago between Unimak Pass (165° W long.) and Islands of Four Mountains (Fig. 1). Survey depths range from nearshore waters to 500 m. The total area surveyed is more than 64,400 km^2 (Table 1). The Western Aleutian area represents 24% of the total survey area, the Central Aleutian area, almost 26%, the Eastern Aleutian area, 39%, and the Southern Bering Sea area comprises about 11%. In terms of depth, the 1-100 m and 101-200 m depth intervals comprise 33.5% and 30.4%, respectively. Reflecting the fact that the upper continental slope is relatively narrow and steep in many places, the area represented by the 201-300 m and 301-500 m depth intervals are 14.4% and 21.7%, respectively.

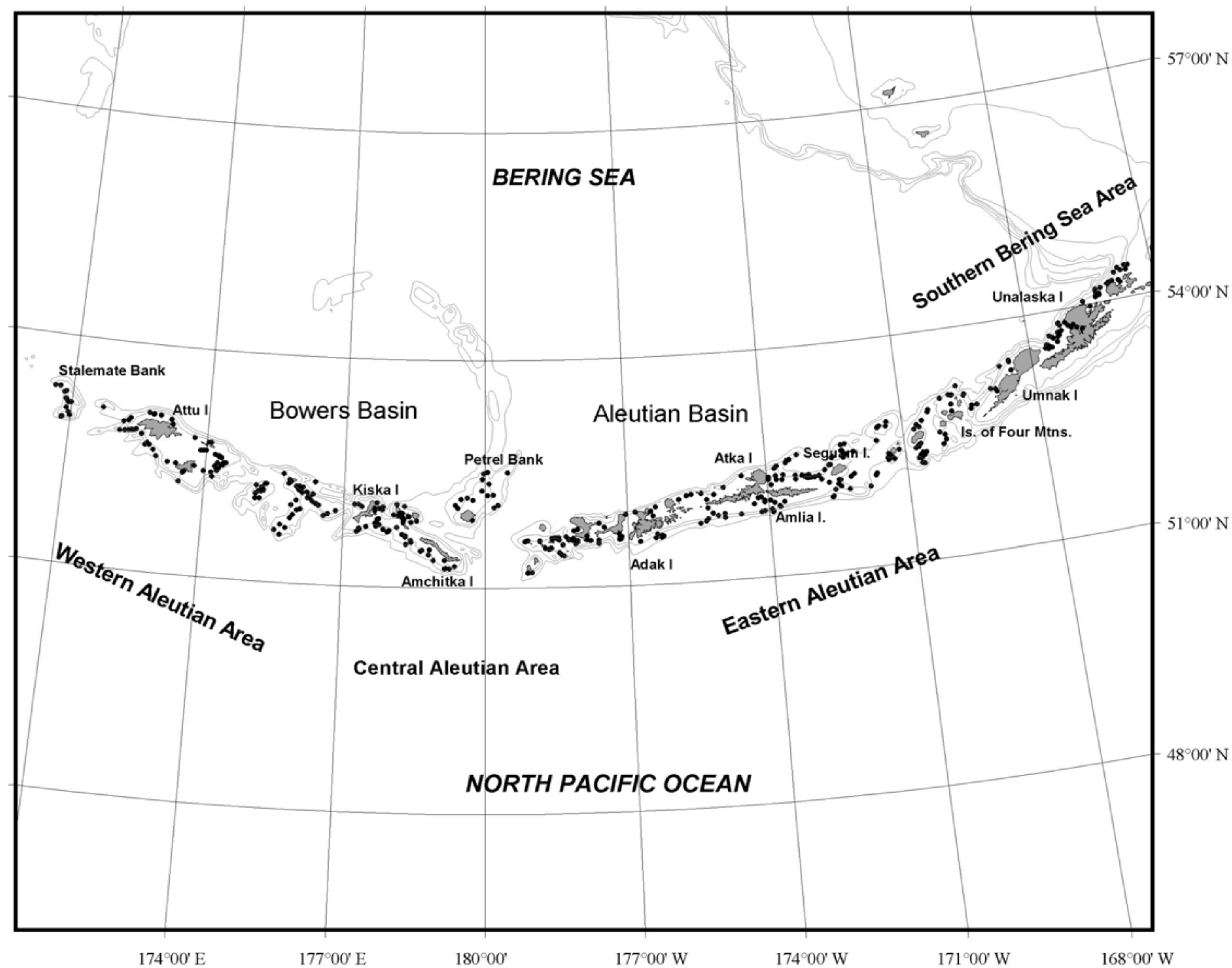


Figure 1.--Locations of trawl hauls (black dot symbol) performed during the 2002 bottom trawl survey of the Aleutian Islands region.

Vessels

All three chartered vessels were house-forward stern trawlers with stern ramps, aft net storage reels (mounted over the stern ramp), telescoping deck cranes, propeller nozzles, and paired, controlled-tension hydraulic trawl winches containing between 1,645 and 2,200 m of 2.54 cm diameter steel cable. The *Sea Storm* is 37.5 m in overall length (LOA) and is powered by a single 1,710 continuous horsepower (HP) main engine. The *Vesteraalen* is 38 m LOA with a 1,725 HP main engine. The *Morning Star* is 45 m LOA with a 1,710 HP main engine. Aboard all three vessels electronic equipment included global positioning system (GPS) with video position plotters, at least two radars, single sideband and VHF transmitter-receivers, color video fishfinders (echosounders), paper recorder echosounders, and auto-pilots.

Captains Tim Cosgrove, Brad Lougheed, and Ken Sjong operated the *Vesteraalen* for one leg apiece. Captain Steve Branstiter operated the *Sea Storm* for the entire 70-day charter period, and Captain Tim Carrier operated the *Morning Star* during its 11-day participation in the Aleutian bottom trawl survey.

Fishing Gear

All vessels used standard RACE Division Poly Nor'Eastern high-opening bottom trawls rigged with rubber bobbin roller gear (Appendix A). The trawl specifications include: a 27.2 m headrope made of 1.3 cm diameter galvanized wire rope, with twenty-one 30 cm diameter floats, and a 24.3 m long-link chain "fishing line" attached to a 24.9 m, 0.95 cm diameter galvanized wire footrope. The roller gear is 24.2 m long and constructed of 1.9 cm diameter galvanized wire rope, 36 cm rubber bobbins separated by 10 cm rubber disks. In addition, 5.9 m wire rope extensions with 10 cm and 20 cm rubber disks were used to span each lower flying wing section. For most tows, a small chain-weighted mesh pouch known as a "benthic bag" was attached to the footrope to collect benthic substrate and organisms.

Trawls are constructed of 12.7 cm stretched-mesh polyethylene web with a 3.2 cm mesh nylon liner in the codend. Net rigging consists of triple 54.9 m, 1.6 cm diameter galvanized wire rope dandylines. The dandylines are rigged with 22.9 cm, 45.7 cm and 60.7 cm chain extensions to the headrope, side, and bottom wing attachment points, respectively. Steel V-doors measuring 1.83 m ∗ 2.74 m and weighing approximately 800 kg each are used to open the net. The fishing dimensions of the trawls were measured using Scanmar acoustic net mensuration equipment.

Survey Design

For this survey the Aleutian region is divided into four major areas based on geographic features and NPFMC regulatory areas. Those areas are further divided into 45 area-depth strata or subareas (Appendix B). Survey depth intervals are as follows: 1-100, 101-200, 201-300, and 301-500 m. Naming conventions to designate direction and relative geographic locations of subareas in text, figures, and tables use the abbreviations N, S, E, and W (or their combinations, i.e. NW) for the four major points of the compass.

Most of the areas suitable to deploy the RACE standard research trawl and to meet trawl duration and performance criteria have been reasonably well defined during past surveys. Thus the vast majority of allocated stations for the 2002 survey were placed at or near locations sampled during previous surveys.

Consistent with recent RACE Division assessment surveys (Martin and Clausen 1995, Stark and Clausen 1995, Munro and Hoff 1995, Martin 1997, Britt and Martin 2001), sample allocations for each stratum were determined using a modified Neyman optimum allocation sampling strategy (Cochran 1977). An estimated maximum of 425 tows was set as the number of tows that we could expect to perform given survey time and vessel scheduling restrictions, expected weather days, and time lost to gear repairs. To avoid duplicate tows, no two selected stations could be located less than a kilometer apart. The model drew on catches of the 20 most important groundfish species captured at the locations of satisfactory performance hauls from the previous four surveys.

Because the position data for tows from the 1994 or later surveys is considered to be more accurate, stations from the last three surveys were selected ahead of 1991 survey tows. Initially, a separate allocation was projected for each species in each stratum. In the final step of the station selection process, to encourage a more objective allocation among high-volume-low-value species and low-volume-high-value species, the model was weighted by ex-vessel price of the principal groundfish species landed from the area. Fortuitously, a minimum of four stations was allocated to any given stratum.

Most of the 423 allocated tow locations were selected randomly without replacement from a database of previously conducted tows, but to satisfy the sampling requirements in certain strata, thus minimizing projected sample variances, some previously unsampled locations were required to fulfill sampling requirements. Assigned sample densities were highest in the 101-200 m and 201-300 m depth intervals at about 8 and 10 tows per 1,000 km^2, respectively (Table 1). The projected overall sample density approximated 6.6 tows per 1,000 km^2. If an allocated station could not be occupied due to fishing gear conflicts or untrawlable bottom, alternate sites in the same stratum were sought. To locate new or alternate tow sites, search patterns were run within the proper stratum using an echosounder to locate trawlable bottom where a successful 15-minute tow could be conducted. Search time at any given site was limited to 2 hours duration.

Trawl Performance Data Collection

A concerted effort was made to standardize towing procedures. The goal of each tow was for the net to arrive quickly on bottom in towing configuration at the standard towing speed of 3 knots, and to maintain the vessel speed while the net held its fishing configuration with proper bottom contact for 15 minutes. To reduce potential fishing power differences between the vessels, standard scope ratio tables of trawl warp relative to bottom depth were used. Towing time was abbreviated on some occasions to avoid gear damage or when echosounder or net mensuration data suggested the potential for an unmanageably large catch. The date, time, and GPS-generated position were recorded every 6 seconds during each tow. Pressure at depth (transformed as estimated depth), water temperature, and time were recorded every 6 seconds during most tows using a Sea Bird Model 39 data logger which was attached near the middle of the trawl headrope. During the tow the vertical and horizontal trawl openings were monitored with Scanmar net sonde units. On rare occasions, Scanmar units were not used on the net to avoid potential loss or damage due to extremely rough bottom conditions. A tilt sensor was attached to the midpoint of the roller gear to record the date, time, and tilt angle relative to bottom, indicating the degree of contact with the bottom. Surface water temperatures were collected with a bucket thermometer during the tow. At the end of each tow, retrieval started with the vessel maintaining towing speed with the objective of lifting the trawl quickly away from the bottom. All tows were performed during daylight hours within the period between one-half hour after sunrise and one-half hour before sunset.

All of the trawl performance data collected during the tow was judged after its completion using computer-generated graphics and data summaries. A trawl sample was considered to be successful if horizontal and vertical net openings remained within a predetermined normal range, the roller gear maintained consistent contact with the bottom, the net suffered little or no damage during the tow, and there were no significant encounters with derelict fishing gear. The minimum accepted duration for satisfactory tows was about 10 minutes.

Catch Processing and Data Collection

Catches weighing up to approximately 1,100 kg were emptied directly onto a sorting table, sorted to species or species group for some invertebrates, and weighed to the nearest 10 g using a Marel Model M60 electronic digital read-out platform scale. Species catches weighing less than about 2 kg were generally weighed to the nearest 2 g on a smaller capacity, electronic Marel digital read-out scale. Larger catches that contained slightly more than 1,100 kg were often processed completely by splitting the total catch onto the table in two or more portions. Very large catches that could be lifted off the deck in the codend were weighed with a dynamometer or the weight was estimated volumetrically. The catch was then dumped into a holding bin and sampled using the procedure described by Hughes (1976). A cargo net was first spread in the bottom of the bin and the fish were then dumped into the bin. The splitting net was lifted through the catch yielding a subsample that was emptied onto a sorting table and processed as described above. (The RACE standard cargo net contains roughly the equivalent of a sorting table full of catch, about 1,100 kg.) Easily differentiated, non-dominant species were separated from the remaining catch in the bin and their total weight was determined and summed with the weights from the subsample to give total weights by species. The total weights of the dominant species were extrapolated using the proportions of their subsample weights, extrapolated to the total catch weight minus the weights of the separated non-dominant species. Pacific halibut were immediately measured and released if not retained for biological samples. Halibut catch weights were estimated during data entry using length-weight parameters supplied by the International Pacific Halibut Commission and length frequency data.

A random sample of between 100 and 200 length frequencies was collected for the major species. A target tow-by-tow length frequency sample size was pre-assigned for each species. A smaller length frequency sample was collected for some minor catch components such as sculpins. Most individuals were sexed prior to measurement. All skates and Pacific halibut were measured. Unsexed length frequencies were collected for forage fish such as herring, capelin, and eulachon. Length frequencies were collected with barcode-reader data loggers and barcoded length boards. Data were downloaded to a computer and appended to an electronic database after each tow.

Age structures (otoliths) were collected for most major species. Separate collections were made from each of the four major subareas. Samples were stratified by sex and size with a fixed number of otoliths (varying by species) collected per centimeter length interval. Limits were placed on the number collected per sex-centimeter per day to distribute the sample over the area. Length was measured to the nearest centimeter and weight was estimated to the nearest 2-10 g (scale accuracy depended on the weight of the specimen) with one of two digital read-out scales. Fork length was measured for all fish species except grenadiers (insertion of ventral fin), and skates and sharks (total length).

Stomach samples for selected species were collected throughout the survey area by biologists from the AFSC's Trophic Interactions Program. Other collections were made for a number of research projects: coral samples, snailfish (Family Cyclopteridae) collections, walleye pollock vertebrae and otolith samples, snail and chiton samples, whole fish collections for studies on parasites, fatty acids, and sea lion prey bioenergetics, rockfish larvae, juvenile halibut collections, and short-tailed albatross and killer whale observations.

Data Analysis

The descriptions in the Data Analysis and Data Limitations sections are largely drawn from Martin (1997) and represent a concise summary of current RACE catch analysis procedures and assumptions about survey sampling limitations.

Biomass estimates were calculated using the area-swept method (Alverson and Pereyra 1969). The area swept by the trawl was estimated by multiplying the estimated distance towed in kilometers (km) by the estimated mean net spread in meters (m) for each tow. The distance towed was estimated by computing the distance traveled over ground by the vessel between the estimated time when the footrope came into contact with the bottom (on-bottom) and the estimated time when the center of the footrope left the bottom (off-bottom). The distance traveled by the vessel was estimated by smoothing the GPS position data to eliminate the dither introduced by variability in signal reception and system precision, and measuring the distance along this line. The mean net spread was estimated by averaging the smoothed Scanmar net spread readings collected during the on-bottom to off-bottom time period. All satisfactory performance tows had at least partial Scanmar data sets available. For each species, a catch-per-unit-effort (CPUE) was calculated for each tow by dividing catch weight (kg) by the area swept by the trawl in hectares (ha). The mean CPUE for each stratum was calculated as the mean of the individual tow CPUEs (including zero catches) within the stratum. Mean CPUEs for combined strata were calculated as the weighted average of the individual stratum CPUE means (weighted by stratum area). Biomass estimates in metric tons (t) were calculated by multiplying each stratum mean CPUE by the stratum area and summing the results to obtain estimates by NPFMC regulatory area and depth intervals. The 95% confidence interval was calculated for each species biomass estimate. A detailed description of the analytical procedures is presented in Wakabayashi et al. (1985).

Population length compositions were estimated by expanding the length-frequency data to the total catch for each species by length and sex category at each station (Wakabayashi et al. 1985). The stratum population within a sex-length category was calculated by multiplying the stratum population by the proportion of fish in that category from the summed station data. Population size composition estimates were summed over strata to create estimates by area.

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

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

where *a* = a coefficient and *b* = an exponent.

Data Limitations

Due to the multi-species nature of this survey, there are some limitations in its ability to estimate fish abundance. Populations whose entire depth range is not covered by the survey are not fully sampled (e.g., sablefish and shortspine thornyhead). Populations that extend into areas untrawlable with the survey gear or that occupy the water column above the headrope of the trawl are not fully represented (e.g., many rockfish species). Populations of species that exhibit a highly contagious distribution pattern (e.g., Atka mackerel and Pacific ocean perch) might be better sampled with a different survey design. For these reasons, survey estimates of abundance are considered more reliable for species that are widely and more uniformly distributed. Contagious distributions might be indicated by catch patterns that show a few high catches, the remainder being much smaller or “zero” catches. For example, in the 101-200 m depth interval of the Western Aleutian area, 28 survey tows were conducted. Of those 28 tows, there was one with 3,080 kg of Pacific ocean perch (POP), 6 tows with between 100 and 900 kg, 5 tows with 1 to 100 kg, and 16 tows with no catch of POP.

Estimates of population size within the survey area are routinely expressed as absolute abundance estimates. These estimates require the assumption that 100% of the fish within the path of the trawl are captured. In fact, as with any fishing gear, the survey trawl exhibits some size selectivity. Small fish might pass through the net mesh and would not be sampled well. Some larger fish may be able to swim ahead of the trawl, at least for a short time. Some fish are herded into the path of the trawl by the doors and the bridles (Somerton and Munro 2001). Some fish escape under the footrope of the net. Video and bottom contact sensor evidence suggests that this might be a problem with the research trawl, especially if towing speed exceeds 3 knots (Somerton and Weinberg 2000). The rate of herding and escapement depend upon several factors including the species and water temperature. This is an active area of ongoing research at the AFSC and at other research institutions. Given these limitations, survey abundance estimates should be considered relative measures of abundance.

RESULTS

A total of 480 trawl tows were attempted. Four hundred seventeen (417) successful tows were conducted at 423 allocated station locations. All successful tows were included in the biomass and size composition analysis (Table 1). Six assigned stations were not sampled because a suitable site could not be found. Scanmar net spread data were collected with all successful tows. Headrope depth and temperature data were successfully recorded for 479 tows. Temperatures at headrope depths ranged from 3.2° to 6.8°C, but the vast majority ranged between 3.5° and 5.0°C (Appendix D). Sea surface temperatures ranged from 3.8° to 10.9°C.

Results by Area

Over 120 species of fish from 26 families and 315 invertebrate species or taxa from 13 phyla were captured during the 2002 survey. Appendix C presents lists of fish (Appendix C-1) and invertebrate (Appendix C-2) species encountered during the survey. This report deals largely with groundfish species. Relative abundance estimates, reported as catch-per-unit-effort (kg/ha), are presented in Table 2 for the 20 most abundant groundfish species in each of the four NPFMC regulatory areas covered by the survey, combined Aleutian areas, and the entire survey region.

Atka mackerel was the most abundant species captured over the entire survey region (Table 2), followed by Pacific ocean perch (POP) and walleye pollock. Atka mackerel and POP generated the two highest mean CPUEs in the Western and Central Aleutian areas. Based on the weight of a few very large catches, giant grenadier was the most abundant species in the Eastern Aleutian area, followed by Atka mackerel, POP, and walleye pollock. In the Southern Bering Sea area walleye pollock mean CPUE was exceptionally high compared to all other species in all other areas. Pacific cod, an important Aleutian groundfish species, was more or less uniformly distributed throughout the survey area, but at levels much lower than Atka mackerel, POP, or walleye pollock.

Table 1.-- Number of stations allocated, attempted, and successfully completed and sampling density for the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

NPFMC Area	Depth (m)	Number of stations Allocated	Attempted	Successful	Area (km^2)	Tows/1,000 km^2 Allocated	Successful
Western	1-100	29	29	26	4,876	5.95	5.33
Aleutian	101-200	51	54	51	5,317	9.59	9.59
	201-300	19	19	19	1,723	11.03	11.03
	301-500	13	13	13	3,272	3.97	3.97
	All depths	112	115	109	15,188	7.37	7.18
Central	1-100	30	32	30	5,848	5.13	5.13
Aleutian	101-200	42	50	45	4,606	9.12	9.77
	201-300	28	27	23	2,108	13.28	10.91
	301-500	17	20	17	3,980	4.27	4.27
	All depths	117	129	115	16,542	7.07	6.95
Eastern	1-100	18	16	16	6,848	2.63	2.34
Aleutian	101-200	48	49	47	7,768	6.18	6.05
	201-300	41	46	42	4,902	8.36	8.57
	301-500	27	42	27	5,683	4.75	4.75
	All depths	134	153	132	25,201	5.32	5.24
Southern	1-100	30	37	30	4,026	7.45	7.45
Bering Sea	101-200	16	21	16	1,849	8.65	8.65
	201-300	6	10	7	564	10.64	12.41
	301-500	8	15	8	1,043	7.67	7.67
	All depths	60	83	61	7,482	8.02	8.15
All areas	1-100	107	114	102	21,598	4.95	4.72
	101-200	157	174	159	19,540	8.03	8.14
	201-300	94	102	91	9,297	10.11	9.79
	301-500	65	90	65	13,978	4.65	4.65
	All depths	423	480	417	64,413	6.57	6.47

Table 2.-- Mean CPUE (kg/ha) for the 20 most abundant groundfish and total sampling effort for each NPFMC regulatory area from the 2002 Aleutian Islands bottom trawl survey.

Western Aleutian Area	CPUE	Central Aleutian Area	CPUE	Eastern Aleutian Area	CPUE
Atka mackerel	167.95	Atka mackerel	197.59	giant grenadier	81.16
Pacific ocean perch	133.06	Pacific ocean perch	84.85	Atka mackerel	75.72
northern rockfish	88.56	walleye pollock	65.41	Pacific ocean perch	43.57
Pacific cod	15.67	northern rockfish	23.09	walleye pollock	21.68
arrowtooth flounder	9.44	Pacific cod	14.63	arrowtooth flounder	19.48
walleye pollock	8.19	northern rock sole	13.76	Pacific cod	10.02
northern rock sole	6.96	Kamchatka flounder	12.14	Kamchatka flounder	8.62
shortspine thornyhead	5.43	arrowtooth flounder	7.81	Pacific halibut	7.33
Pacific halibut	5.14	shortraker rockfish	5.22	northern rock sole	5.75
giant grenadier	3.82	giant grenadier	4.73	whiteblotched skate	3.97
Alaska skate	3.41	Pacific halibut	3.94	Greenland turbot	2.78
whiteblotched skate	2.77	shortspine thornyhead	3.30	sculpin unident.	2.16
shortraker rockfish	2.60	sculpin unident.	3.06	northern rockfish	1.29
prowfish	2.14	Alaska skate	2.41	rougheye rockfish	1.23
Kamchatka flounder	2.00	rougheye rockfish	2.38	flathead sole	1.19
flathead sole	1.58	sablefish	2.28	shortraker rockfish	1.11
sculpin unident.	1.14	whiteblotched skate	1.37	rex sole	0.83
Aleutian skate	0.89	Greenland turbot	1.00	Aleutian skate	0.65
rougheye rockfish	0.87	Aleutian skate	0.92	sablefish	0.55
rex sole	0.60	rex sole	0.70	Alaska skate	0.52
Number of hauls	109	Number of hauls	115	Number of hauls	132

All Aleutian Areas	CPUE	Southern Bering Sea Area	CPUE	All Areas	CPUE
Atka mackerel	135.74	walleye pollock	242.38	Atka mackerel	129.27
Pacific ocean perch	79.44	Atka mackerel	80.04	Pacific ocean perch	72.75
giant grenadier	38.32	Pacific ocean perch	21.80	walleye pollock	55.36
northern rockfish	30.90	arrowtooth flounder	16.51	giant grenadier	33.87
walleye pollock	30.79	Pacific cod	12.83	northern rockfish	27.36
arrowtooth flounder	13.41	Pacific halibut	10.50	arrowtooth flounder	13.77
Pacific cod	12.87	southern rock sole	8.27	Pacific cod	12.86
northern rock sole	8.40	flathead sole	5.89	northern rock sole	7.92
Kamchatka flounder	7.88	Kamchatka flounder	5.59	Kamchatka flounder	7.61
Pacific halibut	5.76	rex sole	4.30	Pacific halibut	6.31
whiteblotched skate	2.90	northern rock sole	4.26	shortraker rockfish	2.62
shortraker rockfish	2.70	sculpin unident.	2.67	whiteblotched skate	2.60
shortspine thornyhead	2.50	shortraker rockfish	1.96	shortspine thornyhead	2.37
sculpin unident.	2.15	rougheye rockfish	1.67	sculpin unident.	2.21
Alaska skate	1.84	shortspine thornyhead	1.35	Alaska skate	1.63
Greenland turbot	1.66	squid	0.94	flathead sole	1.54
rougheye rockfish	1.47	starry flounder	0.90	Greenland turbot	1.54
sablefish	1.06	Greenland turbot	0.59	rougheye rockfish	1.49
flathead sole	0.96	sablefish	0.59	rex sole	1.15
Aleutian skate	0.80	Aleutian skate	0.49	southern rock sole	1.04
Number of hauls	356	Number of hauls	61	Number of hauls	417

Results by Species

More detailed species-specific accounts are provided below. The first species group includes the flatfish, followed by roundfish, rockfish, and skates, respectively. Some minor species of biological interest such as sculpins have been grouped for convenience sake, but when data such as species-specific length frequency or length-weight information are available they are presented separately. Generally, the following items are presented for most, but not all species:

1) a short summary of the data collected and data analysis,
2) a table showing the number of hauls, the number of hauls with catch, mean CPUE, estimated biomass and confidence intervals, mean length and mean weight of that species by NPFMC area and depth interval,
3) a table showing mean CPUE and estimated biomass confidence intervals by subarea and depth stratum,
4) figures showing the station distribution and CPUE as “dotplots”,
5) figures showing the estimated size composition of the population by NPFMC area and depth interval, and
6) figures and nonlinear regression parameters showing the length-weight relationship (power curve) from the individual length and weight data.

The scientific and common names used herein generally follow the fifth edition of the Common Names of Fishes from the United States and Canada (Robins et al. 1991), Fishes of Alaska (Mecklenburg et al. 2002) or Alaska’s Saltwater Fishes and Other Sealife (Kessler 1985).

Flatfish

Arrowtooth flounder (*Atheresthes stomias*)

Arrowtooth flounder was the most abundant flatfish species in the survey area. Its relative abundance was highest in the Eastern Aleutian area and the Southern Bering Sea area (Table 2), approximately twice as high as the mean CPUE in the Western or Central Aleutian areas. This species was distributed throughout the entire survey area and in all depth intervals (Table 3, Fig. 2). Mean CPUE was highest in the 201-300 m depth interval in the combined Aleutian areas and in the 101-200 m interval in the Southern Bering Sea area. The estimated biomass surpassed 88,700 t, 55% of which was found in the Eastern Aleutian area, well distributed among the four survey depth intervals.

In the 15 subareas and depth strata where arrowtooth flounder was most abundant, virtually every trawl haul produced arrowtooth flounder (Table 4). The species was not particularly abundant or highly concentrated but was widely distributed. Many stations produced CPUEs within the range of mean CPUE to two standard deviations above the mean (Fig. 2).

Mean length and weight of arrowtooth flounder increased predictably with depth (Table 3) and were larger in the combined Aleutian areas than in the Southern Bering Sea area. Maximum lengths of males were shorter than females (Fig. 3) and females were more abundant in the deeper strata. The size differences between males and females are illustrated by the length-weight relationships found in Figure 4.

Table 3.--Number of survey hauls, number of hauls with arrowtooth flounder, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits: Minimum biomass (t)	95% Confidence limits: Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	13	0.17	85	8	163	0.214	25.6
Aleutian	101-200	51	31	15.32	8,147	1,895	14,398	0.781	40.2
	201-300	19	17	28.69	4,946	2,066	7,825	0.908	42.1
	301-500	13	11	3.56	1,166	202	2,129	1.289	48.1
	All depths	109	72	9.44	14,343	7,529	21,157	0.835	40.9
Central	1-100	30	11	0.77	451	5	896	0.369	33.1
Aleutian	101-200	45	32	5.14	2,367	240	4,494	1.059	41.0
	201-300	23	22	28.69	6,050	1,006	11,094	1.674	51.4
	301-500	17	14	10.19	4,057	1,093	7,022	2.074	57.7
	All depths	115	79	7.81	12,925	7,148	18,703	1.432	47.7
Eastern	1-100	16	9	11.94	8,175	878	15,473	0.308	29.8
Aleutian	101-200	47	35	14.52	11,278	4,119	18,438	0.721	38.7
	201-300	42	42	33.97	16,648	4,545	28,752	1.118	46.9
	301-500	27	17	22.87	12,996	0	30,896	1.753	55.0
	All depths	132	103	19.48	49,097	26,852	71,343	0.762	38.8
All	1-100	72	33	4.96	8,711	1,382	16,040	0.310	29.9
Aleutian	101-200	143	98	12.32	21,792	12,408	31,175	0.770	39.4
Areas	201-300	84	81	31.65	27,644	14,407	40,881	1.154	46.5
	301-500	57	42	14.08	18,219	49	36,388	1.773	54.9
	All depths	356	254	13.41	76,365	52,534	100,197	0.842	40.1
Southern	1-100	30	29	10.38	4,180	1,893	6,467	0.294	29.8
Bering Sea	101-200	16	16	26.57	4,912	1,119	8,704	0.435	34.4
	201-300	7	7	19.30	1,088	313	1,864	0.853	43.5
	301-500	8	8	20.82	2,172	1,218	3,125	1.455	51.3
	All depths	61	60	16.51	12,352	7,986	16,717	0.437	33.4

Table 4.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of arrowtooth flounder by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	201-300	N Central Aleutian	10	10	105.72	4,641	0	9,743
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	53.64	6,801	0	33,207
Western Aleutian	201-300	W Western Aleutian	9	9	47.40	4,457	1,550	7,364
Eastern Aleutian	301-500	SE Eastern Aleutian	12	10	43.37	11,167	0	29,179
Eastern Aleutian	201-300	NW Eastern Aleutian	2	2	42.78	667	0	8,465
Eastern Aleutian	201-300	SE Eastern Aleutian	12	12	42.66	8,791	0	20,232
Southern Bering	101-200	E Southern Bering Sea	11	11	29.17	3,440	864	6,016
Eastern Aleutian	201-300	NE Eastern Aleutian	22	22	28.56	5,623	1,414	9,831
Southern Bering	101-200	W Southern Bering Sea	5	5	21.98	1,472	0	5,186
Eastern Aleutian	201-300	SW Eastern Aleutian	6	6	21.88	1,568	53	3,083
Southern Bering	301-500	Combined Southern Bering	8	8	20.82	2,172	1,194	3,150
Eastern Aleutian	101-200	NW Eastern Aleutian	6	6	19.38	3,090	0	7,626
Southern Bering	201-300	Combined Southern Bering	7	7	19.30	1,088	286	1,891
Central Aleutian	301-500	N Central Aleutian	8	7	18.28	2,266	0	4,765
Eastern Aleutian	101-200	SW Eastern Aleutian	9	9	18.19	4,112	0	10,087
Western Aleutian	101-200	W Western Aleutian	28	23	18.09	7,352	1,184	13,520
Central Aleutian	201-300	SE Central Aleutian	4	4	18.02	860	600	1,121
Eastern Aleutian	101-200	NE Eastern Aleutian	17	13	17.17	3,455	1,010	5,899
Central Aleutian	301-500	SE Central Aleutian	4	3	13.37	955	0	3,675
Southern Bering	1-100	E Southern Bering Sea	27	26	12.77	3,115	2,047	4,183
Central Aleutian	101-200	SE Central Aleutian	14	11	10.01	752	94	1,411
Central Aleutian	101-200	N Central Aleutian	8	6	9.51	1,014	0	3,096
Southern Bering	1-100	W Southern Bering Sea	3	3	6.72	1,065	0	3,816
Eastern Aleutian	1-100	NW Eastern Aleutian	4	2	6.64	1,283	0	4,367
Western Aleutian	101-200	E Western Aleutian	23	8	6.34	794	0	1,898
Central Aleutian	201-300	SW Central Aleutian	6	5	6.26	267	0	679
Western Aleutian	201-300	E Western Aleutian	10	8	6.24	489	89	889
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	6	6.10	1,629	0	4,450
Central Aleutian	301-500	SW Central Aleutian	2	2	6.00	473	0	1,182
Western Aleutian	301-500	W Western Aleutian	11	9	5.38	921	0	1,899
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	4.55	200	0	2,735
Central Aleutian	201-300	Petrel Bank	3	3	3.68	282	0	591
Eastern Aleutian	101-200	SE Eastern Aleutian	15	7	3.27	621	0	1,399
Central Aleutian	301-500	Petrel Bank	3	2	2.94	363	0	1,146
Central Aleutian	101-200	SW Central Aleutian	17	13	2.61	275	0	591
Central Aleutian	101-200	Petrel Bank	6	2	1.88	326	0	966
Central Aleutian	1-100	N Central Aleutian	14	5	1.78	375	0	818
Western Aleutian	301-500	E Western Aleutian	2	2	1.57	245	0	914
Eastern Aleutian	1-100	SW Eastern Aleutian	5	5	0.48	91	0	189
Central Aleutian	1-100	SW Central Aleutian	5	3	0.27	44	0	142
Central Aleutian	1-100	SE Central Aleutian	7	3	0.27	32	0	75

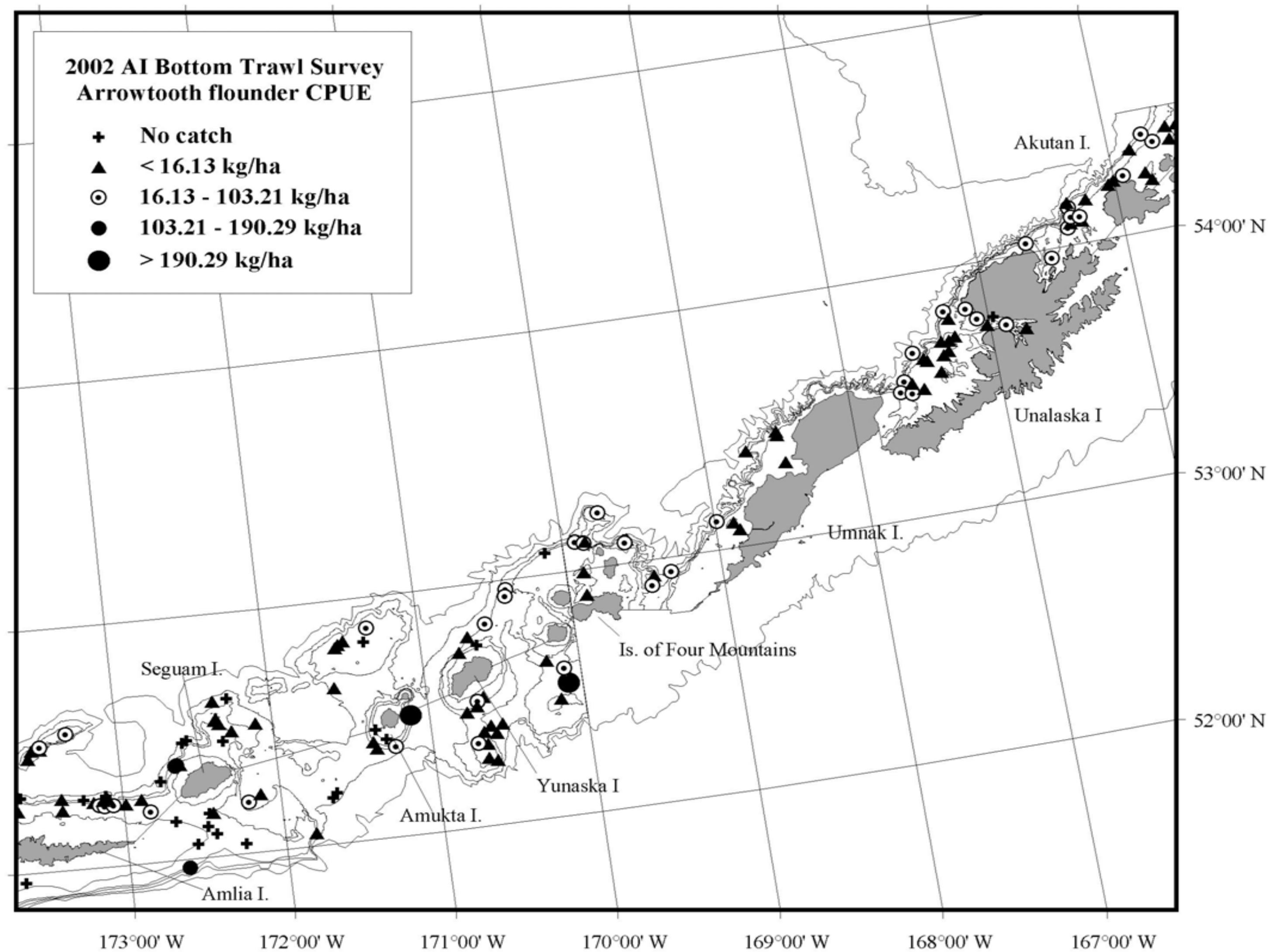
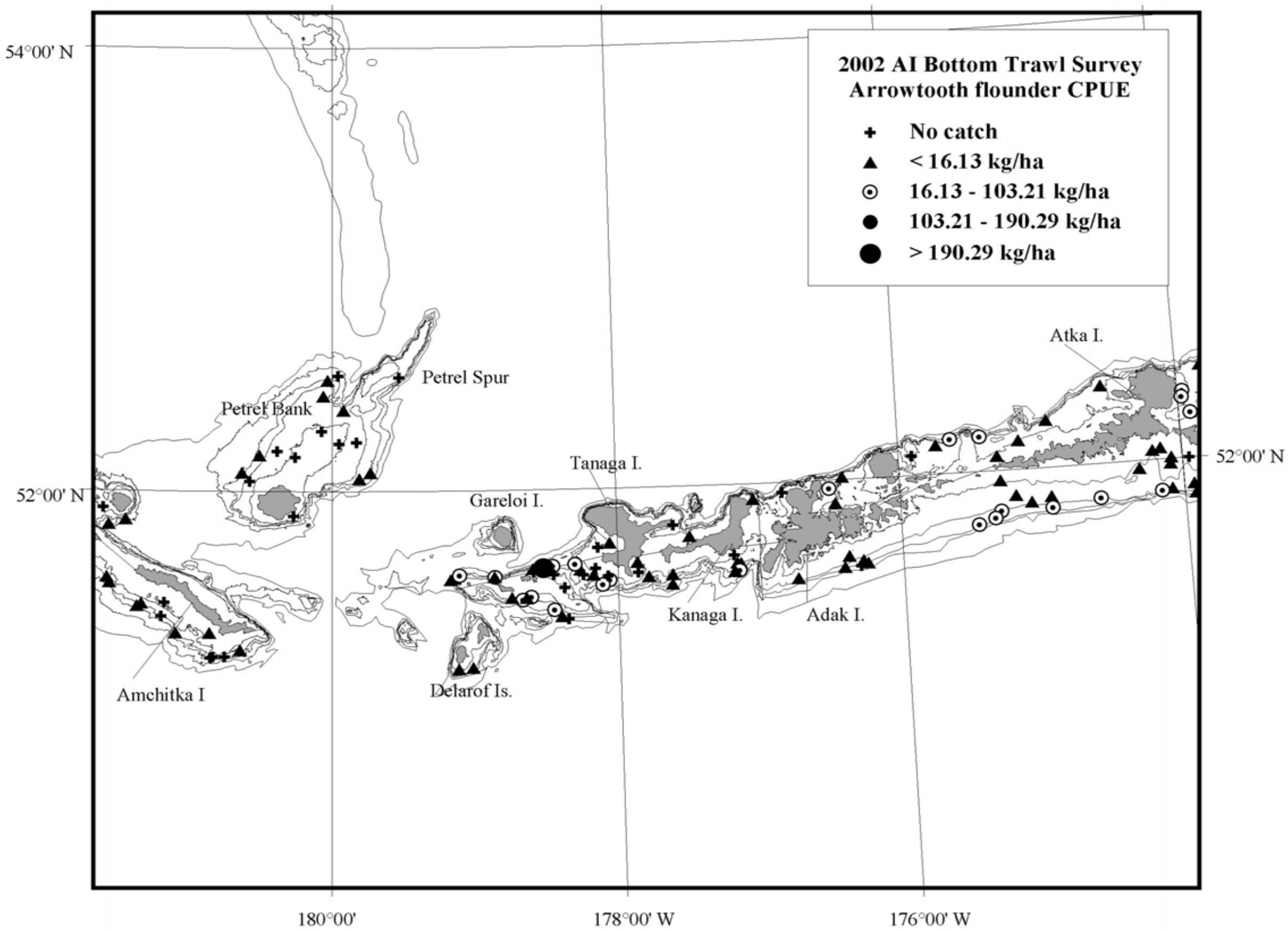


Figure 2.--Distribution and relative abundance of arrowtooth flounder from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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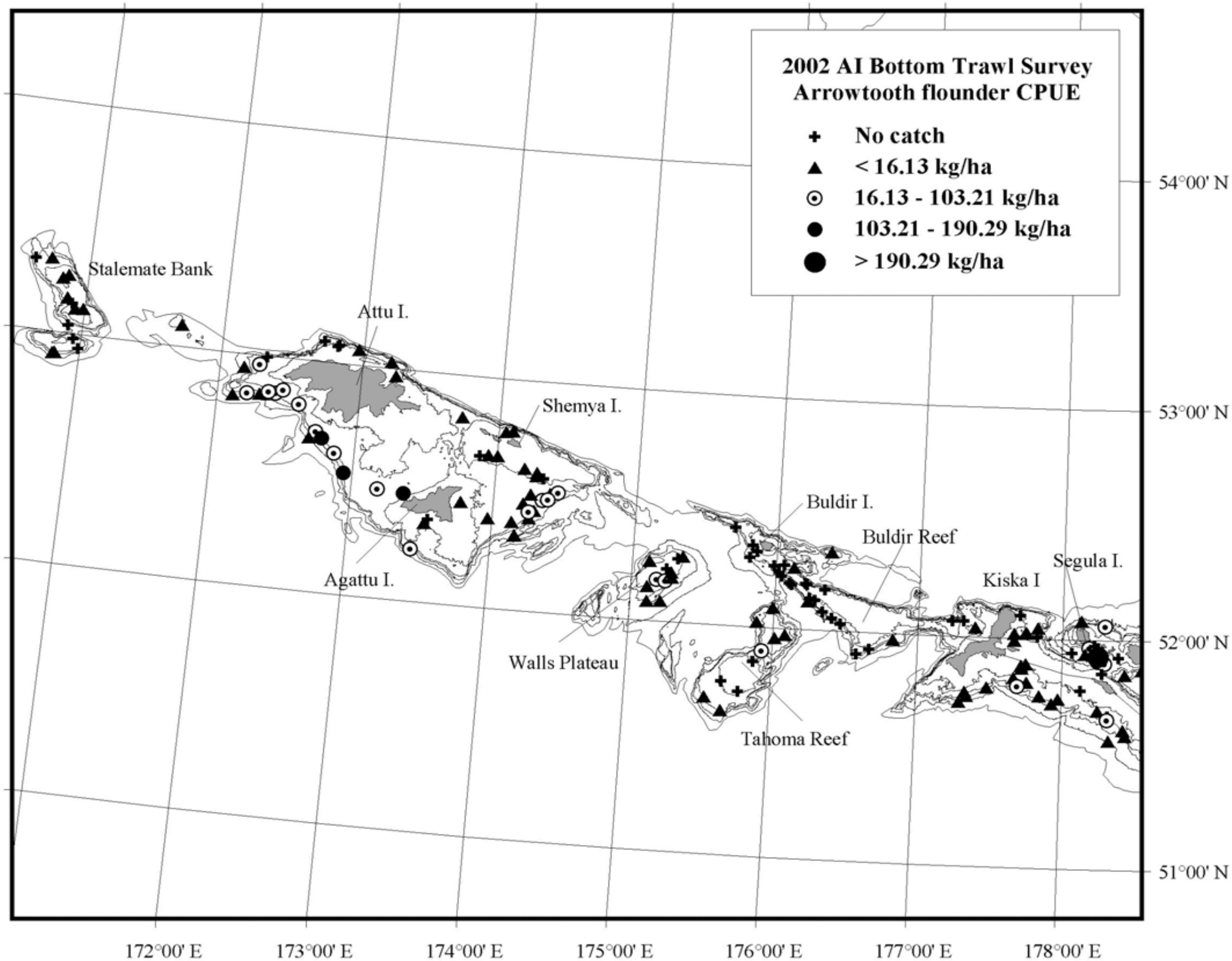

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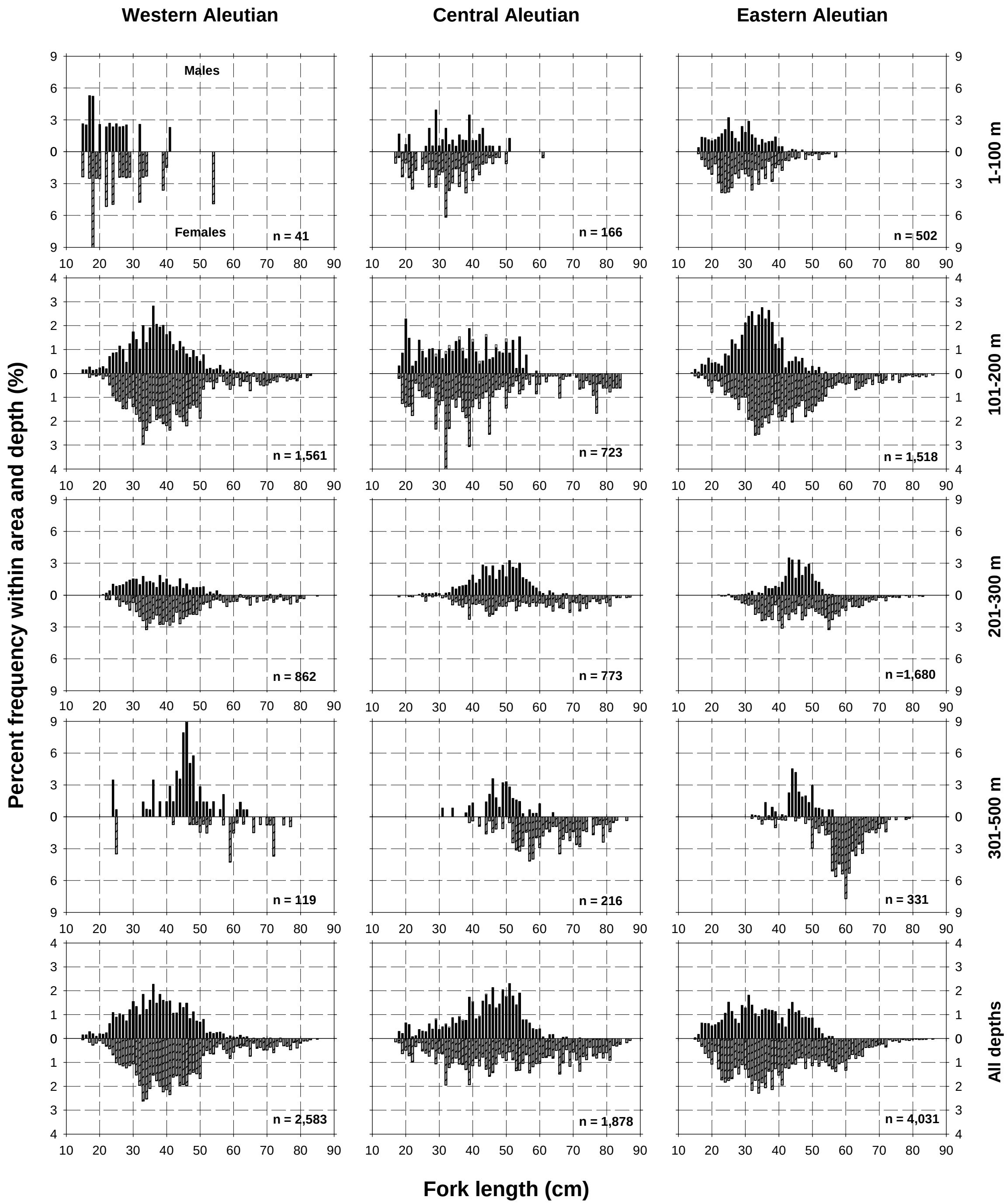


Figure 3.--Size composition of the estimated arrowtooth flounder population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

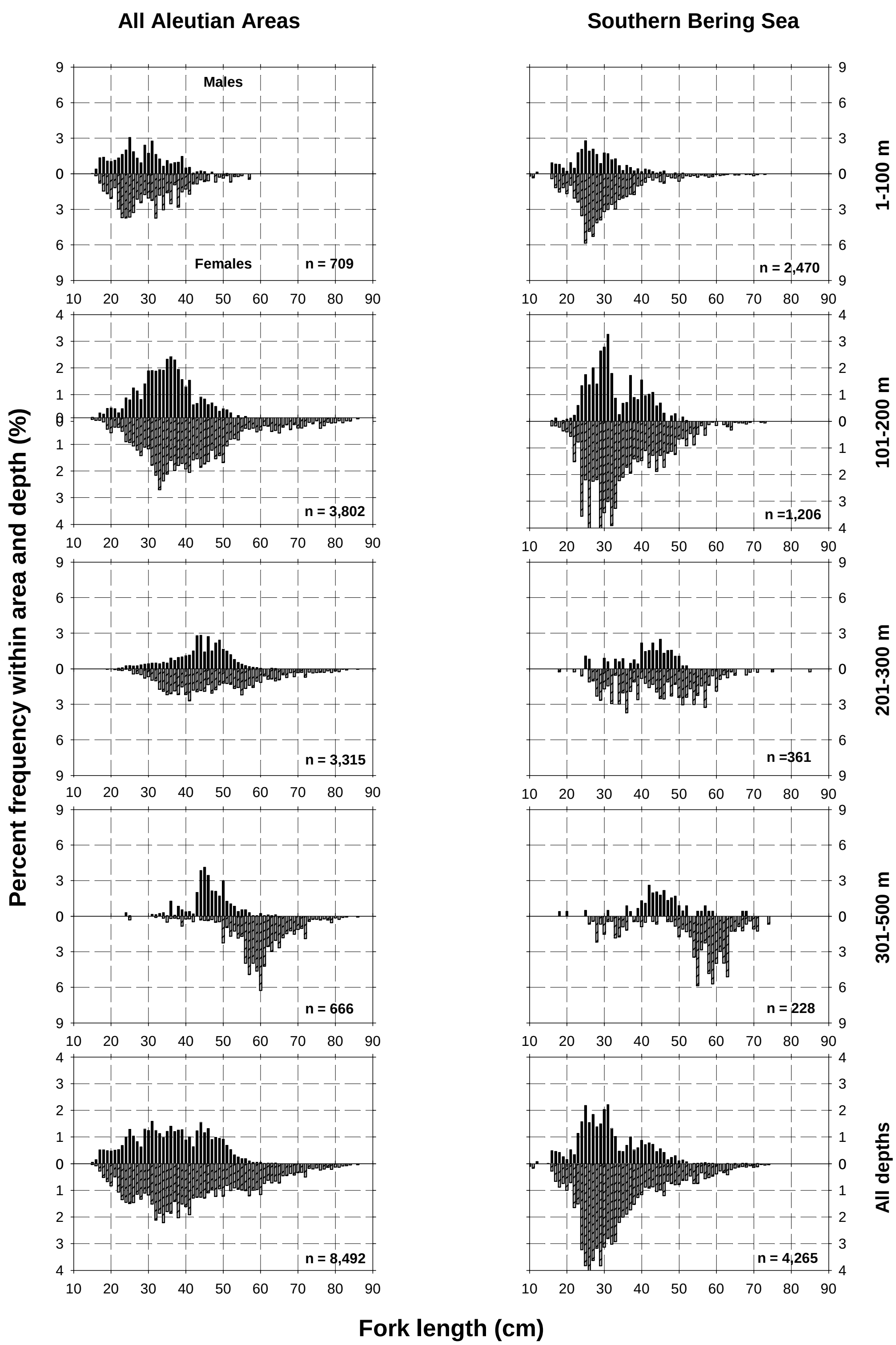


Figure 3.--(Arrowtooth flounder, continued).

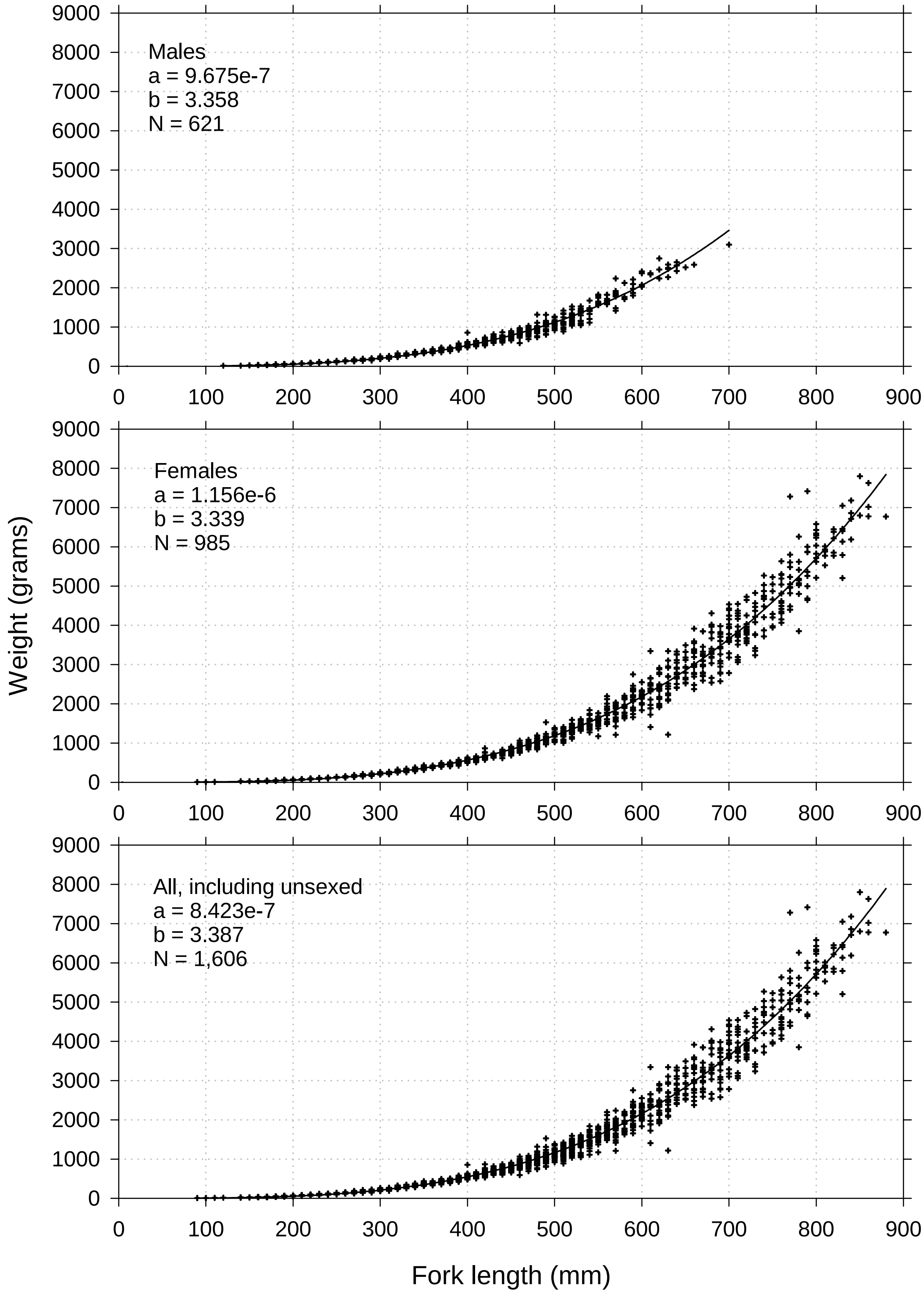


Figure 4.--Length-weight relationship for arrowtooth flounder specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{\ b}$.

Kamchatka flounder (*Atheresthes evermanni*)

Relative abundance of Kamchatka flounder was highest in the Central Aleutian area where it was more abundant than arrowtooth flounder and Pacific halibut (Table 2), but slightly less abundant than northern rock sole. This species was least abundant in the Western Aleutian area. In the Eastern Aleutian and Southern Bering Sea areas Kamchatka flounder was less abundant than arrowtooth flounder, but more abundant than Pacific halibut (Table 2). Total estimated biomass was approximately 49,000 t, 87% of which was found in the 301-500 m depth interval (Table 5). It is possible that this species is also abundant in deeper, unsampled depths. The results of the 1980 U.S.-Japan cooperative trawl survey showed that 31% of the total Aleutian biomass of arrowtooth and Kamchatka flounder combined was found in the 500-900 m depth interval (Ronholt et al. 1986). Relative abundance increased markedly with depth, as did mean individual weight and length. Kamchatka flounder and arrowtooth flounder are physically very similar and probably occupy similar ecological niches, but adults of the former species inhabit the deepest survey strata, whereas the latter is most abundant in the 101-200 m and 201-300 m depth intervals (Tables 3 and 5).

Specifically, Kamchatka flounder mean CPUE was highest in the 301-500 m depth interval in the SW Central Aleutian subarea where only two trawl hauls were conducted (Table 6). Although mean CPUE was somewhat lower in 301-500 m in the N Central Aleutian and SE Eastern Aleutian subareas, sampling density was higher (Tables 1 and 6). Kamchatka flounder was captured in almost every trawl haul that was conducted in depths of 301-500 m. Relatively high CPUEs were found at three stations between Islands of Four Mountains and Amukta Island, W of Tanaga Island, and SE of Kiska Island (Fig. 5).

Like arrowtooth flounder, Kamchatka flounder exhibit sexual dimorphism. Adult females grow larger than males (Figs. 3 and 6). Average size increases with depth for both sexes. The sexual dimorphism is also demonstrated in Figure 7. The sample size was small, probably under-representing the smaller fish.

Table 5.--Number of survey hauls, number of hauls with Kamchatka flounder, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	1	< 0.01	1	0	2	0.095	22.0
Aleutian	101-200	51	12	0.62	329	64	594	0.516	35.4
	201-300	19	12	5.54	955	0	1,918	1.128	42.6
	301-500	13	11	5.35	1,750	0	4,058	1.909	55.4
	All depths	109	36	2.00	3,035	556	5,514	1.261	45.5
Central	1-100	30	7	0.11	64	5	123	0.338	32.4
Aleutian	101-200	45	25	1.33	611	186	1,035	0.920	39.8
	201-300	23	21	8.01	1,689	444	2,934	1.374	46.8
	301-500	17	15	44.52	17,724	0	39,912	2.754	60.8
	All depths	115	68	12.14	20,087	0	42,321	2.359	56.5
Eastern	1-100	16	1	0.08	53	0	200	0.251	30.7
Aleutian	101-200	47	20	1.11	859	376	1,342	0.463	33.5
	201-300	42	25	3.07	1,504	40	2,968	0.853	42.7
	301-500	27	25	33.98	19,312	0	41,770	2.839	61.8
	All depths	132	71	8.62	21,729	0	44,242	2.043	53.1
All	1-100	72	9	0.07	117	0	271	0.289	31.4
Aleutian	101-200	143	57	1.02	1,799	1,154	2,444	0.570	35.2
Areas	201-300	84	58	4.75	4,148	2,178	6,118	1.080	44.0
	301-500	57	51	29.98	38,787	11,015	66,558	2.740	60.9
	All depths	356	175	7.88	44,851	16,998	72,703	2.081	53.6
Southern	1-100	30	1	0.01	5	0	21	0.214	30.0
Bering Sea	101-200	16	4	0.28	53	0	137	0.421	34.5
	201-300	7	4	0.99	56	0	126	1.421	50.6
	301-500	8	8	39.02	4,071	0	10,433	2.450	60.7
	All depths	61	17	5.59	4,184	0	10,547	2.262	58.3

Table 6.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Kamchatka flounder by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	301-500	SW Central Aleutian	2	2	91.95	7,256	0	94,434
Central Aleutian	301-500	N Central Aleutian	8	8	54.28	6,729	356	13,102
Eastern Aleutian	301-500	SE Eastern Aleutian	12	11	51.20	13,183	0	34,564
Southern Bering	301-500	Combined Southern Bering	8	8	39.02	4,071	0	10,596
Central Aleutian	301-500	Petrel Bank	3	3	29.98	3,710	0	17,004
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	12	22.85	6,100	0	15,307
Central Aleutian	201-300	N Central Aleutian	10	9	14.47	635	93	1,178
Western Aleutian	201-300	E Western Aleutian	10	5	7.99	626	0	1,602
Central Aleutian	201-300	Petrel Bank	3	3	7.60	583	0	2,055
Western Aleutian	301-500	W Western Aleutian	11	9	7.19	1,230	0	3,546
Central Aleutian	201-300	SE Central Aleutian	4	4	7.10	339	0	1,095
Eastern Aleutian	201-300	NE Eastern Aleutian	22	17	6.85	1,349	0	2,813
Western Aleutian	201-300	W Western Aleutian	9	7	3.50	329	107	551
Western Aleutian	301-500	E Western Aleutian	2	2	3.33	520	0	3,661
Central Aleutian	201-300	SW Central Aleutian	6	5	3.10	132	0	281
Eastern Aleutian	101-200	NE Eastern Aleutian	17	12	2.79	562	263	862
Central Aleutian	101-200	N Central Aleutian	8	5	2.45	261	3	520
Eastern Aleutian	201-300	NW Eastern Aleutian	2	1	1.88	29	0	403
Eastern Aleutian	101-200	NW Eastern Aleutian	6	5	1.79	285	0	723
Central Aleutian	101-200	Petrel Bank	6	3	1.55	268	0	644
Southern Bering	201-300	Combined Southern Bering	7	4	0.99	56	0	129
Western Aleutian	101-200	W Western Aleutian	28	9	0.69	279	22	535
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	0.68	30	0	207
Central Aleutian	101-200	SW Central Aleutian	17	9	0.51	53	7	99
Eastern Aleutian	201-300	SE Eastern Aleutian	12	2	0.46	95	0	241
Southern Bering	101-200	E Southern Bering Sea	11	4	0.45	53	0	138
Eastern Aleutian	201-300	SW Eastern Aleutian	6	5	0.42	30	0	66
Central Aleutian	301-500	SE Central Aleutian	4	2	0.41	29	0	83
Western Aleutian	101-200	E Western Aleutian	23	3	0.40	51	0	121
Central Aleutian	101-200	SE Central Aleutian	14	8	0.37	28	0	56
Eastern Aleutian	1-100	NW Eastern Aleutian	4	1	0.27	53	0	221
Central Aleutian	1-100	N Central Aleutian	14	5	0.20	42	0	92
Central Aleutian	1-100	SE Central Aleutian	7	2	0.19	22	0	61
Eastern Aleutian	101-200	SW Eastern Aleutian	9	3	0.06	13	0	35
Southern Bering	1-100	W Southern Bering Sea	3	1	0.03	5	0	27
Western Aleutian	1-100	E Western Aleutian	10	1	< 0.01	1	0	2

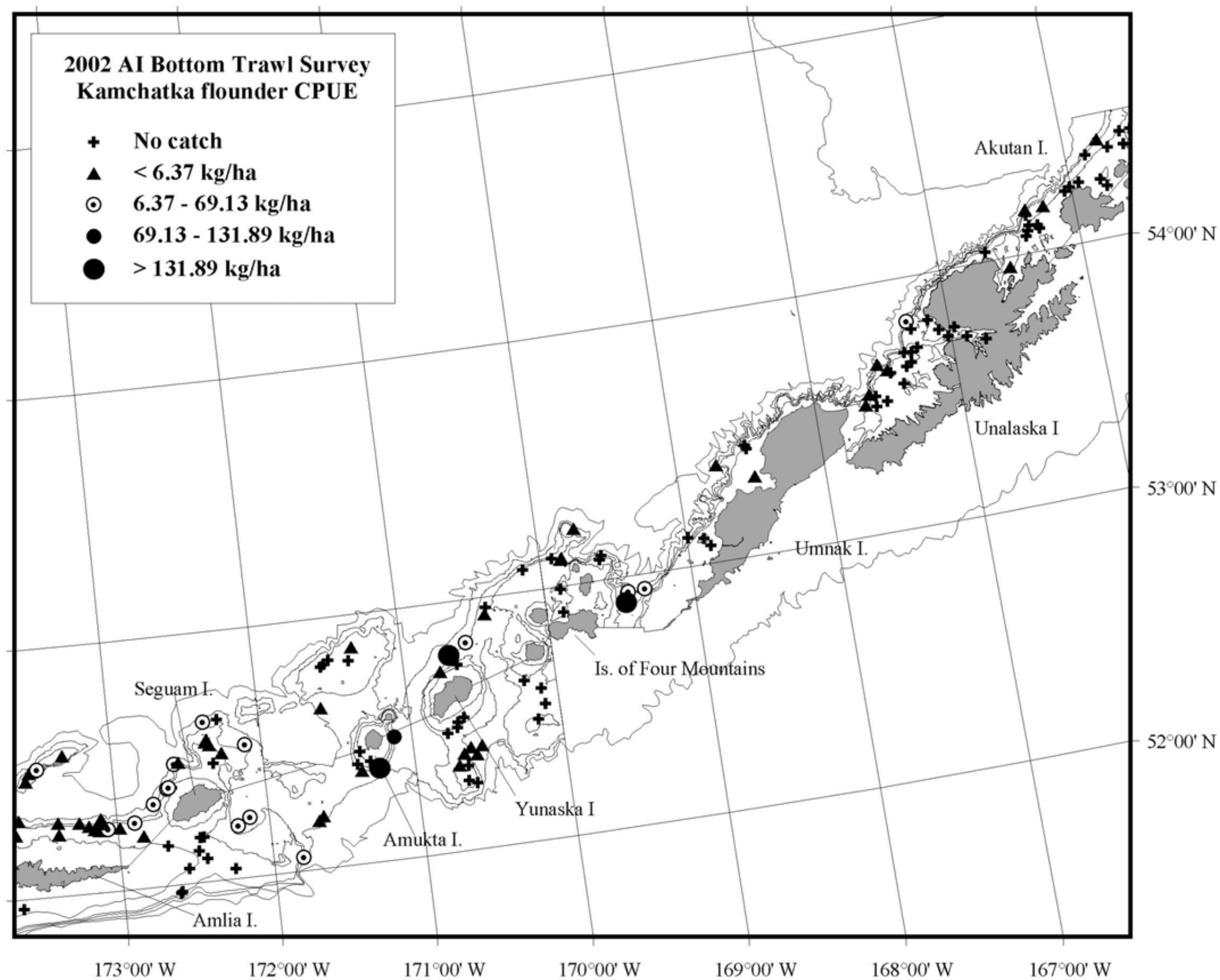
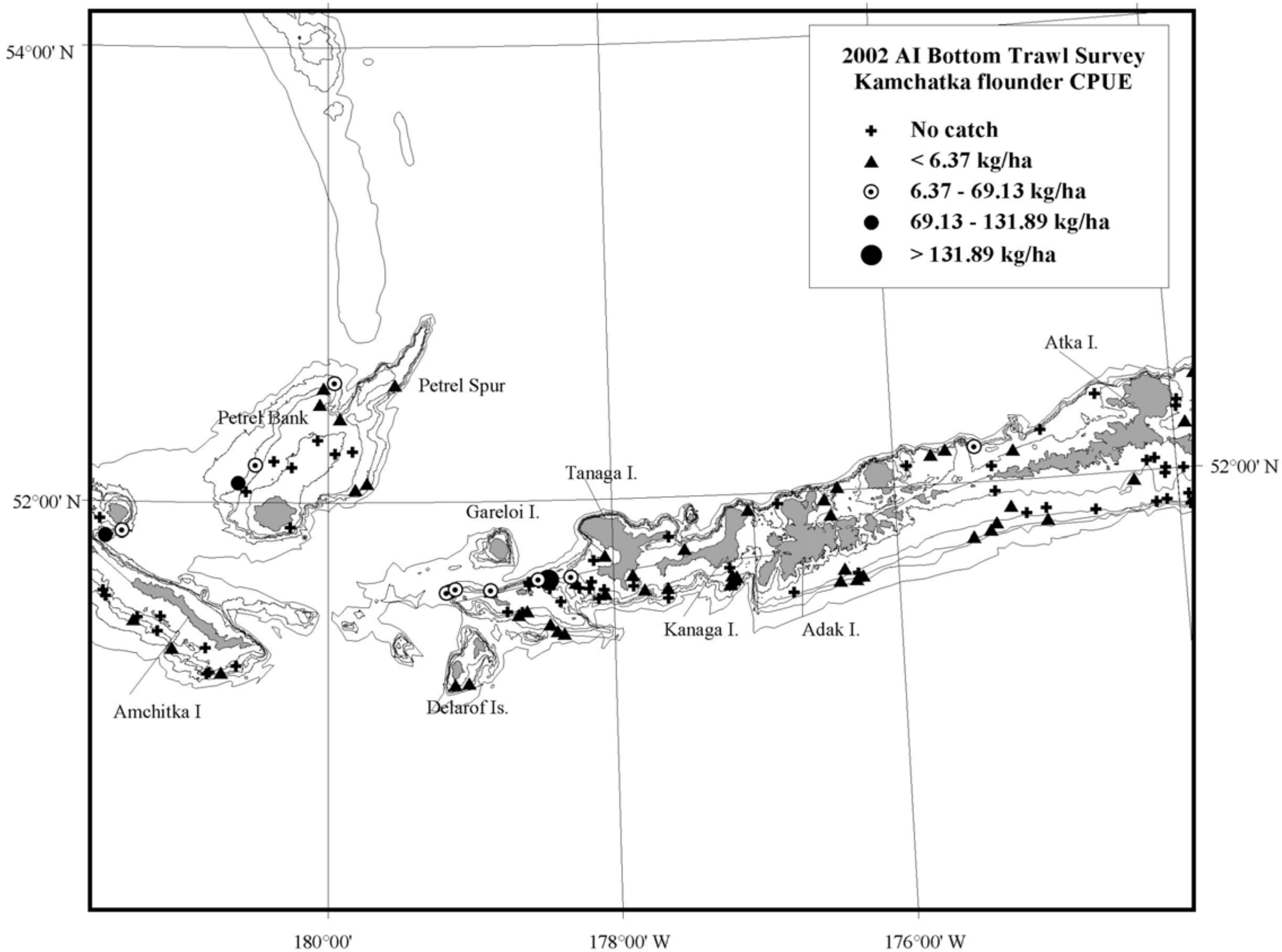


Figure 5.--Distribution and relative abundance of Kamchatka flounder from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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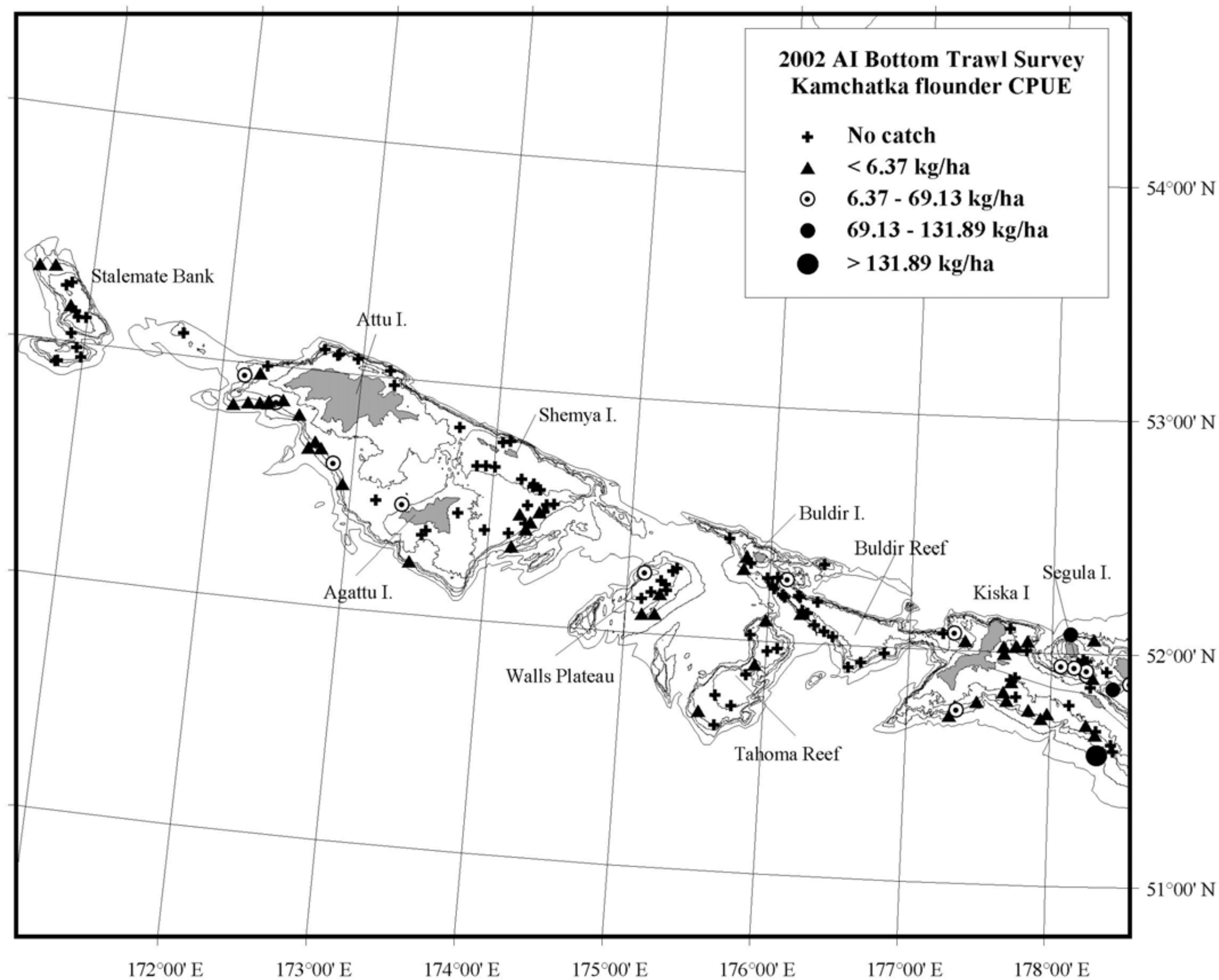

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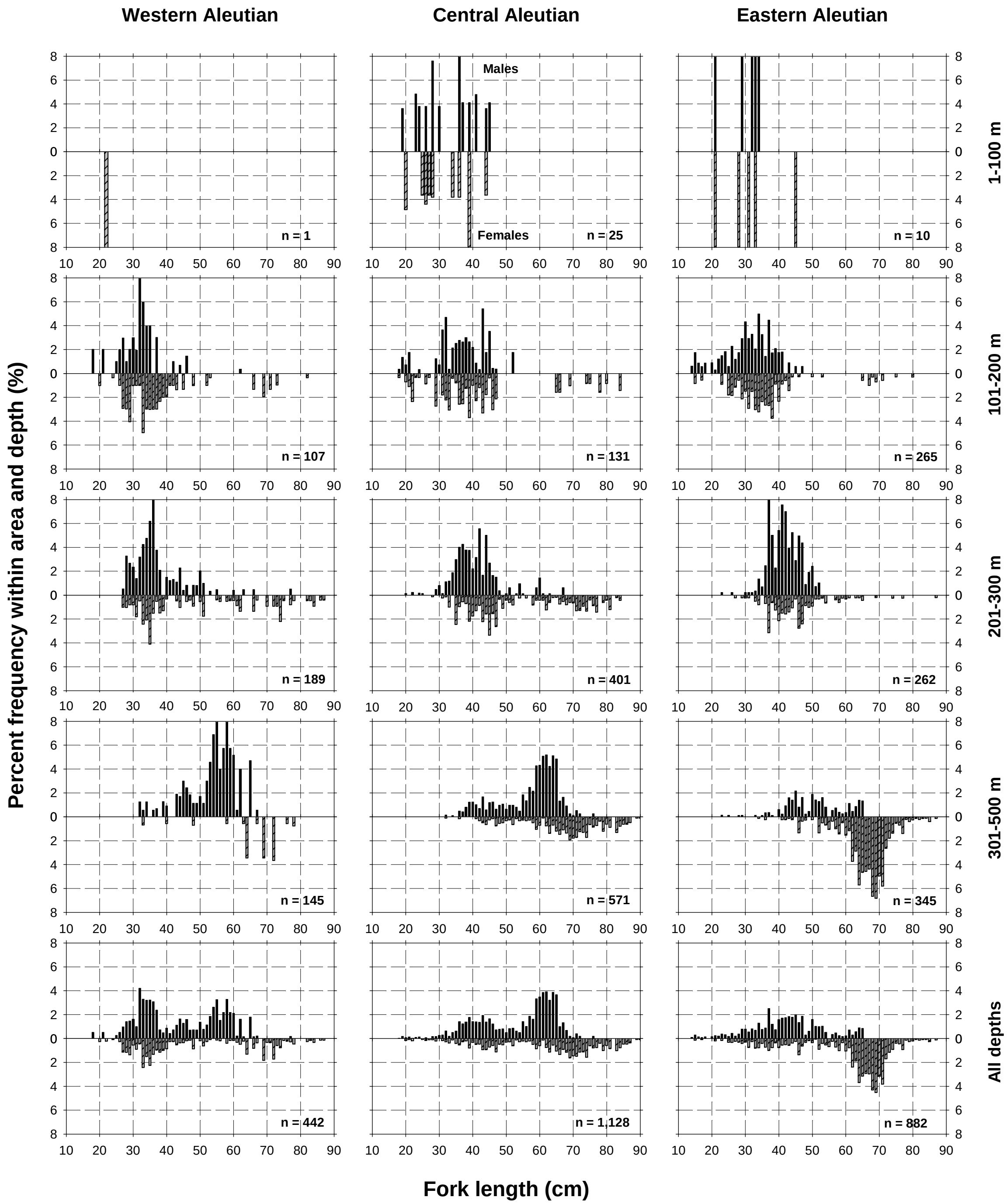


Figure 6.--Size composition of the estimated Kamchatka flounder population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

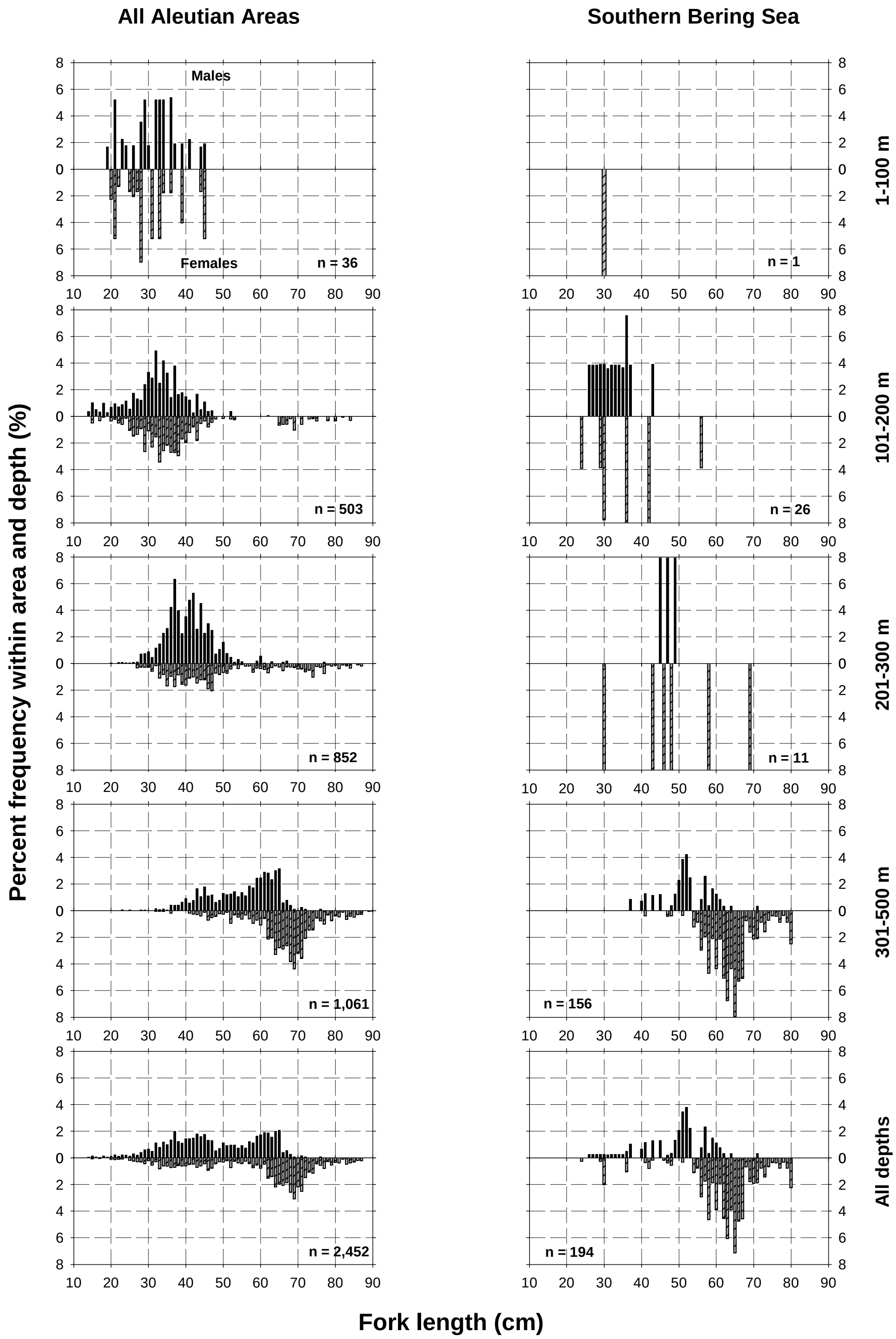


Figure 6.--(Kamchatka flounder, continued).

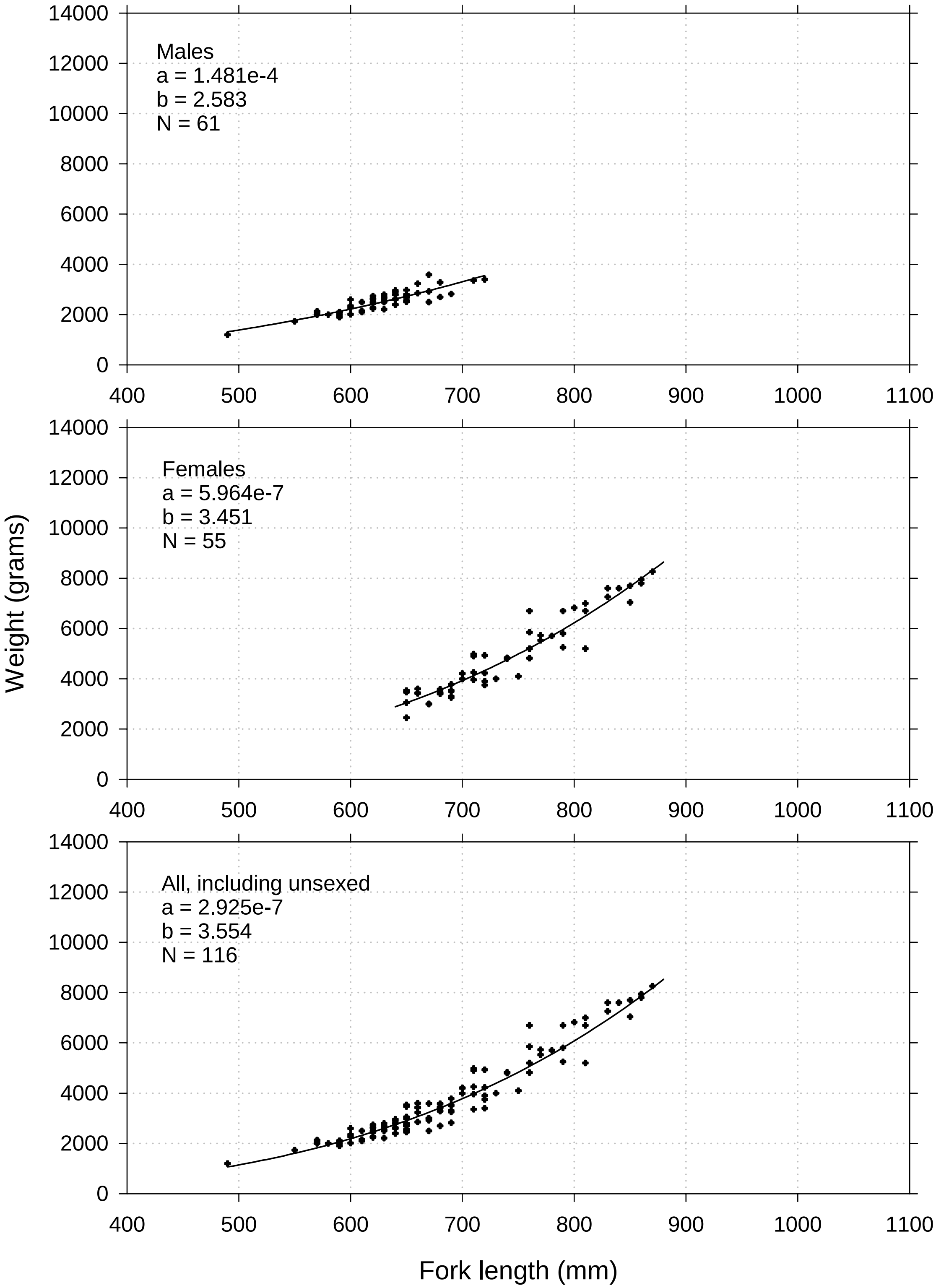


Figure 7.--Length-weight relationship for Kamchatka flounder specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{\ b}$.

Northern rock sole (*Lepidopsetta polyxystra*)

Since the 1997 Aleutian Islands bottom trawl survey, two species of rock sole (the northern rock sole, *L. polyxystra,* and the southern rock sole, *L. bilineata*) have been separated in trawl catches. In the Aleutian areas west of Islands of Four Mountains the newly recognized species, northern rock sole, is the more abundant of the two (Table 2) and in fact was the only species of rock sole found west of Atka Island in the Eastern Aleutian area (Figs. 8 and 11). The relative abundance of northern rock sole ranked eighth overall in the combined Aleutian areas, much less than that of Atka mackerel and POP (Table 2). The highest mean catch rate was in the Central Aleutian area. In the Southern Bering Sea area, northern rock sole mean CPUE is about half that of southern rock sole. Northern rock sole mean CPUE and estimated biomass was highest in the 1-100 m depth interval in all survey areas (Table 7). Although occurrences were reported in waters deeper than 300 m in some locations, northern rock sole abundance was very small in the deepest depth interval. More than 85% of the estimated biomass in the 201-300 m depth interval was composed of females (Fig. 9). More than 69% of the estimated northern rock sole biomass in the Aleutian areas occurred in 1-100 m, and 96% occurred within the shallower two depth intervals. In the Central Aleutian area within the 1-100 m interval, mean CPUE was twice as large as in the same interval in the Western and Eastern Aleutian areas. In general, mean individual weights and lengths increased with depth (Table 7).

The highest stratum-specific mean CPUE occurred in the 1-100 m depth interval, in the NE Eastern Aleutian subarea. However, only two tows were conducted in that subarea; thus, the third highest subarea biomass was based on a very small number of samples (Table 8). Ranked a very close second, the 1-100 m N Central Aleutian subarea produced the highest estimated individual subarea biomass, based on 14 tows. The 1-100 m depth interval on Petrel Bank, directly north of the Central Aleutian area, produced the third highest subarea mean CPUE (Table 8, Fig. 8).

Sexual dimorphism was pronounced. For the combined Aleutian areas the largest female size composition mode was 7 cm larger than that of the males (Fig. 9). The

Table 7.--Number of survey hauls, number of hauls with northern rock sole, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	23	14.22	6,934	4,299	9,570	0.364	30.6
Aleutian	101-200	51	33	6.75	3,590	2,174	5,007	0.392	30.6
	201-300	19	8	0.29	51	8	93	0.606	36.3
	301-500	13	0	-	-	-	-	-	-
	All depths	109	64	6.96	10,575	7,639	13,511	0.374	30.6
Central	1-100	30	29	27.96	16,350	8,176	24,523	0.342	29.8
Aleutian	101-200	45	40	12.07	5,557	2,922	8,192	0.487	34.2
	201-300	23	17	3.87	816	0	1,649	0.663	38.3
	301-500	17	4	0.11	45	0	98	0.659	37.9
	All depths	115	90	13.76	22,768	14,292	31,244	0.376	30.9
Eastern	1-100	16	14	14.54	9,959	0	22,670	0.188	24.0
Aleutian	101-200	47	35	4.63	3,600	2,138	5,063	0.489	33.1
	201-300	42	15	1.87	915	364	1,465	0.692	38.6
	301-500	27	2	0.03	20	0	51	0.735	38.0
	All depths	132	66	5.75	14,493	1,646	27,340	0.235	25.4
All	1-100	72	66	18.92	33,243	18,228	48,258	0.278	27.4
Aleutian	101-200	143	108	7.21	12,748	9,654	15,841	0.456	32.8
Areas	201-300	84	40	2.04	1,781	911	2,652	0.676	38.4
	301-500	57	6	0.05	65	7	122	0.680	37.9
	All depths	356	220	8.40	47,836	32,641	63,032	0.318	28.6
Southern	1-100	30	30	6.36	2,560	1,345	3,775	0.343	29.1
Bering Sea	101-200	16	7	3.28	606	100	1,111	0.380	29.8
	201-300	7	2	0.33	19	0	51	1.028	44.0
	301-500	8	0	-	-	-	-	-	-
	All depths	61	39	4.26	3,184	1,824	4,545	0.351	29.2

Table 8.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of northern rock sole by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	35.77	4,535	0	52,073
Central Aleutian	1-100	N Central Aleutian	14	13	34.34	7,231	73	14,389
Central Aleutian	1-100	Petrel Bank	4	4	28.12	2,699	0	6,797
Central Aleutian	1-100	SW Central Aleutian	5	5	25.65	4,149	0	8,626
Central Aleutian	101-200	SW Central Aleutian	17	17	23.74	2,498	1,196	3,799
Eastern Aleutian	1-100	NW Eastern Aleutian	4	4	21.11	4,080	0	15,508
Central Aleutian	1-100	SE Central Aleutian	7	7	19.51	2,271	956	3,586
Western Aleutian	1-100	W Western Aleutian	16	16	17.08	6,310	3,690	8,929
Central Aleutian	101-200	SE Central Aleutian	14	10	13.62	1,024	0	2,055
Central Aleutian	101-200	N Central Aleutian	8	8	9.37	999	312	1,685
Western Aleutian	101-200	W Western Aleutian	28	22	8.53	3,466	2,050	4,883
Eastern Aleutian	201-300	SW Eastern Aleutian	6	4	8.13	583	0	1,173
Eastern Aleutian	101-200	NW Eastern Aleutian	6	6	6.68	1,066	102	2,030
Southern Bering	1-100	E Southern Bering Sea	27	27	6.55	1,597	912	2,282
Southern Bering	1-100	W Southern Bering Sea	3	3	6.07	963	0	2,404
Central Aleutian	101-200	Petrel Bank	6	5	5.97	1,037	0	3,057
Central Aleutian	201-300	N Central Aleutian	10	8	5.97	262	74	450
Eastern Aleutian	1-100	SW Eastern Aleutian	5	5	5.35	1,019	298	1,741
Western Aleutian	1-100	E Western Aleutian	10	7	5.28	625	210	1,040
Eastern Aleutian	101-200	SW Eastern Aleutian	9	8	4.97	1,123	265	1,982
Southern Bering	101-200	W Southern Bering Sea	5	3	4.16	278	0	734
Eastern Aleutian	101-200	SE Eastern Aleutian	15	10	3.92	745	0	1,587
Central Aleutian	201-300	Petrel Bank	3	2	3.58	274	0	1,326
Central Aleutian	201-300	SW Central Aleutian	6	4	3.54	151	0	472
Eastern Aleutian	101-200	NE Eastern Aleutian	17	11	3.31	666	79	1,254
Southern Bering	101-200	E Southern Bering Sea	11	4	2.78	327	0	712
Central Aleutian	201-300	SE Central Aleutian	4	3	2.71	129	0	411
Eastern Aleutian	1-100	SE Eastern Aleutian	5	3	1.87	325	0	700
Western Aleutian	101-200	E Western Aleutian	23	11	0.99	124	37	210
Eastern Aleutian	201-300	NE Eastern Aleutian	22	6	0.95	187	0	386
Eastern Aleutian	201-300	SE Eastern Aleutian	12	5	0.70	145	0	331
Western Aleutian	201-300	E Western Aleutian	10	5	0.41	32	0	69
Southern Bering	201-300	Combined Southern Bering	7	2	0.33	19	0	52
Central Aleutian	301-500	N Central Aleutian	8	3	0.28	34	0	84
Western Aleutian	201-300	W Western Aleutian	9	3	0.20	19	0	47
Central Aleutian	301-500	SW Central Aleutian	2	1	0.14	11	0	149
Eastern Aleutian	301-500	SE Eastern Aleutian	12	1	0.05	14	0	44
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	1	0.02	6	0	19

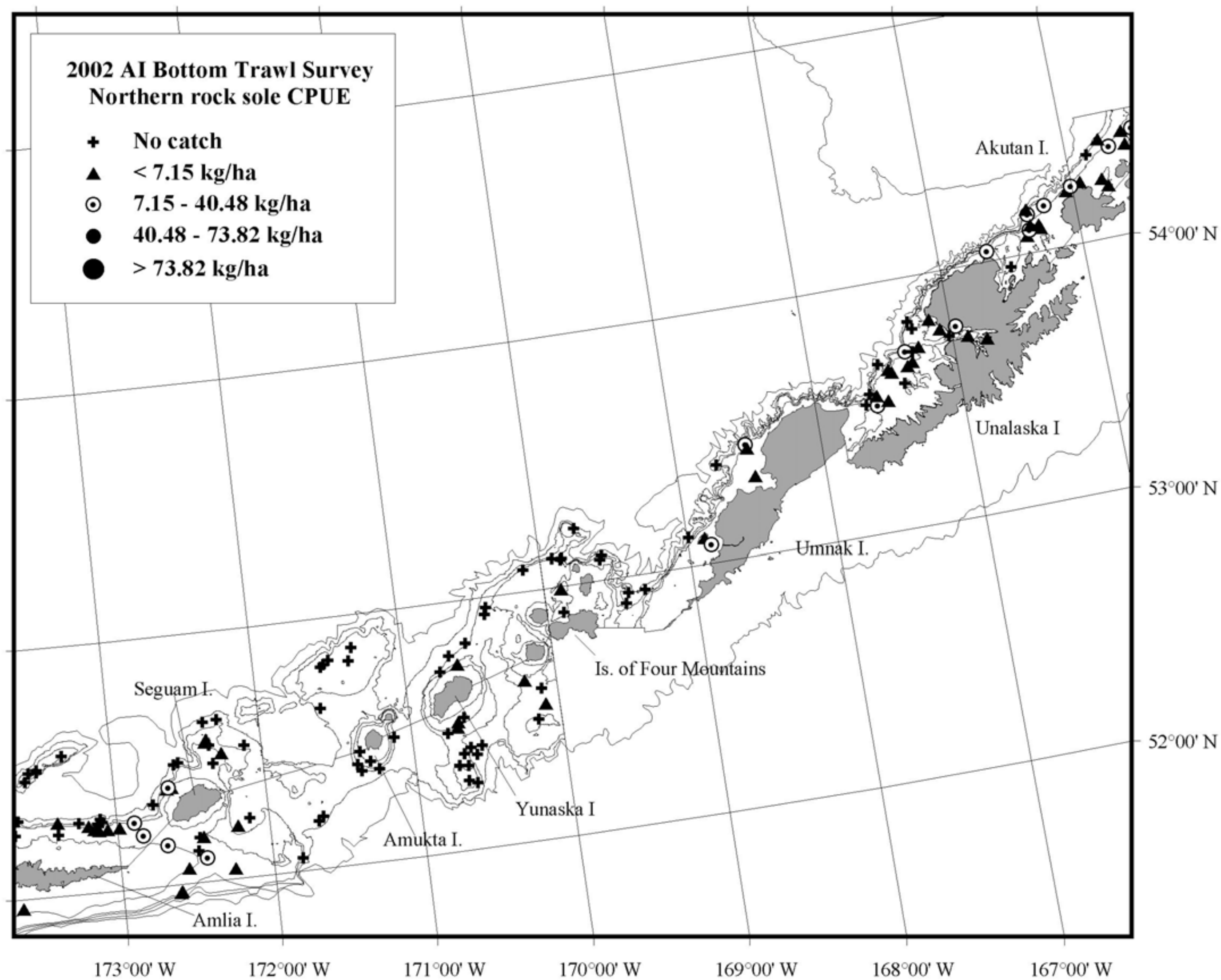
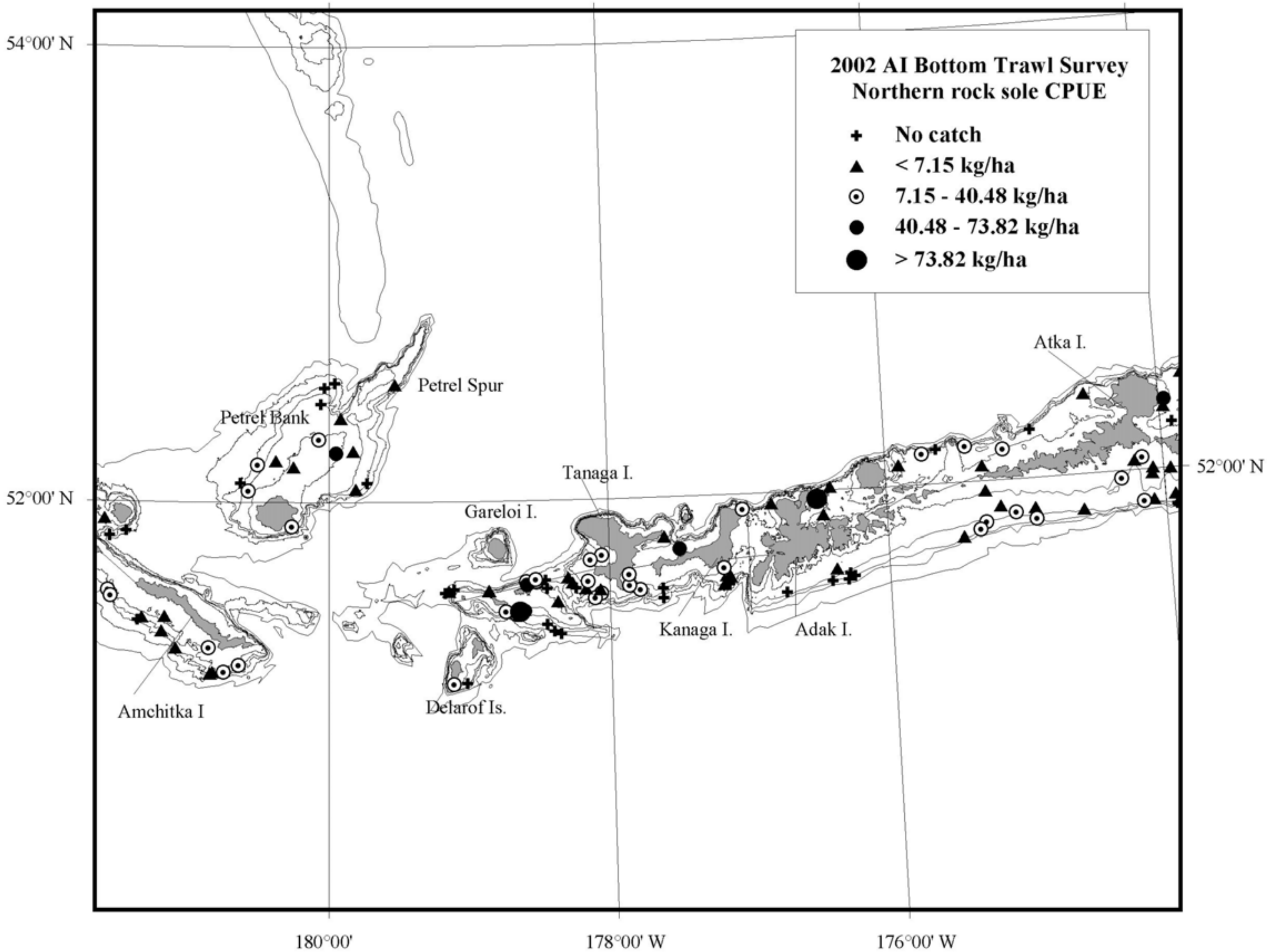


Figure 8.--Distribution and relative abundance of northern rock sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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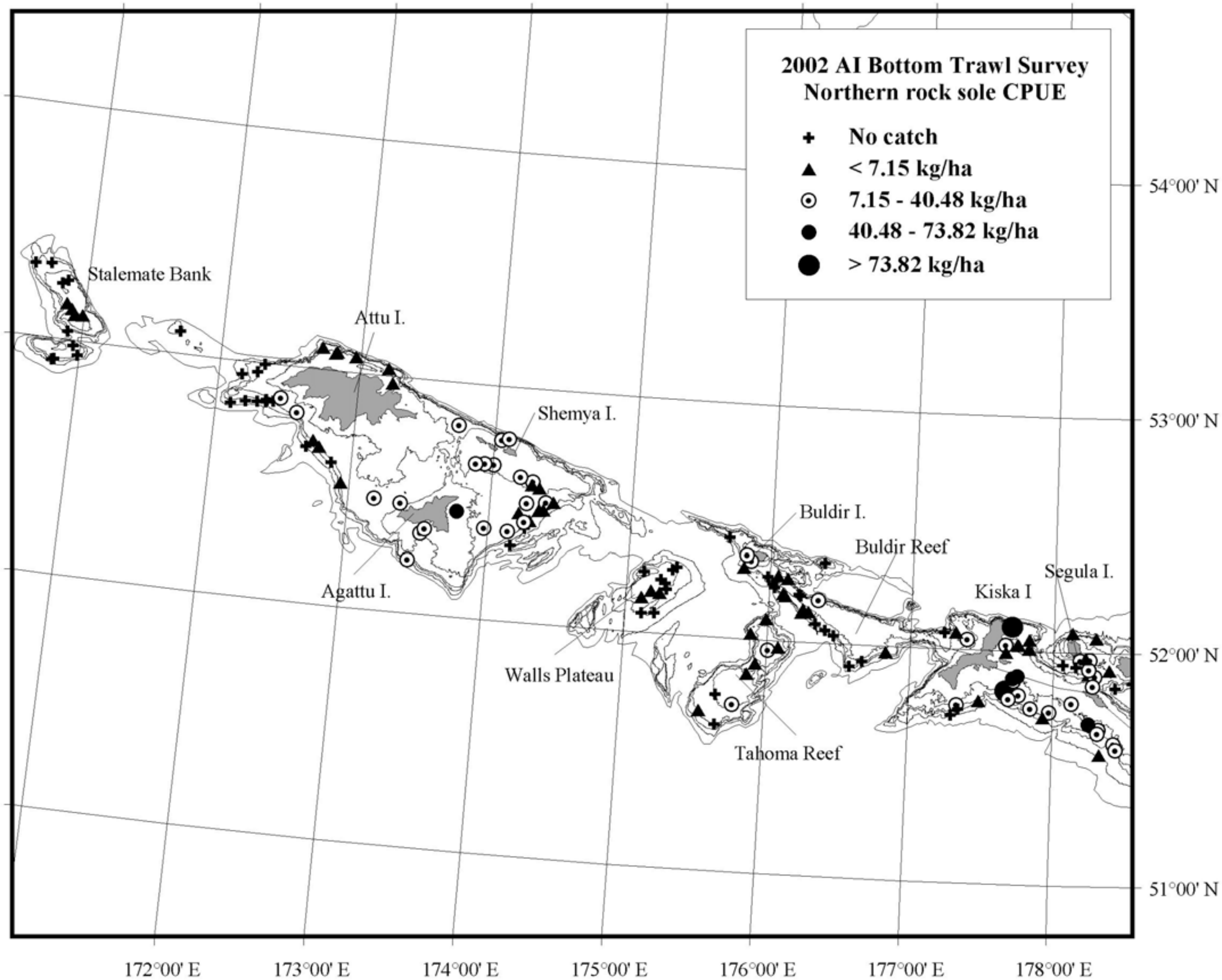

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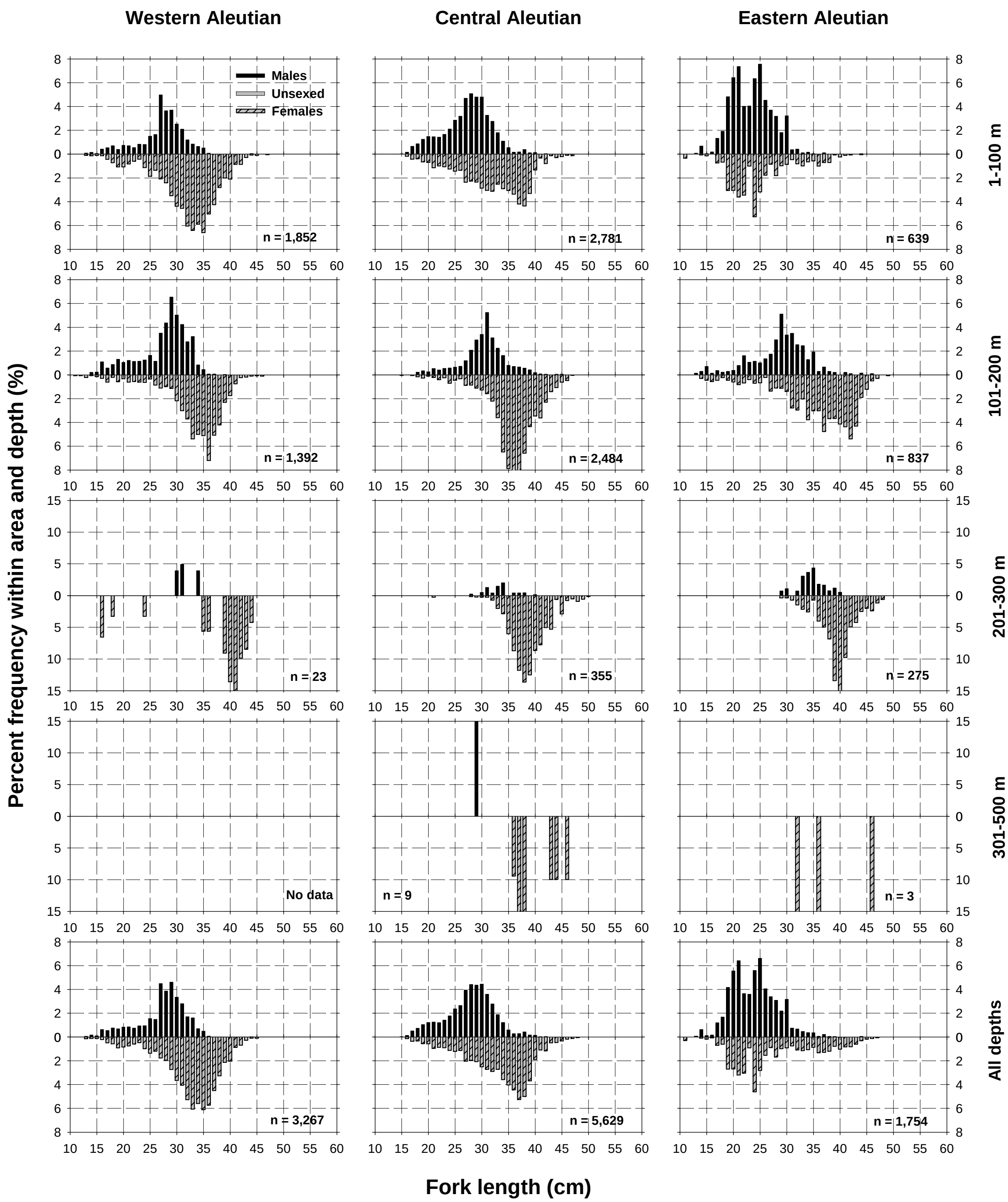


Figure 9.--Size composition of the estimated northern rock sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

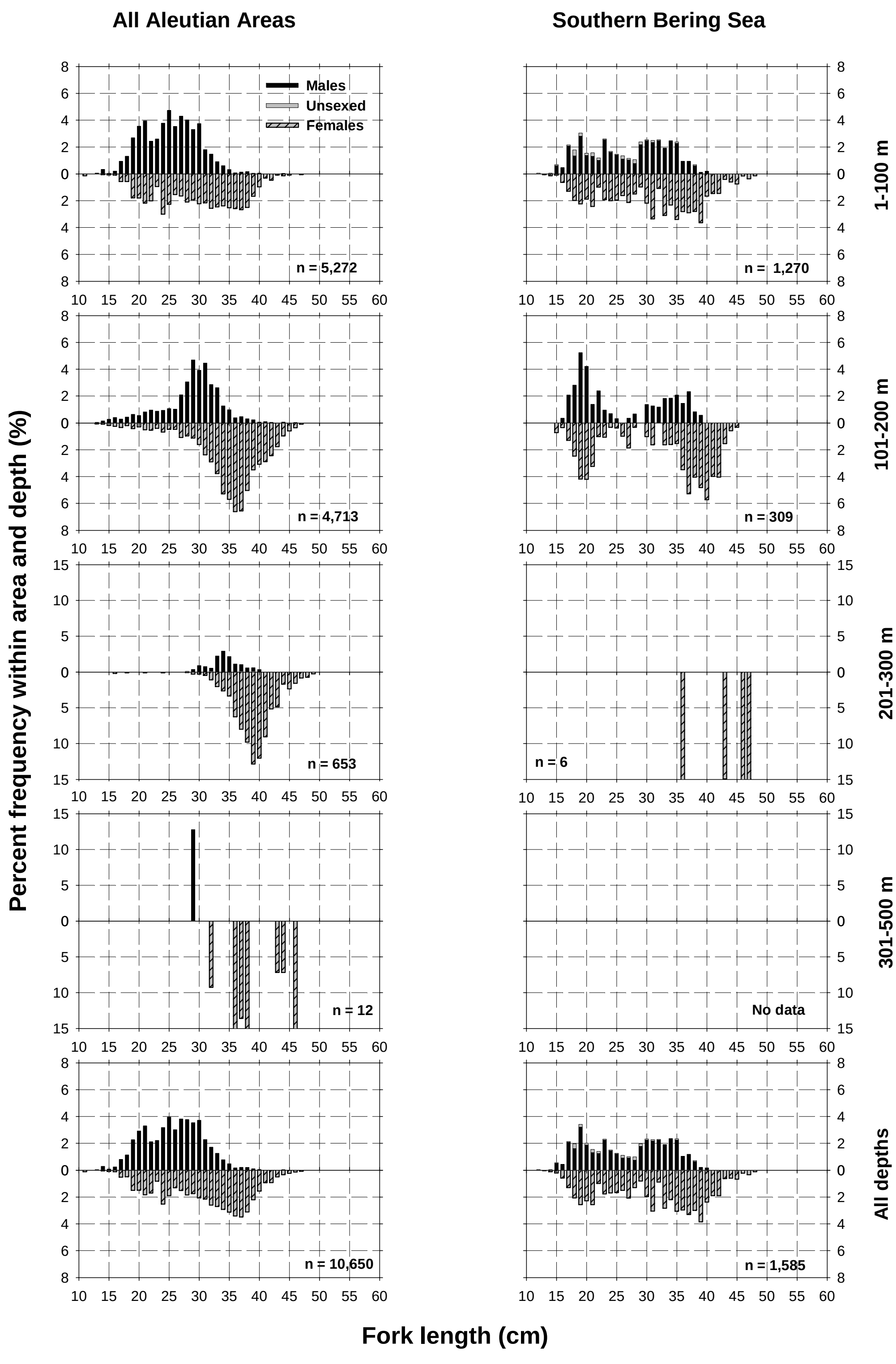


Figure 9.--(Northern rock sole, continued).

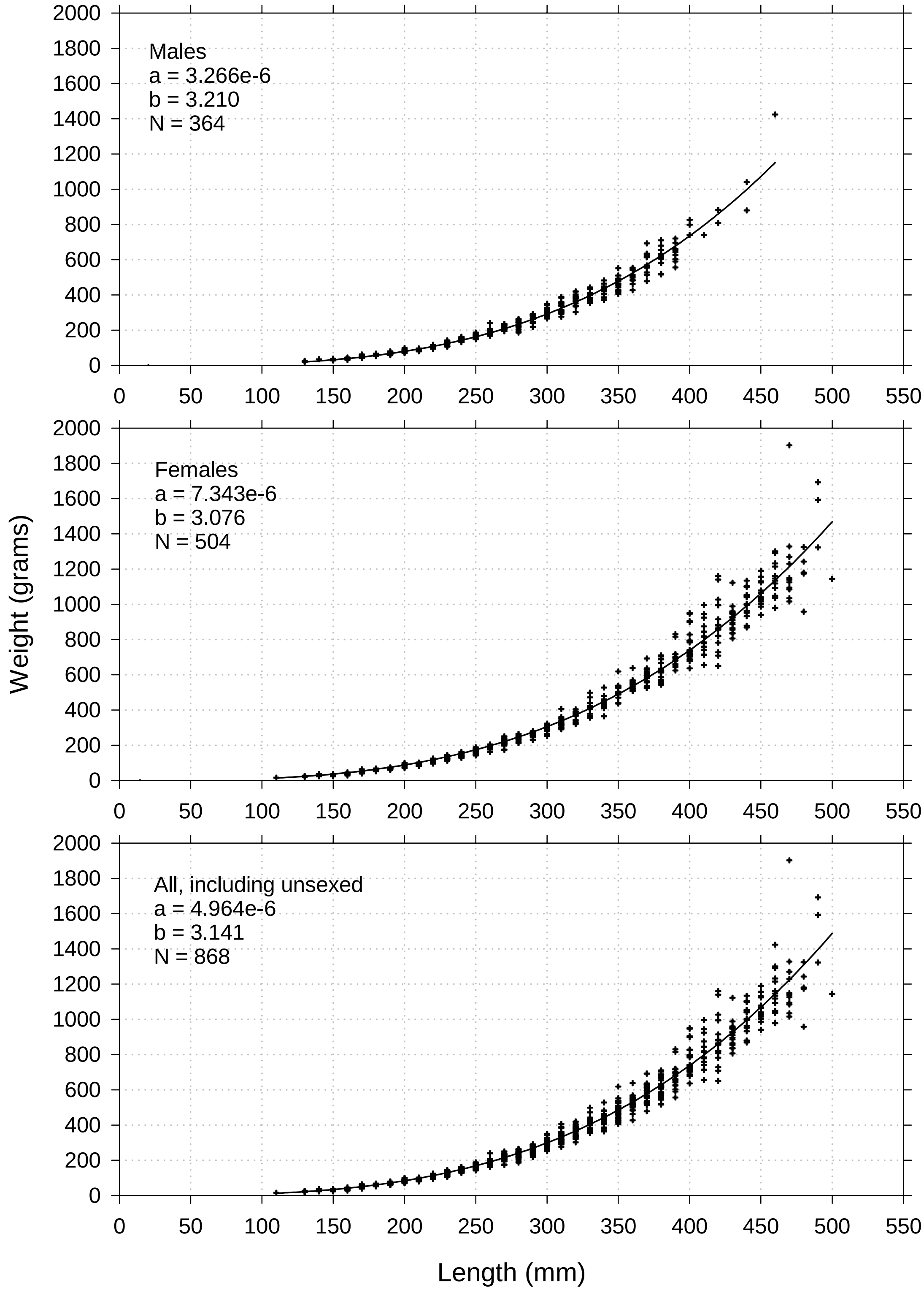


Figure 10.--Length-weight relationship for northern rock sole specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}{}^{b}$.

majority of northern rock sole found deeper than 200 m were females. Figure 10 presents the length-weight relationships for male, female, and combined sexes of northern rock sole.

Southern rock sole (*L. bilineata*)

Southern rock sole was most abundant in the Southern Bering Sea area (Table 2). Occurrences of this species were uncommon west of Umnak Island and none were reported from catches west of Atka Island (Fig. 11). Thus, the survey defines what appears to be the western margin of the southern rock sole distribution in the Aleutian archipelago. In the Southern Bering Sea area 96% of the estimated biomass was found in the 1-100 m depth interval where all but one tow reported southern rock sole (Tables 9 and 10). Figure 11 shows that the largest catches were limited to the area east of Umnak Island.

Female southern rock sole represent 58% of the total biomass. All of the southern rock sole larger than 41 cm in the biomass-weighted size composition were females (Fig. 12). Figure 13 shows the length-weight relationships for male, female and combined sex southern rock sole.

Table 9.--Number of survey hauls, number of hauls with southern rock sole, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	0	-	-	-	-	-	-
	301-500	13	0	-	-	-	-	-	-
	All depths	109	0	-	-	-	-	-	-
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	0	-	-	-	-	-	-
	201-300	23	0	-	-	-	-	-	-
	301-500	17	0	-	-	-	-	-	-
	All depths	115	0	-	-	-	-	-	-
Eastern	1-100	16	8	0.69	469	0	940	0.647	35.6
Aleutian	101-200	47	1	0.04	28	0	97	0.314	29.4
	201-300	42	1	< 0.01	2	0	6	0.491	35.0
	301-500	27	0	-	-	-	-	-	-
	All depths	132	10	0.20	499	24	975	0.610	34.9
All	1-100	72	8	0.27	469	0	940	0.647	35.6
Aleutian	101-200	143	1	0.02	28	0	97	0.314	29.4
Areas	201-300	84	1	< 0.01	2	0	6	0.491	35.0
	301-500	57	0	-	-	-	-	-	-
	All depths	356	10	0.09	499	24	975	0.610	34.9
Southern	1-100	30	29	14.76	5,941	3,192	8,691	0.498	32.6
Bering Sea	101-200	16	8	1.31	243	0	565	0.404	30.9
	201-300	7	0	-	-	-	-	-	-
	301-500	8	0	-	-	-	-	-	-
	All depths	61	37	8.27	6,184	3,417	8,952	0.493	32.5

Table 10.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of southern rock sole by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Southern Bering	1-100	E Southern Bering Sea	27	26	21.59	5,268	2,721	7,814
Southern Bering	1-100	W Southern Bering Sea	3	3	4.25	674	0	2,611
Southern Bering	101-200	E Southern Bering Sea	11	6	1.42	168	0	463
Southern Bering	101-200	W Southern Bering Sea	5	2	1.13	75	0	278
Eastern Aleutian	1-100	SE Eastern Aleutian	5	3	0.99	173	0	390
Eastern Aleutian	1-100	NW Eastern Aleutian	4	1	0.87	169	0	705
Eastern Aleutian	1-100	SW Eastern Aleutian	5	4	0.67	128	0	264
Eastern Aleutian	101-200	NW Eastern Aleutian	6	1	0.18	28	0	101
Eastern Aleutian	201-300	NE Eastern Aleutian	22	1	0.01	2	0	6

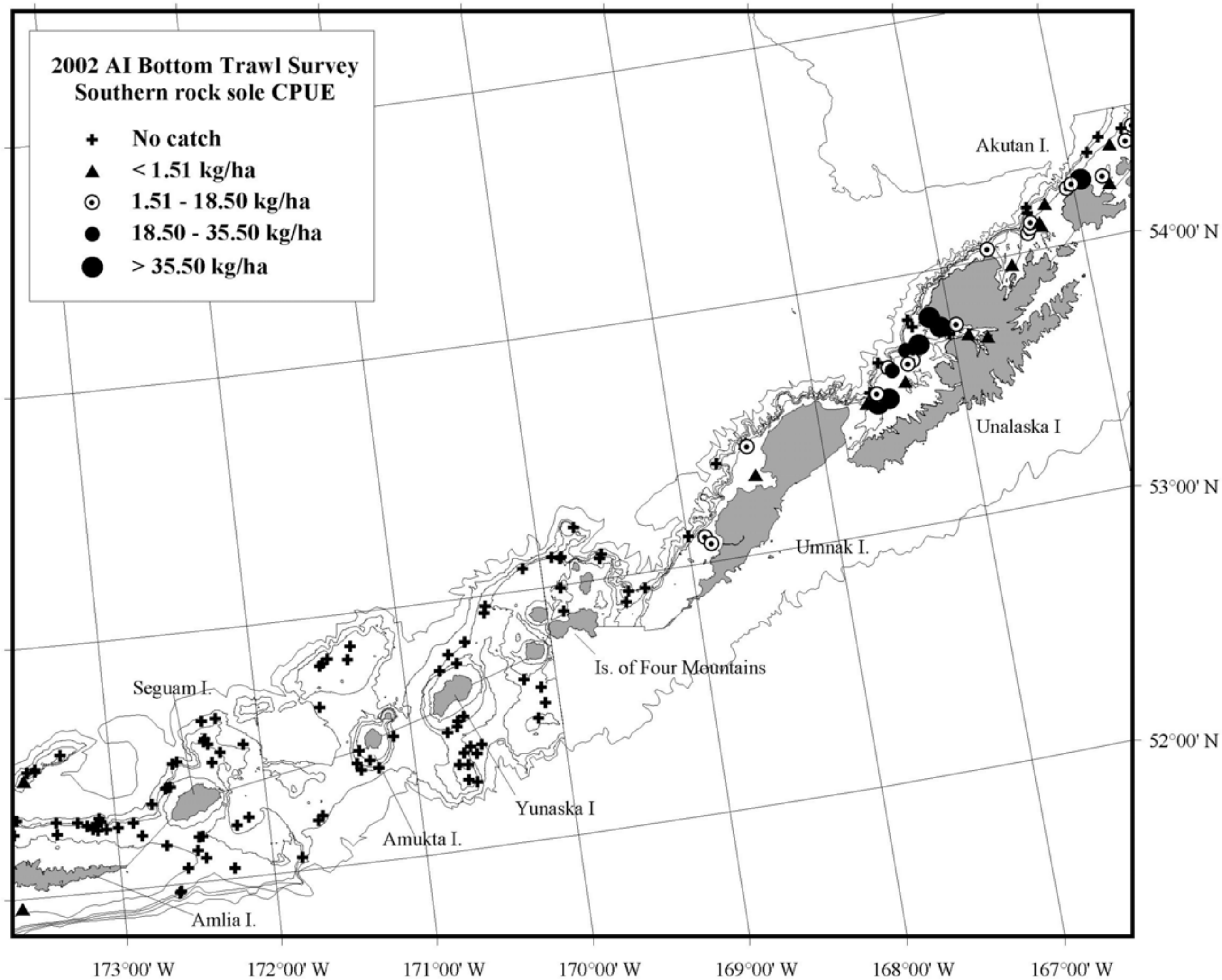


Figure 11.--Distribution and relative abundance of southern rock sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.

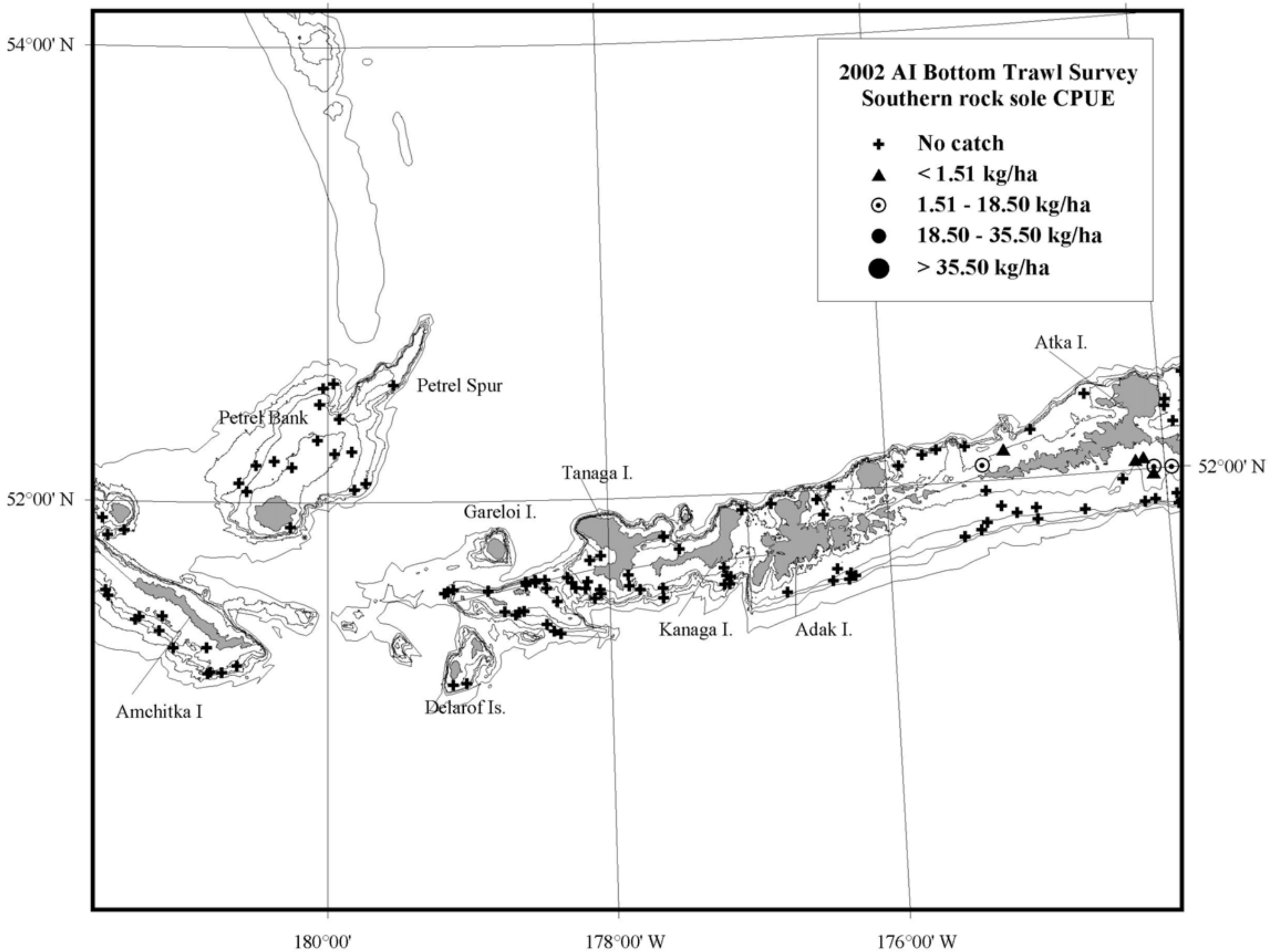
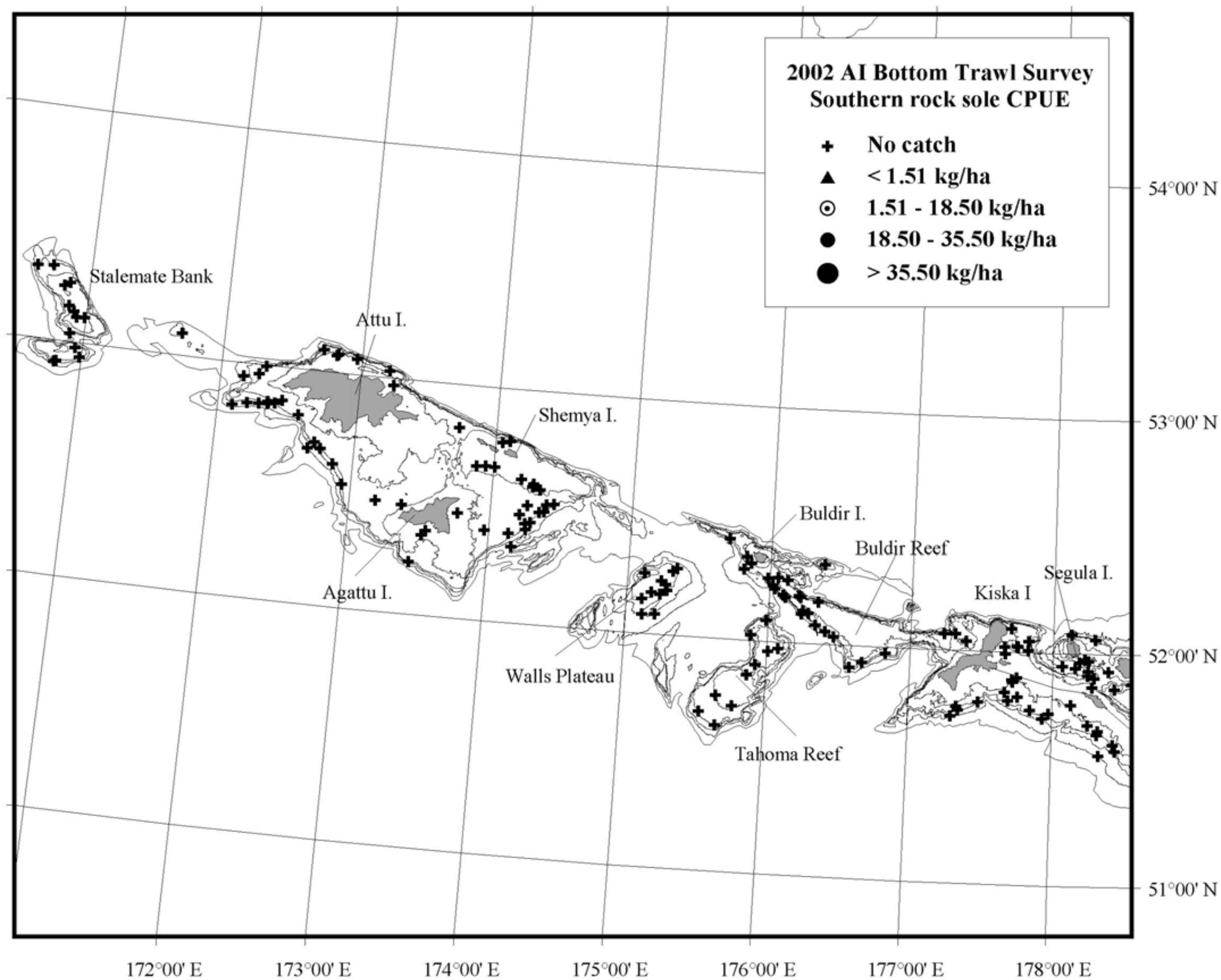


Figure 11.--(Continued).



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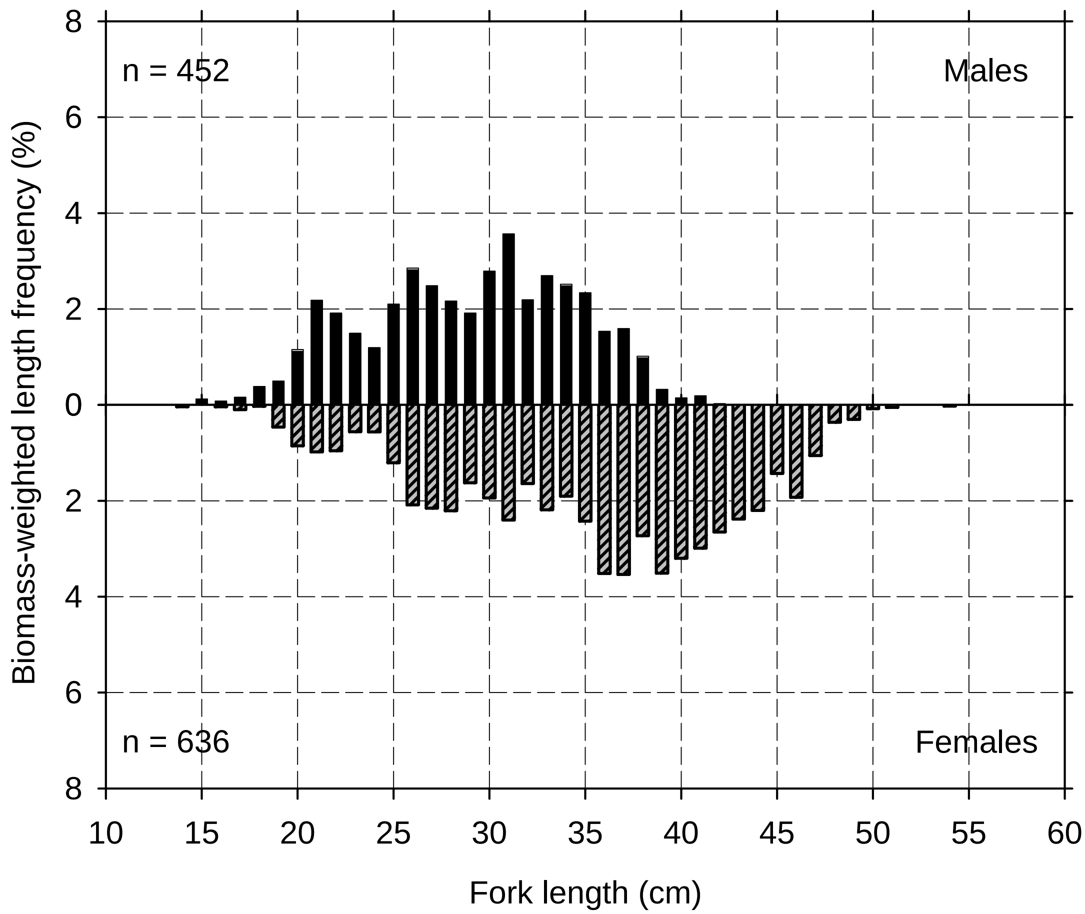


Figure 12.--Size composition of the estimated southern rock sole population from the 2002 Aleutian Islands bottom trawl survey. All depths and areas combined.

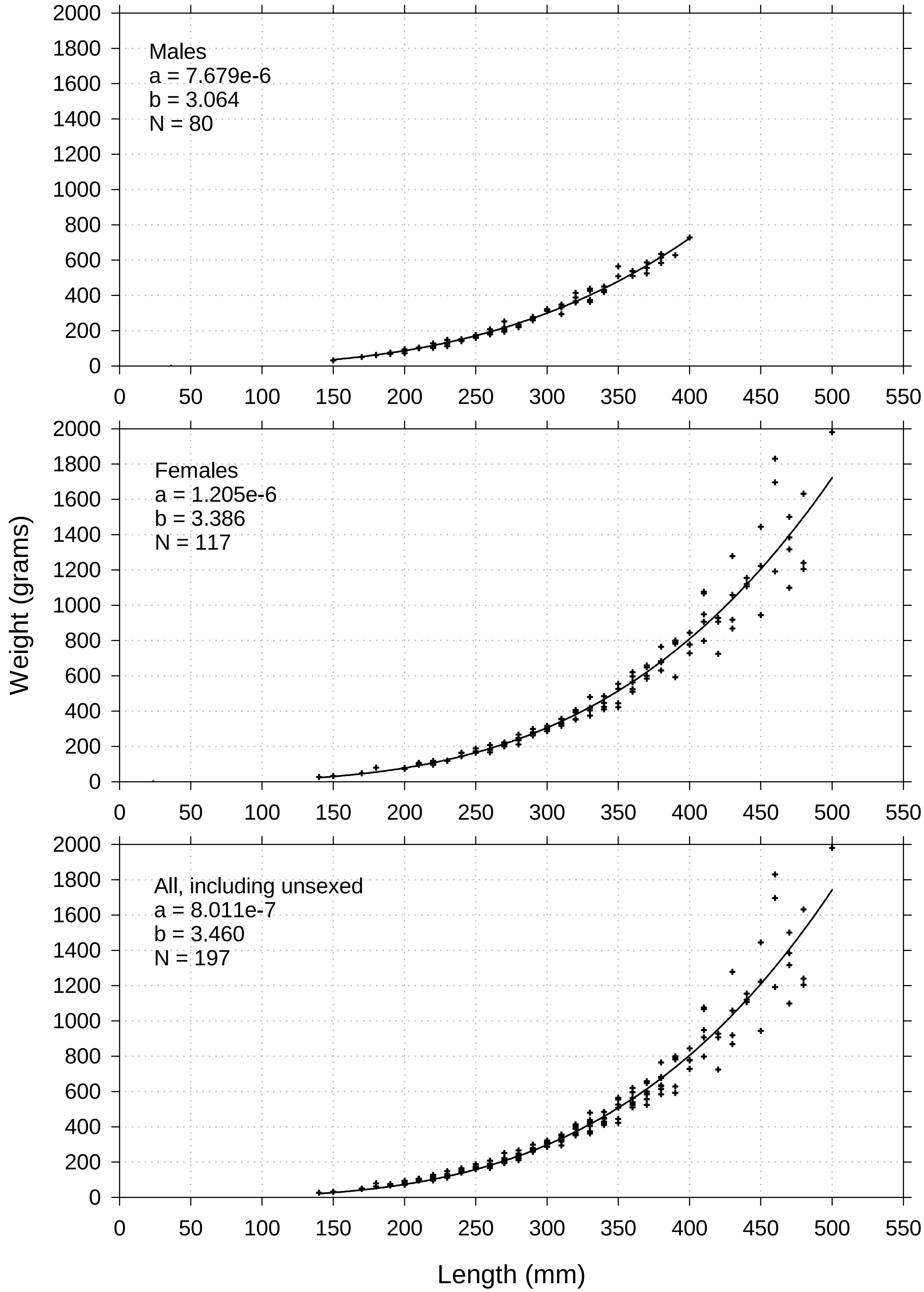


Figure 13.--Length-weight relationship for southern rock sole specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Pacific halibut (*Hippoglossus stenolepis*)

Pacific halibut was distributed throughout the survey area with the exception of the extreme western end, on Stalemate Bank (Fig. 14). It was not particularly abundant in the NPFMC Aleutian regulatory areas, although its mean CPUE ranked sixth in the Southern Bering Sea area (Table 2). Exceptions were the 1-100 m depth interval in the Western Aleutian area and the 101-200 m depth interval in the Eastern Aleutian area (Table 11). Estimated biomass totaled slightly above 40,000 t, with almost half found in the Eastern Aleutian area and 79% of the estimated total Aleutian biomass in the 1-100 m and 101-200 m depth intervals. Whereas abundance generally decreased with increasing depth, mean individual weight and length increased, except in the Southern Bering Sea area where Pacific halibut from the 301-500 m depth interval were smaller than from comparable depth intervals in the Aleutian areas.

The two highest individual subarea mean CPUEs were from the 1-100 m and 101-200 m depth intervals in the NW Eastern Aleutian subarea between Atka and Adak Islands (Table 12). The mean CPUEs from the 1-100 m depth interval in the two Southern Bering Sea subareas were ranked seventh and ninth and produced a relatively large length frequency mode at 40 cm that dominated the size composition from that area (Fig. 15). Individual length and weight data were not collected during this survey.

Table 11.--Number of survey hauls, number of hauls with Pacific halibut, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	19	12.30	6,000	2,689	9,312	4.759	69.6
Aleutian	101-200	51	15	2.69	1,431	316	2,546	8.383	82.1
	201-300	19	5	2.19	378	0	773	16.291	102.7
	301-500	13	0	-	-	-	-	-	-
	All depths	109	39	5.14	7,809	4,324	11,294	5.368	71.6
Central	1-100	30	25	5.54	3,239	1,544	4,933	2.902	54.3
Aleutian	101-200	45	21	2.63	1,211	465	1,957	7.493	79.7
	201-300	23	8	2.17	458	172	743	10.502	92.8
	301-500	17	5	4.05	1,611	0	4,193	27.867	125.6
	All depths	115	59	3.94	6,519	3,981	9,056	4.727	61.5
Eastern	1-100	16	13	8.49	5,813	0	11,936	4.520	69.5
Aleutian	101-200	47	34	10.50	8,155	5,435	10,876	7.311	81.7
	201-300	42	13	4.34	2,125	470	3,781	15.323	101.5
	301-500	27	8	4.19	2,379	156	4,603	19.983	110.8
	All depths	132	68	7.33	18,472	11,512	25,433	6.946	78.1
All	1-100	72	57	8.57	15,052	8,366	21,738	4.109	64.9
Aleutian	101-200	143	70	6.10	10,797	7,819	13,775	7.457	81.5
Areas	201-300	84	26	3.39	2,960	1,234	4,687	14.410	99.8
	301-500	57	13	3.08	3,991	1,212	6,769	22.560	115.6
	All depths	356	166	5.76	32,800	24,982	40,617	5.971	72.2
Southern	1-100	30	28	12.25	4,933	1,841	8,024	1.767	47.1
Bering Sea	101-200	16	11	8.37	1,547	423	2,670	6.449	75.0
	201-300	7	7	12.38	698	265	1,131	15.265	98.6
	301-500	8	5	6.52	680	38	1,321	8.082	84.6
	All depths	61	51	10.50	7,857	4,590	11,124	2.485	50.9

Table 12.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Pacific halibut by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	1-100	NW Eastern Aleutian	4	4	18.94	3,660	0	10,829
Eastern Aleutian	101-200	NW Eastern Aleutian	6	5	18.44	2,939	1,197	4,681
Southern Bering	101-200	W Southern Bering Sea	5	4	17.00	1,138	0	2,363
Western Aleutian	1-100	W Western Aleutian	16	15	15.65	5,778	2,479	9,077
Eastern Aleutian	101-200	SE Eastern Aleutian	15	12	14.27	2,712	808	4,615
Eastern Aleutian	201-300	NW Eastern Aleutian	2	1	13.63	213	0	2,914
Southern Bering	1-100	E Southern Bering Sea	27	25	13.62	3,323	1,470	5,176
Southern Bering	201-300	Combined Southern Bering	7	7	12.38	698	250	1,146
Southern Bering	1-100	W Southern Bering Sea	3	3	10.15	1,610	0	5,035
Central Aleutian	301-500	SW Central Aleutian	2	1	8.92	704	0	9,647
Central Aleutian	1-100	Petrel Bank	4	2	8.91	855	0	2,427
Eastern Aleutian	301-500	SE Eastern Aleutian	12	4	7.83	2,016	0	4,247
Eastern Aleutian	101-200	NE Eastern Aleutian	17	11	7.50	1,510	304	2,715
Southern Bering	301-500	Combined Southern Bering	8	5	6.52	680	22	1,337
Central Aleutian	301-500	N Central Aleutian	8	3	6.38	792	0	1,706
Central Aleutian	1-100	SE Central Aleutian	7	6	5.94	691	129	1,253
Eastern Aleutian	1-100	SE Eastern Aleutian	5	3	5.60	974	0	2,790
Central Aleutian	101-200	SE Central Aleutian	14	11	5.31	399	192	606
Eastern Aleutian	201-300	SE Eastern Aleutian	12	3	5.28	1,087	0	2,569
Central Aleutian	1-100	N Central Aleutian	14	12	5.22	1,098	428	1,769
Central Aleutian	201-300	SE Central Aleutian	4	4	4.89	234	124	343
Eastern Aleutian	101-200	SW Eastern Aleutian	9	6	4.40	995	0	2,039
Central Aleutian	201-300	N Central Aleutian	10	3	4.31	189	0	471
Eastern Aleutian	201-300	NE Eastern Aleutian	22	8	4.13	812	138	1,486
Eastern Aleutian	1-100	SW Eastern Aleutian	5	4	4.04	771	0	1,755
Central Aleutian	1-100	SW Central Aleutian	5	5	3.67	594	0	1,929
Western Aleutian	201-300	E Western Aleutian	10	3	3.46	271	0	656
Southern Bering	101-200	E Southern Bering Sea	11	7	3.46	408	14	802
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	3.21	408	0	3,042
Central Aleutian	101-200	N Central Aleutian	8	5	3.00	320	73	567
Western Aleutian	101-200	W Western Aleutian	28	13	2.96	1,201	168	2,234
Central Aleutian	101-200	Petrel Bank	6	2	2.53	439	0	1,159
Western Aleutian	1-100	E Western Aleutian	10	4	1.88	222	0	692
Western Aleutian	101-200	E Western Aleutian	23	2	1.84	230	0	665
Central Aleutian	301-500	SE Central Aleutian	4	1	1.62	116	0	485
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	4	1.36	364	0	751
Western Aleutian	201-300	W Western Aleutian	9	2	1.13	106	0	283
Central Aleutian	201-300	SW Central Aleutian	6	1	0.82	35	0	125
Central Aleutian	101-200	SW Central Aleutian	17	3	0.50	53	0	119
Eastern Aleutian	201-300	SW Eastern Aleutian	6	1	0.19	13	0	47

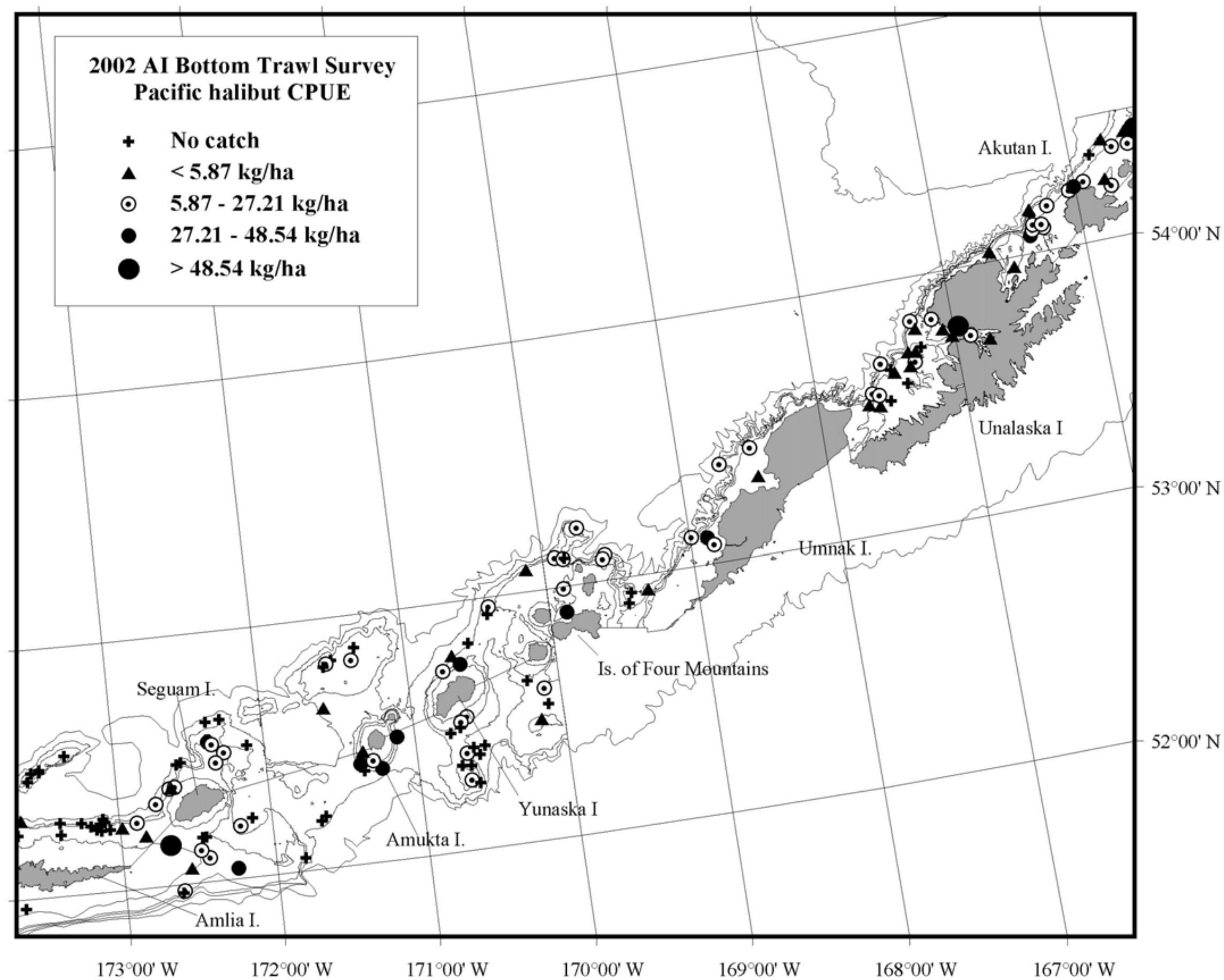
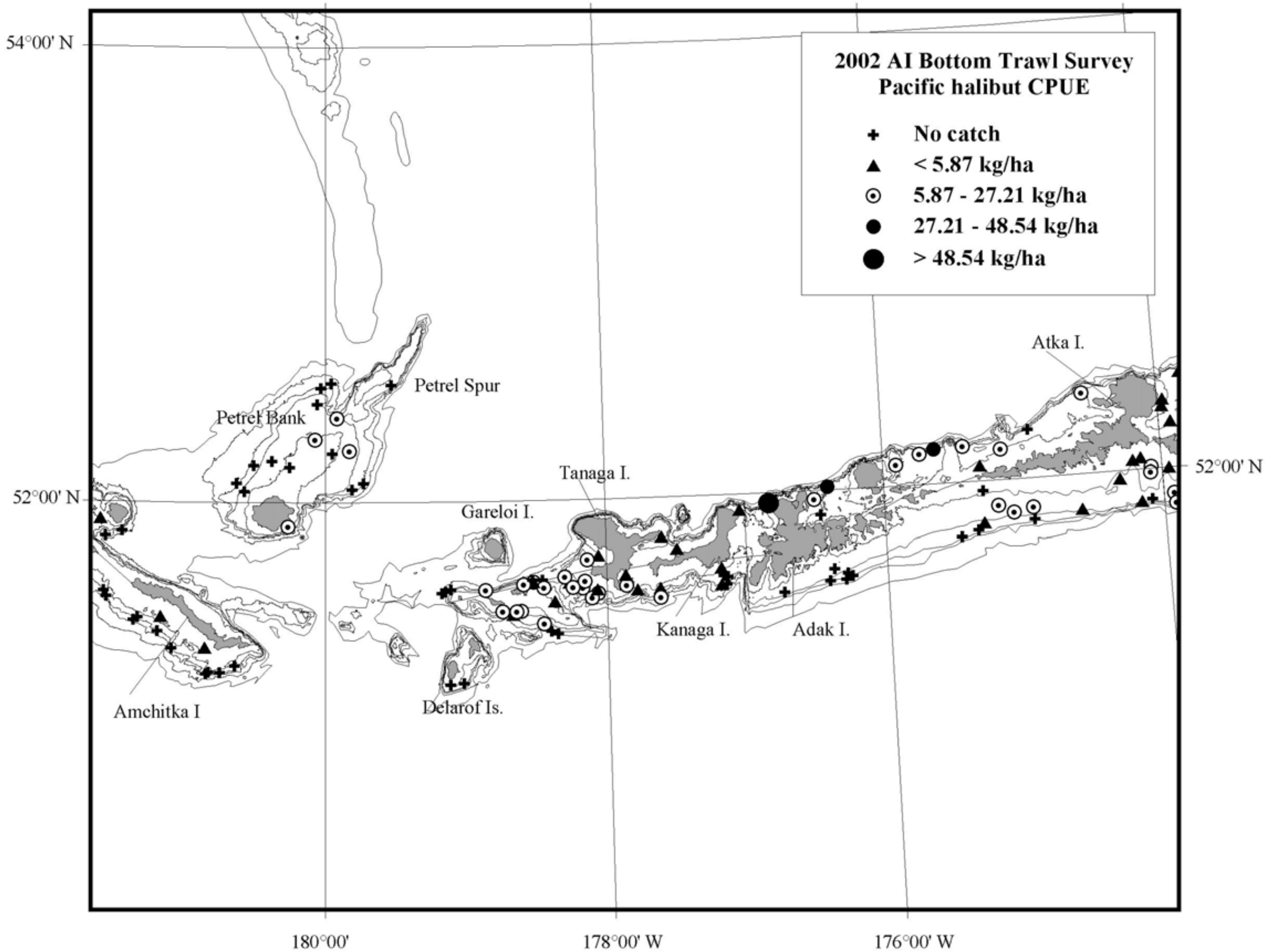


Figure 14.--Distribution and relative abundance of Pacific halibut from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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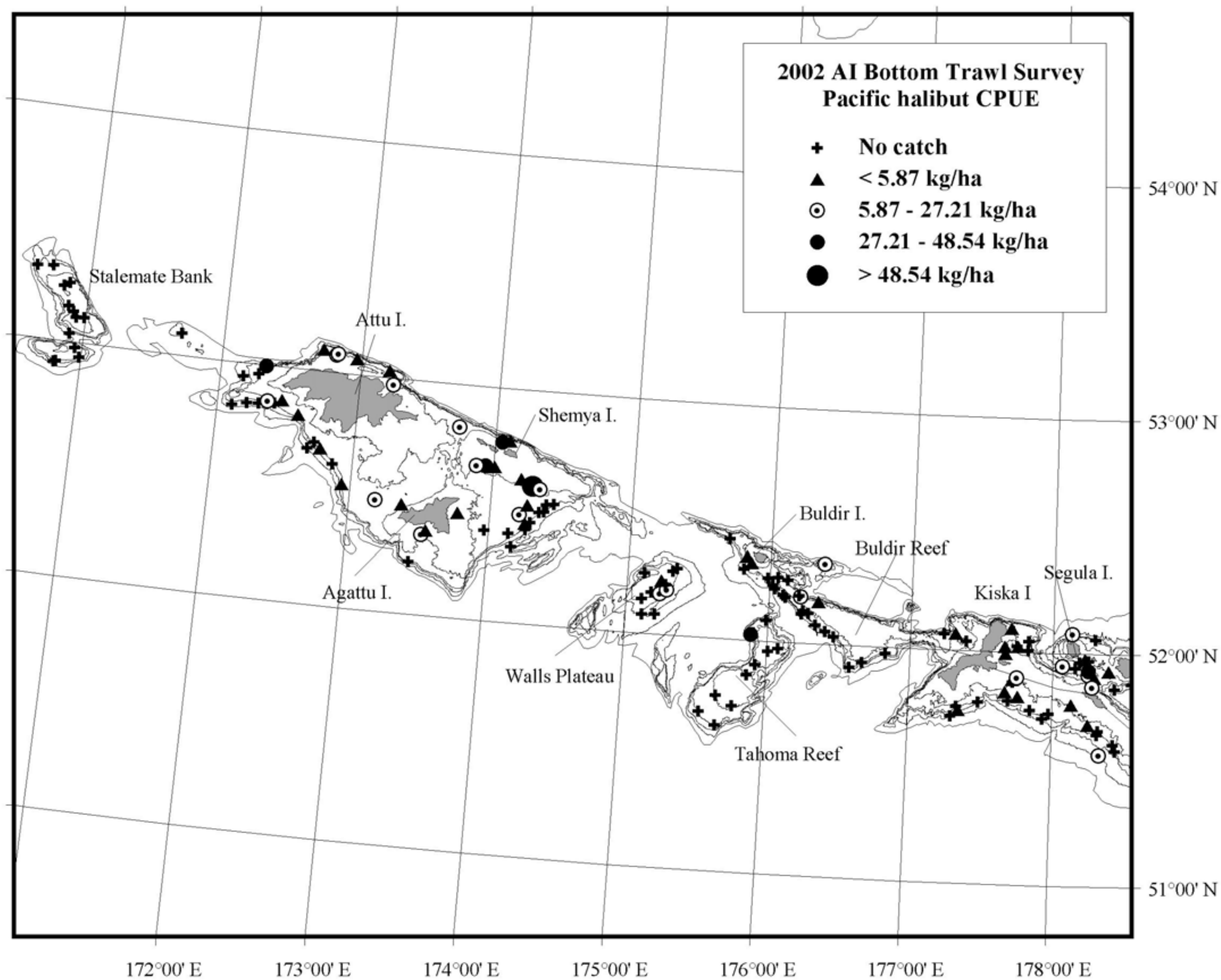

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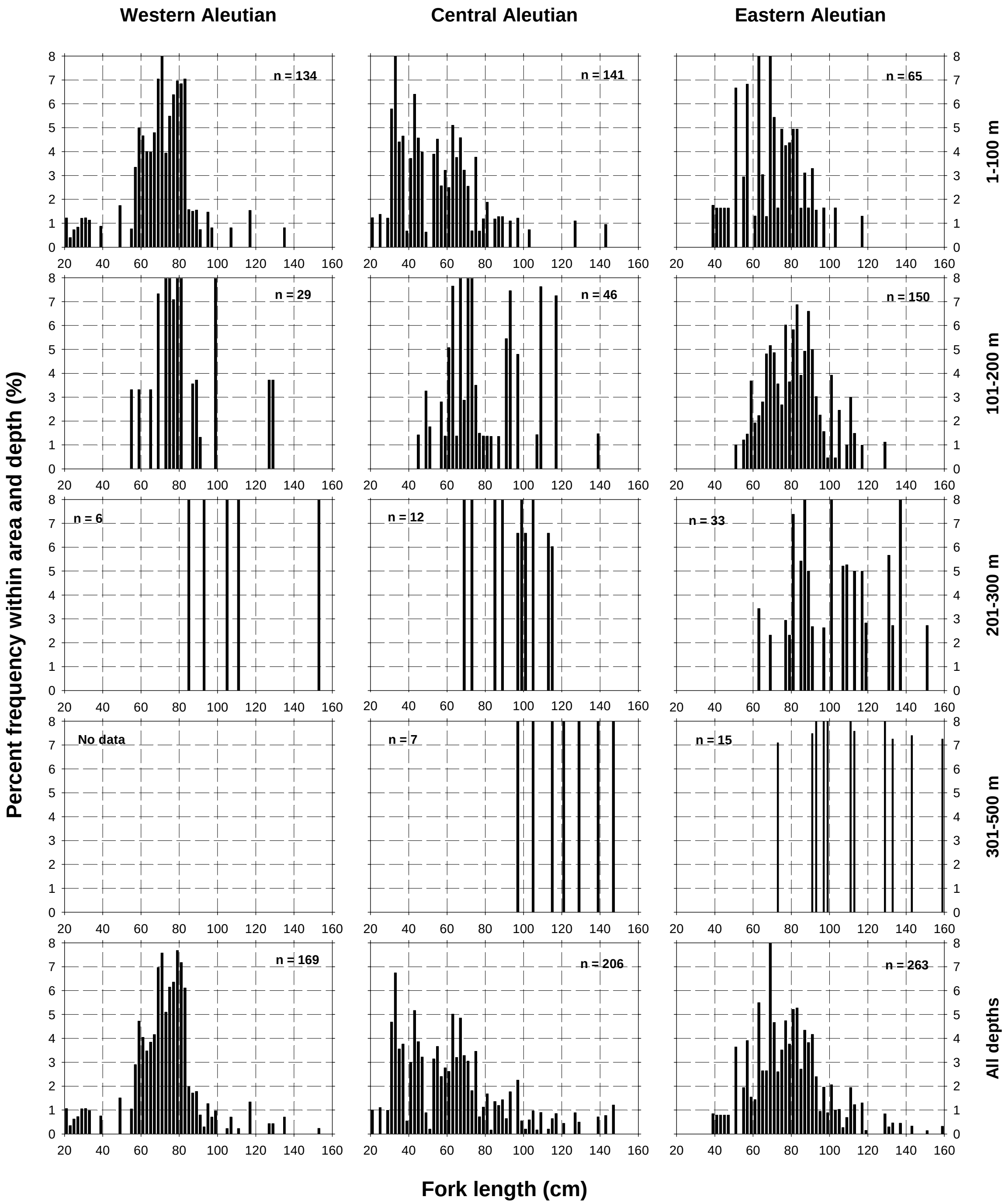


Figure 15.--Size composition of the estimated Pacific halibut population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval. Lengths are grouped in 2 cm increments.

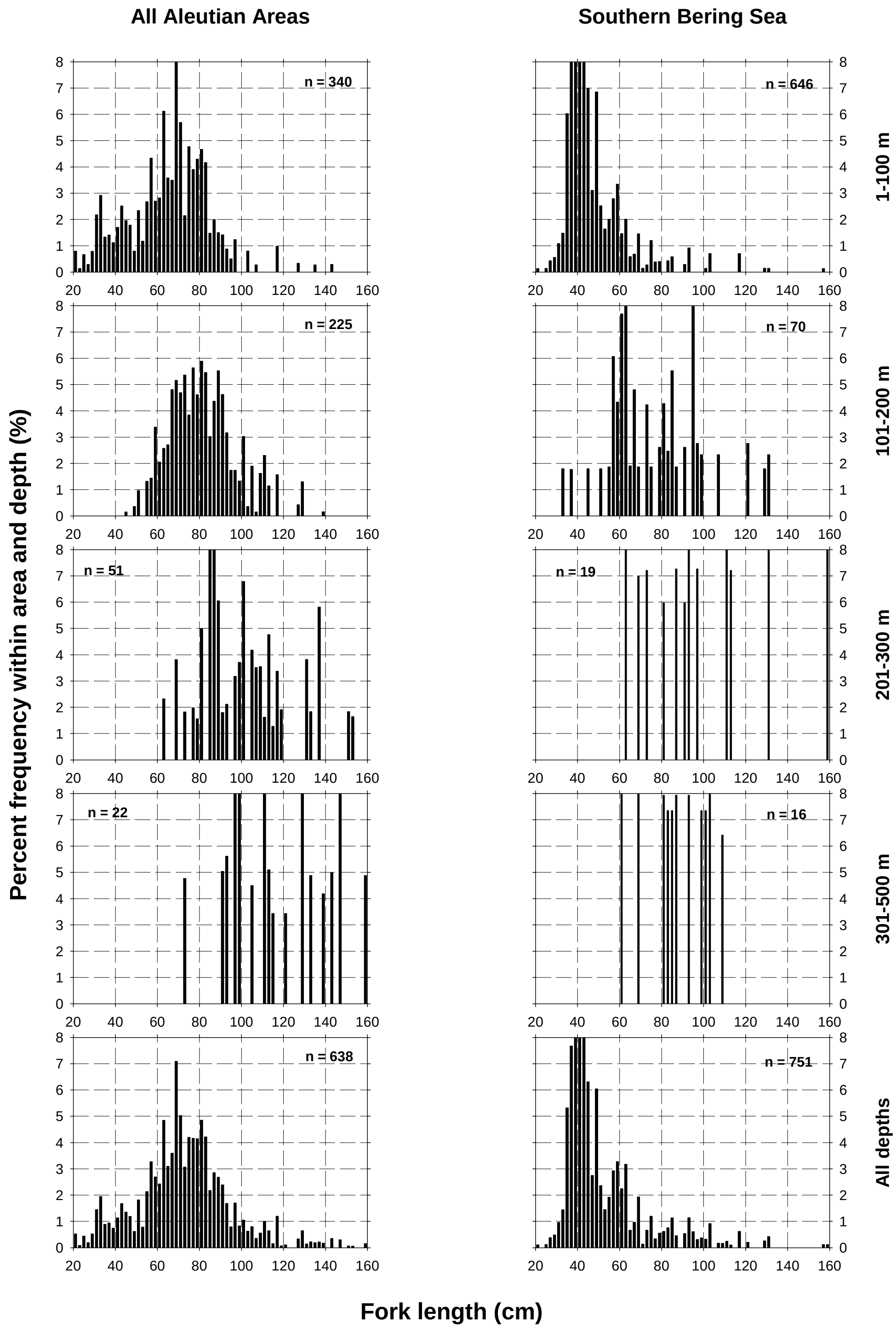


Figure 15.--(Pacific halibut, continued).

Greenland turbot (*Reinhardtius hippoglossoides*)

This commercially important species is probably under-sampled by this trawl survey since the maximum depth sampled is only 500 m. Thus, Greenland turbot biomass is probably grossly underestimated. Aleutian area relative abundance and estimated biomass were invariably highest in the 301-500 m depth interval (Table 13). Sampling in the 301-500 m depths was limited to areas where the survey trawl could be employed. In 1980 the U.S.- Japan cooperative trawl survey sampled to 900 m with a much larger, stronger trawl with a very heavy footrope. In that year, more than 80% of the total estimated Aleutian biomass was found in the 501-900 m depth interval (Ronholt et al. 1986). During the 2002 survey, the most notable incidence of Greenland turbot was found in 301-500 m in the Eastern Aleutian area (Table 14) between Seguam and Atka Islands (Fig. 16).

Catches of female Greenland turbot were relatively small compared to males. Size composition data verify this fact (Fig. 17). Although females were not well represented in the catches, they were generally larger than the males. It is possible that females primarily inhabit greater depths. The results of the 1980 U.S.- Japan cooperative trawl survey showed that virtually all Greenland turbot larger than 75 cm fork length were females. Greenland turbot larger than 75 cm were found most frequently in the 501-900 m depth interval, outside the scope of the present survey.

Figure 18 presents length-weight relationships for male and female Greenland turbot and for the combined sexes. Small sample sizes may render estimates of non-linear least squares parameters somewhat unreliable.

Table 13.--Number of survey hauls, number of hauls with Greenland turbot, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	**Depth (m)**	**Number of trawl hauls**	**Hauls with catch**	**Mean CPUE (kg/ha)**	**Estimated biomass (t)**	**Minimum biomass (t)**	**Maximum biomass (t)**	**Mean weight (kg)**	**Mean length (cm)**
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	0	-	-	-	-	-	-
	301-500	13	7	2.42	793	0	2,634	6.590	84.3
	All depths	109	7	0.52	793	0	2,634	6.590	84.3
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	0	-	-	-	-	-	-
	201-300	23	3	0.58	123	0	394	5.206	82.5
	301-500	17	10	3.86	1,535	361	2,709	3.755	73.8
	All depths	115	13	1.00	1,658	468	2,848	3.835	74.3
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	1	0.15	115	0	357	7.469	88.0
	201-300	42	1	0.07	36	0	110	4.306	76.5
	301-500	27	16	12.05	6,846	0	13,995	2.875	70.1
	All depths	132	18	2.78	6,996	0	14,150	2.909	70.2
All	1-100	72	0	-	-	-	-	-	-
Aleutian	101-200	143	1	0.06	115	0	357	7.469	88.0
Areas	201-300	84	4	0.18	159	0	396	4.973	81.0
	301-500	57	33	7.09	9,174	1,919	16,430	3.152	71.2
	All depths	356	38	1.66	9,448	2,216	16,679	3.195	71.4
Southern	1-100	30	1	0.10	42	0	127	10.279	96.0
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	1	3.10	175	0	588	2.556	68.6
	301-500	8	3	2.18	227	0	560	3.428	72.6
	All depths	61	5	0.59	444	0	934	3.198	71.3

Table 14.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Greenland turbot by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	11	19.33	5,161	0	12,098
Eastern Aleutian	301-500	SE Eastern Aleutian	12	5	6.55	1,685	0	4,131
Central Aleutian	301-500	N Central Aleutian	8	5	5.53	686	0	1,714
Central Aleutian	301-500	Petrel Bank	3	3	5.40	668	0	1,888
Southern Bering	201-300	Combined Southern Bering	7	1	3.10	175	0	602
Western Aleutian	301-500	W Western Aleutian	11	6	2.45	419	0	882
Western Aleutian	301-500	E Western Aleutian	2	1	2.40	374	0	5,125
Central Aleutian	301-500	SW Central Aleutian	2	2	2.30	182	0	364
Southern Bering	301-500	Combined Southern Bering	8	3	2.18	227	0	569
Central Aleutian	201-300	Petrel Bank	3	1	1.00	77	0	406
Central Aleutian	201-300	N Central Aleutian	10	1	0.80	35	0	114
Eastern Aleutian	101-200	NE Eastern Aleutian	17	1	0.57	115	0	358
Central Aleutian	201-300	SW Central Aleutian	6	1	0.27	12	0	41
Eastern Aleutian	201-300	NE Eastern Aleutian	22	1	0.18	36	0	110
Southern Bering	1-100	E Southern Bering Sea	27	1	0.17	42	0	127

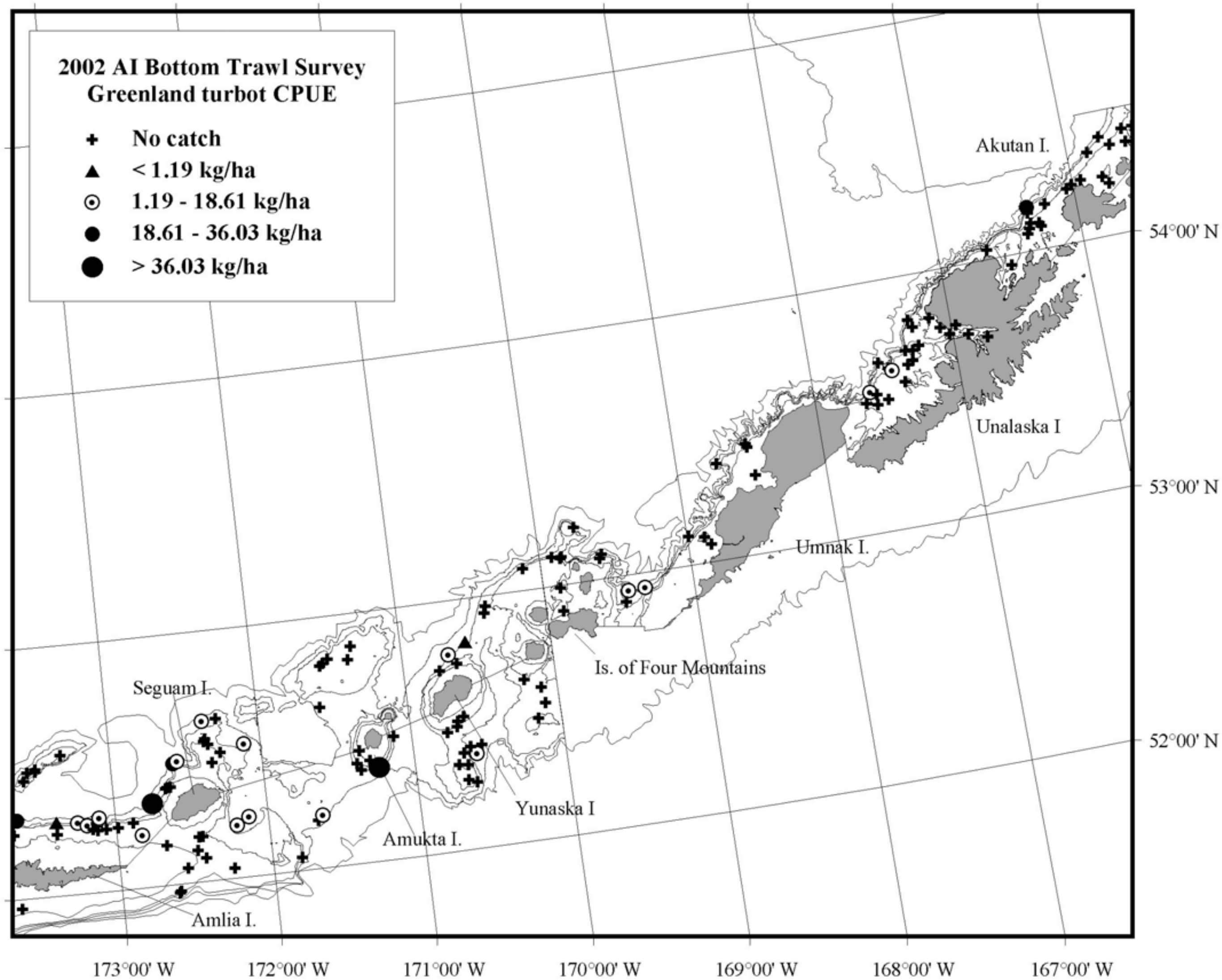
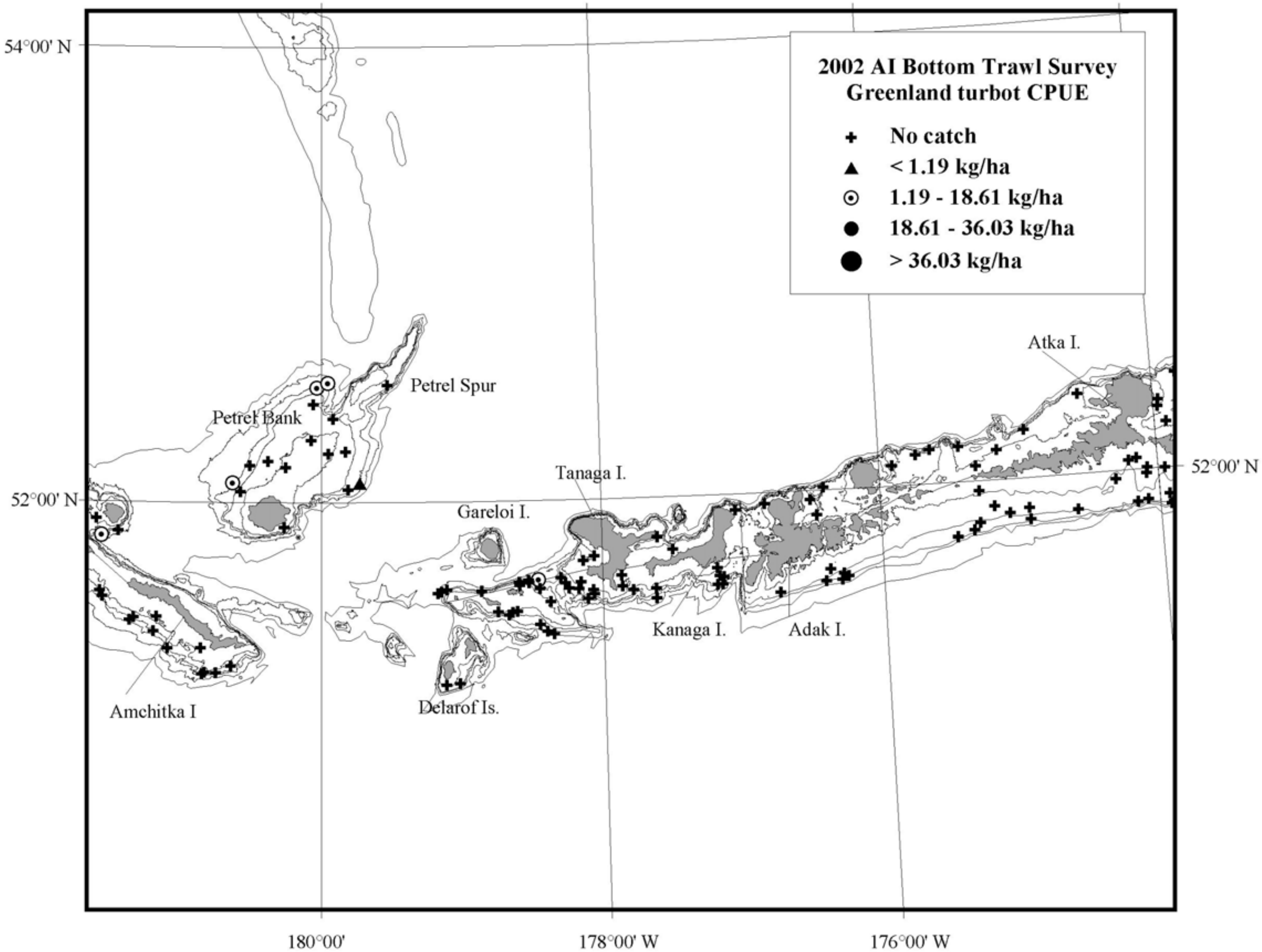


Figure 16.--Distribution and relative abundance of Greenland turbot from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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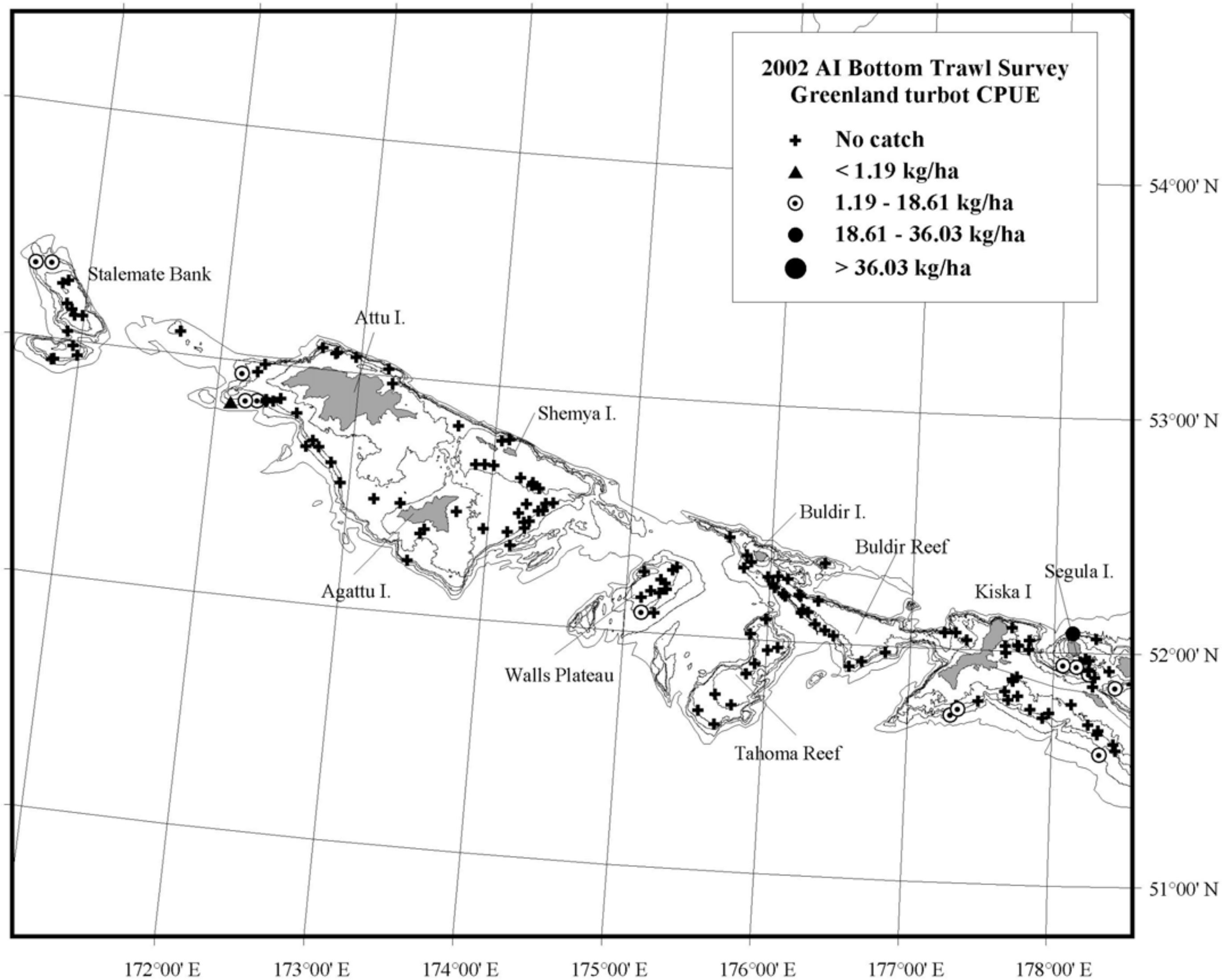

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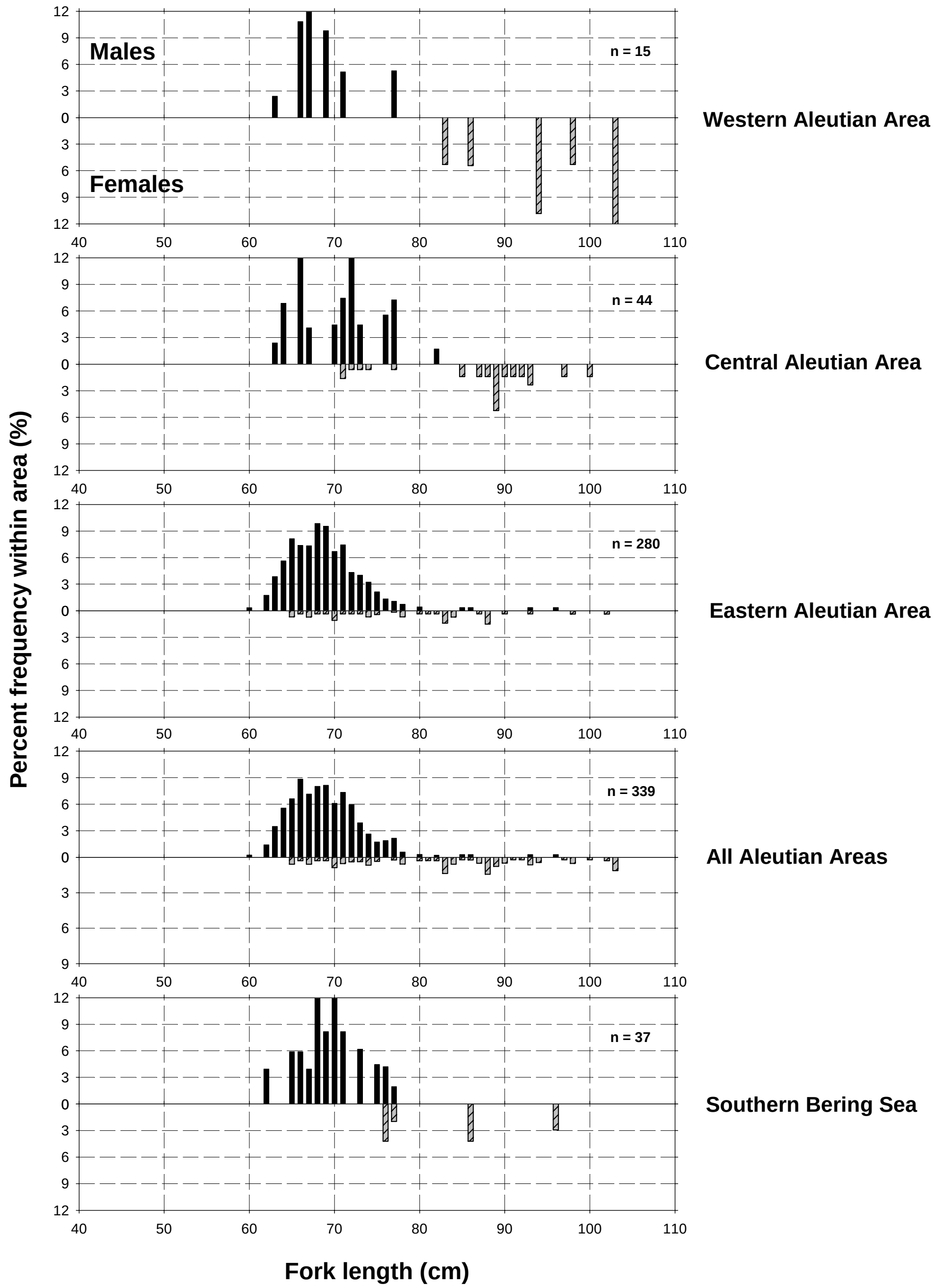


Figure 17.--Size composition of the estimated Greenland turbot population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area. Lengths are from all depths combined.

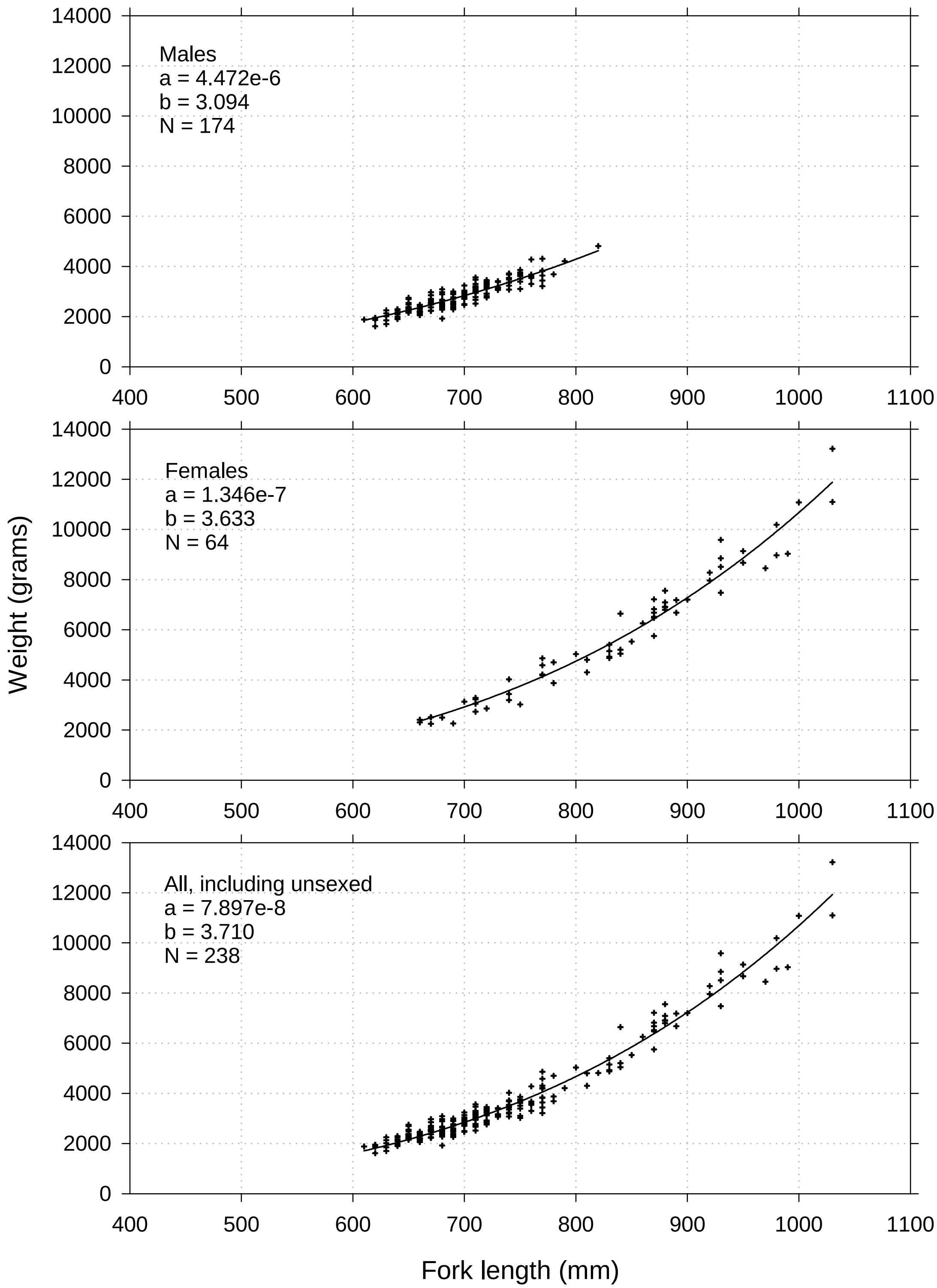


Figure 18.--Length-weight relationship for Greenland turbot specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{\ b}$.

Flathead sole (*Hippoglossoides elassodon*)

Flathead sole is widely distributed in the Aleutian region although at low relative abundance levels (Table 2), especially in the Central Aleutian area where CPUE ranked lower than the top 20 species. Total estimated biomass was 9,900 t, with 44% found in the Southern Bering Sea area (Table 15). The highest mean CPUEs were found in the Southern Bering Sea area in the 101-200 m and 1-100 m depth intervals where flathead sole individual mean lengths and weights were generally the smallest. The highest stratum mean CPUE was in the NE Eastern Aleutian subarea in 1-100 m (where only two trawl hauls were conducted), followed by those in the 101-200 m and 1-100 m depth strata in the E Southern Bering Sea subarea (Table 16). The three largest station-specific CPUEs were concentrated on the west side of Unalaska Island, in Makushin Bay (Fig. 19).

Size compositions were weighted slightly more heavily toward females in the Aleutian areas, and more heavily toward males in the Southern Bering Sea area (Fig. 20). Length-weight data were not collected for this species.

Rex sole (*Glyptocephalus zachirus*)

Rex sole are ubiquitous over the entire survey area, although at relatively low levels of abundance (Table 2). Mean CPUE was highest in the 201-300 m depth interval in the Aleutian areas, and in 301-500 m interval in the Southern Bering Sea area (Table 17). Overall mean CPUE decreased in a westerly direction as did total estimated biomass by area. Three of the top four ranked subarea mean CPUEs were in the Southern Bering Sea area (Fig. 21), and the other was in the SW Eastern Aleutian subarea in 201-300 m (Table 18). The proportion of males to females was 38% to 62% in the combined Aleutian area, and 56% to 44% in the Southern Bering Sea area. Males were most frequently captured in strata deeper than 100 m (Fig. 22).

Table 15.--Number of survey hauls, number of hauls with flathead sole, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	11	1.00	487	110	864	0.637	36.7
Aleutian	101-200	51	23	2.42	1,288	343	2,233	0.287	28.9
	201-300	19	4	3.58	617	0	1,798	0.312	31.2
	301-500	13	1	0.02	5	0	17	0.169	25.6
	All depths	109	39	1.58	2,397	944	3,851	0.330	30.3
Central	1-100	30	4	0.06	34	0	73	0.256	27.3
Aleutian	101-200	45	7	0.11	49	0	118	0.514	36.9
	201-300	23	2	0.02	4	0	9	0.663	37.9
	301-500	17	0	-	-	-	-	-	-
	All depths	115	13	0.05	87	13	161	0.370	31.5
Eastern	1-100	16	4	3.01	2,064	0	8,761	0.202	27.3
Aleutian	101-200	47	8	0.86	669	0	1,394	0.190	27.7
	201-300	42	6	0.54	263	0	582	0.668	39.4
	301-500	27	1	0.01	4	0	12	0.416	35.0
	All depths	132	19	1.19	2,999	0	9,889	0.212	27.7
All	1-100	72	19	1.47	2,585	0	9,326	0.232	27.9
Aleutian	101-200	143	38	1.13	2,006	836	3,176	0.248	28.5
Areas	201-300	84	12	1.01	884	0	2,089	0.371	32.6
	301-500	57	2	0.01	9	0	22	0.224	27.7
	All depths	356	71	0.96	5,484	0	11,070	0.253	28.6
Southern	1-100	30	23	6.23	2,507	0	5,376	0.175	25.6
Bering Sea	101-200	16	12	9.58	1,772	0	3,701	0.181	26.8
	201-300	7	2	0.04	2	0	5	0.322	32.5
	301-500	8	3	1.24	129	0	307	0.546	36.6
	All depths	61	40	5.89	4,410	1,037	7,784	0.181	26.2

Table 16.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of flathead sole by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	14.94	1,895	0	21,562
Southern Bering	101-200	E Southern Bering Sea	11	11	14.91	1,758	0	3,711
Southern Bering	1-100	E Southern Bering Sea	27	21	10.17	2,481	0	5,355
Western Aleutian	201-300	W Western Aleutian	9	4	6.56	617	0	1,821
Western Aleutian	101-200	W Western Aleutian	28	20	3.09	1,255	309	2,201
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	2.58	185	0	529
Eastern Aleutian	101-200	NE Eastern Aleutian	17	6	2.33	469	0	1,083
Western Aleutian	1-100	W Western Aleutian	16	10	1.30	479	100	857
Eastern Aleutian	101-200	NW Eastern Aleutian	6	2	1.25	200	0	699
Southern Bering	301-500	Combined Southern Bering	8	3	1.24	129	0	311
Eastern Aleutian	1-100	NW Eastern Aleutian	4	1	0.84	162	0	678
Eastern Aleutian	201-300	NE Eastern Aleutian	22	4	0.40	78	0	170
Central Aleutian	101-200	N Central Aleutian	8	1	0.28	29	0	99
Western Aleutian	101-200	E Western Aleutian	23	3	0.27	34	0	78
Southern Bering	101-200	W Southern Bering Sea	5	1	0.20	14	0	51
Southern Bering	1-100	W Southern Bering Sea	3	2	0.16	26	0	91
Central Aleutian	1-100	N Central Aleutian	14	4	0.16	34	0	74
Central Aleutian	101-200	SW Central Aleutian	17	3	0.12	12	0	27
Central Aleutian	101-200	SE Central Aleutian	14	3	0.10	7	0	17
Central Aleutian	201-300	N Central Aleutian	10	2	0.08	4	0	9
Western Aleutian	1-100	E Western Aleutian	10	1	0.07	8	0	26
Southern Bering	201-300	Combined Southern Bering	7	2	0.04	2	0	6
Eastern Aleutian	1-100	SW Eastern Aleutian	5	1	0.04	7	0	27
Western Aleutian	301-500	W Western Aleutian	11	1	0.03	5	0	17
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	1	0.01	4	0	12

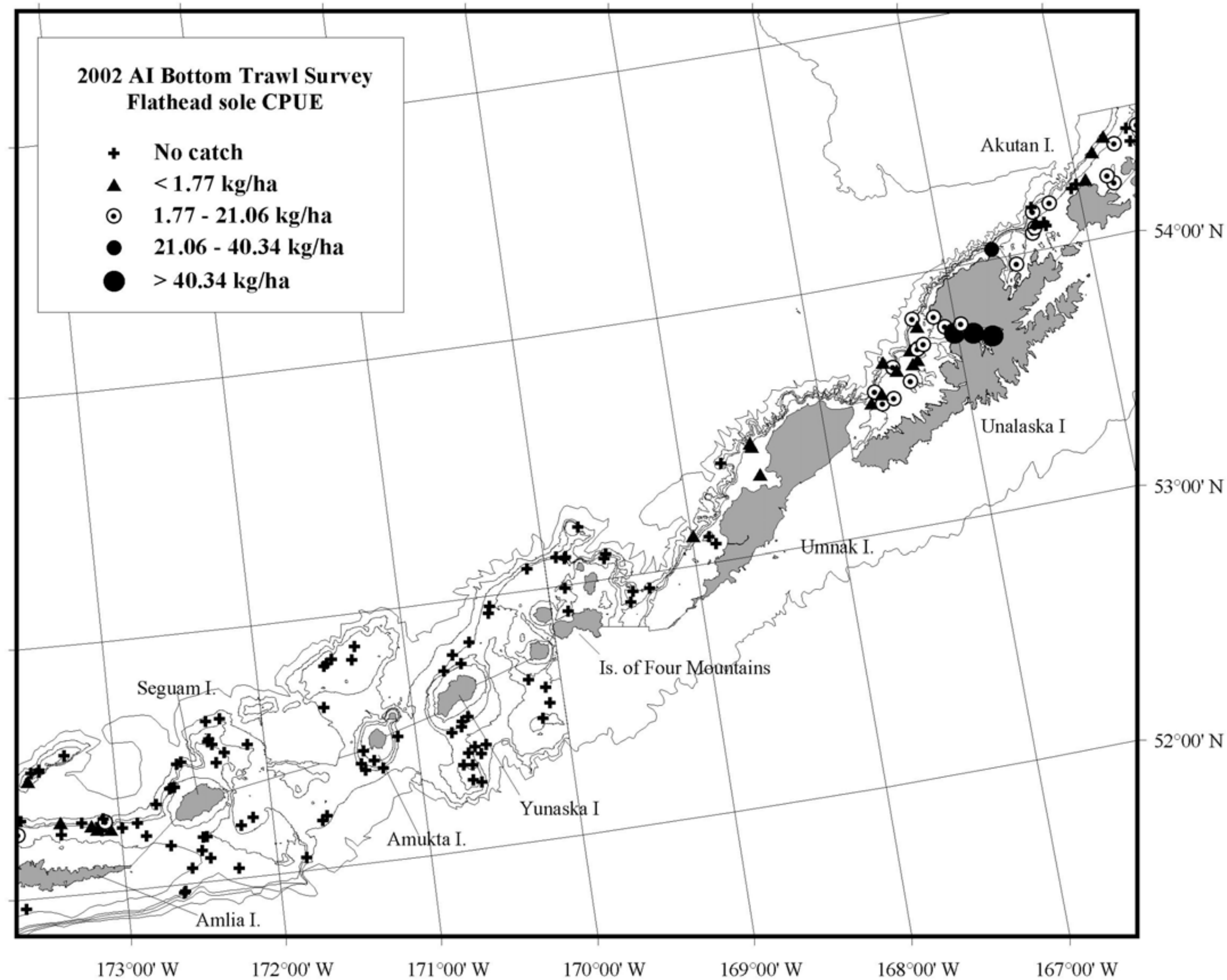
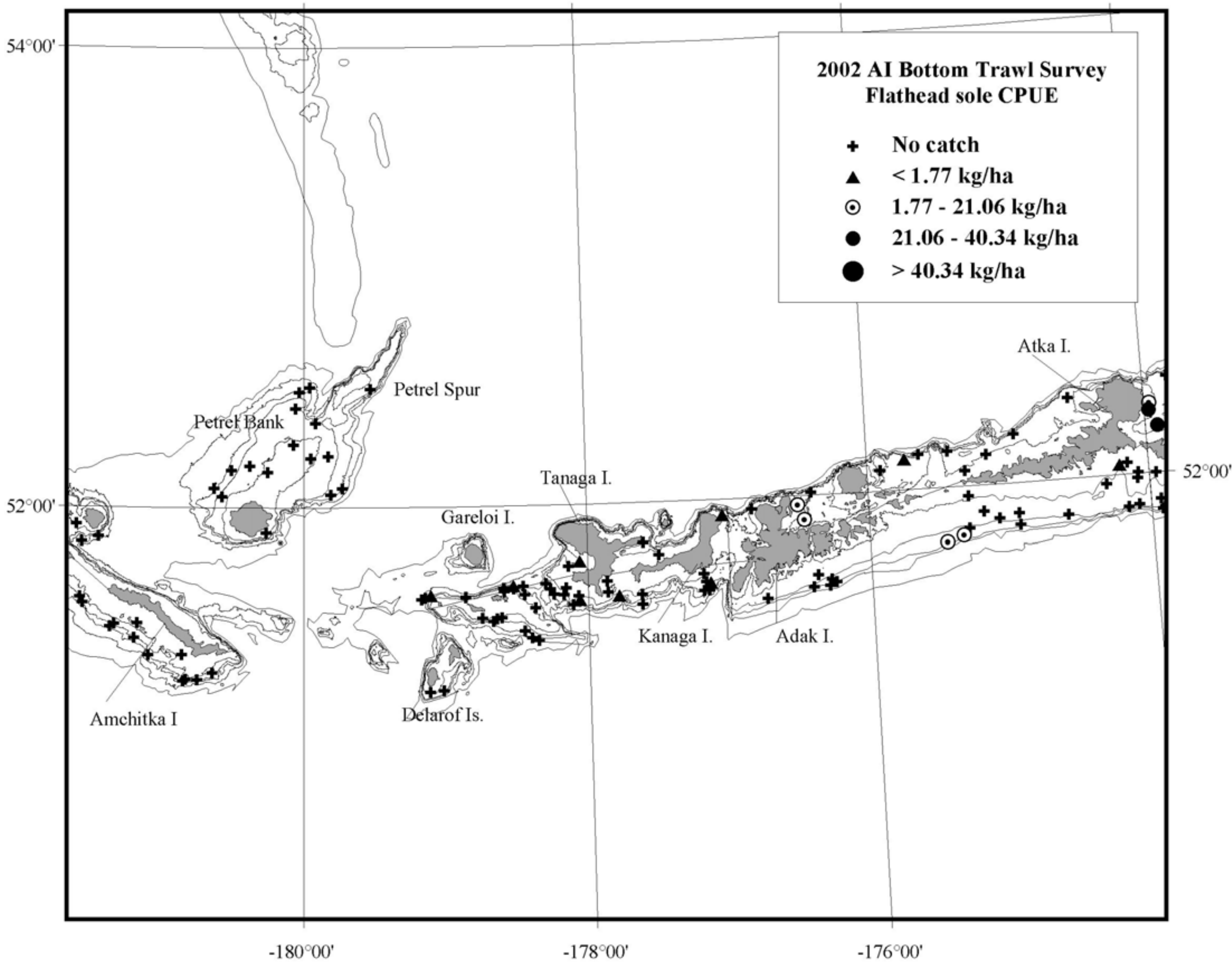


Figure 19.--Distribution and relative abundance of flathead sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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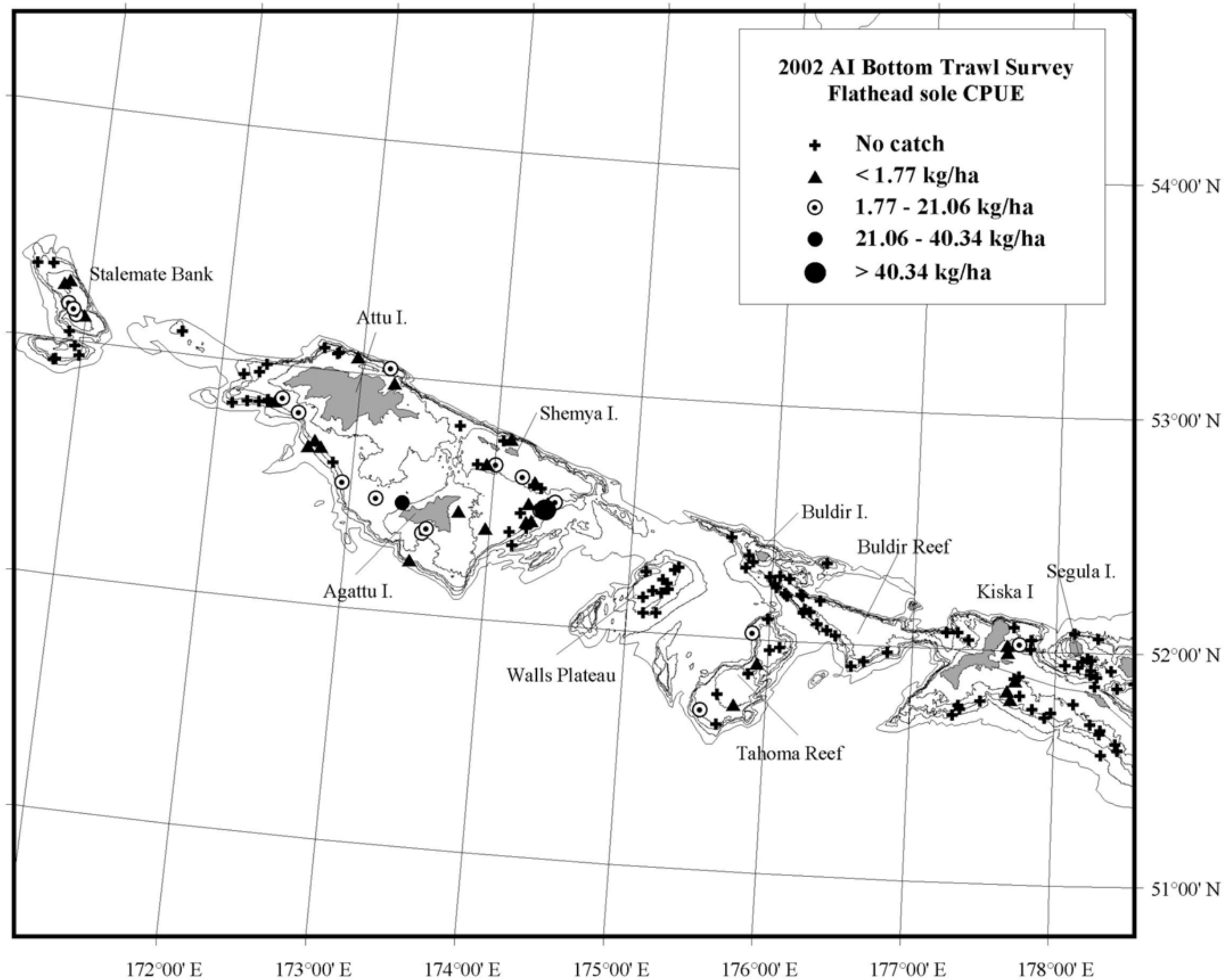

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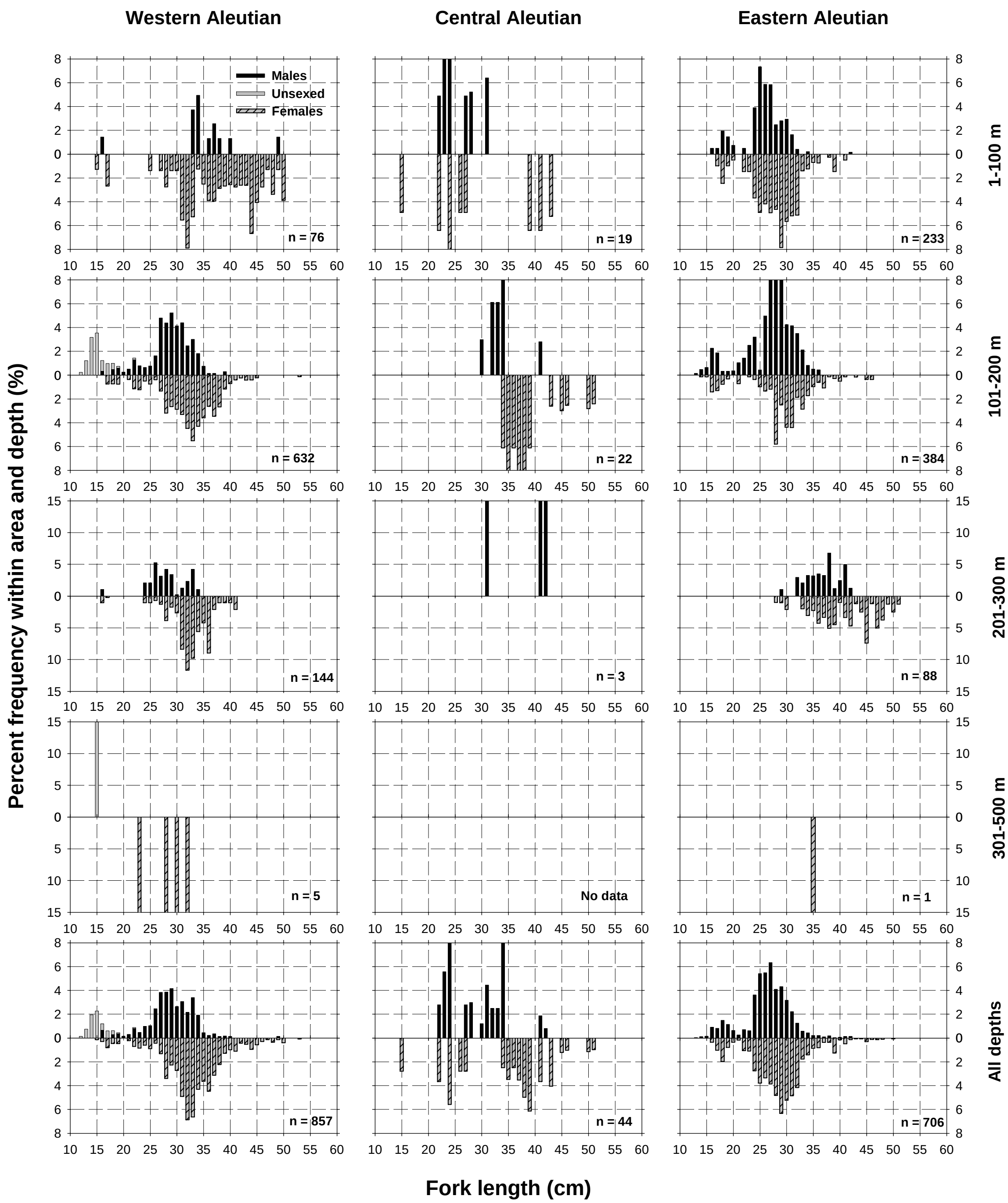


Figure 20.--Size composition of the estimated flathead sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

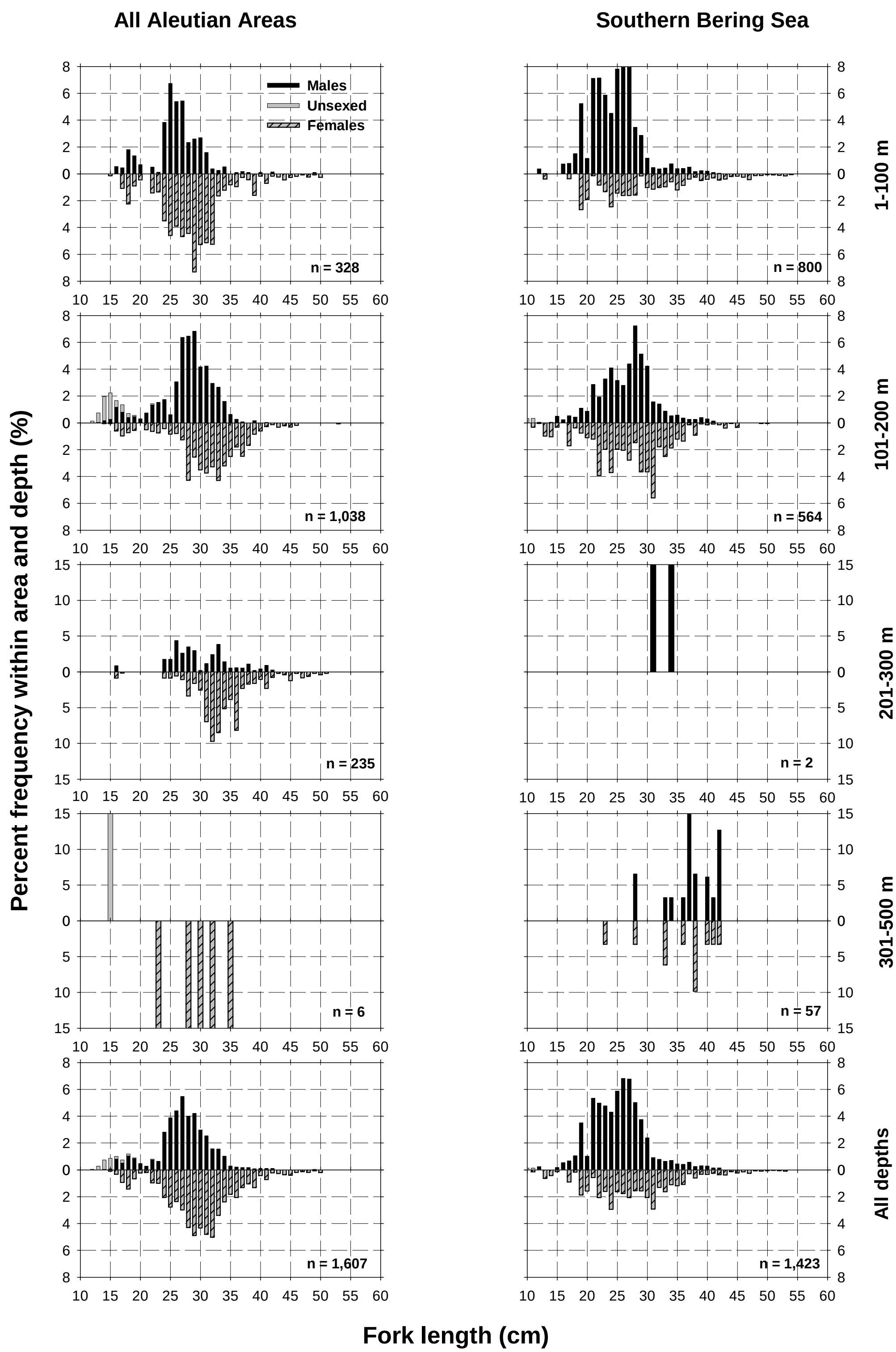


Figure 20.--(Flathead sole, continued).

Table 17.--Number of survey hauls, number of hauls with rex sole, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	3	0.36	175	0	383	0.716	45.5
Aleutian	101-200	51	19	0.66	349	121	577	0.368	36.8
	201-300	19	7	0.86	148	0	426	0.297	33.5
	301-500	13	8	0.71	233	53	413	0.470	39.3
	All depths	109	37	0.60	905	488	1,322	0.414	37.6
Central	1-100	30	4	0.04	25	0	68	0.176	29.7
Aleutian	101-200	45	9	0.15	68	0	154	0.318	35.6
	201-300	23	12	2.88	608	0	1,329	0.512	41.1
	301-500	17	9	1.17	465	89	841	0.559	41.0
	All depths	115	34	0.70	1,165	538	1,793	0.492	39.9
Eastern	1-100	16	4	0.85	584	0	1,745	0.308	33.8
Aleutian	101-200	47	7	0.19	144	0	296	0.312	34.6
	201-300	42	16	1.89	929	66	1,791	0.596	41.9
	301-500	27	8	0.78	441	81	801	0.421	38.3
	All depths	132	35	0.83	2,098	591	3,604	0.423	37.4
All	1-100	72	11	0.45	784	0	1,980	0.344	34.8
Aleutian	101-200	143	35	0.32	561	284	838	0.346	36.0
Areas	201-300	84	35	1.93	1,684	711	2,658	0.519	40.3
	301-500	57	25	0.88	1,139	645	1,633	0.480	39.5
	All depths	356	106	0.73	4,168	2,559	5,777	0.438	38.0
Southern	1-100	30	17	0.68	275	101	449	0.341	35.0
Bering Sea	101-200	16	12	5.76	1,066	521	1,610	0.366	35.2
	201-300	7	5	8.37	472	0	1,138	0.616	42.6
	301-500	8	5	13.43	1,401	0	3,279	0.630	44.1
	All depths	61	39	4.30	3,214	1,207	5,220	0.479	39.0

Table 18.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of rex sole by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Southern Bering	301-500	Combined Southern Bering	8	5	13.43	1,401	0	3,328
Eastern Aleutian	201-300	SW Eastern Aleutian	6	5	10.11	724	0	1,635
Southern Bering	101-200	E Southern Bering Sea	11	11	8.89	1,048	498	1,597
Southern Bering	201-300	Combined Southern Bering	7	5	8.37	472	0	1,162
Central Aleutian	201-300	Petrel Bank	3	2	5.08	389	0	1,309
Eastern Aleutian	201-300	NW Eastern Aleutian	2	1	4.60	72	0	984
Eastern Aleutian	1-100	NE Eastern Aleutian	2	1	2.85	361	0	4,946
Central Aleutian	301-500	SE Central Aleutian	4	2	2.57	183	0	525
Central Aleutian	201-300	N Central Aleutian	10	5	2.38	104	0	245
Central Aleutian	201-300	SW Central Aleutian	6	3	2.03	86	0	188
Western Aleutian	201-300	W Western Aleutian	9	3	1.40	132	0	414
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	5	1.30	347	19	676
Central Aleutian	301-500	Petrel Bank	3	2	1.29	160	0	549
Western Aleutian	1-100	E Western Aleutian	10	2	1.14	135	0	344
Eastern Aleutian	1-100	NW Eastern Aleutian	4	2	1.11	214	0	886
Southern Bering	1-100	E Southern Bering Sea	27	16	1.04	254	85	423
Western Aleutian	101-200	E Western Aleutian	23	5	0.93	116	0	295
Central Aleutian	301-500	N Central Aleutian	8	4	0.88	109	0	254
Western Aleutian	301-500	W Western Aleutian	11	6	0.78	134	0	268
Western Aleutian	301-500	E Western Aleutian	2	2	0.64	99	0	555
Central Aleutian	201-300	SE Central Aleutian	4	2	0.57	27	0	86
Western Aleutian	101-200	W Western Aleutian	28	14	0.57	233	88	378
Eastern Aleutian	201-300	NE Eastern Aleutian	22	8	0.50	99	17	180
Eastern Aleutian	101-200	NE Eastern Aleutian	17	3	0.50	101	0	244
Central Aleutian	101-200	SW Central Aleutian	17	5	0.34	36	0	90
Eastern Aleutian	301-500	SE Eastern Aleutian	12	1	0.33	85	0	271
Southern Bering	101-200	W Southern Bering Sea	5	1	0.27	18	0	67
Western Aleutian	201-300	E Western Aleutian	10	4	0.21	17	0	41
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	0.21	9	0	57
Central Aleutian	301-500	SW Central Aleutian	2	1	0.17	14	0	184
Eastern Aleutian	101-200	NW Eastern Aleutian	6	1	0.17	26	0	94
Eastern Aleutian	201-300	SE Eastern Aleutian	12	2	0.17	34	0	97
Central Aleutian	101-200	Petrel Bank	6	1	0.16	28	0	98
Southern Bering	1-100	W Southern Bering Sea	3	1	0.13	21	0	111
Western Aleutian	1-100	W Western Aleutian	16	1	0.11	40	0	126
Central Aleutian	1-100	N Central Aleutian	14	2	0.10	22	0	65
Eastern Aleutian	101-200	SW Eastern Aleutian	9	3	0.08	17	0	41
Central Aleutian	101-200	SE Central Aleutian	14	2	0.05	4	0	11
Eastern Aleutian	1-100	SW Eastern Aleutian	5	1	0.05	9	0	35

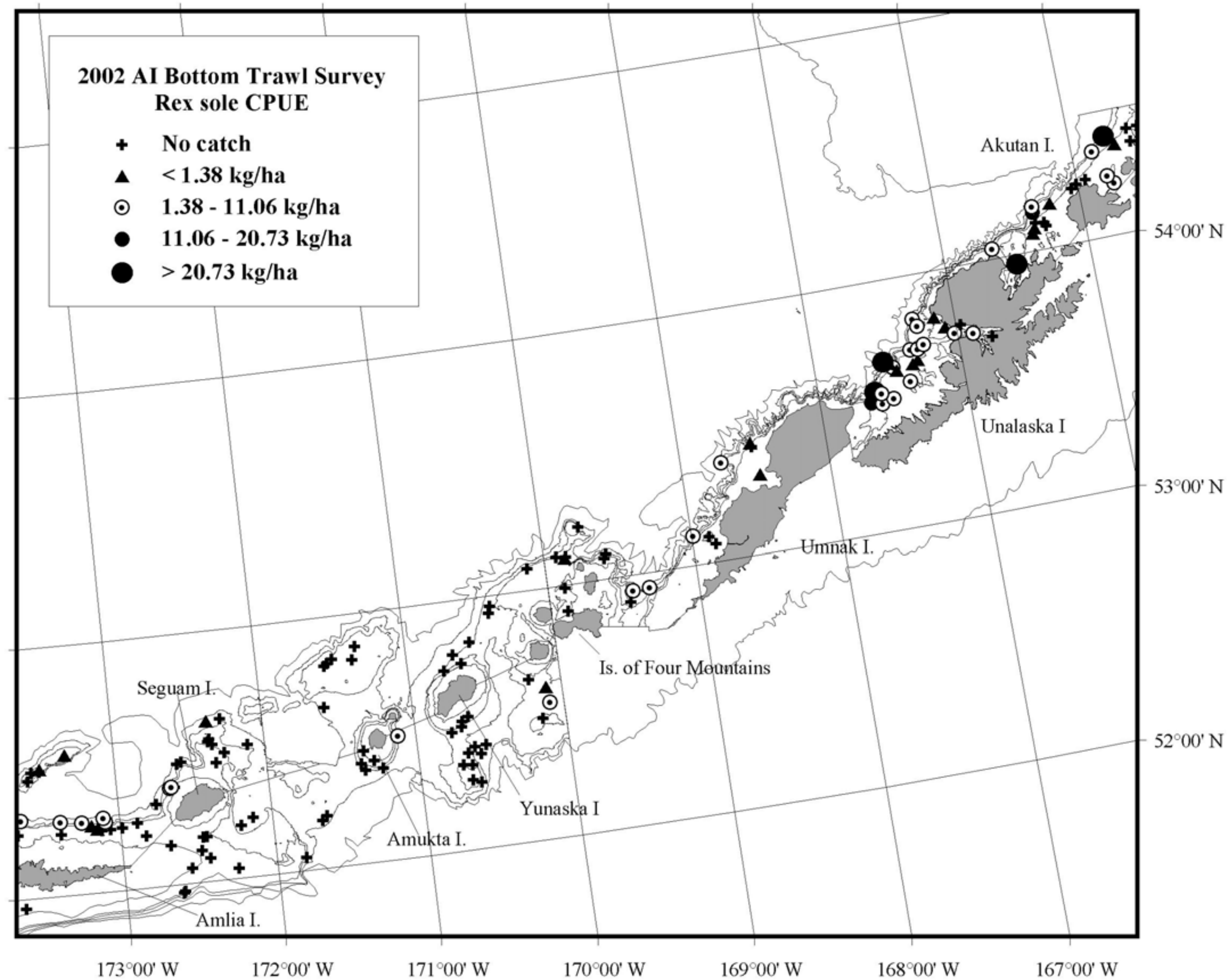


Figure 21.--Distribution and relative abundance of rex sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.

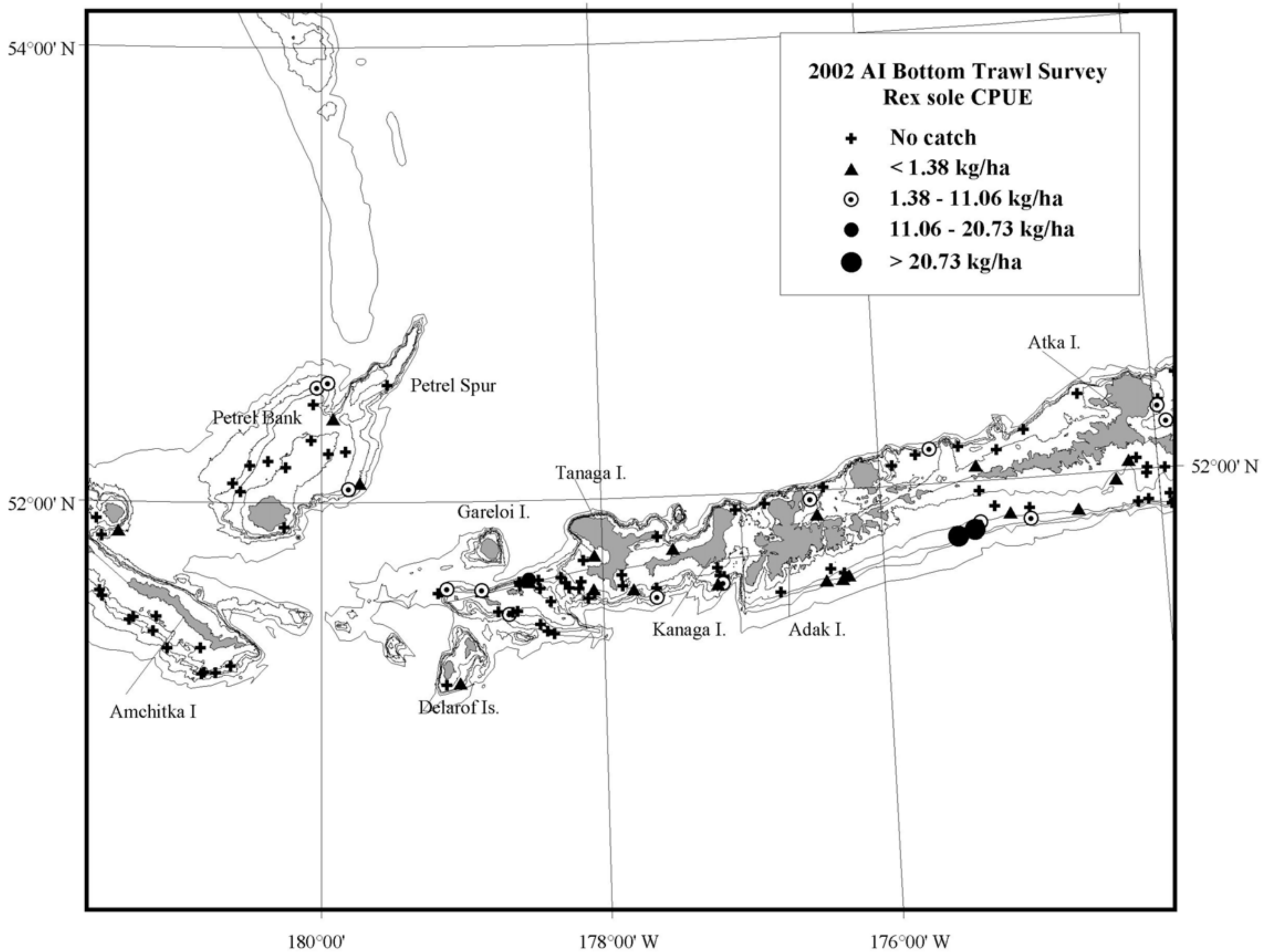


Figure 21.--(Continued).

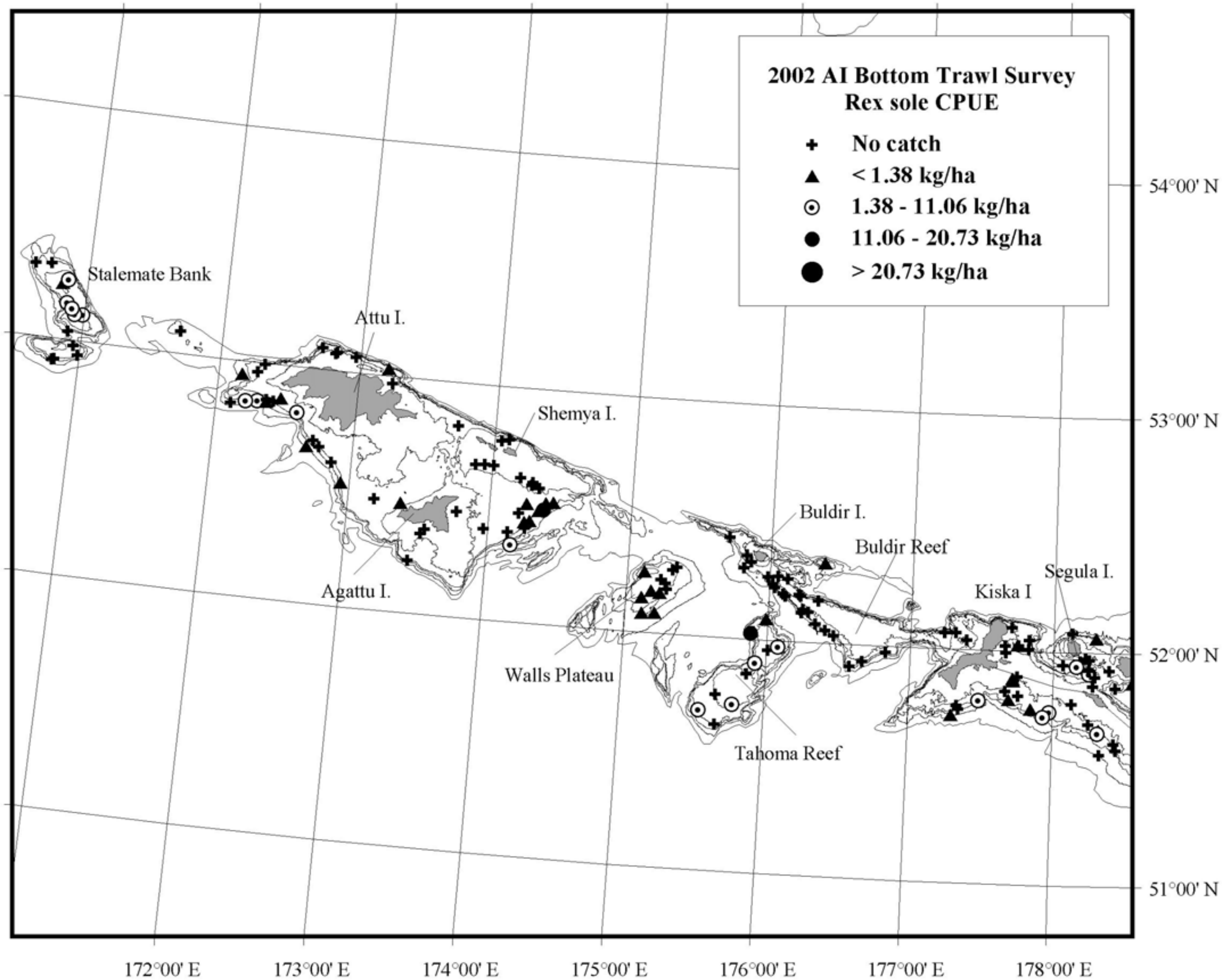


Figure 21.--(Continued).

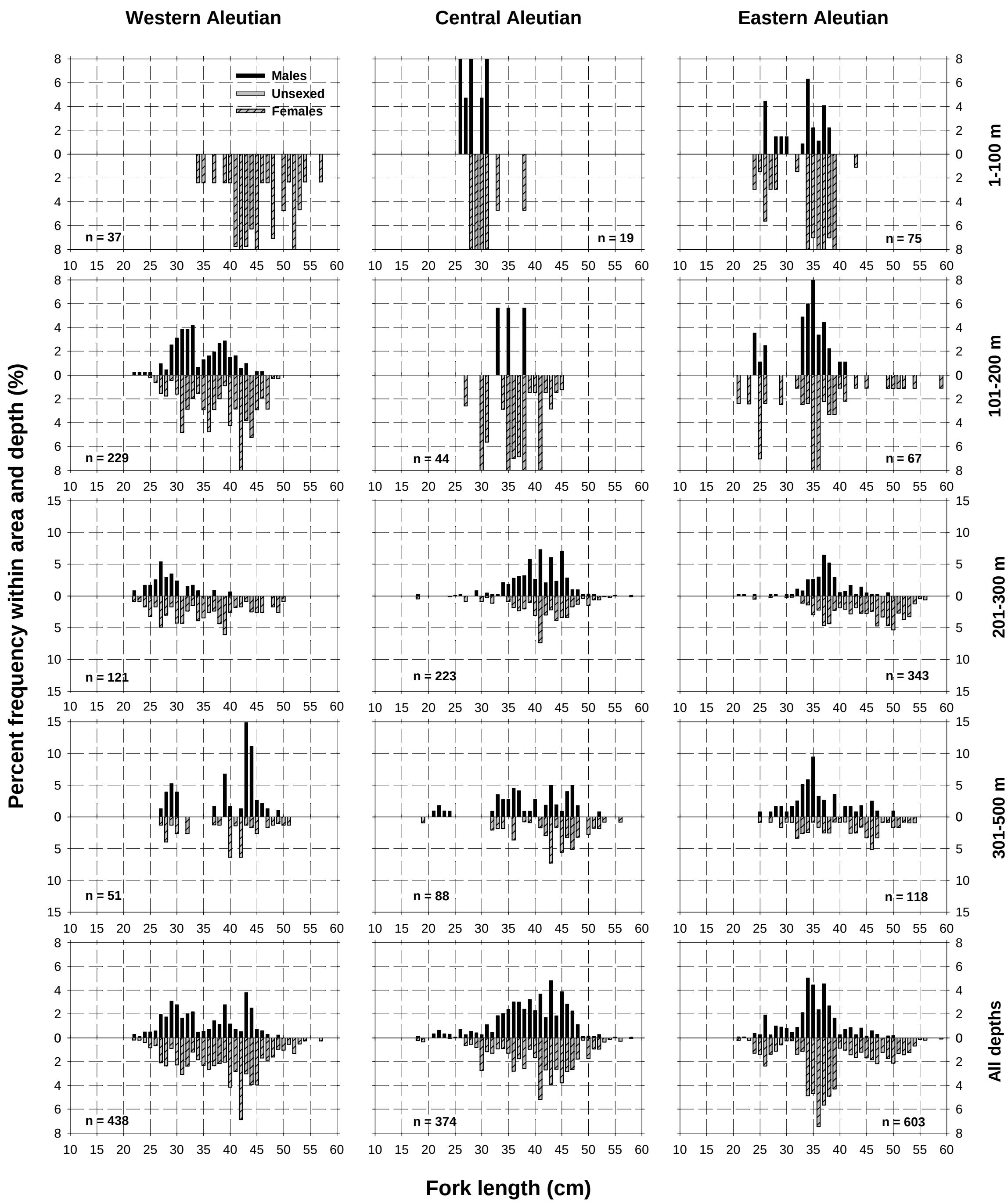


Figure 22.--Size composition of the estimated rex sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

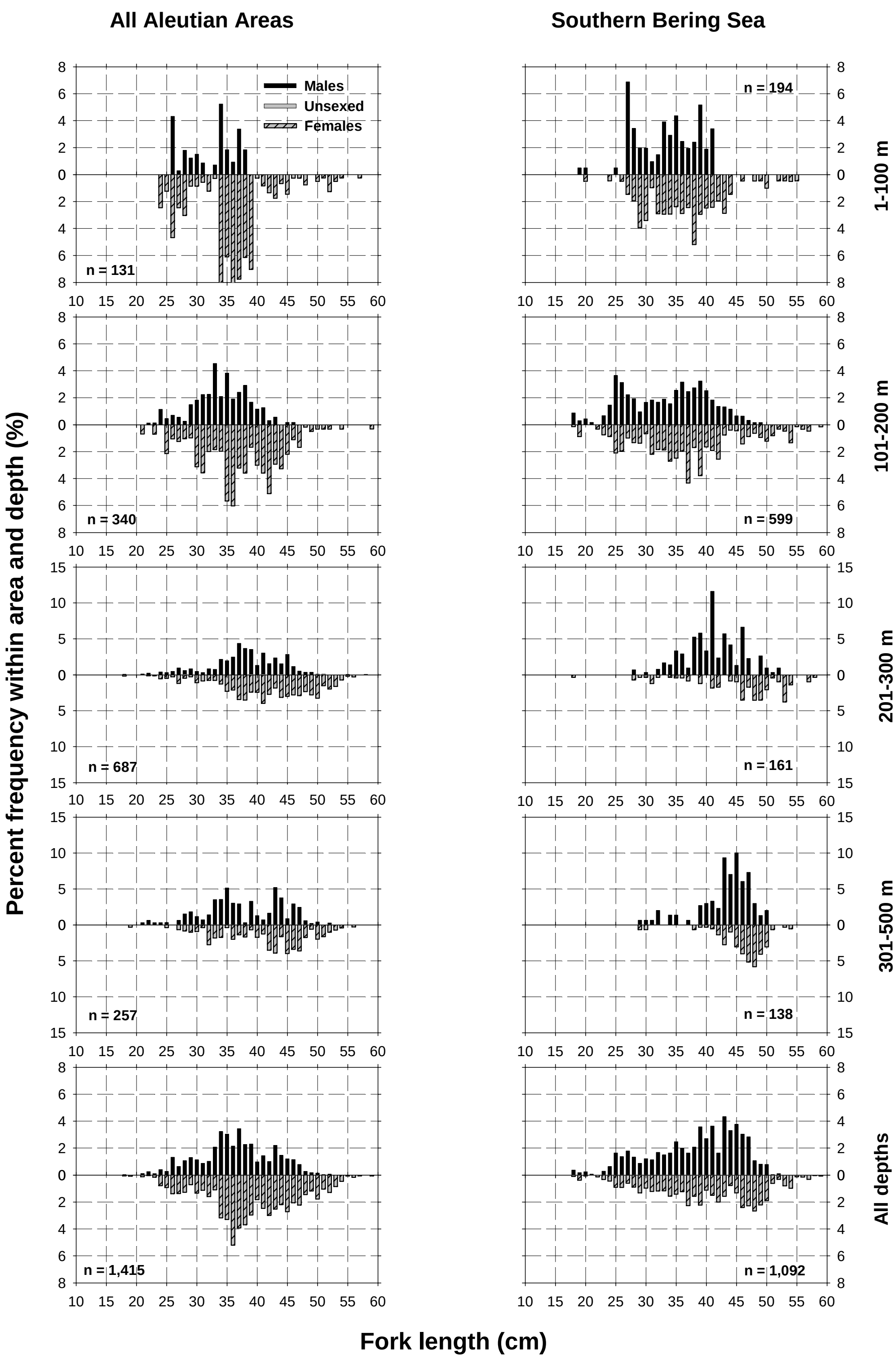


Figure 22.--(Rex sole, continued).

Dover sole (*Microstomus pacificus*)

Dover sole appeared at low abundance levels throughout the survey area, mostly at depths greater than 100 m. Abundance most likely does not approach commercially exploitable levels, so it is mostly of biological interest as part of the Aleutian ecosystem. The highest stratum-specific estimated biomass was reported from the 301-500 m depth interval in the Central Aleutian area (Table 19), more specifically from the 301-500 m and 201-300 m depth intervals on Petrel Bank (Table 20). Males outnumbered females in length frequency collections (Fig. 23).

Table 19.--Number of survey hauls, number of hauls with Dover sole, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	**Depth (m)**	**Number of trawl hauls**	**Hauls with catch**	**Mean CPUE (kg/ha)**	**Estimated biomass (t)**	**Minimum biomass (t)**	**Maximum biomass (t)**	**Mean weight (kg)**	**Mean length (cm)**
Western	1-100	26	0	-	-	-	-	-	No data
Aleutian	101-200	51	9	0.10	55	0	111	0.450	
	201-300	19	2	0.15	26	0	82	1.273	
	301-500	13	1	0.03	8	0	27	1.432	
	All depths	109	12	0.06	90	13	166	0.603	
Central	1-100	30	1	0.01	3	0	10	0.385	
Aleutian	101-200	45	1	0.09	40	0	139	0.688	
	201-300	23	6	0.42	89	0	279	0.571	
	301-500	17	4	0.66	263	0	694	0.771	
	All depths	115	12	0.24	396	0	822	0.701	
Eastern	1-100	16	0	-	-	-	-	-	
Aleutian	101-200	47	0	-	-	-	-	-	
	201-300	42	3	0.01	5	0	11	0.433	
	301-500	27	4	0.06	32	0	68	0.459	
	All depths	132	7	0.01	37	0	74	0.455	
All	1-100	72	1	< 0.01	3	0	10	0.385	
Aleutian	101-200	143	10	0.05	95	0	200	0.527	
Areas	201-300	84	11	0.14	120	0	300	0.640	
	301-500	57	9	0.23	303	0	738	0.728	
	All depths	356	31	0.09	522	113	930	0.658	
Southern	1-100	30	2	< 0.01	2	0	5	0.229	
Bering Sea	101-200	16	6	0.09	17	0	35	0.315	
	201-300	7	0	-	-	-	-	-	
	301-500	8	3	0.33	34	0	82	0.543	
	All depths	61	11	0.07	53	4	103	0.423	

Table 20.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Dover sole by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	301-500	Petrel Bank	3	2	1.76	218.3	0	780.9
Central Aleutian	201-300	Petrel Bank	3	3	1.03	78.9	0	334.3
Central Aleutian	301-500	SE Central Aleutian	4	2	0.62	44.6	0	156.6
Southern Bering	301-500	Combined Southern Bering	8	3	0.33	34.2	0	83.1
Western Aleutian	201-300	W Western Aleutian	9	1	0.26	24.5	0	81
Central Aleutian	101-200	Petrel Bank	6	1	0.23	40.3	0	144.1
Central Aleutian	201-300	SW Central Aleutian	6	2	0.21	9	0	26.3
Eastern Aleutian	201-300	NW Eastern Aleutian	2	1	0.15	2.4	0	32.8
Southern Bering	101-200	E Southern Bering Sea	11	6	0.15	17.4	0	35.1
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	4	0.12	31.8	0	68.5
Western Aleutian	101-200	W Western Aleutian	28	6	0.11	45.9	0	100.3
Western Aleutian	101-200	E Western Aleutian	23	3	0.07	9.1	0	21.1
Western Aleutian	301-500	W Western Aleutian	11	1	0.05	8.3	0	26.8
Central Aleutian	201-300	N Central Aleutian	10	1	0.03	1.4	0	4.7
Western Aleutian	201-300	E Western Aleutian	10	1	0.02	1.7	0	5.4
Central Aleutian	1-100	N Central Aleutian	14	1	0.02	3.3	0	10.6
Eastern Aleutian	201-300	NE Eastern Aleutian	22	2	0.01	2.3	0	6.8
Southern Bering	1-100	E Southern Bering Sea	27	2	0.01	1.8	0	4.5

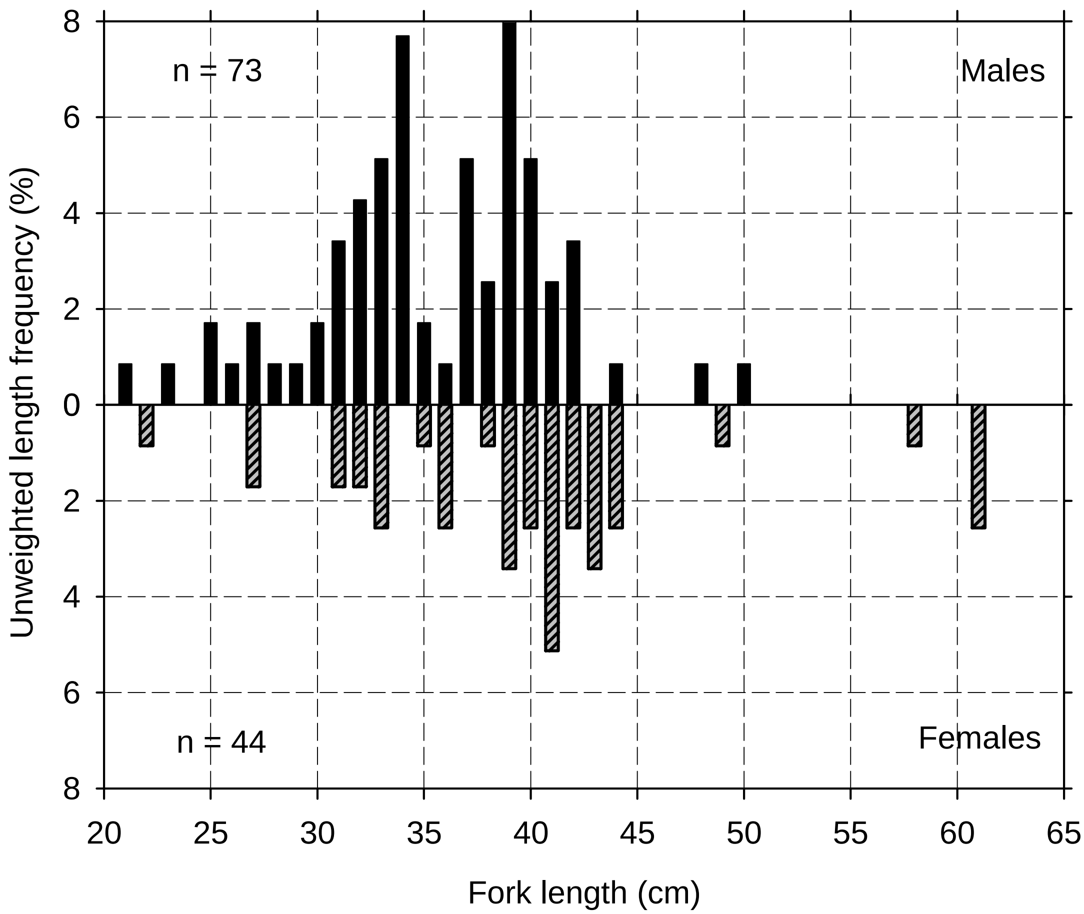


Figure 23.--Length frequency of the estimated Dover sole population from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

Roundfish

Atka mackerel (*Pleurogrammus monopterygius*)

Atka mackerel had the highest mean CPUE and estimated biomass of all species in the 2002 survey (Table 2). Distributed throughout the entire survey area (Fig. 2), its overall mean CPUE was almost twice as high as the next most abundant species, Pacific ocean perch (Table 2). Estimated biomass for the entire survey area surpassed 830,000 t. Atka mackerel mean CPUE and estimated biomass was notably highest (70% of total biomass) in the Central and Western Aleutian areas, respectively (Table 21). The Southern Bering Sea area mean CPUE was slightly higher than that in the Eastern Aleutian area, but due to its larger geographic area, the latter had a much higher biomass estimate. The highest Atka mackerel abundance in the Western and Central areas was found in the 101-200 m depth interval, and in the 1-100 m depth interval in the Eastern Aleutian and Southern Bering Sea areas. Actual catches of 1,000 kg or more were concentrated between about 70 m and 225 m with only one significantly large catch deeper than 200 m. Atka mackerel was captured in 63% of all successful survey tows conducted shallower than 300 m.

The highest three stratum-specific mean CPUEs were found in the SW Central Aleutian subarea between Amchitka and Kiska Islands in the 101-200 m depth interval (Table 22 and Fig. 24); in the SE Eastern Aleutian subarea near Amukta Island in the 1-100 m depth interval; and in the SE Central Aleutian subarea between Tanaga Island and the Delarof Islands in the 101-200 m depth interval. Atka mackerel can be a very contagiously distributed species. For example, the fifth highest mean CPUE was the result of one 7,000 kg catch in 201-300 m out of a total of 9 tows in the Western Aleutian area. The Southern Bering Sea area produced the eleventh highest mean CPUE in the 1-100 m depth interval due to a single 10,000 kg catch at the far eastern end of the area, near Akun Island (Table 22, Fig. 24). This station also produced the largest mean length and mean weight Atka mackerel (Table 21). The smallest mean size fish were found in the Western and Central areas. Over 16,600 Atka mackerel were measured during the survey. Two major modes dominated the Aleutian size composition distributions for males and females: one at 28 cm and the other at 35 cm (Fig. 25). The smaller mode was most predominant in the 1-100 m depth interval, whereas the larger mode was found in the 101-200 depth interval. Although representing a much smaller part of the Atka mackerel population, the primary frequency mode in the Southern Bering Sea area was at 38 cm, more similar to the size composition mode from 101-200 m in the Aleutian areas and probably denoting a larger proportion of adult fish.

Figure 26 shows length-weight relationships for male, female, and combined sexes of Atka mackerel. Larger males were slightly heavier than similar-sized females. Data were pooled over the entire survey area.

Table 21.--Number of survey hauls, number of hauls with Atka mackerel, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	14	106.47	51,921	5,507	98,334	0.288	28.5
Aleutian	101-200	51	36	291.15	154,820	33,018	276,623	0.431	32.9
	201-300	19	9	280.61	48,367	0	157,511	0.469	36.1
	301-500	13	1	0.02	8	0	24	0.328	31.8
	All depths	109	60	167.95	255,115	93,636	416,594	0.397	32.2
Central	1-100	30	25	216.87	126,811	6,429	247,194	0.286	28.7
Aleutian	101-200	45	41	433.69	199,743	92,438	307,048	0.612	36.8
	201-300	23	13	0.80	169	46	292	0.637	37.4
	301-500	17	1	0.36	143	0	538	0.818	42.4
	All depths	115	80	197.59	326,866	166,385	487,347	0.424	32.2
Eastern	1-100	16	12	222.20	152,159	0	432,278	0.572	34.7
Aleutian	101-200	47	27	49.55	38,492	2,816	74,168	0.714	37.2
	201-300	42	11	0.19	94	0	191	0.577	34.9
	301-500	27	7	0.13	71	5	137	0.431	31.2
	All depths	132	57	75.72	190,817	0	474,452	0.596	35.2
All	1-100	72	51	188.31	330,891	23,467	638,316	0.372	30.5
Aleutian	101-200	143	104	222.17	393,055	228,629	557,482	0.532	34.9
Areas	201-300	84	33	55.68	48,630	0	157,774	0.470	36.1
	301-500	57	9	0.17	221	0	579	0.610	36.6
	All depths	356	197	135.74	772,798	417,072	1,128,523	0.446	33.0
Southern	1-100	30	24	148.24	59,682	0	180,892	0.868	39.4
Bering Sea	101-200	16	7	0.56	103	6	200	0.523	34.4
	201-300	7	3	1.73	98	0	271	0.871	41.0
	301-500	8	0	-	-	-	-	-	-
	All depths	61	34	80.04	59,883	0	181,093	0.867	39.4

Table 22.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Atka mackerel by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	101-200	SW Central Aleutian	17	17	1,004.33	105,686	21,163	190,209
Eastern Aleutian	1-100	SE Eastern Aleutian	5	5	866.24	150,781	0	453,229
Central Aleutian	101-200	SE Central Aleutian	14	13	851.60	64,023	8,328	119,718
Western Aleutian	101-200	E Western Aleutian	23	21	659.94	82,655	24,145	141,165
Western Aleutian	201-300	W Western Aleutian	9	1	513.19	48,251	0	159,519
Central Aleutian	1-100	SE Central Aleutian	7	7	329.28	38,330	0	123,942
Western Aleutian	1-100	E Western Aleutian	10	10	292.04	34,558	29	69,087
Central Aleutian	1-100	N Central Aleutian	14	10	286.05	60,231	0	144,603
Central Aleutian	1-100	Petrel Bank	4	3	268.63	25,789	0	107,831
Central Aleutian	101-200	N Central Aleutian	8	7	254.36	27,116	0	79,923
Southern Bering	1-100	E Southern Bering Sea	27	21	243.90	59,519	0	180,965
Western Aleutian	101-200	W Western Aleutian	28	15	177.52	72,165	0	180,009
Eastern Aleutian	101-200	NE Eastern Aleutian	17	11	127.43	25,647	0	56,656
Western Aleutian	1-100	W Western Aleutian	16	4	47.01	17,363	0	52,047
Eastern Aleutian	101-200	SW Eastern Aleutian	9	3	40.70	9,202	0	30,201
Eastern Aleutian	101-200	SE Eastern Aleutian	15	9	18.46	3,507	0	7,253
Central Aleutian	101-200	Petrel Bank	6	4	16.81	2,918	0	10,372
Central Aleutian	1-100	SW Central Aleutian	5	5	15.22	2,462	743	4,181
Eastern Aleutian	1-100	SW Eastern Aleutian	5	4	6.66	1,270	0	3,089
Central Aleutian	301-500	SE Central Aleutian	4	1	2.00	143	0	596
Central Aleutian	201-300	N Central Aleutian	10	6	1.81	79	0	166
Southern Bering	201-300	Combined Southern Bering	7	3	1.73	98	0	277
Western Aleutian	201-300	E Western Aleutian	10	8	1.47	115	0	231
Southern Bering	1-100	W Southern Bering Sea	3	3	1.03	163	0	644
Southern Bering	101-200	W Southern Bering Sea	5	5	1.02	69	0	163
Central Aleutian	201-300	SW Central Aleutian	6	5	1.02	43	0	104
Central Aleutian	201-300	SE Central Aleutian	4	2	0.97	46	0	152
Eastern Aleutian	101-200	NW Eastern Aleutian	6	4	0.86	136	0	304
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	0.79	101	0	206
Southern Bering	101-200	E Southern Bering Sea	11	2	0.30	35	0	101
Eastern Aleutian	201-300	SE Eastern Aleutian	12	4	0.28	58	0	152
Eastern Aleutian	301-500	SE Eastern Aleutian	12	4	0.20	51	0	111
Eastern Aleutian	201-300	NE Eastern Aleutian	22	7	0.18	36	3	69
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	3	0.08	21	0	54
Western Aleutian	301-500	W Western Aleutian	11	1	0.04	8	0	24
Eastern Aleutian	1-100	NW Eastern Aleutian	4	1	0.04	8	0	32

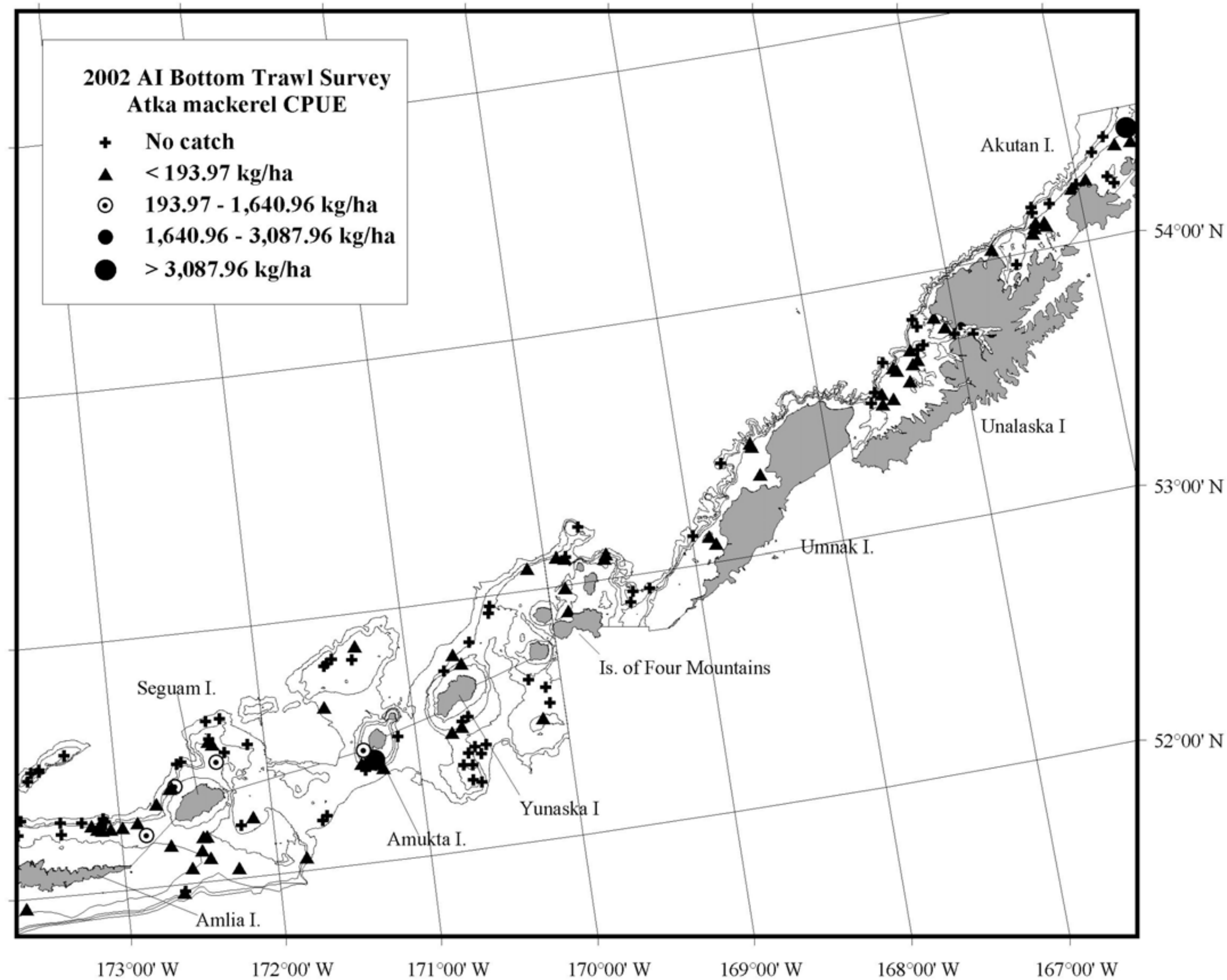
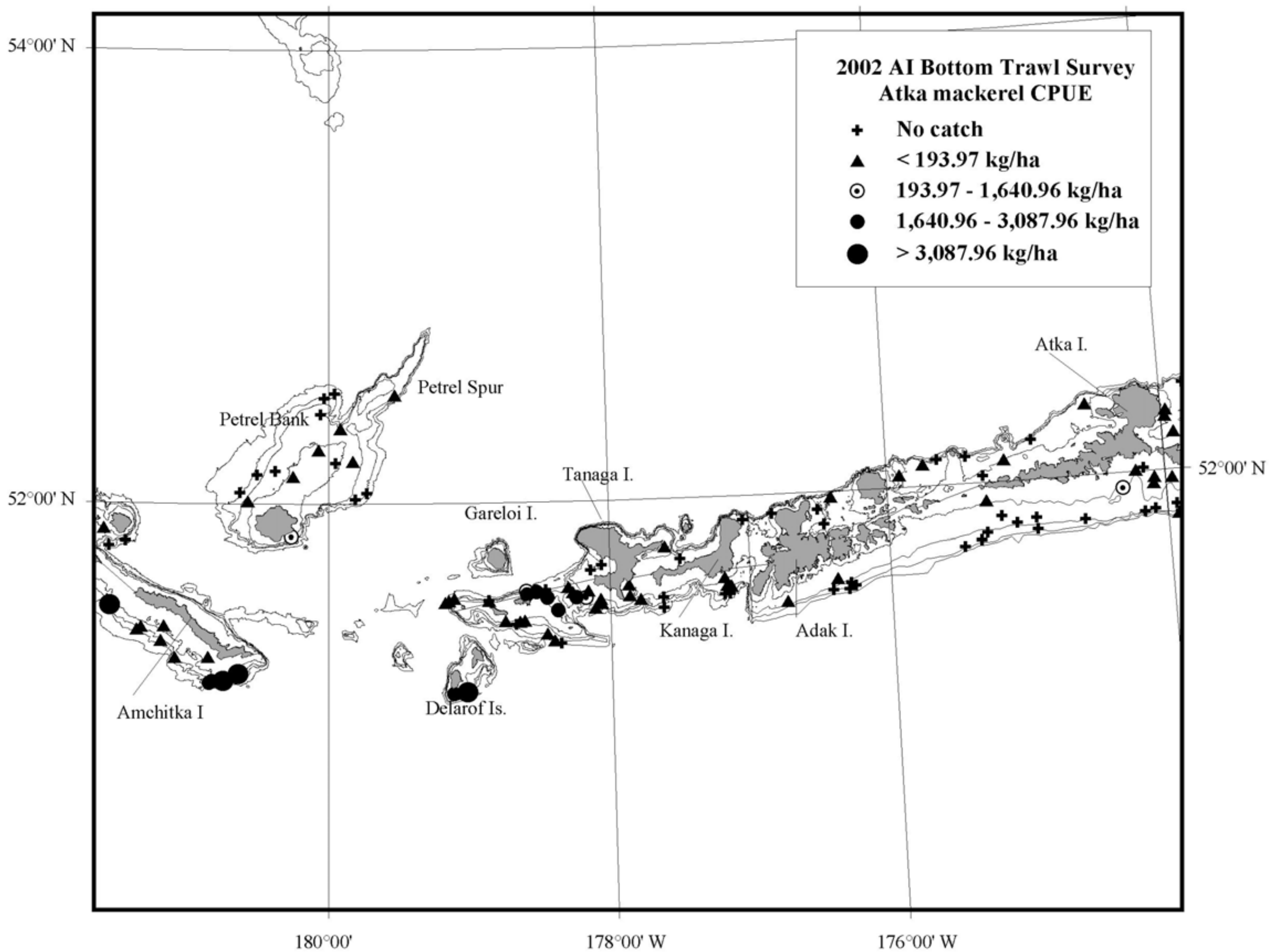


Figure 24.--Distribution and relative abundance of Atka mackerel from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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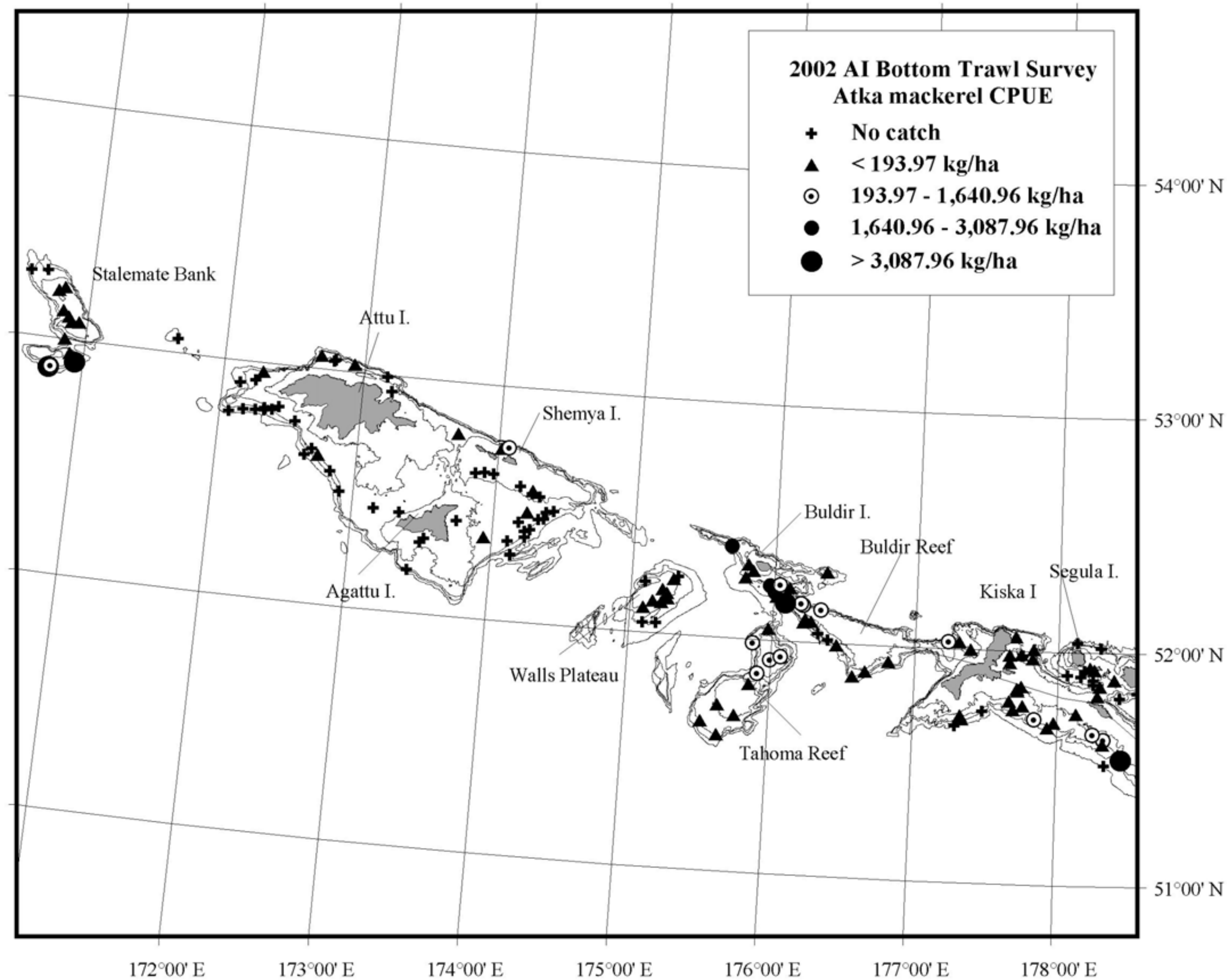


Figure 24.--(Continued).

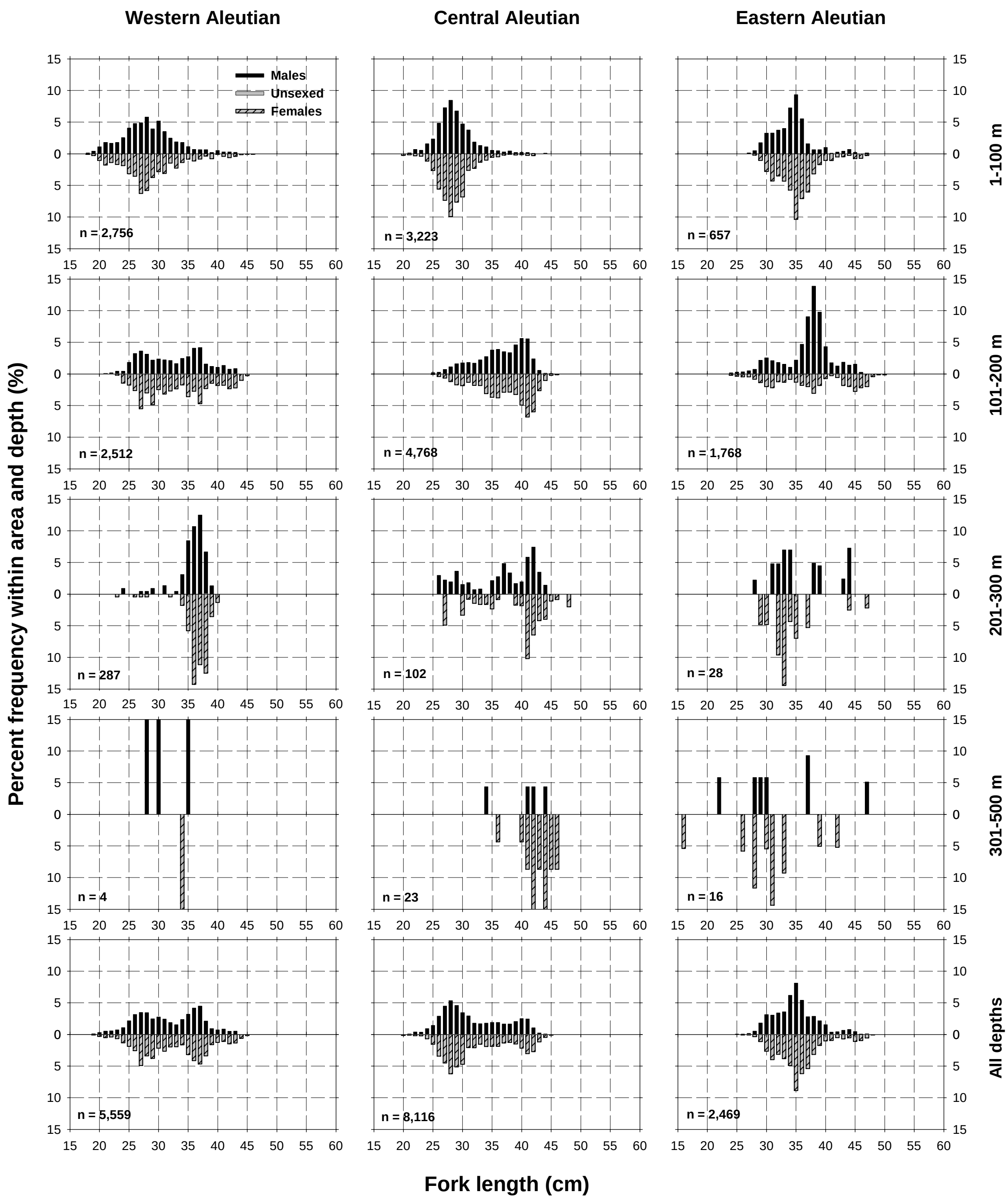


Figure 25.--Size composition of the estimated Atka mackerel population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

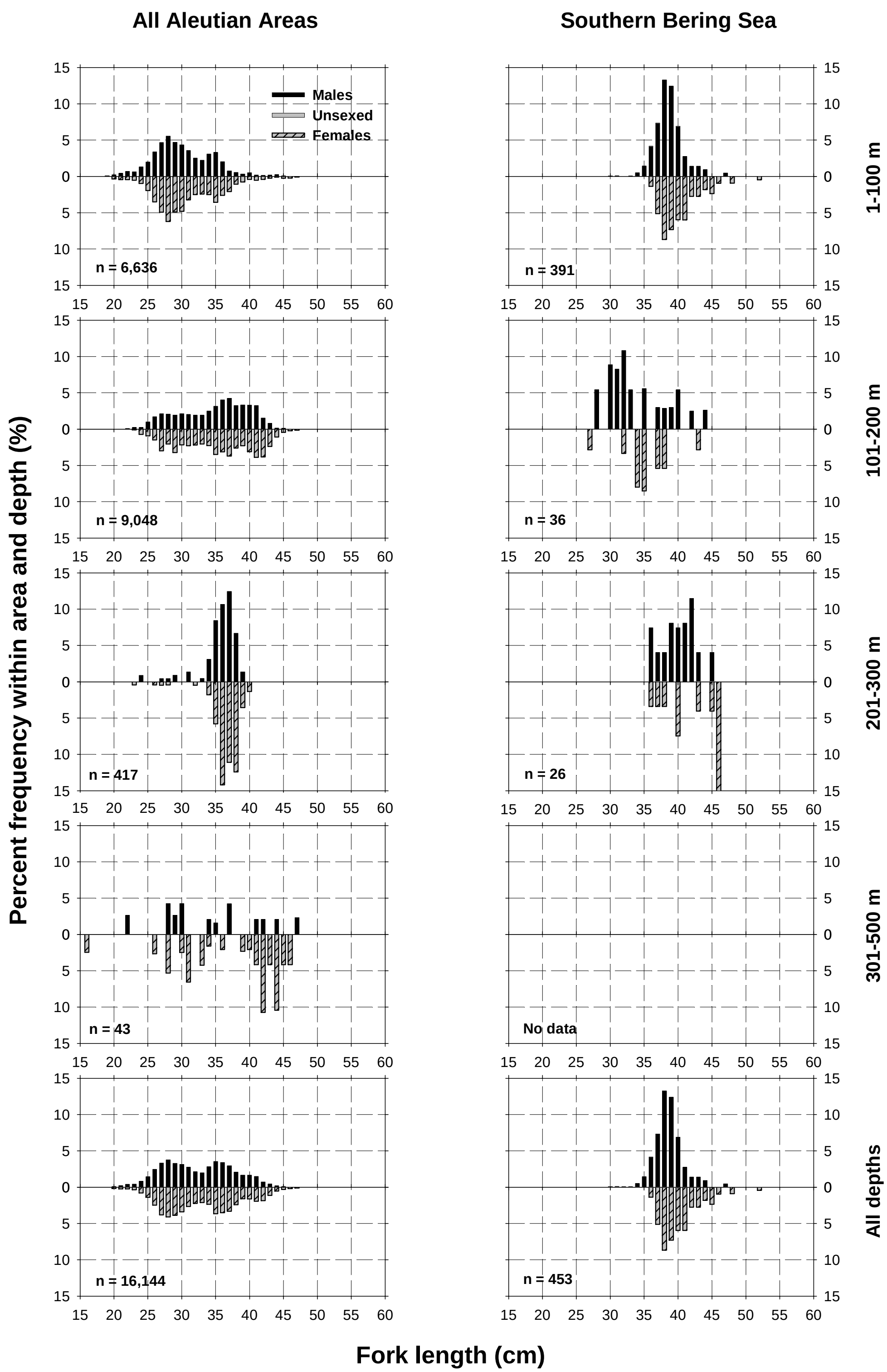


Figure 25.--(Atka mackerel, continued).

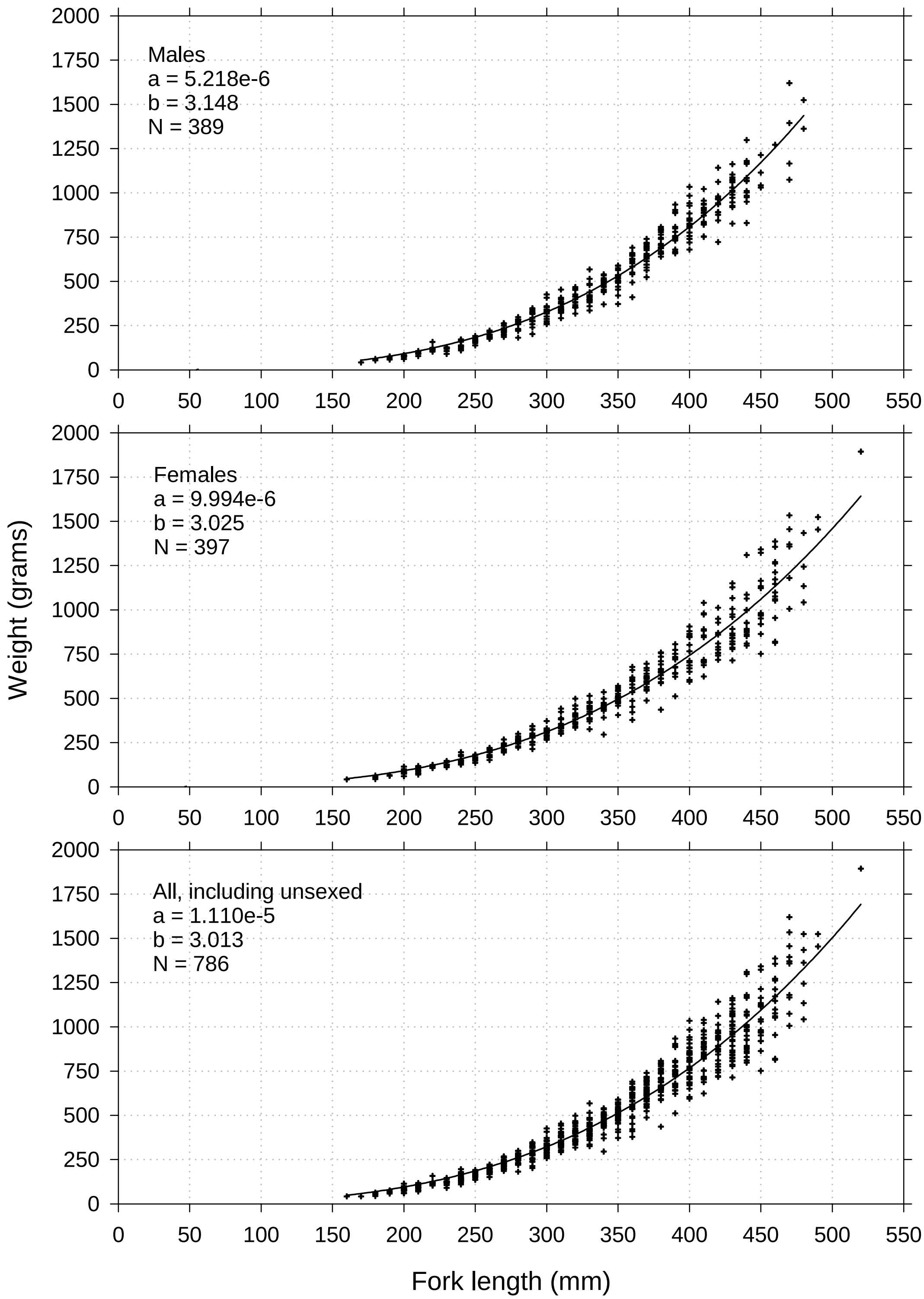


Figure 26.--Length-weight relationship for Atka mackerel specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Pacific cod (*Gadus macrocephalus*)

Pacific cod were more or less evenly distributed throughout the survey area to depths of about 300 m. Cod mean CPUE was highest in the Western and Central Aleutian areas, decreased in the Eastern Aleutian area, and increased in the Southern Bering Sea area (Table 2). Estimated biomass for the entire survey area was 82,853 t. The Aleutian area biomass was quite evenly distributed among the three NPFMC areas with 24,000-25,000 t in each. Although the mean CPUE in the Southern Bering Sea was comparable to the Aleutian areas, the relatively small geographic area only produced an estimated biomass of 9,600 t (Table 23). The 101-200 m depth interval produced 60% of the overall Aleutian biomass. The 1-100 m interval produced 70% of the estimated biomass in the Southern Bering Sea area. Pacific cod was captured in 70% of all successful survey tows conducted shallower than 300 m.

There were no outstandingly large catches of Pacific cod. The highest three CPUEs were observed in the 101-200 m depth interval of all three NPFMC Aleutian regulatory areas (Table 24), specifically on Buldir Reef, south of Amchitka Island, and north of Yunaska Island (Fig. 27). In the three Aleutian areas the smallest individual mean lengths and weights were generally found at the shallower stations. Almost 5,000 cod were measured representing a very broad size range. Lengths ranged from 15 to 115 cm. In the Aleutian areas distinct length frequency modes were found at 18, 37, 48, and 56 cm (Fig. 28), probably corresponding to ages 1^+ through 4^+ years. In the Southern Bering Sea area the 48 cm mode dominated (Fig. 28).

Figure 29 shows length-weight relationships for male, female, and combined sexes of Pacific cod. Judging by the similar coefficients, the male and female regression curves track each other very closely, but there were more of the largest cod represented in the female curve.

Table 23.--Number of survey hauls, number of hauls with Pacific cod, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	13	18.89	9,214	1,938	16,489	2.707	51.3
Aleutian	101-200	51	29	27.09	14,403	5,044	23,763	4.259	64.8
	201-300	19	6	1.07	185	29	341	2.543	59.4
	301-500	13	0	-	-	-	-	-	-
	All depths	109	48	15.67	23,802	12,011	35,592	3.471	58.0
Central	1-100	30	26	21.21	12,400	1,158	23,641	3.659	58.5
Aleutian	101-200	45	40	24.61	11,333	4,777	17,889	3.763	61.0
	201-300	23	14	2.26	477	110	844	2.663	57.1
	301-500	17	0	-	-	-	-	-	-
	All depths	115	80	14.63	24,210	11,337	37,083	3.680	59.6
Eastern	1-100	16	11	6.25	4,281	0	10,921	0.731	38.2
Aleutian	101-200	47	32	23.47	18,231	1,706	34,757	3.207	61.1
	201-300	42	22	5.17	2,535	1,439	3,630	2.631	58.8
	301-500	27	2	0.34	194	0	487	2.515	57.5
	All depths	132	67	10.02	25,241	8,110	42,371	2.007	50.3
All	1-100	72	50	14.74	25,894	12,008	39,780	2.048	47.2
Aleutian	101-200	143	101	24.85	43,968	24,147	63,789	3.640	62.1
Areas	201-300	84	42	3.66	3,196	2,054	4,339	2.631	58.6
	301-500	57	2	0.15	194	0	487	2.515	57.5
	All depths	356	195	12.87	73,252	49,521	96,983	2.816	54.5
Southern	1-100	30	30	16.79	6,758	3,059	10,457	2.223	53.4
Bering Sea	101-200	16	16	7.46	1,380	659	2,100	1.606	49.5
	201-300	7	7	21.95	1,238	56	2,419	2.623	59.8
	301-500	8	4	2.16	226	0	480	3.439	67.7
	All depths	61	57	12.83	9,601	5,707	13,495	2.164	53.5

Table 24.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Pacific cod by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Western Aleutian	101-200	E Western Aleutian	23	14	70.58	8,840	644	17,035
Eastern Aleutian	101-200	NE Eastern Aleutian	17	14	62.92	12,663	0	28,623
Central Aleutian	101-200	SW Central Aleutian	17	17	54.04	5,686	1,084	10,288
Central Aleutian	1-100	N Central Aleutian	14	12	34.89	7,348	0	18,048
Central Aleutian	101-200	N Central Aleutian	8	7	30.65	3,267	0	8,381
Central Aleutian	101-200	SE Central Aleutian	14	14	28.94	2,176	1,111	3,241
Eastern Aleutian	201-300	NW Eastern Aleutian	2	2	27.89	435	0	1,979
Southern Bering	1-100	E Southern Bering Sea	27	27	23.70	5,782	2,080	9,485
Central Aleutian	1-100	SE Central Aleutian	7	7	23.02	2,679	0	6,474
Southern Bering	201-300	Combined Southern Bering	7	7	21.95	1,238	16	2,460
Western Aleutian	1-100	W Western Aleutian	16	9	19.33	7,141	209	14,072
Eastern Aleutian	101-200	SE Eastern Aleutian	15	8	17.86	3,395	0	8,554
Western Aleutian	1-100	E Western Aleutian	10	4	17.52	2,073	0	4,661
Eastern Aleutian	1-100	NW Eastern Aleutian	4	3	13.87	2,680	0	10,123
Western Aleutian	101-200	W Western Aleutian	28	15	13.69	5,563	608	10,519
Central Aleutian	1-100	Petrel Bank	4	3	13.22	1,270	0	4,687
Eastern Aleutian	101-200	NW Eastern Aleutian	6	4	8.43	1,344	0	3,234
Southern Bering	101-200	E Southern Bering Sea	11	11	8.38	988	320	1,657
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	6.96	882	0	2,219
Central Aleutian	1-100	SW Central Aleutian	5	4	6.82	1,104	0	3,121
Eastern Aleutian	201-300	NE Eastern Aleutian	22	12	6.73	1,325	449	2,202
Southern Bering	1-100	W Southern Bering Sea	3	3	6.15	976	392	1,559
Southern Bering	101-200	W Southern Bering Sea	5	5	5.85	391	0	810
Central Aleutian	201-300	SE Central Aleutian	4	4	5.69	272	0	679
Eastern Aleutian	101-200	SW Eastern Aleutian	9	6	3.67	830	37	1,623
Central Aleutian	201-300	N Central Aleutian	10	6	3.27	143	15	271
Eastern Aleutian	1-100	SE Eastern Aleutian	5	3	3.14	546	0	1,847
Eastern Aleutian	201-300	SW Eastern Aleutian	6	3	3.03	217	0	579
Eastern Aleutian	201-300	SE Eastern Aleutian	12	5	2.70	557	0	1,162
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	2.42	106	0	1,452
Southern Bering	301-500	Combined Southern Bering	8	4	2.16	226	0	486
Western Aleutian	201-300	W Western Aleutian	9	5	1.84	173	17	330
Central Aleutian	201-300	SW Central Aleutian	6	4	1.46	62	0	132
Central Aleutian	101-200	Petrel Bank	6	2	1.18	205	0	589
Eastern Aleutian	1-100	SW Eastern Aleutian	5	3	0.90	172	0	573
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	1	0.33	88	0	280
Western Aleutian	201-300	E Western Aleutian	10	1	0.15	12	0	38

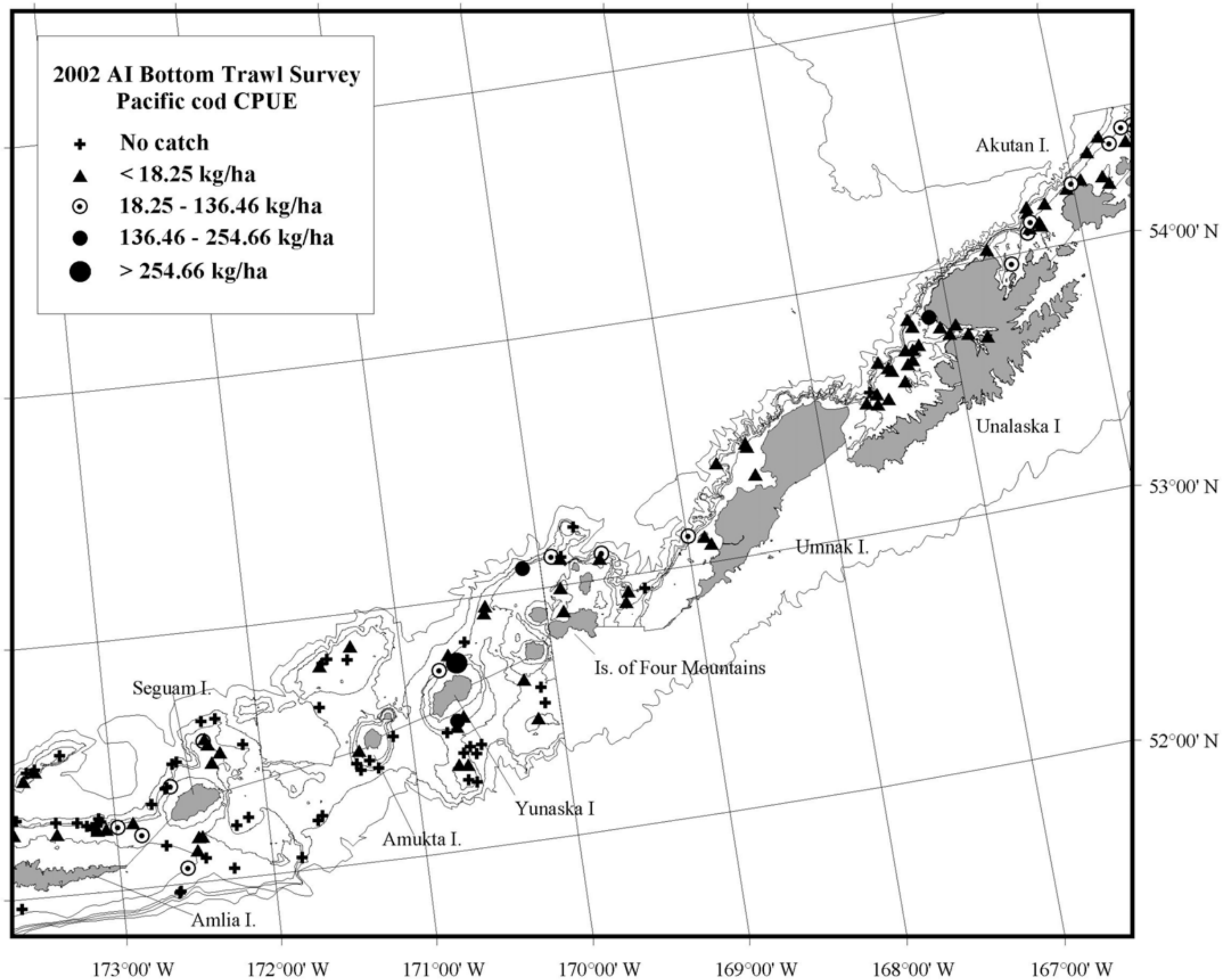


Figure 27.--Distribution and relative abundance of Pacific cod from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.

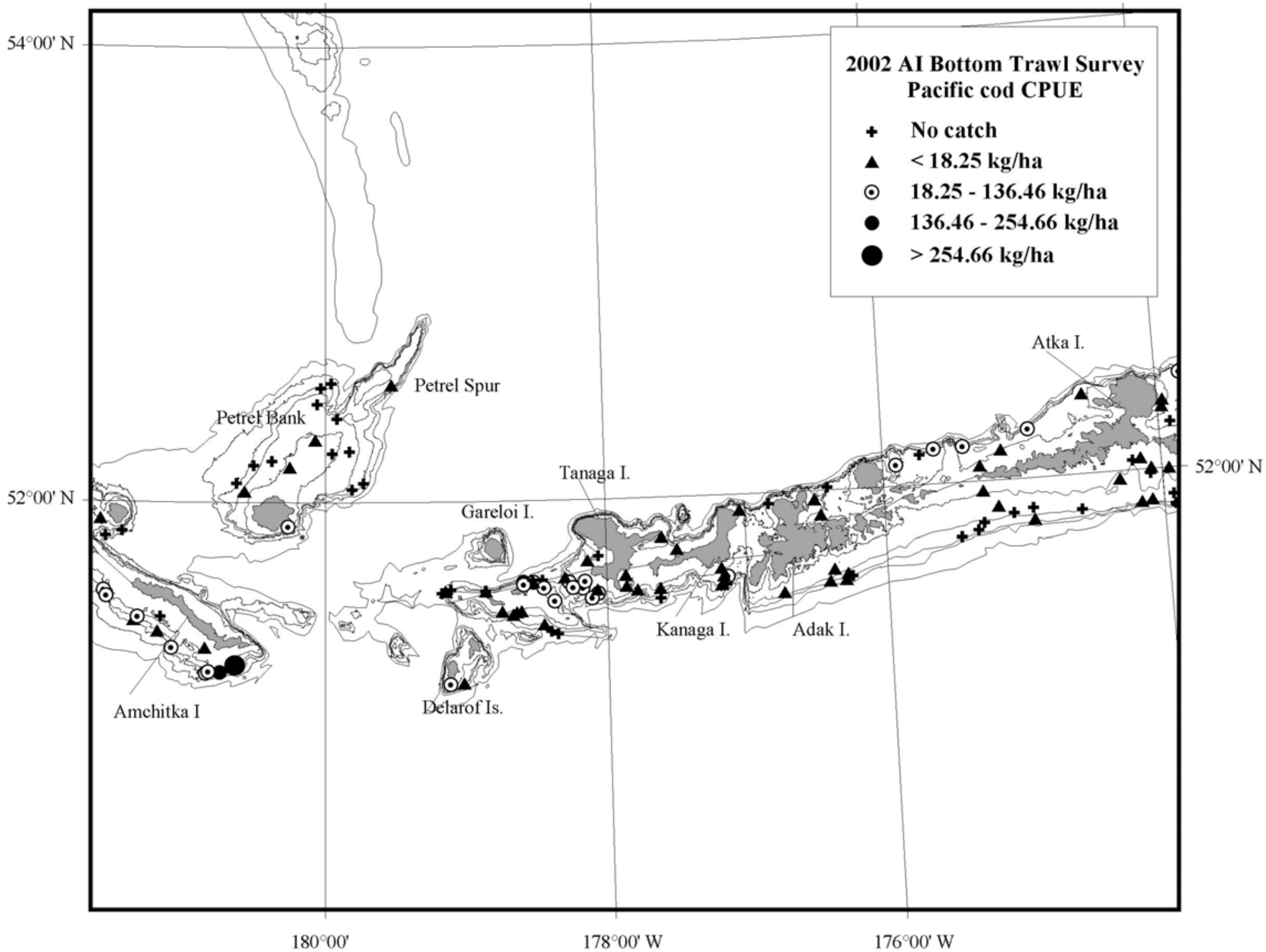


Figure 27.--(Continued).

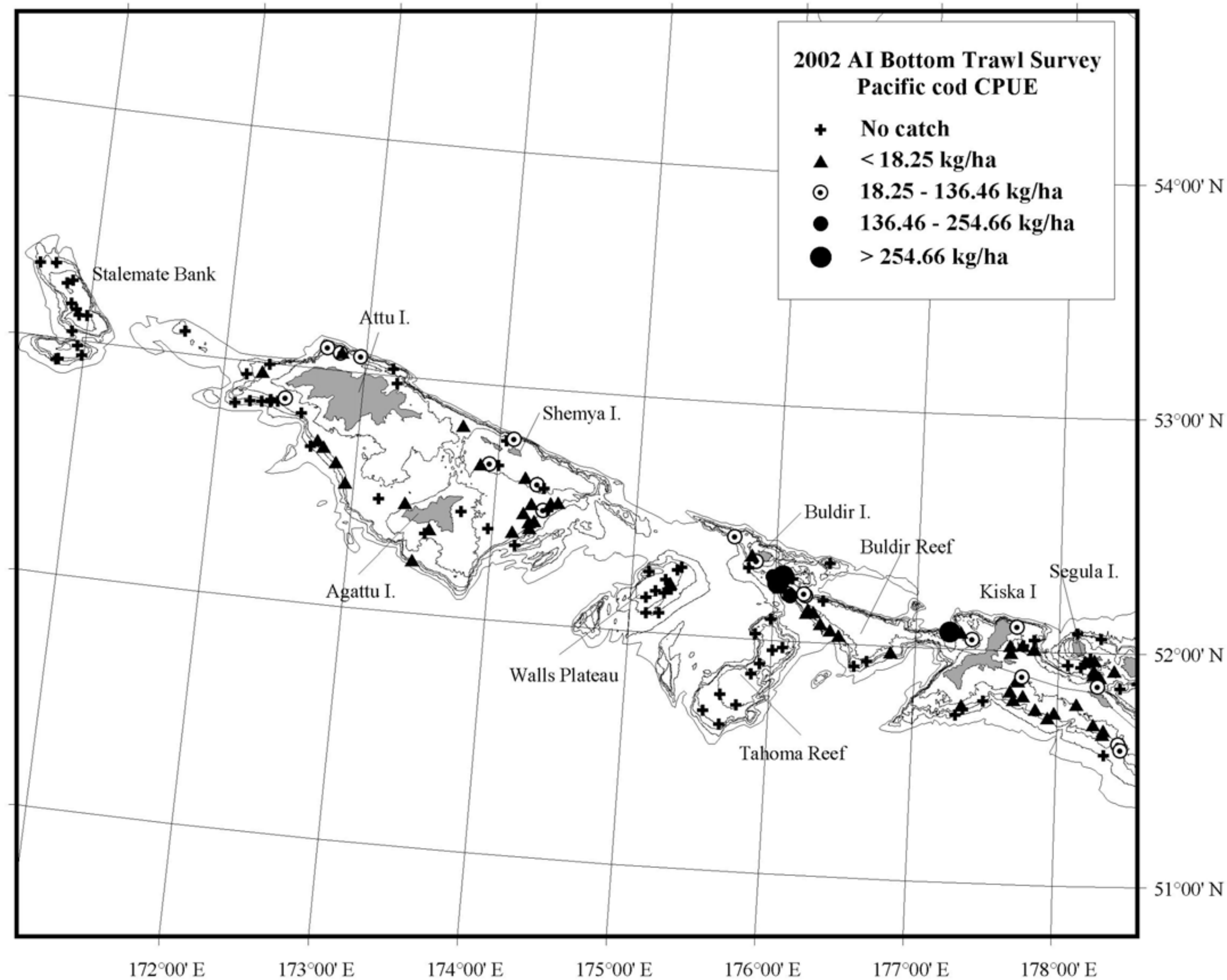


Figure 27.--(Continued).

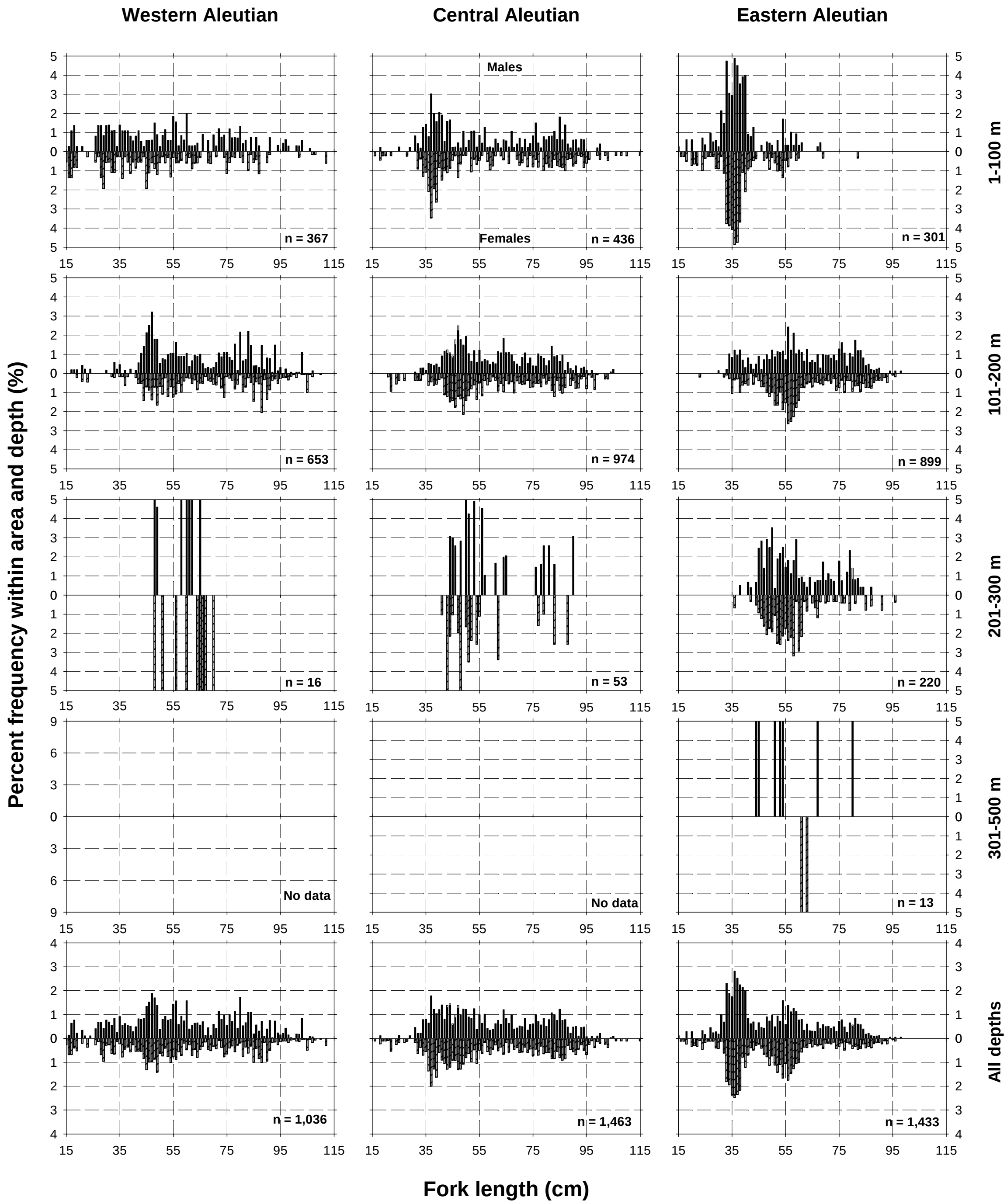


Figure 28.--Size composition of the estimated Pacific cod population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

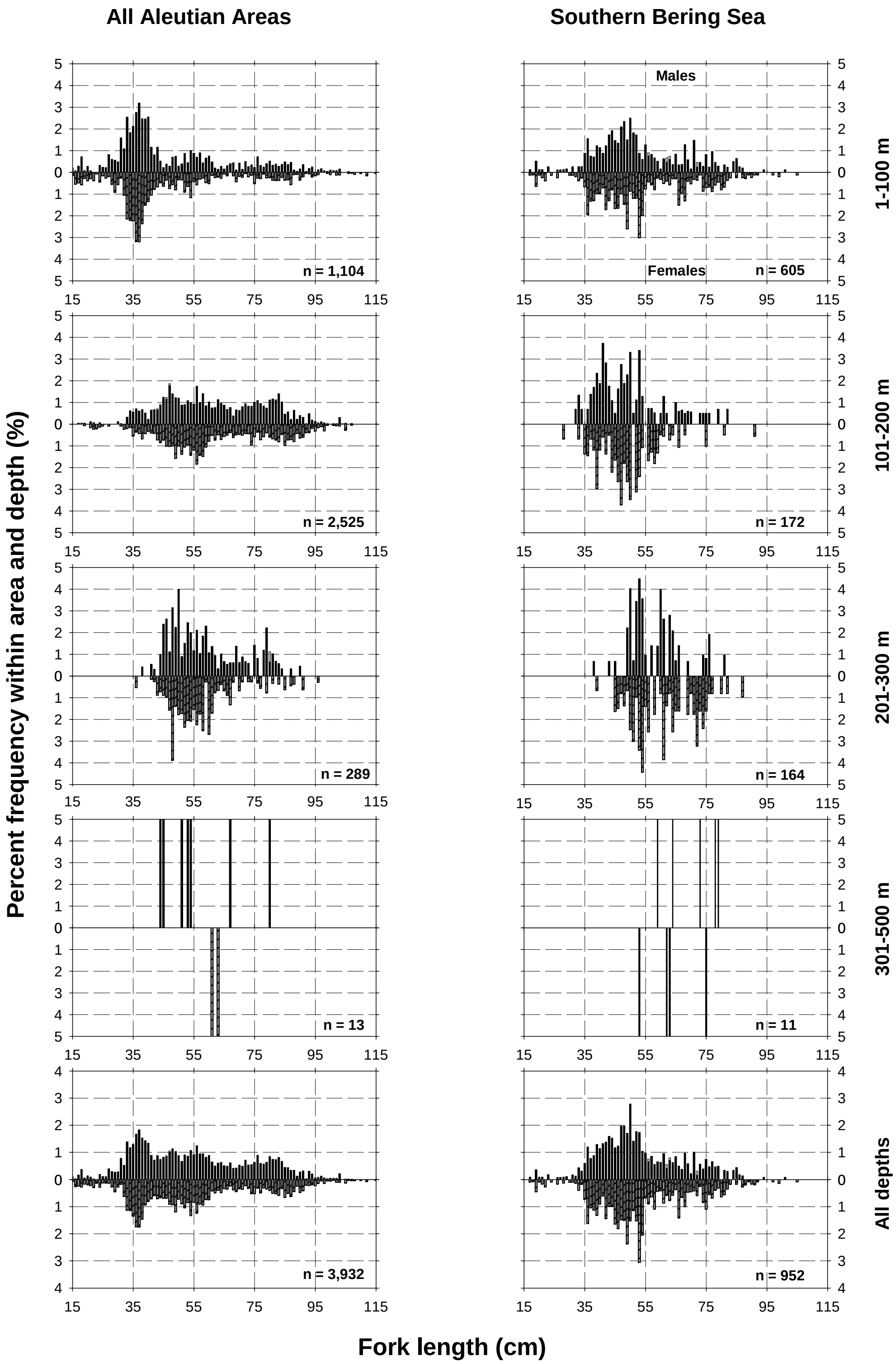


Figure 28.--(Pacific cod, continued).

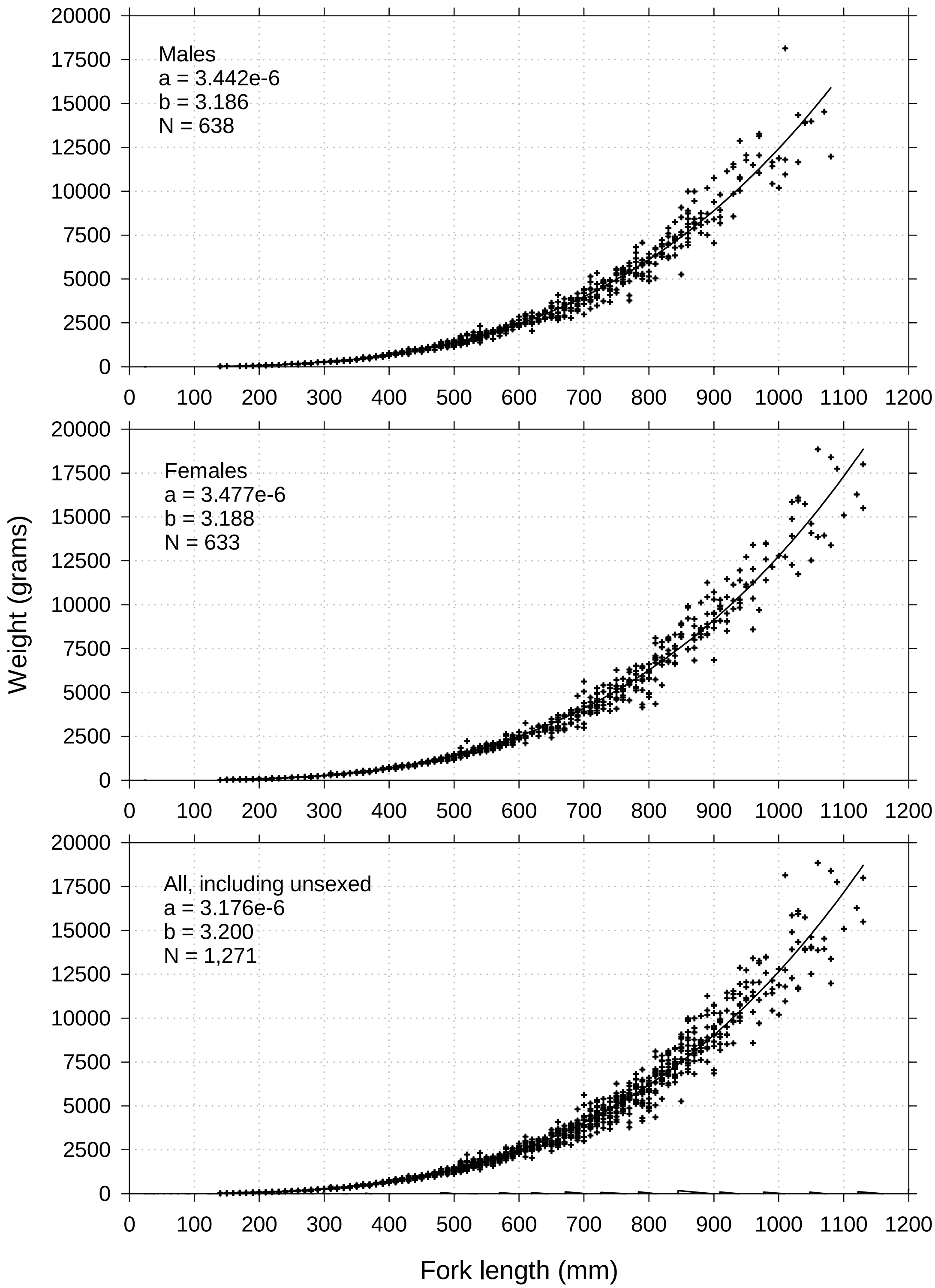


Figure 29.--Length-weight relationship for Pacific cod specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Walleye pollock (*Theragra chalcogramma*)

Walleye pollock mean CPUE was the fifth highest in the combined Aleutian areas and by far the highest in the Southern Bering Sea area (Table 2). Pollock was captured in all areas and depth intervals. Estimated total pollock biomass reached almost 357,000 t and 46% of the total was found in the 1-100 m depth interval in the Southern Bering Sea area (Table 25). Pollock mean CPUE in the Southern Bering Sea area decreased with depth. In the Aleutian areas, mean CPUE was highest in the 201-300 m and 301-500 m depth intervals in the Central Aleutian area, but was less than half of that found in the 1-100 m interval in the Southern Bering Sea area. In the areas where pollock was most abundant, a large proportion of trawl hauls caught that species (Table 25).

The three highest subarea mean CPUEs were in the N Central Aleutian subarea (201-300 m and 301-500 m) and Southern Bering Sea area (1-100 m). Although yielding a higher mean CPUE (Table 26) because it is geographically small in comparison to the 1-100 m depth interval in the Southern Bering Sea area, the 201-300 m depth interval in the N Central Aleutian subarea produced a much smaller estimated biomass. The high mean CPUE in the N Central area resulted from catches that occurred immediately west of Tanaga Island. The high mean CPUE from the Southern Bering Sea area resulted from a group of large catches near Akun and Akutan Islands (Fig. 30). A catch of pollock from a station west of Seguam Island produced the fourth highest subarea mean CPUE.

Pollock from the high abundance depth intervals in the N Central Aleutian area were more than 10 cm longer and more than 0.5 kg heavier on average than pollock from the Southern Bering Sea area (Table 25). Figure 31 shows the difference in the principal modes (fork length) from the Aleutian areas and the Southern Bering Sea area. The female mode at about 60-63 cm likely corresponds to the same cohort as a male mode at about 57-59 cm in the Aleutian areas, as do similar modes of females at about 47-48 cm and males at 45-47 cm in the Southern Bering Sea area. In the entire survey area juvenile and subadult pollock (< 40 cm) were not abundant. Figure 32 illustrates the length-weight relationships for male, female, and combined sexes of walleye pollock.

Table 25.--Number of survey hauls, number of hauls with walleye pollock, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	5	0.83	404	0	1,149	1.373	50.9
Aleutian	101-200	51	30	4.57	2,429	0	5,056	0.803	41.3
	201-300	19	17	55.38	9,546	0	21,663	1.178	53.8
	301-500	13	2	0.19	62	0	269	1.355	56.4
	All depths	109	54	8.19	12,442	288	24,596	1.085	50.4
Central	1-100	30	10	1.16	677	0	1,939	0.349	35.8
Aleutian	101-200	45	34	38.40	17,684	0	35,504	1.244	54.3
	201-300	23	23	174.32	36,761	0	79,614	1.472	57.9
	301-500	17	9	133.36	53,086	0	169,747	1.786	61.3
	All depths	115	76	65.41	108,208	0	232,120	1.527	58.0
Eastern	1-100	16	9	2.27	1,558	0	7,160	0.417	34.5
Aleutian	101-200	47	26	50.20	38,995	0	119,548	1.411	56.6
	201-300	42	26	22.14	10,850	1,065	20,635	1.434	57.0
	301-500	27	18	5.69	3,232	639	5,824	1.427	56.5
	All depths	132	79	21.68	54,634	0	135,542	1.326	54.7
All	1-100	72	24	1.50	2,638	0	7,321	0.442	35.7
Aleutian	101-200	143	90	33.41	59,108	0	141,053	1.317	54.9
Areas	201-300	84	66	65.44	57,157	14,530	99,785	1.406	56.9
	301-500	57	29	43.58	56,380	0	173,077	1.760	60.9
	All depths	356	209	30.79	175,283	35,077	315,489	1.419	56.2
Southern	1-100	30	28	404.59	162,882	51,885	273,879	0.835	48.2
Bering Sea	101-200	16	16	79.18	14,637	6,363	22,911	0.897	47.8
	201-300	7	6	42.70	2,408	0	5,313	1.413	57.0
	301-500	8	7	13.50	1,408	85	2,731	1.125	52.6
	All depths	61	57	242.38	181,334	70,035	292,634	0.846	48.2

Table 26.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of walleye pollock by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	201-300	N Central Aleutian	10	10	728.65	31,988	0	75,780
Southern Bering	1-100	E Southern Bering Sea	27	25	660.63	161,211	50,011	272,411
Central Aleutian	301-500	N Central Aleutian	8	6	426.97	52,934	0	172,579
Eastern Aleutian	101-200	NE Eastern Aleutian	17	11	191.32	38,505	0	119,438
Southern Bering	101-200	E Southern Bering Sea	11	11	121.98	14,384	6,021	22,746
Western Aleutian	201-300	E Western Aleutian	10	9	84.25	6,600	0	18,668
Central Aleutian	101-200	SW Central Aleutian	17	15	71.42	7,515	0	16,170
Eastern Aleutian	201-300	NE Eastern Aleutian	22	12	49.25	9,696	0	19,457
Central Aleutian	201-300	SW Central Aleutian	6	6	42.74	1,821	0	3,715
Southern Bering	201-300	Combined Southern Bering	7	6	42.70	2,408	0	5,414
Central Aleutian	201-300	Petrel Bank	3	3	36.83	2,823	0	11,130
Central Aleutian	101-200	Petrel Bank	6	5	35.80	6,213	0	20,706
Central Aleutian	101-200	N Central Aleutian	8	6	35.79	3,816	0	12,541
Western Aleutian	201-300	W Western Aleutian	9	8	31.34	2,946	0	7,225
Eastern Aleutian	201-300	NW Eastern Aleutian	2	2	27.75	433	0	4,258
Southern Bering	301-500	Combined Southern Bering	8	7	13.50	1,408	51	2,765
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	11.80	1,496	0	18,035
Western Aleutian	101-200	E Western Aleutian	23	13	11.34	1,420	0	3,913
Southern Bering	1-100	W Southern Bering Sea	3	3	10.54	1,671	0	5,246
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	7	6.36	1,698	0	4,046
Eastern Aleutian	201-300	SW Eastern Aleutian	6	4	6.23	446	0	1,333
Eastern Aleutian	301-500	SE Eastern Aleutian	12	9	5.22	1,344	0	2,718
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	4.33	190	0	874
Southern Bering	101-200	W Southern Bering Sea	5	5	3.79	254	0	850
Central Aleutian	1-100	N Central Aleutian	14	6	2.83	596	0	1,858
Central Aleutian	201-300	SE Central Aleutian	4	4	2.70	129	0	328
Western Aleutian	101-200	W Western Aleutian	28	17	2.48	1,009	0	2,023
Central Aleutian	101-200	SE Central Aleutian	14	8	1.86	140	0	350
Eastern Aleutian	101-200	SE Eastern Aleutian	15	7	1.85	351	0	876
Eastern Aleutian	201-300	SE Eastern Aleutian	12	8	1.34	275	0	616
Western Aleutian	1-100	W Western Aleutian	16	4	1.08	399	0	1,147
Central Aleutian	301-500	Petrel Bank	3	1	1.04	129	0	685
Central Aleutian	1-100	SE Central Aleutian	7	2	0.64	75	0	256
Eastern Aleutian	101-200	NW Eastern Aleutian	6	3	0.49	79	0	222
Central Aleutian	301-500	SE Central Aleutian	4	2	0.33	24	0	85
Western Aleutian	301-500	E Western Aleutian	2	1	0.29	45	0	613
Eastern Aleutian	1-100	SW Eastern Aleutian	5	4	0.28	53	0	145
Eastern Aleutian	101-200	SW Eastern Aleutian	9	5	0.27	60	0	160
Western Aleutian	301-500	W Western Aleutian	11	1	0.10	18	0	57
Central Aleutian	1-100	Petrel Bank	4	1	0.05	5	0	20
Western Aleutian	1-100	E Western Aleutian	10	1	0.05	6	0	19

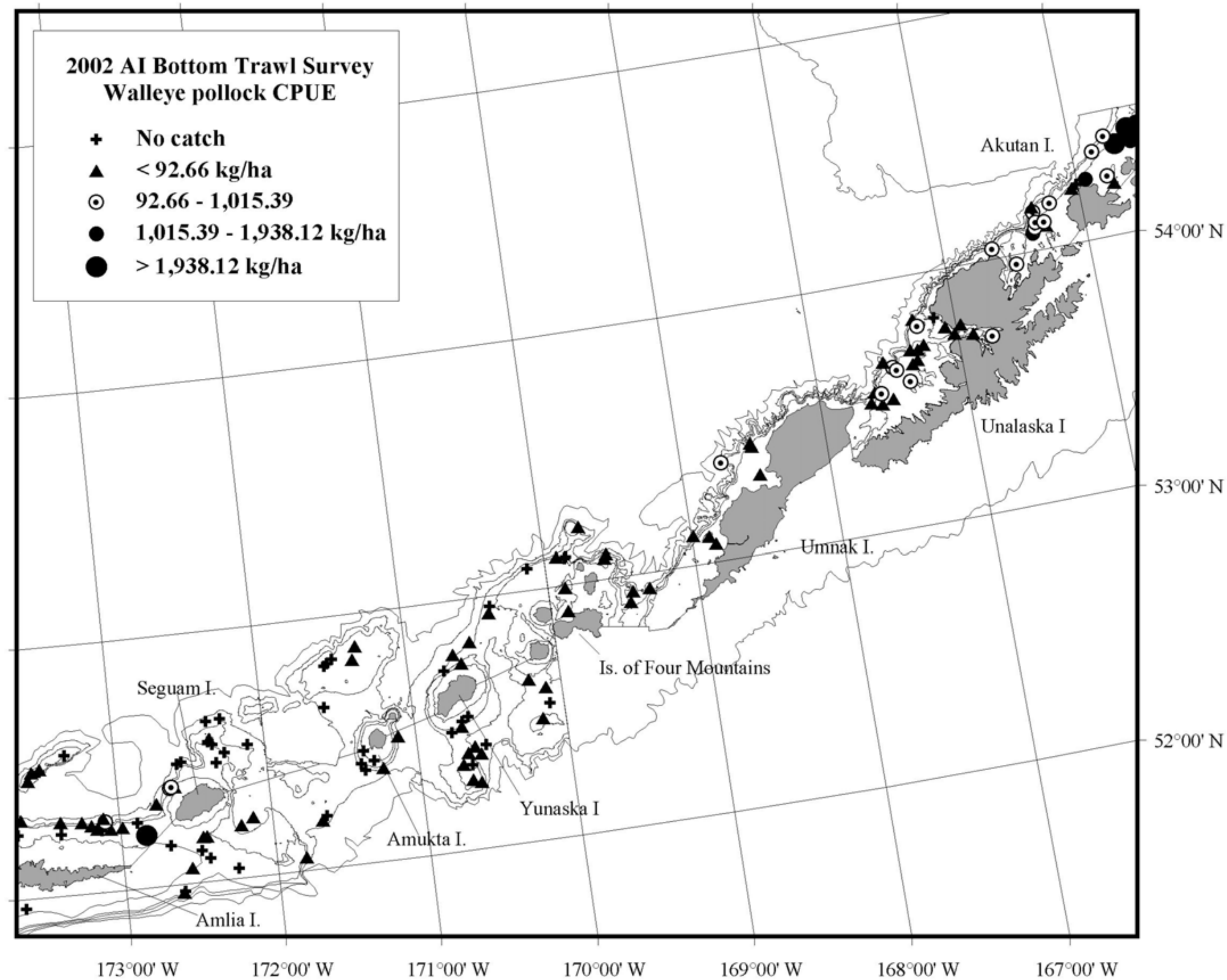
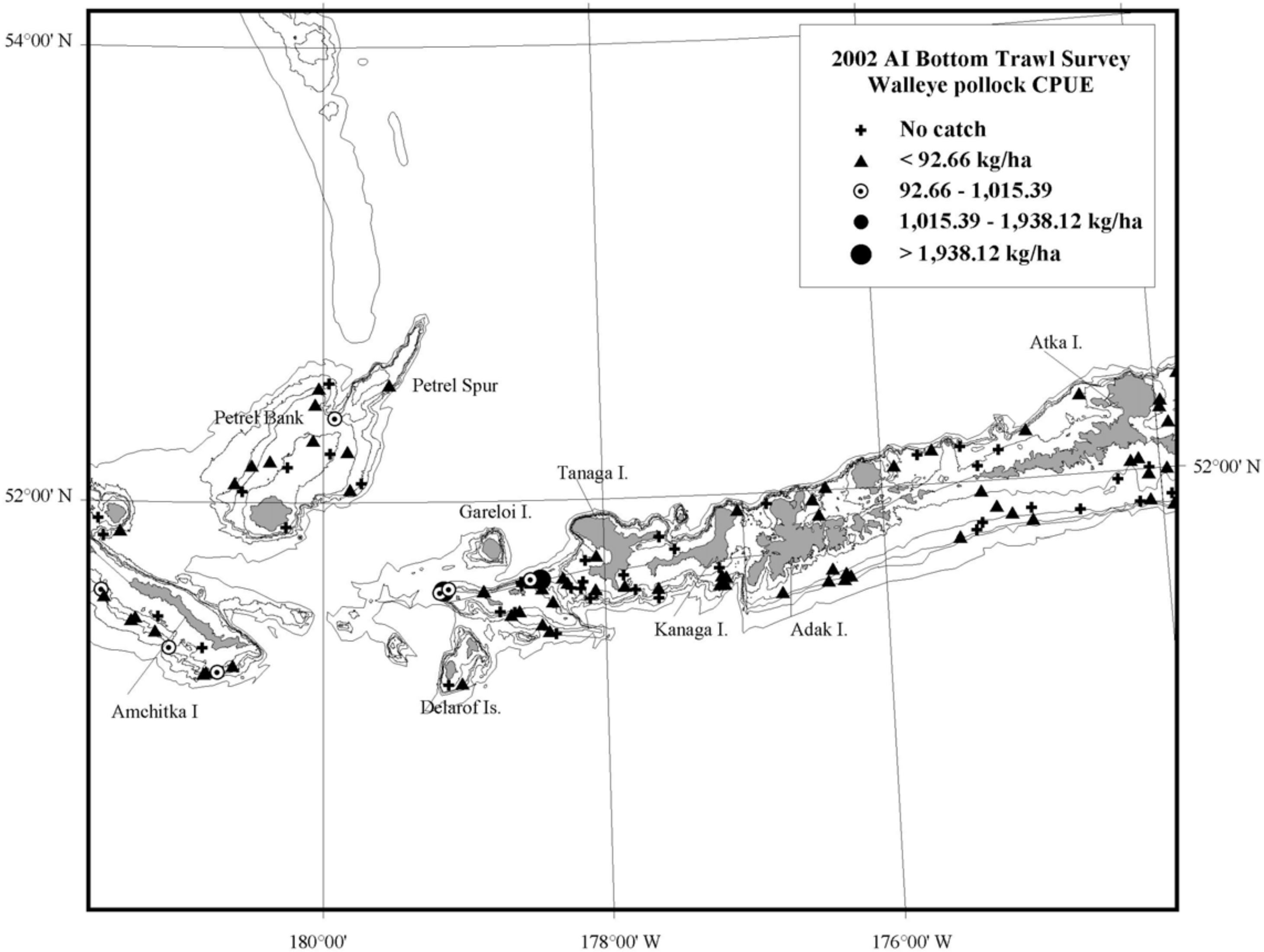


Figure 30.--Distribution and relative abundance of walleye pollock from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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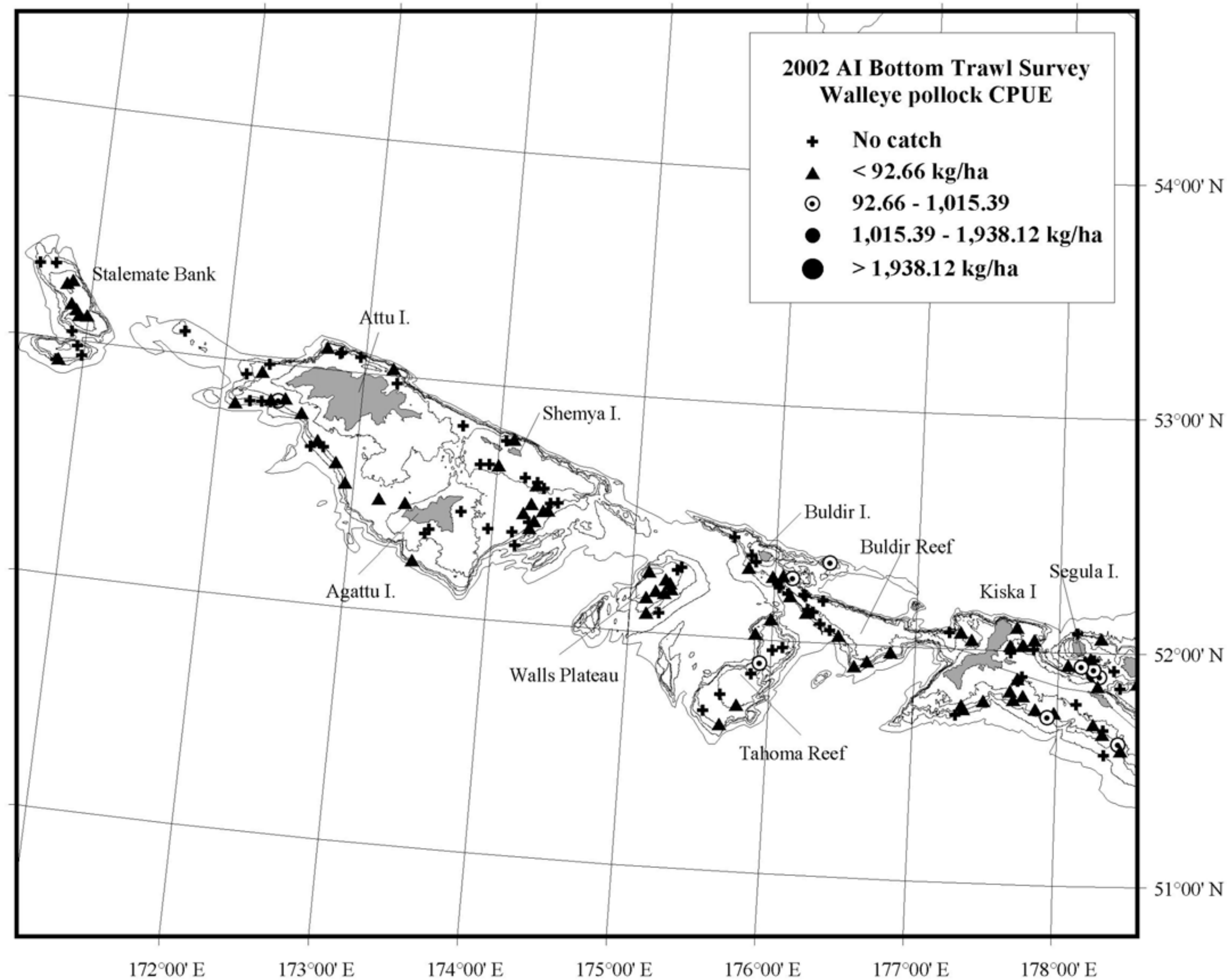

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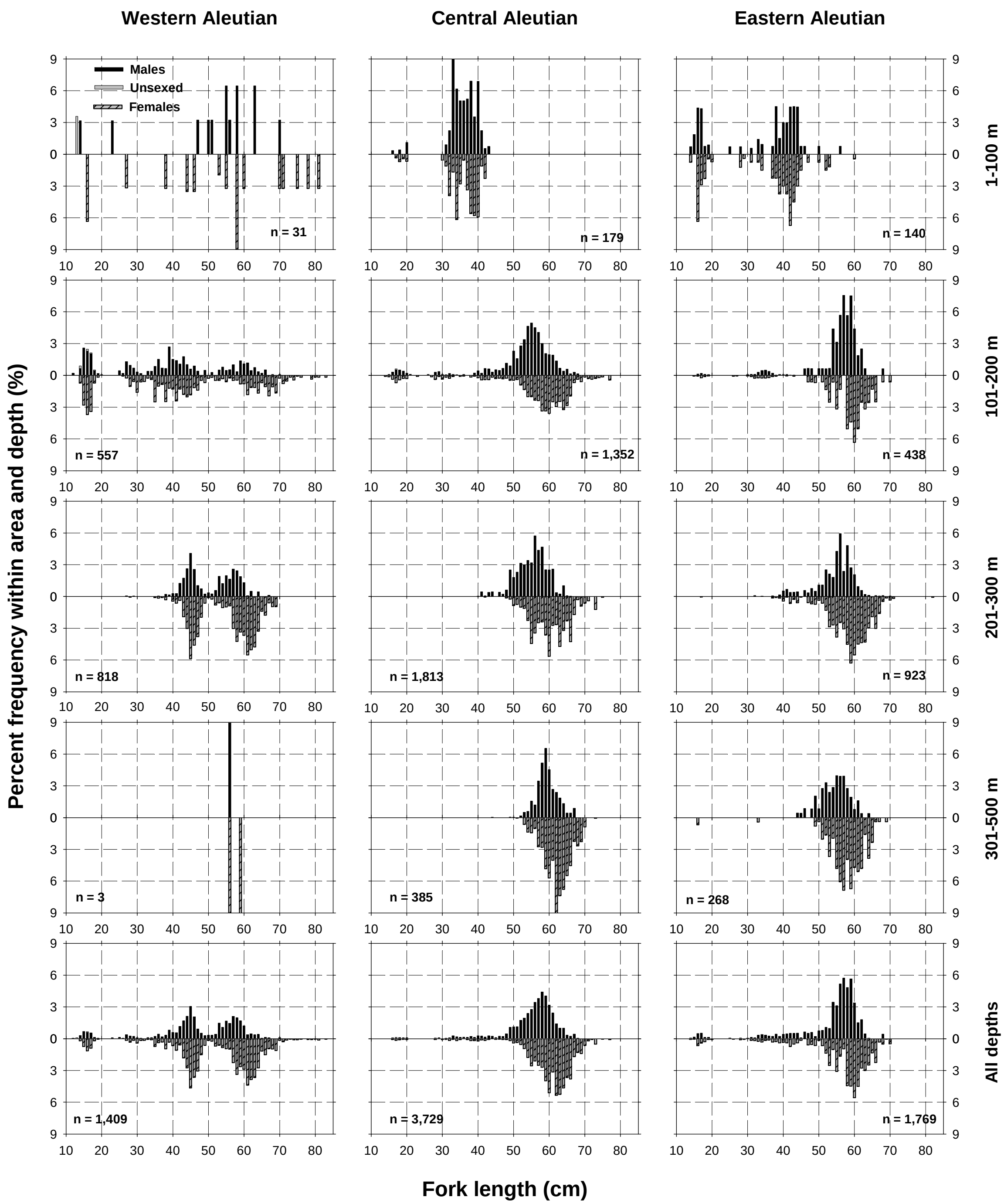


Figure 31.--Size composition of the estimated walleye pollock population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

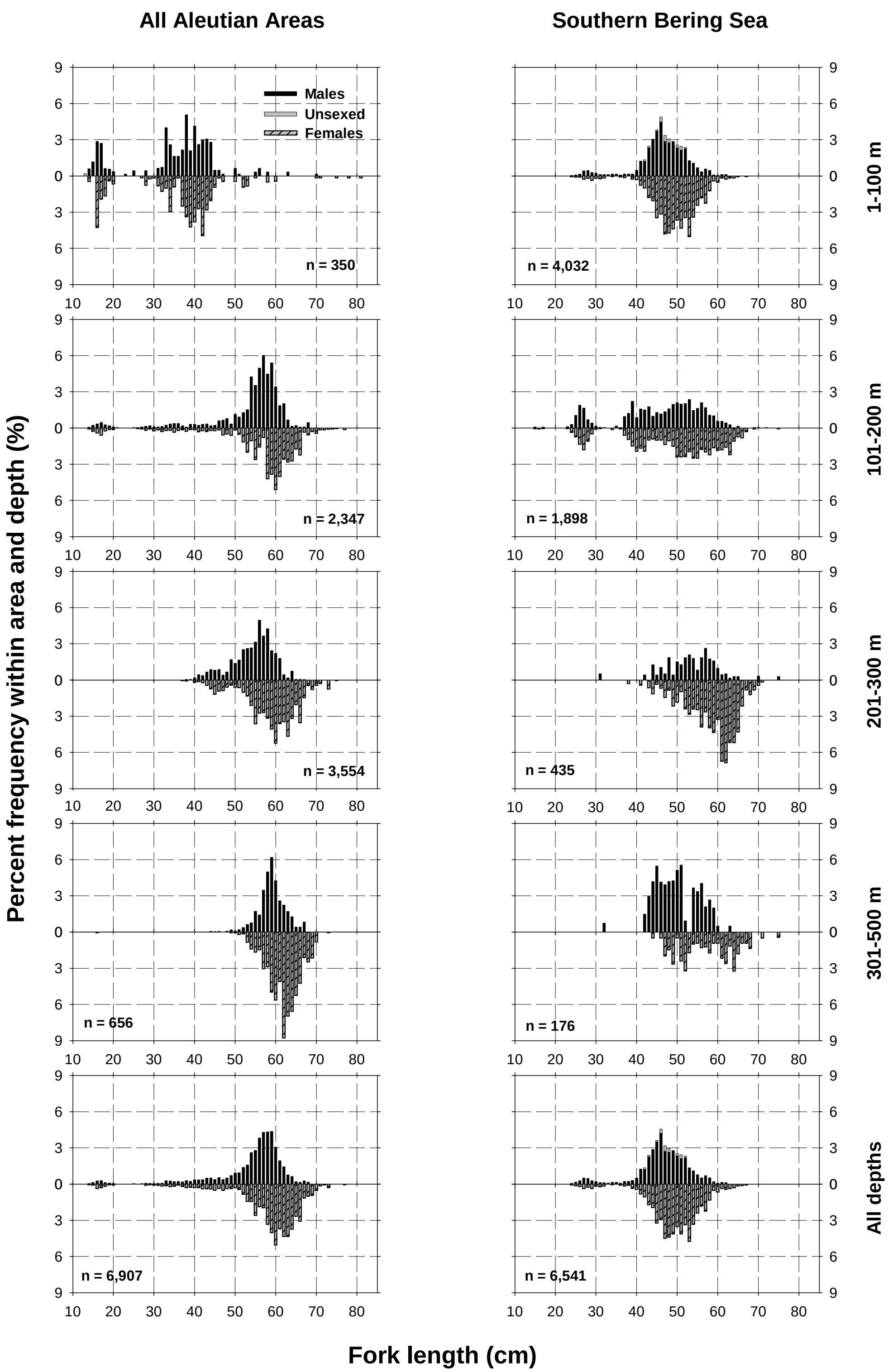


Figure 31.--(Walleye pollock, continued).

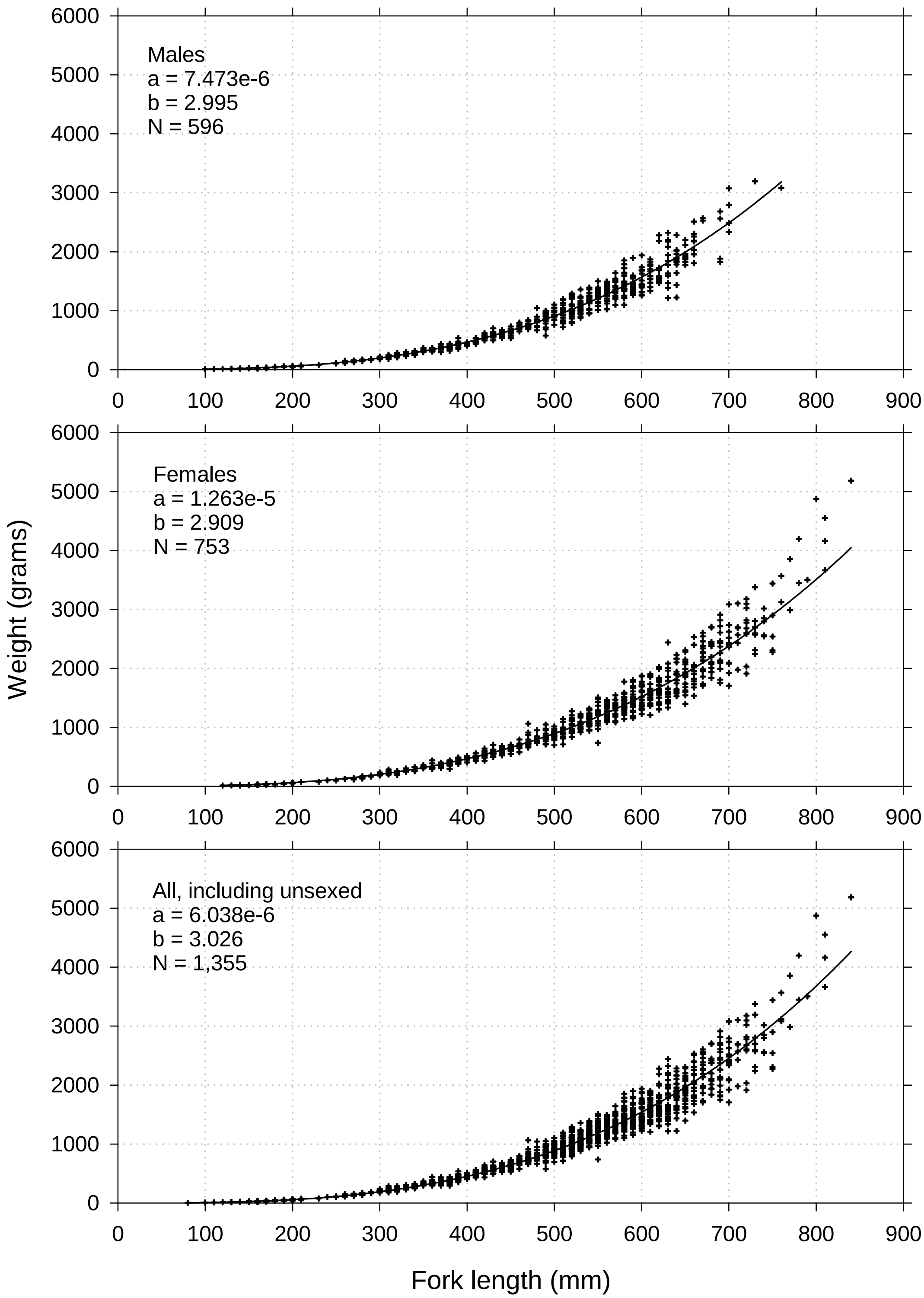


Figure 32.--Length-weight relationship for walleye pollock specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}{}^{b}$.

Sablefish (*Anoplopoma fimbria*)

Sablefish habitat customarily extends deeper than is sampled by this survey. Mean CPUE was highest in the Central Aleutian area (Table 2). Throughout the entire survey area, mean CPUE was always highest in the 301-500 m depth interval. Mean individual weight and length increased with increasing depth (Table 27). The total biomass estimate of 6,500 t is undoubtedly an underestimate of true biomass. The two highest mean CPUEs were reported for the N Central Aleutian subarea in the 301-500 m and 201-300 m depth intervals (Table 28). The largest individual catch rates were reported in the two strata mentioned above, specifically south of Gareloi Island, and on the continental shelf west of Attu Island (Fig. 33). Figure 34 summarizes sablefish size composition data. Generally sablefish captured during the survey were in the middle of their normal adult size range. No length-weight data were collected for sablefish.

Giant grenadier (*Albatrossia pectoralis*)

Catches of giant grenadier were restricted to the 301-500 m depth interval, primarily in the Eastern Aleutian area (Tables 29 and 30). The high mean CPUE in that area resulted from three large catches north of Seguam Island (Fig. 35). While those few large catches contributed unusually heavy influence, giant grenadier abundance is probably very high along the Aleutian Archipelago. The survey does not sample deeper waters adequately to measure grenadier abundance, nor does it capture a significant number of male grenadiers (Fig. 36). This species was found to be most abundant in the 501-900 m depth range during the 1980 U.S.- Japan cooperative trawl survey (Ronholt et al. 1986). Ronholt also reported that the larger grenadiers were found in the 301-500 m depth interval and the smaller sizes were found in the 501-900 m interval. Coincidentally, the mean vent length of males was 21.1 cm and the mean vent length of females was 26.6 cm. (The vent length measurement is the distance from anterior tip of the head to the origin of the anal fin). Thus, it might be expected that males are more likely to be found in depths outside the survey range.

Table 27.--Number of survey hauls, number of hauls with sablefish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	0	-	-	-	-	-	-
	301-500	13	4	2.72	891	0	2,430	5.100	75.8
	All depths	109	4	0.59	891	0	2,430	5.100	75.8
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	2	0.12	56	0	145	-	-
	201-300	23	8	2.50	526	52	1,000	2.420	60.8
	301-500	17	6	8.01	3,189	0	9,493	2.563	62.0
	All depths	115	16	2.28	3,771	0	10,096	2.541	61.8
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	1	0.04	34	0	106	-	-
	201-300	42	9	0.29	141	27	254	2.171	59.2
	301-500	27	16	2.14	1,214	273	2,156	2.531	64.5
	All depths	132	26	0.55	1,389	438	2,340	2.515	64.0
All	1-100	72	0	-	-	-	-	-	-
Aleutian	101-200	143	3	0.05	90	0	201	-	-
Areas	201-300	84	17	0.76	667	209	1,125	2.363	60.5
	301-500	57	26	4.09	5,294	0	11,589	2.789	63.9
	All depths	356	46	1.06	6,051	0	12,366	2.737	63.5
Southern	1-100	30	2	0.02	7	0	16	-	-
Bering Sea	101-200	16	6	0.28	52	9	96	0.586	40.6
	201-300	7	2	0.65	36	0	95	2.744	63.5
	301-500	8	4	3.30	344	0	899	4.366	70.2
	All depths	61	14	0.59	440	0	999	2.269	54.1

Table 28.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of sablefish by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	301-500	N Central Aleutian	8	3	24.81	3,076	0	9,540
Central Aleutian	201-300	N Central Aleutian	10	6	11.26	494	10	979
Western Aleutian	301-500	W Western Aleutian	11	3	4.25	728	0	2,273
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	10	3.37	899	0	1,818
Southern Bering	301-500	Combined Southern Bering	8	4	3.30	344	0	913
Central Aleutian	301-500	SE Central Aleutian	4	3	1.58	113	0	285
Eastern Aleutian	301-500	SE Eastern Aleutian	12	5	1.14	293	0	595
Western Aleutian	301-500	E Western Aleutian	2	1	1.05	163	0	2,236
Central Aleutian	101-200	SE Central Aleutian	14	2	0.75	56	0	145
Central Aleutian	201-300	SE Central Aleutian	4	2	0.67	32	0	104
Southern Bering	201-300	Combined Southern Bering	7	2	0.65	36	0	97
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	0.51	23	0	309
Southern Bering	101-200	E Southern Bering Sea	11	6	0.44	52	8	96
Eastern Aleutian	201-300	NE Eastern Aleutian	22	5	0.34	66	0	136
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	0.27	20	0	53
Eastern Aleutian	201-300	SE Eastern Aleutian	12	2	0.27	55	0	145
Eastern Aleutian	101-200	NE Eastern Aleutian	17	1	0.17	34	0	106
Southern Bering	1-100	E Southern Bering Sea	27	2	0.03	7	0	17

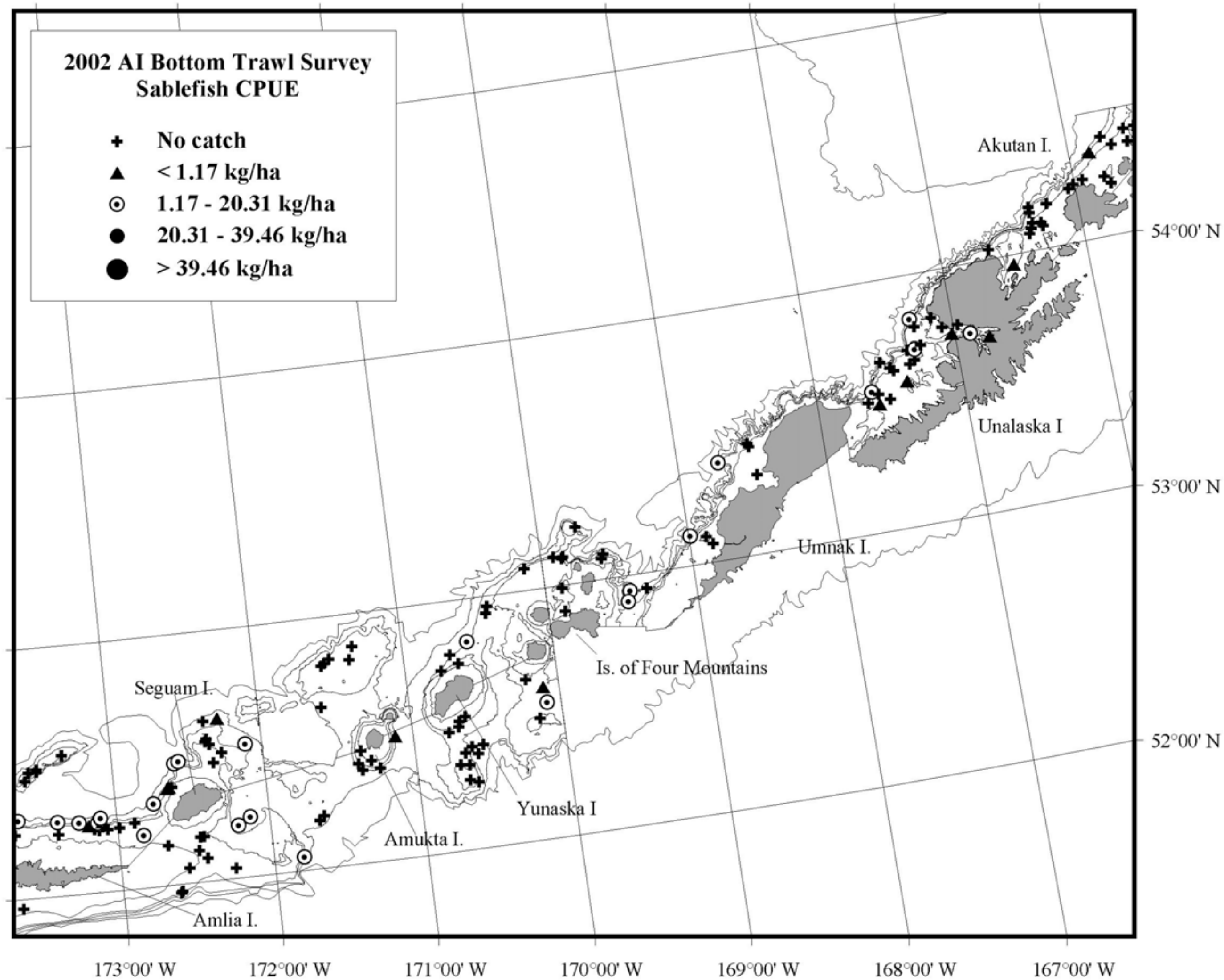
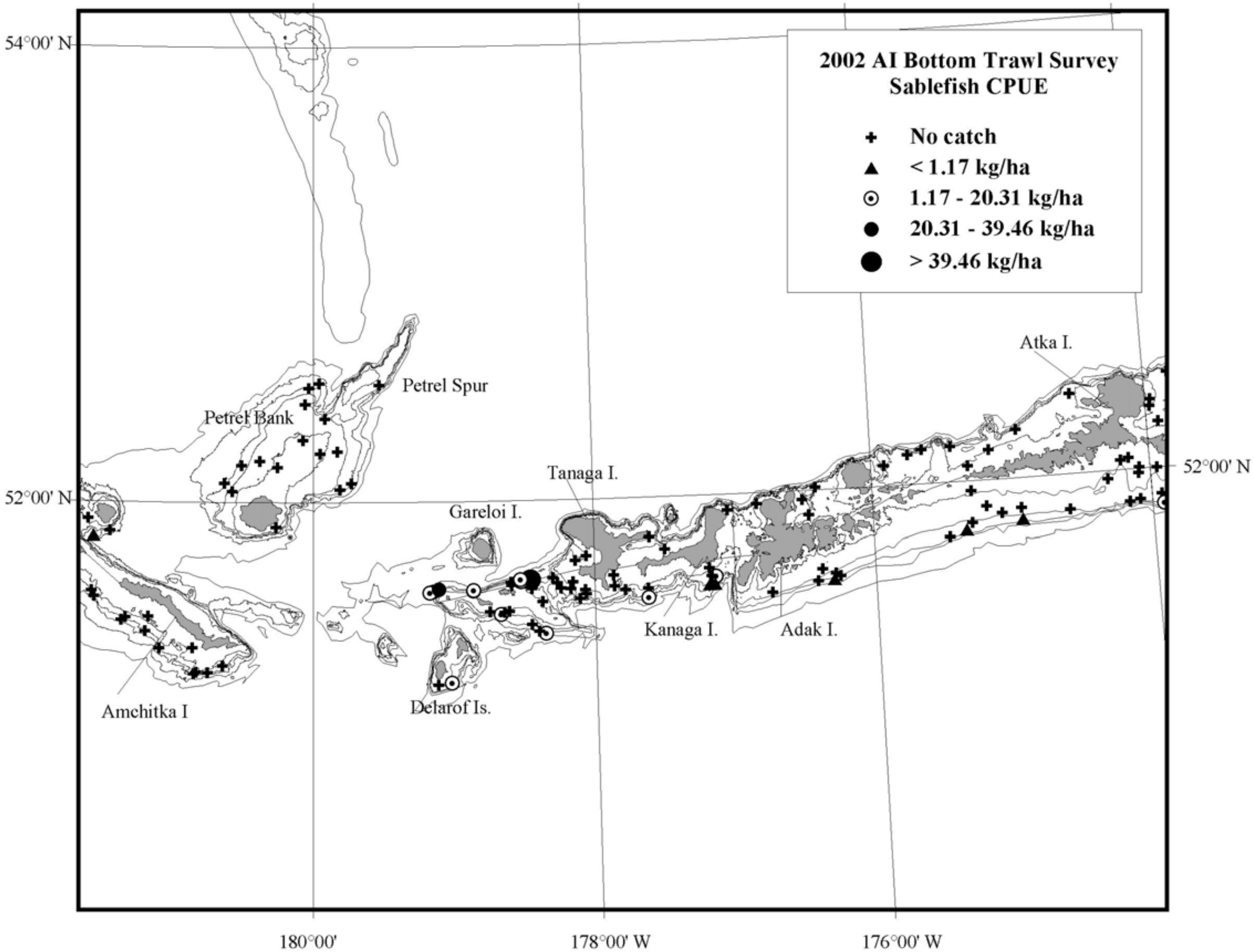


Figure 33.--Distribution and relative abundance of sablefish from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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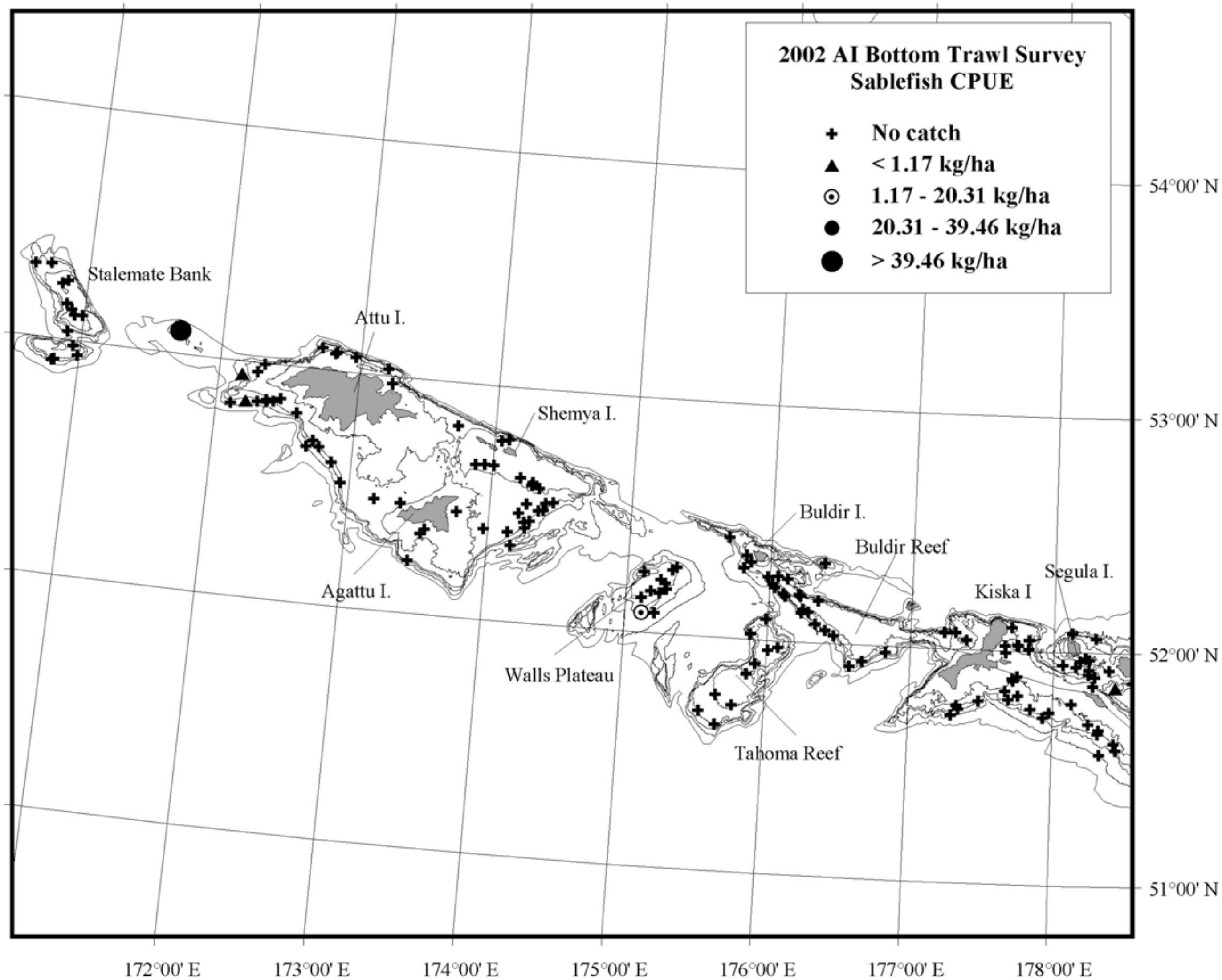

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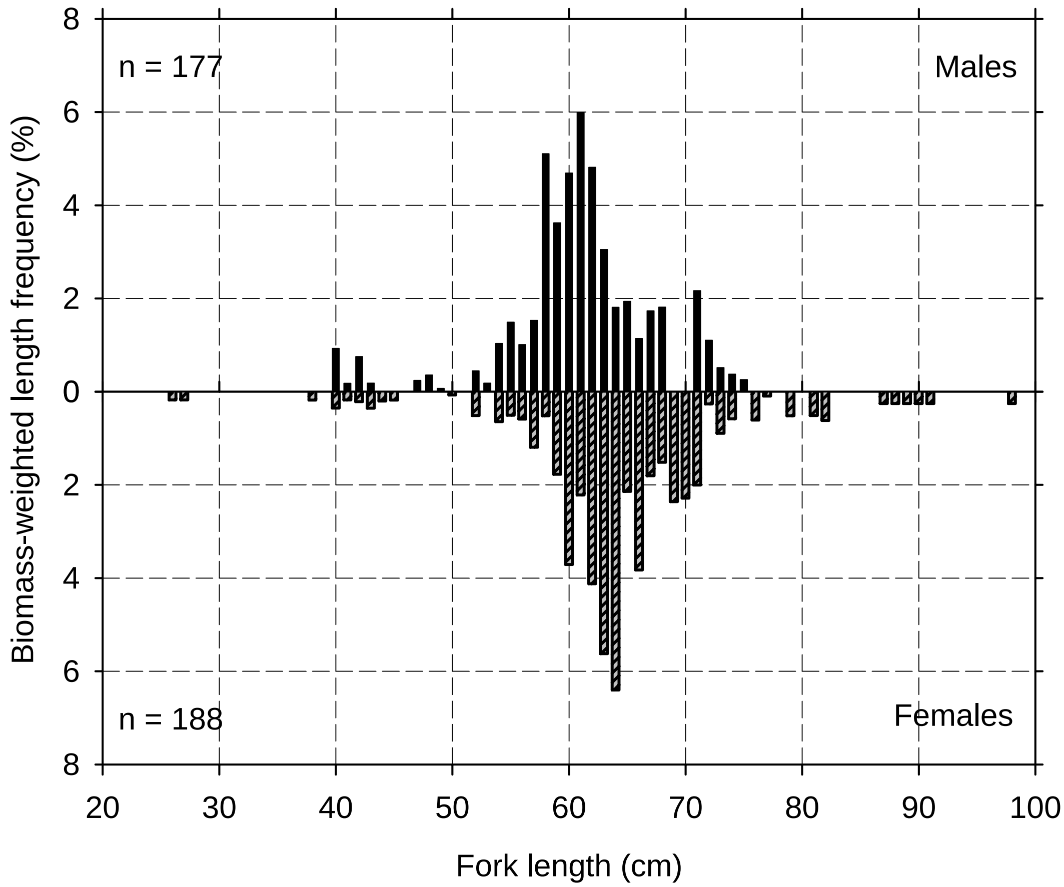


Figure 34.--Size composition of the estimated sablefish population from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

Table 29.--Number of survey hauls, number of hauls with giant grenadier, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	0	-	-	-	-	-	-
	301-500	13	6	17.74	5,805	0	15,495	4.116	29.9
	All depths	109	6	3.82	5,805	0	15,495	4.116	29.9
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	0	-	-	-	-	-	-
	201-300	23	0	-	-	-	-	-	-
	301-500	17	9	19.64	7,818	154	15,481	4.505	32.3
	All depths	115	9	4.73	7,818	154	15,481	4.505	32.3
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	0	-	-	-	-	-	-
	201-300	42	0	-	-	-	-	-	-
	301-500	27	12	359.89	204,524	0	490,661	5.019	34.0
	All depths	132	12	81.16	204,524	0	490,661	5.019	34.0
All	1-100	72	0	-	-	-	-	-	-
Aleutian	101-200	143	0	-	-	-	-	-	-
Areas	201-300	84	0	-	-	-	-	-	-
	301-500	57	27	168.63	218,147	0	504,545	4.970	33.8
	All depths	356	27	38.32	218,147	0	504,545	4.970	33.8
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	0	-	-	-	-	-	-
	301-500	8	0	-	-	-	-	-	-
	All depths	61	0	-	-	-	-	-	-

Table 30.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of giant grenadier by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	6	756.87	202,085	0	490,702
Central Aleutian	301-500	SE Central Aleutian	4	4	38.82	2,773	0	8,762
Western Aleutian	301-500	W Western Aleutian	11	6	33.93	5,805	0	15,614
Central Aleutian	301-500	N Central Aleutian	8	3	25.92	3,213	0	9,374
Central Aleutian	301-500	SW Central Aleutian	2	1	18.43	1,454	0	19,934
Eastern Aleutian	301-500	SE Eastern Aleutian	12	6	9.47	2,439	0	7,162
Central Aleutian	301-500	Petrel Bank	3	1	3.05	377	0	2,001

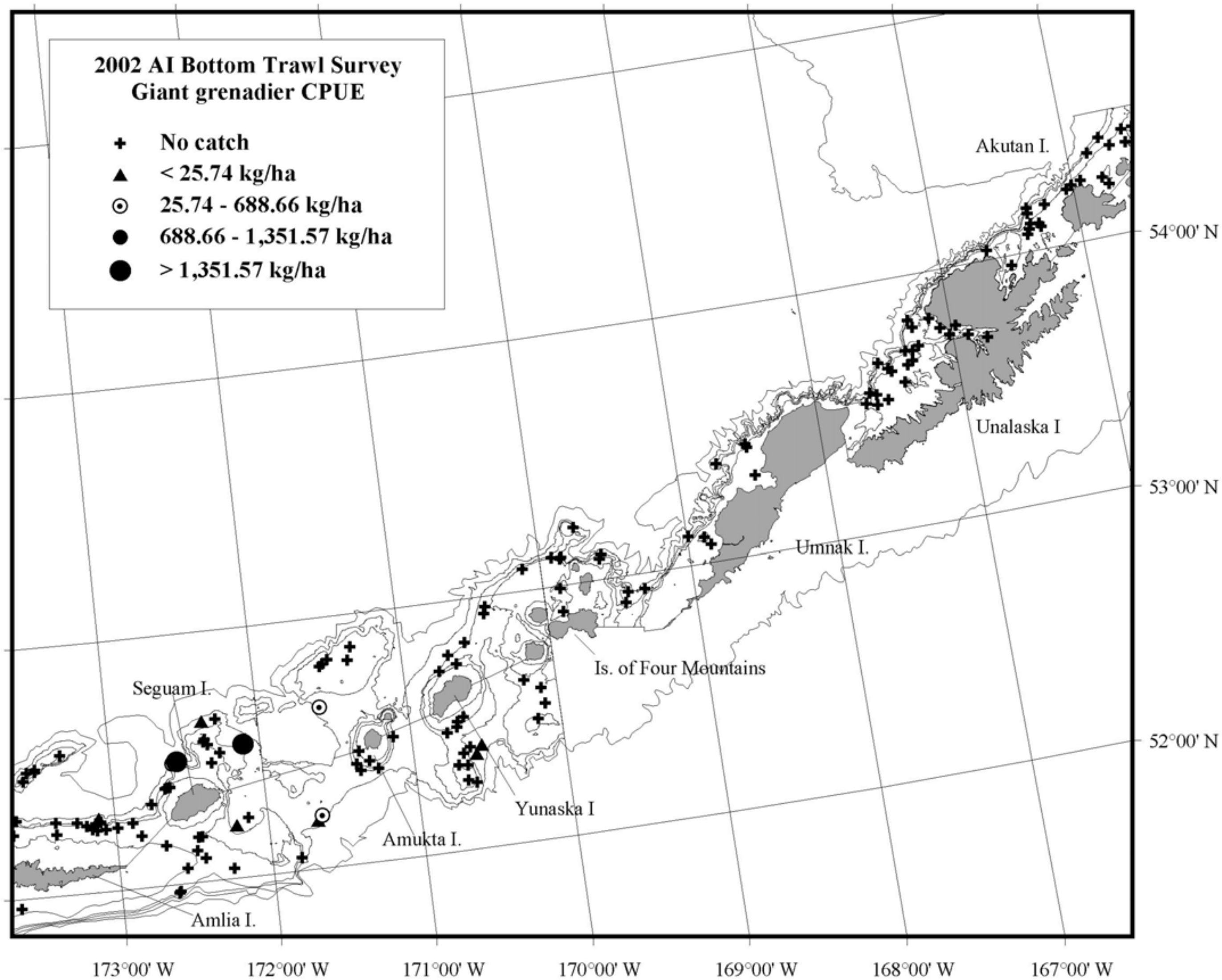
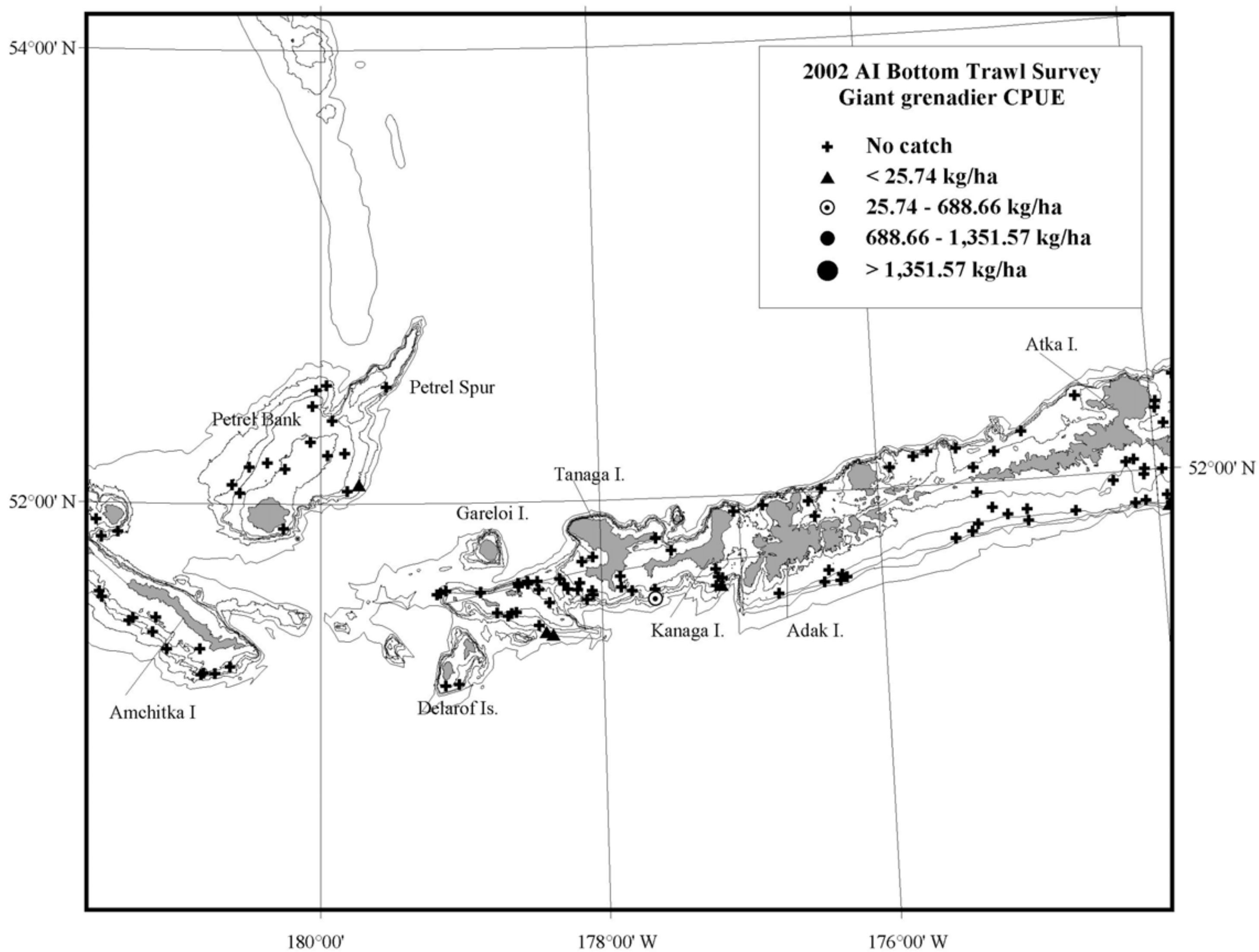


Figure 35.--Distribution and relative abundance of giant grenadier from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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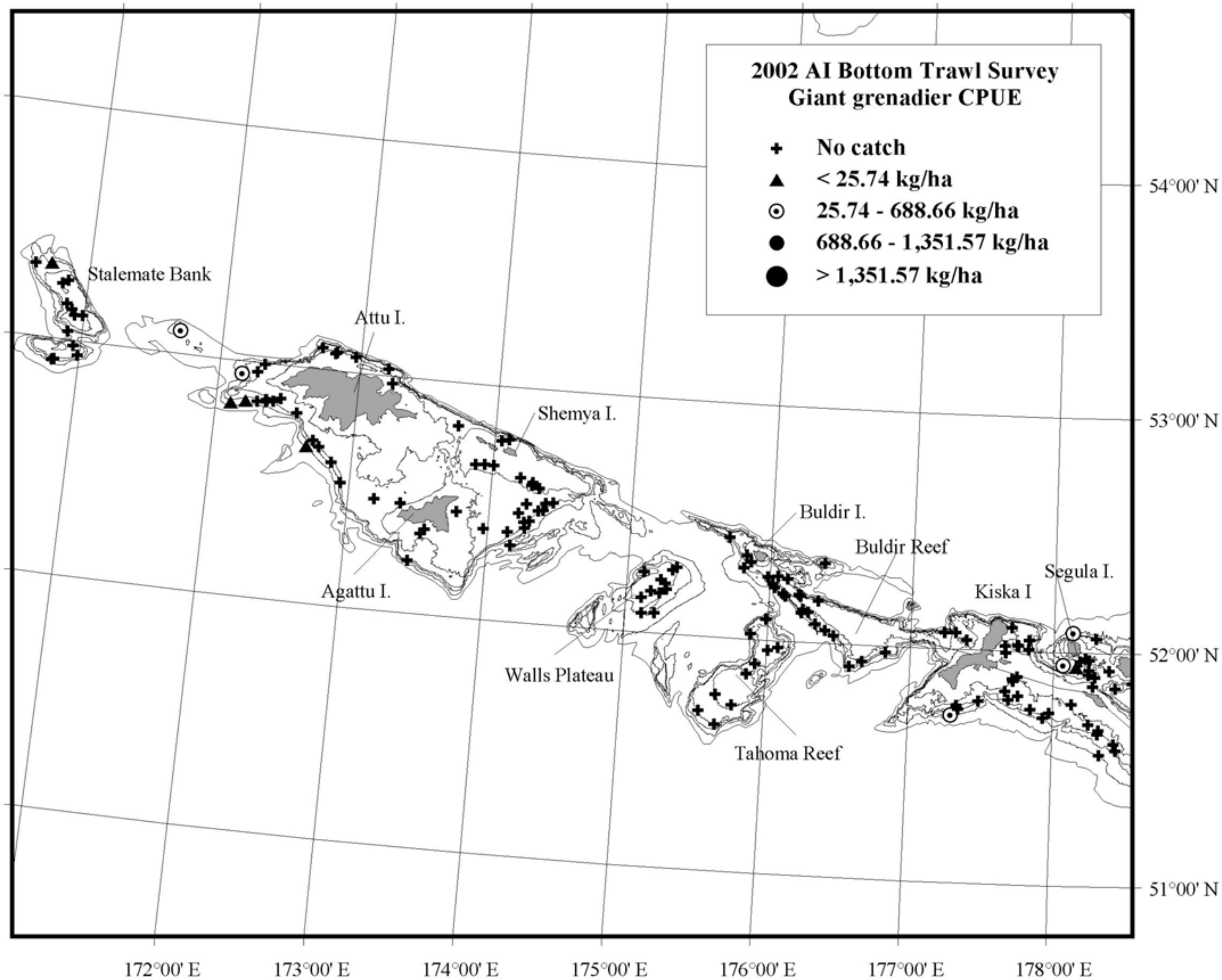

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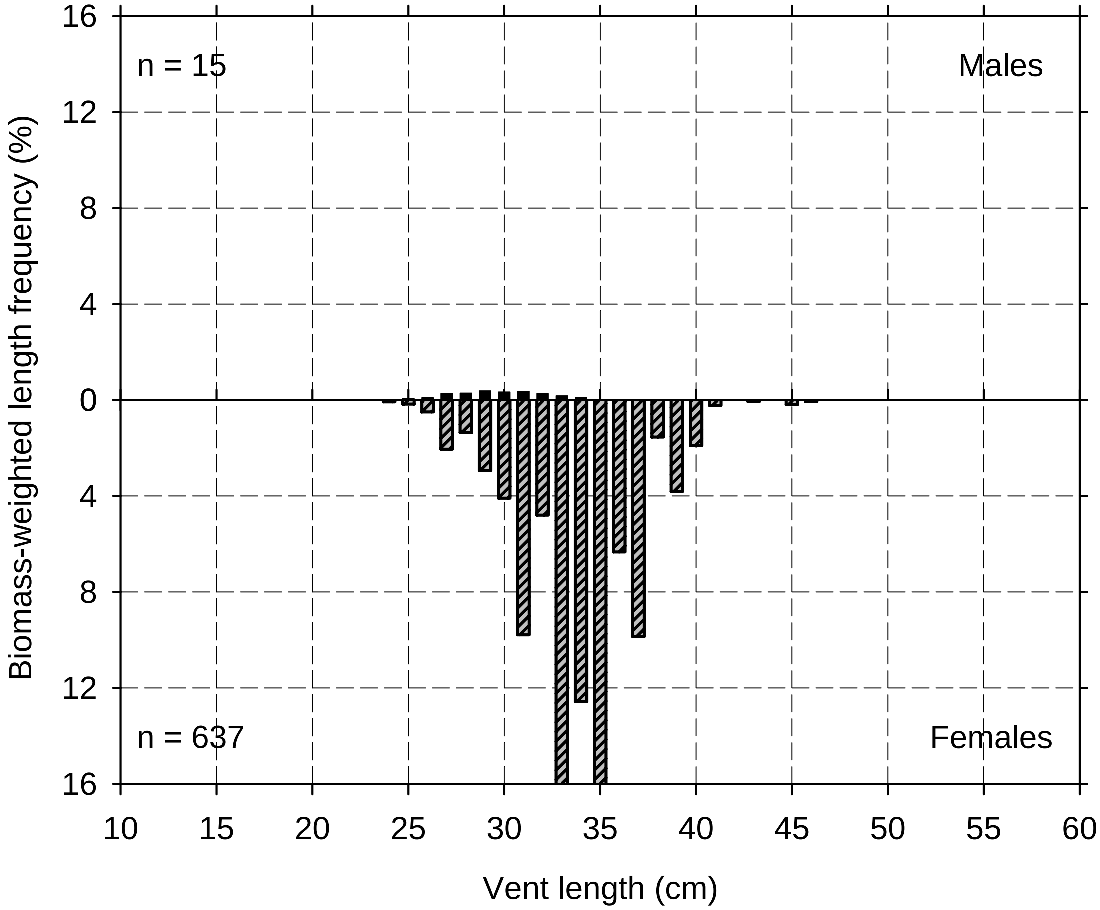


Figure 36.--Size composition of the estimated giant grenadier population from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas combined, 301-500 m.

Sculpins (Cottidae)

Sculpins are probably not sampled well by the AFSC survey trawl. The small size of many of the species and their demersal orientation may help them to escape under the footrope, especially on rough bottom. They are no doubt biologically important, perhaps not as individual species, but as a family. In this report, sculpin catch rates and biomass estimates are treated as a grouped whole. However, in some cases, specific information allows them to be reported upon separately. Eighteen species of sculpins were identified from trawl catches. The table below summarizes the total catches in descending order of total weight. Yellow Irish lord represented the largest total catch in terms of weight, but darkfin sculpin and spectacled sculpin were much more numerous.

Species name	Common name	Weight (kg)	Number
Hemilepidotus jordani	yellow Irish lord	779	1,128
Malacocottus zonurus	darkfin sculpin	719	8,847
Triglops scepticus	spectacled sculpin	405	6,124
Hemitripterus bolini	bigmouth sculpin	205	46
Myoxocephalus polyacanthocephalus	great sculpin	184	52
Triglops forficata	scissortail sculpin	59	721
Gymnocanthus galeatus	armorhead sculpin	24	123
Hemilepidotus zapus	longfin Irish lord	14	315
Dasycottus setiger	spinyhead sculpin	4	52
Triglops macellus	roughspine sculpin	2	27
Thyriscus anoplus	sponge sculpin	1	63
Triglops pingeli	ribbed sculpin	1	20
Icelus euryops	wide-eyed sculpin	<1	25
Icelus spiniger	thorny sculpin	<1	6
Triglops metopias	crescent-tail sculpin	<1	6
Icelus uncinalis	uncinate sculpin	<1	5
Nautichthys oculofasciatus	sailfin sculpin	<1	3
Nautichthys pribilovius	eyeshade sculpin	<1	1

Sculpins were captured throughout the survey area (Table 2) and in all depth intervals (Table 31). They were captured in 86% of all trawl hauls. Sculpin mean CPUE was lowest in the Western Aleutian area and highest in the Central Aleutian area. The 201-300 m depth interval on Petrel Bank was the most productive subarea (Table 32 and Fig. 37). Figure 38 below summarizes depth distribution ranges and relative measures of species catch sizes for the seven most frequently captured species of sculpin. A high degree of species distribution overlap occurs at depths less than about 250 m. At depths greater than 250 m, three of the four most abundant species dominate, including darkfin, spectacled, and bigmouth sculpins. Depth ranges where the highest relative catches by species were found do not overlap in most cases. Bigmouth sculpin catches were relatively small and spread across its depth range.

Figure 38.--Depth distributions for major sculpin species (Total catch - kg)

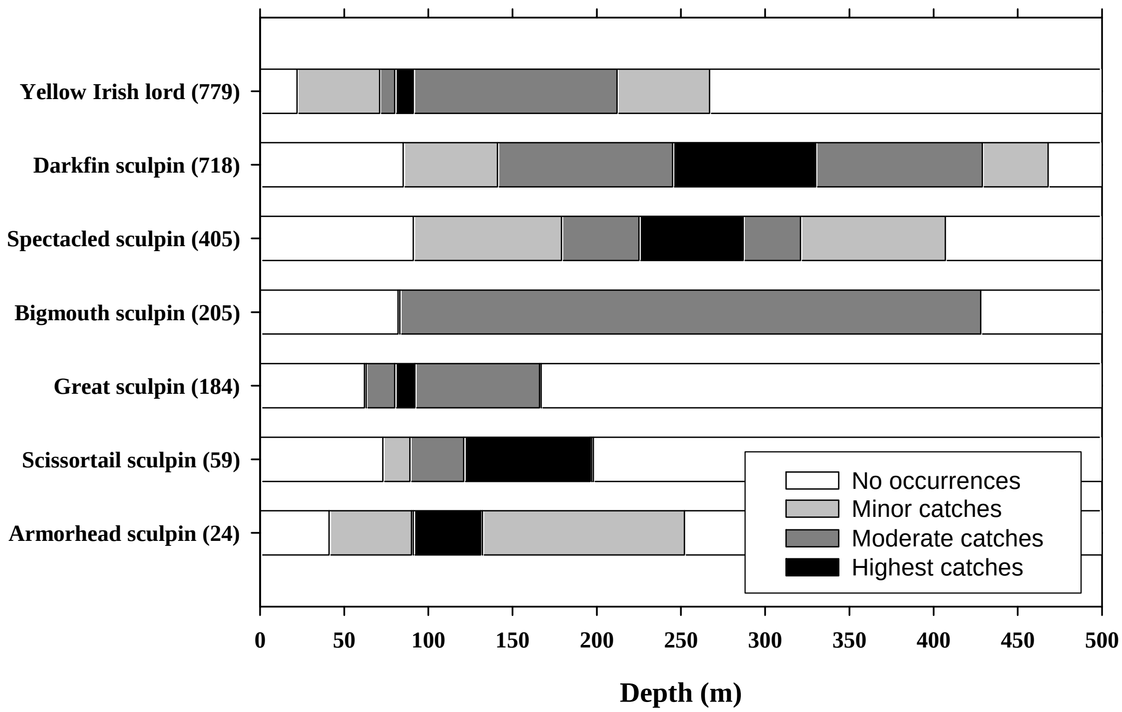


Figure 39 shows the unweighted length frequencies for male, female, and combined sexes of yellow Irish lords. Females were more than twice as abundant in length frequency measurements. Judging by the size distribution, the majority of fish measured were adults. Figure 40 shows the unweighted length frequencies for combined sexes of darkfin sculpins, a relatively small sculpin with a wide depth distribution. Armorhead sculpins (Fig. 41) were generally larger in length than darkfin or spectacled sculpins (Fig. 42), but composed a relatively small part of the total sculpin catch. Scissortail sculpins composed another small component of sculpin catches. Their unweighted length frequencies were heavily dominated by females (Fig. 43).

Table 31.--Number of survey hauls, number of hauls with sculpins (mixed species), mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	17	1.50	730	270	1,189	0.831	No data
Aleutian	101-200	51	44	1.28	681	384	978	0.231	
	201-300	19	18	0.78	135	61	210	0.053	
	301-500	13	8	0.57	188	0	737	0.040	
	All depths	109	87	1.14	1,734	1,118	2,350	0.157	
Central	1-100	30	22	2.90	1,694	0	3,745	0.602	
Aleutian	101-200	45	42	2.38	1,095	666	1,524	0.150	
	201-300	23	23	8.29	1,748	0	3,945	0.068	
	301-500	17	12	1.33	530	0	1,450	0.066	
	All depths	115	99	3.06	5,067	2,555	7,579	0.116	
Eastern	1-100	16	15	1.89	1,294	592	1,996	0.480	
Aleutian	101-200	47	43	1.50	1,162	683	1,642	0.179	
	201-300	42	38	2.76	1,353	813	1,894	0.092	
	301-500	27	23	2.89	1,641	825	2,457	0.067	
	All depths	132	119	2.16	5,451	4,208	6,694	0.113	
All	1-100	72	54	2.12	3,718	1,687	5,749	0.582	
Aleutian	101-200	143	129	1.66	2,938	2,264	3,613	0.176	
Areas	201-300	84	79	3.71	3,237	1,345	5,128	0.075	
	301-500	57	43	1.82	2,359	1,309	3,409	0.064	
	All depths	356	305	2.15	12,252	9,506	14,998	0.119	
Southern	1-100	30	26	2.60	1,048	426	1,670	0.657	
Bering Sea	101-200	16	13	1.41	260	50	470	0.465	
	201-300	7	7	2.03	114	0	266	0.256	
	301-500	8	8	5.51	575	266	884	0.141	
	All depths	61	54	2.67	1,997	1,283	2,710	0.299	

Table 32.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of sculpins (mixed species) by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	201-300	Petrel Bank	3	3	16.95	1,299	0	4,236
Central Aleutian	1-100	SE Central Aleutian	7	4	7.77	904	0	3,008
Central Aleutian	201-300	SE Central Aleutian	4	4	6.05	289	0	598
Southern Bering	301-500	Combined Southern Bering	8	8	5.51	575	258	892
Central Aleutian	1-100	Petrel Bank	4	4	4.06	390	0	910
Eastern Aleutian	301-500	SE Eastern Aleutian	12	11	3.92	1,008	364	1,653
Eastern Aleutian	201-300	SE Eastern Aleutian	12	12	3.76	775	264	1,285
Southern Bering	1-100	E Southern Bering Sea	27	24	3.67	897	320	1,473
Central Aleutian	101-200	N Central Aleutian	8	8	2.89	308	14	602
Eastern Aleutian	101-200	SE Eastern Aleutian	15	15	2.85	542	141	943
Eastern Aleutian	201-300	NE Eastern Aleutian	22	21	2.65	522	332	712
Eastern Aleutian	1-100	SE Eastern Aleutian	5	5	2.60	453	0	1,002
Central Aleutian	101-200	SE Central Aleutian	14	13	2.60	196	75	316
Eastern Aleutian	1-100	NW Eastern Aleutian	4	4	2.43	469	0	1,212
Eastern Aleutian	1-100	NE Eastern Aleutian	2	2	2.34	296	0	892
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	10	2.32	619	41	1,198
Central Aleutian	101-200	Petrel Bank	6	6	2.32	402	91	714
Central Aleutian	301-500	Petrel Bank	3	2	2.28	282	0	1,455
Central Aleutian	201-300	N Central Aleutian	10	10	2.18	96	35	156
Southern Bering	201-300	Combined Southern Bering	7	7	2.03	114	0	271
Central Aleutian	101-200	SW Central Aleutian	17	15	1.80	189	43	336
Central Aleutian	201-300	SW Central Aleutian	6	6	1.52	65	3	127
Western Aleutian	1-100	W Western Aleutian	16	9	1.51	559	128	989
Southern Bering	101-200	W Southern Bering Sea	5	4	1.49	100	0	223
Eastern Aleutian	101-200	NW Eastern Aleutian	6	5	1.46	232	0	539
Western Aleutian	1-100	E Western Aleutian	10	8	1.44	171	0	356
Central Aleutian	301-500	SE Central Aleutian	4	3	1.42	101	0	355
Central Aleutian	1-100	N Central Aleutian	14	11	1.38	291	0	587
Southern Bering	101-200	E Southern Bering Sea	11	9	1.36	160	0	355
Western Aleutian	101-200	W Western Aleutian	28	24	1.34	546	271	820
Central Aleutian	301-500	N Central Aleutian	8	6	1.15	142	12	272
Western Aleutian	101-200	E Western Aleutian	23	20	1.08	136	19	253
Eastern Aleutian	101-200	SW Eastern Aleutian	9	7	1.06	240	84	395
Western Aleutian	201-300	E Western Aleutian	10	10	1.02	80	43	117
Western Aleutian	301-500	E Western Aleutian	2	2	1.02	159	0	1,768
Southern Bering	1-100	W Southern Bering Sea	3	2	0.95	151	0	590
Eastern Aleutian	201-300	SW Eastern Aleutian	6	5	0.79	57	0	149
Eastern Aleutian	101-200	NE Eastern Aleutian	17	16	0.74	148	86	210
Central Aleutian	1-100	SW Central Aleutian	5	3	0.68	110	0	328
Western Aleutian	201-300	W Western Aleutian	9	8	0.59	56	0	124
Eastern Aleutian	1-100	SW Eastern Aleutian	5	4	0.40	76	18	134

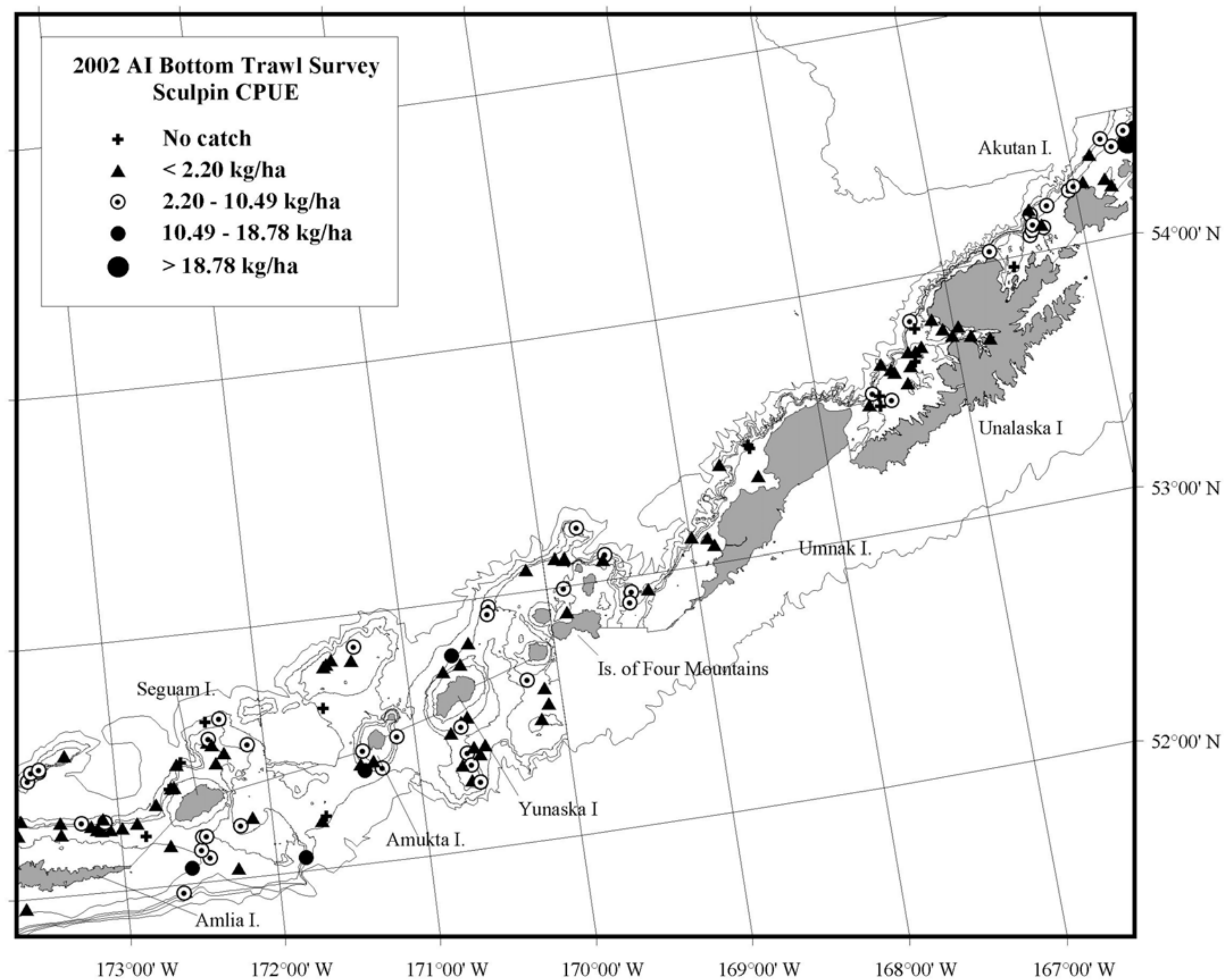
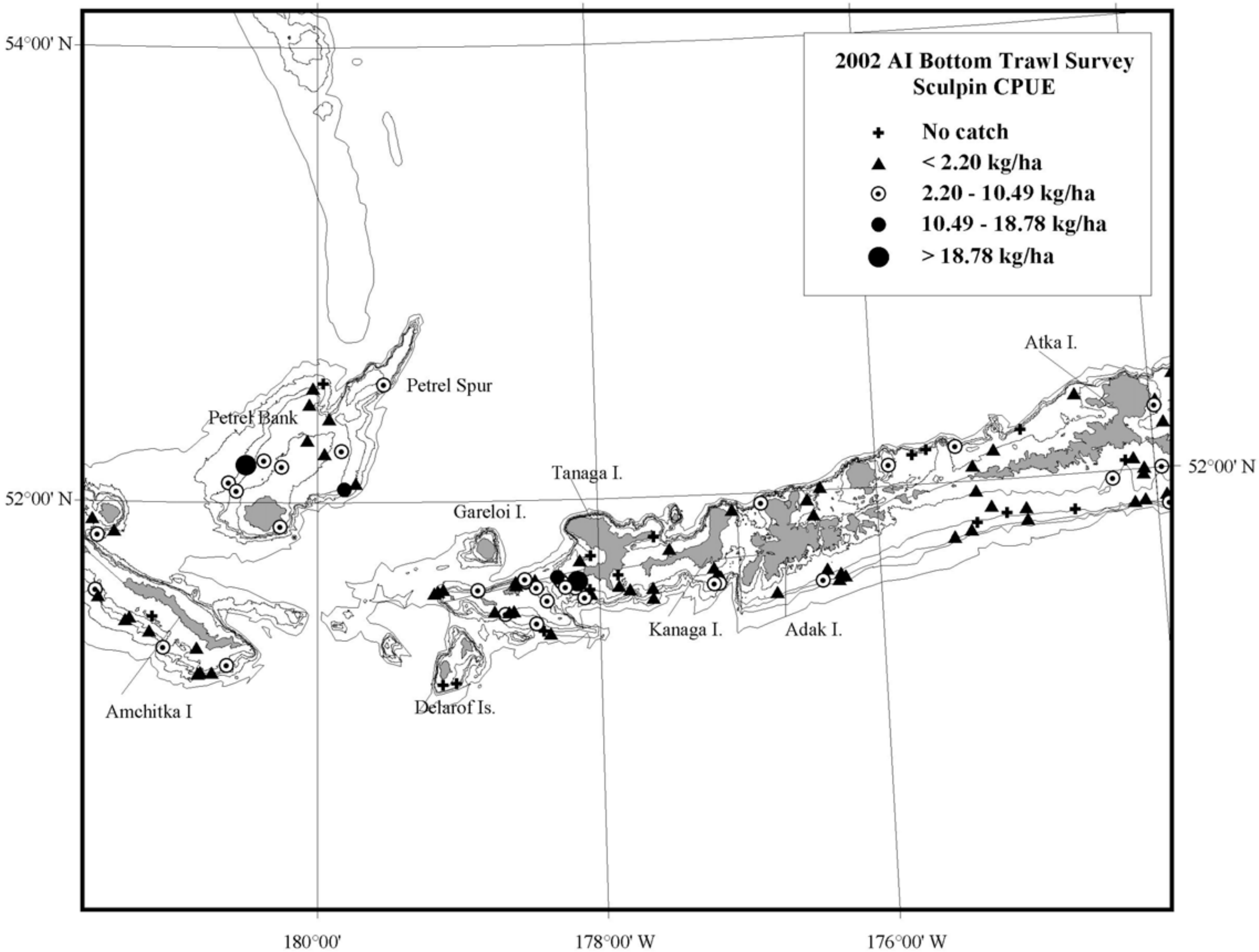


Figure 37.--Distribution and relative abundance of sculpins (all species) from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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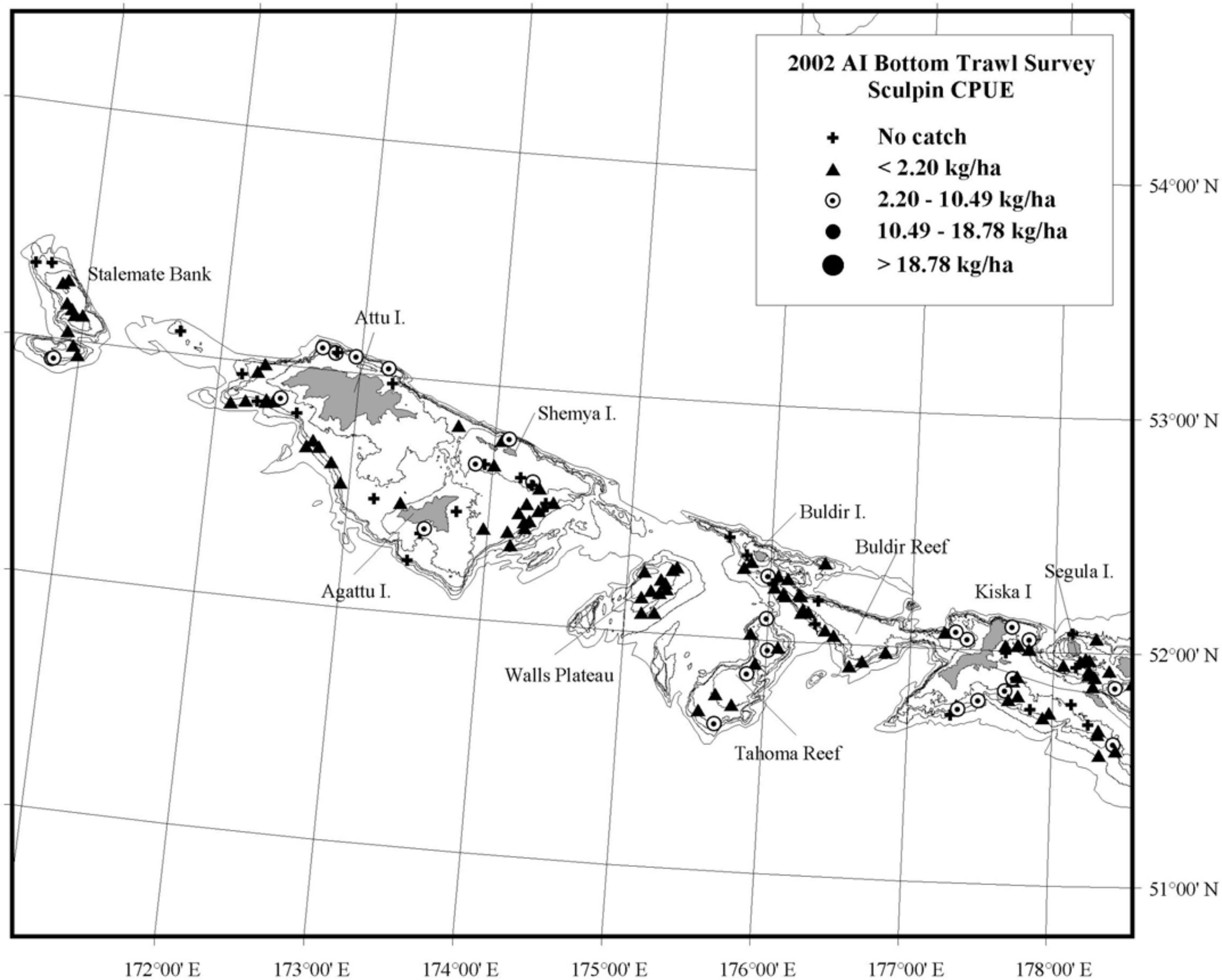

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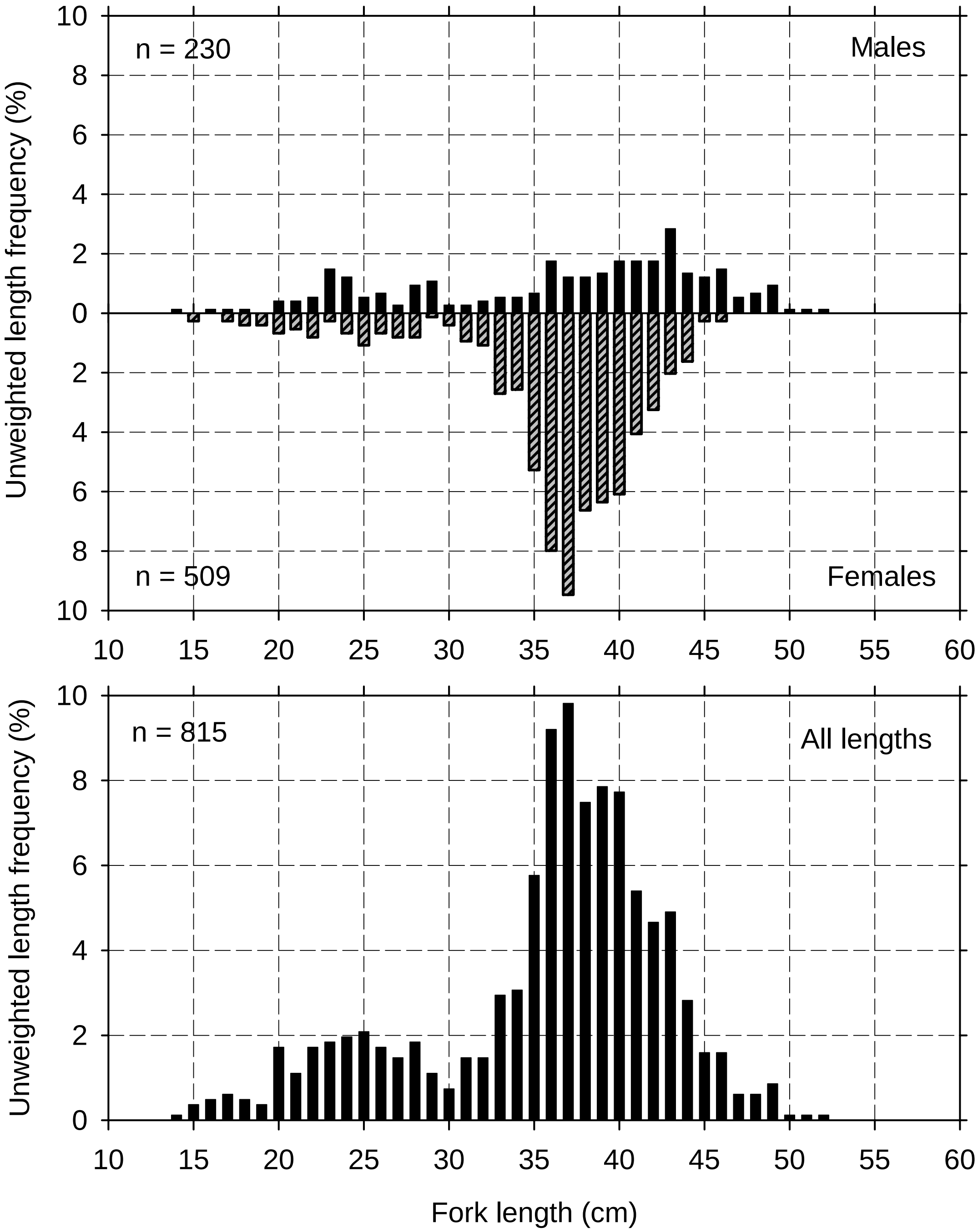


Figure 39.--Length frequencies of yellow Irish lord catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

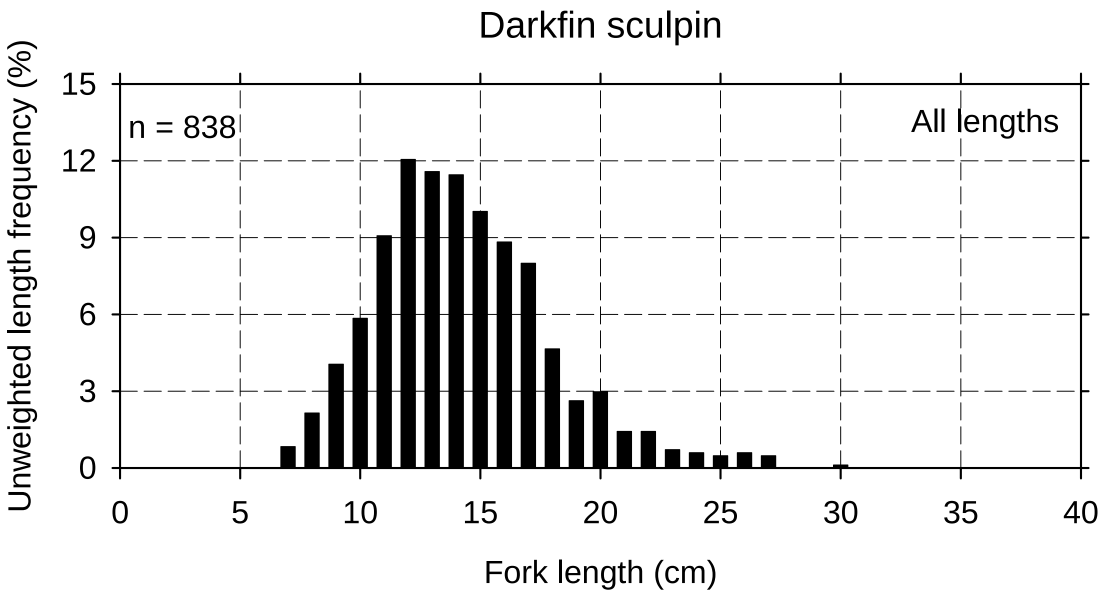


Figure 40.--Length frequencies of darkfin sculpin catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

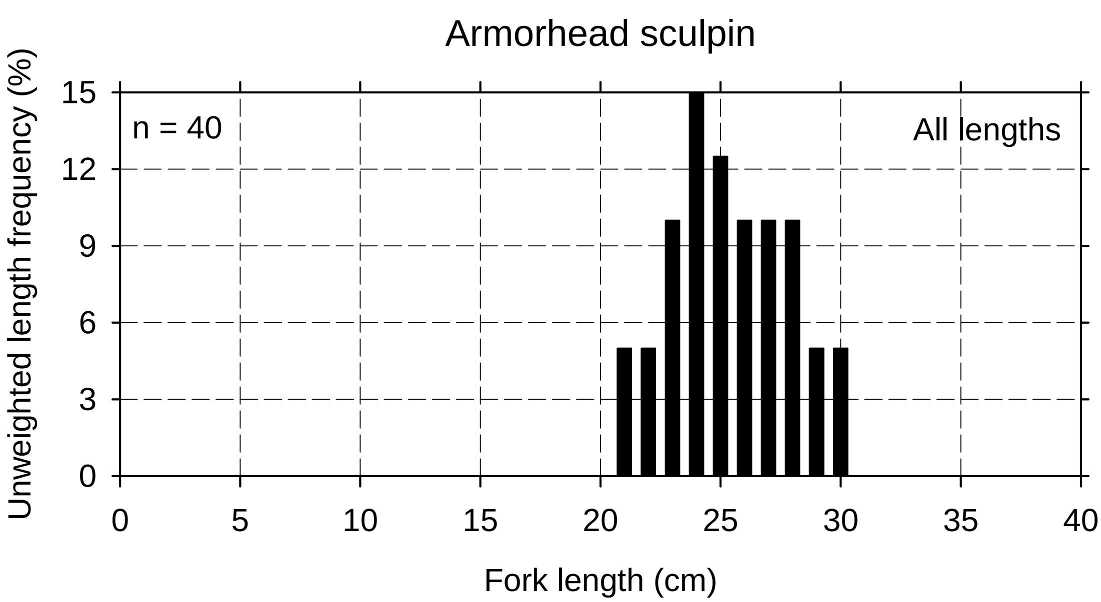


Figure 41.--Length frequencies of armorhead sculpin catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

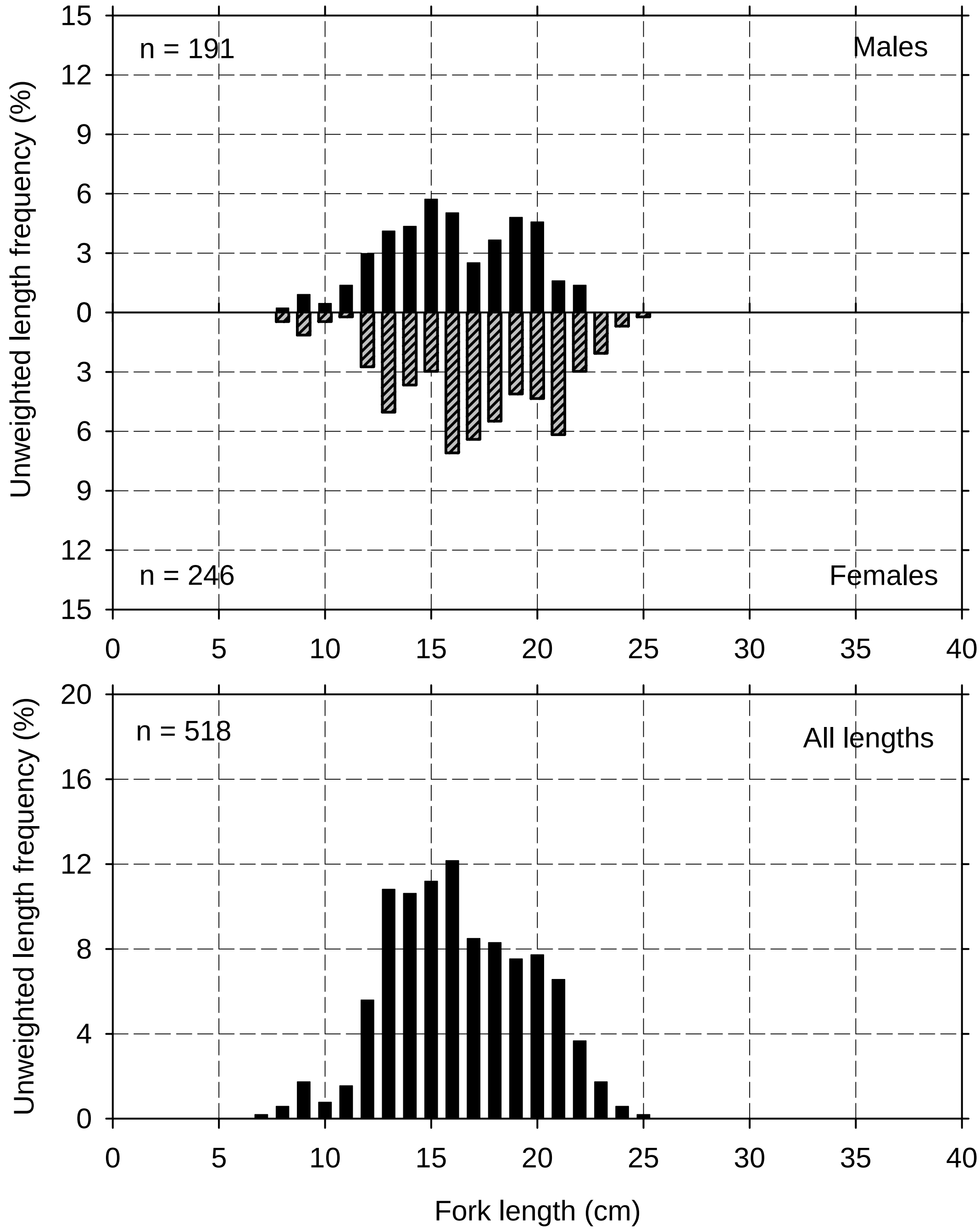


Figure 42.--Length frequencies of spectacled sculpin catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths combined.

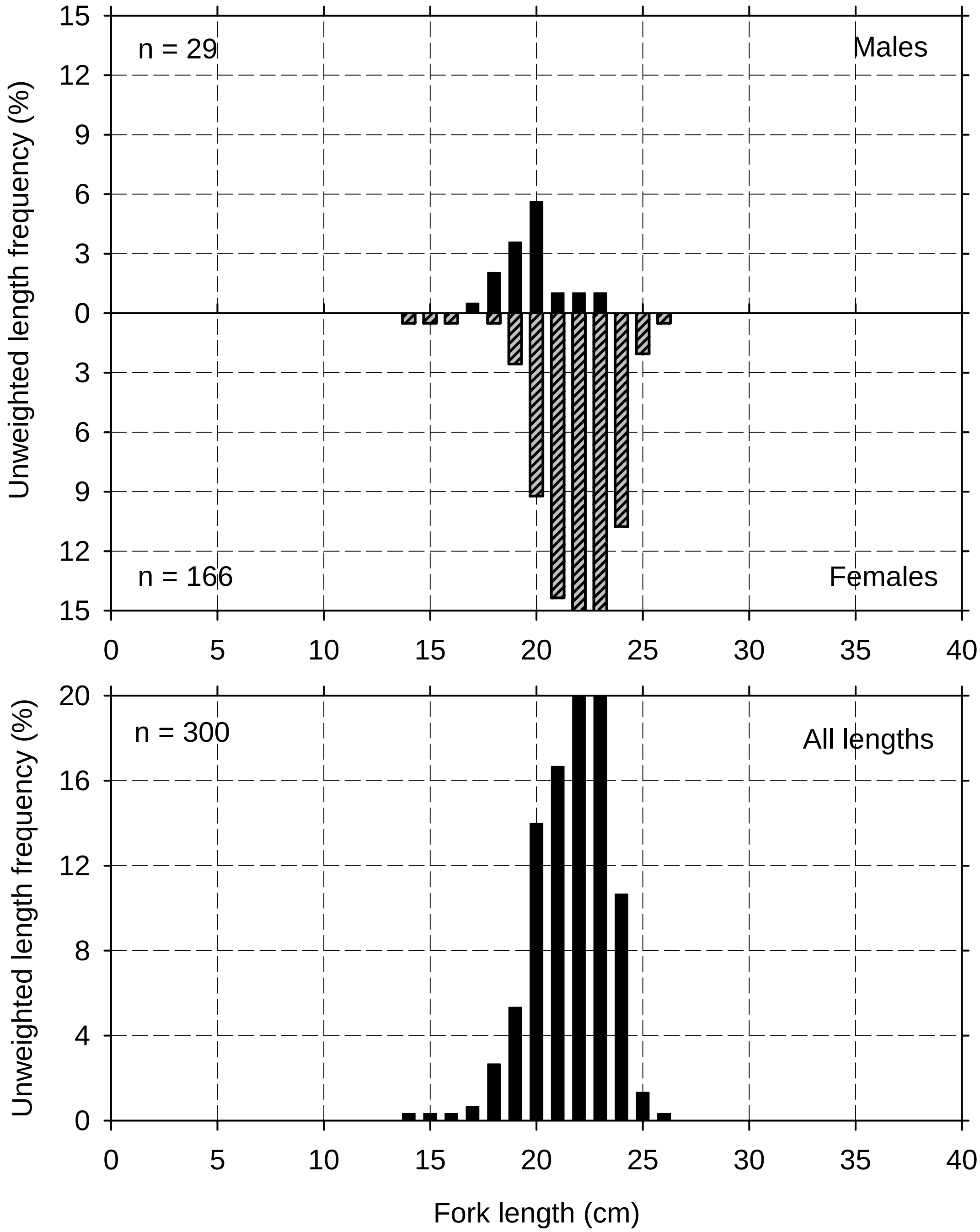


Figure 43.--Length frequencies of scissortail sculpin catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths.

Prowfish (*Zaprora silenus*)

Prowfish is a common component of trawl catches in the Western Aleutian area (Table 2). Its apparent biomass is relatively small, but it is of considerable biological interest as a member of the Aleutian ecosystem. The author has videotaped prowfish over very rough bottom during daylight hours in the vicinity of Seguam Pass where the adults appeared to be semi-demersal and apparently attracted to the lights on the camera frame. The few juveniles detected were associated with rock outcrops, just off the bottom, and apparently using the rocks for protection.

Prowfish catch rates are highest in the 101-200 m depth interval (Table 33). This species may not be sampled well because they appear to spend time off bottom, and they are closely associated with rocky substrates. Prowfish occur sporadically in trawl catches at low CPUE levels (Table 34), mostly in the Western Aleutian area and the SW Central Aleutian subarea in 101-200 m depths. No CPUE distribution charts were produced for this species. Length frequency distributions of males and females are similar, although females are more abundant in the length frequency samples (Fig. 44).

Table 33.--Number of survey hauls, number of hauls with prowfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	7	1.30	635	0	1,292	2.472	58.9
Aleutian	101-200	51	20	4.55	2,419	467	4,371	1.762	52.8
	201-300	19	3	1.10	190	0	563	1.781	54.9
	301-500	13	0	-	-	-	-	-	-
	All depths	109	30	2.14	3,244	1,163	5,324	1.868	53.7
Central	1-100	30	1	0.22	130	0	408	3.679	67.6
Aleutian	101-200	45	8	0.66	306	21	591	2.450	56.2
	201-300	23	2	0.19	41	0	106	5.092	74.3
	301-500	17	0	-	-	-	-	-	-
	All depths	115	11	0.29	477	78	875	2.834	61.5
Eastern	1-100	16	1	0.19	128	0	457	4.250	70.0
Aleutian	101-200	47	1	0.07	54	0	168	9.665	88.0
	201-300	42	4	0.33	162	0	331	3.901	61.1
	301-500	27	0	-	-	-	-	-	
	All depths	132	6	0.14	344	0	726	4.454	64.5
All	1-100	72	9	0.51	892	140	1,644	2.771	60.6
Aleutian	101-200	143	29	1.57	2,779	806	4,751	1.849	53.1
Areas	201-300	84	9	0.45	393	3	783	2.515	59.0
	301-500	57	0	-	-	-	-	-	-
	All depths	356	47	0.71	4,064	1,921	6,206	2.051	54.2
Southern	1-100	30	1	0.07	29	0	88	7.366	87.0
Bering Sea	101-200	16	1	0.08	16	0	50	3.432	63.0
	201-300	7	0	-	-	-	-	-	-
	301-500	8	1	0.81	85	0	281	6.359	-
	All depths	61	3	0.17	129	0	330	5.926	75.0

Table 34.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of prowfish by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Western Aleutian	101-200	E Western Aleutian	23	13	5.35	670	169	1,172
Western Aleutian	101-200	W Western Aleutian	28	7	4.30	1,749	0	3,641
Western Aleutian	1-100	E Western Aleutian	10	6	3.96	469	0	1,087
Central Aleutian	101-200	SW Central Aleutian	17	5	2.30	242	0	517
Western Aleutian	201-300	W Western Aleutian	9	1	1.73	163	0	539
Southern Bering	301-500	Combined Southern Bering	8	1	0.81	85	0	286
Eastern Aleutian	1-100	SE Eastern Aleutian	5	1	0.74	128	0	483
Central Aleutian	201-300	N Central Aleutian	10	1	0.62	27	0	89
Central Aleutian	1-100	N Central Aleutian	14	1	0.62	130	0	410
Eastern Aleutian	201-300	NE Eastern Aleutian	22	3	0.59	117	0	262
Western Aleutian	1-100	W Western Aleutian	16	1	0.45	166	0	520
Central Aleutian	101-200	N Central Aleutian	8	1	0.38	41	0	137
Western Aleutian	201-300	E Western Aleutian	10	2	0.35	27	0	86
Central Aleutian	201-300	SW Central Aleutian	6	1	0.33	14	0	50
Central Aleutian	101-200	SE Central Aleutian	14	2	0.31	23	0	69
Eastern Aleutian	101-200	NE Eastern Aleutian	17	1	0.27	54	0	168
Eastern Aleutian	201-300	SE Eastern Aleutian	12	1	0.22	45	0	143
Southern Bering	101-200	E Southern Bering Sea	11	1	0.13	16	0	51
Southern Bering	1-100	E Southern Bering Sea	27	1	0.12	29	0	88

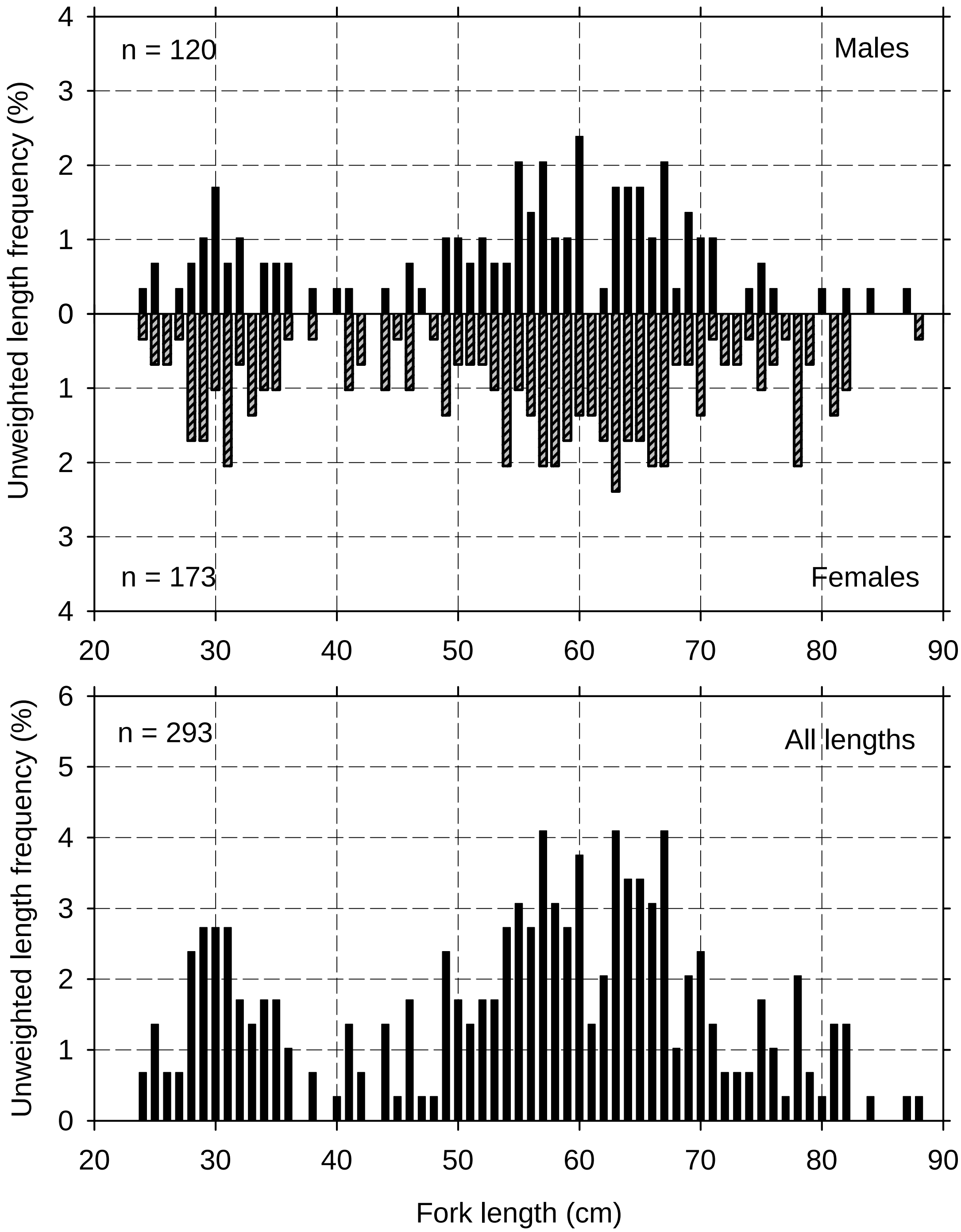


Figure 44.--Length frequencies of prowfish catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths.

Rockfishes

Pacific ocean perch (*Sebastes alutus*)

The highest area-specific catch rate for Pacific ocean perch (POP) was in the Western Aleutian area (Table 2). Although POP was always ranked at least third, its overall mean CPUE by area diminished in an easterly direction (Fig. 45). Estimated biomass for the entire survey area surpassed 468,000 t (Table 35) and more than 96% of the total estimated biomass was found in the Aleutian areas. Biomass and mean CPUE increased with depth to about 300 m. Whereas Atka mackerel abundance was highest in the 101-200 m depth interval, the highest concentrations of POP were found in 201-300 m. While catches of over 1,000 kg were common in depths between slightly less than 100 m to slightly more than 300 m, the exceptionally large catches were found between about 180 m and 280 m. POP was captured in 56% of all successful survey tows that were shallower than 300 m.

The highest three stratum-specific mean CPUEs were all found in the 201-300 m depth interval (Table 36, Fig. 45). These occurred in the NW Eastern Aleutian subarea between Atka Island and Adak Island; in the eastern subarea of the Western Aleutian area which contains Buldir Reef, Tahoma Bank, and Walls Plateau; and in the northern subarea of the Central Aleutian area near Segula and Kiska Islands. The highest stratum-specific mean CPUE resulted from the only two tows in the 201-300 m depth interval in the NW section of the Eastern Aleutian area near the NW end of Atka I (Table 36, Fig. 45). Mean lengths and weights increased with depth in both the Aleutian and Southern Bering Sea areas (Table 35). Size composition data show matching male and female frequency modes (22 cm) for juvenile POP, but the primary adult frequency mode (Fig. 46) for males (37 cm) differs from that of females (39 cm). Size compositions by depth interval showed that in 1-100 m small POP predominated, in 101-200 m there was a mix of adult and juvenile sizes, and the two deeper strata contained adults almost exclusively.

Figure 47 shows length-weight relationships for male, female, and combined sexes of POP. The regression curves for the sexes match closely, but the maximum length of females is about 4 cm larger than males.

Table 35--Number of survey hauls, number of hauls with Pacific ocean perch, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	7	9.50	4,633	0	14,827	0.114	20.5
Aleutian	101-200	51	33	170.63	90,733	12,779	168,686	0.448	30.8
	201-300	19	18	611.60	105,417	39,513	171,322	0.612	35.4
	301-500	13	5	4.10	1,342	0	5,702	0.656	35.6
	All depths	109	63	133.06	202,124	103,237	301,011	0.484	31.8
Central	1-100	30	4	0.32	186	0	451	0.338	25.9
Aleutian	101-200	45	27	160.36	73,857	0	190,622	0.737	36.6
	201-300	23	23	298.91	63,036	11,175	114,897	0.862	38.7
	301-500	17	13	8.24	3,279	0	6,931	0.751	37.4
	All depths	115	67	84.85	140,358	13,307	267,409	0.788	37.5
Eastern	1-100	16	2	0.02	15	0	38	0.155	20.3
Aleutian	101-200	47	22	2.18	1,691	501	2,881	0.249	24.7
	201-300	42	39	217.40	106,557	75,247	137,867	0.662	35.8
	301-500	27	17	2.70	1,532	114	2,950	0.659	34.9
	All depths	132	80	43.57	109,795	78,434	141,156	0.646	35.3
All	1-100	72	13	2.75	4,833	0	15,030	0.117	20.6
Aleutian	101-200	143	82	93.99	166,281	35,174	297,388	0.537	32.6
Areas	201-300	84	80	314.88	275,010	189,968	360,053	0.677	36.1
	301-500	57	35	4.76	6,153	1,216	11,090	0.704	36.3
	All depths	356	210	79.44	452,277	297,281	607,273	0.591	33.9
Southern	1-100	30	8	0.37	151	0	418	0.245	25.9
Bering Sea	101-200	16	9	13.75	2,542	0	8,652	0.540	33.2
	201-300	7	7	109.66	6,183	276	12,091	0.617	34.9
	301-500	8	8	71.28	7,435	0	20,509	0.816	37.2
	All depths	61	32	21.80	16,311	1,524	31,098	0.667	35.2

Table 36--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Pacific ocean perch by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	201-300	NW Eastern Aleutian	2	2	2,964.95	46,232	0	123,829
Western Aleutian	201-300	E Western Aleutian	10	10	1,084.92	84,993	18,442	151,544
Central Aleutian	201-300	N Central Aleutian	10	10	1,048.28	46,020	0	98,319
Central Aleutian	101-200	N Central Aleutian	8	5	478.91	51,054	0	169,965
Western Aleutian	101-200	E Western Aleutian	23	21	372.38	46,640	0	100,467
Western Aleutian	201-300	W Western Aleutian	9	8	217.23	20,425	4,255	36,594
Eastern Aleutian	201-300	NE Eastern Aleutian	22	20	204.09	40,176	16,553	63,800
Central Aleutian	201-300	SW Central Aleutian	6	6	169.32	7,214	0	23,260
Central Aleutian	101-200	SE Central Aleutian	14	5	140.65	10,574	0	30,735
Eastern Aleutian	201-300	SW Eastern Aleutian	6	5	136.37	9,770	0	20,719
Southern Bering	201-300	Combined Southern Bering	7	7	109.66	6,183	71	12,295
Western Aleutian	101-200	W Western Aleutian	28	12	108.47	44,093	0	101,541
Central Aleutian	201-300	SE Central Aleutian	4	4	97.92	4,674	0	10,354
Southern Bering	301-500	Combined Southern Bering	8	8	71.28	7,435	0	20,843
Central Aleutian	201-300	Petrel Bank	3	3	66.91	5,128	0	17,188
Central Aleutian	101-200	SW Central Aleutian	17	13	59.26	6,236	0	14,123
Eastern Aleutian	201-300	SE Eastern Aleutian	12	12	50.37	10,379	0	26,047
Western Aleutian	1-100	E Western Aleutian	10	5	39.07	4,623	0	14,973
Southern Bering	101-200	W Southern Bering Sea	5	2	35.51	2,378	0	8,969
Central Aleutian	101-200	Petrel Bank	6	4	34.54	5,994	0	21,347
Central Aleutian	301-500	N Central Aleutian	8	7	20.65	2,560	0	6,248
Western Aleutian	301-500	E Western Aleutian	2	2	8.15	1,272	0	14,135
Central Aleutian	301-500	SE Central Aleutian	4	3	6.01	429	0	1,752
Eastern Aleutian	101-200	SE Eastern Aleutian	15	11	5.66	1,076	70	2,083
Eastern Aleutian	301-500	SE Eastern Aleutian	12	10	4.52	1,165	0	2,549
Central Aleutian	301-500	Petrel Bank	3	3	2.34	290	77	503
Eastern Aleutian	101-200	SW Eastern Aleutian	9	4	2.24	506	0	1,260
Southern Bering	101-200	E Southern Bering Sea	11	7	1.39	164	0	398
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	6	1.35	360	0	804
Central Aleutian	1-100	Petrel Bank	4	1	1.04	100	0	417
Southern Bering	1-100	E Southern Bering Sea	27	8	0.62	151	0	419
Eastern Aleutian	101-200	NE Eastern Aleutian	17	6	0.49	98	3	192
Western Aleutian	301-500	W Western Aleutian	11	3	0.41	70	0	172
Central Aleutian	1-100	SE Central Aleutian	7	2	0.40	46	0	126
Central Aleutian	1-100	N Central Aleutian	14	1	0.19	40	0	126
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	0.17	7	0	101
Eastern Aleutian	1-100	SE Eastern Aleutian	5	2	0.08	15	0	40
Eastern Aleutian	101-200	NW Eastern Aleutian	6	1	0.07	11	0	40
Western Aleutian	1-100	W Western Aleutian	16	2	0.03	9	0	28

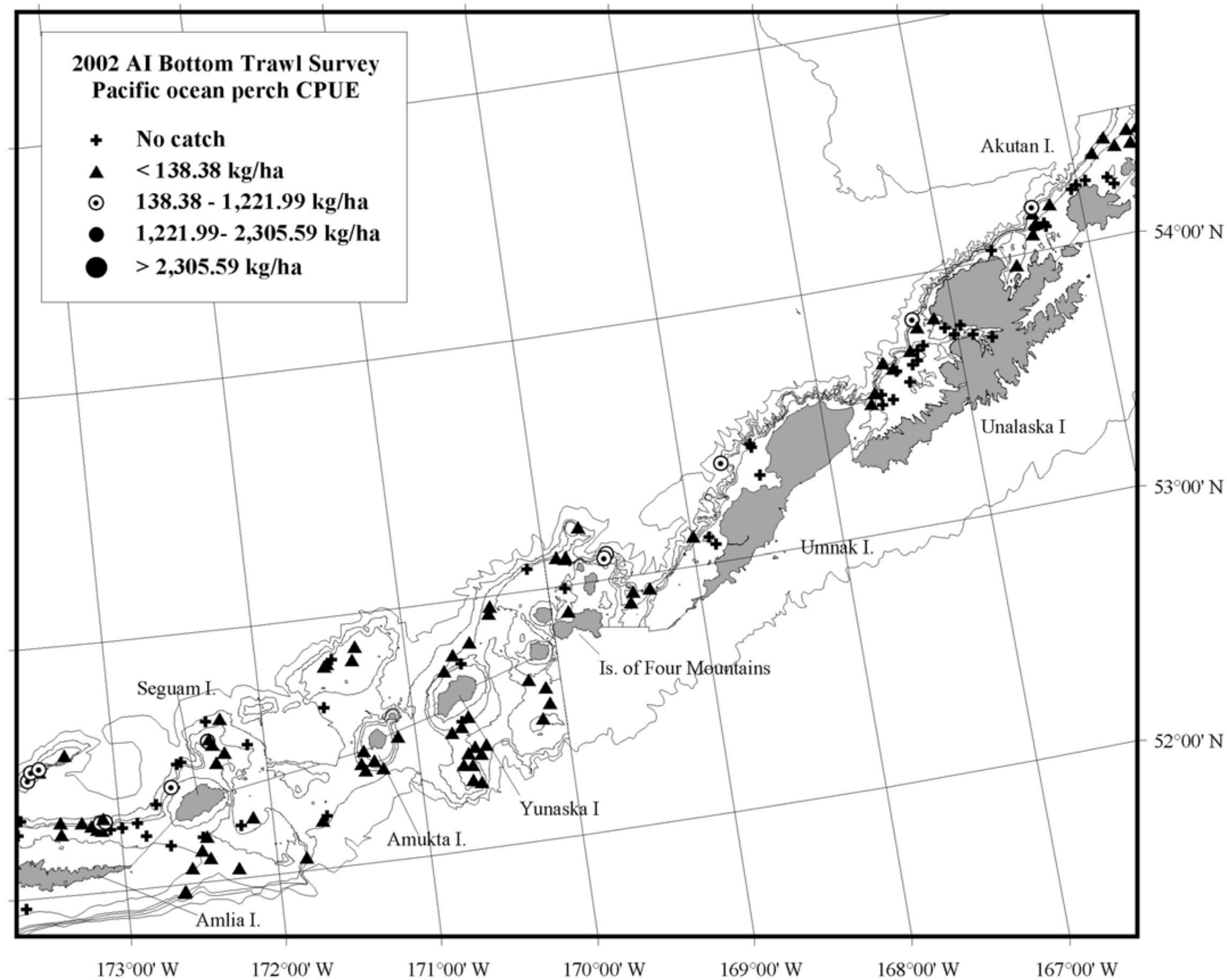
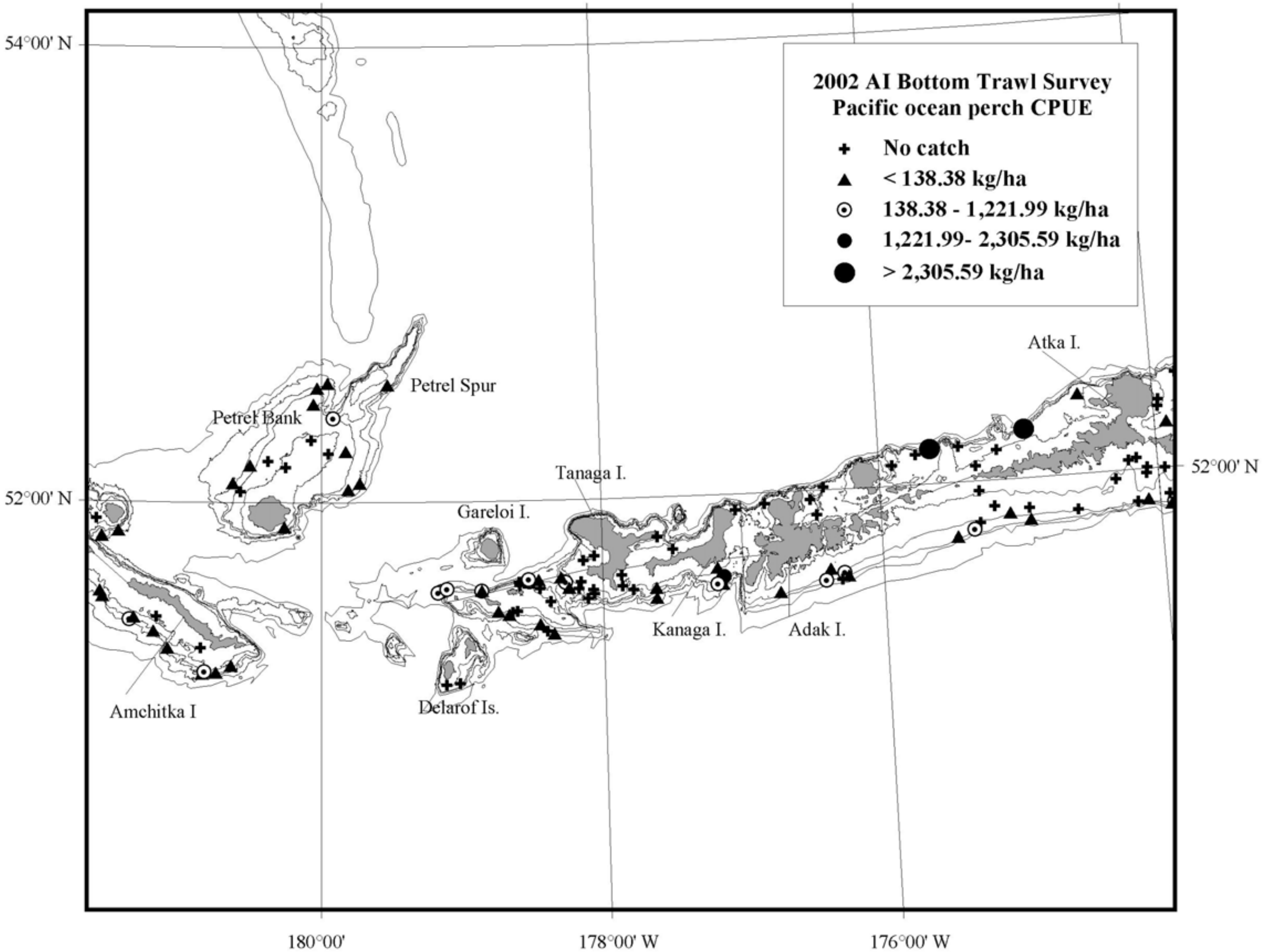


Figure 45.--Distribution and relative abundance of Pacific ocean perch from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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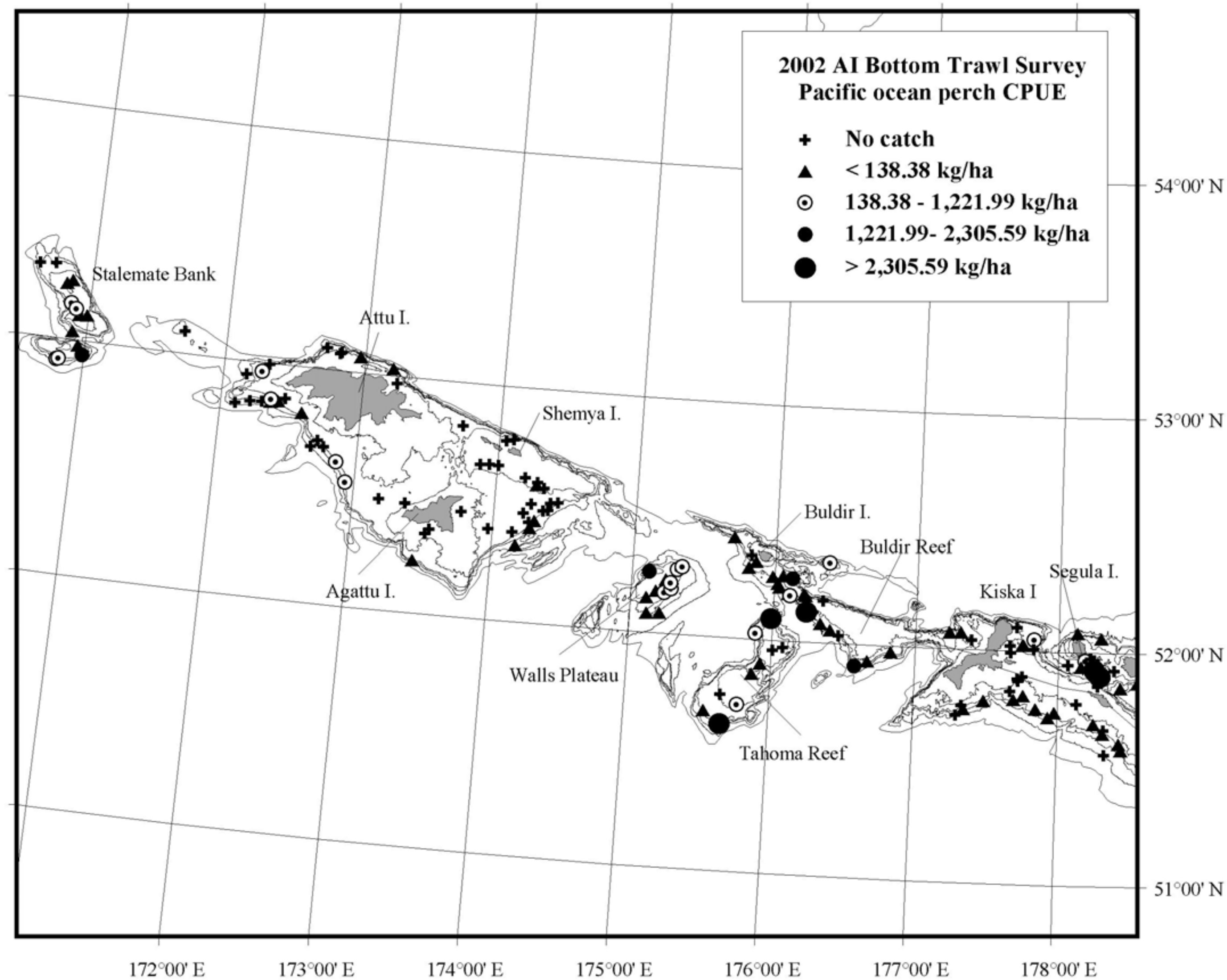


Figure 45.--(Continued).

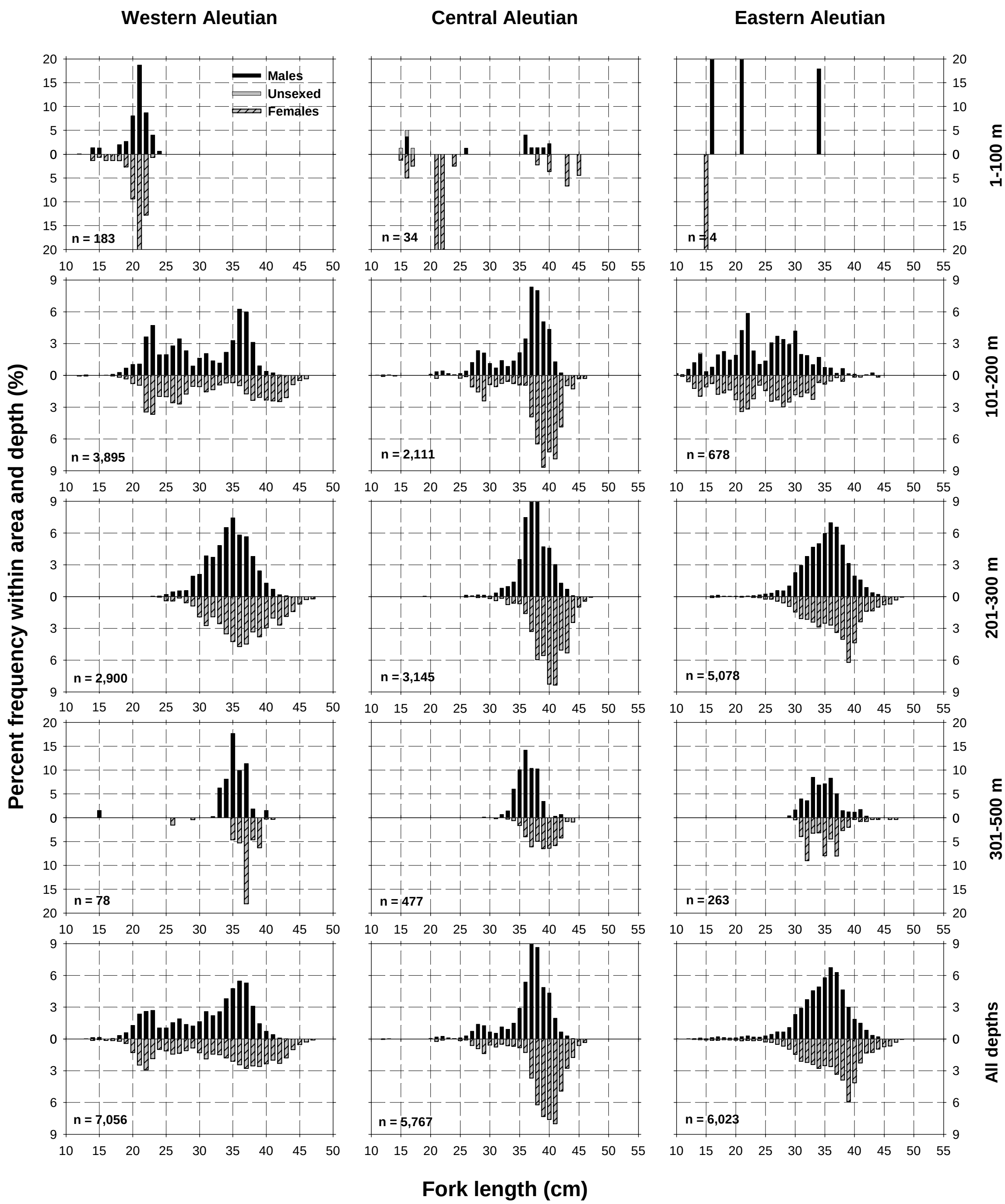


Figure 46.--Size composition of the estimated Pacific ocean perch population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

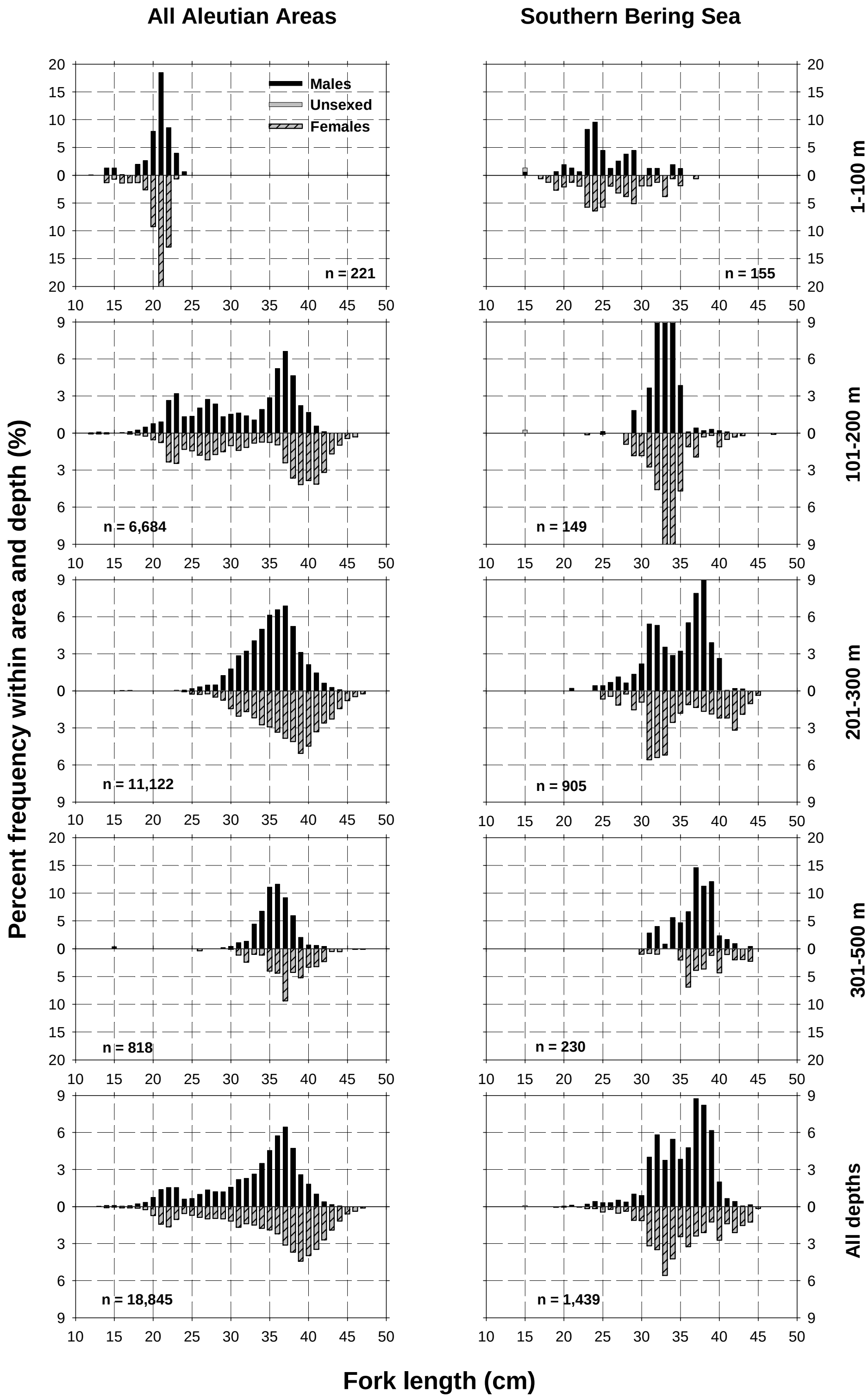


Figure 46.--(Pacific ocean perch, continued).

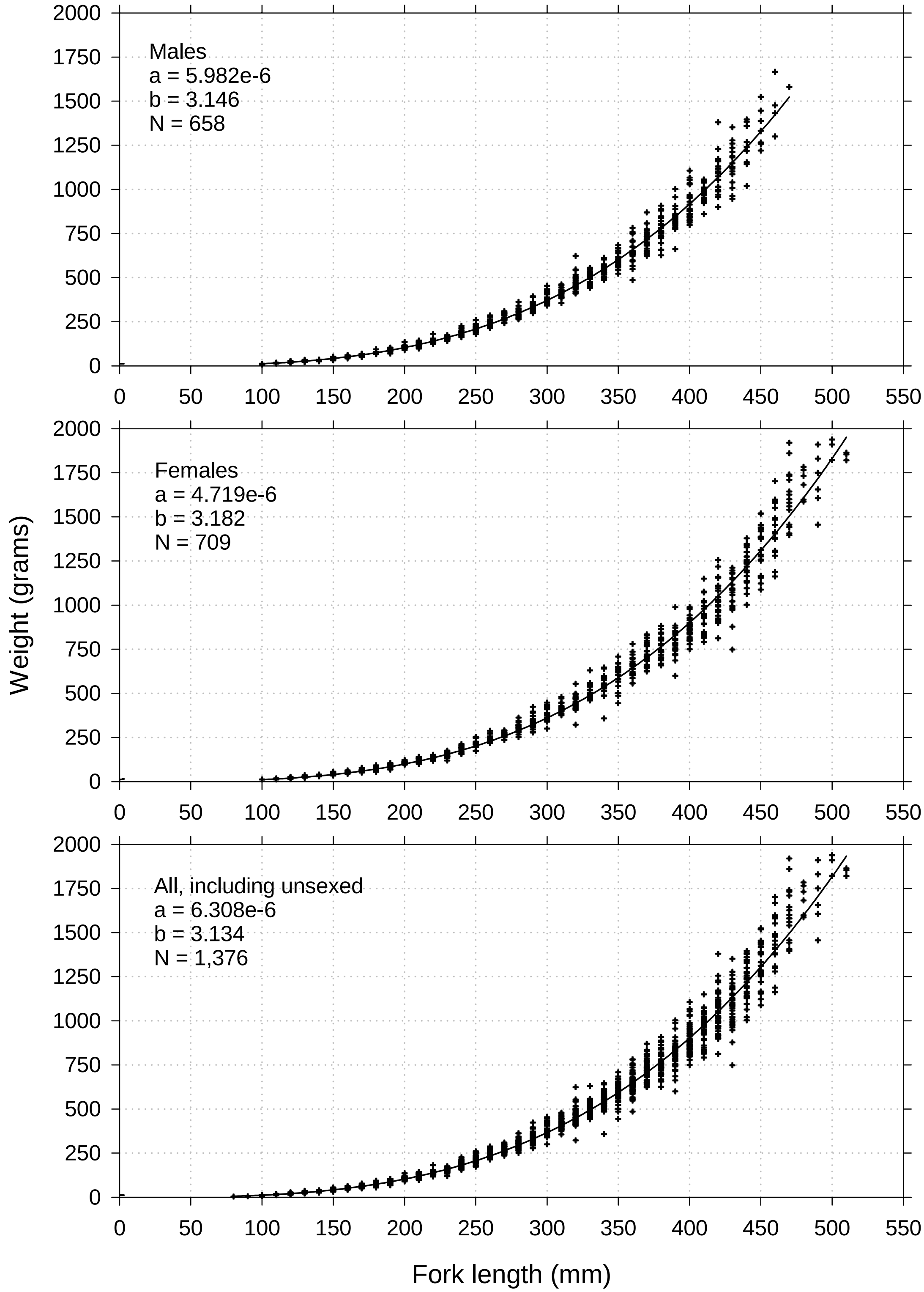


Figure 47.--Length-weight relationship for Pacific ocean perch specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Northern rockfish (*Sebastes polyspinus*)

Northern rockfish relative abundance was highest in the Western Aleutian area and decreased rapidly to the east (Table 2). Figure 8 shows that the largest catches of northern rockfish occurred west of 180° longitude, which bisects the Central Aleutian area. Only one relatively large catch occurred east of 180°, SW of Tanaga Island. Estimated total survey biomass was slightly more than 176,000 t, with about 76% found in the Western Aleutian area (Table 37), and in depths of 101-200 m. Estimated biomass in the Western Aleutian area in the 101-200 m depth interval was 101,000 t, about 10,000 t higher than that of POP (Tables 35 and 37). Northern rockfish were encountered in relatively small numbers in the 201-300 m depth interval and rarely in trawl hauls deeper than 300 m. The distribution by depth is more similar to that of Atka mackerel than POP. Northern rockfish were captured in 42% of all successful survey tows conducted shallower than 300 m, and 49% of all successful tows shallower than 200 m.

The highest catch rate of northern rockfish occurred in 101-200 m in the SW Central Aleutian subarea, between Amchitka and Kiska Islands. All but one tow in that subarea caught northern rockfish (Table 38). The next three highest ranked mean CPUEs were from the Western Aleutian area, notably from Stalemate Bank, Buldir Reef, and Tahoma Reef (Fig. 48). Mean individual length and weight increased with depth to 300 m. In the Western Aleutian area, the size composition modes for both sexes occurred at about 25 and 29 cm in the 1-100 m depth interval and about 30 cm in 101-200 m (Fig. 49). Size compositions in the Central and Eastern Aleutian areas, although representing a smaller biomass, were more heavily weighted toward females with the primary mode closer to 35 cm. The primary modes in the size compositions of both males and females in all Aleutian areas combined were at 30 cm, but larger females represented a greater proportion of the population than larger males.

Figure 50 depicts length-weight relationships for male, female, and combined sexes of northern rockfish. The male and female regression curves are very similar, but the maximum lengths for females are slightly larger than for males.

Table 37.--Number of survey hauls, number of hauls with northern rockfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	12	68.31	33,315	7,151	59,478	0.237	25.7
Aleutian	101-200	51	33	190.21	101,145	14,050	188,241	0.384	29.5
	201-300	19	8	0.34	59	0	129	0.417	31.5
	301-500	13	0	-	-	-	-	-	-
	All depths	109	53	88.56	134,519	43,939	225,100	0.333	28.2
Central	1-100	30	5	15.37	8,987	0	26,314	0.295	27.0
Aleutian	101-200	45	24	63.16	29,090	0	59,331	0.526	33.3
	201-300	23	13	0.48	100	38	163	0.491	32.3
	301-500	17	2	0.03	12	0	35	0.491	31.8
	All depths	115	44	23.09	38,189	4,435	71,943	0.444	31.1
Eastern	1-100	16	5	1.34	917	0	2,504	0.470	31.4
Aleutian	101-200	47	17	1.31	1,018	0	2,203	0.604	34.2
	201-300	42	14	2.62	1,286	0	3,532	0.692	36.4
	301-500	27	3	0.04	21	0	45	0.747	37.5
	All depths	132	39	1.29	3,242	349	6,135	0.587	33.9
All	1-100	72	22	24.60	43,218	12,604	73,833	0.250	26.0
Aleutian	101-200	143	74	74.19	131,254	39,432	223,075	0.410	30.2
Areas	201-300	84	35	1.65	1,446	0	3,693	0.656	35.7
	301-500	57	5	0.03	32	3	62	0.628	34.3
	All depths	356	136	30.90	175,950	79,262	272,638	0.355	28.7
Southern	1-100	30	6	0.52	209	0	602	0.382	29.0
Bering Sea	101-200	16	7	0.33	61	6	117	0.461	31.3
	201-300	7	3	0.35	20	0	51	0.698	35.3
	301-500	8	0	-	-	-	-	-	-
	All depths	61	16	0.39	290	0	687	0.410	29.7

Table 38.--Sampling effort, CPUE, and biomass with 95% confidence limits (CL) of northern rockfish, by NPFMC regulatory area and survey subarea, ranked by descending CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	101-200	SW Central Aleutian	17	16	243.28	25,600	0	55,517
Western Aleutian	101-200	W Western Aleutian	28	12	197.46	80,272	0	166,240
Western Aleutian	1-100	E Western Aleutian	10	9	173.46	20,526	0	41,113
Western Aleutian	101-200	E Western Aleutian	23	21	166.66	20,873	5,718	36,028
Central Aleutian	1-100	N Central Aleutian	14	2	38.90	8,190	0	25,599
Central Aleutian	101-200	SE Central Aleutian	14	4	37.58	2,825	0	8,844
Western Aleutian	1-100	W Western Aleutian	16	3	34.63	12,789	0	31,403
Central Aleutian	101-200	N Central Aleutian	8	4	6.23	664	0	1,927
Eastern Aleutian	201-300	NE Eastern Aleutian	22	3	5.74	1,131	0	3,379
Eastern Aleutian	1-100	SE Eastern Aleutian	5	4	5.19	904	0	2,617
Eastern Aleutian	101-200	SE Eastern Aleutian	15	9	5.17	982	0	2,174
Central Aleutian	1-100	SE Central Aleutian	7	1	3.23	376	0	1,297
Central Aleutian	1-100	SW Central Aleutian	5	2	2.60	421	0	1,507
Central Aleutian	201-300	N Central Aleutian	10	6	0.93	41	0	83
Southern Bering	1-100	E Southern Bering Sea	27	6	0.86	209	0	603
Eastern Aleutian	201-300	NW Eastern Aleutian	2	2	0.75	12	0	94
Western Aleutian	201-300	W Western Aleutian	9	5	0.57	53	0	124
Eastern Aleutian	201-300	SE Eastern Aleutian	12	7	0.56	115	0	236
Central Aleutian	201-300	SW Central Aleutian	6	3	0.50	21	0	49
Central Aleutian	201-300	SE Central Aleutian	4	2	0.45	22	0	70
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	0.41	29	0	97
Southern Bering	101-200	E Southern Bering Sea	11	4	0.38	45	0	99
Southern Bering	201-300	Combined Southern Bering	7	3	0.35	20	0	52
Southern Bering	101-200	W Southern Bering Sea	5	3	0.24	16	0	39
Central Aleutian	201-300	Petrel Bank	3	2	0.22	17	0	64
Central Aleutian	301-500	SW Central Aleutian	2	1	0.09	7	0	96
Eastern Aleutian	101-200	NE Eastern Aleutian	17	4	0.08	17	0	36
Western Aleutian	201-300	E Western Aleutian	10	3	0.07	6	0	13
Eastern Aleutian	1-100	SW Eastern Aleutian	5	1	0.07	13	0	48
Eastern Aleutian	101-200	SW Eastern Aleutian	9	3	0.06	15	0	34
Eastern Aleutian	301-500	SE Eastern Aleutian	12	2	0.06	15	0	37
Central Aleutian	301-500	N Central Aleutian	8	1	0.04	5	0	16
Eastern Aleutian	101-200	NW Eastern Aleutian	6	1	0.03	5	0	18
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	1	0.02	6	0	19

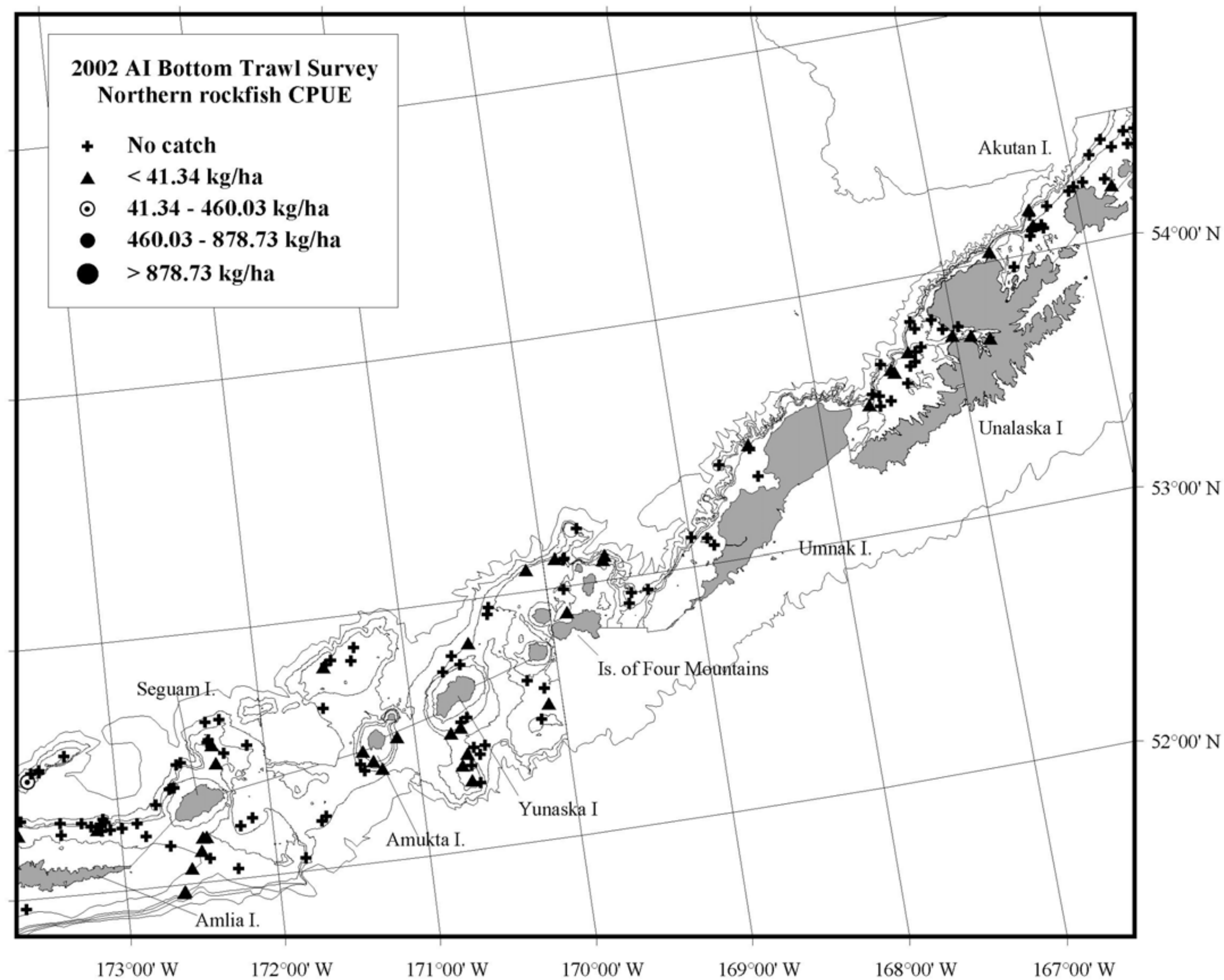
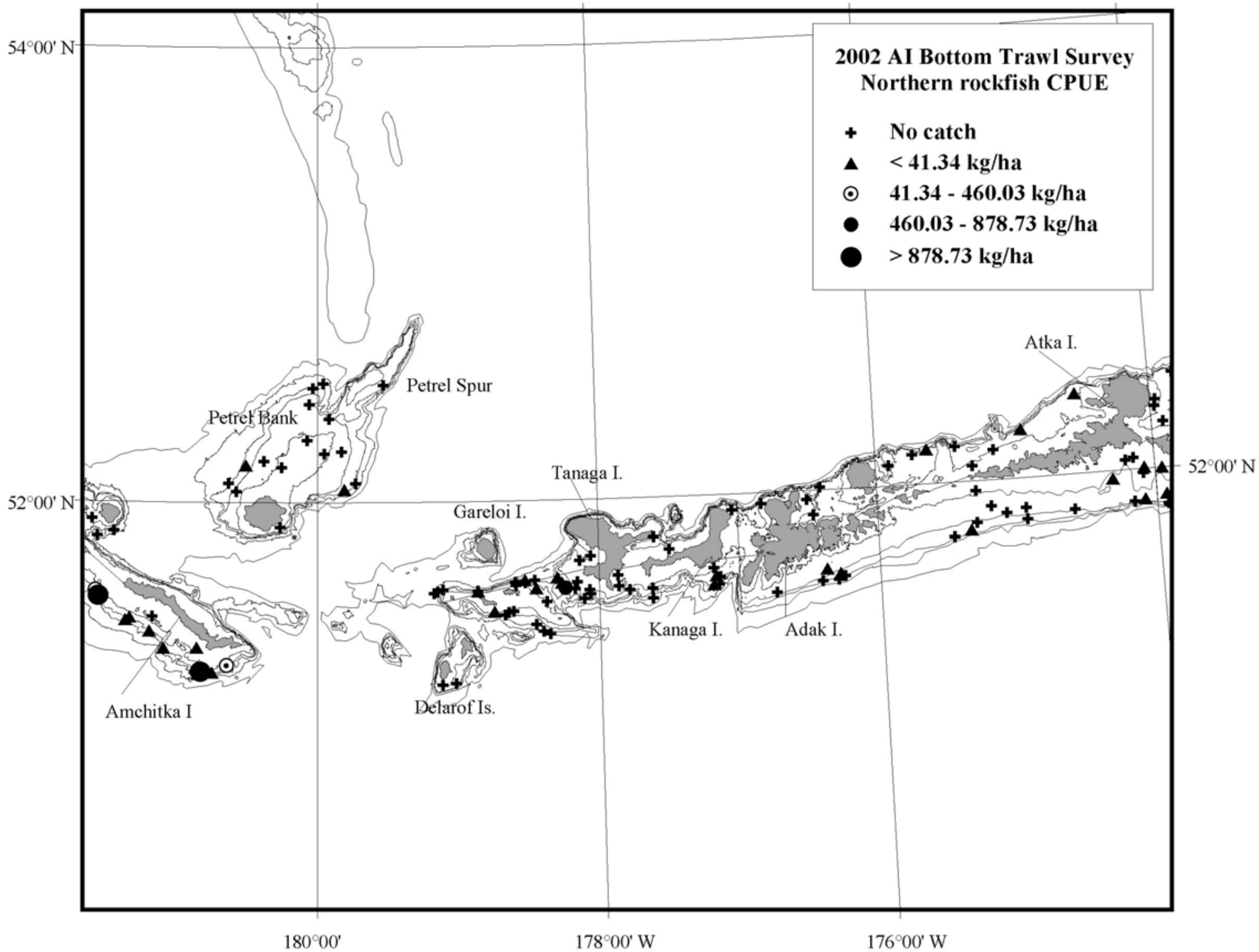


Figure 48.--Distribution and relative abundance of northern rockfish from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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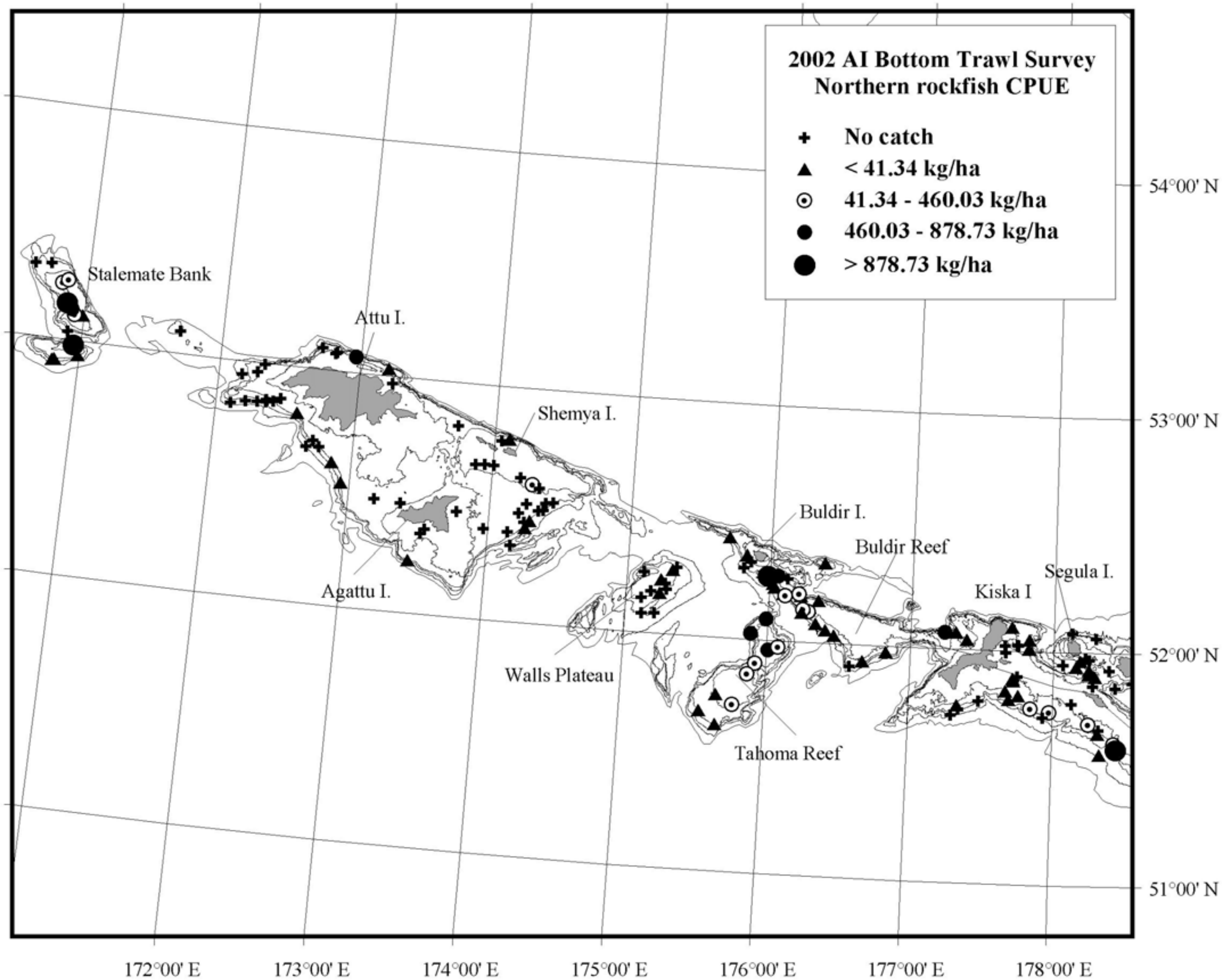

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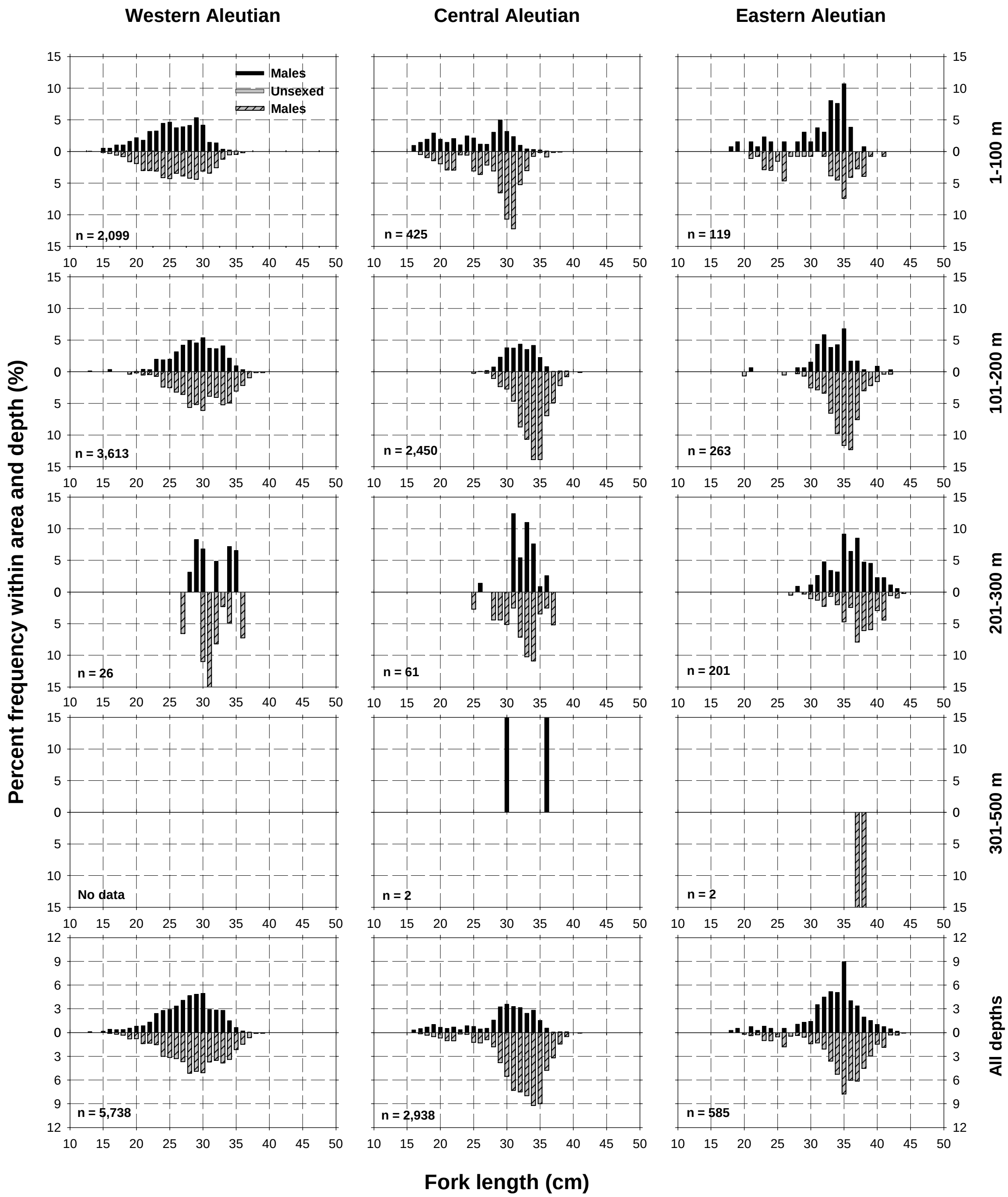


Figure 49.--Size composition of the estimated northern rockfish population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

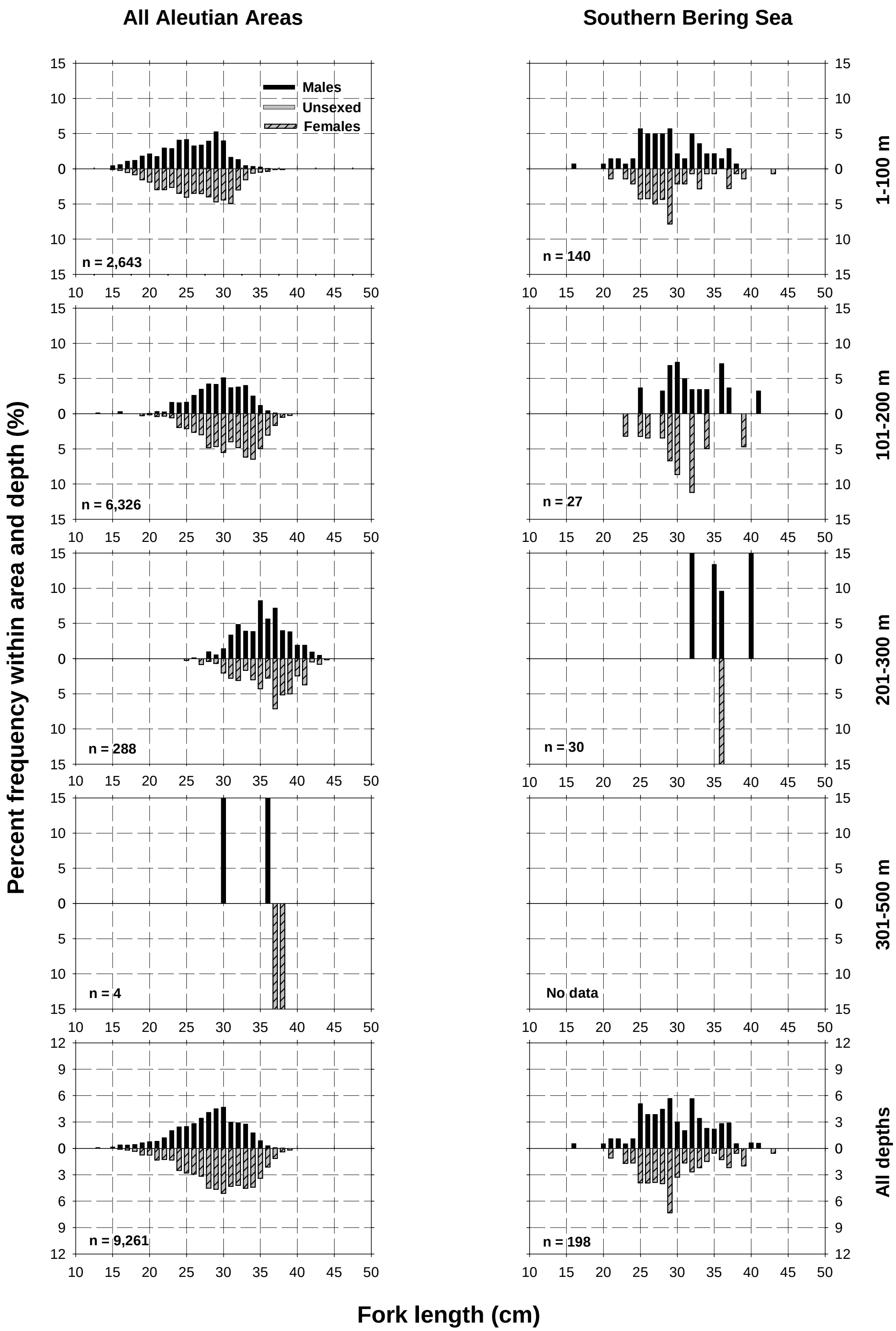


Figure 49.--(Northern rockfish, continued).

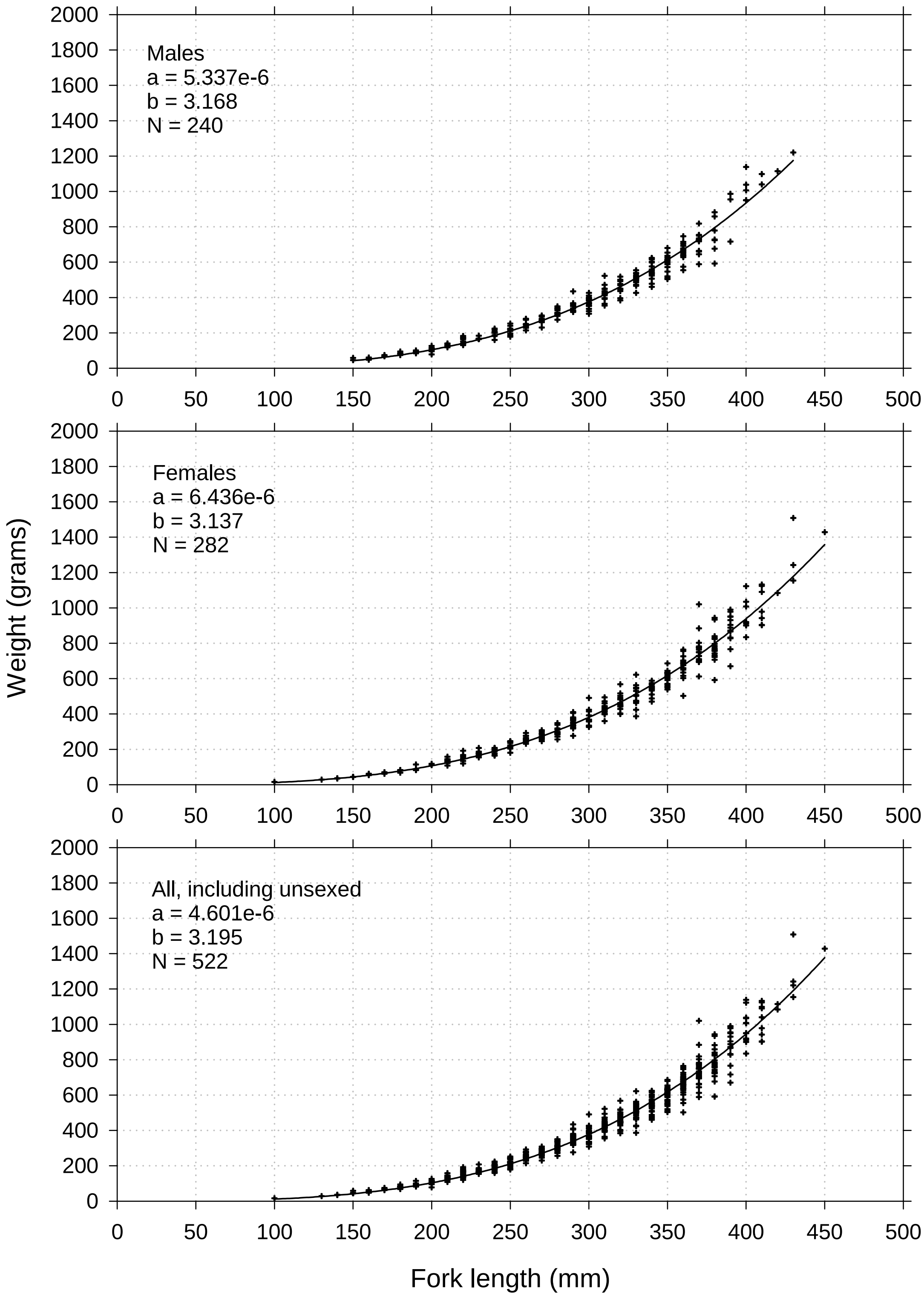


Figure 50.--Length-weight relationship for northern rockfish specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{\ b}$.

Shortraker rockfish (*Sebastes borealis*)

Shortraker rockfish mean CPUE was higher than that of rougheye rockfish in all major survey areas except the Eastern Aleutian area (Table 2). The estimated biomass for this species is distributed by depth similarly to that of rougheye rockfish (Tables 39 and 41). A higher proportion, about 16%, of the total shortraker rockfish biomass estimated from the 1980 U.S.-Japan cooperative Aleutian trawl survey was found in the 501-900 m depth interval (Ronholt et al. 1986). Thus, estimates from the 2002 AFSC survey are likely to have excluded a relatively large part of the shortraker rockfish population. The highest four area-specific mean CPUEs were from the three Central Aleutian subareas, and the far-western section of the Western Aleutian area, all in the 301-500 m depth interval (Table 40). All trawl hauls in those subareas produced catches of shortraker rockfish. Three catches accounted for the entire biomass estimate in the Southern Bering Sea area (Table 39).

Notable individual catches of shortraker rockfish occurred between Unalaska and Umnak Islands, between Adak Island and the Delarof Islands, east of Kiska Island (Segula Island), and on Stalemate Bank (Fig. 51). Given the frequency of catch occurrences, it appears that the south side of the archipelago between Adak Island and the Delarof Islands is an area favorable for shortraker rockfish.

Size compositions of males and females from the combined Aleutian areas were similar, although somewhat more of the largest fish were females (Fig. 52). Females were slightly more abundant (52%) in length frequency samples. The average size of fish in the 301-500 m depth interval was smaller than in shallower depths (Table 39). That depth interval, with its high estimated biomass, most likely contains a broader cross-section of the shortraker rockfish population. Figure 53 presents length-weight relationships for both sexes and combined sexes of shortraker rockfish.

Table 39.--Number of survey hauls, number of hauls with shortraker rockfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	**Depth (m)**	**Number of trawl hauls**	**Hauls with catch**	**Mean CPUE (kg/ha)**	**Estimated biomass (t)**	**Minimum biomass (t)**	**Maximum biomass (t)**	**Mean weight (kg)**	**Mean length (cm)**
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	1	0.24	41	0	133	7.272	74.0
	301-500	13	13	11.94	3,906	0	8,607	1.790	44.0
	All depths	109	14	2.60	3,947	0	8,649	1.804	44.1
Central	1-100	30	2	0.09	51	0	135	2.872	54.1
Aleutian	101-200	45	2	0.45	207	0	669	3.611	56.6
	201-300	23	5	3.01	636	0	1,509	4.318	58.6
	301-500	17	15	19.45	7,745	3,232	12,257	1.896	47.1
	All depths	115	24	5.22	8,638	4,021	13,254	2.005	47.6
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	0	-	-	-	-	-	-
	201-300	42	3	0.29	142	0	356	2.081	47.7
	301-500	27	13	4.67	2,655	1,145	4,165	1.810	46.3
	All depths	132	16	1.11	2,797	1,273	4,321	1.822	46.4
All	1-100	72	2	0.03	51	0	135	2.872	54.1
Aleutian	101-200	143	2	0.12	207	0	669	3.611	56.6
Areas	201-300	84	9	0.94	818	0	1,660	3.705	55.6
	301-500	57	41	11.06	14,306	8,060	20,552	1.850	46.1
	All depths	356	54	2.70	15,382	9,066	21,697	1.915	46.4
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	1	0.11	6	0	22	2.342	52.0
	301-500	8	2	13.97	1,457	0	3,659	3.780	55.9
	All depths	61	3	1.96	1,463	0	3,666	3.770	55.9

Table 40.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of shortraker rockfish by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	301-500	SE Central Aleutian	4	4	33.05	2,361	1,251	3,471
Central Aleutian	301-500	N Central Aleutian	8	8	30.17	3,740	0	8,333
Western Aleutian	301-500	W Western Aleutian	11	11	20.19	3,455	0	8,210
Central Aleutian	301-500	SW Central Aleutian	2	2	14.27	1,127	0	3,769
Southern Bering	301-500	Combined Southern Bering	8	2	13.97	1,457	0	3,716
Central Aleutian	201-300	N Central Aleutian	10	3	13.65	599	0	1,485
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	9.22	404	177	631
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	7	5.03	1,343	234	2,451
Central Aleutian	301-500	Petrel Bank	3	1	4.18	517	0	2,741
Eastern Aleutian	301-500	SE Eastern Aleutian	12	4	3.53	909	0	2,070
Western Aleutian	301-500	E Western Aleutian	2	2	2.89	451	0	1,409
Central Aleutian	101-200	N Central Aleutian	8	1	1.88	200	0	674
Central Aleutian	201-300	SE Central Aleutian	4	2	0.76	36	0	105
Western Aleutian	201-300	E Western Aleutian	10	1	0.53	41	0	134
Eastern Aleutian	201-300	SE Eastern Aleutian	12	1	0.45	93	0	297
Eastern Aleutian	201-300	SW Eastern Aleutian	6	1	0.42	30	0	108
Central Aleutian	1-100	Petrel Bank	4	1	0.33	32	0	132
Southern Bering	201-300	Combined Southern Bering	7	1	0.11	6	0	22
Eastern Aleutian	201-300	NE Eastern Aleutian	22	1	0.09	19	0	57
Central Aleutian	1-100	N Central Aleutian	14	1	0.09	19	0	61
Central Aleutian	101-200	SE Central Aleutian	14	1	0.09	7	0	21

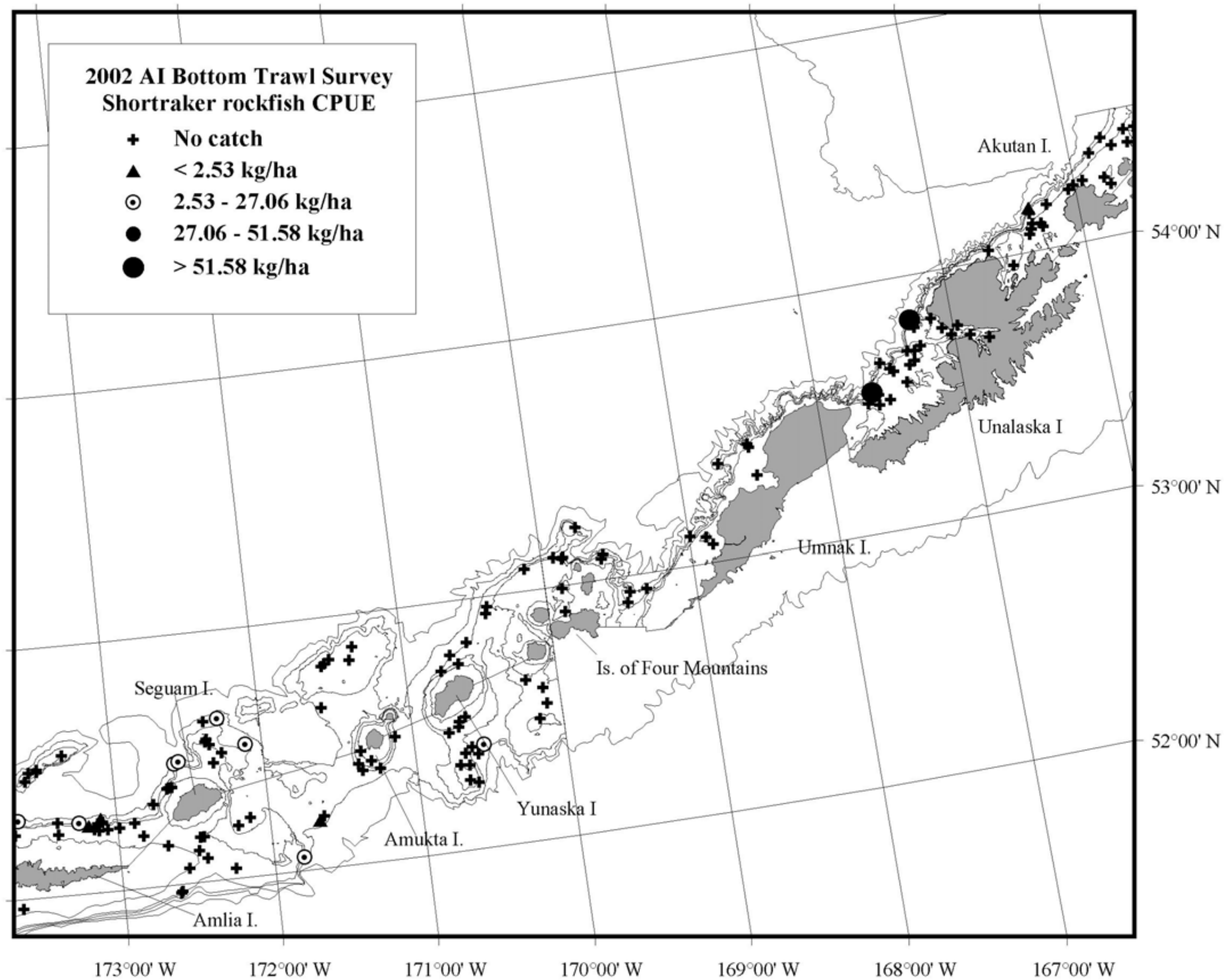
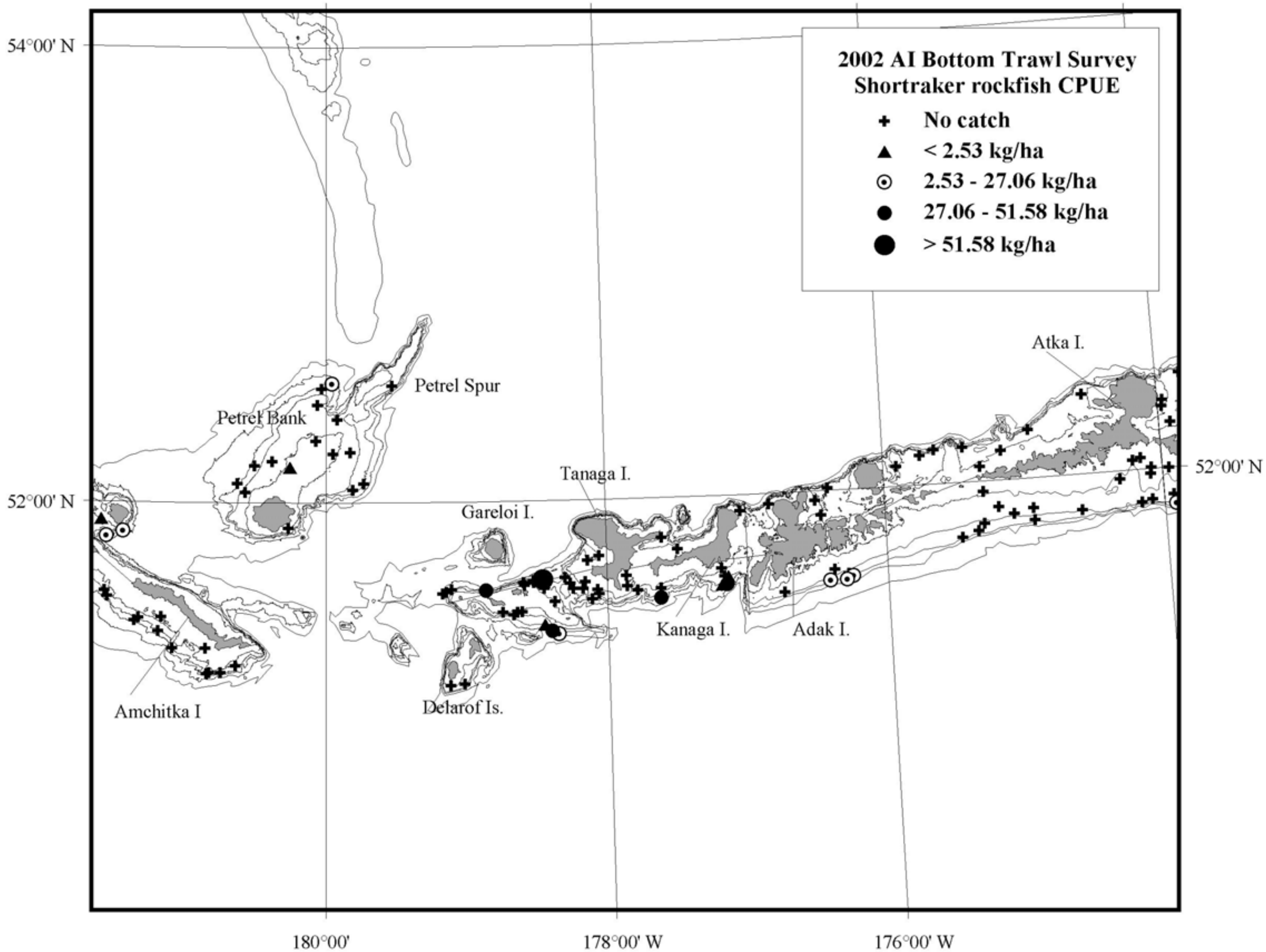


Figure 51.--Distribution and relative abundance of shortraker rockfish from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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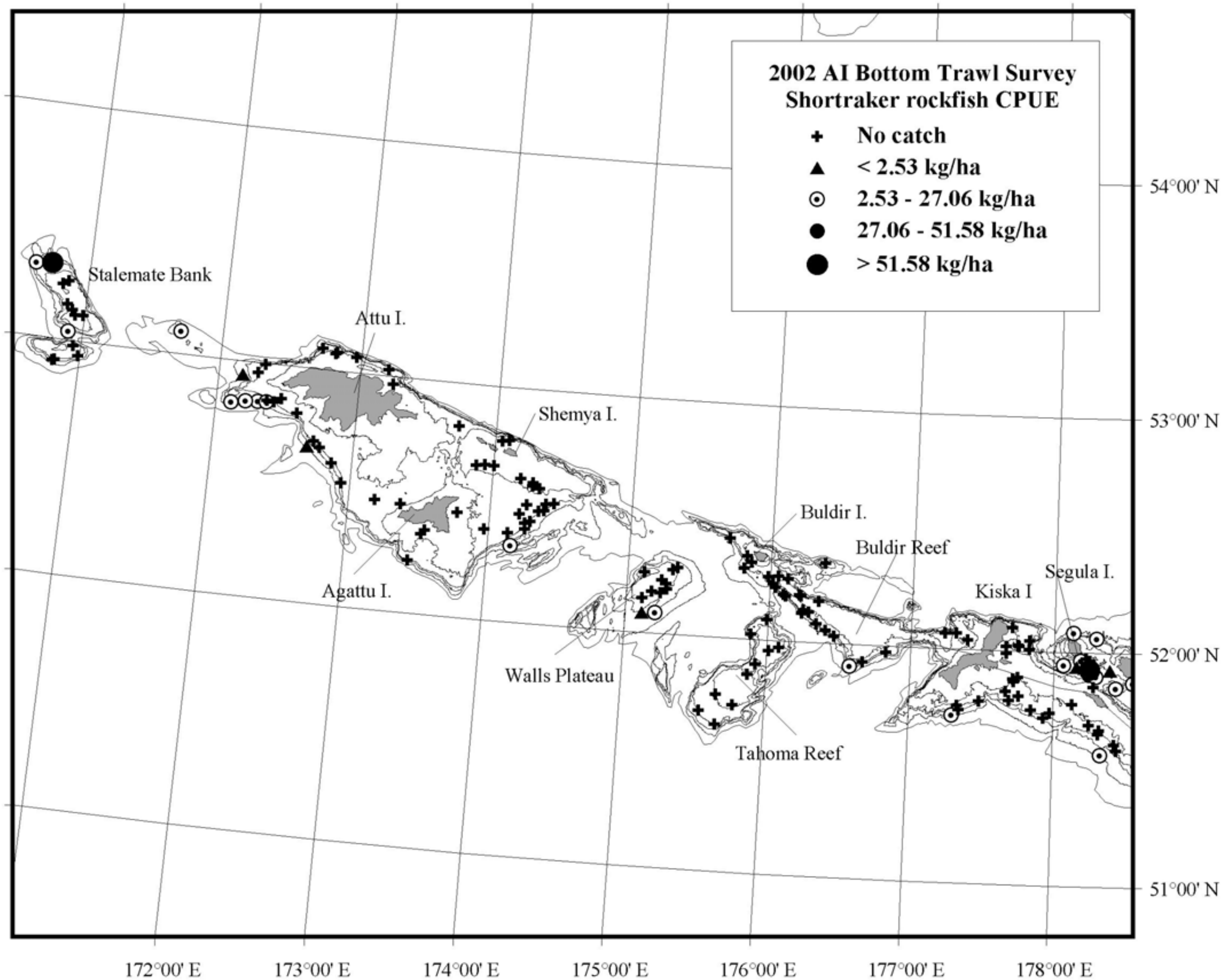

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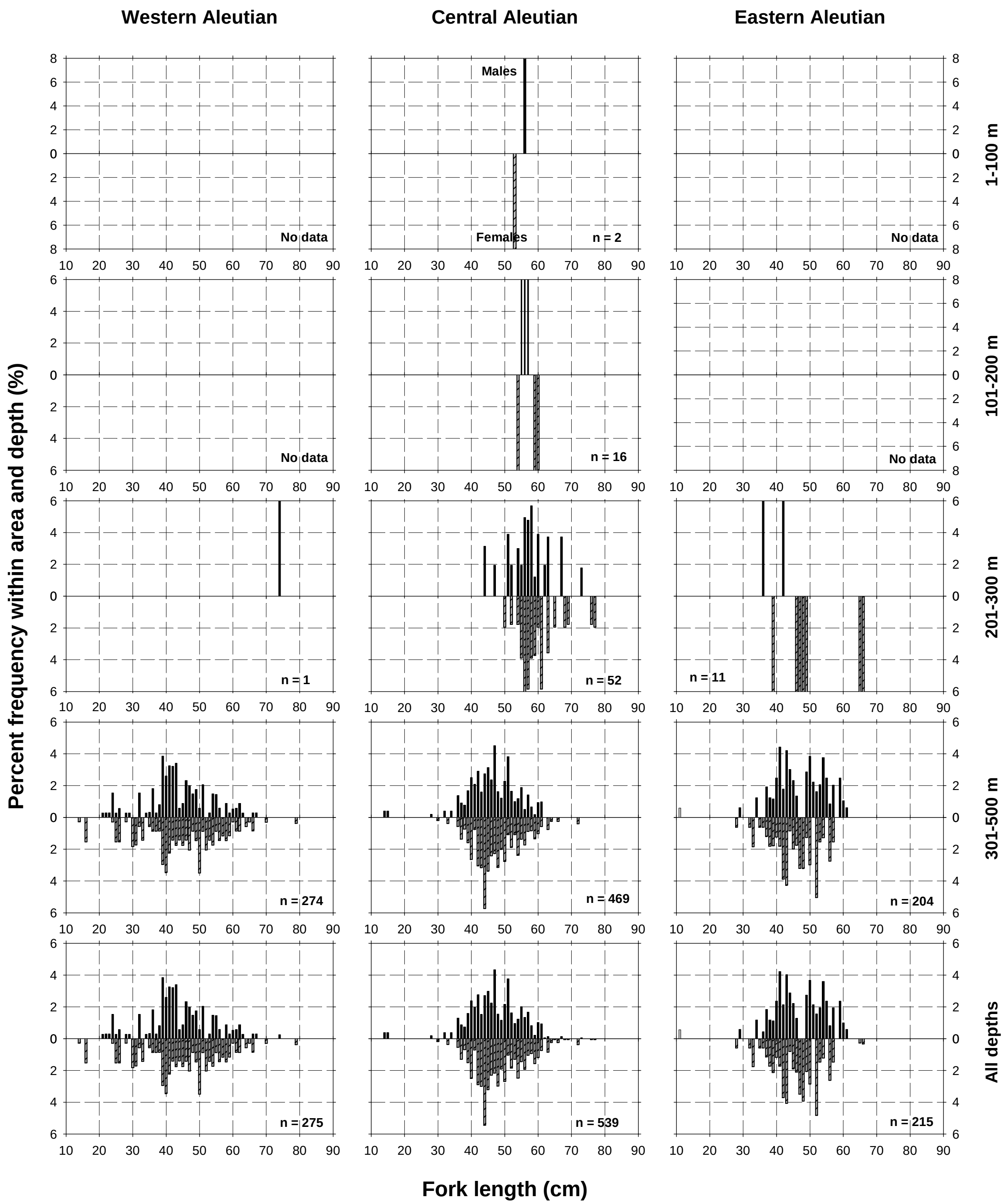


Figure 52.--Size composition of the estimated shortraker rockfish population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

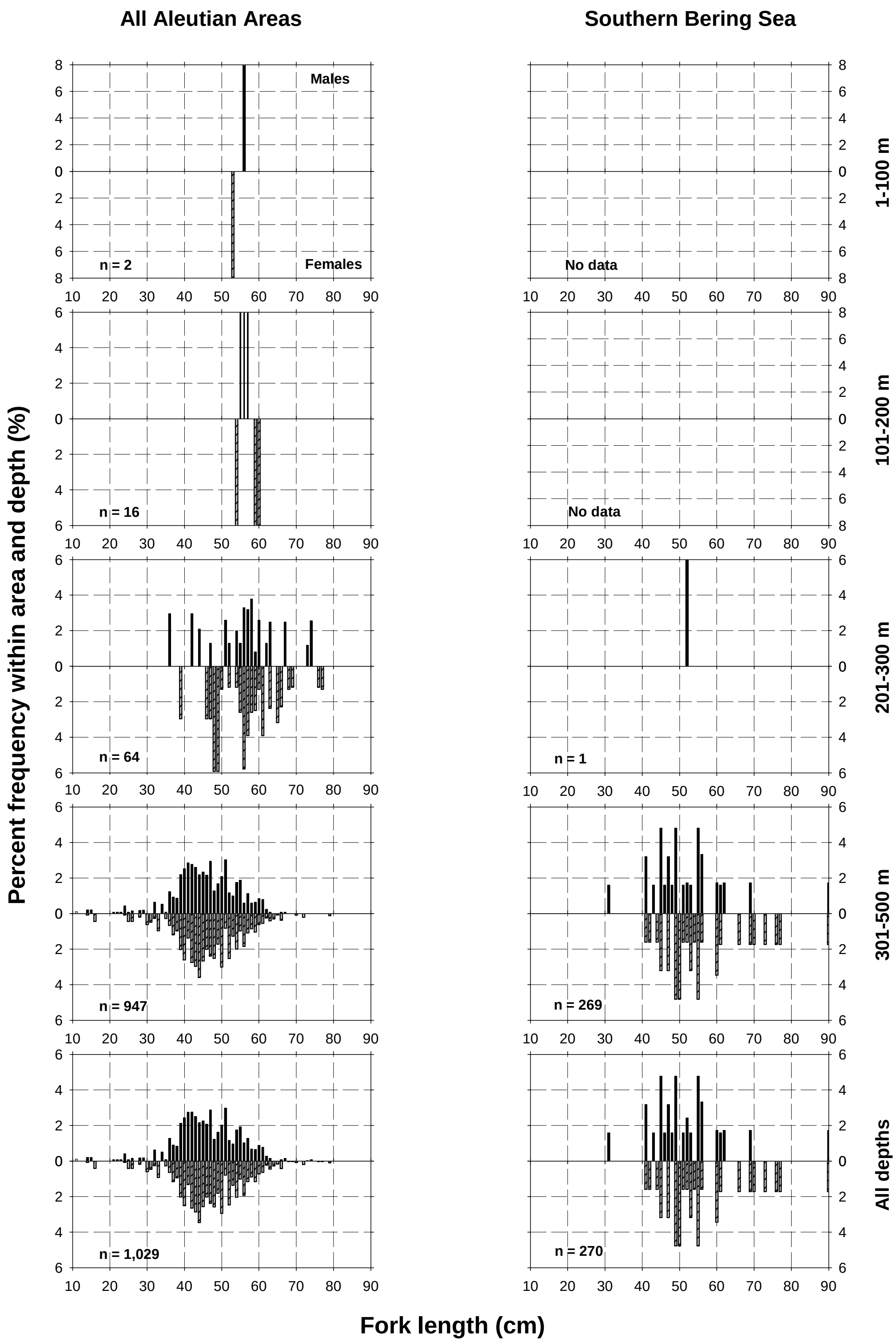


Figure 52.--(Shortraker rockfish, continued).

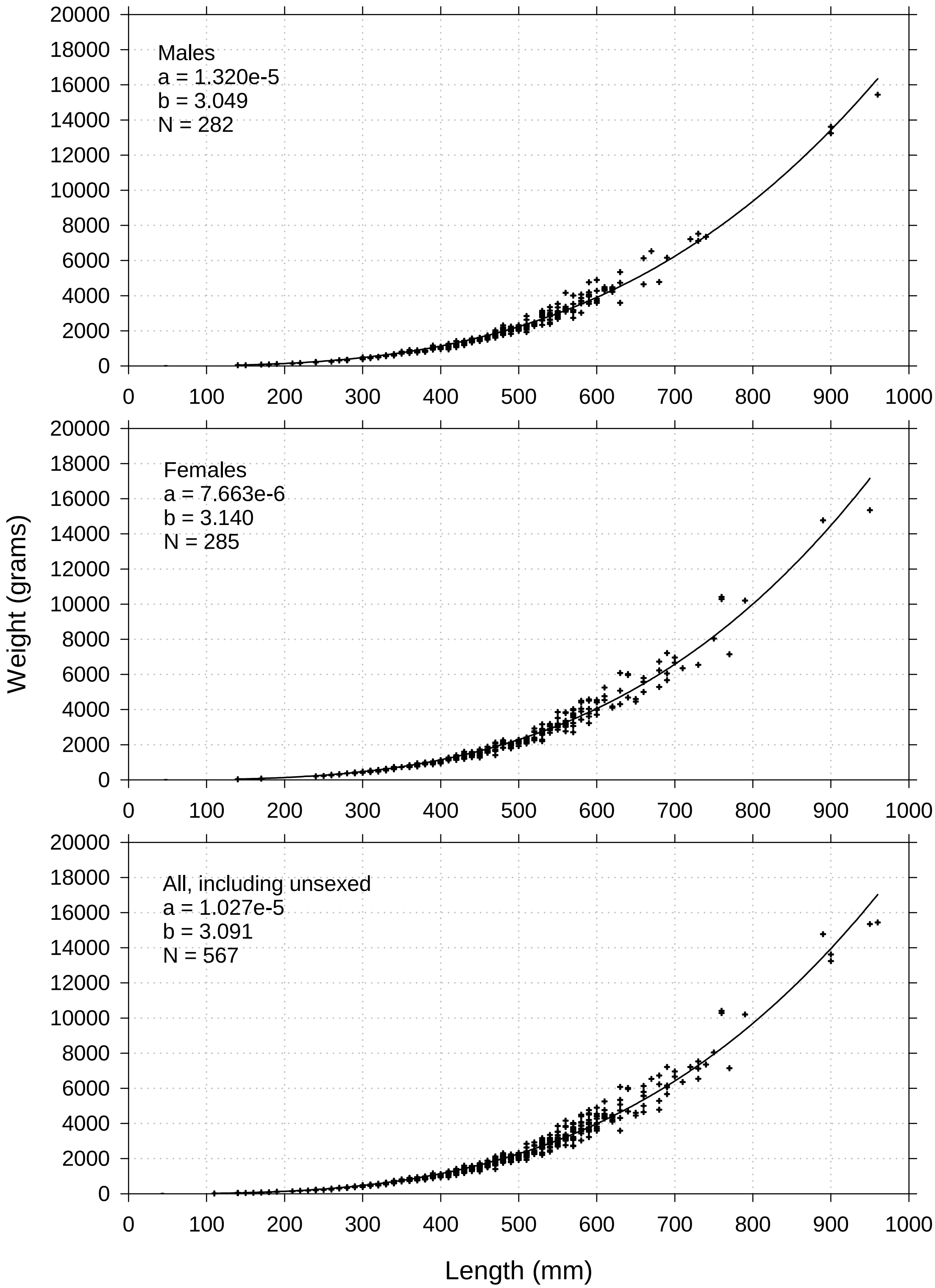


Figure 53.--Length-weight relationship for shortraker rockfish specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Rougheye rockfish (*Sebastes aleutianus*)

Rougheye rockfish mean CPUE was highest in the Central Aleutian area (Table 2). Generally abundance increased with depth with the exception of the Western Aleutian area where mean CPUE was highest in the 201-300 m depth interval (Table 41). The largest average rougheye rockfish lengths and weights were found in the 201-300 m depth interval, with the exception of the Eastern Aleutian area where the largest mean sizes were found in the 301-500 m interval. With the exception of one relatively large catch in each area, abundance in the Southern Bering Sea area and Eastern Aleutian area was relatively small. This survey appears to sample the majority of rougheye rockfish depth distribution, but probably not their preferred rough bottom topography. Ronholt et al. (1986) showed that 74% of the total Aleutian rougheye biomass occurred in the 301-500 m depth interval, and only 2% occurred at depths greater than 500 m.

The highest stratum-specific mean CPUEs were in the 201-300 m and 301-500 m depth intervals in the N Central Aleutian subarea, followed closely by the 301-500 m interval in the SW Eastern Aleutian subarea (Table 42). Notable individual catches of rougheye rockfish were made on the NW corner of Unalaska Island, SE of Atka Island, east of Kiska Island, and on Buldir Reef (Fig. 54).

Combined Aleutian size compositions for males and females mirrored each other to a large extent (Fig. 55), although a second female frequency mode at 46-47 cm was more accentuated than for males. Males outnumbered females slightly, comprising 55% of the measured rougheye rockfish. Figure 56 shows length-weight relationships for rougheye rockfish males, females, and combined sexes.

Table 41.--Number of survey hauls, number of hauls with rougheye rockfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	3	0.03	14	0	32	0.985	40.5
	201-300	19	6	5.51	950	0	2,839	1.792	46.5
	301-500	13	7	1.11	364	0	899	1.408	41.6
	All depths	109	16	0.87	1,328	0	3,195	1.654	44.8
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	3	0.05	21	0	48	1.397	43.3
	201-300	23	10	4.22	889	0	1,896	1.602	44.9
	301-500	17	15	7.60	3,024	916	5,132	1.423	43.9
	All depths	115	28	2.38	3,934	1,626	6,242	1.460	44.1
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	1	0.01	7	0	21	0.444	29.3
	201-300	42	9	0.64	313	0	653	0.945	38.5
	301-500	27	22	4.89	2,779	395	5,163	1.211	41.9
	All depths	132	32	1.23	3,099	691	5,508	1.173	41.4
All	1-100	72	0	-	-	-	-	-	-
Aleutian	101-200	143	7	0.02	42	7	76	0.936	37.6
Areas	201-300	84	25	2.46	2,153	50	4,256	1.519	44.0
	301-500	57	44	4.77	6,167	3,139	9,196	1.318	42.8
	All depths	356	76	1.47	8,361	4,734	11,989	1.362	43.1
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	3	0.52	95	0	204	0.403	27.8
	201-300	7	4	1.83	103	0	242	1.067	39.8
	301-500	8	7	10.09	1,053	0	2,437	0.819	44.2
	All depths	61	14	1.67	1,251	0	2,647	0.773	41.6

Table 42.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of rougheye rockfish by NPFMC regulatory area and survey subarea, ranked by descending CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	201-300	N Central Aleutian	10	5	19.15	841	0	1,862
Central Aleutian	301-500	N Central Aleutian	8	8	17.41	2,158	74	4,243
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	15.23	667	46	1,288
Western Aleutian	201-300	E Western Aleutian	10	4	11.62	911	0	2,827
Southern Bering	301-500	Combined Southern Bering	8	7	10.09	1,053	0	2,473
Central Aleutian	301-500	SE Central Aleutian	4	4	8.85	632	0	1,480
Eastern Aleutian	301-500	SE Eastern Aleutian	12	8	6.36	1,638	0	4,032
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	2.73	195	0	576
Southern Bering	201-300	Combined Southern Bering	7	4	1.83	103	0	247
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	12	1.77	473	236	711
Central Aleutian	301-500	SW Central Aleutian	2	1	1.57	124	0	1,695
Western Aleutian	301-500	W Western Aleutian	11	6	1.48	254	0	538
Central Aleutian	301-500	Petrel Bank	3	2	0.89	110	0	430
Central Aleutian	201-300	SW Central Aleutian	6	3	0.85	36	0	87
Southern Bering	101-200	E Southern Bering Sea	11	3	0.81	95	0	205
Western Aleutian	301-500	E Western Aleutian	2	1	0.70	110	0	1,506
Eastern Aleutian	201-300	SE Eastern Aleutian	12	4	0.52	106	0	222
Western Aleutian	201-300	W Western Aleutian	9	2	0.42	40	0	120
Central Aleutian	201-300	SE Central Aleutian	4	2	0.26	12	0	50
Western Aleutian	101-200	E Western Aleutian	23	3	0.11	14	0	32
Central Aleutian	101-200	SW Central Aleutian	17	2	0.10	11	0	26
Central Aleutian	101-200	N Central Aleutian	8	1	0.10	10	0	35
Eastern Aleutian	201-300	NE Eastern Aleutian	22	3	0.06	12	0	26
Eastern Aleutian	101-200	NE Eastern Aleutian	17	1	0.03	7	0	21

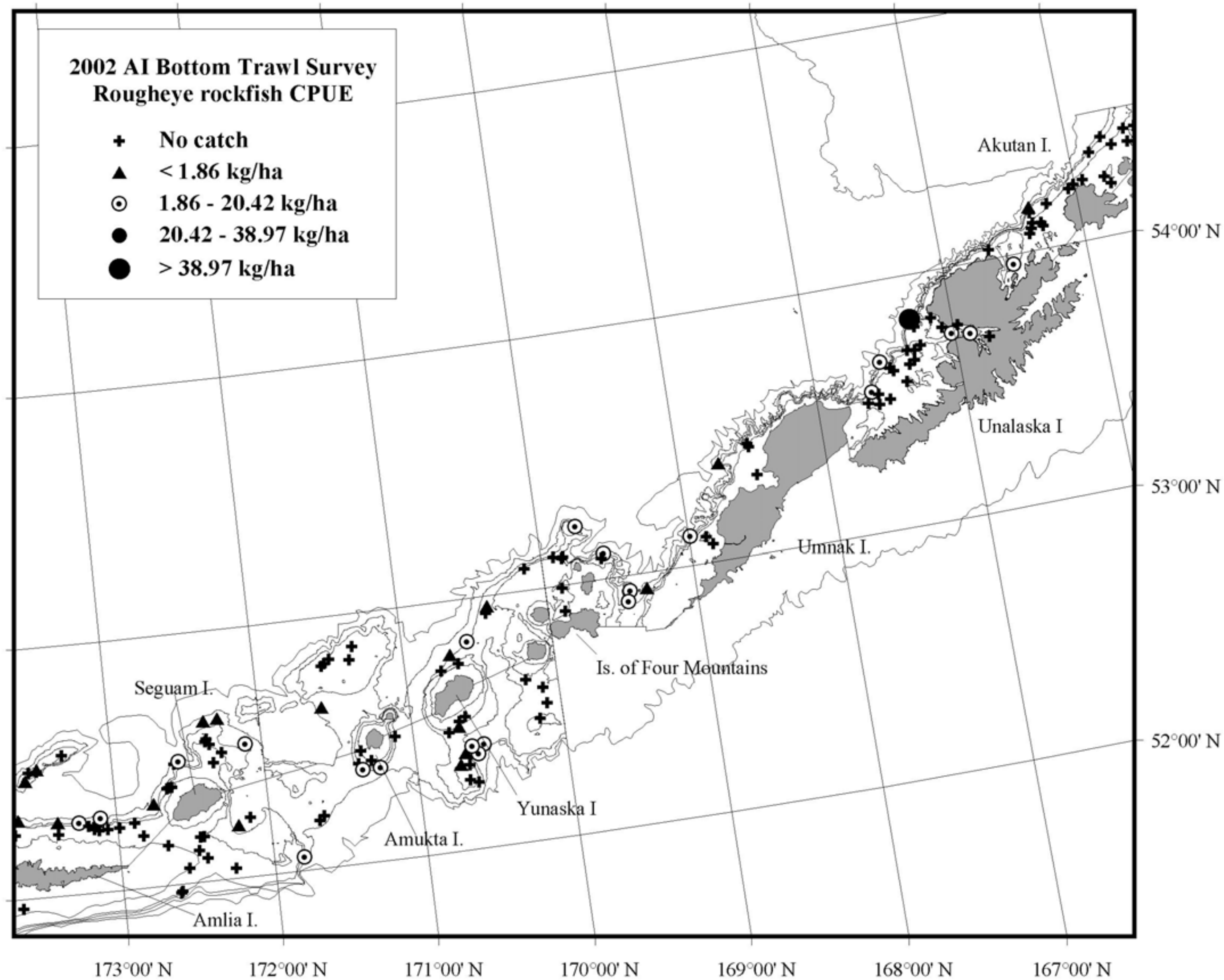
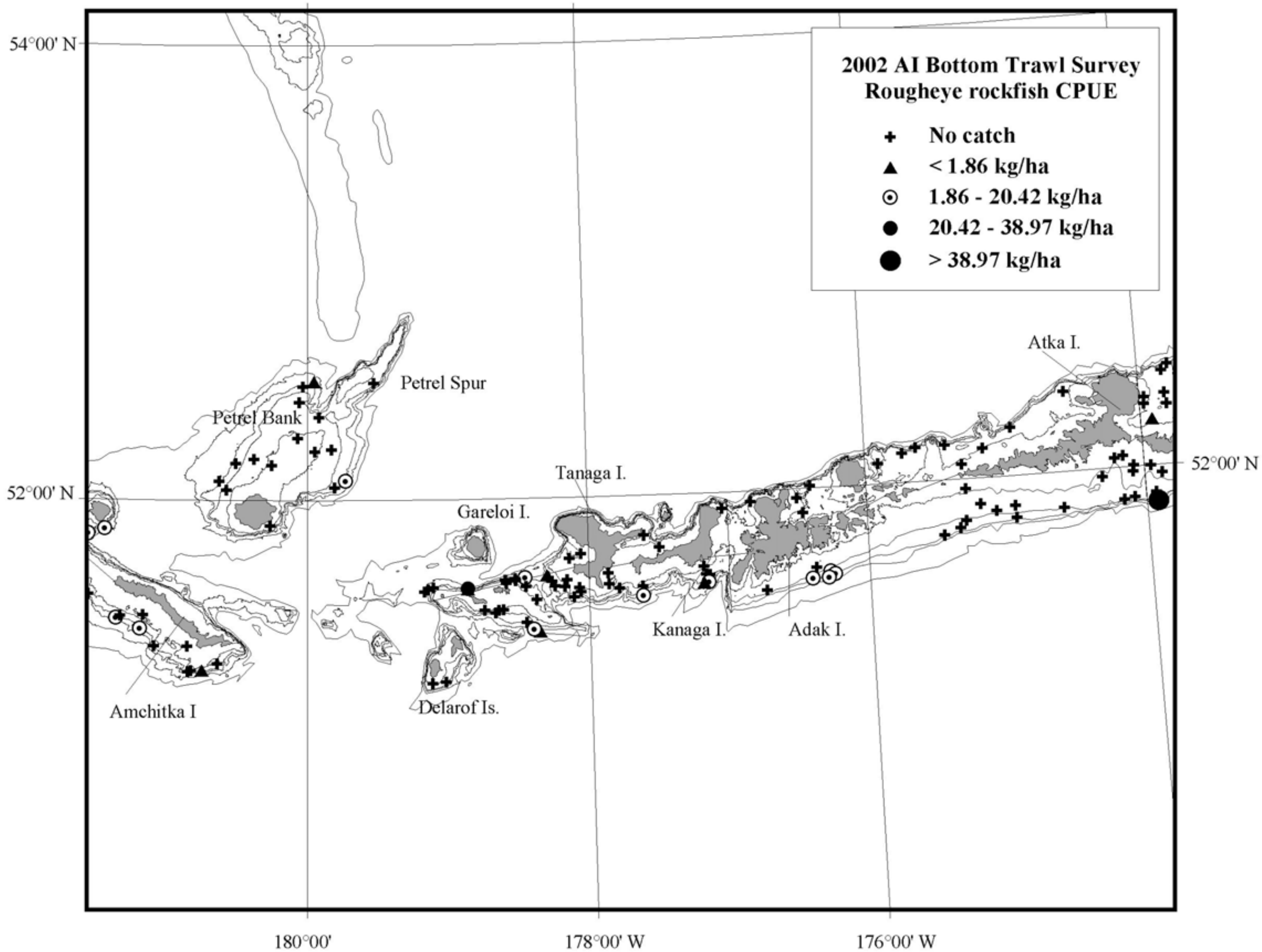


Figure 54.--Distribution and relative abundance of rougheye rockfish from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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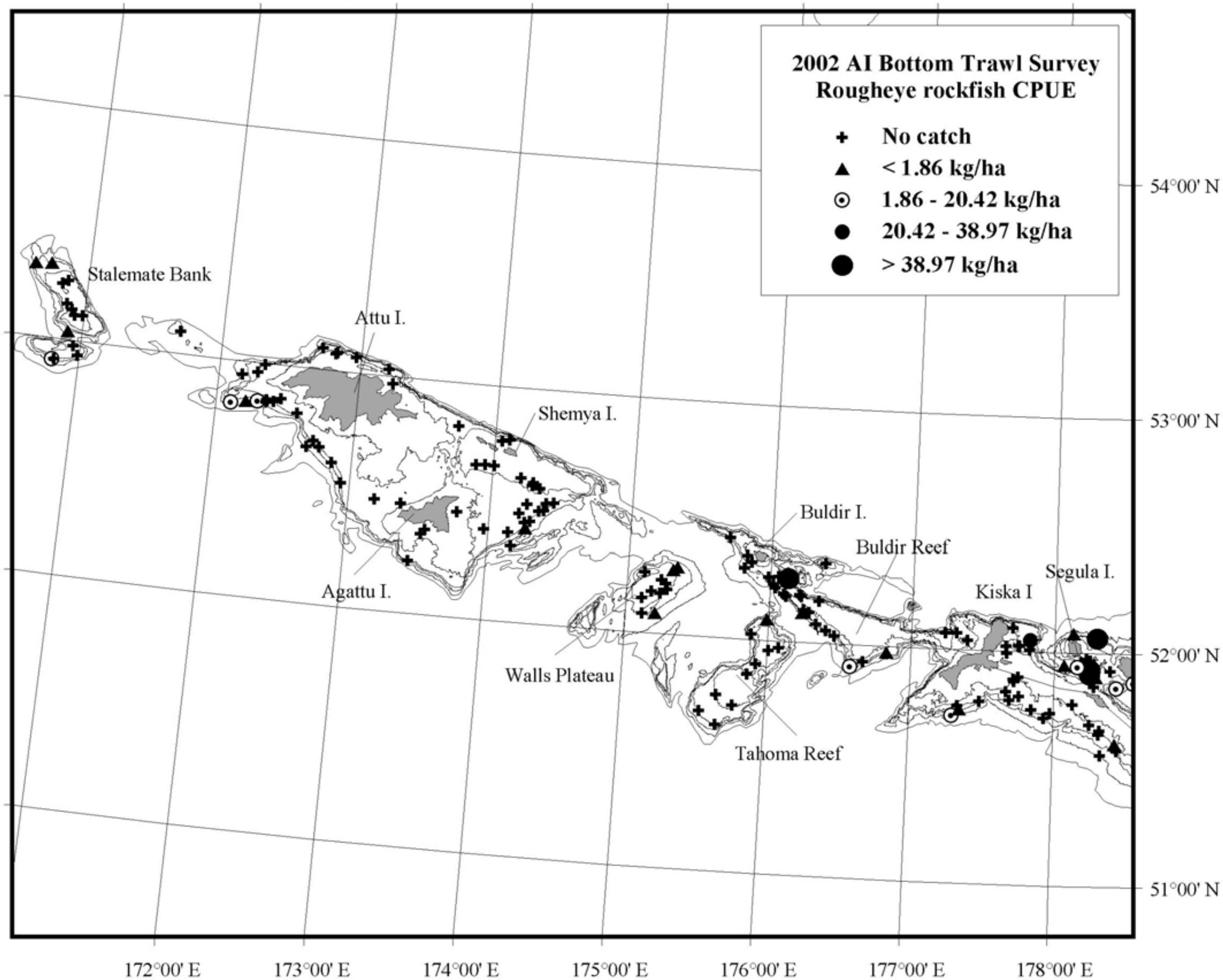

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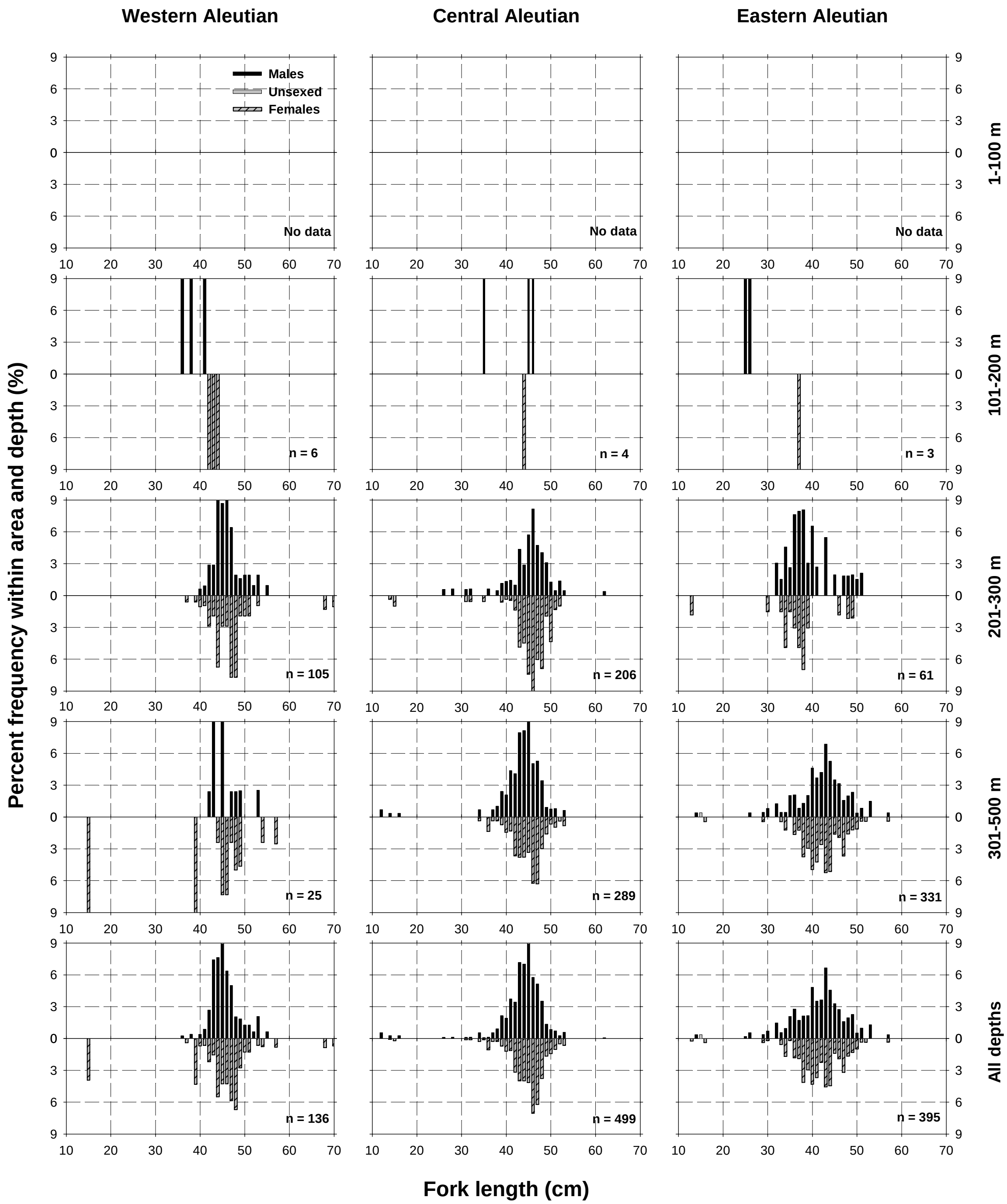


Figure 55.--Size composition of the estimated rougheye rockfish population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

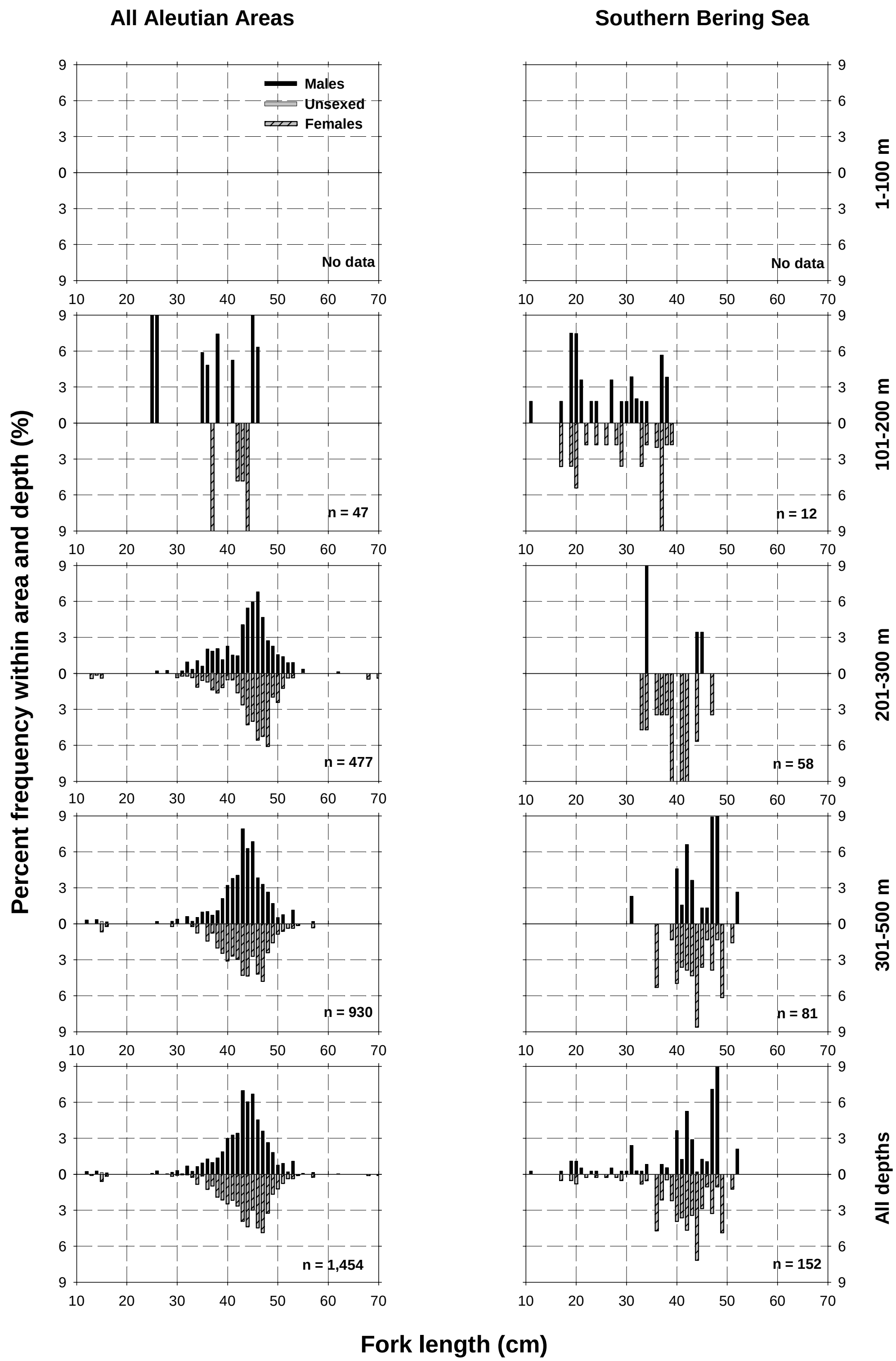


Figure 55.--(Rougheye rockfish, continued).

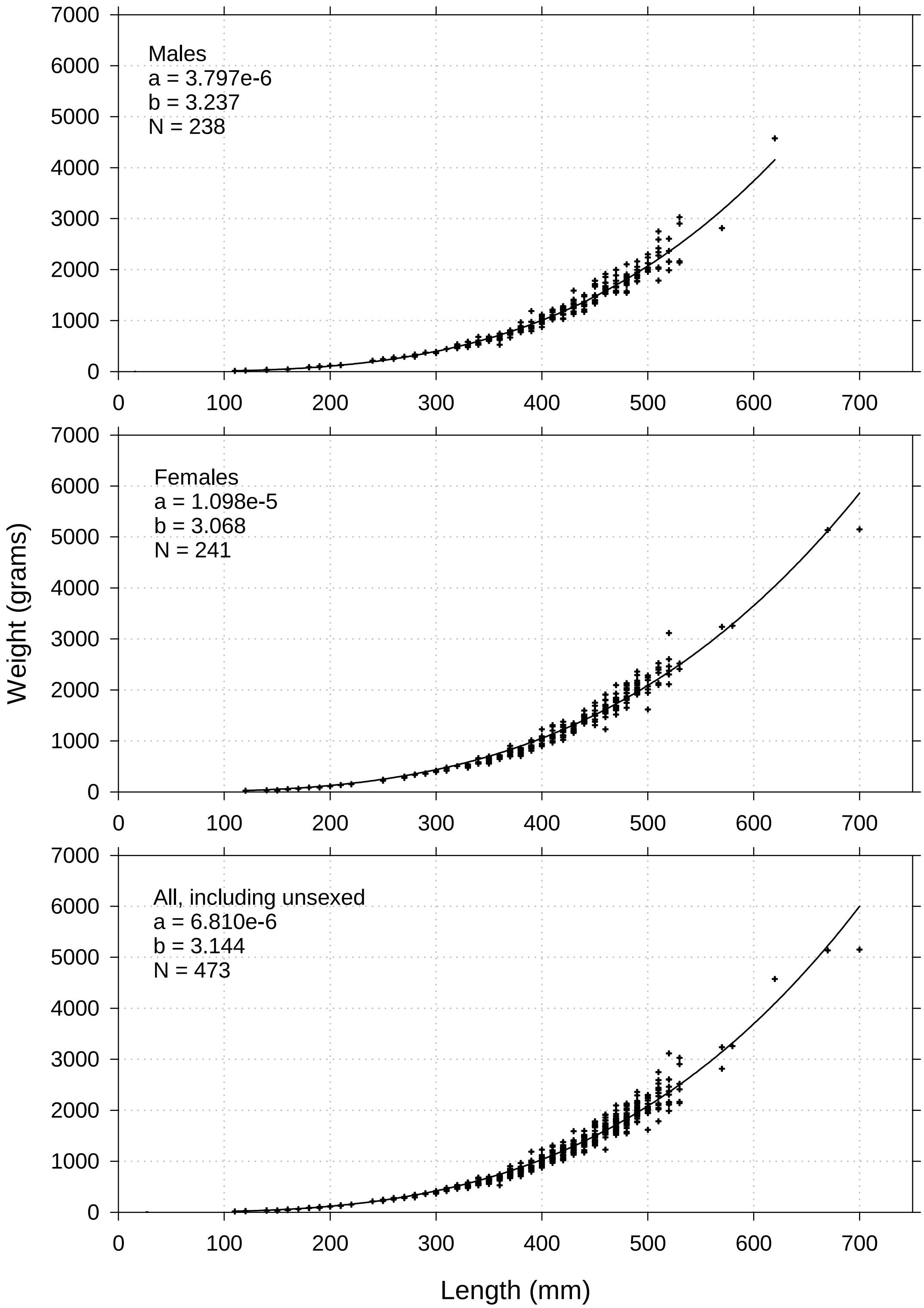


Figure 56.--Length-weight relationship for rougheye rockfish specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}{}^{b}$.

Shortspine thornyhead (*Sebastolobus alascanus*)

Thornyheads tend to be most abundant in the Western and Central Aleutian areas (Table 2) at depths greater than 200 m (Table 43) and catch rates were highest in the 301-500 m depth interval. They were captured in all trawl hauls in the 301-500 m depth interval in the Western Aleutian area, the SW Central Aleutian subarea, and in almost all hauls in the 201-300 m interval in the SW Central Aleutian subarea (Table 44). They were also common in all strata deeper than 200 m on Petrel Bank. Notable individual catches were made on the small plateau north of the Islands of Four Mountains, south of Kiska Island, on Wall's Plateau, and SW of Attu Island (Fig. 57). Biomass estimates from this survey are very likely underestimates of thornyhead abundance; Ronholt et al. (1986) reported that 68% of the total Aleutian thornyhead biomass was found in the 501-900 m depth interval, a depth zone unsampled by the present survey.

Male and female size compositions share similar ranges in fork lengths, but frequency modes do not mirror each other very closely (Fig 58). Females composed 55% of the measured samples in the Southern Bering Sea area and 50% in the combined Aleutian areas. Generally, females outnumbered males by as much as 8:2 in the 101-200 m depth interval and 6:4 in 201-300 m. Males were more numerous in the 301-500 m interval.

Figure 59 presents length-weight relationships for male, female, and combined sexes of shortspine thornyhead. The nonlinear slope of the females is slightly steeper than the males at lengths greater than about 50 cm indicating that large females are slightly heavier than large males.

Table 43.--Number of survey hauls, number of hauls with shortspine thornyhead, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	-
Aleutian	101-200	51	5	0.27	144	0	316	0.602	32.9
	201-300	19	4	1.73	298	0	937	0.477	32.3
	301-500	13	13	23.85	7,805	0	19,298	0.557	32.4
	All depths	109	22	5.43	8,246	0	19,809	0.554	32.4
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	1	< 0.01	< 1	0	1	0.080	20.0
	201-300	23	8	6.78	1,429	0	3,800	0.498	32.8
	301-500	17	15	10.11	4,025	2,053	5,997	0.477	30.7
	All depths	115	24	3.30	5,454	2,925	7,983	0.483	31.3
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	0	-	-	-	-	-	-
	201-300	42	2	0.12	58	0	175	1.470	46.6
	301-500	27	8	0.85	485	0	1,066	1.081	41.7
	All depths	132	10	0.22	543	0	1,133	1.112	42.1
All	1-100	72	0	-	-	-	-	-	-
Aleutian	101-200	143	6	0.08	144	0	316	0.596	32.8
Areas	201-300	84	14	2.04	1,785	0	4,002	0.505	32.8
	301-500	57	36	9.52	12,315	300	24,329	0.538	32.0
	All depths	356	56	2.50	14,243	4,998	23,488	0.534	32.1
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	3	3.70	208	0	515	0.443	32.7
	301-500	8	4	7.70	804	0	1,700	0.469	30.4
	All depths	61	7	1.35	1,012	67	1,957	0.464	30.9

Table 44.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of shortspine thornyhead by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Western Aleutian	301-500	E Western Aleutian	2	2	24.14	3,770	0	33,276
Western Aleutian	301-500	W Western Aleutian	11	11	23.58	4,035	1,095	6,975
Central Aleutian	301-500	SW Central Aleutian	2	2	22.75	1,795	0	7,228
Central Aleutian	201-300	SW Central Aleutian	6	4	12.96	552	0	1,418
Central Aleutian	201-300	Petrel Bank	3	2	11.20	858	0	3,717
Central Aleutian	301-500	Petrel Bank	3	2	8.72	1,079	0	3,558
Southern Bering	301-500	Combined Southern Bering	8	4	7.70	804	0	1,723
Central Aleutian	301-500	SE Central Aleutian	4	4	6.25	446	0	904
Central Aleutian	301-500	N Central Aleutian	8	7	5.68	704	161	1,247
Southern Bering	201-300	Combined Southern Bering	7	3	3.70	208	0	526
Western Aleutian	201-300	W Western Aleutian	9	3	3.07	289	0	941
Eastern Aleutian	301-500	SW Eastern Aleutian	2	2	2.73	120	0	1,435
Eastern Aleutian	301-500	SE Eastern Aleutian	12	3	1.14	293	0	833
Eastern Aleutian	201-300	SW Eastern Aleutian	6	1	0.67	48	0	172
Central Aleutian	201-300	SE Central Aleutian	4	1	0.36	17	0	72
Western Aleutian	101-200	W Western Aleutian	28	4	0.34	137	0	309
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	3	0.27	72	0	182
Western Aleutian	201-300	E Western Aleutian	10	1	0.11	9	0	29
Western Aleutian	101-200	E Western Aleutian	23	1	0.05	7	0	21
Eastern Aleutian	201-300	NE Eastern Aleutian	22	1	0.05	10	0	31
Central Aleutian	201-300	N Central Aleutian	10	1	0.04	2	0	6
Central Aleutian	101-200	SE Central Aleutian	14	1	< 0.01	< 1	0	1

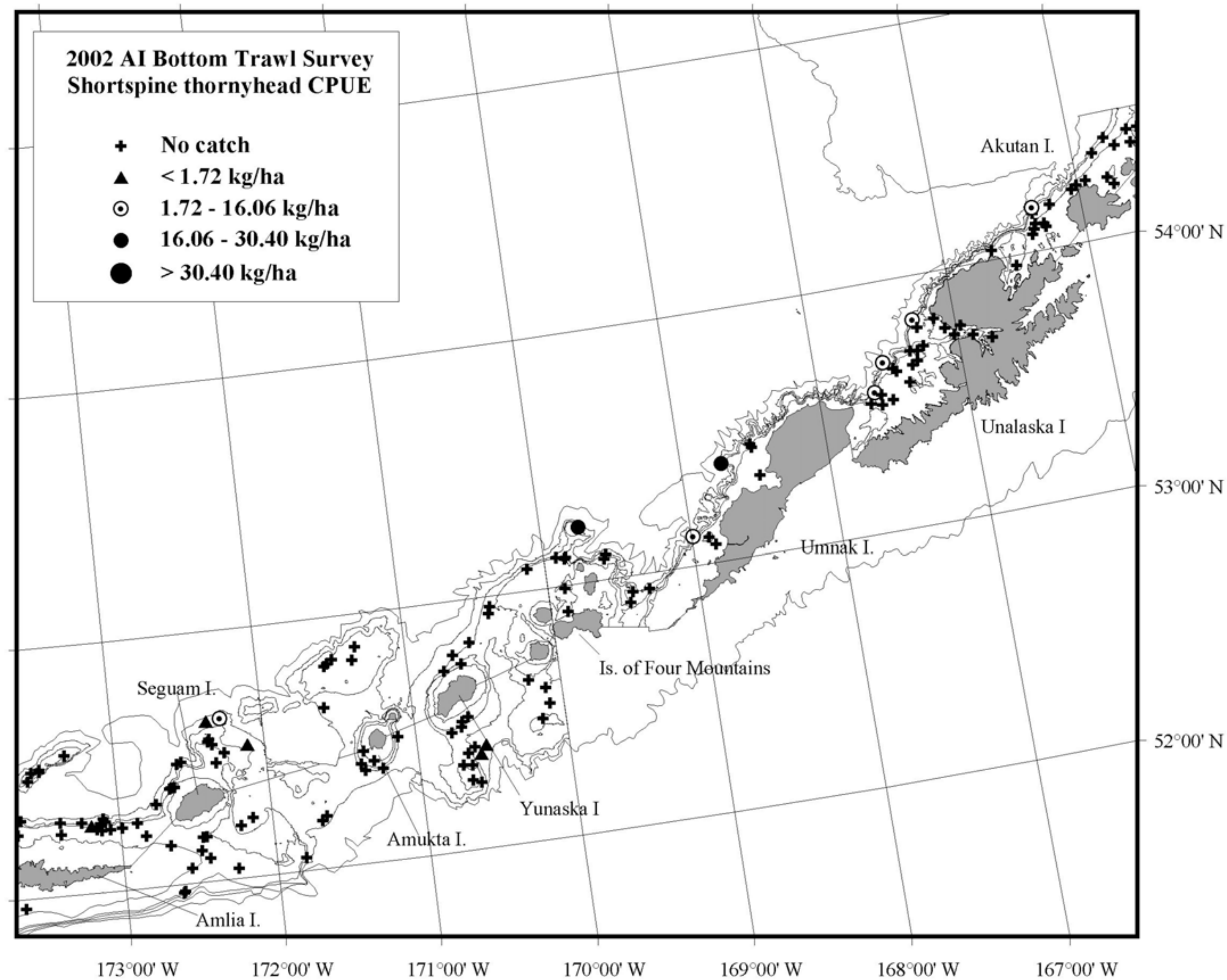
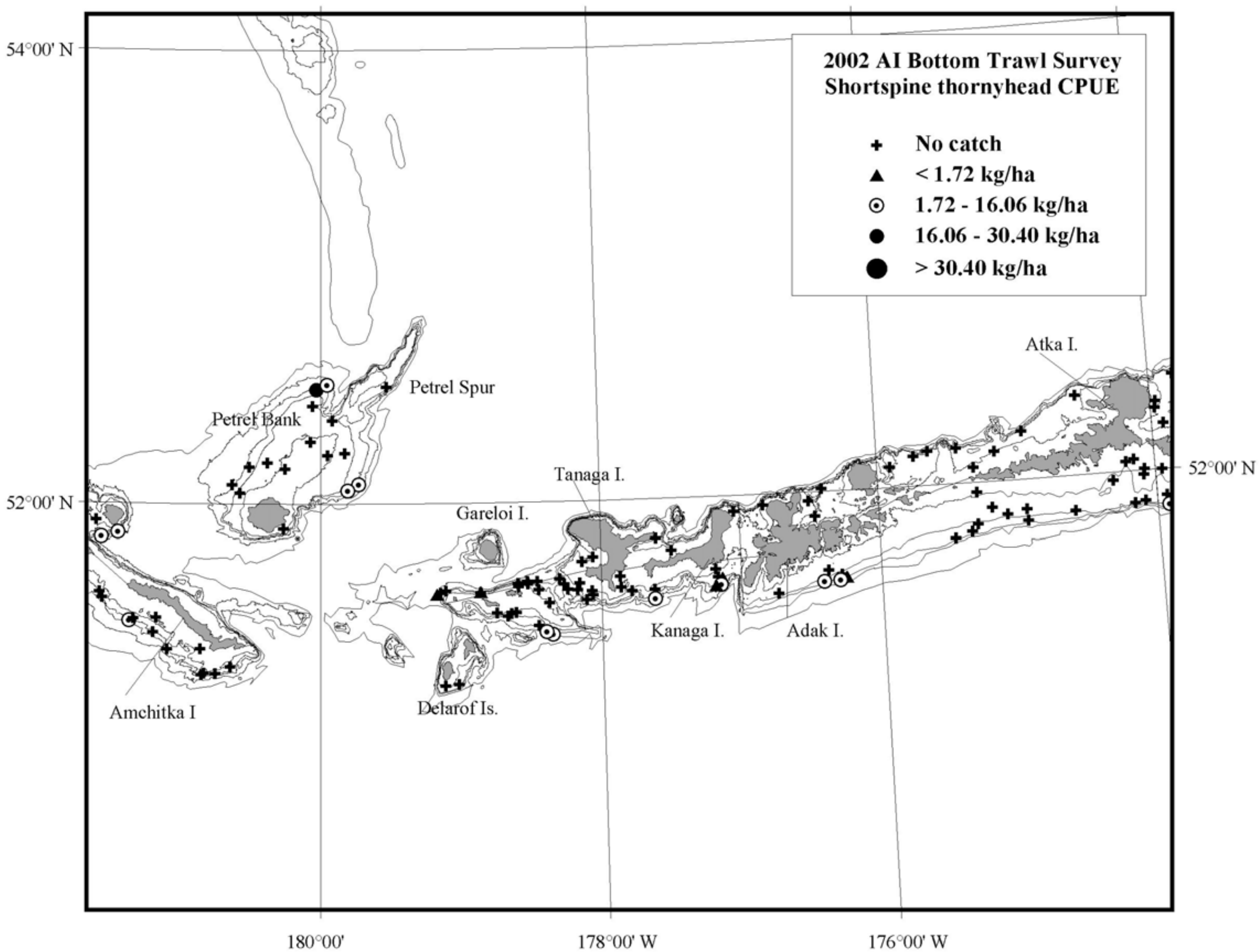


Figure 57.--Distribution and relative abundance of shortspine thornyhead from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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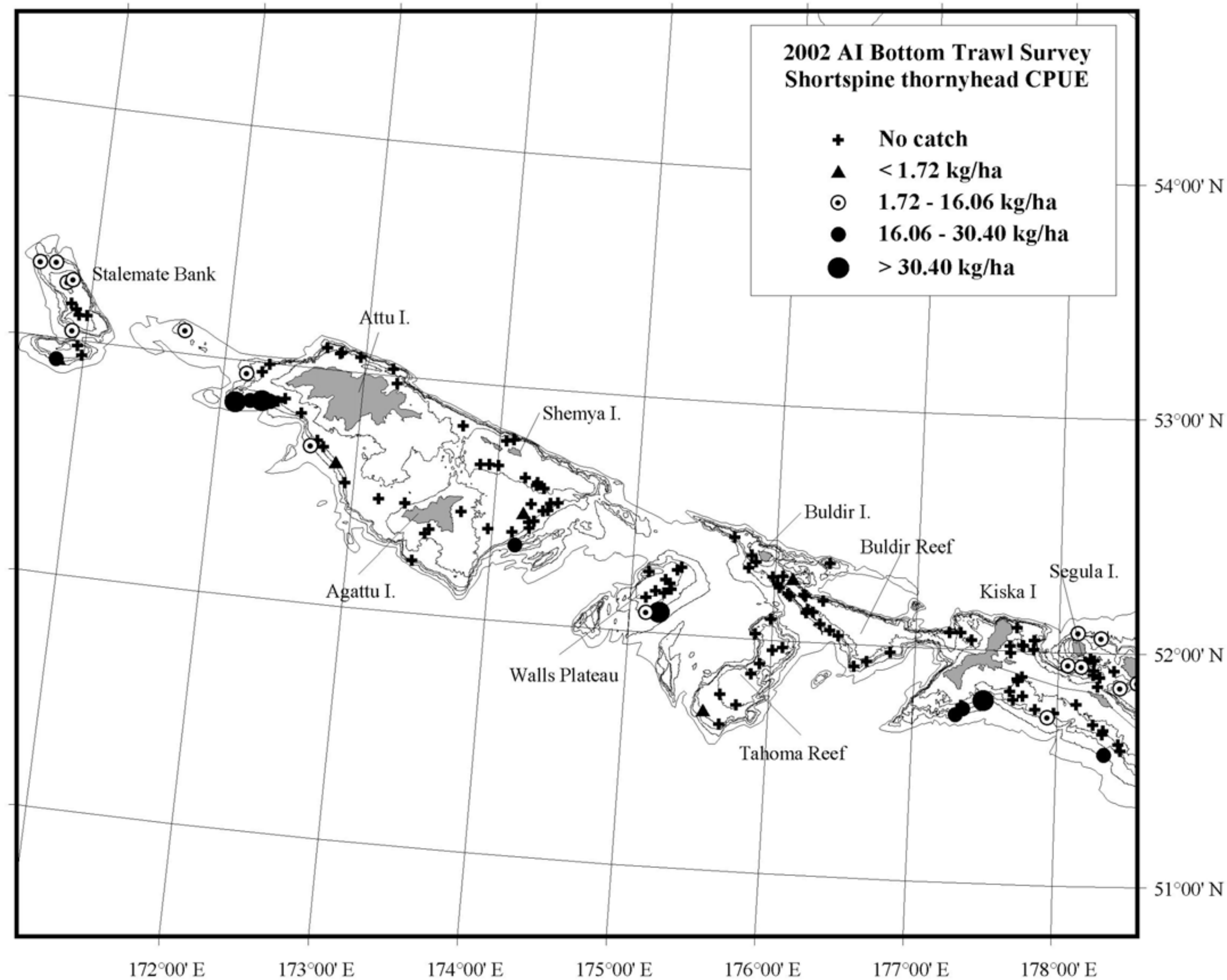

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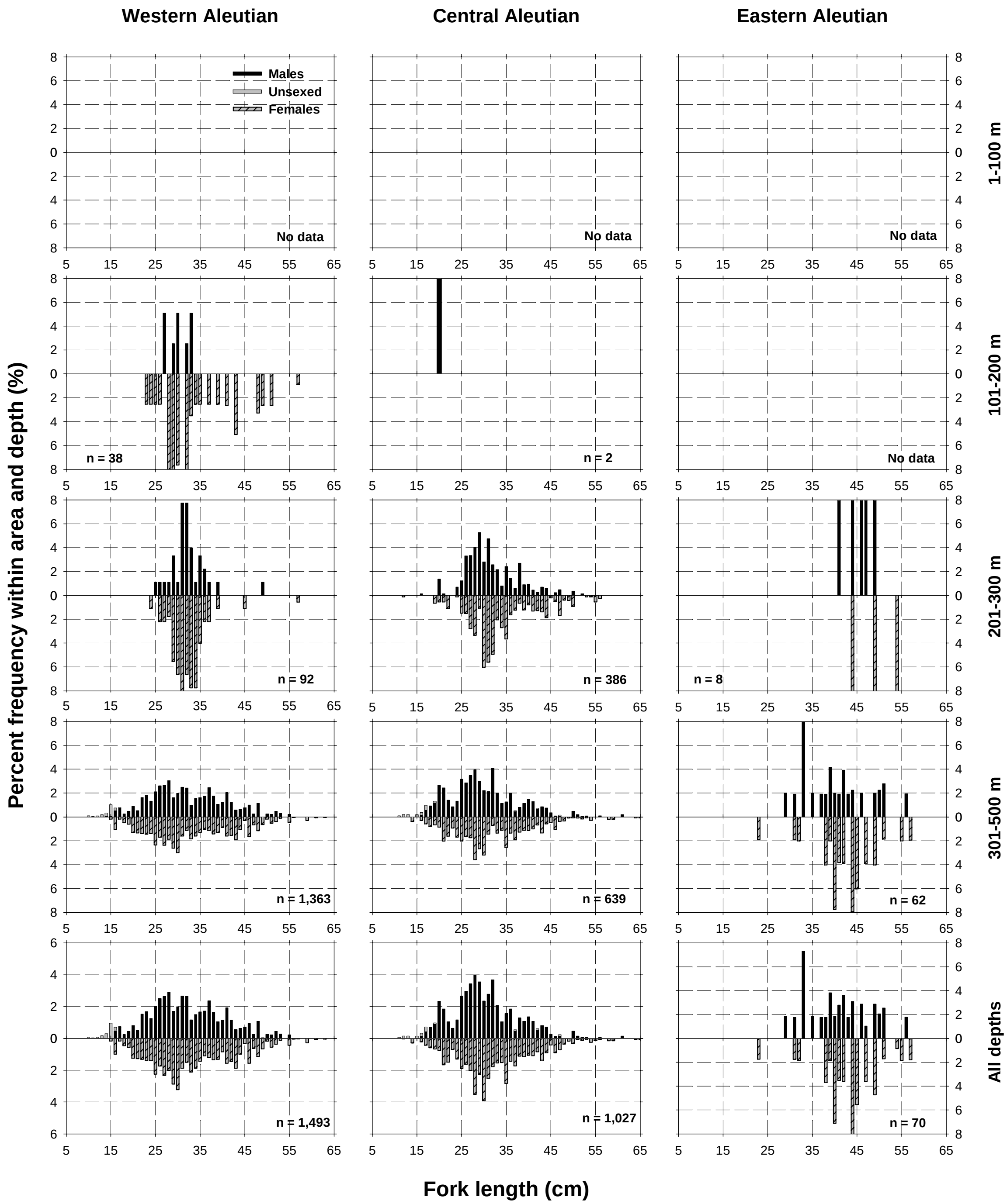


Figure 58.--Size composition of the estimated shortspine thornyhead population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

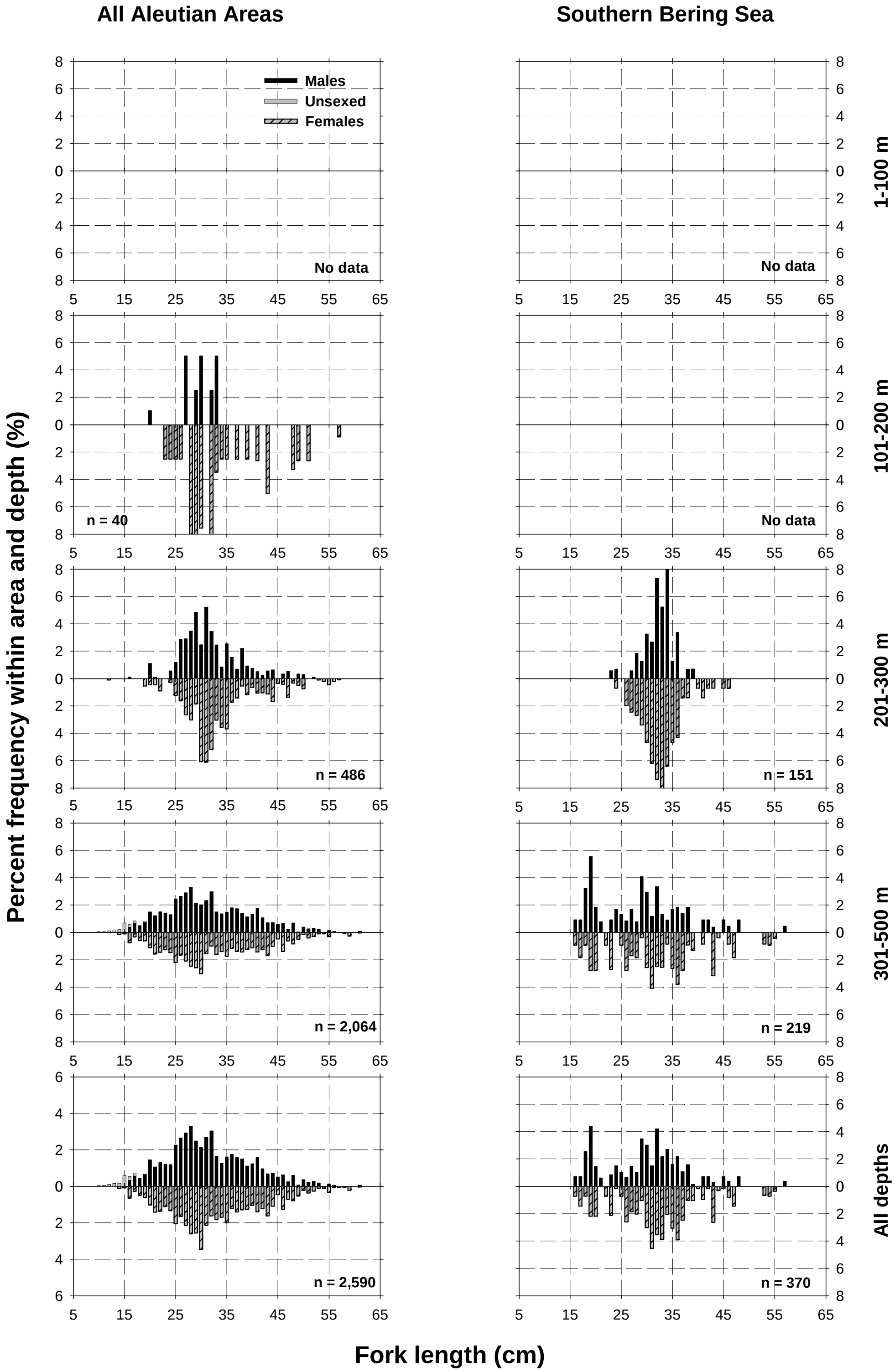


Figure 58.--(Shortspine thornyhead, continued).

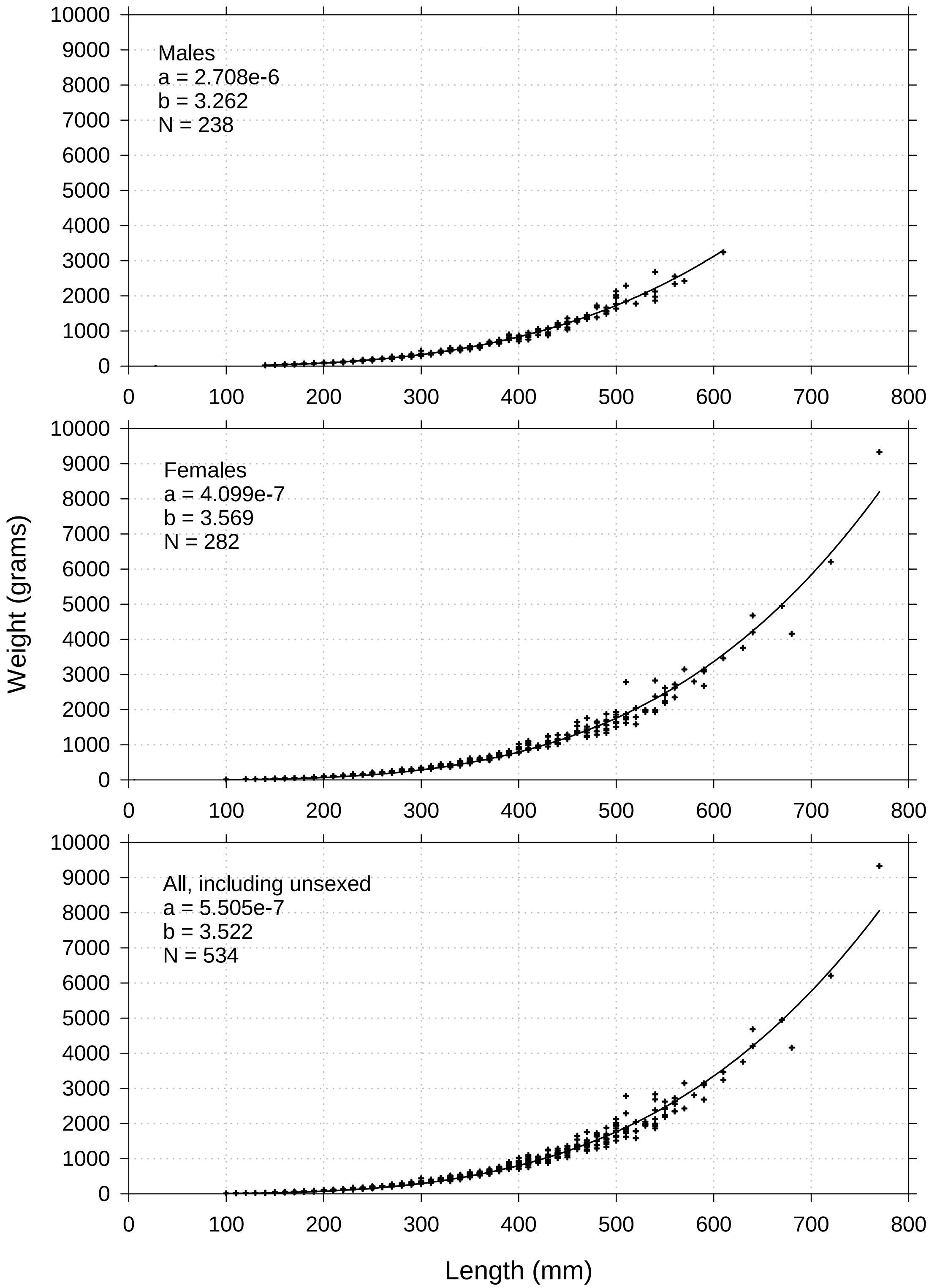


Figure 59.--Length-weight relationship for shortspine thornyhead specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}{}^{b}$.

Dusky rockfish (*Sebastes variabilis*)

Light and dark dusky rockfish were treated as the same species until the 1997 Aleutian Islands bottom trawl survey. Recent taxonomic studies have verified that the two are separate species.

Dusky or “light dusky” rockfish comprise a very minor part of the survey total rockfish catch. It is of interest to managers and some scientists who study this species. Most commonly captured in the Central and Eastern Aleutian areas, total estimated biomass was slightly more than 600 t (Table 45). Abundance was highest in the 1-100 m and 101-200 m depth intervals. Mean fish size generally increased with depth. Unweighted length frequencies for males and females are presented in Figure 60.

Dark rockfish (*Sebastes ciliatus*)

Dark or “dark dusky” rockfish comprise an even smaller component of Aleutian trawl survey catches than do dusky rockfish. Limited to the 1-100 m depth interval, they were found mostly in the Western Aleutian area, and to a much lesser extent in the Southern Bering Sea area. Estimated biomass was 315 t (Table 46).

Table 45.--Number of survey hauls, number of hauls with dusky rockfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	2	0.08	40	0	102	0.931	36.9
Aleutian	101-200	51	1	0.01	3	0	10	1.462	44.0
	201-300	19	0	-	-	-	-	-	-
	301-500	13	0	-	-	-	-	-	-
	All depths	109	3	0.03	43	0	106	0.958	37.7
Central	1-100	30	1	0.16	92	0	309	1.211	39.4
Aleutian	101-200	45	6	0.51	235	0	498	1.086	39.5
	201-300	23	1	0.03	7	0	22	1.202	41.0
	301-500	17	0	-	-	-	-	-	-
	All depths	115	8	0.20	334	10	659	1.120	39.5
Eastern	1-100	16	2	0.12	81	0	214	0.859	34.0
Aleutian	101-200	47	1	0.03	24	0	74	1.381	43.0
	201-300	42	3	0.04	19	0	43	1.360	42.3
	301-500	27	1	0.05	26	0	83	1.699	45.0
	All depths	132	7	0.06	149	2	296	1.064	38.5
All	1-100	72	5	0.12	212	0	450	0.999	37.3
Aleutian	101-200	143	8	0.15	262	0	528	1.111	39.7
Areas	201-300	84	4	0.03	26	0	54	1.313	41.8
	301-500	57	1	0.02	26	0	83	1.699	45.0
	All depths	356	18	0.09	527	177	876	1.089	39.2
Southern	1-100	30	6	0.08	34	3	65	0.813	35.1
Bering Sea	101-200	16	3	0.21	39	0	91	1.033	38.8
	201-300	7	2	0.44	25	0	72	1.506	44.2
	301-500	8	0	-	-	-	-	-	-
	All depths	61	11	0.13	97	25	169	1.018	38.3

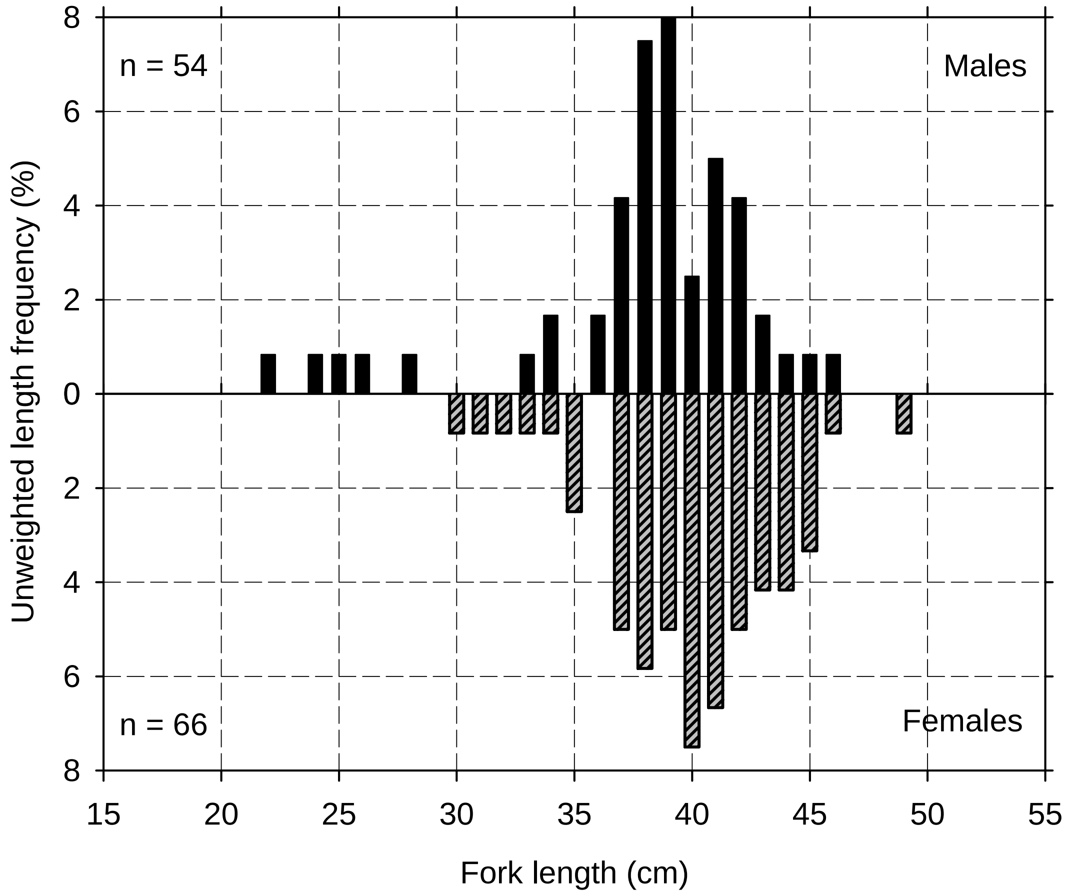


Figure 60.--Length frequency of the estimated dusky rockfish population from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all depths and areas.

Table 46.--Number of survey hauls, number of hauls with dark rockfish, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

						95% Confidence limits			
NPFMC area	**Depth (m)**	**Number of trawl hauls**	**Hauls with catch**	**Mean CPUE (kg/ha)**	**Estimated biomass (t)**	**Minimum biomass (t)**	**Maximum biomass (t)**	**Mean weight (kg)**	**Mean length (cm)**
Western	1-100	26	4	0.64	310	0	712	0.779	35.5
Aleutian	101-200	51	0	-	-	-	-	-	-
	201-300	19	0	-	-	-	-	-	-
	301-500	13	0	-	-	-	-	-	-
	All depths	109	4	0.20	310	0	712	0.779	35.5
Central	1-100	30	0	-	-	-	-	-	-
Aleutian	101-200	45	0	-	-	-	-	-	-
	201-300	23	0	-	-	-	-	-	-
	301-500	17	0	-	-	-	-	-	-
	All depths	115	0	-	-	-	-	-	-
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	0	-	-	-	-	-	-
	201-300	42	0	-	-	-	-	-	-
	301-500	27	0	-	-	-	-	-	-
	All depths	132	0	-	-	-	-	-	-
All	1-100	72	4	0.18	310	0	712	0.779	35.5
Aleutian	101-200	143	0	-	-	-	-	-	-
Areas	201-300	84	0	-	-	-	-	-	-
	301-500	57	0	-	-	-	-	-	-
	All depths	356	4	0.05	310	0	712	0.779	35.5
Southern	1-100	30	1	0.01	5	0	17	1.320	42.0
Bering Sea	101-200	16	0	-	-	-	-	-	
	201-300	7	0	-	-	-	-	-	
	301-500	8	0	-	-	-	-	-	-
	All depths	61	1	0.01	5	0	17	1.320	42.0

Skates

Whiteblotched skate (*Bathyraja maculata*)

Whiteblotched skate accounted for more than 49% of the total estimated combined skates biomass in the entire survey area, being most abundant in the Eastern Aleutian area (Table 47). Mean individual weights (4.86 kg) were generally smaller than either Aleutian skate (10.98 kg) or Alaska skate (8.85 kg). In general, mean CPUE was highest in the 101-200 m and 301-500 m depth intervals. The highest subarea-specific mean CPUEs occurred in the NE and SE Eastern Aleutian subareas in 101-200 m (Table 48), west and south of Seguam Island (Fig. 61), and on Stalemate Bank in 101-200 m.

Males and females were almost equally represented in length frequency collections, and their respective length frequency distributions more or less mirrored each other (Fig. 62). Figure 63 shows the length-weight relationships for male, female, and combined sexes of whiteblotched skate.

Alaska skate (*Bathyraja parmifera*)

Alaska skate was the second most abundant species of skate captured during this survey, but was the most abundant skate in the Western and Central Aleutian areas (Table 2). The estimated biomass of 10,500 t, was highest in the 1-100 m and 101-200 m depth intervals, and was almost equally distributed across both intervals (Table 49). Alaska skate abundance in the Southern Bering Sea area was very low. Mean sizes were largest in the Western Aleutian area and decreased eastward. The smallest mean sizes were found in the deeper depths. The highest four subarea-specific mean CPUEs and estimated biomasses were found on Petrel and Stalemate Banks (Table 50 and Fig.64).

Females far outnumbered males in the length frequency samples. Total lengths ranged from 22 to 130 cm (Fig. 65). Figure 66 summarizes the length-weight relationships for male, female, and combined sexes of Alaska skate.

Table 47.--Number of survey hauls, number of hauls with whiteblotched skate, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	1	2.11	1,028	0	3,207	7.724	97.9
Aleutian	101-200	51	8	5.82	3,095	521	5,669	6.128	89.0
	201-300	19	2	0.50	86	0	230	8.899	114.5
	301-500	13	0	-	-	-	-	-	-
	All depths	109	11	2.77	4,209	924	7,493	6.497	91.0
Central	1-100	30	1	0.18	103	0	389	8.418	109.0
Aleutian	101-200	45	7	2.65	1,221	0	3,041	8.901	108.0
	201-300	23	6	2.19	462	0	1,237	4.335	84.6
	301-500	17	9	1.20	476	0	964	3.391	74.9
	All depths	115	23	1.37	2,262	292	4,232	5.707	88.6
Eastern	1-100	16	2	1.08	739	0	1,979	8.715	106.8
Aleutian	101-200	47	15	5.54	4,306	20	8,591	5.031	89.1
	201-300	42	16	2.95	1,447	582	2,311	5.702	93.3
	301-500	27	17	6.20	3,523	1,301	5,745	3.051	72.4
	All depths	132	50	3.97	10,014	5,164	14,864	4.263	83.0
All	1-100	72	4	1.06	1,870	0	4,241	8.126	100.4
Aleutian	101-200	143	30	4.87	8,622	3,539	13,705	5.755	90.4
Areas	201-300	84	24	2.28	1,994	925	3,064	5.391	90.3
	301-500	57	26	3.09	3,999	1,744	6,254	3.088	72.6
	All depths	356	84	2.90	16,485	10,453	22,516	4.858	85.3
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	3	1.18	67	0	166	4.517	82.0
	301-500	8	4	1.67	174	0	383	2.081	65.0
	All depths	61	7	0.32	241	16	467	2.446	72.0

Table 48.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of whiteblotched skate by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	101-200	NE Eastern Aleutian	17	6	13.30	2,677	0	6,873
Eastern Aleutian	101-200	SE Eastern Aleutian	15	9	8.57	1,628	503	2,754
Western Aleutian	101-200	W Western Aleutian	28	7	7.58	3,083	503	5,662
Eastern Aleutian	301-500	SE Eastern Aleutian	12	9	6.75	1,737	225	3,249
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	8	6.69	1,786	0	3,598
Central Aleutian	101-200	Petrel Bank	6	2	6.14	1,065	0	2,965
Central Aleutian	201-300	SE Central Aleutian	4	1	5.90	282	0	1,178
Eastern Aleutian	1-100	SE Eastern Aleutian	5	2	4.24	739	0	2,078
Eastern Aleutian	201-300	SE Eastern Aleutian	12	7	4.15	854	125	1,583
Central Aleutian	201-300	N Central Aleutian	10	4	3.86	169	0	412
Eastern Aleutian	201-300	NE Eastern Aleutian	22	9	3.01	592	79	1,106
Western Aleutian	1-100	W Western Aleutian	16	1	2.78	1,028	0	3,219
Central Aleutian	301-500	SW Central Aleutian	2	1	1.80	142	0	1,946
Southern Bering	301-500	Combined Southern Bering	8	4	1.67	174	0	389
Central Aleutian	301-500	N Central Aleutian	8	6	1.61	200	42	358
Southern Bering	201-300	Combined Southern Bering	7	3	1.18	67	0	169
Central Aleutian	301-500	Petrel Bank	3	2	1.08	134	0	664
Central Aleutian	1-100	Petrel Bank	4	1	1.07	103	0	430
Central Aleutian	101-200	SE Central Aleutian	14	3	0.91	68	0	151
Western Aleutian	201-300	W Western Aleutian	9	1	0.65	61	0	201
Central Aleutian	101-200	N Central Aleutian	8	1	0.62	66	0	221
Western Aleutian	201-300	E Western Aleutian	10	1	0.32	25	0	82
Central Aleutian	101-200	SW Central Aleutian	17	1	0.22	23	0	71
Central Aleutian	201-300	Petrel Bank	3	1	0.15	11	0	59
Western Aleutian	101-200	E Western Aleutian	23	1	0.10	13	0	39

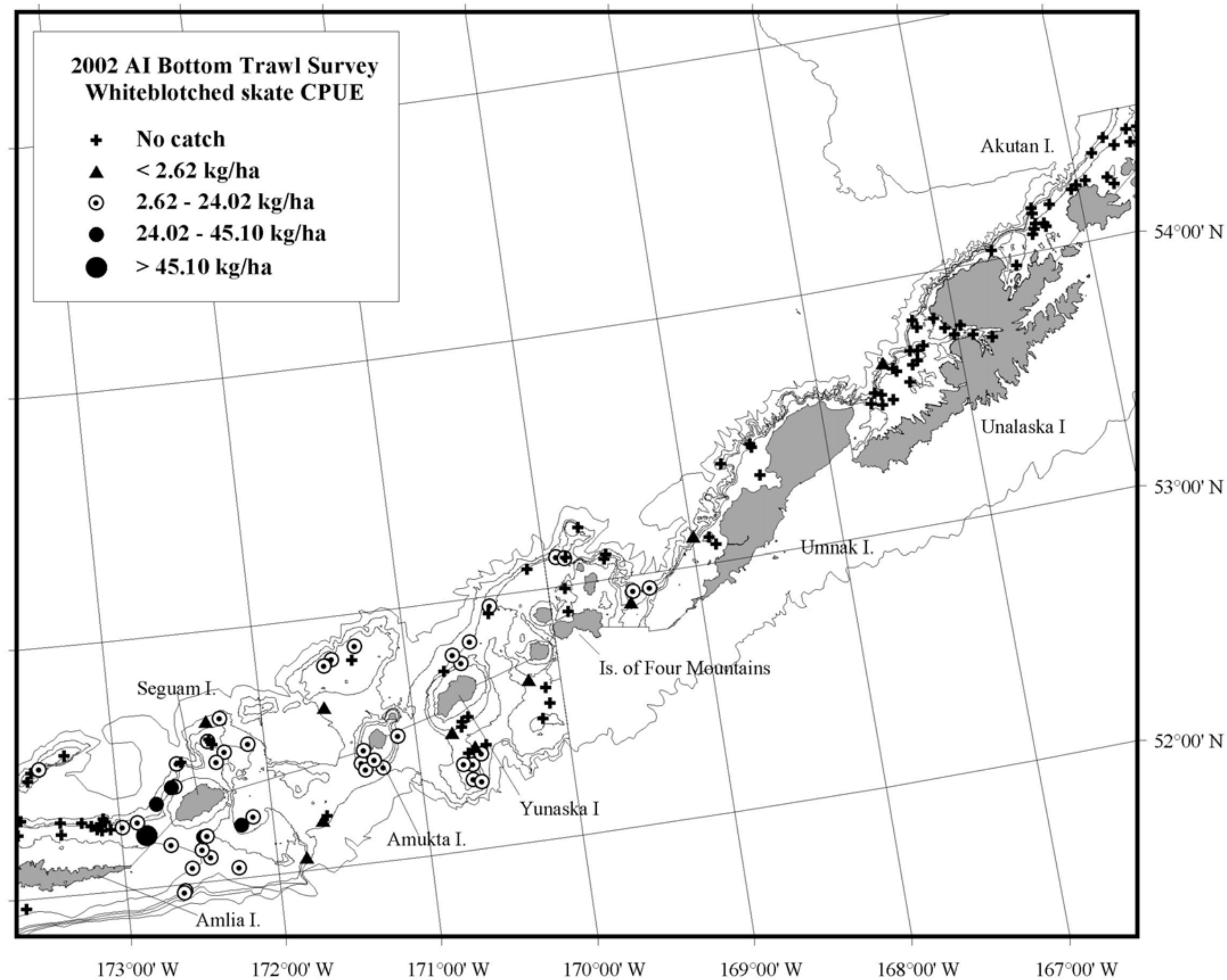
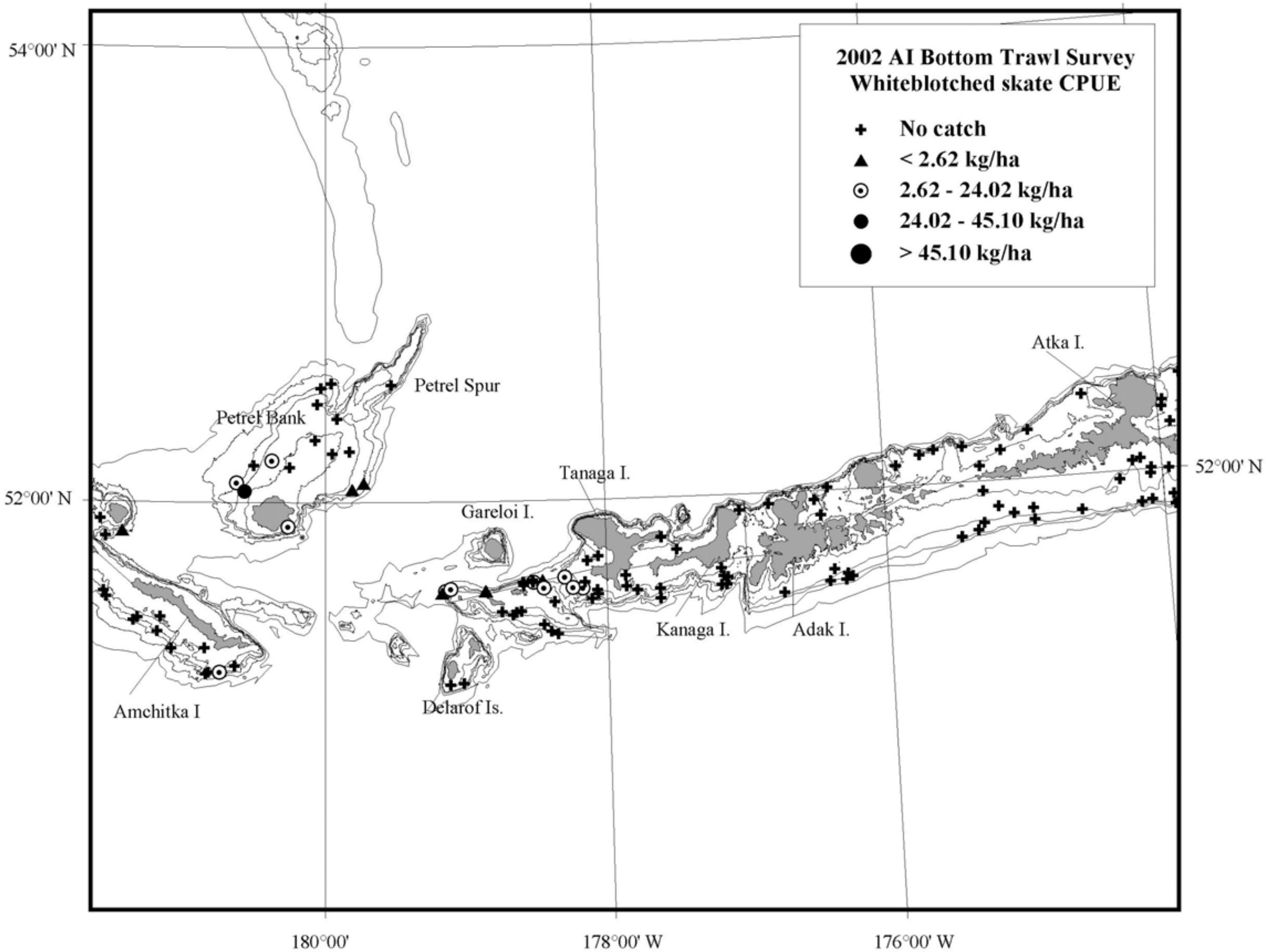


Figure 61.--Distribution and relative abundance of whiteblotched skate from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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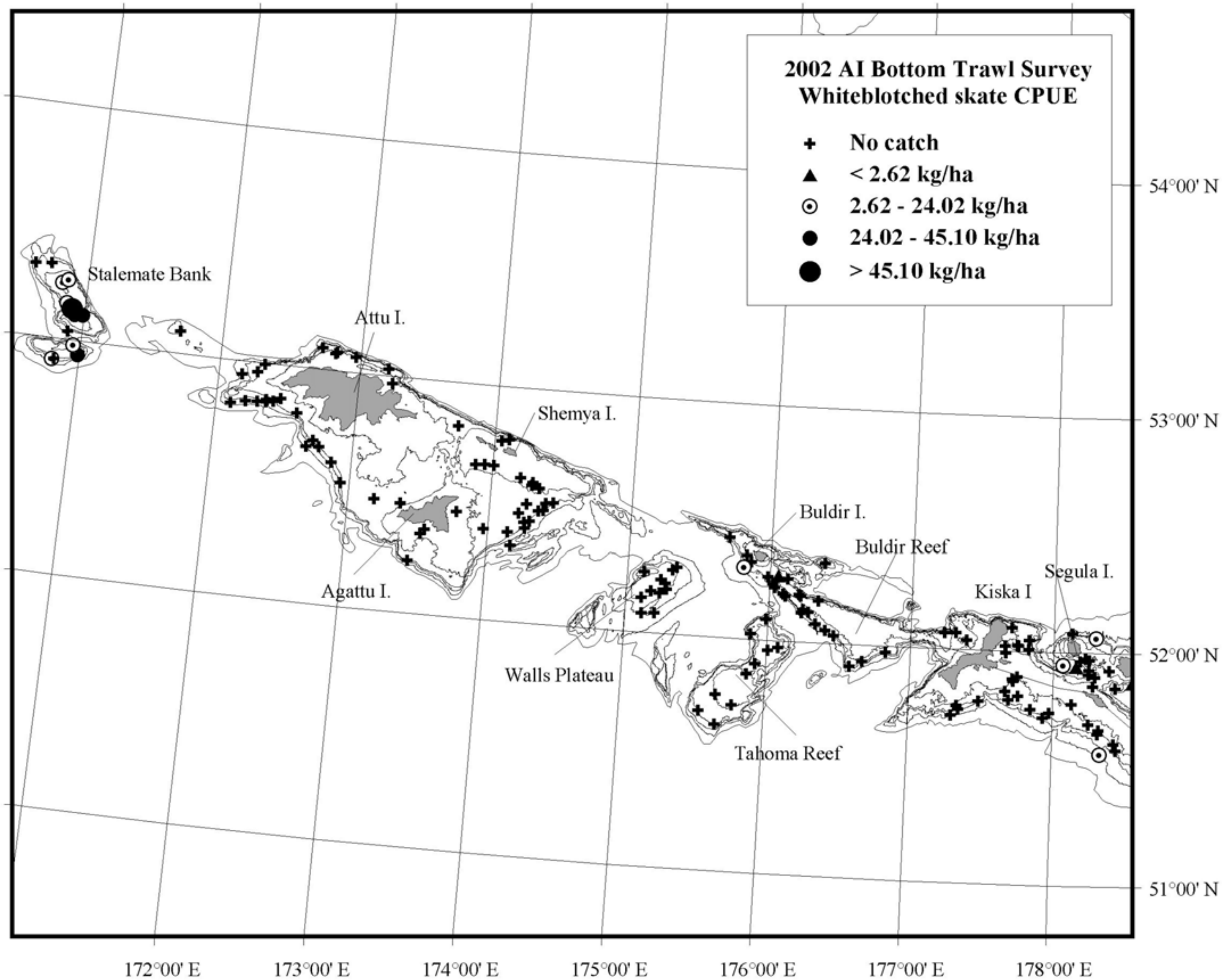

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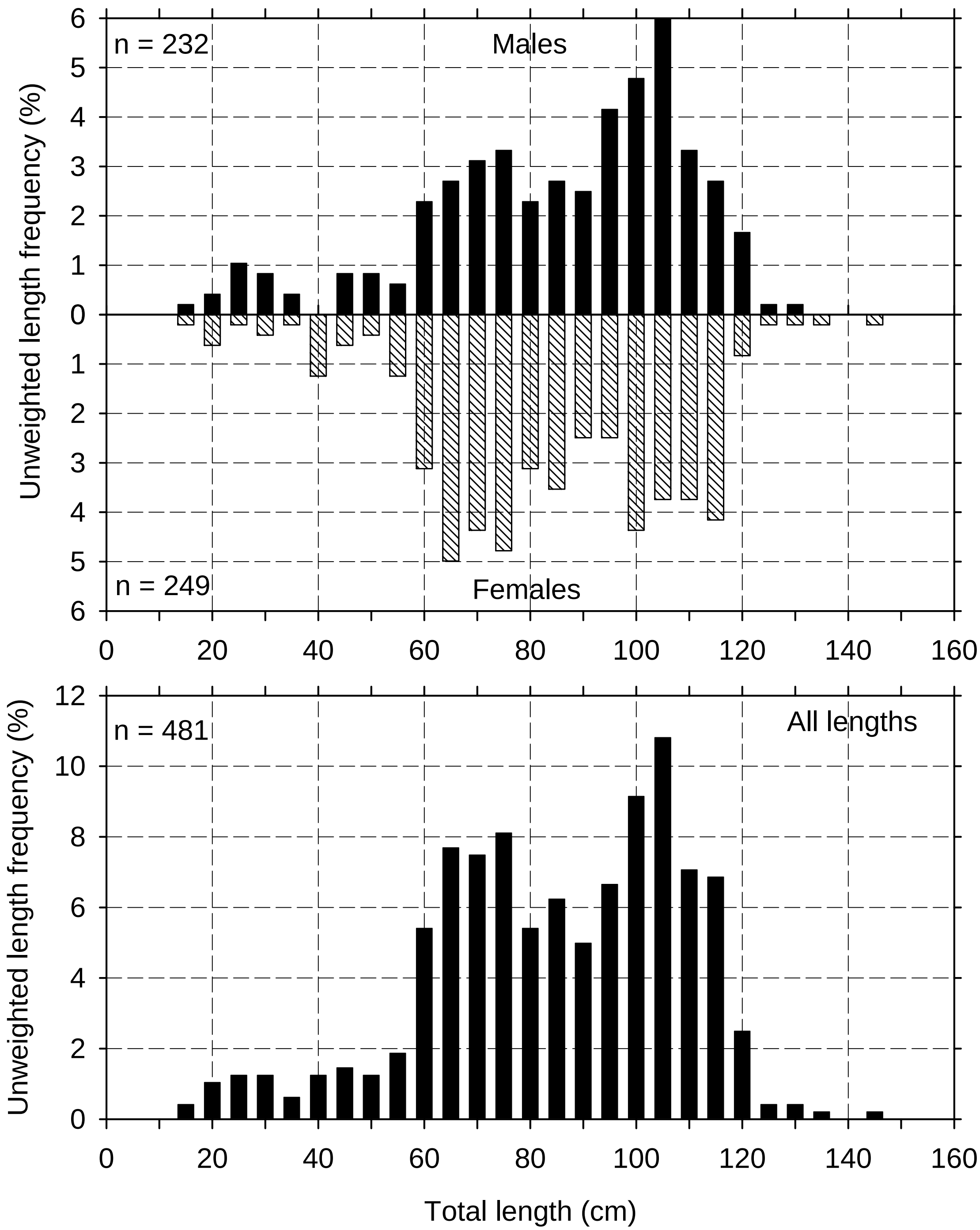


Figure 62.--Length frequencies of whiteblotched skate catches from the 2002 Aleutian Islands bottom trawl survey. Lengths grouped in 5 cm increments. Lengths are from all areas and depths.

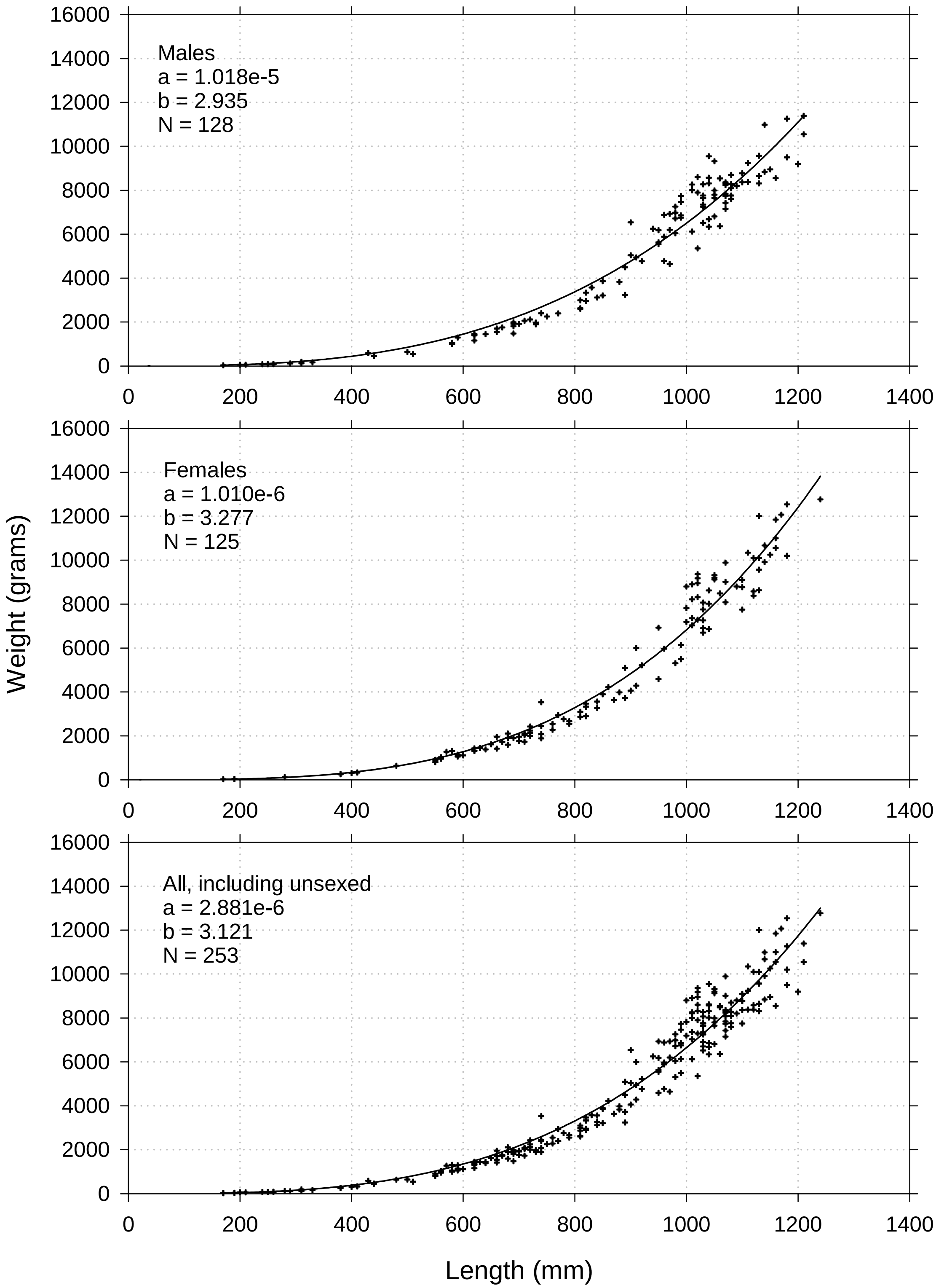


Figure 63.--Length-weight relationship for whiteblotched skate specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}{}^{b}$.

Table 49.--Number of survey hauls, number of hauls with Alaska skate, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	14	5.17	2,521	862	4,179	9.634	99.3
Aleutian	101-200	51	17	4.47	2,376	0	4,872	10.460	99.8
	201-300	19	5	1.60	276	0	554	8.990	94.8
	301-500	13	0	-	-	-	-	-	-
	All depths	109	36	3.41	5,173	2,233	8,112	9.957	99.1
Central	1-100	30	11	3.47	2,030	0	4,555	8.992	97.7
Aleutian	101-200	45	13	4.01	1,845	0	4,170	7.921	97.3
	201-300	23	3	0.52	110	0	308	7.441	47.0
	301-500	17	0	-	-	-	-	-	-
	All depths	115	27	2.41	3,985	925	7,045	8.416	93.3
Eastern	1-100	16	2	0.70	478	0	1,687	6.154	90.5
Aleutian	101-200	47	8	1.08	835	115	1,556	7.736	87.7
	201-300	42	1	<0.01	0	0	1	0.077	71.5
	301-500	27	0	-	-	-	-	-	-
	All depths	132	11	0.52	1,313	0	2,685	6.930	89.7
All	1-100	72	27	2.86	5,028	2,213	7,843	8.899	98.1
Aleutian	101-200	143	38	2.86	5,056	1,819	8,293	8.901	98.0
Areas	201-300	84	9	0.44	386	79	694	7.821	72.6
	301-500	57	0	-	-	-	-	-	-
	All depths	356	74	1.84	10,471	6,231	14,711	8.855	95.8
Southern	1-100	30	2	0.09	37	0	108	3.851	75.0
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	0	-	-	-	-	-	-
	301-500	8	0	-	-	-	-	-	-
	All depths	61	2	0.05	37	0	108	3.851	75.0

Table 50.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Alaska skate by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	1-100	Petrel Bank	4	2	10.08	968	0	4,039
Central Aleutian	101-200	Petrel Bank	6	3	6.89	1,195	0	3,558
Western Aleutian	1-100	W Western Aleutian	16	10	6.09	2,250	612	3,888
Western Aleutian	101-200	W Western Aleutian	28	7	4.97	2,021	0	4,512
Western Aleutian	101-200	E Western Aleutian	23	10	2.84	356	132	580
Central Aleutian	1-100	N Central Aleutian	14	5	2.61	550	0	1,132
Central Aleutian	101-200	N Central Aleutian	8	2	2.57	274	0	724
Western Aleutian	201-300	E Western Aleutian	10	4	2.57	201	0	450
Central Aleutian	101-200	SW Central Aleutian	17	5	2.47	260	0	546
Western Aleutian	1-100	E Western Aleutian	10	4	2.29	271	0	603
Eastern Aleutian	1-100	NW Eastern Aleutian	4	1	2.24	433	0	1,812
Central Aleutian	1-100	SW Central Aleutian	5	2	1.95	315	0	888
Central Aleutian	1-100	SE Central Aleutian	7	2	1.69	197	0	530
Central Aleutian	101-200	SE Central Aleutian	14	3	1.54	116	0	249
Central Aleutian	201-300	Petrel Bank	3	2	1.42	109	0	376
Eastern Aleutian	101-200	SE Eastern Aleutian	15	3	1.28	242	0	544
Eastern Aleutian	101-200	NE Eastern Aleutian	17	2	1.26	254	0	791
Eastern Aleutian	101-200	NW Eastern Aleutian	6	2	1.19	190	0	536
Western Aleutian	201-300	W Western Aleutian	9	1	0.79	75	0	247
Eastern Aleutian	101-200	SW Eastern Aleutian	9	1	0.66	150	0	494
Eastern Aleutian	1-100	SW Eastern Aleutian	5	1	0.23	44	0	167
Southern Bering	1-100	E Southern Bering Sea	27	2	0.15	37	0	108
Central Aleutian	201-300	N Central Aleutian	10	1	0.04	2	0	6
Eastern Aleutian	201-300	NE Eastern Aleutian	22	1	< 0.01	< 1	0	1

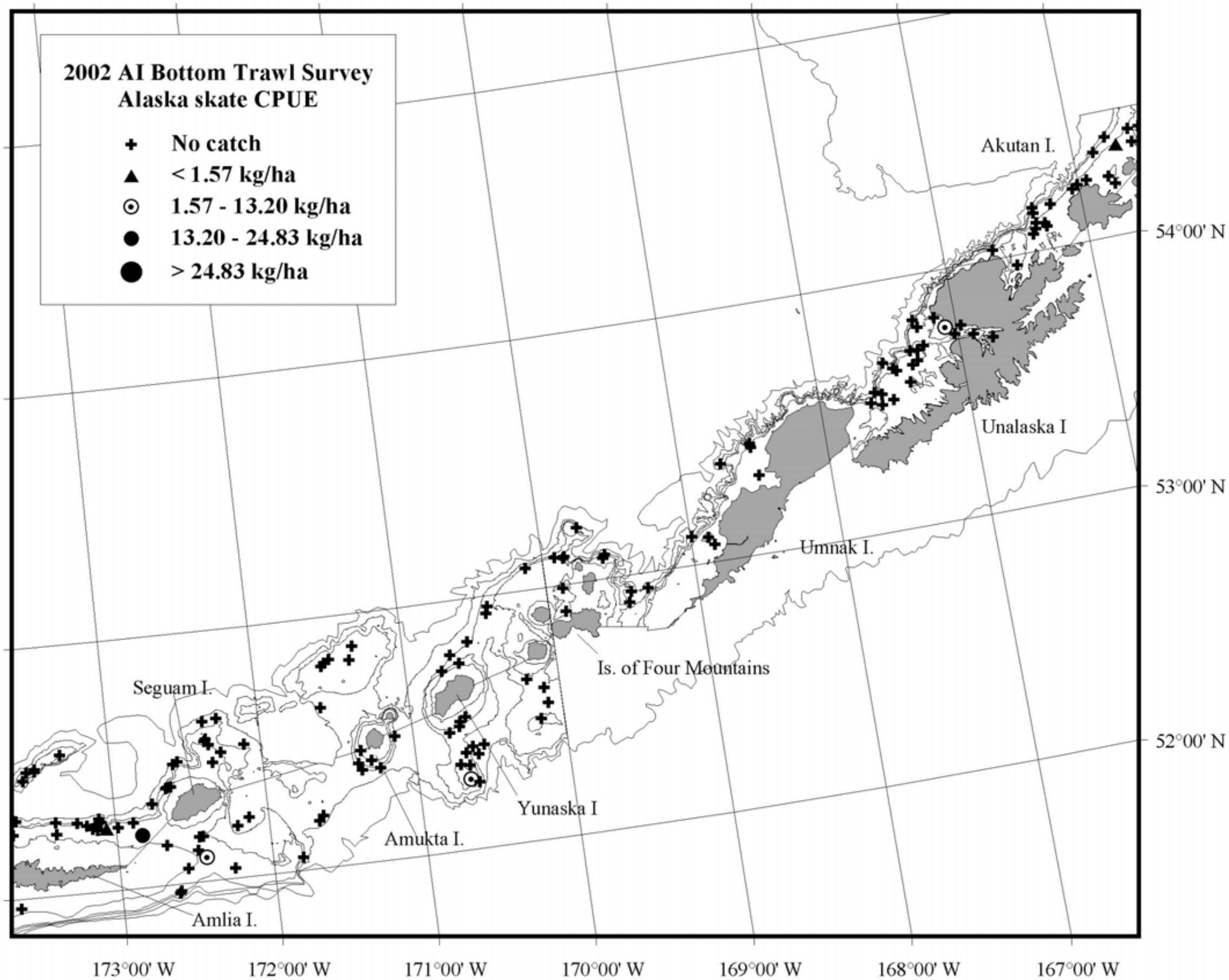
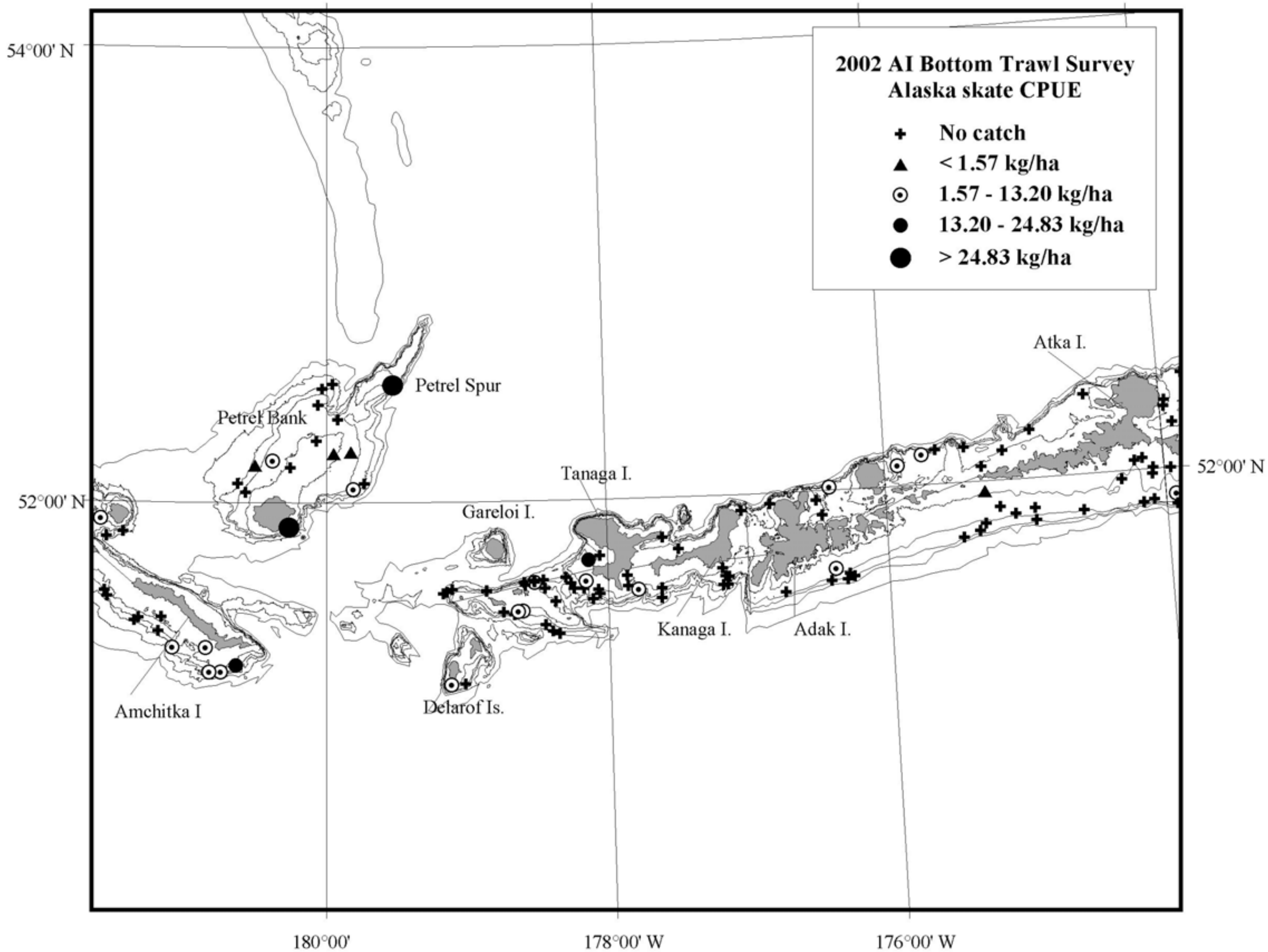


Figure 64.--Distribution and relative abundance of Alaska skate from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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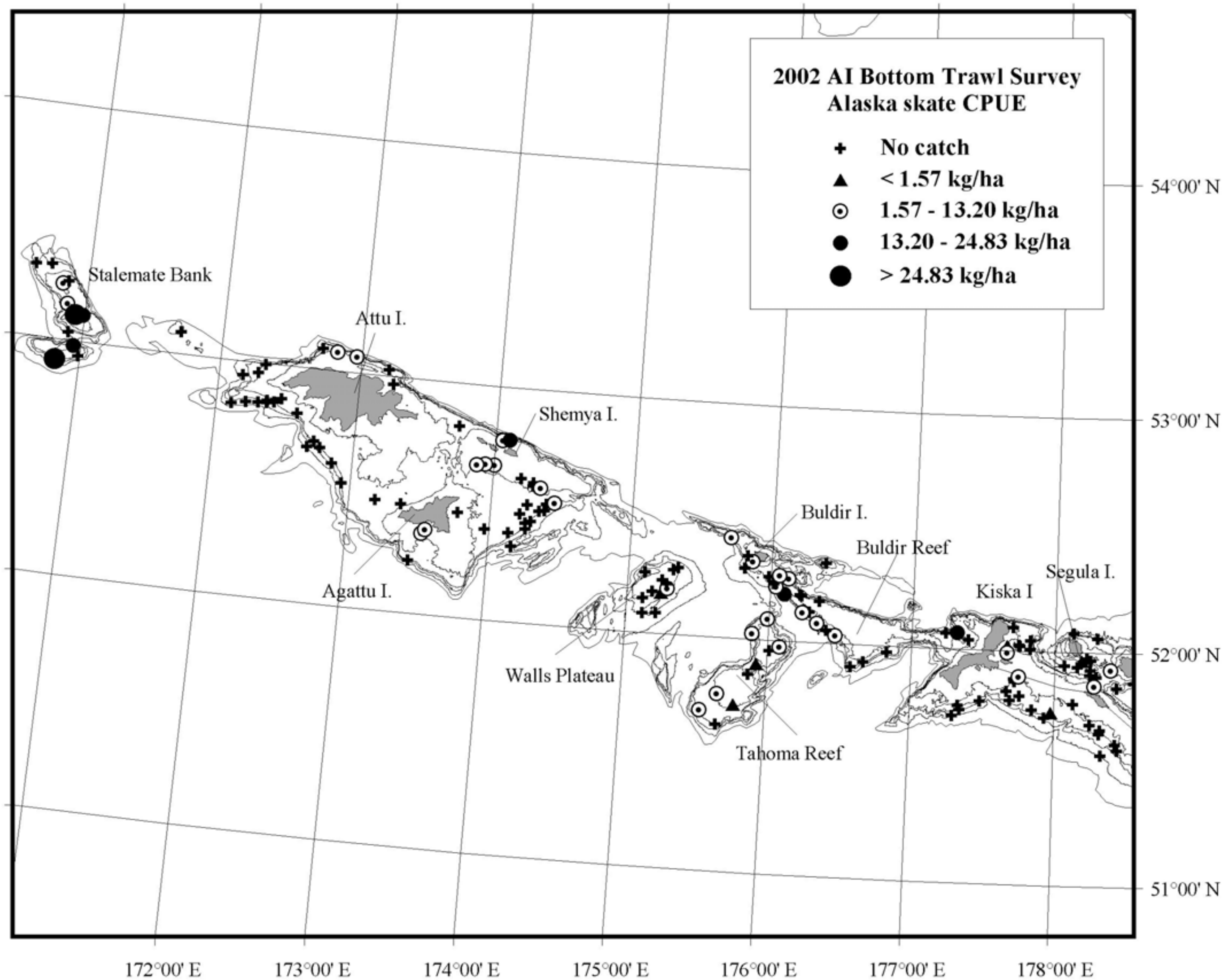

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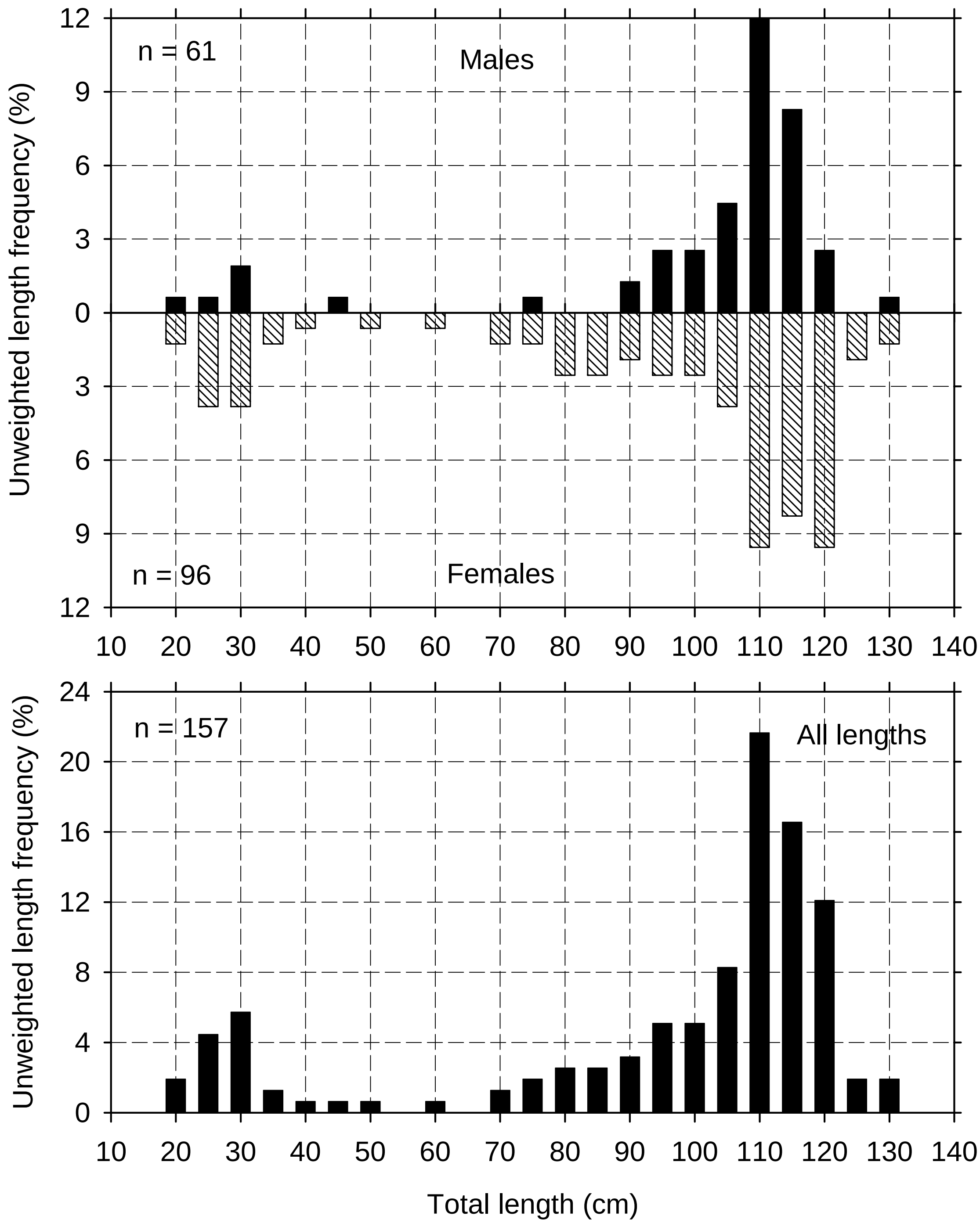


Figure 65.--Length frequencies of Alaska skate catches from the 2002 Aleutian Islands bottom trawl survey. Lengths grouped in 5 cm increments. Lengths are from all areas and depths.

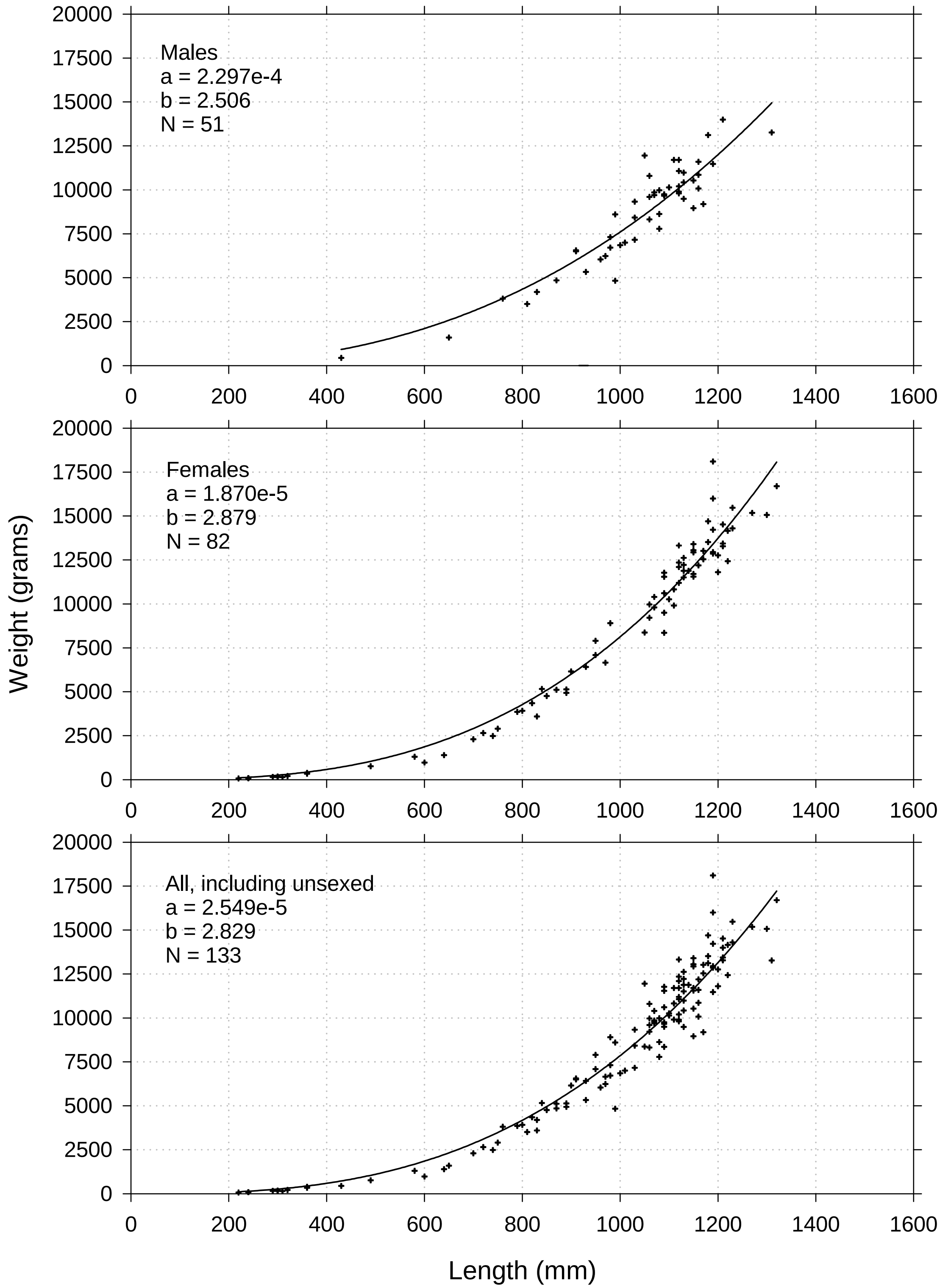


Figure 66.--Length-weight relationship for Alaska skate specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Aleutian skate (*Bathyraja aleutica*)

Aleutian skate distribution was arrayed across all depth intervals sampled in the Aleutian areas, being highest in the 101-200 m and 201-300 m depth intervals (Table 51). This species was much less abundant in the Southern Bering Sea area, where they were caught in only 3 of 61 tows. Estimated total Aleutian skate biomass was less than half that of Alaska skate (Tables 49 and 51). Mean lengths and weights of Aleutian skate were larger than those for Alaska skate. The highest mean CPUE occurred in the SE Central Aleutian subarea in 201-300 m (Table 52), between Tanaga Island and the Delarof Islands and on Stalemate Bank (Fig. 67).

Aleutian skate lengths (Fig. 68) were frequently larger than Alaska skate lengths (Fig. 65). Figure 69 shows the length-weight regression relationships for Aleutian skate males, females, and combined sexes. These relationships may have suffered from small sample sizes.

Mud skate (*Bathyraja taranetzi*)

Mud skates were found throughout the survey area in all depth intervals except the 1-100 m interval in the Southern Bering Sea area (Table 53). Mean CPUE was very modest, increasing somewhat with depth. With an estimated biomass of just over 1,750 t, it represents a small part of the general skate population in the Aleutian region. Subarea-specific mean CPUEs were small, but catches were scattered across the entire survey area, mostly in strata deeper than 200 m (Table 54).

Figure 70 summarizes catch locations and CPUE. Note that the CPUE values cited in the figure legend are very small. Figure 71 presents unweighted length frequencies for male, female, and combined sexes of mud skate. Note that skates are measured from the tip of the head to the tip of the tail. Length-weight relationships for mud skate are shown in Figure 72. The strength of the relationships may suffer from small sample sizes.

Table 51.--Number of survey hauls, number of hauls with Aleutian skate, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	1	0.15	74	0	239	13.801	125.0
Aleutian	101-200	51	8	1.51	805	132	1,477	13.891	131.7
	201-300	19	7	2.73	470	136	804	10.358	115.9
	301-500	13	1	< 0.01	< 1	0	1	0.063	26.0
	All depths	109	17	0.89	1,349	588	2,110	11.727	119.1
Central	1-100	30	2	0.34	200	0	505	9.438	117.5
Aleutian	101-200	45	4	0.87	401	0	806	17.765	141.0
	201-300	23	6	2.87	606	0	1,254	15.098	125.6
	301-500	17	2	0.81	321	0	1,489	7.924	91.5
	All depths	115	14	0.92	1,527	337	2,717	12.283	125.0
Eastern	1-100	16	1	0.20	136	0	720	2.555	73.0
Aleutian	101-200	47	4	0.87	676	0	1,413	11.101	112.2
	201-300	42	3	0.68	333	0	737	15.206	135.0
	301-500	27	4	0.89	506	0	1,292	13.645	108.0
	All depths	132	12	0.65	1,650	522	2,778	9.539	111.9
All	1-100	72	4	0.23	410	0	969	5.140	101.2
Aleutian	101-200	143	16	1.06	1,881	838	2,925	13.308	130.4
Areas	201-300	84	16	1.61	1,409	708	2,109	13.117	122.4
	301-500	57	7	0.64	827	0	1,796	9.854	91.6
	All depths	356	43	0.80	4,527	2,925	6,128	10.977	119.5
Southern	1-100	30	2	0.49	198	0	525	20.020	138.5
Bering Sea	101-200	16	0	-	-	-	-	-	-
	201-300	7	0	-	-	-	-	-	-
	301-500	8	1	1.64	171	0	566	14.627	132.0
	All depths	61	3	0.49	370	0	849	17.099	134.8

Table 52.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of Aleutian skate by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Central Aleutian	201-300	SE Central Aleutian	4	4	12.46	595	0	1,337
Western Aleutian	201-300	E Western Aleutian	10	5	4.05	317	41	594
Central Aleutian	301-500	SW Central Aleutian	2	1	3.37	266	0	3,646
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	3.05	218	0	617
Eastern Aleutian	101-200	NW Eastern Aleutian	6	2	2.54	405	0	1,068
Central Aleutian	101-200	SE Central Aleutian	14	2	2.25	170	0	421
Central Aleutian	101-200	SW Central Aleutian	17	2	2.20	232	0	569
Eastern Aleutian	301-500	SE Eastern Aleutian	12	2	1.85	476	0	1,268
Western Aleutian	101-200	W Western Aleutian	28	5	1.75	713	50	1,377
Central Aleutian	1-100	SE Central Aleutian	7	2	1.72	200	0	516
Southern Bering	301-500	Combined Southern Bering	8	1	1.64	171	0	577
Western Aleutian	201-300	W Western Aleutian	9	2	1.63	153	0	390
Eastern Aleutian	1-100	NE Eastern Aleutian	2	1	1.07	136	0	1,861
Eastern Aleutian	101-200	SW Eastern Aleutian	9	1	1.00	226	0	748
Southern Bering	1-100	E Southern Bering Sea	27	2	0.81	198	0	525
Central Aleutian	301-500	SE Central Aleutian	4	1	0.77	55	0	229
Western Aleutian	101-200	E Western Aleutian	23	3	0.73	91	0	213
Western Aleutian	1-100	E Western Aleutian	10	1	0.63	74	0	241
Eastern Aleutian	201-300	SE Eastern Aleutian	12	1	0.55	114	0	365
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	0.40	17	0	238
Central Aleutian	201-300	N Central Aleutian	10	2	0.26	11	0	30
Eastern Aleutian	101-200	SE Eastern Aleutian	15	1	0.23	44	0	140
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	1	0.05	13	0	40
Western Aleutian	301-500	W Western Aleutian	11	1	< 0.01	< 1	0	1

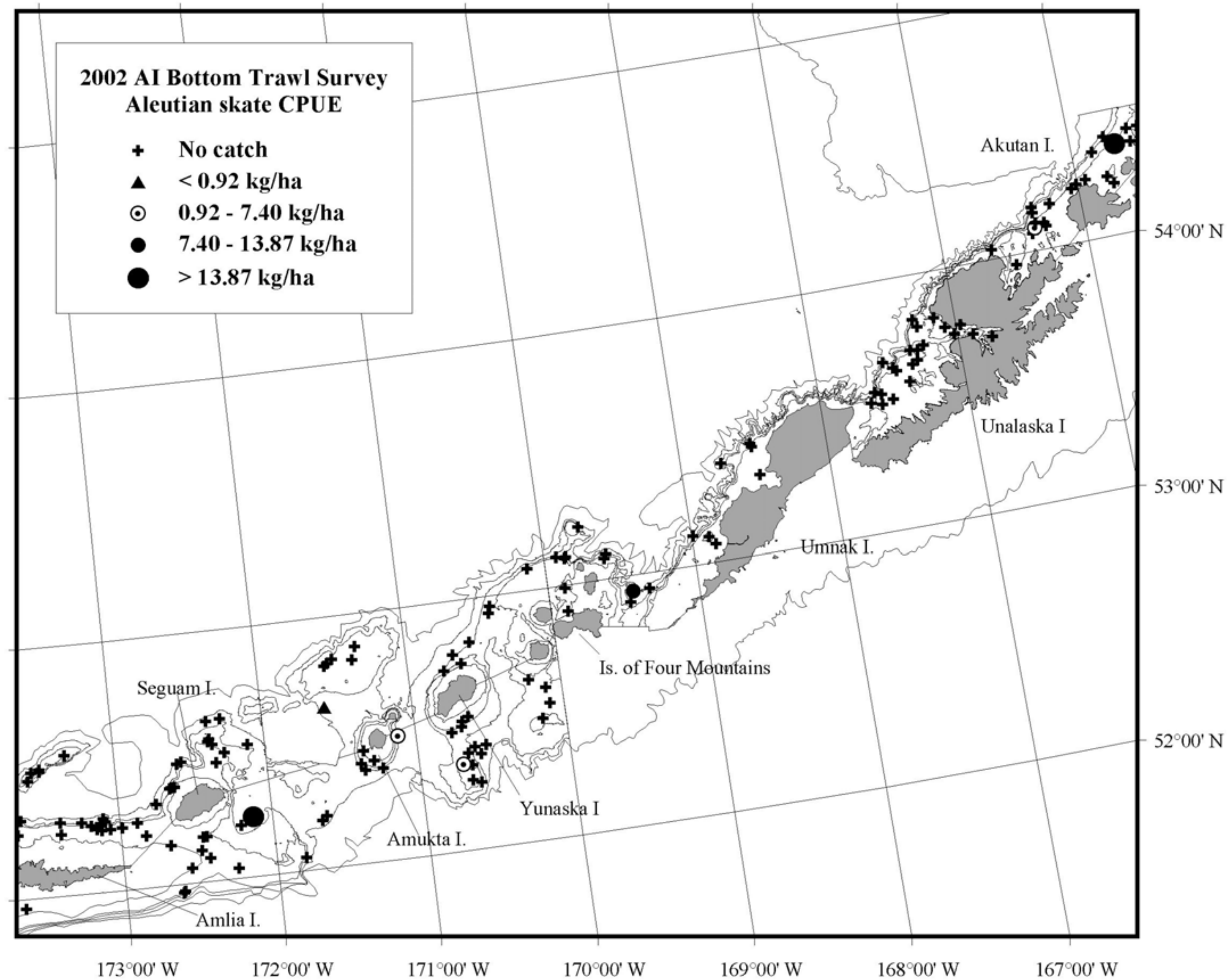
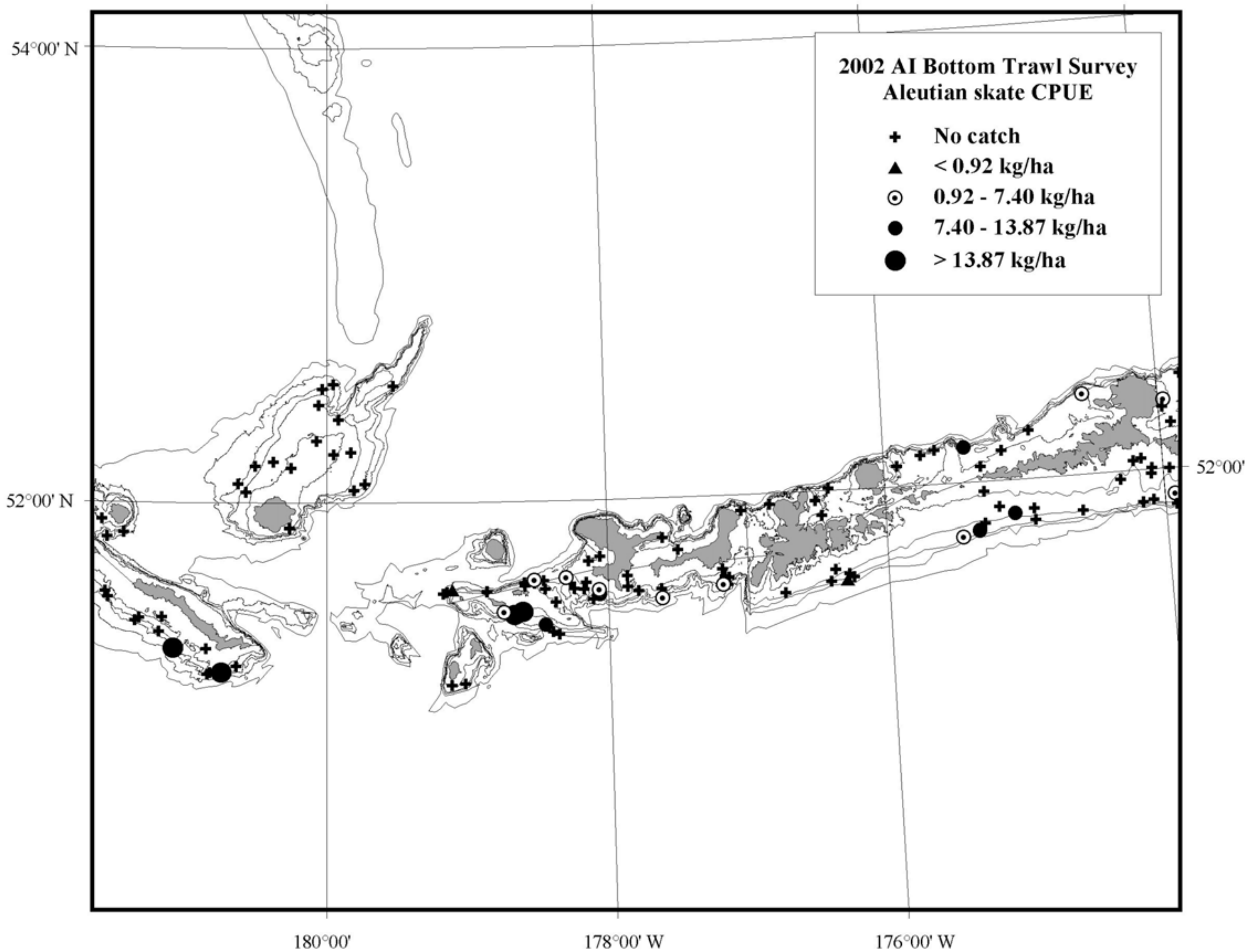


Figure 67.--Distribution and relative abundance of Aleutian skate from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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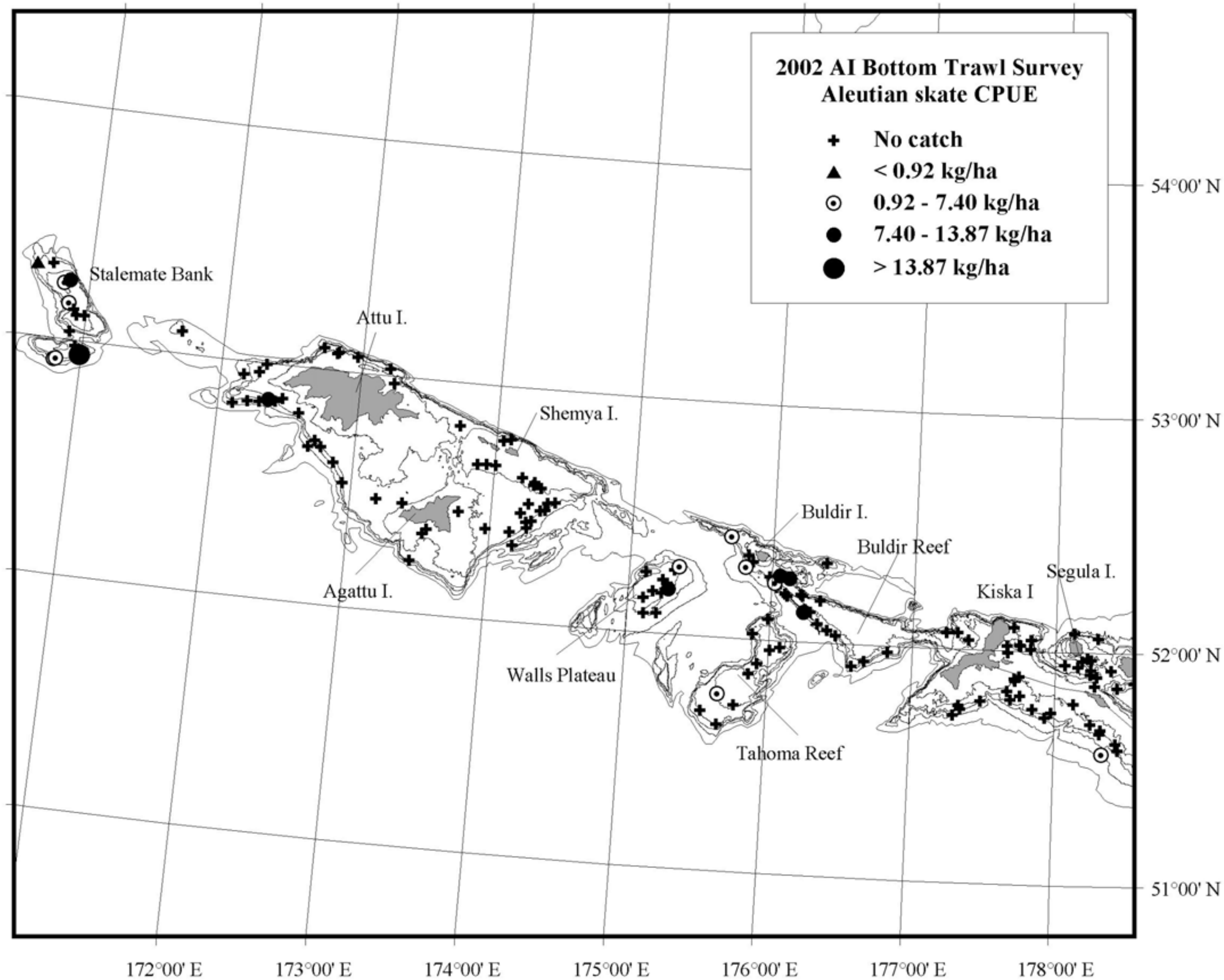

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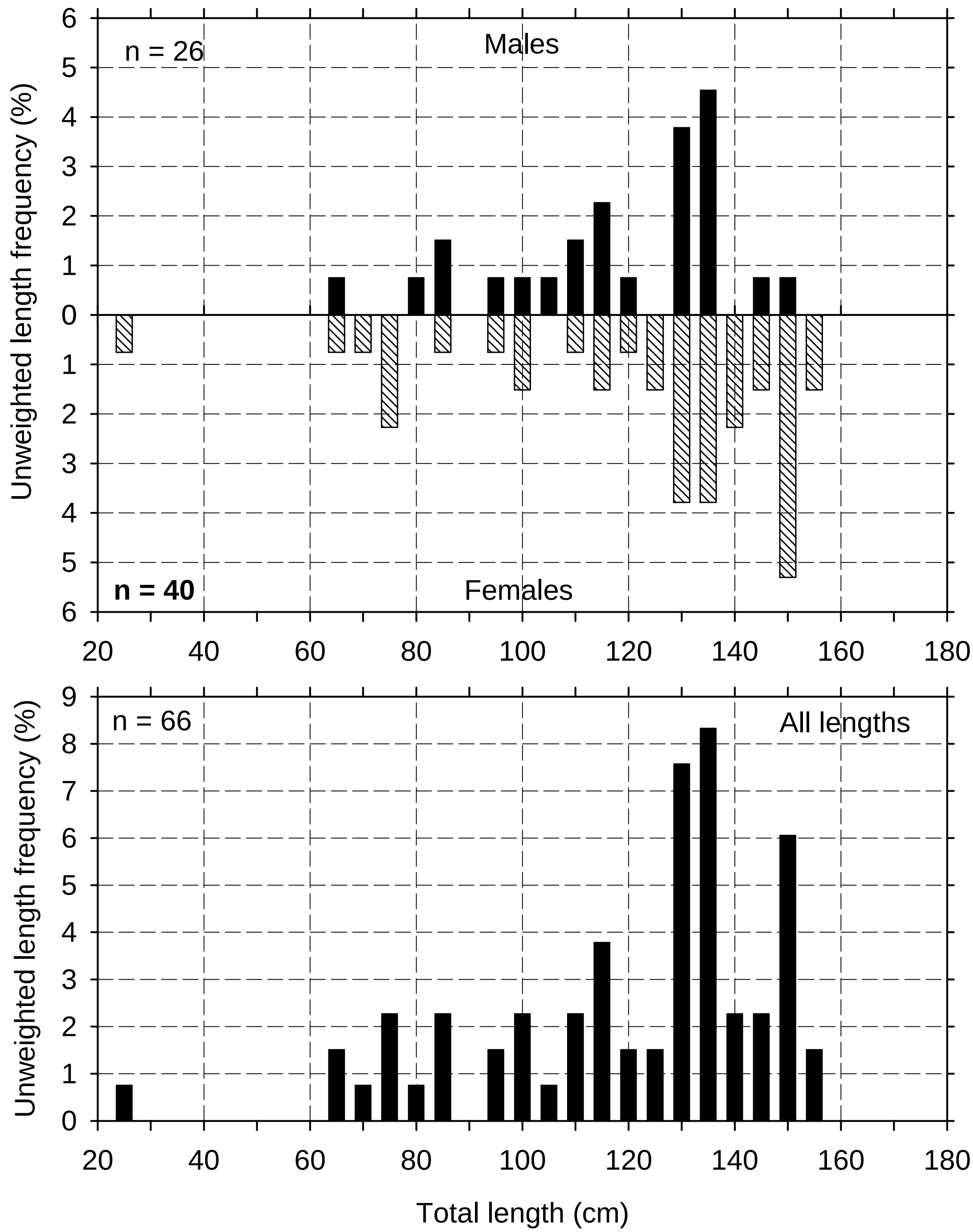


Figure 68.--Length frequencies of Aleutian skate catches from the 2002 Aleutian Islands bottom trawl survey. Lengths grouped in 5 cm increments. Lengths are from all areas and depths.

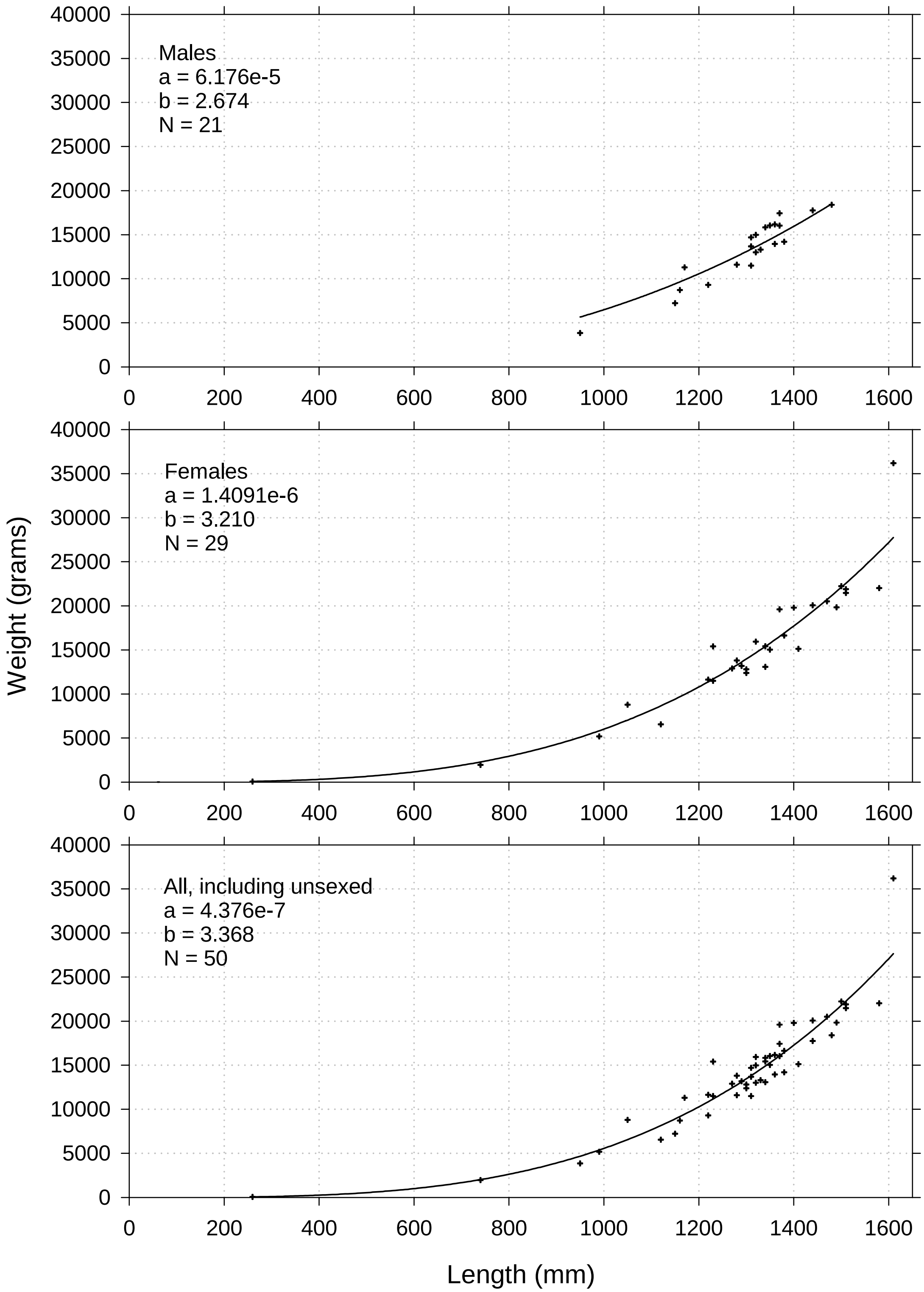


Figure 69.--Length-weight relationship for Aleutian skate specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}{}^{b}$.

Table 53.--Number of survey hauls, number of hauls with mud skate, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	1	0.04	18	0	55	1.770	66.0
Aleutian	101-200	51	3	0.07	40	0	91	1.041	53.3
	201-300	19	3	0.13	22	0	47	1.399	64.4
	301-500	13	6	0.58	188	0	398	1.243	48.4
	All depths	109	13	0.18	268	57	479	1.242	51.3
Central	1-100	30	3	0.05	27	0	69	0.798	48.1
Aleutian	101-200	45	3	0.05	25	0	63	1.618	69.5
	201-300	23	13	0.88	186	44	328	1.090	50.3
	301-500	17	15	0.82	328	186	470	0.687	49.8
	All depths	115	34	0.34	566	374	759	0.812	50.1
Eastern	1-100	16	0	-	-	-	-	-	-
Aleutian	101-200	47	6	0.08	59	8	111	1.215	59.4
	201-300	42	11	0.32	156	1	310	0.587	47.5
	301-500	27	15	1.10	623	127	1,119	0.563	45.7
	All depths	132	32	0.33	838	322	1,354	0.590	46.5
All	1-100	72	4	0.03	45	0	98	1.019	52.2
Aleutian	101-200	143	12	0.07	124	46	203	1.211	57.8
Areas	201-300	84	27	0.42	364	164	564	0.805	49.2
	301-500	57	36	0.88	1,139	602	1,677	0.656	47.1
	All depths	356	79	0.29	1,672	1,097	2,248	0.716	48.0
Southern	1-100	30	0	-	-	-	-	-	-
Bering Sea	101-200	16	1	0.05	10	0	30	2.120	71.0
	201-300	7	2	0.25	14	0	38	0.837	52.9
	301-500	8	4	0.61	64	0	140	0.849	53.9
	All depths	61	7	0.12	87	6	168	0.906	54.5

Table 54.--Sampling effort, mean CPUE, and estimated biomass with 95% confidence limits (CL) of mud skate by NPFMC regulatory area and survey subarea, ranked by descending mean CPUE for the 2002 Aleutian Islands bottom trawl survey.

NPFMC Area	Depth range (m)	Subarea	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Biomass CL Min. (t)	Biomass CL Max. (t)
Eastern Aleutian	301-500	SW Eastern Aleutian	2	1	4.43	194	0	2,658
Central Aleutian	301-500	SE Central Aleutian	4	4	1.67	119	0	275
Central Aleutian	201-300	N Central Aleutian	10	5	1.30	57	0	120
Central Aleutian	201-300	SE Central Aleutian	4	2	1.07	51	0	204
Eastern Aleutian	301-500	SE Eastern Aleutian	12	6	1.06	272	22	523
Central Aleutian	201-300	Petrel Bank	3	3	0.74	57	0	162
Central Aleutian	301-500	Petrel Bank	3	3	0.72	89	0	203
Western Aleutian	301-500	W Western Aleutian	11	4	0.72	123	0	335
Central Aleutian	301-500	N Central Aleutian	8	6	0.64	79	16	142
Southern Bering	301-500	Combined Southern Bering	8	4	0.61	64	0	142
Eastern Aleutian	201-300	NE Eastern Aleutian	22	5	0.60	119	0	272
Eastern Aleutian	301-500	Combined Eastern Aleutian	13	8	0.59	157	26	288
Central Aleutian	301-500	SW Central Aleutian	2	2	0.51	40	0	276
Central Aleutian	201-300	SW Central Aleutian	6	3	0.50	21	0	49
Western Aleutian	301-500	E Western Aleutian	2	2	0.42	66	0	146
Southern Bering	201-300	Combined Southern Bering	7	2	0.25	14	0	39
Western Aleutian	201-300	W Western Aleutian	9	3	0.23	22	0	48
Eastern Aleutian	101-200	NE Eastern Aleutian	17	5	0.21	42	5	80
Eastern Aleutian	201-300	SE Eastern Aleutian	12	4	0.15	31	0	63
Central Aleutian	101-200	N Central Aleutian	8	1	0.14	15	0	50
Central Aleutian	1-100	N Central Aleutian	14	3	0.13	27	0	69
Eastern Aleutian	101-200	NW Eastern Aleutian	6	1	0.11	17	0	60
Central Aleutian	101-200	SE Central Aleutian	14	1	0.10	8	0	24
Eastern Aleutian	201-300	SW Eastern Aleutian	6	2	0.08	6	0	18
Western Aleutian	101-200	W Western Aleutian	28	2	0.08	33	0	83
Southern Bering	101-200	E Southern Bering Sea	11	1	0.08	10	0	31
Western Aleutian	101-200	E Western Aleutian	23	1	0.05	7	0	20
Western Aleutian	1-100	W Western Aleutian	16	1	0.05	18	0	55
Central Aleutian	101-200	SW Central Aleutian	17	1	0.03	3	0	9

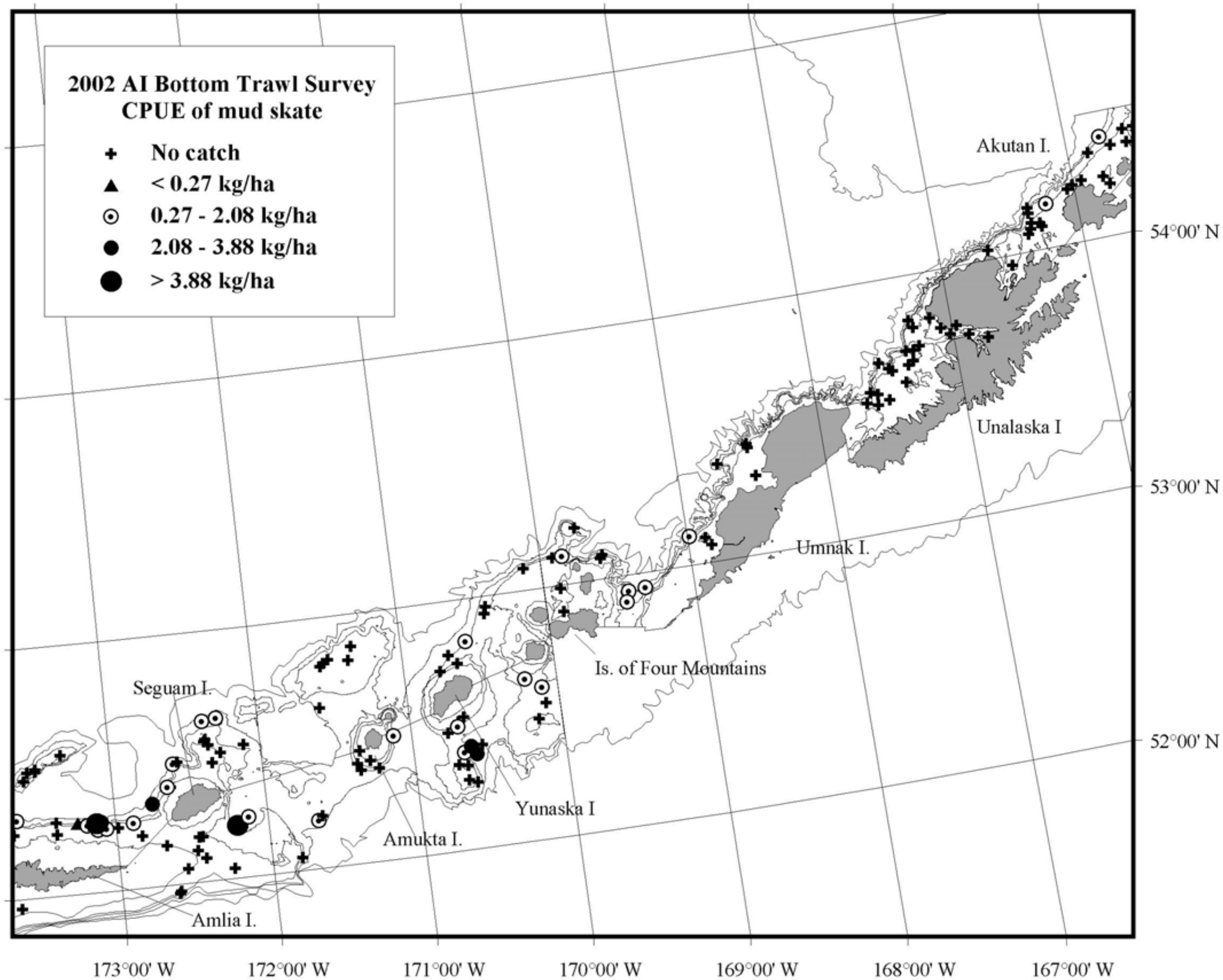
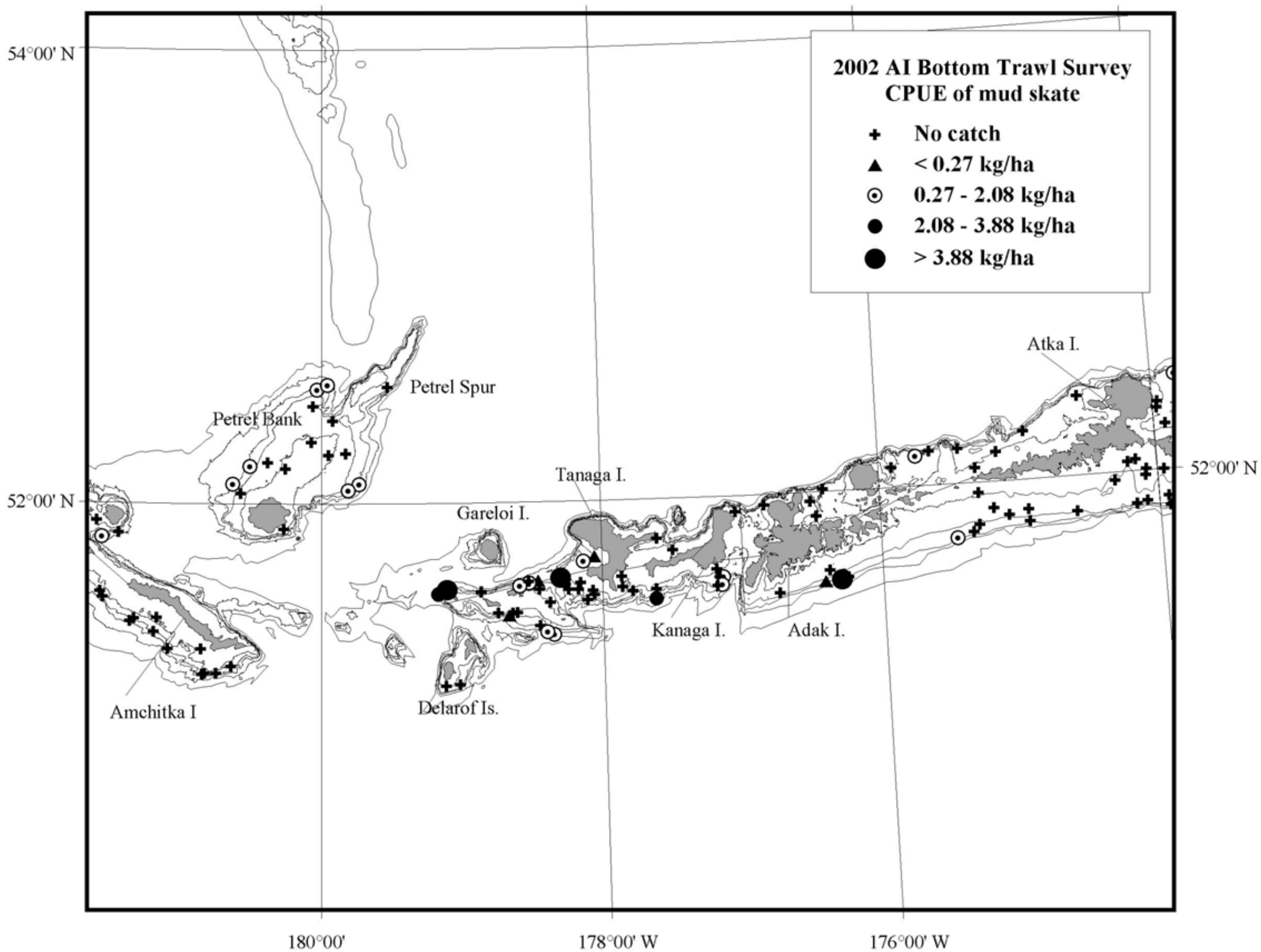


Figure 70.--Distribution and relative abundance of mud skates from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and greater than four standard deviations above mean CPUE.



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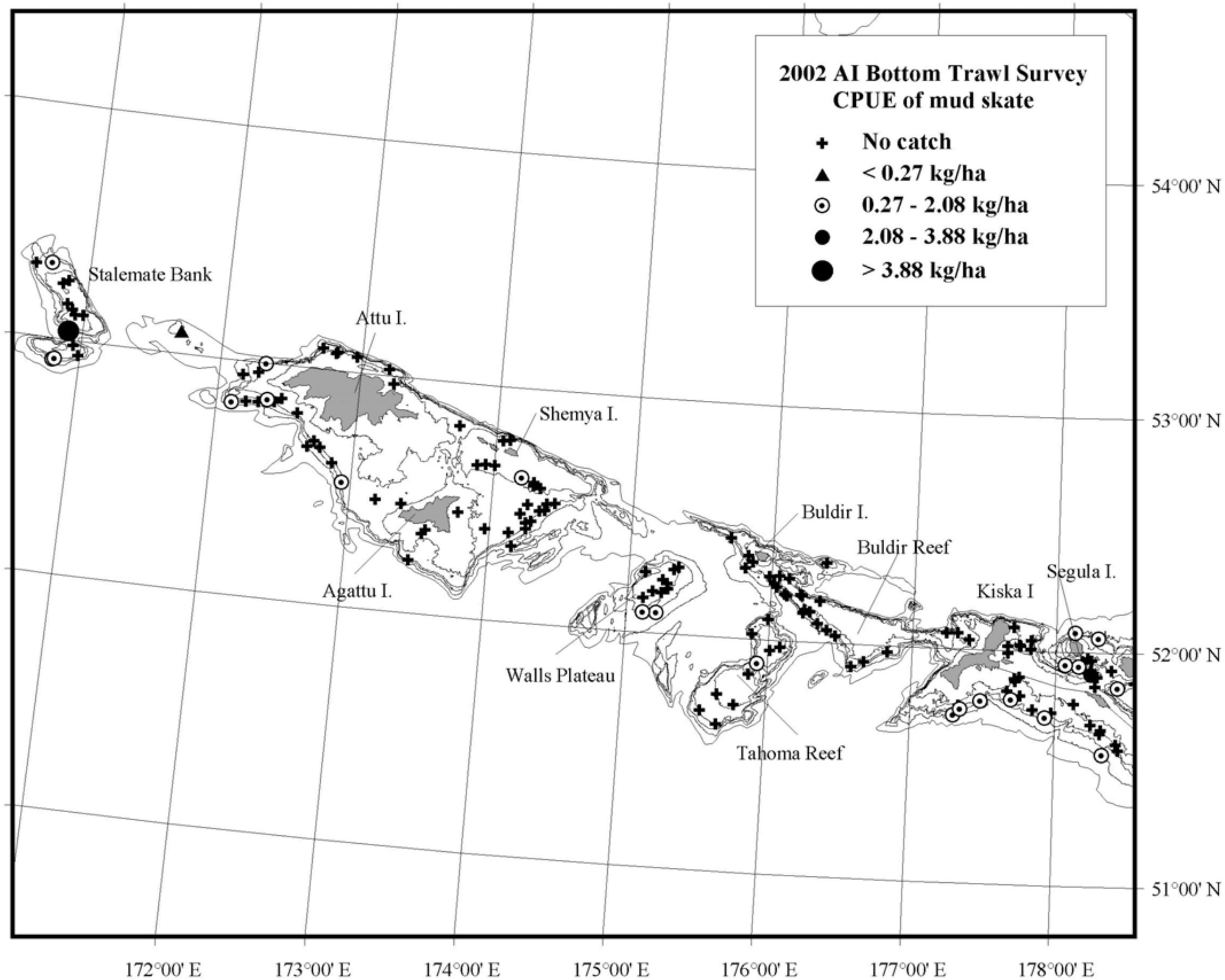

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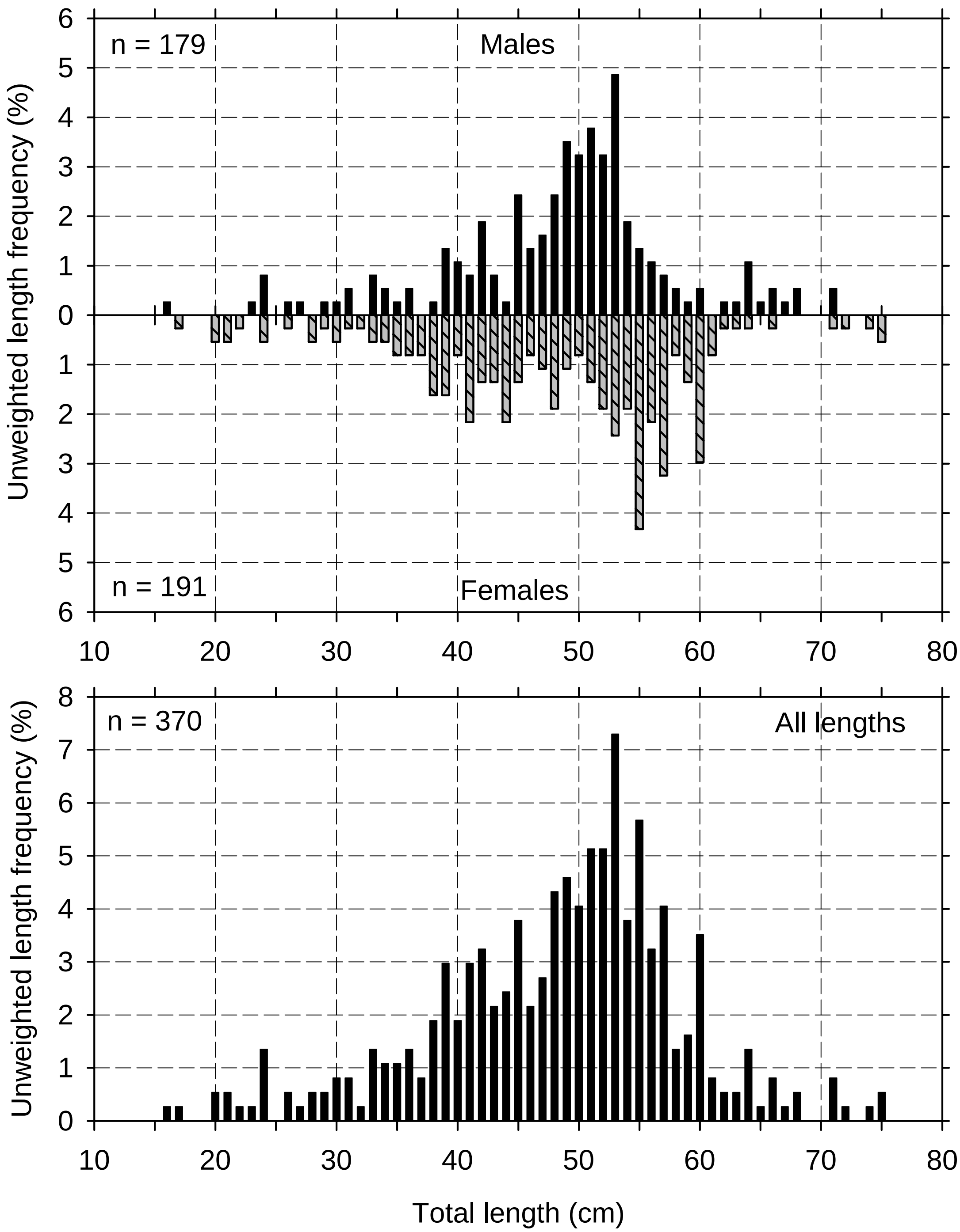

Figure 71.--Length frequencies of mud skate catches from the 2002 Aleutian Islands bottom trawl survey. Lengths are from all areas and depths.

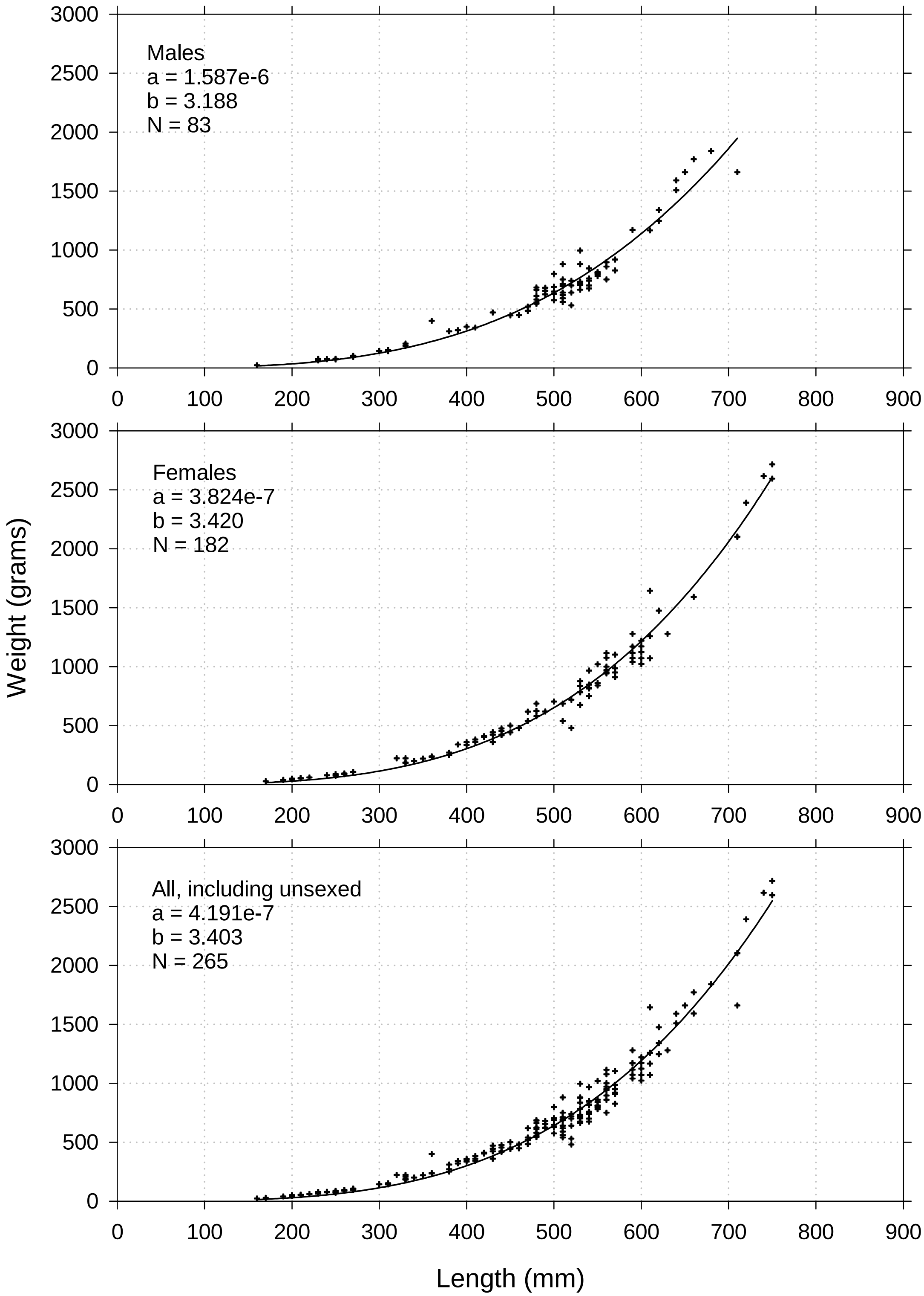

Figure 72.--Length-weight relationship for mud skate specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Miscellaneous skates

Four species of skate and a group of unidentified skates comprise this category: big skate (*Raja binoculata*), Bering skate (*Bathyraja interrupta*), Commander skate (*B. lindbergi*), and whitebrow skate (*B. minispinosa*), and unidentified skates (*Bathyraja* sp.). These skates were relatively rare in survey trawl catches, as the mean CPUE and biomass estimates in Table 55 suggest. Catches of big skate were restricted to the west side of Unalaska Island in a typically muddy bottom habitat. Five catches of Bering skate were made between Unalaska and Umnak Islands (2), west of Seguam Island, west of Tanaga Island, and near the west side of Kiska Island. One catch of Commander skate was made in 458 m on the promontory west of Attu Island. Two catches of whitebrow skate were made near the NE tip of Umnak Island in 365 m and west of Seguam Island in 223 m. There were 6 catches of unidentified *Bathyraja* species that were preserved for subsequent identification.

Table 55.--Number of survey hauls, number of hauls with miscellaneous skates, mean CPUE, biomass estimates with confidence limits, mean weight, and mean length based on the 2002 Aleutian Islands bottom trawl survey, by NPFMC regulatory area and depth interval.

NPFMC area	Depth (m)	Number of trawl hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	95% Confidence limits Minimum biomass (t)	95% Confidence limits Maximum biomass (t)	Mean weight (kg)	Mean length (cm)
Western	1-100	26	0	-	-	-	-	-	No data
Aleutian	101-200	51	0	-	-	-	-	-	
	201-300	19	1	0.08	14	0	46	2.057	
	301-500	13	1	0.10	31	0	101	5.098	
	All depths	109	2	0.03	46	0	120	3.491	
Central	1-100	30	1	0.02	10	0	34	-	
Aleutian	101-200	45	2	0.01	4	0	11	0.117	
	201-300	23	2	0.04	8	0	24	0.205	
	301-500	17	0	-	-	-	-	-	
	All depths	115	5	0.01	22	0	48	0.295	
Eastern	1-100	16	0	-	-	-	-	-	
Aleutian	101-200	47	0	-	-	-	-	-	
	201-300	42	1	< 0.01	2	0	7	0.608	
	301-500	27	0	-	-	-	-	-	
	All depths	132	1	< 0.01	2	0	7	0.608	
All	1-100	72	1	-	-	-	-	-	
Aleutian	101-200	143	2	< 0.01	4	0	11	0.117	
Areas	201-300	84	4	0.03	25	0	59	0.488	
	301-500	57	1	0.02	31	0	101	5.098	
	All depths	356	8	0.01	70	0	148	0.758	
Southern	1-100	30	0	-	-	-	-	-	
Bering Sea	101-200	16	0	-	-	-	-	-	
	201-300	7	0	-	-	-	-	-	
	301-500	8	1	0.15	16	0	53	2.589	
	All depths	61	1	0.02	16	0	53	2.589	

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APPENDIX A

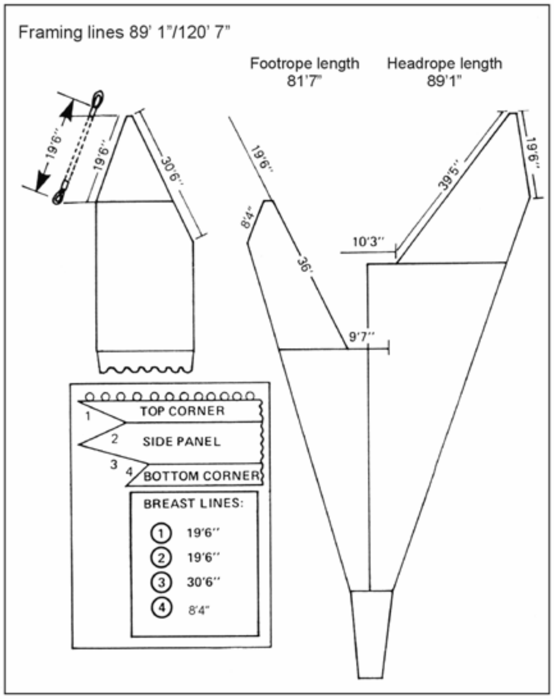
Description of Sampling Gear

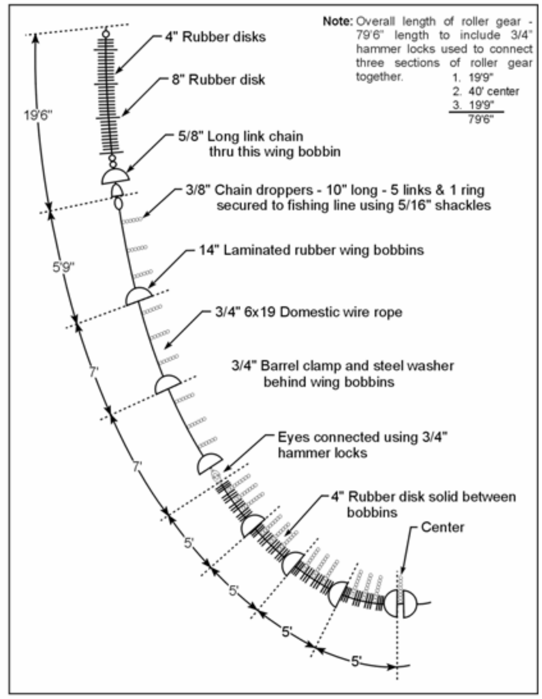
Table A-1 is a summarizes specifications of the Poly-Nor'Eastern trawl and Figure A-1 is a schematic diagram of the trawl and accessories used during the 2002 Aleutian Islands bottom trawl survey.

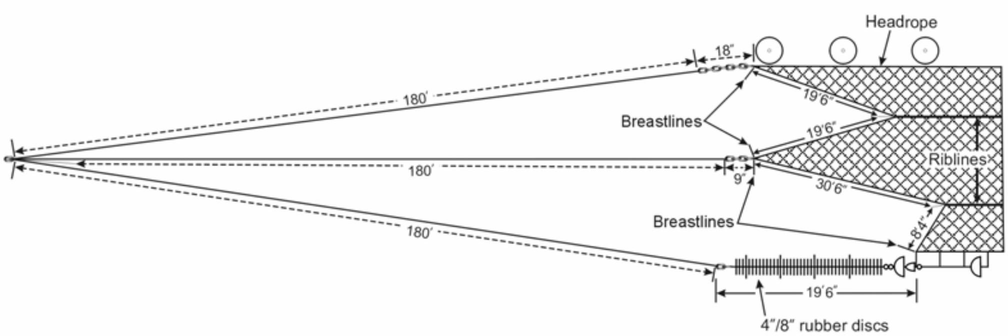
Appendix Table A-1.--Specifications of the trawl, otter doors, and accessory gear used during the 2002 Aleutian Islands bottom trawl survey.

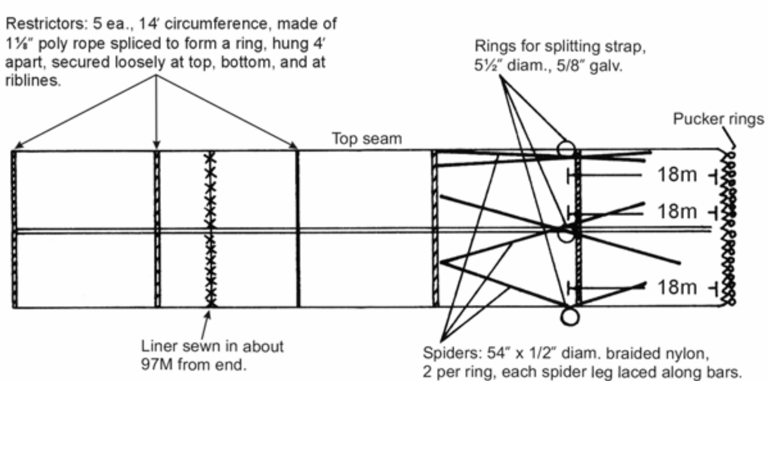
Equipment	Specifications
Netting -	Polyethylene, 12.7 cm (5 in), 4 & 5 millimeter (mm) twine.
Headrope -	27.2 m (89 ft-1 in), 1.3 cm (1/2 in) 6 x 19 gauge galvanized wire rope, wrapped with 1 cm (3/8 in) 3-strand polypropylene rope.
Footrope -	24.9 m (81 ft-7 in), 1 cm (3/8 in) 6 x 19 gauge galvanized wire rope wrapped with polypropylene rope.
Fishing line -	24.3 m (79 ft-7 in), shot-peened long-link chain. Safe working load 5.1 metric ton (t).
Roller gear -	24.2 m (79 ft-6 in), 1.9 cm (3/4 in) diameter, 6 x 19 gauge galvanized wire rope strung through 10.2 cm (4 in) diameter rubber disks, 16 rubber wing bobbins 35.6 cm (14 in) in diameter and 34 galvanized rings hung with 30.5 cm (12 in) long dropper chain.
Breastlines -	1 cm (3/8 in) 6 x 19 gauge galvanized wire rope wrapped with 1 cm polypropylene. Top corner 5.9 m (19 ft-6 in); bottom corner 2.6 m (8 ft-8 in); top side panel 5.9 m; bottom side panel 9.3 m (30 ft-6 in).
Riblines -	1.9 cm (3/4 in) Samson 2 & 1 Duralon. Top two 34.8 m (114.17 ft) and bottom two 31.8 m 104.45 ft), hung 98% of stretched seam length.
Flotation -	Cycolac trawl floats, 30.5 cm (12 in) diameter, 21 pieces. Buoyancy 10.2 kg (22.4 lb.) each and rated for 800 m (400 fm) depth.
Codend liner -	Nylon, no. 18, 3.2 cm (1-1/4 in) stretched mesh (M), 315 M circumference and 200 M deep, laced to inner bag. When stretched the liner protrudes 61-91 cm (2 to 3 ft) beyond codend.
Restrictors -	Polypropylene rope, 2.5 cm (1 in) diameter, 4.3 m (14 ft) circumference and secured loosely to codend at each ribline, 1.2 m (4 ft) apart, 5 pieces.
Splitting gear -	1.3 cm (1/2 in) diameter 6.4 m (21 ft) long galvanized wire rope is passed through 4 galvanized steel rings which are secured to the codend with 1.3 cm diameter braided nylon "spiders".
Side seams -	Panels are joined to each other gathering 3 M (4 knots) from each panel. Panels that are secured to framing lines have a selvaged edge created by gathering 3 M.
Rigging -	3 dandylines each side, 1.6 cm (5/8 in) diameter galvanized wire rope, 54.9 m (30 fm) long.
Doors -	1.8 m x 2.7 m (6 x 9 ft), steel V-doors, approximately 800 kg (1,800 lb) each.
Chafing gear -	Polypropylene 10 in M, 1 cm (3/8 in) polyrope hog-ringed (or interwoven) together, 46 M circumference and 21 M deep, laced to outer bag 68.5 M up from the pucker rings.

Poly Nor' Eastern Bottom Trawl









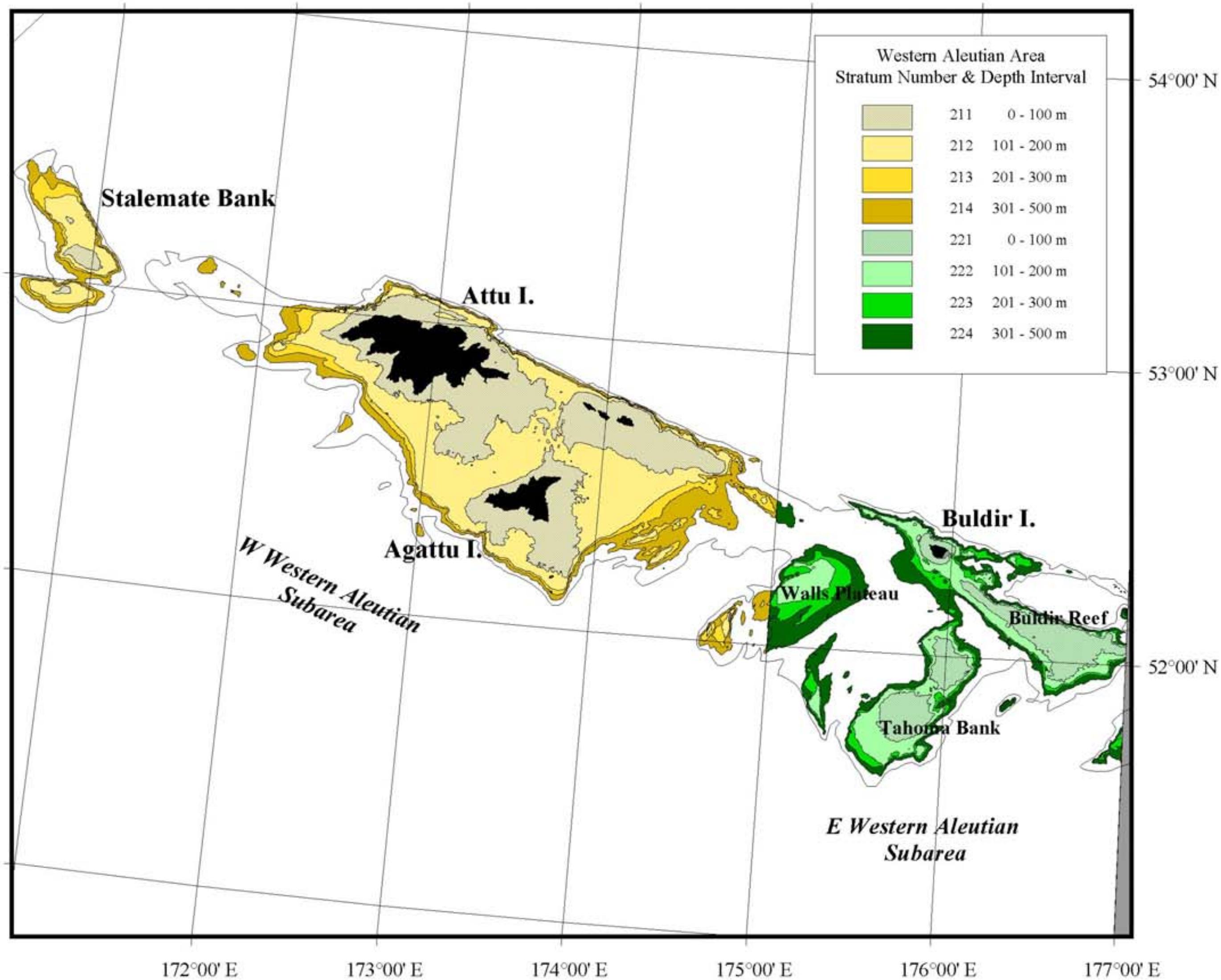
APPENDIX B

Description of the survey region and sampling subareas

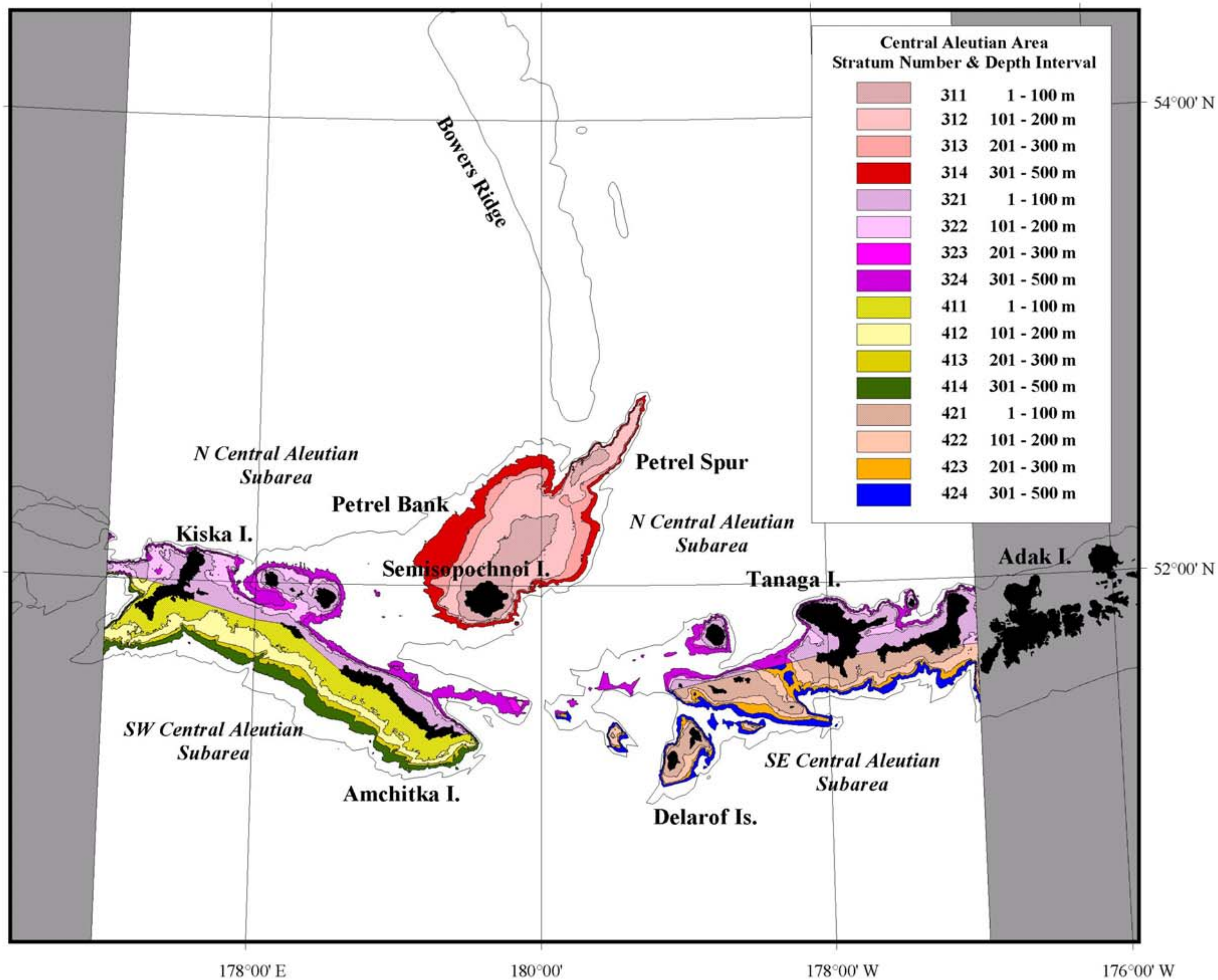
Appendix Table B-1 summarizes the major sampling areas, subareas, stratum codes (see Appendix Figures B1 through B4), depth intervals, and areas in square kilometers. Appendix Figures B1 – B4 show geographic features, stratum isobaths, area, subarea, and stratum boundaries.

Appendix Table B-1.--Survey sampling areas, subareas, stratum codes, depth intervals, and areas.

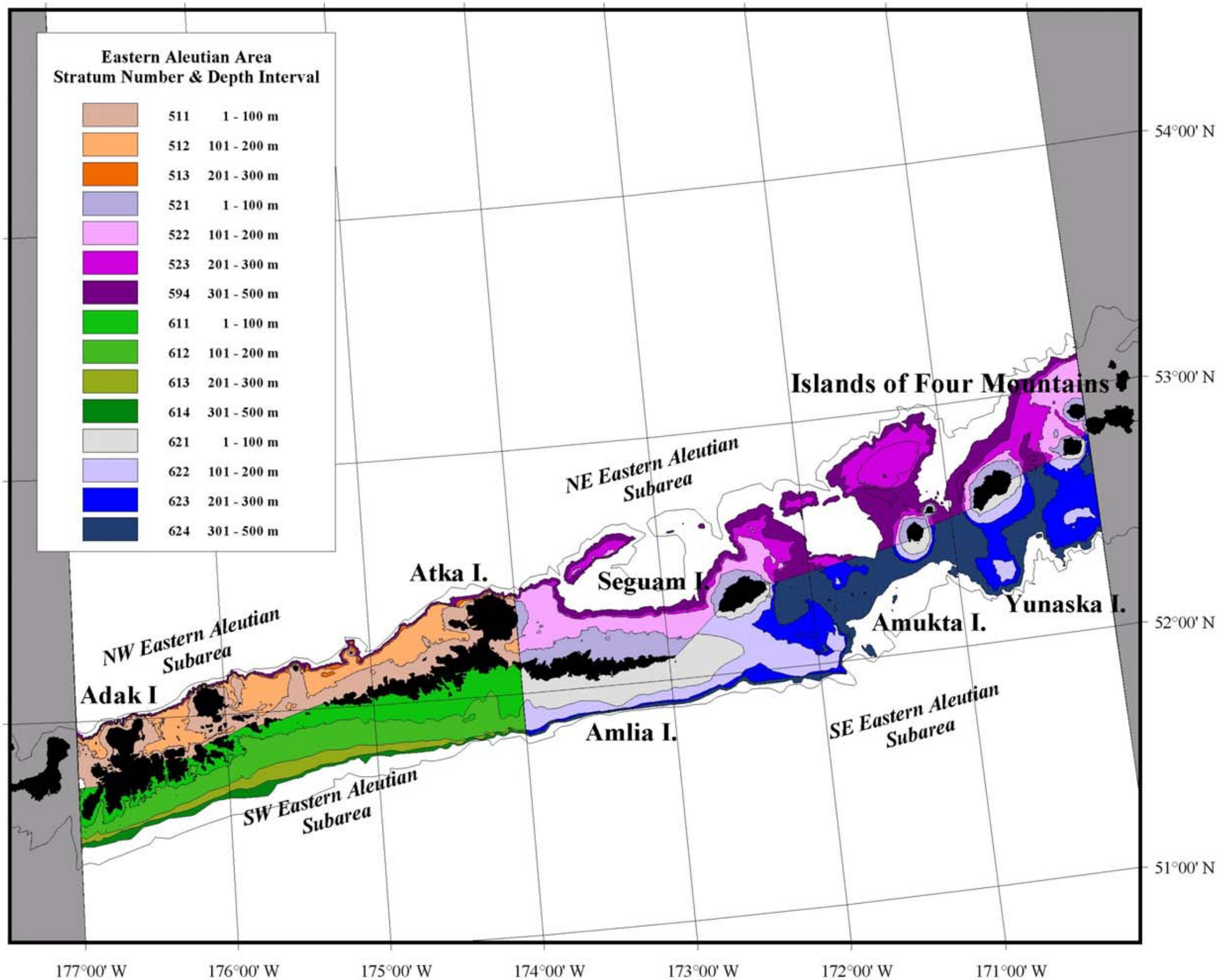
NPFMC Area	Subarea Description	Stratum code	Depth interval (m)	Area (km^2)
Western Aleutian	W Western Aleutian	211	1 - 100	3,693
	W Western Aleutian	212	101 - 200	4,065
	W Western Aleutian	213	201 - 300	940
	W Western Aleutian	214	301 - 500	1,711
	E Western Aleutian	221	1 - 100	1,183
	E Western Aleutian	222	101 - 200	1,252
	E Western Aleutian	223	201 - 300	783
	E Western Aleutian	224	301 - 500	1,561
Central Aleutian	Petrel Bank	311	1 - 100	960
	Petrel Bank	312	101 - 200	1,736
	Petrel Bank	313	201 - 300	766
	Petrel Bank	314	301 - 500	1,237
	N Central Aleutian	321	1 - 100	2,106
	N Central Aleutian	322	101 - 200	1,066
	N Central Aleutian	323	201 - 300	439
	N Central Aleutian	324	301 - 500	1,240
	SW Central Aleutian	411	1 - 100	1,618
	SW Central Aleutian	412	101 - 200	1,052
	SW Central Aleutian	413	201 - 300	426
	SW Central Aleutian	414	301 - 500	789
	SE Central Aleutian	421	1 - 100	1,164
	SE Central Aleutian	422	101 - 200	752
	SE Central Aleutian	423	201 - 300	477
	SE Central Aleutian	424	301 - 500	714
Eastern Aleutian	NW Eastern Aleutian	511	1 - 100	1,932
	NW Eastern Aleutian	512	101 - 200	1,594
	NW Eastern Aleutian	513	201 - 300	156
	NE Eastern Aleutian	521	1 - 100	1,268
	NE Eastern Aleutian	522	101 - 200	2,013
	NE Eastern Aleutian	523	201 - 300	1,969
	Combined Eastern AI	594	301 - 500	2,670
	SW Eastern Aleutian	611	1 - 100	1,907
	SW Eastern Aleutian	612	101 - 200	2,261
	SW Eastern Aleutian	613	201 - 300	716
	SW Eastern Aleutian	614	301 - 500	438
	SE Eastern Aleutian	621	1 - 100	1,741
	SE Eastern Aleutian	622	101 - 200	1,900
	SE Eastern Aleutian	623	201 - 300	2,061
	SE Eastern Aleutian	624	301 - 500	2,575
Southern Bering Sea	W Southern Bering Sea	711	1 - 100	1,586
	W Southern Bering Sea	712	101 - 200	670
	E Southern Bering Sea	721	1 - 100	2,440
	E Southern Bering Sea	722	101 - 200	1,179
	Combined S. Bering Sea	793	201 - 300	564
	Combined S. Bering Sea	794	301 - 500	1,043



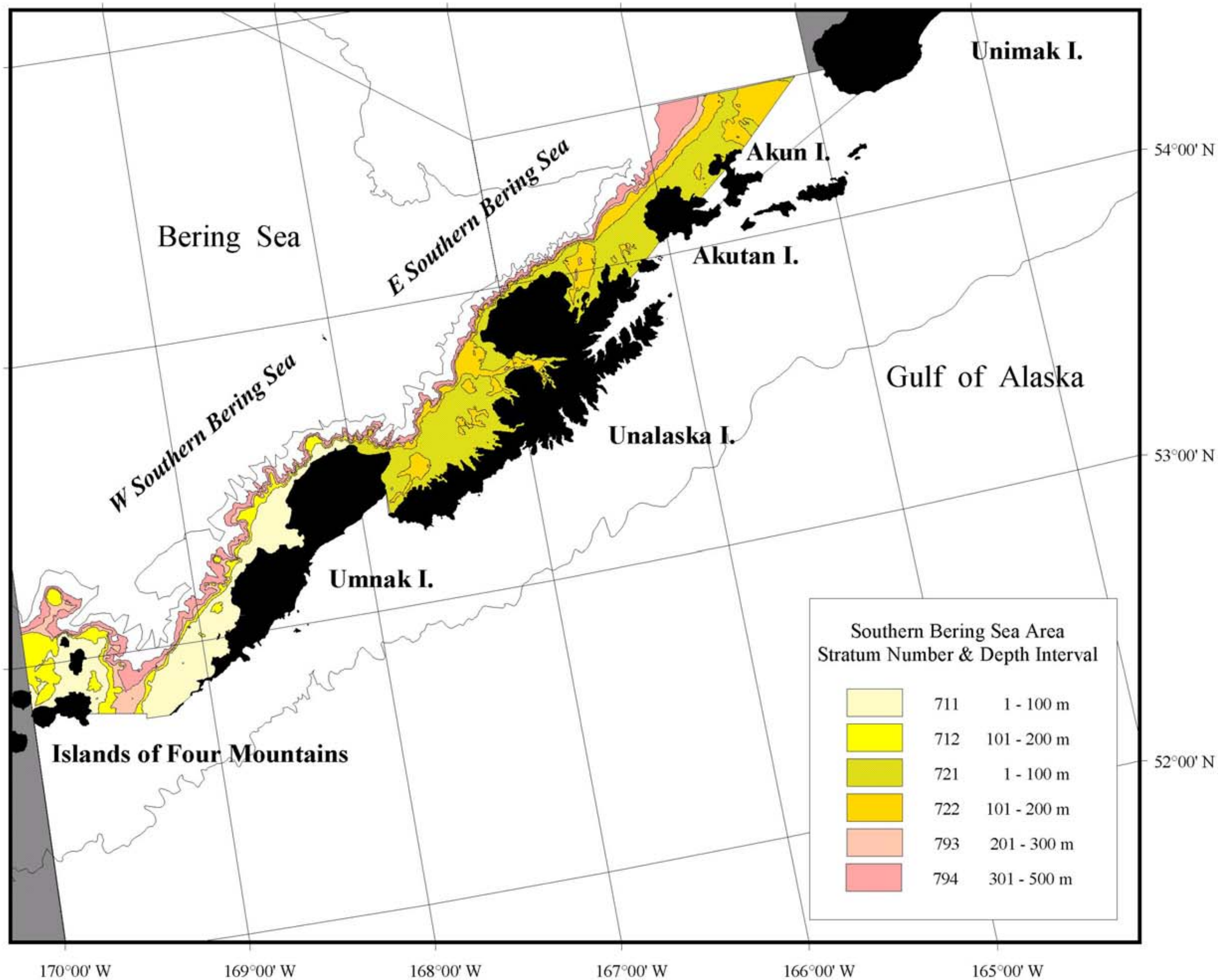
Appendix Figure B-1.--Strata sampled during the Aleutian Islands groundfish trawl survey, by NPFMC management area and sampling subarea.



Appendix Figure B-2.--Strata sampled during the Aleutian Islands groundfish trawl survey, by NPFMC management area and sampling subarea.



Appendix Figure B-3.--Strata sampled during the Aleutian Islands groundfish trawl survey, by NPFMC management area and sampling subarea.



Appendix Figure B-4.--Strata sampled during the Aleutian Islands groundfish trawl survey, by NPFMC management area and sampling subarea.

APPENDIX C

Species Encountered

Appendix Tables C-1 and C-2 list fish and invertebrate taxa encountered and identified during the 2002 Aleutian Islands bottom trawl survey. Most common and scientific names are from Robins *et al.* (1991). Order of listings and common names used are for convenience and do not imply adherence to a particular phylogenetic system.

Appendix Table C-1.--Fish species encountered and identified during the 2002 Aleutian bottom trawl survey.

Family	Species name	Common name
Petromyzontidae	*Lampetra tridentata*	Pacific lamprey
Lamnidae	*Lamna ditropis*	salmon shark
Squalidae	*Somniosus pacificus*	Pacific sleeper shark
Rajidae	*Raja binoculata*	big skate
	Bathyraja interrupta	Bering skate
	Bathyraja taranetzi	mud skate
	Bathyraja parmifera	Alaska skate
	Bathyraja aleutica	Aleutian skate
	Bathyraja lindbergi	commander skate
	Bathyraja maculata	whiteblotched skate
	Bathyraja minispinosa	whitebrow skate
Pleuronectidae	*Atheresthes stomias*	arrowtooth flounder
	Atheresthes evermanni	Kamchatka flounder
	Reinhardtius hippoglossoides	Greenland turbot
	Hippoglossus stenolepis	Pacific halibut
	Hippoglossoides elassodon	flathead sole
	Parophrys vetulus	English sole
	Microstomus pacificus	Dover sole
	Glyptocephalus zachirus	rex sole
	Limanda aspera	yellowfin sole
	Platichthys stellatus	starry flounder
	Lepidopsetta polyxystra	northern rock sole
	Lepidopsetta bilineata	southern rock sole
	Isopsetta isolepis	butter sole
Agonidae	*Sarritor leptorhynchus*	longnose poacher
	Sarritor frenatus	sawback poacher
	Bathyagonus alascanus	gray starsnout
	Bathyagonus infraspinatus	spinycheek starsnout
	Bathyagonus nigripinnis	blackfin poacher
	Podothecus acipenserinus	sturgeon poacher
	Aspidophoroides bartoni	Aleutian alligatorfish
	Hypsagonus quadricornis	fourhorn poacher
Ammodytidae	*Ammodytes hexapterus*	Pacific sand lance
Anoplopomatidae	*Anoplopoma fimbria*	sablefish
Bathylagidae	*Bathylagus pacificus*	Pacific blacksmelt
	Bathylagus milleri	robust blacksmelt
	Leuroglossus schmidti	northern smoothtongue
	Leuroglossus stilbius	California smoothtongue
Bathymasteridae	*Bathymaster caeruleofasciatus*	Alaskan ronquil
	Bathymaster leurolepis	smallmouth ronquil
	Bathymaster signatus	searcher
Chauliodontidae	*Chauliodus macouni*	Pacific viperfish

Appendix Table C-1.--Continued.

Family	Species name	Common name
Macrouridae	*Albatrossia pectoralis*	giant grenadier
Cottidae	*Thyriscus anoplus*	sponge sculpin
	Gymnocanthus galeatus	armorhead sculpin
	Bolinia euryptera	
	Malacocottus kincaidi	blackfin sculpin
	Malacocottus zonurus	darkfin sculpin
	Hemilepidotus gilberti	banded Irish lord
	Hemilepidotus zapus	longfin Irish lord
	Hemilepidotus jordani	yellow Irish lord
	Triglops forficata	scissortail sculpin
	Triglops metopias	crescent-tail sculpin
	Triglops scepticus	spectacled sculpin
	Triglops pingeli	ribbed sculpin
	Triglops macellus	roughspine sculpin
	Myoxocephalus polyacanthocephalus	great sculpin
	Myoxocephalus jaok	plain sculpin
	Enophrys diceraus	antlered sculpin
	Dasycottus setiger	spinyhead sculpin
	Nautichthys pribilovius	eyeshade sculpin
	Nautichthys oculofasciatus	sailfin sculpin
	Rhamphocottus richardsoni	grunt sculpin
	Hemitripterus bolini	bigmouth sculpin
	Icelus spiniger	thorny sculpin
	Icelus euryops	
	Icelus uncinalis	
	Ratrinus scutiger	
	Jordania zonope	longfin sculpin
Trichodontidae	*Trichodon trichodon*	Pacific sandfish
Gadidae	*Gadus macrocephalus*	Pacific cod
	Theragra chalcogramma	walleye pollock
Hexagrammidae	*Pleurogrammus monopterygius*	Atka mackerel
	Hexagrammos decagrammus	kelp greenling
Cyclopteridae	*Aptocyclus ventricosus*	smooth lumpsucker
	Lethotremus muticus	
	Eumicrotremusbirulai	round lumpsucker
	Eumicrotremus orbis	Pacific spiny lumpsucker
	Eumicrotremus derjugini	leatherfin lumpsucker
	Liparis gibbus	dusky snailfish
	Liparis ochotensis	
	Crystallichthys cyclospilus	blotched snailfish
	Elassodiscus tremebundus	
	Allocareproctus jordani	
	Careproctus melanurus	blacktail snailfish

Appendix Table C-1.--Continued

Family	Species name	Common name
Cyclopteridae - (cont.)	*Careproctus furcellus*	forktail snailfish
	Careproctus gilberti	smalldisk snailfish
	Careproctus rastrinus	salmon snailfish
	Paraliparis cephalus	swellhead snailfish
	Paraliparis sp.	unidentified snailfish
	Nectoliparis pelagicus	tadpole snailfish
Melamphaeidae	*Poromitra crassiceps*	crested bigscale
Myctophidae	*Stenobrachius leucopsarus*	northern lampfish
	Stenobrachius nannochir	garnet lampfish
	Diaphus theta	California headlightfish
	Lampanyctus jordani	brokenline lampfish
	Protomyctophum thompsoni	northern flashlightfish
Osmeridae	*Thaleichthys pacificus*	eulachon
	Mallotus villosus	capelin
Salmonidae	*Oncorhynchus tshawytscha*	chinook salmon
	Oncorhynchus keta	chum salmon
Cryptacanthodidae	*Lyconectes aleutensis*	dwarf wrymouth
Stichaeidae	*Lumpenus sagitta*	snake prickleback
	Lumpenella longirostris	longsnout prickleback
	Chirolophis decoratus	decorated warbonnet
	Poroclinus rothrocki	whitebarred prickleback
	Bryozoichthys lysimus	nutcracker prickleback
	Bryozoichthys marjorius	pearly prickleback
Zaproridae	*Zaprora silenus*	prowfish
Zoarcidae	*Bothrocara pusillum*	Alaska eelpout
	Lycodes palearis	wattled eelpout
	Lycodes concolor	ebony eelpout
	Lycodes diapterus	black eelpout
	Lycodes brevipes	shortfin eelpout
Scorpaenidae	*Sebastolobus alascanus*	shortspine thornyhead
	Sebastes aleutianus	rougheye rockfish
	Sebastes alutus	Pacific ocean perch
	Sebastes brevispinis	silvergrey rockfish
	Sebastes ciliatus	dark rockfish
	Sebastes variabilis	dusky rockfish
	Sebastes polyspinis	northern rockfish
	Sebastes borealis	shortraker rockfish

Appendix Table C-2.--Invertebrate species encountered during the 2002 Aleutian bottom trawl survey.

Phylum	**Species/Taxon name**	**Common name**
Cnidaria	Hydrozoa (Class)	unidentified hydroid
	Scyphozoa (Class)	unidentified jellyfish
	Periphylla periphylla	
	Chrysoara melanaster	
	Chrysaora sp.	chrysaora jellyfish
	Atolla sp.	
	Aurelia labiata	
	Aurelia sp.	
	Cyanea sp.	
	Alcyonaria sp.	unidentified octocoral
	Alcyonium sp.	
	Anthomastus sp. A (red)	
	Anthomastus sp. B (gray)	
	Anthomastus sp.	
	Gorgonacea (Order)	unidentified coral
	Primnoa willeyi	red tree coral
	Primnoa sp.	
	Swiftia sp.	
	Paragorgia arborea	Kamchatka coral
	Paragorgi sp.	
	Euplexaura marki	
	Euplexaura sp.	
	Callogorgia sp.	
	Calcigorgia spiculifera	
	Calcigorgia sp.	
	Pennatulacea (Order)	sea pens and sea whips
	Halipteris californica	
	Ptilosarcus gurneyi	orange sea pen
	Actiniaria (Order)	sea anemones
	Actinauge verrillii	
	Metridium giganteum	
	Metridium sp.	
	Stomphia sp.	
	Tealia crassicornis	
	Cribrinopsis fernaldi	
	Liponemis brevicornis	

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Cnidaria - (continued)	Scleractinia (Order)	unidentified stony coral
	Javania borealia	
	Caryophyllia alaskensis	Alaska cup coral
	Caryophyllia sp.	
	Stylaster brochi	
	Stylaster polyorchis	
	Stylaster sp.	
	Stylasterina (Order)	unidentified hydrocoral
	Crypthelia trophostega	
	Cyclohelia lancellata	
	Distichopora borealis	
	Distichopora sp.	
	Errinopora nanneca	
	Errinopora sp.	
	Plumarella sp.	
	Thouarella sp.	
	Keratoisis sp.	bamboo coral
	Fanellia compressa	
	Fanellia sp.	
	Muriceides sp.	
	Amphilaphis sp. 1	
	Amphilaphis sp. 2	
	Amphilaphis sp. 3	
	Arthrogorgia sp.	
Ctenophora	Various unidentified species	unidentified comb jellies
Annelida	Polychaeta (Class)	unidentified polychaete worms
	Aphroditidae (Family).	unidentified sea mouse
	Aphrodita sp.	sea mouse
	Polynoidae (Family)	unidentified scale worm
	Eunoe sp.	
	Eunoe nodosa	giant scale worm
	Eunoe depressa	depressed scale worm
	Hirudinea (Class)	unidentified leech
	Carcinobdella cyclostomum	striped sea leech
Arthropoda	Gammaridae (Family)	unident. gammarid amphipod
	Caprella sp.	unident. caprellid amphipod
	Isopoda (Order)	unidentified isopod

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Arthropoda - (continued)	*Lironeca* sp.	
	Gnathophausia ingens	
	Thoracica (Order)	barnacles
	Balanus evermanni	giant barnacle
	Balanus rostratus	beaked barnacle
	Scalpellum cornutum	eared barnacle
	Sergestes sp.	
	Pandalus jordani	ocean shrimp
	Pandalus borealis	northern shrimp
	Pandalus tridens	yellowleg pandalid
	Pandalus hypsinotus	coonstripe shrimp
	Pandalus sp.	unidentified pandalid shrimp
	Pandalopsis dispar	sidestripe shrimp
	Pandalopsis ampla	
	Eualus sp.	
	Lebbeus groenlandicus	
	Lebbeus sp.	
	Crangon communis	twospine crangon
	Crangon sp.	unidentified crangonid shrimp
	Argis dentata	Arctic argid
	Argis lar	kuro argid
	Argis sp.	unidentified argid shrimp
	Sclerocrangon boreas	sculptured shrimp
	Pasiphaea pacifica	Pacific glass shrimp
	Pasiphaea tarda	crimson pasiphaeid
	Cancer oregonensis	Oregon rock crab
	Oregonia gracilis	graceful decorator crab
	Chorilia longipes	longhorned decorator crab
	Chionoecetes bairdi	Tanner crab
	Hyas lyratus	Pacific lyre crab
	Chionoecetes opilio	narrow snow crab
	Pagurus brandti	sponge hermit crab
	Pagurus aleuticus	Aleutian hermit crab
	Labidochirus splendescens	splendid hermit crab
	Pagurus confragosus	knobbyhand hermit crab
	Pagurus dalli	whiteknee hermit crab
	Pagurus kennerlyi	bluespine hermit crab

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Arthropoda - (continued)	*Pagurus trigonocheirus*	fuzzy hermit crab
	Pagurus ochotensis	Alaskan hermit crab
	Pagurus tanneri	longhand hermit crab
	Elassochirus tenuimanus	widehand hermit crab
	Elassochirus cavimanus	purple hermit
	Elassochirus sp.	
	Lithodidae (Family)	unidentified stone crab
	Lopholithodes mandtii	
	Acantholithodes hispidus	fuzzy crab
	Lithodes aequispina	golden king crab
	Hapalogaster grebnitzkii	
	Hapalogaster sp.	
	Rhinolithodes wosnessenskii	rhinoceros crab
	Paralithodes camtschaticus	red king crab
	Paralithodes brevipes	brown king crab
	Placetron wosnessenskii	scaled crab
	Erimacrus isenbeckii	horsehair crab
	Hyas sp.	
	Pycnogonida (Class)	unidentified sea spiders
	Colossendeis dofleini	
Mollusca	*Placiphorella pacifica*	
	Placiphorella sp.	
	Onchidoridae (Family)	unidentified nudibranch
	Tochuina tetraquetra	giant orange tochui
	Dendronotus sp.	
	Tritonia diomedea	rosy triton
	Tritonia sp.	
	Chlamylla sp.	
	Doridae (Family)	dorid nudibranch
	Cranopsis major	
	Bulbus fragilis	fragile moonsnail
	Natica clausa	Arctic moonsnail
	Natica sp.	unidentified moonsnail
	Crepidula grandis	great slippersnail
	Colus periscelidus	garter whelk
	Colus jordani	
	Colus sp.	

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Mollusca - (continued)	*Pyrulofusus dexius*	
	Volutopsius harpa	left-hand whelk
	Volutopsius middendorfii	tulip whelk
	Volutopsius melonis	
	Volutopsius sp.	
	Beringius kennicottii	
	Beringius undatus	
	Beringius sp.	
	Neptunea amianta	
	Neptunea lyrata	lyre whelk
	Neptunea sp.	whelk
	Volutopsius callorhinus	
	Torellia ammonia	
	Boreotrophon sp.	
	Fusitriton oregonensis	Oregon triton
	Buccinum picturatum	
	Buccinum castaneum	chestnut whelk
	Buccinum sp.	
	Bathybuccinum clarki	Roger’s buccinum
	Bathybuccinum ovulum	
	Arctomelon stearnsii	Alaska volute
	Bivalvia (Class)	unidentified bivalve
	Modiolus modiolus	northern horsemussel
	Mytilus sp.	
	Chlamys behringiana	Iceland scallop
	Chlamys rubida	reddish scallop
	Chlamys sp.	
	Patinopecten caurinus	weathervane scallop
	Parvamussium alaskensis	
	Hiatella arctica	Arctic hiatella
	Yoldia sp.	
	Musculus discors	discordant mussel
	Clinocardium nuttallii	Nuttall cockle
	Clinocardium ciliatum	hairy cockle
	Serripes groenlandicus	Greenland cockle
	Serripes sp.	
	Mya sp.	

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Mollusca - (continued)	*Pododesmus macroschisma*	Alaska falsejingle
	Pododesmus sp.	
	Octopodidae (Family)	
	Opisthoteuthis californiana	flapjack devilfish
	Octopus dofleini	giant octopus
	Octopus leioderma	smoothskin octopus
	Rossia pacifica	eastern Pacific bobtail squid
	Gonatus sp.	
	Berryteuthis magister	magistrate armhook squid
	Gonatopsis sp.	
	Gonatopsis borealis	
	Chiroteuthis calyx	
Echinodermata	*Evasterias echinosoma*	
	Evasterias trochelii	
	Evasterias sp.	
	Orthasterias koehleri	
	Orthasterias sp.	
	Leptasterias hylodes	
	Leptasterias coei	
	Pycnopodia helianthoides	
	Lethasterias nanimensis	
	Pedicellaster magister	
	Stephanasterias albula	
	Pisaster sp.	
	Henricia sanguinolenta	
	Henricia aspera	
	Henricia leviuscula	
	Henricia asthenactis	
	Henricia longispina	
	Henricia sp.	
	Leptasterias polaris	
	Leptasterias arctica	
	Leptasterias sp.	
	Gephyreaster swifti	
	Hippasteria spinosa	
	Hippasteria sp.	
	Pseudarchaster parelii	

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Echinodermata – (cont.)	*Pseudarchaster* sp.	
	Mediaster aequalis	
	Ceramaster japonicus	red bat star
	Ceramaster patagonicus	orange bat star
	Ceramaster arcticus	
	Ceramaster clarki	
	Ceramaster sp.	
	Solaster endeca	
	Solaster hypothrissus	
	Solaster dawsoni	
	Solaster paxillatus	
	Solaster sp.	
	Crossaster borealis	
	Crossaster papposus	rose sea star
	Crossaster sp.	
	Lophaster furcilliger	
	Pteraster tesselatus	
	Pteraster militaris	
	Pteraster temnochiton	
	Pteraster pulvillus	
	Pteraster sp.	
	Diplopteraster multipes	
	Asterias amurensis	purple-orange seastar
	Ctenodiscus crispatus	common mud star
	Leptychaster arcticus	
	Leptychaster sp.	
	Cladaster validus	
	Dipsacaster borealis	
	Luidiaster dawsoni	
	Anteliaster sp.	
	Strongylocentrotus droebachiensis	green sea urchin
	Strongylocentrotus polyacanthus	
	Strongylocentrotus purpuratus	
	Strongylocentrotus pallidus	
	Strongylocentrotus sp.	
	Allocentrotus fragilis	
	Echinarachnius parma	Parma sand dollar

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Echinodermata – (cont.)	*Florometra serratissima*	featherstar crinoid
	Florometra asperima	
	Florometra sp.	
	Ophiuridae (Family)	unidentified brittlestar
	Gorgonocephalus eucnemis	
	Asteronyx loveni	
	Asteronyx sp.	
	Ophiura sarsi	
	Amphiophiura ponderosa	
	Ophiacantha sp.	
	Ophiopholis aculeata	
	Ophiopholis longispina	
	Ophiopholis sp.	
	Holothuroidea (Class)	unidentified sea cucumber
	Molpadia sp.	
	Pentamera lissoplaca	
	Bathyplotes sp.	
	Cucumaria sp.	
	Cucumaria fallax	
	Psolus fabricii	
	Psolus japonicus	
	Psolus squamatus	
	Psolus sp.	
Porifera	Porifera (Phylum)	unidentified sponge
	Suberites ficus	hermit sponge
	Suberites sp.	
	Aphrocallistes vastus	clay pipe sponge
	Mycale loveni	tree sponge
	Rhabdocalyptus sp.	
	Halichondria panicea	barrel sponge
	Halichondria sp.	
	Leucandra sp.	cloud sponge
	Mycale bellabellensis	lampshade sponge
	Myxilla incrustans	scallop sponge
	Polymastia sp.	spud sponge
	Stylissa sp.	club sponge
	Leucosolenia blanca	yellow leafy sponge

Appendix Table C-2.--Continued.

Phylum	Species/Taxon name	Common name
Porifera – (continued)	*Tethya* sp.	ball sponge
	Hylonema sp.	fiberoptic sponge
	Polymastia pachymastia	black-orange spud sponge
	Halichondria sitiens	black papilliate sponge
	Halichondria cf. sitiens	yellow green papillate sponge
	Asbestopluma lycopodium	drumstick sponge
	Neoesperiopsis rigida	
	Hexactinellida (Class)	glass sponges
Nemertea	Nemertea (Phylum)	unidentified nemertean worm
Nematoda	Nematoda (Phylum)	unidentified nematode worm
Sipuncula	Sipuncula (Phylum)	unidentified sipunculid worm
Bryozoa	Bryozoa (Phylum)	unidentified bryozoan
	Eucratea loricata	feathery bryozoan
	Flustra serrulata	leafy bryozoan
	Porella compressa	flattened bryozoan
	Rhamphostomella costata	ribbed bryozoan
Brachiopoda	*Laqueus californianus*	
Chordata	Acidiacea (Class)	unidentified ascidian
	Thaliacea sp.	unidentified salps
	Styela rustica	sea potato
	Halocynthia aurantium	sea peach
	Halocynthia sp.	
	Aplidium sp.	

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