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Data Report: 2016 Aleutian Islands Bottom Trawl Survey

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ABSTRACT

The eighth biennial groundfish assessment survey of the Aleutian Islands region was conducted during the summer of 2016 by the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering Division's Groundfish Assessment Program (RACE-GAP). This effort constitutes the fourteenth in the full series dating from 1980. 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 the Islands of Four Mountains. The survey was conducted aboard two chartered trawlers, the FV *Alaska Provider* and FV *Sea Storm*. Samples were collected successfully at 419 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 commercially or ecologically important principal groundfish and invertebrate species that inhabit the Aleutian marine habitat and to collect additional 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. Pacific ocean perch or POP (*Sebastes alutus*) was the most abundant species with an estimated biomass of 982,522 metric tons (t). Atka mackerel (*Pleurogrammus monopterygius*) and northern rockfish (*Sebastes polyspinis*) were also abundant with estimated biomasses of 447,976 and 253,215 t, respectively. Catches of POP were large throughout the survey area at intermediate depths. Arrowtooth flounder (*Atheresthes stomias*) was the most abundant flatfish species, having almost twice the biomass of second-place northern rock sole (*Lepidopsetta polyxystra*). The skate assemblage was primarily comprised of three skate species, whiteblotched (*Bathyraja maculata*), Aleutian (*B. aleutica*), and leopard (*B. panthera*) skates, with a wide diversity of species captured in the eastern portion of the survey area.

Survey results are presented as estimates of catch per unit of effort and biomass, species distribution and relative abundance, population size composition, and length-weight relationships for commercially important species and for others of biological interest

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INTRODUCTION

The 2016 biennial bottom trawl survey of the Aleutian Islands region was conducted from 1 June through 23 August by the Resource Assessment and Conservation Engineering Division's Groundfish Assessment Program (RACE-GAP) of the Alaska Fisheries Science Center (AFSC), National Marine Fisheries Service (NMFS), Seattle, Washington, marking the fourteenth comprehensive NMFS bottom trawl survey of this area since 1980. 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 2008 survey was cancelled. The primary focus of these surveys is to continue a standardized (Stauffer 2004) time series of data to assess, describe, and monitor the distribution, abundance, and biological condition of Aleutian groundfish and invertebrate stocks. This report presents 2016 survey results for the principal fish species in areas corresponding to subdistricts of each of three North Pacific Fishery Management Council (NPFMC) regulatory areas: Eastern, Central, and Western Aleutians as well as a fourth survey area located in the southern Bering Sea. These areas are further described in the "Survey Design" section of this document. No detailed comparisons to previous surveys are made in this report, however, most time-series of principal groundfish and invertebrate species are available through the AFSC Resource Ecology and Ecosystem Modeling website[1].

Specific survey objectives were to 1) define the distribution and relative abundance of the principal groundfish and important invertebrate species that inhabit the Aleutian region; 2) obtain data to estimate the abundance of principal groundfish and important invertebrate species; 3) collect data to define biological parameters including age, growth rates, length-weight relationships, feeding habits, and size and sex compositions; 4) collect accurate net mensuration data describing the fishing effort 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. Special collections were made for projects addressing genetics of arrowtooth flounder and Kamchatka flounder, different species of corals, and Pacific sleeper and salmon sharks. Additional projects included collection of octopus sex,weight and beaks, maturity data for three species of rockfish, snailfish and squid voucher specimens, fin clips for tracking seasonal movements of Pacific cod, ambient light levels during fishing operations; acoustic profiling, and CTD data.

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 sampling operations difficult. The continental shelf and upper continental slope are typified by hard and sometimes irregular terrain necessitating the use of bobbin-style roller gear on the research trawls (Stauffer 2004). Extending

[1] http://access.afsc.noaa.gov/reem/ecoweb/Index.cfm

over 1,670 km 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 (180° long.), and the northern side of the archipelago between Unimak Pass (165°W long.) and the Islands of Four Mountains (Fig. 1). Survey depths range from near shore waters to 500 m. The total survey area is about 64,416 km^2 (Table 1). The Western Aleutian Islands district (WAI) represents 24% of the total survey area, the Central Aleutian Islands district (CAI) almost 26%, the Eastern Aleutian Islands district (EAI) 39%, and the Southern Bering Sea district (SBS) comprises about 11%. In terms of the sampled depths, the 1-100 m and 101-200 m depth intervals make up 33.5% and 30.3% of the area, 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.

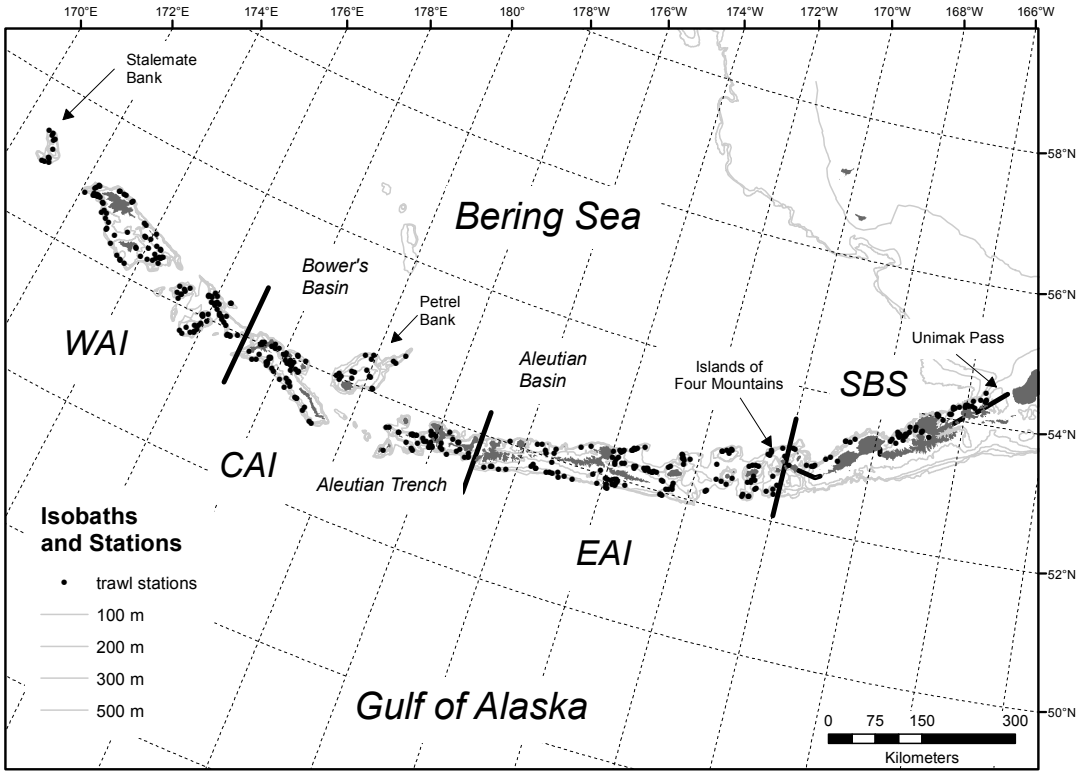


Figure 1. --Map of the Aleutian Islands 2016 bottom trawl survey area indicating survey districts (WAI = Western Aleutian Islands, CAI = Central Aleutian Islands, EAI = Eastern Aleutian Islands, and SBS = Southern Bering Sea), isobaths from 100-500 m and stations sampled (black dots).

Vessels

Both chartered vessels were house-forward stern trawlers. Both vessels had telescoping deck cranes, and paired, controlled-tension (autotrawl) hydraulic trawl winches mounted with 1,000 fathoms (ca. 1,828 m) of 2.54 cm diameter steel cable. The *Sea Storm* is 37.5 m in overall length (LOA), is powered by a single 1,710 continuous horsepower (HP) main engine, and has a single propeller. The *Alaska Provider* is 53.6 m LOA, has two main engines with 2,200 continuous HP,

and has twin propellers. The *Sea Storm* has two net reels mounted aft over the stern trawl ramp while the *Alaska Provider* utilizes a forward and stern net reel and has no trawl ramp. Aboard both vessels electronic equipment included a global positioning system (GPS) with video position plotters, at least two radars, single sideband and VHF transmitter-receivers, color video fish finders (echo sounders), paper recorder echo sounders (*Sea Storm*), and auto-pilots. The survey was divided into three legs of approximately equal length with a port call between each to accommodate crew changes and to resupply. Captain Bud Hanson operated the *Alaska Provider* for all three legs and Captain Jerry Ellefson operated the *Sea Storm* for all three legs.

Fishing Gear

The fishing gear and protocols for deployment are described in detail in Stauffer (2004). Both vessels used standard RACE-GAP Poly Nor'Eastern high-opening bottom trawls with 24.2 m roller gear constructed with 36 cm rubber bobbins separated by 10 cm rubber disks. The fishing dimensions (16 m net width, 7 m net height) of the trawls were measured using Marport acoustic net mensuration equipment mounted on the wing-tips and headrope of the trawl. Each trawl was certified as conforming to standard measurements and dimensions prior to its use in the survey.

Survey Design

The Aleutian Islands Biennial Bottom Trawl Survey is a stratified-random survey design of trawlable areas in the archipelago shallower than 500 m. Strata are based upon four depth intervals (1-100 m, 101-200 m, 201-300 m, and 301-500 m) and established survey districts and subdistricts. The Aleutian Islands survey area is contained within the NPFMC BSAI (Bering Sea and Aleutian Islands) management area[2], and consists of four survey districts. The survey districts correspond to subdivisions of the NPFMC Western, Central, and Eastern Aleutian districts with the addition of a southern Bering Sea (SBS) sampling district defined as the region between 170°W and 165°W and north of the archipelago. There are some minor differences in the NMFS lines and International North Pacific Fisheries Commission (INPFC) lines that we use and SBS is a compilation of several NMFS districts. These four survey districts are further divided into 45 strata defined by geographic subdistricts and corresponding depth intervals. Subdistricts are defined by two to four roughly equal geographical areas within a survey district designated by cardinal points (N, S, E, W), sub-cardinal points (NW, NE, SE, SW), or in some cases by a "combined" subdistrict where a narrow or limited depth interval is integrated over several subdistricts (Appendix A).

The sampling frame is a list of previously successful stations from past surveys. Consistent with recent RACE-GAP assessment surveys (Martin and Clausen 1995, Stark and Clausen 1995, Munro and Hoff 1995, Martin 1997, Britt and Martin 2001, Rooper and Wilkins 2008, von Szalay et al. 2008, von Szalay et al. 2010, Raring et al. 2016), sampling effort for each subdistrict was determined using a modified Neyman optimum allocation sampling strategy (Cochran 1977) which considers relative abundances of commercially important groundfish species from the previous five surveys of the area and the previous year's ex-vessel price for each species. A maximum of 420 stations was selected as the number of trawls that we could expect to complete given survey time and vessel scheduling restrictions, expected weather days,

[2] http://alaskafisheries.noaa.gov/npfmc/PDFdocuments/fmp/BSAI/BSAI.pdf

and other logistics such as time lost to gear repairs. The allocation model drew random stations from within each stratum pool of previously successfully trawled stations. A minimum of two stations were allocated to any given stratum. All but one of the 420 allocated tow locations were selected randomly without replacement from a database of previously conducted tows, but to satisfy the minimal sampling requirements in one of the strata, a previously unsampled station (i.e., a new station had to be found) was required in the Eastern Aleutians survey district. As a result, the majority of allocated stations for the 2016 survey were placed at or near locations successfully sampled during previous surveys. Assigned sample densities were highest in the 201-300 m depth intervals at about 12 tows per 1,000 km^2 (Table 1). Survey wide, the projected overall sample density was 6.5 tows per 1,000 km^2. If fishing gear conflicts or rough or otherwise untrawlable bottom prevented us from sampling a particular pre-selected station, we identified an alternate station in the same subdistrict and depth stratum as a replacement. To locate new or alternate tow sites, search patterns were run within the proper strata using an echosounder to locate trawlable bottom where a successful 15-minute tow could be conducted. Search time to find an alternate station was limited to 2 hours of searching a 5 x 5 km grid cell; maximum search time was proportionally reduced when stations represented less than 25 km^2 of the total grid cell.

Table 1. -- Number of stations allocated, attempted, and successfully completed with sampling density for the 2016 Aleutian Islands bottom trawl survey by survey district and depth interval.

Survey District	Depth Range (m)	Stations Allocated	Stations Attempted	Stations Successful	Area (km²)	Stations/ 1,000 km²
Western Aleutians	1 - 100	24	24	24	4,877	4.92
	101 - 200	75	78	75	5,318	14.10
	201 - 300	30	30	30	1,724	17.41
	301 - 500	6	6	6	3,272	1.83
	All depths	**135**	**138**	**135**	**15,190**	**8.89**
Central Aleutians	1 - 100	25	25	25	5,847	4.28
	101 - 200	49	50	49	4,606	10.64
	201 - 300	30	30	30	2,109	14.23
	301 - 500	10	10	10	3,981	2.51
	All depths	**114**	**115**	**114**	**16,543**	**6.89**
Eastern Aleutians	1 - 100	15	15	15	6,848	2.19
	101 - 200	58	59	58	7,768	7.47
	201 - 300	45	45	45	4,901	9.18
	301 - 500	9	9	9	5,683	1.58
	All depths	**127**	**128**	**127**	**25,200**	**5.04**
Southern Bering Sea	1 - 100	18	18	18	4,026	4.47
	101 - 200	13	13	13	1,849	7.03
	201 - 300	9	9	8	564	14.19
	301 - 500	4	6	4	1,043	3.83
	All depths	**44**	**46**	**43**	**7,482**	**5.75**
All areas	1 - 100	82	82	82	21,598	3.80
	101 - 200	195	200	195	19,540	9.98
	201 - 300	114	114	113	9,298	12.15
	301 - 500	29	31	29	13,979	2.07
	All depths	**420**	**427**	**419**	**64,415**	**6.50**

Trawl Performance Data Collection

A concerted effort was made to follow standard towing procedures (Stauffer 2004). The operational 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 that speed while the net held its fishing configuration with proper bottom contact for 15 minutes. Standardized scope tables of trawl warp relative to bottom depth were used. Towing time was abbreviated on some occasions to avoid potential gear damage or when the echosounder indicated upcoming obstacles or the net mensuration suggested the net configuration was abnormal due to a very large catch. The date, time, and GPS-generated position were recorded every few seconds during each tow. Pressure at depth (used to derive estimated depth), water temperature, and time were recorded every second during most tows using a factory calibrated Seabird Model SBE-39 data logger which was attached near the middle of the trawl headrope. During the trawl haul, the vertical and horizontal trawl openings were monitored with Marport net sonde units. An accelerometer was attached to the midpoint of the roller gear to record the date, time, and acceleration in three dimensions of the footrope, indicating the degree of contact with the bottom. At the end of each trawl haul, retrieval started with the vessel maintaining or increasing towing speed while engaging the trawl winches to wind up the wire with the objective of lifting the trawl quickly away from the bottom. All trawl hauls were performed during daylight hours within the period between one-half hour after sunrise and one-half hour before sunset. Trawl performance was assessed after the trawl haul from the mensuration and other sensors deployed during the trawl event 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 other fishing gear (e.g., catching a crab pot or fouling longline gear). The minimum accepted duration for satisfactory tows was about 10 minutes except when the net mensuration data indicated that a large catch had occurred and the codend was full. In these instances shorter tow durations could be accepted.

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 motion compensated Marel Model M1100 electronic digital platform scale. Species catches weighing less than about 2 kg were generally weighed to the nearest 2 g on a smaller capacity, electronic Marel Model M60 digital scale. Larger catches that contained more than ca. 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 with the crane were weighed with a dynamometer (load cell) when the sea state allowed; the weights of some of the largest catches (exceeding approximately 6 t) were estimated volumetrically. For catches where total weight was determined with a load cell, less abundant species were separated from the catch, their weights were determined, and these were subtracted from the load cell weight. The remainder was then added to the subsample of the abundant species on deck to yield their total weight. For very large catches with more than one abundant species, subsamples of the dominant species were taken to estimate their relative weights, which were then extrapolated to obtain their separate total weights. A similar procedure was used for volumetrically estimated catches except that the

total catch weight was estimated by multiplying the density of a representative sample of the total catch (containing both the abundant and less abundant species) by the total catch volume. Pacific halibut (scientific names for all species encountered during the survey are listed in Appendix Tables B1 and B2) were immediately measured and released when they were not retained for biological samples. Halibut catch weights were estimated from their measured lengths during data entry using length-weight parameters supplied by the International Pacific Halibut Commission. A random sample of up to 200 specimens of each of the major fish species was collected and measured to generate length frequencies. A smaller length frequency sample was collected for some minor catch components such as sculpins. The sex of most individuals was determined prior to measurement. All skates and Pacific halibut were measured. Unsexed length frequencies were collected for forage fish such as Pacific herring, capelin, and eulachon. Length measurements were collected with barcode-reader data loggers and barcoded length boards, downloaded to the data entry computer, and appended to the length database after each tow. This was the first year on the Aleutian Islands survey that we deployed a new system for collecting length data comprised of a computer tablet paired with a wireless Bluetooth wand and a wireless Bluetooth connection for downloading data to the data entry computer.

Age structures (otoliths) were collected for many fish species. Separate collections were made from each of the four major sampling districts. Samples were either randomly selected for some species (walleye pollock, arrowtooth flounder, all rockfishes except shortraker rockfish,) or were stratified by sex and length with a specified number of otoliths collected per 1 cm length interval on a per area basis (e.g., southern rock sole, Greenland turbot, shortraker rockfish, Atka mackerel). For species from which otoliths were collected on a per area basis, limits were placed on the number collected per sex-centimeter per day to distribute the sample evenly over the area. Fish 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, the wind etc.) with the digital scales. Fork length was measured for all fish species except grenadiers (snout to origin of anal fin) and skates and sharks (total length). Stomach samples were collected for selected species throughout the survey area by biologists from the AFSC's Resource Ecology and Ecosystem Management Program.

Data Analysis

Biomass estimates were calculated using an area-swept method (Alverson and Pereyra 1969, Wakabayashi et al. 1985). The area swept by the trawl (i.e., fishing effort) was estimated by multiplying the estimated distance towed (km) by the estimated mean net spread (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 and measuring the distance along this line. The mean net spread was estimated by averaging the Marport net spread readings collected during the on-bottom to off-bottom time period. For each species, catch-per-unit-effort (CPUE) was calculated as the quotient of catch weight (kg) divided by the trawl area swept in hectares (ha). The mean CPUE for each subdistrict was calculated as the mean of the individual tow CPUEs (including zero catches) within the subdistrict. Mean CPUEs for combined subdistricts were calculated as the weighted average of the individual subdistrict

CPUE means (weighted by subdistrict area). Biomass estimates (t) were calculated by multiplying the mean CPUE of each subdistrict by its area and summing the results to obtain estimates by survey district and depth interval. 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 district/depth range population within a sex-length category was calculated by multiplying the district/depth range population by the proportion of fish in that category from the summed station data. Population size composition estimates were summed over subdistricts to derive estimates by area. Lengths and weights collected from individual fish were used to estimate length-weight relationships based on a nonlinear, least-squares regression algorithm. The length-weight relationship assumes isometric growth and was expressed as:

$$W = a * L^b ,$$

where W is weight in grams, L is length in mm and a and b are the fitted parameters (Appendix C).

Data Limitations

The primary purpose of this survey is to support management of multiple species of fishes and benthic invertebrates, including various broader groupings of fishes: flatfishes, roundfishes, and rockfishes. These different species and species groups are expected to display differences in both haul level and survey level catchabilities, which, in turn, are generally unknown and may not be consistent even within each group. Survey catch rates and derived abundance estimates are used to tune stock assessment models and to monitor population trends and status, but are not measures of true abundance. This is especially the case in the Aleutians where there is extensive amounts of untrawlable habitat that is not sampled but the mean cpue is applied to the total stratum area without regard to trawlability. Sampling gear and its deployment are standardized and intentionally not modified over time to ensure consistency and statistical continuity of the time series necessary to reliably monitor the status of fish stocks and to forecast trends.

RESULTS

We successfully sampled 419 of the 420 preselected stations and 427 attempted stations (Table 1). There were 468 attempted tows. All successful tows were included in the biomass and size composition analysis. Marport net spread was successfully recorded for 382 of the 419 successfully sampled stations. For the ~9% of trawl hauls without net width, net spread was predicted from a generalized additive model (GAM) parameterized with successful trawl hauls of similar depth and wire out. Temperatures on the surface and at depth were successfully recorded at all but eight of the successfully trawled stations. Average bottom temperatures ranged from 3.3° to 7.0°C. Sea surface temperatures ranged from 5.0° to 12.3°C.

Results by Area

At least 123 fish species from 25 families and 400 invertebrate species or taxa from 12 phyla were captured during the 2016 survey. Appendix B presents lists of fish (Appendix Table B-1) and invertebrate (Appendix Table B-2) taxa encountered during the survey. Because this report is primarily concerned with groundfish poulations, relative abundance estimates, reported as CPUE in kg/ha, are presented for the 20 most abundant groundfish species in each of the four survey districts surveyed in 2016, for combined Aleutian areas, and for the entire survey region (Table 2). Pacific ocean perch (POP) was by the most abundant species in each of the four survey districts as well as well as over the entire survey area, followed by Atka mackerel, northern rockfish and, to a lesser extent, giant grenadier (Table 2). The only species with a CPUE even close to that of POP in any area was Atka mackerel in the Central Aleutians. Pacific cod were relatively uniformly distributed throughout the survey area, but in much lower densities than POP.

Results by Species

Detailed species-specific accounts of survey results are organized into four major fish groupings: flatfishes, roundfishes, rockfishes, and skates. The cottids are separated by species, as has been standard practice since 2012, at the request of stock assessment scientists. In the cottids and skates sections, tables are included which list the relative abundance in descending order of the most common species in each group along with the cumulative biomass for the entire group. Additional information is provided for species which cumulatively comprise about 90% of the estimated biomass for that group.

The following information is presented for most, but not all species: 1) a brief summary of the data and data analyses, 2) a table with the number of hauls attempted, number of hauls with catch, mean CPUE, estimated biomass with confidence intervals, and mean weight by survey district and depth interval, 3) a table with mean CPUE and estimated biomass with confidence intervals by subdistrict and depth range, 4) a figure showing the CPUE distribution of the survey area, and 5) a figure showing the length distribution of the population. The CPUE distribution maps show relative abundance in five categories: 1) no catch, 2) sample CPUE less than mean CPUE, 3) sample CPUE between mean CPUE and two standard deviations (SD) above mean CPUE, 4) sample CPUE between two and four SDs, and 5) sample CPUE greater than four SDs above the mean CPUE. The species nomenclature generally follows Robins et al. (1991), Mecklenburg et al. (2002) or Kessler (1985).

Table 2. -- Mean CPUE (kg/ha) for the 20 most abundant groundfish species in each survey district during the 2016 Aleutian Islands bottom trawl survey

Western Aleutians	CPUE	Central Aleutians	CPUE	Eastern Aleutians	CPUE
Pacific ocean perch	265.33	Pacific ocean perch	124.89	Pacific ocean perch	113.06
Atka mackerel	102.98	Atka mackerel	80.41	Atka mackerel	62.91
northern rockfish	81.83	giant grenadier	61.02	walleye pollock	23.46
Pacific cod	13.02	northern rockfish	47.68	giant grenadier	22.73
walleye pollock	9.58	Pacific cod	11.79	northern rockfish	19.20
giant grenadier	9.30	northern rock sole	9.71	Pacific cod	17.91
northern rock sole	6.18	Kamchatka flounder	8.85	arrowtooth flounder	14.40
shortspine thornyhead	5.76	arrowtooth flounder	5.73	Pacific halibut	5.81
arrowtooth flounder	5.05	walleye pollock	5.68	whiteblotched skate	4.12
shortraker rockfish	3.85	Pacific halibut	3.22	Kamchatka flounder	3.52
whiteblotched skate	2.60	shortspine thornyhead	3.18	northern rock sole	2.62
magistrate armhook squid	2.15	shortraker rockfish	1.90	blackspotted rockfish	2.45
flathead sole	2.09	yellow Irish lord	1.70	shortraker rockfish	2.39
rex sole	1.61	blackspotted rockfish	1.66	yellow Irish lord	2.01
Kamchatka flounder	1.15	leopard skate	1.56	rex sole	1.71
Pacific halibut	1.03	rex sole	0.99	sablefish	1.51
leopard skate	0.85	dusky rockfish	0.64	shortspine thornyhead	1.01
prowfish	0.83	darkfin sculpin	0.59	giant octopus	0.98
darkfin sculpin	0.38	Dover sole	0.56	Alaska skate	0.67
Aleutian skate	0.36	sablefish	0.52	Aleutian skate	0.59
Number of hauls	135	Number of hauls	114	Number of hauls	127

Combined Aleutian Districts	CPUE	Southern Bering Sea	CPUE	All Districts Combined	CPUE
Pacific ocean perch	157.12	Pacific ocean perch	117.56	Pacific ocean perch	152.53
Atka mackerel	78.68	arrowtooth flounder	16.67	Atka mackerel	69.55
northern rockfish	44.19	Pacific cod	15.14	northern rockfish	39.31
giant grenadier	30.27	walleye pollock	13.43	giant grenadier	26.76
Pacific cod	14.83	Pacific halibut	9.34	Pacific cod	14.86
walleye pollock	14.59	southern rock sole	8.52	walleye pollock	14.46
arrowtooth flounder	9.38	rex sole	5.01	arrowtooth flounder	10.23
northern rock sole	5.63	northern rock sole	3.89	northern rock sole	5.43
Kamchatka flounder	4.44	Kamchatka flounder	3.61	Pacific halibut	4.43
Pacific halibut	3.78	flathead sole	3.11	Kamchatka flounder	4.34
shortspine thornyhead	2.91	yellow Irish lord	2.43	shortspine thornyhead	2.82
shortraker rockfish	2.64	northern rockfish	2.21	whiteblotched skate	2.39
whiteblotched skate	2.60	shortspine thornyhead	2.15	shortraker rockfish	2.33
blackspotted rockfish	1.65	Aleutian skate	1.93	rex sole	1.89
rex sole	1.48	big skate	1.75	yellow Irish lord	1.57
yellow Irish lord	1.45	Greenland turbot	1.32	blackspotted rockfish	1.55
sablefish	0.82	giant octopus	0.84	flathead sole	1.05
flathead sole	0.78	whiteblotched skate	0.77	southern rock sole	0.99
leopard skate	0.74	blackspotted rockfish	0.77	sablefish	0.72
magistrate armhook squid	0.65	great sculpin	0.36	Leopard skate	0.66
Number of hauls	376	Number of hauls	43	Number of hauls	419

Flatfish

Arrowtooth flounder (*Atheresthes stomias*)

Arrowtooth flounder was the seventh most abundant species caught in the 2016 survey (Table 2) and never ranked lower than ninth among the four survey districts. Arrowtooth flounder were caught throughout the survey area at all depths; however, the vast majority in the three Aleutian survey districts were caught at less than 300 m (Table 3). The highest densities were recorded in subdistricts within the Eastern Aleutians and Southern Bering Sea survey districts in waters from 1 to 300 m (Fig. 2 and Table 4). Size generally increased with depth. Length frequency distributions were frequently multi-modal, with females exhibiting a substantially wider length range at larger sizes (Fig. 3). The estimated biomass for arrowtooth flounder was 65,901 t, and the highest survey district biomass was in the Eastern Aleutian Islands, where 55% of the estimated biomass was concentrated (Table 3).

Table 3. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing arrowtooth flounder, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	17	8.88	4,332	757	7,907	0.849
	101 - 200	75	56	4.61	2,453	1,487	3,418	1.168
	201 - 300	30	17	1.65	284	136	431	1.918
	301 - 500	6	2	1.82	596	0	2,860	5.082
	All depths	135	92	5.05	7,665	3,832	11,497	1.027
Central Aleutians	1 - 100	25	20	5.38	3,146	0	13,732	1.290
	101 - 200	49	41	6.28	2,894	1,222	4,567	0.941
	201 - 300	30	24	8.61	1,815	207	3,423	1.514
	301 - 500	10	8	4.07	1,621	0	4,139	2.524
	All depths	114	93	5.73	9,476	0	21,713	1.288
Eastern Aleutians	1 - 100	15	10	10.42	7,135	0	36,354	0.403
	101 - 200	58	53	10.81	8,397	4,746	12,048	0.635
	201 - 300	45	45	41.99	20,579	0	43,641	0.800
	301 - 500	9	3	0.31	176	0	551	0.991
	All depths	127	111	14.40	36,288	1,620	70,955	0.639
Combined Aleutian Districts	1 - 100	64	47	8.32	14,613	0	46,466	0.579
	101 - 200	182	150	7.77	13,745	9,631	17,858	0.747
	201 - 300	105	86	25.97	22,678	0	45,801	0.838
	301 - 500	25	13	1.85	2,393	0	5,111	2.554
	All depths	376	296	9.38	53,428	17,534	89,323	0.746
Southern Bering Sea	1 - 100	18	18	6.31	2,538	1,710	3,367	0.332
	101 - 200	13	13	25.55	4,723	2,668	6,779	0.579
	201 - 300	8	8	44.34	2,500	0	5,655	0.828
	301 - 500	4	4	25.98	2,710	351	5,069	0.930
	All depths	43	43	16.67	12,472	8,422	16,522	0.574

Table 4. -- Summary of arrowtooth flounder mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	201-300	SE Eastern Aleutians	10	10	87.36	18,001	0	41,352
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	8	44.34	2,500	0	5,735
Southern Bering Sea	101-200	E Southern Bering Sea	11	11	36.15	4,262	2,192	6,332
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	35.19	6,800	0	93,052
Central Aleutians	201-300	N Central Aleutians	13	12	34.12	1,498	0	3,118
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	25.98	2,710	6	5,414
Central Aleutians	1-100	SW Central Aleutians	2	2	17.85	2,888	0	34,123
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	16.86	2,688	0	6,029
Central Aleutians	101-200	SE Central Aleutians	11	10	15.72	1,182	0	2,433
Eastern Aleutians	101-200	NE Eastern Aleutians	25	22	12.94	2,605	48	5,162
Central Aleutians	301-500	SE Central Aleutians	2	2	12.56	897	0	10,904
Eastern Aleutians	201-300	NW Eastern Aleutians	7	7	11.89	185	0	513
Western Aleutians	1-100	W Western Aleutians	11	10	11.56	4,271	653	7,888
Eastern Aleutians	101-200	SW Eastern Aleutians	14	14	11.17	2,525	979	4,070
Eastern Aleutians	201-300	NE Eastern Aleutians	22	22	10.61	2,088	551	3,625
Southern Bering Sea	1-100	E Southern Bering Sea	16	16	8.46	2,065	1,379	2,751
Central Aleutians	101-200	N Central Aleutians	9	7	7.02	748	0	2,000
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	6.89	461	0	2,516
Western Aleutians	101-200	E Western Aleutians	26	15	5.83	730	180	1,279
Central Aleutians	101-200	SW Central Aleutians	22	19	5.25	552	300	804
Central Aleutians	201-300	SE Central Aleutians	5	4	4.94	236	0	480
Eastern Aleutians	201-300	SW Eastern Aleutians	6	6	4.27	306	47	564
Western Aleutians	101-200	W Western Aleutians	49	41	4.24	1,723	923	2,524
Central Aleutians	301-500	Petrel Bank	2	1	3.57	442	0	6,052
Western Aleutians	301-500	E Western Aleutians	2	1	3.33	521	0	7,135
Eastern Aleutians	101-200	SE Eastern Aleutians	16	14	3.05	580	175	984
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	2.99	474	0	2,498
Central Aleutians	101-200	Petrel Bank	7	5	2.38	413	20	805
Central Aleutians	301-500	N Central Aleutians	4	4	2.08	258	0	526
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	1.91	243	0	2,309
Western Aleutians	201-300	W Western Aleutians	17	10	1.83	172	49	295
Western Aleutians	201-300	E Western Aleutians	13	7	1.43	112	18	206
Central Aleutians	1-100	N Central Aleutians	10	9	0.91	191	0	393
Central Aleutians	201-300	SW Central Aleutians	8	6	0.82	35	6	65
Central Aleutians	201-300	Petrel Bank	4	2	0.60	46	0	142
Western Aleutians	1-100	E Western Aleutians	13	7	0.52	61	0	141
Central Aleutians	1-100	SE Central Aleutians	7	7	0.50	59	0	133
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.48	127	0	676
Western Aleutians	301-500	W Western Aleutians	4	1	0.44	76	0	317
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	0.30	57	0	528
Central Aleutians	301-500	SW Central Aleutians	2	1	0.30	24	0	323
Eastern Aleutians	1-100	SE Eastern Aleutians	9	4	0.20	35	0	91
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	0.17	44	0	186
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.10	4	0	61
Central Aleutians	1-100	Petrel Bank	6	2	0.09	9	0	28

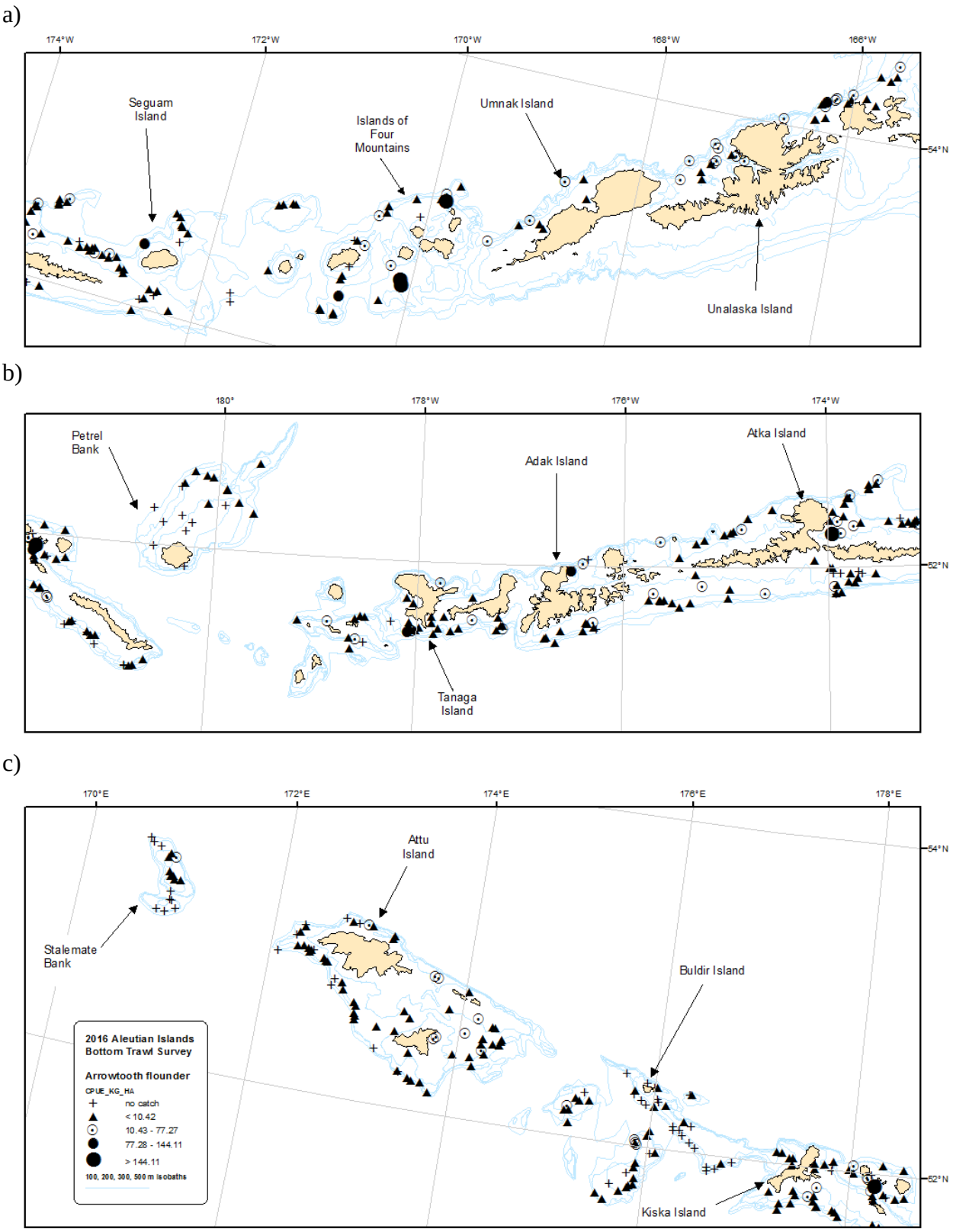


Figure 2. -- Distribution and relative abundance of arrowtooth flounder from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

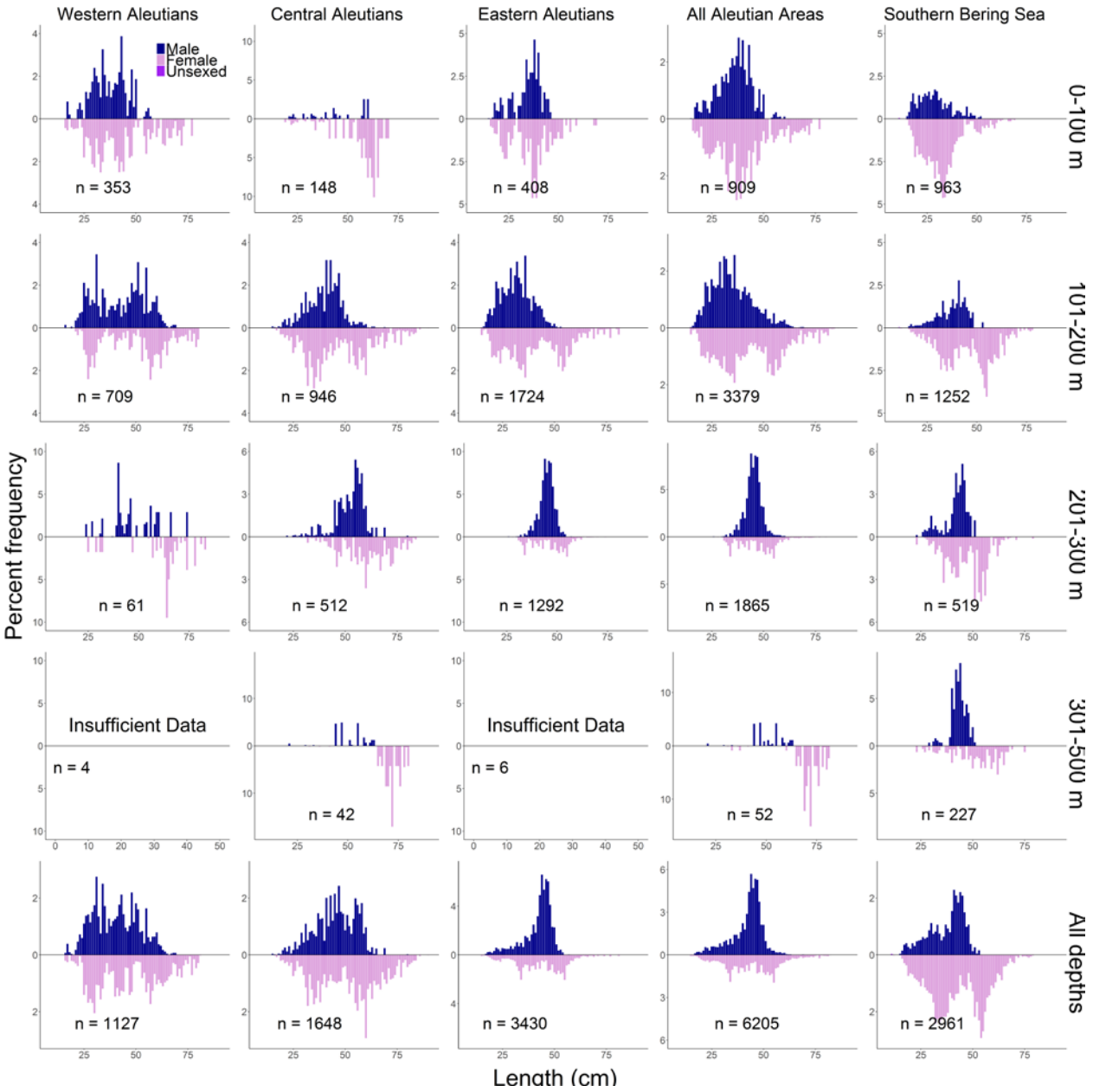


Figure 3. -- Population length composition of arrowtooth flounder by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Kamchatka flounder (*Atheresthes evermanni*)

Kamchatka flounder was the tenth most abundant species caught in the 2016 survey (Table 2) and never ranked lower than fifteenth in any of the four survey districts. Kamchatka flounder were caught throughout the survey area and at all depths, but most were caught at depths between 300 and 500 m in the Central and Eastern Aleutians survey districts (Table 5). The highest densities occurred at depths between 300 and 500 m in the Petrel Bank and the North Central Aleutians subdistricts within the Central Aleutians survey district (Fig. 4 and Table 6). Size consistently increased with depth. The male length frequency distributions in the three Aleutian survey districts were generally characterized by a relatively tight clustering around a distinct mode, which increased with depth. Female length distributions were less well defined, and were characterized by wider range than for males and frequently had more than one mode (Fig. 5). The estimated biomass of Kamchatka flounder was 27,968 t, and the highest survey district biomass was in the Central Aleutians survey district, where 52% of the estimated biomass was concentrated (Table 5).

Table 5. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Kamchatka flounder, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	12	0.38	183	12	354	0.292
	101 - 200	75	51	0.85	454	302	605	0.476
	201 - 300	30	24	2.23	385	206	563	1.157
	301 - 500	6	5	2.22	725	564	887	4.332
	All depths	135	92	1.15	1,747	1,432	2,062	0.840
Central Aleutians	1 - 100	25	10	0.16	96	0	236	0.118
	101 - 200	49	37	0.77	355	223	486	0.267
	201 - 300	30	22	3.89	821	60	1,581	0.933
	301 - 500	10	10	33.58	13,369	0	31,100	2.625
	All depths	114	79	8.85	14,640	0	32,394	1.806
Eastern Aleutians	1 - 100	15	3	0.14	98	0	466	0.122
	101 - 200	58	35	1.10	855	394	1,316	0.170
	201 - 300	45	32	5.52	2,706	0	5,628	0.706
	301 - 500	9	5	9.19	5,224	305	10,143	1.814
	All depths	127	75	3.52	8,883	3,029	14,736	0.708
Combined Aleutian Districts	1 - 100	64	25	0.21	377	38	716	0.168
	101 - 200	182	123	0.94	1,663	1,167	2,159	0.228
	201 - 300	105	78	4.48	3,911	936	6,887	0.775
	301 - 500	25	20	14.93	19,318	4,901	33,735	2.373
	All depths	376	246	4.44	25,269	10,410	40,129	1.112
Southern Bering Sea	1 - 100	18	7	0.04	16	1	30	0.077
	101 - 200	13	10	0.23	43	14	72	0.165
	201 - 300	8	5	0.76	43	0	120	0.465
	301 - 500	4	4	24.89	2,597	0	9,276	2.223
	All depths	43	26	3.61	2,698	0	9,379	1.566

Table 6. -- Summary of Kamchatka flounder mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	CPUE (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	301-500	Petrel Bank	2	2	65.04	8,049	0	62,231
Central Aleutians	301-500	N Central Aleutians	4	4	33.33	4,132	0	15,236
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	24.89	2,597	0	10,253
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	12.71	3,394	705	6,084
Central Aleutians	201-300	N Central Aleutians	13	12	12.32	541	231	850
Eastern Aleutians	201-300	NE Eastern Aleutians	22	17	12.22	2,406	0	5,314
Central Aleutians	301-500	SE Central Aleutians	2	2	12.07	863	0	11,178
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	7.02	1,808	0	7,562
Central Aleutians	301-500	SW Central Aleutians	2	2	4.12	326	0	2,472
Western Aleutians	301-500	E Western Aleutians	2	2	3.91	610	290	931
Western Aleutians	201-300	E Western Aleutians	13	9	3.09	242	76	408
Eastern Aleutians	101-200	NE Eastern Aleutians	25	14	3.06	615	177	1,053
Central Aleutians	201-300	Petrel Bank	4	1	3.05	234	0	977
Eastern Aleutians	201-300	NW Eastern Aleutians	7	7	1.63	26	3	48
Western Aleutians	201-300	W Western Aleutians	17	15	1.52	143	62	224
Central Aleutians	101-200	SW Central Aleutians	22	18	1.52	160	82	238
Eastern Aleutians	201-300	SE Eastern Aleutians	10	3	1.17	242	0	740
Western Aleutians	101-200	W Western Aleutians	49	39	0.91	370	232	508
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	5	0.76	43	0	122
Central Aleutians	101-200	SE Central Aleutians	11	9	0.70	53	0	110
Central Aleutians	101-200	N Central Aleutians	9	5	0.69	74	5	143
Western Aleutians	301-500	W Western Aleutians	4	3	0.67	115	0	310
Western Aleutians	101-200	E Western Aleutians	26	12	0.67	84	19	148
Eastern Aleutians	101-200	SW Eastern Aleutians	14	13	0.64	146	25	266
Central Aleutians	201-300	SW Central Aleutians	8	5	0.64	27	0	64
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	0.51	82	0	302
Western Aleutians	1-100	W Western Aleutians	11	10	0.49	182	9	355
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.48	21	0	288
Eastern Aleutians	201-300	SW Eastern Aleutians	6	5	0.46	33	0	68
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.44	85	0	1,160
Central Aleutians	1-100	N Central Aleutians	10	5	0.42	89	0	232
Central Aleutians	201-300	SE Central Aleutians	5	4	0.40	19	5	33
Central Aleutians	101-200	Petrel Bank	7	5	0.39	68	0	142
Southern Bering Sea	101-200	E Southern Bering Sea	11	8	0.34	40	11	69
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.10	13	0	175
Eastern Aleutians	101-200	SE Eastern Aleutians	16	5	0.07	13	0	26
Southern Bering Sea	1-100	E Southern Bering Sea	16	6	0.05	13	1	25
Central Aleutians	1-100	SE Central Aleutians	7	4	0.05	6	0	13
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	0.04	3	0	7
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.02	3	0	37
Central Aleutians	1-100	Petrel Bank	6	1	0.01	1	0	3
Western Aleutians	1-100	E Western Aleutians	13	2	0.01	1	0	3
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.00	0	0	1

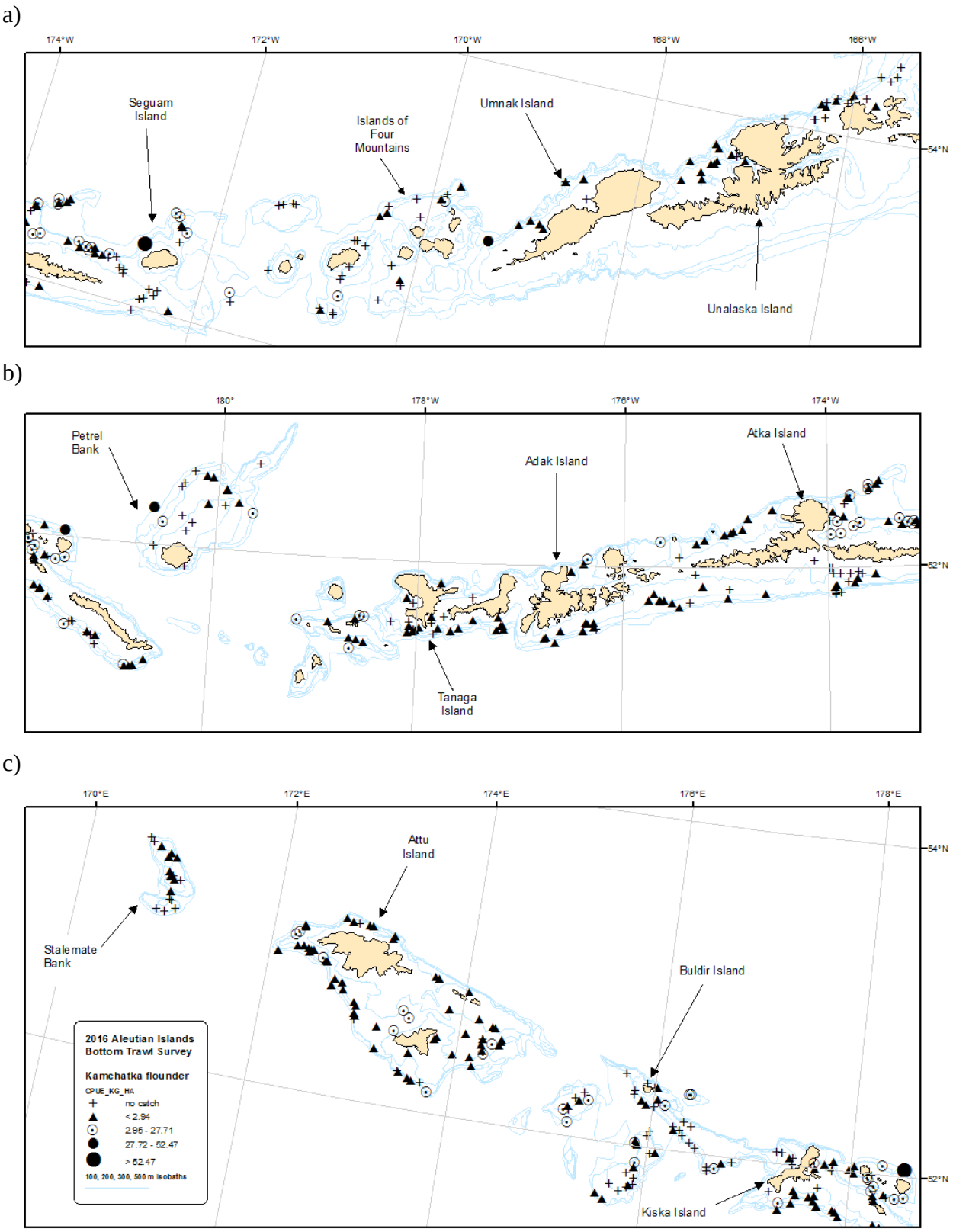


Figure 4. -- Distribution and relative abundance of Kamchatka flounder from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

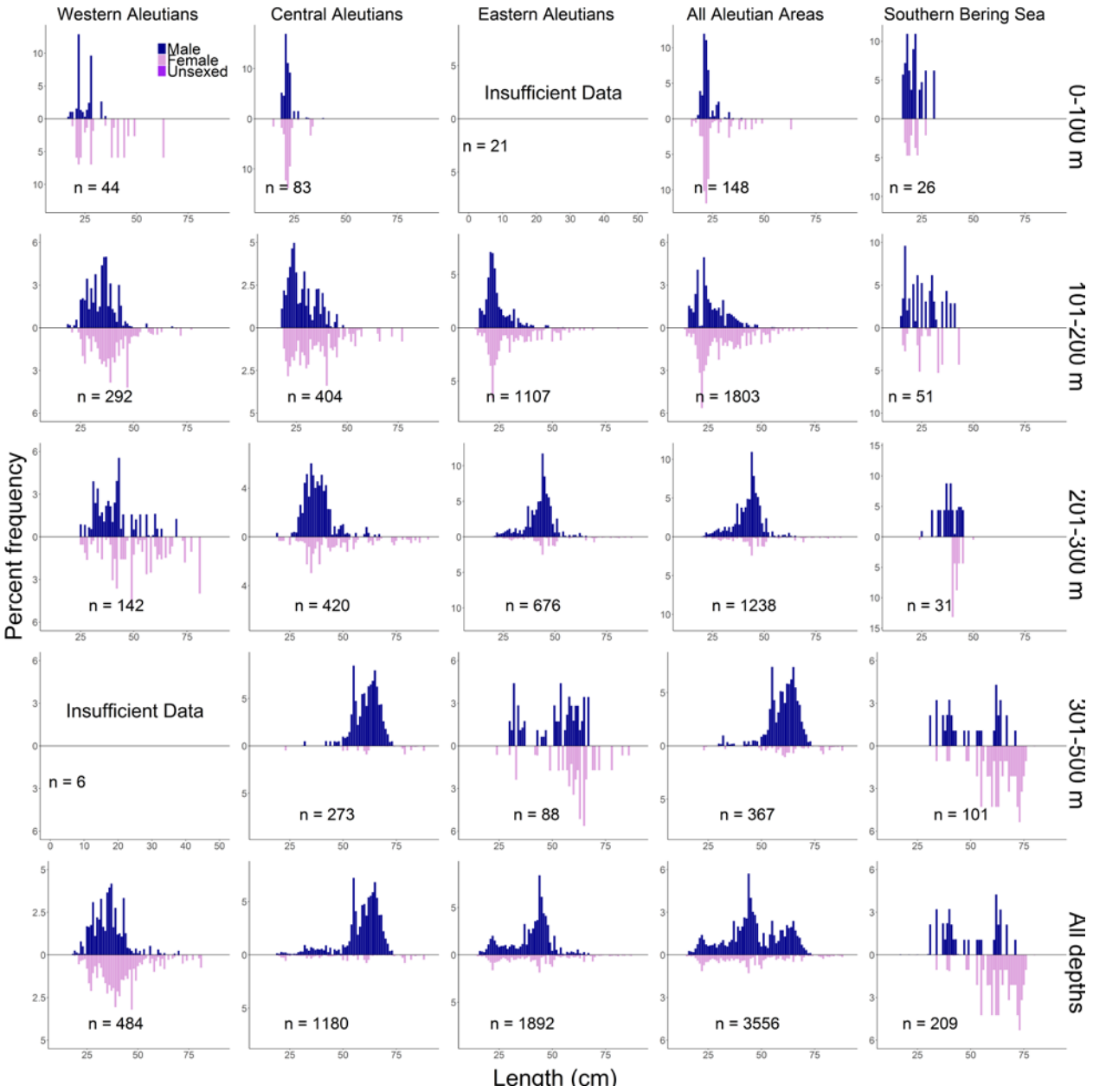


Figure 5. -- Population length composition of Kamtchatka flounder by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Northern rock sole (*Lepidopsetta polyxystra*)

Northern rock sole was the eighth most abundant species caught in the 2016 survey. It ranked among the 20 most abundant species in all four survey districts and never lower than eleventh in any one survey district (Table 2). Almost all northern rock sole were caught at depths shallower than 200 m and were relatively evenly distributed throughout the survey area (Table 7). The highest densities of this species occurred at depths shallower than 200 m in several subdistricts within the Central and Western Aleutian survey districts (Fig. 6 and Table 8). There was a trend of increasing size with depth to 300 m. Females were substantially larger than males in the three Aleutian survey districts as indicated by a length frequency distribution that is shifted by approximately 5 cm to the right relative to that of males. The length distribution of females in the Southern Bering Sea survey district was bimodal, with the smaller mode coinciding with the single mode for males and a second and much larger mode unmatched by the length distribution of males (Fig. 7). The estimated biomass for northern rock sole was 34,976 t, and the highest survey district biomass was in the Central Aleutian survey district, where 46% of the estimated biomass was concentrated (Table 7).

Table 7. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing northern rock sole, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	23	14.75	7,193	3,898	10,487	0.330
	101 - 200	75	48	4.02	2,140	1,361	2,919	0.388
	201 - 300	30	5	0.29	50	0	107	0.619
	301 - 500	6	0	---	---	---	---	---
	All depths	135	76	6.18	9,382	6,013	12,751	0.343
Central Aleutians	1 - 100	25	23	18.68	10,926	0	26,819	0.327
	101 - 200	49	43	9.92	4,567	2,429	6,705	0.428
	201 - 300	30	18	2.72	573	256	890	0.587
	301 - 500	10	1	0.01	4	0	14	0.231
	All depths	114	85	9.71	16,069	0	32,543	0.357
Eastern Aleutians	1 - 100	15	14	2.83	1,939	1,006	2,871	0.328
	101 - 200	58	48	5.14	3,993	1,925	6,061	0.667
	201 - 300	45	11	1.35	661	0	1,394	0.711
	301 - 500	9	1	0.04	21	0	88	0.430
	All depths	127	74	2.62	6,614	4,484	8,744	0.514
Combined Aleutian Districts	1 - 100	64	60	11.41	20,057	7,330	32,783	0.329
	101 - 200	182	139	6.05	10,700	7,696	13,704	0.482
	201 - 300	105	34	1.47	1,284	492	2,076	0.646
	301 - 500	25	2	0.02	25	0	93	0.382
	All depths	376	235	5.63	32,065	18,638	45,492	0.376
Southern Bering Sea	1 - 100	18	16	4.19	1,688	555	2,820	0.347
	101 - 200	13	10	6.62	1,223	244	2,202	0.475
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	26	3.89	2,911	1,616	4,205	0.391

Table 8. -- Summary of northern rock sole mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	1-100	SW Central Aleutians	2	2	34.95	5,654	0	47,573
Central Aleutians	101-200	SW Central Aleutians	22	21	20.63	2,171	1,124	3,218
Central Aleutians	1-100	Petrel Bank	6	4	19.42	1,864	0	5,530
Western Aleutians	1-100	W Western Aleutians	11	11	16.81	6,210	3,014	9,406
Central Aleutians	101-200	SE Central Aleutians	11	11	15.04	1,131	374	1,888
Central Aleutians	1-100	N Central Aleutians	10	10	11.71	2,466	591	4,341
Central Aleutians	101-200	N Central Aleutians	9	9	11.52	1,228	0	3,049
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	9.07	607	0	3,784
Western Aleutians	1-100	E Western Aleutians	13	12	8.31	983	50	1,916
Central Aleutians	1-100	SE Central Aleutians	7	7	8.09	942	464	1,419
Eastern Aleutians	201-300	SW Eastern Aleutians	6	6	7.32	525	0	1,266
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	6.93	1,105	0	3,691
Central Aleutians	201-300	SW Central Aleutians	8	4	6.87	293	0	592
Eastern Aleutians	201-300	NW Eastern Aleutians	7	3	6.43	100	0	284
Eastern Aleutians	101-200	SW Eastern Aleutians	14	13	6.04	1,366	693	2,038
Southern Bering Sea	1-100	E Southern Bering Sea	16	14	5.77	1,408	413	2,403
Southern Bering Sea	101-200	E Southern Bering Sea	11	8	5.22	616	216	1,016
Western Aleutians	101-200	W Western Aleutians	49	35	4.81	1,957	1,202	2,711
Eastern Aleutians	101-200	NE Eastern Aleutians	25	21	3.90	786	287	1,284
Eastern Aleutians	101-200	SE Eastern Aleutians	16	12	3.88	737	322	1,153
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	3.38	653	0	1,942
Central Aleutians	201-300	N Central Aleutians	13	10	3.15	138	6	271
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	3.00	573	0	1,249
Central Aleutians	201-300	SE Central Aleutians	5	4	2.97	142	15	269
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	2.38	301	0	4,131
Eastern Aleutians	1-100	SE Eastern Aleutians	9	9	2.36	411	195	628
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	1.76	280	0	2,838
Western Aleutians	101-200	E Western Aleutians	26	13	1.46	183	0	382
Western Aleutians	201-300	W Western Aleutians	17	3	0.47	44	0	102
Central Aleutians	101-200	Petrel Bank	7	2	0.21	37	0	105
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.15	29	0	88
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.08	21	0	112
Western Aleutians	201-300	E Western Aleutians	13	2	0.07	5	0	14
Eastern Aleutians	201-300	SE Eastern Aleutians	10	1	0.04	8	0	27
Central Aleutians	301-500	N Central Aleutians	4	1	0.03	4	0	15

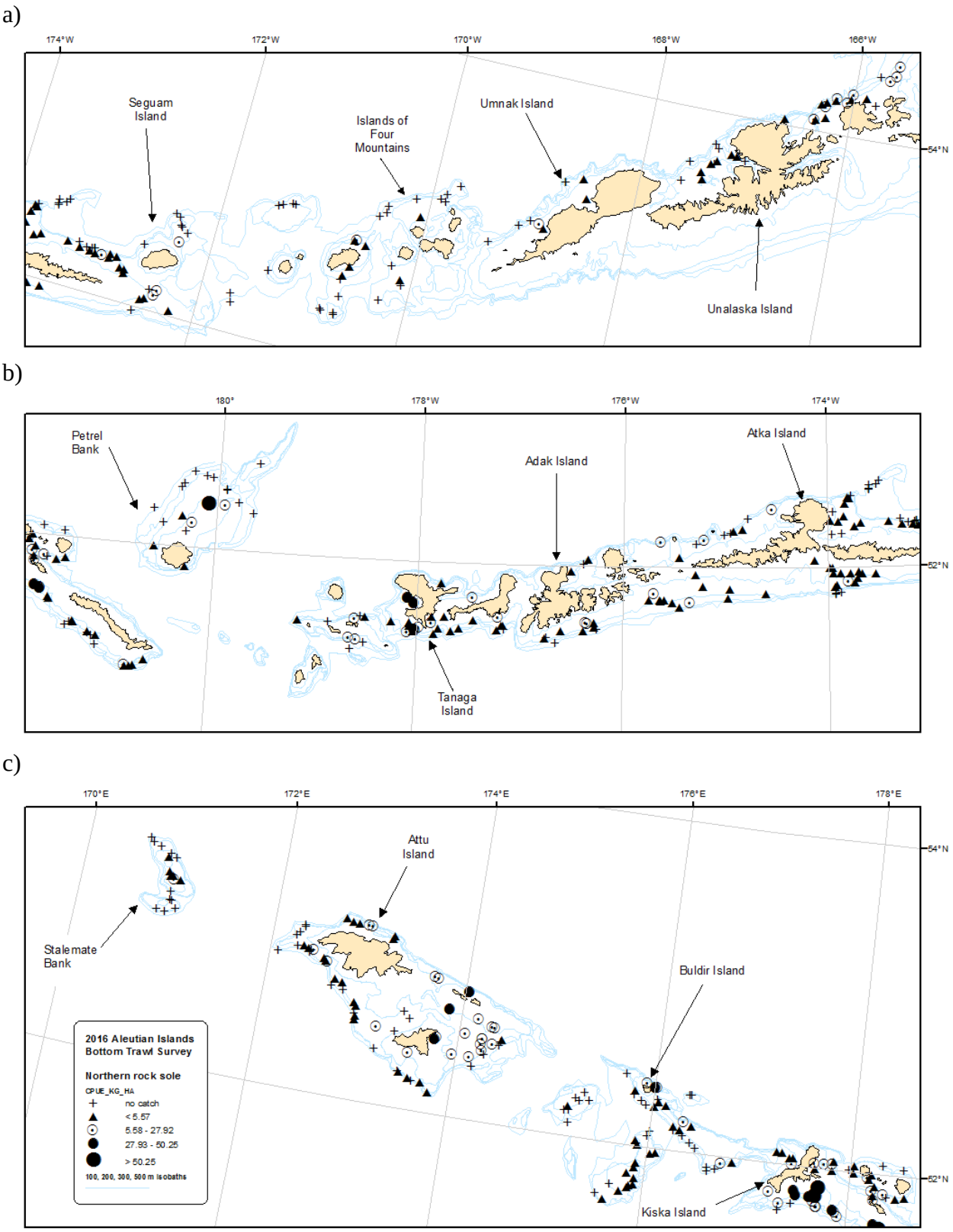


Figure 6. -- Distribution and relative abundance of northern rock sole from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

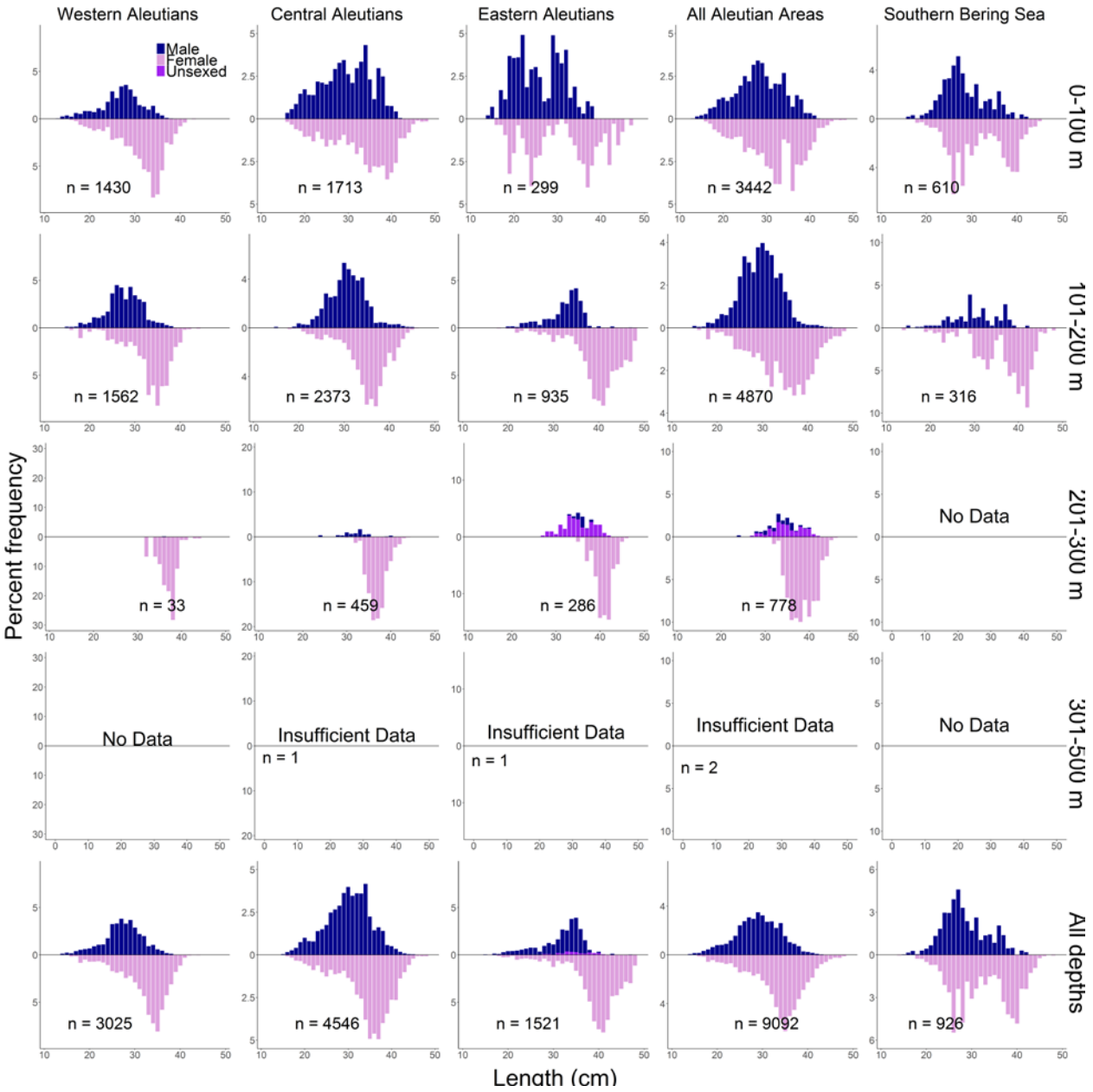


Figure 7. -- Population length composition of northern rock sole by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Southern rock sole (*Lepidopsetta bilineata*)

Southern rock sole was the eighteenth most abundant species caught in the 2016 survey but it only ranked among the top 20 species in the Southern Bering Sea survey district. It was uncommon in other districts (Table 2). Although southern rock sole were caught in all survey districts and at all depths shallower than 300 m, almost all of them were caught at depths less than 200 m in the Southern Bering Sea (Table 9). The highest densities of this species occurred in subdistricts within the Southern Bering Sea survey district at depths less than 100 m (Fig. 8 and Table 10). Females were generally larger than males, having a mode at 38 cm, compared to 35 cm for males (Fig. 9). The estimated biomass for southern rock sole was 7,760 t, and the highest survey district biomass was in the Southern Bering Sea, where 82% of the estimated biomass was concentrated (Table 9).

Table 9. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing southern rock sole, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	1	0.01	7	0	21	0.437
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	1	<0.01	7	0	21	0.437
Central Aleutians	1 - 100	25	2	0.03	20	0	55	0.909
	101 - 200	49	1	<0.01	1	0	2	0.337
	201 - 300	30	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	114	3	0.01	21	0	56	0.861
Eastern Aleutians	1 - 100	15	11	1.97	1,347	0	3,351	0.803
	101 - 200	58	2	0.01	9	0	25	0.956
	201 - 300	45	1	0.01	4	0	11	0.882
	301 - 500	9	0	---	---	---	---	---
	All depths	127	14	0.54	1,360	0	3,364	0.804
Combined Aleutian Districts	1 - 100	64	14	0.78	1,374	0	3,378	0.802
	101 - 200	182	3	0.01	10	0	25	0.847
	201 - 300	105	1	<0.01	4	0	11	0.882
	301 - 500	25	0	---	---	---	---	---
	All depths	376	18	0.24	1,388	0	3,392	0.802
Southern Bering Sea	1 - 100	18	15	14.77	5,947	0	13,005	0.770
	101 - 200	13	7	2.30	426	0	1,369	0.657
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	22	8.52	6,373	0	13,493	0.761

Table 10. -- Summary of southern rock sole mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	16.64	2,638	0	21,203
Southern Bering Sea	1-100	E Southern Bering Sea	16	13	13.56	3,310	1,722	4,897
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	5.26	352	0	3,110
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	4.71	597	0	8,188
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	2.08	397	0	5,444
Eastern Aleutians	1-100	SE Eastern Aleutians	9	8	1.78	309	153	466
Southern Bering Sea	101-200	E Southern Bering Sea	11	5	0.62	74	3	144
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.22	43	0	589
Central Aleutians	1-100	SE Central Aleutians	7	2	0.18	20	0	56
Western Aleutians	1-100	E Western Aleutians	13	1	0.06	7	0	21
Eastern Aleutians	101-200	NE Eastern Aleutians	25	2	0.05	9	0	25
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.02	4	0	11
Central Aleutians	101-200	SW Central Aleutians	22	1	0.01	1	0	2

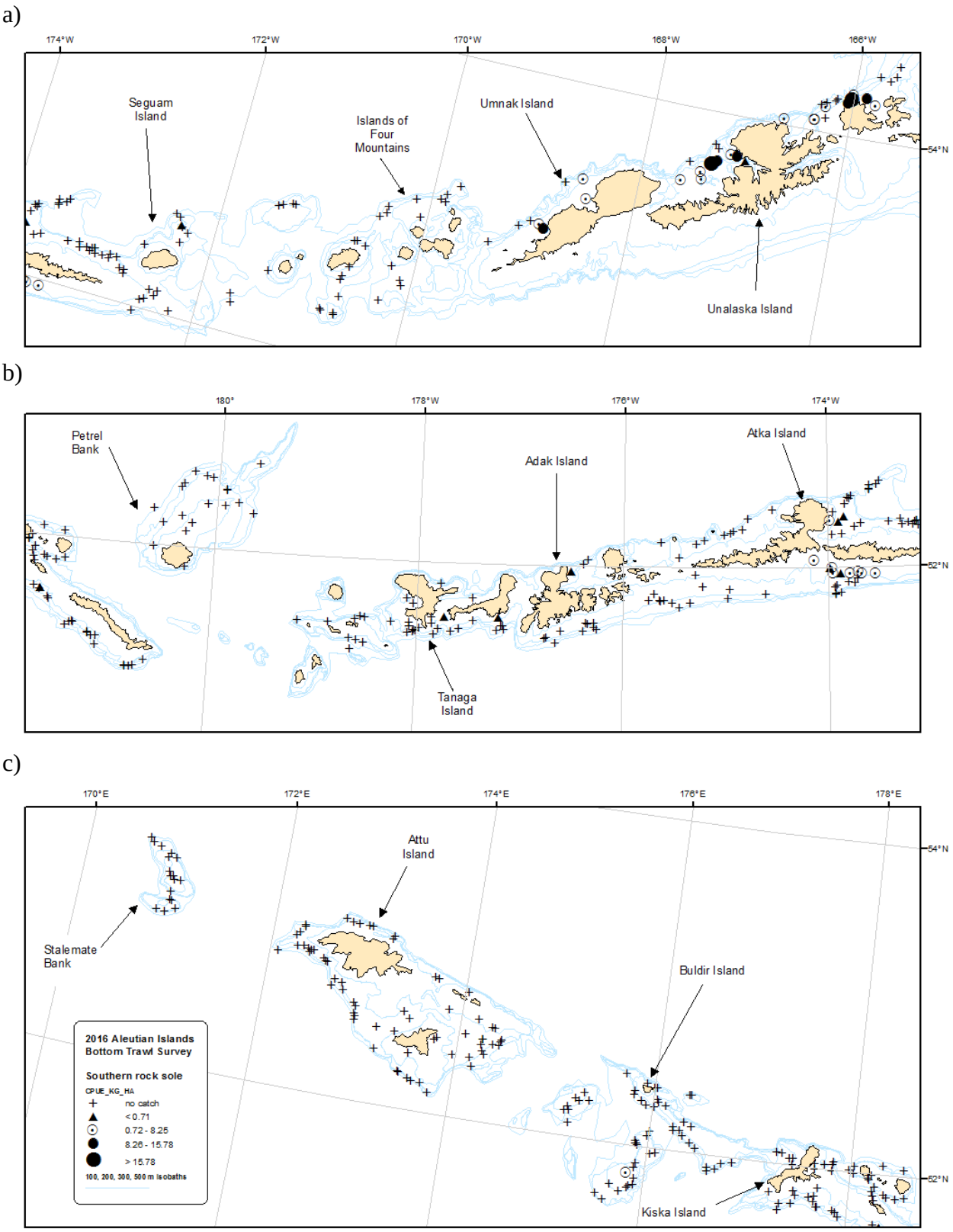


Figure 8. -- Distribution and relative abundance of southern rock sole from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

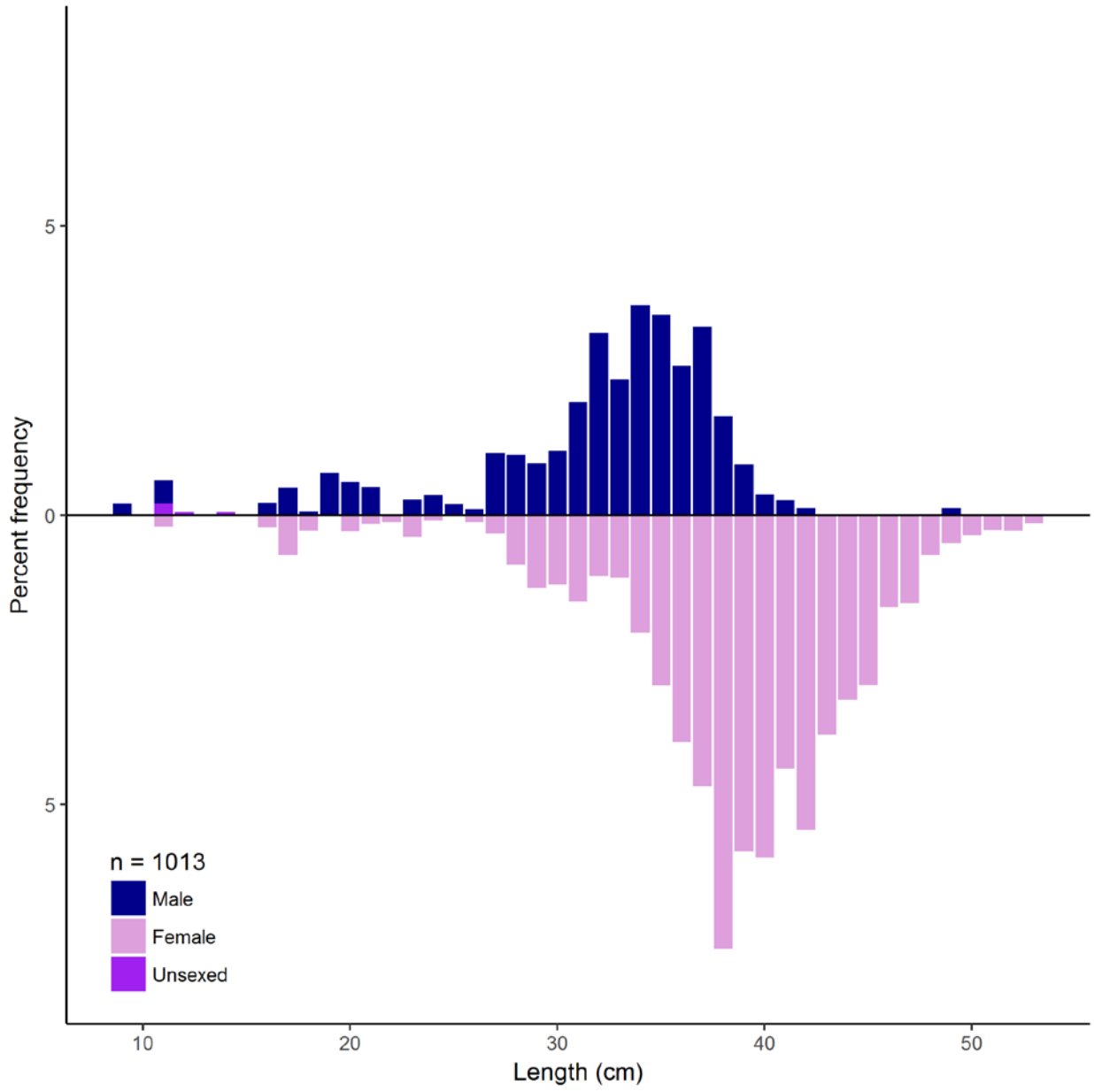


Figure 9. -- Population length composition of southern rock sole in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Pacific halibut (*Hippoglossus stenolepis*)

Pacific halibut was the ninth most abundant species caught in the 2016 survey and it ranked among the top 20 in all four survey districts (Table 2). Pacific halibut were caught in all depth ranges throughout the survey area except in the 300 to 500 m depth interval in the Western Aleutian survey district (Table 11). The highest densities generally occurred at depths less than 200 m in the Eastern Aleutian and Southern Bering Sea survey districts although the single highest density was at depths between 300 and 500 m in a subdistrict within the Central Aleutians survey district (Fig. 10 and Table 12). Size generally increased with depth (Table 11). The length distributions were relatively uniform without any distinct modes in the Western and Central Aleutian survey districts. Lengths in these survey districts ranged from approximately 40 cm to 140 cm. The Eastern Aleutians survey district was characterized by a more bell-shaped length distribution with the bulk of the distribution confined to lengths between 60 cm and 80 cm in the 100 to 200 m depth range. A sharp mode at approximately 45 cm occurred in the Southern Bering Sea length distribution, where most of the measured fish were caught at depths less than 100 m (Fig. 11). The estimated biomass of Pacific halibut was 28,534 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 51% of the estimated biomass was concentrated (Table 11).

Table 11. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Pacific halibut, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	6	2.05	1,001	0	2,056	4.983
	101 - 200	75	7	0.92	490	41	938	12.007
	201 - 300	30	2	0.44	76	0	199	17.113
	301 - 500	6	0	---	---	---	---	---
	All depths	135	15	1.03	1,567	410	2,724	6.365
Central Aleutians	1 - 100	25	13	3.49	2,039	0	4,914	5.526
	101 - 200	49	11	1.46	672	237	1,108	5.732
	201 - 300	30	8	1.97	416	0	919	12.327
	301 - 500	10	2	5.55	2,208	0	10,364	19.936
	All depths	114	34	3.22	5,335	7	10,663	8.459
Eastern Aleutians	1 - 100	15	13	10.76	7,367	0	16,541	5.338
	101 - 200	58	46	7.75	6,024	3,970	8,078	5.064
	201 - 300	45	17	2.12	1,038	203	1,874	7.547
	301 - 500	9	1	0.37	212	0	802	7.628
	All depths	127	77	5.81	14,642	6,175	23,109	5.353
Combined Aleutian Districts	1 - 100	64	32	5.92	10,407	1,539	19,276	5.337
	101 - 200	182	64	4.06	7,186	5,059	9,313	5.332
	201 - 300	105	27	1.75	1,530	593	2,468	8.706
	301 - 500	25	3	1.87	2,420	0	8,490	17.463
	All depths	376	126	3.78	21,544	11,612	31,476	5.964
Southern Bering Sea	1 - 100	18	18	10.50	4,228	1,885	6,572	1.636
	101 - 200	13	12	11.67	2,158	0	4,336	3.196
	201 - 300	8	3	2.31	130	0	290	6.678
	301 - 500	4	2	4.54	474	0	1,280	6.809
	All depths	43	35	9.34	6,990	4,336	9,644	2.087

Table 12. -- Summary of Pacific halibut mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	301-500	SE Central Aleutians	2	2	30.91	2,208	0	26,292
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	20.49	1,372	0	7,567
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	15.08	1,913	0	17,810
Eastern Aleutians	101-200	SE Eastern Aleutians	16	14	14.44	2,744	1,358	4,130
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	12.60	2,402	0	29,963
Eastern Aleutians	1-100	SE Eastern Aleutians	9	7	12.06	2,100	0	5,300
Eastern Aleutians	101-200	NE Eastern Aleutians	25	22	11.22	2,258	1,454	3,062
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	11.02	1,748	0	8,425
Southern Bering Sea	1-100	E Southern Bering Sea	16	16	10.17	2,481	894	4,068
Central Aleutians	201-300	SE Central Aleutians	5	4	7.61	363	0	901
Southern Bering Sea	101-200	E Southern Bering Sea	11	10	6.66	786	481	1,090
Central Aleutians	1-100	N Central Aleutians	10	4	6.44	1,357	0	4,226
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	4.93	953	0	5,256
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	4.54	474	0	1,398
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	4.49	717	0	2,688
Central Aleutians	101-200	N Central Aleutians	9	5	4.33	461	107	816
Central Aleutians	1-100	SE Central Aleutians	7	7	3.73	434	110	758
Eastern Aleutians	201-300	NW Eastern Aleutians	7	2	3.59	56	0	146
Central Aleutians	101-200	SE Central Aleutians	11	6	2.81	211	0	507
Western Aleutians	1-100	W Western Aleutians	11	5	2.65	980	0	2,046
Eastern Aleutians	201-300	NE Eastern Aleutians	22	8	2.41	475	0	951
Eastern Aleutians	201-300	SE Eastern Aleutians	10	6	2.34	482	0	1,196
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	3	2.31	130	0	294
Central Aleutians	1-100	Petrel Bank	6	1	1.96	188	0	671
Eastern Aleutians	101-200	SW Eastern Aleutians	14	7	1.35	306	99	513
Western Aleutians	101-200	W Western Aleutians	49	7	1.21	490	41	938
Central Aleutians	201-300	N Central Aleutians	13	4	1.20	53	0	112
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	0.83	212	0	888
Western Aleutians	201-300	E Western Aleutians	13	1	0.69	54	0	171
Central Aleutians	1-100	SW Central Aleutians	2	1	0.37	60	0	826
Eastern Aleutians	201-300	SW Eastern Aleutians	6	1	0.35	25	0	91
Western Aleutians	201-300	W Western Aleutians	17	1	0.24	22	0	69
Western Aleutians	1-100	E Western Aleutians	13	1	0.18	22	0	69

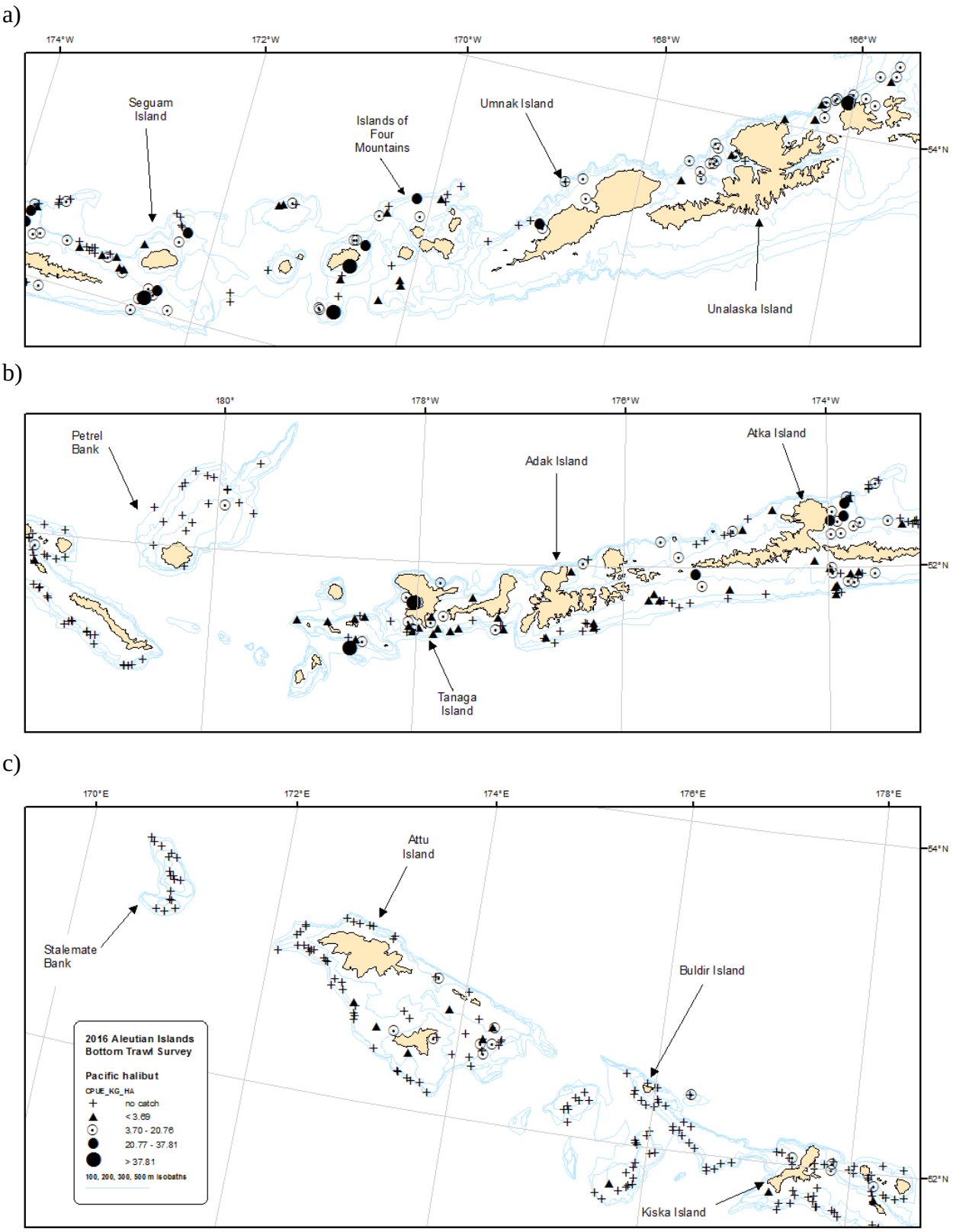


Figure 10. -- Distribution and relative abundance of Pacific halibut from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

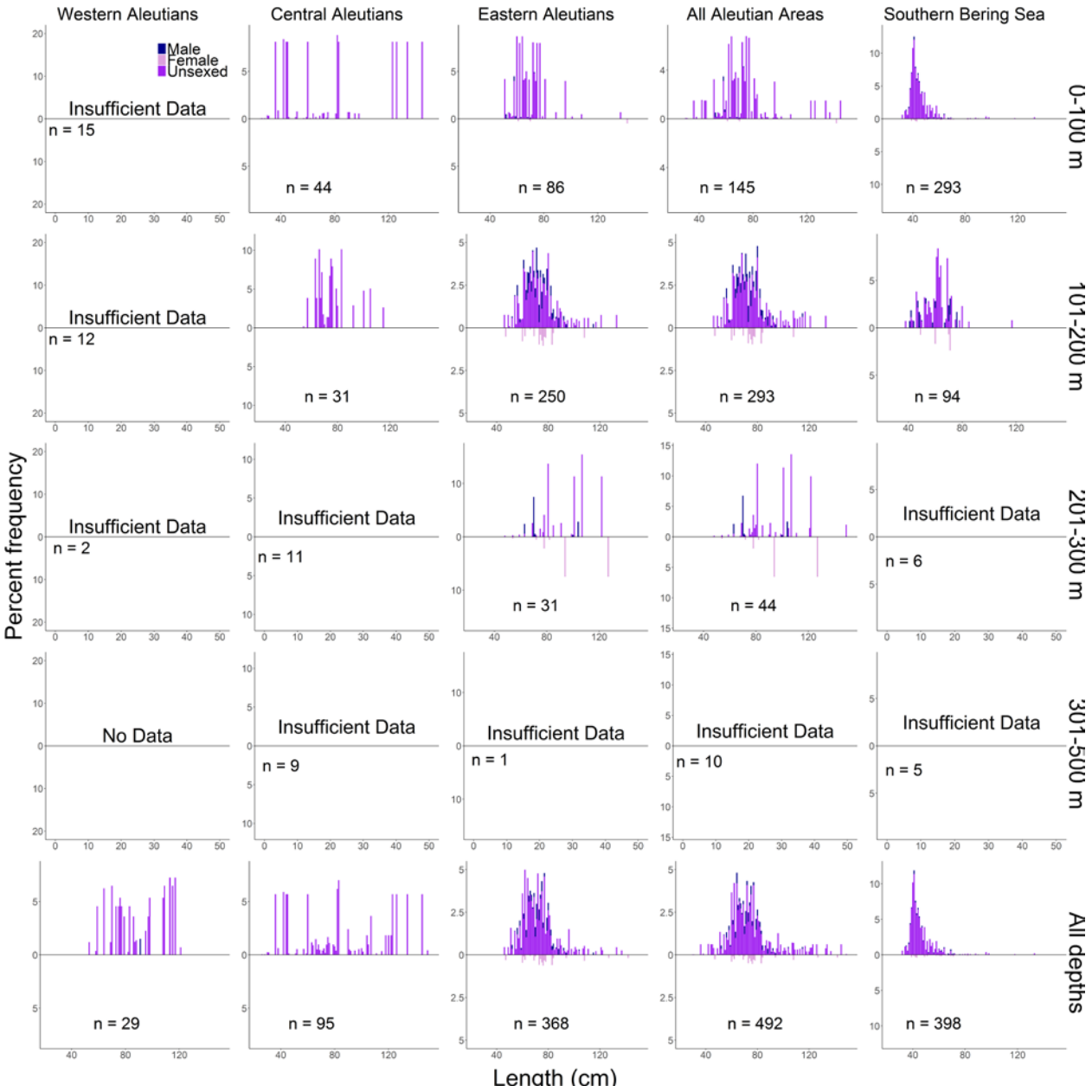


Figure 11. -- Population length composition of Pacific halibut by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Greenland turbot (*Reinhardtius hippoglossoides*)

Greenland turbot was not among the 20 most abundant species caught in the 2016 survey and only ranked among the top 20 in the Southern Bering Sea survey district (Table 2). Greenland turbot were caught in relatively small numbers in all survey districts except for the Western Aleutians survey district where they did not occur, and almost always at depths between 300 and 500 m (Table 13). The highest density by far occurred in a subdistrict within the Southern Bering Sea survey district at depths between 300 and 500 m (Fig. 12 and Table 14). Males were vastly more abundant than females and ranged in size between approximately 52 cm and 75 cm. The length distribution was relatively uniform with a mode at approximately 68 cm (Fig. 13). The estimated biomass of Greenland turbot was 2,378 t, and the highest survey district biomass was essentially tied between the Eastern Aleutians and Southern Bering Sea survey districts, where 82% of the estimated biomass was concentrated (Table 13).

Table 13. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Greenland turbot, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	0	---	---	---	---	---
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	0	---	---	---	---	---
	201 - 300	30	1	0.07	15	0	49	6.940
	301 - 500	10	4	1.03	409	0	1,006	3.145
	All depths	114	5	0.26	424	0	1,023	3.206
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	1	0.04	17	0	54	2.998
	301 - 500	9	3	1.68	952	0	3,381	2.281
	All depths	127	4	0.38	970	0	3,399	2.291
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	0	---	---	---	---	---
	201 - 300	105	2	0.04	32	0	80	4.063
	301 - 500	25	7	1.05	1,361	0	3,862	2.487
	All depths	376	9	0.24	1,394	0	3,895	2.509
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	1	9.43	984	0	3,716	2.699
	All depths	43	1	1.32	984	0	3,716	2.699

Table 14. -- Summary of Greenland turbot mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	9.43	984	0	4,115
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	3.24	865	0	4,128
Central Aleutians	301-500	Petrel Bank	2	2	2.36	292	0	2,387
Central Aleutians	301-500	N Central Aleutians	4	1	0.66	82	0	343
Central Aleutians	301-500	SW Central Aleutians	2	1	0.45	35	0	484
Central Aleutians	201-300	SW Central Aleutians	8	1	0.35	15	0	50
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	0.34	87	0	363
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.09	17	0	54

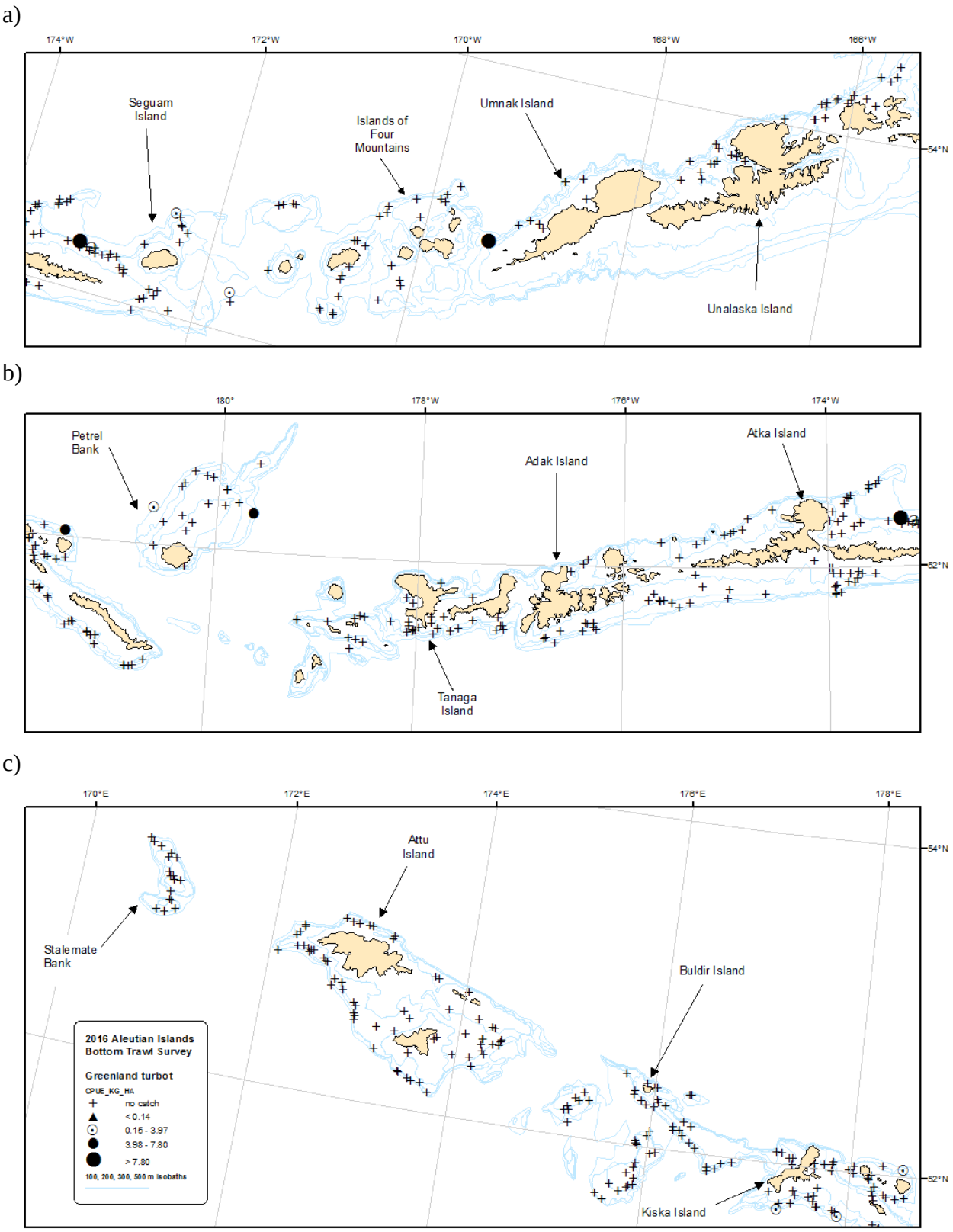


Figure 12. -- Distribution and relative abundance of Greenland turbot from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

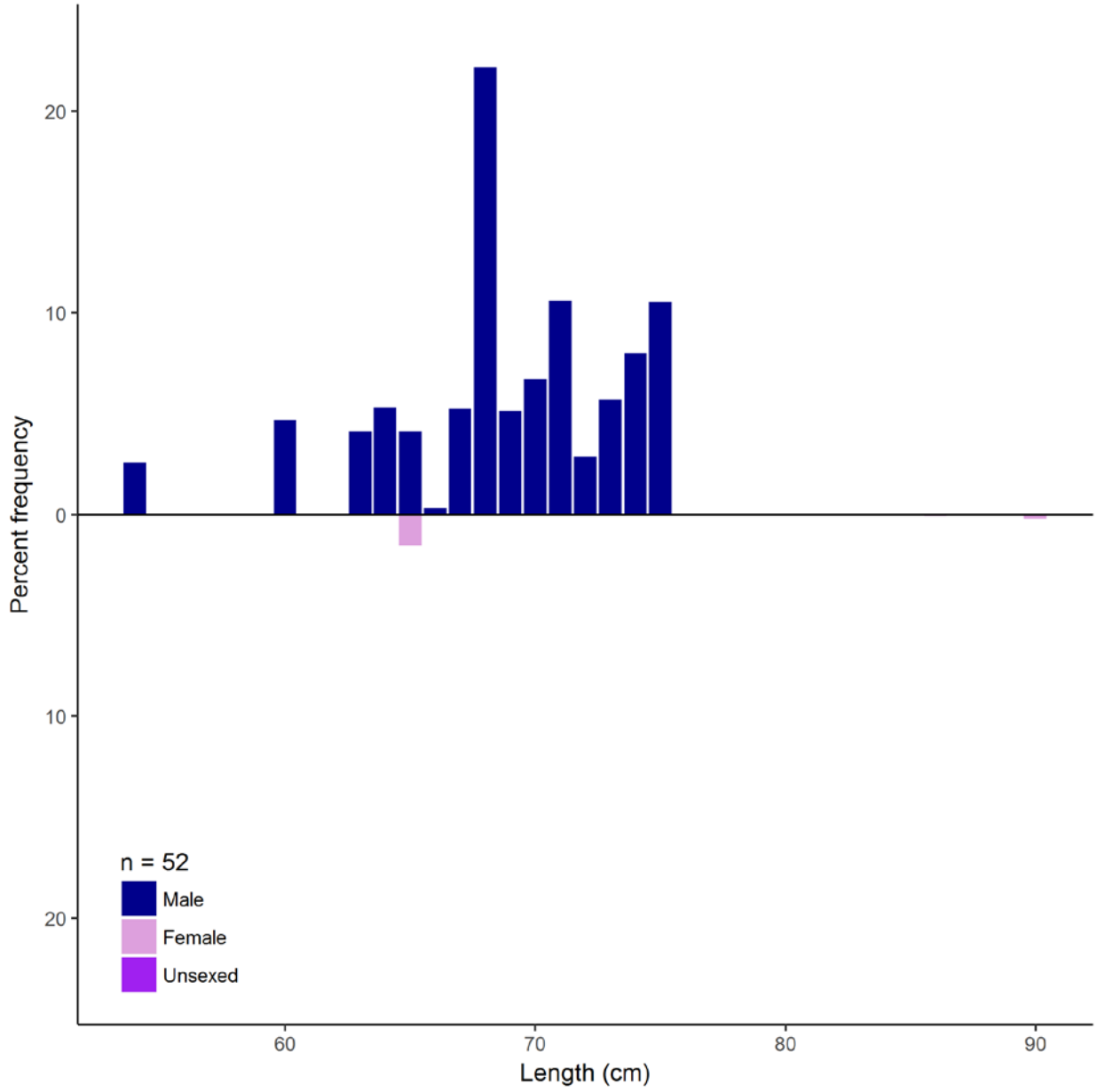


Figure 13. -- Population length composition of Greenland turbot in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Flathead sole (*Hippoglossoides elassodon*)

Flathead sole was the seventeenth most abundant species caught in the 2016 survey but was only ranked among the top 20 species in the Southern Bering Sea and Western Aleutians survey districts (Table 2). Although flathead sole were caught in all survey districts and at all depths shallower than 300 m, the vast majority were caught at depths less than 200 m in the Western Aleutians and Southern Bering Sea survey districts (Table 15). The highest densities of this species occurred at depths between 200 and 300 m in a subdistrict within the Eastern Aleutian Islands and at depths less than 200 m in the Southern Bering Sea and Western Aleutians survey districts (Fig. 14 and Table 16). There was no general trend in size with depth. Females generally exhibited a wider range of lengths in all survey districts and had a mode in the combined Aleutian survey districts that was approximately 3 cm greater than that of males. The length distribution of females across all depths in the Southern Bering Sea survey district was bimodal as a result of size segregation by depth in the two depth intervals where they occurred (Fig. 15). The estimated biomass for flathead sole was 6,759 t, and the highest survey district biomass was in the Western Aleutians Islands, where 47 % the estimated biomass was concentrated (Table 15).

Table 15. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing flathead sole, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	12	3.35	1,634	814	2,454	0.372
	101 - 200	75	47	2.73	1,451	873	2,029	0.224
	201 - 300	30	10	0.49	85	6	164	0.248
	301 - 500	6	0	---	---	---	---	---
	All depths	135	69	2.09	3,169	2,165	4,173	0.282
Central Aleutians	1 - 100	25	2	0.04	22	0	57	0.291
	101 - 200	49	10	0.14	65	23	107	0.500
	201 - 300	30	6	0.17	35	0	73	0.523
	301 - 500	10	0	---	---	---	---	---
	All depths	114	18	0.07	122	56	187	0.448
Eastern Aleutians	1 - 100	15	2	0.10	67	0	309	0.540
	101 - 200	58	17	1.06	825	23	1,627	0.214
	201 - 300	45	14	0.50	246	94	398	0.392
	301 - 500	9	0	---	---	---	---	---
	All depths	127	33	0.45	1,138	304	1,973	0.247
Combined Aleutian Districts	1 - 100	64	16	0.98	1,723	901	2,544	0.375
	101 - 200	182	74	1.32	2,341	1,369	3,312	0.223
	201 - 300	105	30	0.42	366	193	538	0.353
	301 - 500	25	0	---	---	---	---	---
	All depths	376	120	0.78	4,429	3,133	5,724	0.275
Southern Bering Sea	1 - 100	18	18	3.52	1,417	267	2,567	0.478
	101 - 200	13	11	4.86	899	0	2,285	0.130
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	1	0.14	14	0	54	1.050
	All depths	43	30	3.11	2,330	621	4,039	0.235

Table 16. -- Summary of flathead sole mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	201-300	NW Eastern Aleutians	7	7	12.39	193	21	365
Southern Bering Sea	101-200	E Southern Bering Sea	11	11	7.62	899	0	2,302
Southern Bering Sea	1-100	E Southern Bering Sea	16	16	5.65	1,378	222	2,534
Western Aleutians	1-100	W Western Aleutians	11	11	4.42	1,632	802	2,462
Western Aleutians	101-200	W Western Aleutians	49	40	3.42	1,388	813	1,963
Eastern Aleutians	101-200	NE Eastern Aleutians	25	10	3.15	633	0	1,432
Eastern Aleutians	101-200	SW Eastern Aleutians	14	5	0.61	138	14	263
Central Aleutians	201-300	SW Central Aleutians	8	3	0.59	25	0	62
Western Aleutians	201-300	E Western Aleutians	13	3	0.58	45	0	112
Western Aleutians	101-200	E Western Aleutians	26	7	0.50	63	7	118
Western Aleutians	201-300	W Western Aleutians	17	7	0.42	40	0	89
Central Aleutians	101-200	SW Central Aleutians	22	6	0.34	36	3	68
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	0.34	54	0	169
Central Aleutians	101-200	SE Central Aleutians	11	3	0.29	22	0	47
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.28	55	0	753
Eastern Aleutians	201-300	SW Eastern Aleutians	6	3	0.28	20	0	57
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	0.25	39	0	128
Eastern Aleutians	201-300	NE Eastern Aleutians	22	3	0.14	27	0	73
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.14	14	0	59
Central Aleutians	1-100	N Central Aleutians	10	2	0.10	22	0	58
Central Aleutians	201-300	Petrel Bank	4	1	0.09	7	0	29
Central Aleutians	101-200	N Central Aleutians	9	1	0.07	8	0	25
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.06	12	0	168
Central Aleutians	201-300	SE Central Aleutians	5	1	0.04	2	0	7
Eastern Aleutians	201-300	SE Eastern Aleutians	10	1	0.03	6	0	18
Central Aleutians	201-300	N Central Aleutians	13	1	0.02	1	0	3
Western Aleutians	1-100	E Western Aleutians	13	1	0.02	2	0	6

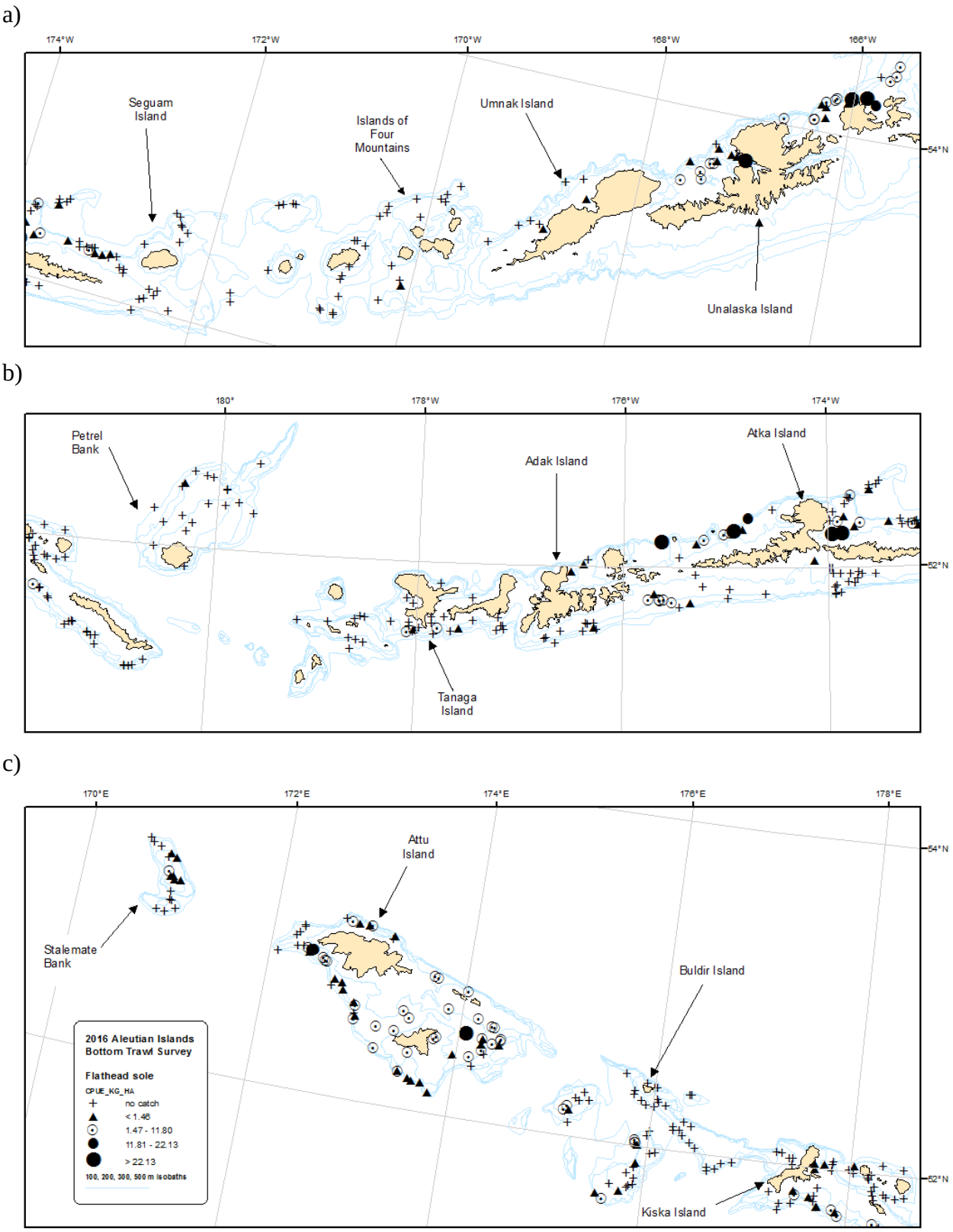


Figure 14. -- Distribution and relative abundance of flathead sole from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

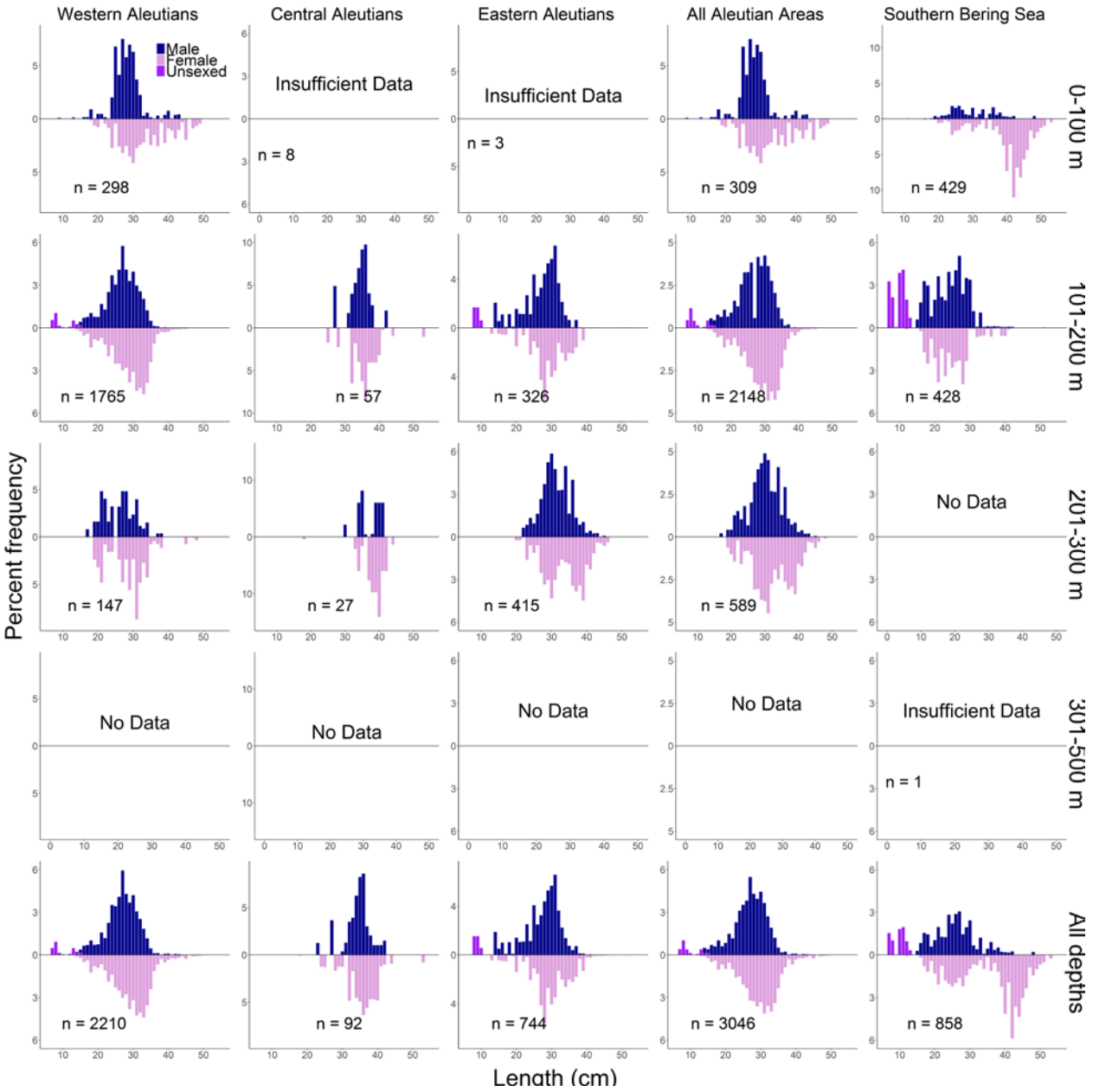


Figure 15. -- Population length composition of flathead sole by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Rex sole (G*lyptocephalus zachirus*)

Rex sole was the fourteenth most abundant species caught in the 2016 survey and ranked among the top 20 in all four survey districts (Table 2). Although rex sole were caught throughout the survey area and at all depths, most were caught at depths deeper than 100 m in the Eastern Aleutians and Southern Bering Sea survey districts (Table 17). The highest densities occurred in three subdistricts in the Southern Bering Sea and Eastern Aleutian survey districts, all in different depth ranges: 301-500 m and 101-200 m in the Southern Bering Sea, and 201-300 m in the Eastern Aleutians (Fig. 16 and Table 18). Females were generally larger than males, especially in the three Aleutian survey districts, having an overall mode for the combined survey districts and depth ranges at approximately 50 cm versus 41 cm for males (Fig. 17). The estimated biomass of rex sole was 12,146 t, and the highest survey district biomass was in the Eastern Aleutian survey district, where 36% of the estimated biomass was concentrated (Table 17).

Table 17. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing rex sole, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	11	1.51	737	118	1,357	0.784
	101 - 200	75	41	2.10	1,115	489	1,740	0.597
	201 - 300	30	14	2.59	447	17	877	0.467
	301 - 500	6	3	0.45	147	0	296	0.486
	All depths	135	69	1.61	2,446	1,471	3,422	0.602
Central Aleutians	1 - 100	25	1	<0.01	1	0	4	0.136
	101 - 200	49	15	0.62	285	52	518	0.499
	201 - 300	30	17	4.59	969	0	2,514	0.721
	301 - 500	10	6	0.96	381	0	779	0.637
	All depths	114	39	0.99	1,636	206	3,066	0.649
Eastern Aleutians	1 - 100	15	2	0.05	37	0	113	0.518
	101 - 200	58	19	1.52	1,182	512	1,852	0.627
	201 - 300	45	20	2.67	1,309	319	2,298	0.742
	301 - 500	9	6	3.15	1,788	297	3,280	0.600
	All depths	127	47	1.71	4,316	2,276	6,356	0.644
Combined Aleutian Districts	1 - 100	64	14	0.44	775	153	1,398	0.760
	101 - 200	182	75	1.46	2,582	1,657	3,506	0.597
	201 - 300	105	51	3.12	2,725	1,130	4,319	0.670
	301 - 500	25	15	1.79	2,316	748	3,885	0.597
	All depths	376	155	1.48	8,398	5,827	10,969	0.632
Southern Bering Sea	1 - 100	18	11	1.66	668	1	1,334	0.438
	101 - 200	13	12	6.60	1,219	638	1,801	0.528
	201 - 300	8	5	4.69	265	7	522	0.504
	301 - 500	4	4	15.31	1,597	0	4,182	0.616
	All depths	43	32	5.01	3,748	1,114	6,383	0.539

Table 18. -- Summary of rex sole mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	15.31	1,597	0	4,560
Eastern Aleutians	201-300	NW Eastern Aleutians	7	6	10.81	169	0	447
Southern Bering Sea	101-200	E Southern Bering Sea	11	10	10.15	1,196	609	1,783
Central Aleutians	201-300	Petrel Bank	4	2	7.49	574	0	2,308
Eastern Aleutians	201-300	SW Eastern Aleutians	6	5	7.44	533	0	1,246
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	6.33	1,689	0	3,688
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	5	4.69	265	1	529
Central Aleutians	201-300	SW Central Aleutians	8	3	4.21	180	0	389
Western Aleutians	201-300	W Western Aleutians	17	10	3.50	329	0	741
Eastern Aleutians	101-200	NE Eastern Aleutians	25	10	3.09	621	130	1,112
Western Aleutians	1-100	E Western Aleutians	13	7	2.81	333	30	635
Central Aleutians	201-300	SE Central Aleutians	5	4	2.67	127	0	279
Southern Bering Sea	1-100	E Southern Bering Sea	16	10	2.48	605	0	1,267
Eastern Aleutians	101-200	SW Eastern Aleutians	14	7	2.34	530	49	1,011
Western Aleutians	101-200	W Western Aleutians	49	33	2.12	860	266	1,454
Western Aleutians	101-200	E Western Aleutians	26	8	2.03	254	56	453
Central Aleutians	201-300	N Central Aleutians	13	8	2.00	88	0	187
Eastern Aleutians	201-300	SE Eastern Aleutians	10	2	1.76	363	0	1,114
Central Aleutians	301-500	SE Central Aleutians	2	1	1.70	121	0	1,662
Central Aleutians	101-200	SW Central Aleutians	22	8	1.65	174	3	345
Central Aleutians	301-500	Petrel Bank	2	2	1.56	194	0	1,077
Western Aleutians	201-300	E Western Aleutians	13	4	1.51	118	0	275
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	1.30	57	0	781
Eastern Aleutians	201-300	NE Eastern Aleutians	22	7	1.24	244	11	477
Western Aleutians	1-100	W Western Aleutians	11	4	1.10	405	0	957
Western Aleutians	301-500	E Western Aleutians	2	2	0.60	94	52	136
Central Aleutians	301-500	N Central Aleutians	4	3	0.53	66	0	169
Central Aleutians	101-200	Petrel Bank	7	3	0.47	81	0	236
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.40	63	0	863
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	0.35	23	0	271
Western Aleutians	301-500	W Western Aleutians	4	1	0.31	54	0	224
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.19	24	0	325
Central Aleutians	101-200	SE Central Aleutians	11	3	0.17	13	0	32
Central Aleutians	101-200	N Central Aleutians	9	1	0.17	18	0	59
Eastern Aleutians	301-500	SE Eastern Aleutians	4	2	0.16	42	0	120
Eastern Aleutians	101-200	SE Eastern Aleutians	16	1	0.13	26	0	80
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.07	13	0	183
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	0.04	6	0	31
Central Aleutians	1-100	SE Central Aleutians	7	1	0.01	1	0	4

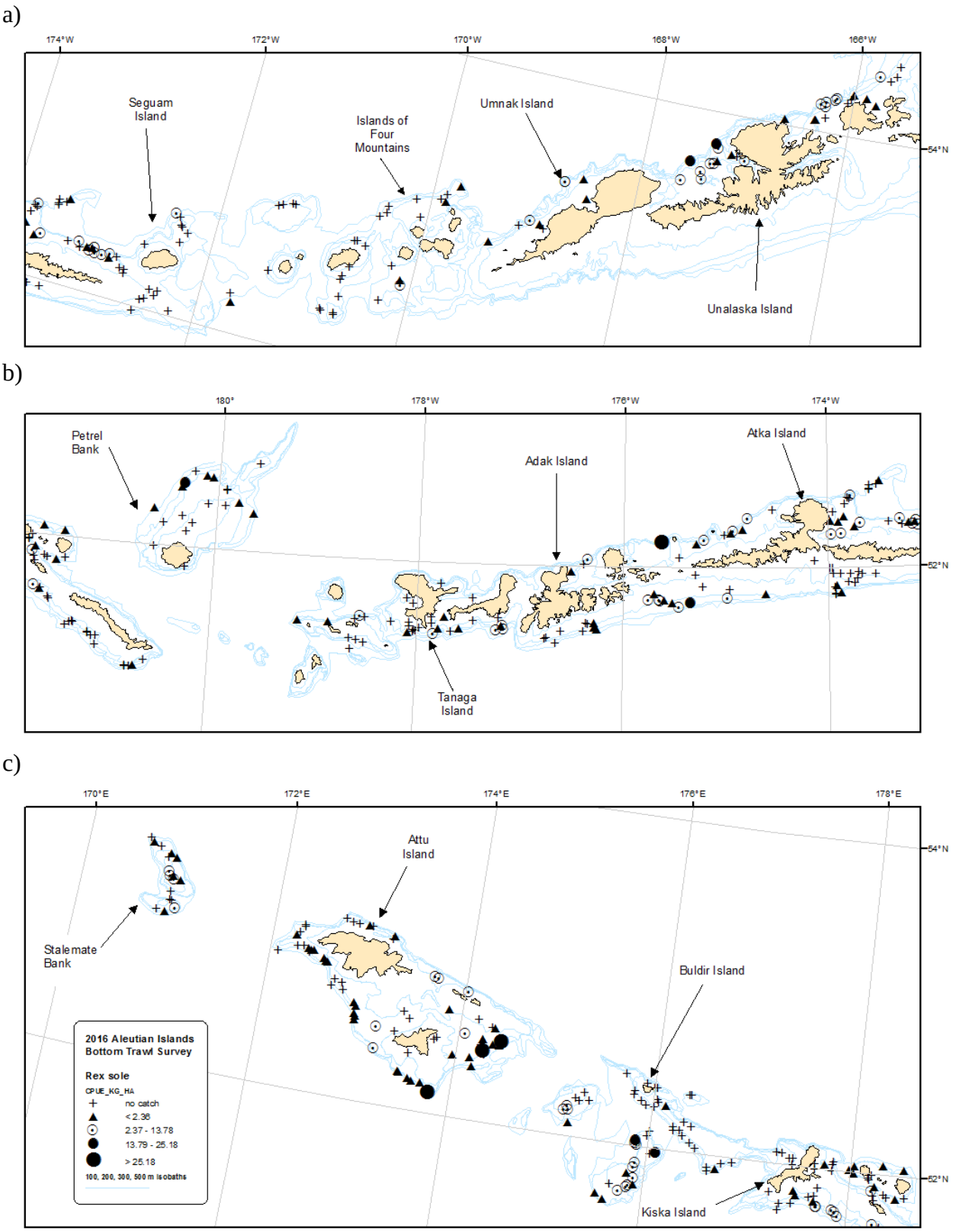


Figure 16. -- Distribution and relative abundance of rex sole from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

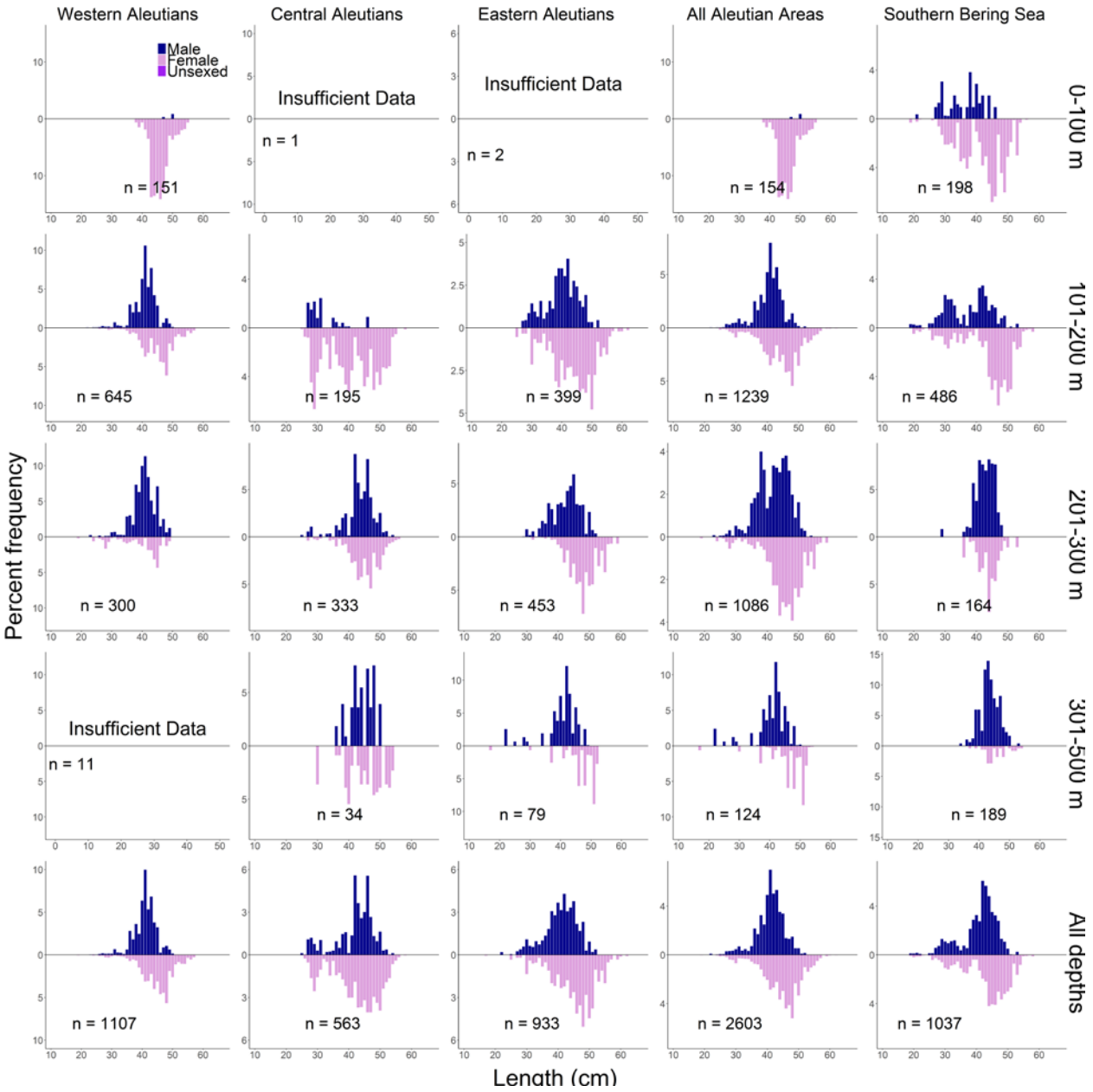


Figure 17. -- Population length composition of rex sole by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Dover sole (*Microstomus pacificus*)

Dover sole was not among the 20 most abundant species caught in the 2016 survey and only ranked in the top 20 in the Central Aleutian survey district (Table 2). Most Dover sole were caught at depths between 200 and 500 m in all survey districts except the Western Aleutians where they were rare (Table 19). The highest densities of this species occurred at depths deeper than 200 m in two subdistricts within the Central Aleutian survey district (Table 20). There was a no clear trend in size with increasing depth. Females were generally larger than males, having a mode at 50 cm, compared to two modes at 41 cm and 43 cm for males (Fig. 18). The estimated biomass for northern Dover sole was 1,459 t, and the highest survey district biomass was in the Central Aleutian survey district, where 63% of the estimated biomass was concentrated (Table 19).

Table 19. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Dover sole, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	2	0.03	13	0	34	0.548
	101 - 200	75	8	0.06	30	2	57	0.986
	201 - 300	30	4	0.05	9	0	19	0.969
	301 - 500	6	0	---	---	---	---	---
	All depths	135	14	0.03	52	17	87	0.820
Central Aleutians	1 - 100	25	1	0.08	44	0	153	1.236
	101 - 200	49	5	0.14	62	0	151	0.854
	201 - 300	30	4	2.00	422	0	1,140	1.522
	301 - 500	10	2	0.99	393	0	1,987	1.446
	All depths	114	12	0.56	921	0	2,882	1.400
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	7	0.08	60	0	121	0.722
	201 - 300	45	6	0.04	19	0	40	1.160
	301 - 500	9	2	0.48	271	0	988	0.977
	All depths	127	15	0.14	350	0	1,074	0.929
Combined Aleutian Districts	1 - 100	64	3	0.03	57	0	165	0.962
	101 - 200	182	20	0.09	152	47	257	0.817
	201 - 300	105	14	0.51	450	0	1,169	1.485
	301 - 500	25	4	0.51	664	0	1,779	1.209
	All depths	376	41	0.23	1,323	75	2,570	1.205
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	1	0.02	3	0	9	0.454
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	2	1.28	134	0	414	0.864
	All depths	43	3	0.18	137	0	417	0.848

Table 20. -- Summary of Dover sole mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	201-300	Petrel Bank	4	2	5.33	408	0	1,231
Central Aleutians	301-500	Petrel Bank	2	1	2.99	370	0	5,068
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	1.28	134	0	455
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.82	220	0	1,164
Eastern Aleutians	201-300	NW Eastern Aleutians	7	5	0.78	12	0	29
Central Aleutians	1-100	Petrel Bank	6	1	0.46	44	0	158
Central Aleutians	301-500	SE Central Aleutians	2	1	0.32	23	0	314
Central Aleutians	101-200	Petrel Bank	7	3	0.32	55	0	146
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	0.20	51	0	215
Eastern Aleutians	101-200	NE Eastern Aleutians	25	5	0.19	38	0	79
Central Aleutians	201-300	N Central Aleutians	13	1	0.18	8	0	25
Central Aleutians	201-300	SW Central Aleutians	8	1	0.13	5	0	18
Eastern Aleutians	101-200	SW Eastern Aleutians	14	2	0.10	22	0	70
Western Aleutians	201-300	E Western Aleutians	13	3	0.09	7	0	15
Western Aleutians	1-100	E Western Aleutians	13	1	0.08	10	0	31
Western Aleutians	101-200	E Western Aleutians	26	4	0.08	10	0	22
Western Aleutians	101-200	W Western Aleutians	49	4	0.05	20	0	45
Central Aleutians	101-200	N Central Aleutians	9	1	0.05	5	0	17
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.04	7	0	22
Southern Bering Sea	101-200	E Southern Bering Sea	11	1	0.03	3	0	10
Western Aleutians	201-300	W Western Aleutians	17	1	0.03	2	0	8
Central Aleutians	101-200	SW Central Aleutians	22	1	0.02	2	0	7
Western Aleutians	1-100	W Western Aleutians	11	1	0.01	3	0	11

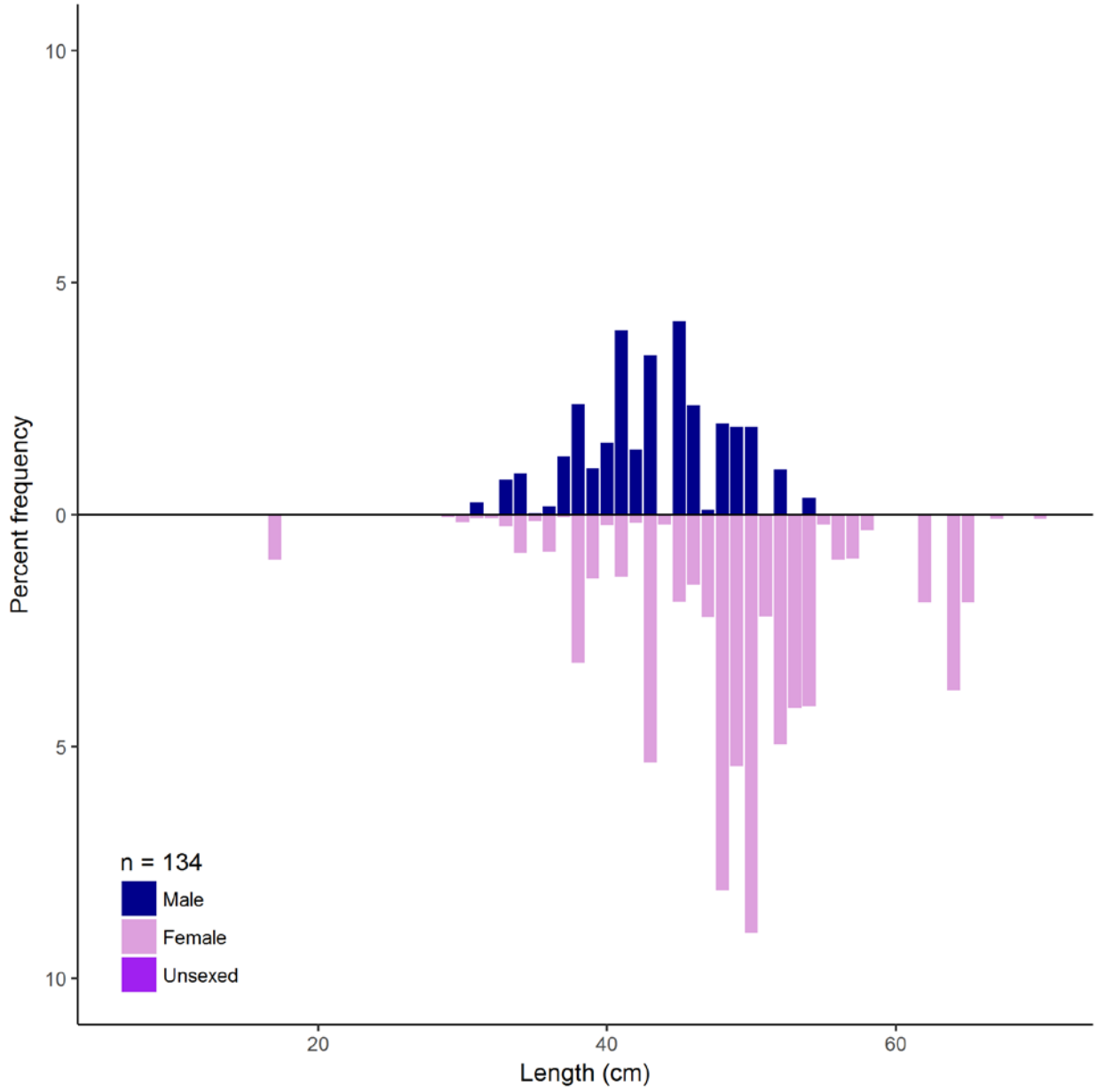


Figure 18. -- Population length composition of Dover sole in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Roundfish

Atka mackerel (*Pleurogrammus monopterygius*)

Atka mackerel was the second most abundant species caught in the 2016 survey and it also ranked second in all three Aleutian survey districts (Table 2). Although Atka mackerel were caught in all survey districts and at all survey depths, almost all were caught at depths less than 200 m in the three Aleutian survey districts with extremely few caught at any depth in the Southern Bering Sea survey district (Table 21). The highest densities of this species occurred at depths between 100 and 200 m in an Eastern Aleutian subdistrict and at depths less than 100 m in a Central Aleutian subdistict. Relatively high densities also occurred at depth less than 200 m in several other subdistricts within the Western and Central Aleutian survey districts (Fig. 19 and Table 22). There was no general trend in size with depth. Males and females had similar overall length frequency distributions in the three Aleutian survey districts, but they often differed within individual depth intervals. Although the length distributions generally had a well-defined mode, both sexes exhibited bimodal distributions in the Central Aleutians survey district (Fig. 20). The estimated biomass for Atka mackerel was 448,166 t, and the highest survey district biomass was essentially tied between the Western and Eastern Aleutian survey districts, where 70% of the estimated biomass was concentrated (Table 21).

Table 21. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Atka mackerel, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	16	34.47	16,808	0	36,645	0.477
	101 - 200	75	36	262.54	139,608	0	316,235	0.452
	201 - 300	30	6	0.10	17	4	30	0.640
	301 - 500	6	0	---	---	---	---	---
	All depths	135	58	102.98	156,433	0	334,047	0.454
Central Aleutians	1 - 100	25	18	209.72	122,628	0	275,074	0.440
	101 - 200	49	30	22.45	10,338	0	26,097	0.813
	201 - 300	30	8	0.18	37	0	79	0.915
	301 - 500	10	1	0.05	18	0	96	0.744
	All depths	114	57	80.41	133,022	0	286,222	0.456
Eastern Aleutians	1 - 100	15	5	5.55	3,802	0	12,224	0.842
	101 - 200	58	19	196.47	152,623	0	314,936	0.873
	201 - 300	45	9	4.06	1,989	0	4,551	0.886
	301 - 500	9	2	0.20	112	0	315	0.742
	All depths	127	35	62.91	158,525	0	321,039	0.872
Combined Aleutian Districts	1 - 100	64	39	81.52	143,239	0	297,143	0.450
	101 - 200	182	85	171.03	302,569	66,792	538,345	0.609
	201 - 300	105	23	2.34	2,043	0	4,605	0.884
	301 - 500	25	3	0.10	130	0	338	0.742
	All depths	376	150	78.68	447,980	171,073	724,887	0.548
Southern Bering Sea	1 - 100	18	5	0.25	100	0	212	0.953
	101 - 200	13	3	0.19	35	0	97	0.748
	201 - 300	8	2	0.89	50	0	154	1.063
	301 - 500	4	0	---	---	---	---	---
	All depths	43	10	0.25	186	33	338	0.931

Table 22. -- Summary of Atka mackerel mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	101-200	NE Eastern Aleutians	25	8	737.79	148,484	0	310,923
Central Aleutians	1-100	Petrel Bank	6	6	702.74	67,465	0	210,617
Western Aleutians	101-200	W Western Aleutians	49	11	298.33	121,276	0	296,716
Central Aleutians	1-100	N Central Aleutians	10	6	245.97	51,791	0	154,491
Western Aleutians	101-200	E Western Aleutians	26	25	146.36	18,331	0	39,173
Western Aleutians	1-100	E Western Aleutians	13	11	136.04	16,098	0	36,230
Central Aleutians	101-200	SE Central Aleutians	11	7	130.35	9,799	0	25,744
Central Aleutians	1-100	SE Central Aleutians	7	5	28.37	3,302	0	10,766
Eastern Aleutians	101-200	SE Eastern Aleutians	16	10	21.70	4,123	0	12,227
Eastern Aleutians	1-100	SE Eastern Aleutians	9	4	21.66	3,771	0	12,356
Eastern Aleutians	201-300	NE Eastern Aleutians	22	9	10.10	1,989	0	4,558
Central Aleutians	101-200	SW Central Aleutians	22	14	2.74	288	0	671
Western Aleutians	1-100	W Western Aleutians	11	5	1.92	710	0	1,621
Central Aleutians	101-200	N Central Aleutians	9	5	1.76	187	0	451
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	2	0.89	50	0	156
Central Aleutians	201-300	N Central Aleutians	13	5	0.46	20	0	55
Central Aleutians	1-100	SW Central Aleutians	2	1	0.43	70	0	953
Southern Bering Sea	1-100	E Southern Bering Sea	16	5	0.41	100	0	212
Central Aleutians	101-200	Petrel Bank	7	4	0.37	64	8	119
Central Aleutians	201-300	SE Central Aleutians	5	2	0.30	14	0	44
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	0.29	74	0	310
Central Aleutians	301-500	SE Central Aleutians	2	1	0.25	18	0	249
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	0.24	16	0	221
Western Aleutians	201-300	E Western Aleutians	13	6	0.22	17	4	30
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.17	32	0	433
Southern Bering Sea	101-200	E Southern Bering Sea	11	2	0.16	19	0	59
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.14	38	0	200
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	0.09	15	0	79
Central Aleutians	201-300	SW Central Aleutians	8	1	0.07	3	0	10

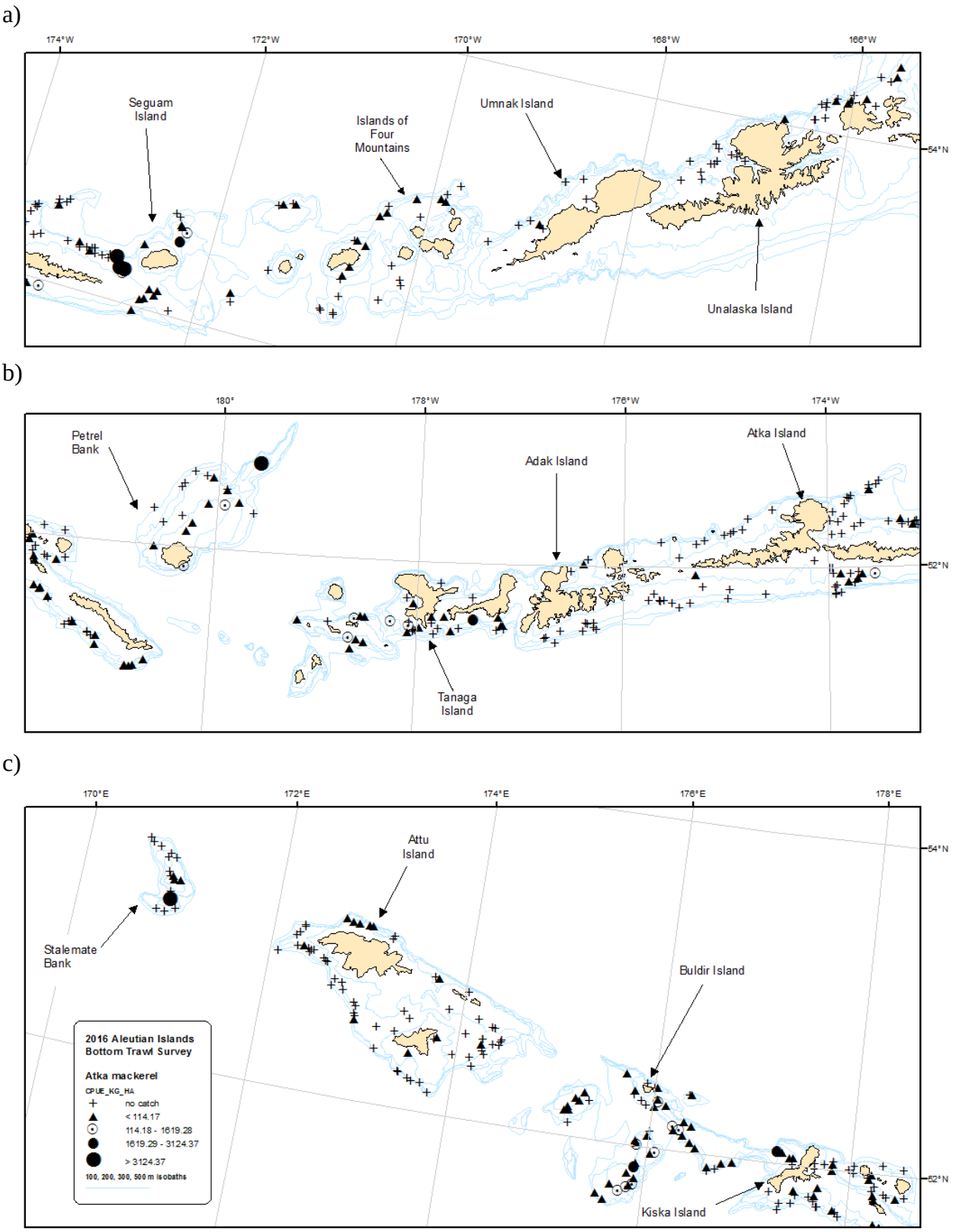


Figure 19. -- Distribution and relative abundance of Atka mackerel from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

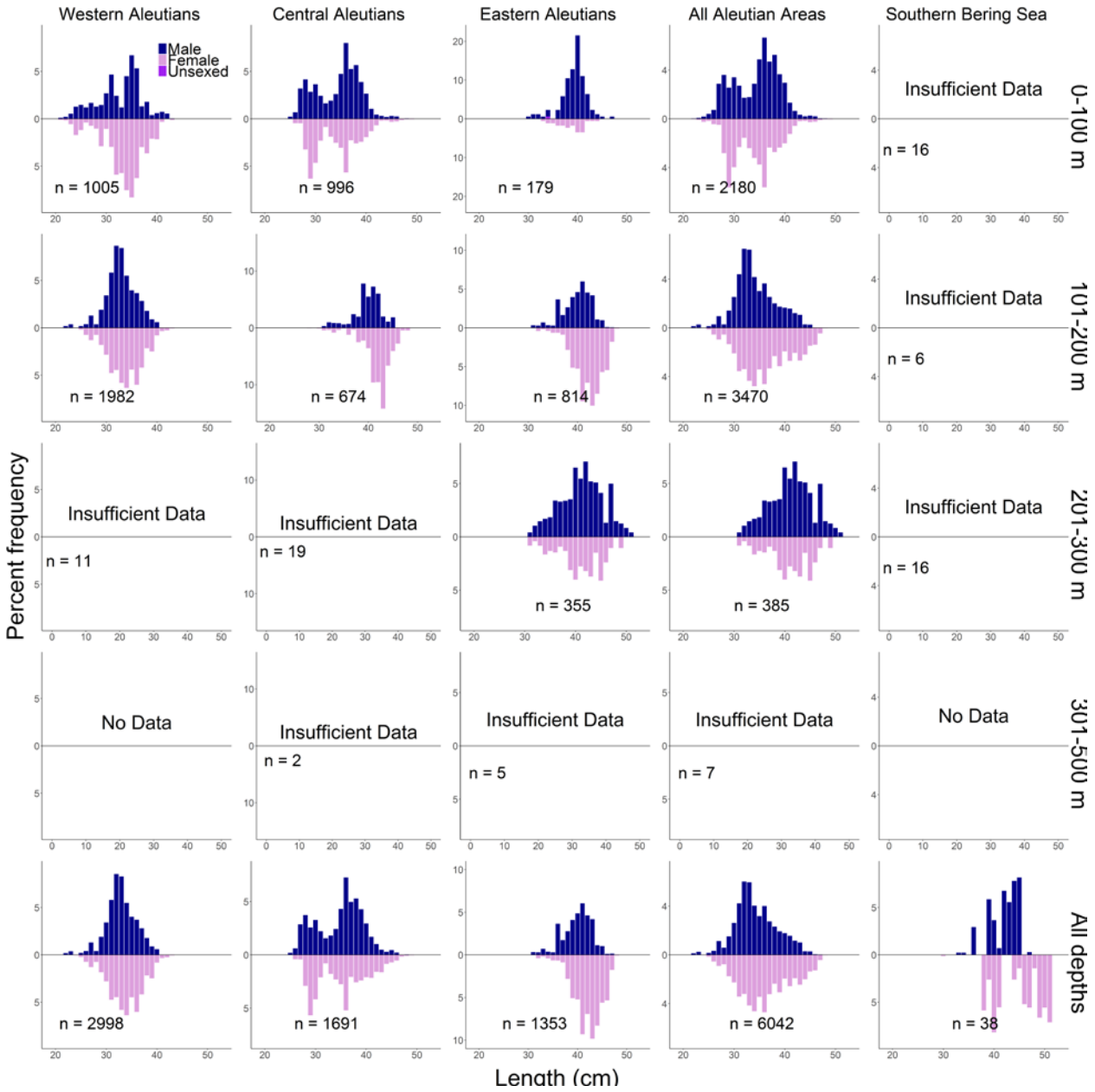


Figure 20. -- Population length composition of Atka mackerel by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Pacific cod (*Gadus macrocephalus*)

Pacific cod was the fifth most abundant species caught in the 2016 survey, and it never ranked lower than sixth in any of the four survey districts (Table 2). Pacific cod were caught at all depths throughout the survey area, but most were caught at depths shallower than 200 m (Table 23). The highest densities occurred at depths shallower than 200 m in various subdistricts throughout the three Aleutian survey districts. The single highest concentration was in the NE Eastern Aleutians (101-200 m) subdistrict, where the CPUE was more than twice as high as the CPUE of the next highest subdistrict (Table 24). Most of the largest individual catches occurred in a vicinity of Seguam and Yunaksa Islands (Fig. 21). Males and females were similar in size in all four survey districts. Sizes were noticeably larger in the three Aleutian survey districts than in the Southern Bering Sea survey districts, with modes at approximately 60 cm and 50 cm, respectively (Fig. 22). The estimated biomass of Pacific cod was 95,735 t, and the highest survey district biomass was in the Eastern Aleutians district, where 47% of the estimated biomass was concentrated (Table 23).

Table 23. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Pacific cod, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	14	32.32	15,763	0	31,927	4.234
	101 - 200	75	47	7.12	3,787	1,690	5,883	2.573
	201 - 300	30	12	1.31	226	66	385	2.525
	301 - 500	6	0	---	---	---	---	---
	All depths	135	73	13.02	19,775	3,450	36,100	3.743
Central Aleutians	1 - 100	25	21	23.73	13,873	0	35,209	3.438
	101 - 200	49	41	10.13	4,667	1,951	7,383	1.571
	201 - 300	30	21	4.53	956	264	1,648	1.856
	301 - 500	10	0	---	---	---	---	---
	All depths	114	83	11.79	19,496	0	41,046	2.592
Eastern Aleutians	1 - 100	15	10	2.30	1,577	279	2,874	0.526
	101 - 200	58	52	47.96	37,259	18,047	56,472	2.645
	201 - 300	45	40	11.93	5,847	3,939	7,755	2.029
	301 - 500	9	2	0.80	455	0	1,210	1.940
	All depths	127	104	17.91	45,138	25,788	64,488	2.235
Combined Aleutian Districts	1 - 100	64	45	17.76	31,213	6,081	56,345	2.903
	101 - 200	182	140	25.84	45,713	26,202	65,224	2.467
	201 - 300	105	73	8.05	7,029	5,018	9,039	2.016
	301 - 500	25	2	0.35	455	0	1,210	1.940
	All depths	376	260	14.83	84,409	52,604	116,214	2.557
Southern Bering Sea	1 - 100	18	16	17.76	7,149	2,205	12,092	1.482
	101 - 200	13	12	15.21	2,813	623	5,002	2.263
	201 - 300	8	8	15.08	850	423	1,278	2.243
	301 - 500	4	2	4.93	514	0	1,349	3.368
	All depths	43	38	15.14	11,325	5,953	16,698	1.717

Table 24. -- Summary of Pacific cod mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	101-200	NE Eastern Aleutians	25	21	114.41	23,026	6,101	39,951
Central Aleutians	1-100	N Central Aleutians	10	8	53.18	11,198	0	32,697
Eastern Aleutians	101-200	SE Eastern Aleutians	16	14	53.07	10,085	205	19,965
Western Aleutians	1-100	W Western Aleutians	11	9	40.33	14,894	0	31,223
Eastern Aleutians	201-300	NW Eastern Aleutians	7	7	37.45	584	135	1,033
Southern Bering Sea	1-100	E Southern Bering Sea	16	15	27.45	6,697	1,776	11,619
Central Aleutians	101-200	SE Central Aleutians	11	11	24.27	1,825	0	4,176
Southern Bering Sea	101-200	E Southern Bering Sea	11	11	20.32	2,396	358	4,433
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	8	15.08	850	412	1,289
Central Aleutians	101-200	SW Central Aleutians	22	22	14.95	1,573	464	2,682
Central Aleutians	1-100	SE Central Aleutians	7	6	13.80	1,607	0	3,976
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	13.55	2,161	0	6,915
Eastern Aleutians	201-300	NE Eastern Aleutians	22	19	13.18	2,595	1,157	4,032
Central Aleutians	101-200	N Central Aleutians	9	7	11.47	1,222	0	2,589
Central Aleutians	201-300	SE Central Aleutians	5	5	10.79	515	0	1,095
Central Aleutians	1-100	Petrel Bank	6	5	10.64	1,022	0	2,716
Eastern Aleutians	201-300	SE Eastern Aleutians	10	10	10.51	2,166	1,012	3,319
Western Aleutians	101-200	E Western Aleutians	26	14	10.30	1,290	355	2,224
Eastern Aleutians	101-200	SW Eastern Aleutians	14	14	8.79	1,988	595	3,381
Central Aleutians	201-300	N Central Aleutians	13	11	8.03	352	0	829
Western Aleutians	1-100	E Western Aleutians	13	5	7.35	870	0	1,874
Eastern Aleutians	1-100	SE Eastern Aleutians	9	5	7.17	1,248	0	2,543
Eastern Aleutians	201-300	SW Eastern Aleutians	6	4	7.02	503	0	1,287
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	6.23	417	0	5,715
Western Aleutians	101-200	W Western Aleutians	49	33	6.14	2,497	611	4,382
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	4.93	514	0	1,471
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	2.85	451	0	6,186
Central Aleutians	201-300	SW Central Aleutians	8	5	2.08	89	0	197
Western Aleutians	201-300	E Western Aleutians	13	5	1.98	155	1	309
Eastern Aleutians	301-500	SE Eastern Aleutians	4	2	1.77	455	0	1,320
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	1.55	196	0	2,624
Western Aleutians	201-300	W Western Aleutians	17	7	0.75	71	17	124
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.44	84	0	1,147
Central Aleutians	1-100	SW Central Aleutians	2	2	0.29	47	0	357
Central Aleutians	101-200	Petrel Bank	7	1	0.27	47	0	163
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	0.25	49	0	623

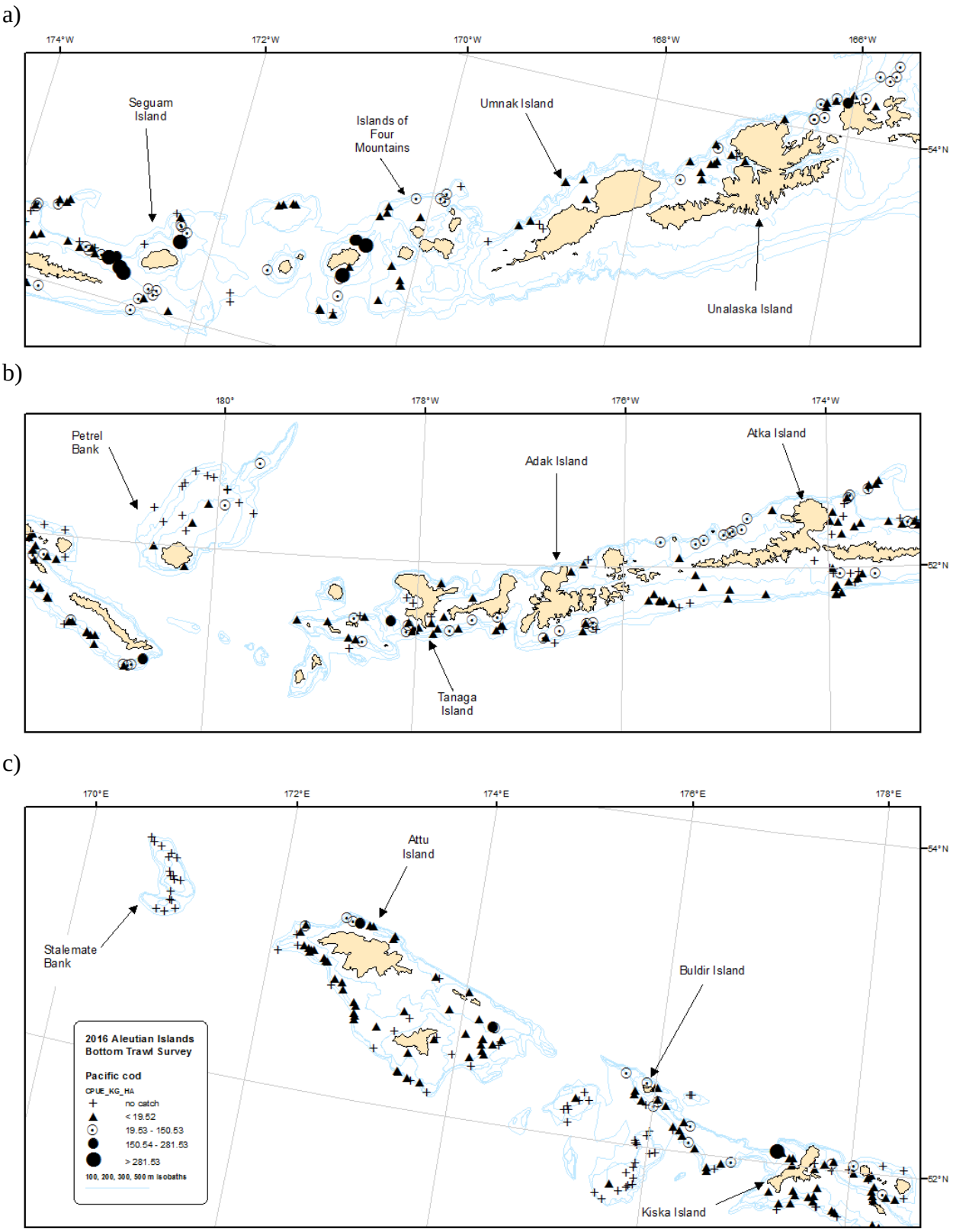


Figure 21. -- Distribution and relative abundance of Pacific cod from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

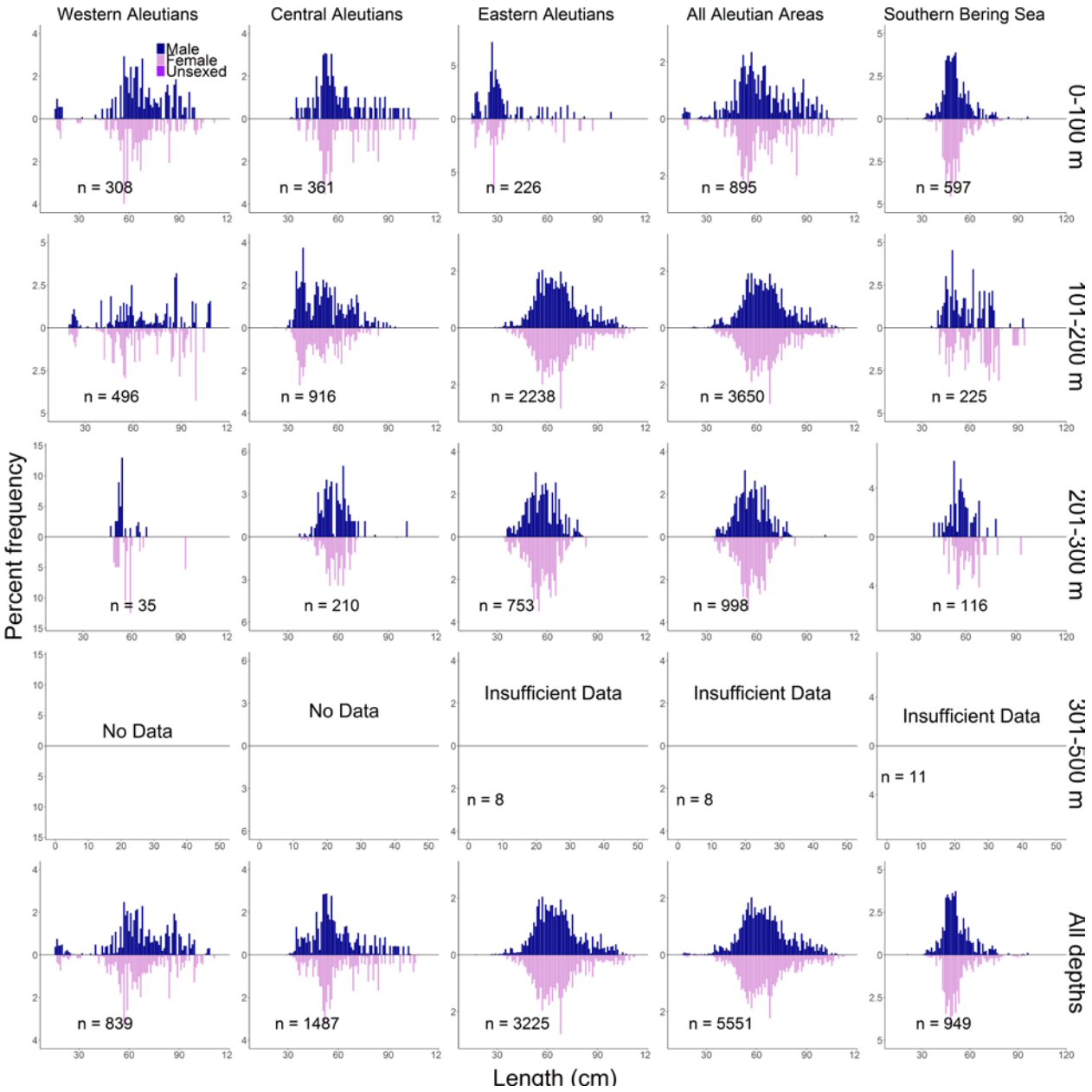


Figure 22. -- Population length composition of Pacific cod by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Walleye pollock (*Gadus chalcogrammus*)

Walleye pollock was the sixth most abundant species caught in the 2016 survey and it never ranked lower than ninth in any of the four survey districts (Table 2). Although walleye pollock were caught throughout the survey area and at all depths, most were caught at depths between 100 and 300 m in the Eastern Aleutians survey district (Table 25). The highest densities by far occurred in the 101-200 m and 201-300 m depth ranges in two subdistricts in the Eastern Aleutians survey district (Table 26). The largest individual catches were recorded near the Islands of Four Mountains and west of Seguam Island (Figure 23). Males and females had relatively similar length distributions with distinct modes occurring only in the Western Aleutian and Southern Bering Sea survey districts at 55 cm and 40 cm, respectively. The bulk of the distribution for both sexes was confined to lengths between 40 cm and 65 cm in all survey districts (Fig. 24). The estimated biomass of walleye pollock was 93,117 t, and the highest regional biomass was in the Eastern Aleutians survey district, where 63% of the estimated biomass was concentrated (Table 25).

Table 25. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing walleye pollock, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	7	4.35	2,121	0	4,536	0.092
	101 - 200	75	57	19.80	10,528	4,134	16,922	0.988
	201 - 300	30	19	11.01	1,899	15	3,782	1.419
	301 - 500	6	0	---	---	---	---	---
	All depths	135	83	9.58	14,547	7,535	21,559	0.414
Central Aleutians	1 - 100	25	9	0.71	414	0	1,194	1.418
	101 - 200	49	36	12.91	5,946	0	12,242	1.041
	201 - 300	30	28	14.44	3,044	186	5,902	1.274
	301 - 500	10	0	---	---	---	---	---
	All depths	114	73	5.38	9,404	2,467	16,340	1.120
Eastern Aleutians	1 - 100	15	3	0.24	167	0	836	0.045
	101 - 200	58	39	40.10	31,149	0	76,192	1.047
	201 - 300	45	39	53.25	26,102	0	62,159	0.986
	301 - 500	9	5	2.99	1,701	0	6,219	0.337
	All depths	127	86	23.46	59,119	3,113	115,125	0.910
Combined Aleutian Districts	1 - 100	64	19	1.54	2,702	183	5,221	0.100
	101 - 200	182	132	26.92	47,623	2,115	93,130	1.033
	201 - 300	105	86	35.54	31,045	0	67,285	1.028
	301 - 500	25	5	1.31	1,701	0	6,219	0.337
	All depths	376	242	14.59	83,070	26,494	139,645	0.766
Southern Bering Sea	1 - 100	18	9	5.22	2,102	0	6,276	0.561
	101 - 200	13	11	25.80	4,769	302	9,235	0.686
	201 - 300	8	8	51.17	2,885	0	6,852	1.033
	301 - 500	4	4	2.80	292	0	625	0.826
	All depths	43	32	13.43	10,047	3,265	16,830	0.726

Table 26. -- Summary of walleye pollock mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	101-200	NE Eastern Aleutians	25	18	150.50	30,289	0	75,414
Eastern Aleutians	201-300	SE Eastern Aleutians	10	7	96.26	19,836	0	56,069
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	8	51.17	2,885	0	6,953
Eastern Aleutians	201-300	NW Eastern Aleutians	7	6	44.30	691	0	1,922
Central Aleutians	201-300	N Central Aleutians	13	13	43.68	1,917	0	4,758
Southern Bering Sea	101-200	E Southern Bering Sea	11	10	40.44	4,768	247	9,289
Eastern Aleutians	201-300	NE Eastern Aleutians	22	20	26.03	5,124	449	9,800
Western Aleutians	101-200	W Western Aleutians	49	40	24.08	9,787	3,468	16,105
Central Aleutians	101-200	Petrel Bank	7	6	22.37	3,883	0	9,936
Western Aleutians	201-300	W Western Aleutians	17	12	13.98	1,314	0	3,113
Central Aleutians	101-200	SE Central Aleutians	11	7	13.35	1,003	0	3,038
Central Aleutians	201-300	SW Central Aleutians	8	7	12.64	538	0	1,263
Central Aleutians	101-200	SW Central Aleutians	22	16	9.60	1,010	241	1,779
Central Aleutians	201-300	SE Central Aleutians	5	5	9.31	444.2	0	1076.3
Southern Bering Sea	1-100	E Southern Bering Sea	16	9	8.61	2101.6	0	6298
Western Aleutians	201-300	E Western Aleutians	13	7	7.46	584.4	0	1287.9
Eastern Aleutians	201-300	SW Eastern Aleutians	6	6	6.30	451.2	178.8	723.7
Western Aleutians	101-200	E Western Aleutians	26	17	5.92	741	0	1741.1
Western Aleutians	1-100	W Western Aleutians	11	6	5.69	2101	0	4544.9
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	5.60	1495.2	0	7583.5
Central Aleutians	1-100	Petrel Bank	6	3	3.61	346.5	0	1190.4
Eastern Aleutians	101-200	SW Eastern Aleutians	14	12	3.12	705.3	58.7	1352
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	2.80	292.1	0	674
Central Aleutians	201-300	Petrel Bank	4	3	1.88	144.3	0	364
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	1.31	166.6	0	2142.7
Eastern Aleutians	301-500	SE Eastern Aleutians	4	3	0.80	205.4	0	592.2
Eastern Aleutians	101-200	SE Eastern Aleutians	16	7	0.55	103.8	0	300.2
Central Aleutians	101-200	N Central Aleutians	9	7	0.46	49.1	0	100.3
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	0.32	51.4	0	263.4
Central Aleutians	1-100	N Central Aleutians	10	4	0.18	38.7	0	85.6
Western Aleutians	1-100	E Western Aleutians	13	1	0.17	19.9	0	63.1
Central Aleutians	1-100	SW Central Aleutians	2	1	0.14	23.1	0	316
Central Aleutians	1-100	SE Central Aleutians	7	1	0.05	5.4	0	18.8
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	0.01	0.4	0	6.1
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.00	0.4	0	1.2

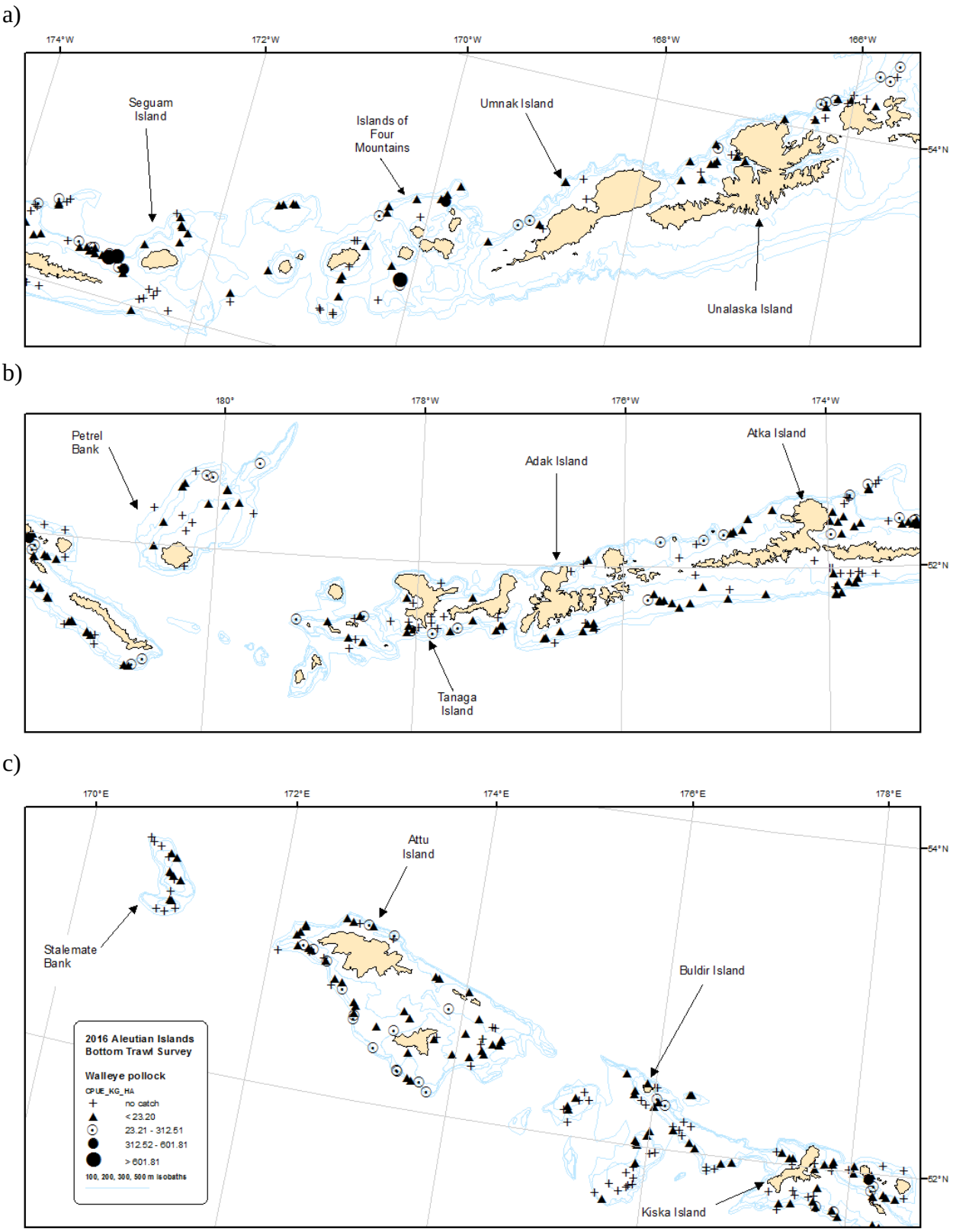


Figure 23. -- Distribution and relative abundance of walleye pollock from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

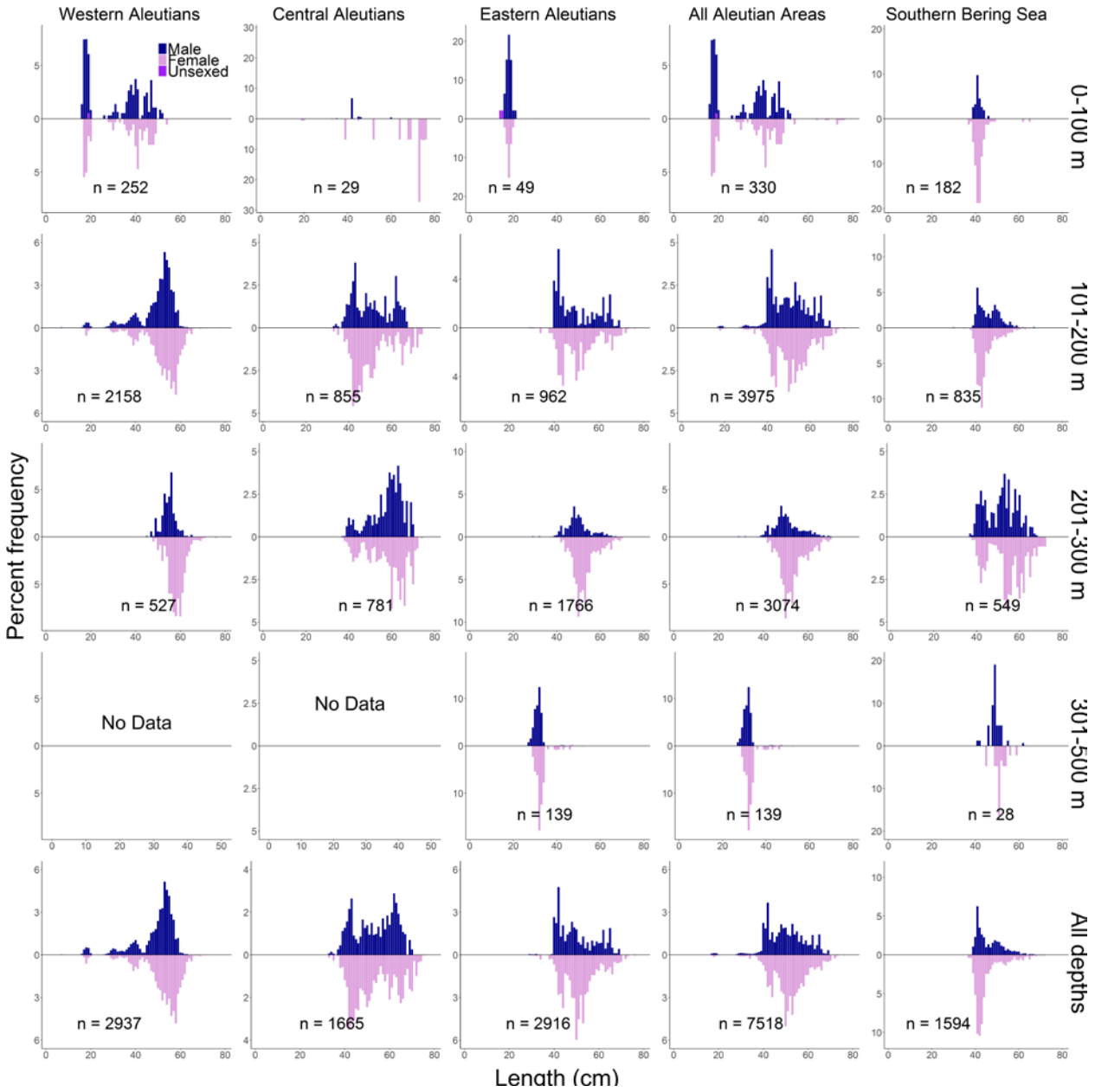


Figure 24. -- Population length composition of walleye pollock by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Sablefish (*Anoplopoma fimbria*)

Sablefish was the nineteenth most abundant species caught in the 2016 survey, but it only ranked among the top 20 in two survey districts: Eastern and Central Aleutian survey districts (Table 2). The vast majority of sablefish were caught at depths between 200 and 500 m in the Eastern Aleutian survey district, with no catches recorded at any depth interval in the Western Aleutian survey district (Table 27). The highest densities of this species occurred at depths deeper than 200 m in several subdistricts within the Central and Eastern survey districts (Fig. 25 and Table 28). Mean size generally increased with depth. Males and females had similar and relatively narrow length distributions, with the bulk of the distributions in the 42 cm to 55 cm range, and modes at 45 cm and 47 cm, respectively (Fig. 26). The estimated biomass for sablefish was 4,882 t, and the highest survey district biomass by far was in the Eastern Aleutian survey district, where 78% of the estimated biomass was concentrated (Table 27).

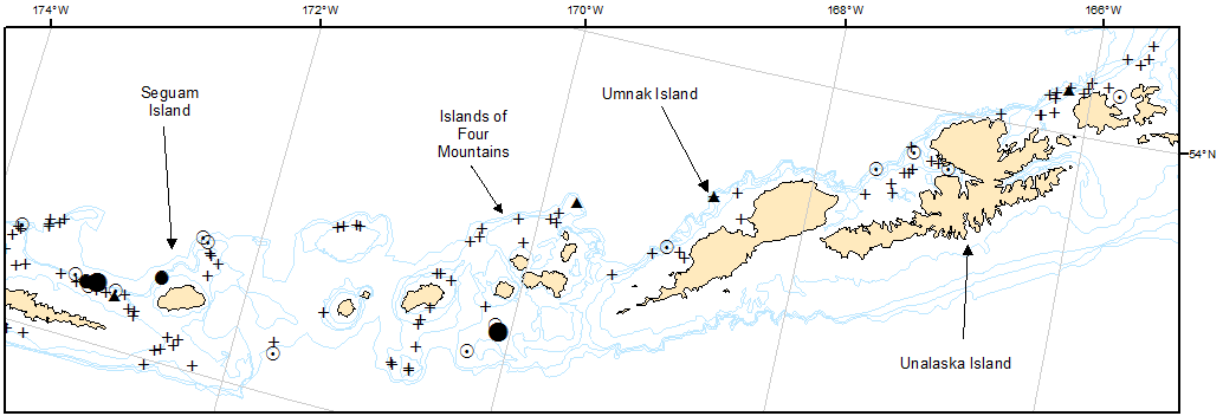
Table 27. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing sablefish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	0	---	---	---	---	---
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	4	0.36	166	0	406	0.839
	201 - 300	30	10	1.72	362	81	643	1.093
	301 - 500	10	4	0.82	328	0	824	2.445
	All depths	114	18	0.52	856	228	1,485	1.290
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	4	0.07	53	0	117	0.901
	201 - 300	45	15	4.48	2,196	0	4,560	0.850
	301 - 500	9	6	2.75	1,562	0	3,571	1.761
	All depths	127	25	1.51	3,810	725	6,895	1.080
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	8	0.12	219	0	453	0.853
	201 - 300	105	25	2.93	2,558	176	4,939	0.878
	301 - 500	25	10	1.46	1,890	0	3,976	1.851
	All depths	376	43	0.82	4,667	1,518	7,815	1.114
Southern Bering Sea	1 - 100	18	1	0.14	56	0	174	0.816
	101 - 200	13	3	0.58	107	0	301	0.741
	201 - 300	8	2	0.33	19	0	56	0.890
	301 - 500	4	2	0.33	34	0	91	1.335
	All depths	43	8	0.29	215	0	435	0.832

Table 28. -- Summary of sablefish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	201-300	N Central Aleutians	13	4	5.85	257	0	535
Eastern Aleutians	201-300	NE Eastern Aleutians	22	8	5.33	1,049	47	2,052
Eastern Aleutians	201-300	SE Eastern Aleutians	10	3	5.28	1,089	0	3,286
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	4.37	1,167	0	4,019
Eastern Aleutians	201-300	NW Eastern Aleutians	7	3	2.56	40	0	120
Central Aleutians	301-500	SE Central Aleutians	2	1	2.27	162	0	2,225
Central Aleutians	101-200	SE Central Aleutians	11	4	2.21	166	0	409
Central Aleutians	201-300	SE Central Aleutians	5	5	2.17	103	0	208
Eastern Aleutians	301-500	SE Eastern Aleutians	4	3	1.46	377	0	1,297
Central Aleutians	301-500	N Central Aleutians	4	2	1.20	148	0	531
Southern Bering Sea	101-200	E Southern Bering Sea	11	3	0.90	107	0	303
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.43	19	0	258
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	2	0.33	19	0	57
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	0.33	34	0	100
Eastern Aleutians	201-300	SW Eastern Aleutians	6	1	0.25	18	0	63
Southern Bering Sea	1-100	E Southern Bering Sea	16	1	0.23	56	0	175
Central Aleutians	301-500	SW Central Aleutians	2	1	0.22	18	0	240
Eastern Aleutians	101-200	SW Eastern Aleutians	14	2	0.14	31	0	84
Eastern Aleutians	101-200	NE Eastern Aleutians	25	2	0.11	22	0	61
Central Aleutians	201-300	SW Central Aleutians	8	1	0.04	2	0	6

a)



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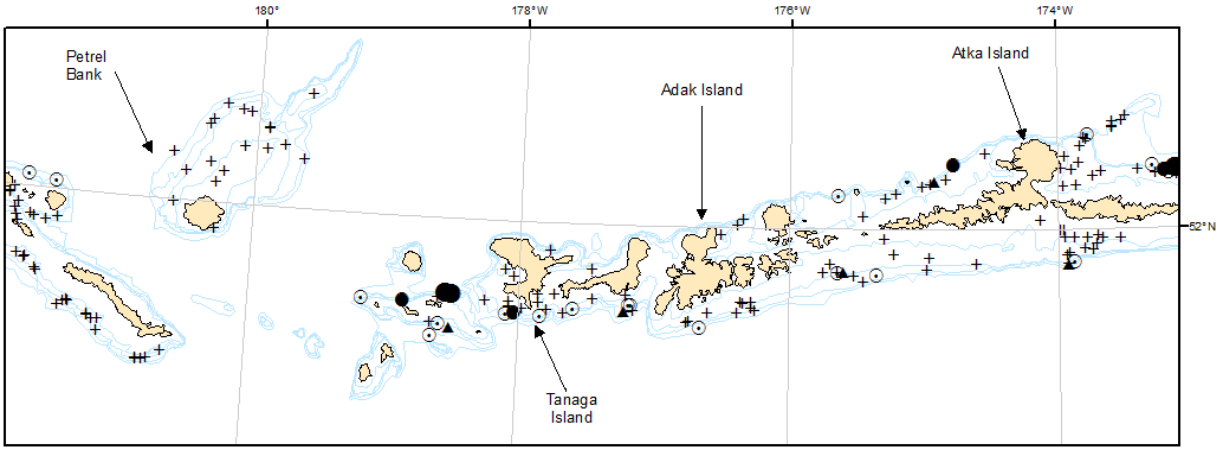

c)

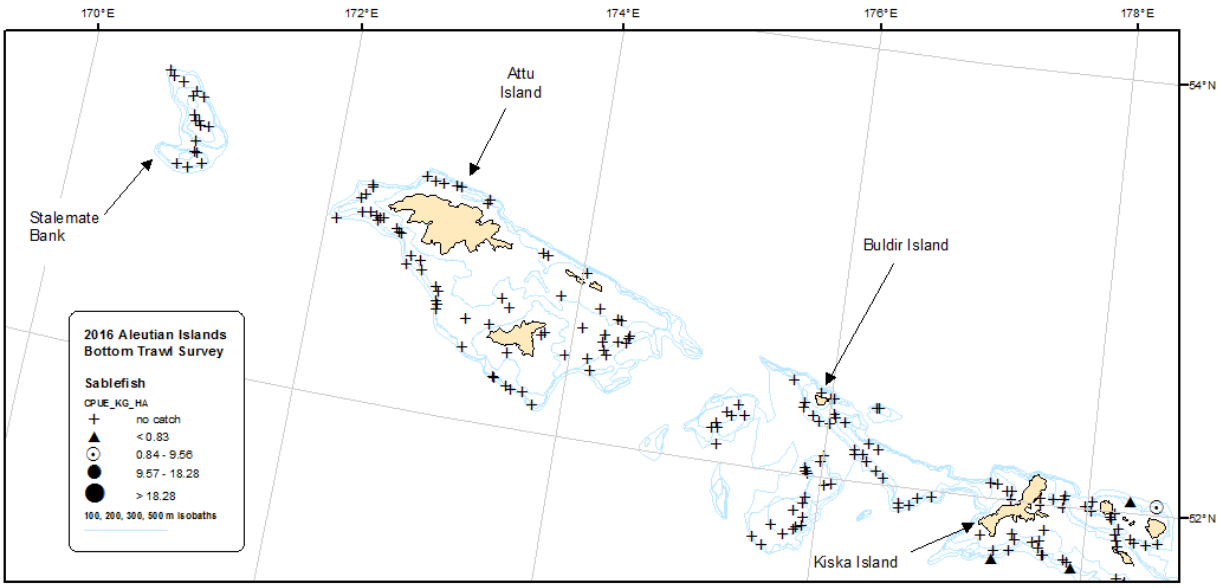

Figure 25. -- Distribution and relative abundance of sablefish from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

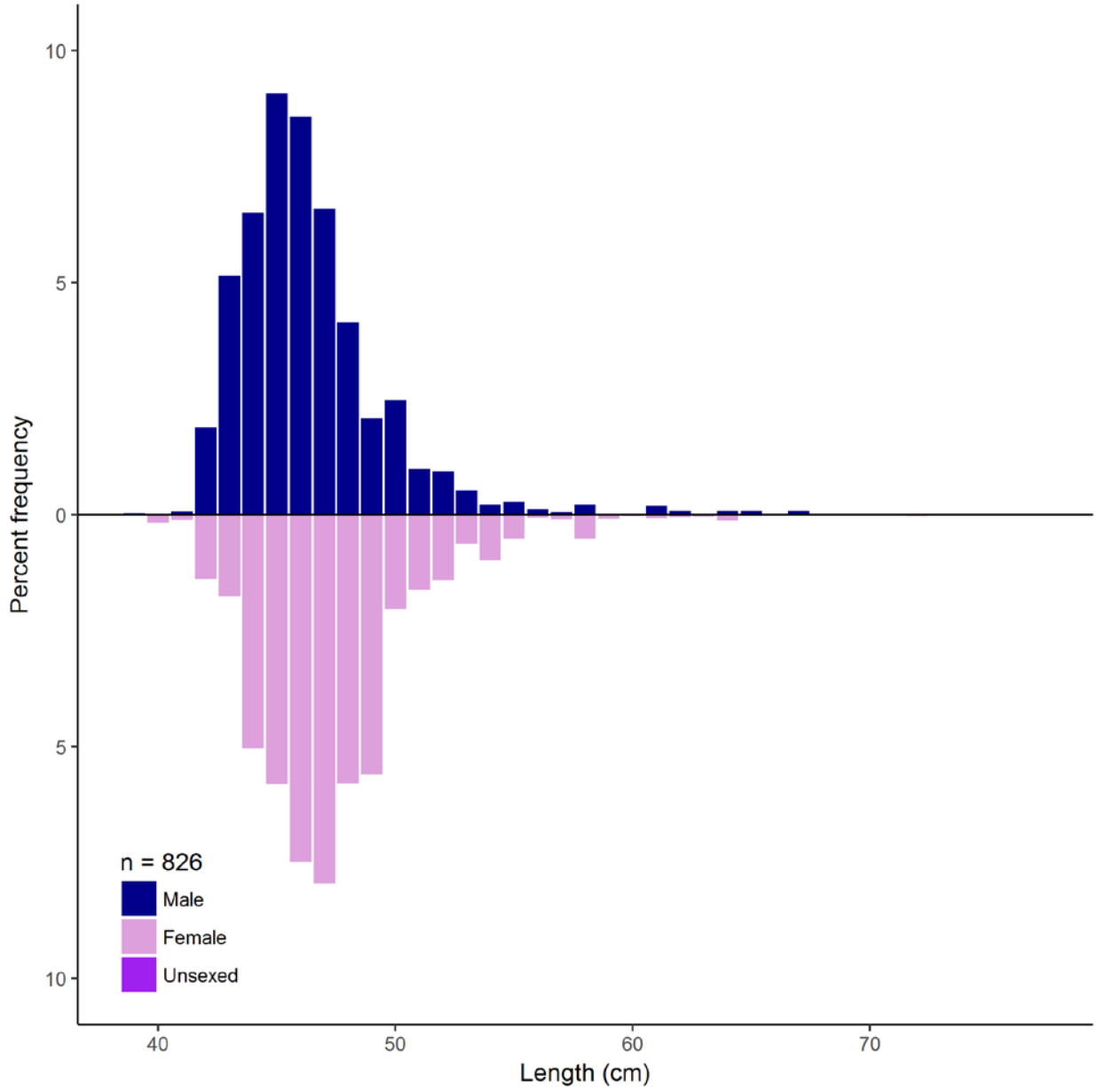

Figure 26. -- Population length composition of sablefish in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Giant grenadier (*Albatrossia pectoralis*)

Giant grenadier was the fourth most abundant species caught in the 2016 survey and it never ranked lower than sixth in any of the three Aleutian survey districts (Table 2). No giant grenadier were caught in the Southern Bering Sea survey district, and with the exception of one tow in the 201-300 m depth range, they were only caught at depths deeper than 300 m (Table 29). The highest densities occurred at depths between 300 and 500 m in two subdistricts near Petrel Bank within the Central Aleutians survey district (Fig. 27 and Table 30). Females were vastly more abundant than males and ranged in size between 22 cm and 40 cm, with a distinct mode at approximately 28 cm. Unlike all other species in this report whose length is either fork or total length, giant grenadier were measured from the tip of the snout to the insertion of the anal fin (Fig. 28). The estimated biomass of giant grenadier was 172,347 t, and the highest survey district biomass was in the Central Aleutians survey district, where 59% of the estimated biomass was concentrated (Table 29).

Table 29. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing giant grenadier, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	5	43.18	14,130	0	52,698	4.401
	All depths	135	5	9.30	14,130	0	52,698	4.401
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	10	8	253.56	100,937	0	375,298	3.952
	All depths	114	8	61.02	100,937	0	375,298	3.952
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	1	0.04	19	0	64	3.166
	301 - 500	9	5	100.76	57,262	0	139,169	3.390
	All depths	127	6	22.73	57,281	0	139,188	3.390
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	0	---	---	---	---	---
	201 - 300	105	1	0.02	19	0	64	3.166
	301 - 500	25	18	132.21	172,328	704	343,952	3.775
	All depths	376	19	30.27	172,347	723	343,971	3.775
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	0	---	---	---	---	---

Table 30. -- Summary of giant grenadier mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	301-500	Petrel Bank	2	2	497.71	61,591	0	788,818
Central Aleutians	301-500	N Central Aleutians	4	3	291.66	36,159	0	125,466
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	117.47	30,246	0	126,490
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	96.78	25,840	0	87,325
Western Aleutians	301-500	E Western Aleutians	2	2	78.58	12,269	0	124,912
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	26.84	1,176	0	16,120
Central Aleutians	301-500	SW Central Aleutians	2	2	23.51	1,855	0	5,262
Central Aleutians	301-500	SE Central Aleutians	2	1	18.64	1,332	0	18,252
Western Aleutians	301-500	W Western Aleutians	4	3	10.88	1,861	0	6,059
Eastern Aleutians	201-300	SW Eastern Aleutians	6	1	0.26	19	0	67

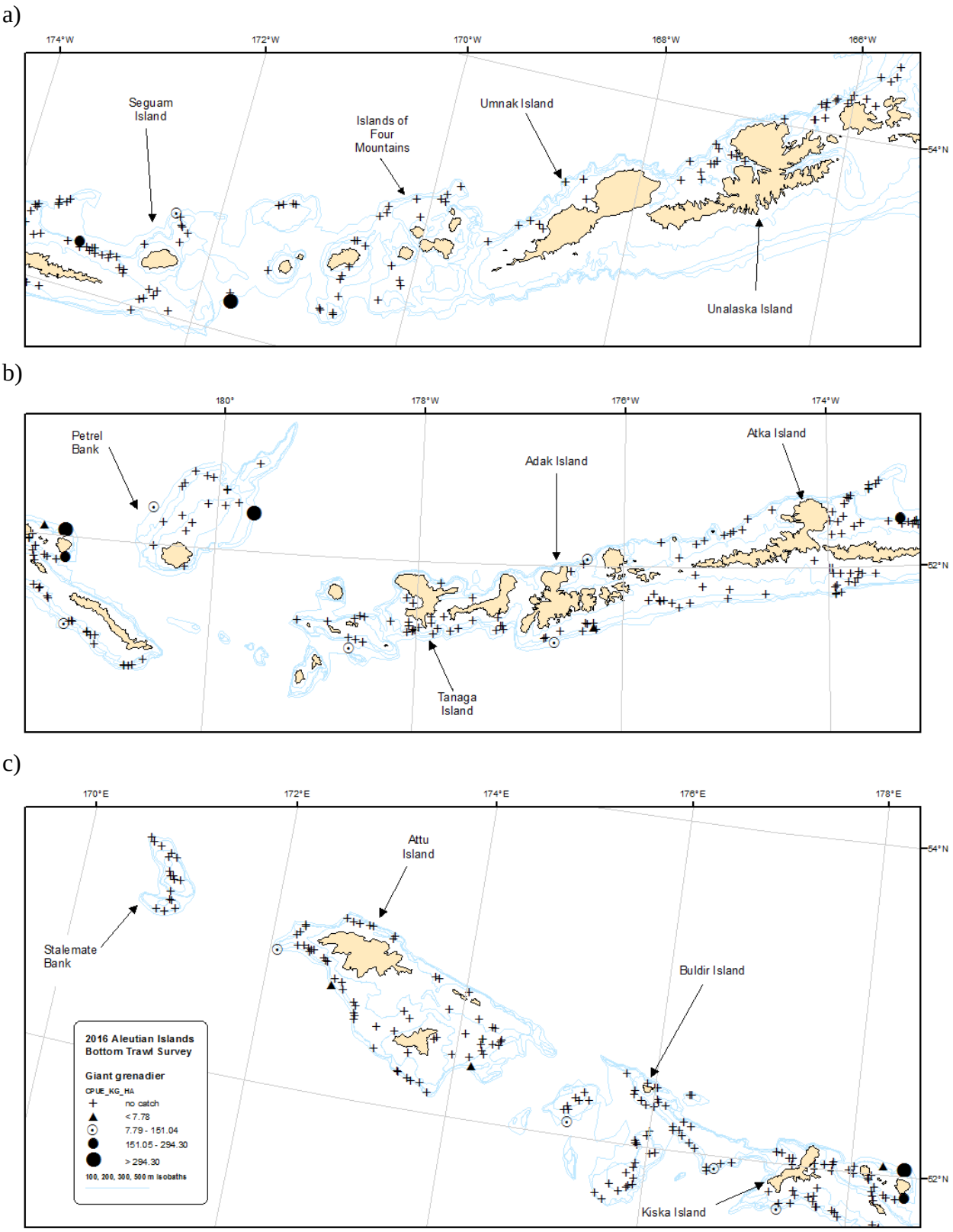

Figure 27. -- Distribution and relative abundance of giant grenadier from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

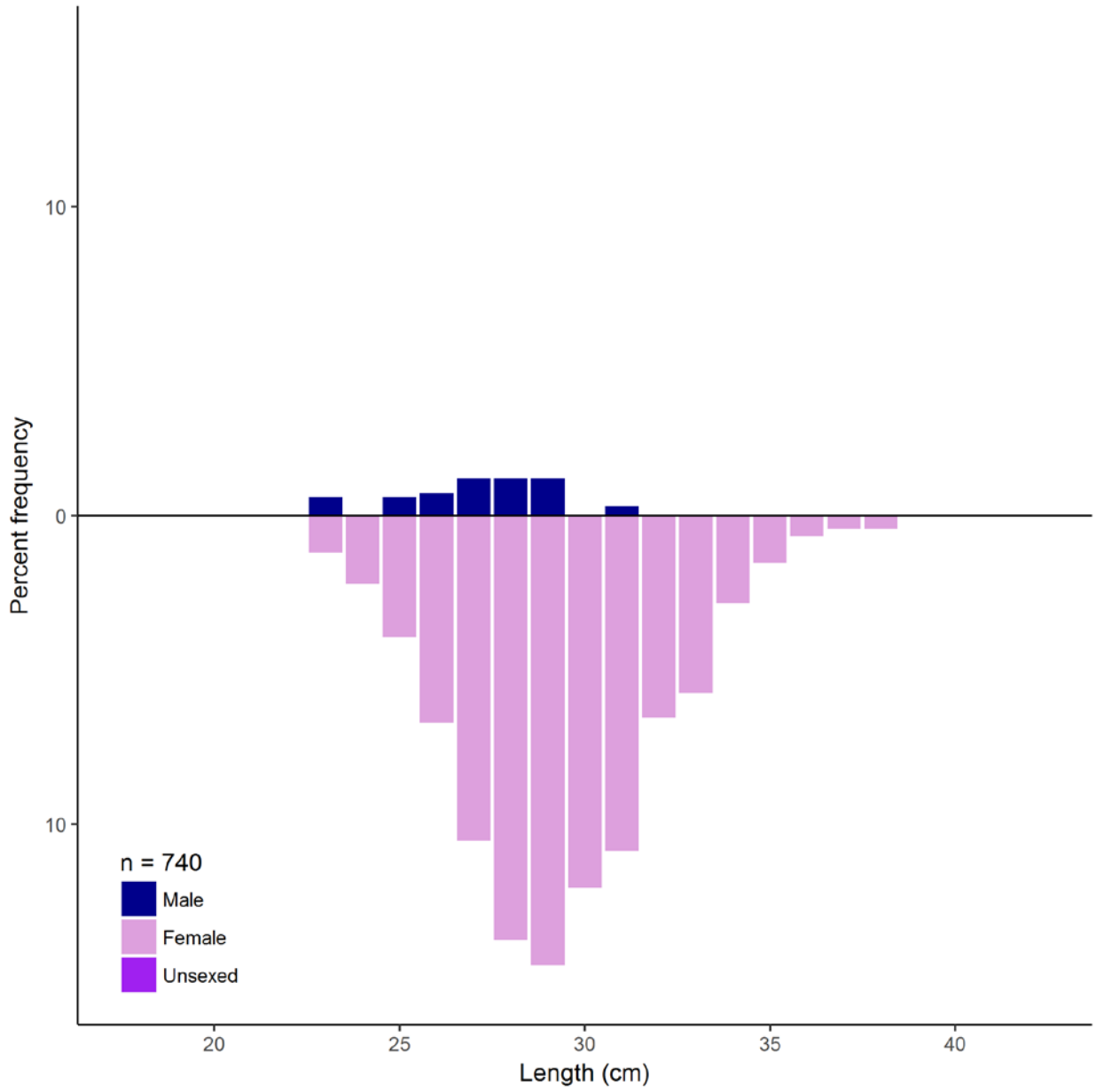

Figure 28. -- Population length composition of giant grenadier in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Sculpins (Cottoidea)

Table 31 presents abundance information for all species in the Cottidae, Hemitripteridae, Psychrolutidae, and Rhamphocottidae families of the superfamily Cottoidea caught during the 2016 Aleutian Islands bottom trawl survey whose biomasses were estimated. All other species in these families are grouped into a "Miscellaneous sculpins" category. A total of 21 species or species groups of sculpins were identified during the 2016 Aleutian Islands survey (Appendix B). We only provide more detailed CPUE and biomass information for species whose cumulative biomass accounts for up to ~90% of the total family biomass. In 2016 they were yellow Irish lord, darkfin sculpin and great sculpin.

Table 31. -- Catch-per-unit-effort (CPUE), biomass, relative (%) biomass, and cumulative abundance (%) of sculpins (Cottidae) collected during the 2016 Aleutian Islands bottom trawl survey combined across all four survey districts.

Common Name	Mean CPUE (kg/ha)	Biomass (t)	% Biomass	Cumulative %
yellow Irish lord	1.57	10,097	64	64
darkfin sculpin	0.49	3,010	19	83
great sculpin	0.20	1,267	8	91
bigmouth sculpin	0.07	451	3	94
spectacled sculpin	0.07	420	3	97
scissortail sculpin	0.03	193	1	98
armorhead sculpin	0.02	153	1	99
Miscellaneous sculpins	0.02	115	1	100
spinyhead sculpin	<0.001	4	< 1	--
thorny sculpin	<0.001	1	< 1	--

Yellow Irish lord (*Hemilepidotus jordani*)

Yellow Irish lord was the most abundant sculpin species and the fifteenth most abundant species overall caught in the 2016 survey (Tables 2 and 31). Although yellow Irish lords were caught at all depths less than 300 m and in all four survey districts, the vast majority were caught at depths shallower than 200 m, primarily in the Eastern and Central Aleutians survey districts (Table 32). The highest densities by far occurred in two subdistricts: at depths less than 100 m at Petrel Bank in the Central Aleutian survey district, and at depths between 100 and 200 m in a subdistrict within the Eastern Aleutians survey district (Table 33). The estimated biomass of yellow Irish lord was 10,097 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 50% of the estimated biomass was concentrated (Table 32).

Table 32. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing yellow Irish lord, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	13	0.58	281	107	456	0.637
	101 - 200	75	18	0.22	116	54	178	0.677
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	31	0.26	397	212	582	0.648
Central Aleutians	1 - 100	25	16	3.16	1,850	387	3,313	0.622
	101 - 200	49	32	2.03	934	346	1,523	0.712
	201 - 300	30	7	0.14	29	0	60	0.885
	301 - 500	10	0	---	---	---	---	---
	All depths	114	55	1.70	2,813	1,359	4,266	0.651
Eastern Aleutians	1 - 100	15	13	2.40	1,640	0	5,644	0.769
	101 - 200	58	35	4.21	3,270	1,774	4,766	0.894
	201 - 300	45	9	0.32	159	0	378	0.686
	301 - 500	9	0	---	---	---	---	---
	All depths	127	57	2.01	5,069	1,295	8,843	0.842
Combined Aleutian Districts	1 - 100	64	42	2.15	3,771	0	8,592	0.680
	101 - 200	182	85	2.44	4,320	2,746	5,894	0.840
	201 - 300	105	16	0.21	188	0	409	0.710
	301 - 500	25	0	---	---	---	---	---
	All depths	376	143	1.45	8,279	3,940	12,618	0.756
Southern Bering Sea	1 - 100	18	14	2.30	926	211	1,641	0.694
	101 - 200	13	9	3.38	625	180	1,070	0.726
	201 - 300	8	3	4.74	267	0	718	0.861
	301 - 500	4	0	---	---	---	---	---
	All depths	43	26	2.43	1,818	907	2,729	0.726

Table 33. -- Summary of yellow Irish lord mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	1-100	Petrel Bank	6	6	15.89	1,525	0	3,086
Eastern Aleutians	101-200	SE Eastern Aleutians	16	13	10.99	2,088	794	3,383
Central Aleutians	101-200	SE Central Aleutians	11	9	4.95	372	166	578
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	3	4.74	267	0	730
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	4.41	852	0	11,683
Southern Bering Sea	101-200	E Southern Bering Sea	11	7	4.30	507	123	891
Eastern Aleutians	1-100	SE Eastern Aleutians	9	9	3.75	652	0	1,492
Eastern Aleutians	101-200	NE Eastern Aleutians	25	12	3.46	696	82	1,310
Southern Bering Sea	1-100	E Southern Bering Sea	16	12	3.20	781	73	1,489
Central Aleutians	101-200	Petrel Bank	7	2	2.00	347	0	898
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	1.77	118	0	1,408
Western Aleutians	1-100	E Western Aleutians	13	9	1.65	195	42	347
Eastern Aleutians	101-200	SW Eastern Aleutians	14	9	1.34	302	0	734
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	1.15	184	0	975
Central Aleutians	101-200	SW Central Aleutians	22	14	1.12	118	23	214
Central Aleutians	1-100	N Central Aleutians	10	6	1.00	210	0	440
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	0.92	145	0	1,064
Central Aleutians	101-200	N Central Aleutians	9	7	0.91	97	41	153
Eastern Aleutians	201-300	SE Eastern Aleutians	10	2	0.62	127	0	347
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	0.59	113	0	1,111
Central Aleutians	1-100	SE Central Aleutians	7	2	0.53	62	0	203
Western Aleutians	101-200	E Western Aleutians	26	6	0.35	44	2	85
Central Aleutians	1-100	SW Central Aleutians	2	2	0.32	52	0	390
Central Aleutians	201-300	N Central Aleutians	13	4	0.26	12	0	28
Western Aleutians	1-100	W Western Aleutians	11	4	0.24	87	0	183
Eastern Aleutians	201-300	NW Eastern Aleutians	7	2	0.22	3	0	9
Central Aleutians	201-300	SE Central Aleutians	5	2	0.20	9	0	26
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.18	23	0	310
Western Aleutians	101-200	W Western Aleutians	49	12	0.18	72	25	119
Eastern Aleutians	201-300	SW Eastern Aleutians	6	1	0.17	12	0	43
Central Aleutians	201-300	Petrel Bank	4	1	0.11	8	0	34
Eastern Aleutians	201-300	NE Eastern Aleutians	22	4	0.08	16	0	32

Darkfin sculpin (*Malacocottus zonurus*)

Darkfin sculpin was the second most abundant sculpin species, but was not among the 20 most abundant species overall caught in the 2016 survey (Tables 2 and 31). Although darkfin sculpins were caught at all depths and in all four survey districts, the vast majority were caught at depths deeper than 100 m in the Eastern and Central Aleutian survey districts where they ranked among the top 20 species overall (Table 34). The highest densities occurred at two different depth intervals (301-500 m and 201-300 m) in three subdistricts within three different Aleutian survey districts (Table 35). The estimated biomass of darkfin sculpin was 3,111 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 46% of the estimated biomass was concentrated (Table 34).

Table 34. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing darkfin sculpin, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	5	0.03	14	0	36	0.209
	101 - 200	75	43	0.52	275	126	423	0.15
	201 - 300	30	27	1.28	221	116	326	0.071
	301 - 500	6	5	0.19	62	0	235	0.042
	All depths	135	80	0.38	571	293	944	0.109
Central Aleutians	1 - 100	25	5	0.05	26	0	61	0.225
	101 - 200	49	29	0.87	402	152	653	0.186
	201 - 300	30	25	1.11	235	108	362	0.127
	301 - 500	10	5	0.79	314	0	818	0.089
	All depths	114	64	0.59	977	0	1894	0.142
Eastern Aleutians	1 - 100	15	1	<0.01	< 1	0	0	0.009
	101 - 200	58	17	0.02	12	4	20	0.038
	201 - 300	45	35	1.24	607	55	1,158	0.127
	301 - 500	9	7	1.41	801	33	1,569	0.060
	All depths	127	60	0.57	1,420	733	2,840	0.088
Combined Aleutian Districts	1 - 100	64	11	0.02	40	0	4	0.148
	101 - 200	182	89	0.39	689	234	1,113	0.125
	201 - 300	105	87	1.22	1,063	643	1,783	0.108
	301 - 500	25	17	0.91	1,177	412	1,645	0.064
	All depths	376	204	0.53	2,968	2180	4,192	0.113
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	2	<0.01	0	0	1	0.027
	201 - 300	8	6	1.56	88	0	197	0.258
	301 - 500	4	3	0.52	54	0	186	0.068
	All depths	43	11	0.19	142	5	315	0.185

Table 35. -- Summary of darkfin sculpin mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	301-500	SE Central Aleutians	2	2	4.00	286	0	1,762
Eastern Aleutians	301-500	SE Eastern Aleutians	4	3	2.67	688	0	1,617
Western Aleutians	201-300	E Western Aleutians	13	13	2.60	204	99	309
Central Aleutians	201-300	SE Central Aleutians	5	4	1.85	88	0	193
Western Aleutians	101-200	E Western Aleutians	26	21	1.71	214	77	352
Central Aleutians	201-300	SW Central Aleutians	8	5	1.69	72	0	162
Eastern Aleutians	201-300	SE Eastern Aleutians	10	8	1.62	334	0	878
Central Aleutians	101-200	SW Central Aleutians	22	14	1.59	168	41	294
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	6	1.56	88	0	200
Central Aleutians	101-200	Petrel Bank	7	7	1.07	186	0	394
Eastern Aleutians	201-300	NE Eastern Aleutians	22	20	1.00	196	76	317
Eastern Aleutians	201-300	NW Eastern Aleutians	7	3	0.90	14	0	46
Eastern Aleutians	201-300	SW Eastern Aleutians	6	4	0.87	62	0	162
Central Aleutians	201-300	N Central Aleutians	13	12	0.78	34	0	77
Central Aleutians	201-300	Petrel Bank	4	4	0.53	40	0	92
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	3	0.52	54	0	205
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	0.42	113	0	385
Central Aleutians	101-200	SE Central Aleutians	11	4	0.41	31	0	95
Western Aleutians	301-500	E Western Aleutians	2	2	0.33	51	0	547
Central Aleutians	1-100	Petrel Bank	6	4	0.26	25	0	61
Central Aleutians	301-500	N Central Aleutians	4	2	0.22	28	0	79
Western Aleutians	201-300	W Western Aleutians	17	14	0.18	17	3	32
Central Aleutians	101-200	N Central Aleutians	9	4	0.16	17	0	37
Western Aleutians	101-200	W Western Aleutians	49	22	0.15	60	0	127
Western Aleutians	301-500	W Western Aleutians	4	3	0.06	11	0	42
Western Aleutians	1-100	E Western Aleutians	13	4	0.03	4	0	9
Western Aleutians	1-100	W Western Aleutians	11	1	0.03	10	0	32
Eastern Aleutians	101-200	SE Eastern Aleutians	16	6	0.03	5	0	10
Eastern Aleutians	101-200	SW Eastern Aleutians	14	6	0.02	4	0	10
Eastern Aleutians	101-200	NE Eastern Aleutians	25	5	0.02	3	0	7
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.01	0	0	5
Central Aleutians	1-100	N Central Aleutians	10	1	0.01	2	0	5
Southern Bering Sea	101-200	E Southern Bering Sea	11	2	0.00	0	0	1
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.00	0	0	0
Central Aleutians	301-500	Petrel Bank	2	1	0.00	0	0	1

Great sculpin (*Myoxocephalus polyacanthocephalus*)

Great sculpin was the third most abundant sculpin species but was not among the 20 most abundant species overall caught in the 2016 survey (Tables 2 and 31). Although great sculpins were caught at all depths in all four survey districts, they were most common at depths shallower than 100 m in the Eastern Aleutians survey district (Table 36). There was only a single catch recorded at depths deeper than 300 m. The highest densities occurred at the 1-100 m and 101-200 m depth ranges in the Eastern Aleutians survey district (Table 37). The estimated biomass of great sculpin was 1,267 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 53% of the estimated biomass was concentrated (Table 36).

Table 36. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing great sculpin, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	2	0.45	221	0	634	5.016
	101 - 200	75	5	0.09	48	0	97	1.605
	201 - 300	30	1	0.02	3	0	10	1.519
	301 - 500	6	0	---	---	---	---	---
	All depths	135	8	0.18	273	0	689	3.573
Central Aleutians	1 - 100	25	2	0.08	45	0	114	2.785
	101 - 200	49	2	0.01	6	0	14	1.426
	201 - 300	30	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	114	4	0.03	51	0	120	2.516
Eastern Aleutians	1 - 100	15	3	0.75	512	0	1,984	3.830
	101 - 200	58	4	0.21	164	0	505	2.856
	201 - 300	45	0	---	---	---	---	---
	301 - 500	9	0	---	---	---	---	---
	All depths	127	7	0.27	676	0	2,218	3.538
Combined Aleutian Districts	1 - 100	64	7	0.44	778	0	2,024	4.012
	101 - 200	182	11	0.12	218	0	568	2.383
	201 - 300	105	1	<0.01	3	0	10	1.519
	301 - 500	25	0	---	---	---	---	---
	All depths	376	19	0.18	1,000	0	2,293	3.475
Southern Bering Sea	1 - 100	18	6	0.41	165	44	285	2.953
	101 - 200	13	1	0.11	20	0	63	4.361
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	1	0.79	83	0	312	1.943
	All depths	43	8	0.36	267	36	498	2.598

Table 37. -- Summary of great sculpin mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	1.61	311	0	4,260
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	0.92	146	0	603
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.81	103	0	1,414
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.79	83	0	345
Southern Bering Sea	1-100	E Southern Bering Sea	16	6	0.68	165	43	286
Western Aleutians	1-100	W Western Aleutians	11	2	0.60	221	0	639
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.57	98	0	326
Central Aleutians	1-100	Petrel Bank	6	1	0.28	26	0	94
Southern Bering Sea	101-200	E Southern Bering Sea	11	1	0.17	20	0	64
Western Aleutians	101-200	W Western Aleutians	49	5	0.12	48	0	97
Central Aleutians	1-100	N Central Aleutians	10	1	0.09	19	0	61
Eastern Aleutians	101-200	SW Eastern Aleutians	14	1	0.06	12	0	39
Central Aleutians	101-200	SW Central Aleutians	22	2	0.05	6	0	14
Western Aleutians	201-300	W Western Aleutians	17	1	0.03	3	0	10
Eastern Aleutians	101-200	NE Eastern Aleutians	25	1	0.03	6	0	17

Rockfishes

Pacific ocean perch (*Sebastes alutus*)

Pacific ocean perch was by far the most abundant species caught in the 2016 survey and ranked in the top spot in all four survey districts (Table 2). The vast majority of Pacific ocean perch were caught at depths between 100 and 300 m in all survey districts (Table 38). The highest densities of this species occurred at depths between 200 and 300 m in various subdistricts within all three of the Aleutian survey districts (Fig. 29 and Table 39). Mean size generally increased with depth. The range and modes of the length distributions were similar for males and females in the Aleutian survey districts although the modes were much more pronounced for males in the Western and Central Aleutian survey districts. Females were generally larger than males in all depth ranges in the Southern Bering Sea survey district (Fig. 30). The estimated biomass for Pacific ocean perch was 982,503 t, and the highest survey district biomass was in the Western Aleutian survey district, where 41% of the estimated biomass was concentrated (Table 38).

Table 38. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Pacific ocean perch, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	8	8.53	4,160	0	11,437	0.396
	101 - 200	75	69	524.92	279,134	141,290	416,977	0.533
	201 - 300	30	30	692.54	119,368	57,889	180,846	0.658
	301 - 500	6	2	1.18	388	0	1,098	0.816
	All depths	135	109	265.33	403,049	252,225	553,873	0.563
Central Aleutians	1 - 100	25	6	0.35	207	0	439	0.509
	101 - 200	49	33	229.81	105,842	32,413	179,270	0.616
	201 - 300	30	30	441.34	93,071	56,038	130,104	0.756
	301 - 500	10	7	18.77	7,473	0	19,121	0.805
	All depths	114	76	124.89	206,593	126,219	286,968	0.678
Eastern Aleutians	1 - 100	15	8	0.35	242	0	502	0.177
	101 - 200	58	41	48.66	37,802	10,165	65,440	0.558
	201 - 300	45	45	499.77	244,962	148,104	341,821	0.641
	301 - 500	9	4	3.35	1,901	0	6,409	0.595
	All depths	127	98	113.06	284,909	185,486	384,331	0.627
Combined Aleutian Districts	1 - 100	64	22	2.62	4,609	0	11,894	0.375
	101 - 200	182	143	238.97	422,778	264,762	580,795	0.554
	201 - 300	105	105	523.71	457,401	339,137	575,666	0.666
	301 - 500	25	13	7.55	9,763	0	20,727	0.753
	All depths	376	283	157.12	894,551	698,886	1,090,215	0.606
Southern Bering Sea	1 - 100	18	6	1.51	608	0	1,727	0.749
	101 - 200	13	9	269.35	49,792	0	137,344	0.782
	201 - 300	8	8	611.05	34,454	6,977	61,932	0.737
	301 - 500	4	3	29.69	3,097	0	7,725	0.807
	All depths	43	26	117.56	87,952	0	178,514	0.764

Table 39. -- Summary of Pacific ocean perch mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	201-300	NW Eastern Aleutians	7	7	1,583.17	24,686	8,713	40,660
Central Aleutians	201-300	N Central Aleutians	13	13	897.82	39,415	17,487	61,342
Eastern Aleutians	201-300	NE Eastern Aleutians	22	22	798.19	157,128	71,662	242,595
Western Aleutians	201-300	E Western Aleutians	13	13	725.34	56,824	13,207	100,440
Central Aleutians	101-200	SW Central Aleutians	22	18	674.88	71,017	1,348	140,686
Western Aleutians	201-300	W Western Aleutians	17	17	665.20	62,544	14,868	110,220
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	8	611.05	34,454	6,274	62,635
Western Aleutians	101-200	W Western Aleutians	49	44	563.25	228,971	93,578	364,364
Central Aleutians	201-300	SW Central Aleutians	8	8	488.80	20,825	4,335	37,314
Southern Bering Sea	101-200	E Southern Bering Sea	11	8	422.06	49,766	0	138,392
Western Aleutians	101-200	E Western Aleutians	26	25	400.52	50,163	23,790	76,537
Eastern Aleutians	201-300	SW Eastern Aleutians	6	6	394.18	28,238	0	61,488
Central Aleutians	201-300	SE Central Aleutians	5	5	381.08	18,191	0	38,931
Central Aleutians	201-300	Petrel Bank	4	4	191.02	14,641	0	39,764
Eastern Aleutians	201-300	SE Eastern Aleutians	10	10	169.42	34,910	0	77,329
Eastern Aleutians	101-200	SW Eastern Aleutians	14	13	146.48	33,119	5,369	60,869
Central Aleutians	101-200	N Central Aleutians	9	4	122.83	13,094	0	37,648
Central Aleutians	101-200	Petrel Bank	7	5	103.62	17,984	1,329	34,640
Central Aleutians	301-500	SE Central Aleutians	2	1	55.23	3,945	0	54,068
Central Aleutians	101-200	SE Central Aleutians	11	6	49.84	3,747	0	11,282
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	3	29.69	3,097	0	8,402
Central Aleutians	301-500	N Central Aleutians	4	3	18.41	2,282	0	8,870
Eastern Aleutians	101-200	SE Eastern Aleutians	16	12	18.00	3,421	79	6,763
Western Aleutians	1-100	W Western Aleutians	11	4	11.14	4,114	0	11,480
Central Aleutians	301-500	SW Central Aleutians	2	1	10.40	821	0	11,252
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	5.31	847	0	4,349
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	5.09	1,359	0	7,209
Central Aleutians	301-500	Petrel Bank	2	2	3.44	426	244	607
Southern Bering Sea	1-100	E Southern Bering Sea	16	6	2.49	608	0	1,733
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	2.21	97	0	1,330
Eastern Aleutians	101-200	NE Eastern Aleutians	25	14	2.07	416	49	782
Eastern Aleutians	301-500	SE Eastern Aleutians	4	2	1.73	445	0	1,676
Western Aleutians	301-500	W Western Aleutians	4	1	1.27	218	0	912
Eastern Aleutians	1-100	SE Eastern Aleutians	9	7	1.14	199	0	438
Western Aleutians	301-500	E Western Aleutians	2	1	1.09	170	0	2,326
Central Aleutians	1-100	SE Central Aleutians	7	2	0.91	106	0	326
Central Aleutians	1-100	Petrel Bank	6	1	0.55	53	0	189
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	0.39	26	0	357
Western Aleutians	1-100	E Western Aleutians	13	4	0.39	46	0	104
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.23	44	0	601

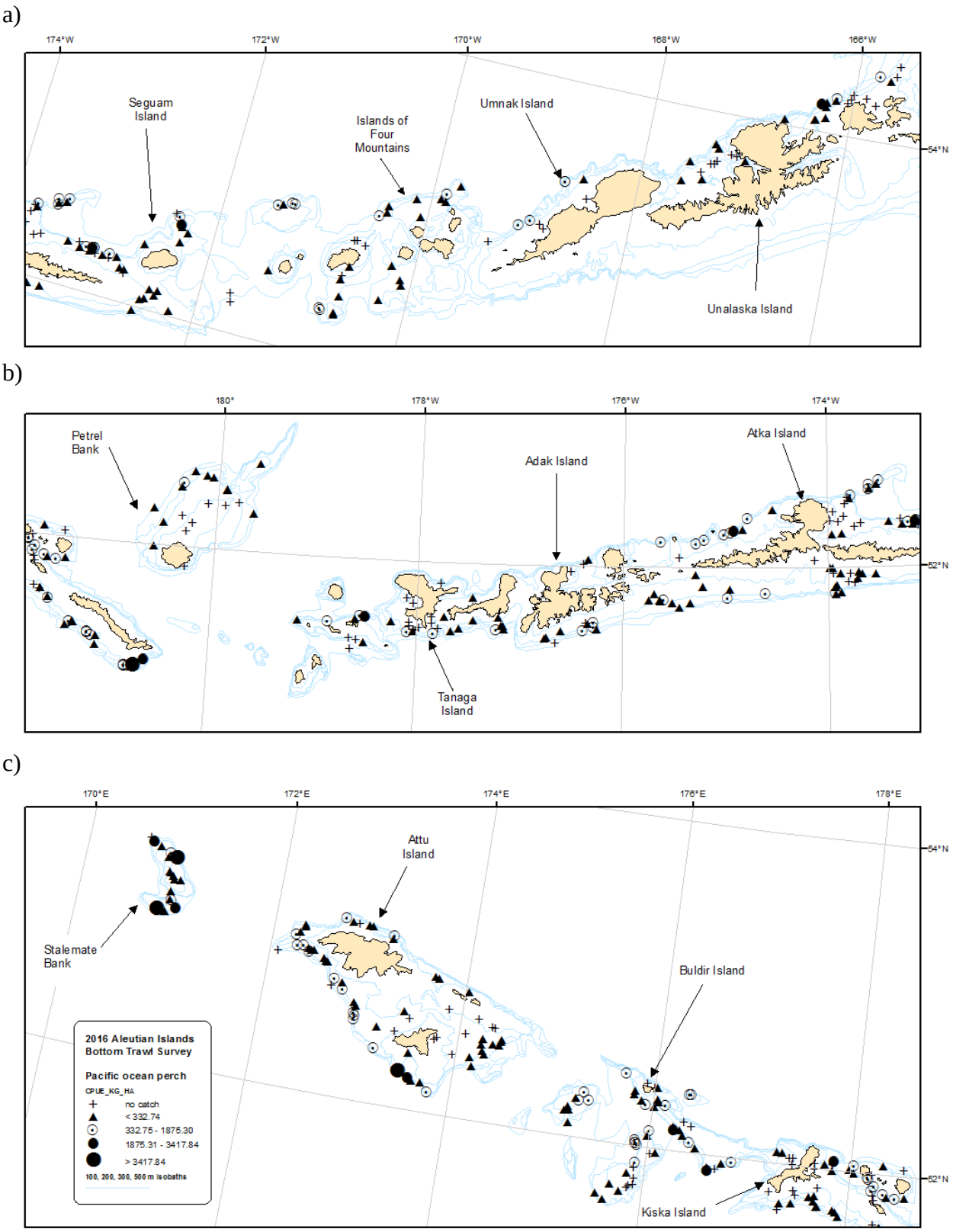

Figure 29. -- Distribution and relative abundance of Pacific ocean perch from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

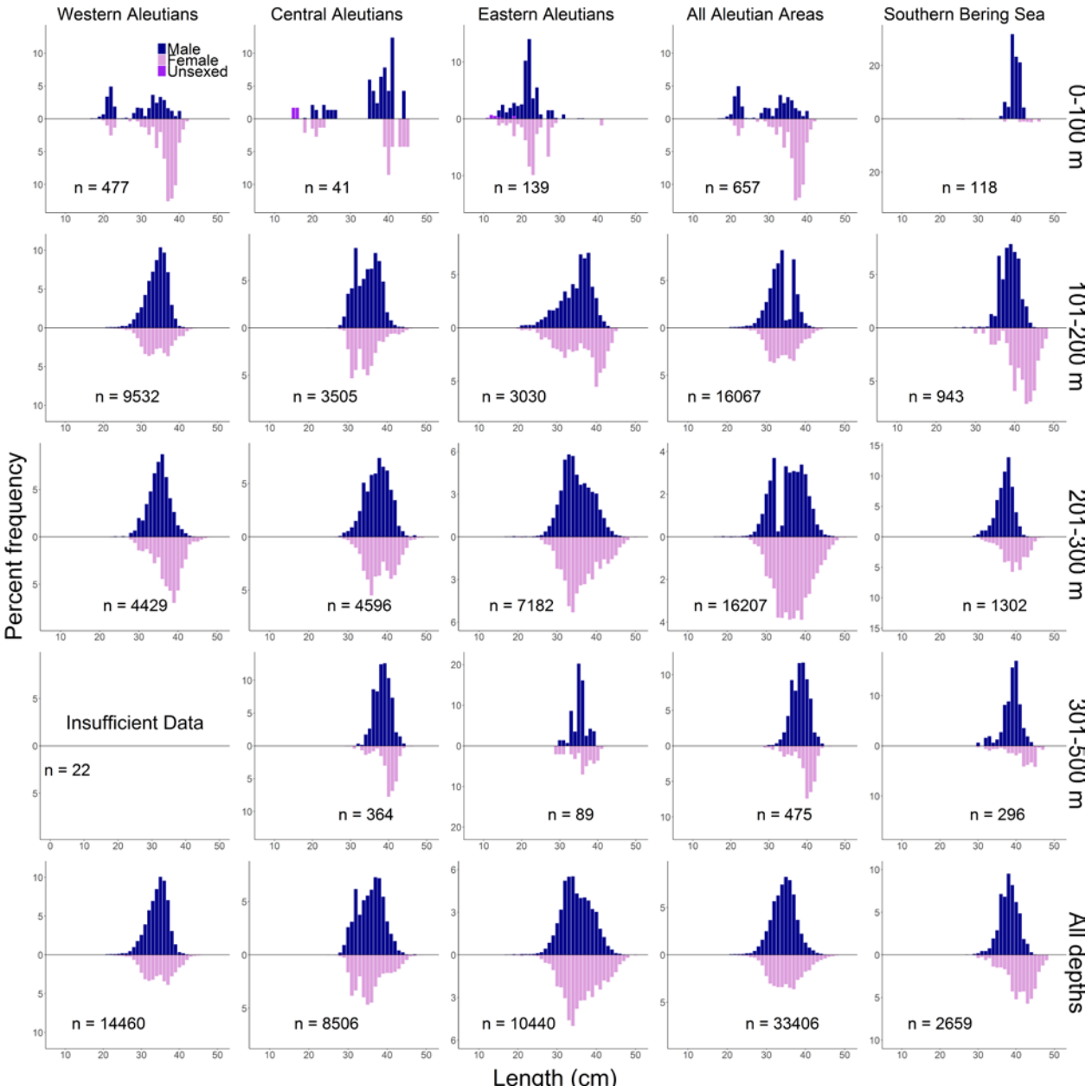

Figure 30. -- Population length composition of Pacific ocean perch by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Northern Rockfish (*Sebastes polyspinus*)

Northern rockfish was the third most abundant species caught in the 2016 survey (Table 2), and it never ranked lower than twelfth in any of the four survey districts. Although northern rockfish were caught throughout the survey area and at all depths, the vast majority were caught at depths shallower than 200 m and the catches increased from east to west (Table 40). The highest densities occurred at depths shallower than 200 m in subdistricts within the Western and Central Aleutians survey districts (Table 41). All but one of the largest catches were located in the vicinity of Kiska and Buldir Islands (Fig. 31). The length distributions of males and females were relatively similar when combined over all depth ranges, characterized by a relatively tight clustering around a single distinct mode. However, females were larger in the shallowest depth range in the Western and Eastern Aleutian survey districts but were noticeably smaller in the 200-300 m depth range (Fig. 32). The estimated biomass of northern rockfish was 253,217 t, and the highest survey district biomass was in the Western Aleutians survey district, where 49% of the estimated biomass was concentrated (Table 40).

Table 40. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing northern rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	17	120.25	58,641	17,183	100,099	0.363
	101 - 200	75	64	123.10	65,459	29,195	101,723	0.413
	201 - 300	30	16	1.22	210	0	507	0.595
	301 - 500	6	0	---	---	---	---	---
	All depths	135	97	81.83	124,310	69,363	179,258	0.388
Central Aleutians	1 - 100	25	14	89.07	52,080	0	114,113	0.452
	101 - 200	49	37	58.01	26,716	8,555	44,877	0.530
	201 - 300	30	19	0.31	64	28	100	0.495
	301 - 500	10	1	0.02	9	0	46	0.649
	All depths	114	71	47.68	78,869	13,757	143,981	0.475
Eastern Aleutians	1 - 100	15	10	6.05	4,144	913	7,376	0.516
	101 - 200	58	26	56.17	43,632	0	99,838	0.587
	201 - 300	45	20	1.23	605	0	1,463	0.780
	301 - 500	9	0	---	---	---	---	---
	All depths	127	56	19.20	48,382	0	104,691	0.582
Combined Aleutian Districts	1 - 100	64	41	65.37	114,865	44,859	184,872	0.403
	101 - 200	182	127	76.76	135,808	67,176	204,439	0.480
	201 - 300	105	55	1.01	880	0	1,780	0.698
	301 - 500	25	1	0.01	9	0	46	0.649
	All depths	376	224	44.19	251,561	156,290	346,833	0.442
Southern Bering Sea	1 - 100	18	6	2.80	1,129	0	2,906	0.707
	101 - 200	13	6	1.95	361	0	1,756	0.672
	201 - 300	8	3	0.18	10	0	22	0.685
	301 - 500	4	1	1.50	156	0	590	0.849
	All depths	43	16	2.21	1,656	0	3,565	0.710

Table 41. -- Summary of northern rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Western Aleutians	1-100	E Western Aleutians	13	11	228.07	26,988	5,991	47,984
Western Aleutians	101-200	E Western Aleutians	26	23	226.06	28,313	9,622	47,003
Central Aleutians	1-100	N Central Aleutians	10	9	223.79	47,122	0	109,199
Central Aleutians	101-200	SW Central Aleutians	22	22	109.25	11,497	2,721	20,272
Eastern Aleutians	101-200	SW Eastern Aleutians	14	8	100.37	22,693	0	67,202
Central Aleutians	101-200	SE Central Aleutians	11	5	91.57	6,884	0	21,686
Western Aleutians	101-200	W Western Aleutians	49	41	91.38	37,146	5,860	68,433
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	90.32	14,400	0	75,313
Western Aleutians	1-100	W Western Aleutians	11	6	85.71	31,654	0	68,205
Central Aleutians	101-200	N Central Aleutians	9	7	78.03	8,319	0	17,805
Central Aleutians	1-100	Petrel Bank	6	2	48.93	4,698	0	16,766
Eastern Aleutians	101-200	SE Eastern Aleutians	16	10	34.27	6,513	0	13,711
Eastern Aleutians	1-100	SE Eastern Aleutians	9	8	21.89	3,809	513	7,106
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	4.84	324	0	4,439
Southern Bering Sea	1-100	E Southern Bering Sea	16	6	4.63	1,129	0	2,915
Western Aleutians	201-300	E Western Aleutians	13	6	2.38	186	0	486
Eastern Aleutians	201-300	NE Eastern Aleutians	22	7	2.21	435	0	1,278
Eastern Aleutians	201-300	NW Eastern Aleutians	7	6	2.15	34	0	69
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	1.75	334	0	4,580
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	1.50	156	0	654
Central Aleutians	1-100	SE Central Aleutians	7	1	1.38	160	0	552
Central Aleutians	201-300	N Central Aleutians	13	10	0.75	33	7	59
Central Aleutians	1-100	SW Central Aleutians	2	2	0.62	100	0	593
Eastern Aleutians	201-300	SE Eastern Aleutians	10	2	0.51	105	0	332
Central Aleutians	201-300	SW Central Aleutians	8	6	0.50	21	0	50
Eastern Aleutians	201-300	SW Eastern Aleutians	6	5	0.44	31	0	63
Southern Bering Sea	101-200	E Southern Bering Sea	11	5	0.31	37	0	73
Western Aleutians	201-300	W Western Aleutians	17	10	0.25	24	11	37
Central Aleutians	201-300	SE Central Aleutians	5	3	0.21	10	0	22
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	3	0.18	10	0	23
Eastern Aleutians	101-200	NE Eastern Aleutians	25	6	0.13	27	4	49
Central Aleutians	301-500	SE Central Aleutians	2	1	0.12	9	0	120
Central Aleutians	101-200	Petrel Bank	7	3	0.10	17	0	37
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.01	1	0	10

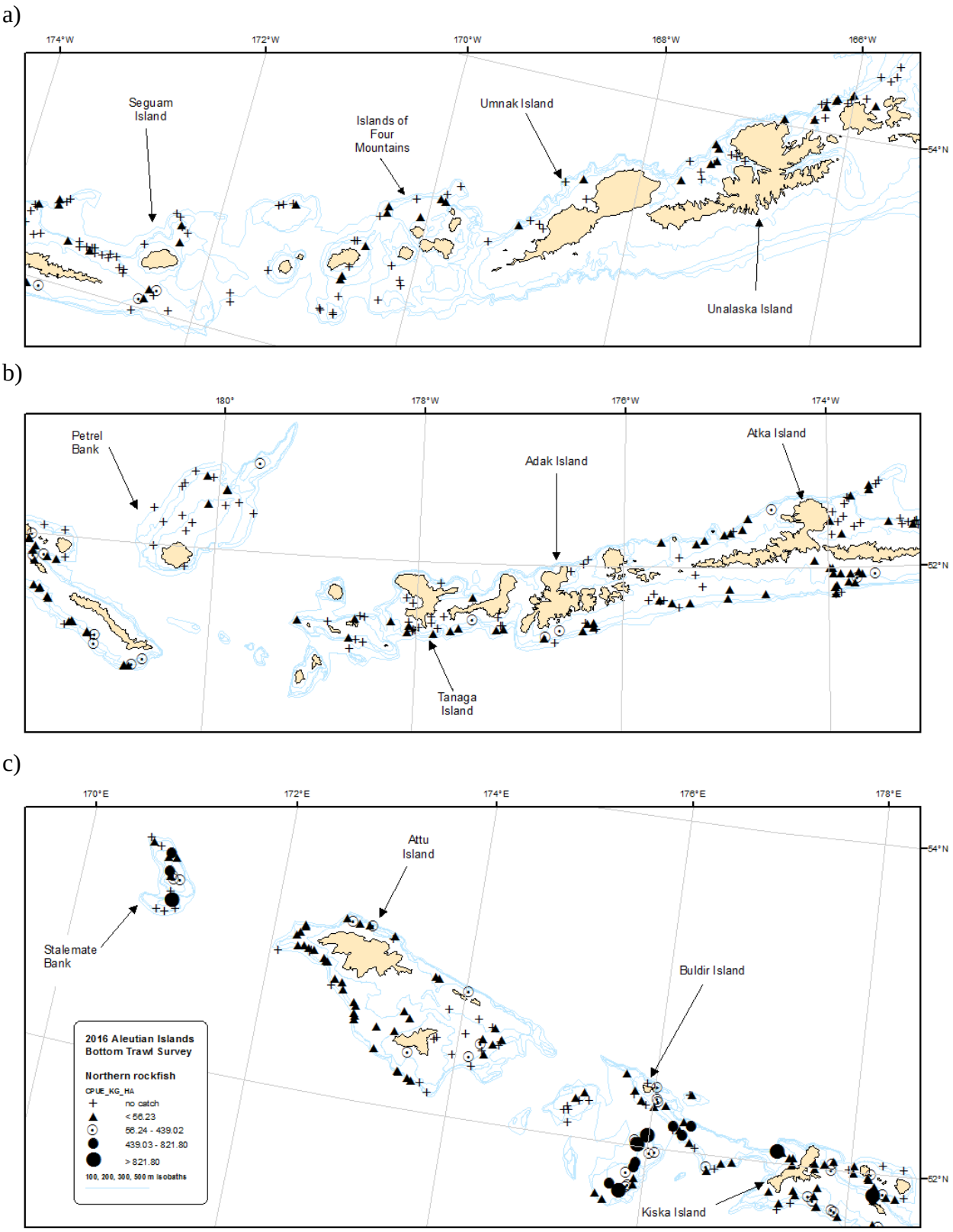

Figure 31. -- Distribution and relative abundance of northern rockfish from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

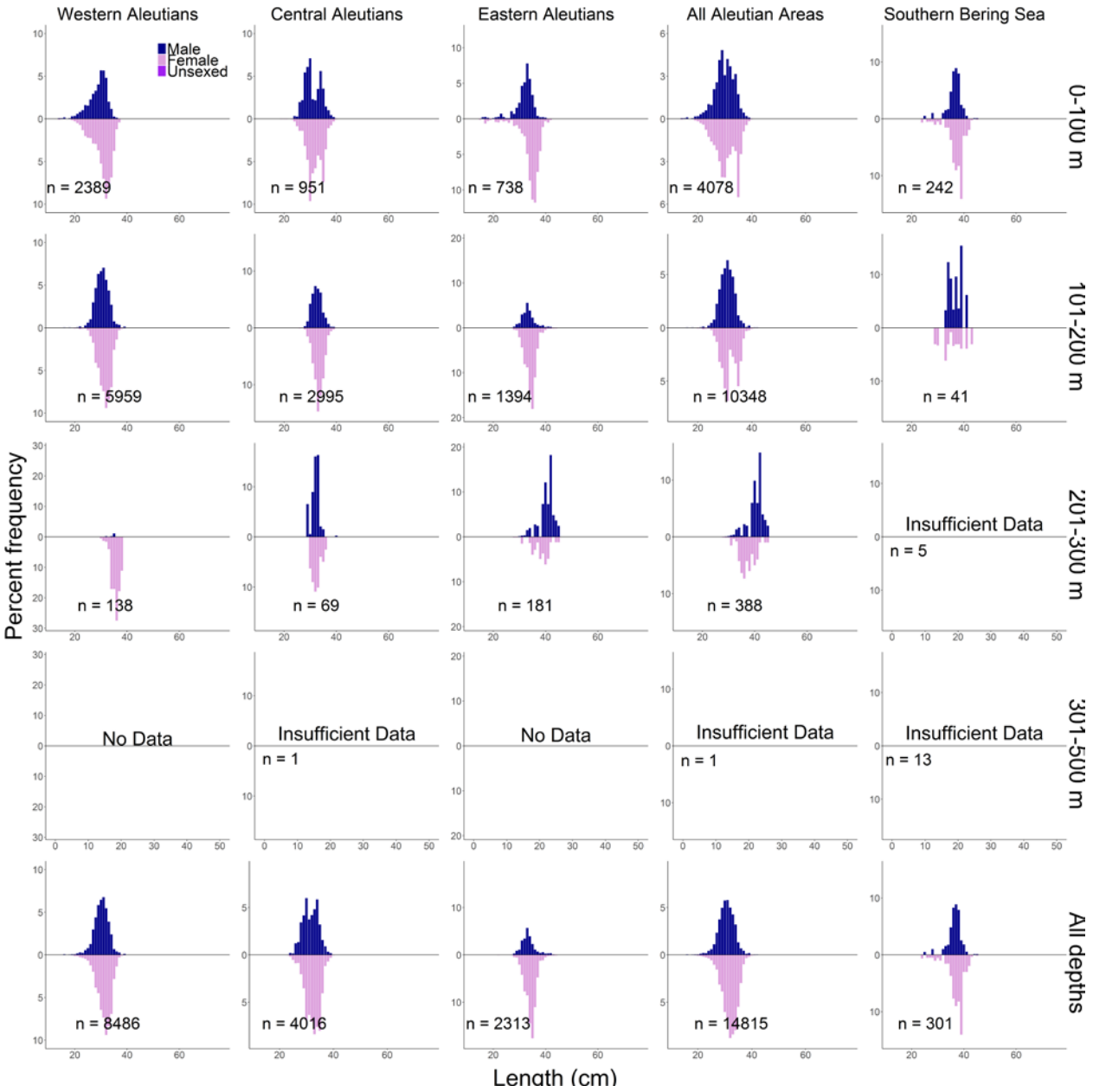

Figure 32. -- Population length composition of northern rockfish by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Shortraker rockfish (*Sebastes borealis*)

Shortraker rockfish was the thirteenth most abundant species caught in the 2016 survey and ranked among the top 20 in all three Aleutian survey districts (Table 2). Shortraker rockfish were only caught at depths deeper than 200 m and were only encountered in a single tow in the Southern Bering Sea survey district (Table 42). The highest densities by far occurred at depths between 300 and 500 m in three subdistricts, all in different survey districts (Table 43). The largest individual catches were recorded at Stalemate Bank and in areas near Atka and Adak Islands (Figure 33). Although males and females had relatively similar length distributions for the bulk of the measured specimen, with a mode at approximately 40 cm, almost all specimens larger than 70 cm were female (Fig. 34). The estimated biomass of shortraker rockfish was 15,099 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 40% of the estimated biomass was concentrated (Table 42).

Table 42. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing shortraker rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	4	0.53	91	0	229	3.478
	301 - 500	6	5	17.59	5,755	0	16,950	1.342
	All depths	135	9	3.85	5,846	0	17,042	1.355
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	0	---	---	---	---	---
	201 - 300	30	4	0.17	37	0	93	3.631
	301 - 500	10	10	7.82	3,113	1,963	4,263	1.370
	All depths	114	14	1.90	3,150	1,998	4,301	1.380
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	4	1.11	544	0	1,315	2.987
	301 - 500	9	7	9.65	5,486	887	10,085	1.239
	All depths	127	11	2.39	6,030	1,338	10,722	1.308
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	0	---	---	---	---	---
	201 - 300	105	12	0.77	671	0	1,457	3.076
	301 - 500	25	22	11.10	14,354	3,444	25,263	1.307
	All depths	376	34	2.64	15,025	4,082	25,967	1.341
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	1	0.71	74	0	281	1.050
	All depths	43	1	0.10	74	0	281	1.050

Table 43. -- Summary of shortraker rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Western Aleutians	301-500	W Western Aleutians	4	3	26.79	4,585	0	18,109
Central Aleutians	301-500	SE Central Aleutians	2	2	26.42	1,887	0	6,247
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	24.42	1,070	0	4,179
Eastern Aleutians	301-500	SE Eastern Aleutians	4	3	14.21	3,659	0	9,125
Western Aleutians	301-500	E Western Aleutians	2	2	7.50	1,170	0	13,204
Central Aleutians	301-500	N Central Aleutians	4	4	6.27	778	0	1,799
Eastern Aleutians	201-300	SW Eastern Aleutians	6	3	5.43	389	0	1,231
Central Aleutians	301-500	SW Central Aleutians	2	2	4.58	362	328	395
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	2.84	757	0	2,626
Western Aleutians	201-300	W Western Aleutians	17	3	0.83	78	0	215
Eastern Aleutians	201-300	SE Eastern Aleutians	10	1	0.75	154	0	504
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.71	74	0	311
Central Aleutians	301-500	Petrel Bank	2	2	0.70	86	1	172
Central Aleutians	201-300	SE Central Aleutians	5	1	0.44	21	0	78
Central Aleutians	201-300	N Central Aleutians	13	2	0.29	13	0	33
Western Aleutians	201-300	E Western Aleutians	13	1	0.16	13	0	40
Central Aleutians	201-300	SW Central Aleutians	8	1	0.07	3	0	10

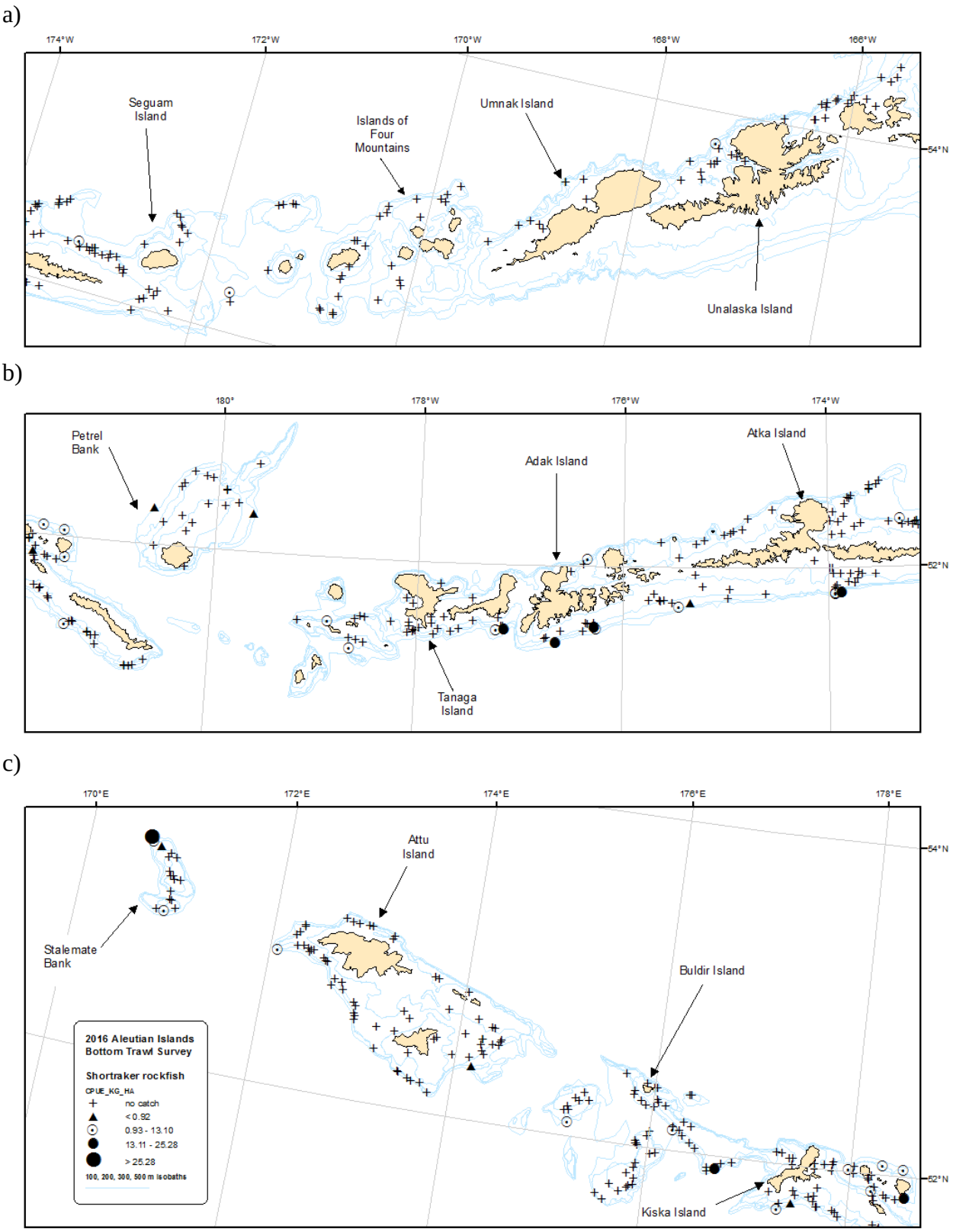

Figure 33. -- Distribution and relative abundance of shortraker rockfish from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

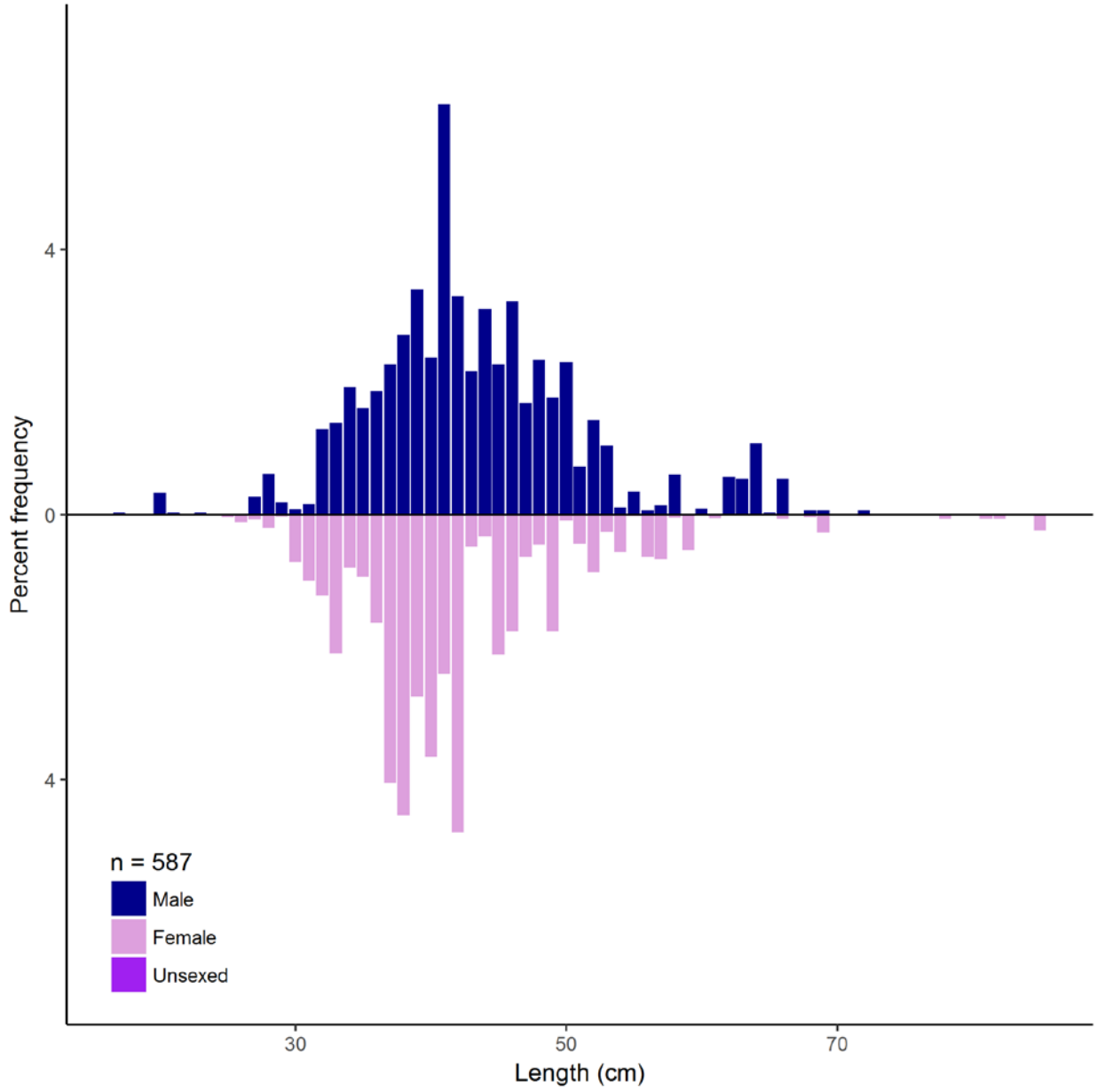

Figure 34. -- Population length composition of shortraker rockfish in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Rougheye rockfish (*Sebastes aleutianus*)

Rougheye rockfish was the least abundant among reported species caught in the 2016 survey, and it did not rank in the top 20 in any of the survey districts (Table 2). In 2006 it was determined that what had previously been identified as rougheye rockfish was actually two separate species, with the vast majority in the Aleutian Islands survey area being blackspotted rockfish. Almost all rougheye rockfish were caught at depths between 300 and 500 m in the Central Aleutian and Southern Bering Sea survey districts (Table 44). The highest densities of this species occurred at depths between 300 and 500 m in two subdistricts within the Central Aleutian and Southern Bering Sea survey districts (Fig. 35 and Table 45). There was no general trend in size with depth. The sample size (n=7) was too low to make a meaningful interpretation of the length frequency distribution (Fig. 36). The estimated biomass for rougheye rockfish was 78 t, and the highest survey district biomass was in the Central Aleutian survey district, where 62% of the estimated biomass was concentrated (Table 44).

Table 44. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing rougheye rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	0	---	---	---	---	---
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	0	---	---	---	---	---
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	0	---	---	---	---	---
	201 - 300	30	1	0.02	4	0	13	3.017
	301 - 500	10	1	0.12	48	0	180	1.790
	All depths	114	2	0.03	52	0	184	1.851
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	1	0.01	3	0	10	0.990
	301 - 500	9	0	---	---	---	---	---
	All depths	127	1	<0.01	3	0	10	0.990
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	0	---	---	---	---	---
	201 - 300	105	2	0.01	8	0	18	1.587
	301 - 500	25	1	0.04	48	0	180	1.790
	All depths	376	3	0.01	55	0	188	1.759
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	1	0.01	1	0	2	0.109
	301 - 500	4	2	0.22	23	0	67	0.823
	All depths	43	3	0.03	23	0	68	0.722

Table 45. -- Summary of rougheye rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	301-500	N Central Aleutians	4	1	0.38	48	0	199
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	0.22	23	0	74
Central Aleutians	201-300	N Central Aleutians	13	1	0.10	4	0	14
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.02	3	0	10
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	1	0.01	1	0	2

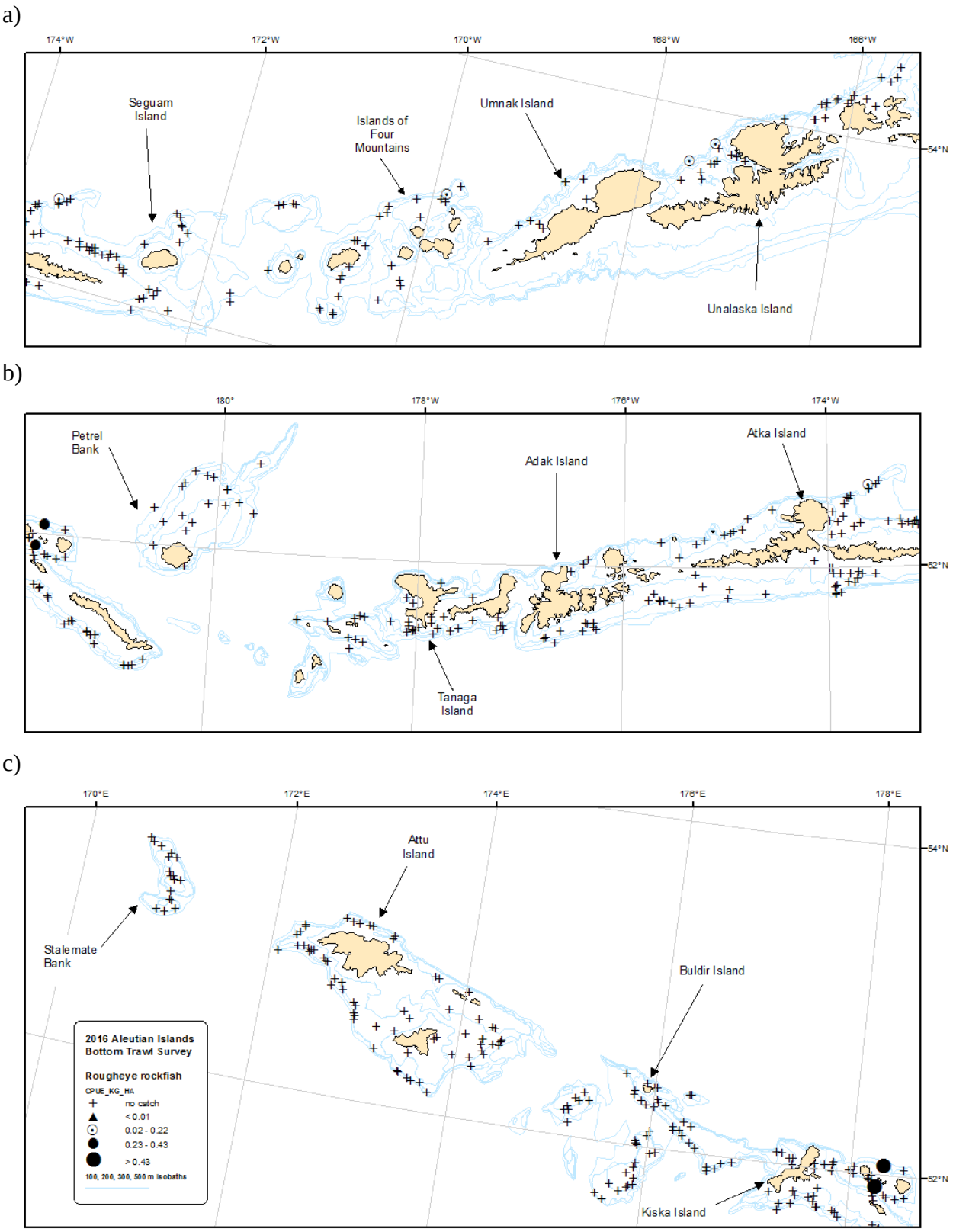

Figure 35. -- Distribution and relative abundance of rougheye rockfish from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

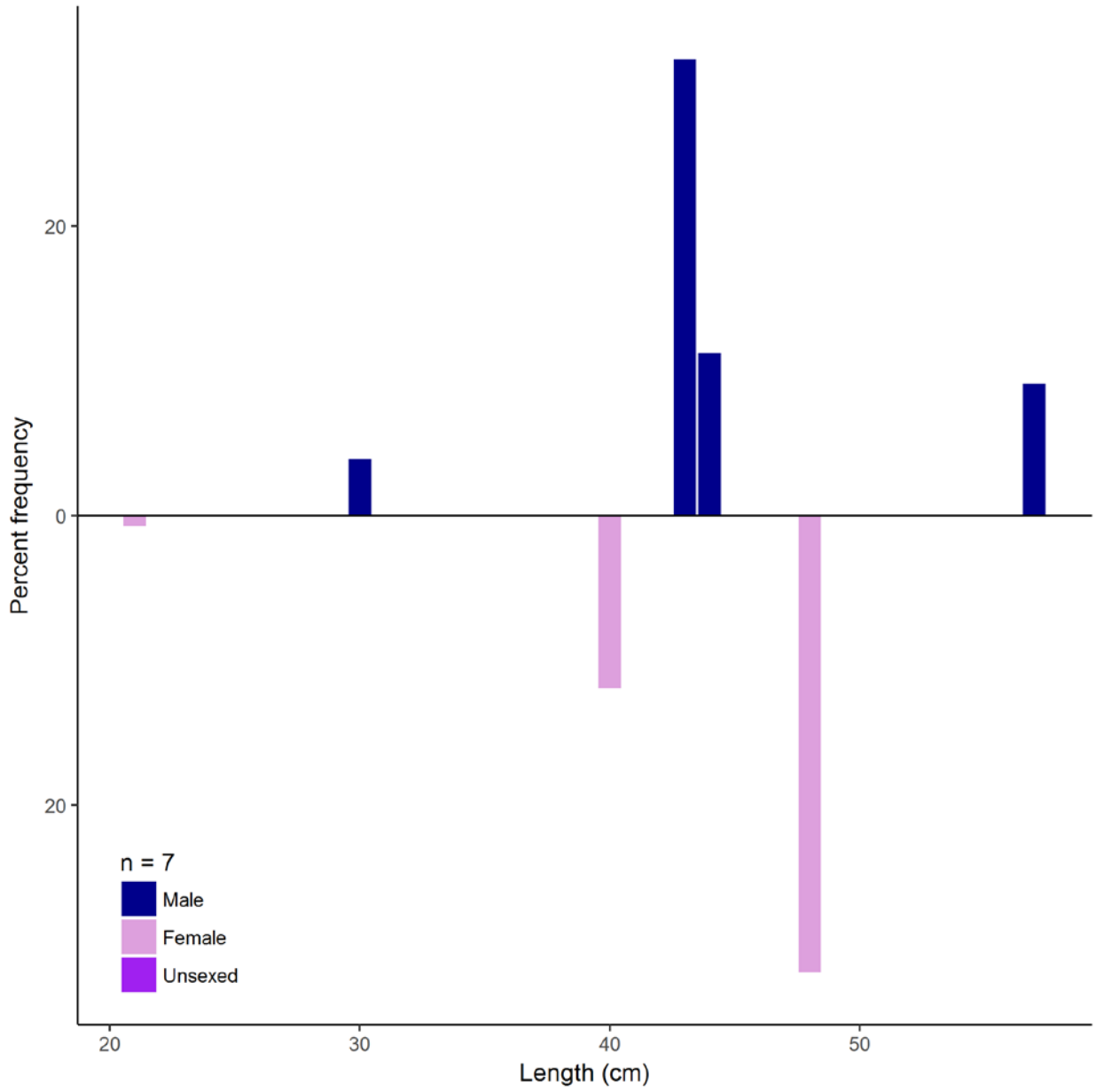

Figure 36. -- Population length composition of rougheye rockfish in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Blackspotted Rockfish (*Sebastes melanostictus)*

Blackspotted rockfish was the sixteenth most abundant species caught in the 2016 survey and ranked in the top 20 in all but one of the survey districts (Western Aleutians, Table 2). Although abundance was relatively low throughout the survey area, blackspotted rockfish were caught in all survey districts and at all depths deeper than 100 m (Table 46). The highest density occurred in a subdistrict near Kiska Island within the Central Aleutians survey district, with a CPUE twice that of the second highest CPUE (Fig. 37 and Table 47). There was no general trend in size with depth. Males and females had very similar length distributions, ranging from 16 cm to approximately 60 cm, with a very strong mode at approximately 48 cm (Fig. 38). The estimated biomass of black-spotted rockfish was 9,991 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 62% of the estimated biomass was concentrated (Table 46).

Table 46. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing blackspotted rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	11	0.33	175	0	369	1.512
	201 - 300	30	12	0.82	141	32	249	0.688
	301 - 500	6	2	0.56	185	0	525	1.763
	All depths	135	25	0.33	501	96	906	1.177
Central Aleutians	1 - 100	25	0	---	---	---	---	---
	101 - 200	49	7	0.16	76	0	170	0.549
	201 - 300	30	21	6.00	1,265	0	3,109	1.291
	301 - 500	10	7	3.54	1,411	282	2,540	1.001
	All depths	114	35	1.66	2,751	572	4,930	1.089
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	4	0.03	20	0	48	0.520
	201 - 300	45	23	3.47	1,699	0	3,417	0.619
	301 - 500	9	7	7.82	4,443	0	9,869	0.776
	All depths	127	34	2.45	6,162	358	11,966	0.724
Combined Aleutian Districts	1 - 100	64	0	---	---	---	---	---
	101 - 200	182	22	0.15	271	55	487	0.927
	201 - 300	105	56	3.55	3,105	607	5,602	0.790
	301 - 500	25	16	4.67	6,038	452	11,625	0.834
	All depths	376	94	1.65	9,414	3,061	15,767	0.821
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	1	0.01	2	0	6	0.461
	201 - 300	8	6	1.87	105	0	211	0.606
	301 - 500	4	4	4.50	470	0	1,033	0.941
	All depths	43	11	0.77	577	0	1,154	0.852

Table 47. -- Summary of blackspotted rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	201-300	N Central Aleutians	13	8	24.02	1,055	0	2,910
Eastern Aleutians	301-500	SE Eastern Aleutians	4	3	12.80	3,296	0	9,731
Eastern Aleutians	201-300	SW Eastern Aleutians	6	3	11.65	835	0	2,243
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	7.56	331	0	3,348
Central Aleutians	301-500	N Central Aleutians	4	4	6.57	815	0	1,805
Central Aleutians	301-500	SE Central Aleutians	2	1	4.88	348	0	4,774
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	4.50	470	0	1,115
Eastern Aleutians	201-300	SE Eastern Aleutians	10	5	3.39	698	0	2,009
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	3.06	816	0	3,205
Central Aleutians	201-300	SE Central Aleutians	5	4	2.52	120	0	257
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	6	1.87	105	0	214
Central Aleutians	201-300	SW Central Aleutians	8	8	1.77	75	0	160
Central Aleutians	301-500	SW Central Aleutians	2	1	1.41	111	0	1,526
Western Aleutians	201-300	E Western Aleutians	13	7	1.34	105	1	209
Central Aleutians	301-500	Petrel Bank	2	1	1.10	136	0	1,869
Eastern Aleutians	201-300	NE Eastern Aleutians	22	15	0.85	167	12	322
Central Aleutians	101-200	SW Central Aleutians	22	6	0.70	73	0	168
Western Aleutians	301-500	W Western Aleutians	4	1	0.63	107	0	447
Western Aleutians	301-500	E Western Aleutians	2	1	0.50	78	0	1,068
Western Aleutians	201-300	W Western Aleutians	17	5	0.38	36	0	75
Western Aleutians	101-200	E Western Aleutians	26	8	0.34	42	0	87
Western Aleutians	101-200	W Western Aleutians	49	3	0.33	133	0	322
Central Aleutians	201-300	Petrel Bank	4	1	0.19	15	0	62
Eastern Aleutians	101-200	SW Eastern Aleutians	14	3	0.08	18	0	46
Central Aleutians	101-200	SE Central Aleutians	11	1	0.03	2	0	7
Southern Bering Sea	101-200	E Southern Bering Sea	11	1	0.02	2	0	6
Eastern Aleutians	101-200	NE Eastern Aleutians	25	1	0.01	2	0	7

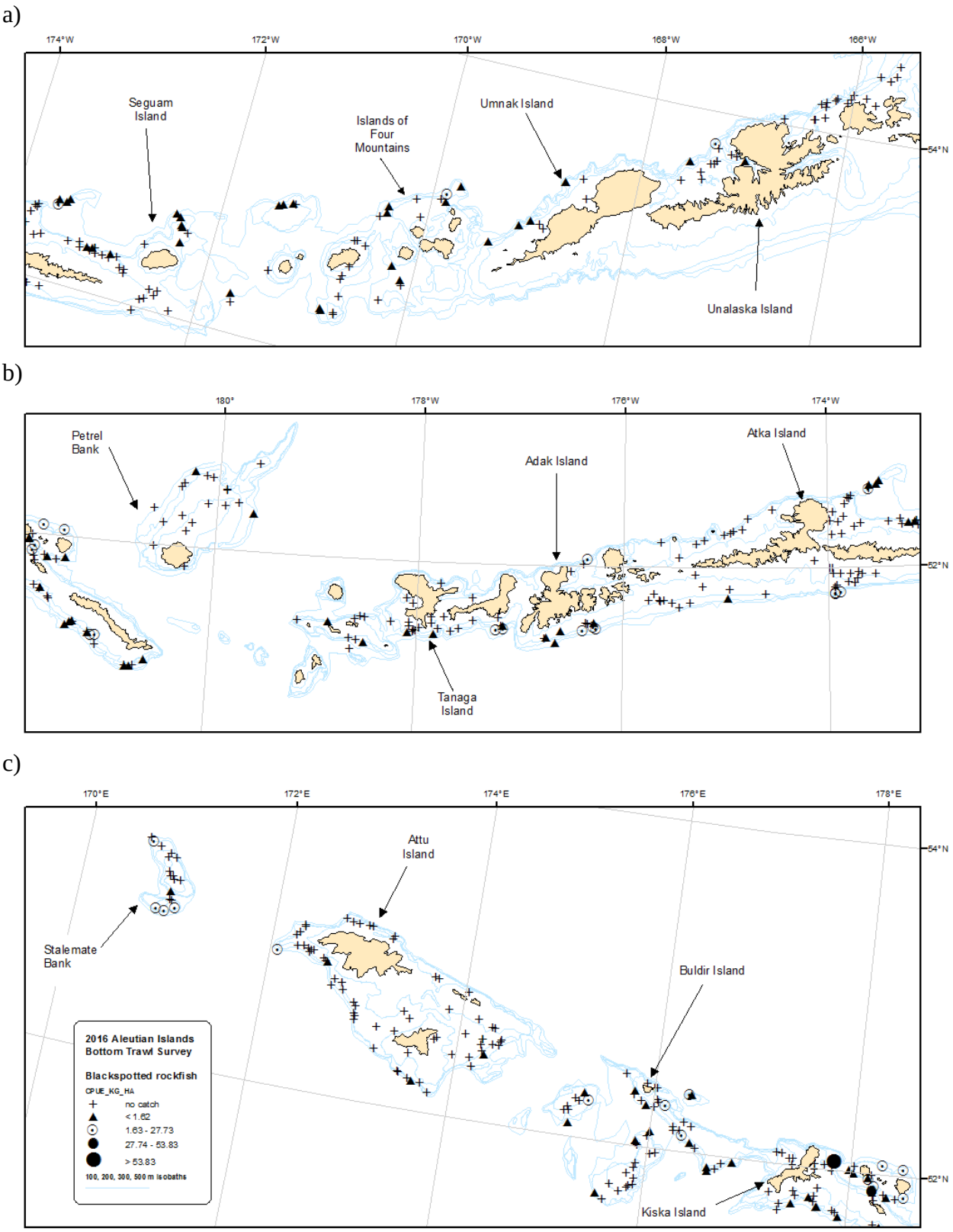

Figure 37. -- Distribution and relative abundance of blackspotted rockfish from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

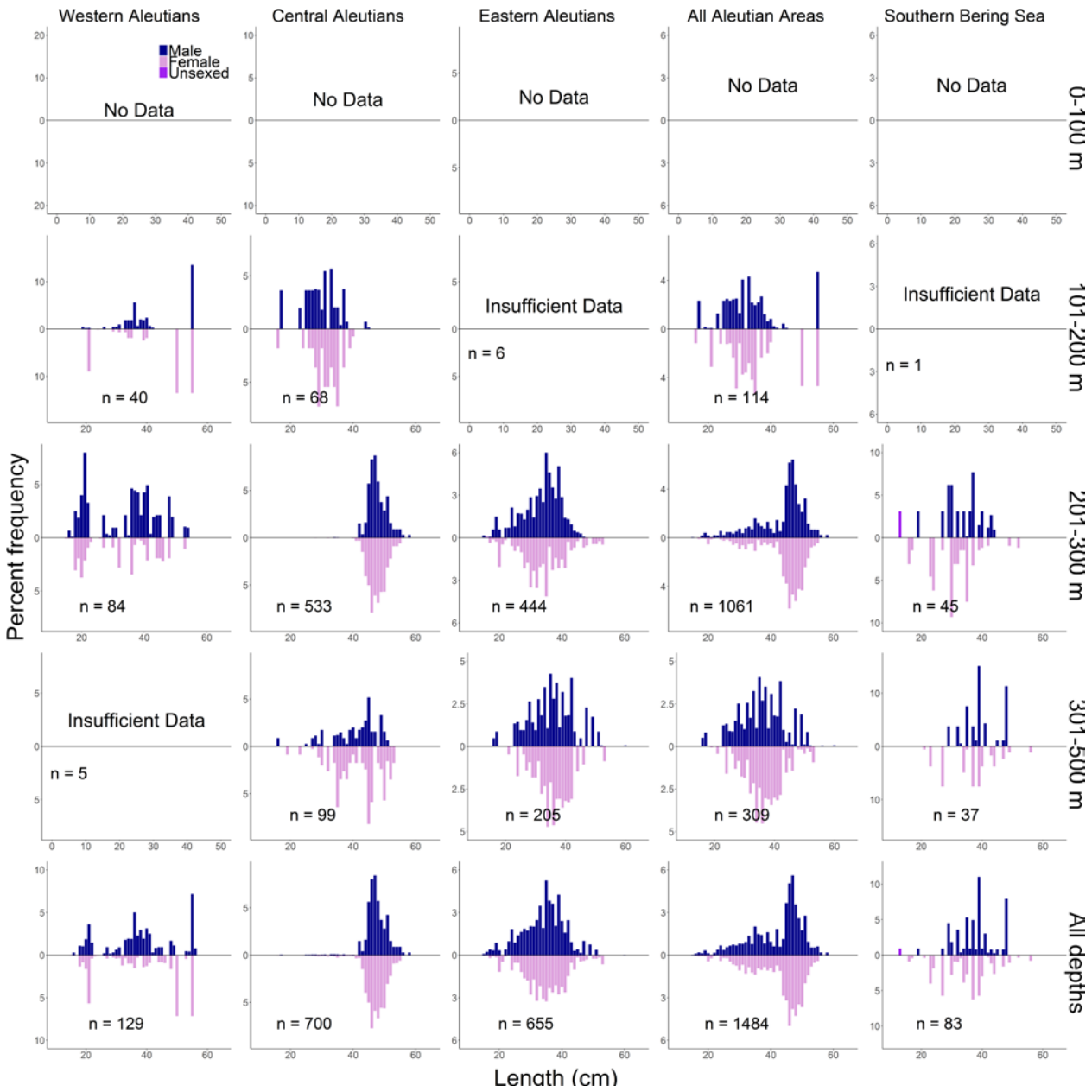

Figure 38. -- Population length composition of blackspotted rockfish in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Shortspine thornyhead (*Sebastolobus alascanus*)

Shortspine thornyhead was the eleventh most abundant species caught in the 2016 survey and ranked in the top 20 in all four survey districts (Table 2). Almost all shortspine thornyhead were caught at depths deeper than 200 m in all survey districts except the Western Aleutians, where great numbers were also caught at depths between 100 and 200 m (Table 48). The highest densities of this species generally occurred at depths between 300 and 500 m in several different subdistricts within all of the survey districts except the Eastern Aleutian survey district (Fig. 39 and Table 49). There was a no clear trend in size with increasing depth. Because shortspine thornyhead were not separated by sex, any potential differences in the length distributions between males and females cannot be determined. The length distribution was close to bell-shaped, with a mean, mode, and median all at approximately 35 cm (Fig. 40). The estimated biomass for shortspine thornyhead was 18,148 t, and the highest survey district biomass was in the Western Aleutian survey district, where 48% of the estimated biomass was concentrated (Table 48).

Table 48. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing shortspine thornyhead, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	27	4.15	2,205	809	3,602	0.770
	201 - 300	30	27	10.99	1,894	950	2,837	0.455
	301 - 500	6	6	14.21	4,649	0	10,080	0.374
	All depths	135	60	5.76	8,748	3,289	14,207	0.450
Central Aleutians	1 - 100	25	3	0.05	26	0	59	0.432
	101 - 200	49	7	0.36	167	0	405	0.834
	201 - 300	30	19	6.01	1,267	0	3,059	0.362
	301 - 500	10	9	9.53	3,795	0	7,722	0.333
	All depths	114	38	3.18	5,256	1,379	9,132	0.346
Eastern Aleutians	1 - 100	15	0	---	---	---	---	---
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	6	0.51	248	0	523	1.070
	301 - 500	9	9	4.03	2,290	310	4,270	0.573
	All depths	127	15	1.01	2,538	536	4,540	0.600
Combined Aleutian Districts	1 - 100	64	3	0.01	26	0	59	0.432
	101 - 200	182	34	1.34	2,373	961	3,784	0.775
	201 - 300	105	52	3.90	3,408	1,523	5,294	0.432
	301 - 500	25	24	8.30	10,734	5,320	16,149	0.386
	All depths	376	113	2.91	16,541	10,704	22,378	0.426
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	3	2.03	115	0	255	0.431
	301 - 500	4	3	14.31	1,493	0	3,873	0.386
	All depths	43	6	2.15	1,607	0	3,994	0.389

Table 49. -- Summary of shortspine thornyhead mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Western Aleutians	201-300	W Western Aleutians	17	17	17.31	1,628	700	2,556
Western Aleutians	301-500	W Western Aleutians	4	4	16.18	2,769	0	8,976
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	3	14.31	1,493	0	4,221
Central Aleutians	301-500	SW Central Aleutians	2	2	14.27	1,126	0	7,466
Central Aleutians	301-500	SE Central Aleutians	2	2	13.27	948	0	9,491
Western Aleutians	301-500	E Western Aleutians	2	2	12.04	1,880	0	3,795
Central Aleutians	301-500	Petrel Bank	2	2	10.41	1,289	0	12,346
Central Aleutians	201-300	Petrel Bank	4	3	8.67	664	0	2,606
Central Aleutians	201-300	SW Central Aleutians	8	8	6.05	258	95	421
Central Aleutians	201-300	SE Central Aleutians	5	3	5.66	270	0	811
Eastern Aleutians	301-500	SE Eastern Aleutians	4	4	5.55	1,429	0	3,706
Western Aleutians	101-200	W Western Aleutians	49	23	5.16	2,096	708	3,484
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	5.14	225	0	2,257
Central Aleutians	301-500	N Central Aleutians	4	3	3.49	433	0	1,242
Western Aleutians	201-300	E Western Aleutians	13	10	3.40	266	30	503
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	2.38	635	0	2,376
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	3	2.03	115	0	259
Central Aleutians	201-300	N Central Aleutians	13	5	1.71	75	1	149
Eastern Aleutians	201-300	SW Eastern Aleutians	6	3	1.66	119	0	257
Western Aleutians	101-200	E Western Aleutians	26	4	0.87	109	0	272
Central Aleutians	101-200	Petrel Bank	7	2	0.82	142	0	386
Eastern Aleutians	201-300	SE Eastern Aleutians	10	1	0.55	112	0	367
Eastern Aleutians	201-300	NW Eastern Aleutians	7	1	0.27	4	0	14
Central Aleutians	101-200	SW Central Aleutians	22	4	0.22	24	0	47
Central Aleutians	1-100	N Central Aleutians	10	2	0.09	19	0	50
Eastern Aleutians	201-300	NE Eastern Aleutians	22	1	0.06	12	0	37
Central Aleutians	1-100	SE Central Aleutians	7	1	0.06	7	0	24
Central Aleutians	101-200	SE Central Aleutians	11	1	0.03	2	0	6

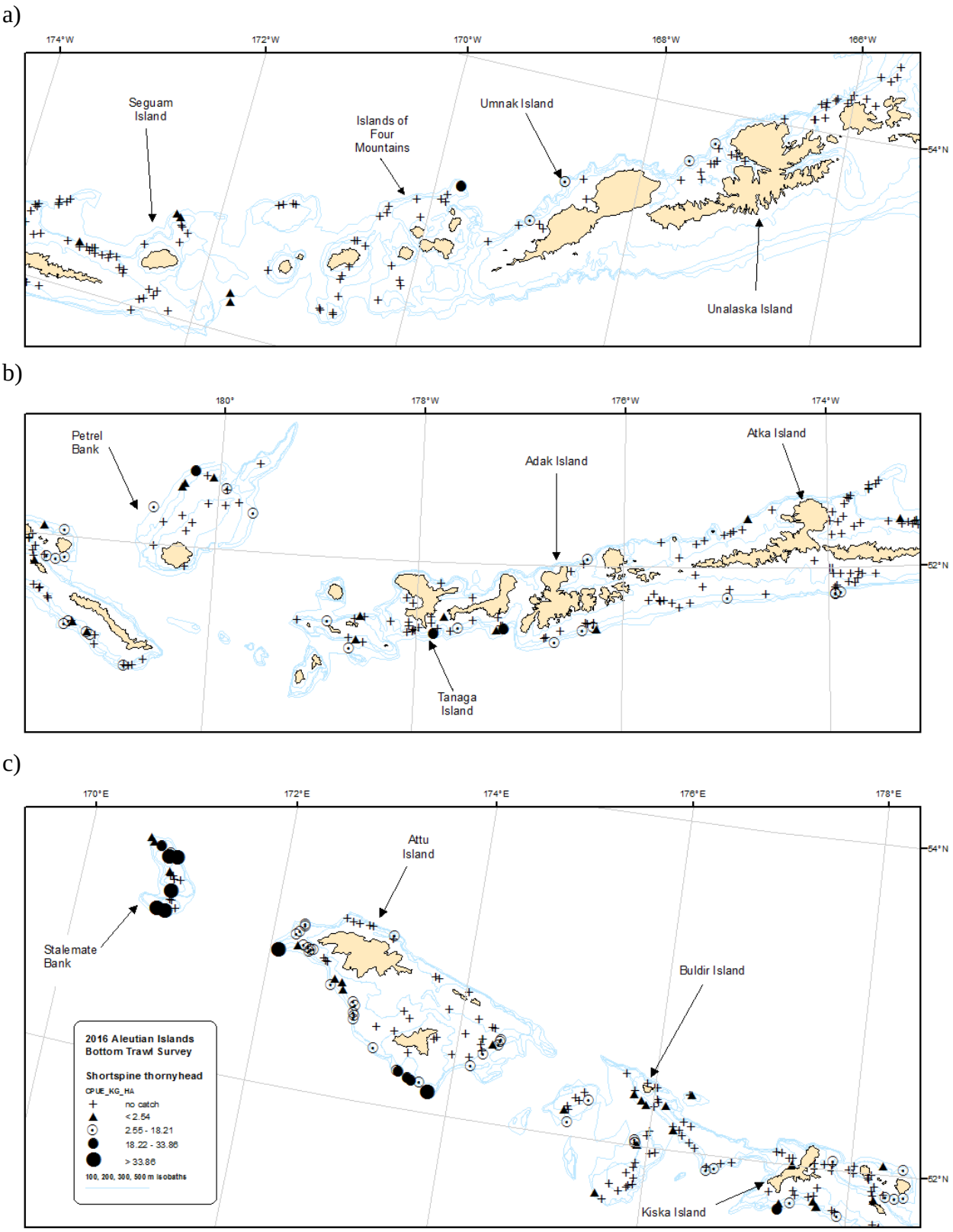

Figure 39. -- Distribution and relative abundance of shortspine thornyhead from the 2016 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

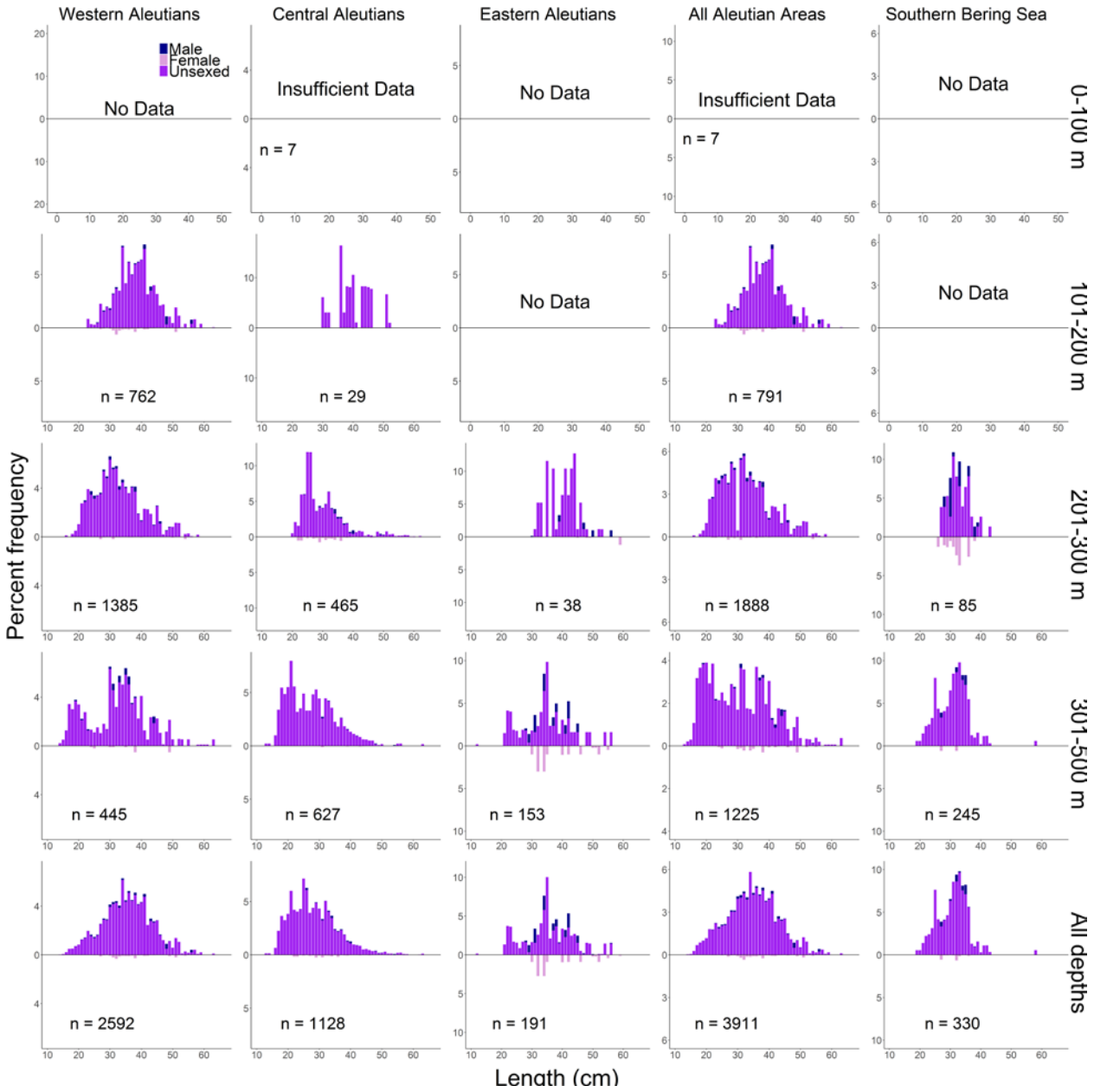

Figure 40. -- Population length composition of shortspine thornyhead by survey district and depth interval in the 2016 Aleutian Islands bottom trawl survey and number of fish measured.

Dusky rockfish (*Sebastes variabilis*)

Dusky rockfish was not among the 20 most abundant species caught in the 2016 survey and only ranked in the top 20 in the Central Aleutian survey district (Table 2). The vast majority of dusky rockfish were caught at depths between 100 and 200 m in the Western and Central Aleutian survey districts (Table 50). The highest densities of this species occurred at depths between 100 and 200 m in two subdistricts within the Central Aleutian survey district (Table 51). There was a general trend of increasing weight with depth (Table 50). The estimated biomass for dusky rockfish was 1,882 t, and the highest survey district biomass was in the Central Aleutian survey district, where 56% of the estimated biomass was concentrated (Table 50).

Table 50. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing dusky rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	3	0.07	35	0	83	1.101
	101 - 200	75	16	0.73	386	0	789	1.213
	201 - 300	30	2	0.03	5	0	13	1.226
	301 - 500	6	0	---	---	---	---	---
	All depths	135	21	0.28	426	21	832	1.203
Central Aleutians	1 - 100	25	2	0.12	68	0	202	1.071
	101 - 200	49	7	2.13	979	0	2,054	1.040
	201 - 300	30	2	0.06	14	0	35	1.402
	301 - 500	10	0	---	---	---	---	---
	All depths	114	11	0.64	1,061	0	2,141	1.045
Eastern Aleutians	1 - 100	15	1	0.02	12	0	39	1.112
	101 - 200	58	1	0.18	138	0	433	1.160
	201 - 300	45	4	0.06	28	0	64	1.500
	301 - 500	9	0	---	---	---	---	---
	All depths	127	6	0.07	177	0	476	1.199
Combined Aleutian Districts	1 - 100	64	6	0.07	115	0	252	1.084
	101 - 200	182	24	0.85	1,503	346	2,660	1.090
	201 - 300	105	8	0.05	47	4	89	1.435
	301 - 500	25	0	---	---	---	---	---
	All depths	376	38	0.29	1,665	499	2,830	1.097
Southern Bering Sea	1 - 100	18	4	0.36	143	0	362	0.592
	101 - 200	13	4	0.40	74	0	198	1.020
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	8	0.29	217	0	463	0.690

Table 51. -- Summary of dusky rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	101-200	SW Central Aleutians	22	5	5.65	595	0	1,344
Central Aleutians	101-200	SE Central Aleutians	11	2	5.12	385	0	1,237
Western Aleutians	101-200	W Western Aleutians	49	10	0.87	352	0	753
Southern Bering Sea	101-200	E Southern Bering Sea	11	4	0.62	74	0	199
Eastern Aleutians	101-200	SW Eastern Aleutians	14	1	0.61	138	0	435
Southern Bering Sea	1-100	E Southern Bering Sea	16	4	0.59	143	0	363
Central Aleutians	1-100	N Central Aleutians	10	2	0.32	68	0	204
Eastern Aleutians	201-300	NW Eastern Aleutians	7	2	0.30	5	0	13
Western Aleutians	101-200	E Western Aleutians	26	6	0.27	34	0	79
Central Aleutians	201-300	N Central Aleutians	13	1	0.22	9	0	30
Eastern Aleutians	201-300	NE Eastern Aleutians	22	2	0.12	23	0	59
Central Aleutians	201-300	SW Central Aleutians	8	1	0.10	4	0	14
Western Aleutians	1-100	W Western Aleutians	11	2	0.09	32	0	80
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.07	12	0	40
Western Aleutians	201-300	W Western Aleutians	17	2	0.06	5	0	13
Western Aleutians	1-100	E Western Aleutians	13	1	0.03	3	0	10

Dark rockfish (*Sebastes ciliatus*)

Dark rockfish was not among the 20 most abundant species caught in the 2016 survey and was not ranked among the top 20 in any of the four survey districts (Table 2). Dark rockfish were caught in all four survey districts and always at depths shallower than 200 m (Table 52). Only two of the eight subdistricts where this species occurred had a CPUE above 1 kg/ha. The other subdistricts had much lower densities (Table 53). Too few were caught for meaningful length frequency analysis. The estimated biomass of dark rockfish was 488 t, and the highest survey district biomass was in the Central Aleutians survey district, where 56% of the estimated biomass was concentrated (Table 52).

Table 52. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing dark rockfish, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	9	0.34	166	0	336	0.830
	101 - 200	75	4	0.05	25	0	55	0.803
	201 - 300	30	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	135	13	0.13	191	18	364	0.827
Central Aleutians	1 - 100	25	2	0.45	261	0	820	1.022
	101 - 200	49	2	0.03	14	0	35	0.982
	201 - 300	30	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	114	4	0.17	275	0	835	1.019
Eastern Aleutians	1 - 100	15	1	0.02	17	0	55	1.005
	101 - 200	58	0	---	---	---	---	---
	201 - 300	45	0	---	---	---	---	---
	301 - 500	9	0	---	---	---	---	---
	All depths	127	1	0.01	17	0	55	1.005
Combined Aleutian Districts	1 - 100	64	12	0.25	444	0	1,024	0.940
	101 - 200	182	6	0.02	39	4	75	0.860
	201 - 300	105	0	---	---	---	---	---
	301 - 500	25	0	---	---	---	---	---
	All depths	376	18	0.08	483	0	1,065	0.933
Southern Bering Sea	1 - 100	18	1	0.01	5	0	16	0.582
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	1	0.01	5	0	16	0.582

Table 53. -- Summary of dark rockfish mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Western Aleutians	1-100	E Western Aleutians	13	9	1.40	166	0	337
Central Aleutians	1-100	N Central Aleutians	10	1	1.19	251	0	819
Western Aleutians	101-200	E Western Aleutians	26	4	0.20	25	0	55
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	0.10	17	0	56
Central Aleutians	101-200	SE Central Aleutians	11	1	0.09	7	0	21
Central Aleutians	1-100	SE Central Aleutians	7	1	0.09	10	0	34
Central Aleutians	101-200	SW Central Aleutians	22	1	0.08	8	0	24
Southern Bering Sea	1-100	E Southern Bering Sea	16	1	0.02	5	0	16

Skates

Table 54 presents total abundance information for all skate species caught during the 2016 Aleutian Islands bottom trawl survey. Additional information is provided only for the three most abundant species (whiteblotched, leopard, and Aleutian skates) whose cumulative estimated biomass accounts for approximately 83% of the entire skate family biomass.

Table 54. -- Catch-per-unit-effort (CPUE), biomass, relative (%) biomass, and cumulative abundance (%) of skates (Rajidae) caught during the 2016 Aleutian Islands bottom trawl survey combined across all survey districts

Common Name	Mean CPUE (kg/ha)	Biomass (t)	% Biomass	Cumulative %
whiteblotched skate	2.4	15,380	55	55
leopard skate	0.7	4,220	15	70
Aleutian skate	0.6	3,703	13	83
Alaska skate	0.3	1,808	7	90
big skate	0.2	1,306	5	95
mud skate	0.2	1,165	4	99
butterfly skate	< 0.1	86	< 1	99
Bering skate	< 0.1	50	< 1	99
Commander skate	< 0.1	29	< 1	100

Whiteblotched skate (*Bathyraja maculata)*

Whiteblotched skate was the most abundant skate species and the twelfth most abundant species overall caught in the 2016 survey (Tables 2 and 54). Although whiteblotched skates were caught throughout the survey area and at all depths, the vast majority were caught at depths between 100 and 200 m in the three Aleutian survey districts and primarily in the Eastern Aleutians survey district (Table 55). The highest densities by far were recorded at depths between 100 and 200 m in two subdistricts within the Eastern Aleutians survey district (Table 56). The estimated biomass of whiteblotched skate was 15,380 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 67% of the estimated biomass was concentrated (Table 55).

Table 55. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing whiteblotched skate, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	1	1.95	949	0	3,037	7.125
	101 - 200	75	13	5.62	2,987	0	6,031	7.790
	201 - 300	30	2	0.09	16	0	43	2.433
	301 - 500	6	0	---	---	---	---	---
	All depths	135	16	2.60	3,952	312	7,592	7.553
Central Aleutians	1 - 100	25	2	0.33	193	0	518	10.116
	101 - 200	49	3	0.28	127	0	295	7.022
	201 - 300	30	4	0.43	90	0	224	8.017
	301 - 500	10	2	0.12	49	0	254	1.415
	All depths	114	11	0.28	459	97	822	5.518
Eastern Aleutians	1 - 100	15	1	0.30	204	0	664	6.183
	101 - 200	58	23	9.55	7,422	3,004	11,840	7.283
	201 - 300	45	20	3.34	1,639	786	2,493	5.030
	301 - 500	9	2	1.98	1,126	0	3,379	5.391
	All depths	127	46	4.12	10,391	5,249	15,532	6.549
Combined Aleutian Districts	1 - 100	64	4	0.77	1,345	0	3,501	7.266
	101 - 200	182	39	5.96	10,536	5,262	15,810	7.417
	201 - 300	105	26	2.00	1,745	884	2,606	5.077
	301 - 500	25	4	0.91	1,175	0	3,432	4.823
	All depths	376	73	2.60	14,802	8,723	20,881	6.749
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	1	1.38	255	0	1,354	9.215
	201 - 300	8	6	4.25	240	84	396	4.907
	301 - 500	4	1	0.80	83	0	314	2.434
	All depths	43	8	0.77	578	0	1,459	5.221

Table 56. -- Summary of whiteblotched skate mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Eastern Aleutians	101-200	NE Eastern Aleutians	25	11	23.36	4,700	509	8,892
Eastern Aleutians	101-200	SE Eastern Aleutians	16	10	13.22	2,513	964	4,061
Western Aleutians	101-200	W Western Aleutians	49	10	7.16	2,910	0	5,951
Eastern Aleutians	201-300	NE Eastern Aleutians	22	14	6.45	1,269	445	2,094
Southern Bering Sea	201-300	Combined Southern Bering Sea	8	6	4.25	240	80	400
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	3.81	255	0	3,499
Eastern Aleutians	301-500	SE Eastern Aleutians	4	1	3.19	822	0	3,438
Western Aleutians	1-100	W Western Aleutians	11	1	2.57	949	0	3,062
Central Aleutians	1-100	Petrel Bank	6	2	2.01	193	0	534
Eastern Aleutians	201-300	SE Eastern Aleutians	10	5	1.68	346	52	640
Eastern Aleutians	1-100	SE Eastern Aleutians	9	1	1.17	204	0	673
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	1.14	304	0	1,611
Central Aleutians	201-300	SE Central Aleutians	5	1	1.05	50	0	189
Eastern Aleutians	101-200	SW Eastern Aleutians	14	2	0.92	209	0	571
Central Aleutians	201-300	N Central Aleutians	13	3	0.91	40	0	90
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.80	83	0	348
Central Aleutians	301-500	SE Central Aleutians	2	1	0.66	48	0	650
Western Aleutians	101-200	E Western Aleutians	26	3	0.62	77	0	196
Central Aleutians	101-200	SE Central Aleutians	11	1	0.40	30	0	97
Central Aleutians	101-200	N Central Aleutians	9	1	0.40	43	0	140
Eastern Aleutians	201-300	SW Eastern Aleutians	6	1	0.34	24	0	87
Central Aleutians	101-200	Petrel Bank	7	1	0.32	55	0	188
Western Aleutians	201-300	E Western Aleutians	13	1	0.15	12	0	37
Western Aleutians	201-300	W Western Aleutians	17	1	0.05	4	0	14
Central Aleutians	301-500	N Central Aleutians	4	1	0.02	2	0	8

Leopard skate (*Bathyraja panthera*)

Leopard skate was the second most abundant skate species and the twentieth most abundant species overall caught in the 2016 survey (Tables 2 and 54). It ranked among the 20 most abundant species in the Central and Western Aleutian survey districts. Almost all leopard skates were caught at depths shallower than 200 m in the Western and Central Aleutian survey districts (Table 57). The highest densities of this species generally occurred at depths between 100 and 200 m in several subdistricts within the Central and Western Aleutian survey districts, although the highest density was at depths less than 100 m in a subdistrict in the Western Aleutian survey district (Table 58). There was no trend in size with depth. The estimated biomass for leopard skate was 4,220 t, and the highest survey district biomass was in the Central Aleutian survey district, where 61% of the estimated biomass was concentrated (Table 57).

Table 57. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing leopard skate, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	3	1.44	703	0	1,878	8.527
	101 - 200	75	16	1.10	584	116	1,052	7.648
	201 - 300	30	2	0.05	9	0	23	1.237
	301 - 500	6	0	---	---	---	---	---
	All depths	135	21	0.85	1,296	28	2,564	7.797
Central Aleutians	1 - 100	25	8	3.58	2,093	0	8,762	10.693
	101 - 200	49	10	1.06	487	171	804	9.311
	201 - 300	30	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	114	19	1.56	2,582	0	9,280	10.353
Eastern Aleutians	1 - 100	15	2	0.41	283	0	1,226	3.818
	101 - 200	58	1	0.08	59	0	186	9.713
	201 - 300	45	0	---	---	---	---	---
	301 - 500	9	0	---	---	---	---	---
	All depths	127	3	0.14	342	0	1,319	4.266
Combined Aleutian Districts	1 - 100	64	13	1.75	3,078	0	8,340	8.742
	101 - 200	182	27	0.64	1,131	573	1,688	8.387
	201 - 300	105	3	0.01	11	0	25	1.254
	301 - 500	25	0	---	---	---	---	---
	All depths	376	43	0.74	4,220	0	9,556	8.513
Southern Bering Sea	1 - 100	18	0	---	---	---	---	---
	101 - 200	13	0	---	---	---	---	---
	201 - 300	8	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	43	0	---	---	---	---	---

Table 58. -- Summary of leopard skate mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Western Aleutians	1-100	W Western Aleutians	10	4	5.69	2,100	0	4,925
Central Aleutians	101-200	SW Central Aleutians	16	4	5.14	541	0	1,505
Central Aleutians	201-300	Petrel Bank	5	1	4.39	337	0	1,271
Western Aleutians	101-200	W Western Aleutians	47	15	4.34	1,764	494	3,033
Central Aleutians	101-200	Petrel Bank	7	4	4.27	741	0	1,604
Central Aleutians	101-200	N Central Aleutians	10	5	3.75	400	0	875
Western Aleutians	101-200	E Western Aleutians	23	13	3.60	451	137	765
Western Aleutians	201-300	E Western Aleutians	15	3	1.40	110	0	243
Central Aleutians	1-100	Petrel Bank	5	2	1.21	116	0	409
Eastern Aleutians	101-200	SW Eastern Aleutians	10	1	1.21	273	0	892
Western Aleutians	1-100	E Western Aleutians	14	3	1.13	134	0	348
Central Aleutians	101-200	SE Central Aleutians	10	1	0.91	68	0	223
Western Aleutians	201-300	W Western Aleutians	18	1	0.06	6	0	18

Aleutian skate (*Bathyraja aleutica*)

Aleutian skate was the third most abundant skate species, but was not among the 20 most abundant species overall caught in the 2016 survey (Tables 2 and 54). Aleutian skate were caught throughout the survey area and at all depths but most were caught at depths between 100 and 200 m in the Eastern Aleutians and Southern Bering Sea survey districts (Table 59). The highest densities occurred at depths between 100 and 200 m in various subdistricts within the Central and Western Aleutians, as well as within the Southern Bering Sea survey districts (Table 60). The estimated biomass of Aleutian skate was 3,703 t, and the highest survey district biomass was essentially tied between the Eastern Aleutians and Southern Bering Sea survey districts, where 79% of the estimated biomass was concentrated (Table 59).

Table 59. -- Summary by survey districts and depth intervals of 2016 Aleutian Islands trawl effort (number of trawl hauls), number of hauls containing Aleutian skate, their mean CPUE and biomass estimates with lower and upper 95% confidence limits (LCL and UCL, respectively), and average fish weight.

Survey District	Depth (m)	Haul Count	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	$\overline{\text{Weight}}$ (kg)
Western Aleutians	1 - 100	24	0	---	---	---	---	---
	101 - 200	75	8	0.83	442	0	893	13.904
	201 - 300	30	3	0.61	105	0	231	14.068
	301 - 500	6	0	---	---	---	---	---
	All depths	135	11	0.36	547	80	1,014	13.936
Central Aleutians	1 - 100	25	1	0.17	102	0	329	11.624
	101 - 200	49	2	0.17	81	0	211	16.126
	201 - 300	30	4	0.12	24	0	49	3.606
	301 - 500	10	0	---	---	---	---	---
	All depths	114	8	0.14	233	0	497	6.890
Eastern Aleutians	1 - 100	15	1	0.29	201	0	657	13.028
	101 - 200	58	8	0.95	741	179	1,304	12.596
	201 - 300	45	6	0.98	482	60	903	11.670
	301 - 500	9	2	0.10	55	0	182	1.229
	All depths	127	17	0.59	1,479	669	2,289	9.244
Combined Aleutian Districts	1 - 100	64	2	0.17	303	0	788	12.520
	101 - 200	182	18	0.71	1,264	544	1,983	13.215
	201 - 300	105	13	0.70	611	173	1,049	11.015
	301 - 500	25	3	0.06	81	0	214	1.398
	All depths	376	36	0.40	2,259	1,302	3,215	9.693
Southern Bering Sea	1 - 100	18	1	0.13	53	0	166	8.223
	101 - 200	13	6	3.69	683	139	1,227	13.023
	201 - 300	8	3	2.33	131	0	285	14.414
	301 - 500	4	1	5.53	577	0	2,177	13.567
	All depths	43	11	1.93	1,444	0	3,065	13.065

Table 60. -- Summary of Aleutian skate mean catch-per-unit-effort (CPUE) and estimated biomass (t) including the lower and upper 95% confidence limits (LCL and UCL, respectively) from the 2016 Aleutian Islands bottom trawl survey by stratum (i.e., the composite of survey district, depth interval, and subarea) ordered from highest to lowest CPUE.

Survey District	Depth (m)	Subdistrict Name	Number of Hauls	Hauls w/Catch	$\overline{\text{CPUE}}$ (kg/ha)	Biomass (t)	LCL (t)	UCL (t)
Central Aleutians	101-200	SE Central Aleutians	10	4	6.47	486	0	1,199
Western Aleutians	101-200	W Western Aleutians	47	10	6.32	2,568	0	5,753
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	5.11	342	0	4,692
Central Aleutians	301-500	SE Central Aleutians	2	2	4.55	325	0	3,518
Eastern Aleutians	201-300	NE Eastern Aleutians	23	9	3.80	748	153	1,343
Western Aleutians	101-200	E Western Aleutians	23	4	2.44	306	0	660
Eastern Aleutians	201-300	NW Eastern Aleutians	5	1	2.38	37	0	140
Eastern Aleutians	201-300	SW Eastern Aleutians	6	2	2.19	157	0	522
Central Aleutians	101-200	Petrel Bank	7	2	2.14	371	0	1,106
Central Aleutians	1-100	N Central Aleutians	10	1	2.13	449	0	1,464
Eastern Aleutians	101-200	SW Eastern Aleutians	10	5	1.93	437	0	878
Eastern Aleutians	1-100	SE Eastern Aleutians	8	3	1.84	320	0	699
Southern Bering Sea	201-300	Combined Southern Bering Sea	9	2	1.58	89	0	226
Western Aleutians	201-300	E Western Aleutians	15	5	1.49	117	0	241
Central Aleutians	201-300	SE Central Aleutians	6	1	1.43	68	0	243
Eastern Aleutians	101-200	NE Eastern Aleutians	26	2	1.41	284	0	692
Central Aleutians	201-300	N Central Aleutians	14	4	0.91	40	0	82
Western Aleutians	1-100	E Western Aleutians	14	1	0.84	99	0	313
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.77	34	0	462
Eastern Aleutians	101-200	SE Eastern Aleutians	15	2	0.63	119	0	307
Western Aleutians	301-500	E Western Aleutians	2	1	0.53	83	0	1,138
Central Aleutians	101-200	N Central Aleutians	10	1	0.48	51	0	167
Central Aleutians	201-300	SW Central Aleutians	7	1	0.23	10	0	33
Eastern Aleutians	201-300	SE Eastern Aleutians	10	1	0.12	25	0	83

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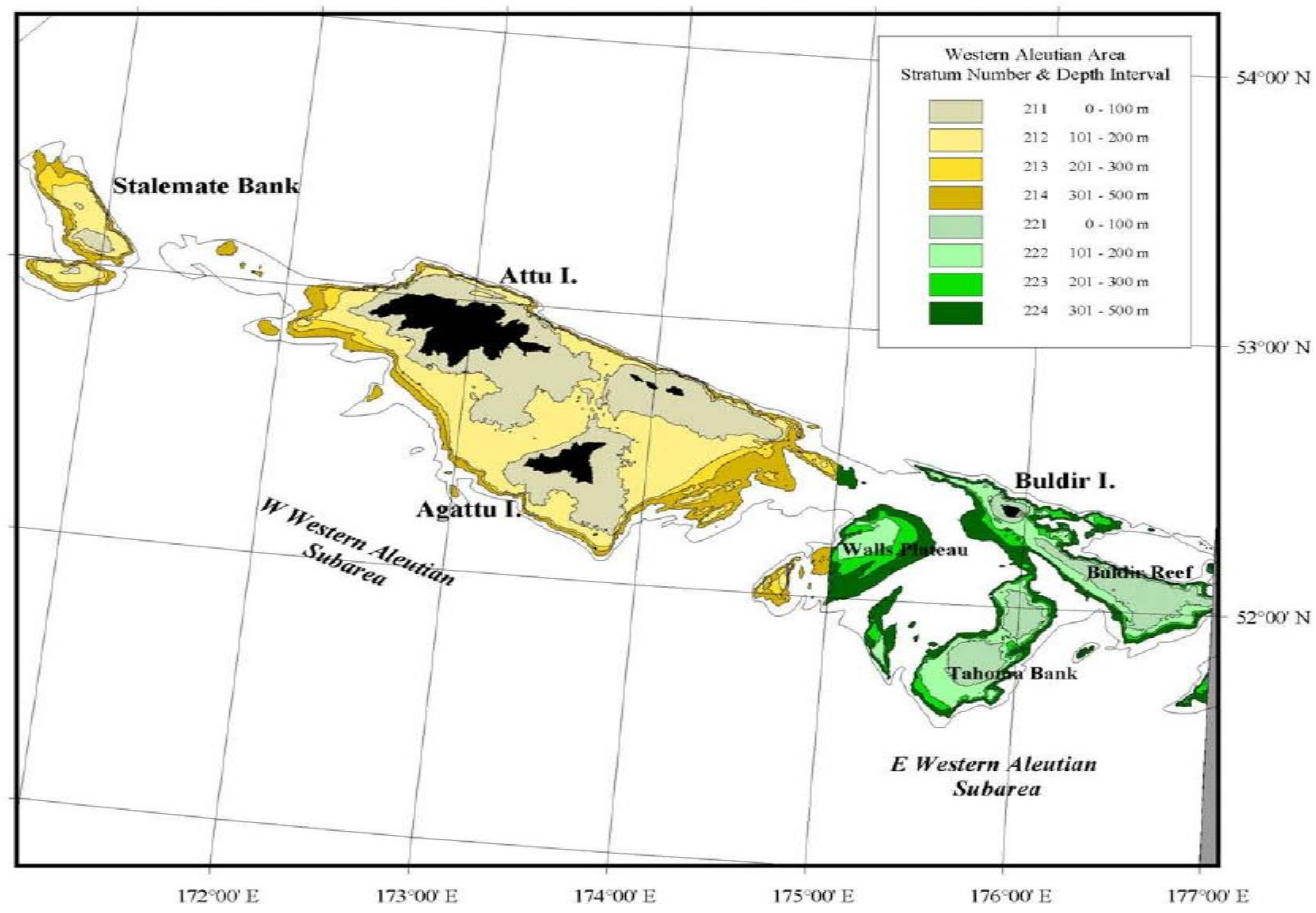
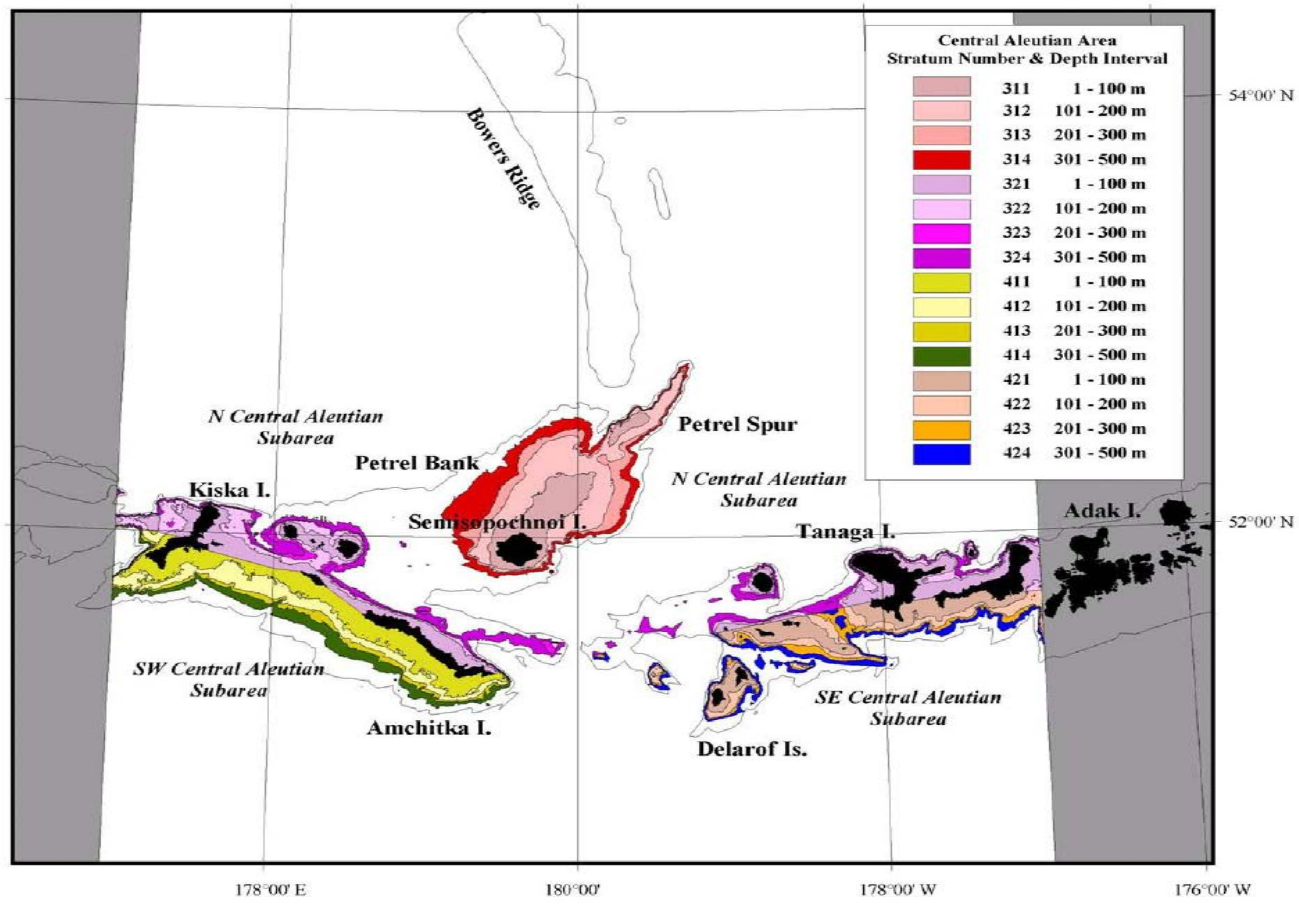
APPENDIX A

Appendix Table A-1. -- Survey strata including sampling districts, subdistricts, subdistrict codes, depth intervals, and areas.

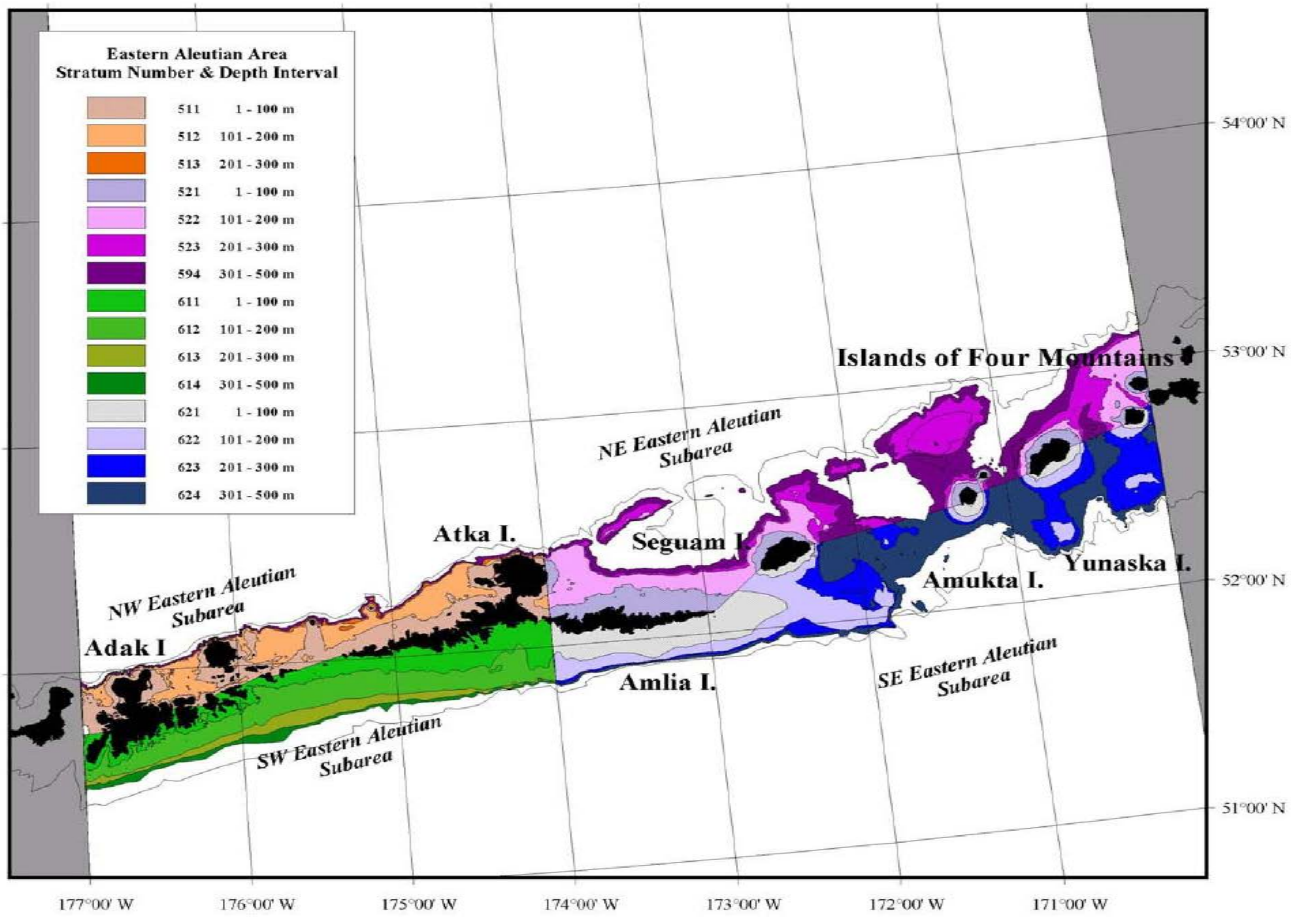
Survey district	Stratum name	Stratum Code	Depth Interval (m)	Area (km^2)
Western Aleutians	W Western Aleutians	211	1-100	3,693
	W Western Aleutians	212	101-200	4,065
	W Western Aleutians	213	201-300	940
	W Western Aleutians	214	301-500	1,711
	E Western Aleutians	221	1-100	1,183
	E Western Aleutians	222	101-200	1,252
	E Western Aleutians	223	201-300	783
	E Western Aleutians	224	301-500	1,561
Central Aleutians	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 Aleutians	321	1-100	2,106
	N Central Aleutians	322	101-200	1,066
	N Central Aleutians	323	201-300	439
	N Central Aleutians	324	301-500	1,240
	SW Central Aleutians	411	1-100	1,618
	SW Central Aleutians	412	101-200	1,052
	SW Central Aleutians	413	201-300	426
	SW Central Aleutians	414	301-500	789
	SE Central Aleutians	421	1-100	1,164
	SE Central Aleutians	422	101-200	752
	SE Central Aleutians	423	201-300	477
	SE Central Aleutians	424	301-500	714
Eastern Aleutians	NW Eastern Aleutians	511	1-100	1,932
	NW Eastern Aleutians	512	101-200	1,594
	NW Eastern Aleutians	513	201-300	156
	NE Eastern Aleutians	521	1-100	1,268
	NE Eastern Aleutians	522	101-200	2,013
	NE Eastern Aleutians	523	201-300	1,969
	Combined Eastern Aleutian Islands	594	301-500	2,670
	SW Eastern Aleutians	611	1-100	1,907
	SW Eastern Aleutians	612	101-200	2,261
	SW Eastern Aleutians	613	201-300	716
	SW Eastern Aleutians	614	301-500	438
	SE Eastern Aleutians	621	1-100	1,741
	SE Eastern Aleutians	622	101-200	1,900
	SE Eastern Aleutians	623	201-300	2,061
	SE Eastern Aleutians	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 Southern Bering Sea	793	201-300	564
	Combined Southern Bering Sea	794	301-500	1,043



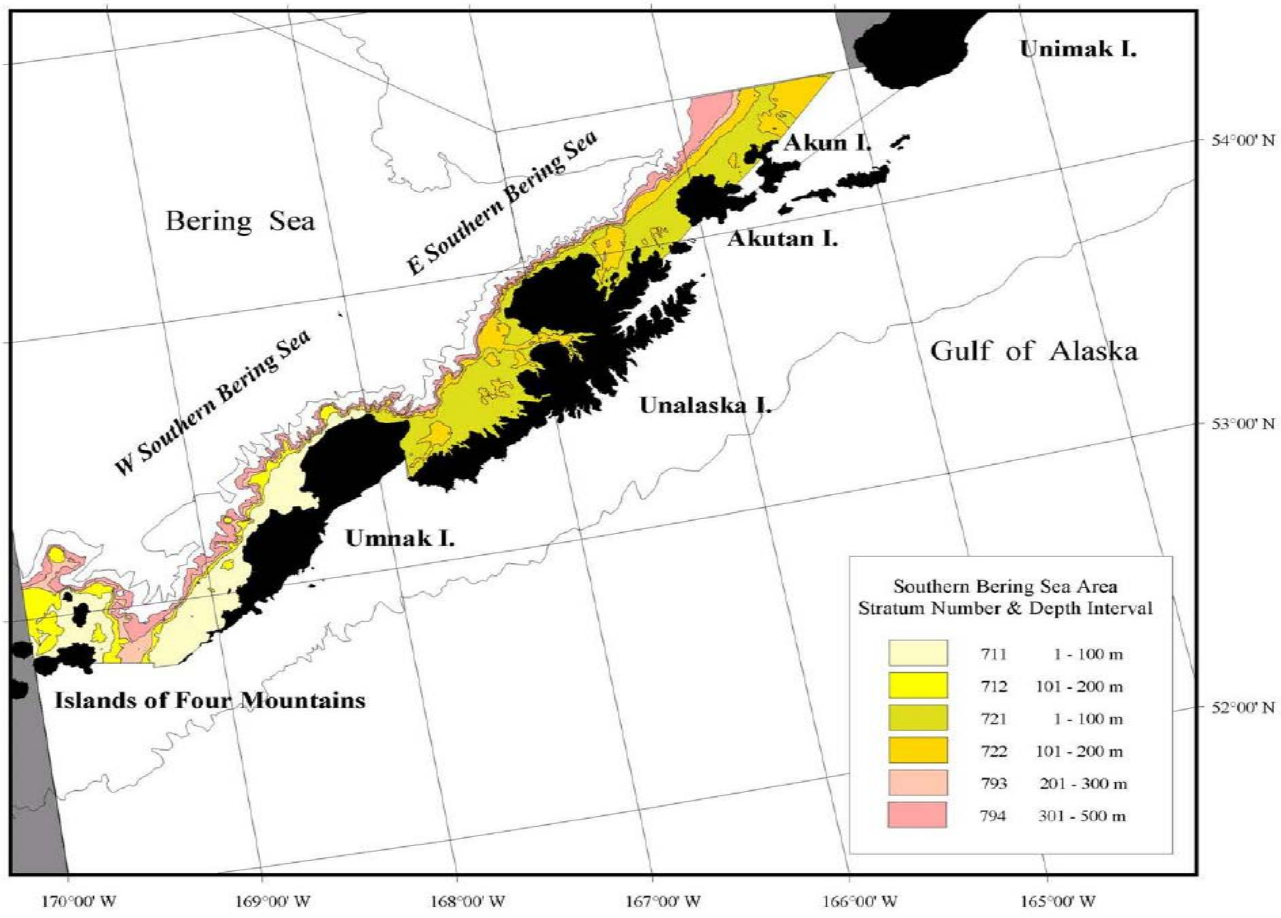
Appendix Figure A-1. -- AI survey strata by subdistricts and depth zones sampled during the 2016 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.



Appendix Figure A-2. -- AI survey strata by subdistricts and depth zones sampled during the 2016 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.



Appendix Figure A-3. -- AI survey strata by subdistricts and depth zones sampled during the 2016 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.



Appendix Figure A-4. -- AI survey strata by subdistricts and depth zones sampled during the 2016 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.

APPENDIX B

Appendix Table B-1. -- Fish species encountered and identified during the 2016 Aleutian Islands bottom trawl survey.

FAMILY	SPECIES_NAME	COMMON_NAME
Squalidae	*Squalus acanthias*	spiny dogfish
Rajidae	*Bathyraja* sp.	
	Bathyraja aleutica	Aleutian skate
	Bathyraja interrupta	Bering skate
	Bathyraja lindbergi	Commander skate
	Bathyraja maculata	whiteblotched skate
	Bathyraja mariposa	butterfly skate
	Bathyraja panthera	leopard skate
	Bathyraja parmifera	Alaska skate
	Bathyraja taranetzi	mud skate
	Raja binoculata	big skate
Clupeidae	*Clupea pallasi*	Pacific herring
Bathylagidae	*Bathylagus ochotensis*	popeye blacksmelt
	Bathylagus pacificus	Pacific blacksmelt
	Leuroglossus schmidti	northern smoothtongue
Osmeridae	*Mallotus villosus*	capelin
	Thaleichthys pacificus	eulachon
Salmonidae	*Oncorhynchus keta*	chum salmon
	Oncorhynchus tshawytscha	chinook salmon
Chauliodontidae	*Chauliodus macouni*	Pacific viperfish
Alepisauridae	*Alepisaurus ferox*	longnose lancetfish
Myctophidae	*Diaphus theta*	California headlightfish
	Lampanyctus jordani	brokenline lampfish
	Myctophidae	lanternfish unid.
	Nannobrachium regale	pinpoint lampfish
	Protomyctophum thompsoni	northern flashlightfish
	Stenobrachius leucopsarus	northern lampfish
	Stenobrachius nannochir	garnet lampfish
	Stenobrachius sp.	
	Tarletonbeania crenularis	blue lanternfish
Macrouridae	*Albatrossia pectoralis*	giant grenadier
	Coryphaenoides cinereus	popeye grenadier
Gadidae	Gadidae	cod unid.
	Gadus chalcogrammus	walleye pollock
	Gadus macrocephalus	Pacific cod
Melamphaeidae	*Melamphaes lugubris*	highsnout bigscale
	Poromitra cristiceps	

	Poromitra curilensis	crested bigscale
Scorpaenidae	*Sebastes* sp.	rockfish unid.
	Sebastes aleutianus	rougheye rockfish
	Sebastes alutus	Pacific ocean perch
	Sebastes babcocki	redbanded rockfish
	Sebastes borealis	shortraker rockfish
	Sebastes ciliatus	dark rockfish
	Sebastes melanops	black rockfish
	Sebastes melanostictus	blackspotted rockfish
	Sebastes polyspinis	northern rockfish
	Sebastes variabilis	dusky rockfish
	Sebastes variegatus	harlequin rockfish
	Sebastes zacentrus	sharpchin rockfish
	Sebastolobus alascanus	shortspine thornyhead
Anoplopomatidae	*Anoplopoma fimbria*	sablefish
Hexagrammidae	*Hexagrammos decagrammus*	kelp greenling
	Hexagrammos lagocephalus	rock greenling
	Hexagrammos stelleri	whitespotted greenling
	Pleurogrammus monopterygius	Atka mackerel
Cottidae	*Artediellus pacificus*	hookhorn sculpin
	Bolinia euryptera	broadfin sculpin
	Dasycottus setiger	spinyhead sculpin
	Enophrys diceraus	antlered sculpin
	Gymnocanthus galeatus	armorhead sculpin
	Hemilepidotus jordani	yellow Irish lord
	Hemilepidotus zapus	longfin Irish lord
	Hemitripterus bolini	bigmouth sculpin
	Icelus sp.	
	Icelus canaliculatus	blacknose sculpin
	Icelus spatula	spatulate sculpin
	Icelus spiniger	thorny sculpin
	Malacocottus zonurus	darkfin sculpin
	Myoxocephalus jaok	plain sculpin
	Myoxocephalus polyacanthocephalus	great sculpin
	Nautichthys pribilovius	eyeshade sculpin
	Psychrolutes phrictus	blob sculpin
	Rastrinus scutiger	roughskin sculpin
	Thyriscus anoplus	sponge sculpin
	Triglops sp.	
	Triglops forficata	scissortail sculpin
	Triglops macellus	roughspine sculpin
	Triglops scepticus	spectacled sculpin

Agonidae	*Agonopsis vulsa*	northern spearnose poacher
	Anoplagonus inermis	smooth alligatorfish
	Bathyagonus alascanus	gray starsnout
	Bathyagonus nigripinnis	blackfin poacher
	Bathyagonus pentacanthus	bigeye poacher
	Hypsagonus quadricornis	fourhorn poacher
	Leptagonus decagonus	Atlantic poacher
	Leptagonus frenatus	sawback poacher
	Leptagonus leptorhynchus	longnose poacher
	Podothecus accipenserinus	sturgeon poacher
Cyclopteridae	*Allocareproctus* sp.	
	Allocareproctus ungak	whiskered snailfish
	Aptocyclus ventricosus	smooth lumpsucker
	Careproctus sp.	
	Careproctus comus	comic snailfish
	Careproctus cypselurus	blackfin snailfish
	Careproctus furcellus	emarginate snailfish
	Careproctus melanurus	blacktail snailfish
	Careproctus scottae	peachskin snailfish
	Crystallichthys cyclospilus	blotched snailfish
	Cyclopteridae	lumpsucker unid.
	Elassodiscus caudatus	humpback snailfish
	Eumicrotremus sp.	spiny lumpsuckers
	Eumicrotremus birulai	round lumpsucker
	Eumicrotremus orbis	Pacific spiny lumpsucker
	Eumicrotremus phrynoides	toad lumpsucker
	Lethotremus muticus	docked snailfish
	Liparidae	snailfish unid.
	Paraliparis cephalus	swellhead snailfish
	Prognatholiparis ptychomandibularis	wrinkle-jaw snailfish
Bathymasteridae	*Bathymaster caeruleofasciatus*	Alaskan ronquil
	Bathymaster leurolepis	smallmouth ronquil
	Bathymaster signatus	searcher
Zoarcidae	*Lycenchelys camchatica*	Kamchatka eelpout
	Lycenchelys crotalinus	snakehead eelpout
	Lycodes beringi	Bering eelpout
	Lycodes brevipes	shortfin eelpout
	Lycodes concolor	ebony eelpout
	Lycodes palearis	wattled eelpout
Stichaeidae	*Bryozoichthys lysimus*	nutcracker prickleback
	Bryozoichthys marjorius	pearly prickleback
Anarhichadidae	*Anarrhichthys ocellatus*	wolf-eel

Zaproridae	*Zaprora silenus*	prowfish
Ammodytidae	*Ammodytes personatus*	Pacific sand lance
Pleuronectidae	*Atheresthes evermanni*	Kamchatka flounder
	Atheresthes stomias	arrowtooth flounder
	Glyptocephalus zachirus	rex sole
	Hippoglossoides elassodon	flathead sole
	Hippoglossus stenolepis	Pacific halibut
	Isopsetta isolepis	butter sole
	Lepidopsetta sp.	rock sole unid.
	Lepidopsetta bilineata	southern rock sole
	Lepidopsetta polyxystra	northern rock sole
	Microstomus pacificus	Dover sole
	Parophrys vetulus	English sole
	Reinhardtius hippoglossoides	Greenland turbot

APPENDIX B

Appendix Table B-2. -- Invertebrate species encountered and identified during the 2016 Aleutian Islands bottom trawl survey.

PHYLUM	SPECIES_NAME	COMMON_NAME
Porifera	Porifera	sponge unid.
	Acanthascus sp.	
	Aphrocallistes vastus	clay pipe sponge
	Asbestopluma sp. A	fuzzy sponge
	Aulosaccus schulzei	vase sponge
	Axinella sp.	firm gray sponge
	Axinella blanca	firm finger sponge
	Chondrocladia gigantea	carnivorous cattail sponge
	Cladocroce attu	rough hat sponge
	Coelosphaeridae	ginseng sponge
	Cornulum clathriata	lattice sponge
	Craniella sp.	puffball sponges
	Craniella arb	
	Craniella craniana	baseball sponge
	Craniella sigmoancoratum	spiny ball sponge
	Craniella sp. B	knobby ball sponge
	Craniella spinosa	furry ball sponge
	Craniella sputnika	spiky ball sponge
	Craniella villosa	
	Demospongiae	
	Echinoclathria sp.	
	Echinoclathria beringensis	hat sponge
	Echinoclathria sp. A	fuzzy tree sponge
	Esperiopsis flagrum	cheesestick sponge
	Farrea sp.	
	Geodia sp.	
	Geodia mesotriaena	soccer ball sponge
	Geodia starki	pita sponge
	Geodinella sp.	
	Geodinella lendenfeldi	calcareous finger sponge
	Halichondria sp.	
	Halichondria oblonga	
	Halichondria panicea	barrel sponge
	Haliclona sp.	
	Haliclona digitata	
	Haliclona sp. 2	
	Heterochone tenera	crusty tube sponge

Hexactinellida	glass sponge unid.
Histodermella kagigunensis	spud sponge
Hymeniacidon assimilis	
Inflatella globosa	yellow ball sponge
Isodictya palmata	prickly pear sponge
Latrunculia sp.	
Latrunculia oparinae	green papillate sponge
Latrunculia sp. B	smooth green sponge
Leucandra heathi	spiny vase sponge
Leucandra tuba	
Monanchora alaskensis	
Monanchora laminachela	
Monanchora pulchra	yellow leafy sponge
Mycale sp.	
Mycale adhaerens	smooth scallop sponge
Mycale bellabellensis	lampshade sponge
Mycale carlilei	trumpet sponge
Mycale loveni	tree sponge
Mycale sp. A	red mycale
Myxilla brunnea	soft brown sponge
Myxilla incrustans	scallop sponge
Myxilla lacunosa	sulfur sponge
Neoesperiopsis rigida	soft finger sponge
Phorbas paucistylifer	
Plakina tanaga	white convoluted sponge
Polymastia sp.	
Polymastia fluegeli	Flugel's nippled sponge
Polymastia pacifica	orange nipple-ball sponge
Polymastia sp. A	prolific nipple sponge
Polymastia sp. C	red nipple sponge
Pseudosuberites montiniger	peach sponge
Rhabdocalyptus sp.	cloud sponge
Semisuberites cribrosa	cat-o-nine-tails sponge
Stelletta sp.	stone sponge
Stelodoryx alaskensis	Alaskan lobed sponge
Stelodoryx oxeata	scapula sponge
Stylocordyla sp.	lollypop sponge
Stylocordyla borealis	slender stalked sponge
Suberites sp.	
Suberites domuncula	hermit sponge
Suberites montalbidus	stinky sponge
Suberites sp. A	wax sponge
Sycon compactum	hairy urn sponge

	Tedania dirhaphis	rough bread crumb sponge
	Tedania kagalaskai	club sponge
	Tentorium semisuberites	two nipple sponge
	Tethya sp.	ball sponge
	Vulcanella sp.	
	Vulcanella sp. 1	fuzzy cratered sponge
	Weberella bursa	pale mammilated sponge
Cnidaria	*Abietinaria* sp.	
	Abietinaria greenei	bushy white hydroid
	Abietinaria sp. A	white tangled hydroid
	Actiniaria	sea anemone unid.
	Actinauge verrilli	reticulate anemone
	Actinostola sp.	
	Actinostola sp. B	
	Actinostolidae	
	Aequorea sp.	
	Aglaophenia sp.	
	Alaskagorgia sp.	
	Alaskagorgia aleutiana	
	Alcyonacea	soft coral unid.
	Alcyonium sp.	
	Alcyonium sp. A	pink orange mushroom coral
	Alcyonium sp. B	
	Anthomastus sp.	
	Anthomastus sp. A	red anthomastus
	Anthoptilum murrayi	Murray sea pen
	Anthozoa	
	Arthrogorgia sp.	
	Arthrogorgia otsukai	
	Atolla sp.	
	Aurelia labiata	
	Bonneviella sp.	
	Bonneviella sp. A	champagne flute hydroid
	Calcigorgia beringi	Bering red sea fan
	Calcigorgia sp.	
	Calcigorgia spiculifera	
	Caryophyllia sp.	
	Chrysaora sp.	chrysaora jellyfish
	Chrysaora fuscescens	sea nettle
	Chrysaora melanaster	
	Chrysopathes speciosa	
	Clavularia incrustans	encrusting coral
	Cribrinopsis fernaldi	chevron-tentacled anemone

Crispatotrochus foxi	cup coral
Cryogorgia koolsae	
Cyanea capillata	lion's mane
Cyclohelia lamellata	
Errinopora sp.	
Errinopora dichotoma	
Errinopora fisheri	
Errinopora nanneca	
Fanellia sp.	
Fanellia compressa	
Fanellia fraseri	
Gersemia sp.	sea raspberry
Halipteris sp.	
Halipteris willemoesi	
Hydroidolina	hydroid unid.
Liponema brevicorne	tentacle-shedding anemone
Metridium farcimen	gigantic anemone
Muriceides nigra	
Oceanactis diomedeae	grape anemone
Paragorgia arborea	Kamchatka coral
Pennatulacea	sea pen or sea whip unid.
Periphylla periphylla	helmet jelly
Phacellophora camtschatica	egg yolk jelly
Phacellophora sp.	
Plumarella sp.	
Plumarella echinata	
Plumarella hapala	
Plumarella nuttingi	loose-branched Plumarella
Plumarella sp. 1	
Plumarella sp. A	
Plumarella sp. B	
Plumarella sp. D	
Plumarella superba	
Primnoa sp.	
Primnoa pacifica	
Primnoa wingi	
Protoptilum sp.	
Ptilosarcus gurneyi	orange sea pen
Scyphozoa	jellyfish unid.
Stomphia sp.	
Stylaster sp.	
Stylaster alaskanus	
Stylaster campylecus	

	Stylaster crassiseptum	
	Stylaster repandus	undulate hydrocoral
	Stylaster trachystomus	
	Swiftia pacifica	
	Thouarella sp.	
	Thouarella cristata	bottlebrush coral
	Urticina sp.	
	Urticina crassicornis	mottled anemone
	Virgulariidae	sea whip unid.
	Zoanthidae sp. A	hot dog zoanthid
Ctenophora	Ctenophora	comb jelly unid.
Annelida	Polychaeta	polychaete worm unid.
	Aphrodita sp.	
	Aphrodita negligens	
	Aphroditidae	sea mouse unid.
	Chaetopterus sp.	
	Cheilonereis cyclurus	
	Eunice valens	
	Eunoe sp.	
	Eunoe nodosa	giant scale worm
	Eunoe senta	
	Hirudinea	leech unid.
	Notostomum cyclostomum	striped sea leech
	Polynoidae	scale worm unid.
	Serpula sp.	
Rhynchocoela	*Emplectonema* sp.	
	Nemertea	nemertean worm unid.
Sipuncula	Sipuncula	peanut worm unid.
Arthropoda	Isopoda	isopod unid.
	Acantholithodes hispidus	fuzzy crab
	Arcturus sp.	
	Argis dentata	Arctic argid
	Balanus sp.	
	Balanus evermanni	giant barnacle
	Balanus nubilus	
	Balanus rostratus	beaked barnacle
	Bentheogennema borealis	
	Cancer oregonensis	Oregon rock crab
	Chionoecetes bairdi	Tanner crab
	Chorilia longipes	longhorned decorator crab
	Colossendeis sp.	
	Crangon sp.	
	Crangon alaskensis	shell shrimp

Crangon dalli	ridged crangon
Dermaturus mandtii	wrinkled crab
Elassochirus cavimanus	purple hermit
Elassochirus gilli	Pacific red hermit
Elassochirus tenuimanus	widehand hermit crab
Erimacrus isenbeckii	horsehair crab
Eualus sp.	
Eualus barbatus	barbed eualid
Eualus biunguis	deepsea eualid
Eualus suckleyi	shortscale eualid
Hapalogaster grebnitzkii	soft crab
Hyas lyratus	Pacific lyre crab
Labidochirus splendescens	splendid hermit
Lebbeus groenlandicus	spiny lebbeid
Lebbeus washingtonianus	slope lebbeid
Lithodes aequispinus	golden king crab
Munida quadrispina	pinchbug
Neognathophausia gigas	giant red mysid
Oregonia gracilis	graceful decorator crab
Pagurus sp.	
Pagurus aleuticus	Aleutian hermit
Pagurus brandti	sponge hermit
Pagurus capillatus	hairy hermit crab
Pagurus confragosus	knobbyhand hermit
Pagurus cornutus	hornyhand hermit
Pagurus kennerlyi	bluespine hermit
Pagurus rathbuni	longfinger hermit
Pagurus trigonocheirus	fuzzy hermit crab
Pandalopsis sp.	
Pandalopsis aleutica	
Pandalopsis dispar	sidestripe shrimp
Pandalopsis longirostris	
Pandalopsis sp. cf. *lamelligera*	
Pandalus sp.	
Pandalus eous	Alaskan pink shrimp
Pandalus goniurus	humpy shrimp
Pandalus jordani	ocean shrimp
Pandalus stenolepis	roughpatch shrimp
Pandalus tridens	yellowleg pandalid
Paralithodes camtschaticus	red king crab
Pasiphaea pacifica	Pacific glass shrimp
Placetron wosnessenskii	scaled crab
Pycnogonida	sea spider unid.

	Rhinolithodes wosnessenskii	rhinoceros crab
	Rhynocrangon alata	saddleback shrimp
	Rhynocrangon sharpi	
	Rocinella angusta	
	Sclerocrangon boreas	sculptured shrimp
	Thoracica	barnacle unid.
Mollusca	Polyplacophora	chiton unid.
	Anisodoris lentiginosa	mottled pale sea-lemon
	Archidorididae	archidorid nudibranchs
	Archidoris sp.	Archidoris nudibranch
	Archidoris odhneri	white night doris
	Arctomelon sp. cf. *stearnsii*	
	Arctomelon stearnsii	Alaska volute
	Arctomelon tamikoae	
	Astarte elliptica	elliptical astarte
	Bathybuccinum ovulum	
	Benthoctopus leioderma	smoothskin octopus
	Benthoctopus oregonensis	
	Benthoctopus sp.	
	Beringius sp.	
	Beringius beringii	
	Beringius crebricostatus	thick-cord whelk
	Beringius sp. D	
	Beringius sp. I	
	Berryteuthis magister	magistrate armhook squid
	Bivalvia	bivalve unid.
	Buccinum sp.	
	Buccinum bulimuloideum	
	Buccinum castaneum	chestnut whelk
	Buccinum eugrammatum	lirate whelk
	Buccinum oedematum	swollen whelk
	Buccinum picturatum	
	Buccinum plectrum	sinuous whelk
	Buccinum scalariforme	ladder whelk
	Bulbus fragilis	fragile moonsnail
	Chiroteuthis calyx	
	Chlamylla sp.	
	Chlamys sp.	
	Clinocardium sp.	
	Clinocardium blandum	low-rib cockle
	Colga pacifica	Pacific Colga
	Colus sp.	
	Colus hypolispus	

Colus jordani	
Cranopsis major	great puncturella
Cryptonatica affinis	Arctic moonsnail
Cryptonatica aleutica	Aleutian moonsnail
Cryptonatica russa	rusty moonsnail
Decapodiformes	squid unid.
Dirona aurantia	
Empleconia vaginata	vaginated limops
Enteroctopus dofleini	giant octopus
Fusitriton oregonensis	Oregon triton
Gastropoda	snail unid.
Gonatopsis borealis	boreopacific armhook squid
Gonatus onyx	clawed armhook squid
Hiatella arctica	Arctic hiatella
Japelion sp. A	
Lamellaria sp.	
Lamellaria sp. C	
Lamellaria sp. F	white lamellarid
Leptochiton sp.	
Macoma sp.	
Mangelia carlotta	
Modiolus modiolus	northern horsemussel
Musculus discors	discordant mussel
Neptunea sp.	
Neptunea amianta	white neptune
Neptunea insularis	
Neptunea lyrata	lyre whelk
Neptunea pribiloffensis	Pribilof whelk
Neptunea smirnia	
Neptunea sp. B	
Nudibranchia	nudibranch unid.
Octopodidae	octopus unid.
Onchidiopsis sp.	
Onchidiopsis glacialis	icy lamellaria
Onchidiopsis sp. A	
Opisthoteuthis californiana	flapjack devilfish
Placiphorella pacifica	
Pododesmus sp.	
Pododesmus cepio	abalone jingle
Pododesmus macrochisma	Alaska falsejingle
Pyrulofusus sp.	
Pyrulofusus deformis	warped whelk
Pyrulofusus dexius	

	Pyrulofusus harpa	left-hand whelk
	Pyrulofusus melonis	
	Rossia pacifica	eastern Pacific bobtail
	Sasakiopus salebrosus	pygmy benthoctopus
	Tochuina tetraquetra	giant orange tochui
	Tritonia sp.	
	Velutina conica	conical lamellaria
	Volutopsius sp.	
	Volutopsius callorhinus	
	Volutopsius simplex	simple whelk
Bryozoa	Bryozoa	bryozoan unid.
	Alcyonidium sp.	
	Alcyonidium disciforme	disc bryozoan
	Alcyonidium pedunculatum	
	Alcyonidium sp. A	medusa bryozoan
	Bugula pacifica	
	Celleporina sp.	
	Celleporina ventricosa	coral bryozoan
	Dendrobeania sp.	
	Flustra serrulata	leafy bryozoan
	Microporina sp.	
	Microporina articulata	
	Myriapora sp.	
	Myriapora orientalis	
	Phidolopora pacifica	lattice-work bryozoan
	Porella sp.	
	Porella compressa	flattened bryozoan
	Rhamphostomella costata	ribbed bryozoan
Brachiopoda	*Hemithiris psittacea*	black brachiopod
	Terebratalia transversa	common brachiopod
Echinodermata	*Aleutiaster* sp.	
	Anteliaster nannodes	
	Astrochele sp.	
	Astrochele laevis	
	Bathyplotes sp.	
	Ceramaster sp.	
	Ceramaster clarki	
	Ceramaster japonicus	red bat star
	Ceramaster patagonicus	orange bat sea star
	Ceramaster stellatus	
	Cheiraster sp.	
	Cheiraster dawsoni	fragile sea star
	Cheiraster sp. A	Aleutian fragile sea star

Chiridota sp.	
Cladaster validus	
Crossaster sp.	
Crossaster papposus	rose sea star
Crossaster sp. A	white rose star
Ctenodiscus crispatus	common mud star
Cucumaria fallax	sea football
Cucumaria frondosa	
Diplopteraster multipes	pincushion sea star
Dipsacaster borealis	northern sea star
Echinarachnius parma	parma sand dollar
Evasterias sp.	
Evasterias troschelii	mottled sea star
Florometra inexpectata	
Florometra sp.	
Gephyreaster swifti	Swift's sea star
Gorgonocephalus sp.	
Gorgonocephalus eucnemis	basketstar
Henricia sp.	
Henricia aleutica	
Henricia aspera	ridged blood star
Henricia asthenactis	
Henricia dyscrita	short-spined Henricia
Henricia leviuscula	blood sea star
Henricia longispina	
Henricia sanguinolenta	sanguine sea star
Henricia sp. B	white Henricia
Henricia sp. C	mottled Henricia
Henricia sp. D	fuzzy henricia
Henricia sp. E	slender pale Henricia
Henricia spiculifera	spiny Henricia
Hippasteria sp.	
Hippasteria armata	
Hippasteria kurilensis	
Hippasteria sp. A	
Hippasteria spinosa	spiny red sea star
Holothuroidea	sea cucumber unid.
Leptasterias sp.	
Leptasterias groenlandica	
Leptasterias hylodes	Aleutian sea star
Leptasterias katharinae	
Leptasterias truculenta	giant Aleutian six-rayed star
Leptychaster sp.	

Leptychaster anomalus	
Leptychaster arcticus	North Pacific sea star
Leptychaster pacificus	
Lethasterias sp.	
Lethasterias nanimensis	blackspined sea star
Lophaster sp. A	
Lophaster vexator	crested star
Mediaster sp.	
Mediaster aequalis	vermilion sea star
Nearchaster sp.	
Nearchaster variabilis	
Odontohenricia sp.	
Odontohenricia fisheri	
Odontohenricia sp. A	
Odontohenricia sp. B	
Odontohenricia sp. C	
Ophiacantha sp.	
Ophiacantha enneactis	
Ophiacantha normani	
Ophiolebes sp.	
Ophiolebes sp. F	
Ophiopholis aculeata	ubiquitous brittle star
Ophiopholis longispina	
Ophiopholis sp.	
Ophiura sp.	
Ophiura lutkeni	gray brittle star
Ophiura sarsi	notched brittlestar
Orthasterias koehleri	redbanded sea star
Pannychia moseleyi	deep sea papillate cucumber
Pedicellaster magister	majestic sea star
Pentamera lissoplaca	crescent sea cucumber
Pseudarchaster alascensis	
Pseudarchaster parelii	scarlet sea star
Pseudarchaster sp.	
Psolus sp.	
Psolus fabricii	brownscaled sea cucumber
Psolus sp. A	
Pteraster sp.	
Pteraster jordani	
Pteraster marssipus	
Pteraster militaris	wrinkled star
Pteraster sp. A	
Pteraster sp. B	

	Pteraster sp. C	
	Pteraster sp. D	
	Pteraster temnochiton	cushion sea star
	Pteraster tesselatus	
	Pycnopodia helianthoides	sunflower sea star
	Solaster sp.	
	Solaster dawsoni	morning sun sea star
	Solaster hypothrissus	
	Solaster sp. A	
	Solaster sp. C	beautiful sun star
	Solaster sp. D	serpent sun star
	Stegophiura ponderosa	
	Strongylocentrotus droebachiensis	green sea urchin
	Strongylocentrotus pallidus	white sea urchin
	Strongylocentrotus sp.	
	Stylasterias forreri	long-rayed star
	Synallactes sp.	
	Synallactes challengeri	
	Synallactes sp. A	
	Thylonidium sp.	
Chordata	*Amaroucium soldatovi*	
	Aplidium sp.	
	Aplidium californicum	
	Aplidium n. sp. A	orange aplidium
	Aplidium sp. A	sea glob
	Ascidia paratropa	glassy tunicate
	Ascidiacea	tunicate unid.
	Boltenia ovifera	
	Botryllus schlosseri	
	Cnemidocarpa finmarkiensis	broad base tunicate
	Distaplia sp.	
	Distaplia occidentalis	
	Distaplia smithi	
	Distaplia sp. A	
	Halocynthia aurantium	sea peach
	Styela rustica	sea potato
	Synoicum sp.	sea blob
	Thaliacea	salp unid.
	Tridemnum opacum	

APPENDIX C

Appendix Table C-1. -- Length-weight parameters (a and b) for species where individual length and weight data were collected and fitted to the model $W = aL^b$. The number of individuals measured and weighed (n) is also provided.

Species	Sex	a	b	n
Atheresthes stomias	Male	2.422E-06	3.199	176
	Female	1.952E-06	3.246	308
	Both	1.888E-06	3.248	484
Atheresthes evermanni	Male	3.072E-06	3.170	219
	Female	2.095E-05	3.241	236
	Both	2.373E-06	3.218	455
Reinhardtius hippoglossoides	Male	3.068E-05	2.795	29
	Female	---	---	2
	Both	3.194E-06	3.142	31
Lepidopsetta polyxystra	Male	5.001E-06	3.132	174
	Female	4.987E-06	3.134	204
	Both	4.843E-06	3.139	378
Lepidopsetta bilineata	Male	6.954E-06	3.082	80
	Female	3.062E-06	3.234	151
	Both	3.626E-06	3.202	231
Gadus macrocephalus	Male	3.019E-06	3.200	374
	Female	3.102E-06	3.197	360
	Both	3.062E-06	3.198	734
Gadus chalcogrammus	Male	7.321E-06	2.992	340
	Female	8.709E-06	2.965	422
	Both	7.886E-06	2.981	762
Pleurogrammus monopterygius	Male	7.019E-06	3.099	154
	Female	2.270E-05	2.892	149
	Both	1.385E-05	2.980	303
Sebastes melanostictus	Male	4.047E-06	3.225	167
	Female	3.001E-06	3.278	156
	Both	3.478E-06	3.252	323
Sebastes alutus	Male	1.211E-05	3.018	590
	Female	1.027E-05	3.045	477
	Both	1.097E-05	3.035	1067
Sebastes variabilis	Male	7.467E-06	3.136	64
	Female	7.500E-06	3.135	62
	Both	7.516E-06	3.135	126
Sebastes polyspinis	Male	1.449E-05	2.991	210
	Female	3.874E-05	2.821	373
	Both	2.759E-05	2.879	583
Sebastes borealis	Male	8.203E-06	3.112	180
	Female	5.135E-06	3.191	184
	Both	6.585E-06	3.149	364
Hemilepidotus jordani	Male	1.984E-06	3.304	145
	Female	2.565E-06	3.267	173
	Both	2.333E-06	3.280	318

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