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Data Report: 2018 Aleutian Islands Bottom Trawl Survey

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September 2020

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
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NOAA FISHERIES

Data Report: 2018 Aleutian Islands Bottom Trawl Survey

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ABSTRACT

The ninth biennial groundfish assessment survey of the Aleutian Islands region was conducted during the summer of 2018 by the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering Division's Groundfish Assessment Program (RACE-GAP). This effort constitutes the fifteenth 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 *Ocean Explorer* and FV *Sea Storm*. Samples were collected successfully at 420 survey stations using standard RACE Division Poly Nor'Eastern high-opening bottom trawl nets with rubber bobbin roller gear.

The primary survey objectives were to define the distribution and estimate the relative abundance of commercially or ecologically important principal groundfish 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 1,016,309 metric tons (t). Atka mackerel (*Pleurogrammus monopterygius*), northern rockfish (*Sebastes polyspinis*), and walleye pollock (*Gadus chalcogrammus*) were also abundant with estimated biomasses of 354,871, 212,536 t, and 197,079 t, respectively. Catches of POP were large throughout the survey area at intermediate depths. Arrowtooth flounder (*Atheresthes stomias*) and northern rock sole (*Lepidopsetta polyxystra*) were the most abundant flatfish species. 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.

CONTENTS

INTRODUCTION

The 2018 biennial bottom trawl survey of the Aleutian Islands region was conducted from 6 June through 14 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 fifteenth 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 2018 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 North Pacific Groundfish Stock Assessments and Fishery Evaluation Reports[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 flatfishes, Pacific cod, different species of octocorals, and Pacific sleeper and salmon sharks. Additional projects included collection of snailfish, Pacific lamprey, and mollusk voucher specimens; collection of bathymetry data around Amlia and Adak; collection of crabs and a variety of fish specimen for outreach programs and observer training; collection of demosponges for cancer study; Pacific halibut tagging; impact of parasites in northern rockfish reproductive success; ambient light levels during fishing operations; acoustic profiling; evaluation of the counted basket method in survey catch processing; and use of a fish sexing video prototype.

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

[1] https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation

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 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.

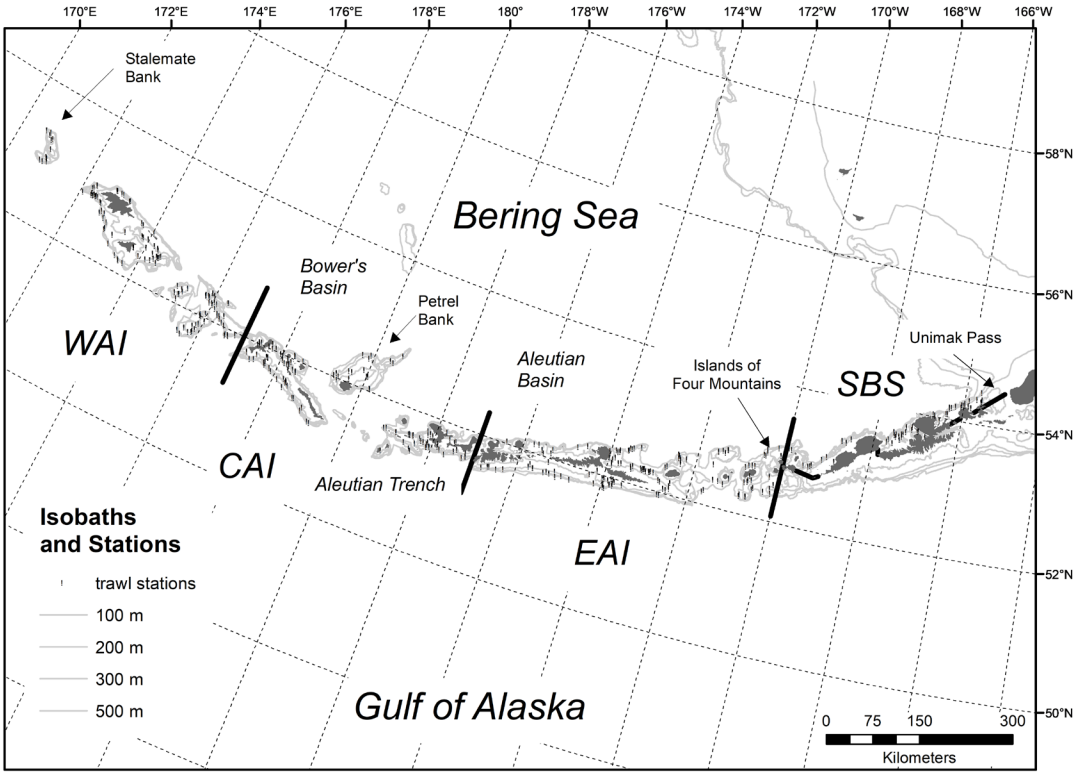


Figure 1. -- Map of the Aleutian Islands 2018 bottom trawl survey area indicating survey districts (WAI = Western Aleutian Islands, CAI = Central Aleutian Islands, EAI = Eastern Aleutian Islands, and SBS = Southern Bering Sea), isobaths from 100–500 m and stations sampled (black dots).

Vessels

The two U.S. commercial fishing vessels chartered for the 2018 AI bottom trawl survey were the FV *Ocean Explorer* and the FV *Sea Storm.* Both vessels are house-forward stern trawlers with hydraulic net reels and paired constant tension (autotrawl) hydraulic trawl winches containing between 1,280 and 1,460 m of 2.60 cm diameter steel cable. Both vessels have articulating hydraulic cranes for handling catches and gear. The *Sea Storm* is 37.5 m in overall length (LOA) and is powered by a single 1,710 continuous horsepower (HP) main engine. The *Ocean Explorer* is 47.2 m LOA with a 1,800 HP main engine. The *Sea Storm* has two net reels mounted aft over the stern trawl ramp while the *Ocean Explorer* utilizes a forward and stern net reel. Both vessels are equipped with global positioning systems (GPS) integrated with radar, computerized plotting, and autopilots. Other essential electronics supplied by the vessels include color video fish finders, recording depth profilers, and trawl warp measuring systems. The survey was divided into three legs of approximately equal length with a port call between each to accommodate crew changes and to resupply. Captains Dan Carney and Adam White operated the *Ocean Explorer* during the survey 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 RACE-GAP Poly Nor'Eastern high-opening bottom trawls. The headrope measures 27.2 m, and the footrope measures 36.3 m based upon the schematic diagram in Stauffer (2004) and recent measurements. The footrope includes roller gear in a 24.4 m main body consisting of 36 cm rubber bobbins separated by 10 cm rubber disks and 5.94 m wing extensions of 10 and 20 cm rubber disks extending from each side of the main body to the forward thimble. Under fishing conditions, the average net width is 16.0 m and average height is 6.7 m based on acoustic net mensuration equipment mounted on the wing-tips and headrope of the trawl. Each trawl was certified as conforming to measurements and dimension standards 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) North Pacific Fishery Management Council (NPFMC) 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 border differences between the NMFS Management Zones and International North Pacific Fisheries Commission (INPFC) Regions that were used to design the AI bottom trawl survey. The SBS is a compilation of several NMFS districts. These four survey districts are further divided into 45 strata defined by geographic subdistricts and

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

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, von Szalay et al. 2017), 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, 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 of the 420 allocated tow locations were selected randomly without replacement from a database of previously conducted tows. As a result, the vast majority of allocated stations for the 2018 survey were placed at or near locations successfully sampled during previous surveys. Assigned sample densities were highest in the 101 –200 and 201–300 m depth intervals at about 10 tows per 1,000 km^2 in each interval (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. We also avoided operating in northern sea lion no-transit zones by precisely navigating within the station but outside the zone or by seeking an alternate sampling site. Search time to find an alternate station was limited to 2 hours of searching a 5 × 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 2018 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	25	26	25	4,877	5.13
	101 - 200	73	76	73	5,318	13.73
	201 - 300	25	25	25	1,724	14.50
	301 - 500	6	6	6	3,272	1.83
	All depths	**129**	**133**	**129**	**15,190**	**8.49**
Central Aleutians	1 - 100	34	34	34	5,847	5.81
	101 - 200	52	52	52	4,606	11.29
	201 - 300	24	25	24	2,109	11.38
	301 - 500	10	10	10	3,981	2.51
	All depths	**120**	**121**	**120**	**16,543**	**7.25**
Eastern Aleutians	1 - 100	18	18	18	6,848	2.63
	101 - 200	61	61	61	7,768	7.85
	201 - 300	39	39	39	4,901	7.96
	301 - 500	8	10	8	5,683	1.41
	All depths	**126**	**128**	**126**	**25,200**	**5.00**
Southern Bering Sea	1 - 100	20	20	20	4,026	4.97
	101 - 200	14	14	14	1,849	7.57
	201 - 300	7	7	7	564	12.41
	301 - 500	4	5	4	1,043	3.83
	All depths	**45**	**46**	**45**	**7,482**	**6.01**
All areas	1 - 100	97	98	97	21,598	4.49
	101 - 200	200	203	200	19,540	10.24
	201 - 300	95	96	95	9,298	10.22
	301 - 500	28	31	28	13,979	2.00
	All depths	**420**	**428**	**420**	**64,415**	**6.52**

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 one to three seconds 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 mensuration equipment. 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

Numbers and weights in catch of all taxa were recorded for each haul. Catches were sorted to species or other appropriate taxonomic levels and then weighed in aggregate using an electronic motion-compensating scale. 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. An alternative volumetric method was used for dominant species by weighing and averaging 30 full sorting baskets and applying the mean weight to the count of unweighed baskets discarded back to the sea (Rugolo et al. In Press). 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 INPFC. A random subsample of 50-200 specimens (target sample size was species-dependent) 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 shortspine thornyhead and 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.

Species or species group	**Target sample size**
Walleye pollock	200
Pacific cod	150
Arrowtooth flounder	150
All rockfish species	150
Sablefish	150
Atka mackerel	100
All species of flatfish (except ATF)	100
Skates and sharks (total length)	50
Grenadiers (tip of snout to insertion of first anal ray)	50
Prowfish	*
Lincod	*
Salmon	*
Yellow Irish lord (*Hemilepidotus jordani*)	*
Bigmouth sculpiin (*Hemilepidotus bolini*)	*
Great sculpin (*Myoxocephalus polyacanthocephalus*)	*
Plain sculpin (*Myoxocephalus jaok*)	*
Shorthorn sculpin (*Myoxocephalus scorpius*)	*
Forage fish (herring, eulachon, capelin, sand lance)	*
Commander squid (*Berryteuthis magister*)	*

When recording fish length, the most common measurement used was fork length (FL), however sharks, skates, and flatfishes without a fork were measured using total length (TL), and giant

grenadier were measured from the tip of the snout to the insertion of the anal fin. Fish that could not be readily sexed were classified as unsexed and measured. 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. Age structures (otoliths) were collected for many fish species. In 2018, samples were selected randomly for all species for the first time in the Aleutian Islands bottom trawl survey. 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. The survey may also be viewed as a index survey because the sampling frame is a list of successfully sampled stations and stations are not randomly selected from the available habitat. 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 all of the 420 preselected stations and 428 stations were attempted (Table 1). There were 447 attempted tows. All successful tows were included in the biomass and size composition analysis. Marport net spread was successfully recorded for 414 of the 420 successfully sampled stations. For the ~1% 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 at depth were recorded at all successfully trawled stations and temperatures for the surface were recorded for all but eight of the successfully trawled stations. Average bottom temperatures ranged from 3.7° to 6.4°C. Sea surface temperatures ranged from 4.6° to 11.5°C.

Results by Area

At least 150 fish species from 29 families and 486 invertebrate species or taxa from 10 phyla were captured during the 2018 survey. Appendix B lists all fish (Appendix Table B-1) and invertebrate (Appendix Table B-2) taxa encountered during the survey. Because the primary focus of this report is on groundfish populations, 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 2018, for combined Aleutian areas, and for the entire survey region (Table 2). Pacific ocean perch (POP) was by far 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 walleye pollock (Table 2). The only species with a CPUE even close to that of POP in any area was Atka mackerel in the Eastern 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 cottid and skate 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 that 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 Integrated Taxonomic Information System (ITIS)[3].

[3] https://www.itis.gov/

Table 2. -- Mean CPUE (kg/ha) for the 20 most abundant groundfish species in each survey district during the 2018 Aleutian Islands bottom trawl survey

Western Aleutians	CPUE	Central Aleutians	CPUE	Eastern Aleutians	CPUE
Pacific ocean perch	281.4	Pacific ocean perch	118.2	Pacific ocean perch	110.4
Atka mackerel	88.7	northern rockfish	36.0	Atka mackerel	66.7
northern rockfish	65.0	giant grenadier	25.2	walleye pollock	48.5
northern rocksole	10.9	walleye pollock	16.7	giant grenadier	21.9
walleye pollock	10.5	Atka mackerel	16.1	Pacific cod	19.5
shortraker rockfish	7.9	Pacific cod	12.5	arrowtooth flounder	8.6
Pacific cod	7.5	northern rocksole	7.5	northern rockfish	8.0
arrowtooth flounder	6.7	Kamchatka flounder	6.9	Pacific halibut	6.2
shortspine thornyhead	5.2	arrowtooth flounder	5.4	shortraker rockfish	4.5
Kamchatka flounder	3.9	Pacific halibut	2.7	whiteblotched skate	4.4
flathead sole	3.0	yellow Irish lord	2.2	northern rocksole	3.8
giant grenadier	2.9	shortspine thornyhead	2.1	Kamchatka flounder	2.7
rex sole	1.9	shortraker rockfish	1.8	yellow Irish lord	2.6
whiteblotched skate	1.6	sablefish	1.5	blackspotted rockfish	2.6
prowfish	1.2	blackspotted rockfish	1.4	sablefish	1.9
leopard skate	1.1	rex sole	0.8	rex sole	1.3
Pacific halibut	1.0	prowfish	0.8	shortspine thornyhead	0.8
Aleutian skate	0.9	Alaska skate	0.7	mud skate	0.7
magistrate armhook squid	0.7	magistrate armhook squid	0.7	Aleutian skate	0.7
blackspotted rockfish	0.4	Aleutian skate	0.6	giant octopus	0.6
Number of hauls	129	Number of hauls	120	Number of hauls	126

Combined Aleutian Districts	CPUE	Southern Bering Sea	CPUE	All Districts Combined	CPUE
Pacific ocean perch	158.3	Pacific ocean perch	153.8	Pacific ocean perch	157.8
Atka mackerel	57.9	northern rockfish	45.6	Atka mackerel	55.1
northern rockfish	31.3	walleye pollock	42.0	northern rockfish	33.0
walleye pollock	29.1	Atka mackerel	34.3	walleye pollock	30.6
giant grenadier	17.8	arrowtooth flounder	25.0	giant grenadier	15.7
Pacific cod	14.3	Pacific cod	19.6	Pacific cod	14.9
arrowtooth flounder	7.2	southern rocksole	12.7	arrowtooth flounder	9.2
northern rocksole	6.8	Pacific halibut	9.2	northern rocksole	6.8
shortraker rockfish	4.6	rex sole	7.9	Kamchatka flounder	4.6
Kamchatka flounder	4.2	northern rocksole	7.3	Pacific halibut	4.4
Pacific halibut	3.8	Kamchatka flounder	6.9	shortraker rockfish	4.1
whiteblotched skate	2.5	Aleutian skate	3.5	whiteblotched skate	2.4
shortspine thornyhead	2.3	sablefish	3.2	shortspine thornyhead	2.3
yellow Irish lord	1.9	yellow Irish lord	2.4	rex sole	2.1
blackspotted rockfish	1.7	dusky rockfish	2.2	yellow Irish lord	1.9
sablefish	1.3	shortspine thornyhead	2.1	southern rocksole	1.7
rex sole	1.3	flathead sole	1.9	sablefish	1.6
flathead sole	1.0	whiteblotched skate	1.4	blackspotted rockfish	1.5
Aleutian skate	0.7	starry flounder	0.7	flathead sole	1.1
prowfish	0.6	giant octopus	0.4	Aleutian skate	1.0
Number of hauls	375	Number of hauls	45	Number of hauls	420

Flatfish

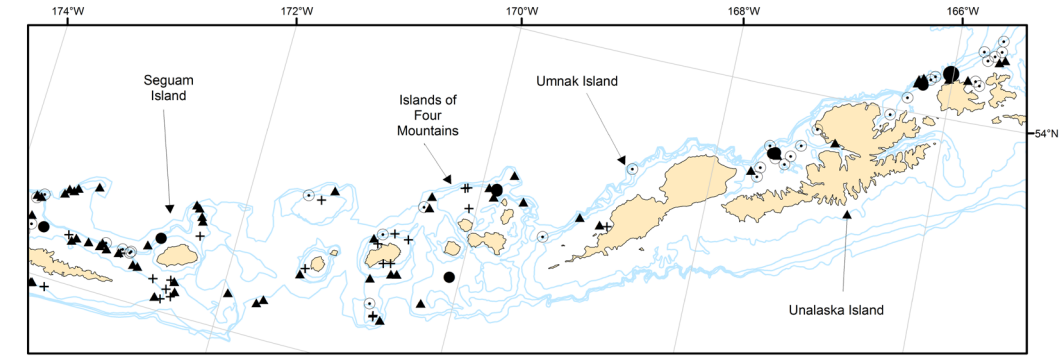
Arrowtooth flounder (*Atheresthes stomias*)

Arrowtooth flounder was the seventh most abundant species caught in the 2018 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 generally recorded in subdistricts within the Central and Eastern Aleutians and Southern Bering Sea survey districts in waters from 101 to 300 m (Fig. 2 and Table 4). Size consistently increased with depth in all survey districts. 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 59,493 t, and the highest survey district biomass was in the Eastern Aleutian Islands, where 36% of the estimated biomass was concentrated (Table 3).

Table 3. -- Summary by survey districts and depth intervals of 2018 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	25	16	6.17	3,008	1,523	4,493	0.397
	101 - 200	73	58	11.67	6,204	4,089	8,320	0.983
	201 - 300	25	17	4.34	748	257	1,239	2.028
	301 - 500	6	2	0.6	197	0	866	3.950
	All depths	129	93	6.69	10,158	7,542	12,773	0.710
Central Aleutians	1 - 100	34	27	2.57	1,503	0	3,197	0.516
	101 - 200	52	45	6.21	2,861	1,565	4,156	0.820
	201 - 300	24	20	12.85	2,711	0	6,512	1.803
	301 - 500	10	7	4.68	1,864	0	7,039	2.505
	All depths	120	99	5.4	8,938	3,635	14,242	1.033
Eastern Aleutians	1 - 100	18	10	3.44	2,357	0	8,991	0.326
	101 - 200	61	45	13.03	10,121	1,687	18,556	0.760
	201 - 300	39	38	17.54	8,599	1,717	15,482	0.882
	301 - 500	8	6	1.05	595	0	1,730	1.279
	All depths	126	99	8.6	21,672	10,715	32,629	0.705
Combined Aleutian Districts	1 - 100	77	53	3.91	6,867	1,242	12,492	0.387
	101 - 200	186	148	10.85	19,186	10,425	27,948	0.830
	201 - 300	88	75	13.81	12,058	4,201	19,915	1.037
	301 - 500	24	15	2.05	2,657	0	5,750	2.109
	All depths	375	291	7.16	40,768	28,705	52,831	0.759
Southern Bering Sea	1 - 100	20	19	14.17	5,707	3,519	7,894	0.435
	101 - 200	14	14	37.43	6,919	1,821	12,017	0.701
	201 - 300	7	7	20.4	1,150	0	2,546	0.966
	301 - 500	4	4	47.44	4,949	0	12,804	1.009
	All depths	45	44	25.03	18,725	9,814	27,635	0.644

a)



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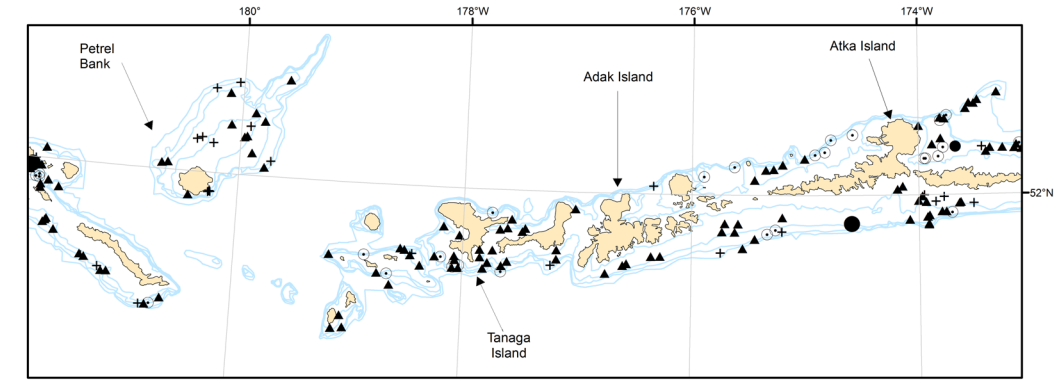

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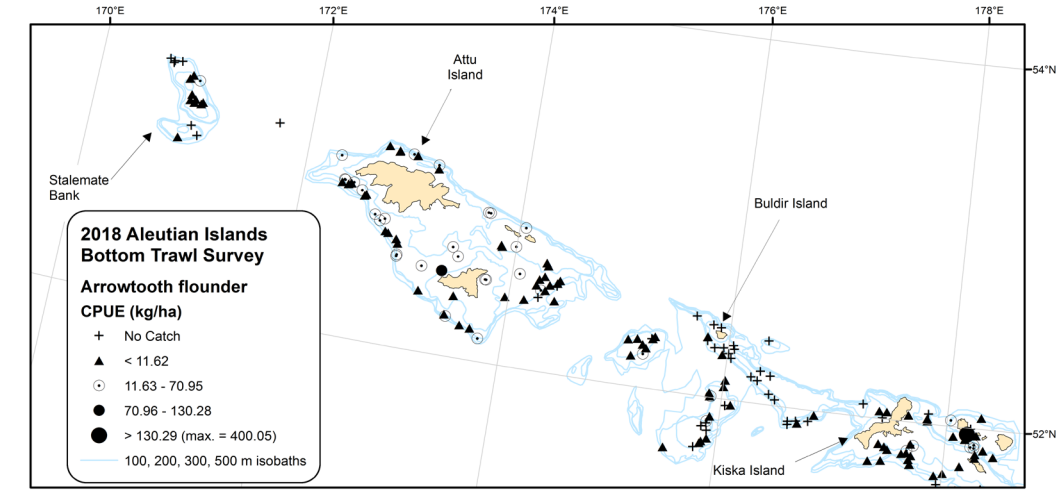

Figure 2. -- Distribution and relative abundance of arrowtooth flounder from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

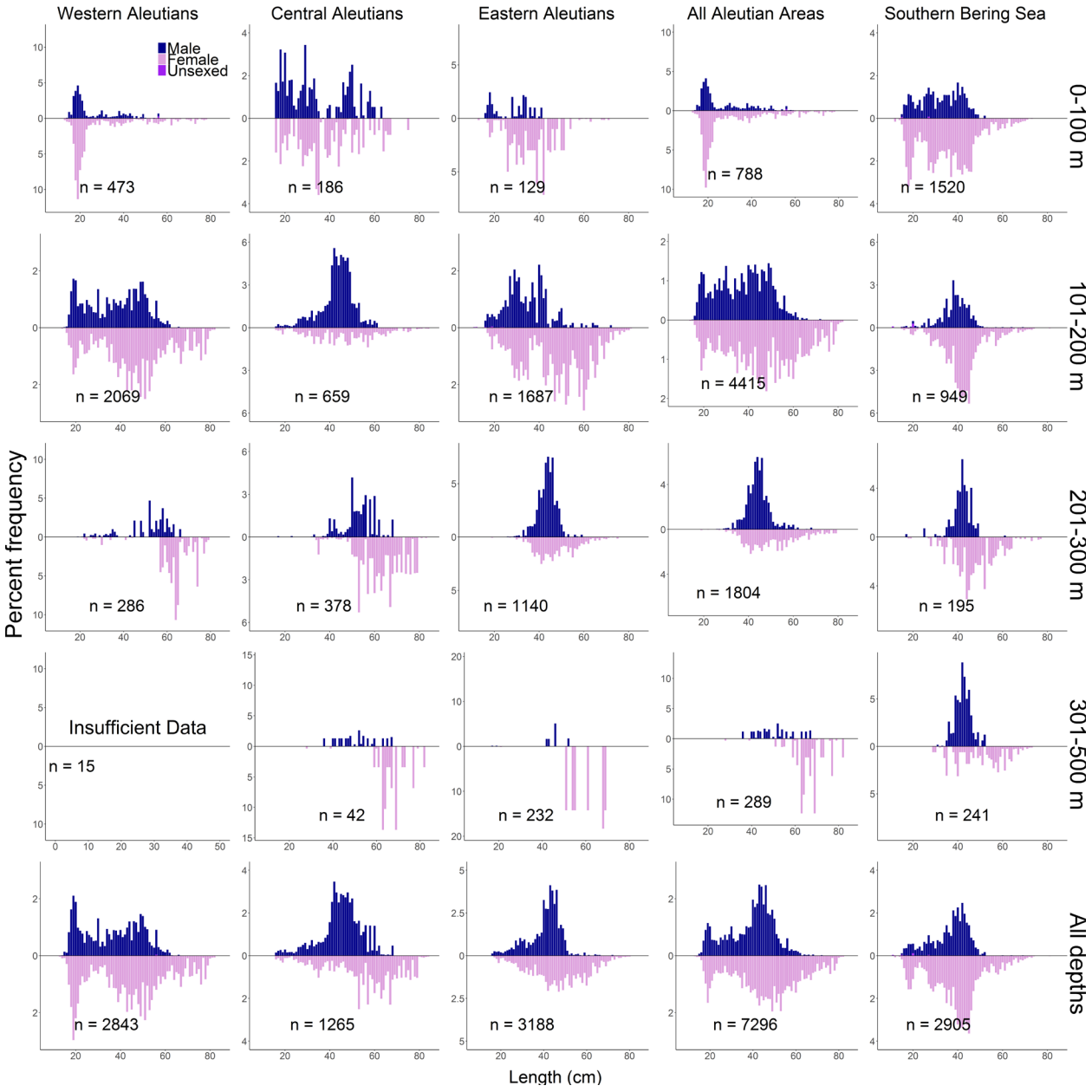

Figure 3. -- Population length composition of arrowtooth flounder by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	101-200	E Southern Bering Sea	12	12	58.05	6,845	1,697	11,993
Central Aleutians	201-300	N Central Aleutians	10	9	53.64	2,355	0	6,205
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	47.44	4,949	0	13,953
Southern Bering Sea	1-100	E Southern Bering Sea	18	18	22.70	5,540	3,355	7,724
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	20.61	3,286	0	12,449
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	7	20.40	1,150	0	2,594
Central Aleutians	301-500	SE Central Aleutians	2	2	20.19	1,442	0	16,472
Eastern Aleutians	201-300	SE Eastern Aleutians	9	9	20.13	4,148	0	10,833
Eastern Aleutians	201-300	NW Eastern Aleutians	6	6	19.55	305	0	735
Eastern Aleutians	101-200	SW Eastern Aleutians	12	12	19.29	4,362	0	11,237
Eastern Aleutians	201-300	NE Eastern Aleutians	19	19	18.25	3,593	1,203	5,983
Central Aleutians	101-200	SE Central Aleutians	14	13	15.16	1,140	210	2,069
Western Aleutians	101-200	W Western Aleutians	48	46	13.88	5,640	3,599	7,682
Eastern Aleutians	101-200	NE Eastern Aleutians	30	21	10.11	2,034	820	3,248
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	8.40	1,624	0	20,814
Central Aleutians	101-200	N Central Aleutians	9	9	8.38	894	64	1,723
Western Aleutians	1-100	W Western Aleutians	12	12	7.85	2,901	1,406	4,396
Eastern Aleutians	201-300	SW Eastern Aleutians	5	4	7.73	554	0	1,185
Central Aleutians	1-100	SW Central Aleutians	3	3	5.99	968	0	3,130
Central Aleutians	101-200	SW Central Aleutians	22	19	5.10	537	222	852
Western Aleutians	201-300	W Western Aleutians	14	10	5.02	472	47	897
Western Aleutians	101-200	E Western Aleutians	25	12	4.50	564	0	1,130
Central Aleutians	201-300	SE Central Aleutians	4	3	4.47	213	0	537
Western Aleutians	201-300	E Western Aleutians	11	7	3.52	276	0	569
Central Aleutians	301-500	N Central Aleutians	4	4	3.12	386	0	1,066
Central Aleutians	1-100	SE Central Aleutians	9	9	2.58	300	20	580
Eastern Aleutians	101-200	SE Eastern Aleutians	16	9	2.31	439	12	867
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	2.07	263	0	3,603
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	1.97	376	0	2,351
Central Aleutians	101-200	Petrel Bank	7	4	1.67	290	0	841
Central Aleutians	201-300	SW Central Aleutians	6	6	1.60	68	12	124
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	1.55	415	0	1,917
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	1.11	74	0	867
Central Aleutians	1-100	N Central Aleutians	13	10	1.10	231	0	512
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	1.05	167	0	2,288
Central Aleutians	201-300	Petrel Bank	4	2	0.98	75	0	217
Western Aleutians	301-500	E Western Aleutians	2	1	0.94	147	0	2,013
Western Aleutians	1-100	E Western Aleutians	13	4	0.91	107	0	234
Eastern Aleutians	301-500	SE Eastern Aleutians	3	3	0.68	175	0	490
Eastern Aleutians	1-100	SE Eastern Aleutians	12	5	0.54	95	0	209
Western Aleutians	301-500	W Western Aleutians	4	1	0.30	51	0	212
Central Aleutians	301-500	Petrel Bank	2	1	0.29	36	0	492
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.12	5	0	71
Central Aleutians	1-100	Petrel Bank	9	5	0.03	3	1	6

Kamchatka flounder (*Atheresthes evermanni*)

Kamchatka flounder was the ninth most abundant species caught in the 2018 survey (Table 2) and never ranked lower than twelfth in any of the four survey districts. Kamchatka flounder were caught throughout the survey area and at all depths. However, most were caught at depths between 200 and 500 m in all survey districts except in the Western Aleutians where a substantial proportion of the catch was also recorded at depths between 100 and 200 m (Table 5). The highest density by far occurred at depths between 200 and 300 m in one of the Central Aleutians subdistricts. Relatively high densities were also recorded at depths between 300 and 500 m in three subdistricts in the Southern Bering Sea and Central and Western Aleutian Islands survey districts (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, were characterized by wider range than for males and frequently had more than one mode (Fig. 5). The estimated biomass of Kamchatka flounder was 29,308 t, and the highest survey district biomass was in the Central Aleutians survey district, where 39% of the estimated biomass was concentrated (Table 5).

Table 5. -- Summary by survey districts and depth intervals of 2018 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	25	10	0.27	132	38	227	0.161
	101 - 200	73	55	2.13	1,132	843	1,421	0.530
	201 - 300	25	21	4.16	718	241	1,194	1.653
	301 - 500	6	3	12.04	3,940	0	17,136	4.342
	All depths	129	89	3.9	5,922	0	19,171	1.377
Central Aleutians	1 - 100	34	12	0.31	181	0	435	0.236
	101 - 200	52	41	1.18	545	243	846	0.353
	201 - 300	24	19	29.74	6,271	0	18,568	2.104
	301 - 500	10	6	11.15	4,440	0	11,356	2.641
	All depths	120	78	6.91	11,437	0	25,601	1.641
Eastern Aleutians	1 - 100	18	6	0.1	66	0	260	0.167
	101 - 200	61	33	1.53	1,185	0	3,111	0.177
	201 - 300	39	26	3.42	1,678	0	3,420	0.483
	301 - 500	8	6	6.84	3,886	0	9,002	2.032
	All depths	126	71	2.7	6,816	1,512	12,119	0.546
Combined Aleutian Districts	1 - 100	77	28	0.22	380	146	613	0.191
	101 - 200	186	129	1.62	2,862	832	4,892	0.276
	201 - 300	88	66	9.92	8,667	0	20,572	1.259
	301 - 500	24	15	9.48	12,266	1,536	22,996	2.725
	All depths	375	238	4.25	24,174	6,724	41,625	1.018
Southern Bering Sea	1 - 100	20	6	0.04	18	0	37	0.235
	101 - 200	14	11	0.57	106	14	197	0.386
	201 - 300	7	4	1.27	72	0	178	0.657
	301 - 500	4	4	47.35	4,939	0	17,418	1.030
	All depths	45	25	6.86	5,134	0	17,614	0.977

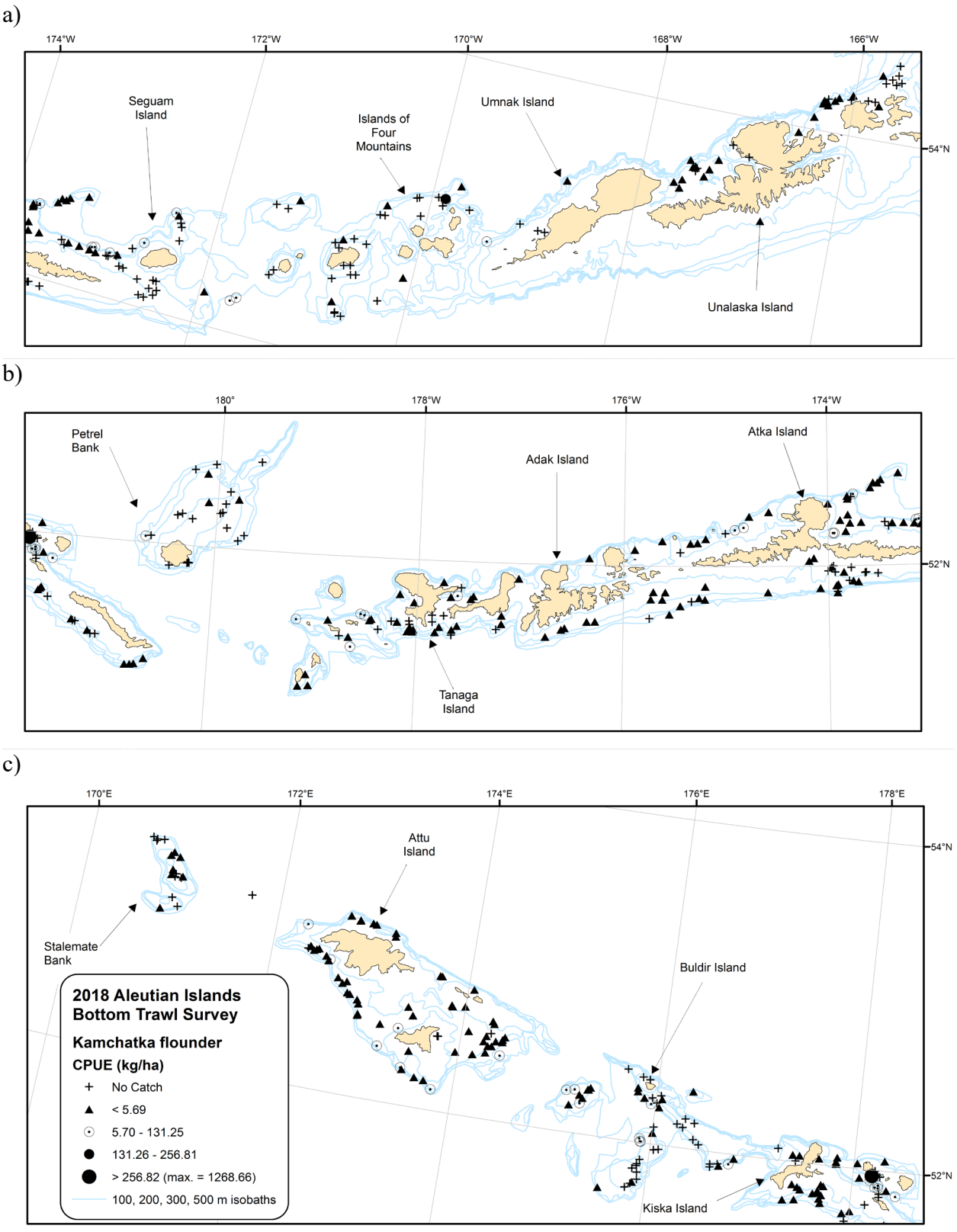

Figure 4. -- Distribution and relative abundance of Kamchatka flounder from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

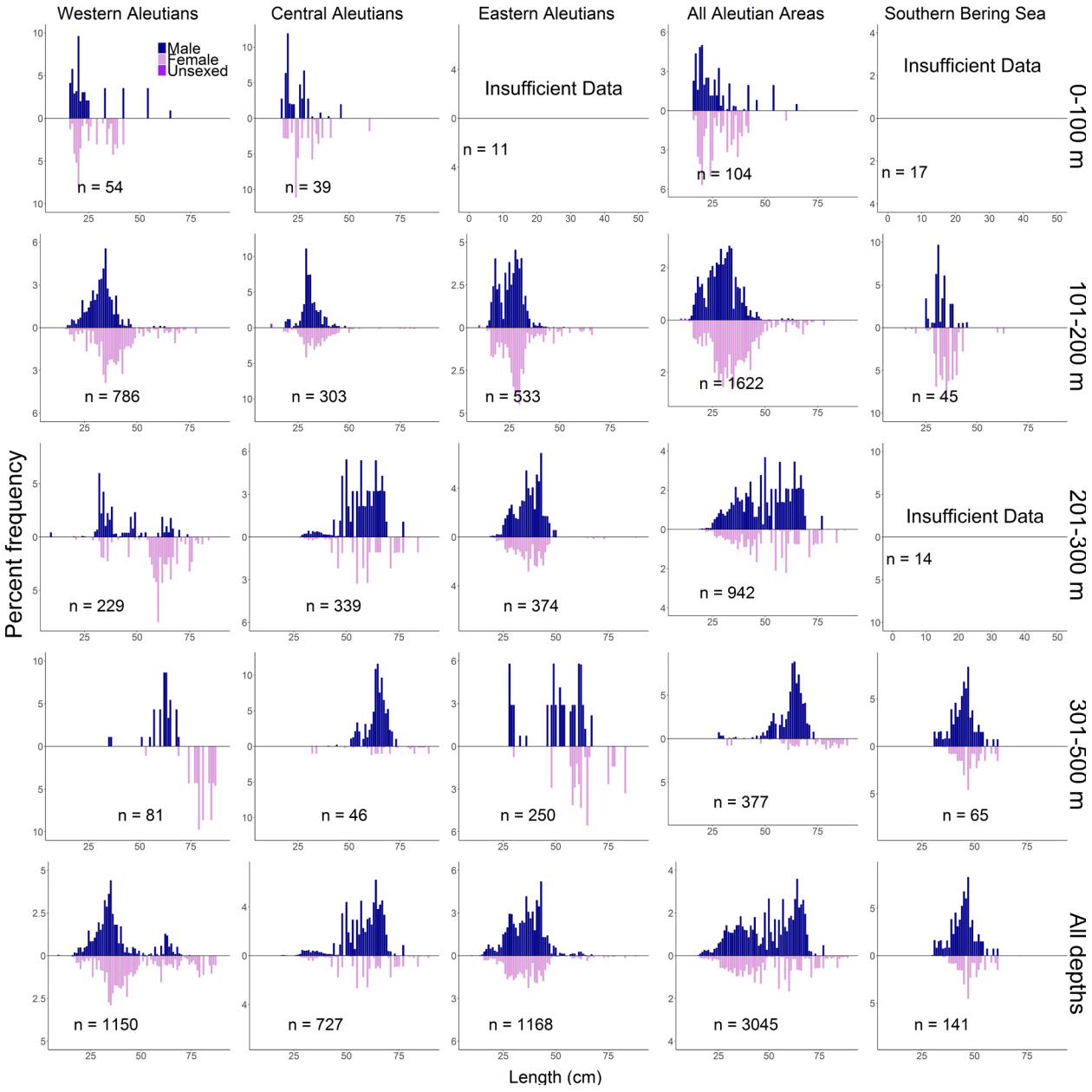

Figure 5. -- Population length composition of Kamtchatka flounder by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	201-300	N Central Aleutians	10	10	138.10	6,063	0	18,542
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	47.35	4,939	0	19,243
Central Aleutians	301-500	N Central Aleutians	4	4	28.17	3,493	0	11,519
Western Aleutians	301-500	E Western Aleutians	2	2	22.54	3,520	0	42,122
Central Aleutians	301-500	SE Central Aleutians	2	1	13.08	934	0	12,805
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	7.93	2,118	0	8,624
Eastern Aleutians	201-300	NE Eastern Aleutians	19	14	7.47	1,471	0	3,216
Eastern Aleutians	301-500	SE Eastern Aleutians	3	3	6.86	1,765	0	4,116
Western Aleutians	201-300	E Western Aleutians	11	10	5.03	394	165	623
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	4.84	771	0	3,347
Western Aleutians	201-300	W Western Aleutians	14	11	3.45	324	0	763
Central Aleutians	101-200	N Central Aleutians	9	9	2.50	266	0	547
Western Aleutians	101-200	W Western Aleutians	48	43	2.49	1,011	740	1,283
Western Aleutians	301-500	W Western Aleutians	4	1	2.45	420	0	1,755
Eastern Aleutians	201-300	NW Eastern Aleutians	6	5	2.25	35	0	105
Central Aleutians	201-300	Petrel Bank	4	1	2.05	157	0	656
Central Aleutians	101-200	SW Central Aleutians	22	18	1.43	150	84	216
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	4	1.27	72	0	182
Eastern Aleutians	101-200	NE Eastern Aleutians	30	14	1.18	238	64	413
Western Aleutians	101-200	E Western Aleutians	25	12	0.97	121	20	222
Central Aleutians	1-100	SW Central Aleutians	3	2	0.91	147	0	484
Southern Bering Sea	101-200	E Southern Bering Sea	12	11	0.90	106	13	198
Central Aleutians	201-300	SW Central Aleutians	6	5	0.87	37	0	78
Central Aleutians	101-200	SE Central Aleutians	14	12	0.83	62	17	107
Eastern Aleutians	101-200	SW Eastern Aleutians	12	12	0.77	174	112	236
Eastern Aleutians	201-300	SE Eastern Aleutians	9	3	0.71	147	0	336
Central Aleutians	101-200	Petrel Bank	7	2	0.38	66	0	220
Eastern Aleutians	201-300	SW Eastern Aleutians	5	4	0.35	25	0	57
Western Aleutians	1-100	W Western Aleutians	12	9	0.33	123	30	217
Central Aleutians	201-300	SE Central Aleutians	4	3	0.31	15	0	35
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.23	44	0	601
Central Aleutians	301-500	SW Central Aleutians	2	1	0.17	13	0	178
Central Aleutians	1-100	N Central Aleutians	13	6	0.12	24	0	57
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	0.09	17	0	136
Central Aleutians	1-100	SE Central Aleutians	9	3	0.08	9	0	20
Western Aleutians	1-100	E Western Aleutians	13	1	0.08	9	0	28
Southern Bering Sea	1-100	E Southern Bering Sea	18	6	0.07	18	0	37
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.07	3	0	44
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.04	5	0	68
Eastern Aleutians	101-200	SE Eastern Aleutians	16	4	0.01	2	0	4
Central Aleutians	1-100	Petrel Bank	9	1	0.01	1	0	2
Eastern Aleutians	1-100	SE Eastern Aleutians	12	2	0.00	1	0	2

Northern rock sole (*Lepidopsetta polyxystra*)

Northern rock sole was the eighth most abundant species caught in the 2018 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 generally occurred at depths shallower than 100 m in several subdistricts within all of four 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 larger mode coinciding with the single mode for males and a second smaller mode unmatched by the length distribution of males (Fig. 7). The estimated biomass for northern rock sole was 44,119 t, and the highest survey district biomass was in the Western Aleutian survey district, where 37% of the estimated biomass was concentrated (Table 7).

Table 7. -- Summary by survey districts and depth intervals of 2018 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	25	25	25.97	12,664	4,308	21,019	0.358
	101 - 200	73	50	6.89	3,666	2,649	4,682	0.450
	201 - 300	25	4	1.19	205	0	476	0.677
	301 - 500	6	0	---	---	---	---	---
	All depths	129	79	10.88	16,534	8,102	24,966	0.377
Central Aleutians	1 - 100	34	32	12.97	7,586	3,710	11,462	0.345
	101 - 200	52	47	8.5	3,916	2,385	5,446	0.435
	201 - 300	24	19	3.75	791	282	1,300	0.533
	301 - 500	10	2	0.48	190	0	661	0.711
	All depths	120	100	7.55	12,483	8,089	16,877	0.381
Eastern Aleutians	1 - 100	18	18	6.42	4,397	2,850	5,944	0.471
	101 - 200	61	46	5.51	4,277	2,453	6,100	0.640
	201 - 300	39	15	1.93	944	324	1,564	0.746
	301 - 500	8	1	<0.01	1	0	3	0.065
	All depths	126	80	3.82	9,618	7,479	11,757	0.556
Combined Aleutian Districts	1 - 100	77	75	14.03	24,646	15,747	33,546	0.370
	101 - 200	186	143	6.7	11,858	9,319	14,397	0.498
	201 - 300	88	38	2.22	1,940	1,134	2,747	0.636
	301 - 500	24	3	0.15	191	0	662	0.690
	All depths	375	259	6.79	38,635	29,406	47,864	0.412
Southern Bering Sea	1 - 100	20	19	10.34	4,164	0	9,155	0.513
	101 - 200	14	12	6.89	1,273	659	1,887	0.626
	201 - 300	7	2	0.83	47	0	119	0.882
	301 - 500	4	0	---	---	---	---	---
	All depths	45	33	7.33	5,484	347	10,622	0.537

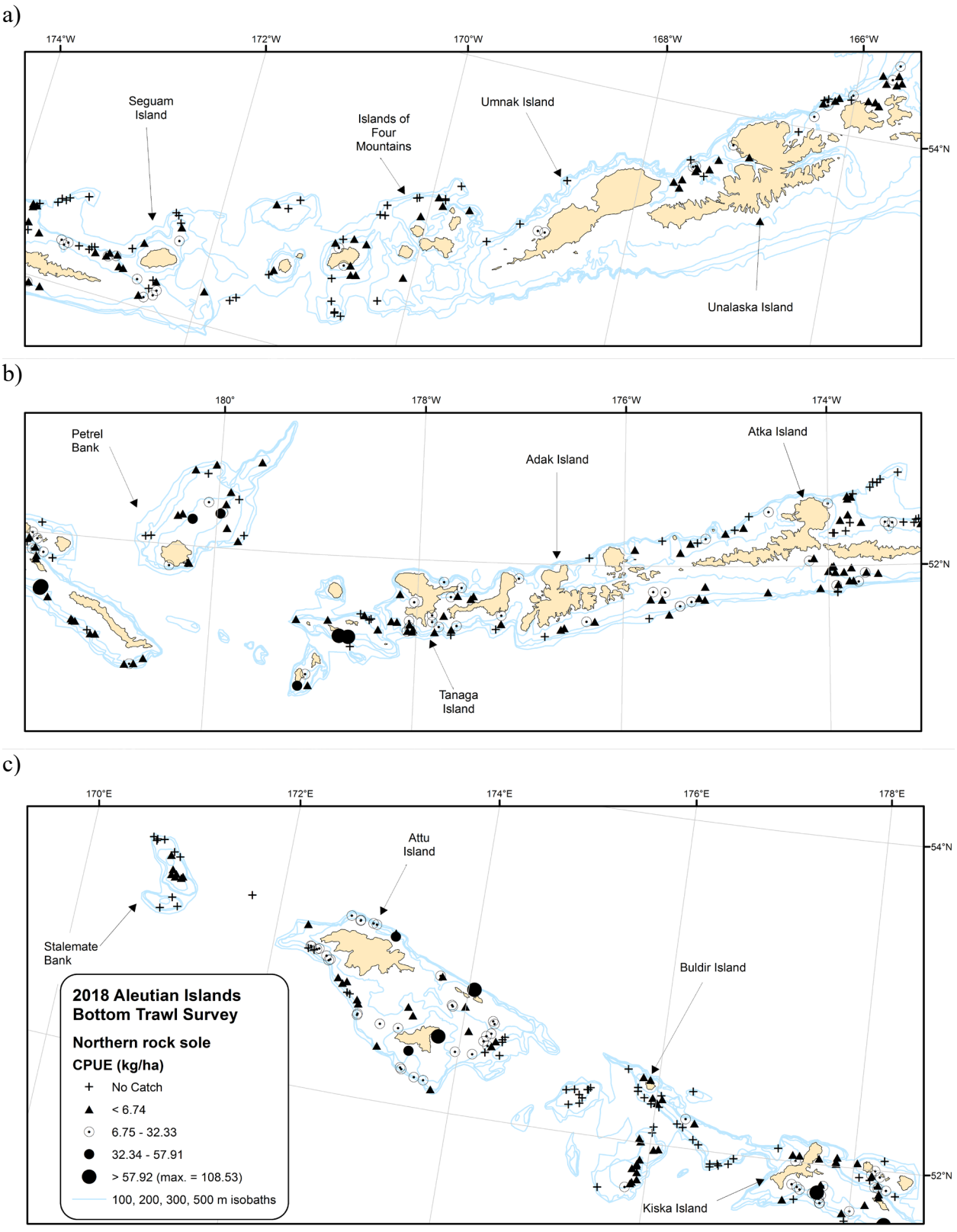

Figure 6. -- Distribution and relative abundance of northern rock sole from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

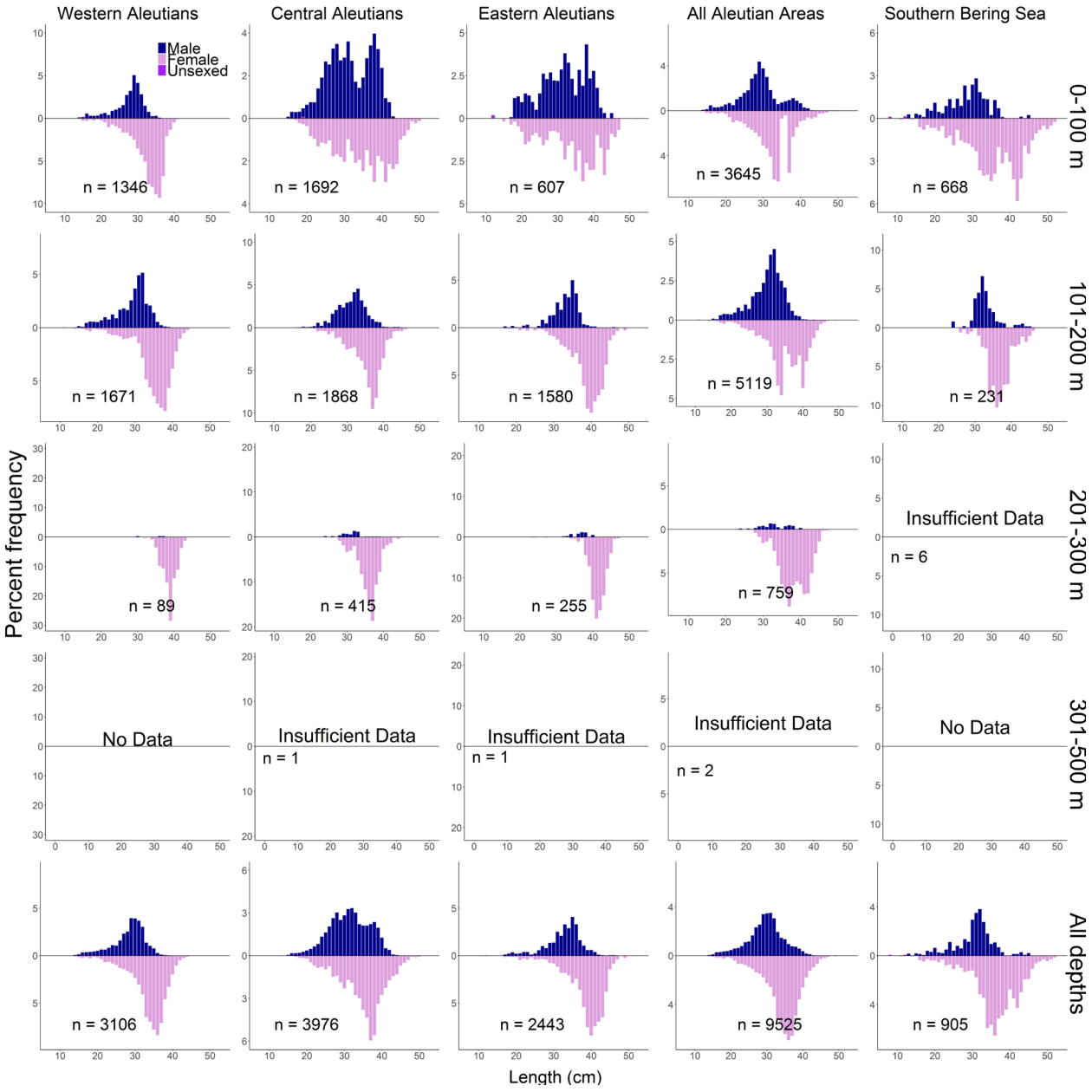

Figure 7. -- Population length composition of northern rock sole by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	12	12	32.53	12,013	3,582	20,443
Central Aleutians	1-100	SE Central Aleutians	9	9	21.29	2,479	388	4,569
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	18.74	2,971	0	17,404
Central Aleutians	101-200	SW Central Aleutians	22	21	17.76	1,869	634	3,104
Central Aleutians	1-100	Petrel Bank	9	8	12.59	1,208	90	2,327
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	12.26	1,554	0	5,016
Central Aleutians	1-100	SW Central Aleutians	3	3	11.90	1,926	0	6,346
Eastern Aleutians	201-300	SW Eastern Aleutians	5	5	11.05	792	81	1,502
Central Aleutians	201-300	SW Central Aleutians	6	5	10.71	456	0	981
Central Aleutians	101-200	SE Central Aleutians	14	12	9.94	747	12	1,483
Southern Bering Sea	101-200	E Southern Bering Sea	12	10	9.78	1,153	533	1,773
Central Aleutians	101-200	N Central Aleutians	9	9	9.72	1,037	370	1,703
Central Aleutians	1-100	N Central Aleutians	13	12	9.37	1,973	1,100	2,847
Western Aleutians	101-200	W Western Aleutians	48	43	8.94	3,633	2,617	4,649
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	7.25	1,382	0	6,109
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	6.68	1,065	0	3,315
Eastern Aleutians	101-200	SW Eastern Aleutians	12	11	6.13	1,385	461	2,309
Eastern Aleutians	101-200	SE Eastern Aleutians	16	12	5.75	1,093	526	1,660
Western Aleutians	1-100	E Western Aleutians	13	13	5.50	651	248	1,055
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	4.91	949	557	1,342
Southern Bering Sea	1-100	E Southern Bering Sea	18	17	4.89	1,193	698	1,688
Central Aleutians	201-300	SE Central Aleutians	4	3	4.03	193	0	450
Eastern Aleutians	101-200	NE Eastern Aleutians	30	20	3.65	734	353	1,115
Eastern Aleutians	1-100	SE Eastern Aleutians	12	12	2.94	511	179	844
Central Aleutians	201-300	N Central Aleutians	10	9	2.89	127	0	269
Western Aleutians	201-300	W Western Aleutians	14	4	2.18	205	0	478
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	1.79	120	32	208
Central Aleutians	301-500	SW Central Aleutians	2	1	1.76	139	0	1,903
Central Aleutians	101-200	Petrel Bank	7	5	1.51	263	0	623
Eastern Aleutians	201-300	NW Eastern Aleutians	6	2	1.23	19	0	66
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	2	0.83	47	0	122
Central Aleutians	301-500	Petrel Bank	2	1	0.42	51	0	704
Eastern Aleutians	201-300	NE Eastern Aleutians	19	5	0.39	78	0	163
Eastern Aleutians	201-300	SE Eastern Aleutians	9	3	0.27	56	0	138
Western Aleutians	101-200	E Western Aleutians	25	7	0.26	33	6	60
Central Aleutians	201-300	Petrel Bank	4	2	0.20	15	0	44
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.01	1	0	9

Southern rock sole (*Lepidopsetta bilineata*)

Southern rock sole was the sixteenth most abundant species caught in the 2018 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 100 m, the vast majority were caught at depths less than 100 m in the Southern Bering Sea and Eastern Aleutian districts (Table 9). The highest densities of this species occurred in two 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, with two modes at approximately 26 cm and 39 cm, compared to 25 cm and 35 cm for males (Fig. 9). The estimated biomass for southern rock sole was 10,652 t, and the highest survey district biomass was in the Southern Bering Sea, where 89% of the estimated biomass was concentrated (Table 9).

Table 9. -- Summary by survey districts and depth intervals of 2018 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	25	2	0.02	10	0	30	0.267
	101 - 200	73	0	---	---	---	---	---
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	129	2	0.01	10	0	30	0.267
Central Aleutians	1 - 100	34	6	0.09	55	0	162	0.656
	101 - 200	52	2	0.02	8	0	25	0.582
	201 - 300	24	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	120	8	0.04	64	0	159	0.645
Eastern Aleutians	1 - 100	18	11	1.47	1,004	559	1,448	0.629
	101 - 200	61	2	0.02	15	0	37	0.592
	201 - 300	39	3	0.06	28	0	83	0.670
	301 - 500	8	0	---	---	---	---	---
	All depths	126	16	0.42	1,046	590	1,503	0.629
Combined Aleutian Districts	1 - 100	77	19	0.61	1,069	600	1,538	0.622
	101 - 200	186	4	0.01	23	0	50	0.588
	201 - 300	88	3	0.03	28	0	83	0.670
	301 - 500	24	0	---	---	---	---	---
	All depths	375	26	0.2	1,120	639	1,602	0.622
Southern Bering Sea	1 - 100	20	17	21.61	8,701	5,957	11,445	0.589
	101 - 200	14	7	4.49	831	0	1,887	0.644
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	24	12.74	9,532	6,558	12,505	0.593

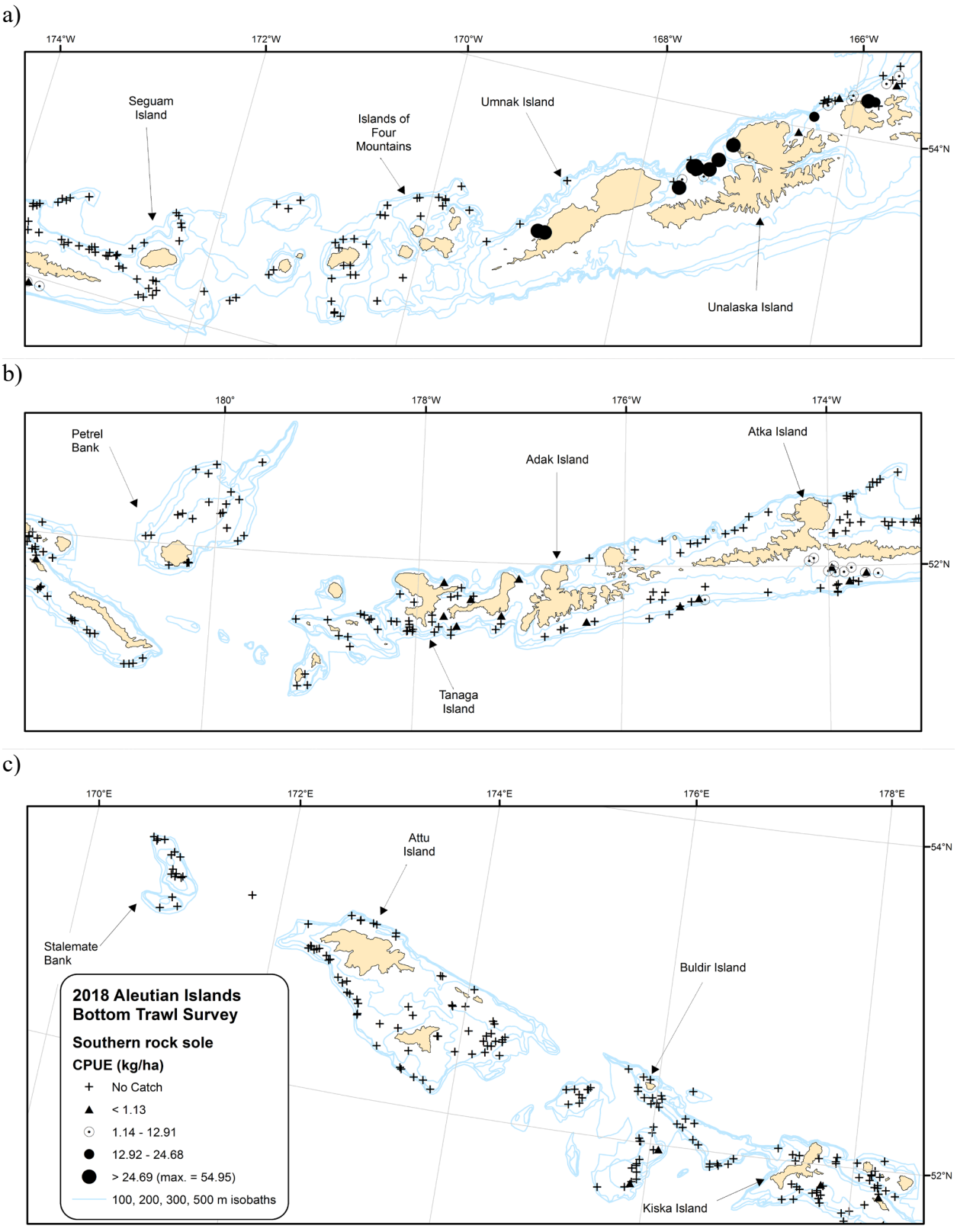

Figure 8. -- Distribution and relative abundance of southern rock sole from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

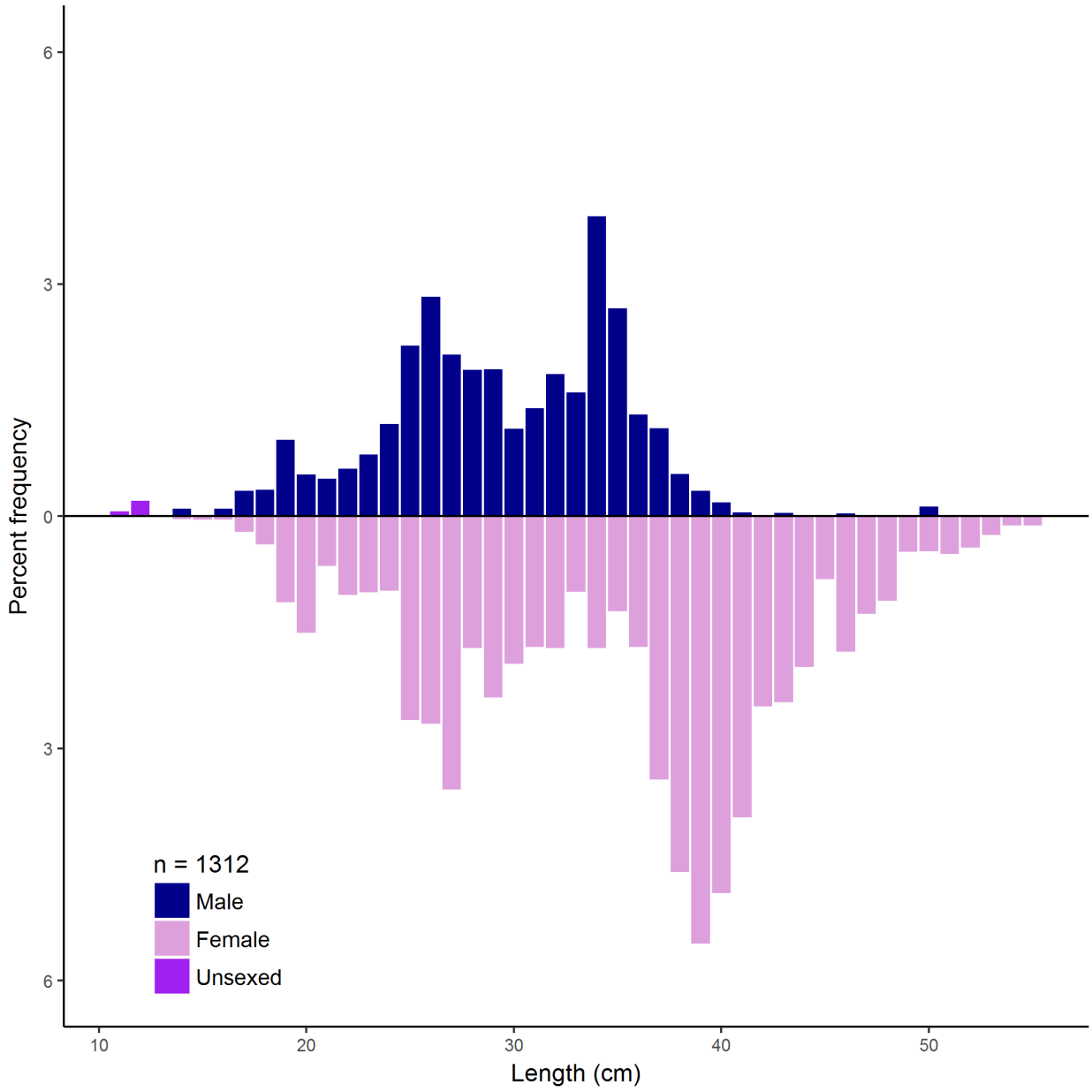

Figure 9. -- Population length composition of southern rock sole in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	28.66	4,544	0	11,739
Southern Bering Sea	1-100	E Southern Bering Sea	18	15	17.04	4,157	2,021	6,294
Southern Bering Sea	101-200	E Southern Bering Sea	12	7	7.04	831	0	1,898
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	4.11	784	0	1,948
Eastern Aleutians	1-100	SE Eastern Aleutians	12	9	1.26	220	115	325
Eastern Aleutians	201-300	SW Eastern Aleutians	5	3	0.39	28	0	88
Central Aleutians	1-100	SW Central Aleutians	3	1	0.19	31	0	162
Western Aleutians	1-100	E Western Aleutians	13	2	0.09	10	0	31
Central Aleutians	1-100	N Central Aleutians	13	3	0.08	17	0	44
Central Aleutians	1-100	SE Central Aleutians	9	2	0.07	8	0	22
Central Aleutians	101-200	N Central Aleutians	9	1	0.07	7	0	24
Eastern Aleutians	101-200	SE Eastern Aleutians	16	1	0.05	9	0	30
Eastern Aleutians	101-200	SW Eastern Aleutians	12	1	0.02	5	0	17
Central Aleutians	101-200	SE Central Aleutians	14	1	0.02	1	0	4

Pacific halibut (*Hippoglossus stenolepis*)

Pacific halibut was the tenth most abundant species caught in the 2018 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 some relatively high densities also occurred at depths between 300 and 500 m in two subdistricts within the Eastern and Central Aleutians survey districts (Fig. 10 and Table 12). Size generally increased with depth (Table 11). There were insufficient length frequency data from the Western and Eastern Aleutians to identify any clear patterns in the length frequency distributions. The Eastern Aleutians survey district was characterized by a bell-shaped length distribution with the bulk of the distribution confined to lengths between 50 cm and 90 cm. A mode at approximately 50 cm occurred in the Southern Bering Sea length distribution, where most of the measured fish were caught at depths less than 200 m (Fig. 11). The estimated biomass of Pacific halibut was 28,564 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 76% of the estimated biomass was concentrated (Table 11).

Table 11. -- Summary by survey districts and depth intervals of 2018 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	25	6	1.56	760	0	1,699	6.797
	101 - 200	73	12	1.18	629	100	1,158	10.210
	201 - 300	25	2	0.91	157	0	436	16.906
	301 - 500	6	0	---	---	---	---	---
	All depths	129	20	1.02	1,545	435	2,656	8.461
Central Aleutians	1 - 100	34	13	3.39	1,985	466	3,504	3.309
	101 - 200	52	12	3.24	1,491	0	3,273	15.038
	201 - 300	24	3	0.86	181	0	490	11.894
	301 - 500	10	2	2.1	835	0	2,220	19.393
	All depths	120	30	2.72	4,492	2,182	6,801	5.931
Eastern Aleutians	1 - 100	18	14	5.92	4,053	502	7,604	3.499
	101 - 200	61	48	8.5	6,606	4,697	8,515	4.968
	201 - 300	39	18	3.76	1,842	875	2,810	5.872
	301 - 500	8	2	5.54	3,149	0	9,946	17.291
	All depths	126	82	6.21	15,650	8,130	23,170	5.245
Combined Aleutian Districts	1 - 100	77	33	3.87	6,797	2,978	10,616	3.635
	101 - 200	186	72	4.93	8,726	6,241	11,211	5.855
	201 - 300	88	23	2.5	2,180	1,147	3,212	6.445
	301 - 500	24	4	3.08	3,984	0	10,858	17.693
	All depths	375	132	3.81	21,687	13,414	29,959	5.527
Southern Bering Sea	1 - 100	20	20	11.54	4,646	2,663	6,630	2.105
	101 - 200	14	14	9.45	1,747	0	4,509	3.788
	201 - 300	7	5	4.11	232	5	458	6.096
	301 - 500	4	2	2.42	252	0	695	10.194
	All depths	45	41	9.19	6,877	4,453	9,302	2.518

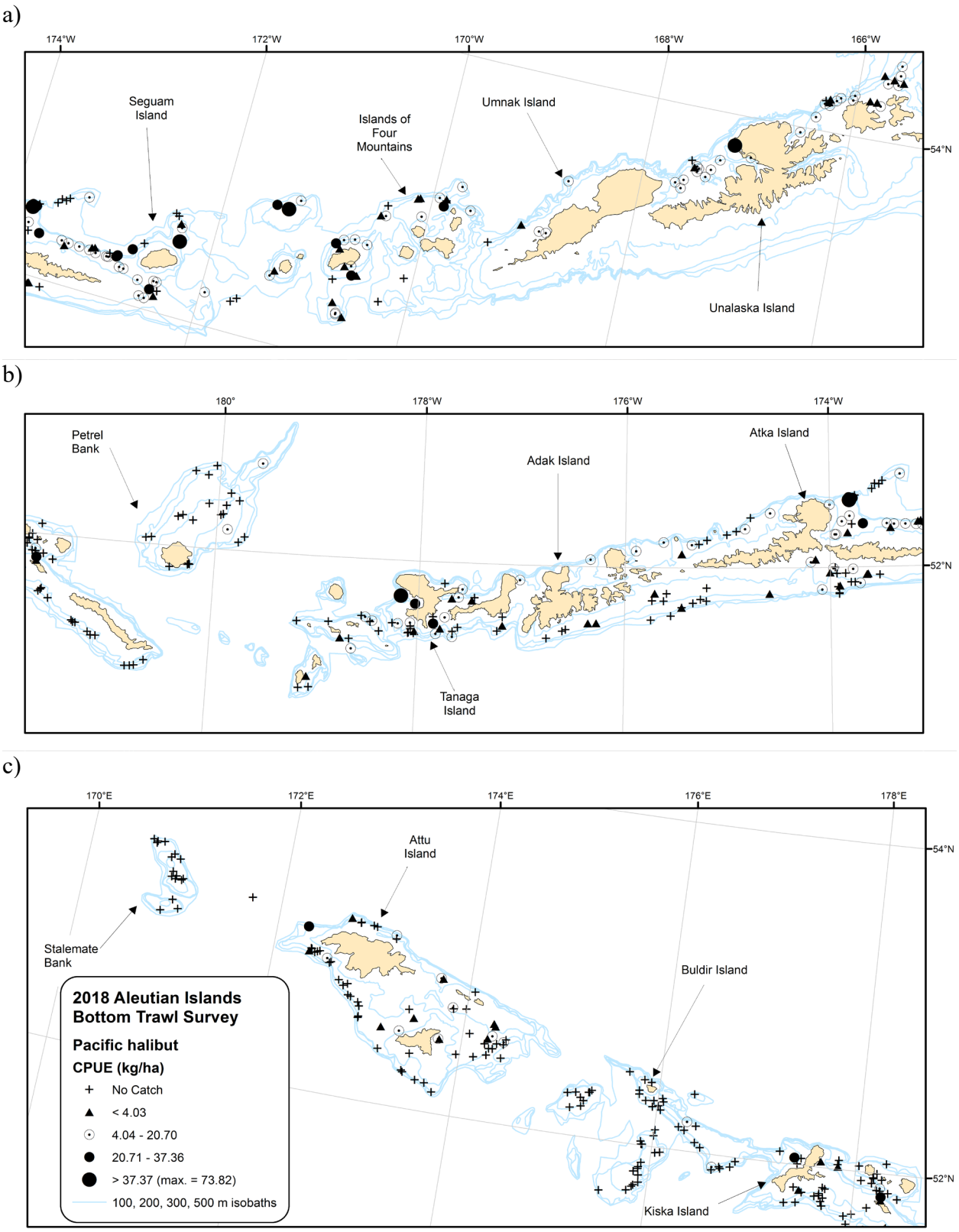

Figure 10. -- Distribution and relative abundance of Pacific halibut from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

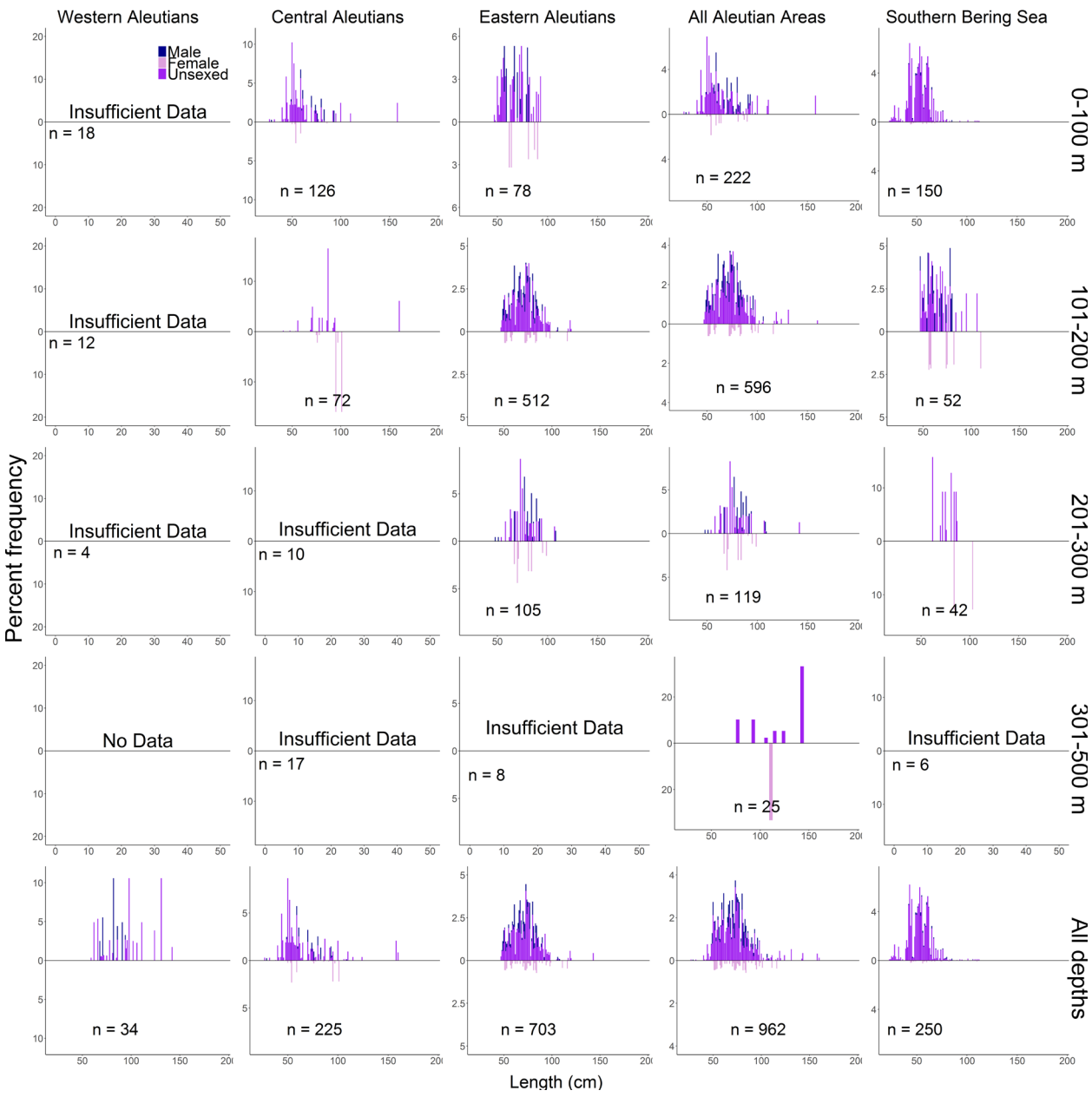

Figure 11. -- Population length composition of Pacific halibut by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	101-200	W Southern Bering Sea	2	2	14.91	998	0	9,015
Eastern Aleutians	101-200	NE Eastern Aleutians	30	28	14.02	2,821	1,901	3,741
Southern Bering Sea	1-100	W Southern Bering Sea	2	2	13.41	2,126	0	4,656
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	12.14	1,539	0	14,777
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	11.79	3,149	0	12,340
Central Aleutians	301-500	SE Central Aleutians	2	2	11.69	835	0	4,926
Central Aleutians	101-200	N Central Aleutians	9	5	11.64	1,241	0	3,059
Southern Bering Sea	1-100	E Southern Bering Sea	18	18	10.33	2,520	559	4,482
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	10.10	1,610	0	3,553
Eastern Aleutians	101-200	SE Eastern Aleutians	16	12	9.28	1,763	808	2,718
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	6.85	1,323	0	11,183
Central Aleutians	1-100	N Central Aleutians	13	7	6.44	1,356	0	2,746
Southern Bering Sea	101-200	E Southern Bering Sea	12	12	6.36	749	490	1,009
Eastern Aleutians	201-300	NE Eastern Aleutians	19	11	5.52	1,086	384	1,788
Central Aleutians	1-100	SE Central Aleutians	9	5	5.03	586	0	1,331
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	5	4.11	232	0	466
Eastern Aleutians	1-100	SE Eastern Aleutians	12	8	4.04	703	96	1,309
Eastern Aleutians	201-300	SE Eastern Aleutians	9	5	3.34	689	0	1,426
Eastern Aleutians	1-100	SW Eastern Aleutians	2	2	2.56	488	0	5,315
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	2.42	252	0	760
Central Aleutians	201-300	SE Central Aleutians	4	1	2.32	111	0	464
Western Aleutians	1-100	W Western Aleutians	12	5	1.95	719	0	1,664
Eastern Aleutians	101-200	SW Eastern Aleutians	12	5	1.82	412	0	877
Central Aleutians	101-200	SE Central Aleutians	14	5	1.80	135	0	291
Western Aleutians	201-300	W Western Aleutians	14	2	1.66	157	0	438
Central Aleutians	201-300	N Central Aleutians	10	2	1.60	70	0	176
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	1.53	24	0	85
Western Aleutians	101-200	W Western Aleutians	48	11	1.49	605	78	1,131
Central Aleutians	101-200	Petrel Bank	7	1	0.64	112	0	385
Eastern Aleutians	201-300	SW Eastern Aleutians	5	1	0.61	44	0	165
Central Aleutians	1-100	Petrel Bank	9	1	0.46	44	0	145
Western Aleutians	1-100	E Western Aleutians	13	1	0.34	40	0	128
Western Aleutians	101-200	E Western Aleutians	25	1	0.20	24	0	75
Central Aleutians	101-200	SW Central Aleutians	22	1	0.03	4	0	11

Greenland turbot (*Reinhardtius hippoglossoides*)

Greenland turbot was not among the 20 most abundant species caught in the 2018 survey and did not rank among the top 20 in any of the survey districts (Table 2). Greenland turbot were caught only in the Western and Central Aleutians survey districts at depths deeper than 200 m, and only in very small numbers (Table 13). The highest density by far occurred in a subdistrict within the Western Aleutians survey district at depths between 300 and 500 m (Fig. 12 and Table 14). There was an insufficient number of length specimens collected in all depth zones and survey districts to meaningfully interpret the length distribution (Fig. 13). The estimated biomass of Greenland turbot was 373 t, and almost all of that was caught in the Western Aleutians survey district, where 86% of the estimated biomass was concentrated (Table 13).

Table 13. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	0	---	---	---	---	---
	201 - 300	25	1	0.05	9	0	30	3.005
	301 - 500	6	1	0.95	311	0	1,650	9.191
	All depths	129	2	0.21	321	0	1,660	8.673
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	0	---	---	---	---	---
	201 - 300	24	3	0.25	53	0	127	3.045
	301 - 500	10	0		---	---	---	---
	All depths	120	3	0.03	53	0	127	3.045
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	0	---	---	---	---	---
	201 - 300	39	0	---	---	---	---	---
	301 - 500	8	0	---	---	---	---	---
	All depths	126	0	---	---	---	---	---
Combined Aleutian Districts	1 - 100	77	0	---	---	---	---	---
	101 - 200	186	0	---	---	---	---	---
	201 - 300	88	4	0.07	62	0	137	3.039
	301 - 500	24	1	0.24	311	0	1,650	9.191
	All depths	375	5	0.07	373	0	1,720	6.873
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	0	---	---	---	---	---

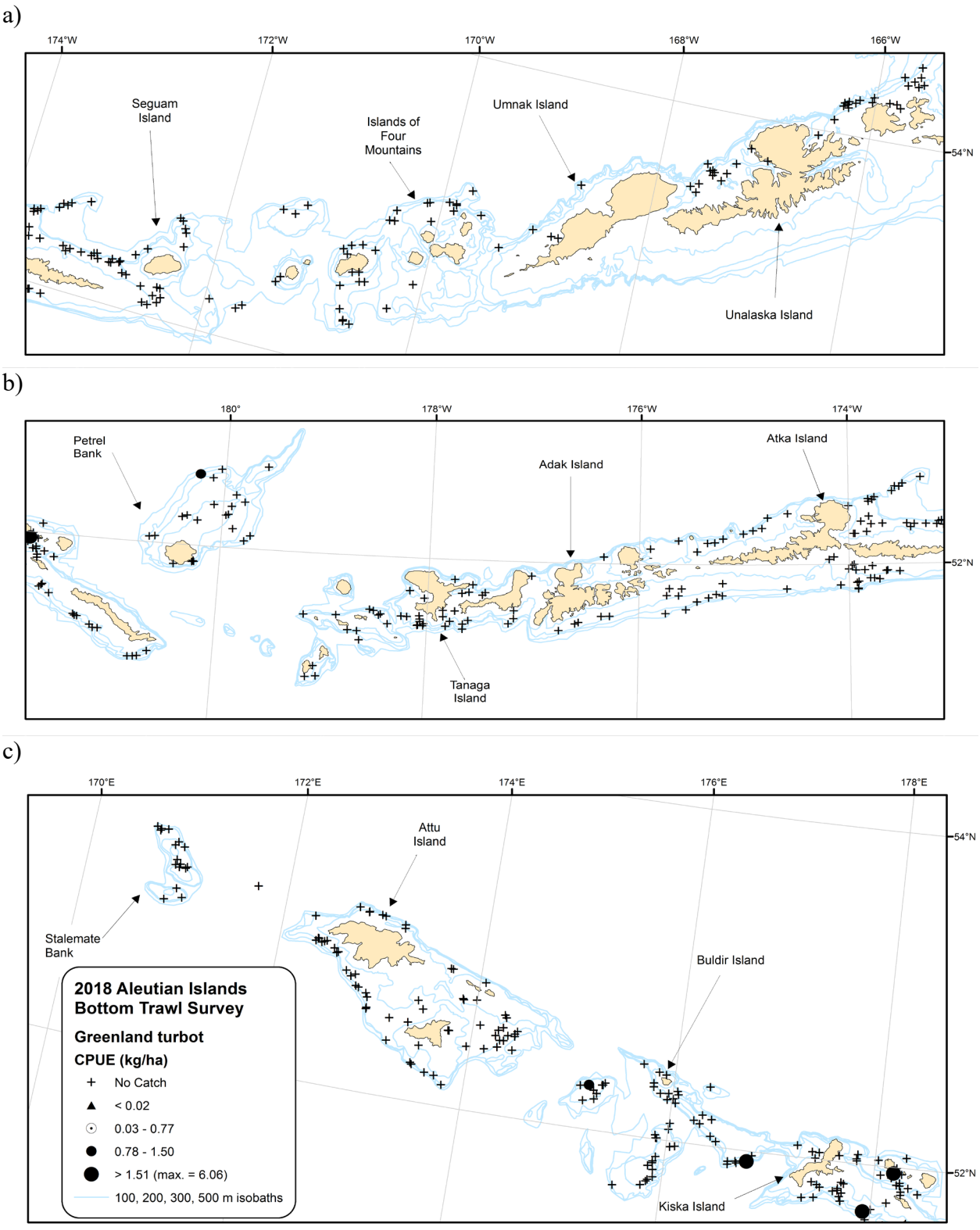

Figure 12. -- Distribution and relative abundance of Greenland turbot from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

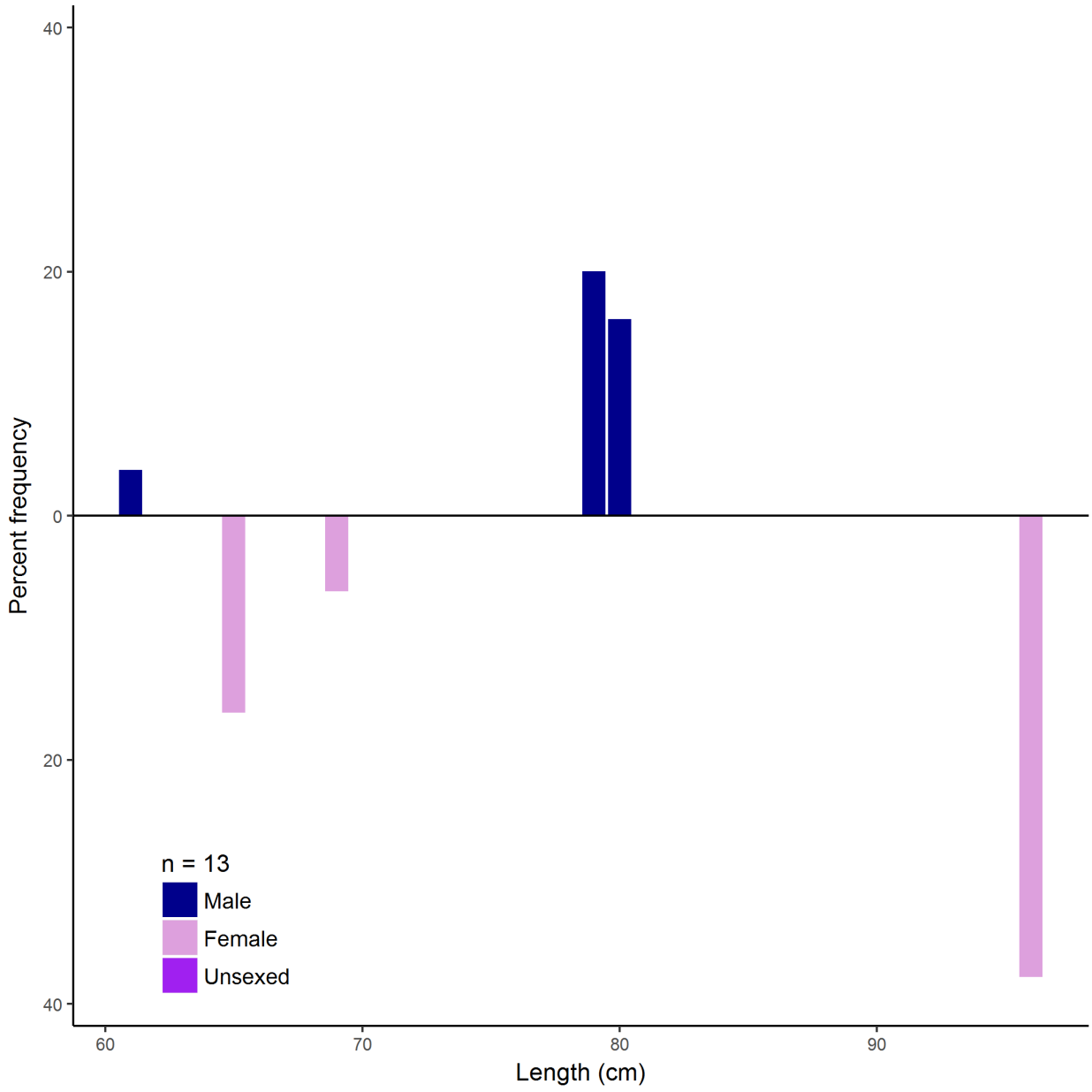

Figure 13. -- Population length composition of Greenland turbot in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	E Western Aleutians	2	1	1.99	311	0	4,265
Central Aleutians	201-300	N Central Aleutians	10	1	0.61	27	0	87
Central Aleutians	201-300	SW Central Aleutians	6	1	0.25	11	0	38
Central Aleutians	201-300	Petrel Bank	4	1	0.20	16	0	65
Western Aleutians	201-300	E Western Aleutians	11	1	0.12	9	0	30

Flathead sole (*Hippoglossoides elassodon*)

Flathead sole was the nineteenth most abundant species caught in the 2018 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 less than 200 m in subdistricts within the Western Aleutian Islands and the Southern Bering Sea (Fig. 14 and Table 16). There was no general trend in size with depth. Although the length ranges were relatively similar for males and females in all survey districts, the mode was approximately 3 cm greater for females (32 cm vs. 29 cm) in the Western Aleutian district, where 70% of the lengths from the three Aleutian districts were measured. The length distribution of males across all depths in the Southern Bering Sea survey district was somewhat 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 6,930 t, and the highest survey district biomass was in the Western Aleutians Islands, where 67 % the estimated biomass was concentrated (Table 15).

Table 15. -- Summary by survey districts and depth intervals of 2018 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	25	15	3.28	1,600	837	2,364	0.384
	101 - 200	73	47	5.36	2,850	1,711	3,990	0.243
	201 - 300	25	11	0.97	167	4	330	0.218
	301 - 500	6	0	---	---	---	---	---
	All depths	129	73	3.04	4,618	3,254	5,982	0.277
Central Aleutians	1 - 100	34	2	0.03	18	0	61	0.261
	101 - 200	52	7	0.03	15	2	27	0.500
	201 - 300	24	6	0.12	25	2	48	0.425
	301 - 500	10	0	---	---	---	---	---
	All depths	120	15	0.04	58	8	109	0.366
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	18	0.86	667	56	1,278	0.211
	201 - 300	39	13	0.33	162	59	265	0.465
	301 - 500	8	0	---	---	---	---	---
	All depths	126	31	0.33	829	205	1,453	0.236
Combined Aleutian Districts	1 - 100	77	17	0.92	1,619	855	2,383	0.382
	101 - 200	186	72	2	3,532	2,296	4,769	0.236
	201 - 300	88	30	0.41	354	167	542	0.302
	301 - 500	24	0	---	---	---	---	---
	All depths	375	119	0.97	5,505	4,053	6,957	0.271
Southern Bering Sea	1 - 100	20	15	1.86	749	322	1,175	0.267
	101 - 200	14	12	3.37	622	0	1,271	0.282
	201 - 300	7	3	0.52	29	0	70	0.422
	301 - 500	4	1	0.24	25	0	93	0.560
	All depths	45	31	1.9	1,425	686	2,163	0.278

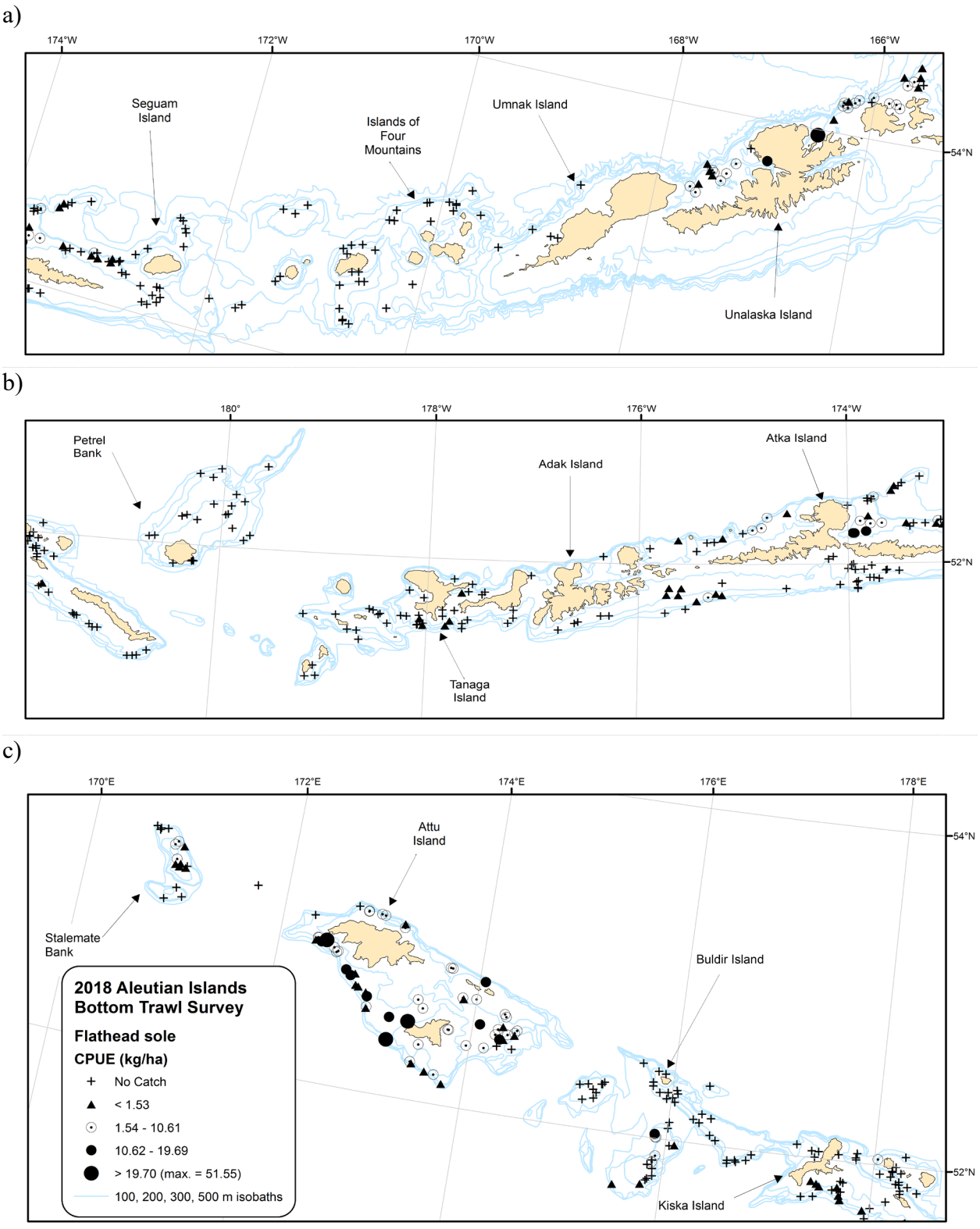

Figure 14. -- Distribution and relative abundance of flathead sole from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

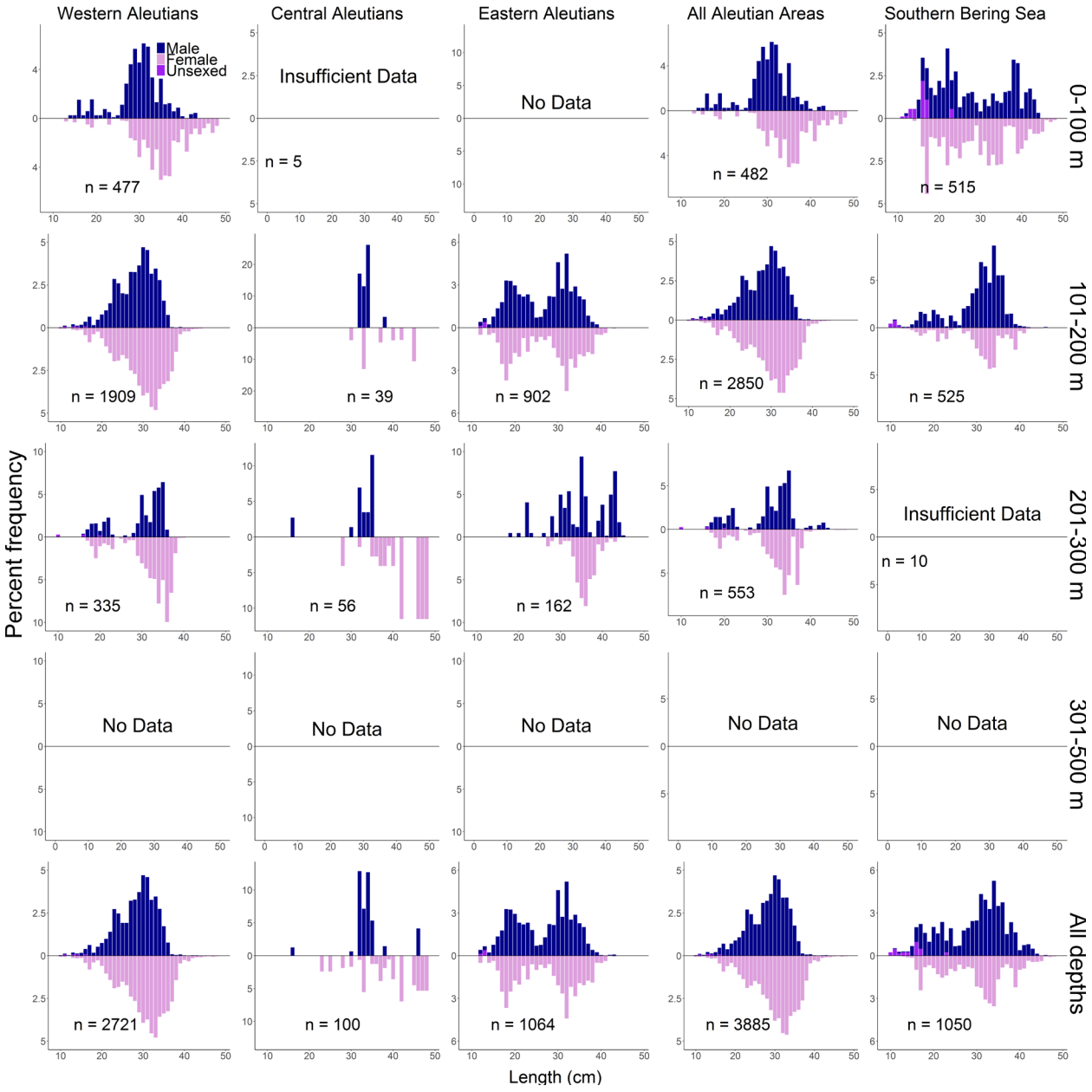

Figure 15. -- Population length composition of flathead sole by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	101-200	W Western Aleutians	48	43	6.78	2,754	1,623	3,885
Southern Bering Sea	101-200	E Southern Bering Sea	12	12	5.28	622	0	1,277
Western Aleutians	1-100	W Western Aleutians	12	12	4.27	1,575	805	2,345
Southern Bering Sea	1-100	E Southern Bering Sea	18	15	3.07	749	320	1,177
Eastern Aleutians	101-200	NE Eastern Aleutians	30	12	2.16	435	71	798
Eastern Aleutians	201-300	NW Eastern Aleutians	6	4	1.67	26	0	57
Western Aleutians	201-300	W Western Aleutians	14	10	1.43	134	0	286
Eastern Aleutians	201-300	SW Eastern Aleutians	5	5	1.21	87	0	188
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	1.06	169	0	832
Western Aleutians	101-200	E Western Aleutians	25	4	0.77	96	0	235
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	3	0.52	29	0	71
Western Aleutians	201-300	E Western Aleutians	11	1	0.42	33	0	106
Eastern Aleutians	101-200	SW Eastern Aleutians	12	4	0.28	64	0	137
Eastern Aleutians	201-300	NE Eastern Aleutians	19	4	0.25	49	0	115
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.24	25	0	103
Western Aleutians	1-100	E Western Aleutians	13	3	0.21	25	0	62
Central Aleutians	201-300	SW Central Aleutians	6	3	0.21	9	0	21
Central Aleutians	201-300	N Central Aleutians	10	1	0.18	8	0	25
Central Aleutians	201-300	SE Central Aleutians	4	2	0.17	8	0	26
Central Aleutians	101-200	SW Central Aleutians	22	5	0.09	10	0	20
Central Aleutians	1-100	SW Central Aleutians	3	1	0.07	12	0	62
Central Aleutians	1-100	SE Central Aleutians	9	1	0.06	7	0	22
Central Aleutians	101-200	N Central Aleutians	9	1	0.03	3	0	11
Central Aleutians	101-200	SE Central Aleutians	14	1	0.02	2	0	5

Rex sole (G*lyptocephalus zachirus*)

Rex sole was the fourteenth most abundant species caught in the 2018 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 and Western Aleutians, as well as the Southern Bering Sea survey districts (Table 17). The highest densities occurred in three subdistricts within the Southern Bering Sea and Eastern Aleutian survey districts, all in different depth ranges: 101-200 m and 301-500 m in the Southern Bering Sea, and 201-300 m in the Eastern Aleutians (Fig. 16 and Table 18). Females were consistently larger than males in all four survey districts with a mode occurring at 48 cm for females and 45 cm for males in the combined three Aleutian districts. The length distributions were bimodal for both sexes in the Southern Bering Sea survey district with modes occurring at approximately 30 cm and 46 cm for both sexes (Fig. 17). The estimated biomass of rex sole was 13,406 t, and the highest survey district biomass was in the Southern Bering Sea survey district, where 44% of the estimated biomass was concentrated (Table 17).

Table 17. -- Summary by survey districts and depth intervals of 2018 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	25	12	0.92	450	77	824	0.714
	101 - 200	73	47	3.33	1,770	1,123	2,417	0.635
	201 - 300	25	13	2.54	437	18	856	0.463
	301 - 500	6	2	0.82	267	0	856	0.602
	All depths	129	74	1.93	2,924	1,950	3,899	0.608
Central Aleutians	1 - 100	34	2	0.04	21	0	86	0.154
	101 - 200	52	20	0.59	271	84	458	0.673
	201 - 300	24	12	2.41	508	65	951	0.563
	301 - 500	10	7	1.29	512	0	1,041	0.691
	All depths	120	41	0.79	1,313	657	1,969	0.601
Eastern Aleutians	1 - 100	18	1	<0.01	1	0	3	0.143
	101 - 200	61	22	1.17	913	313	1,512	0.620
	201 - 300	39	19	3.63	1,778	289	3,266	0.748
	301 - 500	8	3	1.06	601	0	2,254	0.518
	All depths	126	45	1.31	3,292	580	6,003	0.656
Combined Aleutian Districts	1 - 100	77	15	0.27	472	96	848	0.611
	101 - 200	186	89	1.67	2,954	2,070	3,838	0.633
	201 - 300	88	44	3.12	2,723	1,188	4,257	0.645
	301 - 500	24	12	1.07	1,380	0	3,328	0.588
	All depths	375	160	1.32	7,529	4,692	10,365	0.627
Southern Bering Sea	1 - 100	20	10	2.24	901	104	1,699	0.450
	101 - 200	14	11	13.79	2,549	1,253	3,845	0.503
	201 - 300	7	5	9.86	556	85	1,027	0.658
	301 - 500	4	4	17.94	1,871	0	6,416	0.625
	All depths	45	30	7.86	5,877	1,263	10,491	0.539

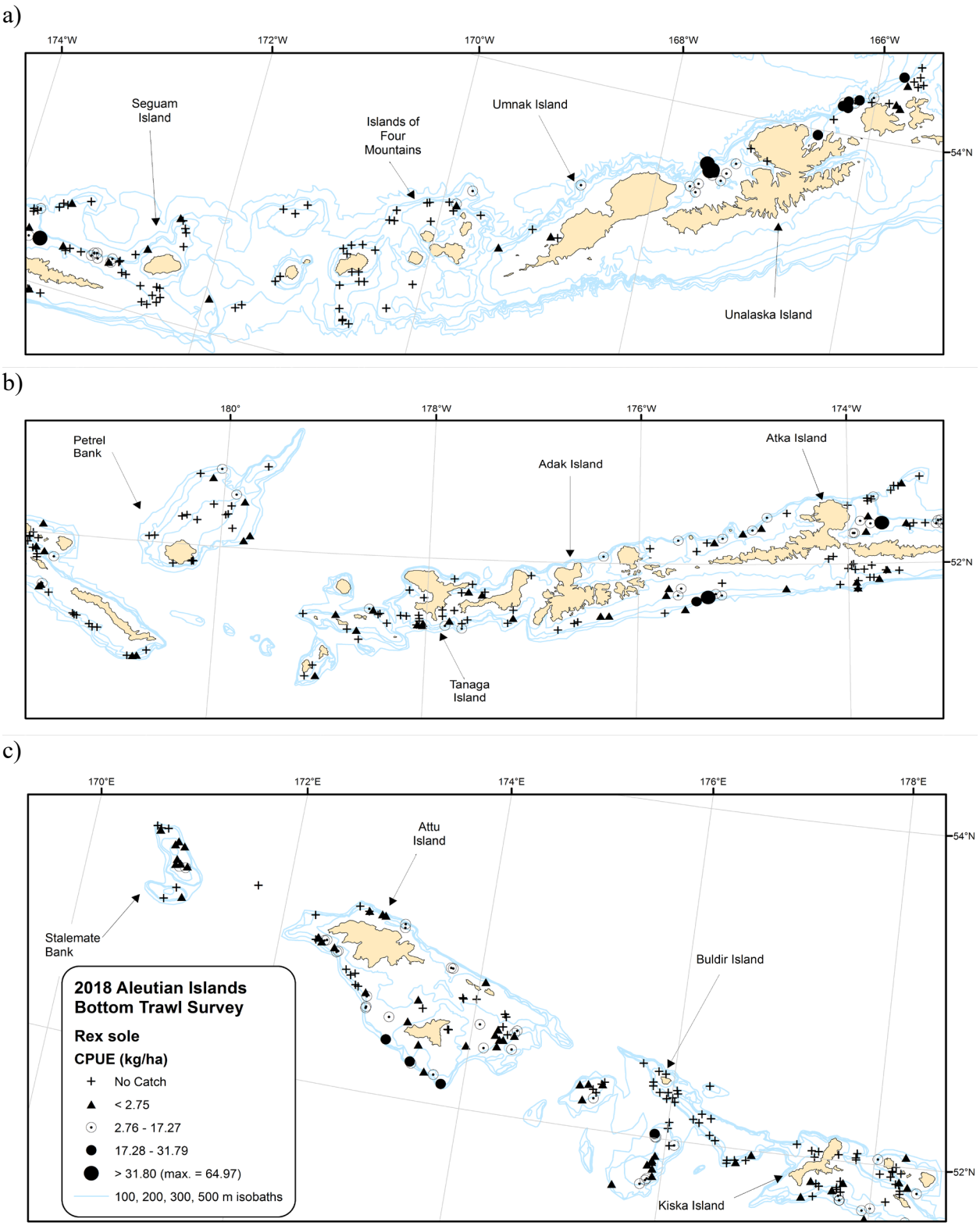

Figure 16. -- Distribution and relative abundance of rex sole from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

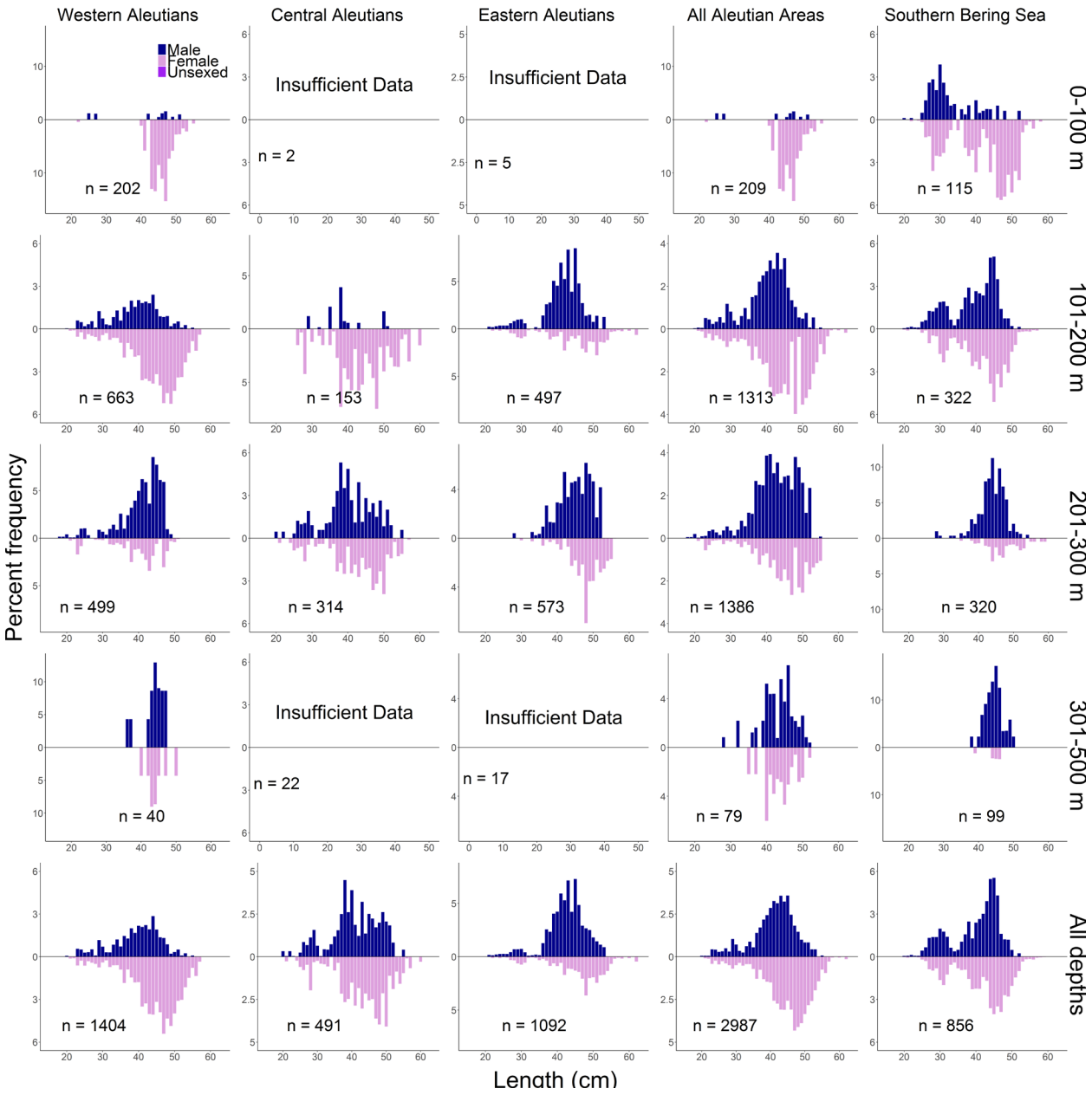

Figure 17. -- Population length composition of rex sole by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	101-200	E Southern Bering Sea	12	11	21.62	2,549	1,239	3,859
Eastern Aleutians	201-300	SW Eastern Aleutians	5	5	19.85	1,422	0	3,073
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	17.94	1,871	0	7,081
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	5	9.86	556	69	1,043
Central Aleutians	201-300	SW Central Aleutians	6	4	5.24	223	0	505
Eastern Aleutians	201-300	NW Eastern Aleutians	6	6	4.26	67	0	133
Western Aleutians	101-200	W Western Aleutians	48	39	3.90	1,585	987	2,182
Southern Bering Sea	1-100	E Southern Bering Sea	18	9	3.43	836	41	1,631
Western Aleutians	201-300	W Western Aleutians	14	9	3.28	308	0	697
Eastern Aleutians	101-200	NE Eastern Aleutians	30	12	2.63	529	16	1,042
Western Aleutians	1-100	E Western Aleutians	13	8	2.28	270	0	540
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	2.13	568	0	2,800
Central Aleutians	301-500	SE Central Aleutians	2	1	2.07	148	0	2,029
Central Aleutians	201-300	N Central Aleutians	10	5	1.89	83	0	182
Central Aleutians	201-300	Petrel Bank	4	1	1.69	129	0	540
Western Aleutians	201-300	E Western Aleutians	11	4	1.65	129	0	323
Central Aleutians	301-500	Petrel Bank	2	2	1.52	188	0	1,262
Central Aleutians	201-300	SE Central Aleutians	4	2	1.52	72	0	218
Western Aleutians	101-200	E Western Aleutians	25	8	1.48	185	0	439
Eastern Aleutians	101-200	SW Eastern Aleutians	12	7	1.45	328	4	653
Eastern Aleutians	201-300	NE Eastern Aleutians	19	6	1.38	271	8	534
Western Aleutians	301-500	W Western Aleutians	4	1	1.32	225	0	941
Central Aleutians	301-500	N Central Aleutians	4	2	1.29	160	0	645
Central Aleutians	101-200	SW Central Aleutians	22	9	0.82	86	17	155
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.74	33	0	446
Central Aleutians	101-200	Petrel Bank	7	3	0.73	126	0	299
Western Aleutians	1-100	W Western Aleutians	12	4	0.49	181	0	453
Central Aleutians	101-200	SE Central Aleutians	14	6	0.46	35	5	64
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.41	65	0	892
Western Aleutians	301-500	E Western Aleutians	2	1	0.27	42	0	576
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	0.24	38	0	199
Central Aleutians	101-200	N Central Aleutians	9	2	0.23	25	0	64
Central Aleutians	301-500	SW Central Aleutians	2	2	0.20	16	0	209
Central Aleutians	1-100	SW Central Aleutians	3	1	0.13	20	0	108
Eastern Aleutians	101-200	SE Eastern Aleutians	16	2	0.10	18	0	45
Eastern Aleutians	201-300	SE Eastern Aleutians	9	2	0.09	18	0	46
Eastern Aleutians	1-100	SE Eastern Aleutians	12	1	0.00	1	0	3
Central Aleutians	1-100	N Central Aleutians	13	1	0.00	1	0	2

Dover sole (*Microstomus pacificus*)

Dover sole was not among the 20 most abundant species caught in the 2018 survey and did not rank among the top 20 in any of the survey districts (Table 2). Most Dover sole were caught at depths between 200 and 500 m in the Central and Eastern Aleutians survey districts but were rare in the Western Aleutians and Southern Bering Sea survey districts (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. Relatively few length-frequency data were collected for Dover sole in all survey districts and depths, making it difficult to detect clear patterns in the length distributions. Females had a considerably wider range of lengths than males with no distinct mode. The bulk of the male lengths were between approximately 40 cm and 48 cm, with no distinct mode (Fig. 18). The estimated biomass for Dover sole was 975 t, and the highest survey district biomass was in the Central Aleutian survey district, where 66% of the estimated biomass was concentrated (Table 19).

Table 19. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	5	0.04	19	0	41	0.872
	201 - 300	25	1	0.02	4	0	12	1.152
	301 - 500	6	0	---	---	---	---	---
	All depths	129	6	0.02	23	0	46	0.908
Central Aleutians	1 - 100	34	1	0.01	4	0	18	0.199
	101 - 200	52	1	0.07	31	0	104	1.667
	201 - 300	24	2	0.49	103	0	385	1.268
	301 - 500	10	3	1.28	509	0	2,027	1.058
	All depths	120	7	0.39	647	0	2,233	1.074
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	1		3	0	12	0.146
	201 - 300	39	4	0.04	21	0	50	1.654
	301 - 500	8	3	0.37	210	0	626	1.120
	All depths	126	8	0.09	234	0	652	1.062
Combined Aleutian Districts	1 - 100	77	1	<0.01	4	0	18	0.199
	101 - 200	186	7	0.03	53	0	129	0.878
	201 - 300	88	7	0.15	127	0	412	1.314
	301 - 500	24	6	0.56	719	0	1,705	1.075
	All depths	375	21	0.16	904	0	1,928	1.066
Southern Bering Sea	1 - 100	20	1	<0.01	1	0	3	0.188
	101 - 200	14	1	0.01	2	0	5	0.201
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	1	0.66	69	0	259	0.888
	All depths	45	3	0.1	71	0	262	0.783

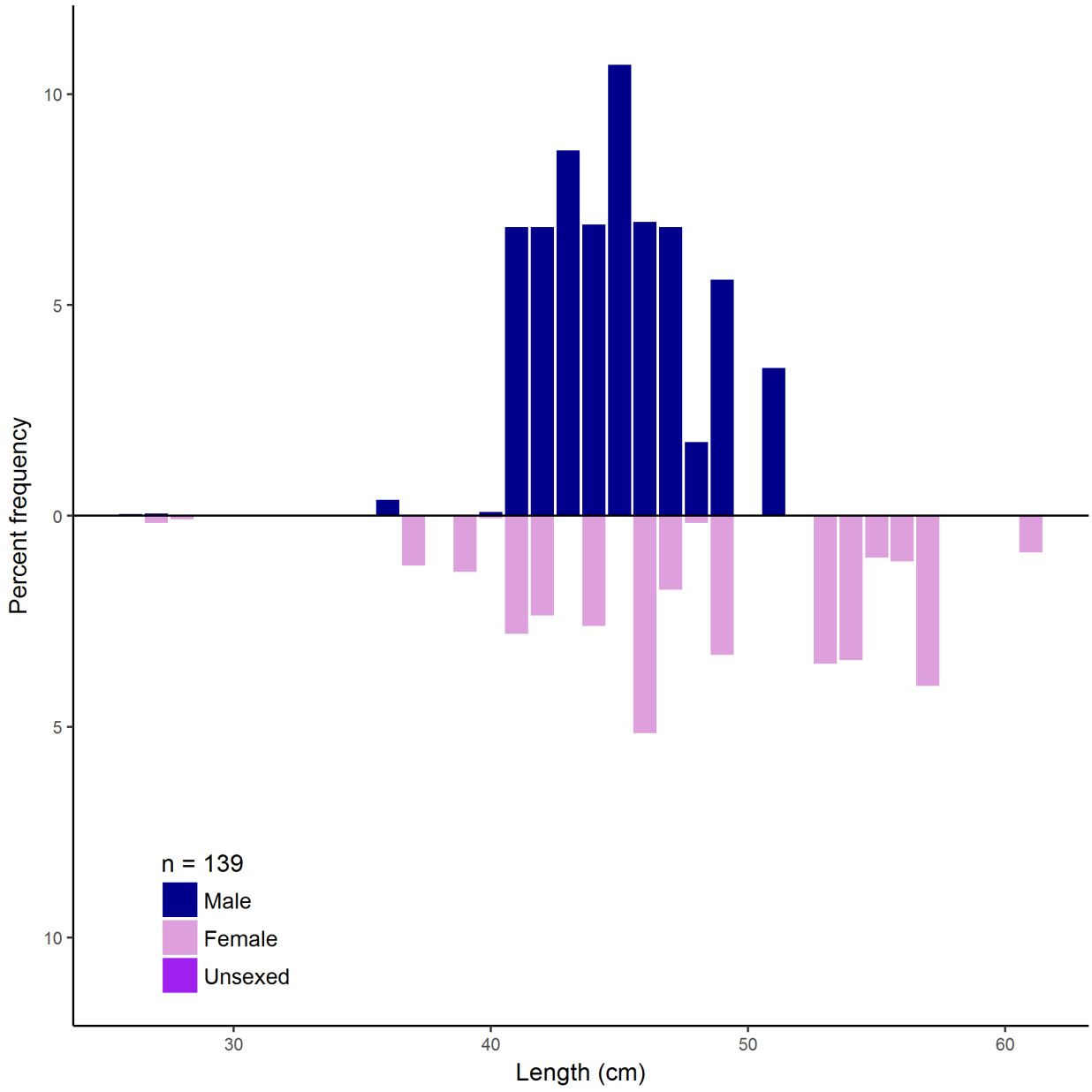

Figure 18. -- Population length composition of Dover sole in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	3.61	447	0	4,858
Central Aleutians	201-300	Petrel Bank	4	1	1.33	102	0	425
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	0.66	69	0	287
Central Aleutians	301-500	N Central Aleutians	4	1	0.51	63	0	262
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.50	134	0	710
Eastern Aleutians	201-300	NW Eastern Aleutians	6	3	0.45	7	0	16
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	0.26	67	0	355
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.21	9	0	127
Central Aleutians	101-200	Petrel Bank	7	1	0.18	31	0	107
Eastern Aleutians	201-300	NE Eastern Aleutians	19	1	0.07	14	0	42
Western Aleutians	201-300	E Western Aleutians	11	1	0.05	4	0	12
Western Aleutians	101-200	W Western Aleutians	48	3	0.04	15	0	35
Western Aleutians	101-200	E Western Aleutians	25	2	0.03	4	0	11
Central Aleutians	201-300	N Central Aleutians	10	1	0.03	1	0	4
Central Aleutians	1-100	SW Central Aleutians	3	1	0.03	4	0	23
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	0.02	3	0	15
Southern Bering Sea	101-200	E Southern Bering Sea	12	1	0.01	2	0	5
Southern Bering Sea	1-100	E Southern Bering Sea	18	1	0.01	1	0	4

Roundfish

Atka mackerel (*Pleurogrammus monopterygius*)

Atka mackerel was the second most abundant species caught in the 2018 survey, and it also ranked second in the Western and Eastern Aleutian survey districts (Table 2). Although Atka mackerel were caught in all survey districts and at all survey depths, the majority were caught at depths less than 200 m in the three Aleutian survey districts and were notably not abundant in the Central Aleutians district (Table 21). The highest densities of this species occurred at depths less than 200 m in one Eastern and two Western Aleutian subdistricts. Relatively high densities also occurred at depths between 101 and 300 m in two Eastern Aleutian and one Southern Bering Sea subdistricts (Fig. 19 and Table 22). There was no discernable trend in size with depth. Although the length mode occurred at a slightly larger size for females, the length distributions were generally similar between the sexes in the three Aleutian survey districts. In the Southern Bering Sea survey district, females had a wider length distribution than males, with no distinct mode over the combined depth intervals. This is in contrast to the much narrower length distribution of males, with a distinct mode at approximately 45 cm (Fig. 20). The estimated biomass for Atka mackerel was 355,213 t, and the highest survey district biomass was the Eastern Aleutian survey district, where 47% of the estimated biomass was concentrated (Table 21).

Table 21. -- Summary by survey districts and depth intervals of 2018 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	25	20	147.08	71,728	0	143,848	0.517
	101 - 200	73	38	118.33	62,922	0	126,853	0.680
	201 - 300	25	9	0.67	116	8	224	0.712
	301 - 500	6	0	---	---	---	---	---
	All depths	129	67	88.72	134,766	40,951	228,580	0.582
Central Aleutians	1 - 100	34	26	33.54	19,613	5,512	33,713	0.569
	101 - 200	52	34	14.86	6,843	0	14,048	0.838
	201 - 300	24	6	0.37	79	0	168	0.872
	301 - 500	10	3	0.2	80	0	342	0.524
	All depths	120	69	16.09	26,615	10,779	42,450	0.621
Eastern Aleutians	1 - 100	18	11	18.71	12,815	0	36,834	0.757
	101 - 200	61	22	140.88	109,439	0	280,219	0.974
	201 - 300	39	10	93.65	45,903	0	141,525	0.922
	301 - 500	8	1	0.05	31	0	128	0.723
	All depths	126	44	66.74	168,188	0	362,071	0.939
Combined Aleutian Districts	1 - 100	77	57	59.27	104,156	29,386	178,925	0.547
	101 - 200	186	94	101.29	179,203	0	359,823	0.841
	201 - 300	88	25	52.78	46,098	0	141,720	0.921
	301 - 500	24	4	0.09	111	0	286	0.567
	All depths	375	180	57.89	329,568	116,268	542,868	0.727
Southern Bering Sea	1 - 100	20	11	16.56	6,668	0	18,459	1.125
	101 - 200	14	6	101.95	18,847	0	92,789	0.953
	201 - 300	7	3	1.45	82	0	224	0.855
	301 - 500	4	2	0.47	49	0	145	0.938
	All depths	45	22	34.28	25,645	0	83,167	0.992

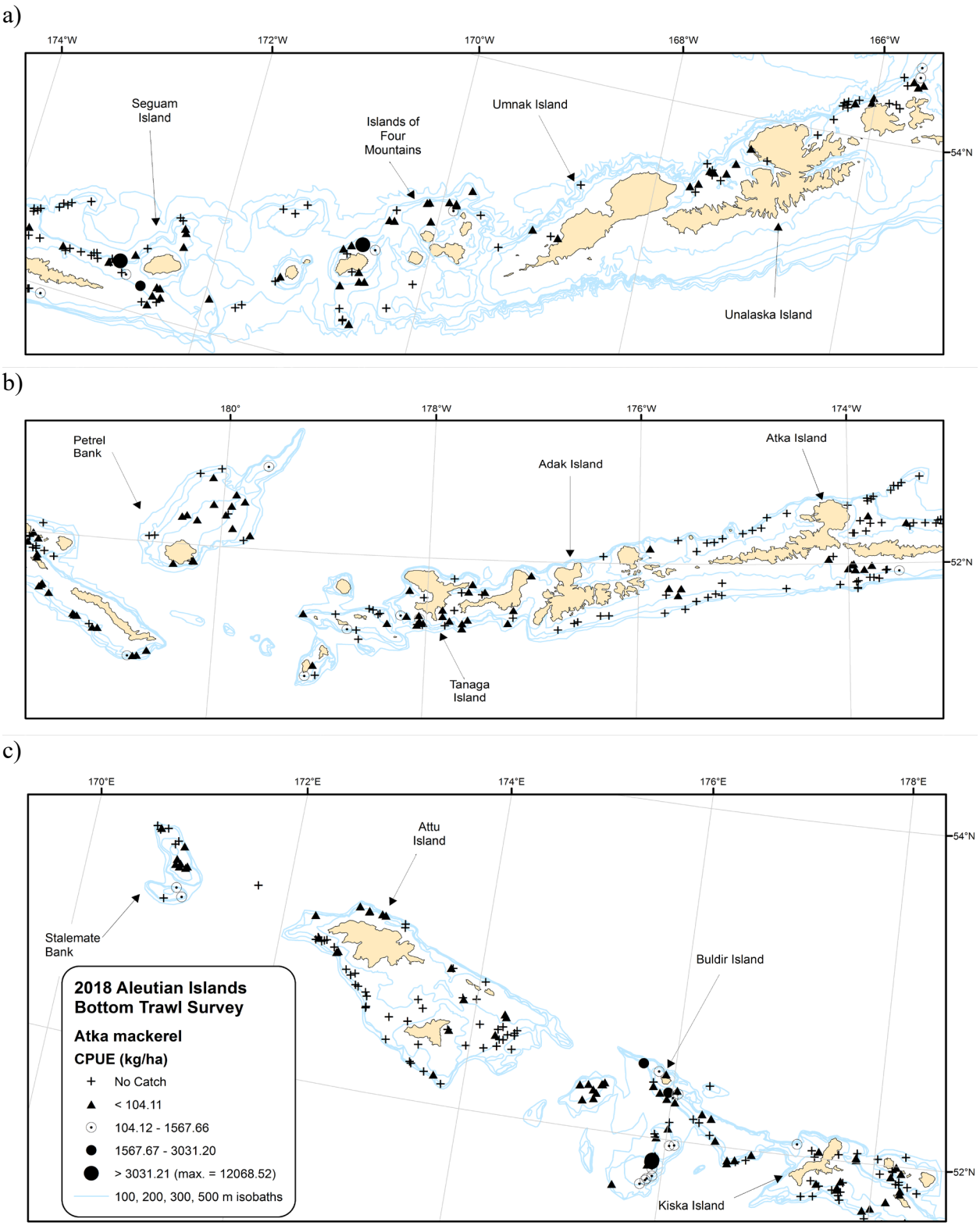

Figure 19. -- Distribution and relative abundance of Atka mackerel from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

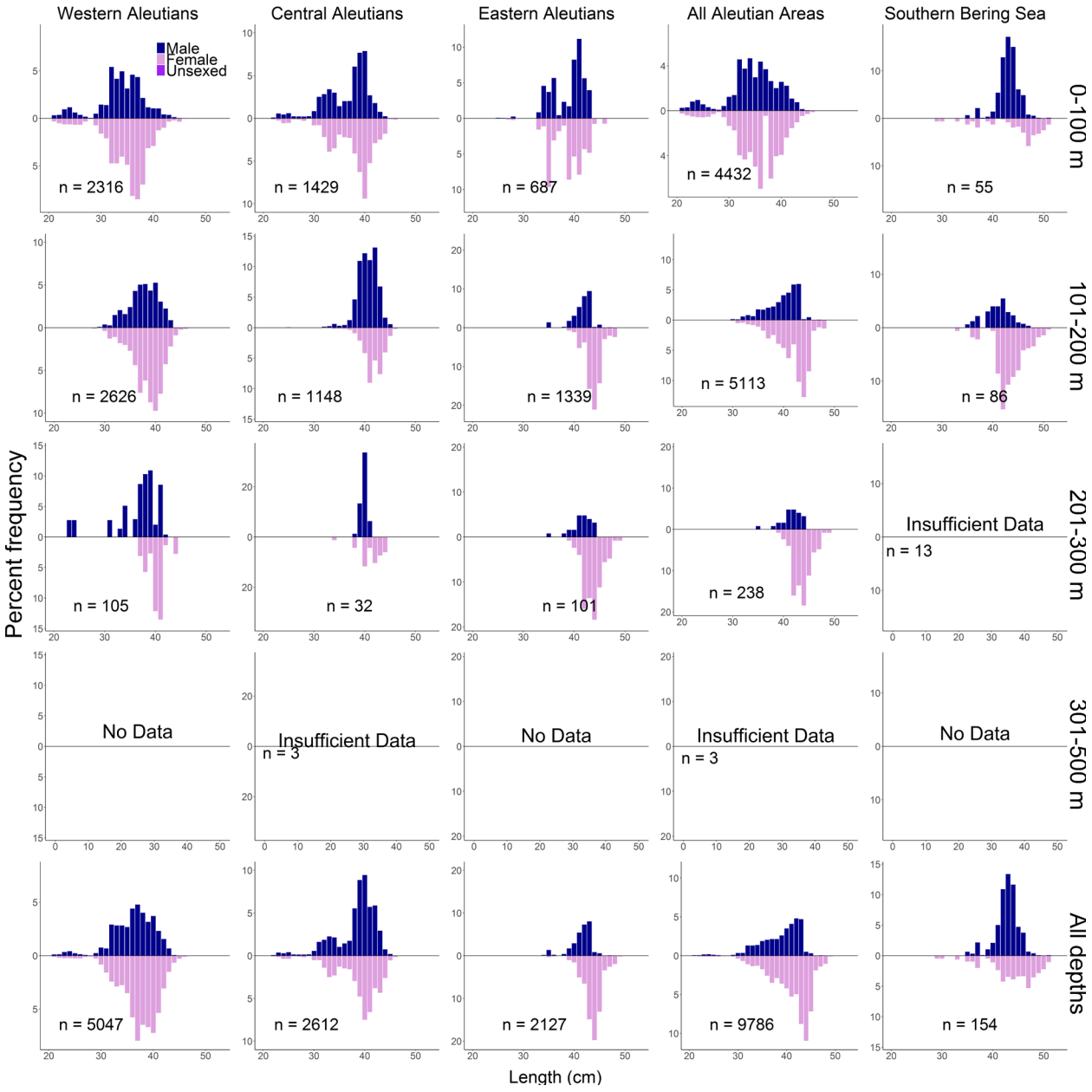

Figure 20. -- Population length composition of Atka mackerel by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	13	583.66	69,066	0	142,167
Eastern Aleutians	101-200	NE Eastern Aleutians	30	12	437.61	88,071	0	253,506
Western Aleutians	101-200	E Western Aleutians	25	20	426.05	53,362	0	116,560
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	255.42	17,101	0	234,381
Eastern Aleutians	201-300	NE Eastern Aleutians	19	6	232.67	45,803	0	141,790
Eastern Aleutians	101-200	SE Eastern Aleutians	16	7	112.38	21,354	0	66,569
Central Aleutians	1-100	SE Central Aleutians	9	8	73.34	8,537	0	17,445
Eastern Aleutians	1-100	SE Eastern Aleutians	12	9	73.08	12,721	0	36,982
Central Aleutians	1-100	Petrel Bank	9	7	58.43	5,610	0	17,175
Central Aleutians	101-200	SW Central Aleutians	22	15	39.07	4,112	0	10,387
Central Aleutians	101-200	SE Central Aleutians	14	8	33.62	2,527	0	6,478
Southern Bering Sea	1-100	E Southern Bering Sea	18	10	27.24	6,647	0	18,490
Western Aleutians	101-200	W Western Aleutians	48	18	23.52	9,560	0	22,760
Central Aleutians	1-100	N Central Aleutians	13	9	21.77	4,583	0	10,299
Southern Bering Sea	101-200	E Southern Bering Sea	12	5	14.81	1,746	0	5,467
Western Aleutians	1-100	W Western Aleutians	12	7	7.21	2,662	0	7,585
Central Aleutians	1-100	SW Central Aleutians	3	2	5.46	884	0	4,539
Western Aleutians	201-300	E Western Aleutians	11	8	1.45	114	4	223
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	3	1.45	82	0	229
Central Aleutians	201-300	SW Central Aleutians	6	3	0.95	40	0	98
Central Aleutians	101-200	Petrel Bank	7	7	0.93	161	35	288
Central Aleutians	201-300	SE Central Aleutians	4	2	0.77	37	0	129
Eastern Aleutians	201-300	SE Eastern Aleutians	9	4	0.49	101	0	220
Central Aleutians	301-500	Petrel Bank	2	1	0.48	59	0	806
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	0.47	49	0	159
Central Aleutians	101-200	N Central Aleutians	9	4	0.40	43	0	96
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.38	73	0	1,002
Central Aleutians	301-500	SE Central Aleutians	2	1	0.19	14	0	186
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.13	20	0	277
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.11	31	0	162
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.11	21	0	286
Eastern Aleutians	101-200	SW Eastern Aleutians	12	3	0.06	14	0	31
Central Aleutians	301-500	N Central Aleutians	4	1	0.06	8	0	33
Central Aleutians	201-300	N Central Aleutians	10	1	0.03	1	0	5
Western Aleutians	201-300	W Western Aleutians	14	1	0.02	2	0	7

Pacific cod (*Gadus macrocephalus*)

Pacific cod was the sixth most abundant species caught in the 2018 survey, and it never ranked lower than seventh 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 generally occurred at depths shallower than 200 m in various subdistricts throughout all survey districts except the Western Aleutians. A relatively high density was also recorded at depths between 201 and 300 m in an Eastern Aleutians subdistrict. The single highest concentration was in the SE Eastern Aleutians (101-200 m) subdistrict, where the CPUE was more than 50% higher than the CPUE of the next highest subdistrict (Table 24). The largest individual catches occurred in a vicinity of Seguam, Yunaksa, and Tanaga islands, as well as at Petrel Bank (Fig. 21). There was no trend in size with depth. Males and females were similar in size and had similar length ranges in all four survey districts. A relatively distinct mode occurred at approximately 60 cm for both sexes and in all survey districts (Fig. 22). The estimated biomass of Pacific cod was 95,904 t, and the highest survey district biomass was in the Eastern Aleutians district, where 51% of the estimated biomass was concentrated (Table 23).

Table 23. -- Summary by survey districts and depth intervals of 2018 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	25	18	9.47	4,618	1,080	8,156	1.533
	101 - 200	73	50	11.48	6,104	3,846	8,362	2.976
	201 - 300	25	15	4.08	703	296	1,110	2.833
	301 - 500	6	0	---	---	---	---	---
	All depths	129	83	7.52	11,425	7,137	15,713	2.151
Central Aleutians	1 - 100	34	31	20.25	11,839	3,634	20,044	3.013
	101 - 200	52	50	16.12	7,425	3,358	11,491	2.596
	201 - 300	24	16	6.32	1,332	756	1,908	2.313
	301 - 500	10	0	---	---	---	---	---
	All depths	120	97	12.45	20,596	11,486	29,707	2.796
Eastern Aleutians	1 - 100	18	11	17.5	11,987	0	28,391	2.102
	101 - 200	61	57	37.43	29,076	6,810	51,343	2.992
	201 - 300	39	36	15.72	7,704	4,328	11,079	3.014
	301 - 500	8	1	0.85	484	0	2,026	1.968
	All depths	126	105	19.54	49,251	21,035	77,467	2.703
Combined Aleutian Districts	1 - 100	77	60	16.19	28,444	7,054	49,834	2.250
	101 - 200	186	157	24.08	42,605	19,910	65,300	2.913
	201 - 300	88	67	11.15	9,739	6,288	13,190	2.881
	301 - 500	24	1	0.37	484	0	2,026	1.968
	All depths	375	285	14.28	81,272	51,540	111,005	2.630
Southern Bering Sea	1 - 100	20	15	15.04	6,055	2,253	9,857	3.303
	101 - 200	14	14	35.85	6,627	547	12,707	4.371
	201 - 300	7	7	28.28	1,595	296	2,893	3.994
	301 - 500	4	2	3.41	355	0	978	4.174
	All depths	45	38	19.56	14,632	8,080	21,184	3.817

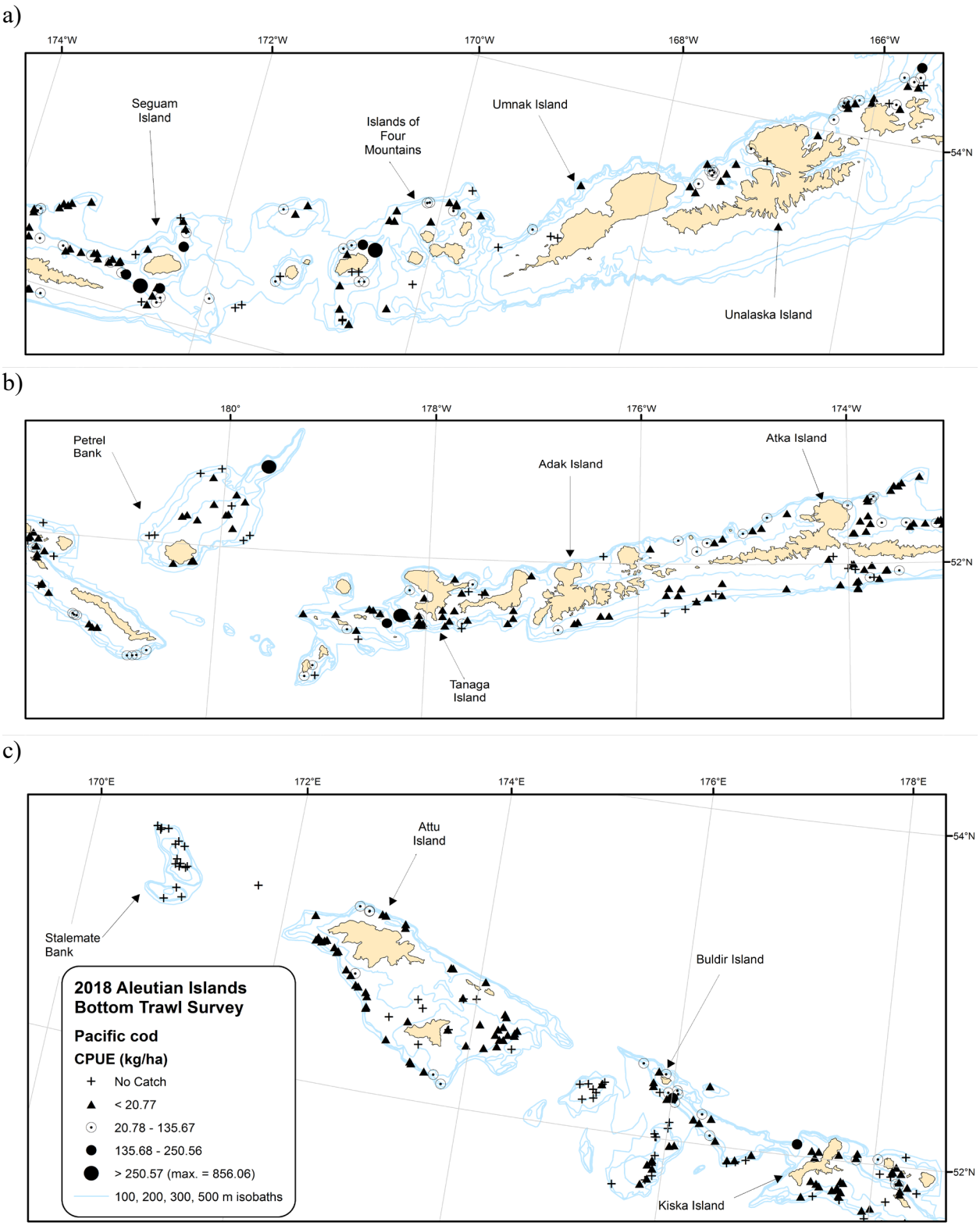

Figure 21. -- Distribution and relative abundance of Pacific cod from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

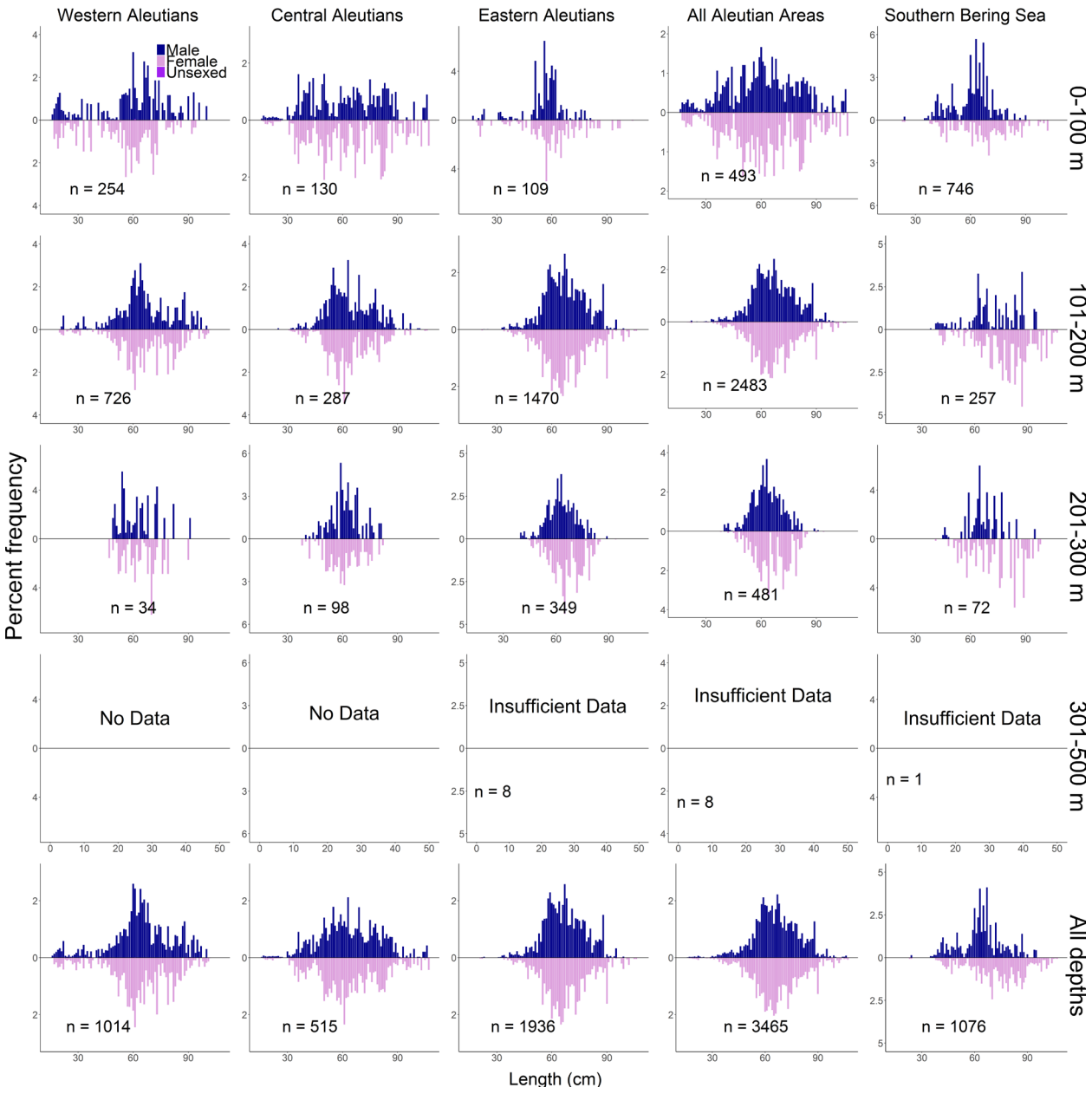

Figure 22. -- Population length composition of Pacific cod by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	SE Eastern Aleutians	16	12	80.70	15,335	0	36,842
Eastern Aleutians	101-200	NE Eastern Aleutians	30	30	53.13	10,693	4,332	17,053
Central Aleutians	101-200	SE Central Aleutians	14	13	46.25	3,477	0	7,369
Southern Bering Sea	101-200	E Southern Bering Sea	12	12	39.17	4,618	453	8,784
Central Aleutians	1-100	Petrel Bank	9	8	36.34	3,488	0	10,558
Eastern Aleutians	201-300	NW Eastern Aleutians	6	6	35.04	546	0	1,193
Eastern Aleutians	1-100	NW Eastern Aleutians	2	2	32.78	6,335	0	62,014
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	32.08	4,068	0	36,972
Central Aleutians	1-100	SE Central Aleutians	9	9	31.31	3,644	827	6,462
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	30.00	2,009	0	22,465
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	7	28.28	1,595	251	2,938
Southern Bering Sea	1-100	E Southern Bering Sea	18	15	24.81	6,055	2,237	9,874
Western Aleutians	101-200	E Western Aleutians	25	15	22.42	2,808	660	4,957
Central Aleutians	1-100	N Central Aleutians	13	12	20.44	4,303	0	9,146
Eastern Aleutians	201-300	SE Eastern Aleutians	9	8	18.41	3,793	615	6,972
Central Aleutians	101-200	N Central Aleutians	9	8	17.56	1,872	293	3,450
Eastern Aleutians	201-300	NE Eastern Aleutians	19	19	16.71	3,290	1,981	4,599
Central Aleutians	201-300	N Central Aleutians	10	10	16.53	726	339	1,112
Central Aleutians	101-200	SW Central Aleutians	22	22	15.40	1,621	726	2,516
Western Aleutians	1-100	E Western Aleutians	13	11	14.59	1,726	123	3,329
Central Aleutians	201-300	SE Central Aleutians	4	4	9.95	475	0	960
Eastern Aleutians	101-200	NW Eastern Aleutians	3	3	9.02	1,438	0	6,699
Eastern Aleutians	1-100	SE Eastern Aleutians	12	6	8.65	1,505	0	3,296
Western Aleutians	101-200	W Western Aleutians	48	35	8.11	3,296	2,412	4,180
Western Aleutians	1-100	W Western Aleutians	12	7	7.83	2,892	0	6,113
Eastern Aleutians	101-200	SW Eastern Aleutians	12	12	7.12	1,611	739	2,482
Western Aleutians	201-300	W Western Aleutians	14	11	5.46	513	140	886
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	3.41	355	0	1,069
Central Aleutians	201-300	SW Central Aleutians	6	2	3.09	132	0	459
Central Aleutians	101-200	Petrel Bank	7	7	2.63	456	203	709
Central Aleutians	1-100	SW Central Aleutians	3	2	2.50	404	0	1,731
Western Aleutians	201-300	E Western Aleutians	11	4	2.43	190	0	392
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	1.88	484	0	2,569
Eastern Aleutians	201-300	SW Eastern Aleutians	5	3	1.04	74	0	159
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.41	79	0	1,078

Walleye pollock (*Gadus chalcogrammus*)

Walleye pollock was the fourth most abundant species caught in the 2018 survey and it never ranked lower than fifth 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 200 and 300 m in the Eastern Aleutians survey district (Table 25). The highest density by far occurred in the 201-300 m range in one subdistrict 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 (Fig. 23). Males and females had relatively similar length distributions in all survey districts and all depth intervals. The distributions were bimodal in the three Aleutian survey districts (unimodal in the Southern Bering Sea), with distinct modes at approximately 36 cm and 44 cm for both sexes. Length distributions were generally unimodal in the deeper depth intervals of all survey districts, with distinct modes ranging between approximately 42 cm and 50 cm for the different depth intervals and survey districts (Fig. 24). The estimated biomass of walleye pollock was 197,182 t, and the highest regional biomass was in the Eastern Aleutians survey district, where 62% of the estimated biomass was concentrated (Table 25).

Table 25. -- Summary by survey districts and depth intervals of 2018 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	25	15	0.85	414	0	875	0.194
	101 - 200	73	65	27.3	14,518	5,175	23,861	0.872
	201 - 300	25	22	5.53	953	672	1,233	1.038
	301 - 500	6	1	0.05	18	0	67	1.081
	All depths	129	103	10.47	15,902	6,545	25,259	0.806
Central Aleutians	1 - 100	34	9	3.36	1,966	0	5,093	0.624
	101 - 200	52	44	37.83	17,421	0	40,402	0.918
	201 - 300	24	23	35.99	7,589	0	16,509	1.240
	301 - 500	10	2	1.45	578	0	2,112	1.368
	All depths	120	78	16.66	27,553	3,494	51,613	0.961
Eastern Aleutians	1 - 100	18	7	2.52	1,725	0	6,530	0.341
	101 - 200	61	45	4.83	3,755	0	9,057	0.686
	201 - 300	39	33	237.44	116,382	0	256,405	1.291
	301 - 500	8	2	0.76	430	0	1,773	1.412
	All depths	126	87	48.53	122,291	0	262,429	1.211
Combined Aleutian Districts	1 - 100	77	31	2.34	4,104	0	9,962	0.397
	101 - 200	186	154	20.18	35,694	10,693	60,696	0.869
	201 - 300	88	78	143.03	124,923	0	265,135	1.285
	301 - 500	24	5	0.79	1,026	0	2,957	1.380
	All depths	375	268	29.11	165,747	24,463	307,031	1.110
Southern Bering Sea	1 - 100	20	13	51.05	20,552	0	41,666	0.723
	101 - 200	14	14	34.54	6,386	2,116	10,656	0.752
	201 - 300	7	7	44.23	2,494	0	5,582	1.022
	301 - 500	4	4	19.21	2,004	0	5,259	1.076
	All depths	45	38	42.02	31,435	9,692	53,177	0.763

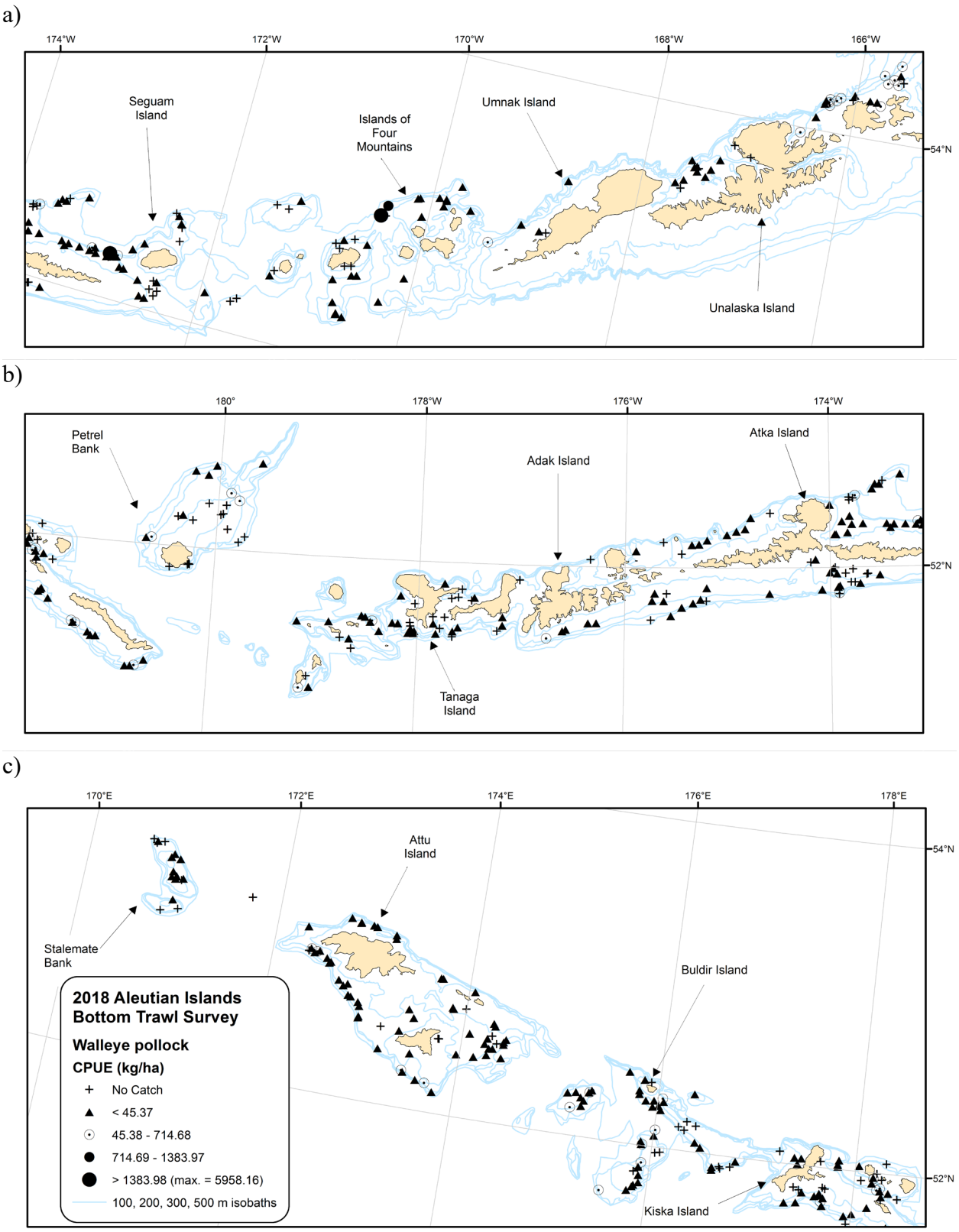

Figure 23. -- Distribution and relative abundance of walleye pollock from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

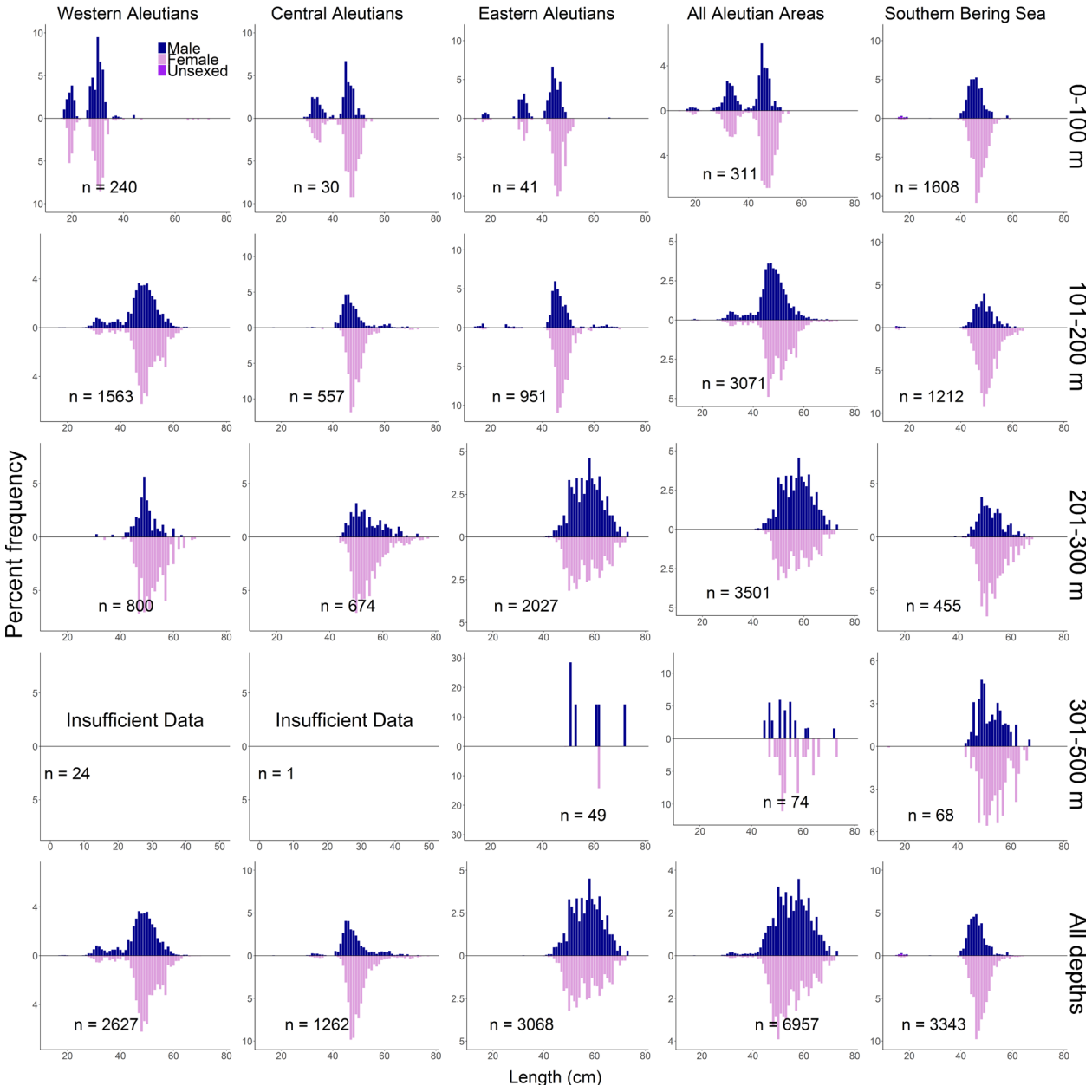

Figure 24. -- Population length composition of walleye pollock by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	NE Eastern Aleutians	19	15	574.61	113,115	0	253,630
Central Aleutians	201-300	N Central Aleutians	10	10	86.71	3,806	0	8,799
Southern Bering Sea	1-100	E Southern Bering Sea	18	12	84.21	20,549	0	41,753
Central Aleutians	101-200	Petrel Bank	7	4	71.61	12,429	0	35,912
Western Aleutians	101-200	E Western Aleutians	25	22	56.65	7,095	328	13,862
Southern Bering Sea	101-200	E Southern Bering Sea	12	12	53.86	6,351	2,038	10,663
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	7	44.23	2,494	0	5,689
Central Aleutians	201-300	Petrel Bank	4	4	38.87	2,979	0	11,444
Central Aleutians	101-200	SW Central Aleutians	22	20	23.67	2,491	689	4,294
Central Aleutians	101-200	SE Central Aleutians	14	13	21.31	1,602	0	4,070
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	19.21	2,004	0	5,735
Western Aleutians	101-200	W Western Aleutians	48	43	18.26	7,423	697	14,149
Eastern Aleutians	201-300	SE Eastern Aleutians	9	9	15.04	3,100	0	6,931
Eastern Aleutians	101-200	SW Eastern Aleutians	12	11	13.02	2942.7	0	8253.8
Central Aleutians	1-100	SE Central Aleutians	9	3	11.94	1390.3	0	4564.6
Central Aleutians	201-300	SE Central Aleutians	4	3	11.51	549.2	0	1448.8
Central Aleutians	101-200	N Central Aleutians	9	7	8.44	899.3	0	2086.9
Western Aleutians	201-300	E Western Aleutians	11	11	7.43	581.8	393.6	770.1
Central Aleutians	201-300	SW Central Aleutians	6	6	5.97	254.4	10.1	498.7
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	5.17	998.9	0	13690.6
Central Aleutians	301-500	N Central Aleutians	4	1	4.45	552.1	0	2309
Eastern Aleutians	1-100	SE Eastern Aleutians	12	4	4.02	700	0	1798.4
Western Aleutians	201-300	W Western Aleutians	14	11	3.94	370.8	140.5	601.1
Eastern Aleutians	101-200	NE Eastern Aleutians	30	22	2.71	545.3	0	1148.8
Eastern Aleutians	201-300	NW Eastern Aleutians	6	5	2.66	41.4	0	101.1
Central Aleutians	1-100	N Central Aleutians	13	4	2.18	458	0	1414
Eastern Aleutians	201-300	SW Eastern Aleutians	5	4	1.75	125.4	0	270.6
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	1.58	421.9	0	2237.3
Eastern Aleutians	101-200	SE Eastern Aleutians	16	10	1.09	207.8	0	418.9
Central Aleutians	1-100	Petrel Bank	9	1	0.98	94	0	310.7
Western Aleutians	1-100	W Western Aleutians	12	9	0.91	334.8	0	794.5
Western Aleutians	1-100	E Western Aleutians	13	6	0.67	79.2	3.7	154.7
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	0.53	35.3	0	280.6
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	0.37	59.3	0	209
Central Aleutians	301-500	SW Central Aleutians	2	1	0.33	25.8	0	354.1
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.19	23.7	0	324.2
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.19	8.1	0	110.9
Central Aleutians	1-100	SW Central Aleutians	3	1	0.14	23.3	0	123.3
Western Aleutians	301-500	W Western Aleutians	4	1	0.10	18	0	74
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.02	3.1	0	42.4
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.01	2.1	0	29.4

Sablefish (*Anoplopoma fimbria*)

Sablefish was the seventeenth most abundant species caught in the 2018 survey and was ranked among the top 20 in all survey districts except for the Western Aleutian survey district (Table 2). The vast majority of sablefish were caught at depths between 200 and 500 m in all survey districts except for the Western Aleutians, where no or very small catches were recorded at all depth intervals (Table 27). The highest densities of this species occurred at depths deeper than 200 m in two Central Aleutians and one Southern Bering Sea subdistricts (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 with a common mode at approximately 49 cm. A distinct mode for unsexed fish occurred at approximately 28 cm (Fig. 26). The estimated biomass for sablefish was 10,076 t, and the highest survey district biomass was in the Eastern Aleutian survey district, where 48% of the estimated biomass was concentrated (Table 27).

Table 27. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	1	0.01	3	0	10	1.533
	201 - 300	25	1	0.02	4	0	12	1.326
	301 - 500	6	3	0.89	292	0	685	2.597
	All depths	129	5	0.2	299	0	692	2.548
Central Aleutians	1 - 100	34	2	0.02	12	0	30	1.058
	101 - 200	52	11	2.07	952	265	1,638	1.170
	201 - 300	24	12	4.78	1,007	218	1,796	1.375
	301 - 500	10	5	1.45	577	264	890	1.710
	All depths	120	30	1.54	2,548	1,511	3,584	1.345
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	4	0.1	77	0	178	1.205
	201 - 300	39	17	3.06	1,500	158	2,842	1.159
	301 - 500	8	7	5.7	3,241	1,636	4,846	1.898
	All depths	126	28	1.91	4,818	2,703	6,933	1.572
Combined Aleutian Districts	1 - 100	77	2	0.01	12	0	30	1.058
	101 - 200	186	16	0.58	1,032	357	1,706	1.173
	201 - 300	88	30	2.87	2,511	969	4,053	1.237
	301 - 500	24	15	3.18	4,110	2,421	5,800	1.905
	All depths	375	63	1.35	7,665	5,208	10,122	1.510
Southern Bering Sea	1 - 100	20	3	1.69	680	0	2,087	0.234
	101 - 200	14	4	0.28	51	0	105	0.912
	201 - 300	7	4	5.77	326	0	762	1.488
	301 - 500	4	4	12.98	1,354	0	3,852	1.710
	All depths	45	15	3.22	2,411	0	4,913	0.607

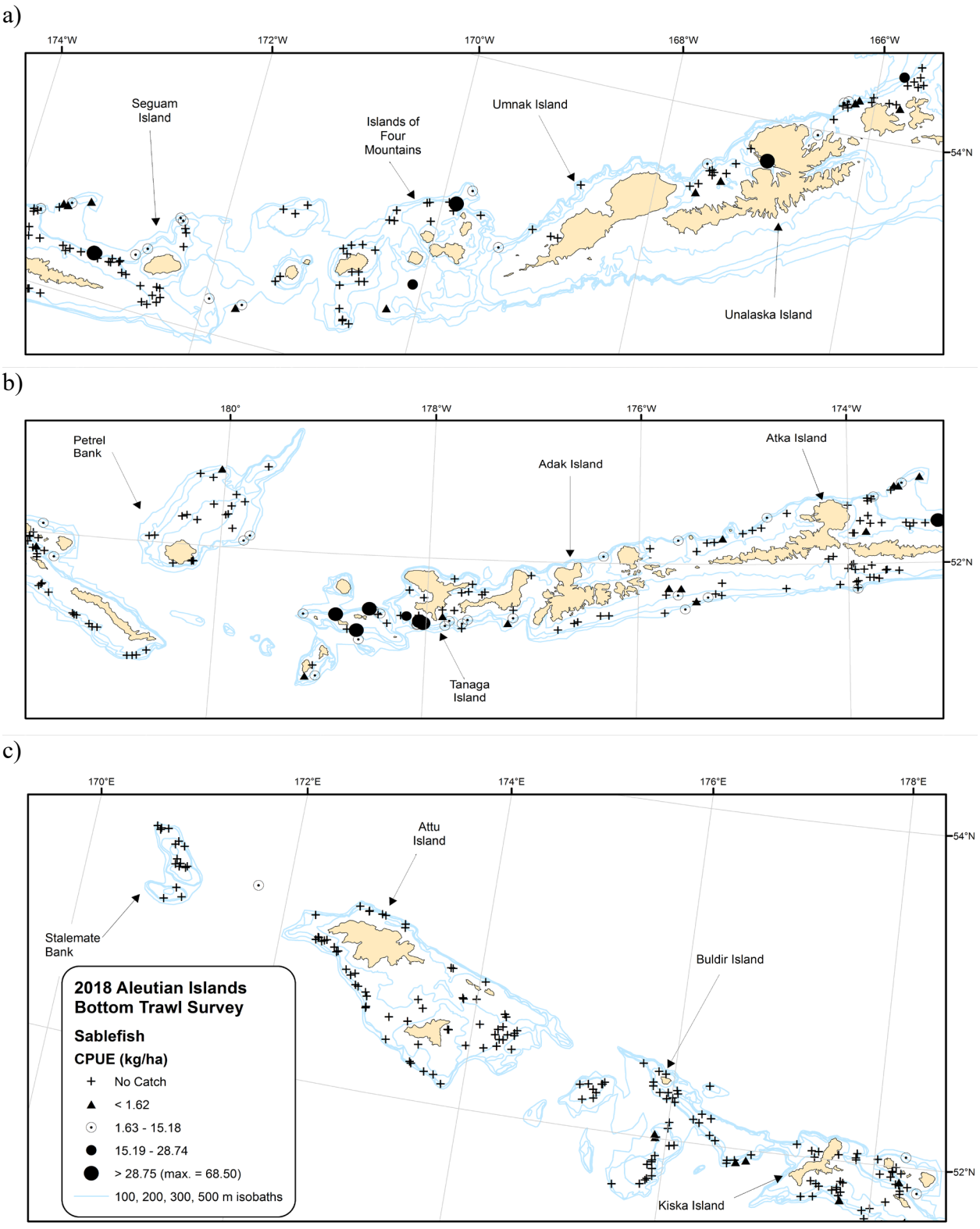

Figure 25. -- Distribution and relative abundance of sablefish from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

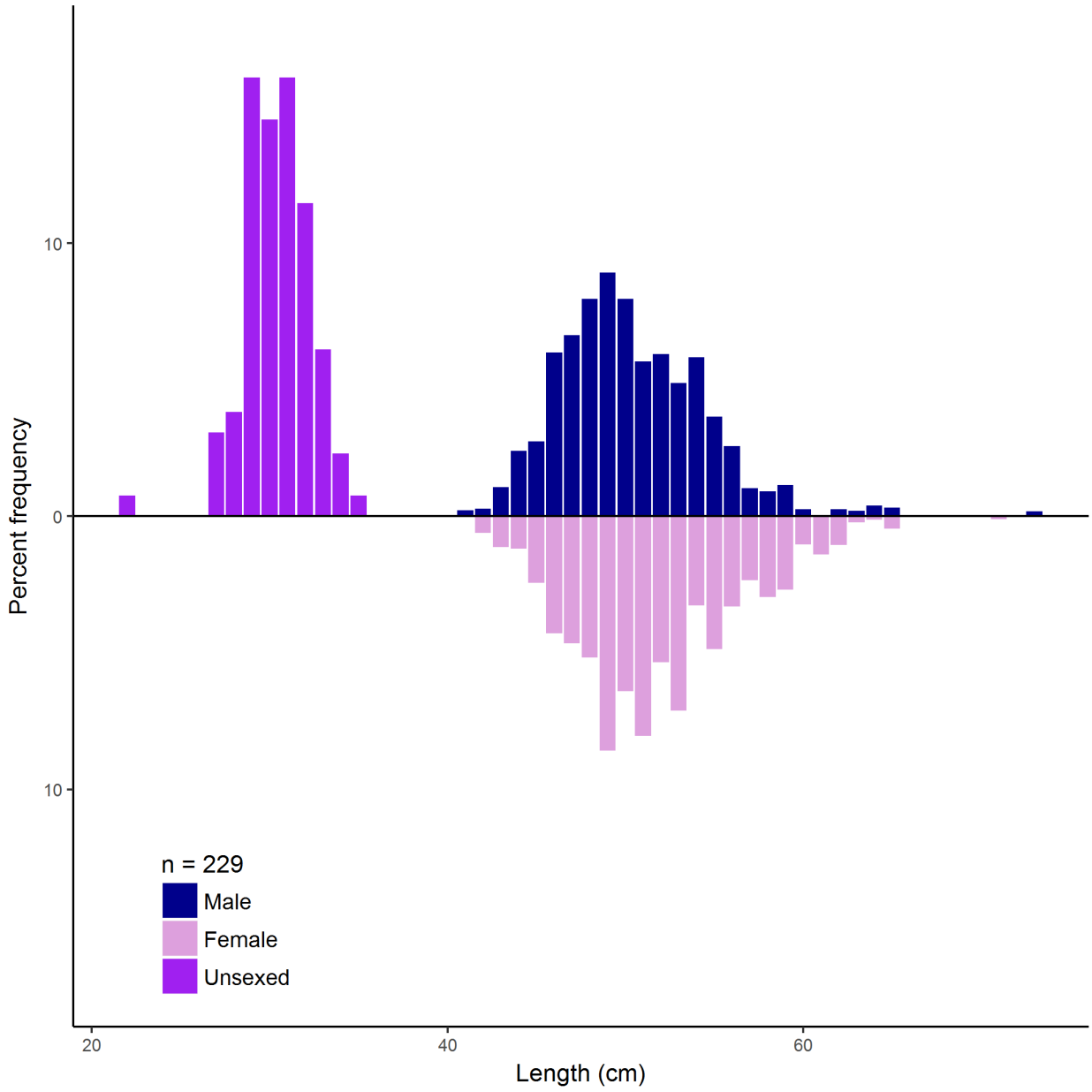

Figure 26. -- Population length composition of sablefish in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	10	5	13.48	592	0	1,343
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	12.98	1,354	0	4,218
Central Aleutians	101-200	SE Central Aleutians	14	11	12.66	952	260	1,643
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	8.61	2,299	297	4,300
Central Aleutians	201-300	SE Central Aleutians	4	4	7.87	376	0	872
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	4	5.77	326	0	777
Eastern Aleutians	201-300	NE Eastern Aleutians	19	9	4.13	813	0	1,679
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	3.21	141	0	1,925
Eastern Aleutians	301-500	SE Eastern Aleutians	3	3	3.12	802	0	2,489
Southern Bering Sea	1-100	E Southern Bering Sea	18	3	2.79	680	0	2,093
Eastern Aleutians	201-300	SE Eastern Aleutians	9	3	2.63	542	0	1,641
Central Aleutians	301-500	Petrel Bank	2	2	2.62	324	274	374
Eastern Aleutians	201-300	NW Eastern Aleutians	6	3	2.02	32	0	80
Eastern Aleutians	201-300	SW Eastern Aleutians	5	2	1.59	114	0	396
Central Aleutians	301-500	N Central Aleutians	4	2	1.45	179	0	512
Central Aleutians	301-500	SE Central Aleutians	2	1	1.03	74	0	1,008
Western Aleutians	301-500	E Western Aleutians	2	2	0.92	144	0	931
Western Aleutians	301-500	W Western Aleutians	4	1	0.87	148	0	620
Southern Bering Sea	101-200	E Southern Bering Sea	12	4	0.43	51	0	105
Central Aleutians	201-300	SW Central Aleutians	6	2	0.33	14	0	41
Central Aleutians	201-300	Petrel Bank	4	1	0.33	25	0	106
Eastern Aleutians	101-200	SW Eastern Aleutians	12	3	0.32	73	0	175
Central Aleutians	1-100	SE Central Aleutians	9	2	0.10	12	0	31
Western Aleutians	201-300	E Western Aleutians	11	1	0.05	4	0	12
Western Aleutians	101-200	E Western Aleutians	25	1	0.03	3	0	10
Eastern Aleutians	101-200	NE Eastern Aleutians	30	1	0.02	4	0	11

Giant grenadier (*Albatrossia pectoralis*)

Giant grenadier was the fifth most abundant species caught in the 2018 survey, and it never ranked lower than twelfth 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 three tows 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 four subdistricts within the Central and Eastern Aleutian survey districts. The largest catches were concentrated between Kiska and Amchitka islands (Fig. 27 and Table 30). Almost all recorded lengths were from females, which were vastly more abundant than males within the survey depth range. The bulk of the length distribution ranged between approximately 27 cm and 35 cm, with a distinct mode at approximately 29 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 101,332 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 55% of the estimated biomass was concentrated (Table 29).

Table 29. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	0	---	---	---	---	---
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	4	13.28	4,347	0	10,277	4.119
	All depths	129	4	2.86	4,347	0	10,277	4.119
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	0	---	---	---	---	---
	201 - 300	24	3	4.50	948	0	2,339	3.660
	301 - 500	10	10	102.37	40,749	4,815	76,683	3.545
	All depths	120	13	25.21	41,697	5,727	77,667	3.548
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	1	<0.01	3	0	9	1.172
	201 - 300	39	0	---	---	---	---	---
	301 - 500	8	6	97.28	55,285	0	162,421	3.517
	All depths	126	7	21.94	55,288	0	162,424	3.517
Combined Aleutian Districts	1 - 100	77	0	---	---	---	---	---
	101 - 200	186	1	<0.01	3	0	9	1.172
	201 - 300	88	3	1.09	948	0	2,339	3.660
	301 - 500	24	20	77.6	100,381	0	216,637	3.551
	All depths	375	24	17.80	101,332	0	217,605	3.552
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	0	---	---	---	---	---

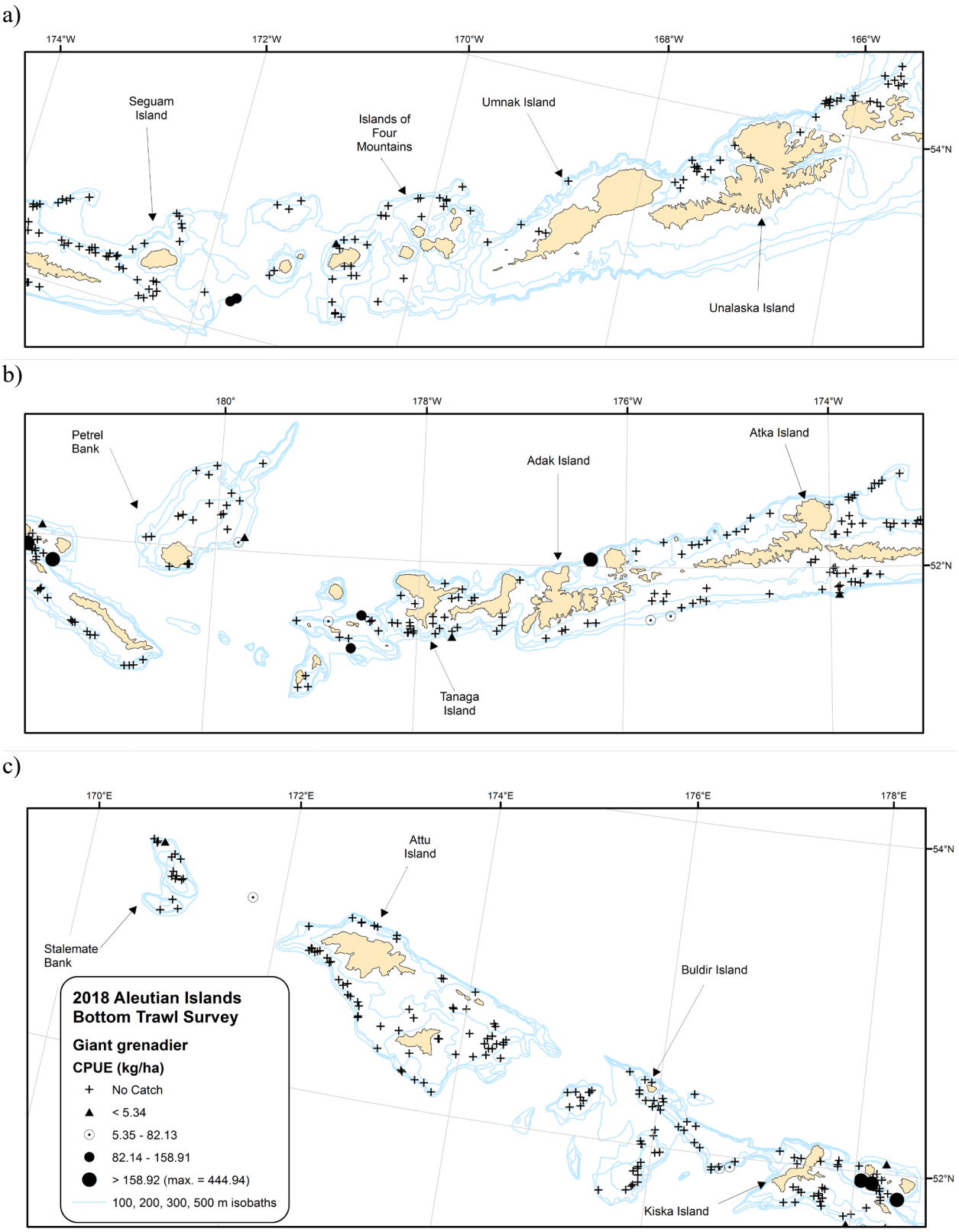

Figure 27. -- Distribution and relative abundance of giant grenadier from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

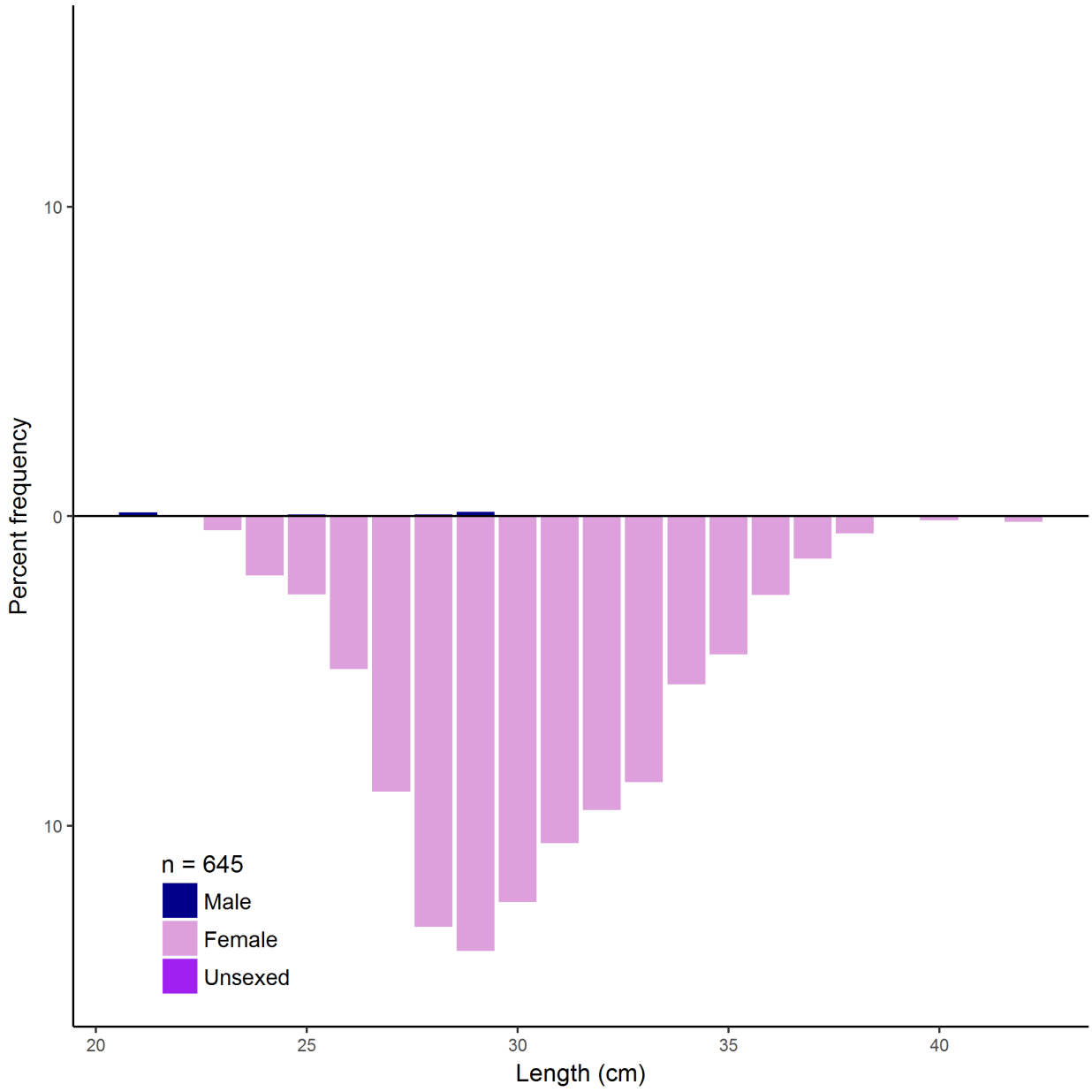

Figure 28. -- Population length composition of giant grenadier in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	4	266.96	33096.4	0	74,108
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	119.64	31944.3	0	169,401
Eastern Aleutians	301-500	SE Eastern Aleutians	3	3	84.193	21677.4	0	67,063
Central Aleutians	301-500	SE Central Aleutians	2	2	78.171	5583.8	0	72,748
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	37.958	1663.4	0	19,390
Central Aleutians	201-300	N Central Aleutians	10	3	21.59	948	0	2,361
Western Aleutians	301-500	E Western Aleutians	2	2	13.81	2,156	0	17,480
Western Aleutians	301-500	W Western Aleutians	4	2	12.80	2,191	0	8,879
Central Aleutians	301-500	SW Central Aleutians	2	2	10.44	824	0	7,329
Central Aleutians	301-500	Petrel Bank	2	2	10.06	1,245	0	14,120
Eastern Aleutians	101-200	NE Eastern Aleutians	30	1	0.02	3	0	9

Sculpins (Cottoidea)

Table 31 presents abundance information for all species in the families Cottidae, Hemitripteridae, Psychrolutidae, and Rhamphocottidae of the superfamily Cottoidea caught during the 2018 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 22 species or species groups of sculpins were identified during the 2018 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 2018 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 2018 Aleutian Islands bottom trawl survey combined across all four survey districts.

Common Name	Mean CPUE (kg/ha)	Biomass (t)	% Biomass	Cumulative %
yellow Irish lord	1.92	12,372	75	75
darkfin sculpin	0.34	2,185	13	88
great sculpin	0.19	1,211	7	95
spectacled sculpin	0.06	384	2	99
armorhead sculpin	0.03	189	1	99
bigmouth sculpin	0.02	133	1	99
Miscellaneous sculpins	0.01	58	<1	99
scissortail sculpin	0.01	45	<1	99
spinyhead sculpin	<0.001	3	< 1	100

Yellow Irish lord (*Hemilepidotus jordani*)

Yellow Irish lord was the most abundant sculpin species, and the fifteenth most abundant species overall caught in the 2018 survey (Tables 2 and 31). Although yellow Irish lords were caught at all depths intervals and in all four survey districts, the vast majority were caught at depths shallower than 200 m in the Eastern and Central Aleutians survey districts (Table 32). The highest densities occurred in five subdistricts in the Eastern and Central Aleutians at depths less than 200 m (Table 33). The estimated biomass of yellow Irish lord was 12,372 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 52% of the estimated biomass was concentrated (Table 32).

Table 32. -- Summary by survey districts and depth intervals of 2018 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	25	15	0.85	415	153	678	0.640
	101 - 200	73	12	0.16	85	29	141	0.630
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	129	27	0.33	500	233	767	0.638
Central Aleutians	1 - 100	34	19	3.66	2,142	540	3,745	0.836
	101 - 200	52	41	3.04	1,402	608	2,197	0.590
	201 - 300	24	6	0.23	49	0	99	0.755
	301 - 500	10	1	0.02	10	0	51	0.377
	All depths	120	67	2.18	3,603	1,902	5,305	0.716
Eastern Aleutians	1 - 100	18	15	3.37	2,311	0	4,679	0.868
	101 - 200	61	34	4.88	3,795	1,373	6,217	0.868
	201 - 300	39	9	0.74	362	34	689	0.985
	301 - 500	8	0	---	---	---	---	---
	All depths	126	58	2.57	6,467	3,260	9,674	0.874
Combined Aleutian Districts	1 - 100	77	49	2.77	4,868	2,096	7,640	0.829
	101 - 200	186	87	2.99	5,282	2,764	7,800	0.767
	201 - 300	88	15	0.47	411	80	741	0.950
	301 - 500	24	1	0.01	10	0	51	0.377
	All depths	375	152	1.86	10,570	6,975	14,165	0.800
Southern Bering Sea	1 - 100	20	15	1.83	738	200	1,275	0.599
	101 - 200	14	12	4.4	814	336	1,292	0.772
	201 - 300	7	3	1.74	98	0	213	0.786
	301 - 500	4	1	1.46	152	0	575	0.859
	All depths	45	31	2.41	1,802	1,041	2,562	0.696

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 2018 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	SE Eastern Aleutians	16	14	10.58	2,010	377	3,644
Central Aleutians	1-100	SE Central Aleutians	9	5	9.52	1,108	0	2,684
Central Aleutians	1-100	Petrel Bank	9	9	8.92	856	309	1,402
Central Aleutians	101-200	SE Central Aleutians	14	14	8.29	623	213	1,034
Eastern Aleutians	1-100	SE Eastern Aleutians	12	12	8.15	1,419	0	3,756
Eastern Aleutians	1-100	NE Eastern Aleutians	2	2	5.16	654	0	3,062
Southern Bering Sea	101-200	E Southern Bering Sea	12	10	4.49	530	100	959
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	4.24	284	0	1,491
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	3.78	602	0	3,194
Eastern Aleutians	101-200	SW Eastern Aleutians	12	8	3.10	702	0	1,603
Central Aleutians	101-200	N Central Aleutians	9	8	3.09	329	0	773
Western Aleutians	1-100	E Western Aleutians	13	10	2.95	349	81	617
Southern Bering Sea	1-100	E Southern Bering Sea	18	14	2.91	710	171	1,249
Eastern Aleutians	101-200	NE Eastern Aleutians	30	11	2.39	481	138	824
Central Aleutians	101-200	Petrel Bank	7	4	1.79	311	0	886
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	3	1.74	98	0	217
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	1.46	152	0	637
Central Aleutians	101-200	SW Central Aleutians	22	15	1.32	139	47	232
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	1.23	237	0	3,250
Eastern Aleutians	201-300	NE Eastern Aleutians	19	5	1.06	210	0	481
Central Aleutians	1-100	N Central Aleutians	13	5	0.85	178	0	361
Eastern Aleutians	201-300	SE Eastern Aleutians	9	3	0.73	150	0	365
Central Aleutians	201-300	SE Central Aleutians	4	2	0.67	32	0	91
Western Aleutians	101-200	W Western Aleutians	48	11	0.21	83	27	140
Western Aleutians	1-100	W Western Aleutians	12	5	0.18	66	0	137
Southern Bering Sea	1-100	W Southern Bering Sea	2	1	0.17	28	0	376
Central Aleutians	201-300	N Central Aleutians	10	2	0.15	7	0	17
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	0.15	2	0	8
Central Aleutians	201-300	Petrel Bank	4	1	0.11	9	0	36
Central Aleutians	301-500	Petrel Bank	2	1	0.08	10	0	132
Central Aleutians	201-300	SW Central Aleutians	6	1	0.04	2	0	6
Western Aleutians	101-200	E Western Aleutians	25	1	0.01	1	0	4

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 2018 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 three Aleutian Islands survey districts (Table 34). The highest densities occurred at two different depth intervals (301-500 m and 201-300 m) in seven subdistricts within the three different Aleutian survey districts (Table 35). The estimated biomass of darkfin sculpin was 2,184 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 42% of the estimated biomass was concentrated (Table 34).

Table 34. -- Summary by survey districts and depth intervals of 2018 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	CPUE (kg/ha)	Biomass (t)	95% LCL (t)	95% UCL (t)	Weight (kg)
Western Aleutians	1 - 100	25	3	<0.01	2	0	6	0.161
	101 - 200	73	31	0.48	254	50	457	0.108
	201 - 300	25	20	0.93	161	42	280	0.077
	301 - 500	6	3	0.12	38	34	42	0.028
	All depths	129	57	0.30	455	226	685	0.078
Central Aleutians	1 - 100	34	3	0.01	7	0	18	0.164
	101 - 200	52	21	0.29	132	48	215	0.246
	201 - 300	24	18	1.26	267	0	607	0.150
	301 - 500	10	6	0.68	270	0	898	0.048
	All depths	120	48	0.41	676	135	1217	0.085
Eastern Aleutians	1 - 100	18	0	---	---	0	0	---
	101 - 200	61	14	0.02	16	2	30	0.050
	201 - 300	39	22	0.98	482	0	1,091	0.141
	301 - 500	8	4	0.72	410	0	1,430	0.099
	All depths	126	40	0.36	908	0	2,070	0.116
Combined Aleutian Districts	1 - 100	77	6	<0.01	9	0	20	0.163
	101 - 200	186	66	0.23	402	184	619	0.125
	201 - 300	88	60	1.04	910	241	1,580	0.125
	301 - 500	24	13	0.55	718	0	1,838	0.065
	All depths	375	145	0.36	2,039	817	3,262	0.094
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	3	0.01	3	0	7	0.118
	201 - 300	7	7	0.25	14	0	29	0.165
	301 - 500	4	3	1.22	128	0	332	0.042
	All depths	45	13	0.19	145	0	350	0.046

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 2018 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	2.94	210	0	2,014
Central Aleutians	201-300	SE Central Aleutians	4	4	2.02	96	0	208
Eastern Aleutians	201-300	SE Eastern Aleutians	9	6	1.86	382	0	997
Western Aleutians	201-300	E Western Aleutians	11	11	1.82	143	23	262
Central Aleutians	201-300	Petrel Bank	4	3	1.82	139	0	509
Western Aleutians	101-200	E Western Aleutians	25	17	1.71	214	13	415
Eastern Aleutians	201-300	NW Eastern Aleutians	6	3	1.61	25	0	88
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	1.23	318	0	1,685
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	3	1.23	128	0	362
Central Aleutians	101-200	SW Central Aleutians	22	10	0.97	102	25	180
Central Aleutians	201-300	N Central Aleutians	10	7	0.63	28	0	63
Eastern Aleutians	201-300	NE Eastern Aleutians	19	12	0.38	75	23	127
Central Aleutians	301-500	N Central Aleutians	4	2	0.36	45	0	154
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	3	0.35	92	0	275
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	7	0.25	14	0	30
Western Aleutians	301-500	E Western Aleutians	2	2	0.23	36	35	38
Western Aleutians	201-300	W Western Aleutians	14	9	0.20	19	0	39
Central Aleutians	101-200	SE Central Aleutians	14	8	0.17	13	0	30
Central Aleutians	301-500	Petrel Bank	2	2	0.12	15	3	26
Western Aleutians	101-200	W Western Aleutians	48	14	0.10	40	0	81
Central Aleutians	201-300	SW Central Aleutians	6	4	0.10	4	0	11
Central Aleutians	101-200	Petrel Bank	7	2	0.09	16	0	48
Central Aleutians	1-100	Petrel Bank	9	2	0.07	7	0	17
Eastern Aleutians	101-200	SW Eastern Aleutians	12	7	0.04	8	0	20
Western Aleutians	1-100	E Western Aleutians	13	3	0.02	3	0	6
Eastern Aleutians	101-200	NE Eastern Aleutians	30	3	0.02	4	0	11
Southern Bering Sea	101-200	E Southern Bering Sea	12	2	0.02	2	0	6
Eastern Aleutians	101-200	SE Eastern Aleutians	16	3	0.02	3	0	8
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	0.01	1	0	11
Western Aleutians	301-500	W Western Aleutians	4	1	0.01	2	0	6
Eastern Aleutians	101-200	NW Eastern Aleutians	3	1	0.01	1	0	5
Central Aleutians	1-100	N Central Aleutians	13	1	0.00	1	0	2
Central Aleutians	101-200	N Central Aleutians	9	1	0.00	0	0	1
Eastern Aleutians	201-300	SW Eastern Aleutians	5	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 2018 survey (Tables 2 and 31). Great sculpins were only caught at depths shallower than 200 m and were relatively evenly distributed among the four survey districts (Table 36). The highest densities occurred at depths less than 100 m in two subdistricts in the Eastern and Central Aleutians survey district (Table 37). The estimated biomass of great sculpin was 1,211 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 34% of the estimated biomass was concentrated (Table 36).

Table 36. -- Summary by survey districts and depth intervals of 2018 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	25	4	0.31	152	0	345	2.054
	101 - 200	73	14	0.29	152	66	238	2.459
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	129	18	0.2	304	92	515	2.239
Central Aleutians	1 - 100	34	4	0.46	267	0	663	4.310
	101 - 200	52	0	---	---	---	---	---
	201 - 300	24	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	120	4	0.16	267	0	663	4.310
Eastern Aleutians	1 - 100	18	1	0.57	393	0	2,084	7.461
	101 - 200	61	1	0.02	15	0	46	6.102
	201 - 300	39	0	---	---	---	---	---
	301 - 500	8	0	---	---	---	---	---
	All depths	126	2	0.16	408	0	2,100	7.399
Combined Aleutian Districts	1 - 100	77	9	0.46	812	0	2,224	4.307
	101 - 200	186	15	0.09	167	76	258	2.601
	201 - 300	88	0	---	---	---	---	---
	301 - 500	24	0	---	---	---	---	---
	All depths	375	24	0.17	979	0	2,398	3.873
Southern Bering Sea	1 - 100	20	7	0.41	165	41	288	3.042
	101 - 200	14	4	0.36	67	0	152	3.387
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	11	0.31	232	86	378	3.135

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 2018 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	NE Eastern Aleutians	2	1	3.10	393	0	5,386
Central Aleutians	1-100	SE Central Aleutians	9	1	1.51	175	0	580
Southern Bering Sea	1-100	E Southern Bering Sea	18	7	0.68	165	41	289
Southern Bering Sea	101-200	E Southern Bering Sea	12	4	0.57	67	0	153
Western Aleutians	1-100	W Western Aleutians	12	4	0.41	152	0	347
Western Aleutians	101-200	W Western Aleutians	48	14	0.37	152	66	238
Central Aleutians	1-100	N Central Aleutians	13	2	0.33	69	0	192
Central Aleutians	1-100	SW Central Aleutians	3	1	0.15	23	0	124
Eastern Aleutians	101-200	NE Eastern Aleutians	30	1	0.08	15	0	46

Rockfishes

Pacific ocean perch (*Sebastes alutus*)

Pacific ocean perch was by far the most abundant species caught in the 2018 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 generally similar for males and females in the three shallowest depth intervals in the Aleutian survey districts, but females tended to be somewhat larger than males in the 301-500 m depth interval, as well as in all depth ranges in the Southern Bering Sea survey district (Fig. 30). The estimated biomass for Pacific ocean perch was 1,016,309 t, and the highest survey district biomass was in the Western Aleutian survey district, where 42% of the estimated biomass was concentrated (Table 38).

Table 38. -- Summary by survey districts and depth intervals of 2018 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	25	6	0.32	157	0	369	0.235
	101 - 200	73	64	346.64	184,333	93,868	274,798	0.549
	201 - 300	25	25	978.89	168,725	103,766	233,683	0.664
	301 - 500	6	5	226.82	74,225	0	258,870	0.707
	All depths	129	100	281.39	427,440	224,217	630,662	0.614
Central Aleutians	1 - 100	34	8	0.42	248	0	582	0.091
	101 - 200	52	37	200.53	92,356	25,893	158,819	0.714
	201 - 300	24	24	459.2	96,837	41,413	152,260	0.928
	301 - 500	10	8	15.22	6,057	3,380	8,734	0.904
	All depths	120	77	118.18	195,497	114,943	276,051	0.804
Eastern Aleutians	1 - 100	18	9	0.17	119	0	359	0.237
	101 - 200	61	40	55.69	43,264	4,436	82,092	0.566
	201 - 300	39	38	474.54	232,593	116,094	349,092	0.731
	301 - 500	8	2	4.14	2,350	0	8,106	0.679
	All depths	126	89	110.44	278,326	157,300	399,352	0.699
Combined Aleutian Districts	1 - 100	77	23	0.3	524	31	1,017	0.135
	101 - 200	186	141	180.85	319,953	206,018	433,887	0.591
	201 - 300	88	87	570.37	498,154	358,651	637,657	0.736
	301 - 500	24	15	63.88	82,632	0	267,354	0.717
	All depths	375	266	158.3	901,263	661,315	1,141,211	0.674
Southern Bering Sea	1 - 100	20	6	1.33	535	0	1,488	0.486
	101 - 200	14	12	357.62	66,110	2,410	129,810	0.864
	201 - 300	7	7	573.45	32,334	5,975	58,694	0.729
	301 - 500	4	4	154.01	16,066	0	44,220	0.984
	All depths	45	29	153.77	115,046	45,643	184,448	0.832

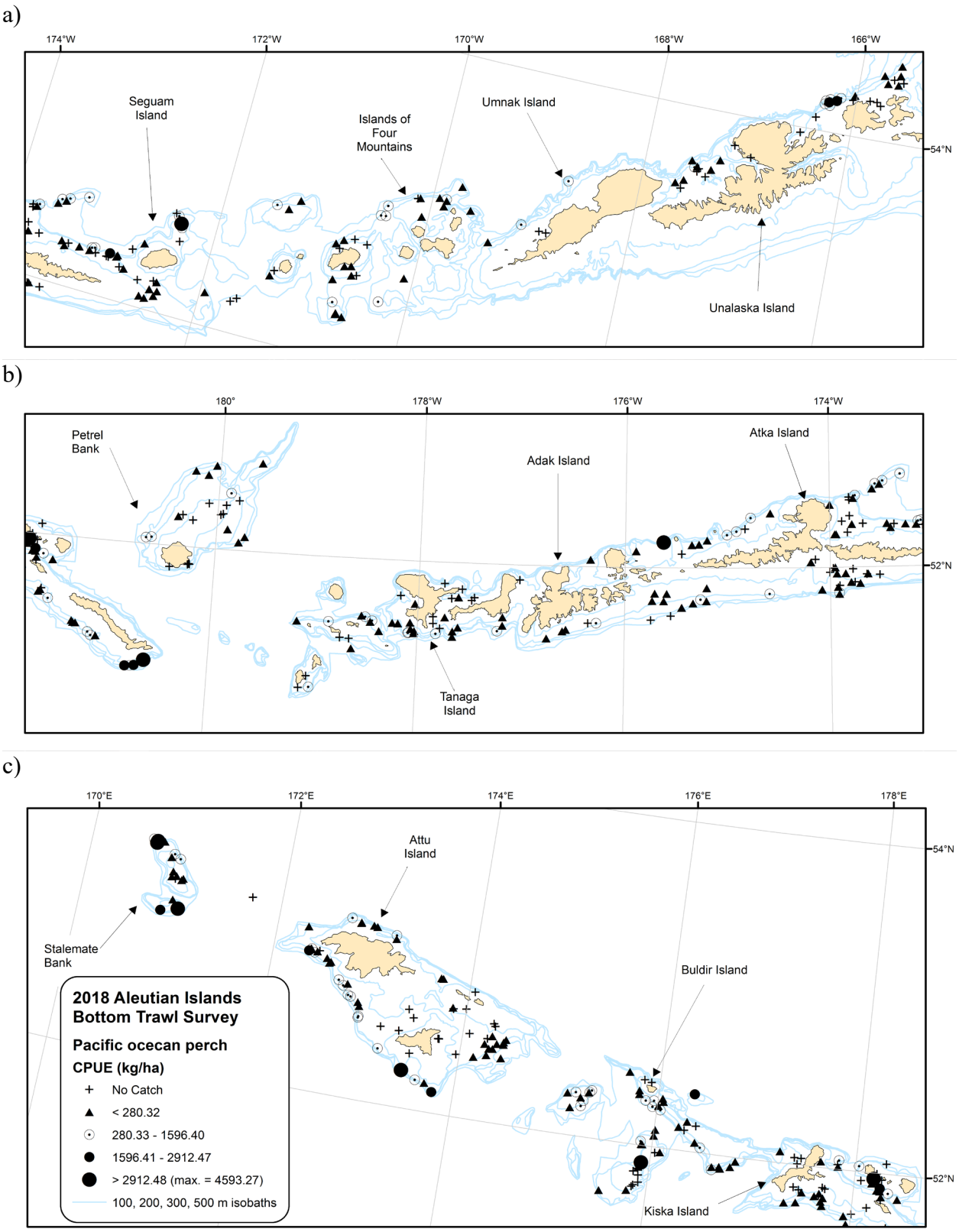

Figure 29. -- Distribution and relative abundance of Pacific ocean perch from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

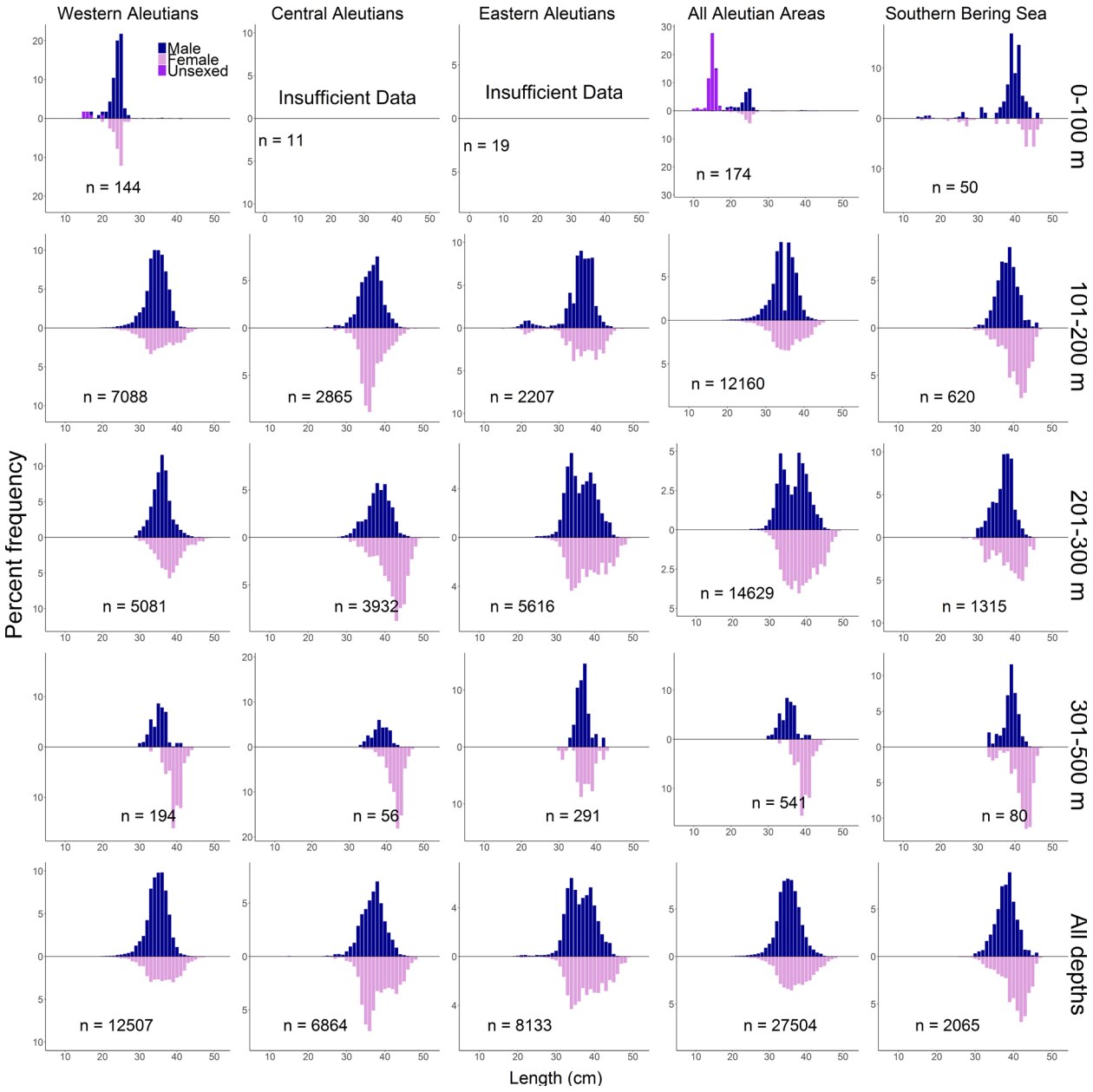

Figure 30. -- Population length composition of Pacific ocean perch by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	14	14	1,382.95	130,029	68,199	191,858
Eastern Aleutians	201-300	NW Eastern Aleutians	6	6	1,255.99	19,585	0	43,325
Central Aleutians	201-300	N Central Aleutians	10	10	971.77	42,661	8,410	76,912
Eastern Aleutians	201-300	NE Eastern Aleutians	19	19	702.05	138,202	46,738	229,666
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	7	573.45	32,334	5,061	59,608
Southern Bering Sea	101-200	E Southern Bering Sea	12	10	560.45	66,083	1,740	130,427
Western Aleutians	201-300	E Western Aleutians	11	11	493.95	38,696	12,662	64,730
Central Aleutians	101-200	SW Central Aleutians	22	17	487.24	51,272	0	102,753
Western Aleutians	301-500	W Western Aleutians	4	3	419.05	71,703	0	283,260
Central Aleutians	201-300	Petrel Bank	4	4	369.90	28,350	0	75,654
Central Aleutians	201-300	SE Central Aleutians	4	4	363.35	17,345	5,620	29,069
Western Aleutians	101-200	W Western Aleutians	48	40	357.98	145,524	60,446	230,601
Eastern Aleutians	201-300	SE Eastern Aleutians	9	8	315.13	64,935	0	143,717
Western Aleutians	101-200	E Western Aleutians	25	24	309.86	38,809	7,401	70,217
Central Aleutians	201-300	SW Central Aleutians	6	6	199.05	8,480	0	26,507
Central Aleutians	101-200	SE Central Aleutians	14	12	160.53	12,068	1,062	23,074
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	154.01	16,066	0	48,337
Eastern Aleutians	201-300	SW Eastern Aleutians	5	5	137.79	9,871	0	29,629
Central Aleutians	101-200	Petrel Bank	7	4	123.62	21,454	0	61,148
Eastern Aleutians	101-200	SW Eastern Aleutians	12	11	117.49	26,564	0	58,145
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	85.94	13,702	0	57,338
Central Aleutians	101-200	N Central Aleutians	9	4	70.94	7,562	0	19,908
Central Aleutians	301-500	Petrel Bank	2	2	45.36	5,613	0	13,207
Western Aleutians	301-500	E Western Aleutians	2	2	16.15	2,522	0	27,590
Eastern Aleutians	101-200	NE Eastern Aleutians	30	15	8.37	1,684	0	4,287
Eastern Aleutians	101-200	SE Eastern Aleutians	16	12	6.91	1,314	0	3,310
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	6.29	1,680	0	8,909
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	2.60	670	0	3,554
Central Aleutians	301-500	SE Central Aleutians	2	2	2.53	181	0	2,094
Southern Bering Sea	1-100	E Southern Bering Sea	18	6	2.19	535	0	1,492
Central Aleutians	301-500	SW Central Aleutians	2	2	1.76	139	0	581
Central Aleutians	1-100	Petrel Bank	9	1	1.54	148	0	488
Western Aleutians	1-100	E Western Aleutians	13	3	1.04	124	0	341
Central Aleutians	301-500	N Central Aleutians	4	2	1.01	125	0	368
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	0.40	27	0	97
Central Aleutians	1-100	N Central Aleutians	13	4	0.40	83	0	192
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.37	71	0	969
Central Aleutians	1-100	SE Central Aleutians	9	3	0.15	17	0	56
Eastern Aleutians	1-100	SE Eastern Aleutians	12	6	0.14	24	0	49
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.12	23	0	316
Western Aleutians	1-100	W Western Aleutians	12	3	0.091	33.4	0	73.9
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	0.012	1.5	0	20.9

Northern Rockfish (*Sebastes polyspinis*)

Northern rockfish was the third most abundant species caught in the 2018 survey (Table 2), and it never ranked lower than seventh 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 consistently 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). The largest catches were not concentrated in any one area but were spread out throughout the survey area (Fig. 31). There was no trend in size with depth. The length ranges were similar for males and females but females were generally larger, having a distinct mode at approximately 35 cm, versus 32 cm for males in the three Aleutian survey districts. The length ranges were narrower for both sexes in the Southern Bering Sea district, with modes at approximately 38 cm and 40 cm for males and females, respectively (Fig. 32). The estimated biomass of northern rockfish was 212,472 t, and the highest survey district biomass was in the Western Aleutians survey district, where 46% of the estimated biomass was concentrated (Table 40).

Table 40. -- Summary by survey districts and depth intervals of 2018 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	25	17	83.33	40,637	19,995	61,278	0.405
	101 - 200	73	64	109.14	58,034	15,166	100,902	0.405
	201 - 300	25	15	0.41	70	32	109	0.529
	301 - 500	6	1	0.05	15	0	79	0.443
	All depths	129	97	65.01	98,756	52,078	145,435	0.405
Central Aleutians	1 - 100	34	14	55.69	32,564	0	76,085	0.474
	101 - 200	52	37	57.12	26,306	682	51,929	0.560
	201 - 300	24	8	2.91	613	0	1,718	0.513
	301 - 500	10	1	0.04	18	0	95	0.534
	All depths	120	60	35.97	59,500	9,086	109,914	0.509
Eastern Aleutians	1 - 100	18	13	8.82	6,041	0	20,094	0.566
	101 - 200	61	27	17.97	13,961	0	39,940	0.676
	201 - 300	39	14	0.19	93	20	166	0.670
	301 - 500	8	0	---	---	---	---	---
	All depths	126	54	7.97	20,096	0	46,854	0.638
Combined Aleutian Districts	1 - 100	77	44	45.1	79,241	32,299	126,184	0.441
	101 - 200	186	128	55.56	98,301	43,376	153,226	0.466
	201 - 300	88	37	0.89	777	0	1,849	0.529
	301 - 500	24	2	0.03	33	0	107	0.488
	All depths	375	211	31.33	178,352	106,761	249,943	0.455
Southern Bering Sea	1 - 100	20	9	56.64	22,803	0	69,972	0.874
	101 - 200	14	8	61.07	11,290	0	29,008	0.844
	201 - 300	7	2	0.48	27	0	73	0.717
	301 - 500	4	0	---	---	---	---	---
	All depths	45	19	45.61	34,120	0	83,980	0.864

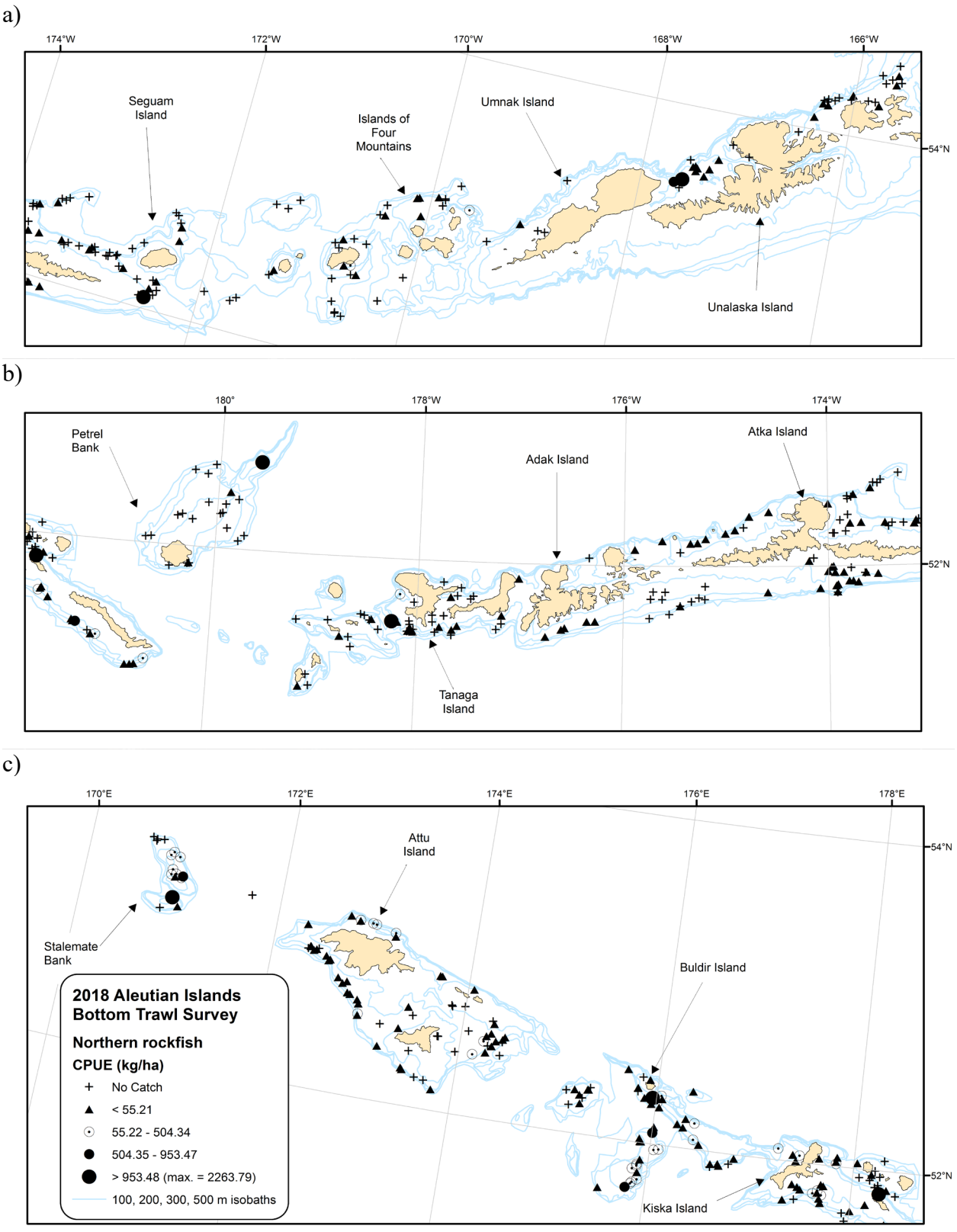

Figure 31. -- Distribution and relative abundance of northern rockfish from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

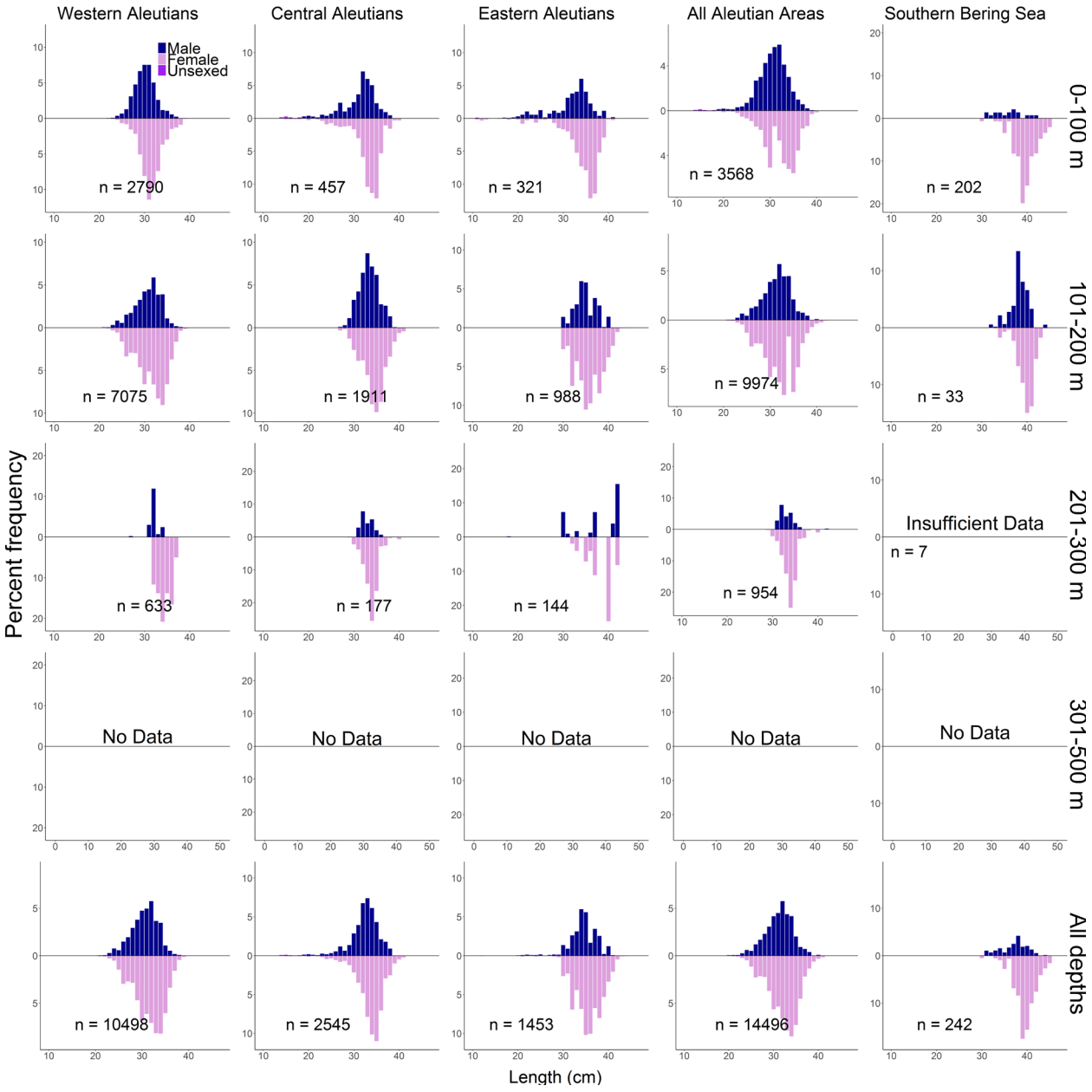

Figure 32. -- Population length composition of northern rockfish by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	12	277.16	32,797	16,727	48,866
Central Aleutians	101-200	SE Central Aleutians	14	8	151.80	11,412	0	35,888
Central Aleutians	101-200	SW Central Aleutians	22	21	113.96	11,992	2,221	21,763
Western Aleutians	101-200	E Western Aleutians	25	23	112.98	14,150	0	29,691
Central Aleutians	1-100	Petrel Bank	9	2	109.60	10,522	0	34,778
Western Aleutians	101-200	W Western Aleutians	48	41	107.95	43,884	3,808	83,961
Central Aleutians	1-100	N Central Aleutians	13	6	99.60	20,972	0	59,351
Southern Bering Sea	1-100	E Southern Bering Sea	18	9	93.44	22,803	0	70,174
Southern Bering Sea	101-200	E Southern Bering Sea	12	7	70.71	8,337	0	25,180
Eastern Aleutians	101-200	SE Eastern Aleutians	16	8	68.71	13,056	0	39,163
Southern Bering Sea	101-200	W Southern Bering Sea	2	1	44.11	2,953	0	40,480
Central Aleutians	101-200	N Central Aleutians	9	7	27.05	2,883	0	7,290
Eastern Aleutians	1-100	NE Eastern Aleutians	2	1	24.32	3,084	0	42,273
Western Aleutians	1-100	W Western Aleutians	12	5	21.23	7,840	0	21,832
Eastern Aleutians	1-100	SE Eastern Aleutians	12	10	16.11	2,805	460	5,150
Central Aleutians	201-300	SW Central Aleutians	6	4	13.57	578	0	1,738
Central Aleutians	1-100	SW Central Aleutians	3	3	6.13	991	0	4,310
Eastern Aleutians	101-200	NW Eastern Aleutians	3	2	1.71	273	0	999
Eastern Aleutians	101-200	NE Eastern Aleutians	30	10	1.67	335	0	700
Eastern Aleutians	101-200	SW Eastern Aleutians	12	7	1.32	297	6	588
Central Aleutians	1-100	SE Central Aleutians	9	3	0.67	78	0	184
Eastern Aleutians	1-100	NW Eastern Aleutians	2	1	0.67	130	0	1,775
Central Aleutians	201-300	N Central Aleutians	10	3	0.66	29	0	71
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	2	0.48	27	0	74
Western Aleutians	201-300	E Western Aleutians	11	7	0.44	35	8	62
Eastern Aleutians	201-300	NW Eastern Aleutians	6	6	0.39	6	2	10
Western Aleutians	201-300	W Western Aleutians	14	8	0.38	36	6	66
Eastern Aleutians	201-300	NE Eastern Aleutians	19	5	0.30	60	0	121
Central Aleutians	301-500	SW Central Aleutians	2	1	0.23	18	0	245
Central Aleutians	201-300	SE Central Aleutians	4	1	0.12	6	0	25
Eastern Aleutians	1-100	SW Eastern Aleutians	2	1	0.12	23	0	311
Eastern Aleutians	201-300	SE Eastern Aleutians	9	2	0.12	24	0	70
Central Aleutians	101-200	Petrel Bank	7	1	0.11	18	0	63
Western Aleutians	301-500	E Western Aleutians	2	1	0.10	15	0	205
Eastern Aleutians	201-300	SW Eastern Aleutians	5	1	0.05	3	0	12

Shortraker rockfish (*Sebastes borealis*)

Shortraker rockfish was the eleventh most abundant species caught in the 2018 survey and ranked among the top 20 in all three Aleutian survey districts (Table 2). Shortraker rockfish were almost exclusively 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 Aleutian Islands survey districts (Table 43). The largest individual catches were recorded at Stalemate Bank and in an area northeast of Adak Island (Fig. 33). The length ranges were relatively wide for both males and females, with the bulk of lengths between approximately 38 cm and 70 cm and a poorly defined mode at approximately 42 cm for both sexes (Fig. 34). The estimated biomass of shortraker rockfish was 26,333 t, and the highest survey district biomass was essentially tied between the Western and Eastern Aleutians survey districts, where 89% of the estimated biomass was concentrated (Table 42).

Table 42. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	0	---	---	---	---	---
	201 - 300	25	1	0.05	9	0	28	2.056
	301 - 500	6	5	36.55	11,961	0	42,974	2.285
	All depths	129	6	7.88	11,970	0	42,983	2.285
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	1	0.03	13	0	42	2.365
	201 - 300	24	3	0.7	147	0	503	4.398
	301 - 500	10	5	6.97	2,773	0	5,940	1.348
	All depths	120	9	1.77	2,933	0	6,116	1.399
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	1	0.04	33	0	106	2.038
	201 - 300	39	3	1.35	661	0	1,663	3.020
	301 - 500	8	6	18.87	10,723	0	40,351	1.275
	All depths	126	10	4.53	11,417	0	41,079	1.320
Combined Aleutian Districts	1 - 100	77	0	---	---	---	---	---
	101 - 200	186	2	0.03	46	0	123	2.120
	201 - 300	88	7	0.93	817	0	1,860	3.183
	301 - 500	24	16	19.68	25,457	0	62,996	1.621
	All depths	375	25	4.62	26,320	0	63,877	1.647
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	1	0.24	13	0	45	2.140
	301 - 500	4	0	---	---	---	---	---
	All depths	45	1	0.02	13	0	45	2.140

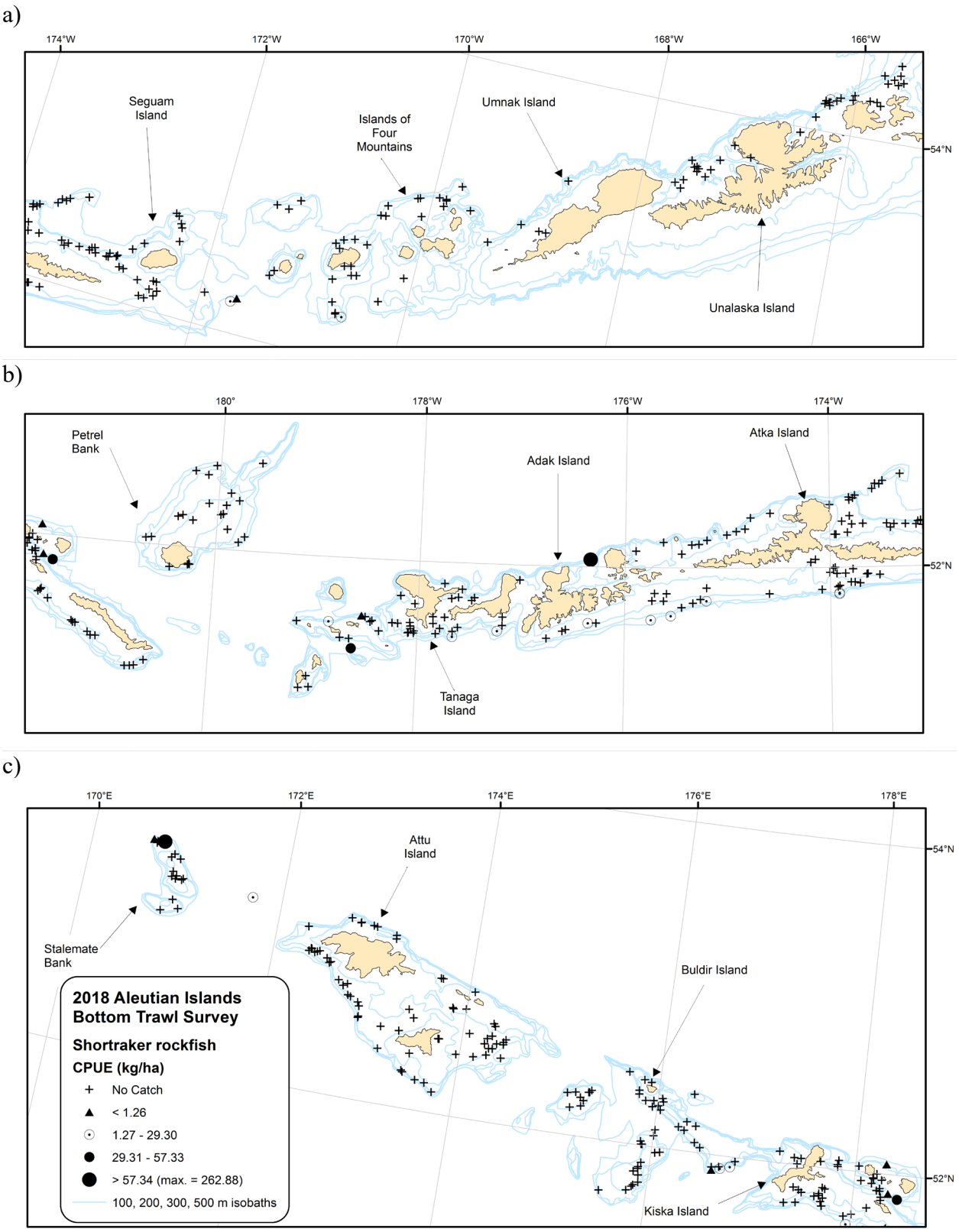

Figure 33. -- Distribution and relative abundance of shortraker rockfish from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

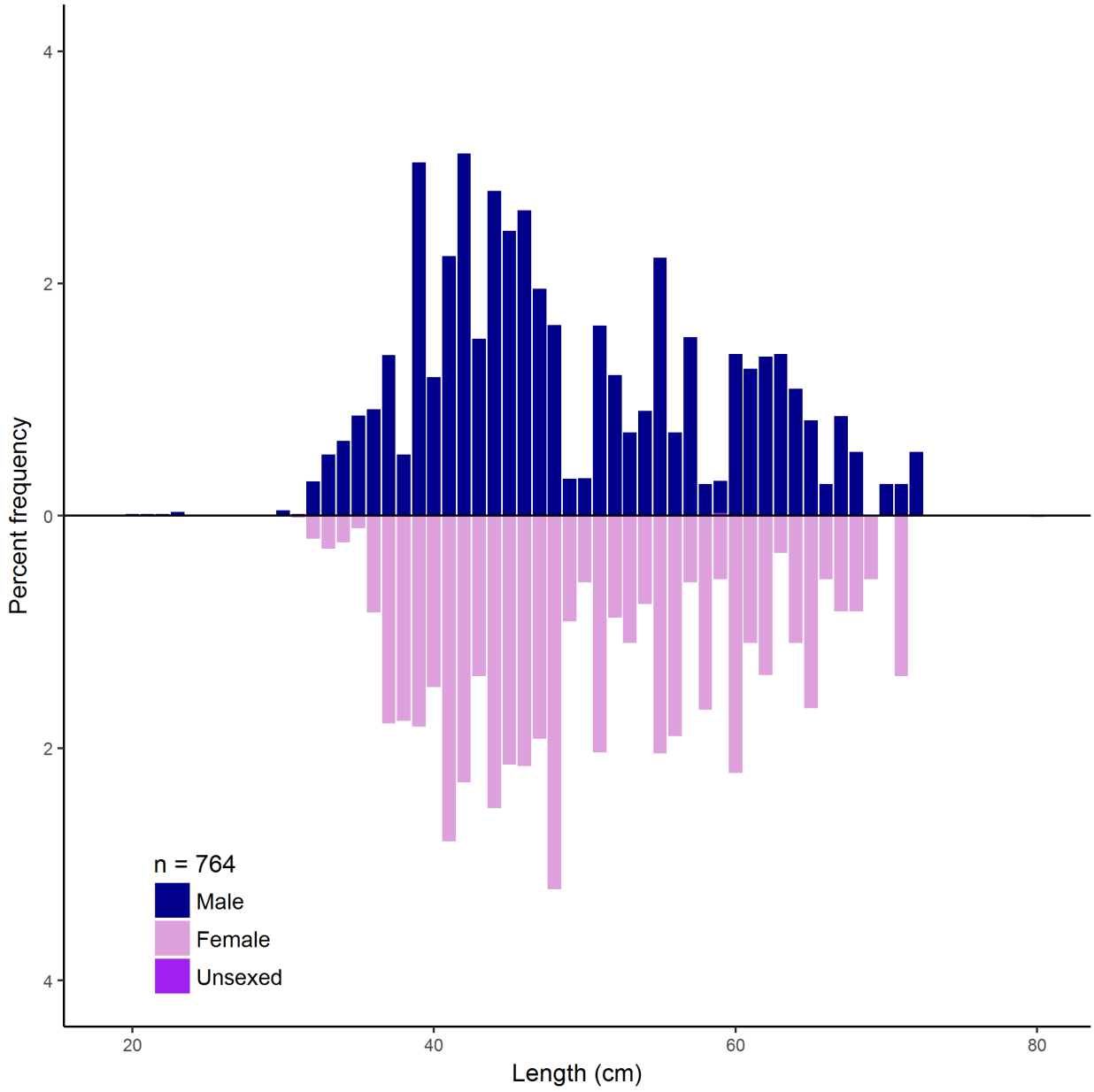

Figure 34. -- Population length composition of shortraker rockfish in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	67.02	11,467	0	47,017
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	34.71	9,267	0	49,142
Central Aleutians	301-500	SE Central Aleutians	2	2	20.26	1,447	0	10,653
Central Aleutians	301-500	N Central Aleutians	4	2	8.70	1,079	0	4,400
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	5.27	231	0	569
Eastern Aleutians	301-500	SE Eastern Aleutians	3	3	4.76	1,225	0	5,130
Western Aleutians	301-500	E Western Aleutians	2	2	3.16	494	379	608
Central Aleutians	301-500	SW Central Aleutians	2	1	3.14	247	0	3,391
Eastern Aleutians	201-300	SE Eastern Aleutians	9	2	3.12	642	0	1,664
Central Aleutians	201-300	SE Central Aleutians	4	1	2.66	127	0	531
Central Aleutians	201-300	N Central Aleutians	10	2	0.46	20	0	60
Eastern Aleutians	201-300	SW Eastern Aleutians	5	1	0.26	18	0	69
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	1	0.24	13	0	46
Eastern Aleutians	101-200	SW Eastern Aleutians	12	1	0.15	33	0	106
Central Aleutians	101-200	N Central Aleutians	9	1	0.12	13	0	43
Western Aleutians	201-300	E Western Aleutians	11	1	0.11	9	0	29

Rougheye rockfish (*Sebastes aleutianus*)

Rougheye rockfish was the least abundant among reported species caught in the 2018 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. The majority of rougheye rockfish were caught at depths between 200 and 500 m in the Eastern Aleutian survey districts (Table 44). The highest densities of this species occurred at depths between 200 and 500 m in one Eastern Aleutian subdistrict and two Central Aleutians subdistricts (Fig. 35 and Table 45). There was a general increase in size with depth. The sample sizes in all survey districts and depth zones were too low to meaningfully interprete the length frequency distribution (Fig. 36). The estimated biomass for rougheye rockfish was 133 t, and the highest survey district biomass by far was in the Eastern Aleutian survey district, where 70% of the estimated biomass was concentrated (Table 44).

Table 44. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	0	---	---	---	---	---
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	129	0	---	---	---	---	---
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	0	---	---	---	---	---
	201 - 300	24	2	0.03	7	0	22	0.558
	301 - 500	10	1	0.04	18	0	66	1.423
	All depths	120	3	0.01	25	0	77	0.984
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	1	<0.01	3	0	8	0.986
	201 - 300	39	2	0.05	26	0	64	1.943
	301 - 500	8	1	0.11	65	0	271	1.840
	All depths	126	4	0.04	93	0	307	1.820
Combined Aleutian Districts	1 - 100	77	0	---	---	---	---	---
	101 - 200	186	1	<0.01	3	0	8	0.986
	201 - 300	88	4	0.04	33	0	73	1.263
	301 - 500	24	2	0.06	82	0	296	1.732
	All depths	375	7	0.02	118	0	340	1.545
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	1	0.06	11	0	35	0.561
	201 - 300	7	1	0.08	4	0	14	1.303
	301 - 500	4	0	---	---	---	---	---
	All depths	45	2	0.02	15	0	41	0.665

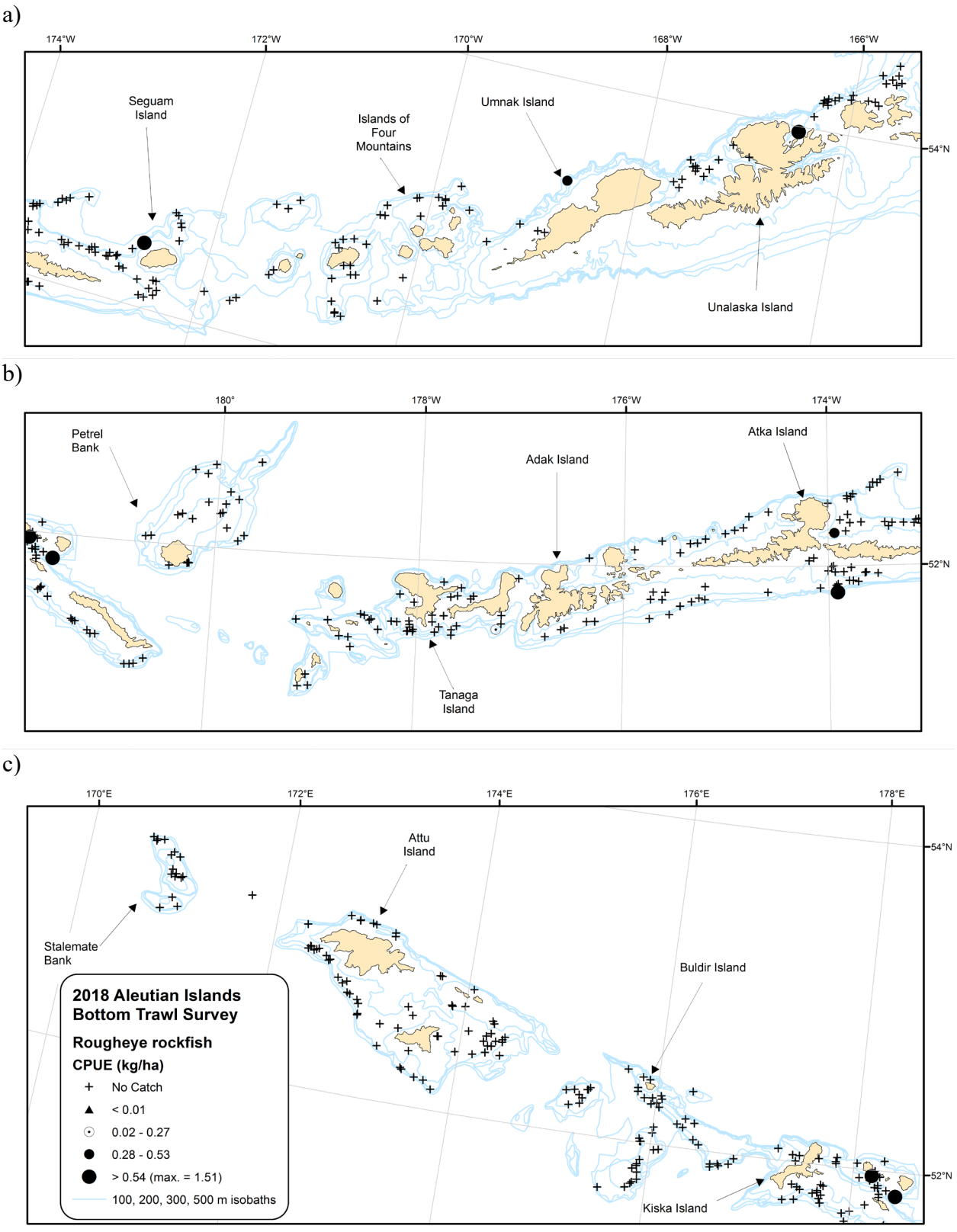

Figure 35. -- Distribution and relative abundance of rougheye rockfish from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

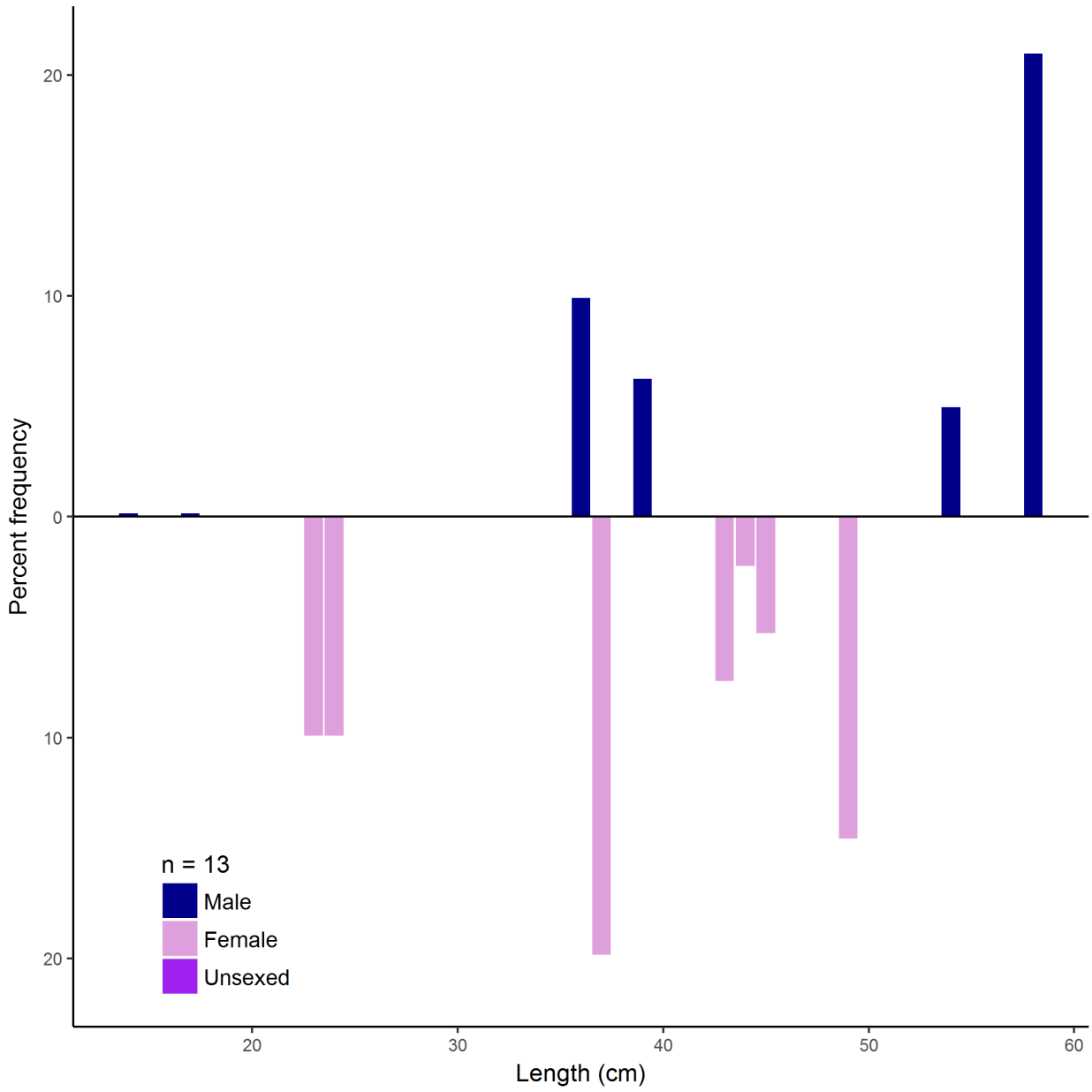

Figure 36. -- Population length composition of rougheye rockfish in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	301-500	SE Eastern Aleutians	3	1	0.25	65	0	343
Central Aleutians	201-300	N Central Aleutians	10	1	0.15	7	0	22
Central Aleutians	301-500	N Central Aleutians	4	1	0.14	18	0	74
Southern Bering Sea	101-200	E Southern Bering Sea	12	1	0.09	11	0	35
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	1	0.08	4	0	15
Eastern Aleutians	201-300	NE Eastern Aleutians	19	1	0.08	15	0	46
Eastern Aleutians	201-300	SE Eastern Aleutians	9	1	0.05	11	0	37
Eastern Aleutians	101-200	NE Eastern Aleutians	30	1	0.01	3	0	8
Central Aleutians	201-300	SE Central Aleutians	4	1	0.01	1	0	2

Blackspotted Rockfish (*Sebastes melanostictus)*

Blackspotted rockfish was the eighteenth most abundant species caught in the 2018 survey and ranked in the top 20 in all but one of the survey districts (Southern Bering Sea, 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 densities occurred at depths between 200 and 500 m in several Eastern and Central Aleutians subdistricts, while the largest catches were recorded off of Amchitka, Amlia, and Kiska islands, as well as at Stalemate Bank (Fig. 37 and Table 47). There was no general trend in size with depth. Males and females had similar length distributions, with sizes ranging between approximately 16 cm and 50 cm. The bulk of recorded lengths was between 30 cm and 42 cm. A pronounced mode occurred at approximately 38 cm for both males and females in the combined Aleutian survey districts (Fig. 38). The estimated biomass of blackspotted rockfish was 9,710 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 66% of the estimated biomass was concentrated (Table 46).

Table 46. -- Summary by survey districts and depth intervals of 2018 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	25	0	---	---	---	---	---
	101 - 200	73	19	0.2	106	47	165	0.458
	201 - 300	25	15	2.00	345	0	704	1.141
	301 - 500	6	2	0.55	181	0	525	2.270
	All depths	129	36	0.42	632	112	1,152	1.030
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	9	0.44	202	0	466	1.031
	201 - 300	24	17	4.94	1,041	28	2,054	0.522
	301 - 500	10	5	2.72	1,081	0	2,806	1.019
	All depths	120	31	1.4	2,324	303	4,344	0.715
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	7	0.13	101	0	224	0.545
	201 - 300	39	14	1.57	768	0	2,062	0.680
	301 - 500	8	4	9.81	5,573	0	17,713	0.673
	All depths	126	25	2.56	6,442	0	18,687	0.671
Combined Aleutian Districts	1 - 100	77	0	---	---	---	---	---
	101 - 200	186	35	0.23	408	114	702	0.668
	201 - 300	88	46	2.47	2,154	468	3,839	0.629
	301 - 500	24	11	5.28	6,835	0	19,137	0.725
	All depths	375	92	1.65	9,397	0	21,883	0.698
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	1	0.01	2	0	5	0.191
	201 - 300	7	5	1.92	108	0	269	0.659
	301 - 500	4	4	1.95	203	44	362	1.145
	All depths	45	10	0.42	313	95	530	0.896

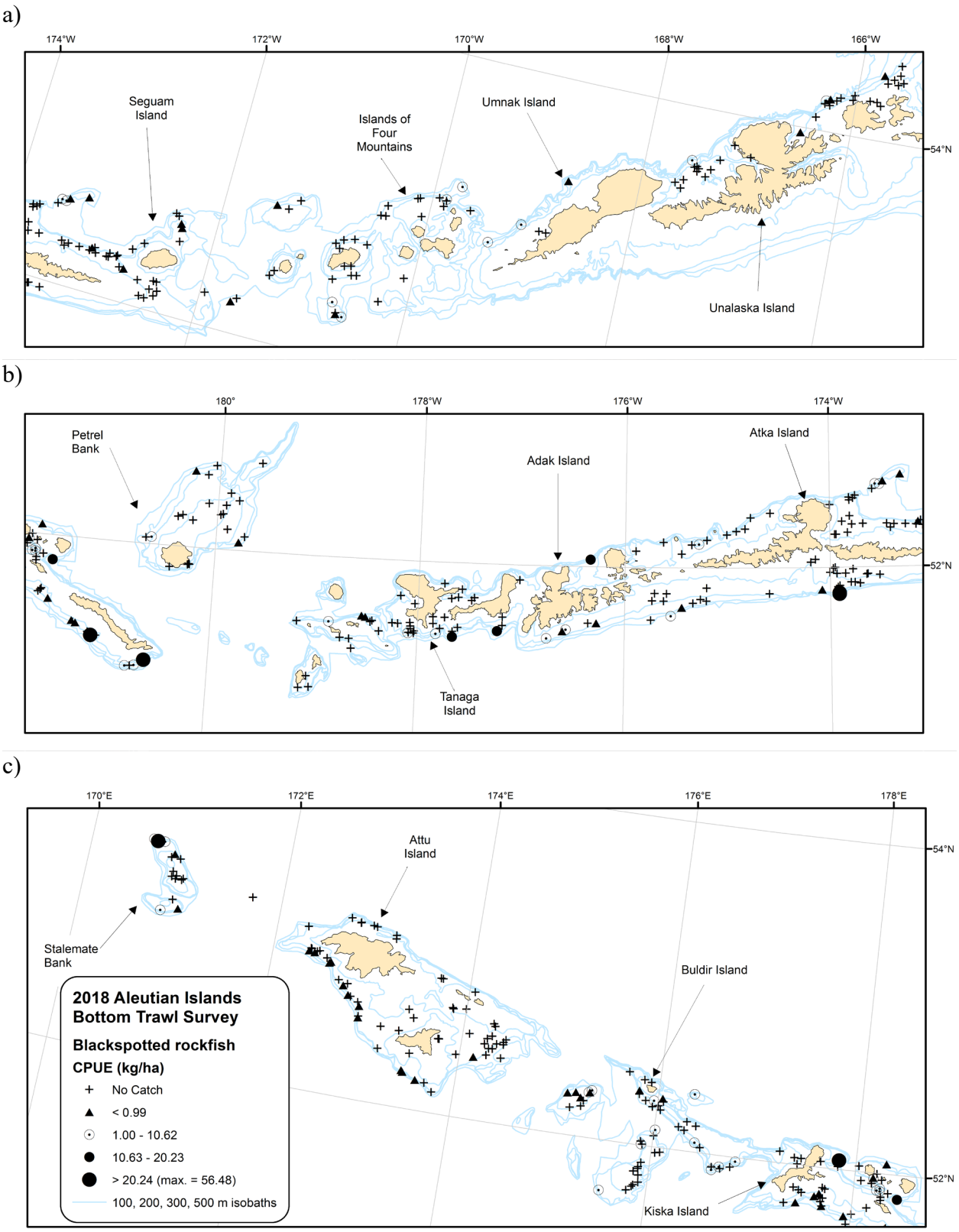

Figure 37. -- Distribution and relative abundance of blackspotted rockfish from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

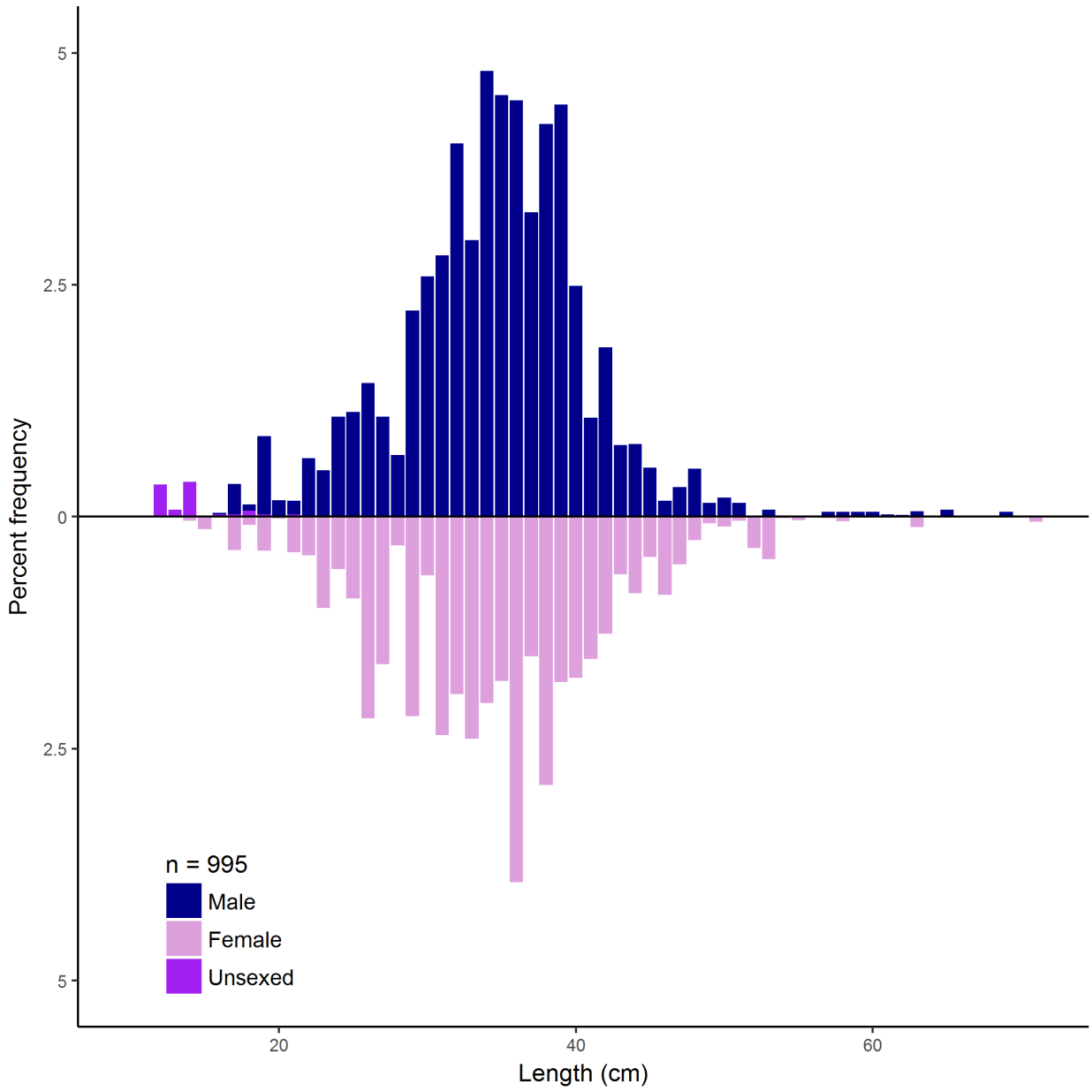

Figure 38. -- Population length composition of blackspotted rockfish in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	301-500	SE Eastern Aleutians	3	2	16.72	4,306	0	22,349
Central Aleutians	201-300	SW Central Aleutians	6	4	9.61	410	0	1,436
Central Aleutians	301-500	SE Central Aleutians	2	1	7.10	507	0	6,947
Central Aleutians	201-300	SE Central Aleutians	4	3	6.81	325	0	935
Central Aleutians	201-300	N Central Aleutians	10	8	6.00	263	0	574
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	4.65	1,242	0	6,585
Central Aleutians	301-500	N Central Aleutians	4	2	4.17	517	0	2,069
Eastern Aleutians	201-300	SE Eastern Aleutians	9	3	3.32	684	0	2,000
Western Aleutians	201-300	W Western Aleutians	14	8	2.42	227	0	569
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	4	1.95	203	21	386
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	5	1.92	108	0	274
Central Aleutians	101-200	SW Central Aleutians	22	8	1.52	160	0	414
Western Aleutians	201-300	E Western Aleutians	11	7	1.50	117	0	257
Western Aleutians	301-500	W Western Aleutians	4	2	1.06	181	0	575
Western Aleutians	101-200	E Western Aleutians	25	10	0.63	78	23	134
Eastern Aleutians	301-500	SW Eastern Aleutians	2	1	0.58	26	0	350
Central Aleutians	201-300	Petrel Bank	4	2	0.56	43	0	143
Eastern Aleutians	101-200	SW Eastern Aleutians	12	5	0.44	99	0	224
Central Aleutians	101-200	N Central Aleutians	9	1	0.40	42	0	140
Eastern Aleutians	201-300	NE Eastern Aleutians	19	8	0.37	73	0	150
Central Aleutians	301-500	Petrel Bank	2	1	0.35	44	0	596
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	0.23	4	0	13
Central Aleutians	301-500	SW Central Aleutians	2	1	0.18	14	0	190
Eastern Aleutians	201-300	SW Eastern Aleutians	5	2	0.11	8	0	21
Western Aleutians	101-200	W Western Aleutians	48	9	0.07	28	6	49
Southern Bering Sea	101-200	E Southern Bering Sea	12	1	0.01	2	0	5
Eastern Aleutians	101-200	SE Eastern Aleutians	16	1	0.01	1	0	4
Eastern Aleutians	101-200	NE Eastern Aleutians	30	1	0.00	0	0	1

Shortspine thornyhead (*Sebastolobus alascanus*)

Shortspine thornyhead was the thirteenth most abundant species caught in the 2018 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 occurred at depths between 200 and 500 m in three subdistricts within the Western Aleutians and Southern Bering Sea survey districts (Fig. 39 and Table 49). There was a no clear trend in size with increasing depth. Because most shortspine thornyhead were not separated by sex, any potential differences in the length distributions between males and females cannot be determined. The length distribution for the combined Aleutian survey districts was relatively close to bell-shaped, with a mean, mode, and median all at approximately 38 cm. A second and less pronounced mode occurred at approximately 24 cm (Fig. 40). The estimated biomass for shortspine thornyhead was 14,821 t, and the highest survey district biomass was in the Western Aleutian survey district, where 53% of the estimated biomass was concentrated (Table 48).

Table 48. -- Summary by survey districts and depth intervals of 2018 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	25	1	0.01	3	0	10	0.306
	101 - 200	73	27	3.25	1,727	55	3,399	0.978
	201 - 300	25	24	15.71	2,708	957	4,459	0.473
	301 - 500	6	6	10.6	3,468	0	11,640	0.307
	All depths	129	58	5.21	7,907	0	17,495	0.421
Central Aleutians	1 - 100	34	0	---	---	---	---	---
	101 - 200	52	15	0.48	223	88	358	1.355
	201 - 300	24	16	4.88	1,029	168	1,891	0.360
	301 - 500	10	9	5.38	2,143	771	3,514	0.326
	All depths	120	40	2.05	3,394	1,845	4,944	0.354
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	1	0.01	5	0	14	0.581
	201 - 300	39	4	0.09	42	0	92	0.999
	301 - 500	8	4	3.29	1,868	0	4,948	0.613
	All depths	126	9	0.76	1,915	0	4,995	0.618
Combined Aleutian Districts	1 - 100	77	1	<0.01	3	0	10	0.306
	101 - 200	186	43	1.1	1,954	277	3,632	1.009
	201 - 300	88	44	4.33	3,779	1,928	5,630	0.438
	301 - 500	24	19	5.78	7,479	1,464	13,495	0.358
	All depths	375	107	2.32	13,216	6,764	19,667	0.420
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	2	1.82	103	0	328	0.456
	301 - 500	4	3	14.4	1,502	0	4,529	0.458
	All depths	45	5	2.14	1,605	0	4,643	0.458

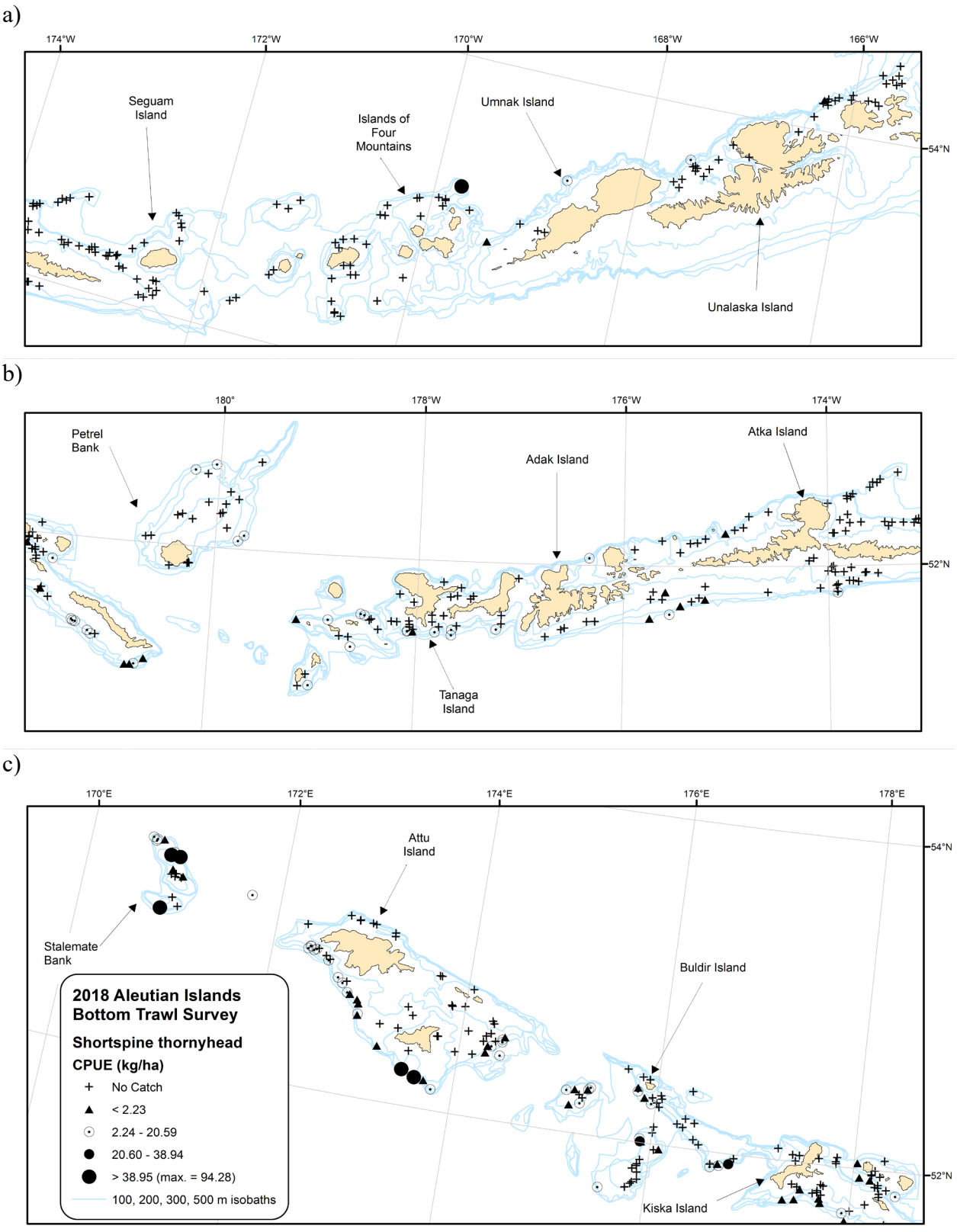

Figure 39. -- Distribution and relative abundance of shortspine thornyhead from the 2018 Aleutian Islands bottom trawl survey across the a) eastern, b) central, and c) western archipelago.

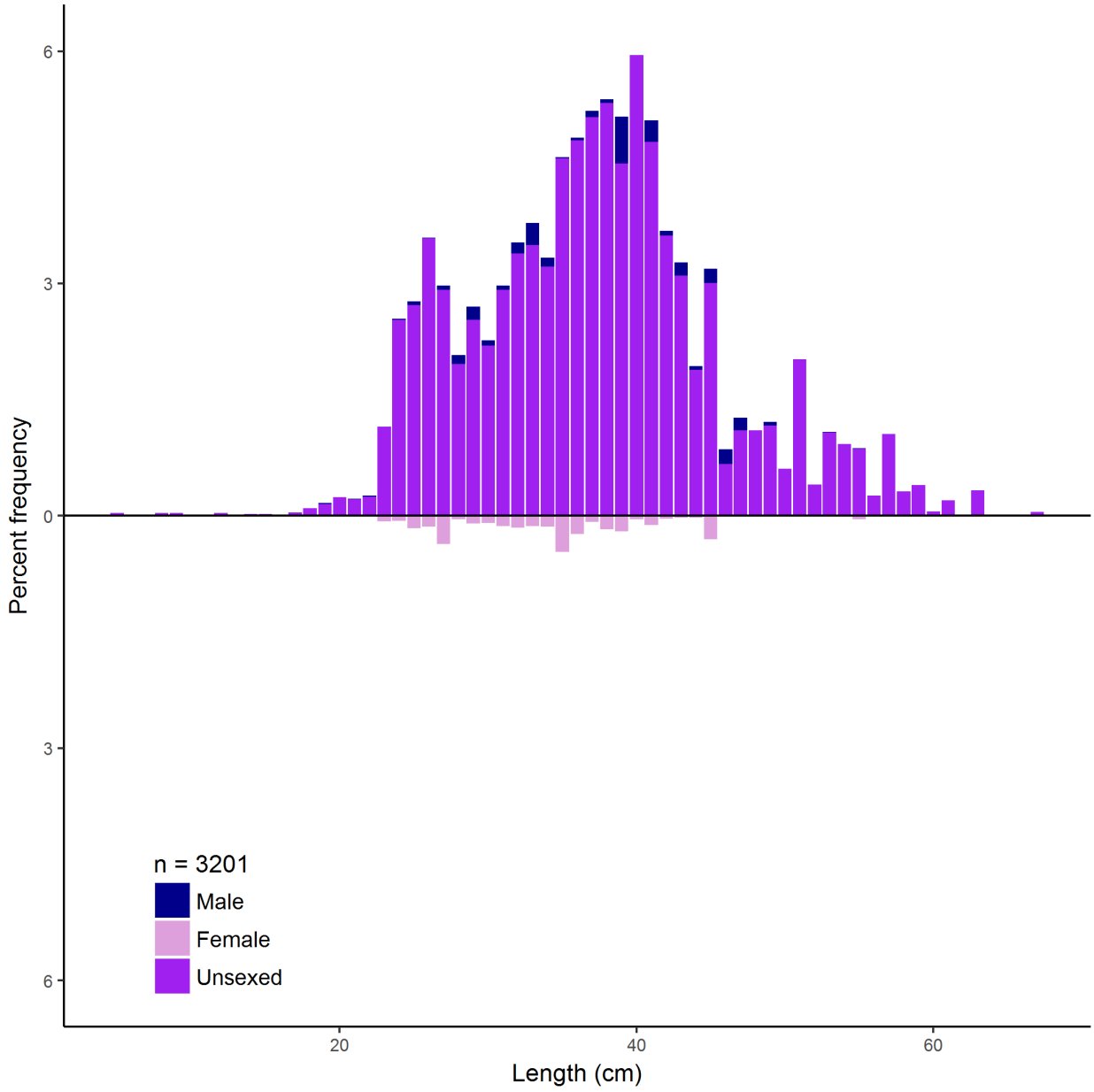

Figure 40. -- Population length composition of shortspine thornyhead by survey district and depth interval in the 2018 Aleutian Islands bottom trawl survey and number of fish measured.

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 2018 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	14	14	23.68	2,226	497	3,956
Western Aleutians	301-500	E Western Aleutians	2	2	18.71	2,921	0	26,973
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	3	14.40	1,502	0	4,972
Central Aleutians	301-500	Petrel Bank	2	2	7.78	963	0	2,388
Central Aleutians	201-300	SE Central Aleutians	4	4	7.27	347	0	762
Central Aleutians	201-300	Petrel Bank	4	2	6.64	509	0	1,468
Central Aleutians	301-500	SE Central Aleutians	2	2	6.36	454	238	671
Western Aleutians	201-300	E Western Aleutians	11	10	6.15	482	72	891
Central Aleutians	301-500	N Central Aleutians	4	3	5.04	625	0	2,282
Western Aleutians	101-200	W Western Aleutians	48	20	4.04	1,641	0	3,312
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	3.92	1,010	0	5,358
Western Aleutians	301-500	W Western Aleutians	4	4	3.20	548	69	1,027
Central Aleutians	201-300	SW Central Aleutians	6	5	2.86	122	0	281
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	2.80	747	0	3,962
Eastern Aleutians	301-500	SW Eastern Aleutians	2	2	2.53	111	0	983
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	2	1.82	103	0	336
Central Aleutians	101-200	SW Central Aleutians	22	12	1.57	165	45	286
Central Aleutians	301-500	SW Central Aleutians	2	2	1.27	101	0	315
Central Aleutians	201-300	N Central Aleutians	10	5	1.17	51	0	104
Central Aleutians	101-200	SE Central Aleutians	14	3	0.76	57	0	126
Western Aleutians	101-200	E Western Aleutians	25	7	0.69	86	12	160
Eastern Aleutians	201-300	SW Eastern Aleutians	5	3	0.56	40	0	94
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	0.13	2	0	7
Western Aleutians	1-100	E Western Aleutians	13	1	0.03	3	0	10
Eastern Aleutians	101-200	SW Eastern Aleutians	12	1	0.02	5	0	14

Dusky rockfish (*Sebastes variabilis*)

Dusky rockfish was not among the 20 most abundant species caught in the 2018 survey and only ranked in the top 20 in the Southern Bering Sea survey district (Table 2). The vast majority of dusky rockfish were caught at depths between 100 and 200 m in the Central and Eastern Aleutian survey districts as well as at depths less than 200 m in the Southern Bering Sea district (Table 50). The highest densities of this species occurred at depths less than 100 m in one Southern Bering Sea district and at depths between 100 and 200 m in one Central Aleutians and one Southern Bering Sea subdistrict (Table 51). There was a general trend of increasing weight with depth (Table 50). The estimated biomass for dusky rockfish was 2,535 t, and the highest survey district biomass was in the Southern Bering Sea survey district, where 65% of the estimated biomass was concentrated (Table 50).

Table 50. -- Summary by survey districts and depth intervals of 2018 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	25	1	0.01	5	0	17	0.760
	101 - 200	73	10	0.13	67	8	126	1.285
	201 - 300	25	3	0.09	16	0	36	1.376
	301 - 500	6	0	---	---	---	---	---
	All depths	129	14	0.06	89	26	152	1.248
Central Aleutians	1 - 100	34	4	0.06	38	0	76	1.197
	101 - 200	52	7	1.08	499	0	1,041	1.039
	201 - 300	24	3	0.15	32	0	88	1.527
	301 - 500	10	0	---	---	---	---	---
	All depths	120	14	0.34	569	26	1,112	1.068
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	4	0.26	200	0	463	1.520
	201 - 300	39	4	0.08	38	0	80	1.648
	301 - 500	8	0	---	---	---	---	---
	All depths	126	8	0.09	238	0	503	1.539
Combined Aleutian Districts	1 - 100	77	5	0.02	43	4	83	1.118
	101 - 200	186	21	0.43	767	176	1,358	1.154
	201 - 300	88	10	0.1	86	22	150	1.545
	301 - 500	24	0	---	---	---	---	---
	All depths	375	36	0.16	896	300	1,491	1.181
Southern Bering Sea	1 - 100	20	3	3.15	1,269	0	3,903	1.168
	101 - 200	14	8	1.97	364	0	761	1.157
	201 - 300	7	1	0.09	5	0	18	1.480
	301 - 500	4	0	---	---	---	---	---
	All depths	45	12	2.19	1,639	0	4,300	1.167

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 2018 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	E Southern Bering Sea	18	3	5.20	1,269	0	3,914
Central Aleutians	101-200	SW Central Aleutians	22	6	4.49	472	0	1,013
Southern Bering Sea	101-200	E Southern Bering Sea	12	8	3.09	364	0	765
Eastern Aleutians	101-200	SE Eastern Aleutians	16	2	0.65	123	0	365
Central Aleutians	201-300	SE Central Aleutians	4	1	0.41	20	0	83
Central Aleutians	101-200	SE Central Aleutians	14	1	0.36	27	0	86
Eastern Aleutians	101-200	SW Eastern Aleutians	12	2	0.34	78	0	205
Central Aleutians	201-300	SW Central Aleutians	6	2	0.28	12	0	35
Western Aleutians	101-200	E Western Aleutians	25	6	0.19	24	4	44
Central Aleutians	1-100	SE Central Aleutians	9	2	0.17	20	0	52
Western Aleutians	201-300	W Western Aleutians	14	3	0.17	16	0	36
Eastern Aleutians	201-300	NE Eastern Aleutians	19	3	0.12	23	0	50
Western Aleutians	101-200	W Western Aleutians	48	4	0.11	43	0	99
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	1	0.09	5	0	18
Central Aleutians	1-100	N Central Aleutians	13	2	0.09	18	0	44
Eastern Aleutians	201-300	SE Eastern Aleutians	9	1	0.07	15	0	51
Western Aleutians	1-100	E Western Aleutians	13	1	0.05	5	0	17

Dark rockfish (*Sebastes ciliatus*)

Dark rockfish was not among the 20 most abundant species caught in the 2018 survey and was not ranked among the top 20 in any of the four survey districts (Table 2). Dark rockfish were caught only in the Western and Central Aleutian Islands survey districts and primarily at depths shallower than 200 m (Table 52). Only one of the seven subdistricts (E Western Aleutians at depths shallower than 100 m) 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 638 t, and the highest survey district biomass was in the Western Aleutians survey district, where 65% of the estimated biomass was concentrated (Table 52).

Table 52. -- Summary by survey districts and depth intervals of 2018 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	25	9	0.84	410	36	783	0.850
	101 - 200	73	1	0.01	6	0	19	0.876
	201 - 300	25	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	129	10	0.27	416	42	790	0.850
Central Aleutians	1 - 100	34	4	0.23	132	0	343	1.143
	101 - 200	52	3	0.17	79	0	192	0.756
	201 - 300	24	1	0.05	11	0	38	1.841
	301 - 500	10	0	---	---	---	---	---
	All depths	120	8	0.13	222	0	463	0.983
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	0	---	---	---	---	---
	201 - 300	39	0	---	---	---	---	---
	301 - 500	8	0	---	---	---	---	---
	All depths	126	0	---	---	---	---	---
Combined Aleutian Districts	1 - 100	77	13	0.31	542	134	950	0.907
	101 - 200	186	4	0.05	85	0	199	0.764
	201 - 300	88	1	0.01	11	0	38	1.841
	301 - 500	24	0	---	---	---	---	---
	All depths	375	18	0.11	638	215	1,062	0.892
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	0	---	---	---	---	---

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 2018 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	3.46	410	33	787
Central Aleutians	101-200	SW Central Aleutians	22	3	0.75	79	0	193
Central Aleutians	1-100	N Central Aleutians	13	1	0.46	96	0	305
Central Aleutians	201-300	SW Central Aleutians	6	1	0.26	11	0	40
Central Aleutians	1-100	SE Central Aleutians	9	2	0.20	24	0	66
Central Aleutians	1-100	Petrel Bank	9	1	0.13	13	0	42
Western Aleutians	101-200	E Western Aleutians	25	1	0.05	6	0	19

Skates

Table 54 presents total abundance information for all skate species caught during the 2018 Aleutian Islands bottom trawl survey. Additional information is provided only for the whiteblotched, leopard, and Aleutian skates whose cumulative estimated biomass accounts for approximately 82% 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 2018 Aleutian Islands bottom trawl survey combined across all survey districts

Common Name	Mean CPUE (kg/ha)	Biomass (t)	% Biomass	Cumulative %
whiteblotched skate	2.4	15,182	52	52
Aleutian skate	1.0	6,690	23	75
Alaska skate	0.4	2,720	9	84
mud skate	0.4	2,254	8	92
leopard skate	0.3	2,198	7	99
big skate	< 0.1	185	1	99
butterfly skate	< 0.1	81	< 1	99
Bering skate	< 0.1	74	< 1	99
Commander skate	< 0.1	52	< 1	100

Whiteblotched skate (*Bathyraja maculata)*

Whiteblotched skate was the most abundant skate species and the twelfth most abundant species overall caught in the 2018 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 300 m in three subdistricts within the Eastern Aleutians survey district (Table 56). The estimated biomass of whiteblotched skate was 15,182 t, and the highest survey district biomass was in the Eastern Aleutians survey district, where 72% of the estimated biomass was concentrated (Table 55).

Table 55. -- Summary by survey districts and depth intervals of 2018 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	25	1	1.60	781	0	2,484	7.190
	101 - 200	73	10	3.03	1,612	206	3,018	6.927
	201 - 300	25	2	0.49	85	0	217	4.499
	301 - 500	6	1	0.01	2	0	7	0.113
	All depths	129	14	1.63	2,480	287	4,674	6.592
Central Aleutians	1 - 100	34	3	0.27	159	0	341	9.013
	101 - 200	52	3	0.38	177	0	509	9.468
	201 - 300	24	7	1.25	264	0	781	4.340
	301 - 500	10	1	0.14	56	0	212	4.068
	All depths	120	14	0.4	656	82	1,230	5.911
Eastern Aleutians	1 - 100	18	2	0.2	139	0	348	7.196
	101 - 200	61	21	8.12	6,307	1,466	11,148	6.734
	201 - 300	39	20	6.08	2,980	570	5,389	5.584
	301 - 500	8	3	2.75	1,560	0	6,062	5.605
	All depths	126	46	4.36	10,985	2,669	19,301	6.214
Combined Aleutian Districts	1 - 100	77	6	0.61	1,079	0	2,804	7.411
	101 - 200	186	34	4.58	8,096	3,092	13,099	6.815
	201 - 300	88	29	3.81	3,329	885	5,773	5.427
	301 - 500	24	5	1.25	1,618	0	6,123	5.252
	All depths	375	74	2.48	14,121	5,934	22,309	6.262
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	2	2.1	388	174	603	7.198
	201 - 300	7	3	2	113	0	268	4.605
	301 - 500	4	2	5.36	560	0	1,761	2.678
	All depths	45	7	1.42	1,061	0	2,283	3.691

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 2018 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	30	11	20.83	4,191	0	8,893
Eastern Aleutians	201-300	NE Eastern Aleutians	19	14	12.87	2,534	131	4,936
Eastern Aleutians	101-200	SE Eastern Aleutians	16	10	11.14	2,116	884	3,348
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	2	5.81	1,552	0	7,640
Southern Bering Sea	101-200	W Southern Bering Sea	2	2	5.80	388	0	1,021
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	2	5.36	560	0	1,936
Western Aleutians	101-200	W Western Aleutians	48	10	3.97	1,612	206	3,018
Central Aleutians	201-300	Petrel Bank	4	2	2.92	224	0	809
Central Aleutians	101-200	SE Central Aleutians	14	2	2.21	166	0	499
Eastern Aleutians	201-300	SE Eastern Aleutians	9	5	2.16	445	18	871
Western Aleutians	1-100	W Western Aleutians	12	1	2.12	781	0	2,501
Southern Bering Sea	201-300	Combined Southern Bering Sea	7	3	2.00	113	0	273
Central Aleutians	1-100	Petrel Bank	9	2	1.12	107	0	271
Central Aleutians	201-300	N Central Aleutians	10	5	0.93	41	0	108
Eastern Aleutians	1-100	SE Eastern Aleutians	12	2	0.80	139	0	350
Western Aleutians	201-300	E Western Aleutians	11	1	0.71	55	0	179
Central Aleutians	301-500	N Central Aleutians	4	1	0.45	56	0	234
Western Aleutians	201-300	W Western Aleutians	14	1	0.32	30	0	95
Central Aleutians	1-100	N Central Aleutians	13	1	0.25	52	0	164
Central Aleutians	101-200	SW Central Aleutians	22	1	0.10	11	0	33
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	0.08	1	0	5
Eastern Aleutians	301-500	SE Eastern Aleutians	3	1	0.03	8	0	43
Western Aleutians	301-500	W Western Aleutians	4	1	0.01	2	0	7

Leopard skate (*Bathyraja panthera*)

Leopard skate was not among the 20 most abundant species caught in the 2018 survey, but ranked sixteenth in the Western Aleutians district and fifth among skate species (Tables 2 and 54). The vast majority of leopard skates were caught at depths shallower than 200 m in the Western and Central Aleutian survey districts (Table 57). The highest density of this species occurred at depths between 200 and 300 m in one Western Aleutian subdistrict and at depths less than 100 m in three other subdistricts within the Western and Central Aleutian survey districts (Table 58). There was no trend in size with depth. The estimated biomass for leopard skate was 2,198 t, and the highest survey district biomass by far was in the Western Aleutian survey district, where 79% of the estimated biomass was concentrated (Table 57).

Table 57. -- Summary by survey districts and depth intervals of 2018 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	25	8	2.08	1,016	111	1,921	9.371
	101 - 200	73	17	0.92	489	198	781	6.424
	201 - 300	25	1	1.38	237	0	760	12.175
	301 - 500	6	0	---	---	---	---	---
	All depths	129	26	1.15	1,743	671	2,814	8.539
Central Aleutians	1 - 100	34	4	0.52	302	0	656	8.761
	101 - 200	52	7	0.31	144	0	307	4.965
	201 - 300	24	0	---	---	---	---	---
	301 - 500	10	0	---	---	---	---	---
	All depths	120	11	0.27	446	68	824	7.025
Eastern Aleutians	1 - 100	18	0	---	---	---	---	---
	101 - 200	61	0	---	---	---	---	---
	201 - 300	39	0	---	---	---	---	---
	301 - 500	8	0	---	---	---	---	---
	All depths	126	0	---	---	---	---	---
Combined Aleutian Districts	1 - 100	77	12	0.75	1,318	360	2,276	9.224
	101 - 200	186	25	0.36	643	316	969	5.848
	201 - 300	88	1	0.27	237	0	760	12.175
	301 - 500	24	0	---	---	---	---	---
	All depths	375	38	0.39	2,198	1,072	3,323	8.073
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	0	---	---	---	---	---
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	0	---	---	---	---	---
	All depths	45	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 2018 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	E Western Aleutians	11	1	3.03	237	0	766
Western Aleutians	1-100	W Western Aleutians	12	5	2.12	784	0	1,646
Western Aleutians	1-100	E Western Aleutians	13	3	1.97	233	0	531
Central Aleutians	1-100	N Central Aleutians	13	2	1.09	230	0	572
Western Aleutians	101-200	E Western Aleutians	25	7	0.97	122	14	230
Western Aleutians	101-200	W Western Aleutians	48	10	0.90	368	96	639
Central Aleutians	101-200	SW Central Aleutians	22	5	0.80	84	0	188
Central Aleutians	1-100	Petrel Bank	9	2	0.75	72	0	188
Central Aleutians	101-200	Petrel Bank	7	1	0.30	51	0	176
Central Aleutians	101-200	N Central Aleutians	9	1	0.08	9	0	29
Eastern Aleutians	101-200	SE Eastern Aleutians	16	1	0.05	9	0	28

Aleutian skate (*Bathyraja aleutica*)

Aleutian skate was the second most abundant skate species and the twentieth most abundant species overall caught in the 2018 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 density by far occurred at depths between 100 and 200 m in one Southern Bering Sea subdistrict (Table 60). The estimated biomass of Aleutian skate was 6,691 t, and the highest survey district biomass was the Southern Bering Sea survey district, where 39% of the estimated biomass was concentrated (Table 59).

Table 59. -- Summary by survey districts and depth intervals of 2018 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	25	1	1.49	728	0	2,314	15.070
	101 - 200	73	8	1.00	533	129	938	11.019
	201 - 300	25	4	0.96	166	0	471	6.796
	301 - 500	6	0	---	---	---	---	---
	All depths	129	13	0.94	1,427	0	3,102	11.781
Central Aleutians	1 - 100	34	3	0.84	493	0	1,116	10.380
	101 - 200	52	4	0.66	304	0	933	17.537
	201 - 300	24	4	0.34	72	0	239	2.256
	301 - 500	10	2	0.31	125	0	345	2.676
	All depths	120	13	0.60	994	136	1,851	6.936
Eastern Aleutians	1 - 100	18	1	0.21	141	0	448	7.717
	101 - 200	61	15	1.11	860	374	1,347	10.917
	201 - 300	39	6	1.13	554	0	1,198	9.221
	301 - 500	8	1	0.23	130	0	544	2.662
	All depths	126	23	0.67	1,686	697	2,674	8.181
Combined Aleutian Districts	1 - 100	77	5	0.78	1,362	0	3,083	11.939
	101 - 200	186	27	0.96	1,698	847	2,548	11.746
	201 - 300	88	14	0.91	792	78	1,507	6.803
	301 - 500	24	3	.20	255	0	758	2.669
	All depths	375	49	0.72	4,107	2,074	6,139	8.729
Southern Bering Sea	1 - 100	20	0	---	---	---	---	---
	101 - 200	14	8	12.13	2,242	0	5,860	15.416
	201 - 300	7	0	---	---	---	---	---
	301 - 500	4	1	3.28	342	0	1,291	25.042
	All depths	45	9	3.45	2,584	0	6,221	16.242

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 2018 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	101-200	E Southern Bering Sea	12	8	19.01	2,242	0	5,897
Eastern Aleutians	201-300	SW Eastern Aleutians	5	2	3.54	254	0	826
Southern Bering Sea	301-500	Combined Southern Bering Sea	4	1	3.28	342	0	1,430
Western Aleutians	1-100	W Western Aleutians	12	1	1.97	728	0	2,330
Western Aleutians	101-200	E Western Aleutians	25	4	1.91	239	0	512
Central Aleutians	1-100	N Central Aleutians	13	2	1.79	377	0	961
Eastern Aleutians	101-200	SW Eastern Aleutians	12	5	1.70	384	28	741
Eastern Aleutians	101-200	SE Eastern Aleutians	16	4	1.64	313	0	647
Central Aleutians	101-200	Petrel Bank	7	1	1.52	264	0	910
Western Aleutians	201-300	W Western Aleutians	14	1	1.50	141	0	446
Central Aleutians	201-300	SE Central Aleutians	4	2	1.25	60	0	249
Central Aleutians	1-100	Petrel Bank	9	1	1.21	117	0	385
Eastern Aleutians	201-300	NE Eastern Aleutians	19	2	1.17	230	0	712
Eastern Aleutians	201-300	NW Eastern Aleutians	6	1	0.89	14	0	50
Eastern Aleutians	101-200	NE Eastern Aleutians	30	6	0.81	163	23	303
Eastern Aleutians	1-100	SE Eastern Aleutians	12	1	0.81	141	0	451
Western Aleutians	101-200	W Western Aleutians	48	4	0.72	294	0	604
Central Aleutians	301-500	SE Central Aleutians	2	1	0.67	48	0	659
Central Aleutians	301-500	N Central Aleutians	4	1	0.62	76	0	320
Eastern Aleutians	301-500	Combined Eastern Aleutian Islands	3	1	0.49	130	0	690
Central Aleutians	101-200	SE Central Aleutians	14	2	0.46	34	0	98
Western Aleutians	201-300	E Western Aleutians	11	3	0.32	25	0	57
Central Aleutians	201-300	N Central Aleutians	10	2	0.28	12	0	32
Eastern Aleutians	201-300	SE Eastern Aleutians	9	1	0.28	57	0	187
Central Aleutians	101-200	SW Central Aleutians	22	1	0.06	6	0	18

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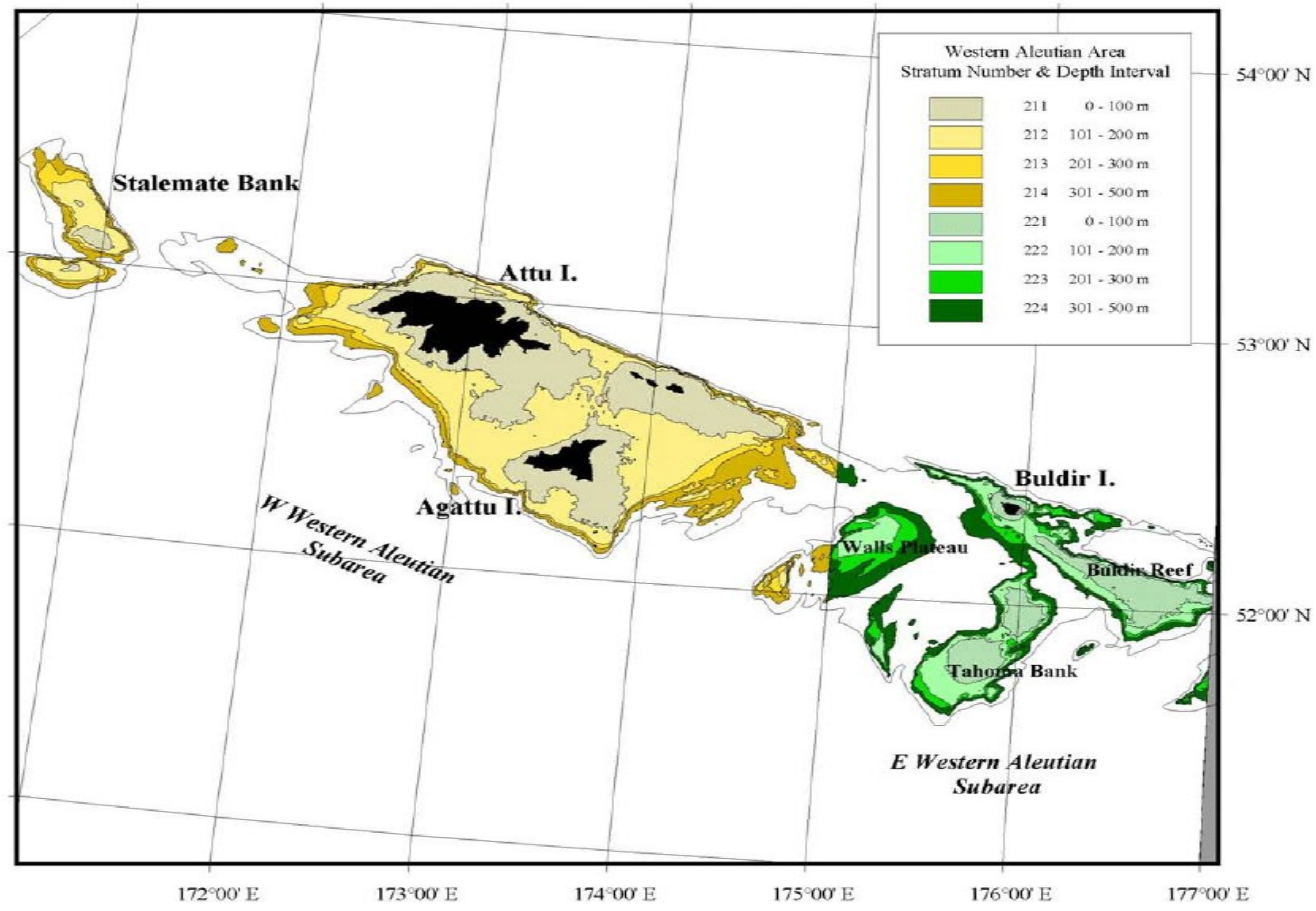
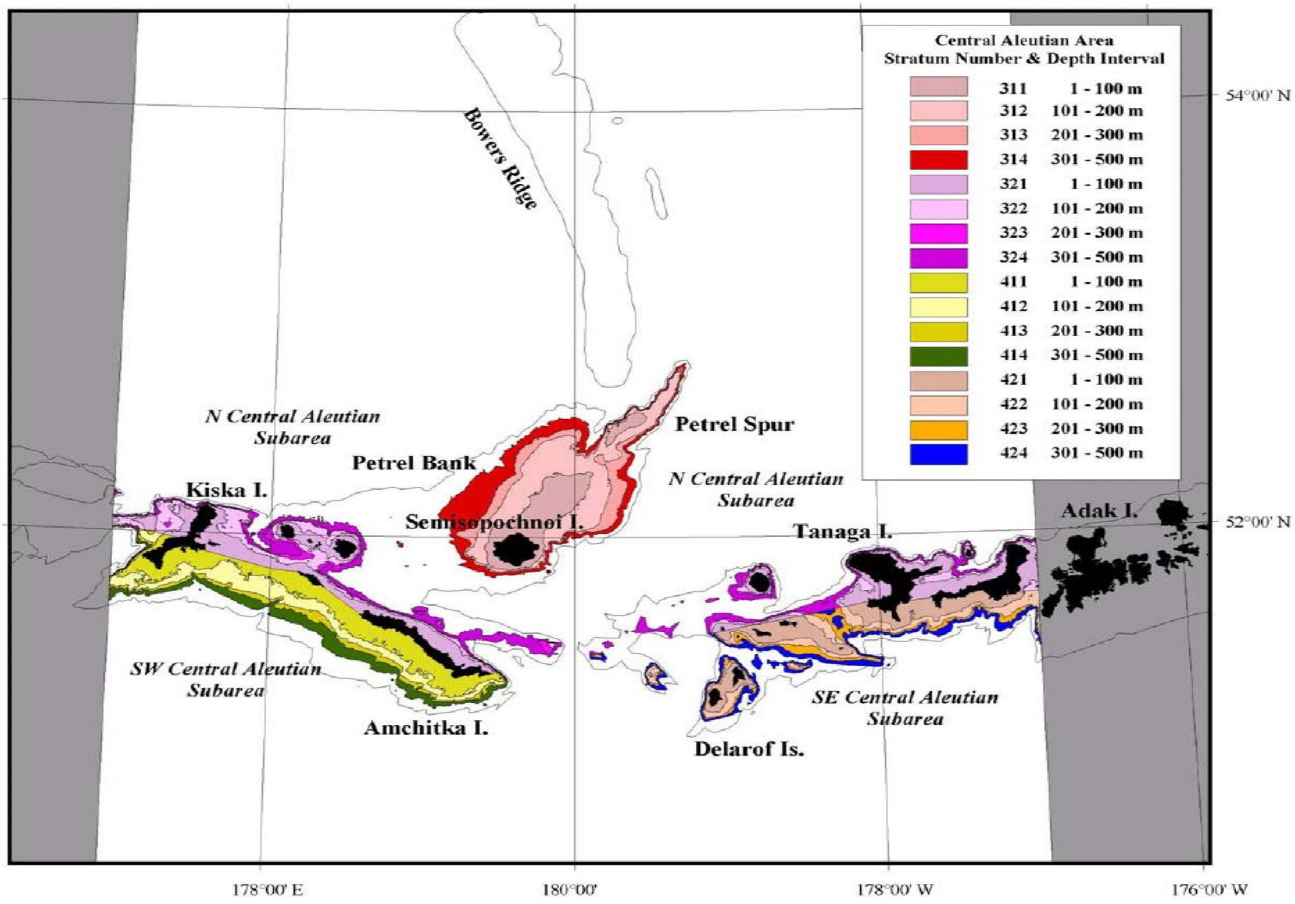
APPENDIX A

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

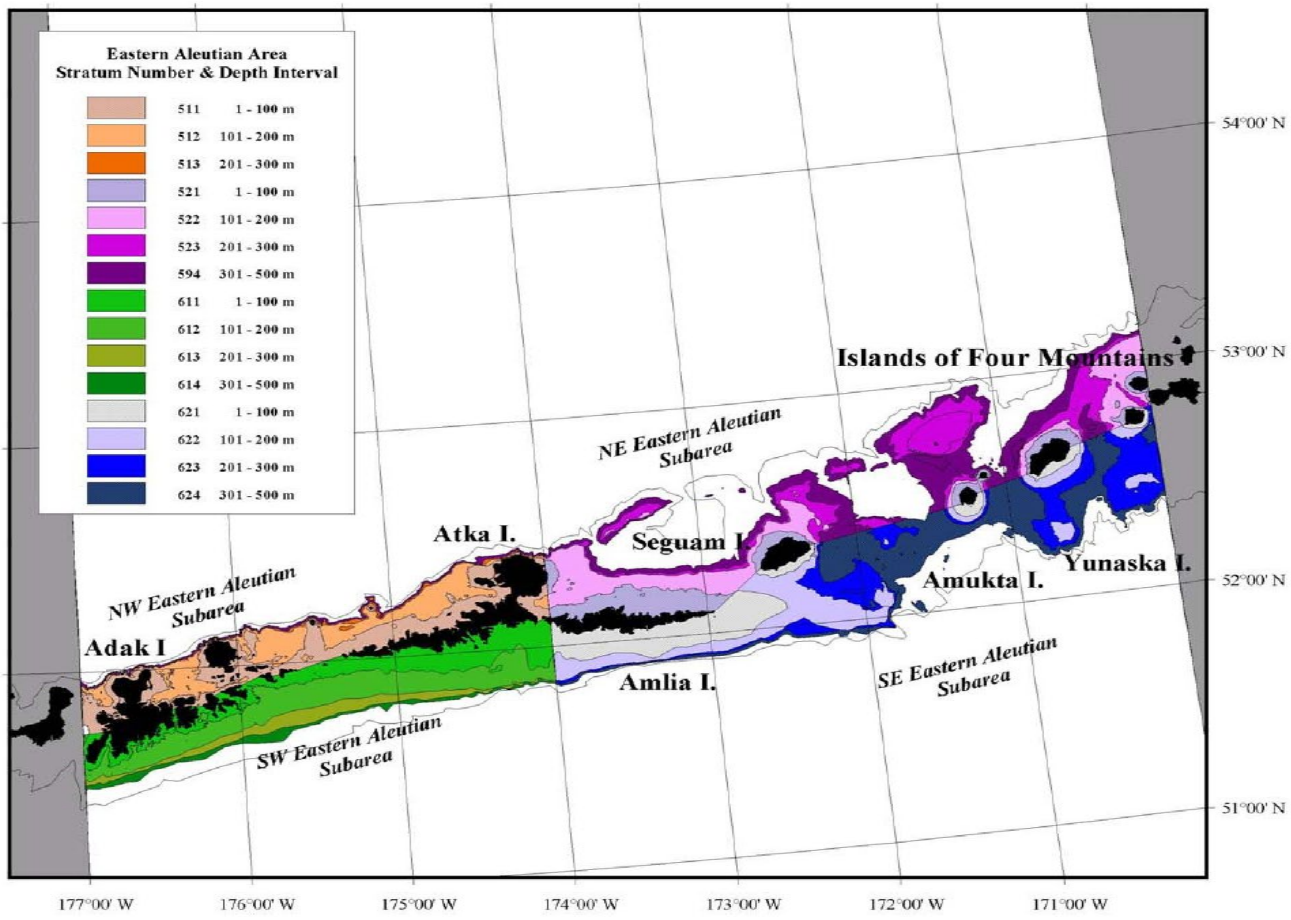
Survey district	Stratum name	Stratum Code	Depth Interval (m)	Area (km^2)
Western Aleutians	W Western Aleutians	211	1-100	3,693
	W Western Aleutians	212	101-200	4,065
	W Western Aleutians	213	201-300	940
	W Western Aleutians	214	301-500	1,711
	E Western Aleutians	221	1-100	1,183
	E Western Aleutians	222	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



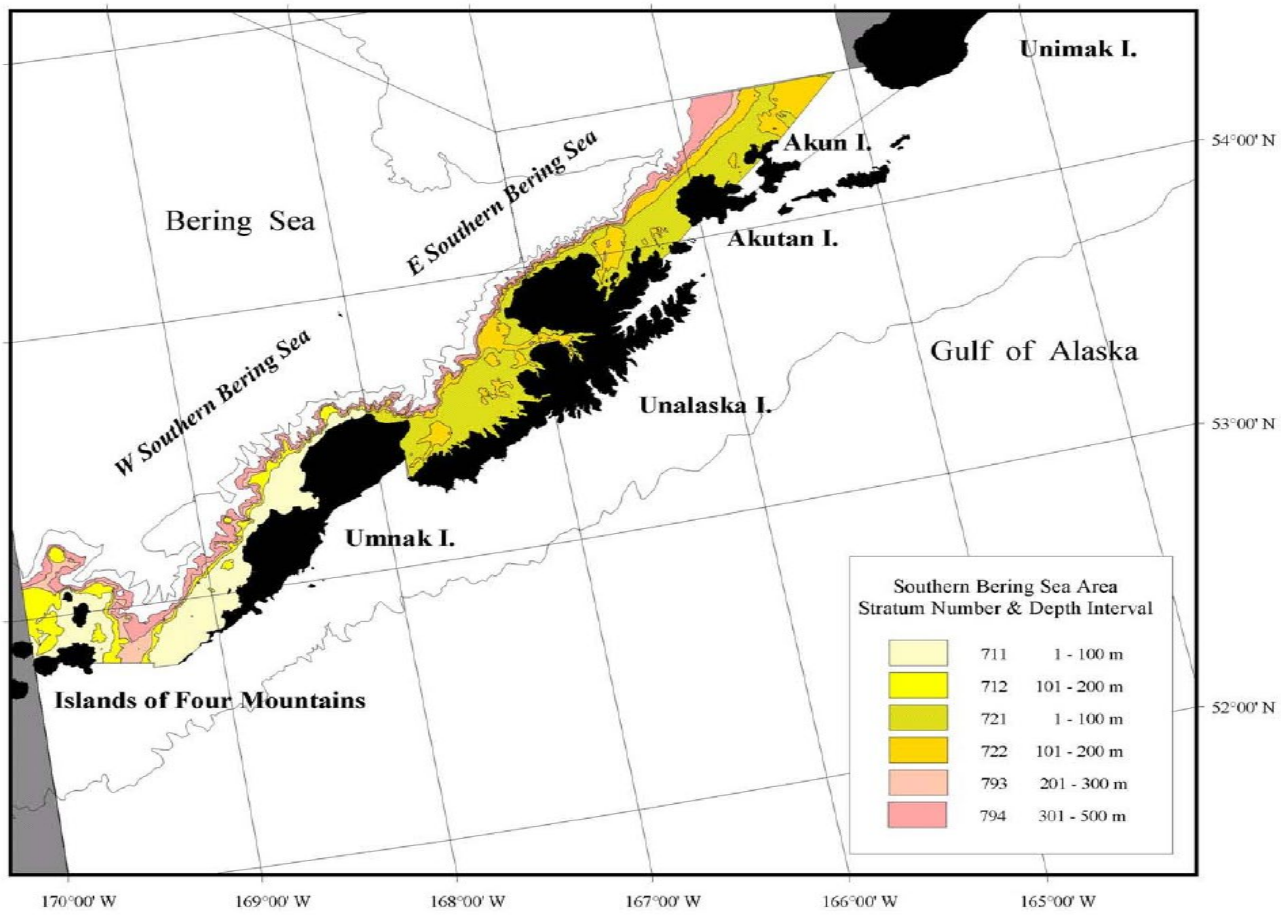
Appendix Figure A-1. -- AI survey strata by subdistricts and depth zones sampled during the 2018 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.



Appendix Figure A-2. -- AI survey strata by subdistricts and depth zones sampled during the 2018 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 2018 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 2018 Aleutian Islands groundfish trawl survey by survey district and sampling subarea.

APPENDIX B

Appendix Table B-1. -- Fish species encountered and identified during the 2018 Aleutian Islands bottom trawl survey.

FAMILY	SPECIES NAME	COMMON NAME
Petromyzontidae	*Lampetra tridentata*	Pacific lamprey
Squalidae	*Somniosus pacificus*	Pacific sleeper shark
Rajidae	*Beringraja binoculata*	big skate
	Bathyraja interrupta	Bering skate
	Bathyraja taranetzi	mud skate
	Bathyraja taranetzi egg case	mud skate egg case
	Bathyraja trachura	roughtail skate
	Bathyraja parmifera	Alaska skate
	Bathyraja aleutica	Aleutian skate
	Bathyraja lindbergi	Commander skate
	Bathyraja panthera	leopard skate
	Bathyraja panthera egg case	leopard skate egg case
	Bathyraja maculata	whiteblotched skate
	Bathyraja maculata egg case	whiteblotched skate egg case
	Bathyraja mariposa	butterfly skate
	Bathyraja mariposa egg case	butterfly skate egg case
	Bathyraja minispinosa	whitebrow skate
Clupeidae	*Clupea pallasii*	Pacific herring
Bathylagidae	*Bathylagus* sp.	blacksmelt unid.
	Bathylagus milleri	robust blacksmelt

	Leuroglossus schmidti	northern smoothtongue
Searsiidae	*Sagamichthys abei*	shining tubeshoulder
Osmeridae	*Mallotus villosus*	capelin
Salmonidae	*Oncorhynchus tshawytscha*	chinook salmon
	Oncorhynchus keta	chum salmon
Chauliodontidae	*Chauliodontinae*	viperfish unid.
	Chauliodus macouni	Pacific viperfish
Scopelarchidae	*Benthalbella dentata*	northern pearleye
Paralepidae	*Magnisudis atlantica*	duckbill barracudina
Myctophidae	Myctophidae unid.	lanternfish unid.
	Stenobrachius sp.	
	Stenobrachius leucopsarus	northern lampfish
	Stenobrachius nannochir	garnet lampfish
	Diaphus theta	California headlightfish
	Lampanyctus sp.	
	Nannobrachium ritteri	broadfin lanternfish
	Nannobrachium regale	pinpoint lampfish
	Lampanyctus jordani	brokenline lampfish
	Protomyctophum thompsoni	northern flashlightfish
	Coryphaenoides pectoralis	giant grenadier
Gadidae	*Gadus macrocephalus*	Pacific cod
	Gadus chalcogrammus	walleye pollock
Oneirodidae	*Oneirodes thompsoni*	
Melamphaeidae	*Poromitra curilensis*	crested bigscale
	Melamphaes lugubris	highsnout bigscale

Scorpaenidae	*Sebastolobus alascanus*	shortspine thornyhead
	Sebastes sp.	rockfish unid.
	Sebastes aleutianus	rougheye rockfish
	Sebastes melanostictus	blackspotted rockfish
	Sebastes alutus	Pacific ocean perch
	Sebastes ciliatus	dark rockfish
	Sebastes variabilis	dusky rockfish
	Sebastes polyspinis	northern rockfish
	Sebastes babcocki	redbanded rockfish
	Sebastes variegatus	harlequin rockfish
	Sebastes borealis	shortraker rockfish
Anoplopomatidae	*Anoplopoma fimbria*	sablefish
Hexagrammidae	*Pleurogrammus monopterygius*	Atka mackerel
	Hexagrammos octogrammus	masked greenling
	Hexagrammos decagrammus	kelp greenling
Cottidae	Cottidae unid.	sculpin unid.
	Thyriscus anoplus	sponge sculpin
	Icelinus borealis	northern sculpin
	Gymnocanthus pistilliger	threaded sculpin
	Gymnocanthus galeatus	armorhead sculpin
	Radulinus asprellus	slim sculpin
	Bolinia euryptera	broadfin sculpin
	Malacocottus zonurus	darkfin sculpin
	Hemilepidotus zapus	longfin Irish lord
	Hemilepidotus jordani	yellow Irish lord

	Triglops forficata	scissortail sculpin
	Triglops scepticus	spectacled sculpin
	Triglops macellus	roughspine sculpin
	Myoxocephalus polyacanthocephalus	great sculpin
	Myoxocephalus jaok	plain sculpin
	Leptocottus armatus	Pacific staghorn sculpin
	Dasycottus setiger	spinyhead sculpin
	Nautichthys oculofasciatus	sailfin sculpin
	Hemitripterus bolini	bigmouth sculpin
	Icelus spiniger	thorny scuplin
	Icelus canaliculatus	blacknose sculpin
	Icelus spatula	spatulate sculpin
	Rastrinus scutiger	roughskin sculpin
Agonidae	*Leptagonus leptorhynchus*	longnose poacher
	Leptagonus frenatus	sawback poacher
	Bathyagonus sp.	starsnout poacher unid.
	Bathyagonus alascanus	gray starsnout
	Podothecus accipenserinus	sturgeon poacher
	Aspidophoroides monopterygius	Aleutian alligatorfish
	Hypsagonus quadricornis	fourhorn poacher
Cyclopteridae	*Aptocyclus ventricosus*	smooth lumpsucker
	Eumicrotremus orbis	Pacific spiny lumpsucker
	Eumicrotremus gyrinops	Alaskan lumpsucker
	Eumicrotremus sp.	spiny lumpsuckers
	Eumicrotremus barbatus	papillose lumpsucker

Liparidae	Liparidae unid.	snailfish unid.
	Liparis gibbus	variegated snailfish
	Crystallichthys cyclospilus	blotched snailfish
	Elassodiscus tremebundus	blacklip snailfish
	Allocareproctus jordani	cherry snailfish
	Allocareproctus tanix	peach snailfish
	Careproctus sp.	
	Careproctus melanurus	blacktail snailfish
	Careproctus bowersianus	Bowers Bank snailfish
	Careproctus simus	proboscis snailfish
	Careproctus ectenes	shovelhead snailfish
	Careproctus furcellus	emarginate snailfish
	Careproctus scottae	peachskin snailfish
	Careproctus gilberti	smalldisk snailfish
	Careproctus sp. cf. *gilberti (Orr)*	dominator snailfish
	Careproctus candidus	bigeye snailfish
	Paraliparis dactylosus	red snailfish
	Careproctus comus	comic snailfish
	Paraliparis sp.	
	Nectoliparis pelagicus	tadpole snailfish
	Careproctus staufferi	wry snailfish
	Careproctus sp. *F*	two-tone snailfish
	Lopholiparis flerxi	hardhead snailfish
	Allocareproctus kallaion	combed snailfish
	Allocareproctus ungak	whiskered snailfish

	Allocareproctus unangas	goldeneye snailfish
	Careproctus faunus	mischievous snailfish
Bathymasteridae	*Bathymaster caeruleofasciatus*	Alaskan ronquil
	Bathymaster signatus	searcher
Zoarcidae	*Lycodes akuugun*	bicolor eelpout
	Lycodes palearis	wattled eelpout
	Lycodes concolor	ebony eelpout
	Lycodes beringi	Bering eelpout
Stichaeidae	*Lumpenus sagitta*	snake prickleback
	Chirolophis decoratus	decorated warbonnet
	Poroclinus rothrocki	whitebarred prickleback
	Bryozoichthys lysimus	nutcracker prickleback
Anarhichadidae	*Anarrhichthys ocellatus*	wolf-eel
Zaproridae	*Zaprora silenus*	prowfish
Ammodytidae	*Ammodytes personatus*	Pacific sand lance
Pleuronectidae	*Atheresthes stomias*	arrowtooth flounder
	Atheresthes evermanni	Kamchatka flounder
	Reinhardtius hippoglossoides	Greenland turbot
	Hippoglossus stenolepis	Pacific halibut
	Hippoglossoides elassodon	flathead sole
	Lyopsetta exilis	slender sole
	Parophrys vetulus	English sole
	Microstomus pacificus	Dover sole
	Glyptocephalus zachirus	rex sole
	Limanda aspera	yellowfin sole

Platichthys stellatus	starry flounder
Lepidopsetta polyxystra	northern rock sole
Lepidopsetta bilineata	southern rock sole
Isopsetta isolepis	butter sole

APPENDIX B

Appendix Table B-2. -- Invertebrate species encountered and identified during the 2018 Aleutian Islands bottom trawl survey.

PHYLUM	SPECIES NAME	COMMON NAME
Porifera	*Porifera* unid.	sponge unid.
	Suberites sp.	
	Suberites sp. A	wax sponge
	Pseudosuberites montiniger	peach sponge
	Suberites domuncula	hermit sponge
	Aphrocallistes vastus	clay pipe sponge
	Heterochone calyx	goblet sponge
	Mycale sp.	
	Mycale loveni	tree sponge
	Mycale sp. A	red mycale
	Geodia mesotriaena	soccer ball sponge
	Geodia sp.	
	Acanthascus sp.	
	Halichondria sp.	
	Halichondria panicea	barrel sponge
	Leucandra heathi	spiny vase sponge
	Rhabdocalyptus sp.	cloud sponge
	Mycale bellabellensis	lampshade sponge
	Stelodoryx oxeata	scapula sponge
	Semisuberites cribrosa	cat-o-nine-tails sponge

Myxilla lacunosa	sulfur sponge
Crella brunnea	soft brown sponge
Axinella blanca	firm finger sponge
Histodermella kagigunensis	spud sponge
Tedania kagalaskai	club sponge
Monanchora pulchra	yellow leafy sponge
Tethya sp.	ball sponge
Polymastia sp.	
Polymastia pacifica	orange nipple-ball sponge
Mycale carlilei	trumpet sponge
Leucandra tuba	
Isodictya rigida	soft finger sponge
Cladocroce attu	rough hat sponge
Esperiopsis flagrum	cheesestick sponge
Mycale tylota	slimy kelp sponge
Cladocroce kiska	
Geodia starki	pita sponge
Phorbas paucistylifer	
Inflatella globosa	yellow ball sponge
Acanthascus sp. A	angel-hair vase sponge
Stelletta sp.	stone sponge
Polymastia fluegeli	Flugel nippled sponge
Weberella bursa	pale mammilated sponge
Polymastia sp. A	prolific nipple sponge
Vulcanella sp. 1	fuzzy cratered sponge

Vulcanella sp.	
Tentorium semisuberites	two nipple sponge
Craniella villosa	tennis ball sponge
Oscarella lobularis	stalked ball sponge
Stylocordyla borealis	slender stalked sponge
Stylocordyla sp.	lollypop sponge
Plakina tanaga	white convoluted sponge
Latrunculia sp.	
Latrunculia oparinae	green papillate sponge
Latrunculia sp. B	smooth green sponge
Hymeniacidon assimilis	
Axinella sp.	firm gray sponge
Stelodoryx alaskensis	Alaskan lobed sponge
Halichondria oblonga	ginseng sponge
Chondrocladia gigantea	carnivorous cattail sponge
Asbestopluma sp. A	fuzzy sponge
Cornulum clathriata	lattice sponge
Isodictya palmata	prickly pear sponge
Chondrocladia concrescens	lobed tree sponge
Monanchora alaskensis	
Halichondria sitiens	
Haliclona sp. 2	
Haliclona digitata	
Artemisina arcigera	
Hexactinellida	glass sponge unid.

	Geodinella sp.	
	Geodinella lendenfeldi	calcareous finger sponge
	Aulosaccus schulzei	vase sponge
	Farrea sp.	
	Regadrella okinoseana	lacy basket sponge
	Craniella craniana	baseball sponge
	Craniella spinosa	furry ball sponge
	Craniella sputnika	spiky ball sponge
	Craniella sp. B	knobby ball sponge
	Craniella sigmoancoratum	spiny ball sponge
	Craniella sp.	puffball sponges
	Craniella arb	
Cnidaria	Hydrozoa unid.	
	Hydroidolina unid.	hydroid unid.
	Bonneviella sp. A	champagne flute hydroid
	Bonneviella sp.	
	Aglaophenia sp.	
	Abietinaria sp.	
	Abietinaria greenei	bushy white hydroid
	Sertulariidae unid.	Sertulariid hydroid
	Scyphozoa unid.	jellyfish unid.
	Periphylla periphylla	helmet jelly
	Chrysaora melanaster	
	Phacellophora camtschatica	egg yolk jelly
	Aequorea sp.	

Atolla sp.	
Aurelia labiata	
Cyanea capillata	lion's mane
Alcyonacea unid.	soft coral unid.
Alcyonium sp. A	pink orange mushroom coral
Gersemia sp.	sea raspberry
Anthomastus sp.	
Anthomastus sp. A	red anthomastus
Primnoa sp.	
Primnoa pacifica	
Antipatharia unid.	black coral
Parantipathes sp.	
Swiftia pacifica	
Calcigorgia beringi	Bering red sea fan
Paragorgia arborea	Kamchatka coral
Alaskagorgia aleutiana	
Cryogorgia koolsae	
Calcigorgia sp.	
Calcigorgia spiculifera	
Clavularia incrustans	encrusting coral
Virgulariidae unid.	
Halipteris sp. A	maroon sea whip
Halipteris willemoesi	
Umbellula sp.	
Ptilosarcus gurneyi	orange sea pen

Actiniaria unid.	sea anemone unid.
Metridium sp.	
Metridium farcimen	gigantic anemone
Stomphia sp.	
Stomphia coccinea	swimming anemone
Urticina crassicornis	mottled anemone
Zoanthidae sp. A	hot dog zoanthid
Cribrinopsis fernaldi	chevron-tentacled anemone
Liponema brevicorne	tentacle-shedding anemone
Actinostola sp.	
Actinostola sp. B	
Javania sp.	
Caryophyllia alaskensis	Alaska cup coral
Stylasterina unid.	hydrocoral unid.
Stylaster sp.	
Stylaster verrilli	
Stylaster elassotomus	
Crypthelia trophostega	
Stylaster campylecus	
Cyclohelia lamellata	
Stylaster alaskanus	
Stylaster parageus	
Stylaster trachystomus	
Thouarella sp. 1	
Plumarella superba	bushy coral

Errinopora sp. B	pale-edged hydrocoral
Errinopora sp.	
Errinopora nanneca	
Plumarella sp.	
Plumarella sp. 1	feathery Plumarella
Thouarella sp.	
Fanellia sp.	
Fanellia compressa	
Fanellia fraseri	
Muriceides nigra	
Plumarella sp. A	pale Plumarella
Plumarella sp. B	pinnate Plumarella
Plumarella nuttingi	loose-branched Plumarella
Arthrogorgia utinomi	
Plumarella aleutiana	Aleutian Plumarella
Plumarella hapala	
Plumarella sp. D	spiny Plumarella
Anthothela grandiflora	
Thouarella cristata	bottlebrush coral
Primnoa wingi	
Plumarella robusta	
Arthrogorgia otsukai	
Arthrogorgia kinoshitai	
Errinopora fisheri	
Errinopora dichotoma	

	Stylaster crassiseptum	
Ctenophora	Ctenophora unid.	comb jelly unid.
Annelida	Polychaeta unid.	polychaete worm unid.
	Chaetopterus sp.	parchment tubeworms
	Aphrodita negligens	
	Nothria conchylega	gravel tube worm
	Polynoidae unid.	scale worm unid.
	Eunoe sp.	
	Eunoe nodosa	giant scale worm
	Sabellidae unid.	sabellid unid.
	Hirudinea unid.	leech unid.
	Notostomum cyclostomum	striped sea leech
	Notostomobdella sp.	
Rhynchocoela	Nemertea unid.	nemertean worm unid.
	Emplectonema sp.	
Arthropoda	Isopoda unid.	isopod unid.
	Arcturus sp. 1	spiky arcturid
	Arcturus sp.	
	Rocinela angustata	sea cockroach
	Neognathophausia sp.	
	Neognathophausia gigas	giant red mysid
	Thoracica unid.	barnacle unid.
	Balanus sp.	
	Chirona evermanni	giant barnacle
	Balanus nubilus	

Pandalus sp.	
Pandalus jordani	ocean shrimp
Pandalus eous	Alaskan pink shrimp
Heptacarpus maxillipes	Aleutian coastal shrimp
Pandalus tridens	yellowleg pandalid
Pandalus sp. cf. *tridens*	
Pandalus stenolepis	roughpatch shrimp
Pandalopsis aleutica	Aleutian bigeye
Pandalopsis longirostris	northern longbeak
Pandalopsis sp. cf*. lamelligera*	
Pandalopsis dispar	sidestripe shrimp
Pandalopsis ampla	stripeleg pandalid
Spirontocaris sp.	
Eualus biunguis	deepsea eualid
Lebbeus sp.	
Lebbeus groenlandicus	spiny lebbeid
Lebbeus washingtonianus	slope lebbeid
Heptacarpus flexus	slenderbeak coastal shrimp
Crangon sp.	
Argis dentata	Arctic argid
Sclerocrangon boreas	sculptured shrimp
Pasiphaea pacifica	Pacific glass shrimp
Notostomus japonicus	spinyridge shrimp
Cancer sp*.*	cancer crab unid.
Cancer oregonensis	Oregon rock crab

Oregonia bifurca	split-nose decorator crab
Oregonia gracilis	graceful decorator crab
Chorilia longipes	longhorned decorator crab
Chionoecetes tanneri	grooved Tanner crab
Chionoecetes bairdi	Tanner crab
Chionoecetes angulatus	triangle Tanner crab
Hyas lyratus	Pacific lyre crab
Paguridae unid.	hermit crab unid.
Pagurus sp.	
Pagurus brandti	sponge hermit
Pagurus townsendi	Townsend hermit crab
Pagurus aleuticus	Aleutian hermit
Labidochirus splendescens	splendid hermit
Pagurus confragosus	knobbyhand hermit
Pagurus hirsutiusculus	true hairy hermit
Pagurus cornutus	hornyhand hermit
Pagurus dalli	whiteknee hermit
Pagurus kennerlyi	bluespine hermit
Pagurus trigonocheirus	fuzzy hermit crab
Pagurus ochotensis	Alaskan hermit
Pagurus rathbuni	longfinger hermit
Pagurus setosus	setose hermit
Elassochirus tenuimanus	widehand hermit crab
Pagurus capillatus	hairy hermit crab
Elassochirus cavimanus	purple hermit

	Elassochirus gilli	Pacific red hermit
	Lopholithodes foraminatus	brown box crab
	Acantholithodes hispidus	fuzzy crab
	Lithodes aequispinus	golden king crab
	Hapalogaster sp.	
	Hapalogaster grebnitzkii	soft crab
	Rhinolithodes wosnessenskii	rhinoceros crab
	Placetron wosnessenskii	scaled crab
	Erimacrus isenbeckii	horsehair crab
	Munida quadrispina	pinchbug
	Colossendeis sp.	
Mollusca	*Neomenia* sp.	
	Polyplacophora unid.	chiton unid.
	Cryptochiton stelleri	giant Pacific chiton
	Amicula vestita	
	gastropod egg	snail egg
	Nudibranchia unid.	nudibranch unid.
	Tochuina gigantea	giant orange tochui
	Dendronotus dalli	Dall dendronotid
	Tritonia sp.	
	Tritonia festiva	festive Tritonia
	Cadlina modesta	
	Doris odhneri	white night doris
	Diaulula sp. A	
	Cranopsis major	great puncturella

Diodora aspera	
Gastropoda unid.	snail unid.
Naticidae unid.	moonsnail
Cryptonatica aleutica	Aleutian moonsnail
Colus sp.	
Colus periscelidus	garter whelk
Colus halli	shrew whelk
Japelion sp.	
Japelion sp. A	
Volutopsius sp. C	
Pyrulofusus sp.	
Pyrulofusus dexius	
Volutopsius sp.	
Beringius sp.	
Beringius sp. H	
Neptunea sp.	
Neptunea amianta	white neptune
Torellia ammonia	rams-horn hairysnail
Boreotrophon multicostatus	ribbed trophon
Fusitriton oregonensis	Oregon triton
Fusitriton sp.	
Buccinum picturatum	
Buccinum sp.	
Buccinum oedematum	swollen whelk
Buccinum sp. E	two-ribbed chestnut whelk

Buccinum sp. F	crenulated whelk
Buccinum rondinum	eroded whelk
Arctomelon sp.	
Arctomelon stearnsii	Alaska volute
Arctomelon sp. *cf. stearnsii*	
Velutina rubra	
Modiolus modiolus	northern horsemussel
Chlamys sp.	
Chlamys erythocomata	
Hiatella arctica	Arctic Hiatella
Empleconia vaginata	vaginated limops
Astarte sp.	
Astarte elliptica	elliptical Astarte
Astarte arctica	
Clinocardium sp.	
Ciliatoclinocardium ciliatum	hairy cockle
Serripes sp.	
Serripes laperousii	broad cockle
Serripes notabilis	oblique smoothcockle
Pododesmus macrochisma	Alaska falsejingle
Pododesmus cepio	abalone jingle
Octopodidae unid.	octopus unid.
Benthoctopus leioderma	smoothskin octopus
Octopus sp.	
Japetella diaphana	

	Opisthoteuthis californiana	flapjack devilfish
	Enteroctopus dofleini	giant octopus
	Sasakiopus salebrosus	pygmy benthoctopus
	Decapodiformes	squid unid.
	Rossia pacifica	eastern Pacific bobtail
	Gonatus pyros	fiery armhook squid
	Berryteuthis magister	magistrate armhook squid
	Berryteuthis anonychus	
	Gonatopsis borealis	boreopacific armhook squid
	Galiteuthis phyllura	
	Chiroteuthis calyx	
Bryozoa	Bryozoa unid.	bryozoan unid.
	Myriapora orientalis	
	Bugula pacifica	
	Alcyonidium pedunculatum	
	Alcyonidium sp. A	medusa bryozoan
	Alcyonidium sp.	
	Alcyonidium disciforme	disc bryozoan
	Myriapora subgracilis	
	Idmidronea sp.	
	Porella compressa	flattened bryozoan
	Rhamphostomella costata	ribbed bryozoan
	Hippoporina insculpta	
	Celleporina sp.	
	Tubulipora sp.	tubular bryozoan

	Microporina articulata	
	Dendrobeania sp.	
Echinodermata	Asteroidea unid.	sea star unid.
	Diamphiodia occidentalis	
	Orthasterias koehleri	redbanded sea star
	Leptasterias groenlandica	
	Leptasterias truculenta	giant Aleutian six-rayed star
	Pycnopodia helianthoides	sunflower sea star
	Tarsaster alaskanus	
	Lethasterias nanimensis	blackspined sea star
	Pedicellaster sp.	
	Pedicellaster magister	majestic sea star
	Henricia sp. B	white Henricia
	Henricia sp.	
	Henricia aspera	ridged blood star
	Henricia leviuscula	blood sea star
	Henricia aleutica	
	Henricia tumida	tumid sea star
	Henricia asthenactis	
	Henricia longispina	
	Henricia multispina	spiny Henricia
	Odontohenricia fisheri	
	Odontohenricia sp.	
	Odontohenricia sp. A	
	Odontohenricia sp. B	

Odontohenricia ahearnae	
Aleutihenricia federi	
Henricia sp. D	fuzzy henricia
Henricia sp. E	slender pale Henricia
Leptasterias polaris	
Leptasterias katharinae	
Leptasterias sp.	
Leptasterias camtschatica	
Aleutihenricia beringiana	Bering Henricia
Henricia dyscrita	short-spined Henricia
Gephyreaster swifti	Swift sea star
Pseudarchaster sp.	
Pseudarchaster alascensis	
Hippasteria sp.	
Hippasteria kurilensis	
Hippasteria armata	
Hippasteria aleutica	Aleutian spiny star
Hippasteria sp. B	pale spiny star
Hippasteria phrygiana	spiny red sea star
Pseudarchaster parelii	scarlet sea star
Ceramaster sp.	
Ceramaster japonicus	red bat star
Ceramaster patagonicus	orange bat sea star
Ceramaster clarki	
Ceramaster stellatus	

Solaster sp.	
Solaster hypothrissus	
Solaster sp. A	
Solaster spectabilis	beautiful sun star
Solaster sp. D	serpent sun star
Solaster sp. E	Kessler sun star
Solaster sp. F	Fisher sun star
Solaster s*p.* G	ocher sun star
Crossaster sp*.*	
Crossaster borealis	grooved sea star
Crossaster sp*.* A	white rose star
Crossaster sp*.* B	pink rose star
Crossaster papposus	rose sea star
Heterozonias alternatus	cannonball sun star
Lophaster vexator	crested star
Pteraster sp*.*	
Pteraster temnochiton	cushion sea star
Pteraster sp*.* A	
Pteraster sp*.* B	
Pteraster tesselatus	
Pteraster jordani	
Pteraster willsi	
Pteraster sp*.* D	
Pteraster militaris	wrinkled star
Pteraster marssipus	

Pteraster obscurus	obscure sea star
Pteraster pulvillus	
Diplopteraster multipes	pincushion sea star
Ctenodiscus crispatus	common mud star
Leptychaster sp.	
Leptychaster anomalus	
Leptychaster arcticus	North Pacific sea star
Cladaster validus	
Cladaster sp.	
Dipsacaster borealis	northern sea star
Cheiraster sp.	
Cheiraster dawsoni	fragile sea star
Strongylocentrotus sp.	
Strongylocentrotus polyacanthus	
Echinarachnius parma	parma sand dollar
Florometra sp.	
Florometra asperrima	common northern feather star
Ophiuroidea unid.	brittlestar unid.
Gorgonocephalus eucnemis	basketstar
Gorgonocephalus sp.	
Astrochele sp.	
Ophiura sp.	
Ophiura luetkenii	gray brittle star
Ophiura sarsii	notched brittlestar
Stegophiura ponderosa	

Ophiophthalmus cataleimmoidus	
Ophiopholis sp.	
Ophiopholis japonica	
Ophiopholis aculeata	ubiquitous brittle star
Ophiolebes sp.	
Ophiosemnotes pachybactra	thick spined brittle star
Ophiosemnotes brevispina	short spined brittle star
Ophiosemnotes tylota	
Ophiolebes sp. A	
Ophiolebes sp. C	
Ophiolebes sp. F	
Holothuroidea unid.	sea cucumber unid.
Parastichopus sp.	
Pseudostichopus mollis	sandy sea cucumber
Bathyplotes sp.	
Cucumaria fallax	sea football
Cucumaria frondosa	
Psolus sp.	
Psolus chitonoides	
Psolus squamatus	whitescaled sea cucumber
Psolus japonicus	
Thyonidium sp.	
Synallactes sp. A	
Synallactes sp.	
Synallactes challengeri	

Chordata	Ascidiacea unid.	tunicate unid.
	Thaliacea unid.	salp unid.
	Styela sp.	
	Styela rustica	sea potato
	Styela sp. A	Aleutian long-stalked tunicate
	Styela sp. B	hexagonal tunicate
	Halocynthia igaboja	bristly tunicate
	Halocynthia aurantium	sea peach
	Distaplia sp.	
	Distaplia occidentalis	globular ascidian
	Distaplia smithi	paddle ascidian
	Distaplia sp. A	peach ascidian
	Amaroucium soldatovi	sand-grain imbedded ascidian
	Aplidium sp.	
	Ascidia paratropa	glassy tunicate
	Molgula griffithsii	sea grape

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	Species	Sex	a	b	n
Atheresthes stomias	Male	2.677E-06	3.183	239	*Gadus chalcogrammus*	Male	7.574E-06	2.997	333
	Female	1.650E-06	3.274	354		Female	6.698E-06	3.014	583
	Both	1.750E-06	3.261	593		Both	7.194E-06	3.003	916
Atheresthes evermanni	Male	3.079E-06	3.169	318	*Pleurogrammus monopterygius*	Male	4.789E-06	3.166	526
	Female	1.541E-06	3.294	314		Female	1.533E-05	2.959	552
	Both	1.845E-06	3.261	632		Both	1.060E-05	3.026	1078
Reinhardtius hippoglossoides	Male	---	---	---	*Sebastes melanostictus*	Male	3.374E-06	3.256	152
	Female	---	---	---		Female	4.137E-06	3.222	152
	Both	1.430E-05	2.928	7		Both	3.824E-06	3.235	304
Lepidopsetta polyxystra	Male	5.241E-06	3.123	151	*Sebastes alutus*	Male	6.185E-06	3.136	518
	Female	3.059E-06	3.221	346		Female	7.596E-06	3.095	404
	Both	3.020E-06	3.222	497		Both	7.102E-06	3.110	922
Lepidopsetta bilineata	Male	6.576E-06	3.092	63	*Sebastes polyspinis*	Male	8.313E-06	3.083	200
	Female	3.305E-06	3.221	149		Female	1.965E-05	2.940	388
	Both	3.428E-06	3.212	212		Both	1.222E-05	3.020	588
Gadus macrocephalus	Male	3.570E-06	3.173	297	*Sebastes borealis*	Male	4.031E-06	3.226	57
	Female	3.443E-06	3.181	287		Female	6.470E-06	3.152	53
	Both	3.452E-06	3.179	584		Both	4.752E-06	3.201	110

APPENDIX D

Appendix Table D. -- Bottom and surface temperatures Aleutian Islands 2018 bottom trawl survey.

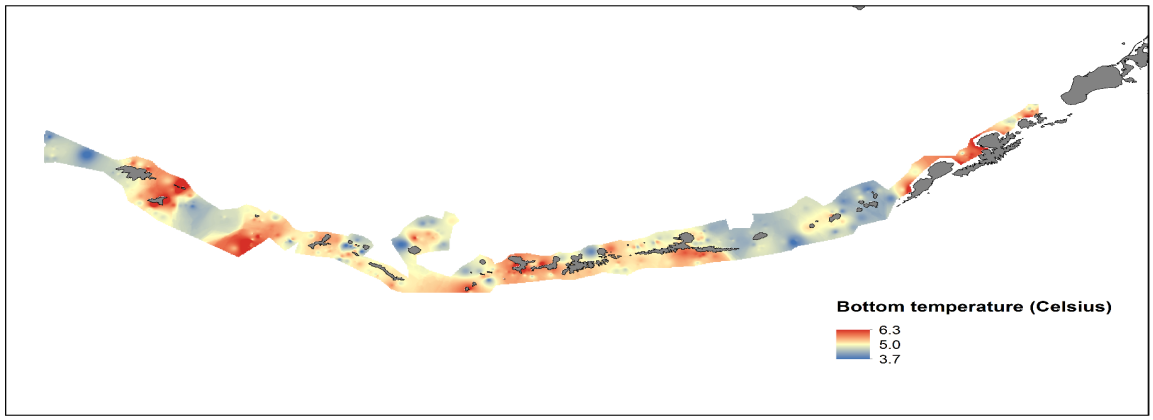


Figure D-1. -- Bottom temperatures Aleutian Islands 2018 bottom trawl survey.

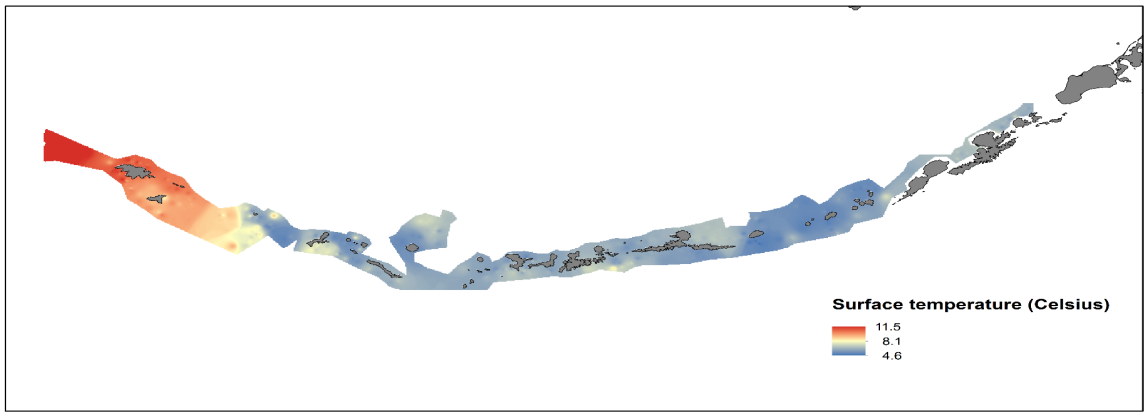


Figure D-2. -- Surface temperatures Aleutian Islands 2018 bottom trawl survey.

U.S. Secretary of Commerce
Wilbur L. Ross, Jr.

Acting Under Secretary of Commerce for Oceans and Atmosphere
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