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Data Report: 2001 Gulf of Alaska Bottom Trawl Survey

by
N. W. Raring, P. G. von Szalay, F. R. Shaw, M. E. Wilkins,
and M. H. Martin

U.S. DEPARTMENT OF COMMERCE
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PREFACE

This data report is one of three types of standard reports presenting data from the 2001 Gulf of Alaska groundfish survey conducted by the National Marine Fisheries Service (NMFS). The three standard reports are as follows:

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

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

3) **Report to Industry**, contains detailed descriptions of the survey planning and operation, summary listings of species catches by haul and vessel, ranked Catch Per Unit Effort by Species or Species Group and Trawl and Accessories Specifications and Diagrams.

ABSTRACT

Scientists of the Groundfish Assessment Program of Alaska Fisheries Science Center's Resource Assessment and Conservation Engineering (RACE) Division conducted the second biennial groundfish assessment survey of the Gulf of Alaska during the summer of 2001. These surveys extend the series of surveys, previously conducted every 3 years between 1984 and 1999, which constitute the time series used in stock assessments of Gulf of Alaska groundfish resources. The survey area covered the continental shelf and upper continental slope to 500 m in the Gulf of Alaska from Islands of Four Mountains (170° W long.) to the east end of Prince William Sound (132° 40' W long.). The survey was conducted aboard three chartered commercial trawlers, and the FV *Morning Star* and FV *Vesteraalen*. Trawl haul samples were collected successfully at 489 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 the principal groundfish within the survey area and to collect data to estimate biological parameters useful to groundfish researchers and managers including age, growth, length-weight relationships, feeding habits, and size, sex, and age composition. The survey also collected ancillary data requested by other research groups.

More than 138 fish and 304 invertebrate species were captured in survey tows. The species highest in total catch abundance (by weight) over the entire survey area were arrowtooth

flounder (*Atheresthes stomias*), Pacific ocean perch (*Sebastes alutus*), Pacific halibut (*Hippoglossus stenolepis*) and northern rockfish (*Sebastes polyspinis*). Survey results are presented including estimates of catch per unit of effort, biomass, population size composition, and length-weight relationships, as well as charts depicting the distribution of catch for commercially important species encountered during the survey.

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INTRODUCTION

The second biennial bottom trawl survey of groundfish and invertebrate resources of the Gulf of Alaska (GOA) was conducted during the summer of 2001 by the National Marine Fisheries Service's (NMFS) Alaska Fisheries Science Center (AFSC). Scientists from the Groundfish Assessment Program of AFSC's Resource Assessment and Conservation Engineering (RACE) Division in Seattle, Washington, were responsible for the survey's design and operations. The biennial regimen extends the series begun in 1984, previously conducted every 3 years between 1984 and 1999, which has provided an information time series of distribution, abundance, and biological characteristics of GOA groundfish resources for the purpose of stock assessment and management.

In this report, we document the operations and results of the 2001 GOA bottom trawl survey. Results of routine analyses of distribution, relative abundance, size composition, and biological characteristics are shown for the principal groundfish species in each of the three International North Pacific Fisheries Commission (INPFC) statistical areas sampled in the GOA during this survey: Shumagin, Chirikof, and Kodiak. The Yakutat, and Southeastern INPFC areas were not sampled in 2001 due to budgetary limitations. These results provide stock assessment scientists and resource managers the most current information to be used for subsequent stock assessments. Only the 2001 survey results are presented and no comparisons are made to the results of previous GOA surveys.

The survey objectives were to:

1.) Delineate the distributions of major groundfish and commercially important invertebrate species inhabiting the continental shelf and upper continental slope of the GOA in depths ≤ 500 m.

2.) Collect data used to estimate the abundance of the major groundfish species.

3.) Collect data on specific biological characters of interest to researchers and resource managers including:

- size, sex, and age composition
- growth and length-weight relationships
- food habits

4.) Collect specimens and related information for special research projects on behalf of researchers at RACE and Resource Ecology and Fisheries Management (REFM) Divisions and Auke Bay Laboratories of the AFSC. The projects included:

- A study of age-1 pollock;
- Genetic studies of rougheye rockfish;
- Development of a new method for aging shortraker rockfish and Pacific ocean perch;
- Collections of mollusk and echinoderm fauna for ongoing taxanomic and distrubutional studies;
- A study of age and growth for dark rockfish;
- A study of fat, protein and caloric content of prey fishes;
- A study of age and maturity for Pacific ocean perch, dusky rockfish and northern rockfish;

- Collection of a variety of fish species for fisheries observer identification training.

METHODS

Survey Area

The Gulf of Alaska forms the northeastern border of the Pacific Ocean and consists of complex bathymetric features ranging from jagged, mountainous pinnacles to flat, muddy areas. These features provide a variety of habitats resulting in a complex ecosystem mosaic (Fig. 1). Prevailing rough bottom conditions in many areas require the standard use of rubber bobbin roller gear for all survey bottom trawling operations. The 2001 GOA survey included the portion of the continental shelf from the Islands of Four Mountains to the east end of Prince William Sound from nearshore waters (minimum depth approximately 15 m) to a depth of 500 m.

The total area the survey represents is approximately 220,569 km² (Table 1). In most years the Gulf of Alaska survey is continued to include the Yakutat and Southeast Alaska INPFC areas which extend all the way to the southern end of Alaska to Dixon Entrance. Survey depths also usually extend out to 1,000 m, making the usual survey area about 320,000 km². The continental shelf, waters shallower than about 200 m and consisting of about 74% of the survey area, varies in width from approximately 20 km (11 nautical miles (nmi)) off of the Islands of Four Mountains to approximately 220 km (120 nmi) off Cook Inlet. Gullies intrude onto the shelf in many areas, extending from the upper slope to the inner shore. These gully areas make up about 16% of the total Gulf of Alaska area. The outer shelf is bordered by the continental slope, a region approximately 20 km in width, which descends steeply to the abyssal Aleutian Trench in

the western and central GOA and to the Alaska Plain in the eastern GOA. The survey assessed only that portion of the slope between 200 and 500 m, which represented about 6% of the total survey area. About 43% (96,250 km²) of the total survey area is within the Kodiak INPFC area (Table 1). The portion of the survey area contained within the Chirikof INPFC area and the Shumagin INPFC area are approximately equal at about 26% (63,034 km²) and 28% (61,285 km²), respectively.

Vessels

Since the inception of the Gulf of Alaska bottom trawl survey series in 1984, commercial trawlers and crew have been chartered to conduct the survey operations under the supervision and guidance of RACE Groundfish Assessment Program staff. Although only two vessels were chartered in 2001, in most years Gulf of Alaska surveys have required the use of three vessels. Since these surveys generate quantitative data for a time series to describe trends in abundance, distribution, and population biology characteristics of managed resources, it is essential that standardized methods be maintained. Stringent standards for selecting charter vessels are specified whenever new charters are arranged to ensure that the sampling platforms can adequately collect samples and do so in as similar a manner as possible within and between years. As such, vessels and crews must meet minimum criteria in terms of size, main engine

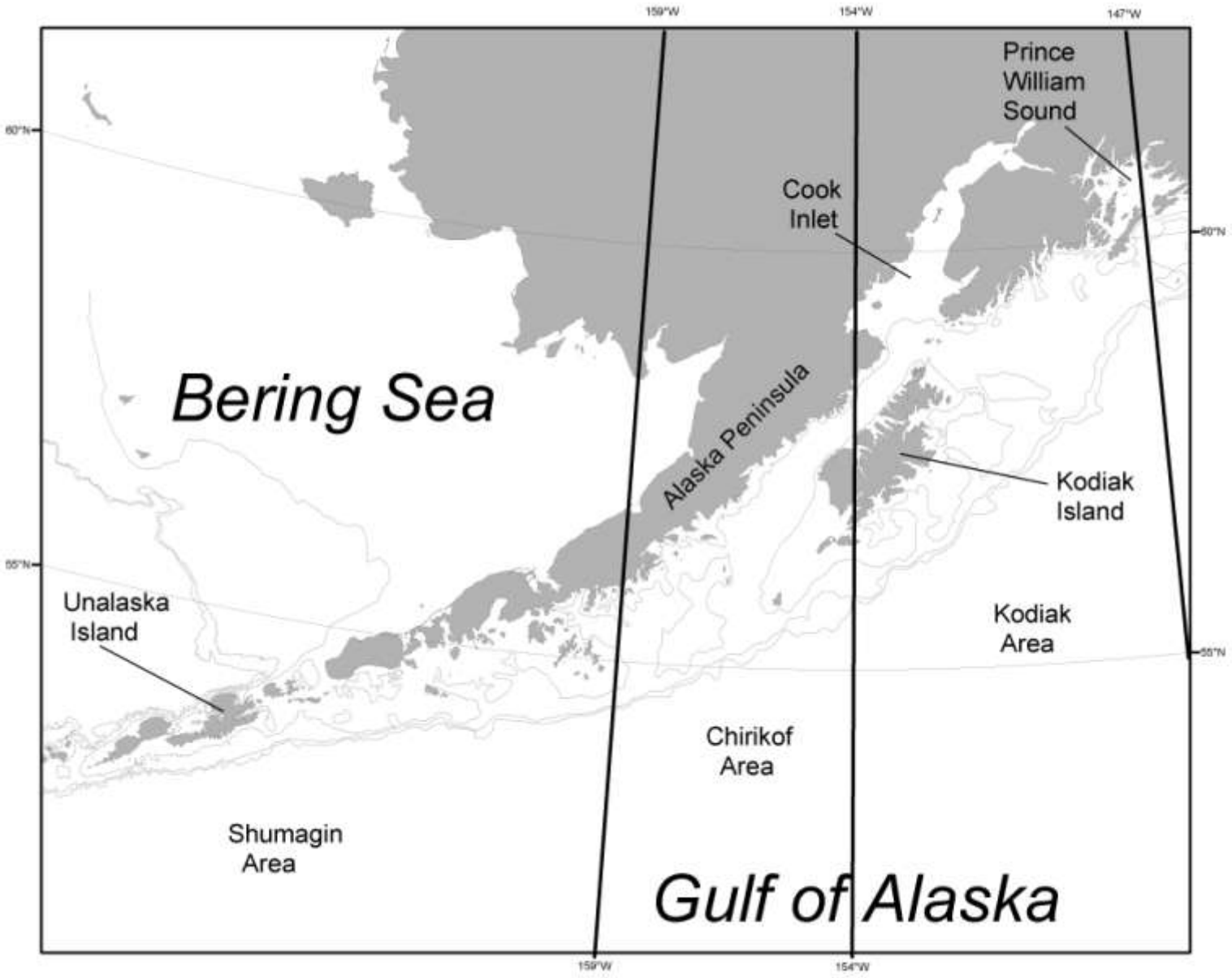

Figure 1. -- 2001 Gulf of Alaska biennial groundfish survey area showing bathymetric and geographic features and INPFC boundaries.

horsepower, fishing machinery, skipper and crew experience, and navigational and safety equipment. Continuity of suitable platforms has been further enhanced in the past decade through the use of multi-year charters, assuring both the government and the contractors a stable planning situation for several years at a time.

In 2001, two U.S. commercial fishing vessels, F/V *Morning Star* and F/V *Vesteraalen* were chartered to conduct the Gulf of Alaska bottom trawl survey. Both chartered vessels are house-forward stern trawlers with hydraulic net reels and paired constant tension hydraulic trawl winches with 2.54 cm diameter steel cable 1,000 to 1,200 m in length. Both vessels have articulating hydraulic cranes for handling catches and gear. Each vessel has a single main diesel engine with a single-nozzled propeller. The F/V *Vesteraalen* is 38 m long (LOA) with a main engine developing 1,725 continuous horsepower (HP). The F/V *Morning Star* is 45 m long (LOA) with a 1,710 HP main engine. 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.

Fishing Gear

All vessels used standard RACE Division Poly Nor'Eastern four-seam bottom trawls with 24.2 m roller gear constructed with 36 cm rubber bobbins separated by 10 cm rubber disks. The fishing dimensions of the trawls during deployment were monitored and recorded using Scanmar acoustic net mensuration equipment mounted on the wing-tips and headrope of the trawl. Each

trawl and associated rigging was measured and certified as conforming to standard measurements prior to its use in the survey.

Survey Design

The 2001 biennial survey used stratified random sampling consistent with previous GOA surveys (Britt and Martin 2000, Martin and Clausen 1995, Stark and Clausen 1995, Munro and Hoff 1995). The survey area was divided into 32 strata defined by water depth, bottom terrain (e.g., shelf, gully, and slope), and INPFC statistical area (Appendix A). As in previous surveys, a modified Neyman optimal allocation strategy (Cochran 1977) based upon catch rates from the 1990-1999 surveys was used to allocate effort among strata. Neyman optimum allocation calculations were made for each of the principal groundfish species for each previous survey year using the estimated time to perform a tow in a given stratum as the cost variable, since observations in deeper strata have a greater probability of unacceptable gear performance. A mean sample size was estimated for each species across years and then a weighted mean of the estimated sample sizes was calculated using each species' mean biomass multiplied by its ex-vessel value as the weighting variable. These numbers were rounded to whole numbers and represented the number of stations allocated to each stratum with the additional constraint that each stratum was required to have at least two samples.

Within each stratum, the allocated stations were randomly selected without replacement from polygons formed from the intersection of a grid composed of cells 25 km^2 in area and the stratum boundaries. Since many of the polygons formed by this process are less than 25 km^2, the

probability of selection was directly related to each polygon's area. Small polygons (less than 5 km^2 in area) were excluded from the pool available for assignment since a vessel would be unable to perform a valid tow within such a small area.

We allocated 489 stations among the 32 strata. Geographic center points of the assigned station polygon were considered to define the location of the station. Vessels were assigned stations and were directed to thoroughly search each area using echosounder returns to locate sufficient trawlable bottom to perform a successful 15-minute tow, preferably through the center point. If trawlable bottom could not be found in the immediate area of the assigned point, a suitable location within the station polygon was sought. If, in the judgment of the field party chief and skipper, no trawlable grounds could be found within the polygon within 2 hours, a nearby alternate station was selected from successful tows completed during previous GOA surveys. If sufficient trawlable bottom was encountered while transiting to the alternate site, this location was instead selected for the sample.

Data Collection Techniques

The 2001 Gulf of Alaska bottom trawl survey was conducted using protocols used by the AFSC's RACE Division. Criteria for a successful tow include maintaining a continuous vessel speed of 3 knots (5.56 m/sec) while keeping the net in contact with the bottom and in fishing configuration for 15 minutes. Occasionally, tows of shorter duration were necessary to avoid obstacles (and, hence, net damage) or when net configuration (e.g., reduced wing spread) indicated that an exceptionally large catch was affecting the performance of the trawl. NMFS-supplied GPS receivers recorded trawling position, time, and trackline position. Water

termperature profiles were recorded every 3 seconds during most tows using a Seabird SBE-39 bathythermograph placed on the headrope of the net. The vertical and horizontal net openings were monitored with Scanmar net mensuration equipment. Scanmar net spread data were generally not collected for tows over extremely rough bottom so as not to risk losing the instruments. Backup surface water temperatures were measured at most stations with a bucket thermometer. To minimize fishing power differences between the survey vessels, standardized trawling and gear handling methods were practiced including the use of scope ratio tables (trawl warp relative to bottom depth) and maintaining a 3-knot trawling speed.

A trawl sample was considered successful if horizontal and vertical net openings remained within established tolerances, the roller gear maintained consistent contact with the bottom, the net suffered little or no damage during the tow, and there were no conflicts with derelict fishing gear. Trawl samples were considered unsuccessful when the field party chief judged that the catch was affected by trawl damage, an unstable trawl configuration, insufficient bottom contact, or in the event the duration of the tow was less than 10 minutes.

Collection and Processing of Samples

Catches were sorted to species or other appropriate taxonomic levels and then weighed in aggregate using an electronic motion-compensating scale. Catches weighing less than approximately 1,000 kg were emptied directly onto a sorting table, sorted by species, and weighed to the nearest 0.1 kg using a mechanical basket scale. Species groups weighing less than about 2 kg were generally weighed to the nearest 2 g on a Marel model M60 digital scale.

Larger catches were processed in like manner by iteratively filling the sorting table from the codend, sorting, and weighing until the entire catch had been processed. Alternatively, the total weight of the catch was determined using a Measurement System's International Portaweigh Model 4300 crane scale. Afterwards the sorting table was filled with a portion of the catch and the excess catch was dumped into a deck bin. The dominant species, usually three or fewer, making up the bulk of the catch were identified. The contents of the deck bin were sorted, the predominant species were discarded and the non-dominant species were retained, which were sorted and weighed with those from the table. Total weight estimates for the predominant species were calculated by expanding their proportion by weight from the sorted sample to the difference between the total catch weight and the total weight of all non-dominant species. Pacific halibut were measured and discarded as promptly as possible and their weights were estimated from the length data. Numbers and weights of all taxa were estimated for each haul.

Additional biological information was recorded from individuals of species of commercial value, ecological importance, or abundance in the survey area. A random subsample of 100 - 300 individuals (target subsample size was species-dependent) of each of these species identified in the catch was sorted by sex, and individual fork lengths (FL) were measured using Polycorder (Omnidata) data loggers with barcode readers and barcoded length strips. Fish that could not be readily sexed were classified as unsexed and measured. Age structures were collected from randomly selected samples of walleye pollock (See Appendix Table B-1 for scientific names of fish species), samples stratified by haul, sex, and size of rockfish species, and samples stratified by area, sex, and size of other target species. Every attempt was made to distribute the age specimen collections over the entire survey area. Individuals sampled for age

were measured to the nearest 1 cm (FL) and weighed to the nearest 2-5 g (scale accuracy depends on the weight of the specimen) with a Marel model M60 scale.

Stomach samples for selected species were collected throughout the survey area by biologists from the AFSC's Resource Ecology and Ecosystem Modeling (REEM) Program aboard the *Morning Star*. Ancillary data and specimens including whole specimens, stomachs, hearts, gonads, and otoliths were collected for several other research projects as described previously

Abundance, Size Composition, and Length-Weight Relations

Biomass estimates were calculated using the area-swept method (Alverson and Pereyra 1969). The area swept was calculated as the product of estimated distance towed and the estimated mean net spread for each tow. The distance towed was assumed to be represented by the distance traveled over ground by the vessel between the time when the footrope came into contact with the bottom (on-bottom) and the time when the center of the footrope left the bottom (off-bottom). The distance traveled by the vessel was estimated by smoothing the GPS location data and measuring the distance along this line. The mean net spread was estimated by averaging the smoothed net spread readings from the Scanmar units between on-bottom and off-bottom positions. Net spreads for tows for with insufficient Scanmar data were estimated by a stepwise generalized additive model using net number, net height (when available), mean speed over ground (when available), depth, total catch and the actual scope/expected scope ratio as variables. For each species, catch-per unit effort (CPUE) was calculated as catch weight (kg) per area swept by the trawl in hectares (ha). Mean CPUE was calculated, including zero catches,

within each stratum. Mean CPUE values of combined strata were calculated as the weighted average of the component strata CPUE means weighted by stratum area. Biomass estimates were calculated by multiplying each stratum mean CPUE by the stratum area and summing the results to obtain estimates by INPFC statistical areas and depth intervals. The 95% confidence interval was calculated for each species biomass estimate. A detailed description of the analytical procedures is presented in Wakabayashi et al. (1985).

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

Individual length and weight measurements were used to establish length-weight relationships. The length-weight allometric relationship was expressed as

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

where W is weight (grams), L is length (mm), and a and b are the fitted parameters from a non-linear least squares regression. Parameters for the most common species are listed in Appendix C.

Survey Limitations

The primary purpose of this survey is to support management of a large number of fish and benthic invertebrate species, including various functional groups of fish: flatfish, roundfish, and rockfish. The different functional groups have expected 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, which are used to tune stock assessment models, are used to monitor population trends and status. Gear deployment is standardized and intentionally not modified over time to ensure scientific consistency and statistical continuity of the time series necessary to reliably monitor the status of fish stocks and forecast trends.

RESULTS

Out of a total of 528 attempted tows, 489 (93%) were completed successfully at allocated survey stations and were included in the biomass and size composition analyses (Table 1). Net spread measurements were successfully collected for 508 tows (96%). Headrope depth and temperature measurements were successfully collected for 494 tows (94%). Bottom temperatures ranged from 4.1° to 12.3° C. Sea surface temperatures were successfully collected for 523 tows and ranged from 4.1° to 13.9° C.

Net height and spread were measured for all but 20 of the successful survey hauls (for these hauls net dimensions were estimated from other bottom trawl hauls). Average net spread ranged from 14.5 to 19.0 m. Average net heights of successfully completed tows ranged from 6.5 to 8.4 m.

Table 1. -- Number of stations allocated, attempted, and successfully completed, and sampling density for the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth range (m)	Stations allocated	Stations attempted	Stations successful	Area (km^2)	Stations/ 1,000 km^2
Shumagin	1 - 100	95	107	94	41,289	2.28
	101 - 200	30	33	30	14,677	2.04
	201 - 300	9	11	9	2,788	3.23
	301 - 500	6	7	6	2,531	2.37
	All depths	**140**	**158**	**139**	**61,285**	**2.27**
Chirikof	1 - 100	55	62	56	26,035	2.15
	101 - 200	57	58	57	23,849	2.39
	201 - 300	22	24	22	11,546	1.91
	301 - 500	5	5	5	1,604	3.12
	All depths	**139**	**149**	**140**	**63,034**	**2.22**
Kodiak	1 - 100	91	97	91	38,516	2.36
	101 - 200	90	95	91	43,332	2.10
	201 - 300	21	21	21	11,490	1.83
	301 - 500	8	8	7	2,912	2.40
	All depths	**210**	**221**	**210**	**96,250**	**2.18**
All areas	1 - 100	241	266	241	105,840	2.28
	101 - 200	177	186	178	81,858	2.17
	201 - 300	52	56	52	25,824	2.01
	301 - 500	19	20	18	7,047	2.55
	All depths	**489**	**528**	**489**	**220,569**	**2.22**

Catch Results by Area

At least 133 fish species from 27 families were captured during the 2001 survey. Appendix B presents lists of fish (Appendix Table B-1) and invertebrate (Appendix Table B-2) species encountered during the survey. Relative abundance estimates, reported as CPUE, are presented in Table 2 for the 20 most abundant groundfish species in each of the five INPFC areas.

Over the entire survey area, arrowtooth flounder was the most abundant groundfish encountered during the survey (Table 2). Arrowtooth flounder also had the highest CPUE of any species in two of the three INPFC areas. Pacific ocean perch, Pacific halibut, northern rockfish, and Pacific cod were also very important components of the Gulf-wide species composition.

In the Shumagin INPFC area, Pacific ocean perch had the greatest CPUE of any species. Atka mackerel, arrowtooth flounder and Pacific cod were also relatively abundant in this area. In the Chirikof INPFC area, arrowtooth flounder dominated all other species in terms of CPUE. Pacific halibut and Pacific cod were also important components of the species composition. In the Kodiak INPFC area, arrowtooth flounder was by far the dominant component of the groundfish CPUE. Pacific ocean perch, northern rockfish, sablefish and Pacific halibut were also relatively abundant in this area.

Table 2. -- Mean CPUE (kg/ha) for the 20 most abundant groundfish in each International North Pacific Fisheries Commission area during the 2001 biennial Gulf of Alaska bottom trawl survey.

Shumagin area	CPUE	**Chirikof area**	CPUE
Pacific ocean perch	44.91	Arrowtooth flounder	98.54
Atka mackerel	36.09	Pacific halibut	17.06
Arrowtooth flounder	30.26	Pacific cod	11.14
Pacific cod	21.74	Flathead sole	6.58
Pacific halibut	15.27	Pacific ocean perch	6.32
Northern rockfish	15.22	Giant grenadier	6.27
Walleye pollock	14.17	Sablefish	5.52
Giant grenadier	11.38	Walleye pollock	5.26
Flathead sole	11.12	Pacific herring	4.15
Southern rock sole	9.68	Northern rockfish	3.88
Yellowfin sole	8.09	Eulachon	2.95
Northern rock sole	6.08	Pacific sleeper shark	2.83
Yellow Irish lord	2.95	Southern rock sole	2.79
Starry flounder	2.33	Rex sole	2.75
Pacific sleeper shark	1.58	Big skate	2.43
Rex sole	1.56	Northern rock sole	2.22
Shortspine thornyhead	1.43	Dover sole	2.20
Big skate	1.37	Longnose skate	1.51
Rougheye rockfish	1.13	Shortspine thornyhead	0.81
Sablefish	0.92	Rougheye rockfish	0.57
Number of hauls	139	Number of hauls	140

Kodiak area	CPUE	**All areas**	CPUE
Arrowtooth flounder	57.58	Arrowtooth flounder	61.69
Pacific ocean perch	37.21	Pacific ocean perch	30.52
Northern rockfish	23.46	Pacific halibut	15.65
Sablefish	15.39	Northern rockfish	15.58
Pacific halibut	14.98	Pacific cod	11.68
Walleye pollock	9.43	Atka mackerel	10.03
Starry flounder	5.74	Walleye pollock	9.56
Giant grenadier	5.66	Sablefish	8.55
Pacific cod	5.63	Giant grenadier	7.42
Southern rock sole	4.74	Flathead sole	6.96
Flathead sole	4.56	Southern rock sole	5.55
Spiny dogfish	3.20	Starry flounder	3.26
Eulachon	3.16	Northern rock sole	2.94
Rex sole	2.53	Yellowfin sole	2.50
Dusky rockfish	2.45	Eulachon	2.35
Rougheye rockfish	2.20	Rex sole	2.32
Dover sole	1.84	Big skate	1.77
Big skate	1.60	Pacific sleeper shark	1.71
Shortspine thornyhead	1.54	Dover sole	1.47
Longnose skate	1.42	Spiny dogfish	1.44
Number of hauls	210	Number of hauls	489

Catch Results by Species

For each commercially or ecologically important species, the following information is presented:

1. A brief synopsis of the data collected.
2. A table presenting the number of hauls, the number of hauls with catch, mean CPUE, estimated biomass with 95% confidence intervals, and mean weight of that species by INPFC area and depth.
3. A figure showing the distribution and relative abundance of that species.
4. A figure showing the estimated size composition of the population for that species.
5. CPUE and biomass estimates (with 95% confidence intervals) by stratum for that species.

For other species that were locally abundant (other flatfish and other rockfish, skates, capelin, eulachon, and Pacific hake), only items 1, 2, and 5 above are presented.

The scientific names follow the fifth edition of the Common and Scientific Names of Fishes from the United States and Canada (Robins et al. 1991). The exceptions to this are in the orders Pleuronectiformes (flatfish) and Scorpaeniformes (rockfish) scientific names. The names used throughout this report reflect recent re-examination of the phylogeny of these orders (Berendzen 1997, Cooper and Chapleau 1998, Ivankov 1996, Orr and Matarese 2000, Rass 1996).

FLATFISHES

Arrowtooth flounder (*Atheresthes stomias*)

Arrowtooth flounder was the most abundant species caught in the 2001 survey (Table 2) with the highest mean CPUE in two of the three surveyed INPFC areas. Arrowtooth flounder were caught throughout the survey area at all depths, occurring in 87% of all tows including 98% of the tows at depths between 101 and 500 m. The highest densities generally occurred on the broad continental shelf in the Kodiak and eastern Chirikof INPFC areas, especially around the Semidi Islands and in the area northeast of Kodiak Island (Fig. 2 and Table 4). Mean densities were highest in depths between 100 - 200 m over the entire survey. Mean weight always increased with depth in every INPFC area (Table 3), as fish less than 30 cm FL were relatively rare at depths greater than 300 m (Fig. 3). A distinct length mode around 40 to 45 cm for males occurred at depths between 201 and 300 m. Another distinct mode occurred in both males and females around 25 cm in the shallow tows 1-100 m. The arrowtooth flounder population in the survey area was dominated by females, which accounted for approximately 70% of the total estimated population.

Table 3. -- Number of survey hauls, number of hauls with arrowtooth flounder, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	71	13.04	53,836	30,710	76,962	0.437
	101 - 200	30	28	83.14	122,029	75,100	168,957	0.588
	201 - 300	9	9	18.45	5,145	1,472	8,818	0.701
	301 - 500	6	6	17.47	4,423	0	11,527	1.593
	All depths	139	114	30.26	185,433	133,706	237,159	0.544
Chirikof	1 - 100	56	41	30.10	78,371	27,843	128,899	0.545
	101 - 200	57	57	184.17	439,231	181,626	696,835	0.845
	201 - 300	22	22	88.74	102,464	46,194	158,735	1.082
	301 - 500	5	5	6.69	1,073	0	2,205	2.174
	All depths	140	125	98.54	621,139	353,840	888,437	0.818
Kodiak	1 - 100	91	71	19.38	74,634	48,417	100,850	0.647
	101 - 200	91	88	101.12	438,175	298,080	578,271	0.873
	201 - 300	21	21	33.58	38,590	0	93,676	0.973
	301 - 500	7	7	9.51	2,768	715	4,822	2.012
	All depths	210	187	57.58	554,167	409,444	698,890	0.842
All areas	1 - 100	241	183	19.54	206,841	146,251	267,431	0.541
	101 - 200	178	173	122.09	999,435	704,958	1,293,911	0.813
	201 - 300	52	52	56.61	146,199	84,219	208,178	1.032
	301 - 500	18	18	11.73	8,264	1,022	15,505	1.779
	All depths	489	426	61.69	1,360,738	1,057,339	1,664,137	0.774

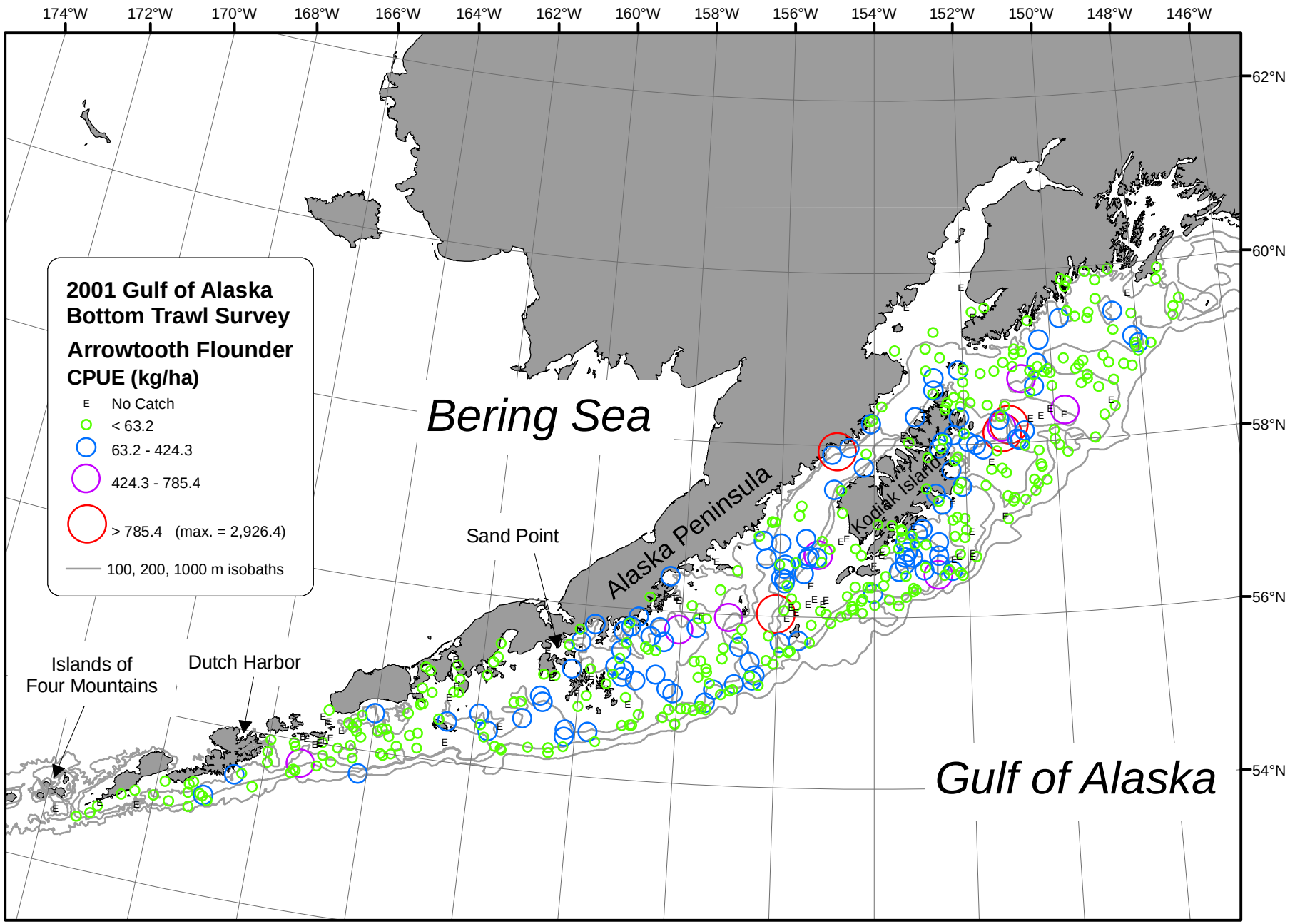

Figure 2. -- Distribution and relative abundance of arrowtooth flounder from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

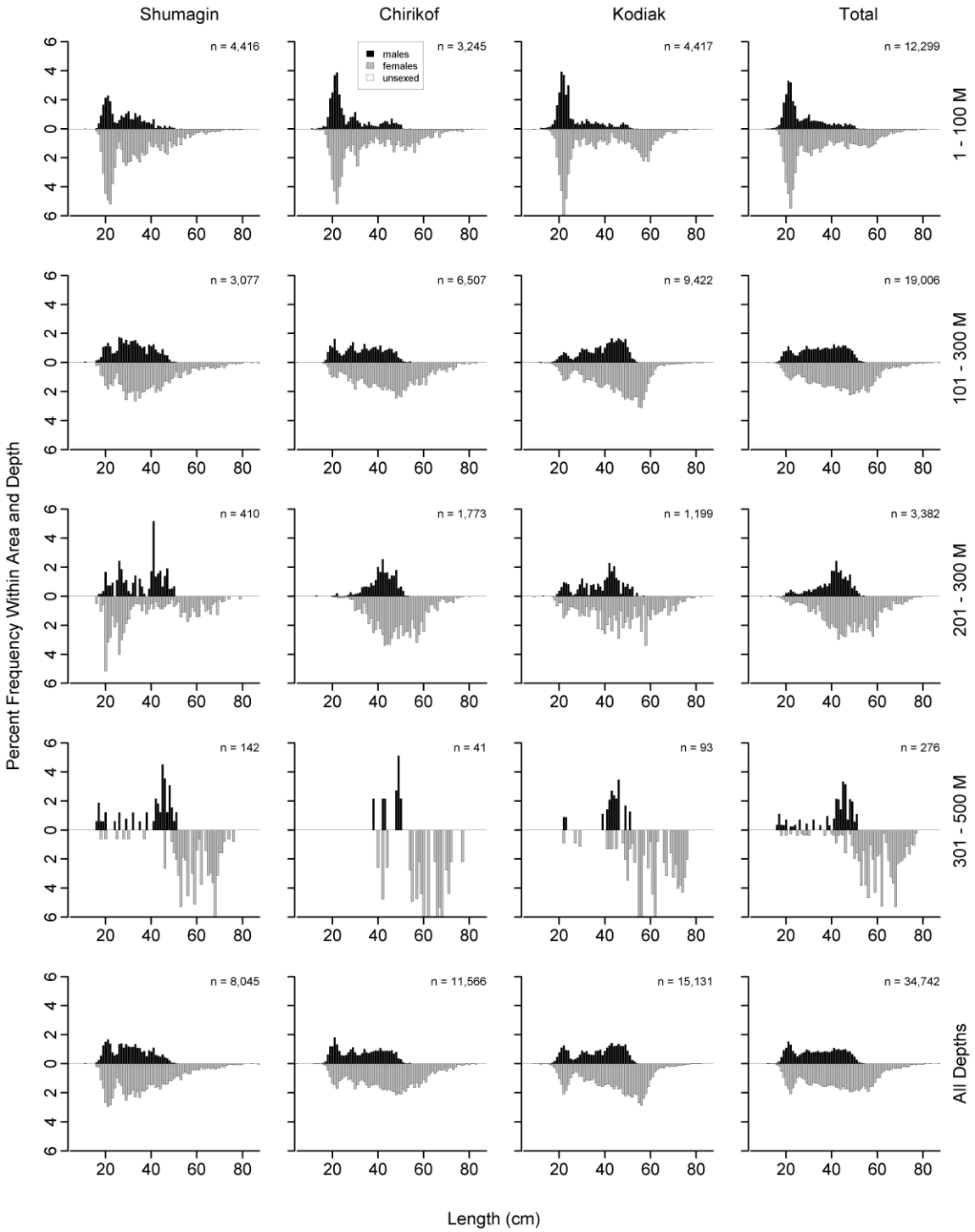

Figure 3. -- Size composition of arrowtooth flounder from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 4. -- Catch per unit of effort by stratum for arrowtooth flounder sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Chirikof	101 - 200	Shelikof Edge	19	19	355.75	275,161	23,561	526,760
Kodiak	101 - 200	Albatross Gullies	24	24	238.28	188,521	93,684	283,358
Kodiak	101 - 200	Portlock Flats	17	17	119.35	87,560	0	175,510
Chirikof	101 - 200	East Shumagin Gully	16	16	118.93	132,062	52,200	211,923
Shumagin	101 - 200	Sanak Gully	6	6	114.33	48,538	31,261	65,814
Chirikof	201 - 300	Lower Shelikof Gully	14	14	99.82	99,993	43,349	156,638
Shumagin	101 - 200	West Shumagin Gully	7	7	97.25	22,157	14,730	29,584
Kodiak	201 - 300	Upper Shelikof Gully	2	2	75.50	24,223	0	183,456
Chirikof	101 - 200	Chirikof Outer Shelf	22	22	63.88	32,008	13,828	50,189
Kodiak	101 - 200	Kenai Flats	15	15	63.45	76,623	27,532	125,714
Shumagin	101 - 200	Shumagin Outer Shelf	17	15	62.96	51,334	6,444	96,224
Kodiak	101 - 200	Barren Islands	13	13	55.27	60,686	19,231	102,141
Kodiak	101 - 200	Kodiak Outer Shelf	22	19	49.32	24,786	0	54,119
Kodiak	1 - 100	Albatross Shallows	34	30	45.81	26,416	12,249	40,584
Chirikof	1 - 100	Chirikof Bank	31	20	43.44	46,883	1,861	91,905
Kodiak	201 - 300	Kodiak Slope	5	5	31.35	5,087	1,778	8,395
Chirikof	1 - 100	Upper Alaska Peninsula	12	9	27.31	21,688	0	44,870
Kodiak	1 - 100	Northern Kodiak Shallows	6	4	20.72	4,558	0	10,816
Shumagin	1 - 100	Shumagin Bank	20	15	20.15	24,985	4,464	45,506
Shumagin	201 - 300	Shumagin Slope	9	9	18.45	5,145	1,401	8,889
Kodiak	1 - 100	Albatross Banks	35	25	17.57	27,063	8,794	45,332
Shumagin	301 - 500	Shumagin Slope	6	6	17.47	4,423	0	11,887
Chirikof	201 - 300	Chirikof Slope	8	8	16.17	2,471	851	4,091
Kodiak	1 - 100	Kenai Peninsula	9	8	15.33	8,064	3,633	12,495
Shumagin	1 - 100	Davidson Bank	35	28	14.22	19,457	9,404	29,509
Kodiak	201 - 300	Kenai Gullies	14	14	13.93	9,280	4,254	14,305
Chirikof	1 - 100	Semidi Bank	13	12	13.42	9,801	0	21,338
Kodiak	301 - 500	Kodiak Slope	7	7	9.51	2,768	644	4,893
Kodiak	1 - 100	Lower Cook Inlet	7	4	8.63	8,532	0	21,256
Shumagin	1 - 100	Lower Alaska Peninsula	20	16	7.88	5,420	780	10,061
Chirikof	301 - 500	Chirikof Slope	5	5	6.69	1,073	0	2,295
Shumagin	1 - 100	Fox Islands	19	12	4.77	3,975	581	7,368

Pacific halibut (*Hippoglossus stenolepis*)

Pacific halibut was the third most abundant species caught in the 2001 survey (Table 2) with the second highest mean CPUE in the Chirikof INPFC area. Pacific halibut were particularly abundant at depths less than 100 m where they were caught in approximately 95% of the tows, and 70% of the estimated halibut biomass was found at these depths. The highest CPUEs were found at this depth range in all INPFC areas (Table 5). The frequency of occurrence of Pacific halibut in tows decreased from west to east, ranging from about 97% of the tows in the Shumagin INPFC area to 71% of the tows in the Kodiak INPFC area. The strata with the highest densities were recorded were the Albatross Banks stratum southeast of Kodiak Island and the Upper Alaska Peninsula in the Chirikov INPFC area (Fig. 4 and Table 6). Most halibut were not sexed prior to length measurement. A pronounced length mode around 20 cm was noted in the shallowest depth zone of the Kodiak INPFC area and to a lesser extent the Chirikof area, and around 50 cm in the Shumagin INPFC area at around 20, 35, 45, and 55 cm (Fig. 5).

Table 5. -- Number of survey hauls, number of hauls with Pacific halibut, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	94	17.77	73,365	57,212	89,519	2.473
	101 - 200	30	27	11.21	16,453	10,350	22,556	4.269
	201 - 300	9	9	5.76	1,605	279	2,932	6.868
	301 - 500	6	5	8.47	2,143	0	4,931	7.986
	All depths	139	135	15.27	93,566	76,331	110,802	2.75
Chirikof	1 - 100	56	55	25.14	65,454	50,313	80,595	2.314
	101 - 200	57	49	15.74	37,530	24,187	50,873	7.647
	201 - 300	22	15	3.25	3,749	1,636	5,862	8.337
	301 - 500	5	3	5.05	811	0	2,021	14.364
	All depths	140	122	17.06	107,544	87,542	127,545	3.191
Kodiak	1 - 100	91	79	26.68	102,756	53,687	151,825	2.526
	101 - 200	91	59	8.59	37,210	23,845	50,576	7.458
	201 - 300	21	10	2.91	3,340	0	10,778	9.678
	301 - 500	7	3	2.95	859	0	1,959	14.605
	All depths	210	151	14.98	144,166	93,180	195,151	3.129
All areas	1 - 100	241	228	22.82	241,575	187,742	295,408	2.449
	101 - 200	178	135	11.14	91,194	71,683	110,705	6.632
	201 - 300	52	34	3.37	8,694	3,362	14,027	8.453
	301 - 500	18	11	5.41	3,813	832	6,793	9.94
	All depths	489	408	15.65	345,276	287,732	402,820	3.034

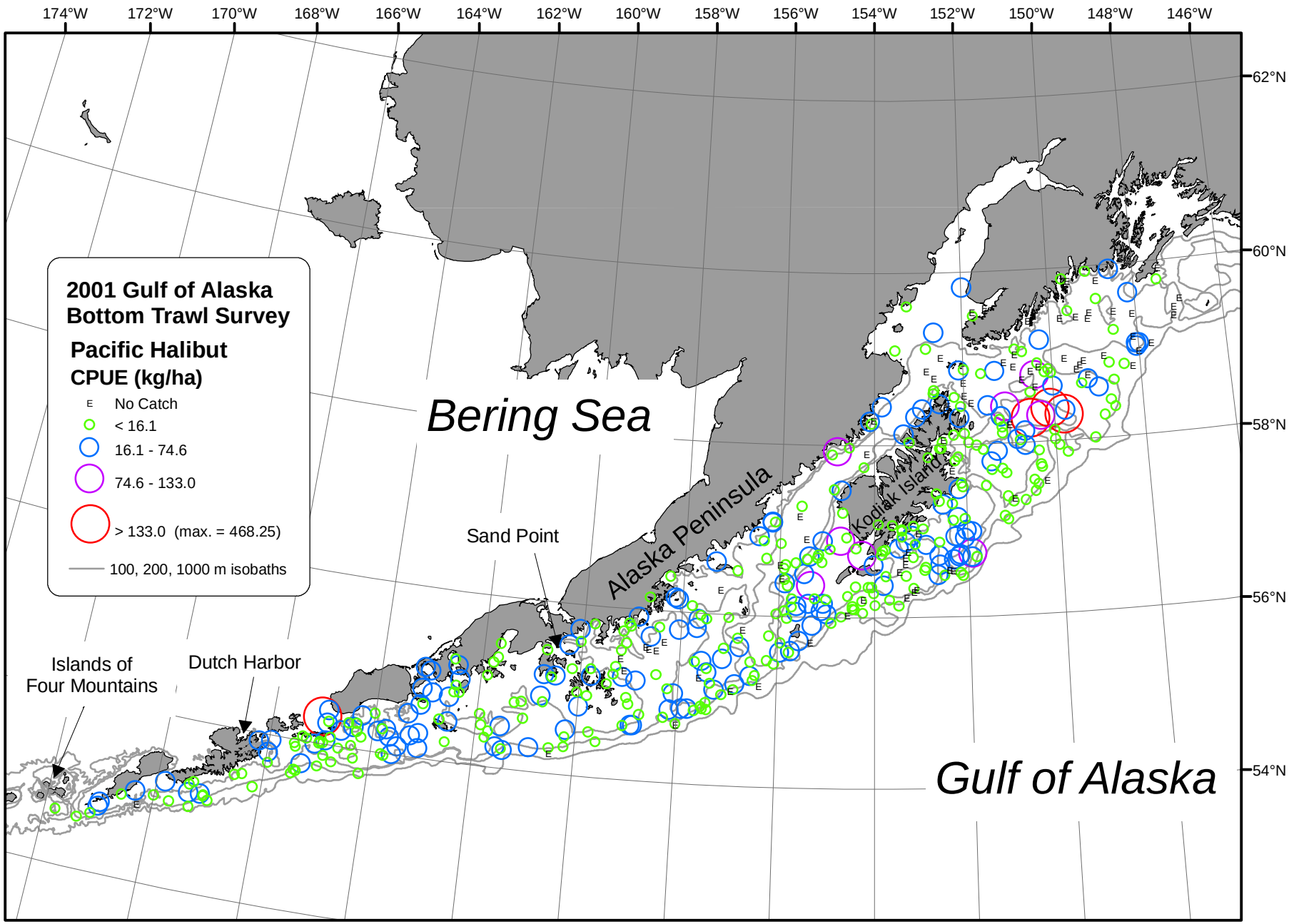

Figure 4. -- Distribution and relative abundance of Pacific halibut from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

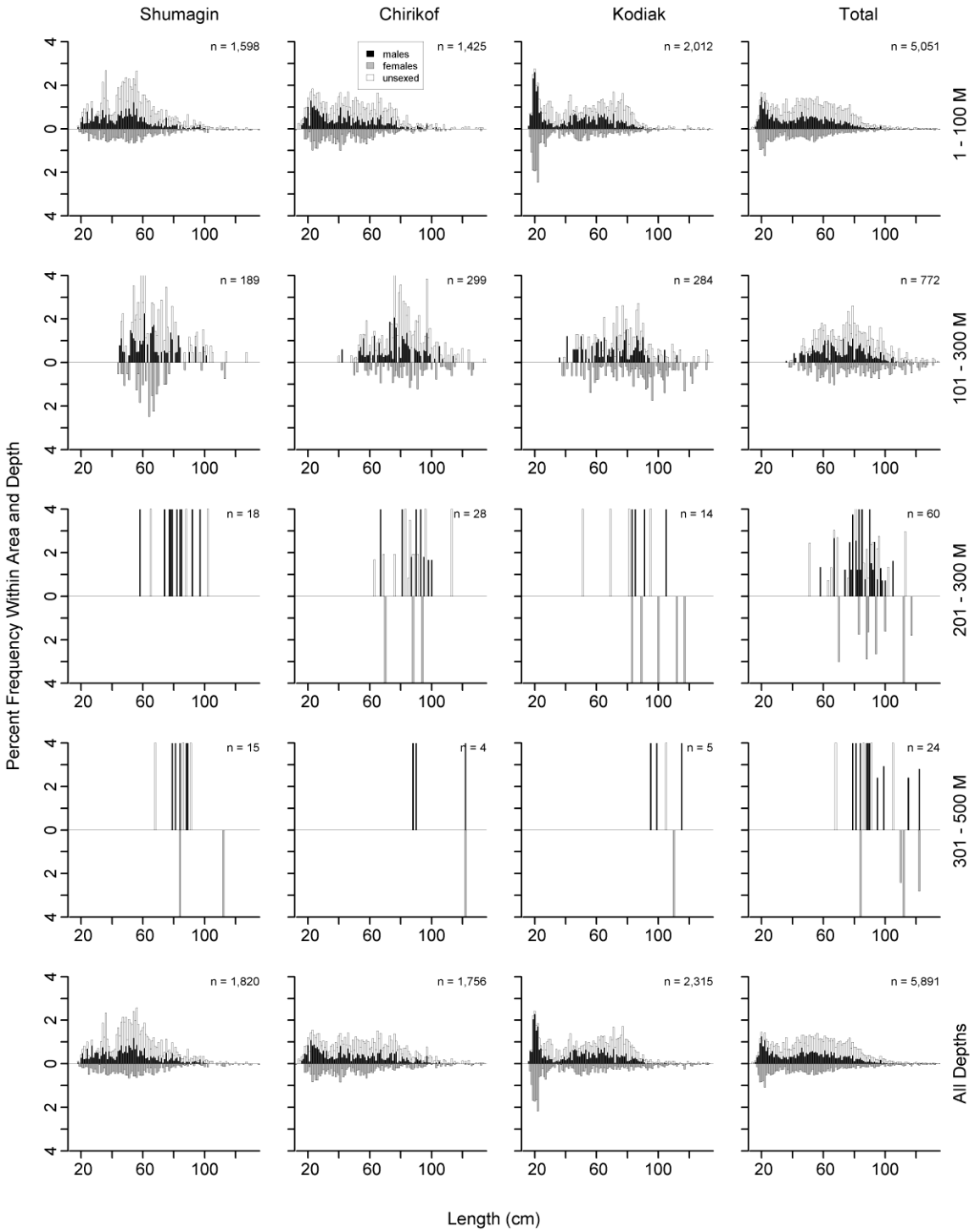

Figure 5. -- Size composition of Pacific halibut from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 6. -- Catch per unit of effort by stratum for Pacific halibut sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Albatross Banks	35	35	44.80	69,012	24,273	113,752
Chirikof	1 - 100	Upper Alaska Peninsula	12	12	29.94	23,774	13,992	33,556
Chirikof	1 - 100	Chirikof Bank	31	31	26.52	28,622	18,124	39,120
Kodiak	1 - 100	Northern Kodiak Shallows	6	6	23.39	5,145	1,062	9,228
Shumagin	1 - 100	Fox Islands	19	19	22.79	18,994	5,623	32,365
Chirikof	101 - 200	Shelikof Edge	19	18	21.70	16,783	6,044	27,523
Shumagin	1 - 100	Lower Alaska Peninsula	20	20	19.31	13,279	8,405	18,154
Shumagin	1 - 100	Davidson Bank	35	35	18.35	25,099	18,474	31,724
Chirikof	1 - 100	Semidi Bank	13	12	17.88	13,058	6,186	19,930
Kodiak	101 - 200	Portlock Flats	17	11	17.50	12,840	1,761	23,919
Kodiak	1 - 100	Lower Cook Inlet	7	5	16.49	16,300	0	39,726
Chirikof	101 - 200	Chirikof Outer Shelf	22	20	15.67	7,850	4,528	11,172
Shumagin	1 - 100	Shumagin Bank	20	20	12.90	15,993	10,287	21,700
Shumagin	101 - 200	Shumagin Outer Shelf	17	16	12.52	10,210	5,199	15,221
Kodiak	1 - 100	Kenai Peninsula	9	5	12.01	6,319	0	15,065
Chirikof	101 - 200	East Shumagin Gully	16	11	11.62	12,897	4,918	20,876
Shumagin	101 - 200	Sanak Gully	6	6	11.44	4,858	618	9,098
Kodiak	1 - 100	Albatross Shallows	34	28	10.37	5,979	4,036	7,923
Kodiak	101 - 200	Kodiak Outer Shelf	22	18	9.88	4,967	2,696	7,237
Kodiak	101 - 200	Albatross Gullies	24	18	9.79	7,746	3,952	11,539
Shumagin	301 - 500	Shumagin Slope	6	5	8.47	2,143	0	5,072
Kodiak	101 - 200	Barren Islands	13	6	7.23	7,937	1,676	14,198
Shumagin	101 - 200	West Shumagin Gully	7	5	6.08	1,385	0	3,000
Shumagin	201 - 300	Shumagin Slope	9	9	5.76	1,605	253	2,958
Chirikof	201 - 300	Chirikof Slope	8	6	5.67	867	188	1,546
Kodiak	201 - 300	Upper Shelikof Gully	2	1	5.11	1,639	0	22,463
Chirikof	301 - 500	Chirikof Slope	5	3	5.05	811	0	2,117
Kodiak	101 - 200	Kenai Flats	15	6	3.08	3,721	0	7,799
Kodiak	301 - 500	Kodiak Slope	7	3	2.95	859	0	1,997
Chirikof	201 - 300	Lower Shelikof Gully	14	9	2.88	2,882	847	4,917
Kodiak	201 - 300	Kenai Gullies	14	7	2.21	1,468	329	2,608
Kodiak	201 - 300	Kodiak Slope	5	2	1.44	233	0	657

Flathead sole (*Hippoglossoides elassodon*)

Flathead sole was the tenth most abundant species caught in the 2001 survey (Table 2). The population was primarily concentrated in bays around Kodiak Island and along the Alaska Peninsula, with 97% of the estimated biomass in waters less than 200 m deep (Fig. 6 and Tables 7-8). Although the mean CPUE was considerably higher in the lower Alaska Peninsula and West Shumagin Gully than in any of the other strata, the biomass of flathead sole was not predominant in any individual stratum. The mean weight of flathead sole did not exhibit a consistent correlation with depth (Table 7). The length frequency showed a distinct length mode at about 33 cm for males in all areas in water shallower than 300 m. Females had a somewhat less distinct mode at about 36 cm (Fig. 7). The sex ratio for flathead sole was even, with males and females both accounting for approximately 50% of the population.

Table 7. -- Number of survey hauls, number of hauls with flathead sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	50	11.96	49,387	25,547	73,228	0.367
	101 - 200	30	19	12.72	18,667	2,468	34,865	0.279
	201 - 300	9	5	0.36	100	0	208	0.178
	301 - 500	6	1	0.04	11	0	37	0.587
	All depths	139	75	11.12	68,164	40,883	95,446	0.338
Chirikof	1 - 100	56	16	6.47	16,851	0	33,865	0.349
	101 - 200	57	38	9.25	22,059	8,875	35,243	0.323
	201 - 300	22	16	2.24	2,587	1,306	3,867	0.405
	301 - 500	5	0	---	---	---	---	---
	All depths	140	70	6.58	41,497	20,474	62,520	0.337
Kodiak	1 - 100	91	39	7.06	27,195	14,136	40,254	0.306
	101 - 200	91	46	3.56	15,407	8,703	22,112	0.31
	201 - 300	21	14	1.15	1,319	296	2,342	0.28
	301 - 500	7	1	0.04	11	0	38	0.246
	All depths	210	100	4.56	43,933	29,562	58,304	0.306
All areas	1 - 100	241	105	8.83	93,433	62,748	124,119	0.344
	101 - 200	178	103	6.86	56,133	35,818	76,448	0.304
	201 - 300	52	35	1.55	4,006	2,495	5,516	0.344
	301 - 500	18	2	0.03	22	0	56	0.342
	All depths	489	245	6.96	153,594	116,994	190,194	0.328

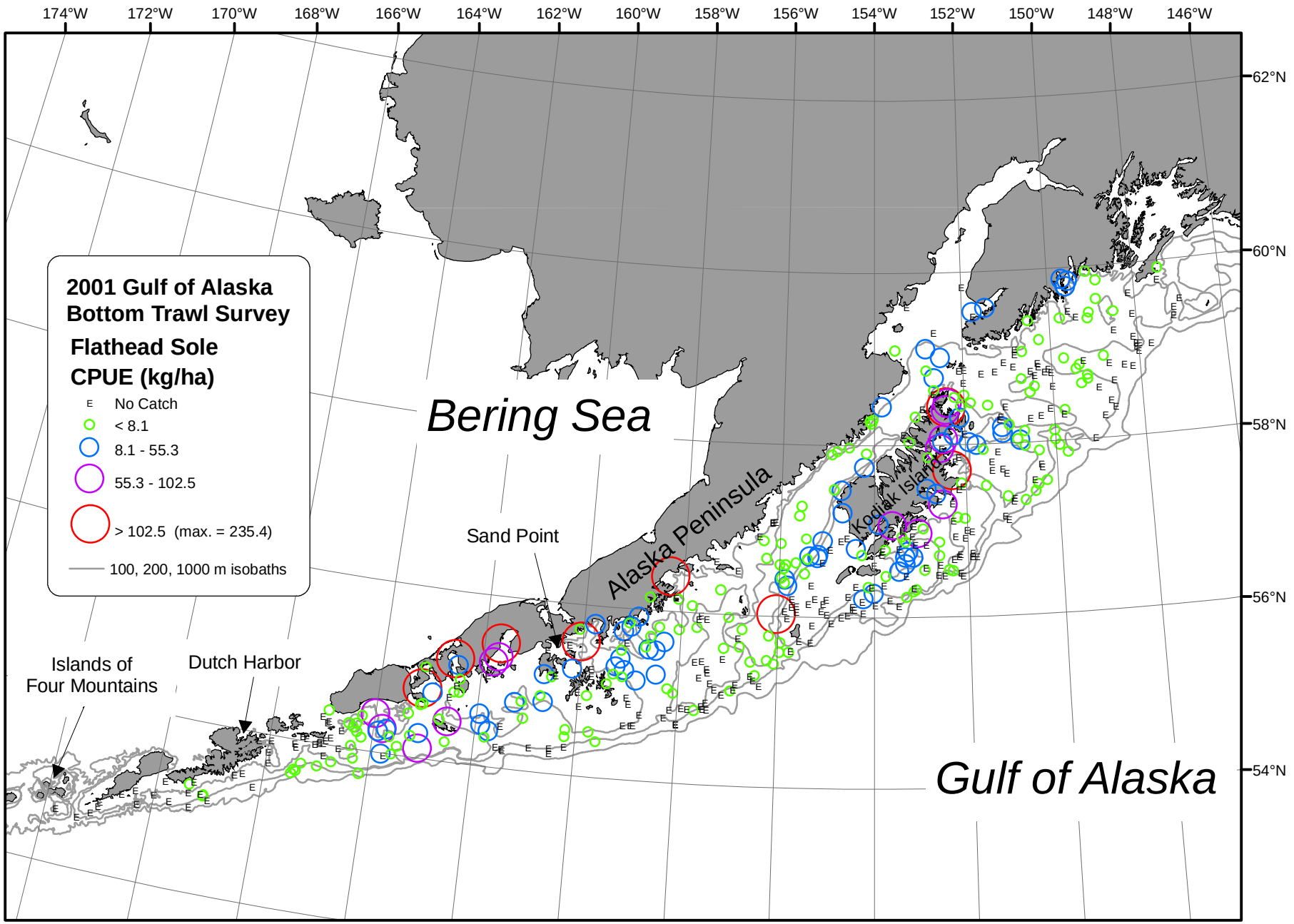

Figure 6. --Distribution and relative abundance of flathead sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

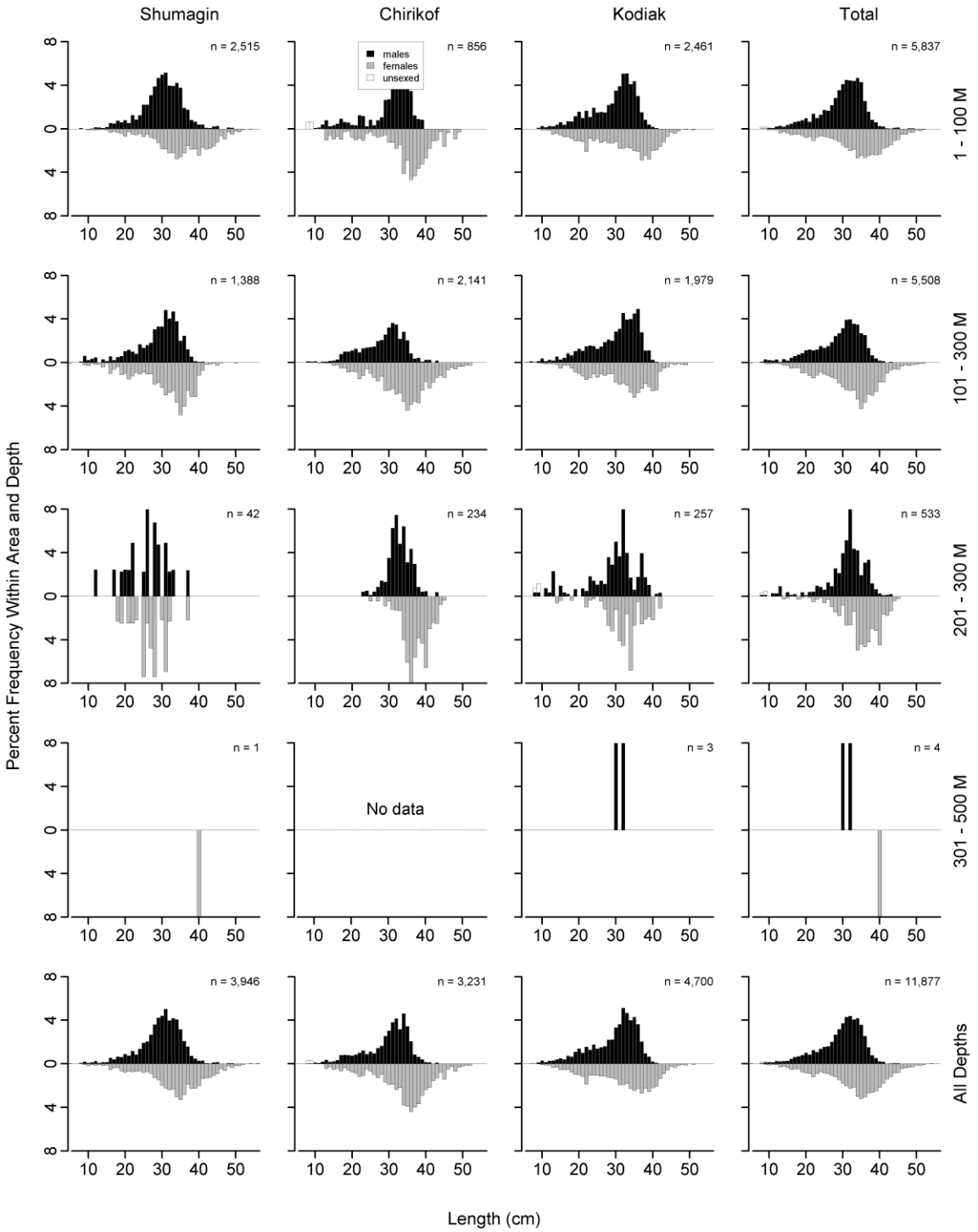

Figure 7. -- Size composition of flathead sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 8. -- Catch per unit of effort by stratum for flathead sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Lower Alaska Peninsula	20	13	39.64	27,254	6,296	48,212
Shumagin	101 - 200	West Shumagin Gully	7	7	30.91	7,043	0	14,762
Kodiak	1 - 100	Albatross Shallows	34	19	27.86	16,067	7,891	24,242
Shumagin	101 - 200	Sanak Gully	6	6	26.60	11,291	0	26,917
Chirikof	101 - 200	Shelikof Edge	19	17	15.56	12,034	0	24,893
Chirikof	1 - 100	Upper Alaska Peninsula	12	6	13.62	10,815	0	27,307
Shumagin	1 - 100	Davidson Bank	35	26	10.48	14,339	3,714	24,965
Kodiak	101 - 200	Albatross Gullies	24	20	10.37	8,202	2,794	13,609
Chirikof	101 - 200	East Shumagin Gully	16	15	7.96	8,834	5,073	12,595
Kodiak	1 - 100	Kenai Peninsula	9	6	7.72	4,058	478	7,638
Shumagin	1 - 100	Shumagin Bank	20	10	6.27	7,775	583	14,967
Kodiak	1 - 100	Lower Cook Inlet	7	3	6.01	5,941	0	15,322
Chirikof	1 - 100	Chirikof Bank	31	8	5.55	5,991	676	11,305
Kodiak	101 - 200	Barren Islands	13	7	4.25	4,666	730	8,601
Kodiak	1 - 100	Northern Kodiak Shallows	6	4	4.07	895	0	1,993
Chirikof	201 - 300	Lower Shelikof Gully	14	14	2.58	2,580	1,291	3,869
Kodiak	201 - 300	Kodiak Slope	5	4	2.40	390	0	1,001
Chirikof	101 - 200	Chirikof Outer Shelf	22	6	2.38	1,191	0	2,947
Kodiak	201 - 300	Upper Shelikof Gully	2	2	1.87	601	0	3,779
Kodiak	101 - 200	Kenai Flats	15	8	1.39	1,683	39	3,328
Kodiak	101 - 200	Portlock Flats	17	7	0.87	637	47	1,228
Kodiak	201 - 300	Kenai Gullies	14	8	0.49	328	0	798
Kodiak	101 - 200	Kodiak Outer Shelf	22	4	0.44	220	0	523
Shumagin	101 - 200	Shumagin Outer Shelf	17	6	0.41	333	27	638
Shumagin	201 - 300	Shumagin Slope	9	5	0.36	100	0	210
Kodiak	1 - 100	Albatross Banks	35	7	0.15	234	7	460
Chirikof	1 - 100	Semidi Bank	13	2	0.06	45	0	123
Chirikof	201 - 300	Chirikof Slope	8	2	0.05	7	0	19
Shumagin	301 - 500	Shumagin Slope	6	1	0.04	11	0	38
Kodiak	301 - 500	Kodiak Slope	7	1	0.04	11	0	39
Shumagin	1 - 100	Fox Islands	19	1	0.02	19	0	59

Southern rock sole (*Lepidopsetta bilineata*)

Southern rock sole was the eleventh most abundant species caught in the 2001 survey (Table 2). The population was confined to water depths less than 200 m in survey area, with 95% caught shallower than 100 m. The highest concentrations were in bays around Kodiak Island and the Shumagin Islands, as well as in the shallow bays along the Alaska Peninsula (Table 10 and Fig. 8). Frequency of occurrence dropped off significantly northeast of Kodiak Island (Fig. 8). A relatively prominent length mode around 35 cm for males occurred in the shallowest depth zone of the Shumagin and Chirikof INPFC areas and at 42-45 cm for females in all areas (Fig. 9). The southern rock sole population in the survey area was dominated by females, which accounted for approximately 73% of the total estimated population.

Table 9. -- Number of survey hauls, number of hauls with southern rock sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	82	13.46	55,583	32,454	78,712	0.739
	101 - 200	30	14	2.54	3,728	1,536	5,920	0.674
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	96	9.68	59,311	36,085	82,537	0.735
Chirikof	1 - 100	56	45	6.60	17,177	8,359	25,995	0.747
	101 - 200	57	8	0.18	424	33	816	0.878
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	53	2.79	17,601	8,774	26,428	0.75
Kodiak	1 - 100	91	66	11.42	43,991	27,252	60,731	0.641
	101 - 200	91	18	0.37	1,588	134	3,043	0.821
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	84	4.74	45,579	28,777	62,382	0.646
All areas	1 - 100	241	193	11.03	116,751	87,270	146,233	0.7
	101 - 200	178	40	0.70	5,741	3,112	8,369	0.722
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	233	5.55	122,492	92,898	152,085	0.701

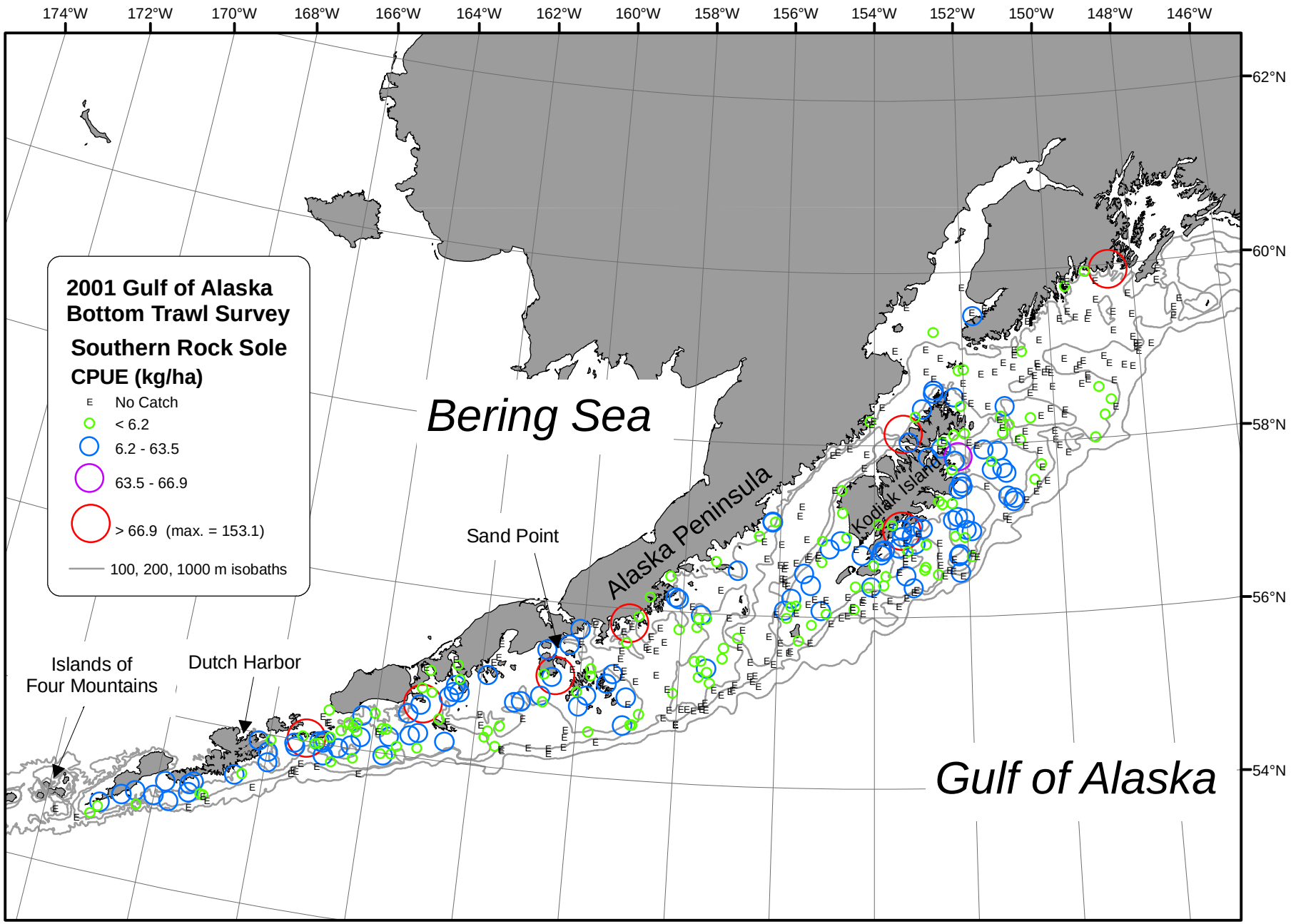

Figure 8. -- Distribution and relative abundance of southern rock sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

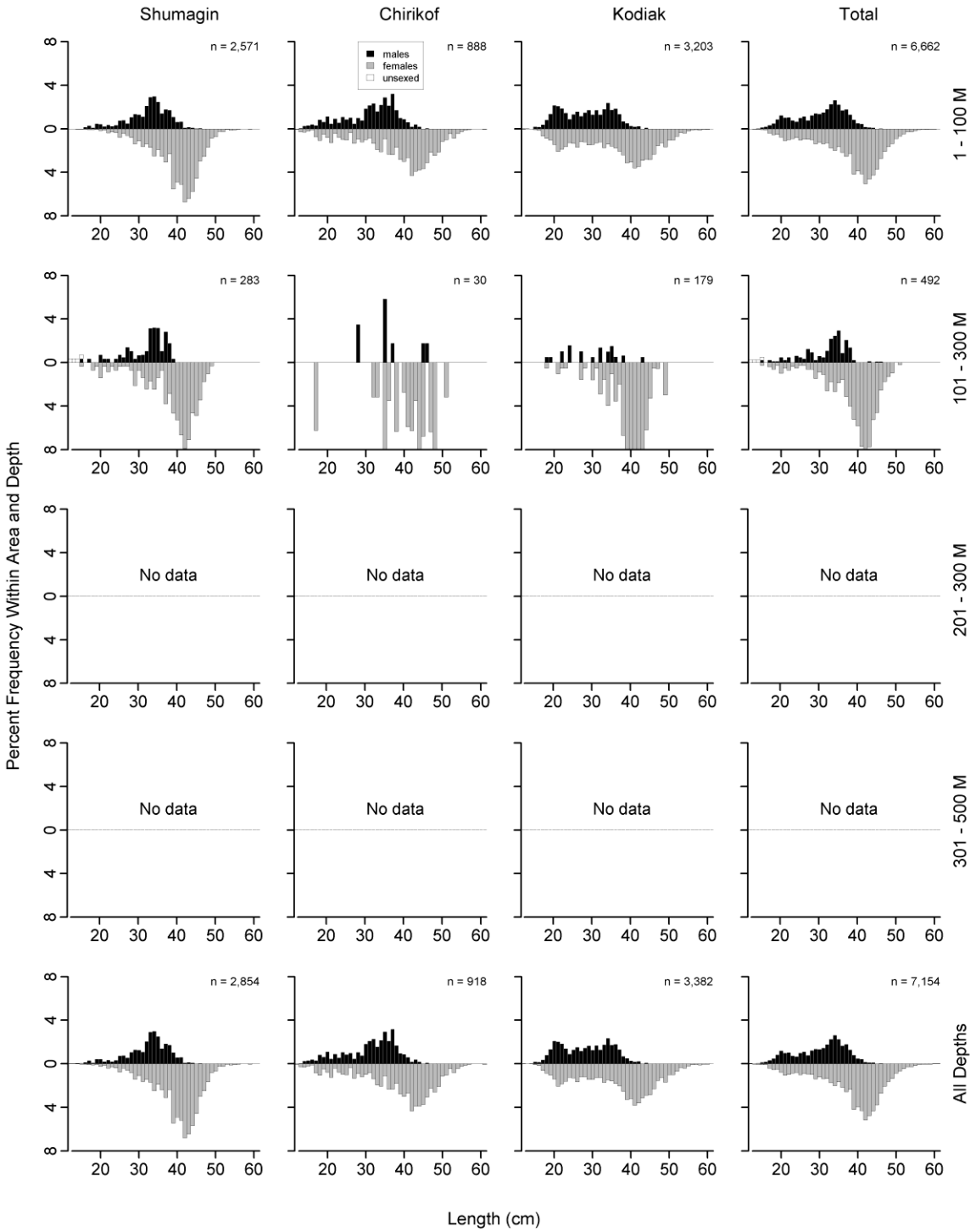

Figure 9. -- Size composition of southern rock sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 10. -- Catch per unit of effort by stratum for southern rock sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Northern Kodiak Shallows	6	6	24.68	5,429	0	12,130
Shumagin	1 - 100	Lower Alaska Peninsula	20	15	16.51	11,355	3,699	19,011
Shumagin	1 - 100	Fox Islands	19	18	15.80	13,168	5,632	20,703
Shumagin	1 - 100	Shumagin Bank	20	17	15.72	19,490	0	39,065
Kodiak	1 - 100	Albatross Shallows	34	25	15.37	8,864	4,649	13,079
Kodiak	1 - 100	Albatross Banks	35	30	13.99	21,553	13,450	29,656
Kodiak	1 - 100	Kenai Peninsula	9	3	11.78	6,199	0	20,264
Chirikof	1 - 100	Upper Alaska Peninsula	12	11	11.35	9,015	648	17,381
Shumagin	1 - 100	Davidson Bank	35	32	8.46	11,571	3,772	19,369
Chirikof	1 - 100	Chirikof Bank	31	22	5.11	5,518	2,718	8,317
Shumagin	101 - 200	Shumagin Outer Shelf	17	12	4.50	3,670	1,470	5,870
Chirikof	1 - 100	Semidi Bank	13	12	3.62	2,644	497	4,792
Kodiak	101 - 200	Kodiak Outer Shelf	22	9	2.58	1,296	0	2,757
Kodiak	1 - 100	Lower Cook Inlet	7	2	1.97	1,946	0	6,321
Chirikof	101 - 200	Shelikof Edge	19	3	0.36	280	0	652
Chirikof	101 - 200	Chirikof Outer Shelf	22	3	0.17	85	0	198
Shumagin	101 - 200	Sanak Gully	6	2	0.14	58	0	183
Kodiak	101 - 200	Albatross Gullies	24	5	0.10	81	8	155
Kodiak	101 - 200	Barren Islands	13	2	0.10	111	0	281
Kodiak	101 - 200	Portlock Flats	17	1	0.07	50	0	157
Chirikof	101 - 200	East Shumagin Gully	16	2	0.05	60	0	157
Kodiak	101 - 200	Kenai Flats	15	1	0.04	50	0	158

Northern rock sole (*Lepidopsetta polyxystra*)

The northern rock sole population was almost exclusively confined to depths less than 100 m throughout the survey area, where approximately 95% of the total biomass was found (Tables 11-12 and Fig. 10). Northern rock sole were extremely rare east of 150º W (Fig. 10). Approximately 53% of the total biomass was concentrated in the shallowest depth zone of the Shumagin INPFC area, which makes up less than 19% of the total survey area. Northern rock sole occurred in approximately 84% of the tows in this area and depth range. A very distinct length mode around 30 cm occurred for males and for females at 37 cm at depths less than 100 m in the Shumagin INPFC area (Fig. 11). No prononounced length modes occurred in the Chirikof and Kodiak areas for either males or females. Females were considerably more abundant in the survey area and accounted for approximately 65% of the northern rock sole population.

Table 11. -- Number of survey hauls, number of hauls with northern rock sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	79	8.39	34,628	17,609	51,647	0.446
	101 - 200	30	13	1.80	2,646	960	4,332	0.619
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	92	6.08	37,274	20,176	54,372	0.455
Chirikof	1 - 100	56	40	5.33	13,880	4,745	23,016	0.493
	101 - 200	57	4	0.06	136	0	300	1.036
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	44	2.22	14,016	4,879	23,153	0.495
Kodiak	1 - 100	91	58	3.51	13,502	7,036	19,967	0.448
	101 - 200	91	4	<1	17	0	40	0.232
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	62	1.40	13,519	7,053	19,985	0.448
All areas	1 - 100	241	177	5.86	62,010	42,094	81,926	0.456
	101 - 200	178	21	0.34	2,799	1,112	4,486	0.625
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	198	2.94	64,809	44,827	84,791	0.461

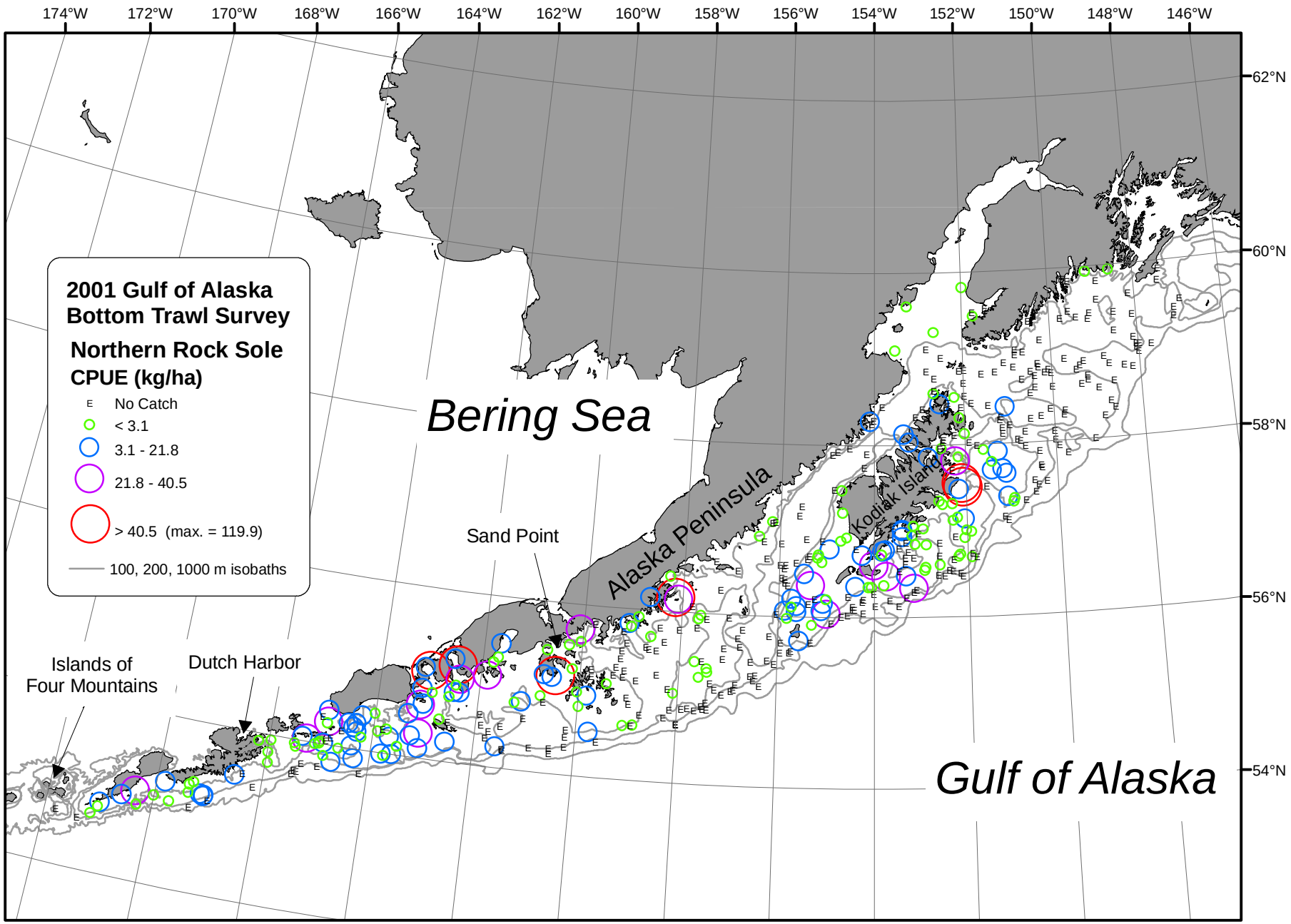

Figure 10.--Distribution and relative abundance of northern rock sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

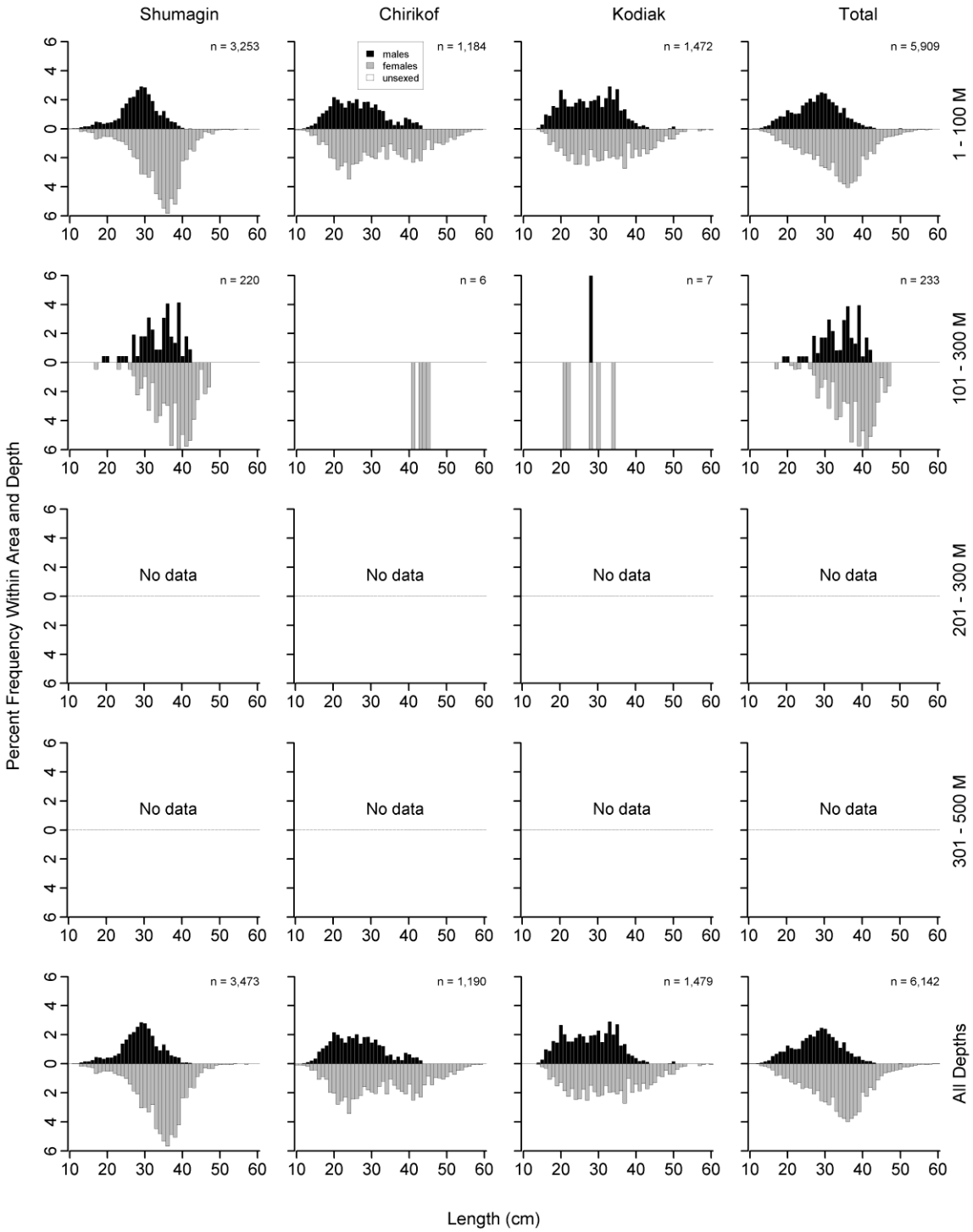

Figure 11. -- Size composition of northern rock sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 12. -- Catch per unit of effort by stratum for northern rock sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Lower Alaska Peninsula	20	19	13.28	9,134	3,723	14,544
Chirikof	1 - 100	Upper Alaska Peninsula	12	7	8.49	6,741	0	15,338
Shumagin	1 - 100	Shumagin Bank	20	12	8.27	10,257	0	25,668
Shumagin	1 - 100	Davidson Bank	35	30	7.88	10,780	6,141	15,419
Kodiak	1 - 100	Albatross Banks	35	28	6.66	10,252	3,969	16,534
Chirikof	1 - 100	Chirikof Bank	31	26	6.39	6,899	3,187	10,611
Shumagin	1 - 100	Fox Islands	19	18	5.35	4,457	1,161	7,754
Shumagin	101 - 200	Shumagin Outer Shelf	17	12	3.24	2,639	946	4,333
Kodiak	1 - 100	Northern Kodiak Shallows	6	4	3.14	690	0	1,413
Kodiak	1 - 100	Albatross Shallows	34	19	2.99	1,726	396	3,057
Kodiak	1 - 100	Lower Cook Inlet	7	5	0.71	698	173	1,223
Chirikof	1 - 100	Semidi Bank	13	7	0.33	240	41	440
Kodiak	1 - 100	Kenai Peninsula	9	2	0.26	136	0	380
Chirikof	101 - 200	East Shumagin Gully	16	2	0.08	92	0	244
Chirikof	101 - 200	Shelikof Edge	19	1	0.04	29	0	91
Shumagin	101 - 200	West Shumagin Gully	7	1	0.03	7	0	23
Kodiak	101 - 200	Kodiak Outer Shelf	22	3	0.03	15	0	37
Chirikof	101 - 200	Chirikof Outer Shelf	22	1	0.03	14	0	43
Kodiak	101 - 200	Albatross Gullies	24	1	0.00	3	0	9

Rex sole (*Glyptocephalus zachirus*)

The rex sole population was widely distributed throughout the survey area, occurring in all depths and all areas of the survey. Most (78% by biomass) was caught between 100 and 300 m (Tables 13-14, Fig. 12), although the four strata with the highest CPUEs were all slope strata. The length frequency data did not exhibit a consistent length mode for either males or females in the different INPFC areas or depth ranges. The sex ratio for rex sole was almost exactly even although females were dominated in the shower strata while males were more common in deeper water (Fig. 13).

Table 13. -- Number of survey hauls, number of hauls with rex sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	23	0.31	1,284	516	2,051	0.272
	101 - 200	30	21	3.01	4,414	2,234	6,593	0.331
	201 - 300	9	8	7.46	2,081	598	3,564	0.362
	301 - 500	6	5	7.08	1,793	721	2,865	0.518
	All depths	139	57	1.56	9,571	6,796	12,346	0.351
Chirikof	1 - 100	56	15	0.85	2,205	133	4,278	0.389
	101 - 200	57	50	4.29	10,241	5,960	14,521	0.391
	201 - 300	22	21	3.67	4,236	1,153	7,319	0.5
	301 - 500	5	5	4.26	683	0	1,856	0.352
	All depths	140	91	2.75	17,365	11,808	22,922	0.411
Kodiak	1 - 100	91	30	1.10	4,253	0	9,155	0.155
	101 - 200	91	74	3.36	14,552	10,559	18,545	0.366
	201 - 300	21	19	4.11	4,728	2,003	7,453	0.314
	301 - 500	7	7	2.71	790	336	1,243	0.272
	All depths	210	130	2.53	24,322	17,688	30,957	0.286
All areas	1 - 100	241	68	0.73	7,742	2,440	13,043	0.205
	101 - 200	178	145	3.57	29,206	23,094	35,318	0.369
	201 - 300	52	48	4.28	11,045	6,830	15,260	0.377
	301 - 500	18	17	4.63	3,265	1,825	4,706	0.393
	All depths	489	278	2.32	51,258	42,264	60,252	0.332

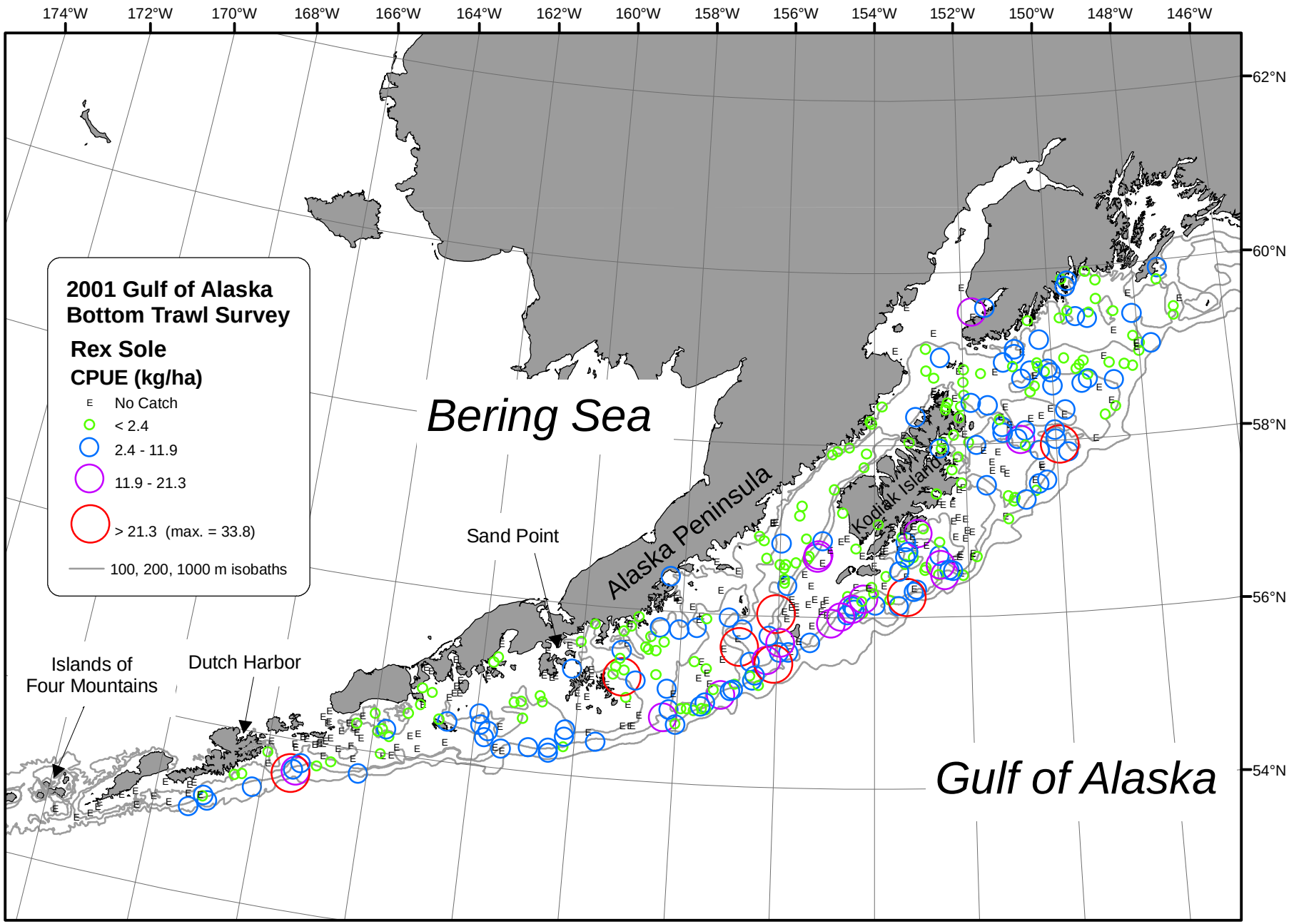

Figure 12.--Distribution and relative abundance of rex sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

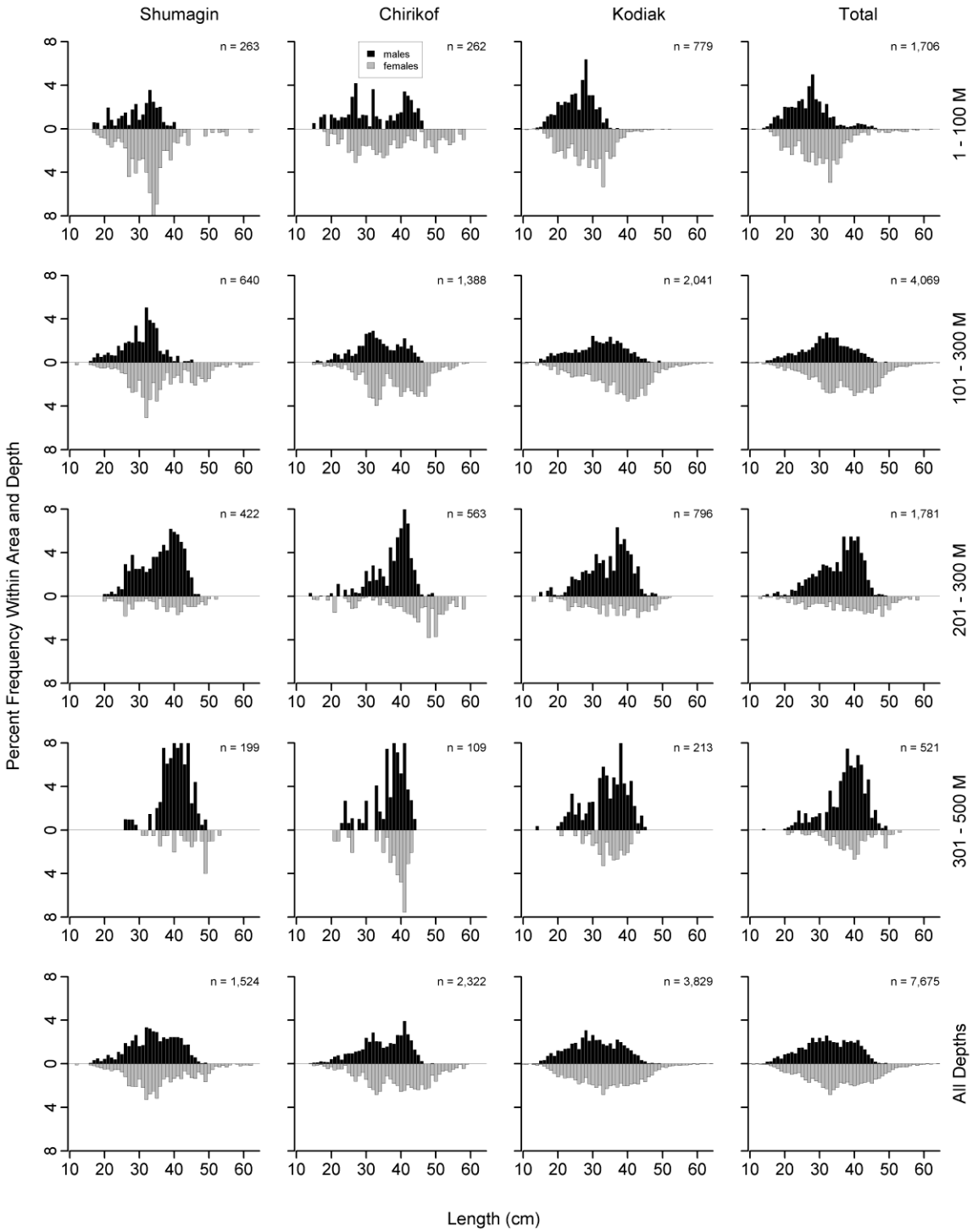

Figure 13. -- Size composition of rex sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 14. -- Catch per unit of effort by stratum for rex sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Kodiak Slope	5	5	12.21	1,981	174	3,789
Chirikof	201 - 300	Chirikof Slope	8	8	8.19	1,252	383	2,120
Shumagin	201 - 300	Shumagin Slope	9	8	7.46	2,081	570	3,593
Shumagin	301 - 500	Shumagin Slope	6	5	7.08	1,793	666	2,919
Kodiak	101 - 200	Albatross Gullies	24	21	5.76	4,560	2,596	6,524
Chirikof	101 - 200	Shelikof Edge	19	17	5.61	4,341	840	7,843
Chirikof	101 - 200	Chirikof Outer Shelf	22	19	5.52	2,764	1,221	4,307
Shumagin	101 - 200	Sanak Gully	6	6	5.05	2,146	614	3,678
Shumagin	101 - 200	West Shumagin Gully	7	7	4.63	1,055	0	2,672
Chirikof	301 - 500	Chirikof Slope	5	5	4.26	683	0	1,949
Kodiak	201 - 300	Kenai Gullies	14	12	4.10	2,731	354	5,109
Kodiak	101 - 200	Portlock Flats	17	15	3.31	2,430	1,186	3,674
Chirikof	201 - 300	Lower Shelikof Gully	14	13	2.98	2,985	0	5,986
Kodiak	101 - 200	Barren Islands	13	11	2.95	3,241	633	5,850
Kodiak	1 - 100	Lower Cook Inlet	7	2	2.83	2,795	0	7,791
Chirikof	101 - 200	East Shumagin Gully	16	14	2.82	3,135	934	5,337
Kodiak	101 - 200	Kenai Flats	15	13	2.78	3,359	1,203	5,514
Kodiak	301 - 500	Kodiak Slope	7	7	2.71	790	321	1,259
Kodiak	1 - 100	Kenai Peninsula	9	7	1.96	1,028	262	1,795
Kodiak	101 - 200	Kodiak Outer Shelf	22	14	1.91	962	196	1,728
Shumagin	101 - 200	Shumagin Outer Shelf	17	8	1.49	1,213	0	2,427
Chirikof	1 - 100	Chirikof Bank	31	7	1.11	1,197	0	2,809
Chirikof	1 - 100	Semidi Bank	13	4	0.86	628	0	1,955
Shumagin	1 - 100	Davidson Bank	35	11	0.59	806	178	1,433
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	0.48	106	0	374
Chirikof	1 - 100	Upper Alaska Peninsula	12	4	0.48	380	0	909
Kodiak	1 - 100	Albatross Shallows	34	14	0.47	273	96	450
Shumagin	1 - 100	Shumagin Bank	20	7	0.31	385	0	841
Shumagin	1 - 100	Lower Alaska Peninsula	20	4	0.13	89	0	189
Kodiak	201 - 300	Upper Shelikof Gully	2	2	0.05	15	0	69
Kodiak	1 - 100	Albatross Banks	35	5	0.03	50	0	102
Shumagin	1 - 100	Fox Islands	19	1	0.01	4	0	13

Dover sole (*Microstomus pacificus*)

Dover sole were distributed throughout the survey area and depth range and were caught in relatively modest numbers in all 32 of the survey strata (Fig. 14 and Tables 15-16). Although large catches of Dover sole were rare, they were present in approximately 77% of the tows at depths greater than 200 m (Table 15). The highest mean CPUEs were generally recorded at the slope strata along Kodiak Island south toward the Shumagin Islands. Although the smallest fish were generally in the shallowest depth zone, there was not a consistent trend of increasing fish size at deeper depths (Fig. 15 and Table 15). Males were considerably more abundant in all INPFC areas, especially at water depths between 301 and 500 m where they were predominant. Overall, however, males and females were almost exactly equal in abundance.

Table 15. -- Number of survey hauls, number of hauls with Dover sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	3	<1	18	0	40	0.305
	101 - 200	30	4	0.04	53	0	113	0.321
	201 - 300	9	5	0.67	188	0	384	0.901
	301 - 500	6	2	2.51	636	0	2,159	0.942
	All depths	139	14	0.15	895	0	2,434	0.808
Chirikof	1 - 100	56	5	1.13	2,939	0	7,376	1.594
	101 - 200	57	37	2.15	5,132	1,973	8,291	0.938
	201 - 300	22	18	3.60	4,162	1,272	7,051	1.409
	301 - 500	5	5	10.08	1,617	468	2,766	0.771
	All depths	140	65	2.20	13,850	7,835	19,864	1.12
Kodiak	1 - 100	91	24	0.22	846	137	1,556	0.382
	101 - 200	91	57	2.56	11,109	7,292	14,925	0.983
	201 - 300	21	17	2.73	3,142	1,599	4,685	0.921
	301 - 500	7	7	8.87	2,582	841	4,324	0.831
	All depths	210	105	1.84	17,679	13,261	22,098	0.882
All areas	1 - 100	241	32	0.36	3,803	0	8,289	0.924
	101 - 200	178	98	1.99	16,294	11,427	21,162	0.962
	201 - 300	52	40	2.90	7,491	4,231	10,752	1.14
	301 - 500	18	14	6.86	4,836	2,583	7,089	0.822
	All depths	489	184	1.47	32,424	24,908	39,940	0.968

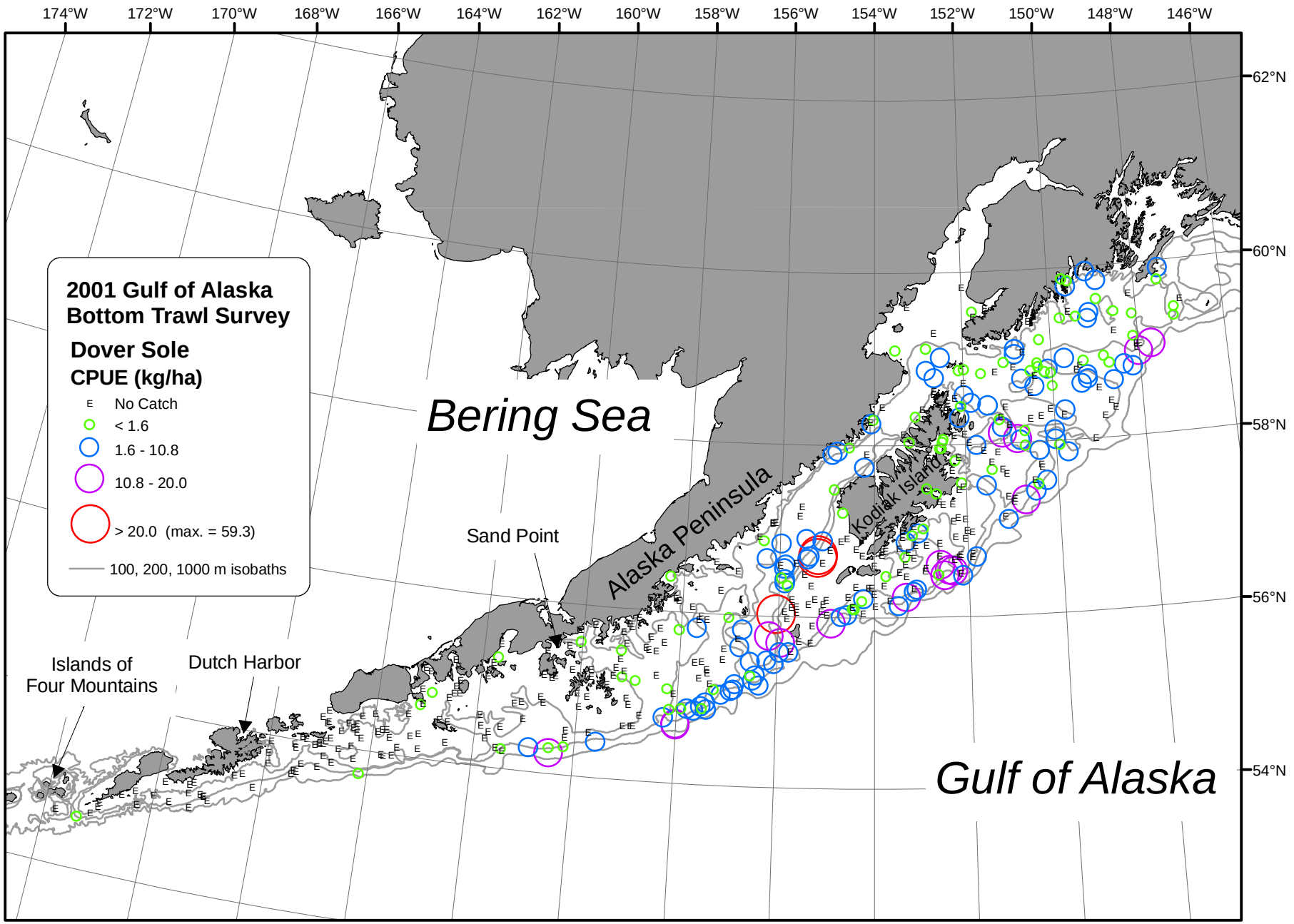

Figure 14.--Distribution and relative abundance of Dover sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

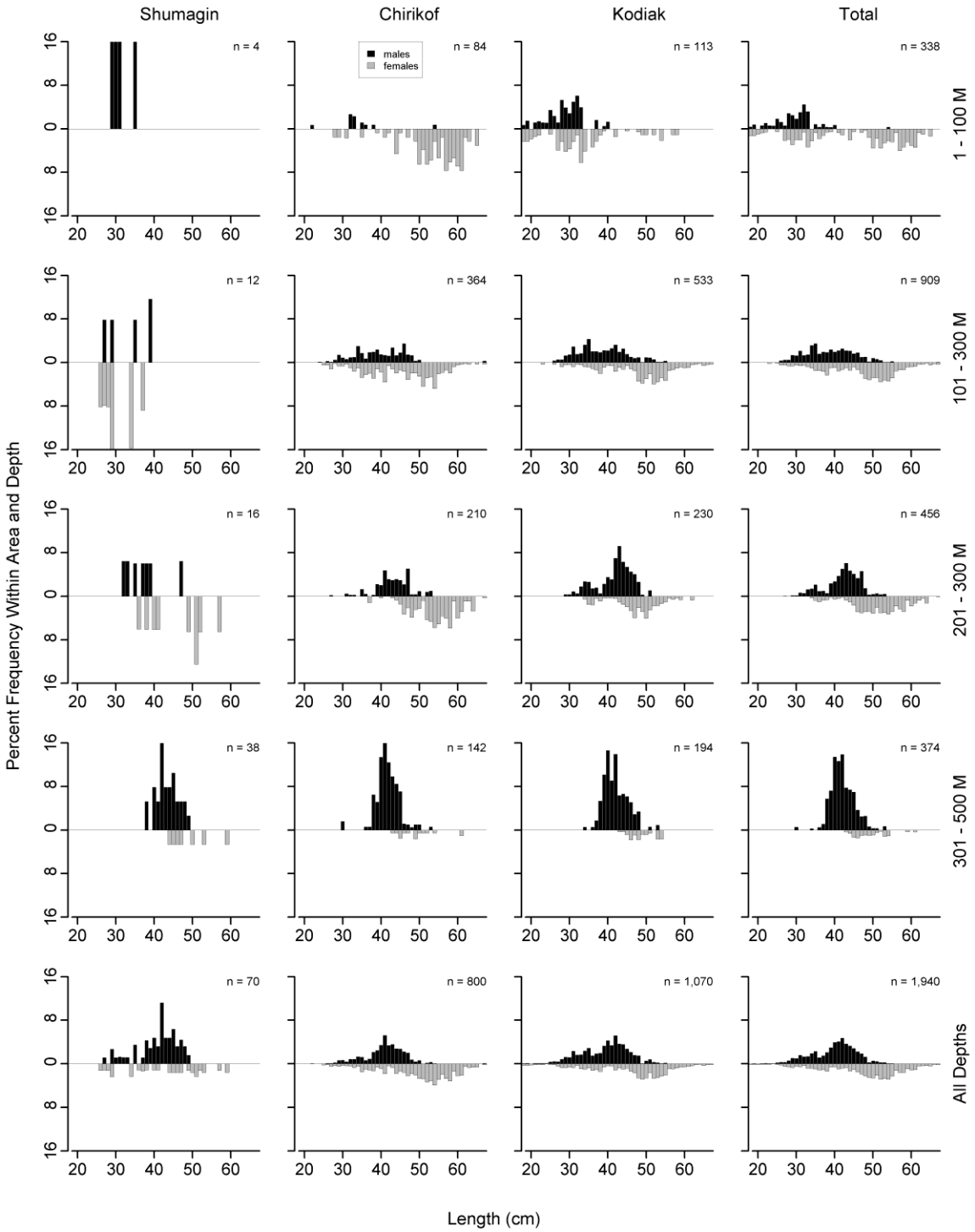

Figure 15. -- Size composition of Dover sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 16. -- Catch per unit of effort by stratum for Dover sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Chirikof	301 - 500	Chirikof Slope	5	5	10.08	1,617	377	2,858
Kodiak	201 - 300	Kodiak Slope	5	5	9.76	1,583	162	3,003
Kodiak	301 - 500	Kodiak Slope	7	7	8.87	2,582	780	4,385
Chirikof	201 - 300	Chirikof Slope	8	8	6.62	1,012	342	1,682
Chirikof	101 - 200	Shelikof Edge	19	17	5.01	3,872	741	7,002
Chirikof	201 - 300	Lower Shelikof Gully	14	10	3.14	3,150	305	5,994
Kodiak	101 - 200	Albatross Gullies	24	14	3.12	2,467	748	4,187
Kodiak	101 - 200	Barren Islands	13	11	3.03	3,329	732	5,926
Chirikof	1 - 100	Chirikof Bank	31	3	2.60	2,808	0	7,239
Shumagin	301 - 500	Shumagin Slope	6	2	2.51	636	0	2,236
Kodiak	101 - 200	Portlock Flats	17	13	2.48	1,820	759	2,880
Kodiak	101 - 200	Kenai Flats	15	12	2.20	2,661	596	4,725
Kodiak	201 - 300	Kenai Gullies	14	11	2.20	1,466	338	2,594
Chirikof	101 - 200	Chirikof Outer Shelf	22	15	1.77	888	395	1,381
Kodiak	101 - 200	Kodiak Outer Shelf	22	7	1.66	832	0	1,777
Kodiak	1 - 100	Kenai Peninsula	9	6	1.14	597	0	1,316
Shumagin	201 - 300	Shumagin Slope	9	5	0.67	188	0	388
Chirikof	101 - 200	East Shumagin Gully	16	5	0.34	372	0	744
Kodiak	201 - 300	Upper Shelikof Gully	2	1	0.29	93	0	1,276
Kodiak	1 - 100	Albatross Shallows	34	11	0.22	129	11	246
Shumagin	101 - 200	West Shumagin Gully	7	3	0.19	42	0	107
Chirikof	1 - 100	Semidi Bank	13	1	0.17	123	0	391
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	0.09	20	0	54
Kodiak	1 - 100	Lower Cook Inlet	7	2	0.04	43	0	133
Kodiak	1 - 100	Albatross Banks	35	3	0.04	58	0	145
Shumagin	1 - 100	Lower Alaska Peninsula	20	2	0.02	14	0	35
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.01	11	0	34
Chirikof	1 - 100	Upper Alaska Peninsula	12	1	0.01	7	0	24
Shumagin	1 - 100	Davidson Bank	35	1	0.00	4	0	12

Yellowfin sole (*Limanda aspera*)

Yellowfin sole were locally abundant in bays around Kodiak Island and the Alaska Peninsula near the Shumagin Islands, but were not widely distributed in the survey area (Table 17, Fig. 16). With the exception of one haul in the 100-200 depth range, all fish were caught in several shallow strata. One stratum on the Alaska Pensinsula accounted for 89% of the biomass for this species (Table 18) despite accounting for only 3% of the survey area. The length frequency data showed a strong mode for males around 33 cm while females had a mode at 36 cm (Fig. 17). The sex ratio for yellowfin sole was approximately even, with females making up approximately 54% of the population.

Table 17. -- Number of survey hauls, number of hauls with yellowfin sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	14	12.01	49,578	0	100,326	0.468
	101 - 200	30	1	0.01	8	0	26	0.573
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	15	8.09	49,586	0	100,334	0.468
Chirikof	1 - 100	56	3	0.31	817	0	2,550	0.304
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	3	0.13	817	0	2,550	0.304
Kodiak	1 - 100	91	10	1.24	4,795	0	10,517	0.297
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	10	0.50	4,795	0	10,517	0.297
All areas	1 - 100	241	27	5.21	55,190	4,299	106,081	0.442
	101 - 200	178	1	<1	8	0	26	0.573
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	28	2.50	55,197	4,306	106,089	0.442

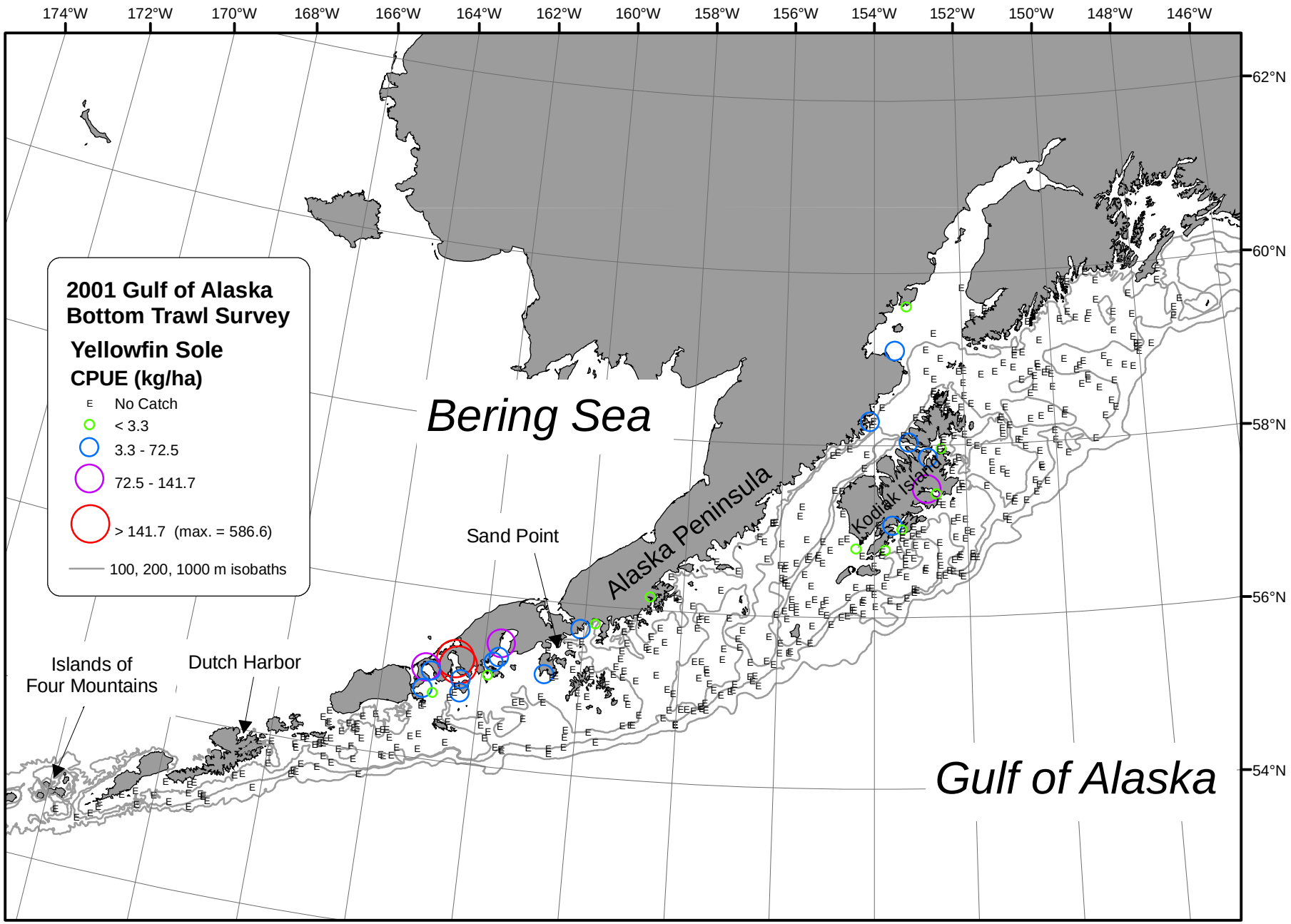

Figure 16.--Distribution and relative abundance of yellowfin sole from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

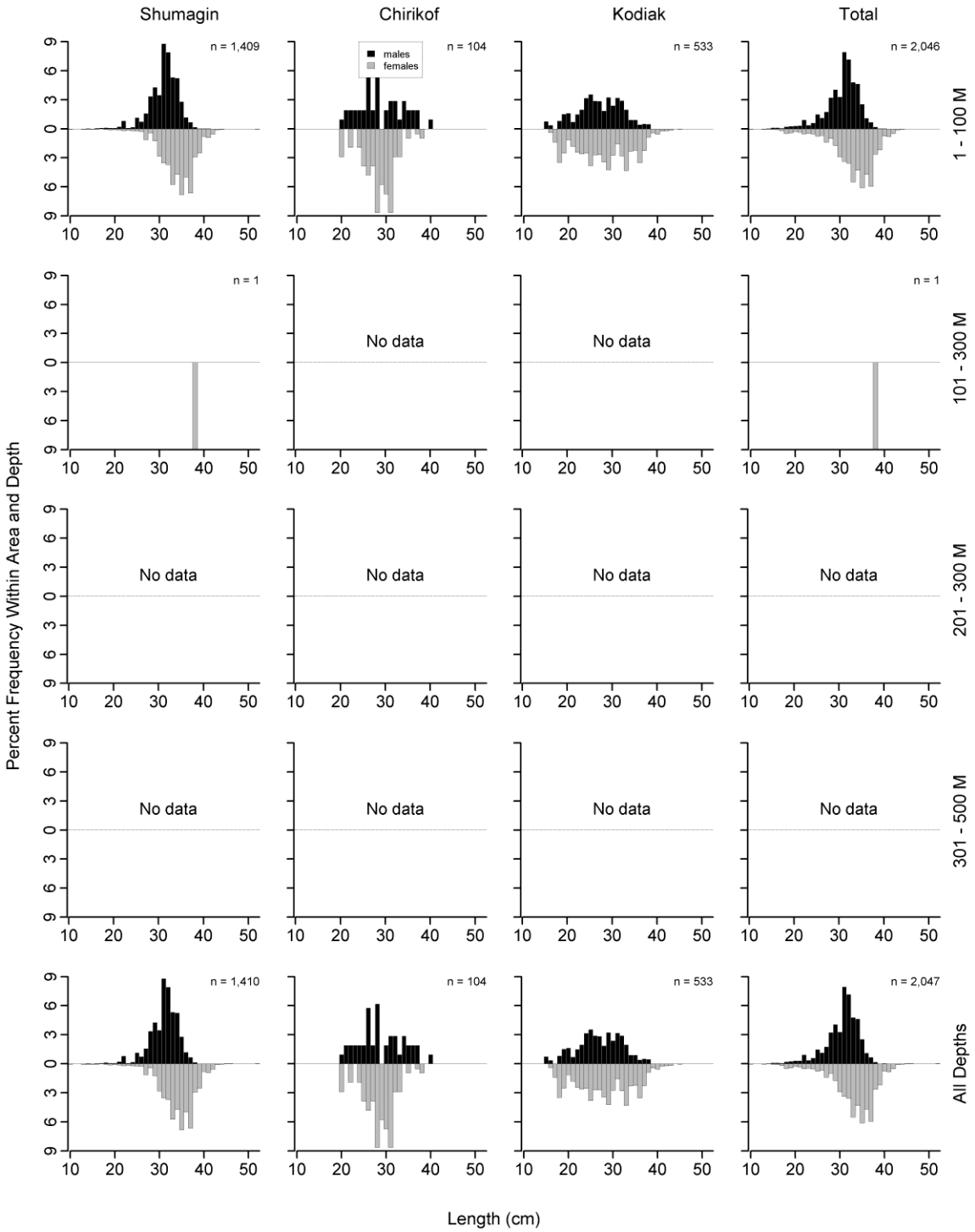

Figure 17. -- Size composition of yellowfin sole from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 18. -- Catch per unit of effort by stratum for yellowfin sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Lower Alaska Peninsula	20	13	71.55	49,197	0	100,109
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	3.95	869	0	2,347
Kodiak	1 - 100	Albatross Shallows	34	6	3.85	2,218	0	5,779
Kodiak	1 - 100	Lower Cook Inlet	7	2	1.73	1,709	0	5,792
Chirikof	1 - 100	Upper Alaska Peninsula	12	2	1.02	806	0	2,557
Shumagin	1 - 100	Shumagin Bank	20	1	0.31	381	0	1,178
Shumagin	101 - 200	West Shumagin Gully	7	1	0.03	8	0	27
Chirikof	1 - 100	Chirikof Bank	31	1	0.01	10	0	32

Other Flatfishes

Alaska plaice (*Pleuronectes quadrituberculatus*)

Approximately 81% of the estimated biomass of Alaska plaice in the survey area came from the shallowest depth zone of the Lower Alaska Peninsula, Northern Kodiak Shallows, and the Lower Cook Inlet strata, which together make up only 8.5% of the total survey area (Tables 19-20). Only one haul produced fish in water greater than 100 m deep.

Starry flounder (*Platichthys stellatus*)

Catches of starry flounder were exclusively confined to water depths less than 100 m in all INPFC areas (Table 21). The highest densities were recorded in Lower Cook Inlet which produced 73% of the total biomass estimate (Table 22). The proportion of females was slightly higher than males at 57%.

English sole (*Parophrys vetulus*)

Approximately 91% of the estimated biomass of English sole in the survey area came from two strata (Northern Kodiak Shallows and Kenai Peninsula) both of which are in the Kodiak INPFC area. Together these two strata make up only 3.3% of the survey area (Table 24). While virtually all fish were caught in shallow strata, there were three hauls in which fish were caught in the 100 - 200 m depth range and one in the 200 - 300 m depth range (Table 23). Mean weight generally increased with depth.

Butter sole (*Isopsetta isolepis*)

Approximately 72% of the estimated biomass of butter sole in the survey area came from three strata: Lower Alaska Peninsula, Lower Cook Inlet, and Chirikof Bank (Table 26). Densities ranged from small to modest everywhere butter sole were caught, and virtually all of the population was confined to depths less than 100 m (Table 25). Catches of butter sole were recorded in all INPFC areas.

Table 19. -- Number of survey hauls, number of hauls with Alaska plaice, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	11	0.48	1,985	546	3,424	1.432
	101 - 200	30	1	0.09	131	0	441	1.219
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	12	0.35	2,116	651	3,580	1.416
Chirikof	1 - 100	56	5	0.13	336	0	790	2.154
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	5	0.05	336	0	790	2.154
Kodiak	1 - 100	91	9	0.31	1,187	77	2,297	1.055
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	9	0.12	1,187	77	2,297	1.055
All areas	1 - 100	241	25	0.33	3,508	1,693	5,324	1.315
	101 - 200	178	1	0.02	131	0	441	1.219
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	26	0.16	3,639	1,803	5,475	1.311

Table 20. -- Catch per unit of effort by stratum for Alaska plaice sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Lower Alaska Peninsula	20	10	2.72	1,869	430	3,308
Kodiak	1 - 100	Northern Kodiak Shallows	6	3	2.30	505	0	1,271
Kodiak	1 - 100	Lower Cook Inlet	7	2	0.58	578	0	1,493
Shumagin	101 - 200	West Shumagin Gully	7	1	0.58	131	0	452
Chirikof	1 - 100	Upper Alaska Peninsula	12	2	0.31	250	0	697
Kodiak	1 - 100	Albatross Shallows	34	4	0.18	104	0	219
Shumagin	1 - 100	Shumagin Bank	20	1	0.09	116	0	358
Chirikof	1 - 100	Chirikof Bank	31	3	0.08	87	0	194

Table 21. -- Number of survey hauls, number of hauls with starry flounder, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	19	3.46	14,303	797	27,809	1.734
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	19	2.33	14,303	797	27,809	1.734
Chirikof	1 - 100	56	8	0.85	2,217	0	4,622	2.425
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	8	0.35	2,217	0	4,622	2.425
Kodiak	1 - 100	91	15	14.36	55,290	0	163,493	1.836
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	15	5.74	55,290	0	163,493	1.836
All areas	1 - 100	241	42	6.78	71,810	0	181,173	1.828
	101 - 200	178	0	---	---	---	---	---
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	42	3.26	71,810	0	181,173	1.828

Table 22. -- Catch per unit of effort by stratum for starry flounder sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Lower Cook Inlet	7	6	53.17	52,571	0	164,457
Shumagin	1 - 100	Lower Alaska Peninsula	20	14	14.48	9,955	0	22,850
Shumagin	1 - 100	Shumagin Bank	20	4	3.15	3,905	0	8,854
Kodiak	1 - 100	Albatross Shallows	34	6	2.17	1,251	0	2,878
Chirikof	1 - 100	Chirikof Bank	31	6	1.87	2,018	0	4,405
Kodiak	1 - 100	Albatross Banks	35	1	0.90	1,389	0	4,226
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	0.36	79	0	212
Shumagin	1 - 100	Davidson Bank	35	1	0.32	443	0	1,348
Chirikof	1 - 100	Upper Alaska Peninsula	12	2	0.25	199	0	517

Table 23. -- Number of survey hauls, number of hauls with English sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	3	0.02	89	0	200	0.669
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	3	0.01	89	0	200	0.669
Chirikof	1 - 100	56	1	0.02	46	0	140	0.522
	101 - 200	57	1	<1	5	0	15	0.52
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	2	0.01	51	0	145	0.522
Kodiak	1 - 100	91	16	0.84	3,236	0	7,743	0.773
	101 - 200	91	2	0.01	57	0	160	1.22
	201 - 300	21	1	0.03	35	0	109	2.065
	301 - 500	7	0	---	---	---	---	---
	All depths	210	19	0.35	3,327	0	7,836	0.783
All areas	1 - 100	241	20	0.32	3,371	0	7,880	0.765
	101 - 200	178	3	0.01	62	0	166	1.1
	201 - 300	52	1	0.01	35	0	109	2.065
	301 - 500	18	0	---	---	---	---	---
	All depths	489	24	0.16	3,467	0	7,978	0.774

Table 24. -- Catch per unit of effort by stratum for English sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Northern Kodiak Shallows	6	3	9.44	2,076	0	7,016
Kodiak	1 - 100	Kenai Peninsula	9	4	2.03	1,069	0	2,940
Shumagin	1 - 100	Shumagin Bank	20	3	0.07	89	0	200
Kodiak	201 - 300	Kenai Gullies	14	1	0.05	35	0	110
Chirikof	1 - 100	Chirikof Bank	31	1	0.04	46	0	140
Kodiak	101 - 200	Kenai Flats	15	1	0.04	48	0	151
Kodiak	1 - 100	Albatross Shallows	34	5	0.03	20	0	42
Kodiak	1 - 100	Lower Cook Inlet	7	1	0.03	32	0	110
Kodiak	1 - 100	Albatross Banks	35	3	0.03	40	0	91
Kodiak	101 - 200	Albatross Gullies	24	1	0.01	9	0	27
Chirikof	101 - 200	Chirikof Outer Shelf	22	1	0.01	5	0	16

Table 25. -- Number of survey hauls, number of hauls with butter sole, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	19	0.81	3,341	0	8,927	0.414
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	19	0.55	3,341	0	8,927	0.414
Chirikof	1 - 100	56	11	0.39	1,018	42	1,995	0.424
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	11	0.16	1,018	42	1,995	0.424
Kodiak	1 - 100	91	25	1.19	4,577	354	8,799	0.294
	101 - 200	91	1	<1	10	0	31	0.907
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	26	0.48	4,587	364	8,809	0.295
All areas	1 - 100	241	55	0.84	8,936	2,004	15,868	0.343
	101 - 200	178	1	<1	10	0	31	0.907
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	56	0.41	8,946	2,014	15,878	0.344

Table 26. -- Catch per unit of effort by stratum for butter sole sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Lower Alaska Peninsula	20	10	4.39	3,015	0	8,611
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	2.65	583	0	2,060
Kodiak	1 - 100	Lower Cook Inlet	7	4	2.44	2,415	0	6,341
Kodiak	1 - 100	Albatross Shallows	34	12	1.06	612	91	1,133
Chirikof	1 - 100	Chirikof Bank	31	11	0.94	1,018	42	1,995
Kodiak	1 - 100	Albatross Banks	35	7	0.63	966	0	2,433
Shumagin	1 - 100	Shumagin Bank	20	5	0.23	286	0	614
Shumagin	1 - 100	Fox Islands	19	3	0.04	33	0	78
Kodiak	101 - 200	Albatross Gullies	24	1	0.01	10	0	31
Shumagin	1 - 100	Davidson Bank	35	1	0.01	7	0	22

ROUNDFISHES

Walleye pollock (*Theragra chalcogramma*)

Walleye pollock was the seventh most abundant species caught in the 2001 survey (Table 2). Pollock were caught throughout the survey area in all 32 survey strata (Fig. 18, Table 27). Over the entire survey catch density was highest in depths less than 100 m where 61% of the estimated biomass occurred. An additional 31% of the estimated biomass occurred between 11 and 200 m. Although the CPUE was highest in the shallowest depth range (12.20 kg/ha) the frequency of occurrence was greatest in the 200 - 300 m depth range where Pollock were seen in 88% of the tows. In each INPFC area the largest fish were seen in the 300 - 500 m depth strata. The highest densities occurred in shallow strata known as Shumagin Bank and Albatross Shallows along Kodiak Island (Table 28). A distinct length mode of young-of-the-year pollock (around 10 cm) were found at depths less than 200 m in the Shumagin INPFC area as well as in the 1 - 100 m depth range in the Chirikof area. Other notable length modes occurred for juveniles at approximately 20 cm in the Chirikof area (depths 100 m - 300 m) and in the Kodiak area in shallower than 200 m (Fig. 19). Females were only slightly more abundant than males in the survey area and accounted for approximately 52% of the total estimated walleye pollock population.

Table 27. -- Number of survey hauls, number of hauls with walleye pollock, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	55	18.43	76,083	0	197,912	0.508
	101 - 200	30	19	5.31	7,788	0	19,693	0.245
	201 - 300	9	8	5.13	1,429	259	2,599	0.825
	301 - 500	6	5	6.11	1,548	0	4,272	1.097
	All depths	139	87	14.17	86,847	0	209,155	0.47
Chirikof	1 - 100	56	31	7.25	18,871	2,578	35,163	0.174
	101 - 200	57	39	3.52	8,395	1,606	15,185	0.121
	201 - 300	22	19	5.08	5,863	2,971	8,755	0.182
	301 - 500	5	2	0.26	42	0	108	0.865
	All depths	140	91	5.26	33,171	15,529	50,812	0.158
Kodiak	1 - 100	91	45	8.87	34,147	7,069	61,225	0.272
	101 - 200	91	58	11.25	48,735	20,924	76,546	0.233
	201 - 300	21	19	6.86	7,888	0	17,240	0.734
	301 - 500	7	2	0.09	27	0	76	1.109
	All depths	210	124	9.43	90,797	52,281	129,312	0.263
All areas	1 - 100	241	131	12.20	129,100	4,445	253,755	0.336
	101 - 200	178	116	7.93	64,918	34,890	94,946	0.209
	201 - 300	52	46	5.88	15,180	6,397	23,962	0.339
	301 - 500	18	9	2.29	1,617	0	4,342	1.09
	All depths	489	302	9.56	210,815	82,323	339,307	0.285

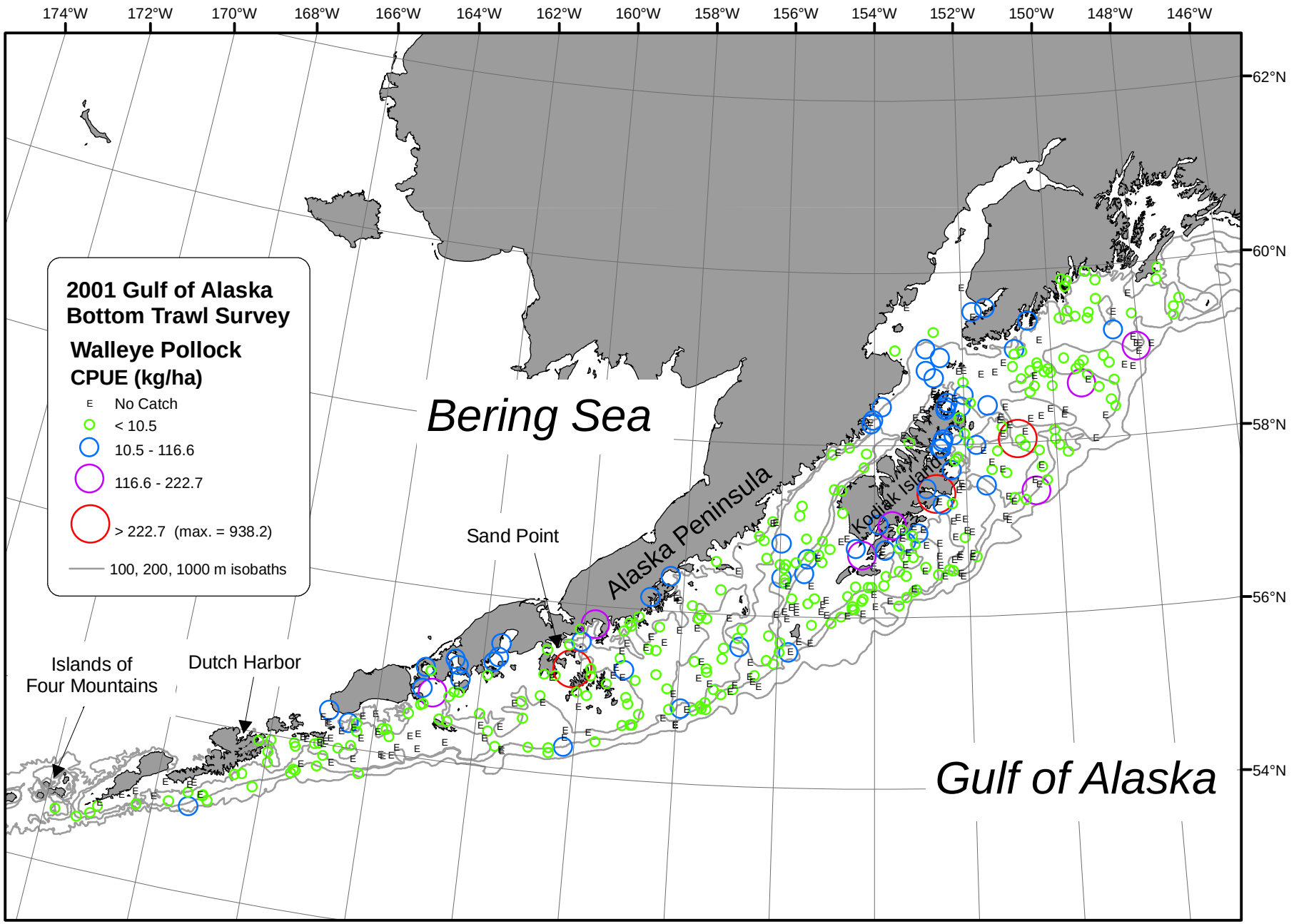

Figure 18.--Distribution and relative abundance of walleye pollock from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

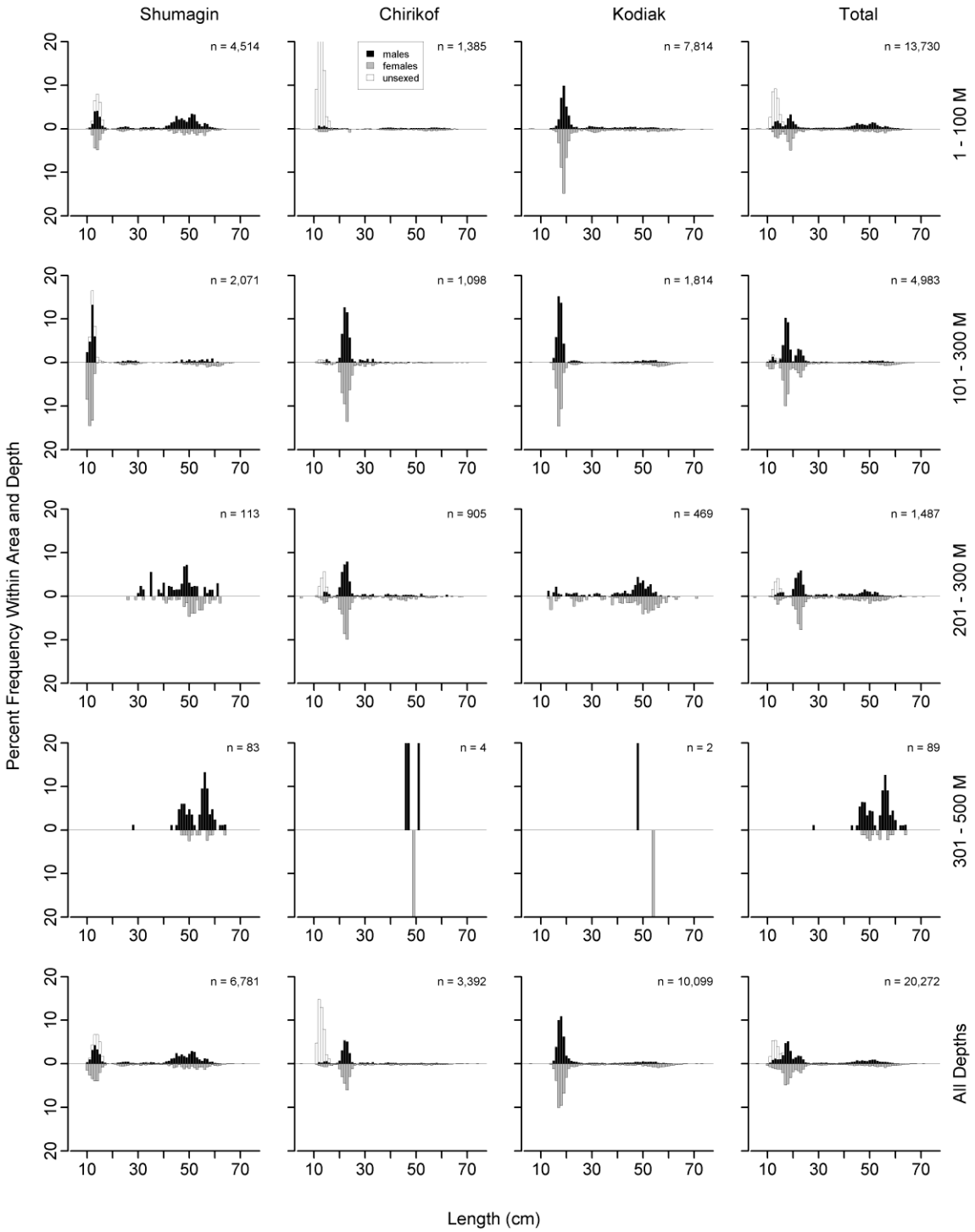

Figure 19. -- Size composition of walleye pollock from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 28. -- Catch per unit of effort by stratum for walleye pollock sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Shumagin Bank	20	15	47.41	58,781	0	180,447
Kodiak	1 - 100	Albatross Shallows	34	22	35.52	20,483	4,328	36,638
Shumagin	101 - 200	West Shumagin Gully	7	4	29.30	6,676	0	18,949
Kodiak	201 - 300	Kodiak Slope	5	4	24.51	3,976	0	14,582
Shumagin	1 - 100	Lower Alaska Peninsula	20	18	20.51	14,105	2,800	25,409
Kodiak	101 - 200	Albatross Gullies	24	14	19.74	15,614	0	34,984
Kodiak	101 - 200	Barren Islands	13	8	14.38	15,794	3,863	27,725
Chirikof	1 - 100	Chirikof Bank	31	16	13.26	14,308	0	29,787
Kodiak	1 - 100	Lower Cook Inlet	7	4	11.50	11,374	0	32,352
Kodiak	101 - 200	Portlock Flats	17	14	10.54	7,732	0	22,760
Chirikof	101 - 200	Shelikof Edge	19	14	8.69	6,717	5	13,430
Kodiak	101 - 200	Kodiak Outer Shelf	22	10	8.11	4,076	0	12,157
Kodiak	201 - 300	Upper Shelikof Gully	2	2	7.29	2,338	0	14,639
Shumagin	301 - 500	Shumagin Slope	6	5	6.11	1,548	0	4,410
Chirikof	201 - 300	Lower Shelikof Gully	14	14	5.76	5,767	2,856	8,677
Chirikof	1 - 100	Upper Alaska Peninsula	12	6	5.48	4,355	0	9,833
Shumagin	201 - 300	Shumagin Slope	9	8	5.13	1,429	237	2,622
Kodiak	101 - 200	Kenai Flats	15	12	4.57	5,519	98	10,940
Kodiak	1 - 100	Kenai Peninsula	9	7	3.78	1,986	0	5,064
Kodiak	201 - 300	Kenai Gullies	14	13	2.36	1,573	874	2,272
Shumagin	1 - 100	Davidson Bank	35	13	2.32	3,167	0	6,494
Chirikof	101 - 200	Chirikof Outer Shelf	22	14	1.79	895	0	1,998
Shumagin	101 - 200	Shumagin Outer Shelf	17	12	0.92	752	105	1,399
Shumagin	101 - 200	Sanak Gully	6	3	0.85	360	0	1,138
Chirikof	101 - 200	East Shumagin Gully	16	11	0.71	782	0	1,801
Chirikof	201 - 300	Chirikof Slope	8	5	0.63	96	0	203
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	0.55	120	0	379
Chirikof	1 - 100	Semidi Bank	13	9	0.29	208	75	341
Chirikof	301 - 500	Chirikof Slope	5	2	0.26	42	0	114
Kodiak	1 - 100	Albatross Banks	35	10	0.12	183	6	360
Kodiak	301 - 500	Kodiak Slope	7	2	0.09	27	0	77
Shumagin	1 - 100	Fox Islands	19	9	0.04	30	0	62

Pacific cod (*Gadus macrocephalus*)

Pacific cod was the fith most abundant species caught in the 2001 survey (Table 2). Cod were caught throughout the survey area in 27 of the 32 survey strata at depths less than 300 m, although CPUEs were low at depths greater than 200 m (Fig. 20, Table 30). Approximately 66% of the survey-wide biomass was estimated to be shallower than 100 m and cod occurred in about 66% of the tows at this depth range. Catches were also more abundant in the Shumagin INPFC area, which produced 52% of the entire biomass caught despite comprising only 27% of the entire area surveyed. Catch density decreased progressively in the two eastern INPFC areas (Table 29). The highest density was recorded in the Fox Islands stratum (Fig. 20). Mean weight generally increased with depth. Length data showed a bimodal distribution in water shallower than 200 m in the Kodiak and Chirikof INPFC areas with a strong peak at about 20 - 25 cm and a much broader peak in the 40 - 60 cm range in the shallow tows. The 100 - 200 m tows had peaks at 42 and 60 cm. (Fig. 21). The sex ratio of the Pacific cod population in the survey area was almost even, with males accounting for approximately 51% of the total estimated population.

Table 29. -- Number of survey hauls, number of hauls with Pacific cod, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	61	29.42	121,483	31,006	211,960	1.798
	101 - 200	30	21	7.54	11,071	0	23,298	3.44
	201 - 300	9	2	2.37	660	0	1,997	2.734
	301 - 500	6	0	---	---	---	---	---
	All depths	139	84	21.74	133,214	42,898	223,531	1.876
Chirikof	1 - 100	56	37	9.67	25,182	239	50,126	1.261
	101 - 200	57	37	17.77	42,377	0	90,589	1.568
	201 - 300	22	13	2.31	2,668	788	4,548	2.773
	301 - 500	5	0	---	---	---	---	---
	All depths	140	87	11.14	70,228	16,474	123,981	1.465
Kodiak	1 - 100	91	60	6.04	23,281	13,448	33,113	0.927
	101 - 200	91	51	6.87	29,785	17,418	42,151	2.136
	201 - 300	21	2	0.96	1,107	0	4,227	2.943
	301 - 500	7	0	---	---	---	---	---
	All depths	210	113	5.63	54,172	38,470	69,874	1.373
All areas	1 - 100	241	158	16.06	169,946	76,540	263,352	1.508
	101 - 200	178	109	10.17	83,233	32,387	134,079	1.884
	201 - 300	52	17	1.72	4,435	1,686	7,184	2.808
	301 - 500	18	0	---	---	---	---	---
	All depths	489	284	11.68	257,614	152,701	362,527	1.626

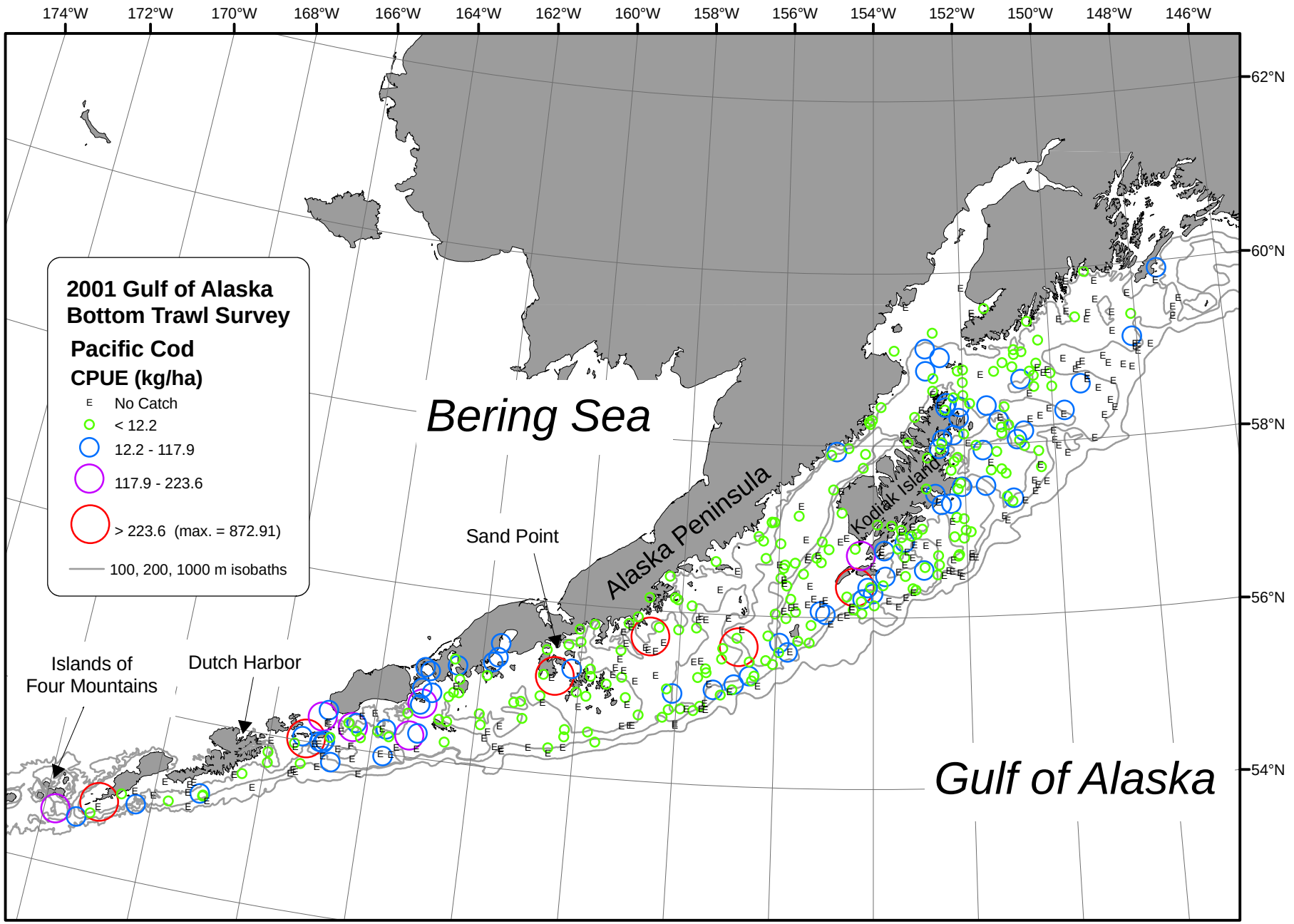

Figure 20.--Distribution and relative abundance of Pacific cod from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

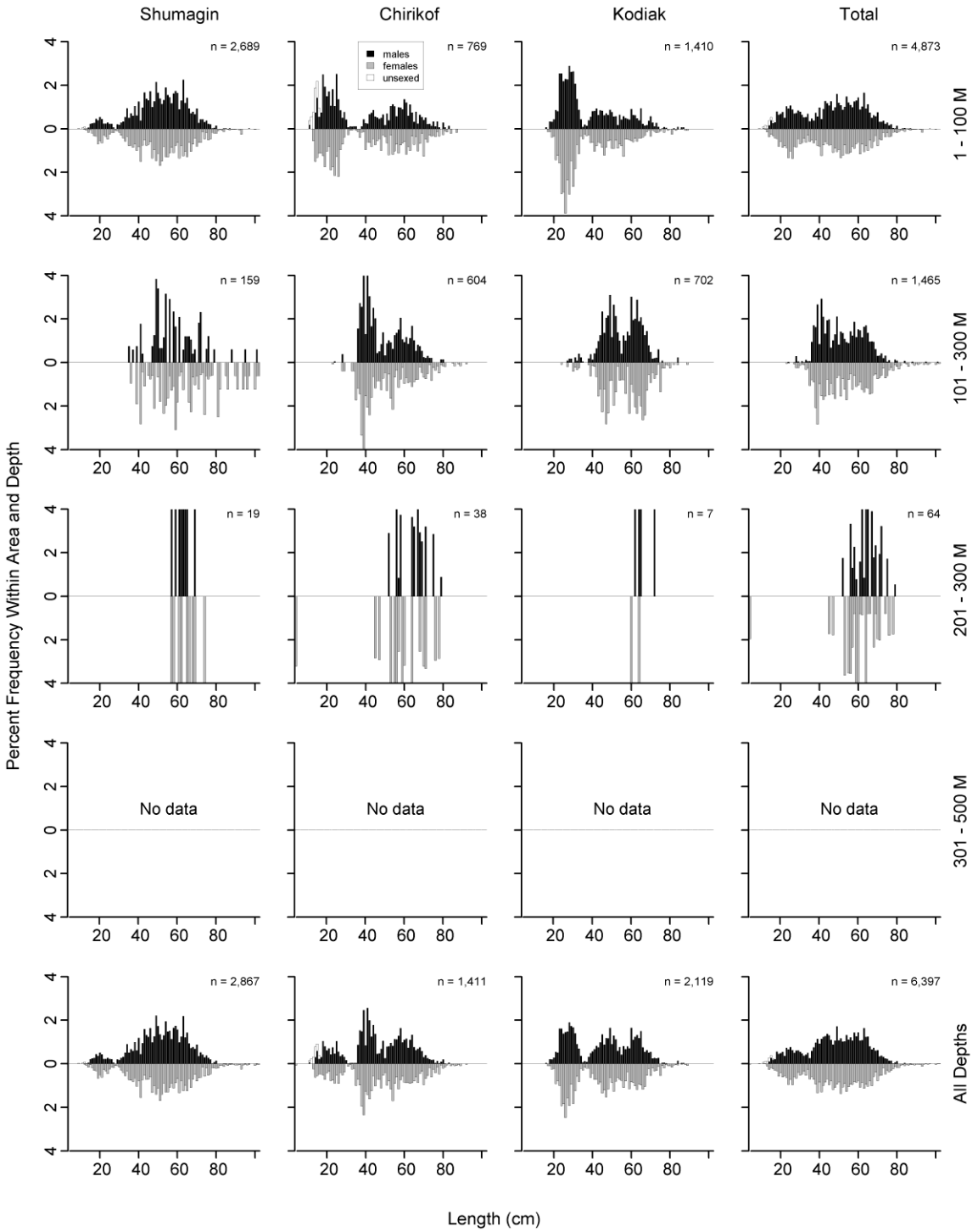

Figure 21. -- Size composition of Pacific cod from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 30. -- Catch per unit of effort by stratum for Pacific cod sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	1 - 100	Fox Islands	19	8	67.71	56,423	0	138,326
Shumagin	1 - 100	Davidson Bank	35	21	26.94	36,851	10,736	62,967
Chirikof	101 - 200	Shelikof Edge	19	15	23.75	18,368	0	48,228
Chirikof	1 - 100	Chirikof Bank	31	19	20.11	21,702	0	46,543
Chirikof	101 - 200	East Shumagin Gully	16	7	18.11	20,104	0	59,389
Shumagin	1 - 100	Shumagin Bank	20	14	17.53	21,737	0	56,595
Shumagin	101 - 200	Shumagin Outer Shelf	17	13	12.40	10,112	0	22,373
Kodiak	101 - 200	Portlock Flats	17	10	10.64	7,804	0	17,648
Kodiak	101 - 200	Albatross Gullies	24	17	10.44	8,261	3,351	13,171
Kodiak	1 - 100	Albatross Shallows	34	26	10.02	5,776	3,059	8,494
Shumagin	1 - 100	Lower Alaska Peninsula	20	18	9.41	6,473	3,125	9,820
Kodiak	101 - 200	Barren Islands	13	12	8.44	9,271	4,003	14,539
Kodiak	1 - 100	Albatross Banks	35	25	7.84	12,073	4,591	19,554
Chirikof	101 - 200	Chirikof Outer Shelf	22	15	7.79	3,905	1,695	6,115
Kodiak	1 - 100	Kenai Peninsula	9	3	4.50	2,365	0	7,503
Kodiak	201 - 300	Upper Shelikof Gully	2	2	3.45	1,107	0	10,320
Kodiak	101 - 200	Kenai Flats	15	7	3.02	3,642	0	8,005
Kodiak	1 - 100	Lower Cook Inlet	7	3	2.86	2,827	0	7,404
Chirikof	201 - 300	Lower Shelikof Gully	14	9	2.55	2,551	661	4,440
Shumagin	201 - 300	Shumagin Slope	9	2	2.37	660	0	2,023
Chirikof	1 - 100	Upper Alaska Peninsula	12	11	2.37	1,879	903	2,854
Shumagin	101 - 200	West Shumagin Gully	7	4	2.27	518	0	1,254
Chirikof	1 - 100	Semidi Bank	13	7	2.19	1,602	0	3,809
Kodiak	101 - 200	Kodiak Outer Shelf	22	5	1.61	807	0	1,875
Kodiak	1 - 100	Northern Kodiak Shallows	6	3	1.09	240	0	526
Shumagin	101 - 200	Sanak Gully	6	4	1.04	441	0	952
Chirikof	201 - 300	Chirikof Slope	8	4	0.77	117	0	242

Atka mackerel (*Pleurogrammus monopterygius*)

Atka mackerel was the sixth most abundant species caught in the 2001 survey (Table 2) although virtually the entire biomass estimate is attritutable to a single catch of over 11.2 t in the Shumagin Outer Shelf stratum (100 – 200 m)(Fig. 22 and Tables 31-32). Small catches of this species (< 3.2 kg) were seen in 11 of the 32 strata as far east as Kodiak Island and always in water shallower than 200 m. The length data showed a strong mode for females at 45 cm while males appeared to have a more bimodal distribution with peaks at about 38 and 44 cm (Fig. 23). The sex ratio of the Atka mackerel population in the survey area was dominated by females, which accounted for approximately 57% of the total estimated population.

Table 31. -- Number of survey hauls, number of hauls with Atka mackerel, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	11	0.04	182	57	308	0.749
	101 - 200	30	3	150.57	220,994	0	687,125	1.102
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	14	36.09	221,176	0	687,307	1.101
Chirikof	1 - 100	56	2	0.02	40	0	99	0.928
	101 - 200	57	2	0.02	41	0	111	1.082
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	4	0.01	81	0	170	0.999
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	1	<1	9	0	28	1.009
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	1	<1	9	0	28	1.009
All areas	1 - 100	241	13	0.02	223	86	360	0.776
	101 - 200	178	6	27.00	221,044	0	687,174	1.101
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	19	10.03	221,266	0	687,397	1.101

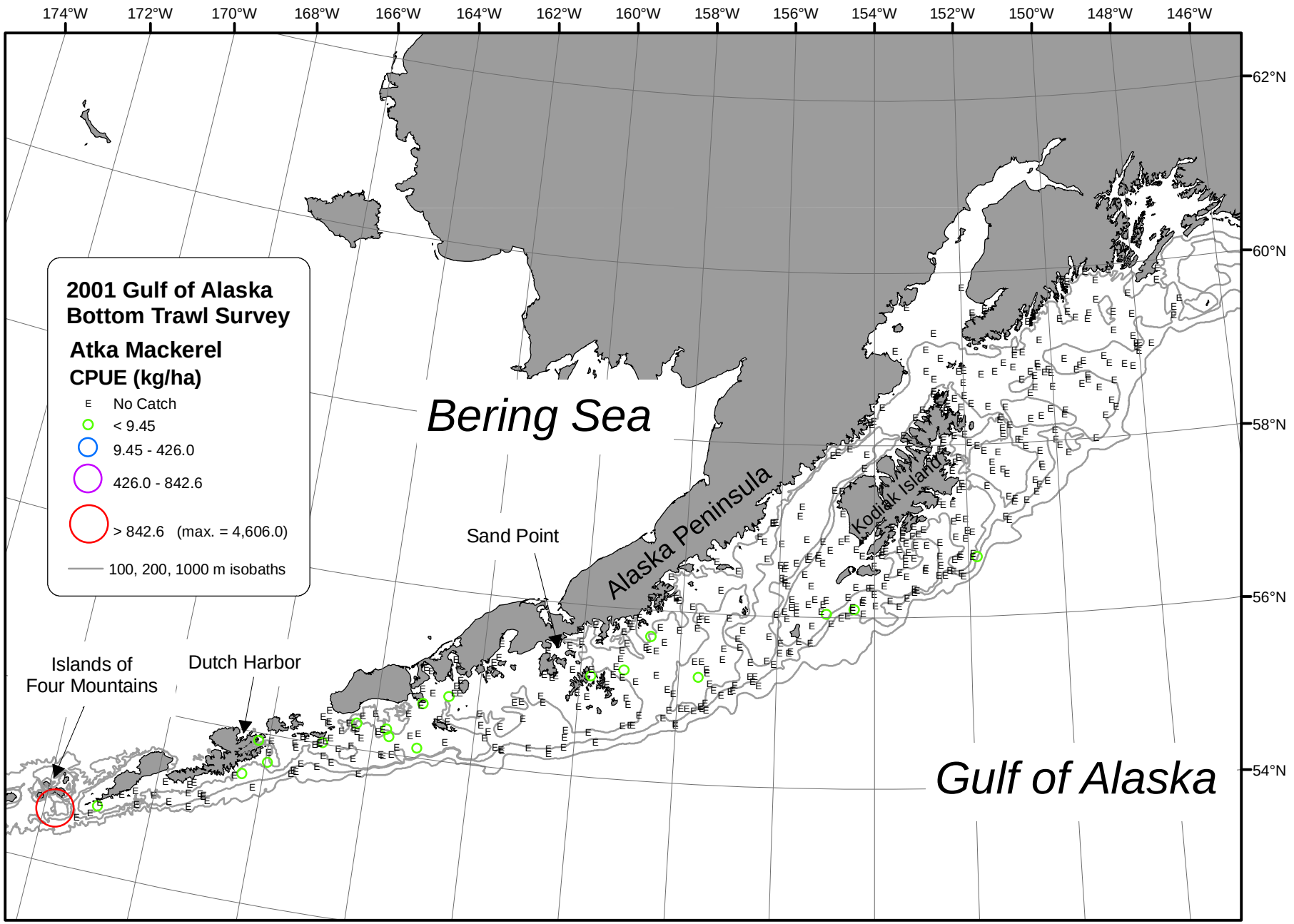

Figure 22.--Distribution and relative abundance of Atka mackerel from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

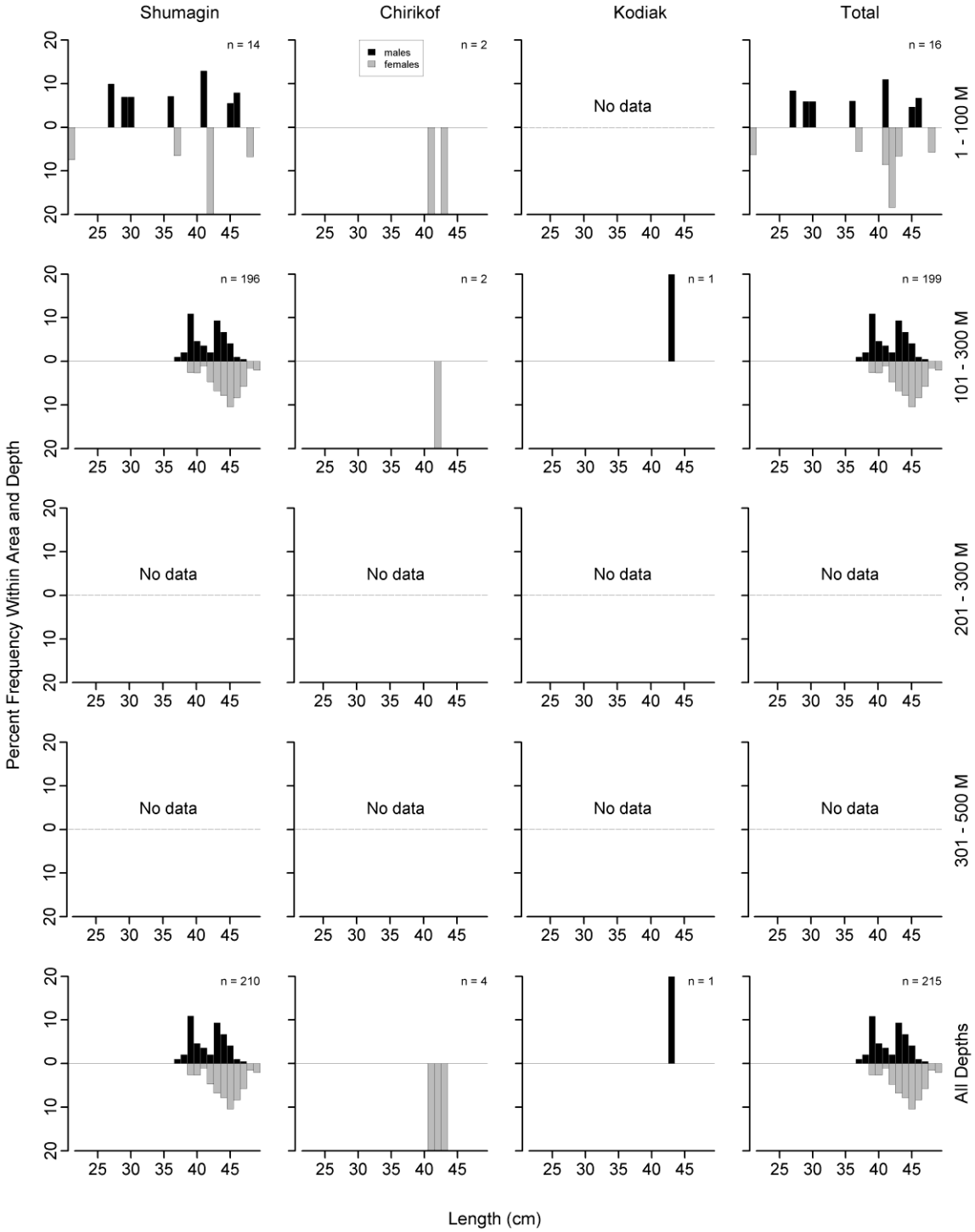

Figure 23. -- Size composition of Atka mackerel from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 32. -- Catch per unit of effort by stratum for Atka mackerel sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	101 - 200	Shumagin Outer Shelf	17	2	271.02	220,981	0	689,320
Shumagin	1 - 100	Davidson Bank	35	6	0.08	110	17	204
Shumagin	1 - 100	Fox Islands	19	3	0.07	57	0	142
Shumagin	101 - 200	West Shumagin Gully	7	1	0.06	14	0	47
Chirikof	101 - 200	East Shumagin Gully	16	1	0.03	32	0	100
Chirikof	1 - 100	Semidi Bank	13	1	0.03	21	0	66
Chirikof	1 - 100	Chirikof Bank	31	1	0.02	20	0	60
Kodiak	101 - 200	Kodiak Outer Shelf	22	1	0.02	9	0	28
Chirikof	101 - 200	Chirikof Outer Shelf	22	1	0.02	9	0	27
Shumagin	1 - 100	Lower Alaska Peninsula	20	1	0.02	10	0	32
Shumagin	1 - 100	Shumagin Bank	20	1	0.00	5	0	16

Sablefish (*Anoplopoma fimbria*)

Sablefish was the eighth most abundant species caught in the 2001 survey (Table 2). They were caught throughout the survey area in 29 of the 32 survey strata and at all depths (Table 34). Frequency of occurence increased with depth and they were present in 100% of tows deeper than 300 m. Mean weight also increased with depth, although the estimated biomass was greatest in the 100 - 200 m depth range where 64% of the total estimated biomass was caught (Table 33). Strata with the highest catch rates included Albatross Gullies and Barren Islands, as well as Kodiak Slope all of which are in the Kodiak INPFC area. The Chirikof Slope stratum also had a relatively high CPUE (Fig. 24, Table 34). Length frequency data showed a distinct mode for both males and females at approximately 30 cm in waters shallower than 100 m in the Shumagin and Chirikof INPFC areas and slightly larger than that in the Kodiak INPFC area (Fig. 25). Another mode appeared for both males and females around 58 cm in the 100 - 200 m depths of the Chirikof and Kodiak INPFC areas, as well as in the 200 - 300 m depths of the Chirikof area. Males in that same depth range had a strong mode at about 65 cm in the Kodiak area but females did not show the same pattern. Males were slightly more abundant, comprising 55% of the population.

Table 33. -- Number of survey hauls, number of hauls with sablefish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	13	0.23	951	0	2,478	0.211
	101 - 200	30	3	0.05	79	0	190	1.654
	201 - 300	9	7	11.33	3,157	200	6,115	1.967
	301 - 500	6	6	5.67	1,435	691	2,179	2.063
	All depths	139	29	0.92	5,622	2,473	8,772	0.82
Chirikof	1 - 100	56	3	0.33	868	0	2,520	0.32
	101 - 200	57	20	2.84	6,762	0	14,580	1.925
	201 - 300	22	22	21.27	24,554	15,476	33,632	2.216
	301 - 500	5	5	16.36	2,624	0	5,437	2.831
	All depths	140	50	5.52	34,809	22,630	46,988	1.909
Kodiak	1 - 100	91	17	0.33	1,290	439	2,142	0.737
	101 - 200	91	57	26.48	114,729	16,156	213,302	1.83
	201 - 300	21	19	17.99	20,667	676	40,659	2.778
	301 - 500	7	7	39.31	11,445	0	25,488	4.038
	All depths	210	100	15.39	148,132	47,304	248,960	1.983
All areas	1 - 100	241	33	0.29	3,110	774	5,445	0.347
	101 - 200	178	80	14.85	121,570	22,666	220,475	1.835
	201 - 300	52	48	18.73	48,379	27,121	69,636	2.404
	301 - 500	18	18	22.00	15,505	1,208	29,802	3.479
	All depths	489	179	8.55	188,563	86,927	290,200	1.889

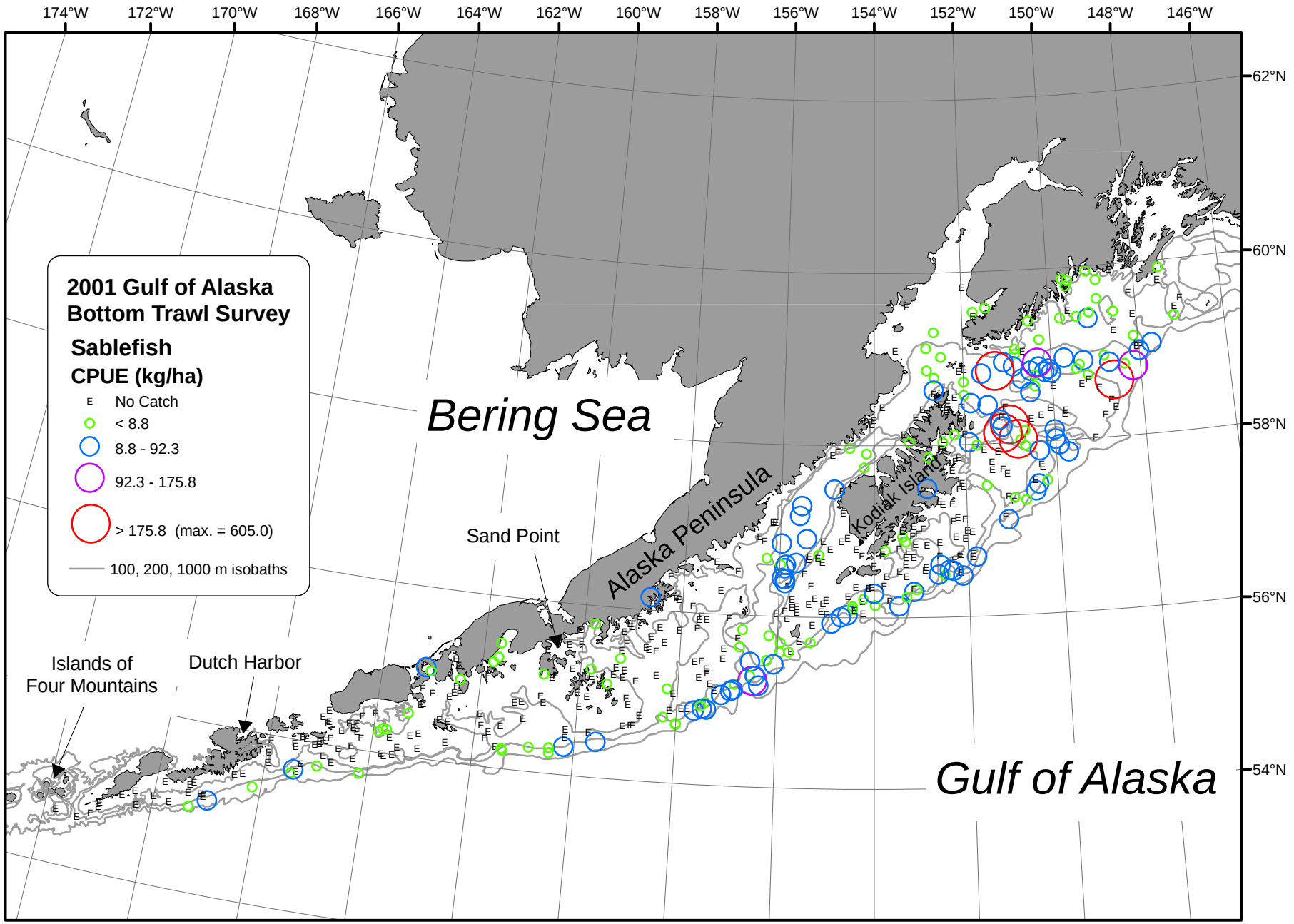

Figure 24.--Distribution and relative abundance of sablefish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

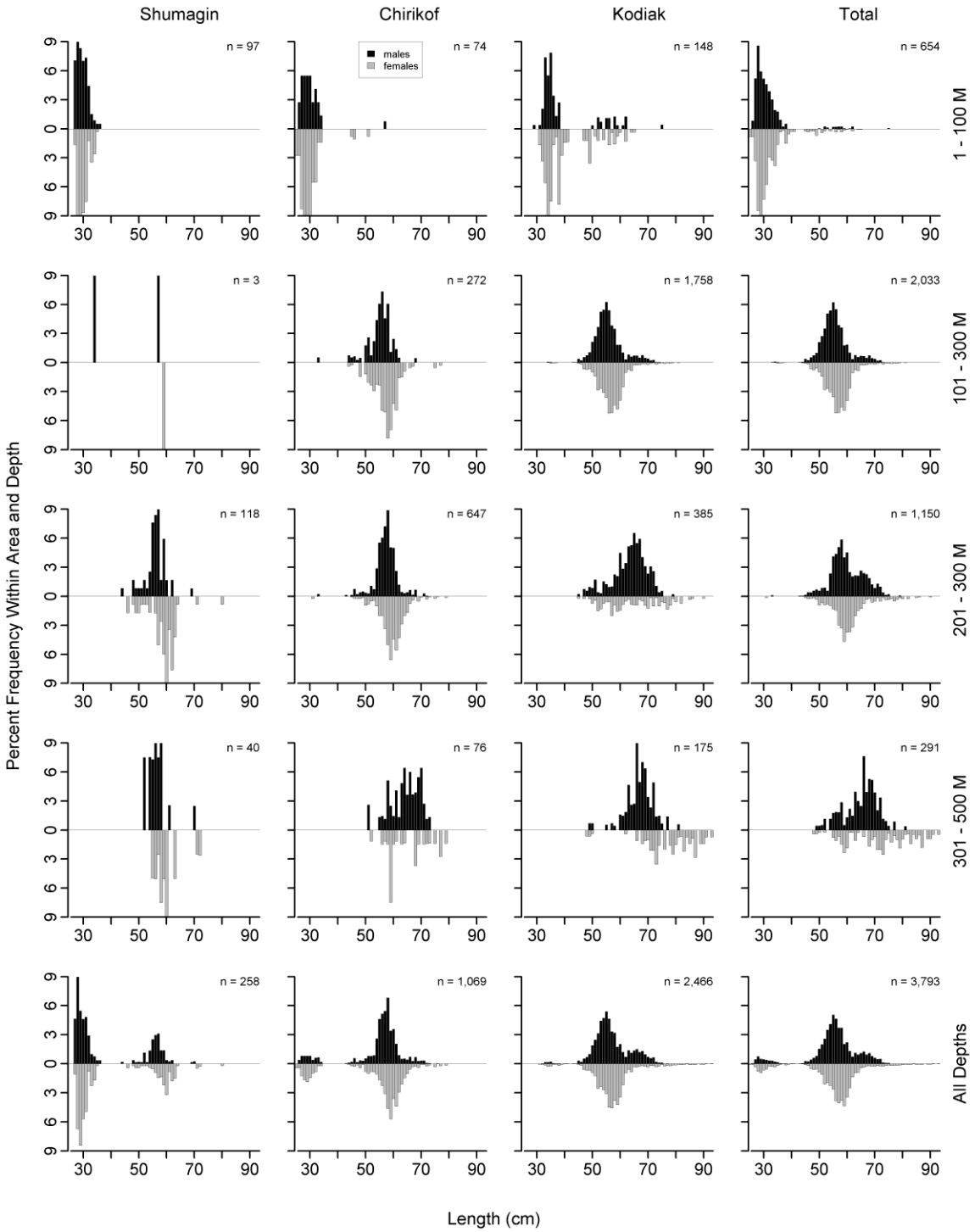

Figure 25. -- Size composition of sablefish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 34. -- Catch per unit of effort by stratum for sablefish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Albatross Gullies	24	14	53.23	42,112	0	87,036
Kodiak	101 - 200	Barren Islands	13	11	43.39	47,647	0	135,546
Kodiak	301 - 500	Kodiak Slope	7	7	39.31	11,445	0	25,975
Chirikof	201 - 300	Chirikof Slope	8	8	34.47	5,268	2,296	8,239
Kodiak	201 - 300	Kenai Gullies	14	12	25.74	17,138	0	37,150
Kodiak	101 - 200	Portlock Flats	17	12	24.72	18,132	5,486	30,779
Chirikof	201 - 300	Lower Shelikof Gully	14	14	19.25	19,286	10,557	28,016
Kodiak	201 - 300	Kodiak Slope	5	5	17.06	2,769	0	5,590
Chirikof	301 - 500	Chirikof Slope	5	5	16.36	2,624	0	5,661
Shumagin	201 - 300	Shumagin Slope	9	7	11.33	3,157	142	6,173
Chirikof	101 - 200	Chirikof Outer Shelf	22	13	10.49	5,259	0	13,039
Kodiak	101 - 200	Kodiak Outer Shelf	22	9	7.85	3,943	0	8,355
Shumagin	301 - 500	Shumagin Slope	6	6	5.67	1,435	654	2,216
Kodiak	101 - 200	Kenai Flats	15	11	2.40	2,895	899	4,891
Kodiak	201 - 300	Upper Shelikof Gully	2	2	2.37	760	612	908
Chirikof	101 - 200	Shelikof Edge	19	6	1.85	1,434	96	2,773
Shumagin	1 - 100	Lower Alaska Peninsula	20	6	1.14	786	0	2,313
Kodiak	1 - 100	Kenai Peninsula	9	6	1.01	530	4	1,056
Kodiak	1 - 100	Albatross Shallows	34	6	0.95	549	0	1,224
Chirikof	1 - 100	Upper Alaska Peninsula	12	1	0.95	753	0	2,409
Kodiak	1 - 100	Lower Cook Inlet	7	3	0.19	189	0	454
Shumagin	101 - 200	West Shumagin Gully	7	2	0.16	35	0	110
Chirikof	1 - 100	Semidi Bank	13	1	0.12	89	0	282
Kodiak	1 - 100	Northern Kodiak Shallows	6	2	0.10	22	0	63
Shumagin	1 - 100	Shumagin Bank	20	3	0.08	100	0	275
Chirikof	101 - 200	East Shumagin Gully	16	1	0.06	70	0	218
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.05	44	0	136
Shumagin	1 - 100	Davidson Bank	35	4	0.05	66	0	156
Chirikof	1 - 100	Chirikof Bank	31	1	0.03	27	0	82

Giant grenadier (*Albatrossia pectoralis*)

Giant grenadier was the ninth most abundant species caught in the 2001 survey (Table 2). They were caught throughout the survey area, although almost exclusively in slope strata at depths exceeding 300 m (Fig. 26, Tables 35-36). Giant grenadier occurred in 17 out of 18 (94%) tows deeper than 300 m (Table 35). Mean CPUEs were very high in all three of the slope strata where giant grenadier occurred. The size composition of female giant grenedier was similar wherever they occurred; a relatively broad length mode was centered around 25-30 cm (snout to anal fin origin) (Fig. 27). Males were not caught in high enough numbers to discern any pattern. The sex ratio of the giant grenadier population was dominated by females which comprised approximately 99% of the total estimated population.

Table 35. -- Number of survey hauls, number of hauls with giant grenadier, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	2	15.64	4,359	0	11,259	3.543
	301 - 500	6	6	258.30	65,377	0	181,776	3.381
	All depths	139	8	11.38	69,736	0	186,374	3.391
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	1	3.65	4,218	0	13,943	3.085
	301 - 500	5	5	219.94	35,278	0	77,348	3.413
	All depths	140	6	6.27	39,495	0	82,940	3.375
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	6	187.17	54,500	0	113,714	3.774
	All depths	210	6	5.66	54,500	0	113,714	3.774
All areas	1 - 100	241	0	---	---	---	---	---
	101 - 200	178	0	---	---	---	---	---
	201 - 300	52	3	3.32	8,577	0	19,611	3.302
	301 - 500	18	17	220.18	155,154	28,052	282,257	3.517
	All depths	489	20	7.42	163,731	36,084	291,377	3.505

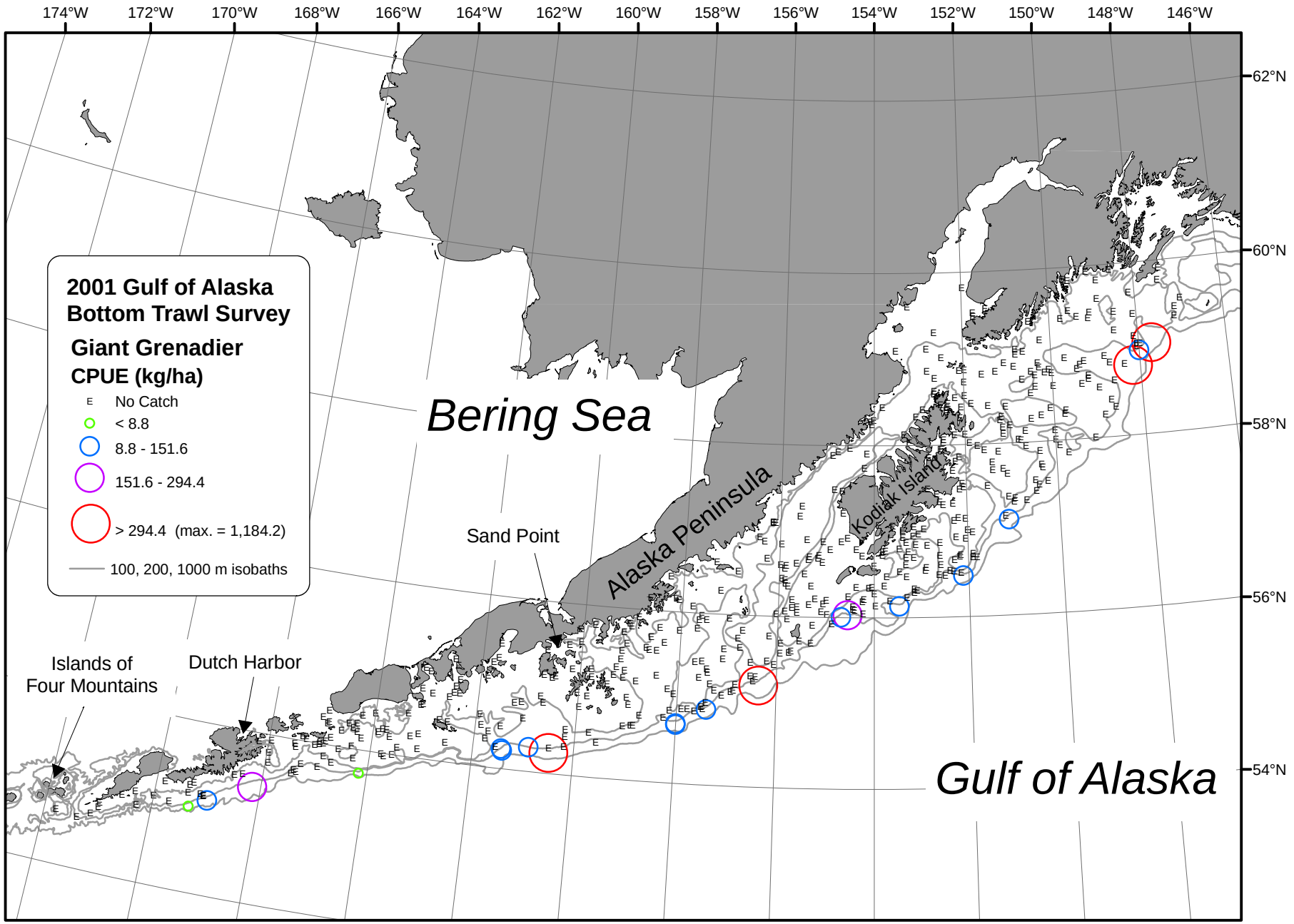

Figure 26.--Distribution and relative abundance of giant grenadier from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

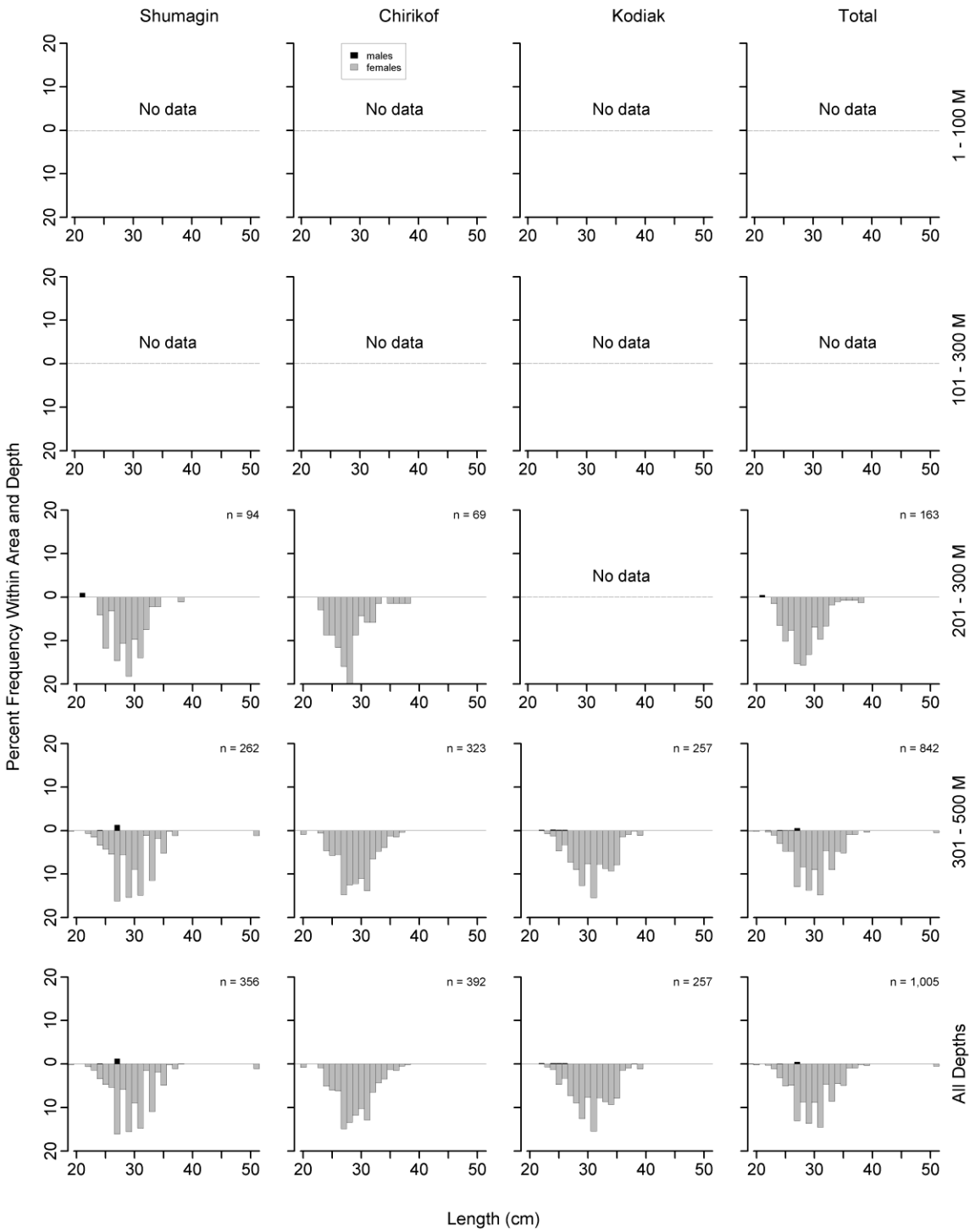

Figure 27. -- Size composition of giant grenadier from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 36. -- Catch per unit of effort by stratum for giant grenadier sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	301 - 500	Shumagin Slope	6	6	258.30	65,377	0	187,674
Chirikof	301 - 500	Chirikof Slope	5	5	219.94	35,278	0	80,702
Kodiak	301 - 500	Kodiak Slope	7	6	187.17	54,500	0	115,767
Chirikof	201 - 300	Chirikof Slope	8	1	27.60	4,218	0	14,192
Shumagin	201 - 300	Shumagin Slope	9	2	15.64	4,359	0	11,393

ROCKFISHES

Pacific ocean perch (*Sebastes alutus*)

Pacific ocean perch was the second most abundant species caught in the 2001 survey and was by far the most abundant and widely distributed rockfish species encountered in the survey (Table 2). They were caught throughout the survey area, in 27 of the 32 survey strata and at all depths. The highest concentrations were in the area of Portlock Bank, as well as Shumagin Slope and Shumagin outer shelf (Fig. 28, Table 38). The CPUEs were highest in the 201-300 m depth range in the Shumagin INPFC area, while the Chirikof and Kodiak areas had greater concentrations in the 100 to 200 m depth range. The Kodiak area had the highest estimated biomass (Table 37). Approximately 79% of the estimated population biomass was recorded in the 101 to 200 m depth range and over 97% of it was found in the 101 to 300 m range. The length distribution showed a distinct mode at around 18 cm in the shallowest zone of the Shumagin INPFC area and at around 22 cm in the same depth zone of the Kodiak INPFC area. Larger fish (35 - 48 cm) were found in all areas deeper than 100 m. Fish length and mean weight also showed a general tendency to increase toward the eastern portion of the survey area (Fig. 29, Table 37). The sex ratio of Pacific ocean perch in the survey area was relatively close to even with males accounting for approximately 54% of the total estimated population.

Table 37. -- Number of survey hauls, number of hauls with Pacific ocean perch, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	12	1.48	6,121	0	17,412	0.092
	101 - 200	30	11	129.73	190,407	0	501,683	0.455
	201 - 300	9	9	276.41	77,061	0	234,988	0.532
	301 - 500	6	5	6.40	1,621	0	5,026	0.639
	All depths	139	37	44.91	275,211	0	617,011	0.436
Chirikof	1 - 100	56	8	4.15	10,795	0	33,813	0.706
	101 - 200	57	35	11.09	26,441	2,572	50,311	0.647
	201 - 300	22	16	2.23	2,574	0	5,190	0.731
	301 - 500	5	1	0.05	9	0	30	0.629
	All depths	140	60	6.32	39,819	7,150	72,488	0.667
Kodiak	1 - 100	91	5	0.40	1,548	0	4,414	0.13
	101 - 200	91	55	72.55	314,384	3,862	624,907	0.744
	201 - 300	21	18	36.26	41,661	1,329	81,993	0.663
	301 - 500	7	5	1.83	533	0	1,158	0.588
	All depths	210	83	37.21	358,126	46,152	670,099	0.719
All areas	1 - 100	241	25	1.74	18,463	0	43,207	0.197
	101 - 200	178	101	64.90	531,233	103,342	959,123	0.603
	201 - 300	52	43	46.97	121,297	0	277,497	0.575
	301 - 500	18	11	3.07	2,162	0	5,628	0.626
	All depths	489	180	30.52	673,155	219,825	1,126,485	0.566

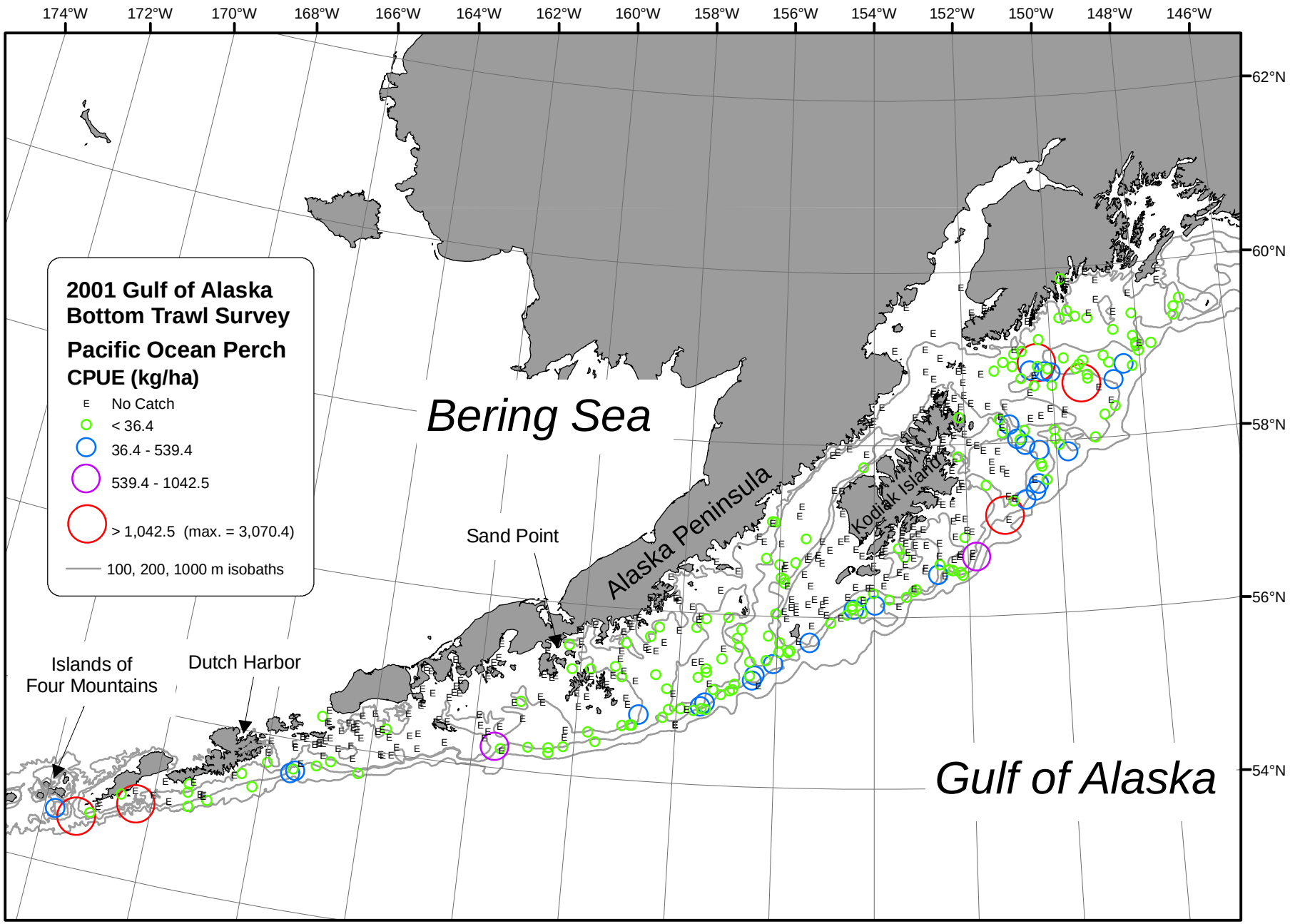

Figure 28.--Distribution and relative abundance of Pacific ocean perch from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

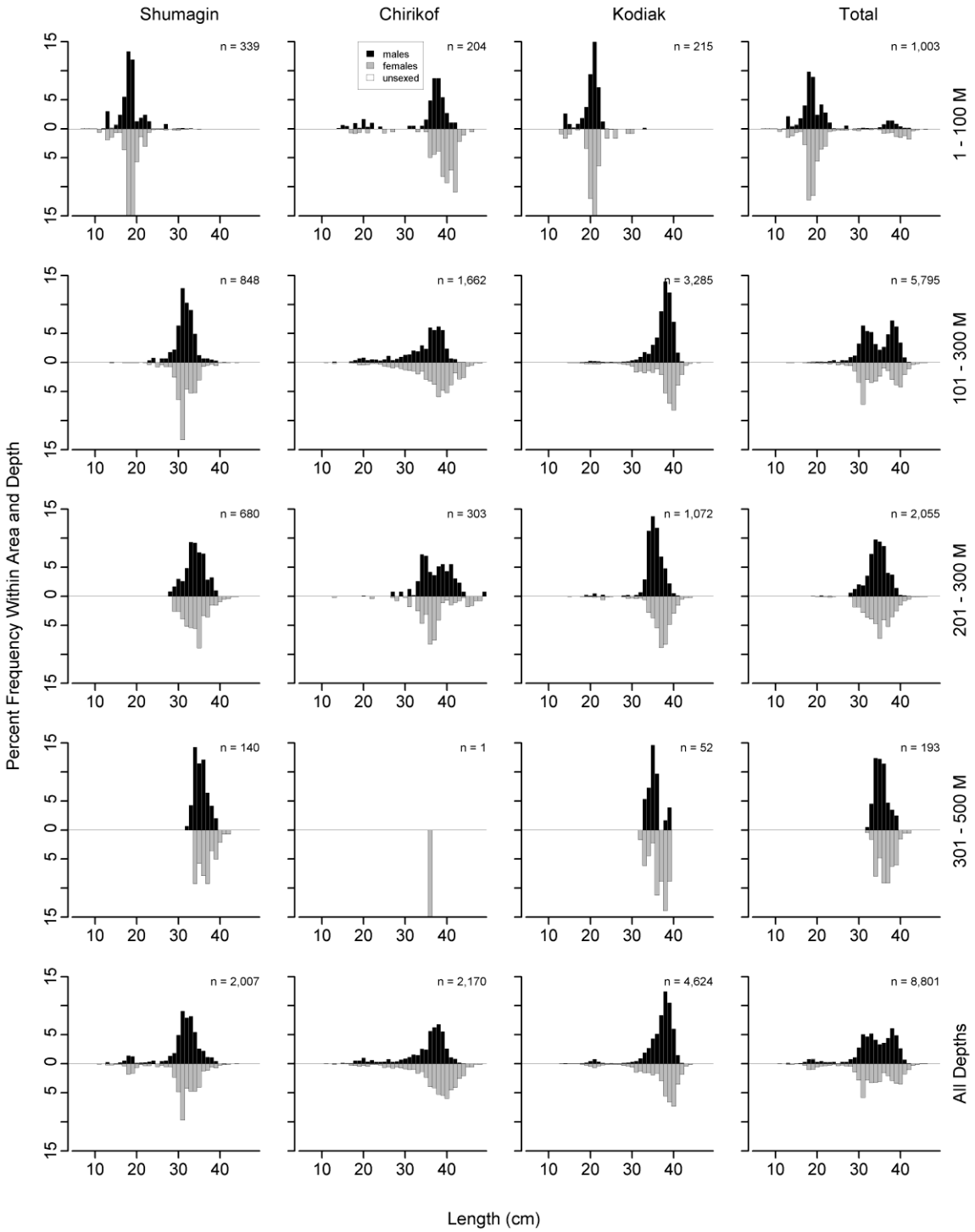

Figure 29. -- Size composition of Pacific ocean perch from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 38. -- Catch per unit of effort by stratum for Pacific ocean perch sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Portlock Flats	17	13	293.63	215,421	0	512,523
Shumagin	201 - 300	Shumagin Slope	9	9	276.41	77,061	0	238,060
Shumagin	101 - 200	Shumagin Outer Shelf	17	9	233.51	190,394	0	503,144
Kodiak	101 - 200	Kodiak Outer Shelf	22	17	134.22	67,457	0	163,874
Kodiak	201 - 300	Kenai Gullies	14	14	55.53	36,977	0	76,771
Chirikof	101 - 200	Chirikof Outer Shelf	22	20	47.39	23,744	0	47,715
Kodiak	101 - 200	Albatross Gullies	24	13	37.19	29,426	0	60,272
Kodiak	201 - 300	Kodiak Slope	5	4	28.87	4,684	0	15,114
Chirikof	1 - 100	Semidi Bank	13	6	14.72	10,752	0	33,973
Chirikof	201 - 300	Chirikof Slope	8	8	7.86	1,201	0	2,521
Shumagin	301 - 500	Shumagin Slope	6	5	6.40	1,621	0	5,198
Shumagin	1 - 100	Shumagin Bank	20	5	4.88	6,053	0	17,382
Kodiak	301 - 500	Kodiak Slope	7	5	1.83	533	0	1,179
Chirikof	101 - 200	Shelikof Edge	19	9	1.70	1,318	0	2,767
Chirikof	201 - 300	Lower Shelikof Gully	14	8	1.37	1,373	0	3,715
Kodiak	101 - 200	Kenai Flats	15	10	1.29	1,561	180	2,942
Chirikof	101 - 200	East Shumagin Gully	16	6	1.24	1,379	0	3,483
Kodiak	1 - 100	Albatross Banks	35	1	0.91	1,401	0	4,261
Kodiak	101 - 200	Barren Islands	13	2	0.47	519	0	1,319
Kodiak	1 - 100	Albatross Shallows	34	3	0.17	97	0	263
Kodiak	1 - 100	Kenai Peninsula	9	1	0.09	50	0	164
Shumagin	101 - 200	West Shumagin Gully	7	2	0.06	14	0	36
Chirikof	1 - 100	Upper Alaska Peninsula	12	2	0.05	43	0	107
Chirikof	301 - 500	Chirikof Slope	5	1	0.05	9	0	32
Shumagin	1 - 100	Lower Alaska Peninsula	20	2	0.05	32	0	98
Shumagin	1 - 100	Fox Islands	19	4	0.03	26	0	54
Shumagin	1 - 100	Davidson Bank	35	1	0.01	10	0	31

Northern rockfish (*Sebastes polyspinis*)

Northern rockfish was the fourth most abundant species and the second most abundant rockfish species caught in the 2001 survey (Table 2). About 90% of its estimated biomass came from the Shumagin and Kodiak INPFC areas in waters between 100 and 200 m (Fig. 30, Table 39). Overall these fish were nearly always caught in moderately shallow water with less than 0.2% coming from water deeper than 200 m. The highest CPUEs of northern rockfish came from the Kodiak and Shumagin Outer Shelf (Table 40). The length distribution of northern rockfish caught during the survey showed a mode around 35-40 cm for both sexes (Fig. 31). Males and females showed near equal abundance.

Table 39. -- Number of survey hauls, number of hauls with northern rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	7	1.73	7,160	0	17,213	0.475
	101 - 200	30	7	58.59	85,994	0	184,731	0.735
	201 - 300	9	3	0.49	138	0	369	0.794
	301 - 500	6	0	---	---	---	---	---
	All depths	139	17	15.22	93,291	0	192,127	0.705
Chirikof	1 - 100	56	9	1.59	4,150	0	10,924	0.399
	101 - 200	57	25	8.46	20,175	0	49,773	0.803
	201 - 300	22	5	0.14	165	0	340	0.727
	301 - 500	5	0	---	---	---	---	---
	All depths	140	39	3.88	24,490	0	54,415	0.685
Kodiak	1 - 100	91	15	0.89	3,418	0	8,975	0.492
	101 - 200	91	32	51.30	222,274	0	635,955	0.802
	201 - 300	21	4	0.12	141	0	330	0.6
	301 - 500	7	0	---	---	---	---	---
	All depths	210	51	23.46	225,833	0	639,553	0.795
All areas	1 - 100	241	31	1.39	14,729	1,671	27,786	0.454
	101 - 200	178	64	40.12	328,442	0	747,818	0.784
	201 - 300	52	12	0.17	443	127	759	0.699
	301 - 500	18	0	---	---	---	---	---
	All depths	489	107	15.58	343,614	0	763,193	0.76

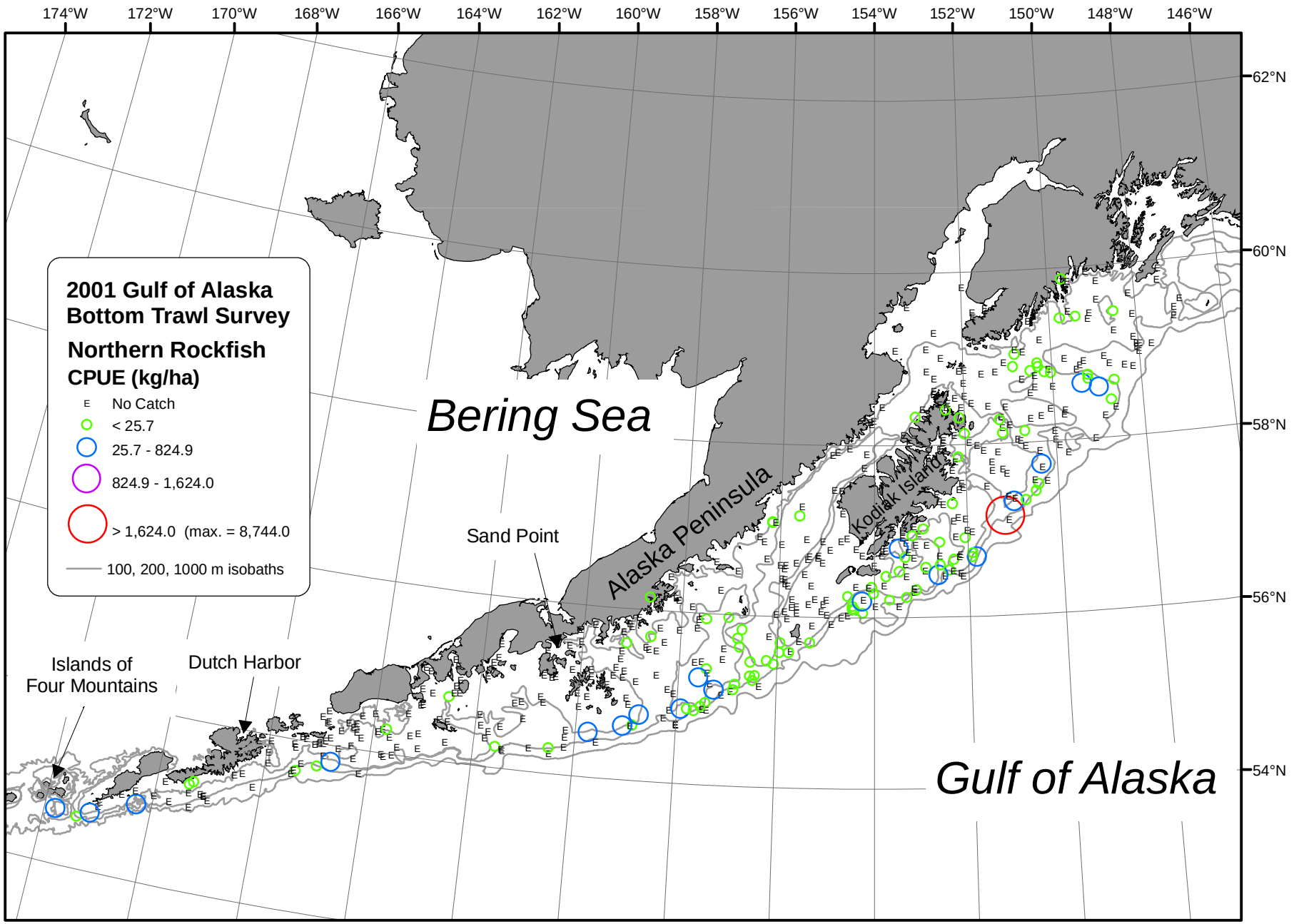

Figure 30.--Distribution and relative abundance of northern rockfish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

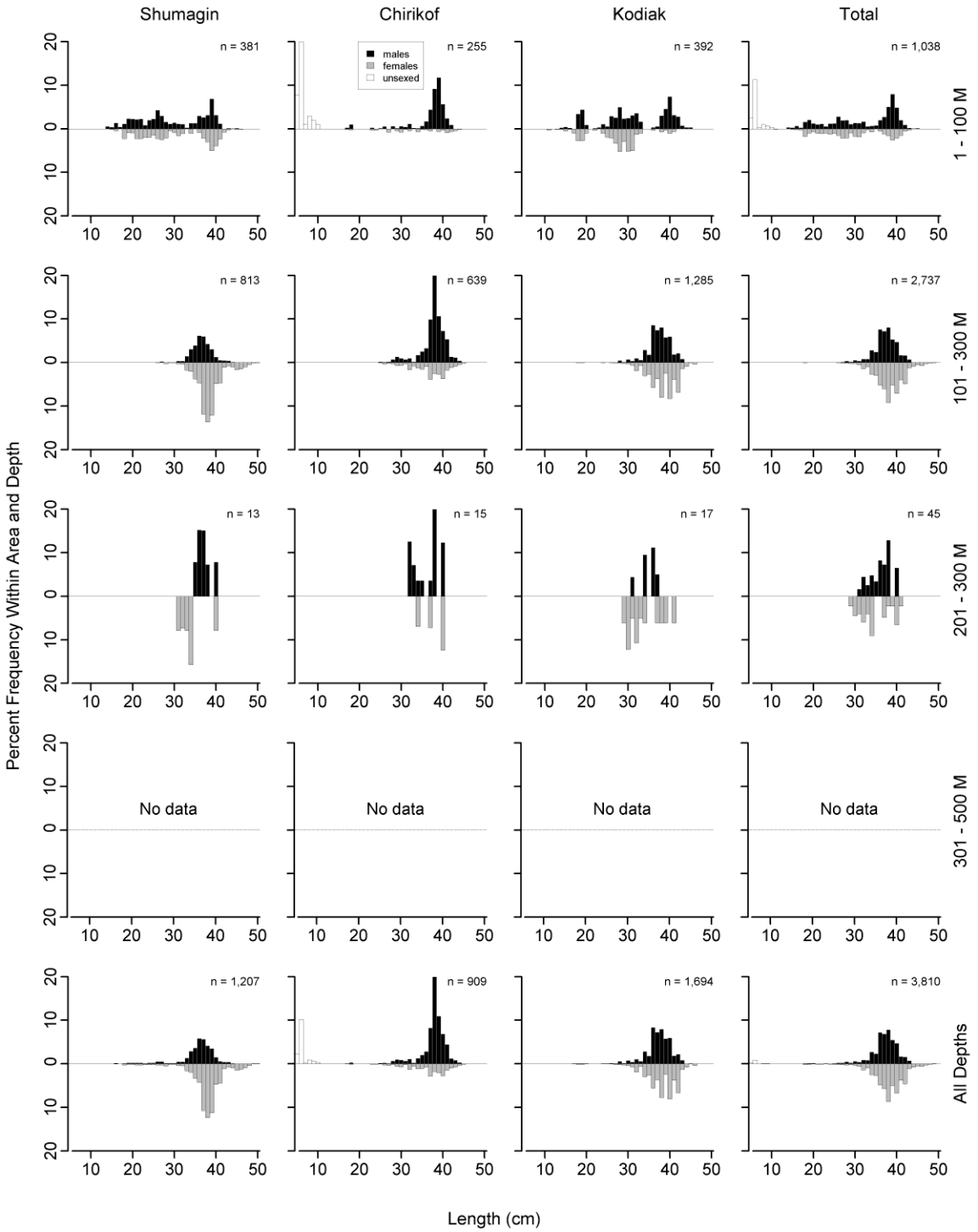

Figure 31. -- Size composition of northern rockfish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 40. -- Catch per unit of effort by stratum for northern rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Kodiak Outer Shelf	22	10	424.17	213,178	0	627,959
Shumagin	101 - 200	Shumagin Outer Shelf	17	7	105.47	85,994	0	185,199
Chirikof	101 - 200	Chirikof Outer Shelf	22	19	36.04	18,059	0	47,732
Kodiak	101 - 200	Portlock Flats	17	10	7.16	5,255	0	12,482
Shumagin	1 - 100	Shumagin Bank	20	2	5.58	6,915	0	16,993
Kodiak	1 - 100	Albatross Shallows	34	7	4.98	2,870	0	8,399
Chirikof	1 - 100	Semidi Bank	13	4	4.45	3,246	0	9,935
Kodiak	101 - 200	Albatross Gullies	24	8	4.26	3,367	0	8,720
Chirikof	101 - 200	Shelikof Edge	19	5	1.87	1,443	0	3,185
Chirikof	1 - 100	Chirikof Bank	31	2	0.80	868	0	2,552
Kodiak	201 - 300	Kodiak Slope	5	3	0.78	127	0	346
Chirikof	101 - 200	East Shumagin Gully	16	1	0.61	672	0	2,104
Shumagin	201 - 300	Shumagin Slope	9	3	0.49	138	0	374
Kodiak	101 - 200	Kenai Flats	15	4	0.39	474	0	1,361
Kodiak	1 - 100	Albatross Banks	35	6	0.35	537	0	1,511
Chirikof	201 - 300	Chirikof Slope	8	2	0.34	51	0	163
Shumagin	1 - 100	Davidson Bank	35	1	0.15	201	0	611
Chirikof	201 - 300	Lower Shelikof Gully	14	3	0.113	114	0	258
Kodiak	1 - 100	Northern Kodiak Shallows	6	1	0.047	10	0	37
Chirikof	1 - 100	Upper Alaska Peninsula	12	3	0.046	36	0	81
Shumagin	1 - 100	Fox Islands	19	2	0.035	29	0	88
Shumagin	1 - 100	Lower Alaska Peninsula	20	2	0.021	15	0	44
Kodiak	201 - 300	Kenai Gullies	14	1	0.021	14	0	44
Kodiak	1 - 100	Kenai Peninsula	9	1	0.002	1	0	4

Rougheye rockfish (*Sebastes aleutianus*)

In recent years, the species previously referred to as rougheye rockfish was morphometrically and genetically shown to be two separate species - the rougheye rockfish (*Sebastes aleutianus*) and the blackspotted rockfish (*S. melanostictus*)(Orr and Hawkins 2008). In the year of this survey they had not been distinguished and were all considered to be rougheye rockfish. Rougheye rockfish were found throughout the entire survey area. This species was encountered in each of the three INPFC areas and at each depth within each area, although it was more commonly found deeper than 200 m where approximately 70% of its biomass was estimated to be (Fig. 32, Tables 41-42). About half of the total estimated biomass was found deeper than
200 m in the Kodiak INPFC area, even though that comprises only about 6.5% of the total survey area. Size generally increased with depth. Fish from the Shumagin and Kodiak INPFC areas showed a strong mode around 44 cm in the 300 to 500 m depth range (Fig. 33). The sex ratio was nearly even with approximately 51% females.

Table 41. -- Number of survey hauls, number of hauls with rougheye rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	3	0.02	98	0	232	0.34
	101 - 200	30	5	0.08	120	0	252	0.413
	201 - 300	9	8	3.07	855	36	1,673	0.927
	301 - 500	6	6	23.21	5,874	0	15,136	1.257
	All depths	139	22	1.13	6,945	0	16,253	1.126
Chirikof	1 - 100	56	1	0.01	14	0	42	0.947
	101 - 200	57	10	0.47	1,120	0	2,246	0.462
	201 - 300	22	16	1.66	1,922	0	3,884	1.442
	301 - 500	5	4	3.35	537	0	1,132	1.365
	All depths	140	31	0.57	3,592	1,326	5,859	0.863
Kodiak	1 - 100	91	14	0.40	1,543	250	2,837	0.349
	101 - 200	91	26	0.79	3,407	880	5,935	0.597
	201 - 300	21	15	6.39	7,339	0	15,077	0.796
	301 - 500	7	7	30.42	8,858	0	19,039	1.239
	All depths	210	62	2.20	21,148	9,363	32,932	0.798
All areas	1 - 100	241	18	0.16	1,655	372	2,938	0.351
	101 - 200	178	41	0.57	4,647	1,936	7,357	0.552
	201 - 300	52	39	3.92	10,116	2,133	18,099	0.881
	301 - 500	18	17	21.67	15,268	2,876	27,661	1.25
	All depths	489	115	1.44	31,685	17,391	45,980	0.86

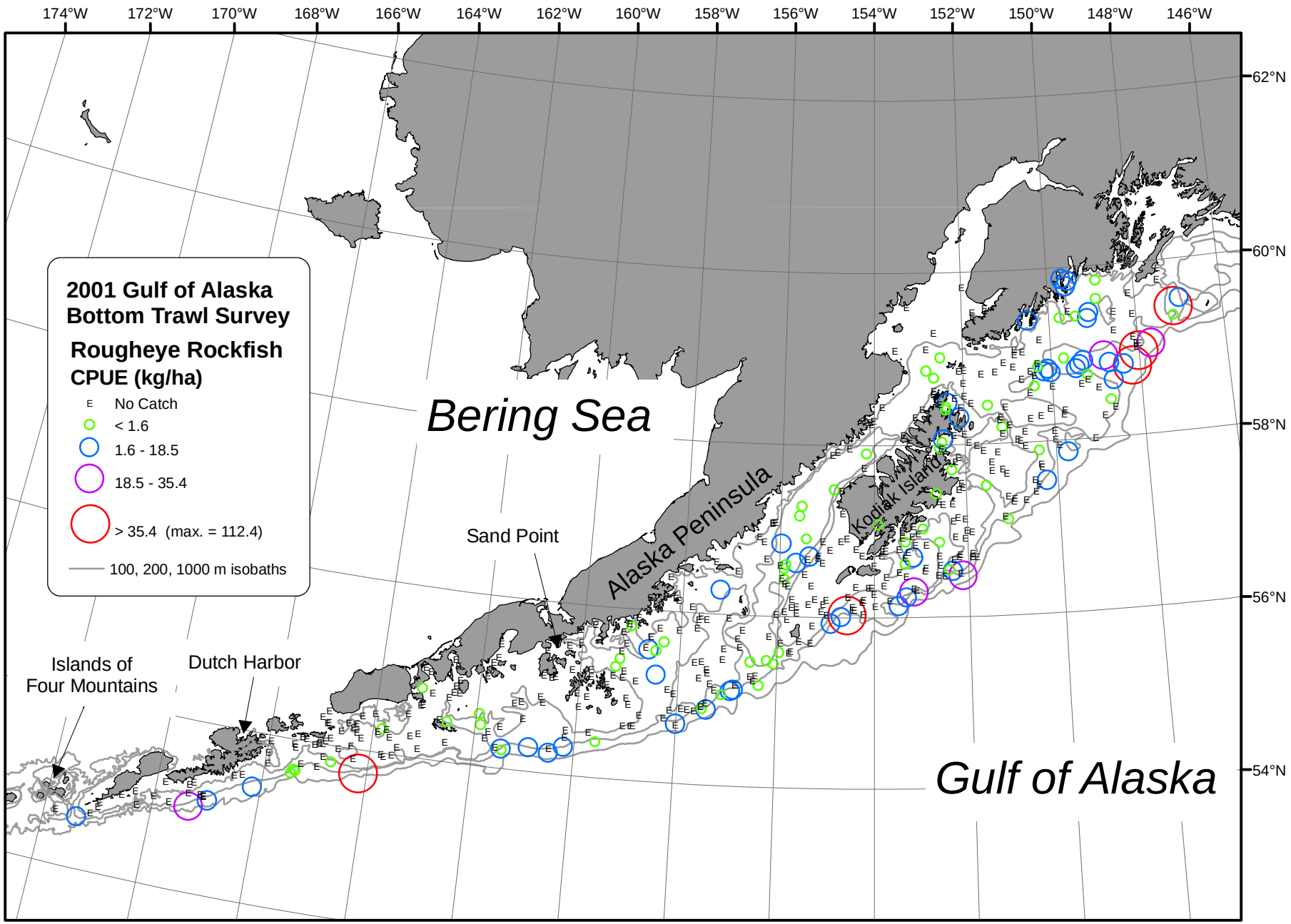

Figure 32.--Distribution and relative abundance of rougheye rockfish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

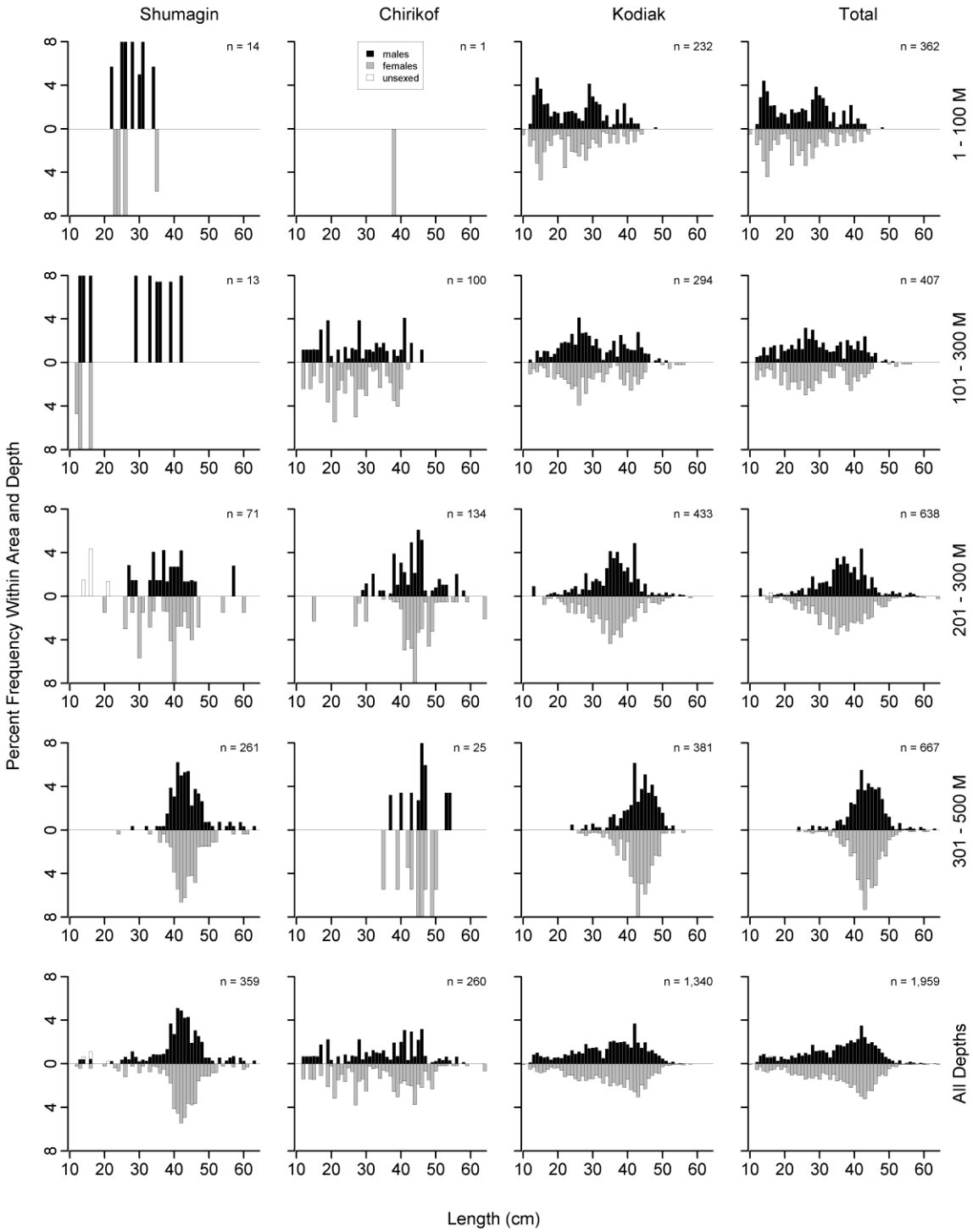

Figure 33. -- Size composition of rougheye rockfish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 42. -- Catch per unit of effort by stratum for rougheye rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	301 - 500	Kodiak Slope	7	7	30.422	8858.1	0	19392.3
Shumagin	301 - 500	Shumagin Slope	6	6	23.205	5873.5	0	15605.7
Kodiak	201 - 300	Kenai Gullies	14	11	9.137	6085	0	13638.9
Chirikof	201 - 300	Chirikof Slope	8	6	7.417	1133.6	0	3251.2
Kodiak	201 - 300	Kodiak Slope	5	3	6.562	1064.7	0	3462.1
Chirikof	301 - 500	Chirikof Slope	5	4	3.346	536.7	0	1179.4
Shumagin	201 - 300	Shumagin Slope	9	8	3.065	854.5	19.8	1689.2
Kodiak	1 - 100	Kenai Peninsula	9	4	2.321	1220.9	0	2501.2
Kodiak	101 - 200	Kenai Flats	15	6	1.514	1828.8	0	4112.3
Kodiak	101 - 200	Portlock Flats	17	6	1.214	891	0	1867.7
Chirikof	101 - 200	East Shumagin Gully	16	6	0.82	910.2	0	1998
Chirikof	201 - 300	Lower Shelikof Gully	14	10	0.787	788.7	149.6	1427.8
Kodiak	201 - 300	Upper Shelikof Gully	2	1	0.591	189.5	0	2596.7
Kodiak	101 - 200	Kodiak Outer Shelf	22	3	0.585	294.2	0	844.2
Kodiak	1 - 100	Albatross Shallows	34	10	0.559	322.3	42.2	602.5
Chirikof	101 - 200	Shelikof Edge	19	2	0.225	174.1	0	495.9
Kodiak	101 - 200	Barren Islands	13	4	0.218	238.9	0	489.4
Kodiak	101 - 200	Albatross Gullies	24	7	0.195	154.2	0	316.8
Shumagin	101 - 200	Sanak Gully	6	2	0.15	63.5	0	169.2
Chirikof	101 - 200	Chirikof Outer Shelf	22	2	0.071	35.4	0	105
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.059	48.2	0	150.5
Shumagin	1 - 100	Shumagin Bank	20	1	0.044	54	0	166.9
Shumagin	101 - 200	West Shumagin Gully	7	2	0.035	8	0	25.3
Shumagin	1 - 100	Davidson Bank	35	1	0.027	36.9	0	112.1
Chirikof	1 - 100	Chirikof Bank	31	1	0.013	13.7	0	41.7
Shumagin	1 - 100	Lower Alaska Peninsula	20	1	0.01	6.8	0	21.1

Dusky rockfish (*Sebastes variabilis*)

Orr and Blackburn (2004) distinguished dusky and dark rockfish as separate species. In surveys prior to 1996, these species were reported together as dusky rockfish. They are reported as separate species in this document. Dusky rockfish were found throughout the survey area, exclusively in waters shallower than 300 m. Approximately 72% of its estimated biomass was found in the 101 - 200 m depth range (Fig. 34, Table 43) and very few fish were found in the 200 - 300 m depth range. The highest CPUEs were recorded on the Albatross Shallows, Portlock Flats, and Kodiak Outer Shelf strata which combined to account for over 66% of the estimated biomass even though they constitute less than 22% of the survey area (Table 44). Those fish found in the 1 - 100 m depth range were generally larger than those found in deeper water. Overall the highest concentration of both sexes of fish was around 47 cm Fig. 35). The sex ratio of the dusky rockfish population in the survey area was relatively even with females accounting for approximately 51% of the total estimated population.

Table 43. -- Number of survey hauls, number of hauls with dusky rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	4	0.11	465	0	1,120	0.694
	101 - 200	30	7	3.26	4,788	0	10,868	1.098
	201 - 300	9	3	0.36	100	0	249	1.491
	301 - 500	6	0	---	---	---	---	---
	All depths	139	14	0.87	5,352	0	11,444	1.05
Chirikof	1 - 100	56	6	0.09	226	0	455	0.525
	101 - 200	57	13	0.77	1,836	29	3,643	1.078
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	19	0.33	2,062	240	3,884	0.967
Kodiak	1 - 100	91	10	1.93	7,431	0	20,506	0.86
	101 - 200	91	25	3.65	15,811	3,590	28,032	1.425
	201 - 300	21	2	0.30	348	0	1,732	1.049
	301 - 500	7	0	---	---	---	---	---
	All depths	210	37	2.45	23,590	6,049	41,131	1.176
All areas	1 - 100	241	20	0.77	8,121	0	21,215	0.834
	101 - 200	178	45	2.74	22,435	8,896	35,974	1.308
	201 - 300	52	5	0.17	448	0	1,861	1.123
	301 - 500	18	0	---	---	---	---	---
	All depths	489	70	1.41	31,004	12,446	49,561	1.136

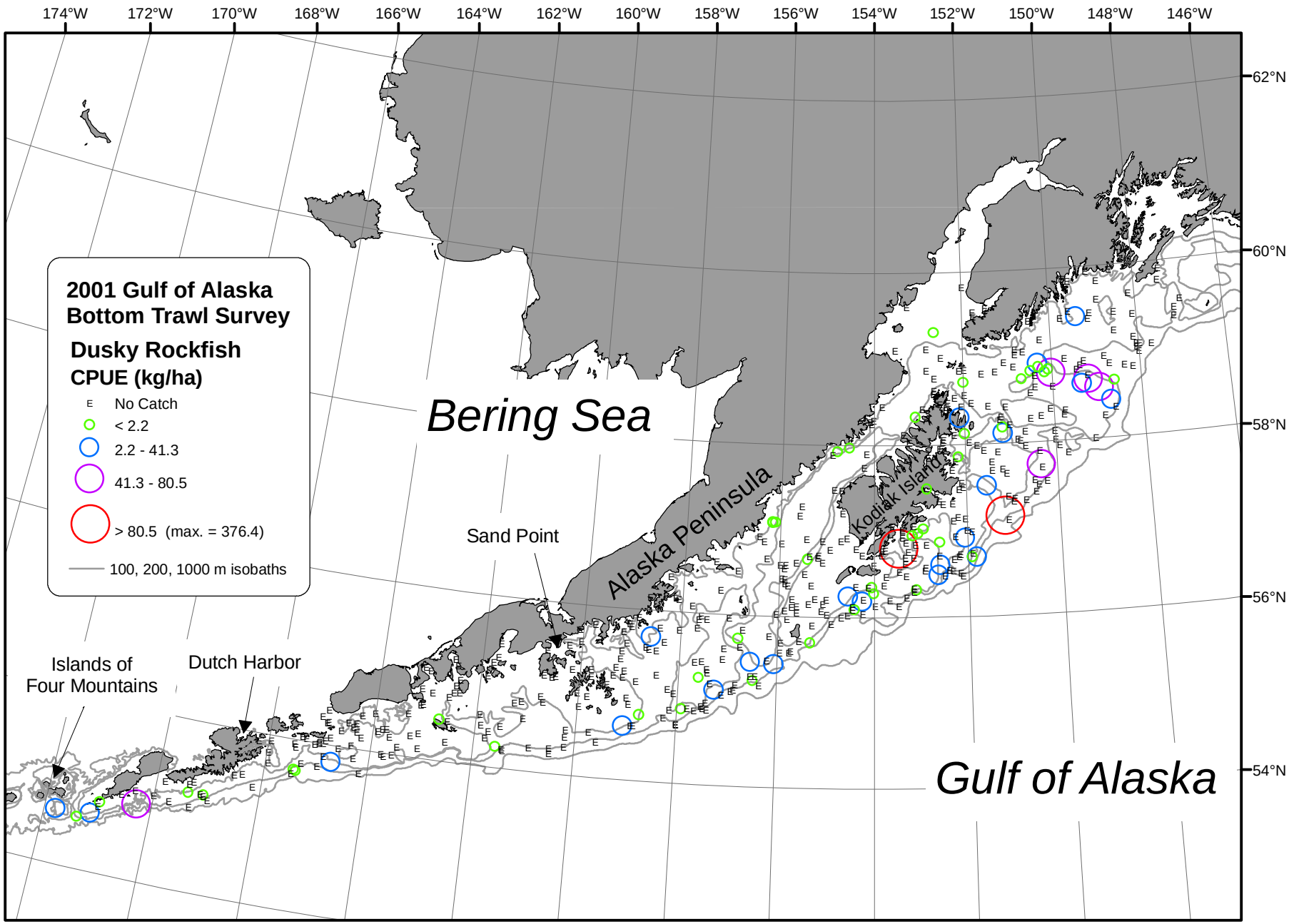

Figure 34.--Distribution and relative abundance of dusky rockfish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

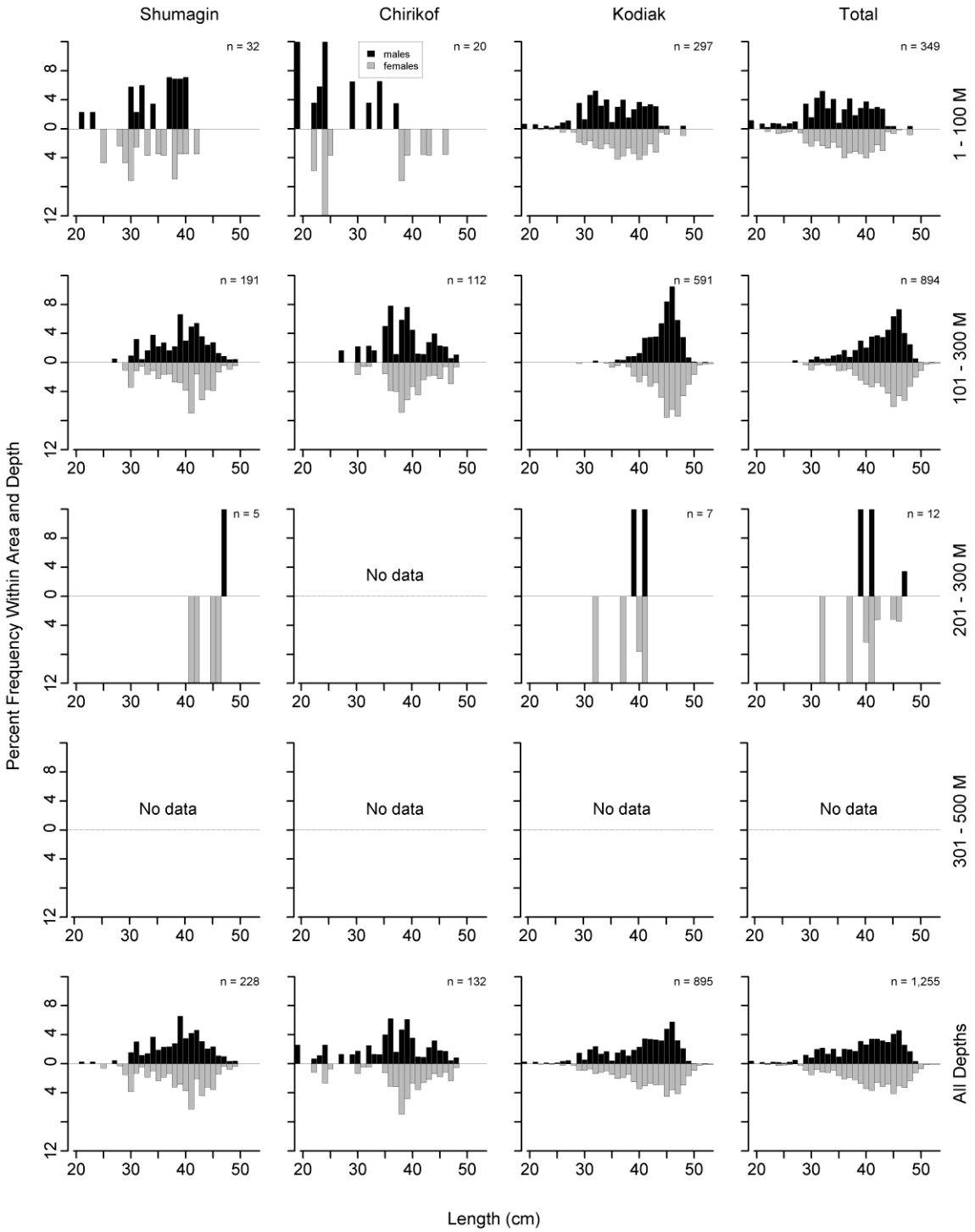

Figure 35. -- Size composition of dusky rockfish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 44. -- Catch per unit of effort by stratum for dusky rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Albatross Shallows	34	7	12.39	7,142	0	20,206
Kodiak	101 - 200	Portlock Flats	17	10	12.23	8,972	0	18,352
Kodiak	101 - 200	Kodiak Outer Shelf	22	6	8.46	4,249	0	11,923
Shumagin	101 - 200	Shumagin Outer Shelf	17	7	5.87	4,788	0	10,897
Kodiak	101 - 200	Albatross Gullies	24	7	2.72	2,148	0	5,407
Chirikof	101 - 200	Chirikof Outer Shelf	22	8	1.70	851	0	1,884
Kodiak	201 - 300	Upper Shelikof Gully	2	1	1.00	321	0	4,394
Chirikof	101 - 200	East Shumagin Gully	16	1	0.60	666	0	2,086
Chirikof	101 - 200	Shelikof Edge	19	4	0.41	319	0	850
Shumagin	201 - 300	Shumagin Slope	9	3	0.36	100	0	252
Shumagin	1 - 100	Shumagin Bank	20	2	0.33	405	0	1,055
Kodiak	101 - 200	Kenai Flats	15	1	0.32	385	0	1,211
Kodiak	1 - 100	Albatross Banks	35	1	0.17	262	0	795
Chirikof	1 - 100	Chirikof Bank	31	2	0.14	149	0	362
Chirikof	1 - 100	Upper Alaska Peninsula	12	3	0.09	72	0	172
Kodiak	1 - 100	Northern Kodiak Shallows	6	1	0.08	18	0	66
Shumagin	1 - 100	Fox Islands	19	1	0.06	52	0	161
Kodiak	101 - 200	Barren Islands	13	1	0.05	56	0	179
Kodiak	201 - 300	Kenai Gullies	14	1	0.04	27	0	86
Kodiak	1 - 100	Lower Cook Inlet	7	1	0.01	10	0	33
Shumagin	1 - 100	Davidson Bank	35	1	0.01	8	0	23
Chirikof	1 - 100	Semidi Bank	13	1	0.01	4	0	13

Sharpchin rockfish (*Sebastes zacentrus*)

Sharpchin rockfish were rarely captured west of Kodiak Island (Fig. 36). Over 98% of its biomass estimate occurred in the Kodiak INPFC area (Table 45). The highest CPUEs were recorded between 100 - 200 m in a stratum northeast of Portlock Bank (Table 46). All sharpchin rockfish caught in this survey came from depths between 100 - 300 m (Tables 45-46). The size composition of females showed a significant mode at 32 cm (Fig. 37). The male length frequency distribution was much more spread out and no distinct pattern was visible. The sex ratio of the sharpchin rockfish population in the survey showed a much higher percentage (65%) of females in the population.

Table 45. -- Number of survey hauls, number of hauls with sharpchin rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	1	<1	1	0	2	0.031
	201 - 300	9	1	0.08	23	0	74	0.334
	301 - 500	6	0	---	---	---	---	---
	All depths	139	2	<1	23	0	74	0.266
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	1	<1	4	0	15	0.575
	301 - 500	5	0	---	---	---	---	---
	All depths	140	1	<1	4	0	15	0.575
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	9	0.40	1,739	0	4,338	0.364
	201 - 300	21	2	0.03	31	0	107	0.405
	301 - 500	7	0	---	---	---	---	---
	All depths	210	11	0.18	1,770	0	4,370	0.364
All areas	1 - 100	241	0	---	---	---	---	---
	101 - 200	178	10	0.21	1,740	0	4,339	0.362
	201 - 300	52	4	0.02	58	0	138	0.382
	301 - 500	18	0	---	---	---	---	---
	All depths	489	14	0.08	1,797	0	4,398	0.363

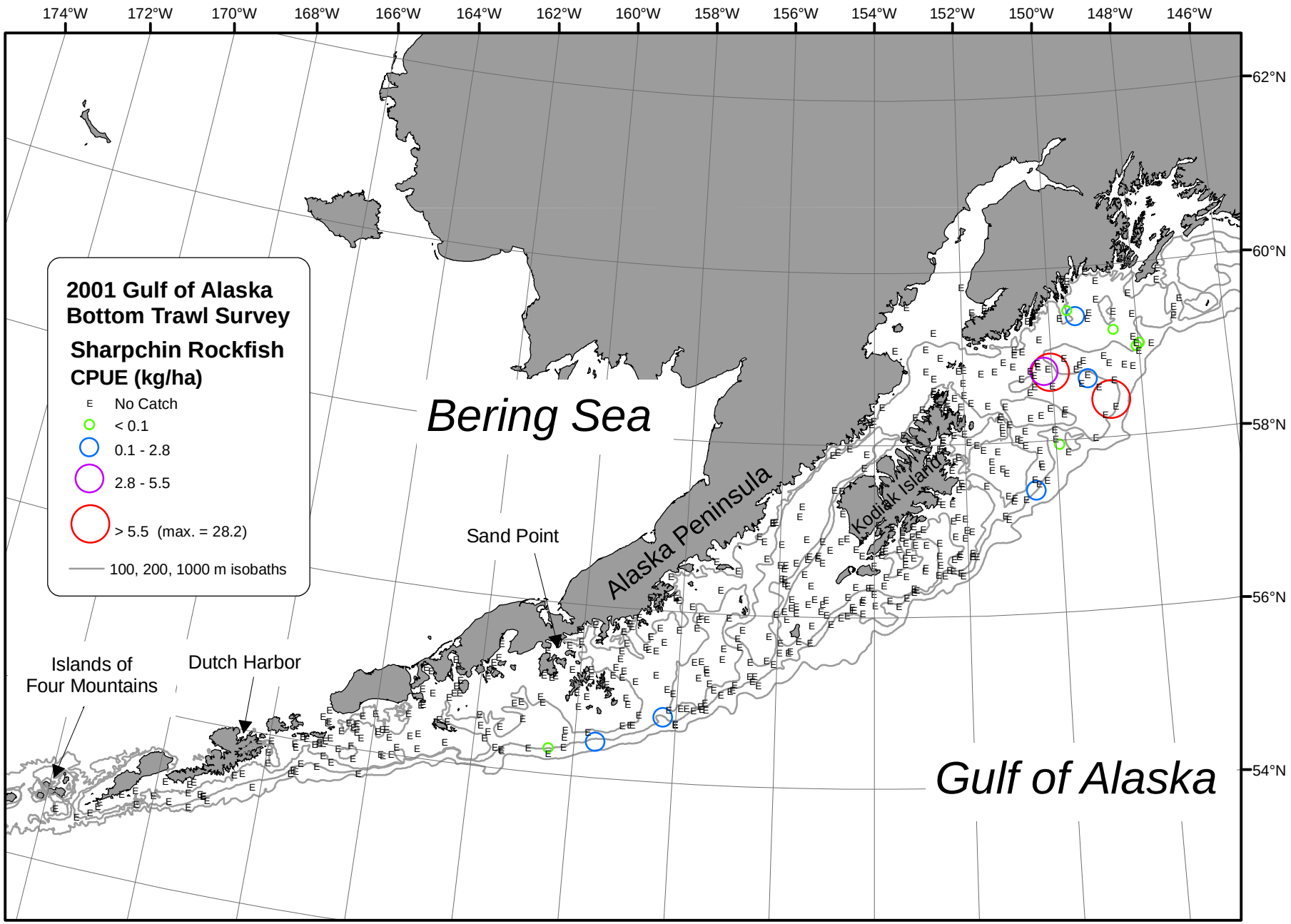

Figure 36.--Distribution and relative abundance of sharpchin rockfish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

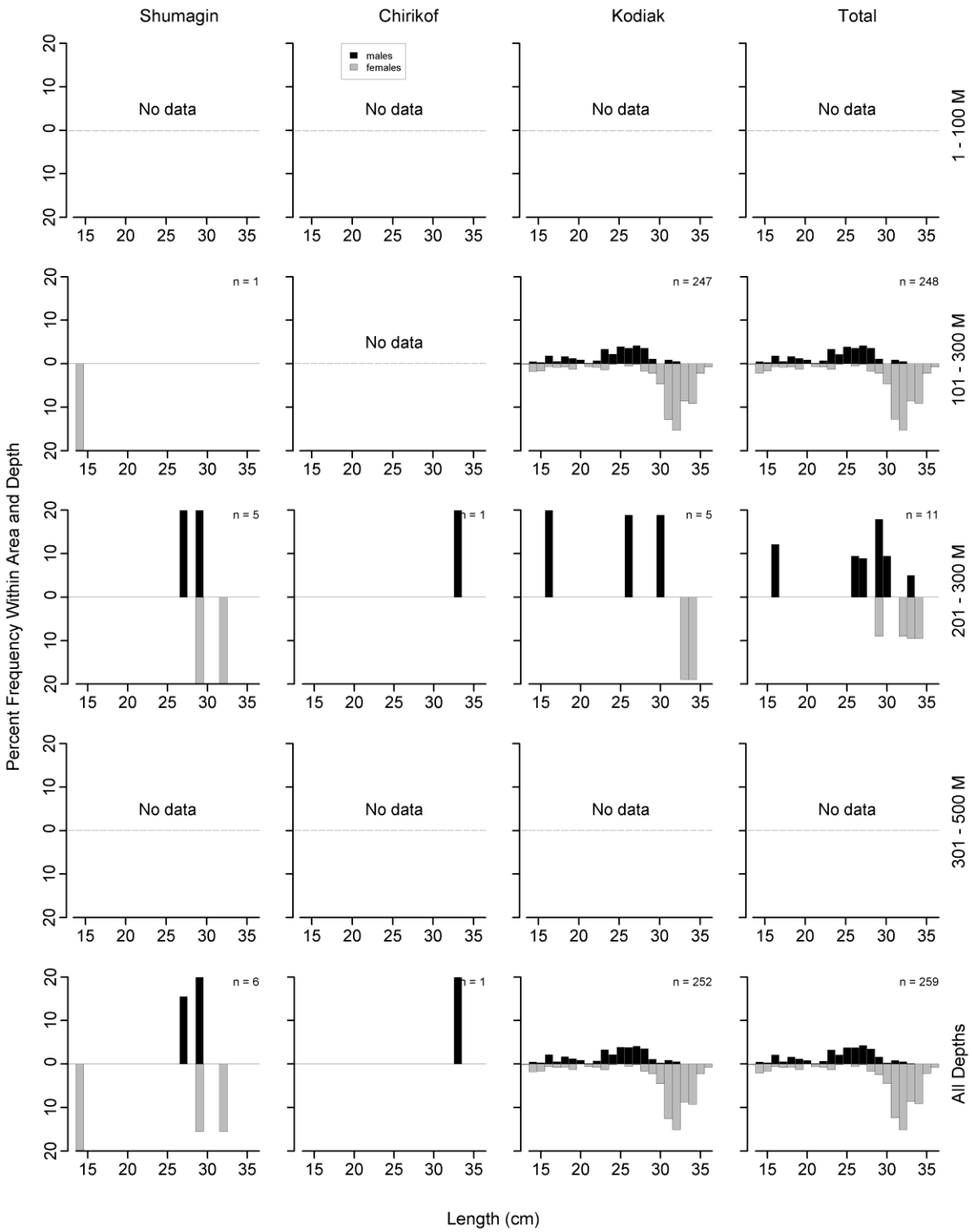

Figure 37. -- Size composition of sharpchin rockfish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 46. -- Catch per unit of effort by stratum for sharpchin rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Portlock Flats	17	3	2.06	1,511	0	4,093
Kodiak	101 - 200	Kodiak Outer Shelf	22	3	0.37	184	0	560
Kodiak	201 - 300	Kodiak Slope	5	1	0.18	30	0	112
Shumagin	201 - 300	Shumagin Slope	9	1	0.08	23	0	75
Kodiak	101 - 200	Kenai Flats	15	3	0.04	44	0	127
Chirikof	201 - 300	Chirikof Slope	8	1	0.03	4	0	15
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.00	1	0	2
Kodiak	201 - 300	Kenai Gullies	14	1	0.00	1	0	3

Shortraker rockfish (*Sebastes borealis*)

Shortraker rockfish were found throughout the survey area, although almost exclusively on the continental slope in the 200 - 500 m depth range (Fig. 38, Table 48). The highest CPUEs were consistently recorded in the 301 - 500 m depth range, which accounted for almost 66% of the total biomass (Table 48). In this depth range, shortraker rockfish were caught in about 94% of the tows. Shortraker rockfish were abundant in the Kodiak and Shumagin INPFC areas which provided approximately 91% of the estimated biomass even though it constitutes less than 14% of the survey area deeper than 200 m (Table 47). The length data showed both sexes distributed broadly between 40 and 80 cm with a mode around 57 cm (Fig. 39). This species displayed a similar size compostion at all depths where they were caught. The sex ratio of the shortraker rockfish population in the survey area was almost exactly even.

Table 47. -- Number of survey hauls, number of hauls with shortraker rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	3	1.67	467	0	1,050	2.391
	301 - 500	6	5	15.20	3,846	382	7,310	2.658
	All depths	139	8	0.70	4,313	792	7,834	2.626
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	3	0.30	342	0	1,024	2.411
	301 - 500	5	5	7.78	1,247	127	2,367	2.449
	All depths	140	8	0.25	1,589	344	2,834	2.441
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	1	0.07	321	0	988	4.635
	201 - 300	21	7	4.21	4,832	0	10,262	3.58
	301 - 500	7	7	21.84	6,359	2,557	10,162	3.038
	All depths	210	15	1.20	11,513	5,430	17,596	3.278
All areas	1 - 100	241	0	---	---	---	---	---
	101 - 200	178	1	0.04	321	0	988	4.635
	201 - 300	52	13	2.18	5,641	241	11,041	3.344
	301 - 500	18	17	16.25	11,453	6,731	16,174	2.828
	All depths	489	31	0.79	17,415	10,685	24,145	3

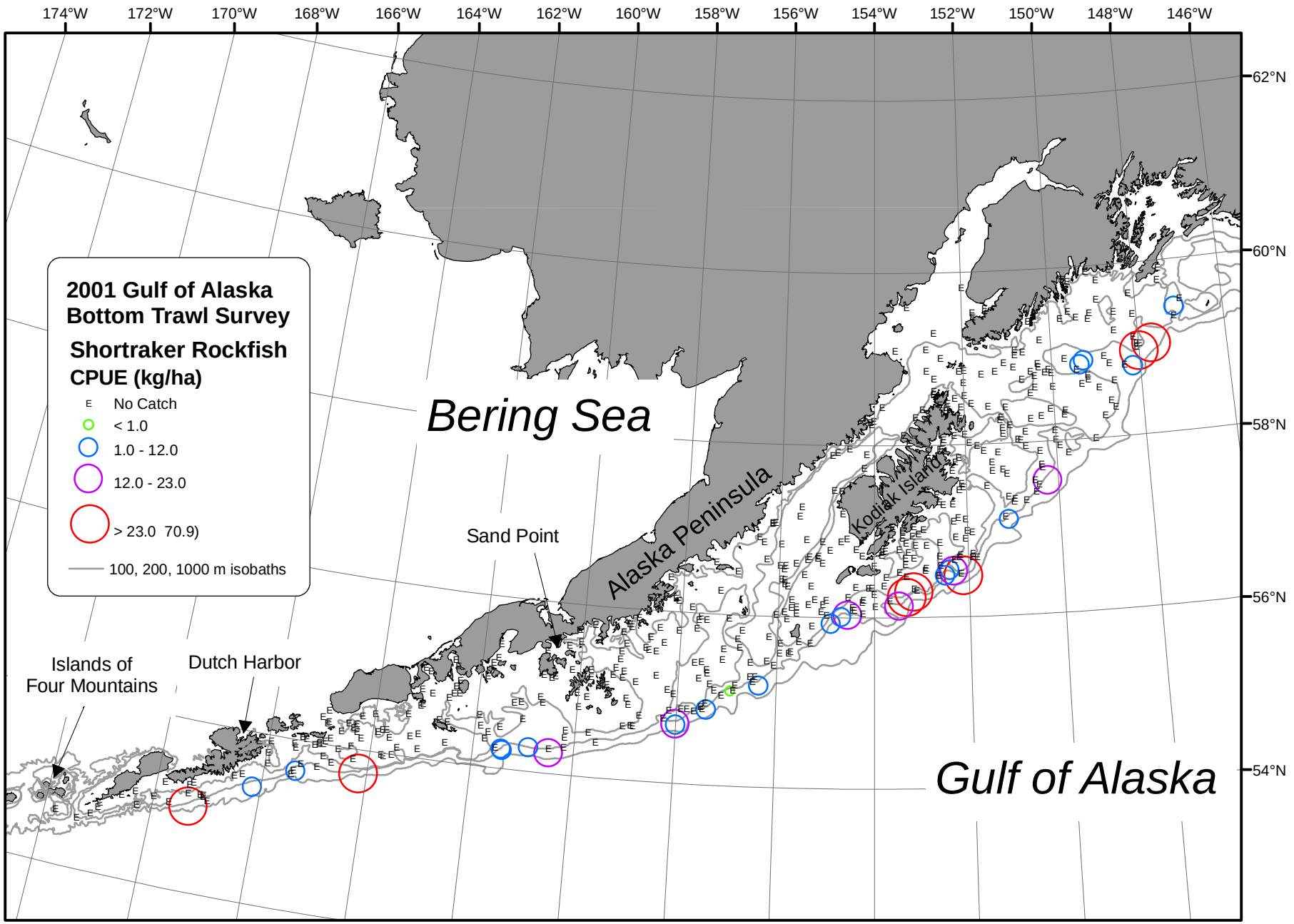

Figure 38.--Distribution and relative abundance of shortraker rockfish from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

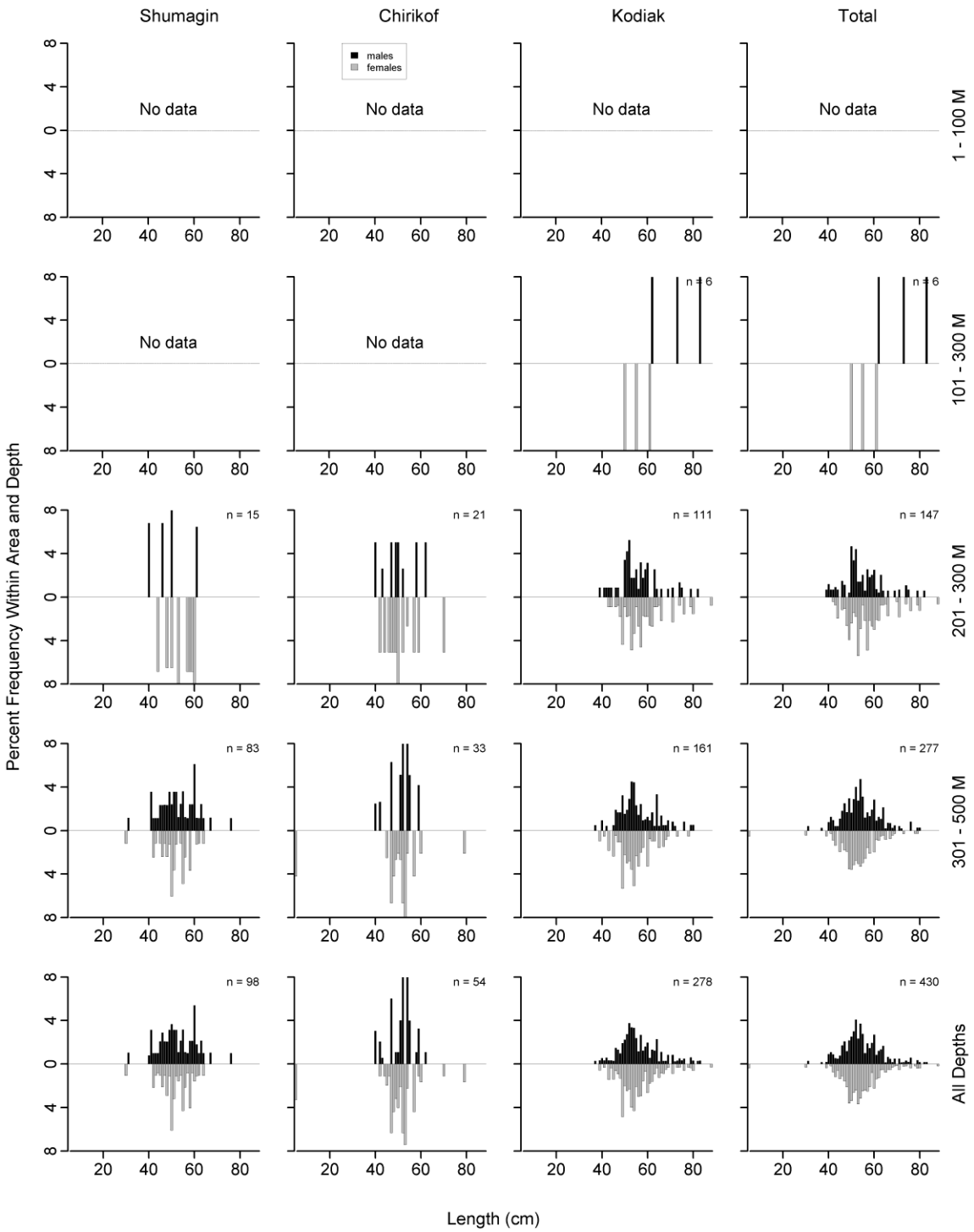

Figure 39. -- Size composition of shortraker rockfish from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 48. -- Catch per unit of effort by stratum for shortraker rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Kodiak Slope	5	4	25.40	4,121	0	10,505
Kodiak	301 - 500	Kodiak Slope	7	7	21.84	6,359	2,425	10,293
Shumagin	301 - 500	Shumagin Slope	6	5	15.20	3,846	207	7,486
Chirikof	301 - 500	Chirikof Slope	5	5	7.78	1,247	38	2,456
Chirikof	201 - 300	Chirikof Slope	8	3	2.24	342	0	1,042
Shumagin	201 - 300	Shumagin Slope	9	3	1.67	467	0	1,061
Kodiak	201 - 300	Kenai Gullies	14	3	1.07	712	0	1,803
Kodiak	101 - 200	Kodiak Outer Shelf	22	1	0.64	321	0	990

Shortspine thornyhead (*Sebastolobus alascanus*)

Shortspine thornyhead were found throughout the survey in all three INPFC areas and in all tows deeper than 300 m (Fig. 40, Table 49). The highest CPUEs were recorded in the slope strata between 300 and 500 m, which contained approximately 46% of its total biomass (Tables 49 and 50). Population length distributions were similar in all areas and at all depths, with both males and females exhibiting length modes between approximately 27 and 30 cm FL and considerable representation between 10 and 40 cm (Fig. 41). The sex ratio of the shortspine thornyhead population in the survey area was about even.

Table 49. -- Number of survey hauls, number of hauls with shortspine thornyhead, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	8	14.28	3,981	1,601	6,362	0.239
	301 - 500	6	6	18.85	4,771	2,175	7,368	0.216
	All depths	139	14	1.43	8,753	5,547	11,959	0.226
Chirikof	1 - 100	56	1	<1	11	0	35	0.518
	101 - 200	57	3	0.06	140	0	412	0.232
	201 - 300	22	10	1.69	1,950	919	2,982	0.24
	301 - 500	5	5	18.90	3,032	1,367	4,696	0.292
	All depths	140	19	0.81	5,133	3,414	6,851	0.268
Kodiak	1 - 100	91	2	0.01	35	0	96	0.276
	101 - 200	91	9	0.38	1,636	140	3,132	0.249
	201 - 300	21	20	6.69	7,687	5,618	9,757	0.274
	301 - 500	7	7	18.60	5,417	3,791	7,043	0.196
	All depths	210	38	1.54	14,776	11,929	17,622	0.237
All areas	1 - 100	241	3	<1	46	0	110	0.311
	101 - 200	178	12	0.22	1,776	257	3,294	0.247
	201 - 300	52	38	5.27	13,619	10,518	16,720	0.258
	301 - 500	18	18	18.76	13,220	10,125	16,316	0.22
	All depths	489	71	1.30	28,661	24,249	33,074	0.238

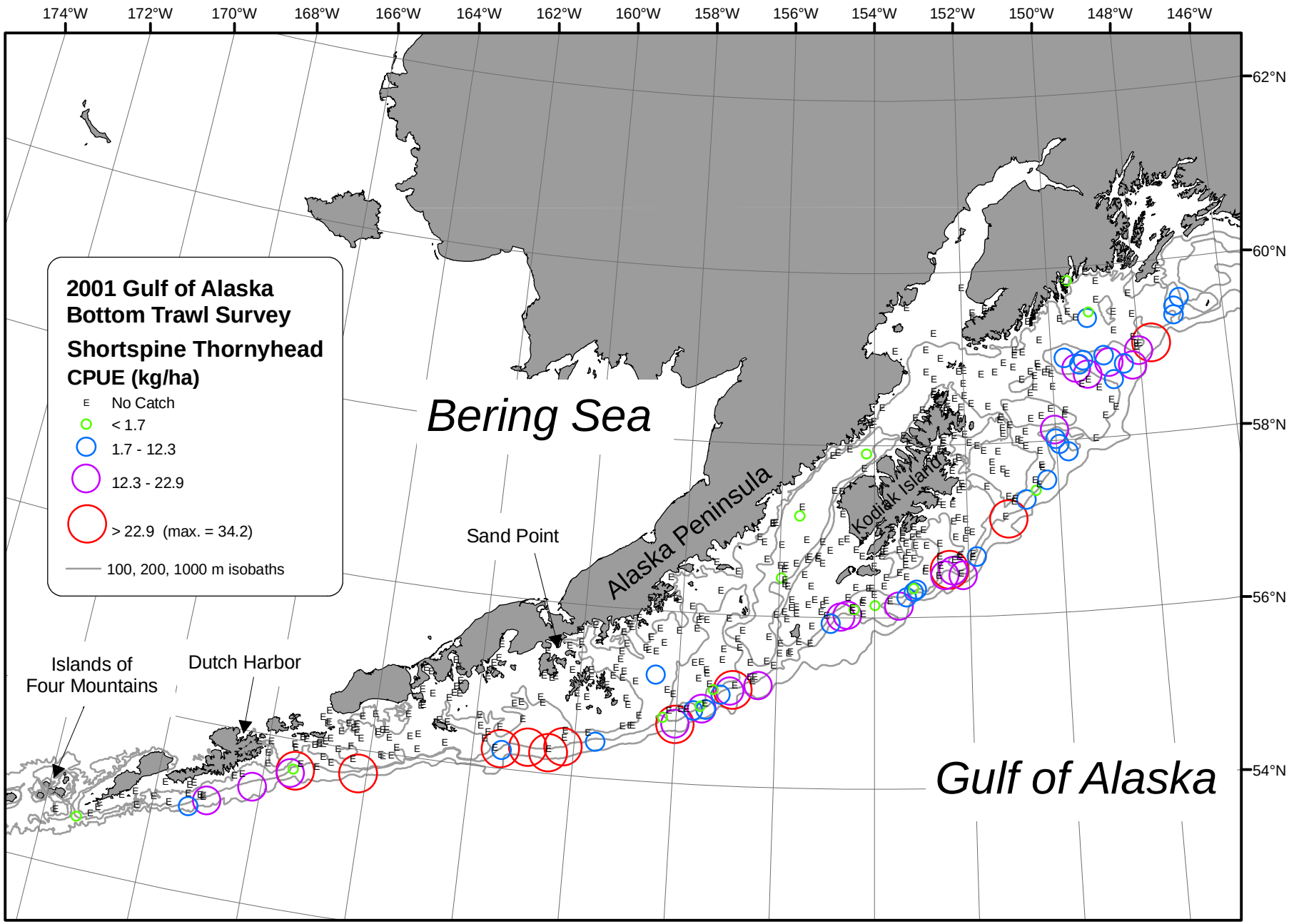

Figure 40.--Distribution and relative abundance of shortspine thornyhead from the 2001 Gulf of Alaska bottom trawl survey Relative abundance is categorized by no catch, sample CPUE less than the mean CPUE, between the mean CPUE and two standard deviations above the mean, between two and four standard deviations above the mean, and greater than four standard deviations above the mean.

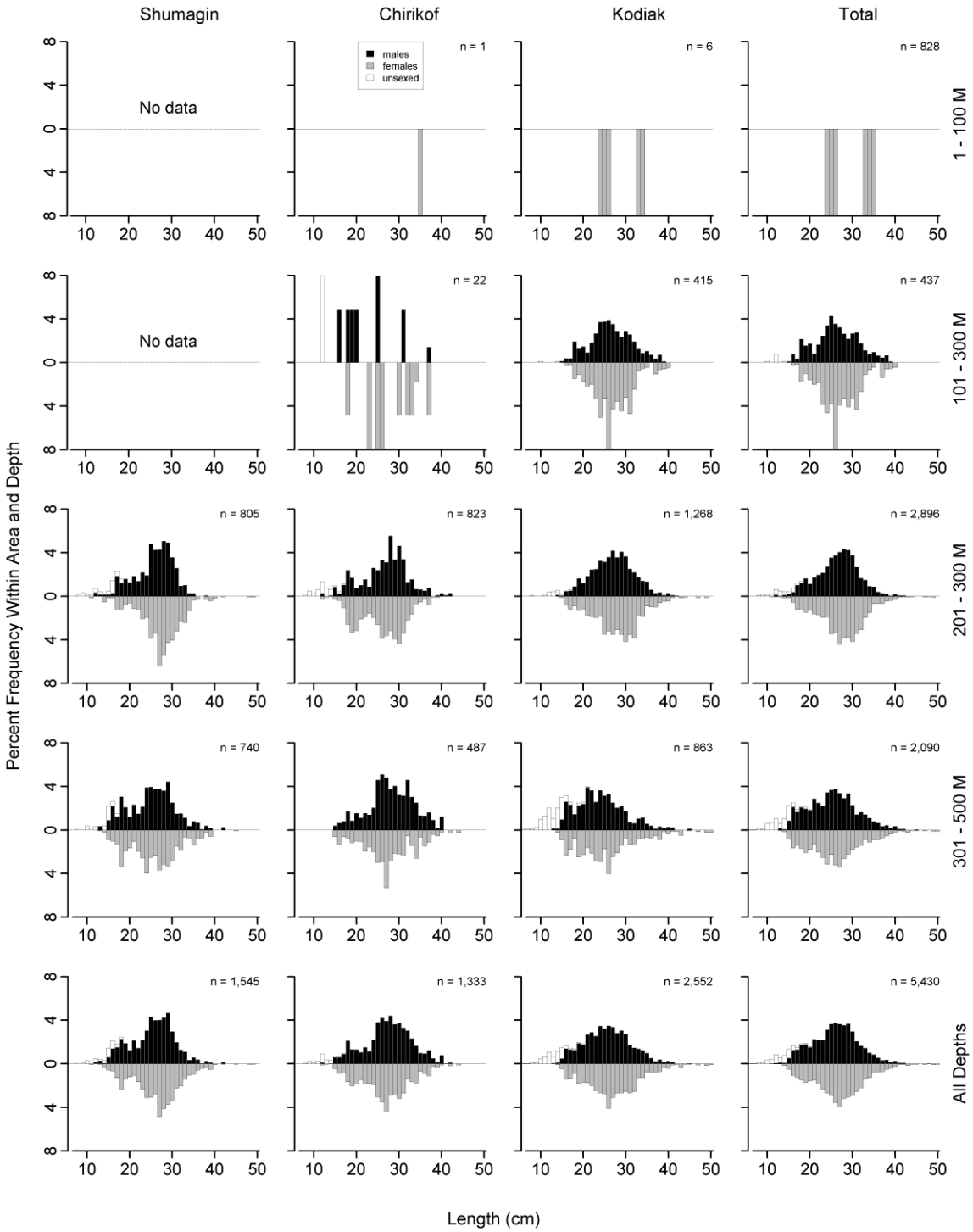

Figure 41. -- Size composition of shortspine thornyhead from the 2001 Gulf of Alaska bottom trawl survey by International North Pacific Fisheries Commission statistical areas and depth intervals.

Table 50. -- Catch per unit of effort by stratum for shortspine thornyhead sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Chirikof	301 - 500	Chirikof Slope	5	5	18.90	3,032	1,234	4,829
Shumagin	301 - 500	Shumagin Slope	6	6	18.85	4,771	2,043	7,500
Kodiak	301 - 500	Kodiak Slope	7	7	18.60	5,417	3,735	7,100
Shumagin	201 - 300	Shumagin Slope	9	8	14.28	3,981	1,555	6,408
Kodiak	201 - 300	Kodiak Slope	5	5	13.35	2,167	426	3,908
Chirikof	201 - 300	Chirikof Slope	8	8	12.47	1,906	813	2,999
Kodiak	201 - 300	Kenai Gullies	14	14	8.25	5,491	3,863	7,118
Kodiak	101 - 200	Kodiak Outer Shelf	22	6	1.72	863	0	1,855
Kodiak	101 - 200	Portlock Flats	17	1	0.74	539	0	1,682
Kodiak	101 - 200	Kenai Flats	15	2	0.19	234	0	604
Chirikof	101 - 200	East Shumagin Gully	16	1	0.12	128	0	402
Kodiak	201 - 300	Upper Shelikof Gully	2	1	0.09	30	0	413
Kodiak	1 - 100	Kenai Peninsula	9	1	0.05	27	0	90
Chirikof	201 - 300	Lower Shelikof Gully	14	2	0.04	44	0	110
Chirikof	101 - 200	Chirikof Outer Shelf	22	2	0.02	11	0	27
Chirikof	1 - 100	Semidi Bank	13	1	0.02	11	0	36
Kodiak	1 - 100	Albatross Banks	35	1	0.01	8	0	24

Other Rockfishes

Dark rockfish (*Sebastes ciliatus*)

Dark rockfish were rarely caught over the course of the survey (Table 51). Catch of this species was reported only in four separate hauls, each in a different stratum. The highest CPUE was recorded along Umnak Island in water between 100 and 200 m. This catch accounted for 82% of the estimated biomass of this species. All three other catches were in water which was 200 - 300 m in depth (Table 52). Little information on length frequency could be derived from the data as the sample size was very small.

Redstripe rockfish (*Sebastes proriger*)

Redstripe rockfish were rare during this survey having been caught in only five hauls (Table 53). While generally more common in the eastern Gulf of Alaska, which was not surveyed in 2001, this species was caught as far west as the Shumagin Islands. All fish were caught shallower than 200 m and all but one of these hauls were in 100 to 200 m strata (Table 54). Approximately 92% of the estimated biomass from this survey came from the Kodiak INPFC area (Table 53).

Silvergray rockfish (*Sebastes brevispinis*)

Silvergray rockfish were very rare and were only encountered in four hauls during the entire survey (Table 55). Like redstripe rockfish this species is generally more common in the eastern Gulf of Alaska. This trend was also illustrated by the fact that estimated biomass decreased within each INPFC area toward the west (Table 55). Capture depths ranged from 1 to 200 m with 75% of the estimated biomass coming from shallower than 100 m (Table 56).

Harlequin rockfish (*Sebastes variegatus*)

Although not frequently caught, harlequin rockfish were caught over the entire survey area, in all depth strata shallower than 300 m (Table 57). The highest CPUEs came from the Portlock Fats and Shumagin and Kodiak Outer Shelf strata in the Kodiak and Shumagin INPFC areas. These strata accounted for 92% of the estimated biomass (Table 58), although they represent less than 1% of the total survey area.

Redbanded rockfish (*Sebastes babcocki*)

Redbanded rockfish were caught infrequently and in relatively modest numbers, but they were caught over the entire range of the survey and from every depth range (Table 59). While 73% of the estimated biomass came from the Kodiak INPFC area, the highest stratum CPUE came from a stratum located in the Shumagin INPFC area (Table 60). This species was most commonly caught in depths between 200 and 300 m which accounted for 65% of the estimated biomass. Size generally increased with depth.

Yelloweye rockfish (*Sebastes ruberrimus*)

Yelloweye rockfish were caught very infrequently and in very modest numbers over most of the range survey area (Table 61). They were caught exclusively in the 100 to 200 m depth strata (Table 62). The highest mean CPUEs were all recorded in the Kodiak INPFC area, which accounted for almost 92% of its estimated biomass.

Table 51. -- Number of survey hauls, number of hauls with dark rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	1	0.01	22	0	68	1.392
	101 - 200	30	1	0.23	340	0	1,057	1.544
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	2	0.06	362	0	1,081	1.534
Chirikof	1 - 100	56	1	0.01	15	0	46	1.017
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	1	<1	15	0	46	1.017
Kodiak	1 - 100	91	1	0.01	36	0	108	0.646
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	1	<1	36	0	108	0.646
All areas	1 - 100	241	3	0.01	73	0	162	0.847
	101 - 200	178	1	0.04	340	0	1,057	1.544
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	4	0.02	413	0	1,136	1.349

Table 52. -- Catch per unit of effort by stratum for dark rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.42	340	0	1,061
Kodiak	1 - 100	Albatross Shallows	34	1	0.06	36	0	108
Shumagin	1 - 100	Fox Islands	19	1	0.03	22	0	68
Chirikof	1 - 100	Chirikof Bank	31	1	0.01	15	0	46

Table 53. -- Number of survey hauls, number of hauls with redstripe rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	1	<1	3	0	8	0.102
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	1	<1	3	0	8	0.102
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	1	<1	7	0	21	0.648
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	1	<1	7	0	21	0.648
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	3	0.03	117	0	272	0.885
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	3	0.01	117	0	272	0.885
All areas	1 - 100	241	1	<1	3	0	8	0.102
	101 - 200	178	4	0.02	124	0	280	0.867
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	5	0.01	127	0	283	0.755

Table 54. -- Catch per unit of effort by stratum for redstripe rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Portlock Flats	17	1	0.09	66	0	207
Kodiak	101 - 200	Kodiak Outer Shelf	22	1	0.06	32	0	98
Kodiak	101 - 200	Kenai Flats	15	1	0.02	19	0	60
Chirikof	101 - 200	Chirikof Outer Shelf	22	1	0.01	7	0	21
Shumagin	1 - 100	Shumagin Bank	20	1	0.00	3	0	8

Table 55. -- Number of survey hauls, number of hauls with silvergray rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	0	---	---	---	---	---
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	1	0.01	16	0	50	1.703
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	1	<1	16	0	50	1.703
Kodiak	1 - 100	91	3	0.01	47	0	118	0.321
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	3	<1	47	0	118	0.321
All areas	1 - 100	241	3	<1	47	0	118	0.321
	101 - 200	178	1	<1	16	0	50	1.703
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	4	<1	63	0	142	0.406

Table 56. -- Catch per unit of effort by stratum for silvergray rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	1 - 100	Kenai Peninsula	9	1	0.06	30	0	98
Chirikof	101 - 200	Chirikof Outer Shelf	22	1	0.03	16	0	50
Kodiak	1 - 100	Albatross Shallows	34	2	0.03	17	0	45

Table 57. -- Number of survey hauls, number of hauls with harlequin rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	1	<1	2	0	5	0.069
	101 - 200	30	2	2.03	2,986	0	8,610	0.371
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	3	0.49	2,987	0	8,611	0.37
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	7	0.09	217	0	473	0.459
	201 - 300	22	2	<1	5	0	12	0.407
	301 - 500	5	0	---	---	---	---	---
	All depths	140	9	0.04	221	0	478	0.457
Kodiak	1 - 100	91	2	0.01	45	0	119	0.115
	101 - 200	91	13	1.18	5,102	0	11,807	0.346
	201 - 300	21	1	0.01	10	0	34	0.67
	301 - 500	7	0	---	---	---	---	---
	All depths	210	16	0.54	5,157	0	11,862	0.34
All areas	1 - 100	241	3	<1	47	0	120	0.112
	101 - 200	178	22	1.01	8,304	0	16,817	0.357
	201 - 300	52	3	0.01	14	0	39	0.554
	301 - 500	18	0	---	---	---	---	---
	All depths	489	28	0.38	8,365	0	16,879	0.353

Table 58. -- Catch per unit of effort by stratum for harlequin rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Portlock Flats	17	4	4.94	3,622	0	10,133
Shumagin	101 - 200	Shumagin Outer Shelf	17	2	3.66	2,986	0	8,636
Kodiak	101 - 200	Kodiak Outer Shelf	22	5	2.19	1,103	0	2,922
Chirikof	101 - 200	Chirikof Outer Shelf	22	6	0.43	215	0	473
Kodiak	101 - 200	Albatross Gullies	24	1	0.25	194	0	597
Kodiak	101 - 200	Kenai Flats	15	3	0.15	183	0	549
Kodiak	201 - 300	Kodiak Slope	5	1	0.06	10	0	36
Chirikof	201 - 300	Chirikof Slope	8	2	0.03	5	0	13
Kodiak	1 - 100	Albatross Banks	35	1	0.02	34	0	104
Kodiak	1 - 100	Albatross Shallows	34	1	0.02	11	0	34
Chirikof	101 - 200	Shelikof Edge	19	1	0.00	1	0	4
Shumagin	1 - 100	Shumagin Bank	20	1	0.00	2	0	5

Table 59. -- Number of survey hauls, number of hauls with redbanded rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	0	---	---	---	---	---
	201 - 300	9	4	0.22	61	0	161	0.457
	301 - 500	6	0	---	---	---	---	---
	All depths	139	4	0.01	61	0	161	0.457
Chirikof	1 - 100	56	1	0.01	29	0	92	1.341
	101 - 200	57	0	---	---	---	---	---
	201 - 300	22	3	0.02	22	0	50	0.925
	301 - 500	5	0	---	---	---	---	---
	All depths	140	4	0.01	51	0	119	1.125
Kodiak	1 - 100	91	2	0.01	21	0	57	0.468
	101 - 200	91	5	0.02	78	7	149	0.551
	201 - 300	21	7	0.17	191	40	343	0.624
	301 - 500	7	1	0.05	13	0	44	0.847
	All depths	210	15	0.03	303	135	472	0.596
All areas	1 - 100	241	3	<1	50	0	122	0.75
	101 - 200	178	5	0.01	78	7	149	0.551
	201 - 300	52	14	0.11	274	98	449	0.591
	301 - 500	18	1	0.02	13	0	44	0.847
	All depths	489	23	0.02	415	215	614	0.604

Table 60. -- Catch per unit of effort by stratum for redbanded rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Kodiak Slope	5	3	0.88	143	0	322
Shumagin	201 - 300	Shumagin Slope	9	4	0.22	61	0	163
Chirikof	201 - 300	Chirikof Slope	8	3	0.14	22	0	51
Kodiak	101 - 200	Portlock Flats	17	5	0.11	78	6	149
Kodiak	201 - 300	Kenai Gullies	14	4	0.07	48	0	119
Kodiak	301 - 500	Kodiak Slope	7	1	0.05	13	0	45
Chirikof	1 - 100	Semidi Bank	13	1	0.04	29	0	92
Kodiak	1 - 100	Albatross Shallows	34	2	0.04	21	0	57

Table 61. -- Number of survey hauls, number of hauls with yelloweye rockfish, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	1	0.03	42	0	129	2.134
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	1	0.01	42	0	129	2.134
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	2	0.04	86	0	218	1.149
	201 - 300	22	0	---	---	---	---	---
	301 - 500	5	0	---	---	---	---	---
	All depths	140	2	0.01	86	0	218	1.149
Kodiak	1 - 100	91	0	---	---	---	---	---
	101 - 200	91	7	0.33	1,423	0	3,016	3.363
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	7	0.15	1,423	0	3,016	3.363
All areas	1 - 100	241	0	---	---	---	---	---
	101 - 200	178	10	0.19	1,550	0	3,148	2.998
	201 - 300	52	0	---	---	---	---	---
	301 - 500	18	0	---	---	---	---	---
	All depths	489	10	0.07	1,550	0	3,148	2.998

Table 62. -- Catch per unit of effort by stratum for yelloweye rockfish sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	101 - 200	Portlock Flats	17	2	1.33	979	0	2,549
Kodiak	101 - 200	Kodiak Outer Shelf	22	3	0.38	189	0	445
Kodiak	101 - 200	Barren Islands	13	1	0.12	133	0	423
Kodiak	101 - 200	Kenai Flats	15	1	0.10	122	0	383
Shumagin	101 - 200	Shumagin Outer Shelf	17	1	0.05	42	0	130
Chirikof	101 - 200	East Shumagin Gully	16	1	0.05	56	0	176
Chirikof	101 - 200	Shelikof Edge	19	1	0.04	29	0	91

SKATES

Alaska skate (*Bathyraja parmifera*)

Alaska skates were caught infrequently and in modest numbers They were represented in only 24 of the 489 tows and only 12 of the 32 survey strata, however they were caught in all of the four depth ranges and in all three INPFC areas (Tables 63-64). Virtually all Alaska skates were caught in water shallower than 300 m. Mean weight generally decreased with depth. The overall estimated biomass was nearly equal among the three shallower depth ranges, however this species' depth distribution varied considerably among the INPFC areas. In the Kodiak area most of the estimated biomass came from the 200 - 300 m depth range, however in the other two areas most of the biomass was found in the 1 - 100 m depth range.

Aleutian skate (*Bathyraja aleutica*)

Although they were caught in a relatively small number of tows, Aleutian skate were caught over almost the entire survey range and in all of the surveyed depth ranges (Table 65). Within the three INPFC areas, the CPUE ranged from being highest in the shallowest depth strata in the Shumagin area to the deepest depth strata in the Kodiak area (Table 66). The Chirikof INPFC area contained almost 46% of the total estimated biomass. Mean fish weight generally decreased with depth.

Bering skate (*Bathyraja interrupta*)

Bering skates were caught in modest numbers throughout the survey area (Table 67). The highest CPUEs were recorded in the Upper Shelikof Gully, the Shelikof Edge and the Lower Shelikof Gully survey strata in the Kodiak and Chirikof INPFC areas (Table 68). Bering skate were caught in all depths but almost 90% of the estimated biomass was recorded in the

101 - 300 m depth range.

Big skate (*Raja binoculata*)

Big skates were caught in modest numbers in approximately 9% of all survey hauls in all three of the INPFC areas (Table 69). The species was much more abundant in the shallowest depth range in each of the three INPFC areas, where over 89% of the estimated biomass was found. None were caught in water deeper than 300 m (Table 70). The sex ratio was strongly skewed in favor of females, which comprised approximately 81% of the catch.

Longnose skate (*Raja rhina*)

Longnose skate were caught in relatively low numbers in approximately 17% of all survey hauls. Although they were caught in all three INPFC areas, over 99% of the estimated biomass came from the Kodiak and Chirikof areas (Table 71). They were caught in all depth ranges less than 300 m and were most commonly caught in the 100 to 200 m depth range (Table 72). Strata with the highest CPUEs were all in the waters surrounding Kodiak Island. The sex ratio of the fish sampled showed that males comprised approximately 60% of the catch.

Table 63. -- Number of survey hauls, number of hauls with Alaska skate, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	6	0.24	1,008	171	1,846	7.428
	101 - 200	30	2	0.14	205	0	646	4.876
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	8	0.20	1,213	309	2,117	6.825
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	5	0.32	755	0	1,547	3.76
	201 - 300	22	4	0.26	304	0	647	2.427
	301 - 500	5	1	0.12	20	0	71	0.927
	All depths	140	10	0.17	1,079	232	1,925	3.106
Kodiak	1 - 100	91	2	0.04	157	0	394	6.426
	101 - 200	91	3	0.09	378	0	901	5.125
	201 - 300	21	1	0.70	809	0	4,291	5.8
	301 - 500	7	0	---	---	---	---	---
	All depths	210	6	0.14	1,343	0	4,063	5.655
All areas	1 - 100	241	8	0.11	1,165	304	2,026	7.275
	101 - 200	178	10	0.16	1,337	346	2,328	4.226
	201 - 300	52	5	0.43	1,113	0	4,662	4.206
	301 - 500	18	1	0.03	20	0	71	0.927
	All depths	489	24	0.16	3,635	1,147	6,123	4.767

Table 64. -- Catch per unit of effort by stratum for Alaska skate sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Upper Shelikof Gully	2	1	2.52	809	0	11,091
Chirikof	101 - 200	Chirikof Outer Shelf	22	3	0.75	377	0	888
Shumagin	1 - 100	Davidson Bank	35	4	0.44	608	14	1,202
Shumagin	101 - 200	Sanak Gully	6	1	0.42	178	0	637
Chirikof	201 - 300	Lower Shelikof Gully	14	3	0.30	297	0	642
Chirikof	101 - 200	East Shumagin Gully	16	1	0.25	273	0	856
Kodiak	101 - 200	Albatross Gullies	24	2	0.23	183	0	505
Shumagin	1 - 100	Shumagin Bank	20	1	0.21	259	0	802
Kodiak	101 - 200	Barren Islands	13	1	0.18	195	0	619
Shumagin	1 - 100	Fox Islands	19	1	0.17	141	0	437
Chirikof	101 - 200	Shelikof Edge	19	1	0.14	104	0	323
Chirikof	301 - 500	Chirikof Slope	5	1	0.12	20	0	75
Shumagin	101 - 200	West Shumagin Gully	7	1	0.12	26	0	91
Kodiak	1 - 100	Albatross Shallows	34	1	0.09	53	0	161
Kodiak	1 - 100	Albatross Banks	35	1	0.07	104	0	316
Chirikof	201 - 300	Chirikof Slope	8	1	0.05	7	0	23

Table 65. -- Number of survey hauls, number of hauls with Aleutian skate, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	3	0.13	554	0	1,268	10.798
	101 - 200	30	3	0.87	1,278	0	3,408	12.251
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	1	0.10	26	0	89	1.491
	All depths	139	7	0.30	1,858	0	4,075	10.743
Chirikof	1 - 100	56	0	---	---	---	---	---
	101 - 200	57	8	0.84	1,997	281	3,712	10.19
	201 - 300	22	7	0.88	1,021	83	1,960	3.368
	301 - 500	5	0	---	---	---	---	---
	All depths	140	15	0.48	3,018	1,114	4,922	6.045
Kodiak	1 - 100	91	1	0.03	106	0	321	14.379
	101 - 200	91	3	0.10	439	0	1,076	8.601
	201 - 300	21	2	0.74	855	0	4,371	9.871
	301 - 500	7	2	1.09	317	0	951	7.345
	All depths	210	8	0.18	1,716	0	5,674	9.123
All areas	1 - 100	241	4	0.06	660	0	1,405	11.246
	101 - 200	178	14	0.45	3,713	959	6,468	10.571
	201 - 300	52	9	0.73	1,876	0	4,449	4.812
	301 - 500	18	3	0.49	343	0	980	5.669
	All depths	489	30	0.30	6,592	3,092	10,092	7.663

Table 66. -- Catch per unit of effort by stratum for Aleutian skate sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Upper Shelikof Gully	2	1	2.54	816	0	11,186
Chirikof	101 - 200	Shelikof Edge	19	4	1.90	1,470	0	3,106
Shumagin	101 - 200	Shumagin Outer Shelf	17	2	1.36	1,106	0	3,225
Kodiak	301 - 500	Kodiak Slope	7	2	1.09	317	0	973
Chirikof	201 - 300	Lower Shelikof Gully	14	6	1.01	1,013	68	1,958
Chirikof	101 - 200	Chirikof Outer Shelf	22	3	0.68	341	0	828
Kodiak	101 - 200	Albatross Gullies	24	2	0.51	402	0	1,036
Shumagin	101 - 200	Sanak Gully	6	1	0.41	172	0	614
Shumagin	1 - 100	Fox Islands	19	2	0.31	260	0	669
Shumagin	1 - 100	Davidson Bank	35	1	0.22	295	0	896
Kodiak	1 - 100	Albatross Shallows	34	1	0.18	106	0	321
Chirikof	101 - 200	East Shumagin Gully	16	1	0.17	186	0	582
Shumagin	301 - 500	Shumagin Slope	6	1	0.10	26	0	92
Kodiak	101 - 200	Kodiak Outer Shelf	22	1	0.07	37	0	114
Kodiak	201 - 300	Kenai Gullies	14	1	0.06	39	0	123
Chirikof	201 - 300	Chirikof Slope	8	1	0.06	9	0	29

Table 67. -- Number of survey hauls, number of hauls with Bering skate, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	2	0.02	99	0	244	2.914
	101 - 200	30	2	0.04	64	0	156	1.629
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	1	0.03	8	0	28	0.45
	All depths	139	5	0.03	170	0	341	1.874
Chirikof	1 - 100	56	2	0.03	70	0	173	1.463
	101 - 200	57	10	0.27	633	185	1,081	2.252
	201 - 300	22	8	0.44	504	35	973	1.695
	301 - 500	5	0	---	---	---	---	---
	All depths	140	21	0.19	1,227	585	1,869	1.92
Kodiak	1 - 100	91	2	0.01	30	0	72	2.187
	101 - 200	91	16	0.17	736	390	1,082	1.582
	201 - 300	21	5	0.34	392	86	698	1.733
	301 - 500	7	1	0.14	39	0	133	1.968
	All depths	210	24	0.12	1,197	789	1,605	1.651
All areas	1 - 100	241	6	0.02	198	19	377	2.084
	101 - 200	178	28	0.18	1,433	871	1,994	1.825
	201 - 300	52	13	0.35	896	389	1,402	1.711
	301 - 500	18	3	0.10	67	0	167	1.326
	All depths	489	50	0.12	2,594	1,830	3,358	1.783

Table 68. -- Catch per unit of effort by stratum for Bering skate sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Upper Shelikof Gully	2	2	0.96	307	0	1,366
Chirikof	101 - 200	Shelikof Edge	19	6	0.54	413	31	796
Chirikof	201 - 300	Lower Shelikof Gully	14	7	0.50	501	29	974
Kodiak	101 - 200	Kenai Flats	15	7	0.32	388	138	638
Kodiak	101 - 200	Barren Islands	13	3	0.17	182	0	397
Chirikof	101 - 200	East Shumagin Gully	16	2	0.15	170	0	421
Kodiak	101 - 200	Portlock Flats	17	3	0.15	112	0	248
Kodiak	301 - 500	Kodiak Slope	7	1	0.14	39	0	136
Kodiak	201 - 300	Kenai Gullies	14	3	0.13	85	0	188
Chirikof	301 - 500	Chirikof Slope	5	1	0.12	20	0	75
Chirikof	101 - 200	Chirikof Outer Shelf	22	2	0.10	50	0	122
Shumagin	101 - 200	Shumagin Outer Shelf	17	2	0.08	64	0	156
Shumagin	1 - 100	Fox Islands	19	1	0.07	61	0	188
Kodiak	101 - 200	Albatross Gullies	24	2	0.07	51	0	125
Kodiak	1 - 100	Albatross Shallows	34	2	0.05	30	0	72
Chirikof	1 - 100	Upper Alaska Peninsula	12	1	0.05	40	0	127
Chirikof	1 - 100	Semidi Bank	13	1	0.04	30	0	95
Shumagin	301 - 500	Shumagin Slope	6	1	0.03	8	0	29
Shumagin	1 - 100	Davidson Bank	35	1	0.03	38	0	116
Chirikof	201 - 300	Chirikof Slope	8	1	0.02	3	0	9
Kodiak	101 - 200	Kodiak Outer Shelf	22	1	0.01	3	0	8

Table 69. -- Number of survey hauls, number of hauls with big skate, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	11	1.69	6,998	1,050	12,946	29.828
	101 - 200	30	3	0.97	1,427	0	3,090	32.865
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	14	1.37	8,425	2,314	14,536	30.302
Chirikof	1 - 100	56	12	4.84	12,604	2,011	23,197	24.852
	101 - 200	57	2	0.35	839	0	2,163	24.692
	201 - 300	22	2	1.60	1,848	0	4,542	36.822
	301 - 500	5	0	---	---	---	---	---
	All depths	140	16	2.43	15,291	4,316	26,266	25.859
Kodiak	1 - 100	91	16	3.99	15,367	6,835	23,898	19.679
	101 - 200	91	0	---	---	---	---	---
	201 - 300	21	0	---	---	---	---	---
	301 - 500	7	0	---	---	---	---	---
	All depths	210	16	1.60	15,367	6,835	23,898	19.679
All areas	1 - 100	241	39	3.30	34,969	20,582	49,356	22.966
	101 - 200	178	5	0.28	2,265	320	4,210	29.277
	201 - 300	52	2	0.72	1,848	0	4,542	36.822
	301 - 500	18	0	---	---	---	---	---
	All depths	489	46	1.77	39,082	24,349	53,816	23.684

Table 70. -- Catch per unit of effort by stratum for big skate sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Chirikof	1 - 100	Chirikof Bank	31	11	11.44	12,346	1,766	22,926
Kodiak	1 - 100	Lower Cook Inlet	7	5	9.42	9,314	2,090	16,537
Shumagin	101 - 200	West Shumagin Gully	7	3	6.26	1,427	0	3,148
Kodiak	1 - 100	Albatross Shallows	34	7	3.15	1,814	0	4,184
Kodiak	1 - 100	Albatross Banks	35	4	2.75	4,240	0	8,927
Shumagin	1 - 100	Shumagin Bank	20	2	2.50	3,097	0	8,284
Chirikof	201 - 300	Lower Shelikof Gully	14	2	1.85	1,848	0	4,561
Shumagin	1 - 100	Fox Islands	19	2	1.80	1,497	0	3,948
Shumagin	1 - 100	Lower Alaska Peninsula	20	2	1.23	846	0	2,110
Shumagin	1 - 100	Davidson Bank	35	5	1.14	1,558	18	3,098
Chirikof	101 - 200	Shelikof Edge	19	2	1.08	839	0	2,168
Chirikof	1 - 100	Upper Alaska Peninsula	12	1	0.33	258	0	826

Table 71. -- Number of survey hauls, number of hauls with longnose skate, mean CPUE, biomass, and mean weight, based on the 2001 Gulf of Alaska biennial bottom trawl survey, by International North Pacific Fisheries Commission statistical areas and depth intervals.

INPFC area	Depth (m)	Number of hauls	Hauls with catch	Mean CPUE (kg/ha)	Estimated biomass (t)	Lower 95% biomass CI (t)	Upper 95% biomass CI (t)	Mean weight (kg)
Shumagin	1 - 100	94	0	---	---	---	---	---
	101 - 200	30	2	0.07	104	0	271	2.627
	201 - 300	9	0	---	---	---	---	---
	301 - 500	6	0	---	---	---	---	---
	All depths	139	2	0.02	104	0	271	2.627
Chirikof	1 - 100	56	9	1.25	3,248	381	6,116	12.866
	101 - 200	57	17	1.68	4,002	1,748	6,255	9.675
	201 - 300	22	5	1.95	2,253	350	4,155	9.599
	301 - 500	5	0	---	---	---	---	---
	All depths	140	31	1.51	9,503	5,536	13,469	10.55
Kodiak	1 - 100	91	23	1.12	4,311	2,251	6,371	10.418
	101 - 200	91	26	1.48	6,406	3,521	9,290	8.895
	201 - 300	21	3	2.57	2,951	0	14,050	11.514
	301 - 500	7	0	---	---	---	---	---
	All depths	210	52	1.42	13,668	5,671	21,665	9.831
All areas	1 - 100	241	32	0.71	7,559	4,090	11,028	11.346
	101 - 200	178	45	1.28	10,512	6,892	14,131	8.958
	201 - 300	52	8	2.02	5,204	0	13,883	10.599
	301 - 500	18	0	---	---	---	---	---
	All depths	489	85	1.06	23,275	15,178	31,371	9.986

Table 72. -- Catch per unit of effort by stratum for longnose skate sorted by descending CPUE for the 2001 Gulf of Alaska bottom trawl survey.

INPFC area	Depth range	Stratum name	Number of hauls	Hauls with catch	CPUE (kg/ha)	Biomass (t)	Lower CI biomass	Upper CI biomass
Kodiak	201 - 300	Upper Shelikof Gully	2	1	8.00	2,565	0	35,159
Kodiak	1 - 100	Northern Kodiak Shallows	6	3	3.24	714	0	1,799
Chirikof	101 - 200	Shelikof Edge	19	9	2.80	2,164	421	3,907
Kodiak	101 - 200	Portlock Flats	17	9	2.50	1,834	466	3,202
Kodiak	1 - 100	Albatross Shallows	34	13	2.36	1,363	602	2,124
Chirikof	201 - 300	Lower Shelikof Gully	14	5	2.25	2,253	337	4,168
Chirikof	1 - 100	Upper Alaska Peninsula	12	3	2.24	1,776	0	4,415
Kodiak	101 - 200	Kenai Flats	15	6	2.17	2,622	436	4,809
Kodiak	1 - 100	Kenai Peninsula	9	3	1.84	968	0	2,107
Chirikof	101 - 200	East Shumagin Gully	16	5	1.43	1,585	80	3,091
Kodiak	101 - 200	Albatross Gullies	24	5	1.33	1,055	0	2,146
Chirikof	1 - 100	Chirikof Bank	31	4	1.02	1,100	0	2,300
Kodiak	101 - 200	Kodiak Outer Shelf	22	5	0.88	442	1	882
Kodiak	1 - 100	Albatross Banks	35	4	0.82	1,267	0	2,678
Kodiak	201 - 300	Kenai Gullies	14	2	0.58	386	0	967
Chirikof	1 - 100	Semidi Bank	13	2	0.51	373	0	923
Chirikof	101 - 200	Chirikof Outer Shelf	22	3	0.50	252	0	618
Kodiak	101 - 200	Barren Islands	13	1	0.41	453	0	1,439
Shumagin	101 - 200	West Shumagin Gully	7	1	0.22	51	0	176
Shumagin	101 - 200	Sanak Gully	6	1	0.13	53	0	190

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APPENDIX A

Strata Specifications and Locations

Appendix Table A-1 presents the survey stratum definitions for the 2001 Gulf of Alaska biennial bottom trawl survey including depth range, stratum name, and the area in square nautical miles and square kilometers. Appendix Table A-2 presents the summary stratum code definitions. Appendix Figures A-1 through A-5 are charts showing the locations and extent of the strata as defined.

Appendix Table A-1. -- Survey strata used for the 2001 Gulf of Alaska biennial survey including depth, stratum code, name and area in square nautical miles (nmi^2) and square kilometers (km^2).

Depth range (m)	Stratum code	Stratum name	Area (nmi^2)	Area (km^2)
1 - 100	10	Fox Islands	2,430	8,333
	11	Davidson Bank	3,989	13,681
	12	Lower Alaska Peninsula	2,005	6,876
	13	Shumagin Bank	3,615	12,399
	20	Upper Alaska Peninsula	2,315	7,941
	21	Semidi Bank	2,129	7,302
	22	Chirikof Bank	3,147	10,792
	30	Albatross Shallows	1,681	5,766
	31	Albatross Banks	4,491	15,403
	32	Lower Cook Inlet	2,883	9,887
	33	Kenai Peninsula	1,534	5,260
	35	Northern Kodiak Shallows	641	2,200
	991	**Subtotal**	**30,860**	**105,840**
101 - 200	110	Sanak Gully	1,238	4,245
	111	Shumagin Outer Shelf	2,377	8,154
	112	West Shumagin Gully	664	2,278
	120	East Shumagin Gully	3,238	11,104
	121	Shelikof Edge	2,255	7,735
	122	Chirikof Outer Shelf	1,461	5,011
	130	Albatross Gullies	2,307	7,912
	131	Portlock Flats	2,139	7,336
	132	Barren Islands	3,202	10,981
	133	Kenai Flats	3,521	12,077
	134	Kodiak Outer Shelf	1,465	5,026
	992	**Subtotal**	**23,867**	**81,859**

Appendix Table A-1. -- Continued.

Depth range (m)	Stratum code	Stratum name	Area (nmi^2)	Area (km^2)
201 - 300	210	Shumagin Slope	813	2,788
	220	Lower Shelikof Gully	2,921	10,018
	221	Chirikof Slope	446	1,528
	230	Kenai Gullies	1,942	6,659
	231	Kodiak Slope	473	1,623
	232	Upper Shelikof Gully	935	3,208
	993	**Subtotal**	**7,530**	**25,824**
301 - 500	310	Shumagin Slope	738	2,531
	320	Chirikof Slope	468	1,604
	330	Kodiak Slope	849	2,912
	994	**Subtotal**	**2,055**	**7,047**
1 – 500	**999**	**Grand Total**	**64,312**	**220,570**

Appendix Table A-2. -- Summary area codes used for the 2001 Gulf of Alaska biennial bottom trawl survey including depth range, International North Pacific Fisheries Commission statistical areas and square area, and strata included in the summary area.

Summary code number	Depth range (m)	INPFC area	Area (nmi^2)	Area (km^2)	Strata included
911	1 - 100	**Shumagin**	12,039	41,289	10 -13
912	101 - 200		4,280	14,677	110 - 112
913	201 - 300		813	2,788	210
914	301 - 500		738	2,531	310
919	1 -500		17,870	61,285	
921	1 - 100	**Chirikof**	7,591	26,035	20-22
922	101 - 200		6,954	23,850	120-122
923	201 - 300		3,350	11,490	230, 231
924	301 - 500		468	1,604	320
929	1 -500		18,363	62,979	
931	1 - 100	**Kodiak**	11,230	38,516	30 - 33, 35
932	101 - 200		12,634	43,332	130 - 134
933	201 - 300		3,350	11,490	230 - 232
934	301 - 500		849	2,912	330
939	1 -500		28,063	96,250	
999	1 – 500	**All Areas**	64,296	220,514	

APPENDIX B

Fish and Invertebrate Taxa Encountered

Appendix Tables B-1 and B-2 list fish and invertebrate taxa encountered and identified during the 2001 Gulf of Alaska biennial bottom trawl survey. Most common and scientific names are from Robins et al. (1991). Order of listings and common names used are for convenience and do not imply adherence to a particular phylogenetic system.

Appendix Table B-1. -- Fish species encountered during the 2001 Gulf of Alaska bottom trawl survey.

Family	Scientific Name	Common Name
Petromyzontidae	*Lampetra tridentata*	Pacific lamprey
Squalidae	*Squalus acanthias*	spiny dogfish
	Somniosus pacificus	Pacific sleeper shark
Rajidae	*Bathyraja* sp.	
	Raja binoculata	big skate
	Bathyraja interrupta	Bering skate
	Raja rhina	longnose skate
	Bathyraja parmifera	Alaska skate
	Bathyraja aleutica	Aleutian skate
Clupeidae	*Clupea pallasi*	Pacific herring
Bathylagidae	*Leuroglossus schmidti*	northern smoothtongue
Osmeridae	*Osmeridae*	smelt unident.
	Thaleichthys pacificus	eulachon
	Mallotus villosus	capelin
Salmonidae	*Oncorhynchus* sp.	salmon unident.
	Oncorhynchus tshawytscha	chinook salmon
	Oncorhynchus kisutch	coho salmon
	Oncorhynchus gorbuscha	pink salmon
	Oncorhynchus keta	chum salmon
	Oncorhynchus nerka	sockeye salmon
	Salvelinus malma	Dolly Varden
Chauliodontidae	*Chauliodus macouni*	Pacific viperfish
Myctophidae	*Myctophidae*	lanternfish unident.
	Stenobrachius leucopsarus	northern lampfish
Macrouridae	*Coryphaenoides acrolepis*	Pacific grenadier
	Albatrossia pectoralis	giant grenadier
	Coryphaenoides cinereus	popeye grenadier
Gadidae	*Microgadus proximus*	Pacific tomcod
	Gadus macrocephalus	Pacific cod
	Eleginus gracilis	saffron cod
	Theragra chalcogramma	walleye pollock
Melamphaeidae	*Poromitra curilensis*	crested bigscale
Scorpaenidae	*Sebastolobus alascanus*	shortspine thornyhead
	Sebastes sp.	rockfish unident.
	Sebastes alutus	Pacific ocean perch
	Sebastes brevispinis	silvergray rockfish
	Sebastes ciliatus	dark rockfish
	Sebastes variabilis	dusky rockfish
	Sebastes maliger	quillback rockfish
	Sebastes melanops	black rockfish
	Sebastes pinniger	canary rockfish
	Sebastes polyspinis	northern rockfish
	Sebastes proriger	redstripe rockfish
	Sebastes ruberrimus	yelloweye rockfish
	Sebastes babcocki	redbanded rockfish
	Sebastes variegatus	harlequin rockfish
	Sebastes zacentrus	sharpchin rockfish

	Sebastes borealis	shortraker rockfish
Anoplopomatidae	*Anoplopoma fimbria*	sablefish
Hexagrammidae	*Ophiodon elongatus*	lingcod
	Pleurogrammus monopterygius	Atka mackerel
	Hexagrammos octogrammus	masked greenling
	Hexagrammos stelleri	whitespotted greenling
	Hexagrammos decagrammus	kelp greenling
Cottidae	*Icelinus borealis*	northern sculpin
	Gymnocanthus pistilliger	threaded sculpin
	Gymnocanthus galeatus	armorhead sculpin
	Artediellus sp.	
	Malacocottus aleuticus	whitetail sculpin
	Malacocottus zonurus	darkfin sculpin
	Hemilepidotus sp.	Irish lord
	Hemilepidotus hemilepidotus	red Irish lord
	Hemilepidotus jordani	yellow Irish lord
	Triglops forficata	scissortail sculpin
	Triglops scepticus	spectacled sculpin
	Triglops pingeli	ribbed sculpin
	Triglops macellus	roughspine sculpin
	Myoxocephalus verrucosus	warty sculpin
	Myoxocephalus polyacanthocephalus	great sculpin
	Myoxocephalus jaok	plain sculpin
	Leptocottus armatus	Pacific staghorn sculpin
	Enophrys diceraus	antlered sculpin
	Dasycottus setiger	spinyhead sculpin
	Psychrolutes paradoxus	tadpole sculpin
	Blepsias bilobus	crested sculpin
	Nautichthys oculofasciatus	sailfin sculpin
	Rhamphocottus richardsoni	grunt sculpin
	Hemitripterus bolini	bigmouth sculpin
	Eurymen gyrinus	smoothcheek sculpin
	Icelus spiniger	thorny sculpin
	Icelus spatula	spatulate sculpin
Agonidae	*Leptagonus leptorhynchus*	longnose poacher
	Leptagonus frenatus	sawback poacher
	Bathyagonus alascanus	gray starsnout
	Bathyagonus infraspinatus	spinycheek starsnout
	Bathyagonus pentacanthus	bigeye poacher
	Bathyagonus nigripinnis	blackfin poacher
	Podothecus accipenserinus	sturgeon poacher
	Hypsagonus quadricornis	fourhorn poacher
Cyclopteridae	*Cyclopterinae*	lumpsucker unident.
	Aptocyclus ventricosus	smooth lumpsucker
	Eumicrotremus orbis	Pacific spiny lumpsucker
	Eumicrotremus derjugini	leatherfin lumpsucker
	Eumicrotremus sp.	spiny lumpsuckers
	Eumicrotremus phrynoides	toad lumpsucker
	Liparidinae	snailfish unident.
	Liparis sp.	

	Liparis gibbus	variegated snailfish
	Elassodiscus sp.	
	Careproctus sp.	
	Careproctus melanurus	blacktail snailfish
	Careproctus gilberti	smalldisk snailfish
	Careproctus colletti	Alaska snailfish
	Careproctus rastrinus	salmon snailfish
	Paraliparis sp.	
Bathymasteridae	*Bathymasteridae*	ronquil unident.
	Ronquilus jordani	northern ronquil
	Bathymaster leurolepis	smallmouth ronquil
	Bathymaster signatus	searcher
Zoarcidae	*Zoarcidae*	eelpout unident.
	Bothrocara molle	soft eelpout
	Lycodes palearis	wattled eelpout
	Lycodes diapterus	black eelpout
	Lycodes brevipes	shortfin eelpout
	Lycodes pacificus	blackbelly eelpout
	Lycodapus sp.	
Stichaeidae	*Stichaeidae*	prickleback unident.
	Stichaeus punctatus	Arctic shanny
	Lumpenus maculatus	daubed shanny
	Lumpenus sagitta	snake prickleback
	Lumpenella longirostris	longsnout prickleback
	Chirolophis decoratus	decorated warbonnet
	Bryozoichthys lysimus	nutcracker prickleback
Cryptacanthodidae	*Lyconectes aleutensis*	dwarf wrymouth
	Cryptacanthodes giganteus	giant wrymouth
Anarhichadidae	*Anarrhichthys ocellatus*	wolf-eel
	Anarhichas orientalis	Bering wolffish
Zaproridae	*Zaprora silenus*	prowfish
Trichodontidae	*Trichodon trichodon*	Pacific sandfish
Ammodytidae	*Ammodytes hexapterus*	Pacific sand lance
Pleuronectidae	*Atheresthes stomias*	arrowtooth flounder
	Atheresthes evermanni	Kamchatka flounder
	Hippoglossus stenolepis	Pacific halibut
	Hippoglossoides elassodon	flathead sole
	Lyopsetta exilis	slender sole
	Eopsetta jordani	petrale sole
	Parophrys vetulus	English sole
	Microstomus pacificus	Dover sole
	Embassichthys bathybius	deepsea sole
	Glyptocephalus zachirus	rex sole
	Limanda aspera	yellowfin sole
	Platichthys stellatus	starry flounder
	Platichthys stellatus X Pleuronectes quadrituberculatus	Hybrid starry flounder X Alaska plaice
	Psettichthys melanostictus	sand sole
	Lepidopsetta polyxystra	northern rock sole
	Lepidopsetta bilineata	southern rock sole

Isopsetta isolepis	butter sole
Pleuronectes quadrituberculatus	Alaska plaice

Appendix Table B-2. -- Invertebrate species encountered during the 2001 Gulf of Alaska bottom trawl survey.

Phylum	Scientific Name	Common Name
Porifera	*Porifera*	sponge unident.
	Suberites sp.	
	Suberites ficus	
	Aphrocallistes vastus	clay pipe sponge
	Mycale loveni	tree sponge
	Halichondria panicea	barrel sponge
	Rhabdocalyptus sp.	cloud sponge
	Mycale bellabellensis	lampshade sponge
	Myxilla incrustans	scallop sponge
	Plicatellopsis amphispicula	firm finger sponge
	Histodermella sp. A	spud sponge
	Leucosolenia blanca	yellow leafy sponge
	Tethya sp.	ball sponge
	Halichondria sitiens	black papilliate sponge
	Halichondria cf. sitiens	yellow green papillate sponge
	Yellow papillate sponge	
	Neoesperiopsis rigida	soft finger sponge
	Neoesperiopsis infundibula	rough China hat sponge
	Stelletta sp.	stone sponge
	Hexactinellida	glass sponge unident.
Cnidaria	*Hydrozoa*	
	Bonneviella sp. A	champagne flute hydroid
	Aglaophenia sp.	
	Scyphozoa	jellyfish unident.
	Periphylla periphylla	
	Chrysaora melanaster	
	Phacellophora camtschatica	egg yolk jelly
	Aequorea sp.	
	Aurelia sp.	
	Aurelia labiata	
	Cyanea capillata	lion's mane
	Anthozoa	
	Octocorallia	
	Alcyonium sp.	
	Gersemia sp.	sea raspberry
	Anthomastus sp.	
	Gorgonacea	gorgonian coral unident.
	Primnoa willeyi	red tree coral
	Chrysopathes speciosa	
	Swiftia sp.	
	Paragorgia arborea	Kamchatka coral
	Callogorgia sp.	
	Calcigorgia sp.	
	Pennatulacea	sea pen or sea whip unident.

	Virgularia sp.	smoothstem seawhip
	Virgulariidae	sea whip unident.
	Stylatula sp.	slender seawhips
	Halipteris sp.	
	Halipteris californica	
	Ptilosarcus gurneyi	orange sea pen
	Actiniaria	sea anemone unident.
	Actinauge verrilli	reticulate anemone
	Metridium sp.	
	Metridium farcimen	gigantic anemone
	Stomphia sp.	
	Stomphia coccinea	swimming anemone
	Urticina sp.	
	Urticina crassicornis	mottled anemone
	Bathyphelia australis	hot dog sea anemone
	Cribrinopsis fernaldi	chevron-tentacled anemone
	Liponema brevicornis	tentacle-shedding anemone
	Actinostolidae	
	Hormathiidae	
	Zoanthus sp.	
	Stylaster sp.	
	Cyclohelia lamellata	
	Distichopora borealis	
	Plumarella sp. 1	
	Thouarella sp.	
	Fanellia compressa	
	Muriceides sp.	
	Amphilaphis sp.	
Ctenophora	*Ctenophora*	comb jelly unident.
	Beroe sp.	
Annelida	*Polychaeta*	polychaete worm unident.
	Aphroditidae	sea mouse unident.
	Aphrodita sp.	
	Aphrodita negligens	
	Polynoidae	scale worm unident.
	Eunoe sp.	
	Eunoe nodosa	giant scale worm
	Eunoe depressa	depressed scale worm
	Hirudinea	leech unident.
	Notostomobdella cyclostoma	striped sea leech
Platyhelminthes	*Platyhelminthes*	flatworm unident.
Rhynchocoela	*Nemertea*	nemertean worm unident.
Sipuncula	*Sipuncula*	peanut worm unid.
Arthropoda	*Amphipoda*	amphipod unident.
	Caprella sp.	caprellid amphipod unident.
	Isopoda	isopod unident.
	Thoracica	barnacle unident.
	Balanus sp.	
	Balanus evermanni	giant barnacle
	Balanus rostratus	beaked barnacle

Balanus nubilus	
Pandalidae	pandalid shrimp unident.
Pandalus sp.	
Pandalus jordani	ocean shrimp
Pandalus eous	Alaskan pink
Pandalus tridens	yellowleg pandalid
Pandalus platyceros	spot shrimp
Pandalus goniurus	humpy shrimp
Pandalus hypsinotus	coonstripe shrimp
Pandalopsis dispar	sidestripe shrimp
Eualus sp.	
Eualus barbatus	barbed eualid
Eualus gaimardii	
Eualus macilentus	Greenland shrimp
Eualus macrophthalmus	bigeye eualid
Eualus suckleyi	shortscale eualid
Lebbeus groenlandicus	spiny lebbeid
Crangon sp.	
Crangon communis	twospine crangon
Crangon dalli	ridged crangon
Argis sp.	
Argis dentata	Arctic argid
Sclerocrangon boreas	sculptured shrimp
Pasiphaea pacifica	Pacific glass shrimp
Cancer sp.	cancer crab unident.
Cancer branneri	
Cancer oregonensis	Oregon rock crab
Oregonia gracilis	graceful decorator crab
Chorilia longipes	Longhorned decorator crab
Chionoecetes bairdi	Tanner crab
Hyas lyratus	Pacific lyre crab
Telmessus cheiragonus	helmet crab
Paguridae	hermit crab unident.
Discorsopagurus schmitti	
Pagurus sp.	
Pagurus brandti	sponge hermit
Pagurus aleuticus	Aleutian hermit
Labidochirus splendescens	splendid hermit
Pagurus confragosus	knobbyhand hermit
Pagurus dalli	whiteknee hermit
Pagurus kennerlyi	bluespine hermit
Pagurus trigonocheirus	fuzzy hermit crab
Pagurus ochotensis	Alaskan hermit
Pagurus rathbuni	longfinger hermit
Pagurus tanneri	longhand hermit
Elassochirus tenuimanus	widehand hermit crab
Pagurus capillatus	hairy hermit crab
Elassochirus cavimanus	purple hermit
Elassochirus gilli	Pacific red hermit
Lopholithodes foraminatus	box crab

	Acantholithodes hispidus	fuzzy crab
	Lithodes aequispinus	golden king crab
	Hapalogaster mertensii	
	Rhinolithodes wosnessenskii	rhinoceros crab
	Phyllolithodes papillosus	flatspine triangle crab
	Paralithodes camtschaticus	red king crab
	Placetron wosnessenskii	scaled crab
	Hyas sp.	
	Pugettia gracilis	graceful kelp crab
	Munida quadrispina	pinchbug
Mollusca	*Neomenia* sp.	
	Polyplacophora	chiton unident.
	Cryptochiton stelleri	giant Pacific chiton
	Lepidozona trifida	
	Lepidozona abyssicola	
	Lepidozona sp.	
	Mopalia swanii	
	Nudibranchia	nudibranch unident.
	Tochuina tetraquetra	giant orange tochui
	Hermissenda crassicornis	thick-horned aeolid
	Cadlina luteomarginata	yellow-edged cadlina
	Dendronotus sp.	
	Tritonia sp.	
	Tritonia diomedea	rosy tritonia
	Triopha catalinae	sea-clown triopha
	Archidoris montereyensis	Monterey dorid
	Armina californica	California armina
	Chlamylla sp.	
	Doridae	dorid nudibranch unident.
	Archidoris odhneri	white night doris
	Puncturella rothi	
	Gastropoda	snail unident.
	Natica sp.	
	Natica clausa	
	Cryptonatica	Aleutian moonsnail
	Cryptonatica	rusty moonsnail
	Nucella lamellosa	frilled dogwinkle
	Euspira pallida	pale moonsnail
	Crepidula grandis	great slippersnail
	Colus sp.	
	Colus halli	shrew whelk
	Japelion aleutica	
	Japelion sp.	
	Volutopsius sp.	
	Pyrulofusus harpa	left-hand whelk
	Volutopsius regularis	regular whelk
	Volutopsius middendorffii	tulip whelk
	Beringius sp.	
	Beringius kennicottii	
	Beringius crebricostatus	thick-cord whelk

Beringius undatus	
Neptunea sp.	
Neptunea amianta	white neptune
Neptunea pribiloffensis	Pribilof whelk
Neptunea middendorffii	
Neptunea lyrata	lyre whelk
Volutopsius callorhinus	
Trichotropidae	
Boreotrophon stuarti	winged trophon
Boreotrophon sp.	
Fusitriton oregonensis	Oregon triton
Cidarina cidaris	
Margarites sp.	
Buccinum sp.	
Buccinum viridum	turban whelk
Buccinum plectrum	sinuous whelk
Buccinum scalariforme	ladder whelk
Arctomelon stearnsii	Alaska volute
Arctomelon borealis	
Bivalvia	bivalve unident.
Mytilidae	mussel unident.
Modiolus modiolus	northern horsemussel
Mytilus sp.	
Mytilus edulis	blue mussel
Chlamys sp.	
Chlamys rubida	reddish scallop
Patinopecten caurinus	weathervane scallop
Yoldia sp.	
Yoldia seminuda	crisscrossed yoldia
Yoldia thraciaeformis	broad yoldia
Nuculana sp.	
Musculus sp.	
Musculus discors	discordant mussel
Astarte crenata	crenulate astarte
Astarte borealis	boreal astarte
Cyclocardia sp.	
Clinocardium sp.	
Clinocardium nuttallii	Nuttall cockle
Clinocardium ciliatum	hairy cockle
Clinocardium californiense	California cockle
Tresus capax	fat gaper
Mactromeris sp.	
Macoma sp.	
Serripes groenlandicus	Greenland cockle
Mya truncata	truncate softshell
Pododesmus macrochisma	Alaska falsejingle
Anomiidae	falsejingles unident.
Octopodidae	octopus unident.
Benthoctopus leioderma	smoothskin octopus
Octopus dofleini	giant octopus

	Teuthoidea	squid unident.
	Rossia pacifica	eastern Pacific bobtail
	Berryteuthis magister	magistrate armhook squid
	Moroteuthis robusta	robust clubhook squid
	Cranchia scabra	sandpaper squid
Bryozoa	*Bryozoa*	bryozoan unident.
	Eucratea loricata	feathery bryozoan
	Flustra serrulata	leafy bryozoan
	Flustrellidra corniculata	
	Alcyonidium sp. A	medusa bryozoan
	Myriozoum subgracile	
	Porella compressa	flattened bryozoan
	Cellepora ventricosa	coral bryozoan
Brachiopoda	*Brachiopoda*	lampshell unident.
	Terebratalia transversa	common brachiopod
	Terebratulina unguicula	snakeshead brachiopod
	Laqueus californianus	California lamp shell
	Hemithiris psittacea	black brachiopod
Echinodermata	*Evasterias* sp.	
	Evasterias troschelii	mottled sea star
	Evasterias echinosoma	giant sea star
	Orthasterias sp.	
	Orthasterias koehleri	redbanded sea star
	Leptasterias hexactis	
	Leptasterias hylodes	Aleutian sea star
	Rathbunaster californicus	
	Pycnopodia helianthoides	sunflower sea star
	Stylasterias forreri	long-rayed star
	Lethasterias nanimensis	blackspined sea star
	Pedicellaster sp.	
	Pisaster ochraceus	purple star
	Poraniopsis inflata	thorny sea star
	Henricia sp.	
	Henricia aspera	ridged blood star
	Henricia leviuscula	blood sea star
	Henricia longispina	
	Odontohenricia fisheri	
	Odontohenricia sp.	
	Leptasterias polaris	
	Leptasterias sp.	
	Gephyreaster swifti	Swift's sea star
	Hippasteria sp.	
	Hippasteria sp. A	
	Hippasteria spinosa	spiny red sea star
	Pseudarchaster parelii	scarlet sea star
	Mediaster aequalis	vermilion sea star
	Ceramaster patagonicus	orange bat sea star
	Luidia foliolata	sand sea star
	Dermasterias imbricata	leather sea star
	Solaster sp.	

Solaster endeca	northern sun sea star
Solaster sp. B	
Solaster dawsoni	morning sun sea star
Solaster stimpsoni	striped sun sea star
Solaster sp. A	
Solaster paxillatus	evening sun sea star
Crossaster sp.	
Crossaster borealis	grooved sea star
Crossaster papposus	rose sea star
Lophaster sp.	
Lophaster furcilliger	crested sea star
Pteraster sp.	
Pteraster tesselatus	
Pteraster militaris	wrinkled star
Pteraster marssipus	
Diplopteraster multipes	pincushion sea star
Asterias amurensis	purple-orange sea star
Ctenodiscus sp.	
Ctenodiscus crispatus	common mud star
Leptychaster sp.	
Leptychaster pacificus	
Leptychaster arcticus	North Pacific sea star
Dipsacaster borealis	northern sea star
Cheiraster dawsoni	fragile sea star
Nearchaster variabilis	
Nearchaster pedicellaris	
Echinacea	sea urchin unident.
Strongylocentrotus droebachiensis	green sea urchin
Strongylocentrotus sp.	
Strongylocentrotus franciscanus	red sea urchin
Strongylocentrotus purpuratus	purple sea urchin
Strongylocentrotus pallidus	white sea urchin
Allocentrotus fragilis	orange-pink sea urchin
Allocentrotus sp.	
Brisaster latifrons	heart urchin
Echinarachnius parma	parma sand dollar
Florometra sp.	
Florometra serratissima	featherstar crinoid
Ophiuroidea	brittlestarfish unident.
Gorgonocephalus eucnemis	basketstar
Astrochele laevis	
Ophiura sarsi	notched brittlestar
Stegophiura ponderosa	
Ophiacantha sp.	
Ophiopholis sp.	
Ophiopholis longispina	
Ophiopholis aculeata	ubiquitous brittle star
Holothuroidea	sea cucumber unident.
Parastichopus sp.	

	Parastichopus leukothele	giant orange cucumber
	Parastichopus californicus	California sea cucumber
	Pseudostichopus sp.	
	Pseudostichopus mollis	sandy sea cucumber
	Molpadia sp.	
	Molpadia intermedia	sweet sea potato
	Eupentacta quinquesemita	
	Pentamera sp.	
	Bathyplotes sp.	
	Cucumaria sp.	
	Cucumaria fallax	sea football
	Psolus sp.	
	Psolus squamatus	whitescaled sea cucumber
	Synallactes challengeri	
Chordata	*Ascidiacea*	tunicate unident.
	Thaliacea	salp unident.
	Styela rustica	sea potato
	Boltenia sp.	
	Boltenia ovifera	
	Halocynthia aurantium	sea peach
	Cnemidocarpa finmarkiensis	broad base tunicate
	Aplidium sp. A	sea glob
	Synoicum sp.	sea blob
	Ascidia paratropa	glassy tunicate
	Halocynthia hispidus	hairy tunicate
	Molgula sp.	

APPENDIX C

Length-Weight Relationships

Appendix Table C-1. -- Length-weight parameters (a and b) for species where individual length and weight data were collected. The number of individuals measured and weighed (n) is also provided.

Species	Sex	a	b	n	Species	Sex	a	b	n
Arrowtooth flounder	Male	3.509E-06	3.149	514	Walleye pollock	Male	6.075E-06	3.035	499
	Female	4.494E-06	3.114	880		Female	5.311E-06	3.059	603
	Both	3.849E-06	3.137	1394		Both	5.625E-06	3.049	1112
Atka mackerel	Male	3.467E-06	3.222	35	Pacific ocean perch	Male	1.242E-05	3.020	583
	Female	1.195E-05	3.010	41		Female	1.437E-05	2.994	606
	Both	7.939E-06	3.080	76		Both	1.338E-05	3.007	1189
Pacific cod	Male	4.756E-06	3.137	563	Rex sole	Male	4.893E-07	3.440	292
	Female	4.285E-06	3.155	621		Female	5.364E-07	3.430	389
	Both	4.498E-06	3.147	1184		Both	5.048E-07	3.438	682
Dover sole	Male	2.997E-06	3.198	248	Rougheye RF complex	Male	1.023E-05	3.070	250
	Female	2.930E-06	3.202	305		Female	9.492E-06	3.083	248
	Both	2.925E-06	3.202	553		Both	9.827E-06	3.077	498
Dusky rockfish	Male	8.142E-06	3.125	322	Sablefish	Male	1.404E-06	3.308	546
	Female	9.953E-06	3.092	398		Female	1.406E-06	3.308	459
	Both	8.911E-06	3.110	720		Both	1.406E-06	3.308	1005
Flathead sole	Male	1.605E-06	3.295	406	Shortraker rockfish	Male	1.175E-05	3.051	186
	Female	1.357E-06	3.324	466		Female	7.412E-06	3.129	196
	Both	1.589E-06	3.297	876		Both	9.420E-06	3.088	382
Northern rockfish	Male	1.381E-05	3.012	523	Southern rock sole	Male	4.778E-06	3.163	301
	Female	1.225E-05	3.035	536		Female	2.747E-06	3.265	542
	Both	1.259E-05	3.029	1059		Both	2.971E-06	3.250	843
Northern rock sole	Male	4.420E-06	3.167	277	Shortspine thornyhead	Male	3.075E-06	3.234	445
	Female	2.956E-06	3.244	398		Female	3.026E-06	3.240	470
	Both	3.159E-06	3.231	675		Both	3.556E-06	3.210	990

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