Flatfish

Arrowtooth flounder (*Atheresthes stomias*)

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

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

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

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

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

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

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

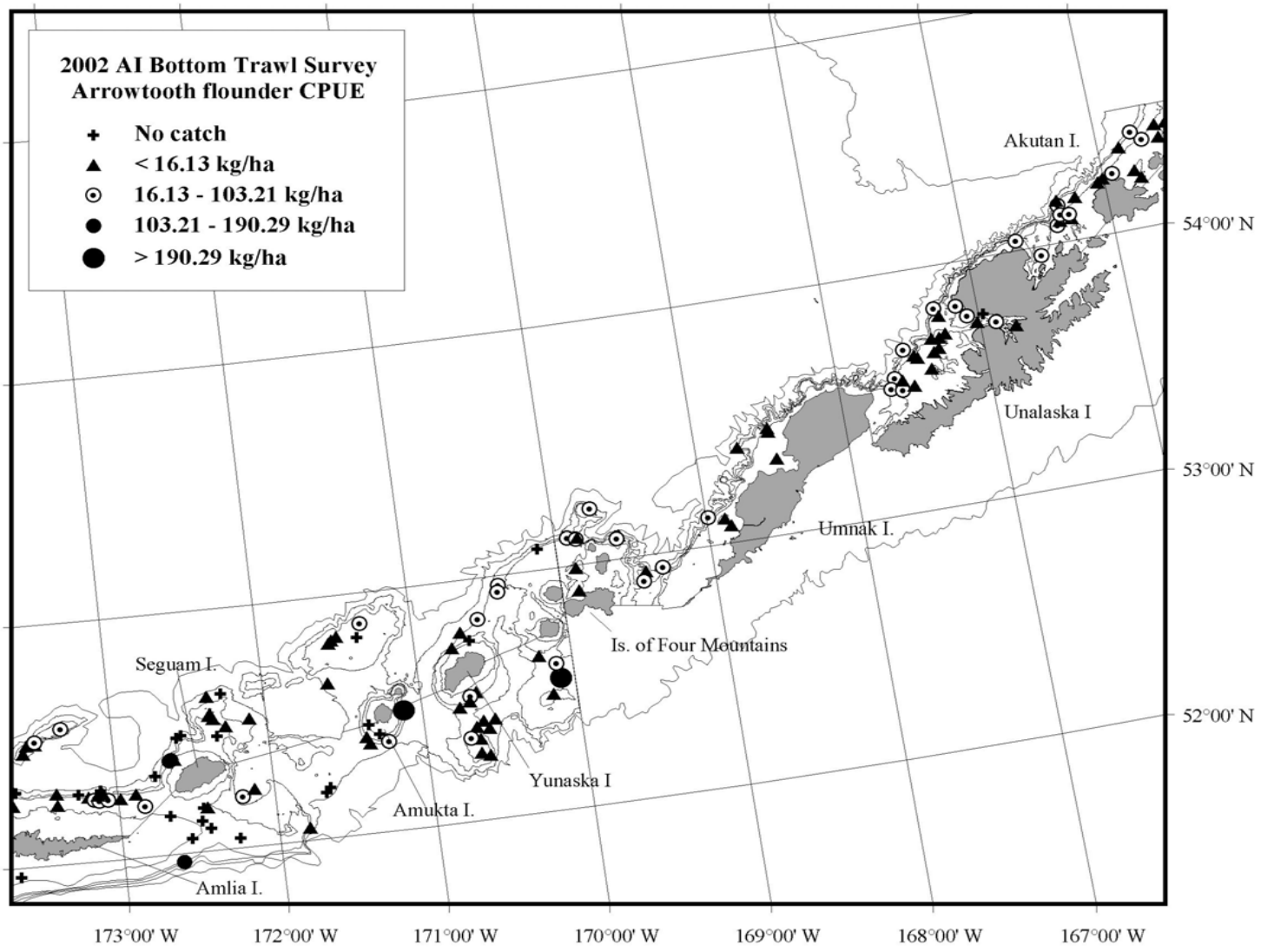

Figure 2.--Distribution and relative abundance of arrowtooth flounder from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

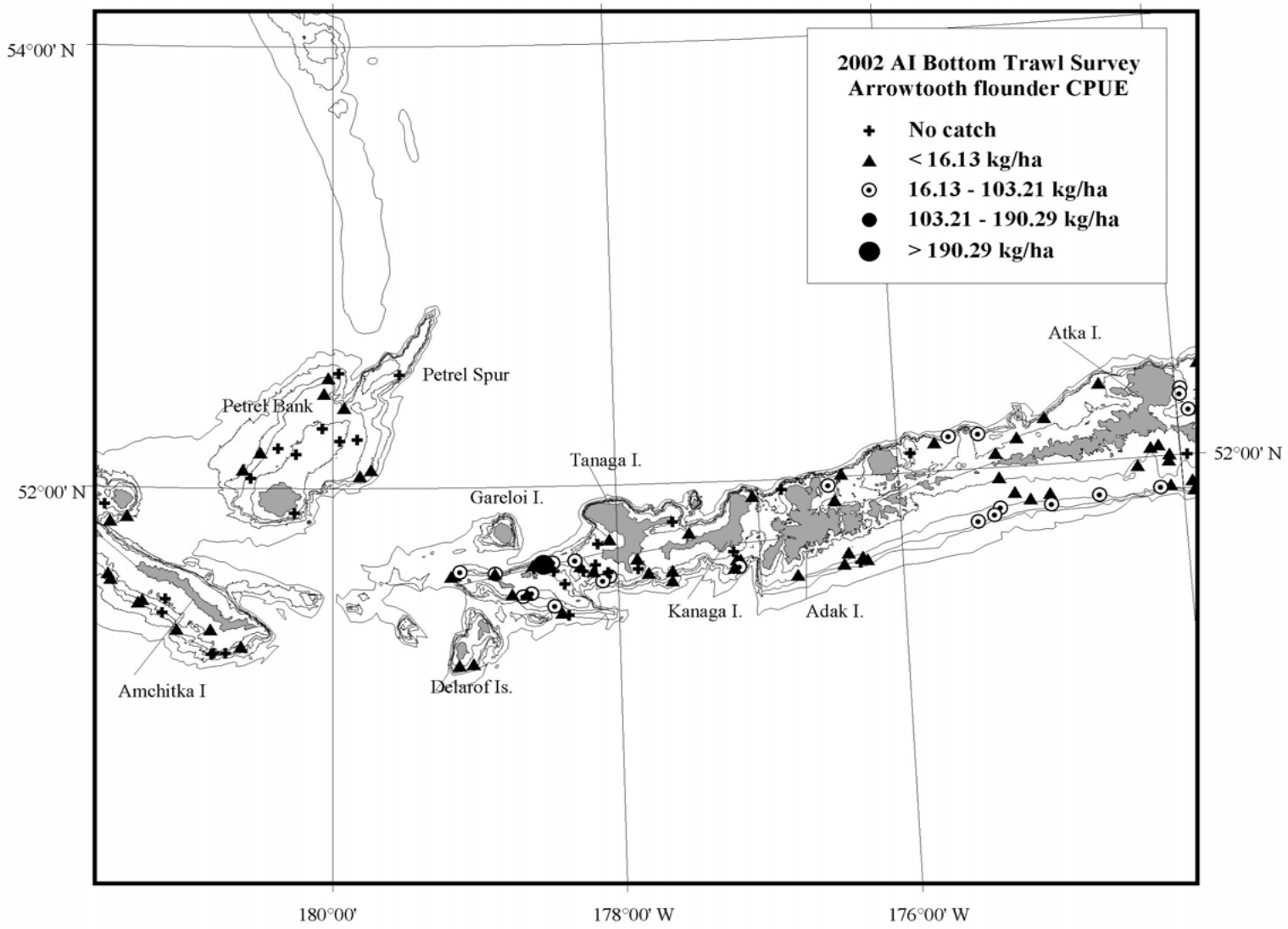

Figure 2.--(Continued).

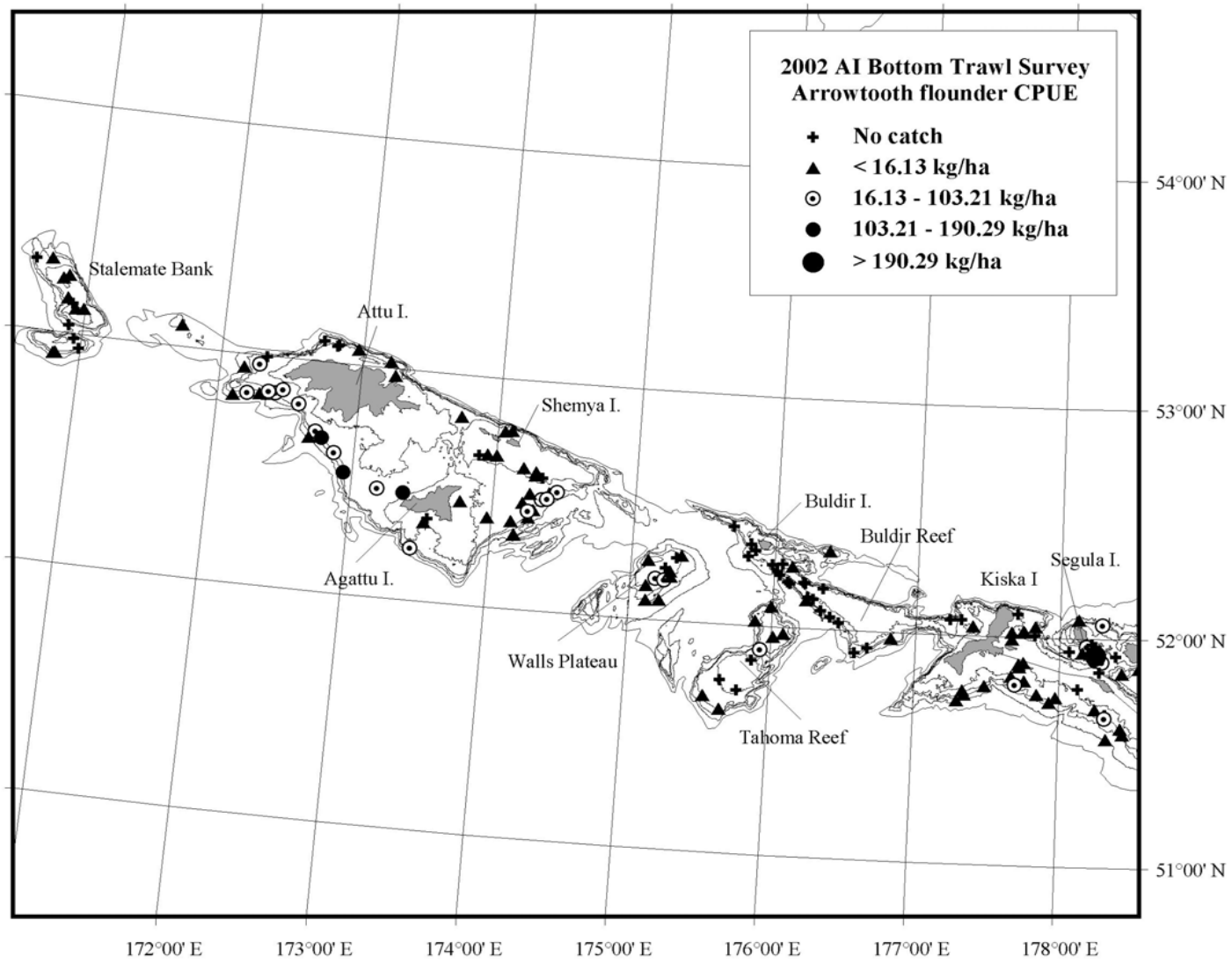

Figure 2.--(Continued).

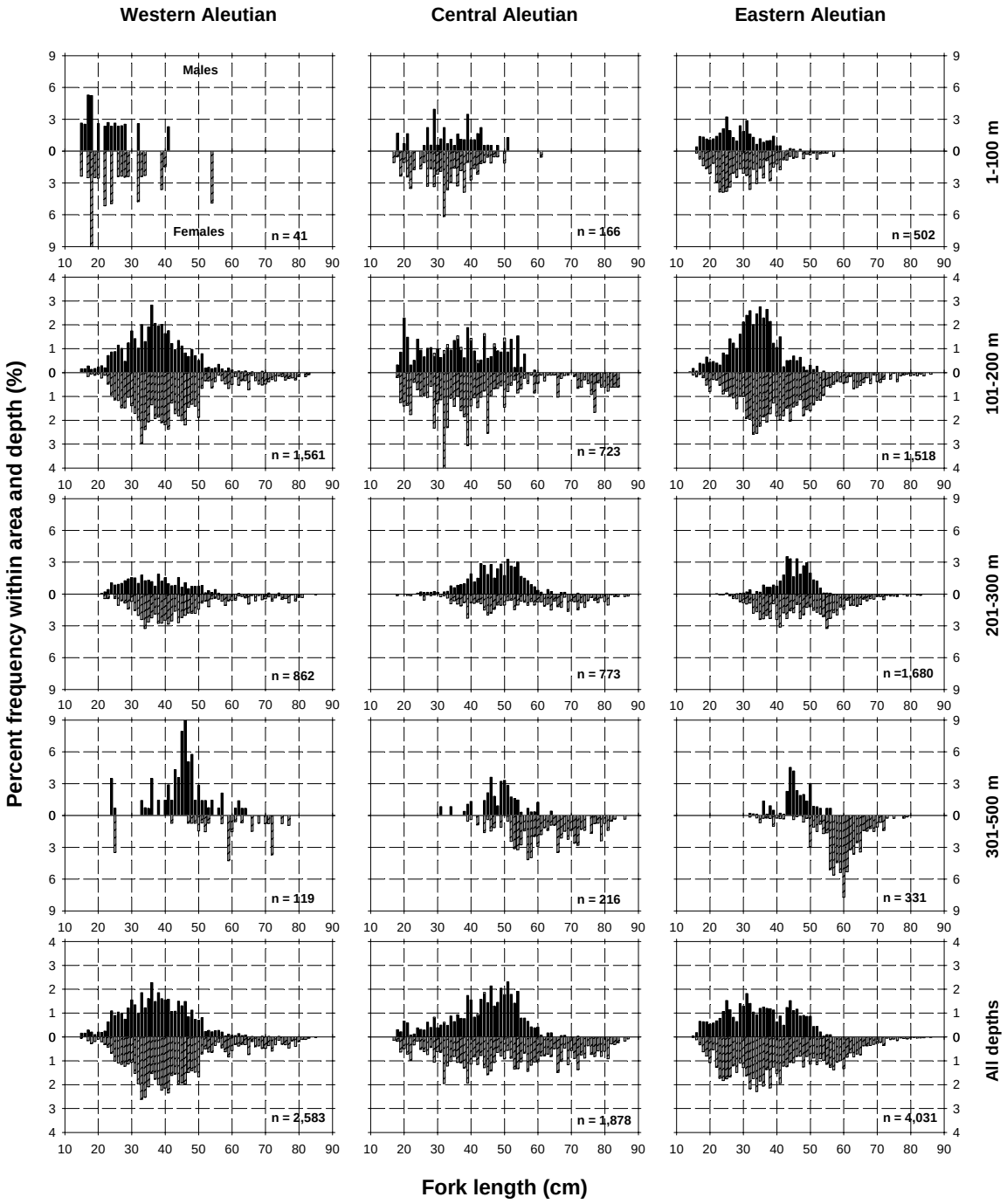

Figure 3.--Size composition of the estimated arrowtooth flounder population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

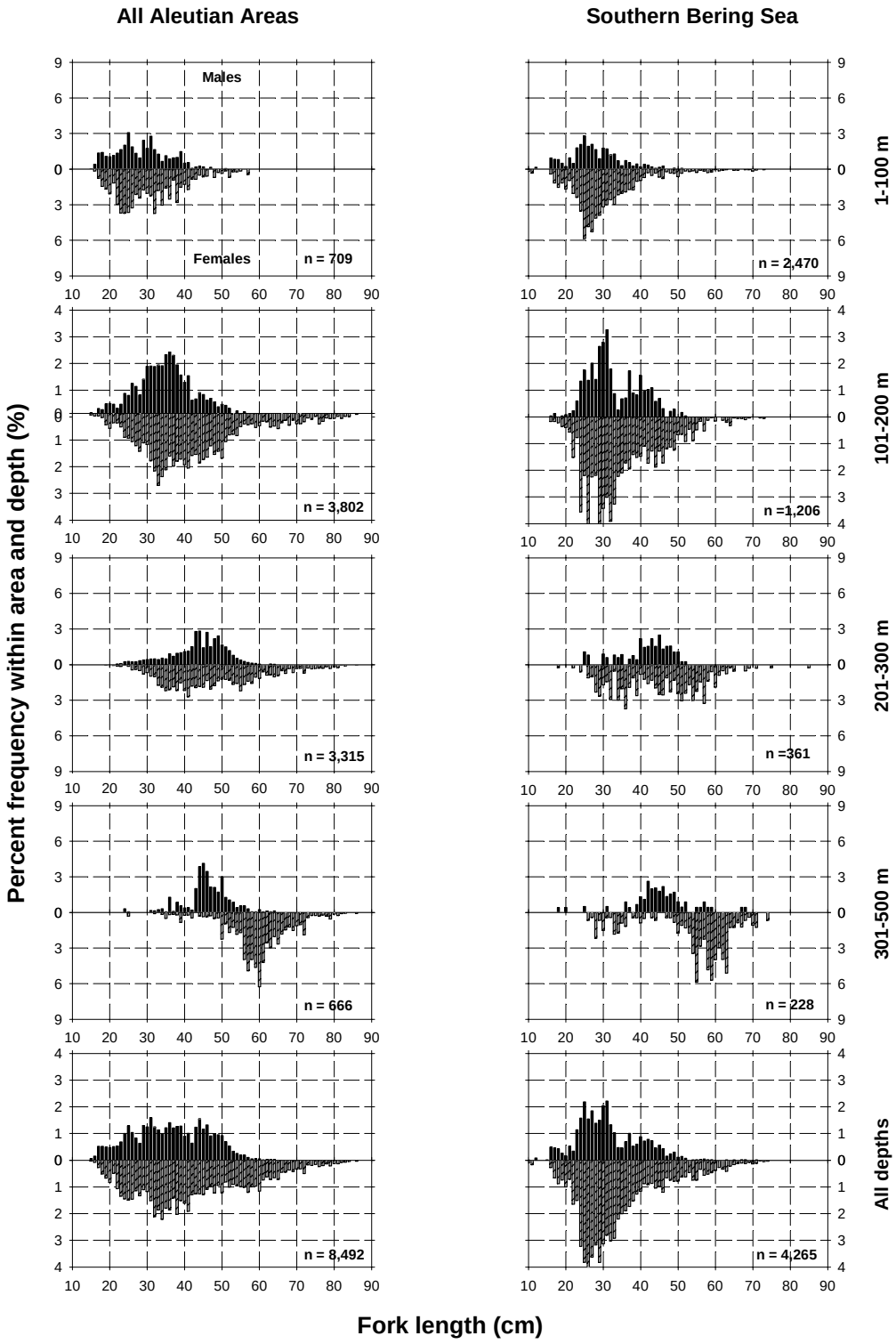

Figure 3.--(Arrowtooth flounder, continued).

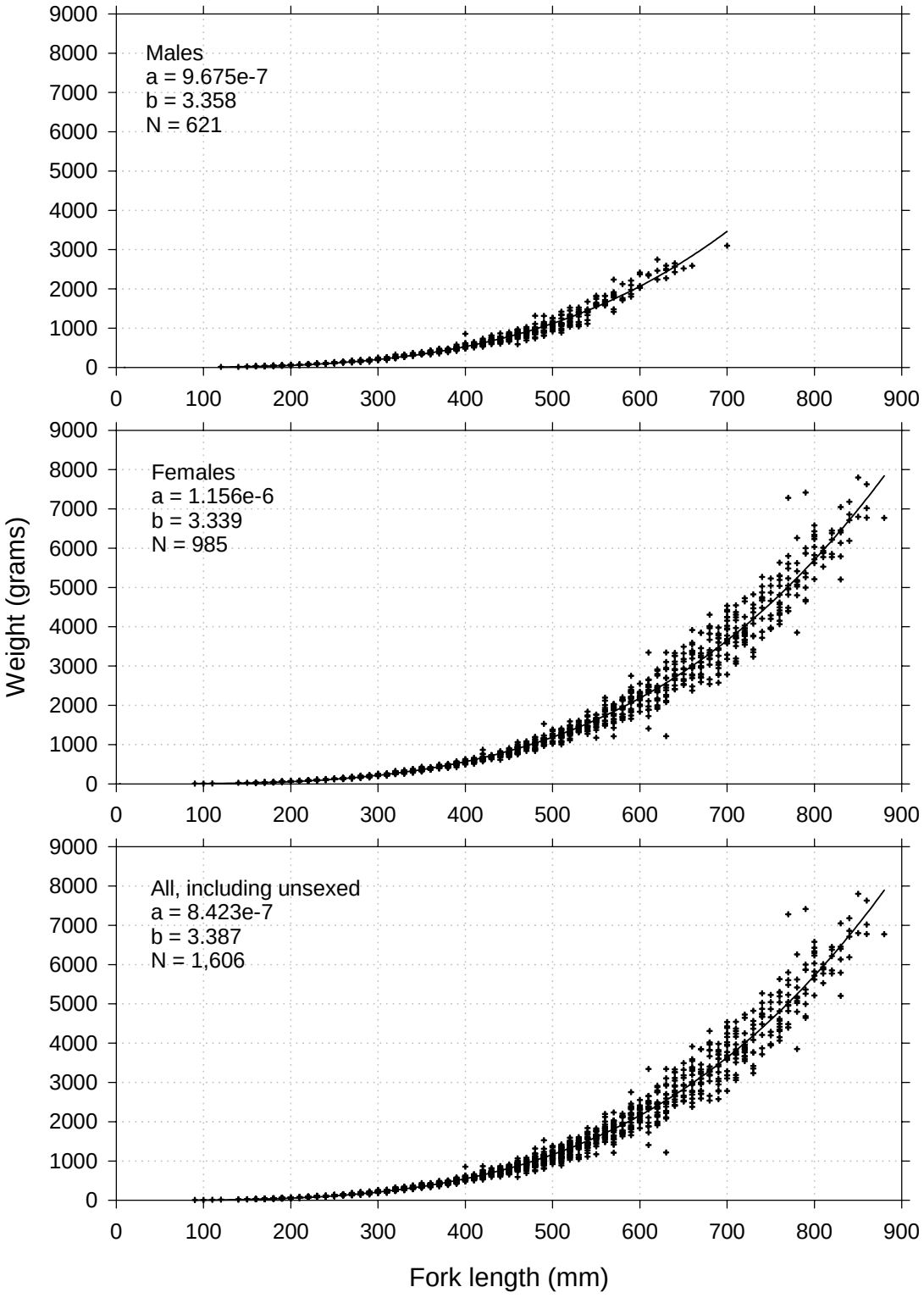

Figure 4.--Length-weight relationship for arrowtooth flounder specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Kamchatka flounder (*Atheresthes evermanni*)

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

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

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

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

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

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

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

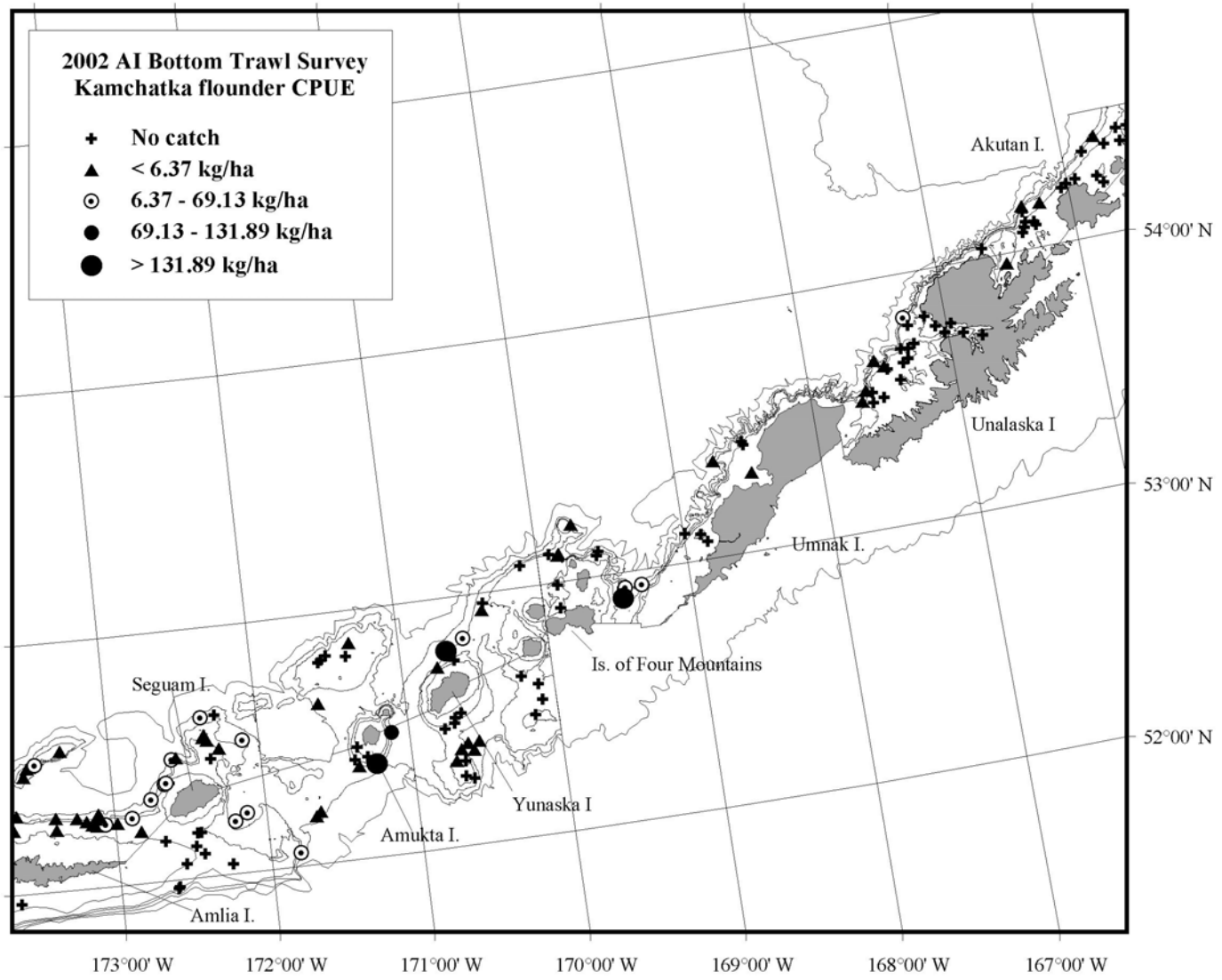

Figure 5.--Distribution and relative abundance of Kamchatka flounder from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

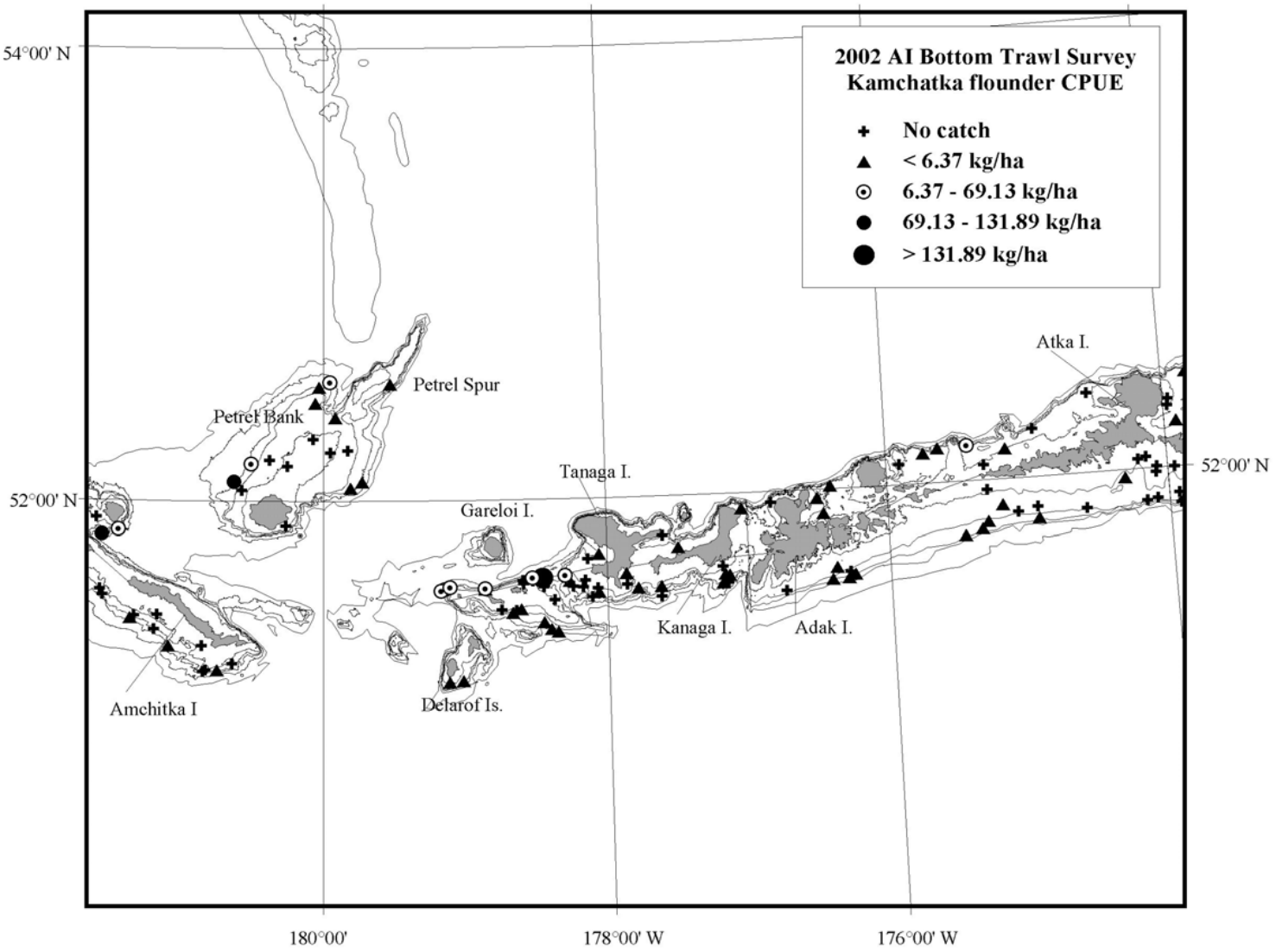

Figure 5.--(Continued).

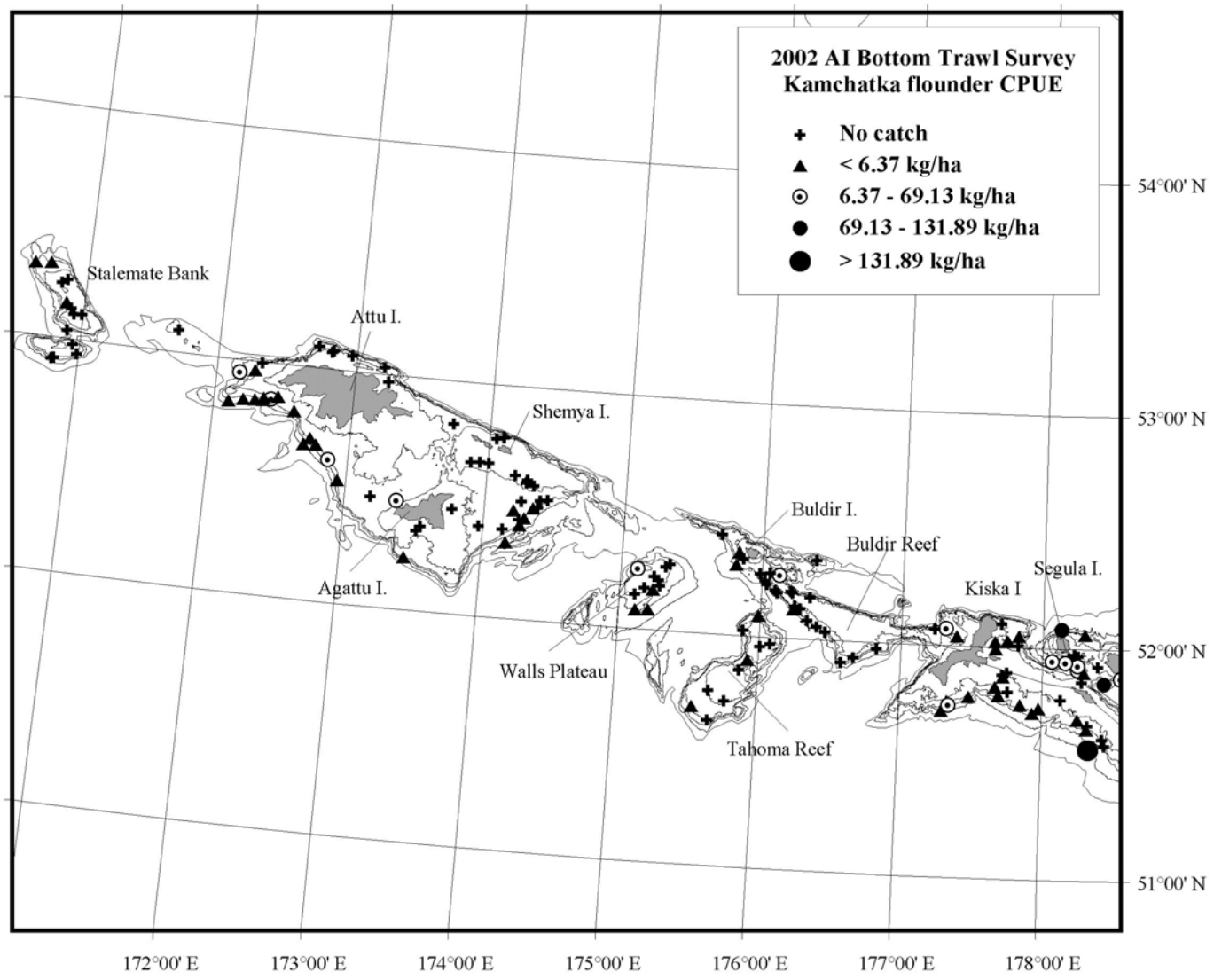

Figure 5.--(Continued).

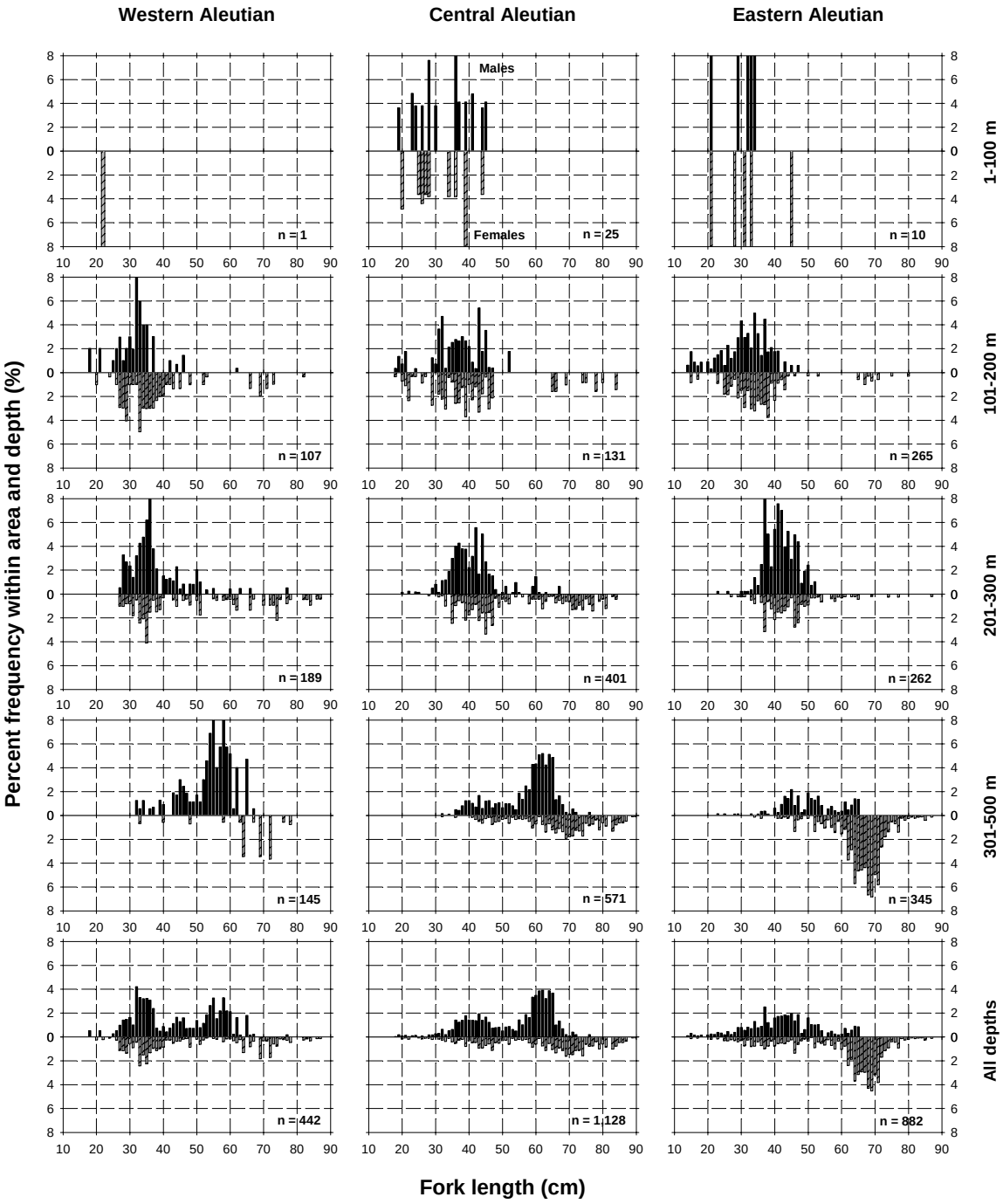

Figure 6.--Size composition of the estimated Kamchatka flounder population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

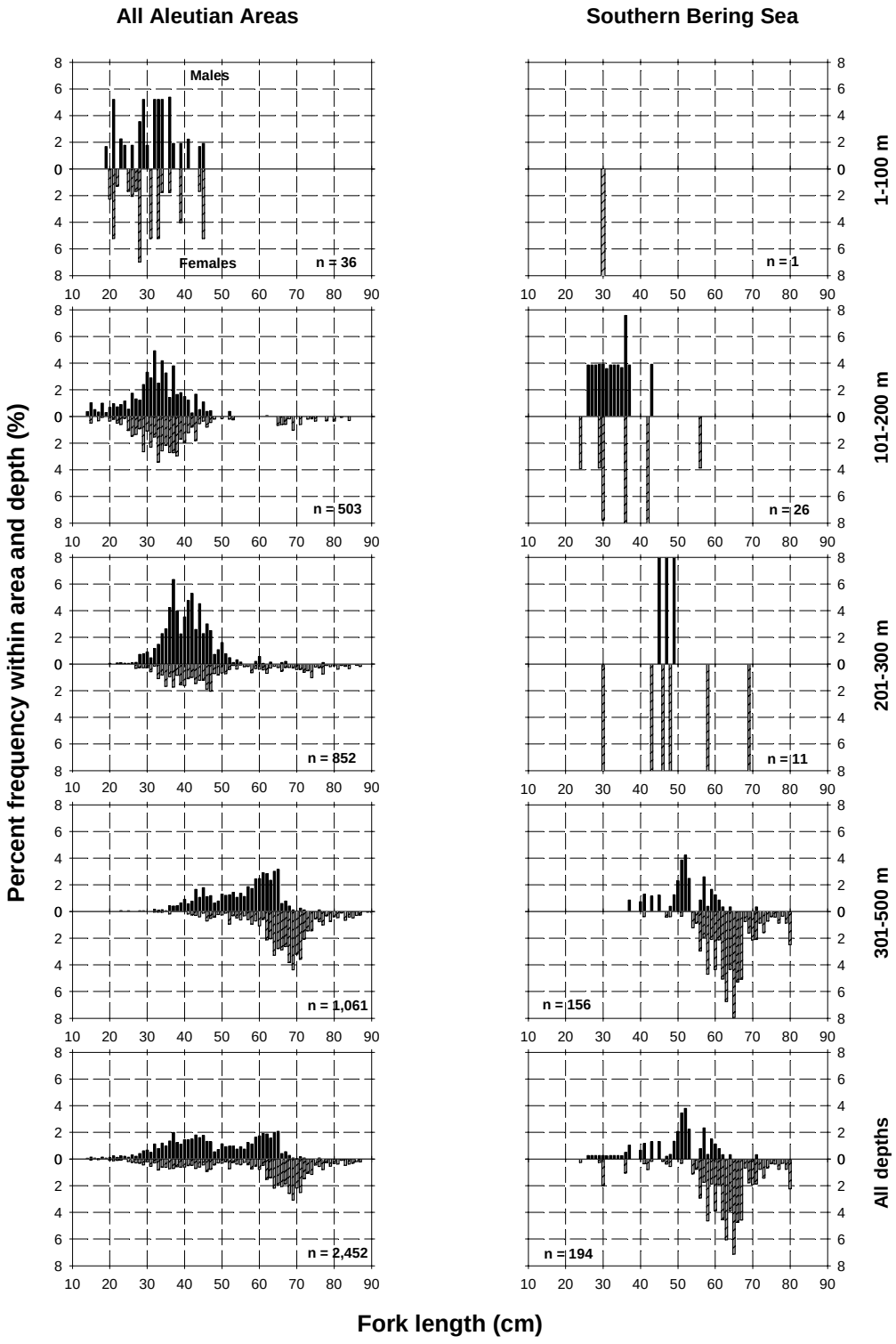

Figure 6.--(Kamchatka flounder, continued).

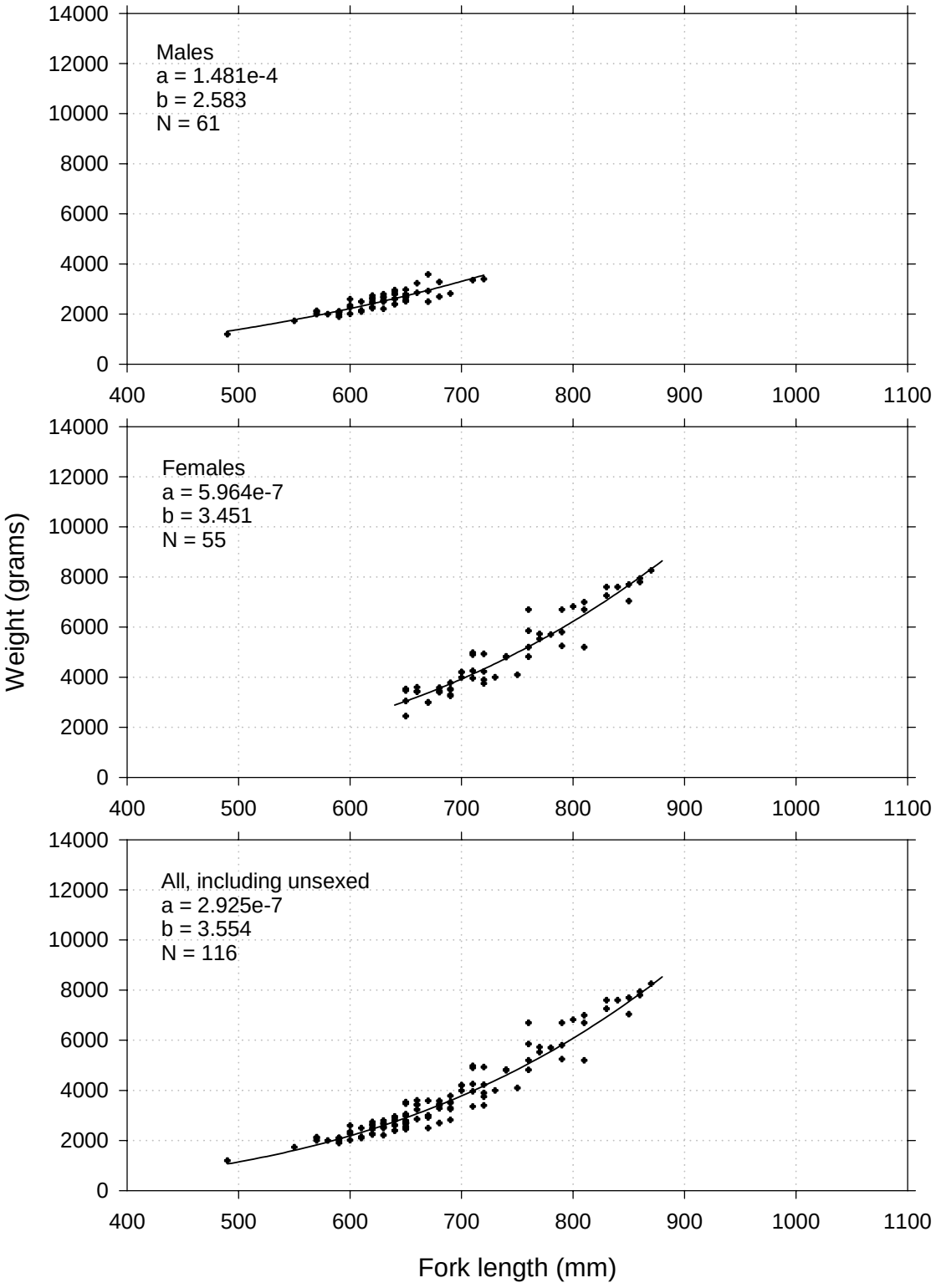

Figure 7.--Length-weight relationship for Kamchatka flounder specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Northern rock sole (*Lepidopsetta polyxystra*)

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

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

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

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

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

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

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

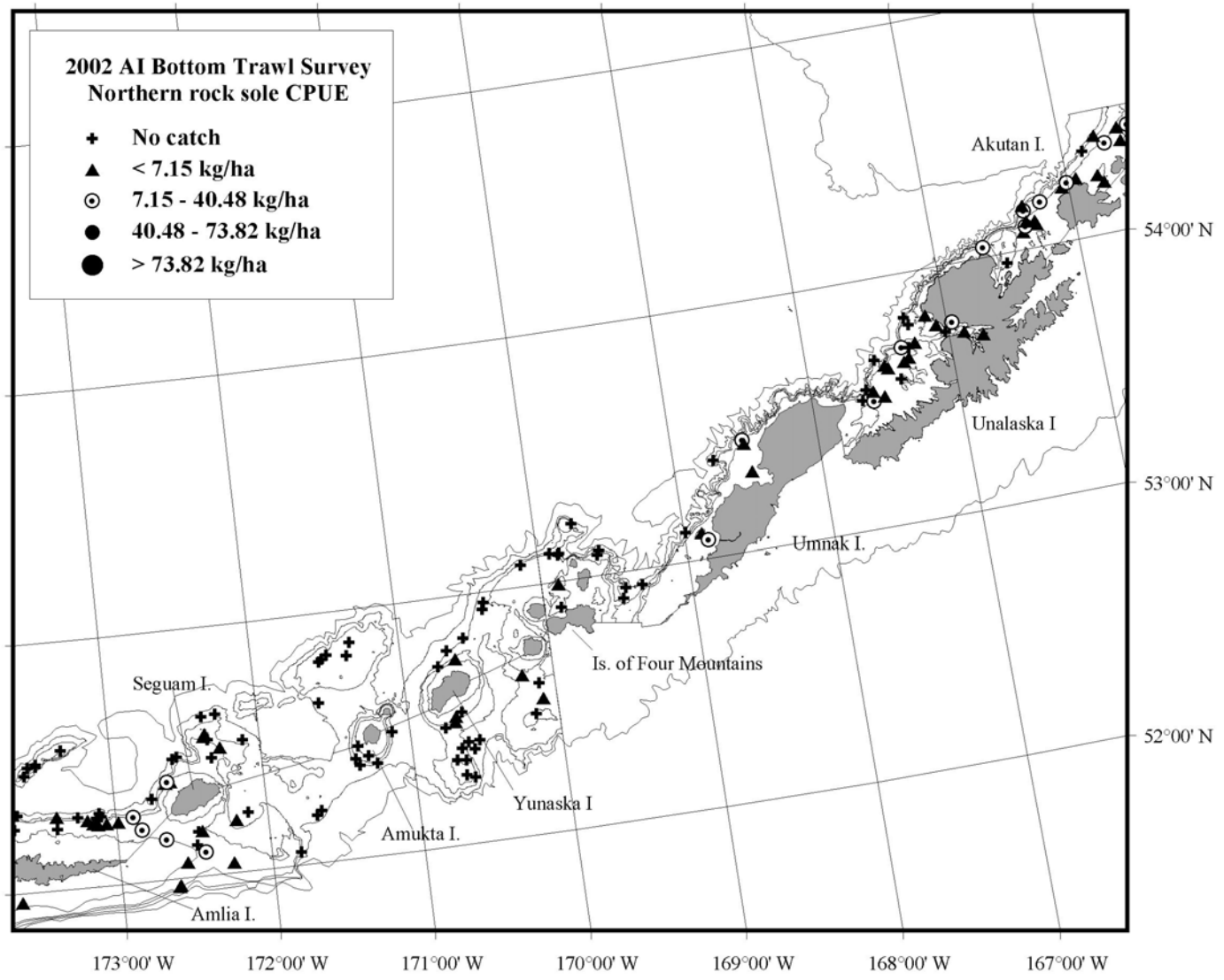

Figure 8.--Distribution and relative abundance of northern rock sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

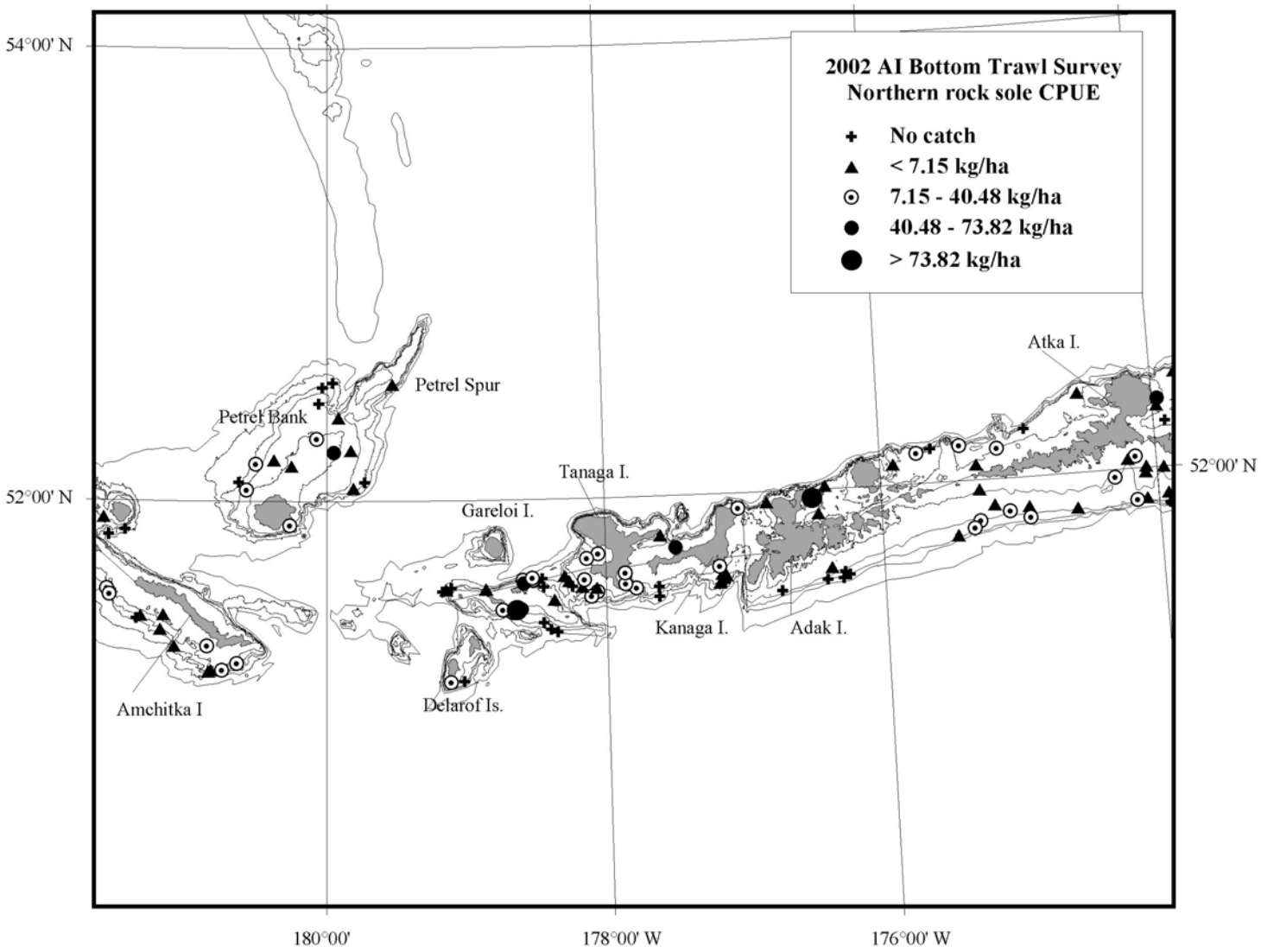

Figure 8.--(Continued).

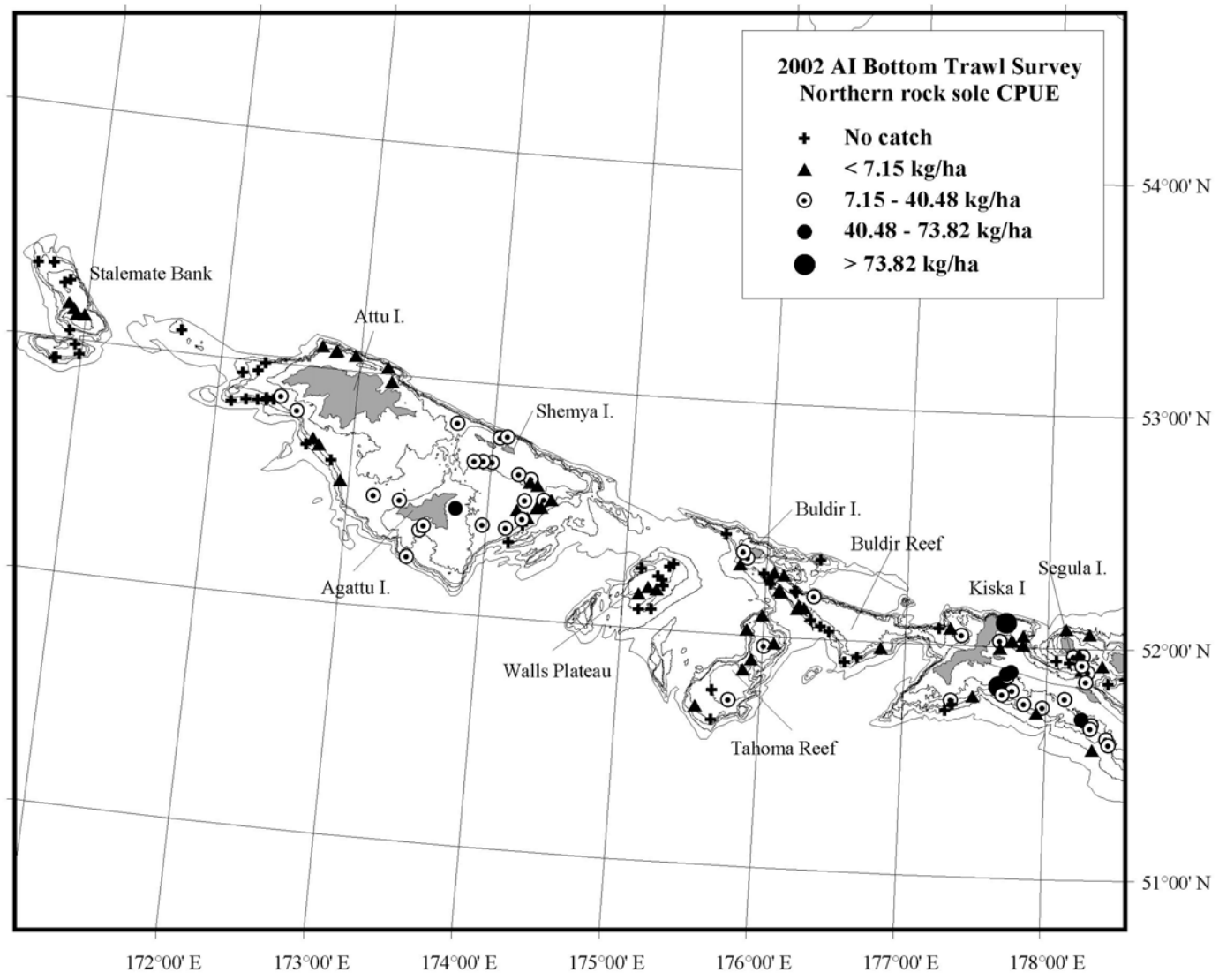

Figure 8.--(Continued).

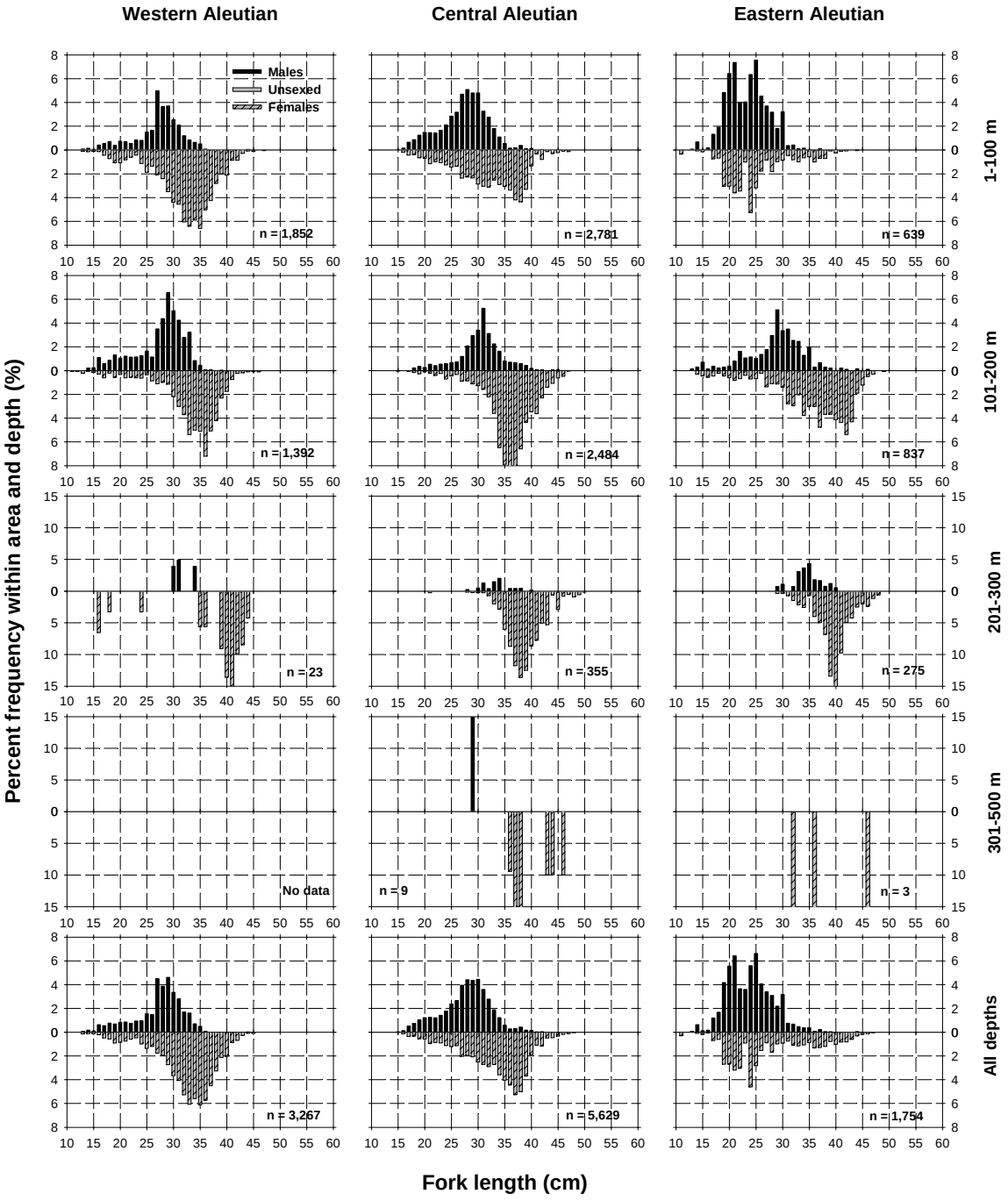

Figure 9.--Size composition of the estimated northern rock sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

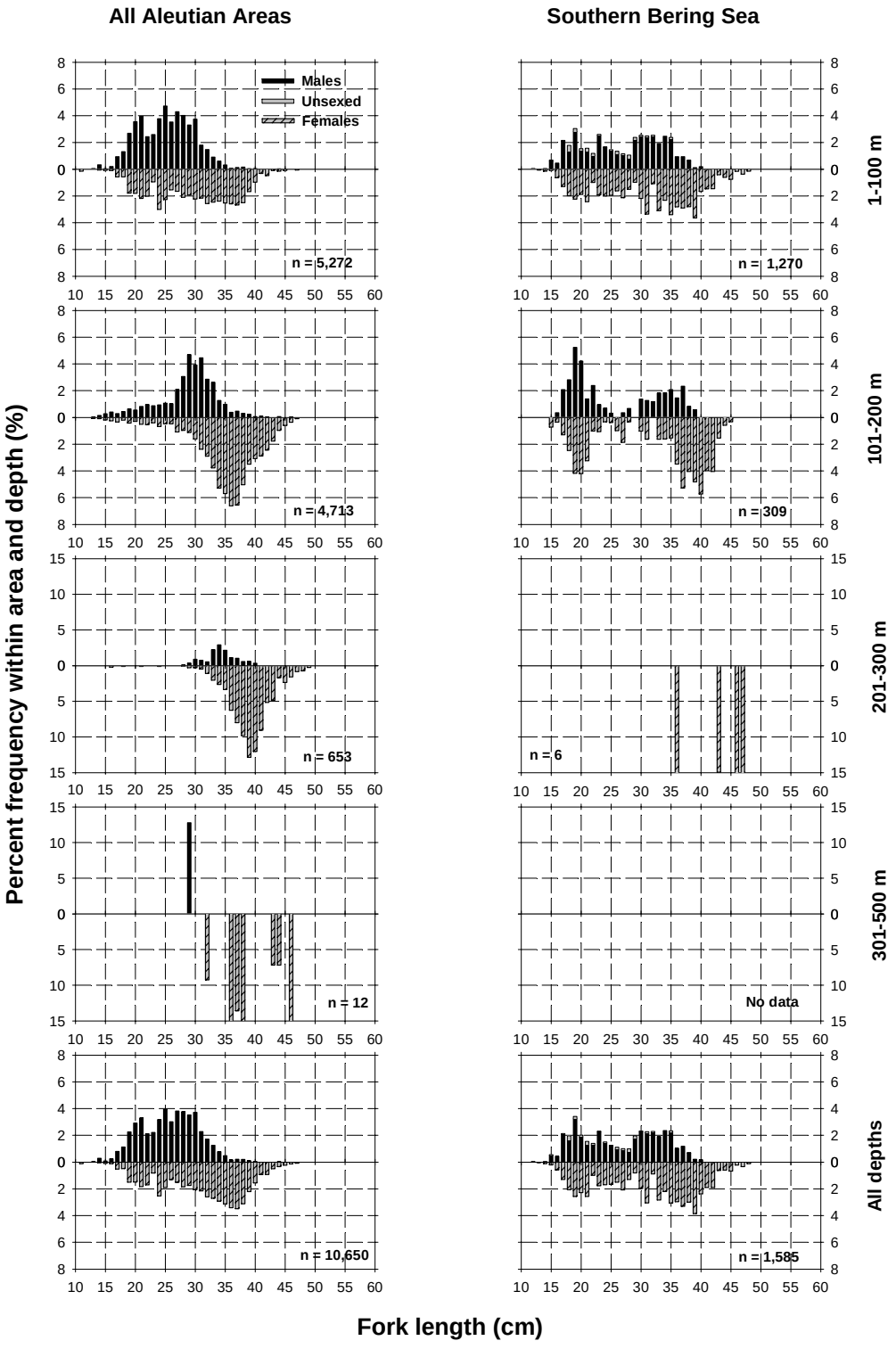

Figure 9.--(Northern rock sole, continued).

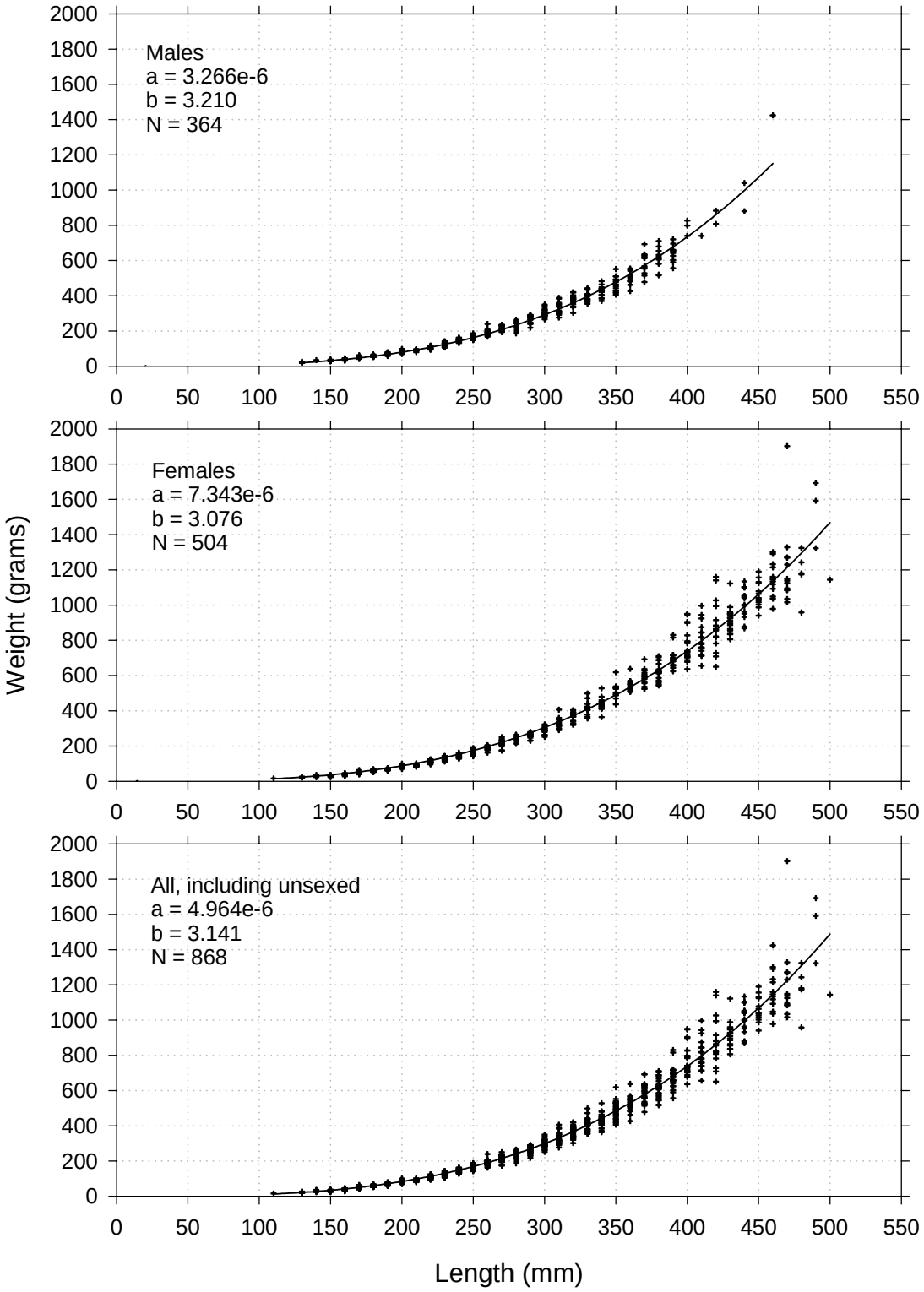

Figure 10.--Length-weight relationship for northern rock sole specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

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

Southern rock sole (*L. bilineata*)

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

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

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

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

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

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

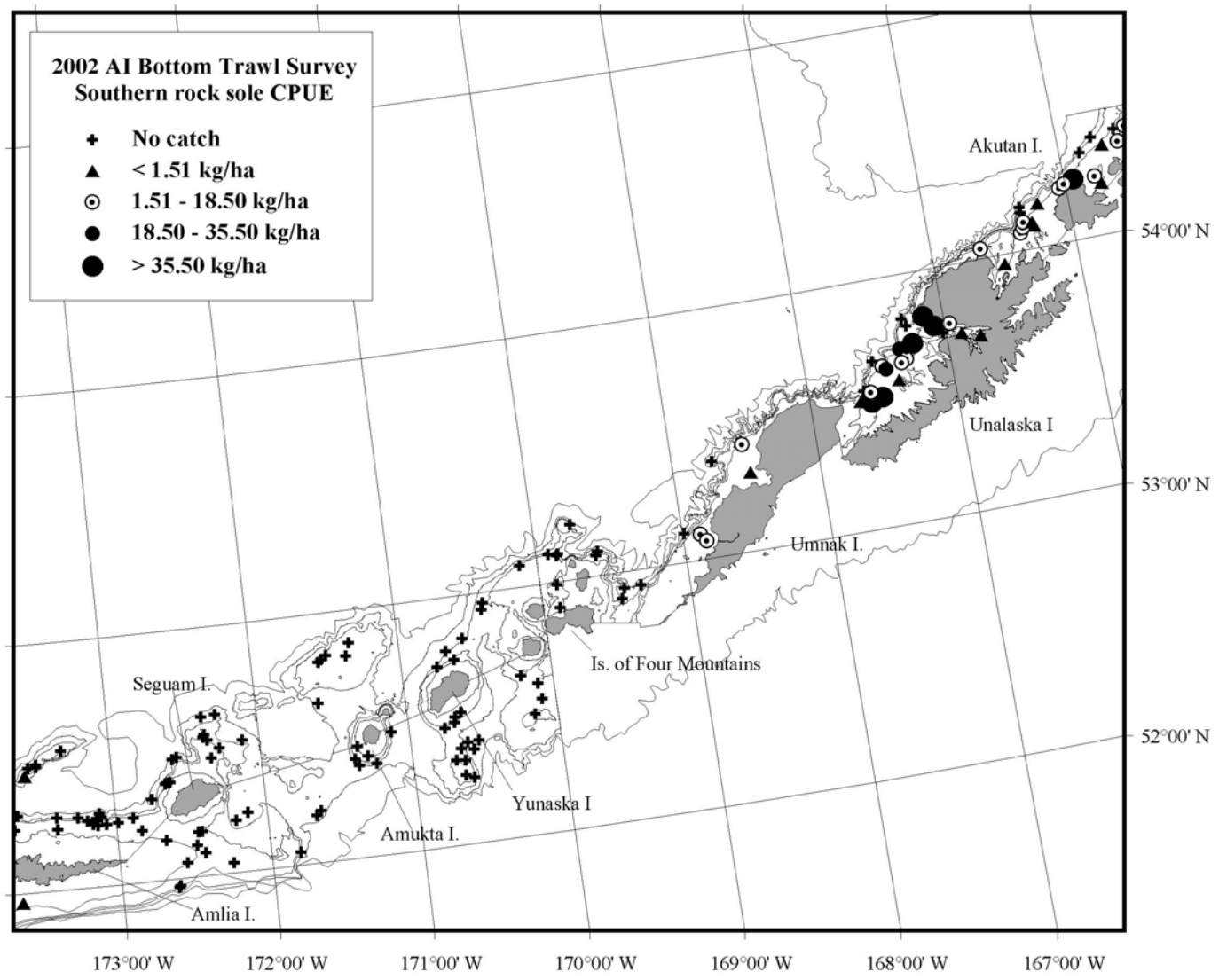

Figure 11.--Distribution and relative abundance of southern rock sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

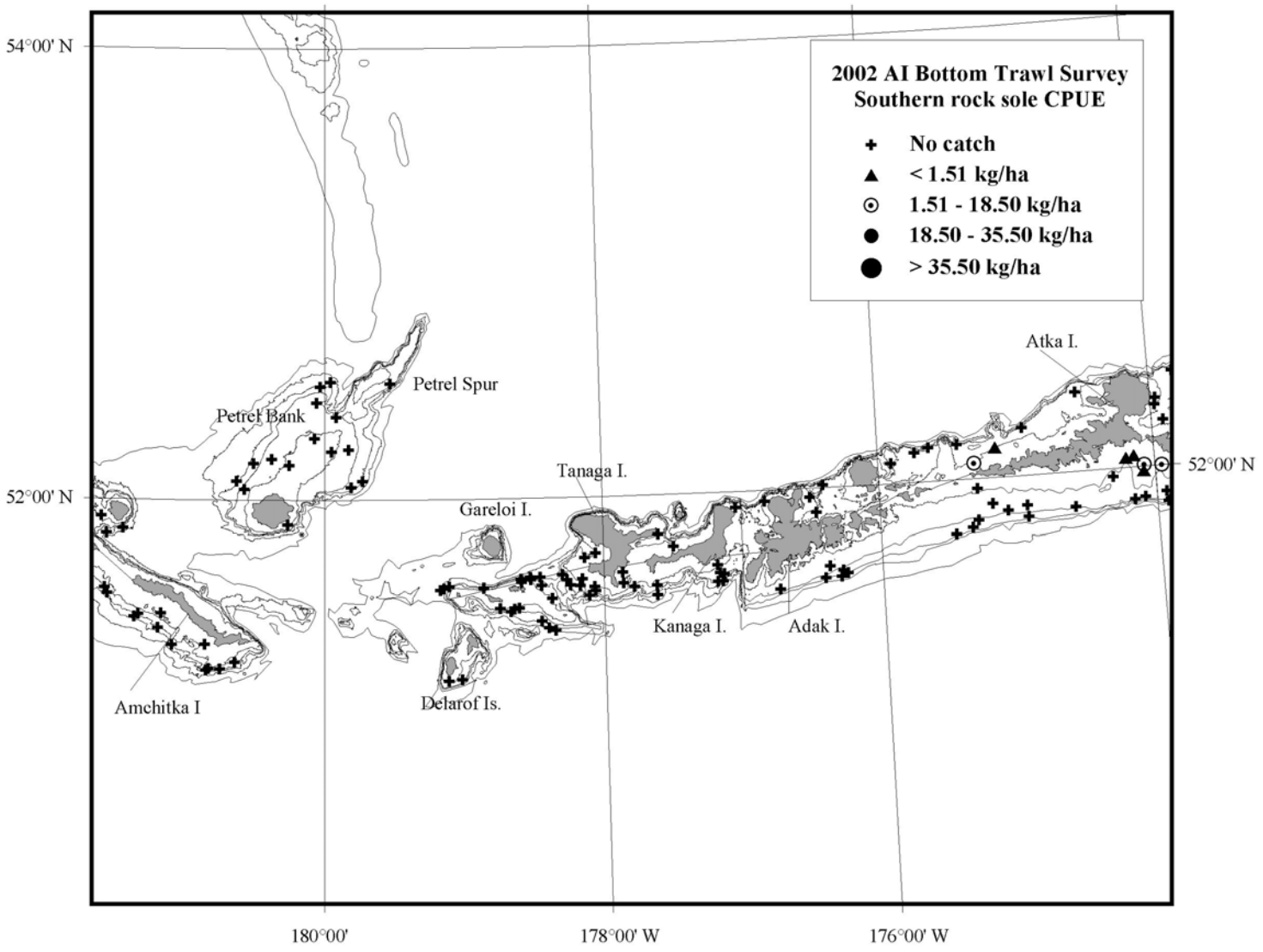

Figure 11.--(Continued).

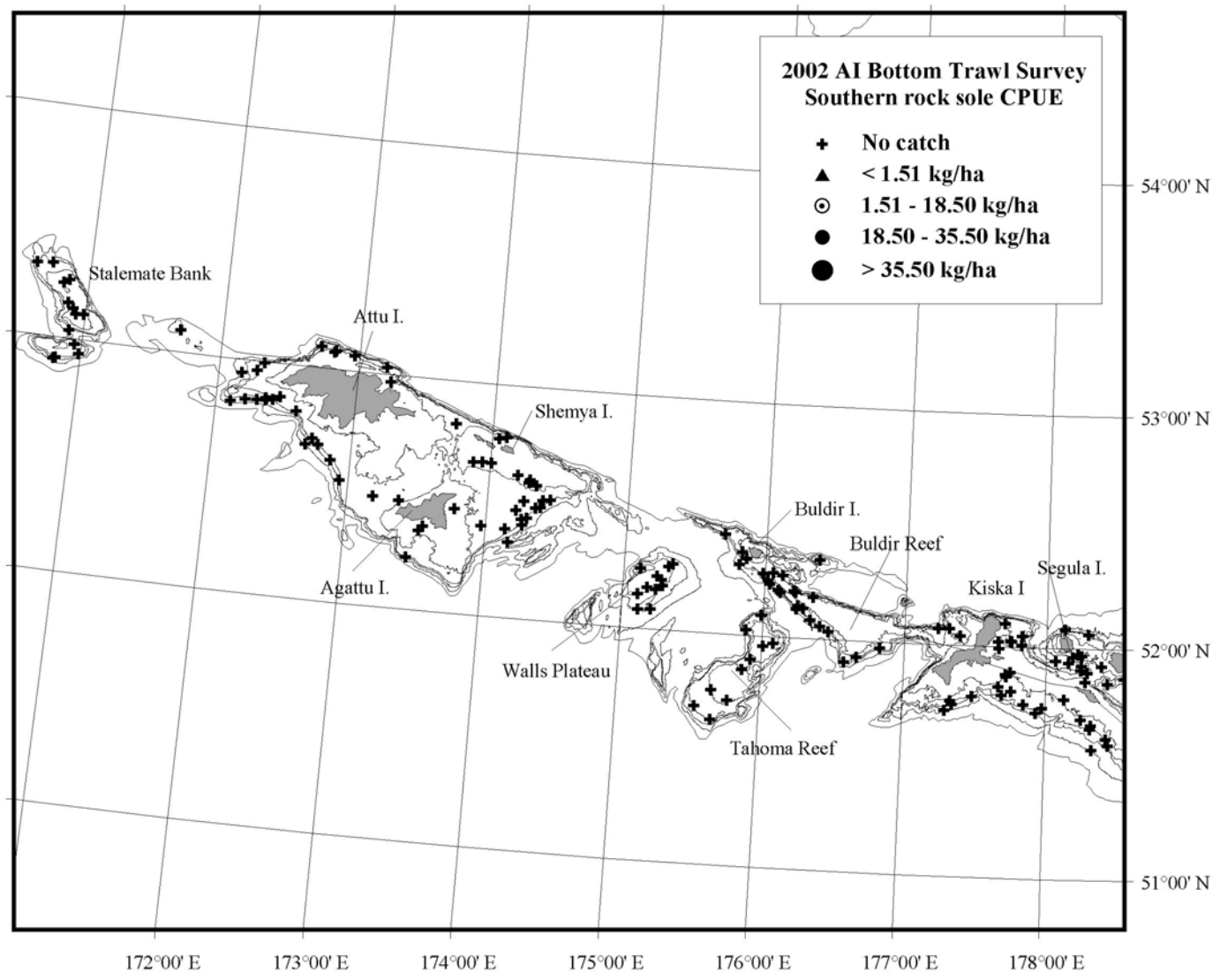

Figure 11.--Continued.

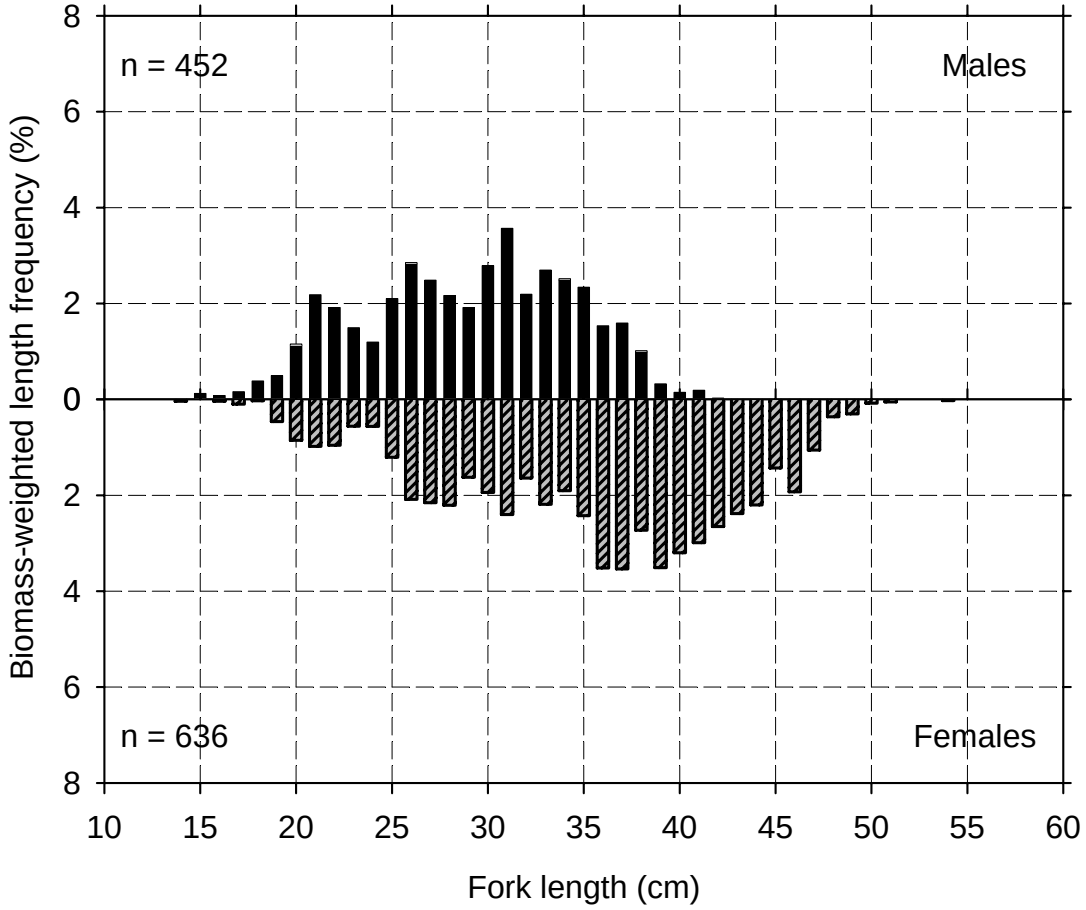

Figure 12.--Size composition of the estimated southern rock sole population from the 2002 Aleutian Islands bottom trawl survey. All depths and areas combined.

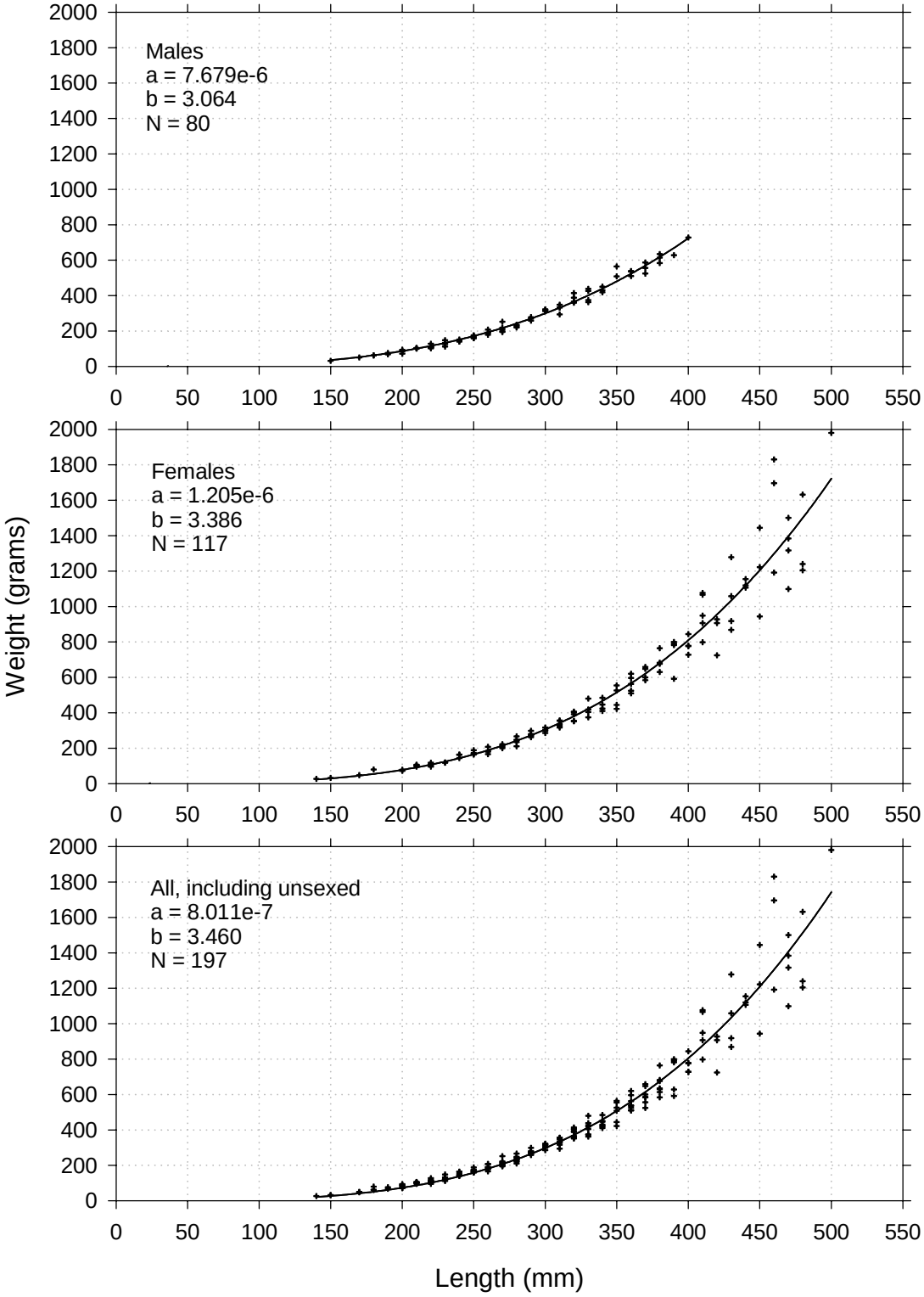

Figure 13.--Length-weight relationship for southern rock sole specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $Weight_{(grams)} = a * Length_{(mm)}^{b}$.

Pacific halibut (*Hippoglossus stenolepis*)

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

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

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

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

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

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

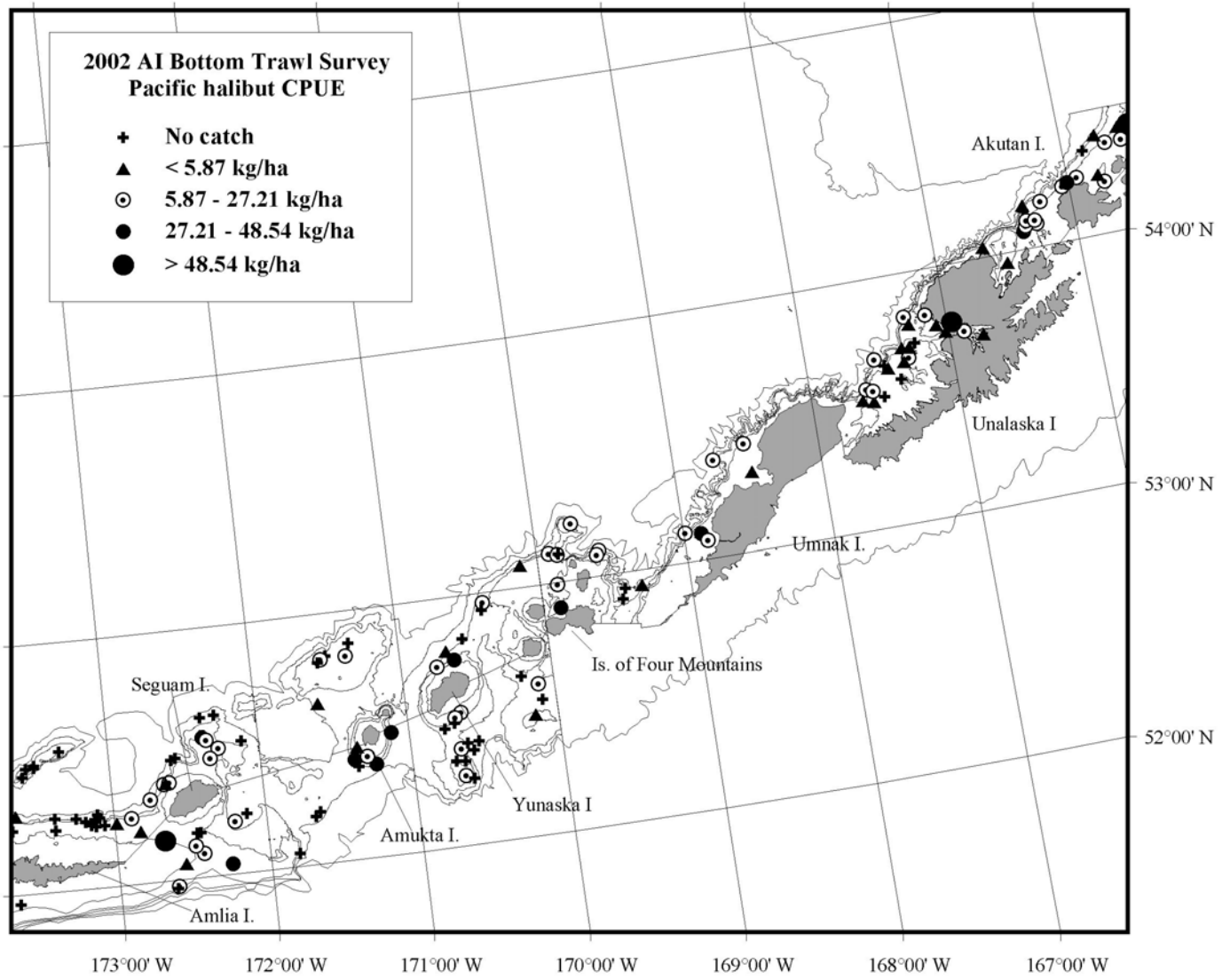

Figure 14.--Distribution and relative abundance of Pacific halibut from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

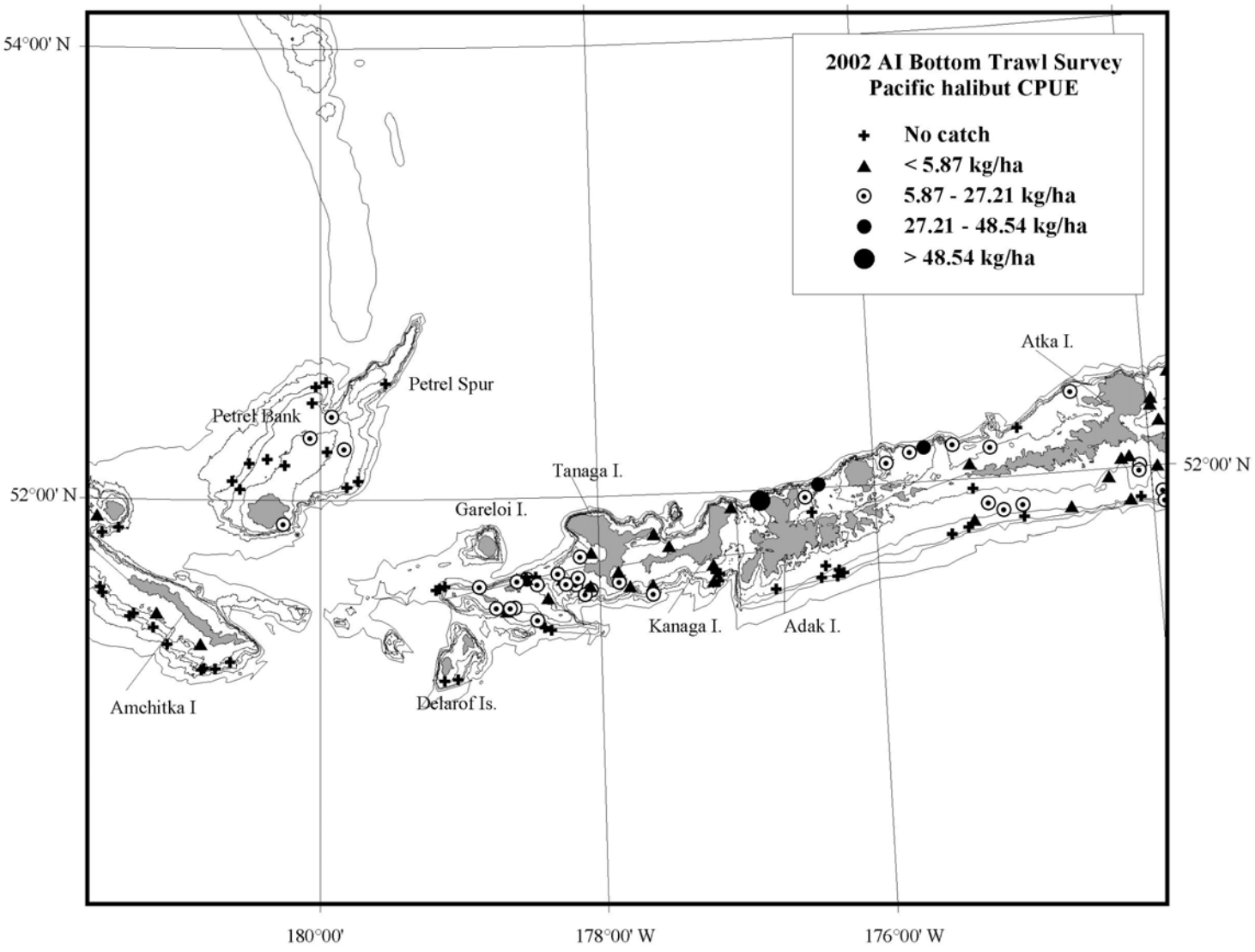

Figure 14.--(Continued).

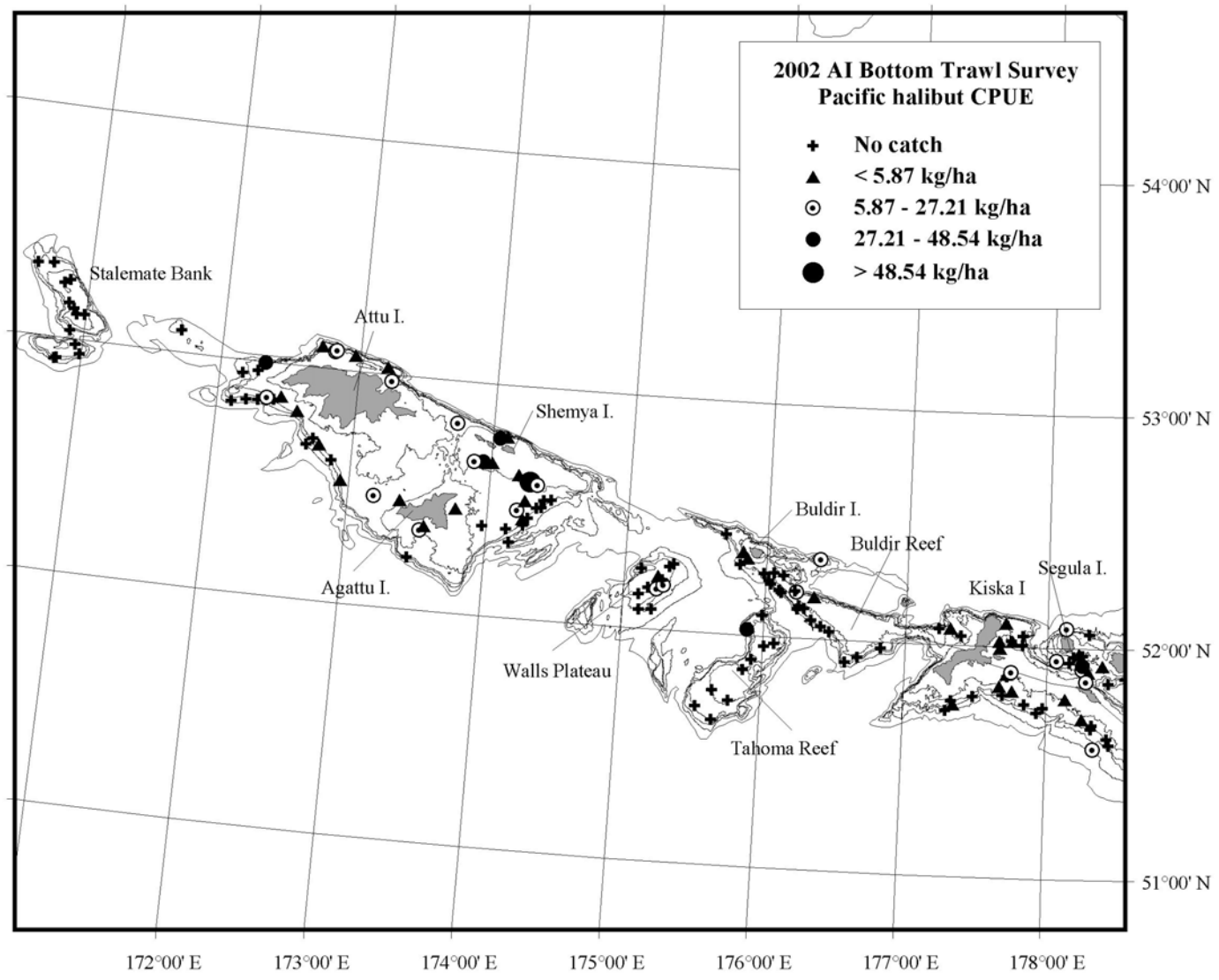

Figure 14.--(Continued).

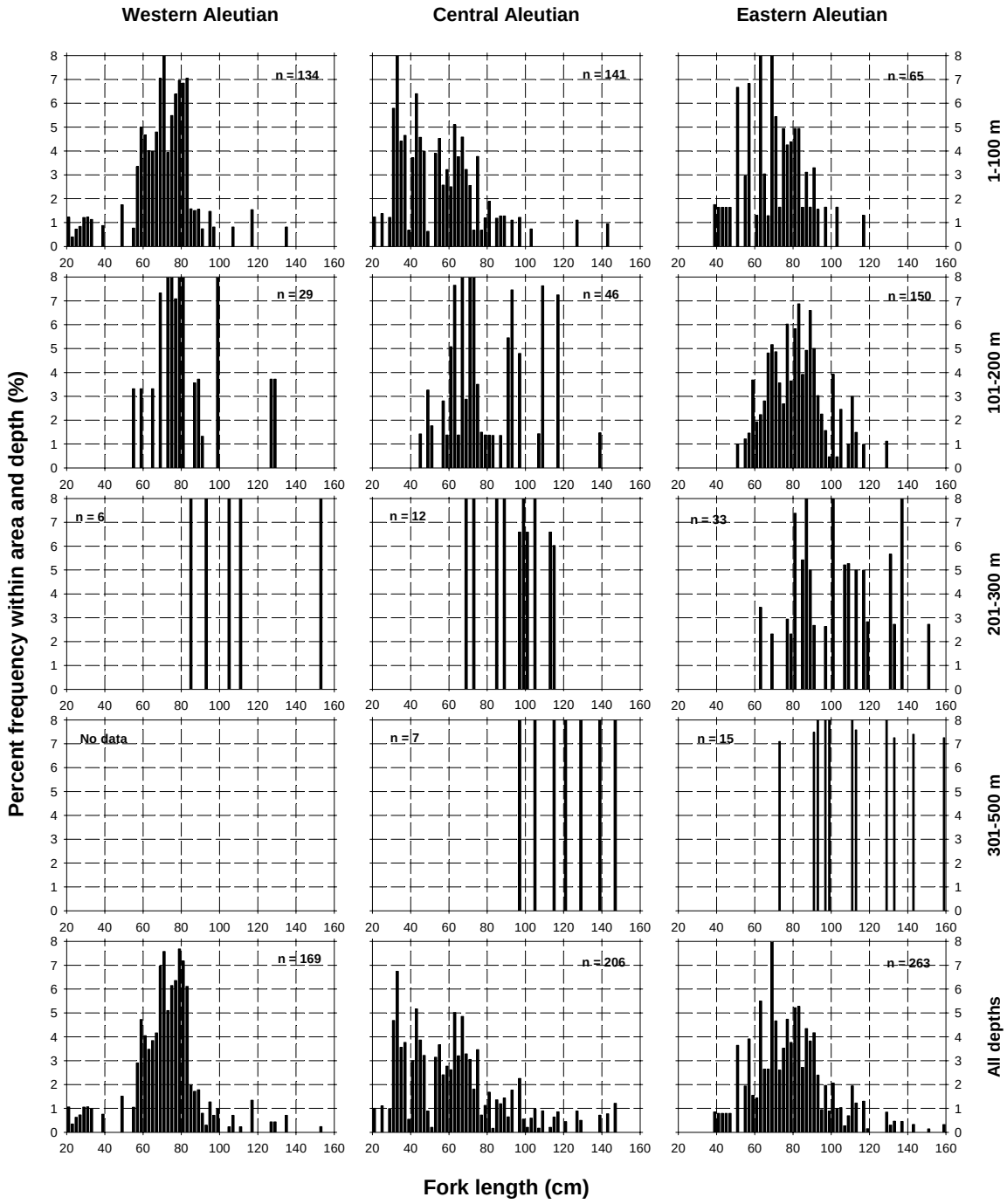

Figure 15.--Size composition of the estimated Pacific halibut population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval. Lengths are grouped in 2 cm increments.

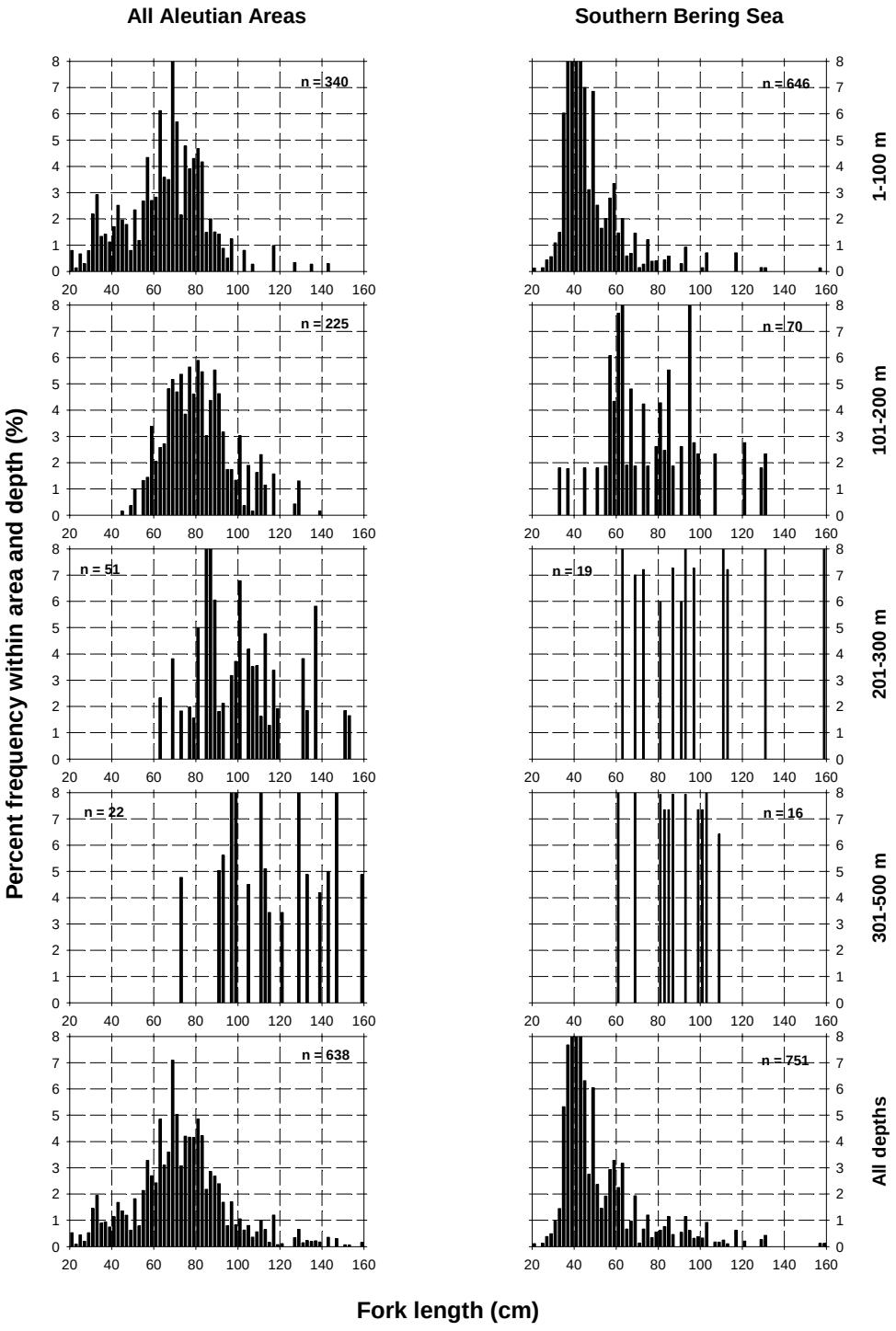

Figure 15.--(Pacific halibut, continued).

Greenland turbot (*Reinhardtius hippoglossoides*)

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

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

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

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

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

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

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

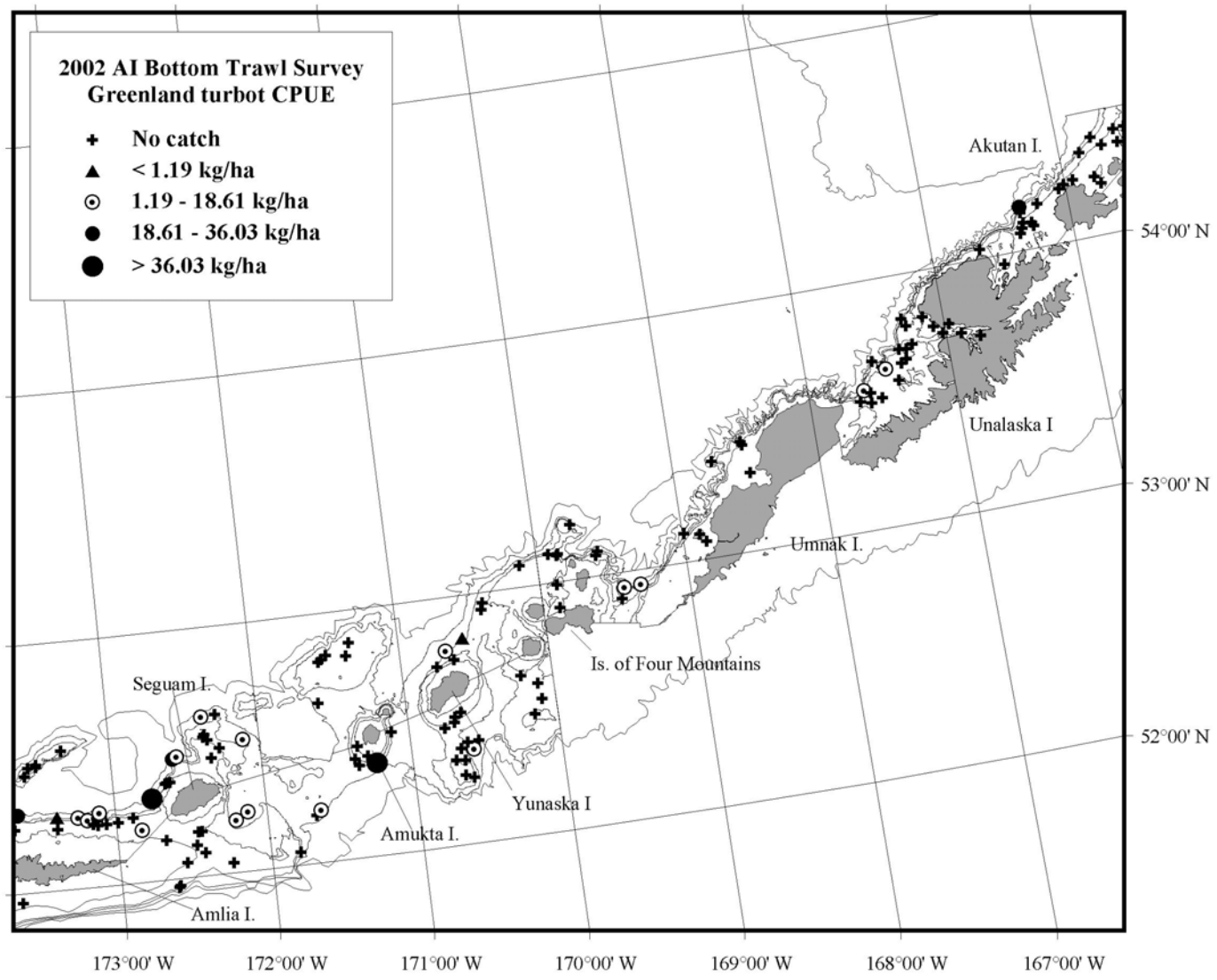

Figure 16.--Distribution and relative abundance of Greenland turbot from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

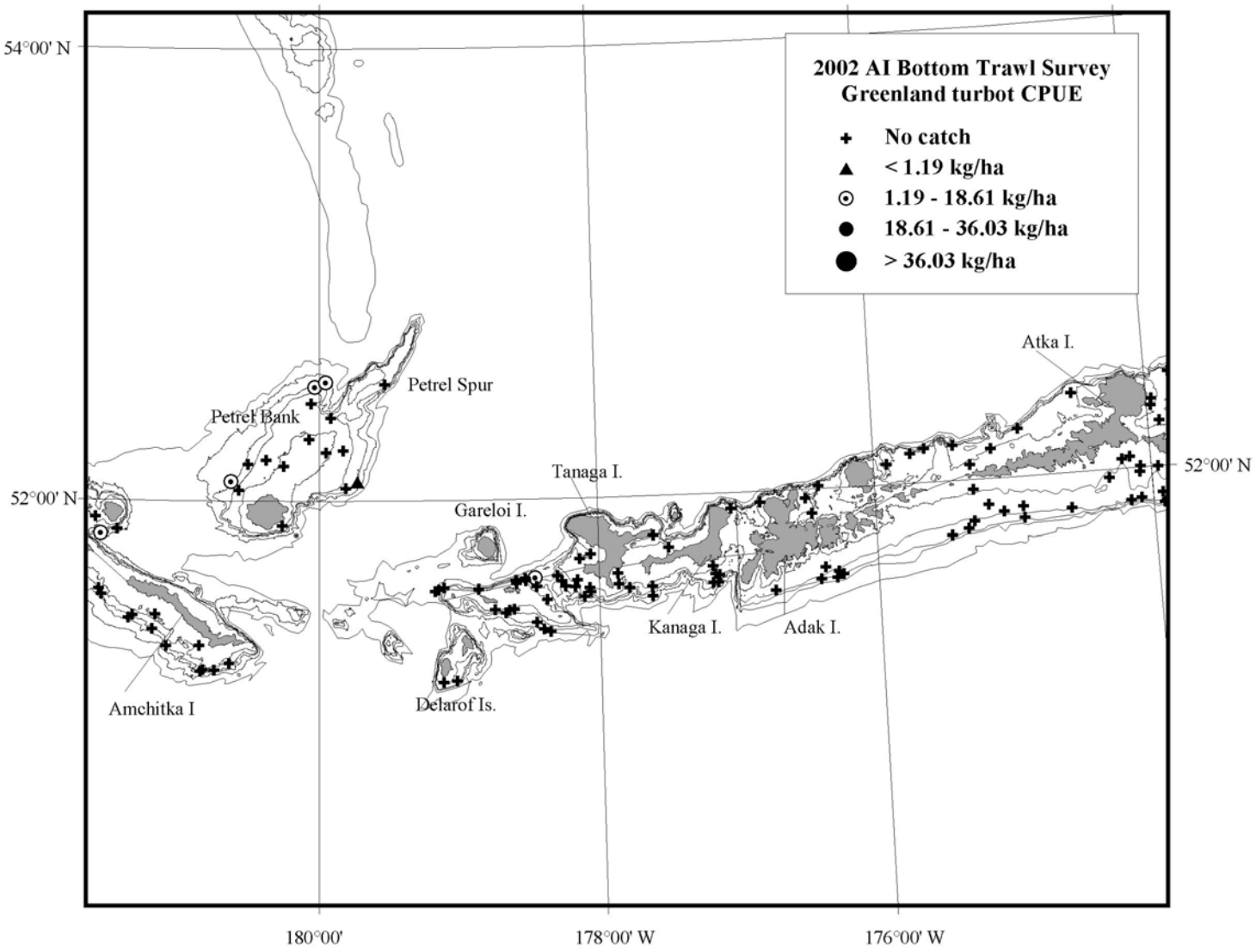

Figure 16.--(Continued).

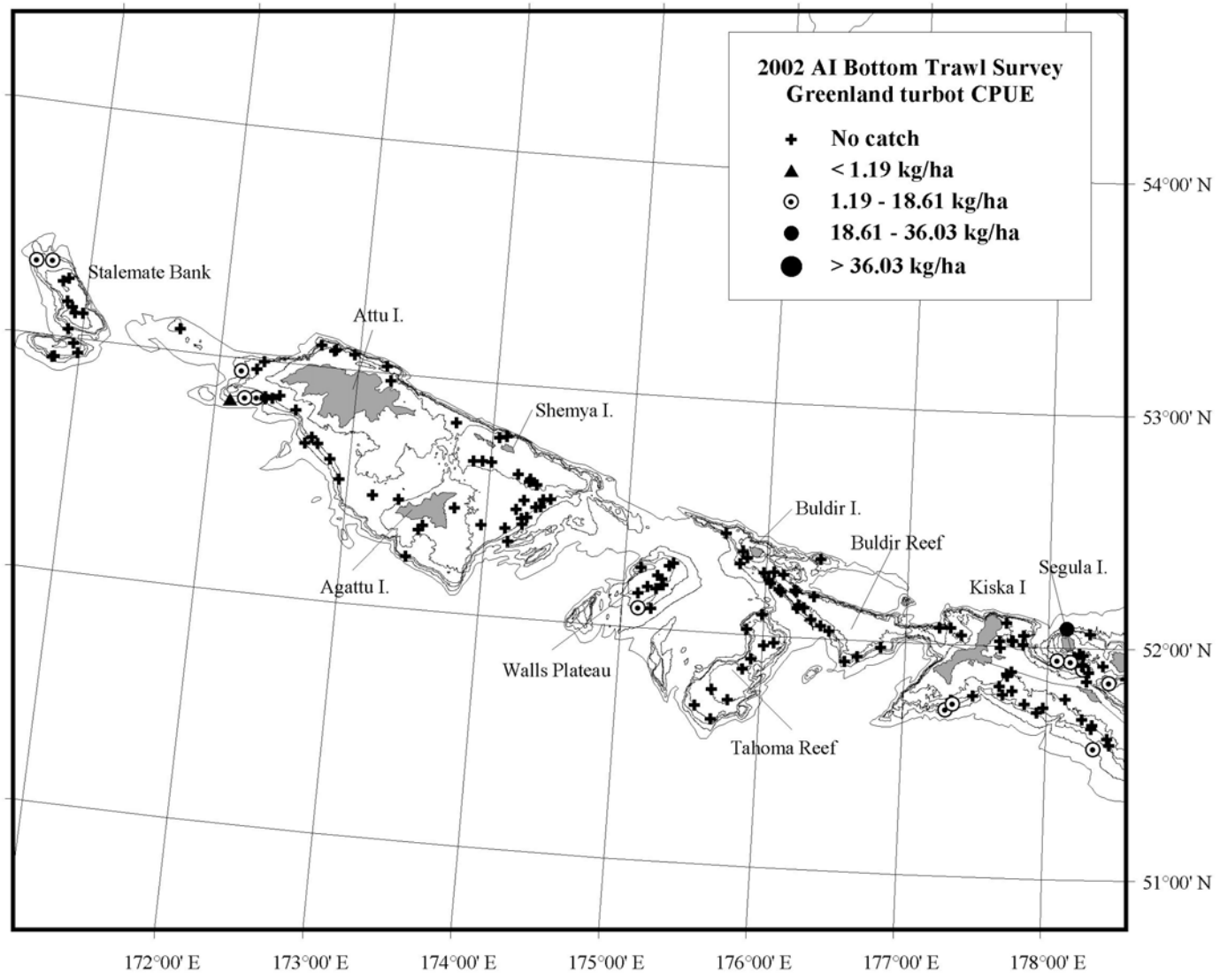

Figure 16.--(Continued).

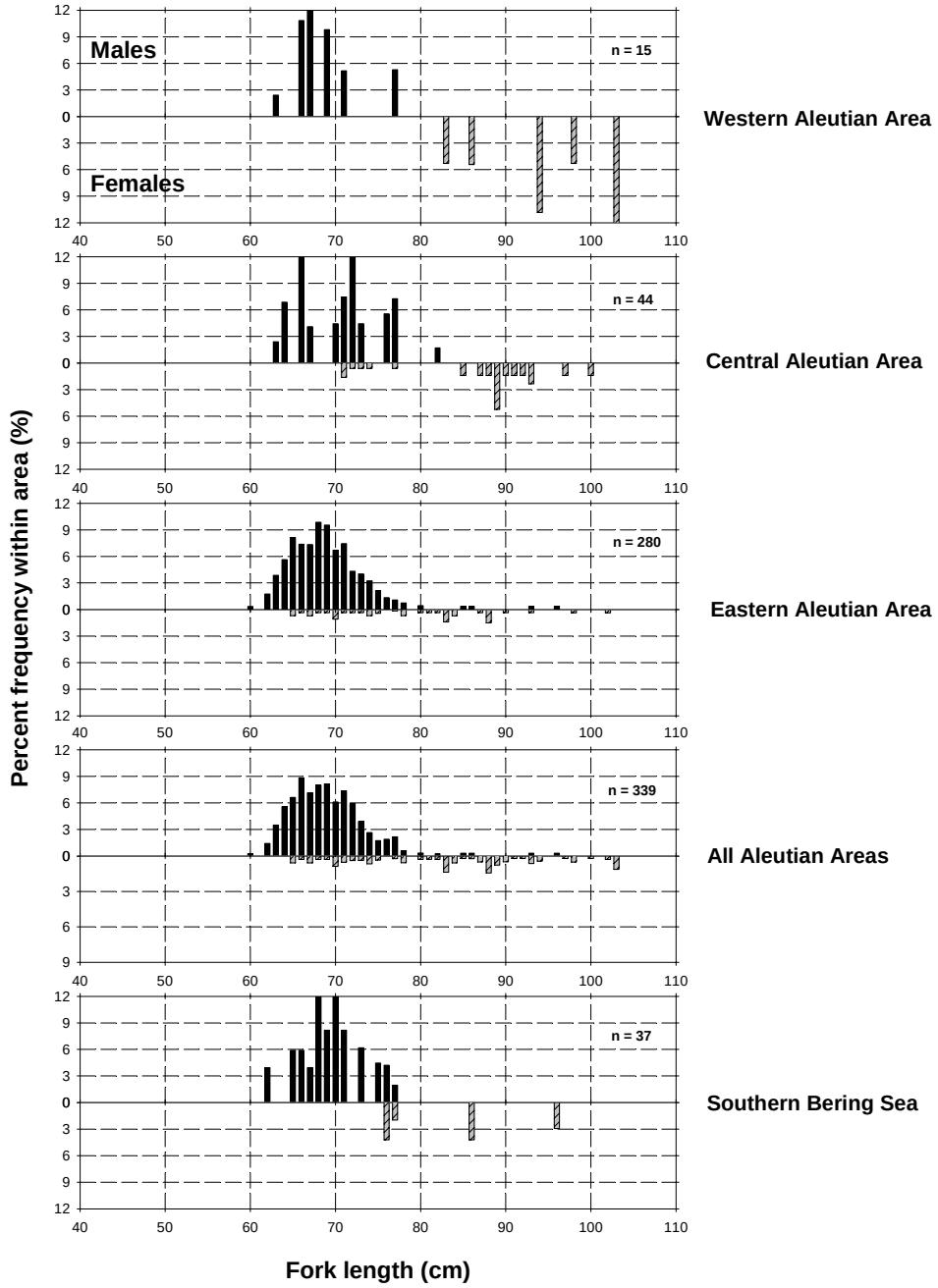

Figure 17.--Size composition of the estimated Greenland turbot population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area. Lengths are from all depths combined.

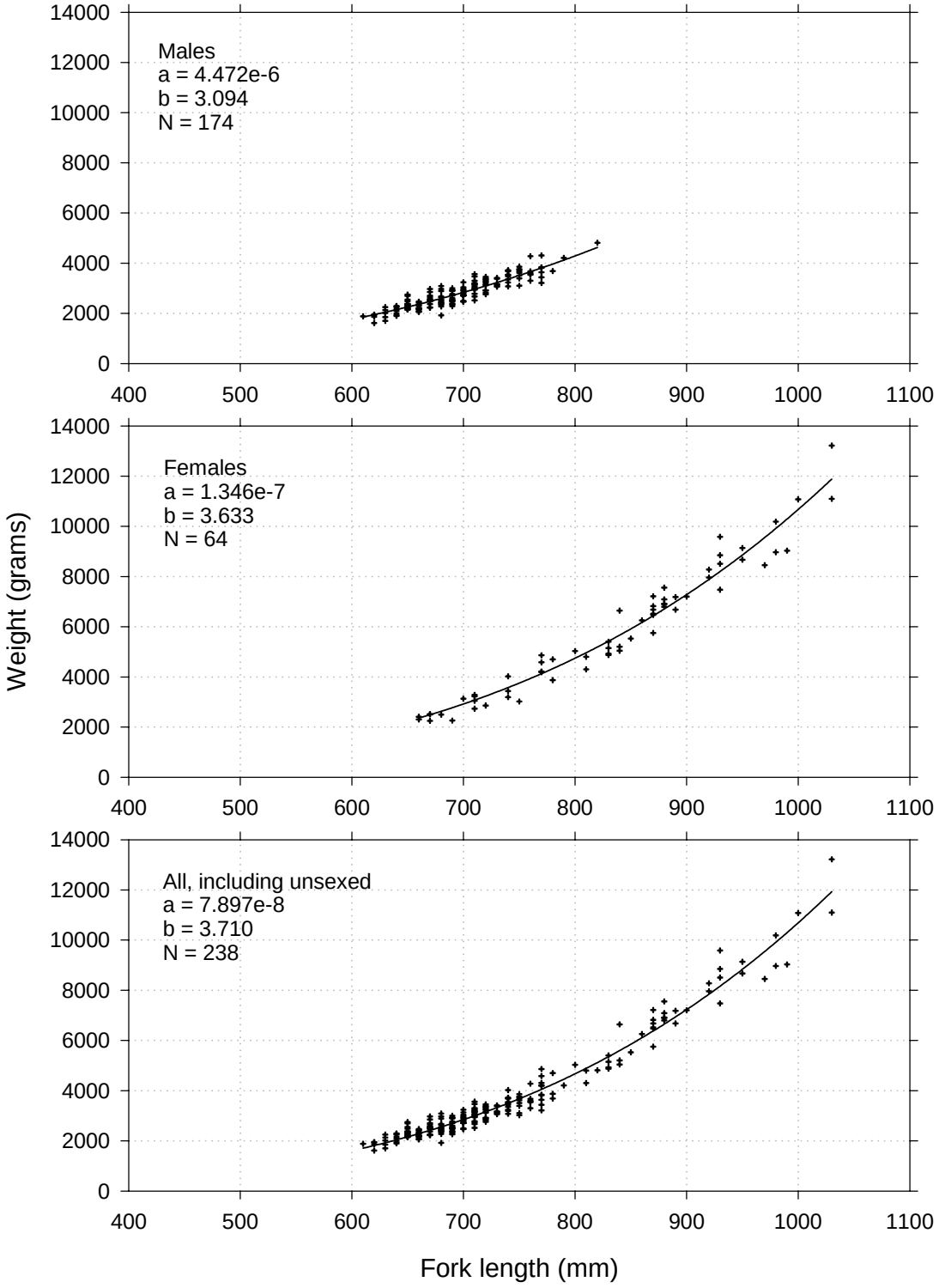

Figure 18.--Length-weight relationship for Greenland turbot specimens collected during the 2002 Aleutian Islands bottom trawl survey. The non-linear least squares regression (solid line) was calculated using the formula $\text{Weight}_{(\text{grams})} = a * \text{Length}_{(\text{mm})}^{\ b}$.

Flathead sole (*Hippoglossoides elassodon*)

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

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

Rex sole (*Glyptocephalus zachirus*)

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

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

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

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

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

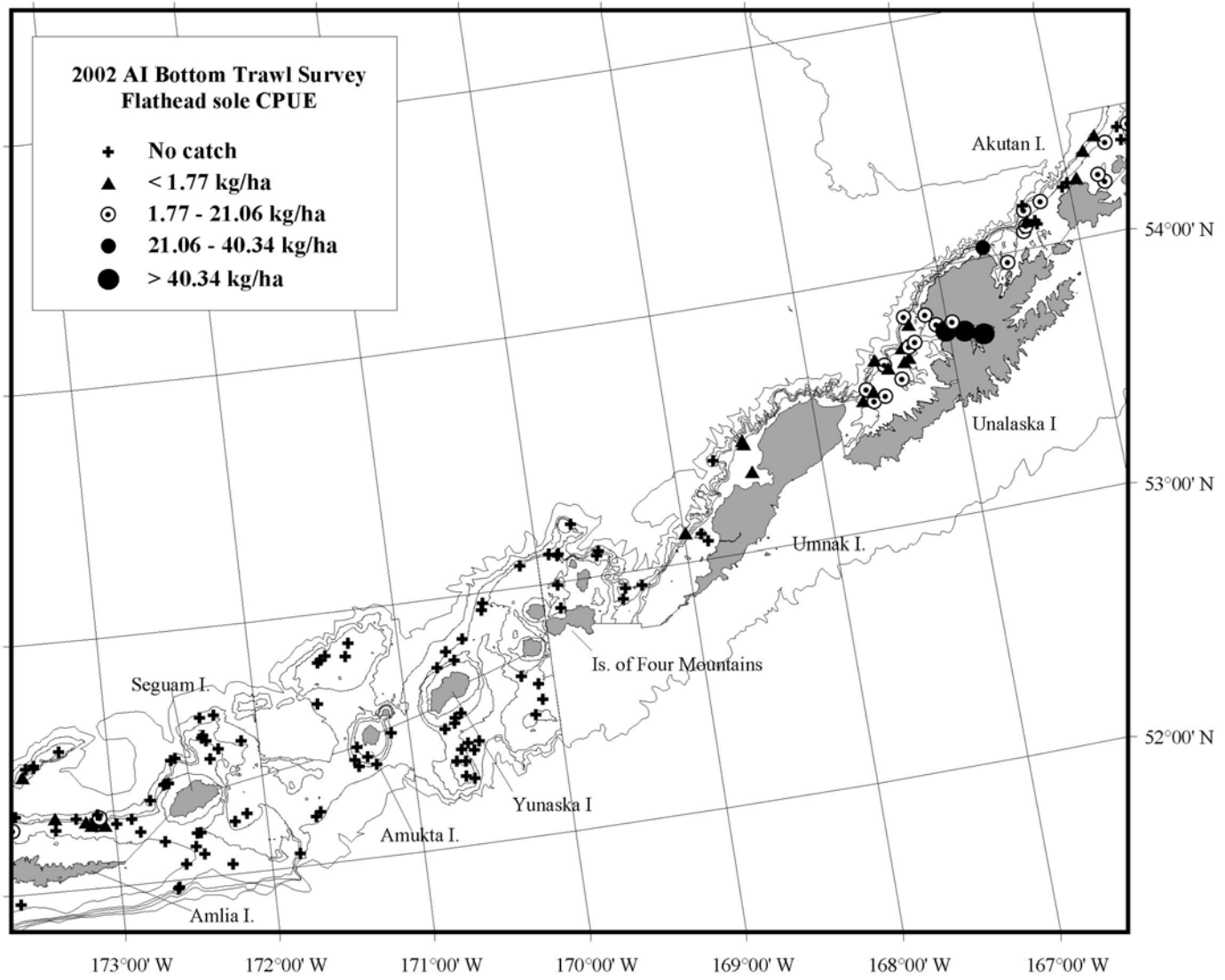

Figure 19.--Distribution and relative abundance of flathead sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations,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

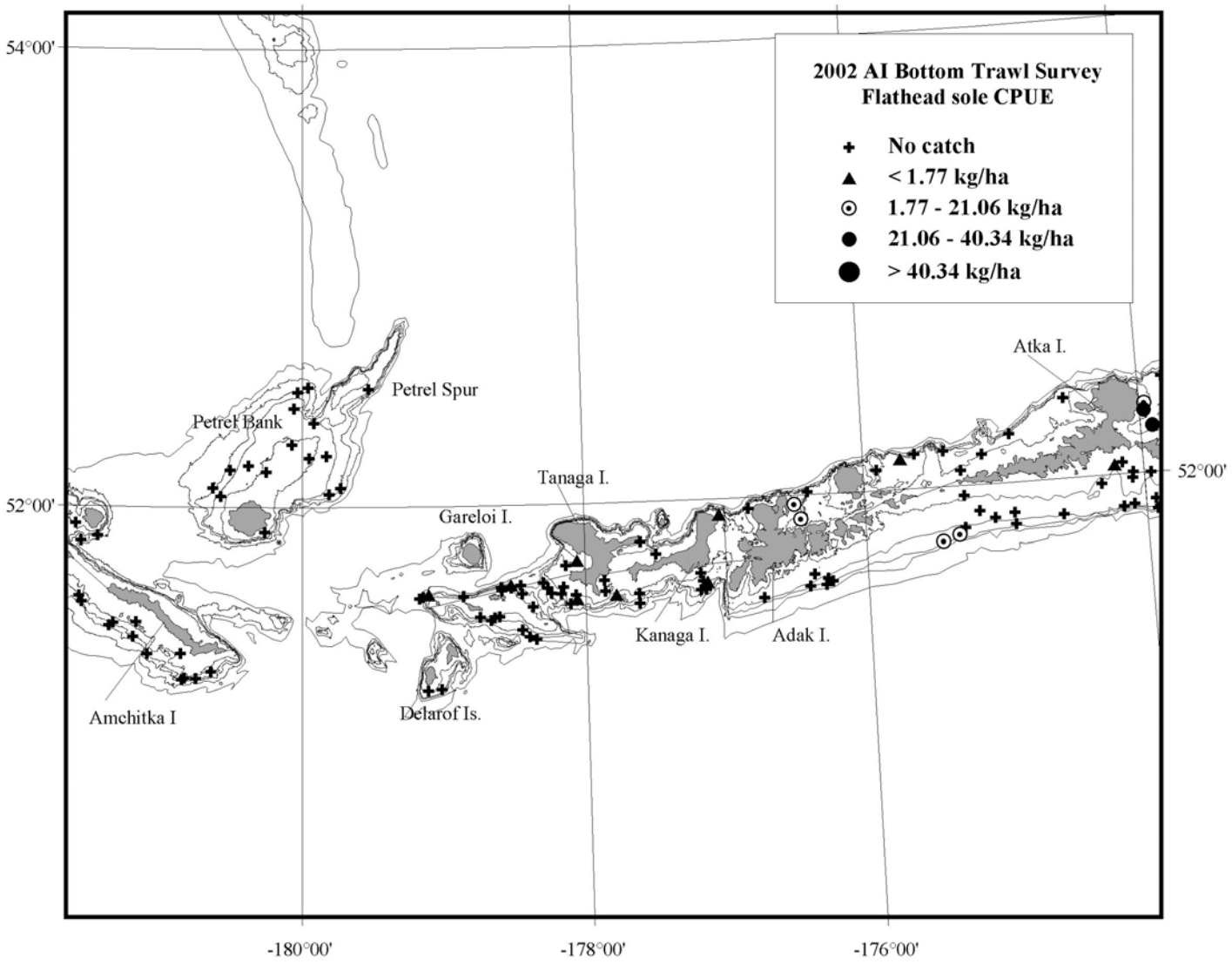

Figure 19.--(Continued).

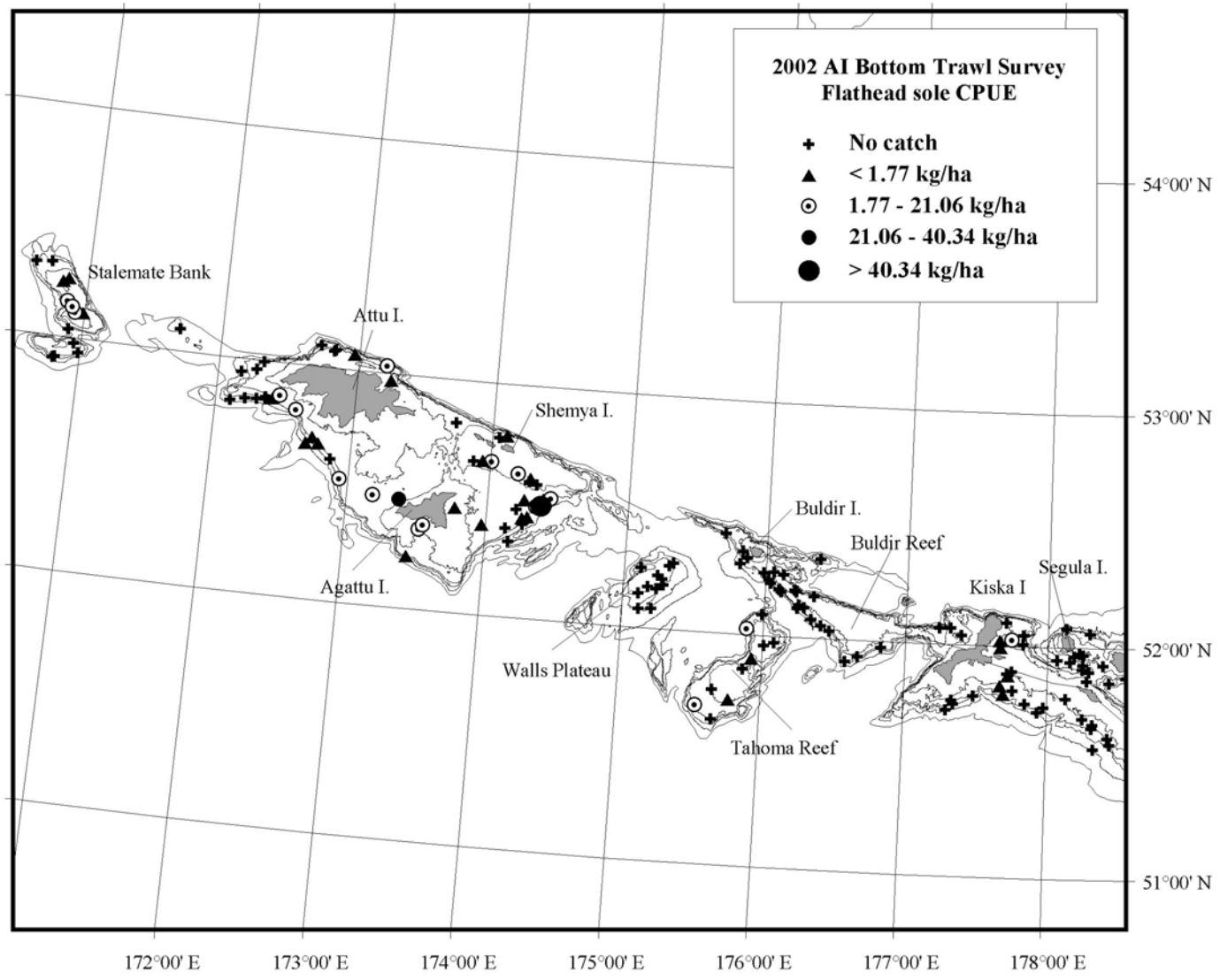

Figure 19.--(Continued).

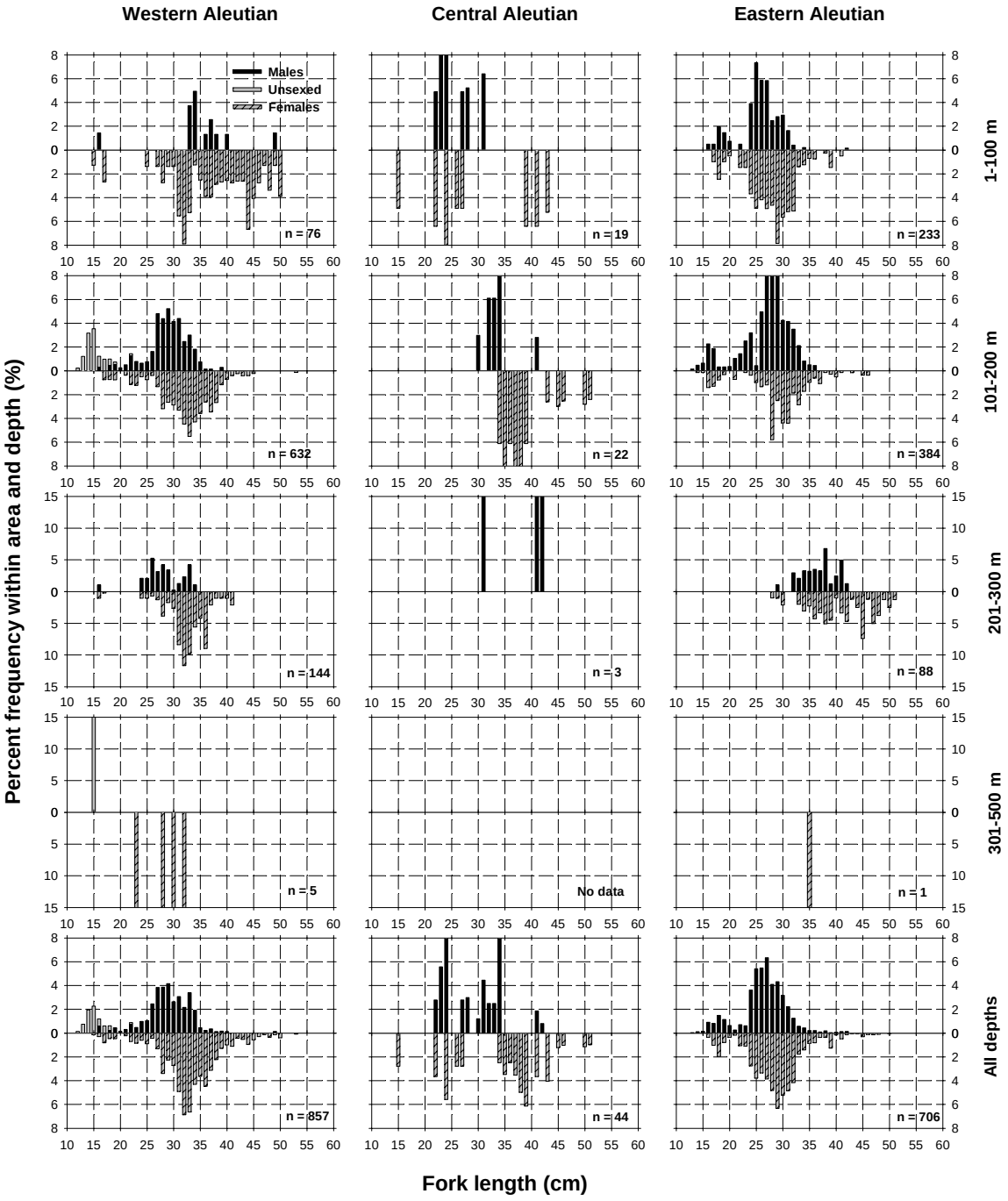

Figure 20.--Size composition of the estimated flathead sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

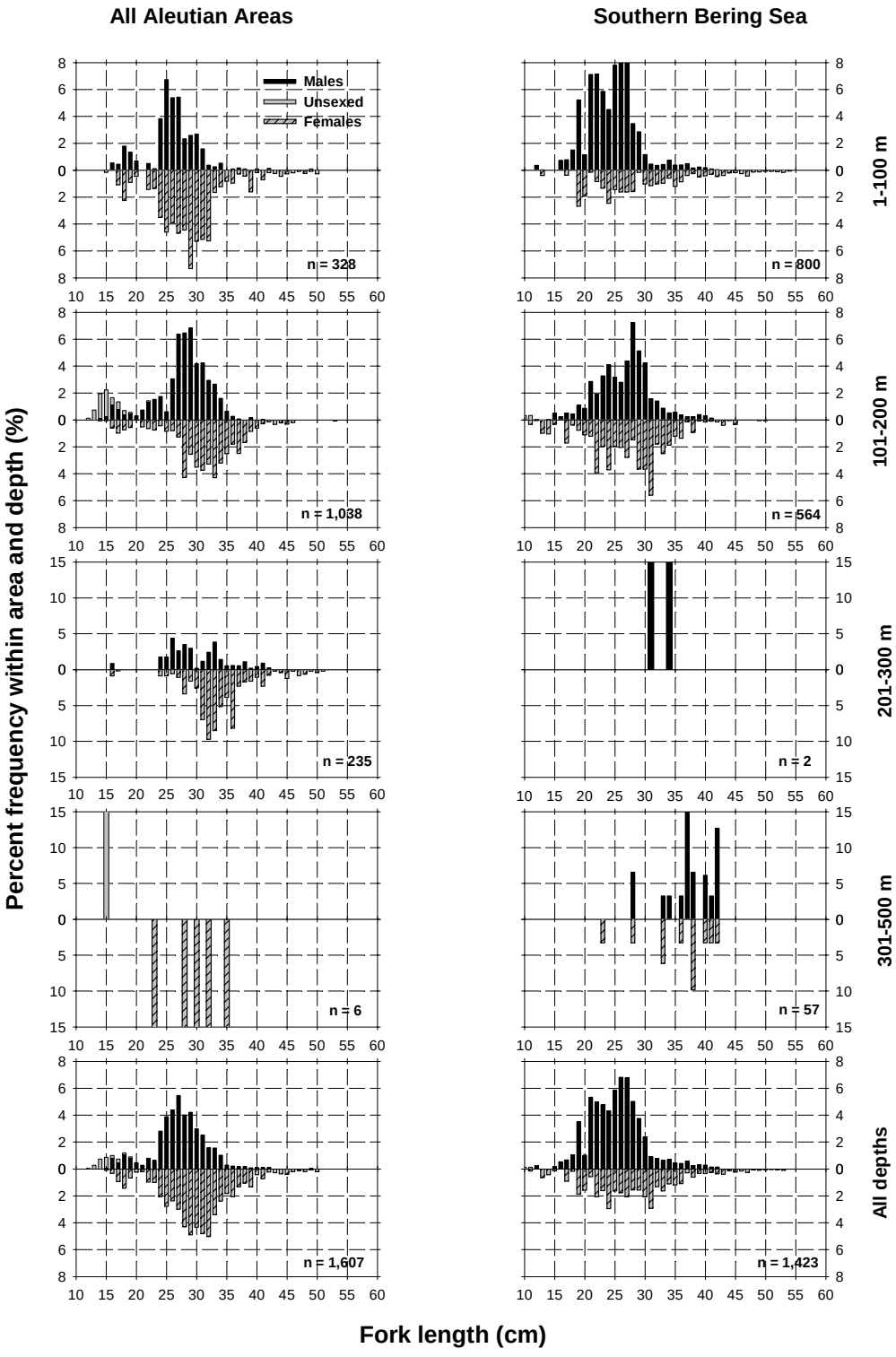

Figure 20.--(Flathead sole, continued).

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

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

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

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

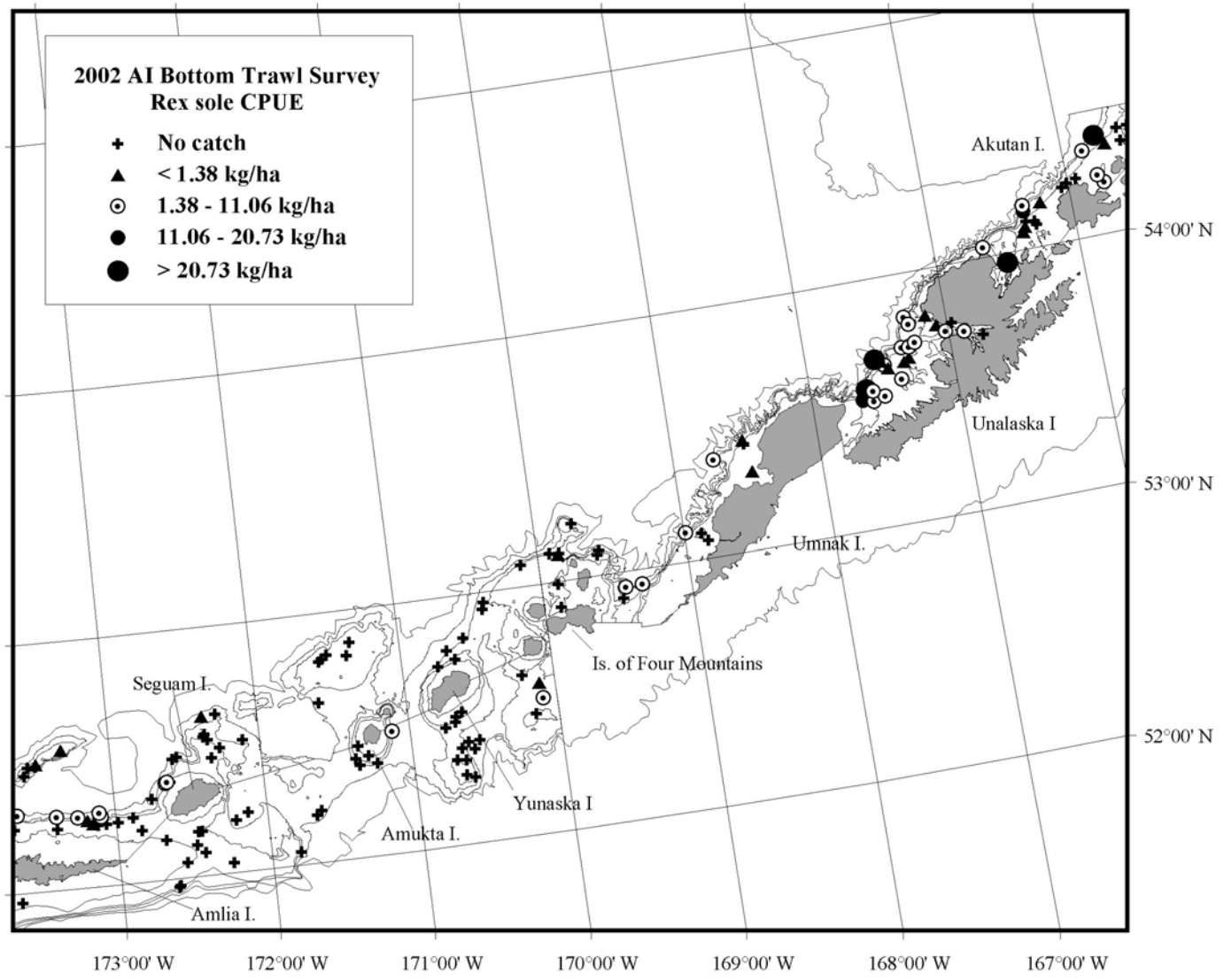

Figure 21.--Distribution and relative abundance of rex sole from the 2002 Aleutian Islands bottom trawl survey. Relative abundance is categorized as no catch, sample CPUE less than mean CPUE, between mean CPUE and two standard deviations above mean CPUE, between two and four standard deviations, and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

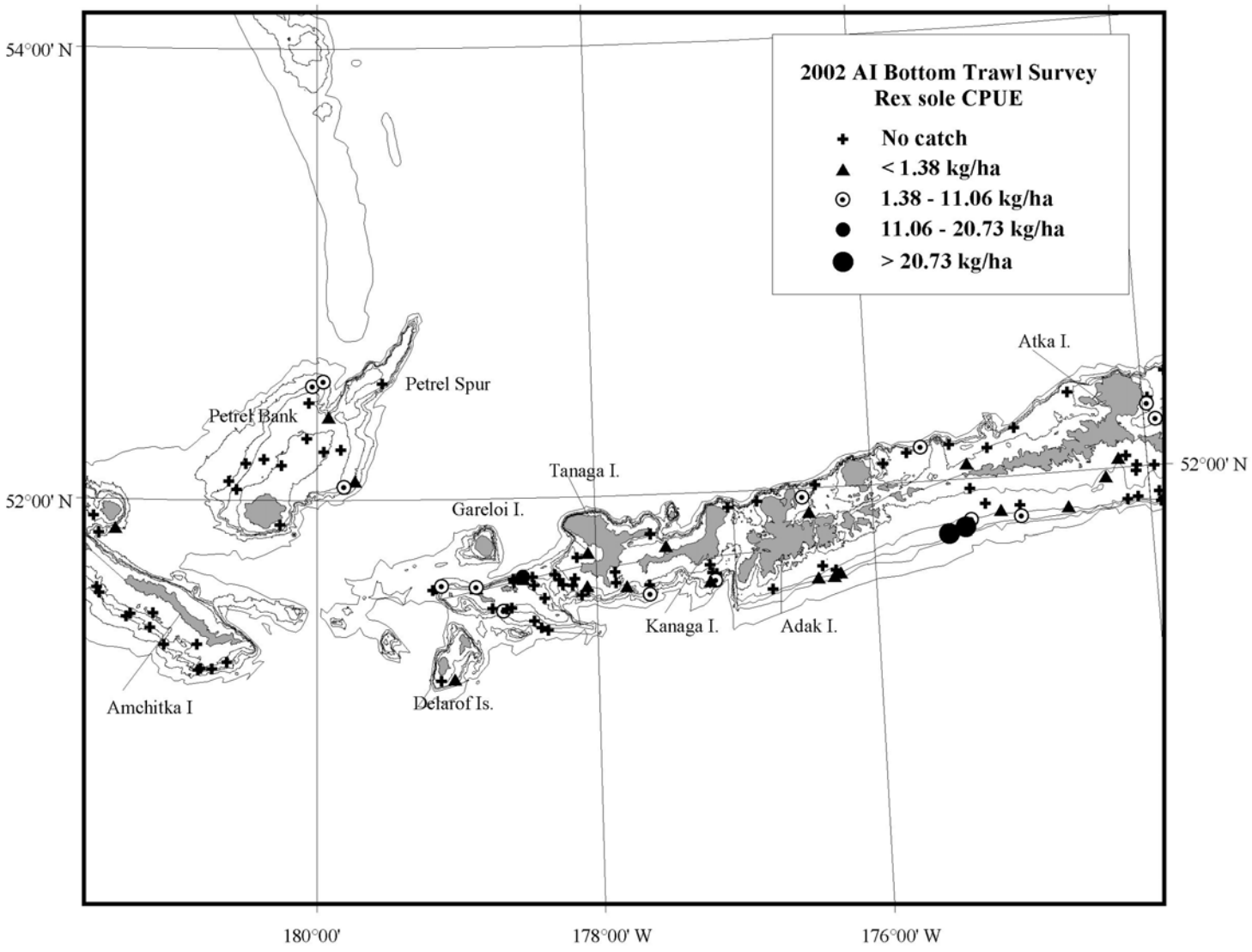

Figure 21.--(Continued).

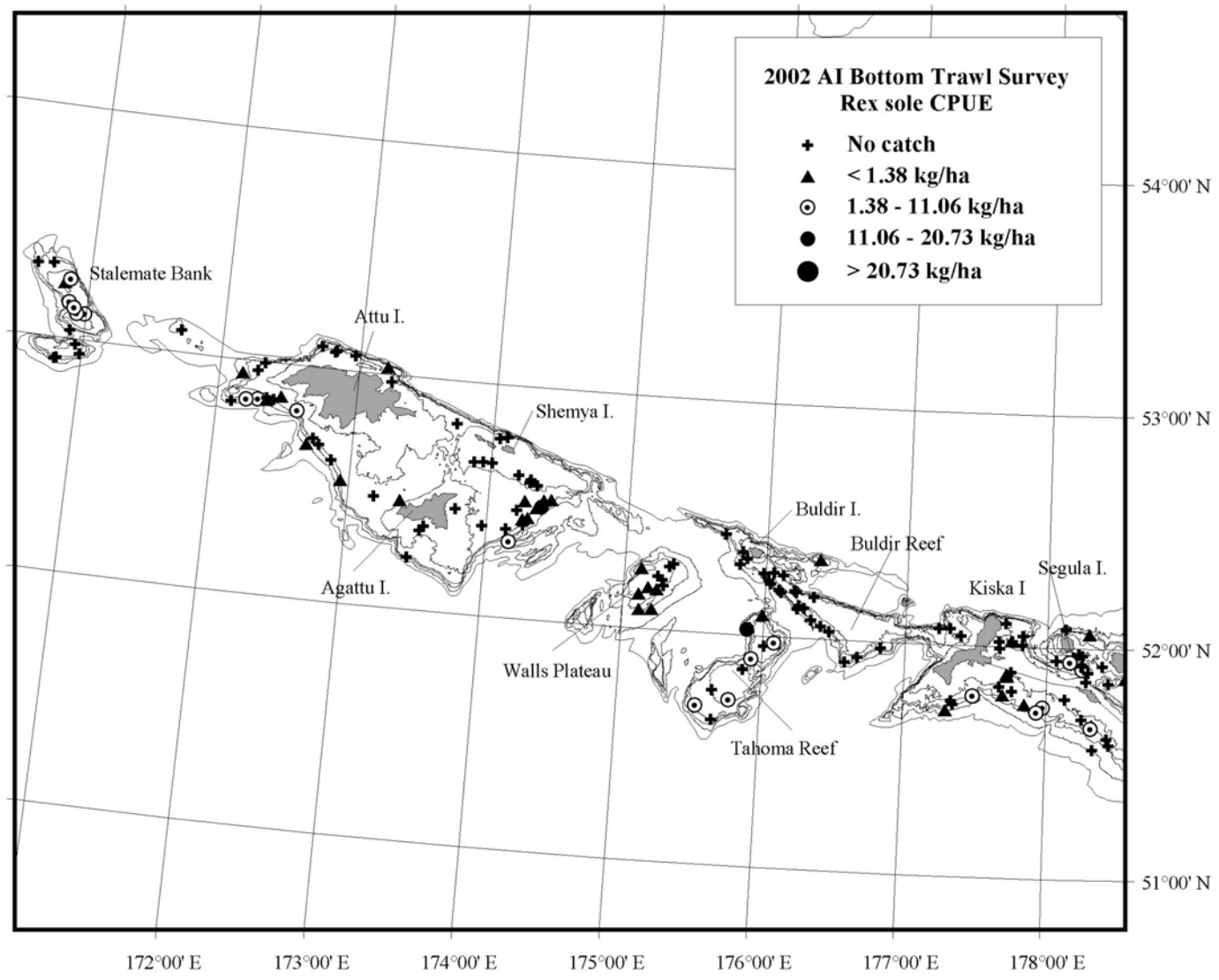

Figure 21.--(Continued).

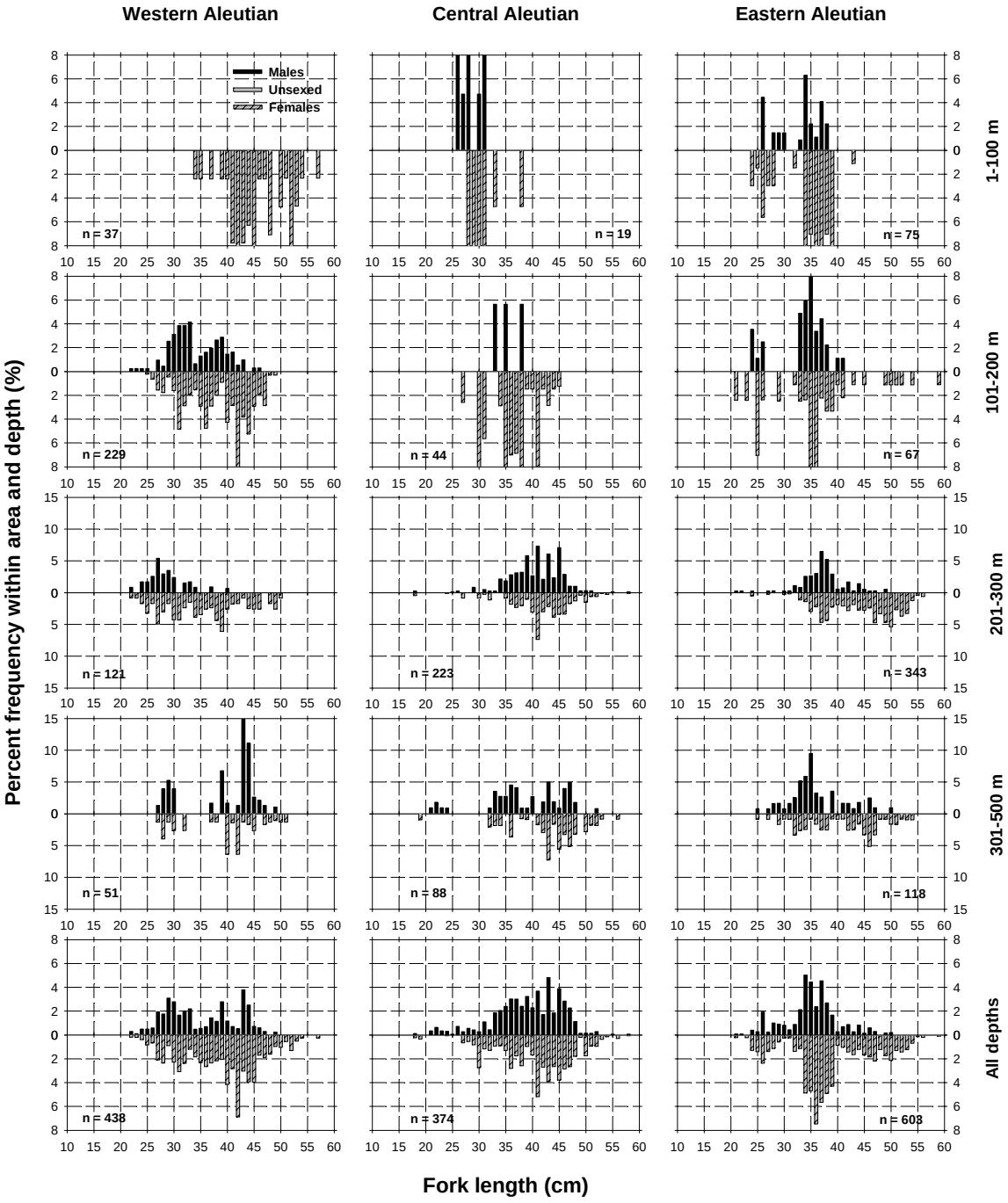

Figure 22.--Size composition of the estimated rex sole population from the 2002 Aleutian Islands bottom trawl survey by NPFMC regulatory area and depth interval.

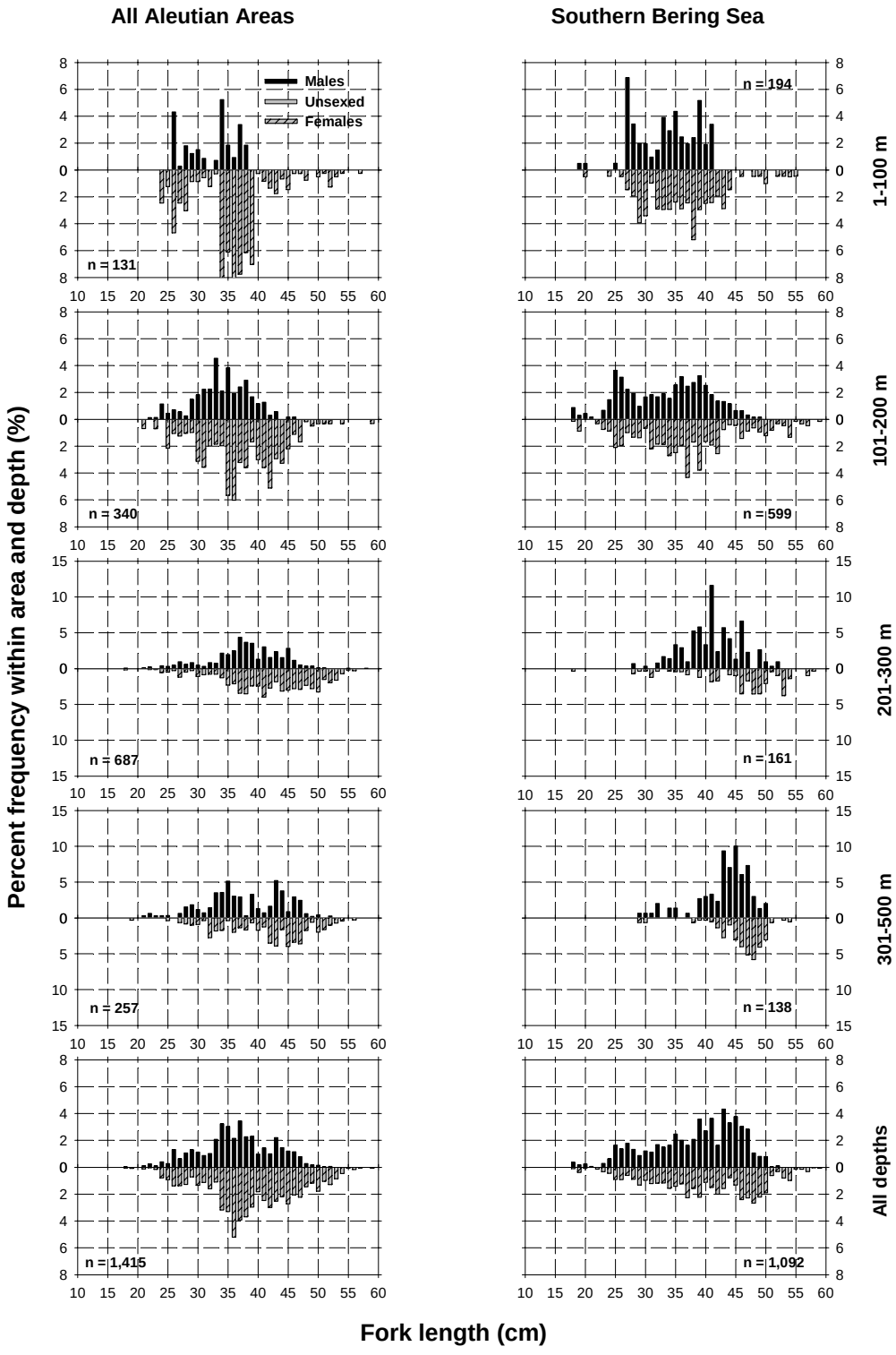

Figure 22.--(Rex sole, continued).

Dover sole (*Microstomus pacificus*)

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