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PRELIMINARY CRUISE RESULTS

NOAA SHIP MILLER FREEMAN, CRUISE NO. 95-02 ECHO INTEGRATION-TRAWL SURVEY OF THE SOUTHEASTERN ALEUTIAN BASIN NEAR BOGOSLOF ISLAND

CRUISE PERIOD, AREA, AND SCHEDULE

Scientists from the Alaska Fisheries Science Center (AFSC) conducted an echo integration-trawl (EIT) survey of walleye pollock (Theragra chalcogramma) aboard the NOAA ship Miller Freeman from February 24, to March 9, 1995. The cruise began and ended in Dutch Harbor, Alaska. The survey area encompassed Aleutian Basin waters near Bogoslof Island from north of Akutan Island westward to Amukta Pass.

The vessel's itinerary was as follows:

Feb 24	Embark scientists in Dutch Harbor, Alaska
Feb 25	Depart Dutch Harbor
Feb 25- Mar 8	EIT survey of the Bogoslof Island region; Amukta Pass conductivity-temperature-depth (CTD) work
Mar 8	Sphere calibration in Makushin Bay
Mar 9	Arrive Dutch Harbor

The primary objective of the cruise was to collect echo integration data and midwater and demersal trawl data necessary to determine the distribution, biomass, and biological composition of walleye pollock in the southeastern Aleutian Basin near Bogoslof Island.

Other objectives of the cruise were to collect and preserve whole stomachs from pollock, to spawn mature pollock, and culture the fertilized eggs for laboratory experiments on larval pollock growth rate and development, to collect mature pollock ovaries for fecundity studies, and to calibrate the acoustic data collection system. A series of four CTDs was conducted in Amukta Pass to continue the acquisition of long-term, oceanographic,



time-series data for Pacific Marine Environmental Laboratory (PMEL)/Fisheries Oceanography Coordinated Investigations (FOCI) joint projects. Throughout the cruise, meteorological and physical oceanographic data were collected, including temperature and salinity profiles at selected sites. Near surface currents, temperature, salinity, and light levels were continuously monitored.

VESSEL, ACOUSTIC EQUIPMENT, AND TRAWL GEAR

The survey was conducted on board the NOAA ship Miller Freeman, a 66-m (216-ft) stern trawler equipped for fisheries and oceanographic research. Acoustic data were collected with a quantitative echo-sounding system (Simrad EK500¹). Simrad 38 kHz and 120 kHz split-beam transducers were mounted on the distal end of the vessel's centerboard. The 38 kHz was the primary data collection transducer. With the centerboard fully extended, the transducers were 9 m below the water's surface. System electronics were housed in a portable laboratory mounted on the vessel's weather deck. Data from the Simrad EK500 echo sounder/receiver were processed using Simrad BI500 echo integration and target strength data analysis software on a SUN workstation.

Midwater echo-sign was sampled using a modified Northern Gold 1200 midwater rope trawl (NET Systems, Inc.). The trawl was constructed with ropes in the forward section and stretch mesh sizes ranging from 163 cm (64 in) immediately behind the rope section to 8.9 cm (3.5 in) in the codend. It was fished in a bridleless configuration and was fitted with a 3.2-cm (1.25-in) mesh codend liner. Headrope and footrope lengths were 94.5 m (310 ft) and 50 m (164 ft), respectively, and the breastlines measured 79.4 m (260.5 ft). The headrope length was measured between the points of attachment to the breastline. The footrope length was measured between the points where the tom weights are attached. The net was fished with 1.8-m X 2.7-m (6-ft X 9-ft) steel V-doors [1,000 kg (2,200 lb)] and 227-kg (500-lb) tom weights on each side. Vertical net opening and depth were monitored with a Furuno wireless netsounder system attached to the headrope of the trawl.

Fish on and near bottom were sampled with a polyethylene Nor'eastern high-opening bottom trawl equipped with roller gear. The trawl was constructed with stretch mesh sizes that ranged from 13 cm (5 in) in the forward portion of the net to 8.9 cm (3.5 in) in the codend. It was fitted with a nylon codend liner with a mesh size of 3.2 cm (1.25 in). The 27.2-m (89.1-ft) headrope held 21 floats [30 cm (12 in) diameter]. A 24.7-m

¹ Reference to trade names or commercial firms does not constitute U.S. Government endorsement.

(81-ft) chain fishing line was attached to the 24.9-m (81.6-ft) footrope which was constructed of 1-cm (0.4-in) 6 x 19 wire rope wrapped with polypropylene rope. The 24.2-m (79.5-ft) roller gear was constructed with 36-cm (14-in) rubber bobbins spaced 1.5 m-2.1 m (5 ft-7 ft) apart. A solid string of 10-cm (4-in) rubber disks separated some of the bobbins in the center section of the roller gear. Two 5.9-m (19.5-ft) wire rope extensions with 10-cm (4-in) and 20-cm (8-in) rubber disks were used to span the two lower flying wing sections and were attached to the roller gear. The roller gear was attached to the fishing line using chain toggles [2.9 kg (6.5 lb) each] which were comprised of five links and one ring. The trawl was rigged with triple 54.9-m (180-ft) galvanized wire rope dandyline. The net was fished with 1.8-m X 2.7-m (6-ft X 9-ft) steel V-doors, [1,000-kg (2,200-lb)]. Vertical net opening and depth were monitored with a Furuno wireless net sounder system attached to the headrope of the trawl.

A Methot trawl and a bongo net were used to sample micronekton and macrozooplankton at two sampling sites, respectively. The mouth of the Methot was a square frame measuring 2.27 m (89.5 in) on each side. Mesh size was 2 mm X 3 mm (0.08 in X 0.12 in) in the main part of the net, and 1 mm (0.04 in) in the codend. A 1.83-m (6-ft) dihedral depressor modified from an Isaacs-Kidd midwater trawl was used. The Methot was not fished with steel V-doors. Instead, it was attached by a single cable fed through a stern-mounted A-frame. Tow depth profile for the Methot trawl was obtained by attaching a microBT (small, retrievable temperature profiler) to the frame. The bongo net system consisted of a 60 cm (23.6 in) bongo frame with 333 μ m mesh nets. A 40 kg lead weight was used as a depressor. To monitor depth and oceanographic conditions, a Seabird CTD profiler was attached to the wire about 0.6 m above the bongo frame.

Water temperature and salinity profile data were collected at trawl and calibration sites with a Seabird CTD system. Additional temperature profile data were obtained by launching an expendable bathythermograph (XBT) and by attaching microBTs to most trawls. Sea surface oceanographic data and environmental data were collected using the NOAA ship Miller Freeman's Scientific Collection System (SCS). Ocean current profile data were provided by the vessel's acoustic Doppler current profiler system whose transducer is mounted in the centerboard.

SURVEY METHODS

Four standard sphere calibrations were conducted in conjunction with the survey (Table 1). Two were completed before the cruise began, on January 26 in Puget Sound, Washington and on February 13 in Ugak Bay, Kodiak Island, Alaska. The third and fourth calibrations were completed at the end of the cruise on March 8,

in Skan Bay, and on April 13, in Anderson Bay, Unalaska Island, Alaska. For the 38 kHz transducer, the main data collection system, no significant differences in the acoustic system parameters were observed between the four calibrations. The 120 kHz transducer experienced some acoustic parameter changes between the first, second and third calibrations. The SV gain for the 120 kHz dropped from 25.1 to 24.1, and the TS gain dropped from 24.9 to 24.1 (Table 1). Between the third and fourth calibration no further acoustic parameter differences occurred. During the Bogoslof area survey, both the 120 kHz and the 38 kHz acoustic systems were operated with February 13 calibration settings.

The Bogoslof Island area survey began in late afternoon on February 25 and ended the morning of March 9. Two EIT survey passes were conducted through the main Bogoslof spawning area covering a total of 1,782 nmi of transects, including transit to and from Amukta Pass. The trackline for pass 1 consisted of north-south transects beginning at 165° 51'W long. westward to 170° 53'W long. (Fig. 1). Transect spacing at the eastern and western ends of the survey area was 10 nautical miles (nmi). In the central survey area where pollock densities were higher, transect spacing was decreased to 5 nmi. The southern transect endpoints were at about 100 m bottom depth on the Aleutian shelf. The northern extent of the transects was similar to that on previous winter surveys in the Bogoslof region, between 54°00' and 54°30'N lat. Because winter 1994 Domestic Observer Program data indicated that there had been a substantial amount of pollock fishing in early March, 1994, at around 170°W long., the 1995 survey area was extended farther west than in previous years. During pass 2, parallel tracklines oriented north-south and spaced at 5 nmi were conducted from 169°15'W long. eastward to about 164°38'W long. (Fig.2). The southern boundaries of pass 2 were similar to those from pass 1, whereas northern transect boundaries were shifted slightly to the south.

EIT survey operations were conducted both day and night. While conducting transects, the vessel maintained speeds ranging between 7 and 12 kts, depending upon weather conditions. The acoustic system collected echo integration data continuously along the transects. After being properly scaled, these data were used to provide estimates of pollock density. Midwater trawl hauls were made at selected locations to identify echo sign and provide biological samples. The average trawling speed was about 3 kts. The vertical opening for the midwater rope trawl averaged about 23 m. Standard catch sorting and biological sampling procedures were used to provide weight and number by species for each haul. Pollock were further sampled to determine sex, length, body weight, age, maturity, and ovary weight. Ovary tissue samples were collected from mature (pre-spawning) females

and preserved in Gilson's solution for fecundity studies. Pollock stomachs were collected and preserved in formalin for food habits studies.

Between survey passes 1 and 2, a series of four CTDs were conducted in Amukta Pass. Procedures for conducting these CTD casts were the same as those used for FOCI cruises. CTD descent rate was 30 m/min for the first 200 m and then increased to 45 m/min below that depth. The ascent rate was 50 m/min. For sensor quality assurance, a salinity sample was collected at the bottom of each cast.

PRELIMINARY RESULTS

Biological data were collected and specimen and tissue samples preserved from catches of 17 midwater rope trawls, one bottom trawl, one Methot trawl, and one bongo net tow (Figs. 3 and 4, Tables 2 and 3). Pollock dominated the midwater and bottom trawl catches in both weight and numbers (Tables 4 and 5). Significant numbers of lanternfish (Myctophidae) and northern smoothtongues (Leuroglossus schmidti) were also captured. Euphausiids and a Pacific lamprey accounted for most of the Methot trawl catch by weight (Table 6). With the exception of the Methot trawl and bongo net tow, the distribution of biological samples was fairly even between hauls (Table 7).

Oceanographic data were collected from 15 CTD casts, 1 XBT cast, and 18 microBT casts (Tables 8-10). Temperature and salinity profiles showed a fairly well mixed water column with temperatures close to 3.5° C between 0 and 700 m depth (Fig. 5). Near-surface water was a little cooler (3° C) on the eastern Bering Sea shelf side of the survey area, and a little warmer on the western (Aleutian Basin) side (4° C). Salinity increased with depth from about 32.5 ppt at the surface to 34 ppt at depths below 500 m.

Pollock echo sign was observed throughout the survey area. Isolated high density aggregations were encountered off the edge of the shelf north of Akutan Island and over deep water northeast of Bogoslof Island. Most of the high density pollock schools were observed along the north side of Umnak Island from 168°W long. to 169°30'W long. (Figs. 1 and 2). The largest pollock aggregations, centered north and west of Umnak Island, were somewhat west of where they had been observed in previous years. The vertical distribution of pollock echo sign ranged from 250 m to 750 m below the surface.

Although pollock caught during the survey had fork lengths (FL) ranging from 10 to 68 cm, the majority were between 40-60 cm FL (Fig. 6). With the exception of several young pollock we estimated to be age 1's, very few fish with FL less than 34 cm

were encountered. Hauls 1, 3, and 5, which were close to the shelf in the eastern portion of the survey area, had fish of shorter average FL than the other hauls. Data from all 17 midwater rope trawls showed that the sex ratio by haul ranged from 8% to 94% female, and averaged around 60% female. During previous Bogoslof area surveys (see unpublished cruise reports MF94-1, MF94-2), observations from paired midwater tows on shallow and deep echo sign layers have shown that the proportion of males captured is higher in deeper layers, implying that vertical stratification by sex occurs. In 1995, midwater trawl data indicate that male pollock usually inhabit deeper layers in the water column than females. Of the 17 rope trawls, the three deepest (haul 3 at 497 m, haul 15 at 545 m and haul 12 at 722 m) caught only 17%, 25%, and 8% females, respectively.

Maturity composition for female pollock 38 cm to 69 cm FL indicated that 5% were in a developing stage and not expected to spawn soon, 80% were in a pre-spawning stage, 8% were actively spawning, and 7% were post-spawning (Fig. 7). Haul 1 had the highest proportion of developing stage females compared to the rest of the hauls. The mean gonadosomatic index (GSI), defined as the ratio of gonad weight to total body weight for pre-spawning females, was 0.19 (Fig. 8).

SCIENTIFIC PERSONNEL

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Neal Williamson	M/USA	Chief Scientist	AFSC
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Table 1. Summary of sphere calibrations conducted before and after the 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island.

Date	Location	Freq kHz	Water Temp (deg. C) at Transducer*	Sphere Range		TS Gain	SV Gain	3db Beam Width	Angle Offset Along Athwart
				at Sphere	from Transducer (m)				
26 Jan 95	Port Susan	38	8.4	9.1	23.9	27.3	27.1	7.13	-0.10
		120	8.4	9.0	19.5	24.9	25.1	8.81	-0.62
13 Feb 95	Ugak Bay	38	3.7	3.5	26.7	27.3	27.1	7.16	-0.12
		120	3.7	3.5	21.9	24.5	24.5	8.81	-0.73
08 Mar 95	Skan Bay	38	3.0	3.0	26.7	27.3	27.1	7.13	-0.14
		120	3.0	3.0	22.2	24.1	24.1	9.29	-0.85
13 Apr 95	Anderson Bay	38	2.9	2.8	26.2	27.3	27.1	7.14	-0.09
		120	2.9	2.8	21.4	24.1	24.1	9.36	-0.54
									∞

* The transducer is located approximately 9 m below the water surface.

Note: Gain and beam pattern terms are defined in the "Operator Manual for Simrad EK500 Scientific Echo Sounder (1993)" available from Simrad Subsea A/S, Standpromenaden 50, P.O. Box 111 N-3191 Horten, Norway.

Table 2. Summary of trawl stations and catch data from the Bogoslof Island area during the 1995 pollock echo integration-trawl survey, Miller Freeman cruise 95-02.

Haul No.	Date (1995)	Gear * Type	Time (GMT)	Start Position		Depth (m)		Temp (C)	Pollock		Other		
				Latitude (N)	Longitude (W)	Gear	Bottom		Surface	Weight (kg)	Numbers	Weight (kg)	Numbers
1	26 Feb	R	0446-0456	54 21.07	165 51.88	165	236	3.7	2.9	527.7	765	0.2	1
2	26 Feb	R	1553-1645	54 23.85	166 09.79	487	620	3.8	2.6	265.9	277	8.9	1262
3	26 Feb	R	2232-2257	54 17.06	166 08.76	497	692	3.7	2.8	323.0	491	10.8	864
4	28 Feb	R	0413-0430	54 12.87	167 52.37	429	1419	3.8	3.6	790.2	784	0.8	26
5	28 Feb	R	2120-2153	53 35.00	167 50.86	413	603	3.8	3.6	373.1	399	6.5	212
6	1 Mar	R	0426-0456	53 42.16	168 08.49	444	1048	3.8	3.9	295.1	249	7.5	425
7	1 Mar	R	0628-0648	53 39.38	168 08.90	442	999	3.8	3.7	839.0	672	6.1	23
8	1 Mar	M	1012-1015	53 41.43	168 09.83	778	1143	3.3	3.8	--	--	1.4	--
9	2 Mar	R	2228-2237	53 12.94	169 01.82	300	825	3.7	3.9	5454.5	3976	--	--
10	3 Mar	R	0125-0126	53 10.56	169 01.34	350	825	3.7	4.0	2755.4	2060	3.6	1
11	3 Mar	R	0634-0639	53 32.44	168 53.97	282	1500	3.7	3.7	428.0	307	1.4	3
12	3 Mar	R	1837-1917	53 08.82	169 15.04	722	1179	3.2	3.8	2829.8	3021	16.7	1381
13	5 Mar	B	0812-0815	52 29.84	172 07.39	270	270	3.7	3.1	60.9	40	13.1	12
14	6 Mar	R	1040-1048	53 02.65	169 24.19	311	585	3.5	3.5	1540.9	1271	3.3	1
15	6 Mar	R	1742-1800	53 16.11	169 26.85	545	1285	3.5	3.5	807.4	772	2.7	75
16	6 Mar	R	0027-0053	53 40.12	169 12.28	244	1762	3.6	3.3	6818.1	5225	--	--
17	7 Mar	R	1850-1920	53 42.64	168 42.13	362	1735	3.7	3.7	914.4	821	5.9	69
18	8 Mar	R	0321-0332	53 34.58	168 23.84	401	963	3.8	3.8	5431.2	5479	23.4	11
19	8 Mar	R	2053-2128	53 37.64	167 39.51	464	894	3.7	3.3	92.0	97	8.6	400

* R indicates rope trawl, M indicates Method trawl, and B indicates bottom trawl.

Table 3. Bongo net tow station from the winter 1995 pollock echo integration-trawl survey, Miller Freeman cruise 95-02.

Bongo Cast	Date (1995)	Time (GMT)	Start Position		Depth (m)		Comments
			Latitude (N)	Longitude (W)	Cast	Bottom	
1	8 Mar	0158	53 34.28	168 22.17	501	932.0	eggs present

Table 4. Summary of catch by species in 17 midwater rope trawls during the 1995 echo integration-trawl survey of the Bogoslof area, MF95-02.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
Walleye Pollock	<i>Theragra chalcogramma</i>	30,485.700	99.6	26,666
Smooth Lump sucker	<i>Aptocyclus ventricosus</i>	42.994	0.1	21
Lanternfish Unidentified	<i>Mycophidae Unidentified</i>	25.043	0.1	2,392
Pacific Lamprey	<i>Lampetra tridentata</i>	9.888	<0.1	24
Northern Smooth tongue	<i>Leuroglossus schmidti</i>	7.953	<0.1	1,533
Squid Unident	Teuthoidea	6.960	<0.1	97
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	4.770	<0.1	2
Jellyfish Unidentified	Scyphozoa	3.828	<0.1	0
Rough eye Rockfish	<i>Sebastes aleutianus</i>	2.600	<0.1	1
Shrimp Unidentified	<i>Pasiphaea pacifica</i>	1.161	<0.1	589
Deepsea Smelt Unidentified	<i>Bathylagidae Unidentified</i>	0.785	<0.1	32
Viperfish Unidentified	<i>Chauliodontidae Unidentified</i>	0.766	<0.1	27
Salps Unidentified	<i>Thaliacea Unidentified</i>	0.278	<0.1	0
Octopus Unidentified	Octopodidae	0.164	<0.1	1
Alka Mackerel	<i>Pleurogrammus monoptygius</i>	0.132	<0.1	2
Eelpout Unidentified	<i>Zoaridae Unidentified</i>	0.010	<0.1	2
Totals		30,593.032	100.0	31,389

Table 5. Summary of catch by species in 1 bottom trawl during the 1995 echo integration-trawl survey of the Bogoslof area, MF95-02.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
Walleye Pollock	<i>Theragra chalcogramma</i>	60.900	82.3	40
Pacific Ocean Perch	<i>Sebastes alutus</i>	10.800	14.6	11
Soft Coral Unidentified	Alcyonacea	1.798	2.4	0
Jellyfish Unidentified	Scyphozoa	0.290	0.4	0
Spectacled Sculpin	<i>Triglops scepcticus</i>	0.122	0.2	1
Sponge Unidentified	Porifera	0.066	0.1	0
Totals		73.976	100.0	52

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Table 6. Summary of catch by species in 1 Methot trawl during the 1995 echo integration-trawl survey of the Bogoslof area, MF95-02.

Common Name	Scientific Name	Weight (kg)	Weight (%)	Numbers
Euphausiid Unidentified	Euphausiacea	0.562	38.4	0
Pacific Lamprey	<i>Lampetra tridentata</i>	0.430	29.4	2
Jellyfish Unidentified	Scyphozoa	0.136	9.3	0
Lanternfish Unidentified	<i>Myctophidae Unidentified</i>	0.110	7.5	49
Shrimp Unidentified	<i>Pandalina pacifica</i>	0.090	6.2	0
Salps Unidentified	<i>Thaliacea Unidentified</i>	0.072	4.9	0
Northern Smoothtongue	<i>Leuroglossus schmidti</i>	0.040	2.7	46
Deepsea Smelt Unidentified	<i>Bathylagidae Unidentified</i>	0.018	1.2	1
Fish Larvae Unidentified	Pisces	0.001	0.1	13
Squid Unident	Teuthoida	0.001	0.1	1
Amphopod Unidentified	Amphipoda	0.001	0.1	0
Copepods Unidentified	Copepoda	0.001	0.1	0
Totals		1.462	100.0	118

Table 7. Summary of biological samples and measurements collected from the Bogoslof area during the echo integration-trawl survey, MF 95-02.

HAUL	LENGTH		MATURITY	OTOLITHS	BODY		OVARY		STOMACH		FOCI*	
	FREQUENCY				WT	WT	WT	WT	COLLECTION	COLLECTION	COLLECTION	COLLECTION
1	293		96	96	96	19	20	--	--	--	--	--
2	277		66	66	66	38	--	--	--	--	--	--
3	491		70	70	70	26	20	--	--	--	--	--
4	450		83	83	83	40	20	12	--	--	--	--
5	399		73	73	73	24	20	--	--	--	--	--
6	249		83	83	83	37	20	--	--	--	--	--
7	331		--	--	--	--	--	9	--	--	--	--
8	--		--	--	--	--	--	--	--	--	13	--
9	281		72	72	72	31	--	--	--	--	--	--
10	303		--	--	--	--	20	13	--	--	--	--
11	307		58	58	58	32	20	--	--	--	--	--
12	426		74	74	74	19	20	--	--	--	--	--
13	40		40	40	40	22	--	21	--	--	--	--
14	480		69	69	69	35	--	2	--	--	--	--
15	327		80	80	80	38	20	--	--	--	--	--
16	424		84	84	84	35	20	1	--	--	--	--
17	338		107	107	107	44	20	--	--	--	--	--
18	490		80	80	80	30	20	--	--	--	--	--
19	97		97	97	97	38	20	5	--	--	--	--
	6,003		1,232	1,232	1,232	508	260	63			13	

* Fisheries Oceanography Coordinated Investigations (FOCI) samples.

Table 8. Summary of conductivity-temperature-depth (CTD) casts conducted during the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island.

Cast	Haul	Transect	Date		Longitude (W)	CTD cast	Depth (m)	
			(1995)	(GMT)			Latitude (N)	Bottom
1	1	1.0	26 Feb	0548	165 51.19	182	198	
2	2	2.0	26 Feb	1441	166 08.83	539	592	
3	3	3.0	27 Feb	0018	166 08.64	673	686	
4	4	8.0	28 Feb	0537	167 50.67	540	1402	
5	5	8.5	28 Feb	2326	167 50.76	596	645	
6	6,7	9.0	01 Mar	0814	168 07.31	365	969	
7	9,10	12.0	03 Mar	0250	169 00.26	681	688	
8	11	11.5	03 Mar	0848	168 53.63	629	1762	
9	PMEL*	18.3	05 Mar	1017	172 08.82	395	402	
10	PMEL*	18.3	05 Mar	1140	171 58.46	322	327	
11	PMEL*	18.3	05 Mar	1315	171 44.07	304	310	
12	PMEL*	18.3	05 Mar	1433	171 33.16	504	532	
13	14	20.0	06 Mar	1219	169 23.73	301	637	
14	17	25.0	07 Mar	2027	168 40.77	549	1737	
15	19	32.0	08 Mar	2238	167 39.13	498	930	
16	cal	-	09 Mar	0633	167 01.92	71	84	

* Pacific Marine Environmental Laboratory (PMEL) casts taken in Amukta Pass, Alaska.

Table 9. Expendable bathy-thermograph (XBT) cast taken during the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island.

XBT Drop	Haul	Transect	Date		Longitude (W)	Cast Depth	Bottom Depth (m)
			(1995)	(GMT)			
1	16	21.1	06 Mar	2302	169 11.8	459	1874

Table 10. Summary of microBT casts conducted during the winter 1995 echo integration-trawl survey of the Bogoslof Island area, MF95-02.

Drop	Haul	Date (1995)	Time (GMT)	Latitude (N)	Position		Depth (m)		Transect	Trawl Type
					Longitude (W)	MBT Cast	Bottom			
1	1	26 Feb	0437-0507	54 21.07	165 51.88	163	236	1.0	Rope	
2	2	26 Feb	1540-1700	54 23.85	166 09.79	496	620	2.0	Rope	
3	3	26 Feb	2210-2312	54 17.06	166 08.75	485	692	3.0	Rope	
4	4	28 Feb	0358-0447	54 12.87	167 52.37	452	1419	8.0	Rope	
5	5	28 Feb	2105-2215	53 35.00	167 50.86	413	603	8.5	Rope	
6	7	1 Mar	0612-0703	53 39.38	168 08.90	440	999	9.0	Rope	
7	8	1 Mar	0922-1115	53 41.43	168 09.83	786	1143	9.0	Method	
8	9	2 Mar	-	53 12.94	169 01.82	-	825	12.0	Rope	
9	10	3 Mar	0104-0148	53 10.55	169 01.34	321	825	12.0	Rope	
10	11	3 Mar	0612-0654	53 32.44	168 53.97	264	1500	11.5	Rope	
11	12	3 Mar	1812-1940	53 08.82	169 15.04	739	1179	13.0	Rope	
12	13	5 Mar	0753-0824	52 29.84	172 07.39	280	281	18.3	Bottom	
13	14	6 Mar	1008-1104	53 02.65	169 24.19	291	585	20.0	Rope	
14	15	6 Mar	1728-1822	53 16.11	169 26.85	563	1285	21.0	Rope	
15	16	6 Mar	-	53 40.12	169 12.28	-	1762	21.1	Rope	
16	17	7 Mar	1832-1942	53 42.64	168 42.13	449	1735	25.0	Rope	
17	18	8 Mar	0310-0350	53 34.58	168 23.84	398	963	27.0	Rope	
18	19	8 Mar	-	53 37.64	167 39.51	-	894	32.0	Rope	

Cast 8, 15, and 18 were unsuccessful.

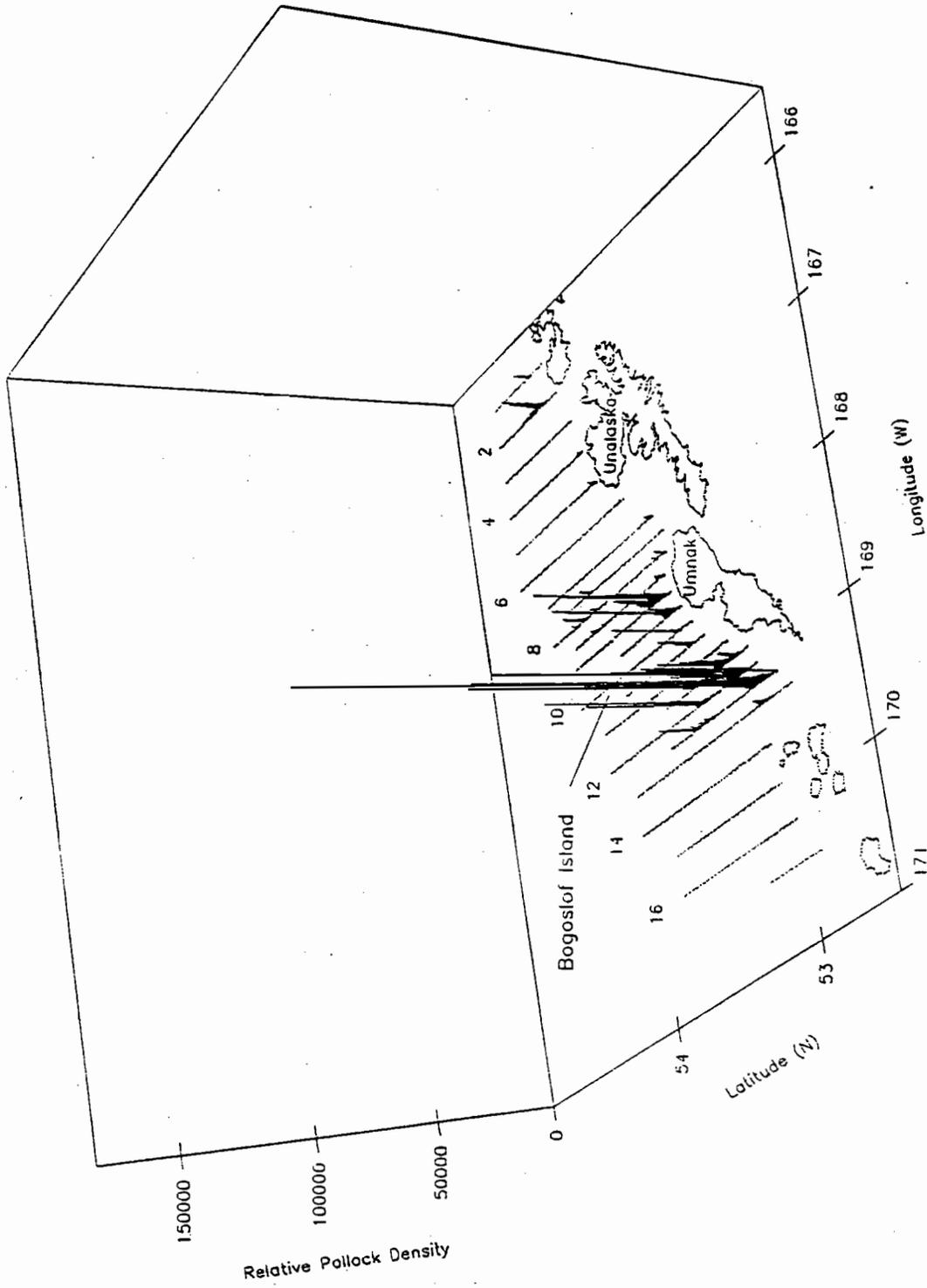


Figure 1. Relative pollock density along trackline from pass 1 of the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island. Transect numbers are indicated.

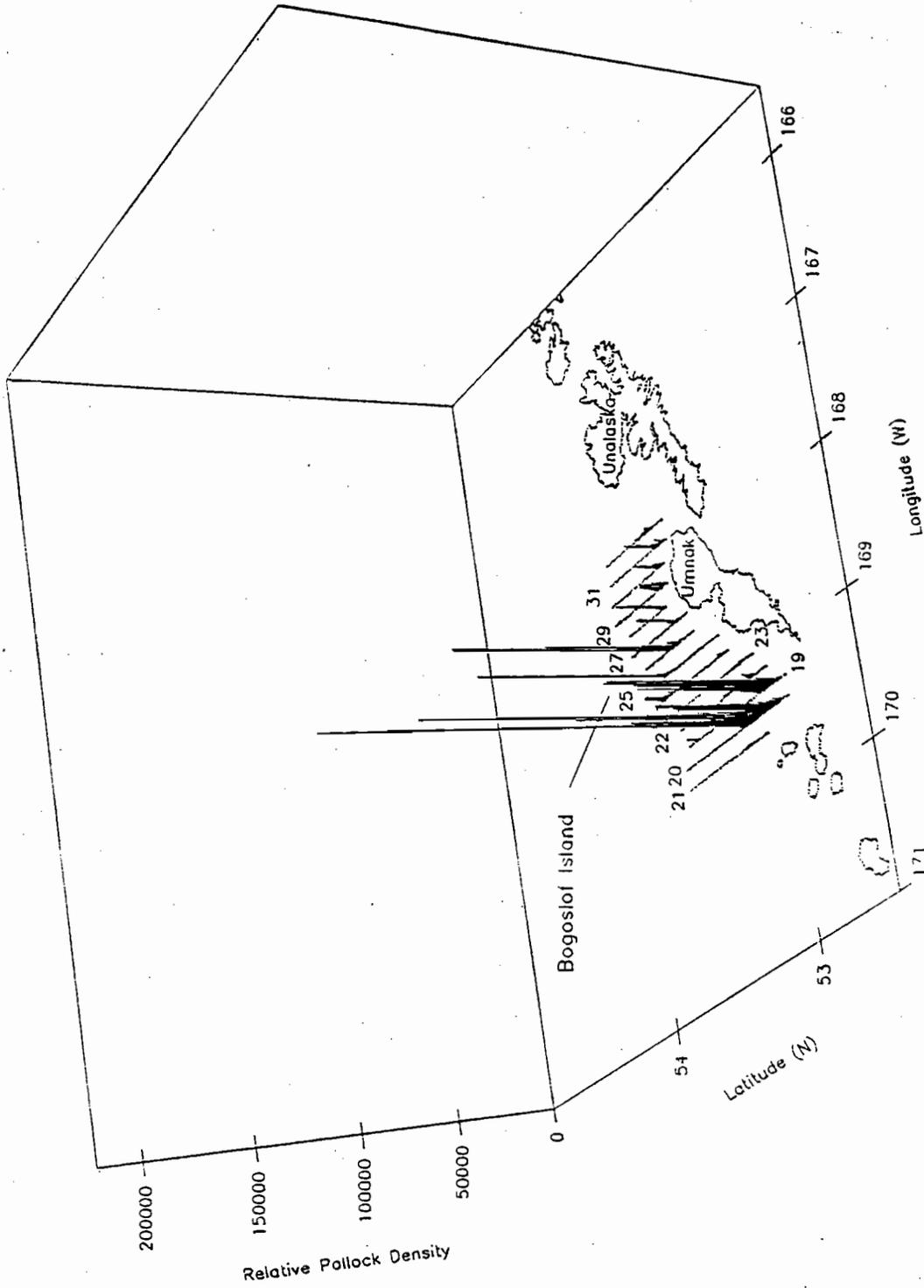


Figure 2. Relative pollock density along trackline from pass 2 of the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island. Transect numbers are indicated.

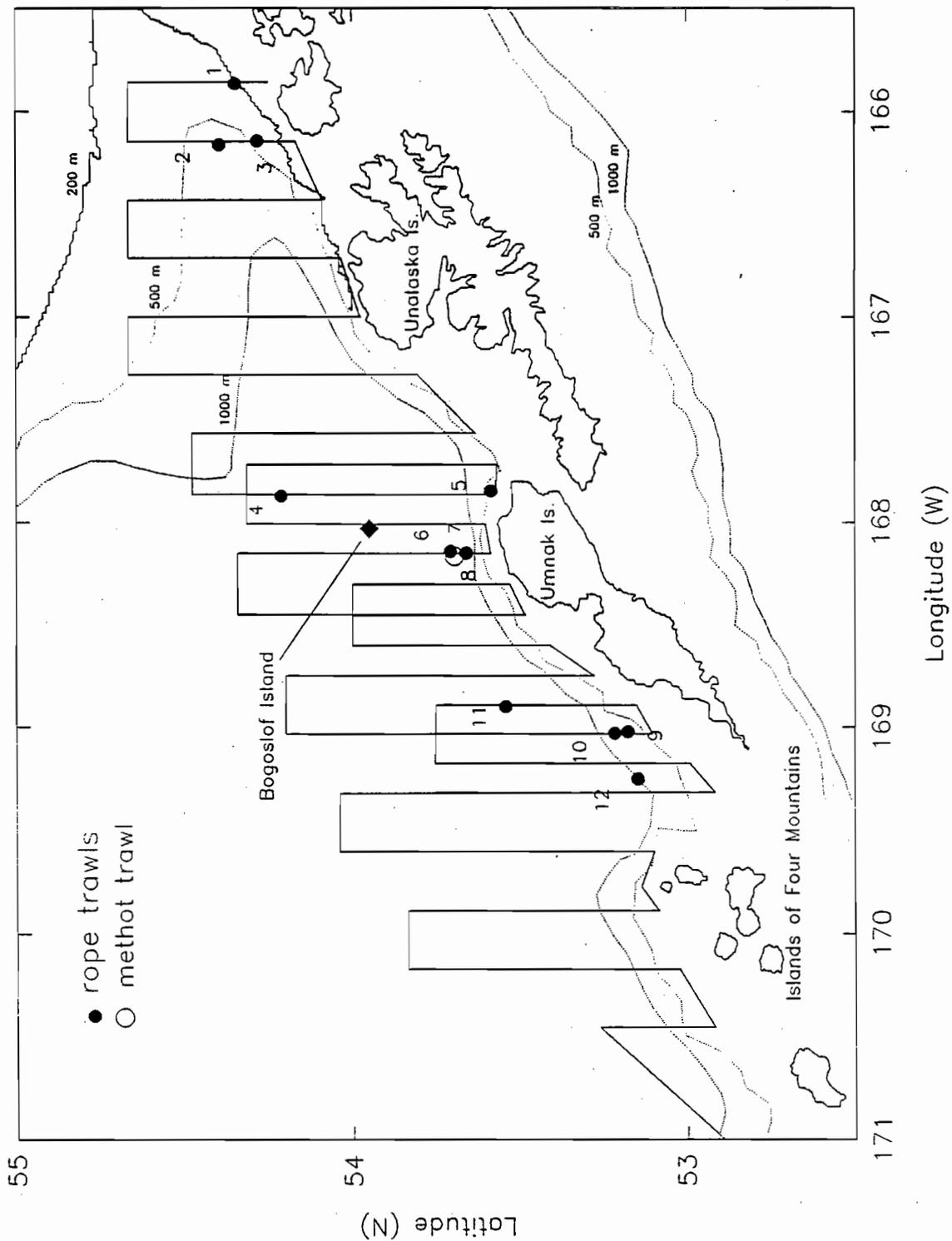


Figure 3. Rope trawl and Methot trawl locations during pass 1 of the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island. Cruise trackline is indicated.

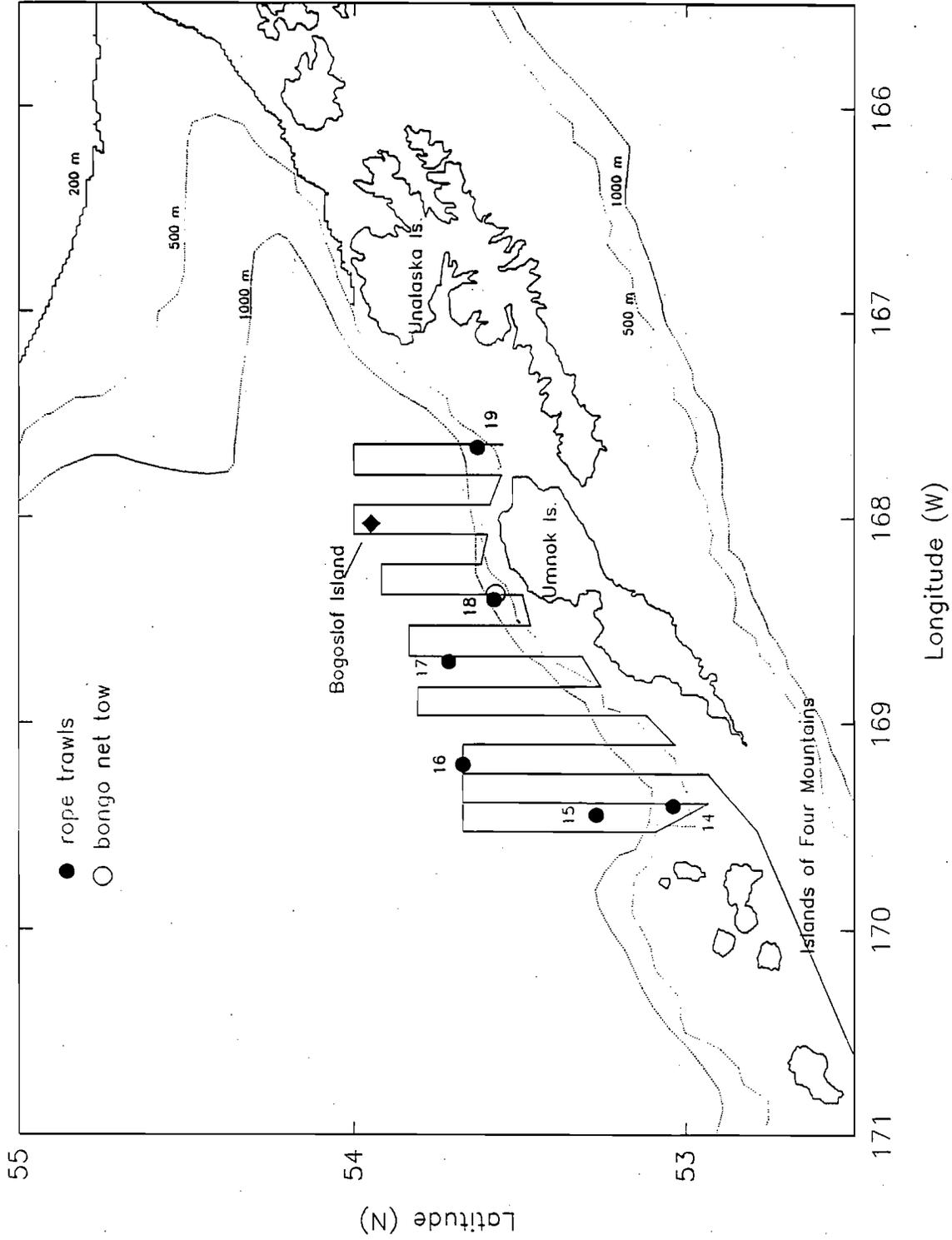


Figure 4. Rope trawl and bongo net tow locations during pass 2 of the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island. Cruise trackline is indicated.

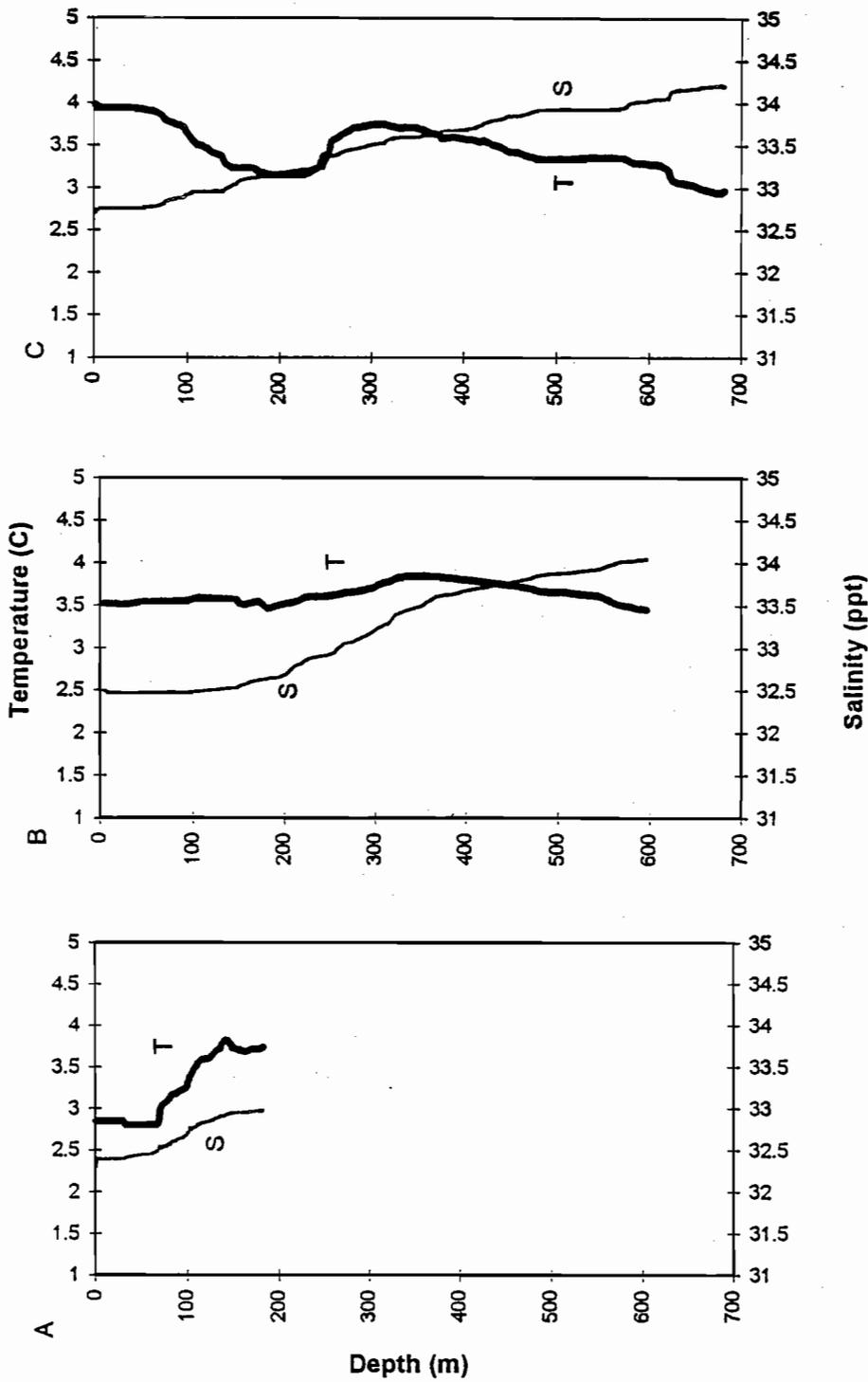


Figure 5. Temperature and salinity profiles of conductivity-temperature-depth (CTD) casts made in the southeastern Aleutian Basin near Bogoslof Island during the winter 1995 echo integration-trawl survey. Profiles from A) eastern, B) central, and C) western sections of the survey area, respectively.

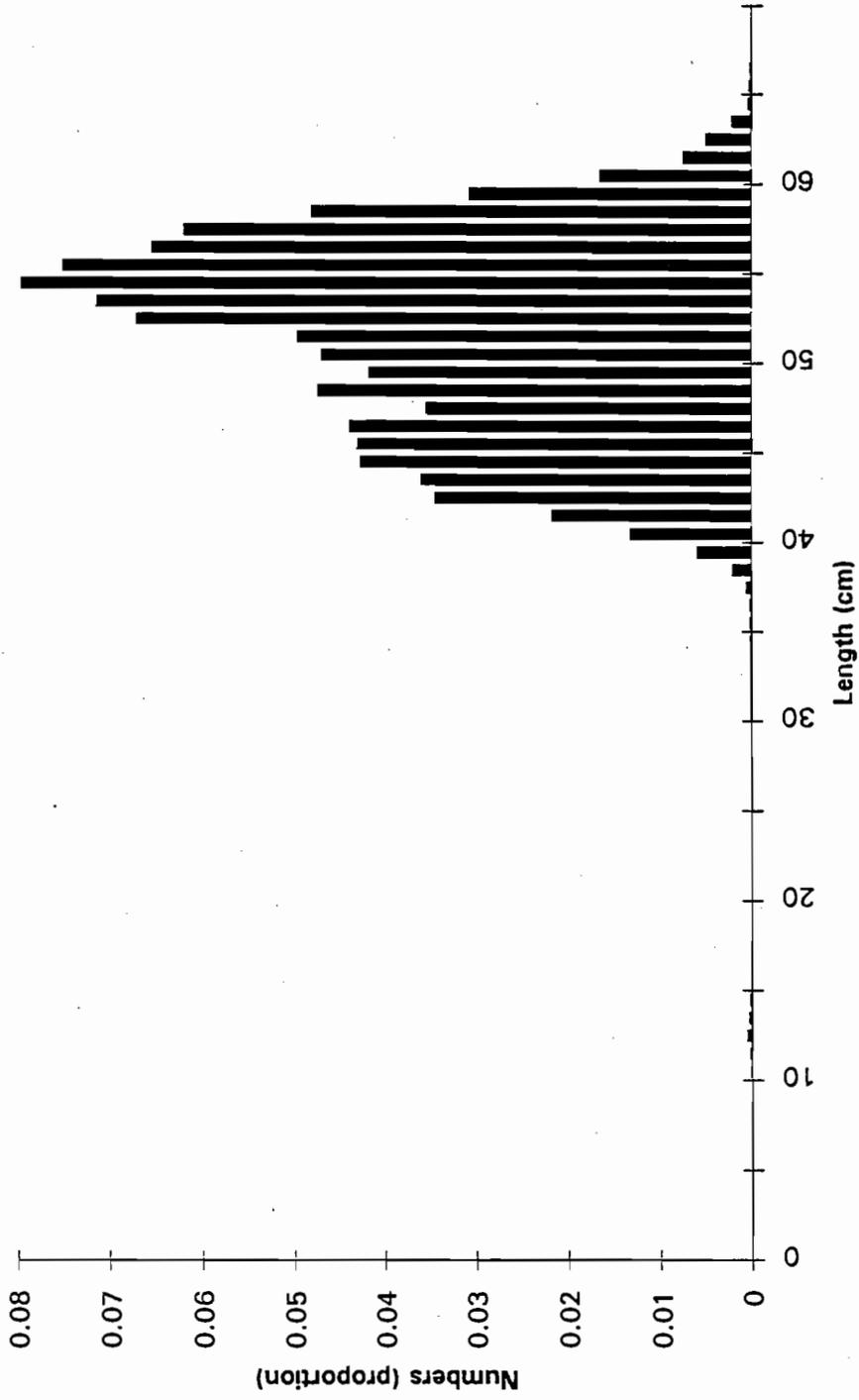


Figure 6. Relative proportion of pollock numbers at length from the 1995 winter echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island.

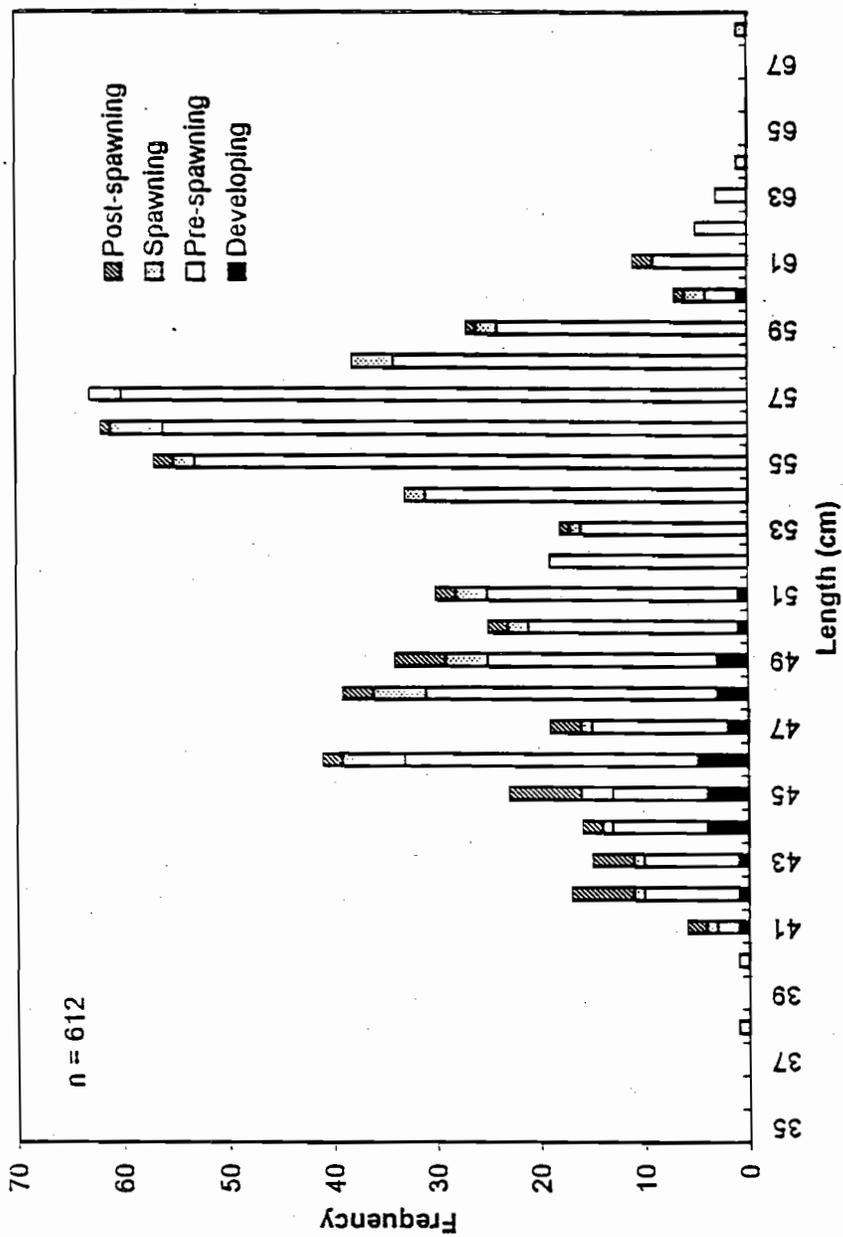


Figure 7. Female pollock maturity-length composition from trawl catches during the winter 1995 echo integration-trawl survey of the southeastern Aleutian Basin near Bogoslof Island.

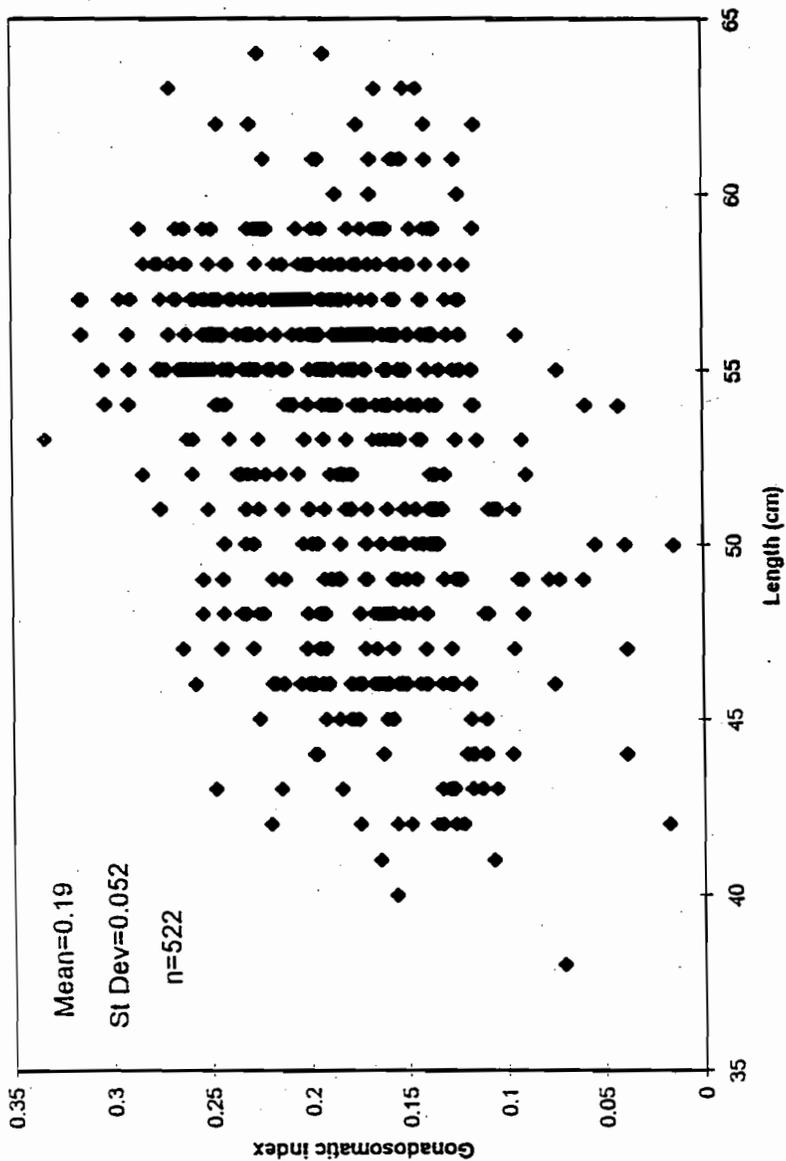


Figure 8. Pollock gonadosomatic indices plotted as a function of length for pre-spawning females from the Bogoslof Island area during the winter 1995 echo integration-trawl survey.