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NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering Division
7600 Sand Point Way Northeast
BIN C15700, Building 4
Seattle, Washington 98115-0070

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PRELIMINARY CRUISE RESULTS
NOAA SHIP *Miller Freeman*, CRUISE NO. MF-97-08
ECHO INTEGRATION-TRAWL SURVEY
OF WALLEYE POLLOCK IN THE EASTERN BERING SEA

Scientists from the Midwater Assessment and Conservation Engineering (MACE) program at the Alaska Fisheries Science Center (AFSC) conducted an echo integration-trawl (EIT) survey of walleye pollock (*Theragra chalcogramma*)on the eastern Bering Sea (EBS) shelf from Port Moller, Alaska, to the U.S./Russia convention line, aboard the NOAA ship *Miller Freeman* from July 16 to September 6, 1997. The cruise began and ended in Dutch Harbor, Alaska.

The cruise itinerary was as follows:

Jul 7-8	Gear trials/sphere calibration in Port Susan. Transit to Dutch Harbor.

Leg 1

Jul 16	Embark scientists in Dutch Harbor. Sphere calibration in Captain's Bay.
Jul 17-Aug 7	EIT survey of the EBS shelf. Touch and go in Dutch Harbor mid-way through leg 1 to disembark scientist.
Aug 8	Inport Dutch Harbor, Alaska.

Leg 2

Aug 9-Sep 6	Sphere calibration in Captain's Bay. EIT survey of the EBS shelf. Retrieval of oceanographic data collection ("Peggy") buoy. Sphere calibration in Makushin Bay.
Sep 6	Arrive Dutch Harbor, Alaska. End of cruise.

OBJECTIVES

The principal 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 on the eastern Bering Sea shelf. We also collected pollock target strength data for use in scaling echo integration data to estimates of absolute abundance and calibrated the 38 kHz and 120 kHz scientific acoustic systems using standard sphere techniques. In addition, we collected physical oceanographic data including temperature and salinity profiles at selected sites, and continuously monitored sea surface parameters (e.g., temperature, salinity, light level, and productivity) and water current profiles.

Secondary objectives of the cruise were to carry out a variety of scientific projects requested by MACE and other investigators. They included the following: acoustic buoy work (leg 1, Chris Wilson 206-526-6435), bottom-typing work (legs 1 and 2, Paul von Szalay 206-526-4245), marine mammal observations (leg 1, Cyndy Tynan 206-526-4033), automated broadband identification of groundfish (leg 2, Skip Denny 360-598-4890), and vessel satellite radar measurements (legs 1 and 2, Don Montgomery 818-354-4691). Other research throughout the cruise included collecting and freezing age-1 pollock to examine their relationship with the "cold pool" (Tina Wylie-Echeverria 206-463-5514), collection of predators and prey for a pollock cannibalism study (Sam Wainright 908-932-6555), collection of pollock stomachs to examine food habits (Pat Livingston 206-526-4242), cephalopod and fish collection for a reference database on marine mammal prey (Beth Sinclair 206-526-6466), fish sample collection for a Steller Sea lion prey study (Mike Strick 206-526-4522), and genetic research on adult and age-0 pollock (Mike Canino 206-526-4174).

METHODS

Sampling Equipment

The survey was conducted on board the NOAA ship *Miller Freeman*, a 66 m (216 ft) stern trawler equipped for fisheries and oceanographic research. Two Simrad[1] split-beam transducers, one operating at 38 kHz and the other at 120 kHz, were mounted on the bottom of the vessel's centerboard. With the centerboard fully extended, the transducers were 9 m below the water surface. System electronics were housed inside the vessel in a new

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[1] Reference to trade names or commercial firms does not constitute U.S. government endorsement.

permanent laboratory space dedicated to acoustics that replaced the portable laboratory used on previous cruises. Acoustic data were collected at both frequencies with a quantitative echo sounding system (Simrad EK500). Data from the Simrad EK500 echo sounder were stored and processed using Simrad BI500 echo integration and target strength data analysis software on a SUN workstation.

Midwater and near-bottom echosign was sampled using an Aleutian wing 30/26 trawl (AWT). The AWT is a full-mesh wing trawl constructed of nylon except for polyethylene in the codend and aft section of the body. The headrope and footrope each measured 81.7 m (268 ft). Mesh sizes tapered from 325.1 cm (128 in) in the forward section of the net to 8.9 cm (3.5 in) in the codend. The net was fitted with a 3.2 cm (1.25 in) codend liner. The AWT was fished with 82.3 m (270 ft) of 1.9 cm (0.75 in) diameter 8x19 non-rotational dandylines, and 453.6 kg (1,000-lb) or 226.8 kg (500 lb) tom weights on each side.

Fish on bottom were sampled with an 83/112 bottom trawl without roller gear. Net mesh sizes ranged from 10.2 cm (4 in) forward and 8.9 cm (3.5 in) in the codend to 3.2 cm (1.25 in) in the codend liner. Headrope and footrope lengths were 25.6 m and 34.1 m (83.9 ft and 111.9 ft), respectively, and the breastlines measured 3.4 m and 3.2 m (11.3 ft and 10.5 ft).

A Methot trawl was used to target age-0 pollock and macrozooplankton. Its mouth 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 was used to generate additional downward force. A calibrated General Oceanics flow meter was attached to the mouth of the Methot trawl to determine the volume of water filtered during trawling. The Methot trawl was attached to a single cable that was fed through a stern-mounted A-frame.

On one occasion, age-0 pollock and macrozooplankton were targeted with a Marinovich trawl. Meshes in the Marinovich trawl measured 7.6 cm (3.0 in) forward, 3.2 cm (1.3 in) in the codend, and 0.32 cm (0.125 in) in the codend liner. Headrope and footrope lengths were each 9.1 m (30 ft).

Five m^2 (53.8 ft^2) "Fishbuster" trawl doors [1,247.4 kg (2,750 lb)] were used with the AWT, 83/112, and Marinovich trawls. When the Marinovich trawl was towed, a 15.24 m (50 ft) long, 2.5 cm (1 in) diameter spectra restrictor line was connected between the ends of two 12.8 m (270 ft) long, 1.9 cm (0.75 in) diameter 6x19 wire ropes trailing each trawl door. Two pairs of 18.3 m (60 ft)

long, 1.3 cm (0.5 in) diameter 6x19 wire ropes led aft from the restrictor line to the head and foot ropes.

Trawl depth and vertical and horizontal openings of AWT, 83/112, and Marinovich trawls were monitored with a WesMar third-wire system attached to the headrope. Trawl depths of Methot trawls were monitored with a SCANMAR depth sensor. Tow depth profiles and water temperature at depth for all trawls were obtained by attaching a small, retrievable micro bathythermograph (MBT) to the net, or, with Methot trawls, to the frame. Water temperature and salinity profile data were collected at calibration sites with a Seabird CTD system. Sea surface oceanographic data and environmental data were collected and stored on the *Miller Freeman*'s Scientific Collection System (SCS). Ocean current profile data were collected using an ADCP system with transducers located in the vessel's centerboard.

Survey Design

The survey trackline consisted of parallel, north-south transects that began near Port Moller at about 160° 20' W longitude (Fig. 1) and proceeded northwest to the U.S./Russia convention line. Transects were spaced about 20 nmi apart and were chosen to coincide with lines of groundfish trawl stations sampled during approximately the same time period by bottom trawl survey vessels. Southern transect endpoints were either limited by Unimak Island and the Alaska Peninsula (transects 1-9) or the shelf break (transects 10-29). Northern endpoints of transects 1-16 were between 57° and 58° N and ranged from 50 m to 71 m bottom depth, while transects 17-20 ended between 58° and 62° N and ranged from 60 m to 85 m bottom depths. All were located north of significant pollock echo sign. As permission to enter the Russian Exclusive Economic Zone (EEZ) was not granted, northern extents of transects 21-29 ended at the U.S./Russia convention line. Endpoint depths along the convention line increased westward from 77 m to 251 m.

The EIT survey was conducted during daylight hours. At the start of the cruise in mid-July, daylight lasted about 17 hours (0620-2315 ADT). By September 2 the day was reduced to about 13 1/2 hours (0845-2215 ADT). Vessel speed during survey data collection reached 12-13 knots in favorable weather, and averaged 11.6 knots. Both acoustic systems (38 kHz and 120 kHz) simultaneously collected echo integration data and split-beam target strength data. Echo integration data from the 38-kHz system were used to provide estimates of pollock abundance. Nights were dedicated to trawling, collecting target strength data, collecting bottom grabs and other data for the ocean bottom

typing project, running acoustic noise tests, and testing an acoustic buoy system.

Midwater and bottom trawl hauls were made at selected locations (Fig. 2) to identify echosign and to provide biological samples. Average trawling speed was about 3 knots. Average vertical net opening for the AWT was 25 m and ranged from 18 m to 38 m. Vertical net openings averaged 3.5 and 4 for the 83/112 and Marinovich, respectively. The Methot had a fixed net opening of 2.3 m. Standard catch sorting and biological sampling procedures were used to provide weight and number by species for each haul. Pollock were sampled to determine sex, fork length, body weight, age, maturity, and ovary weight of selected females. An electronic scale was used to determine all weights taken from individual pollock specimens. Fork lengths of age-1 and older pollock were measured to the nearest cm and recorded with a Polycorder measuring device (a combination of bar code reader and hand-held computer), then downloaded into a computer. Standard lengths of age-0 pollock were measured to the nearest mm and recorded on a tally sheet, then transferred to computer. Maturities were determined by visual inspection using an eight-stage scale expressed in terms of a historical five-stage scale as follows: immature, developing 1 and 2, pre-spawning 1 and 2, spawning, and post-spawning 1 and 2. Pollock stomachs and macrozooplankton samples were preserved in 10% formalin. Samples of age-0 pollock were either preserved in formalin or frozen whole. Age-1 pollock samples, adult pollock tissue samples, and fish for the marine mammal study were frozen.

Collection of target strength data required suitable conditions (e.g., low fish density, single-species aggregations, unimodal size distribution, and calm seas) and involved passing repeatedly over an aggregation of pollock at speeds of less than 4 kts, then collecting biological data from trawl hauls made in conjunction with the acoustic data collection.

Standard sphere calibrations were made to monitor the accuracy of acoustic system performance. During calibrations, the *Miller Freeman* was anchored at bow and stern. We measured the acoustic properties of two different copper spheres--one for each transducer frequency--suspended below the transducer. Split-beam target strength and echo integration data were collected with the Simrad EK500 system and used to determine acoustic system gain parameters and transducer beam pattern characteristics.

PRELIMINARY RESULTS

Standard sphere calibrations

Four standard sphere calibrations were conducted in conjunction with the cruise (Table 1). No significant differences in gain parameters or transducer beam pattern characteristics were observed for the 38 kHz transducer--the primary collection system for the survey--among any of the four calibrations. The target strength (TS) gain of the 120 kHz system decreased about 1.5 dB between Port Susan, WA (water temperature 11.6° C) and Dutch Harbor, AK (water temperatures 7.4°-8.6° C). During the survey, the measured TS gain was relatively stable (23.8-24.2 dB). Decreases in TS gain with decreasing temperature have been observed with the 120 kHz system during previous calibrations.

Survey Results

Pollock were distributed throughout the eastern Bering Sea shelf area surveyed, with the highest densities encountered west and south of St. Matthew Island (transects 18-28) and between Unimak Island and St. George Island (transects 10-14; Fig. 1). Vertical distribution of pollock by transect varied from east to west (Fig. 3). East of 164° W (transects 1-7) where total acoustic return was relatively low most pollock scattering layers were observed within 10 m of bottom and only 0-33% were in midwater. West of 164° W where total acoustic return was generally higher, pollock layered in midwater accounted for 50%-95% of the total (transects 8-29, except for 16, 21 and 23). Three different types of echosign were identified and quantified. Moderately dense near-bottom layers and echosign forming a "carpet" along the bottom were typically composed of adult pollock. Midwater layers that often formed tightly packed discrete schools during the day were usually composed of juvenile pollock ≤35 cm in length, typically age-1 or age-2. The third echosign type described a more complex region of the survey area along portions of transects 24-29, where juvenile pollock of more than one age class extended down into the near bottom layer.

Biological data and specimens were collected from 73 AWT hauls, 1 Marinovich haul, 10 Methot hauls and 13 bottom hauls (Tables 2-7). Oceanographic data were collected from 7 CTD casts (Table 8) and 97 MBT casts (see Table 2). Pollock dominated midwater catches made with the AWT (Table 3) and bottom trawl catches (Table 4), accounting for 86% by weight and 70% by weight, respectively. The one Marinovich haul caught mostly jellyfish (>99% by weight), with some age-0 pollock and other species of fish larvae. Jellyfish made up 13% and 5% by weight in midwater and on bottom, respectively. Pacific herring and chum salmon were caught frequently in midwater trawls although they did not

make up a large portion by weight. Most Pacific ocean perch obtained during the survey came from a single haul (haul 50) that also caught northern rockfish. In addition to pollock and jellyfish, bottom trawl catches contained numerous yellowfin sole and Pacific cod.

Pollock ranged in length from 10 to 73 cm with a major mode at 16 cm and minor modes at 27 and 40 cm (Fig. 4a). East of 170° W longitude, pollock numbers were dominated by the 1996 year class (age 1; Fig. 4b). West of 170° W longitude, the 1996 year class was again the most numerous, followed by the 1995 (age 2) and 1992 (age 5) year classes. The average length of adult pollock (>35 cm) captured in trawl hauls ranged from 43-53 cm east of the Pribilofs, but decreased to 39-47 cm west of the Pribilofs reflecting increased presence of the 1992 year class (Figs. 4b,5). Average length in trawl hauls among pollock 35 cm and smaller showed that age 2 fish were mainly encountered in the northwest corner of the survey area while age 1's were distributed across the shelf (Fig. 6).

Biomass of pollock in midwater (from near the surface to 3 m from the bottom) was estimated at 2.6 million tons with 0.8 million tons east of 170° W longitude and 1.8 million tons west of 170° W longitude (Fig 7). The 1992 year class accounted for 0.9 million tons and the 1996 and 1995 juvenile year classes made up 0.4 million tons each. Although the estimated biomass for summer 1997 (2.6 million tons) was close to that from summer 1996 (2.3 million tons), the estimated numbers of fish in 1997, 18.7 billion--of which the 1996 year class totaled 12.4 billion--contrasted with only 6.5 billion fish in 1996.

SCIENTIFIC PERSONNEL

The principal investigator was Neal Williamson (206) 526-6417, AFSC, Seattle, WA.

Gear Trials (July 7-8)

Name	Sex/ Nationality	Position	Organization
Daniel Twohig	M/USA	Instrument Chief	MACE
Chris Wilson	M/USA	Fish. Biologist	MACE
Mike Guttormsen	M/USA	Fish. Biologist	MACE
Steve de Blois	M/USA	Fish. Biologist	MACE
Bob McConnaughey	M/USA	Fish. Biologist	RACE,GF
Paul von Szalay	M/USA	Graduate Student	UW
Karl Rhynas	M/Canada	Electronics Tech.	QTC

Leg 1 (July 16-August 7)

Name	Sex/ Nationality	Position	Organization
Jim Traynor	M/USA	Chief Scientist	MACE
Daniel Twohig	M/USA	Instrument Chief	MACE
Denise McKelvey	F/USA	Fish. Biologist	MACE
Mike Guttormsen	M/USA	Fish. Biologist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE
Paul von Szalay	M/USA	Graduate Student	UW
Beth Jewell	F/USA	Teacher at Sea	NOAA
Cyndy Tynan	F/USA	Biologist	NOAA,UW
Richard Rowlett	M/USA	Biologist	NMML
Bob Pitman	M/USA	Biologist	SWFSC
Chris Wilson	M/USA	Fish. Biologist	MACE(Jul 16-22)

Leg 2 (August 9-Sept. 6)

Name	Sex/ Nationality	Position	Organization
Neal Williamson	M/USA	Chief Scientist	MACE
Daniel Twohig	M/USA	Instrument Chief	MACE
Steve de Blois	M/USA	Fish. Biologist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE
Taina Honkalehto	F/USA	Fish. Biologist	MACE
Mikhail Stepanenko	M/Russia	Fish. Biologist	TINRO
Alexander Nikolayev	M/Russia	Acoustician	TINRO
Skip Denny	M/USA	Acoustician	SFS
Sara Pautsky	F/USA	Student	WWU

MACE - Midwater Assessment and Conservation Engineering, AFSC, Seattle, WA
NMML - National Marine Mammal Laboratory, AFSC, Seattle WA
NOAA - National Oceanographic and Atmospheric Administration
QTC - Quester Tangent Corporation, Sidney, BC, Canada.
RACE,GF- Resource Assessment and Conservation Engineering, Bering Sea Groundfish Group, AFSC, Seattle, WA
SFS - Scientific Fishery Systems, Inc., Anchorage, AK.
SWFSC - Southwest Fisheries Science Center, San Diego, CA.
TINRO - Pacific Research Institute of Fisheries and Oceanography Vladivostok, Russia
UW - University of Washington, Seattle, WA
WWU - Western Washington University, Bellingham, WA

For further information contact Dr. Gary Stauffer, Director, Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, National Marine Fisheries Service, 7600 Sand Point Way NE, Building 4, BIN C15700, Seattle, WA 98115-0070. Telephone (206) 526-4170.

Table 1. Summary of sphere calibrations conducted before, during, and after the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Date	Location	Freq (kHz)	Water Temp (deg. C) at Transducer*	Water Temp (deg. C) at Sphere	Sphere Range from Transducer (m)	TS[1] Gain (dB)	SV[1] Gain (dB)	3dB Beam[1] Width (deg.)	Angle Offset[1] Along	Angle Offset[1] Athwart
8 Jul	Port Susan, WA	38	11.6	10.0	25.7	27.3	--	--	--	--
		120	11.6	9.7	20.9	25.5	--	--	--	--
16 Jul	Captain's Bay, AK	38	7.4	4.4	32.1	27.1	27.1	6.84	0.00	-0.07
		120	7.4	4.5	25.2	23.8	--	7.02	0.06	0.00
6 Aug	Captain's Bay, AK	38	8.0	4.8	32.7	27.0	27.0	--	--	--
		120	8.0	5.3	25.9	23.9	24.0	--	--	--
5 Sept	Makushin Bay, AK	38	8.6	7.7	32.7	27.2	--	6.84	0.00	-0.06
		120	8.6	7.7	25.9	24.2	24.4	7.06	0.03	0.05
Jul-Aug	System settings during survey	38	--	--	--	27.1	27.1	6.7	-0.09	-0.02
		120	--	--	--	23.9	23.9	7.1	-0.15	0.17

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

[1] 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 summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Haul No.	Gear[1] Type	Date (GMT)	Time (GMT)	Duration (minutes)	Start Position Latitude (N)	Start Position Longitude (W)	Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear	Temp. (deg. C) Surface	MBT No.	Pollock Catch kg	Pollock Catch number	Other Catch kg
1	317	18 Jul	19:09	30	56 47.74	160 21.80	66	66	4	11.4	1	38.0	34	2,442.0
201	626	19 Jul	8:31	9	56 26.21	161 0.80	29	64	4.6	11.5	2	0.2	441	49.4
2	30	19 Jul	18:37	15	56 41.39	161 35.06	90	90	3	11.7	3	1,116.6	1,048	1,952.3
3	30	20 Jul	20:46	15	56 30.14	162 48.49	80	80	2.4	11.6	4	1,085.5	1,720	275.0
4	317	20 Jul	22:03	10	56 29.24	162 48.78	69	79	2.4	11.8	5	838.4	3,784	336.3
202	626	20 Jul	23:16	11	56 28.25	162 49.04	21	80	2.7	12	6	0.1	205	11.5
5	317	21 Jul	2:33	15	56 56.29	162 47.22	62	64	2	11.3	7	5.7	14	52.0
6	30	21 Jul	16:16	15	57 4.80	162 46.63	60	60	2.1	10.6	8	2,347.0	2,605	291.0
7	30	22 Jul	4:34	17	55 38.69	163 24.75	82	82	3.8	10.8	9	97.5	93	228.7
8	317	23 Jul	2:33	20	57 10.04	164 12.09	56	68	1.5	11.7	10	244.7	7,152	39.0
203	626	23 Jul	8:18	13	57 10.46	164 9.70	30	70	1.7	11.7	11	0.0	44	5.2
9	317	24 Jul	2:05	17	55 17.64	164 35.24	98	101	6.4	10.5	12	2,820.2	3,725	79.8
10	317	24 Jul	21:36	10	55 46.42	165 10.21	86	102	5.7	11.5	13	409.1	620	223.0
11	317	25 Jul	5:03	16	56 52.47	165 11.62	61	74	1.3	11.4	14	296.9	7,954	23.8
12	30	25 Jul	17:06	12	57 21.98	165 50.44	68	68	1.5	10.2	15	679.3	667	284.0
13	317	26 Jul	1:51	14	55 59.56	165 47.73	108	108	4.6	11.3	16	459.6	5,040	524.8
14	317	26 Jul	20:40	5	54 56.09	166 20.77	138	148	4.3	9.6	17	1,176.9	13,350	22.5
15	30	28 Jul	3:05	15	57 7.46	167 4.47	74	74	2.6	10.5	18	1,232.8	1,928	461.4
16	317	28 Jul	4:43	29	57 7.46	167 4.59	45	74	2.6	10.6	19	0.1	51	168.0

Haul No.	Gear[1] Type	Date (GMT)	Time (GMT)	Duration (minutes)	Start Position Latitude (N)	Start Position Longitude (W)	Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear	Temp. (deg. C) Surface	MBT No.	Pollock Catch kg	Pollock Catch number	Other Catch kg
17	317	28 Jul	22:41	13	55 18.73	166 57.08	135	141	4.3	10.1	20	838.2	10,880	20.5
18	317	29 Jul	20:36	22	55 50.81	167 35.77	119	133	4.6	10.7	21	2,425.3	4,674	14.7
19	317	31 Jul	0:05	25	56 0.29	168 12.67	141	151	4.1	10.3	22	891.3	1,257	28.8
20	317	31 Jul	5:03	8	55 29.24	168 9.20	152	169	4.9	9.3	23	2,439.4	4,330	0.6
21	317	31 Jul	13:47	66	55 26.47	168 15.72	268	367	4.1	9.3	25	30.2	24	20.6
22	317	31 Jul	23:32	20	56 34.93	168 52.57	96	105	3	10.2	26	9.0	18	84.5
23	30	1 Aug	1:05	14	56 34.81	168 51.58	107	107	3	10.2	27	818.6	1,199	68.7
204	626	3 Aug	6:01	18	58 27.85	171 2.98	19	95	8	9.4	28	0.0	45	22.3
24	30	3 Aug	7:05	30	58 28.90	171 1.95	85	85	2.2	9.6	29	806.2	1,459	118.2
25	317	4 Aug	1:21	20	57 41.87	170 54.36	79	86	3.8	9.4	30	242.9	7,322	365.7
205	626	4 Aug	22:26	10	56 13.62	170 40.00	74	128	3.8	9.6	31	0.0	667	0.7
206	626	4 Aug	23:19	10	56 13.47	170 40.12	119	127	4.1	9.4	32	0.1	332	1.1
26	305	5 Aug	16:48	23	56 23.27	167 3.91	30	112	7.9	10.8	33	1.6	3,172	131.1
27	317	5 Aug	18:56	15	56 16.81	166 56.66	72	117	3.6	10.8	34	1,089.7	31,050	18.5
28	317	11 Aug	2:04	10	56 35.01	171 19.70	101	125	3.8	10.1	35	3.7	128	5.0
29	317	11 Aug	9:00	20	57 42.36	171 30.89	84	100	3.6	10.3	36	800.2	12,951	34.1
30	317	11 Aug	10:18	30	57 40.47	171 30.22	47	100	9.3	10.2	37	105.8	4,087	81.9
31	30	12 Aug	3:18	10	59 44.35	171 52.94	77	77	-.8	11	38	1,034.5	1,768	317.4
32	317	13 Aug	9:18	20	59 39.91	172 34.06	81	86	.2	10.5	39	1,724.5	3,631	3.5
33	30	13 Aug	11:29	25	59 51.57	172 36.57	77	77	.3	10.2	40	890.1	1,645	501.7
34	317	13 Aug	23:06	17	58 11.65	172 15.75	99	104	3.1	10.7	41	846.7	25,132	97.2
35	317	14 Aug	3:35	2	57 43.69	172 10.35	107	108	3.8	10.5	42	1,633.2	38,050	26.8

Haul No.	Gear[1] Type	Date (GMT)	Time (GMT)	Duration (minutes)	Start Position Latitude (N)		Start Position Longitude (W)		Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear	Temp. (deg. C) Surface	MBT No.	Pollock Catch kg	Pollock Catch number	Other Catch kg
36	317	14 Aug	17:31	7	56	41.57	172	34.43	95	134	4.1	9.6	43	0.0	20	0.0
207	626	14 Aug	18:36	10	56	41.86	172	34.60	93	133	--	9.6	43	0.0	50	0.3
37	317	15 Aug	1:58	30	57	52.07	172	48.80	108	114	3.6	10.7	45	1,723.0	3,266	37.0
38	317	15 Aug	9:06	30	58	33.14	172	57.29	67	112	4.1	10.7	46	51.2	1,599	5.1
39	317	15 Aug	10:27	40	58	31.63	172	57.15	83	112	3.8	10.7	47	230.8	5,769	7.0
40	317	15 Aug	14:01	30	58	32.48	172	55.96	78	112	3.8	10.6	48	215.8	5,935	52.1
41	317	16 Aug	7:02	7	61	8.04	173	28.34	70	77	1	9	49	498.5	863	352.1
42	317	16 Aug	14:30	7	61	6.97	173	29.89	70	77	1	8.8	50	4,052.3	7,346	161.7
43	317	17 Aug	9:36	45	62	9.56	174	31.75	60	74	-.1	8.6	51	1,167.9	1,491	976.1
208	626	17 Aug	20:36	10	61	41.82	174	23.77	61	77	-1	8.6	52	0.0	10	11.9
209	626	17 Aug	21:28	10	61	41.80	174	23.66	34	77	.8	8.6	53	0.0	12	27.0
44	317	18 Aug	2:17	24	61	4.96	174	13.58	82	84	1.1	9.5	54	2,039.8	4,113	2,470.2
45	317	19 Aug	0:55	30	58	43.74	173	39.75	101	127	3.5	10.5	55	1,382.6	2,728	10.0
46	317	19 Aug	3:39	5	58	47.37	173	41.42	121	126	3.4	10.5	56	763.1	1,558	2.3
47	317	19 Aug	7:28	30	58	24.48	173	35.74	108	118	3.6	10.2	57	560.9	1,438	1.5
48	317	19 Aug	20:13	5	58	17.48	173	32.84	98	115	3.7	10.4	58	2,202.7	4,078	7.3
49	317	20 Aug	2:41	15	57	26.14	173	20.47	119	124	4	10.3	59	0.2	169	12.6
50	317	20 Aug	19:26	27	57	43.06	174	5.46	102	118	4.2	10.7	60	0.0	0	186.6
51	317	21 Aug	3:41	30	58	51.51	174	20.04	121	136	3.3	10.6	61	1,969.0	2,886	21.0
52	317	21 Aug	9:25	31	59	22.36	174	27.89	75	122	3.5	10.6	62	29.1	1,006	19.8
210	626	21 Aug	18:43	15	59	38.36	174	32.20	26	118	9.4	10.4	63	0.0	7	34.6
53	317	22 Aug	0:28	23	60	21.05	174	43.25	98	103	1.5	10.2	64	2,381.8	5,558	368.2

Haul No.	Gear[1] Type	Date (GMT)	Time (GMT)	Duration (minutes)	Start Position Latitude (N)		Start Position Longitude (W)		Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear	Temp. (deg. C) Surface	MBT No.	Pollock Catch kg	Pollock Catch number	Other Catch kg
54	317	22 Aug	7:09	3	61	2.67	174	54.30	83	93	1.4	9.7	65	2,178.1	5,145	11.9
55	317	22 Aug	18:40	30	61	28.66	175	0.67	85	88	.7	9.3	66	280.2	677	2,587.8
56	317	23 Aug	6:44	13	62	10.04	175	53.95	91	92	-.6	9.2	67	563.3	1,521	29.7
57	317	23 Aug	8:07	2	62	9.49	175	55.81	80	92	-.6	9.3	68	1,111.6	2,934	11.0
58	30	23 Aug	19:15	5	61	35.06	175	44.90	97	97	1.4	9.4	69	23.5	55	135.1
59	317	23 Aug	23:50	7	61	12.48	175	38.96	83	100	1.5	9.6	70	1,760.7	11,809	599.3
60	317	24 Aug	5:14	36	60	38.02	175	29.02	82	110	1.8	9.8	71	713.8	4,876	105.5
61	317	24 Aug	6:55	15	60	38.04	175	28.84	105	110	1.8	9.9	72	3,284.5	18,356	13.5
62	317	24 Aug	13:51	6	60	17.09	175	22.65	98	112	2.6	9.8	73	1,181.5	2,805	12.0
63	317	24 Aug	22:40	20	59	33.33	175	10.69	128	132	2.8	10.5	74	2,383.4	9,735	56.6
64	317	25 Aug	3:40	10	59	12.58	175	4.82	124	133	3.1	10.5	75	2,347.1	12,416	22.9
65	317	25 Aug	4:46	9	59	8.68	175	3.70	124	132	3.2	10.5	76	457.0	1,586	80.3
66	317	25 Aug	12:14	6	58	50.51	175	35.19	114	131	3.2	10.5	--	1,125.3	1,977	3.7
67	317	26 Aug	0:06	15	59	20.99	175	46.13	133	137	2.8	10.7	77	2,335.6	12,759	14.4
68	317	26 Aug	6:41	13	60	9.53	176	1.09	118	128	2.6	10.2	78	782.4	3,543	9.0
69	317	26 Aug	11:21	10	60	37.21	176	10.10	102	120	2.2	10	79	1,462.4	9,831	2.0
70	317	26 Aug	21:16	10	60	59.13	176	16.79	106	113	1.8	9.7	80	1,417.4	8,969	52.6
71	317	27 Aug	1:26	3	61	17.01	176	22.43	104	110	1.7	9.7	81	1,356.1	10,689	323.9
72	30	27 Aug	6:02	9	61	50.89	176	33.25	106	106	1.6	9.7	82	2,021.3	5,539	54.7
73	317	27 Aug	7:34	32	61	53.97	176	34.29	67	105	2	9.7	83	2,633.8	22,542	156.2
74	317	27 Aug	13:37	10	61	31.01	177	8.82	99	118	1.8	9.4	84	1,333.0	4,168	4.5
75	317	27 Aug	19:36	12	61	15.91	177	3.52	117	120	1.9	9.7	85	994.5	4,124	15.3

Haul No.	Gear[1] Type	Date (GMT)	Time (GMT)	Duration (minutes)	Start Position Latitude (N)		Start Position Longitude (W)		Depth (m) Gear	Depth (m) Bottom	Temp. (deg. C) Gear	Temp. (deg. C) Surface	MBT No.	Pollock Catch kg	Pollock Catch number	Other Catch kg
76	317	28 Aug	3:29	36	60	19.58	176	44.57	133	138	2.3	10.2	86	2,556.1	8,621	41.9
77	317	28 Aug	8:16	11	59	52.15	176	35.53	129	140	2.8	10.3	87	523.0	3,035	1.3
78	317	28 Aug	21:11	25	59	8.65	176	21.35	106	139	3.2	10.9	88	1,012.6	20,383	22.5
79	317	29 Aug	22:20	6	59	42.43	177	12.00	161	162	3.1	10.5	89	2,718.6	7,141	1.4
80	317	30 Aug	1:30	37	59	48.36	177	14.10	118	140	3	10.3	90	3,442.7	20,017	17.3
81	317	30 Aug	8:21	25	60	7.39	177	20.61	88	139	2.7	10	91	314.1	3,304	2.6
82	317	30 Aug	20:30	12	60	28.60	177	26.98	133	153	2.3	10	92	1,587.0	8,393	3.0
83	317	31 Aug	18:43	15	60	46.22	178	15.65	137	168	2.5	10	93	927.6	7,649	0.5
84	317	31 Aug	22:32	10	60	22.16	178	6.54	151	157	3	9.8	94	983.9	4,882	2.5
85	317	1 Sep	3:18	20	59	51.04	177	54.59	127	144	2.8	10.2	95	2,161.6	6,733	8.4
86	317	2 Sep	4:54	16	59	54.99	178	36.95	131	142	2.7	10.1	96	2,326.7	11,579	3.3
87	30	4 Sep	18:51	12	54	39.57	164	50.75	44	44	8.2	8.7	97	1.6	1	607.5

[1] gear type 317 = Aleutian wing trawl, 30 = 83-112 bottom trawl, 305 = Marinovich trawl, and 626 = Methot trawl

Table 3. Summary of catch by species from 73 Aleutian Wing trawl hauls conducted during the summer 1997 pollock echo integration-trawl survey of the Bering Sea shelf and slope, MF97-08.

Species Name	Scientific Name	Weight (kg)	Weight Percent	Numbers
walleye pollock	*Theragra chalcogramma*	86,893.6	86.4	486,880
jellyfish unidentified	Scyphozoa	12,789.8	12.7	5
Pacific herring	*Clupea pallasi*	385.3	0.4	1,811
Pacific ocean perch	*Sebastes alutus*	149.2	0.1	600
chum salmon	*Oncorhynchus keta*	121.8	0.1	62
Pacific sleeper shark	*Somniosus pacificus*	40.8	< 0.1	1
Pacific cod	*Gadus macrocephalus*	34.6	< 0.1	11
northern rockfish	*Sebastes polyspinis*	33.5	< 0.1	63
chinook salmon	*Oncorhynchus tshawytscha*	17.7	< 0.1	7
squid unidentified	Teuthoidea	16.6	< 0.1	773
yellowfin sole	*Pleuronectes asper*	10.1	< 0.1	27
smooth lumpsucker	*Aptocyclus ventricosus*	7.9	< 0.1	4
rock sole	*Lepidopsetta sp.*	4.6	< 0.1	14
rainbow smelt	*Osmerus mordax*	3.3	< 0.1	229
eulachon	*Thaleichthys pacificus*	1.4	< 0.1	56
prowfish	*Zaprora silenus*	1.3	< 0.1	5
Alaska plaice	*Pleuronectes quadrituberculatus*	1.4	< 0.1	2
flathead sole	*Hippoglossoides elassodon*	0.7	< 0.1	2
opilio tanner crab	*Chionoecetes opilio*	0.4	< 0.1	1
arrowtooth flounder	*Atheresthes stomias*	0.3	< 0.1	11
lanternfish unidentified	Myctophidae	0.1	< 0.1	2
shrimp unidentified	Decapoda	0.1	< 0.1	14
Pacific spiny lumpsuck	*Eumicrotremus orbis*	< 0.1	< 0.1	1
pink shrimp	*Pandalus borealis*	< 0.1	< 0.1	6
salps unidentified	Thaliacea	< 0.1	< 0.1	2
Pacific sand lance	*Ammodytes hexapterus*	< 0.1	< 0.1	1
Totals		100,514.8	100.0	490,990

Table 4. Summary of catch by species from 13 bottom trawl hauls conducted during the summer 1997 pollock echo integration-trawl survey of the Bering Sea shelf and slope, MF97-08.

Species Name	Scientific Name	Weight (kg)	Weight Percent	Numbers
walleye pollock	*Theragra chalcogramma*	12,154.5	69.7	19,727
sponge unidentified	Porifera	1,550.7	8.9	--
jellyfish unidentified	Scyphozoa	883.2	5.1	--
yellowfin sole	*Pleuronectes asper*	452.5	2.6	1,807
Pacific cod	*Gadus macrocephalus*	403.0	2.3	221
rock sole	*Lepidopsetta sp.*	235.4	1.3	1,045
starry flounder	*Platichthys stellatus*	215.3	1.2	114
opilio tanner crab	*Chionoecetes opilio*	189.2	1.1	986
flathead sole	*Hippoglossoides elassodon*	188.8	1.1	429
Alaska plaice	*Pleuronectes quadrituberculatus*	171.0	1.0	173
butter sole	*Isopsetta isolepis*	157.5	0.9	699
snail unidentified	Gastropoda	119.6	0.7	917
longnose skate	*Raja rhina*	119.5	0.7	4
unsorted shab		97.1	0.6	4
sea potato	*Styela rustica*	85.1	0.5	7
starfish unidentified	Asteroidea	74.2	0.4	259
hermit crab unidentified	Paguridae	42.9	0.2	344
sculpin unidentified	Cottidae	42.0	0.2	32
red king crab	*Paralithodes camtschatica*	33.7	0.2	21
great sculpin	*Myoxocephalus polyacanthocephalus*	30.5	0.2	8
Pacific halibut	*Hippoglossus stenolepis*	30.4	0.2	9
snail unidentified	*Neptunea sp.*	28.0	0.2	111
basketstarfish unidentified	Gorgonocephalidae	26.8	0.2	37
tanner crab unidentified	*Chionoecetes sp.*	18.9	0.1	26
arrowtooth flounder	*Atheresthes stomias*	18.3	0.1	17
empty gastropod shells	Gastropoda	14.7	0.1	143
sculpin unidentified	*Myoxocephalus sp.*	8.6	< 0.1	2
sea cucumber unidentified	Holothuroidea	8.0	< 0.1	18
brittlestarfish unidentified	Ophiuroid	7.5	< 0.1	--
bairdi tanner crab	*Chionoecetes bairdi*	6.0	< 0.1	13
Pacific herring	*Clupea pallasi*	5.8	< 0.1	28
plain sculpin	*Myoxocephalus jaok*	4.8	< 0.1	13
sturgeon poacher	*Podothecus acipenserinus*	3.8	< 0.1	44
hairy triton	*Fusitriton oregonensis*	3.5	< 0.1	37
skate unidentified	Rajidae	3.3	< 0.1	1
Greenland turbot	*Reinhardtius hippoglossoides*	3.0	< 0.1	2
Alaska skate	*Bathyraja parmifera*	2.8	< 0.1	3
blackfinned red snailfish	*Careproctus cypselurus*	2.1	< 0.1	4
Bering wolffish	*Anarhichas orientalis*	1.5	< 0.1	1
bivalve unidentified	Pelecypoda	1.0	< 0.1	24
brown king crab	*Paralithodes brevipes*	0.9	< 0.1	1
anemone unidentified	Actiniaria	0.8	< 0.1	4
tunicate unidentified	Ascidian	0.8	< 0.1	3
Korean horsehair crab	*Erimacrus isenbeckii*	0.6	< 0.1	1
Bering skate	*Bathyraja interrupta*	0.5	< 0.1	1

Table 4. (cont.)

Species Name	Scientific Name	Weight (kg)	Weight Percent	Numbers
crab unidentified	*Hyas sp.*	0.4	< 0.1	11
spider crab unidentified	Majidae	0.4	< 0.1	4
eulachon	*Thaleichthys pacificus*	0.4	< 0.1	3
shortfin eelpout	*Lycodes brevipes*	0.4	< 0.1	2
pygmy cancer crab	*Cancer oregonensis*	0.1	< 0.1	17
Arctic lyre crab	*Hyas coarctatus*	0.1	< 0.1	4
sawback poacher	*Sarritor frenatus*	0.1	< 0.1	3
wattled eelpout	*Lycodes palearis*	0.1	< 0.1	2
shrimp unidentified	Decapoda	< 0.1	< 0.1	6
scale worm unidentified	Polynoidae	< 0.1	< 0.1	5
striped sea leech	*Carcinobdella cyclostomum*	< 0.1	< 0.1	3
fish larvae unidentified		< 0.1	< 0.1	2
Pacific lyre crab	*Hyas lyratus*	< 0.1	< 0.1	2
polychaete worm unidentified	Polychaeta	< 0.1	< 0.1	2
Pacific sandfish	*Trichodon trichodon*	< 0.1	< 0.1	1
Totals		17,450.21	100.0	27,407

Table 5: Summary of biological samples collected for special studies during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Haul	Pollock Stomachs	Cannibalism Study Pollock [1]	Genetics Study Fin clips/Age-0 Pollock [2]	Cold Pool Study Age-1 Pollock	NMML Squid & Fish	NMML Steller S.L. Prey Items	Russian Studies[3]
1	20	-	-	-	X	-	-
2	20	-	-	-	X	-	-
3	-	-	-	-	X	-	-
4	20	10	50/0	-	X	X	-
5	-	-	-	-	-	-	-
6	20	11	52/0	-	X	X	-
7	-	-	-	-	-	-	-
8	20	-	-	X	X	X	-
9	20	10	-	-	-	-	-
10	20	10	25/50	-	-	-	-
11	24	-	-	X	-	-	-
12	20	-	-	-	X	-	-
13	-	-	-	X	X	-	-
14	20	-	-	X	-	-	-
15	-	-	-	X	-	-	-
16	-	-	0/50	-	-	-	-
17	20	10	-	X	-	-	-
18	20	-	-	-	-	-	-
19	20	-	-	-	-	-	-
20	20	-	-	-	-	-	-
21	-	-	-	-	X	X	-
22	-	-	-	-	-	-	-
23	-	10	-	-	-	-	-
24	-	-	-	-	-	-	-
25	20	-	-	-	X	-	-
26	20	-	-	-	-	-	-
27	-	-	-	-	X	X	-
28	-	-	0/50	-	-	-	-
29	-	-	-	-	X	-	-
30	-	-	-	-	-	X	-
31	20	-	-	-	X	-	-
32	-	-	-	-	-	-	-
33	-	-	-	-	-	-	50
34	21	10	50/0	X	X	-	-
35	20	-	-	-	-	-	-
36	-	-	-	-	-	-	-
37	20	10	50/0	-	-	-	50
38	-	-	-	-	X	-	-
39	-	-	-	-	-	-	-
40	-	-	-	-	X	-	-
41	20	-	-	-	-	-	-
42	20	-	-	-	-	-	50
43	-	-	-	-	-	-	-
44	20	10	50/0	-	-	-	50
45	20	-	-	-	-	X	-

Table 5 (cont.)

Haul	Pollock Stomachs	Cannibalism Study Pollock [1]	Genetics Study Adult/Age-0 Pollock [2]	Cold Pool Study Age-1 Pollock	NMML Squid & Fish	NMML Steller S.L. Prey Items	Russian Studies[3]
46	20	-	-	-	-	-	50
47	20	-	-	-	-	-	-
48	20	-	-	-	-	-	-
49	-	-	-	-	-	X	-
50	-	-	-	-	-	X	-
51	20	10	-	-	X	-	50
52	-	-	-	-	-	-	-
53	20	-	-	-	-	-	50
54	20	-	-	-	-		-
55	20	-	-	-	-		-
56	20	-	-	-	-		-
57	-	-	-	-	X	X	-
58	-	-	-	-	-	-	-
59	21	-	40/0	-	-	-	50
60	20	-	-	X	-	-	-
61	20	-	-	-	-	-	-
62	20	-	-	-	-	-	-
63	20	10	50/0	X	-	X	-
64	-	-	-	-	-	-	-
65	20	-	-	-	X	X	50
66	-	-	-	-	-	-	50
67	20	-	-	-	X	-	50
68	20	-	-	-	-	-	-
69	-	-	-	-	-	-	-
70	20	-	-	X	X	X	50
71	20	-	-	-	-	-	-
72	-	-	-	-	-	-	-
73	20	-	-	-	-	X	-
74	20	-	-	-	-	-	-
75	20	-	-	-	-	X	50
76	20	-	-	-	X	-	-
77	20	-	-	-	-	-	-
78	20	-	-	-	-	-	-
79	20	15	50/0	-	-	-	50
80	20	-	-	-	-	-	-
81	20	-	-	-	X	-	-
82	20	10	-	-	-	X	-
83	20	-	50/0	-	-	-	50
84	20	10	-	-	-	-	-
85	20	-	-	-	X	-	-
86	20	15	-	-	X	X	50
87	-	-	-	-	X	-	-
Totals	1,126	161	467/150	10 hauls	26 hauls	17 hauls	800

1- Muscle tissue & Stomach
2- Adult fin clips and age-0
3- Length, sex, maturity, stomach contents, and scale samples (Leg 2)

Table 6. Summary of biological samples collected from Methot trawls for special studies during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Haul	Cannibalism Study Prey Items[1]	Genetics Study Age-0 Pollock	Macro-Zooplankton Euphausiid Mix
201	50/1	-	X
202	12/0	150	
203	-	-	X
204	-	45	-
205	-	-	-
206	11/10	100	X
207	-	-	-
208	-	12	X
209	-	11	-
210	-	-	-
Totals	73/11	318	4 hauls

1- Age-0 pollock / jars of Macrozooplankton

Table 7. Summary of pollock biological samples and measurements collected during the summer 1997 echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Haul	Length[1]	Maturity	Otoliths	Fish Weight	Ovary Weight
1	34	0	0	0	0
2	326	70	70	70	25
3	339	81	81	81	28
4	285	81	81	81	0
5	14	0	0	0	0
6	290	66	66	66	22
7	63	63	63	93	18
8	189	120	20	120	0
9	412	75	75	75	5
10	405	77	77	77	3
11	300	101	20	101	0
12	352	78	78	78	10
13	487	70	70	70	24
14	470	128	68	128	7
15	347	87	87	87	16
16	51	0	0	0	0
17	427	41	41	41	13
18	328	69	69	69	2
19	351	0	0	0	0
20	426	0	0	0	0
21	24	24	0	24	0
22	18	0	0	0	0
23	369	0	0	0	0
24	370	59	59	59	13
25	197	0	0	0	0
26	50	0	0	0	0
27	220	0	0	0	0
28	104	0	0	0	0
29	172	31	31	31	0
30	192	0	0	0	0
31	341	96	96	96	5
32	331	99	99	99	5
33	402	0	0	0	0
34	548	158	102	77	0
35	371	100	100	100	0
36	20	0	0	0	0
37	390	95	95	95	3
38	101	0	0	0	0
39	84	0	0	0	0
40	152	30	30	30	0
41	381	104	104	104	2
42	502	0	0	0	0
43	337	61	61	61	0
44	337	76	76	76	1

Haul	Length[1]	Maturity	Otoliths	Fish Weight	Ovary Weight
45	381	76	76	76	0
46	517	0	0	0	0
47	416	76	76	76	1
48	369	62	62	62	0
49	169	0	0	0	0
50	240	0	0	0	0
51	343	83	83	83	1
52	165	10	10	0	0
53	477	63	63	63	1
54	328	53	53	53	0
55	328	50	50	50	0
56	365	60	60	60	0
57	359	0	0	0	0
58	55	0	0	0	0
59	595	67	67	67	0
60	454	22	22	22	0
61	356	55	55	55	0
62	495	85	85	85	1
63	549	73	73	73	1
64	575	70	70	70	0
65	481	47	47	47	0
66	424	46	46	0	0
67	549	55	55	55	0
68	448	63	63	63	0
69	601	0	0	0	0
70	589	84	84	84	0
71	531	0	0	0	0
72	432	59	59	59	3
73	636	0	0	0	0
74	470	53	53	53	0
75	680	64	64	64	0
76	374	50	50	50	0
77	489	0	0	0	0
78	621	29	29	29	0
79	359	51	51	51	0
80	332	40	40	40	0
81	505	0	0	0	0
82	550	50	50	50	1
83	569	50	50	50	0
84	411	61	61	61	0
85	316	55	55	55	0
86	561	54	54	54	0
87	212	0	0	0	0
Totals	30,585	3,956	3,635	3,849	211

[1] Length includes samples from random length frequency only

Table 8. Summary of CTD casts conducted during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

Cast	Event	Date (GMT)	Time (GMT)	Position Latitude (N)	Position Longitude (W)	Depth (m) CTD cast	Depth (m) Bottom	Location
1	sphere calibration	8 Jul	2316	48 08.36	122 25.11	79	109	Port Susan, WA
2	sphere calibration	17 Jul	1535	53 50.88	166 35.21	58	61	Captains Bay, AK
3	right whale sighting	21 Jul	0643	57 08.36	162 47.27	52	60	--
4	calibrate CTD/MBT	6 Aug	0430	54 34.74	165 50.26	343	419	--
5	sphere calibration	7 Aug	0227	53 51.41	166 34.63	62	77	Captains Bay, AK
6	Peggy mooring retrieval	4 Sep	0353	55 52.67	162 39.31	65	74	--
7	sphere calibration	7 Sep	0002	53 45.41	166 59.19	66	68	Makushin Bay, AK

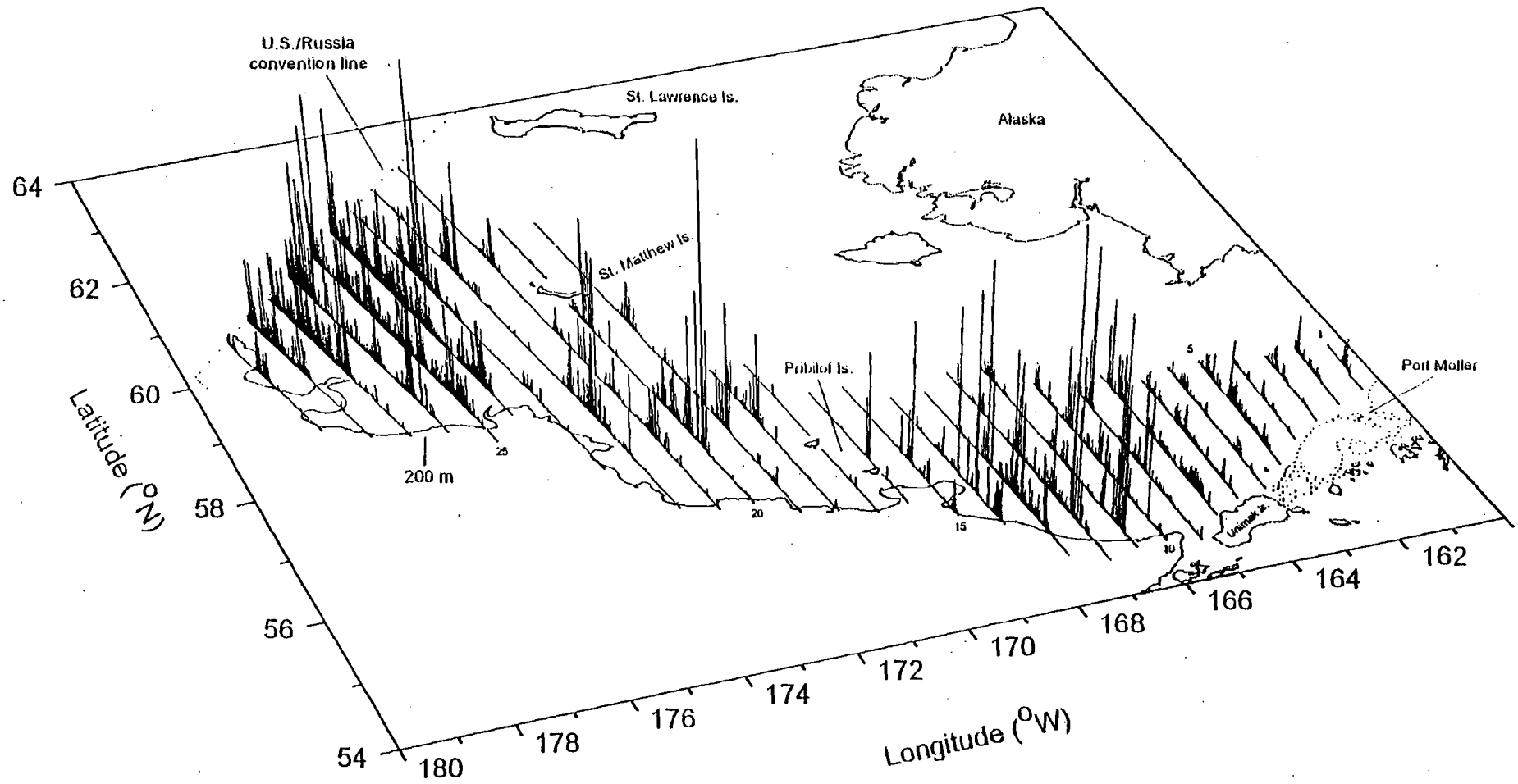

Figure 1. Relative pollock density along trackline during the summer 1997 echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08. Transect numbers are indicated.

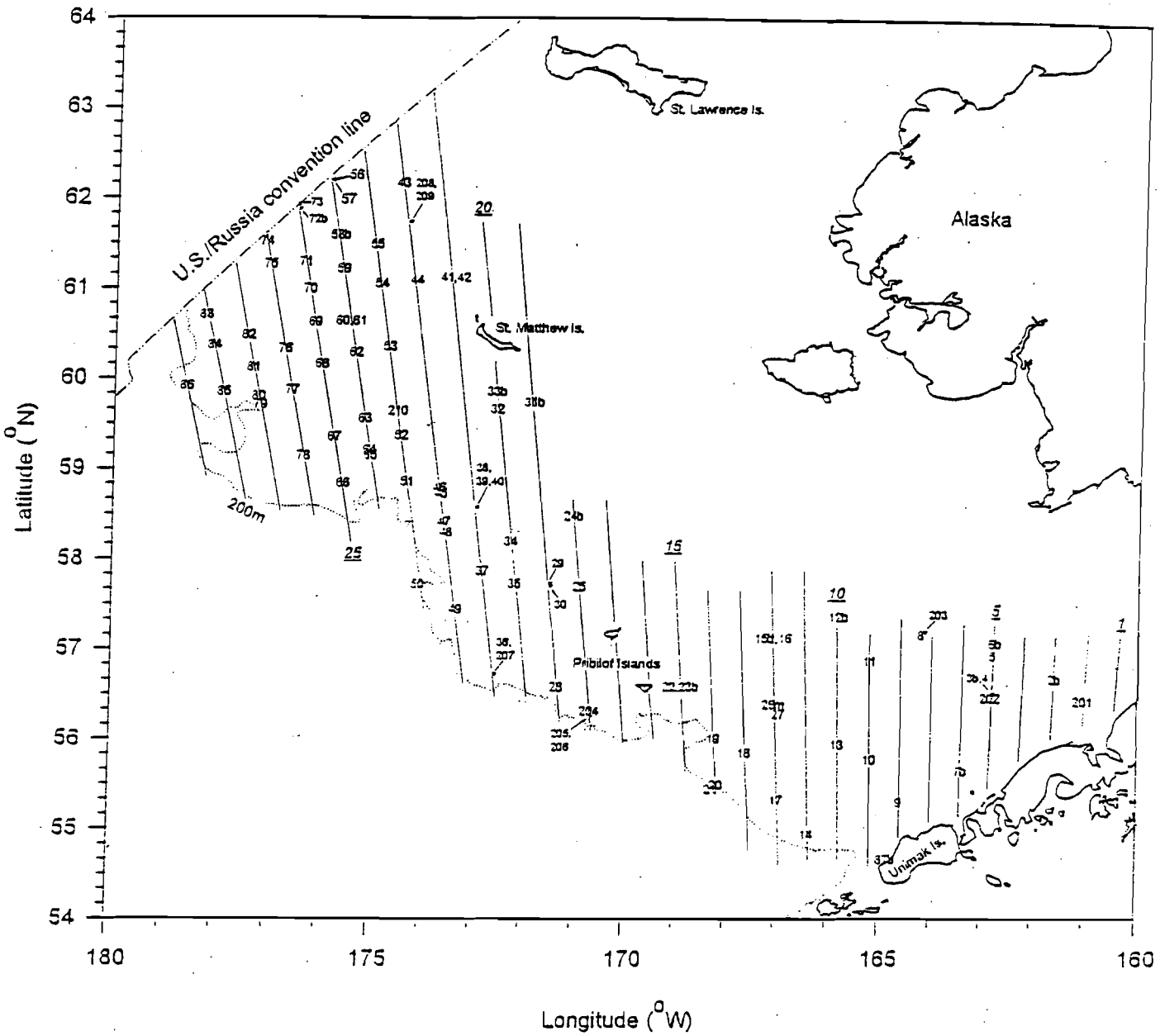

Figure 2. Transect lines with AWT, bottom ("b"), Methot (>200), and Marinovich ("m") trawl haul locations during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08. Underlined numbers indicate transect sequence.

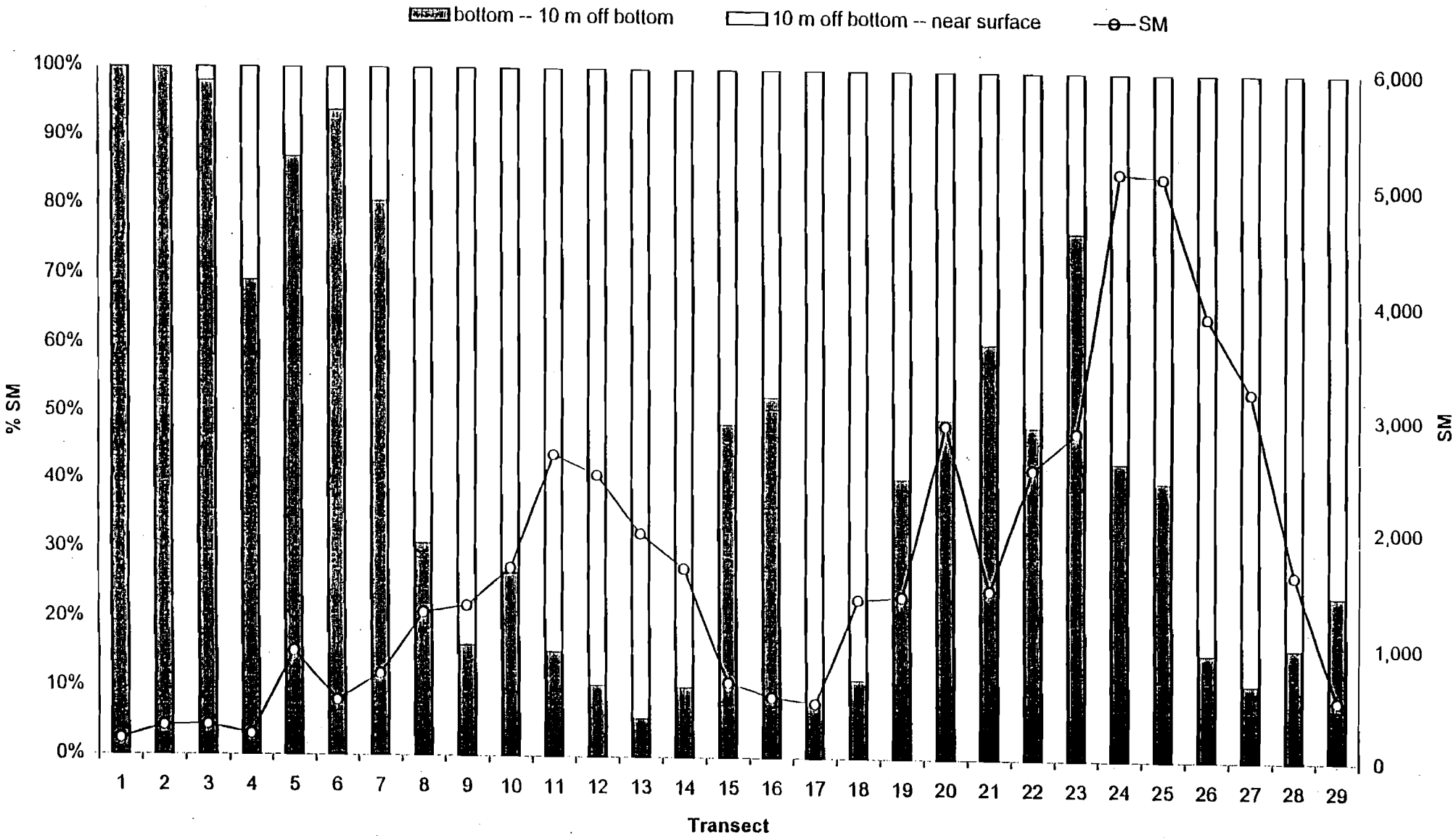

Figure 3. Vertical distribution of pollock acoustic return (% SM) and total pollock acoustic return (SM) by transect during the summer 1997 echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08.

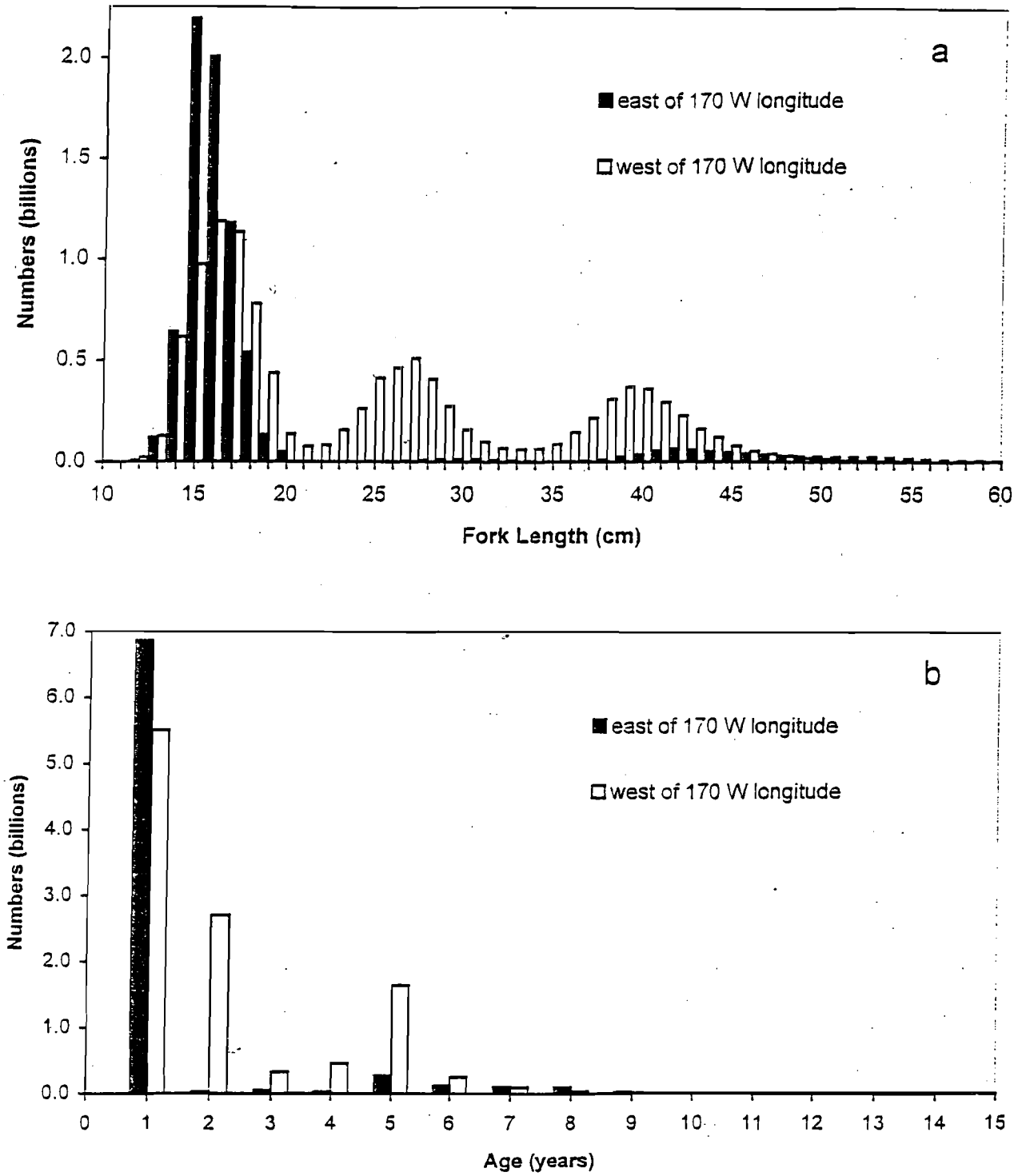

Figure 4. Preliminary estimate for pollock numbers at length (a) and numbers at age (b) from the 1997 hydroacoustic survey of the eastern Bering Sea shelf. Fish from near the surface to 3 m off bottom were included in this analysis.

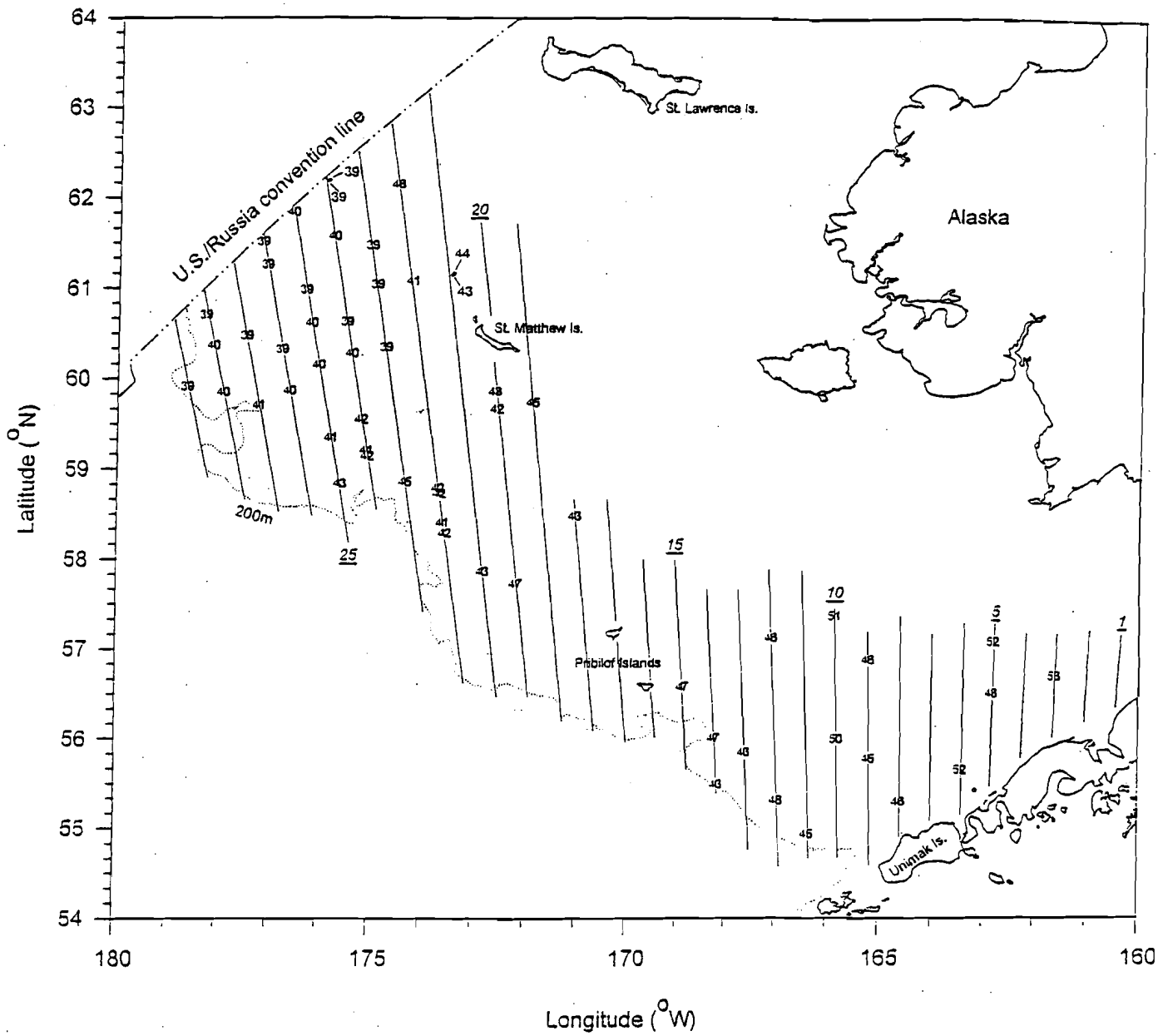

Figure 5. Transect lines with trawl haul average lengths (in cm) for pollock 36 cm and larger (N>50) during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08. Underlined numbers indicate transect sequence.

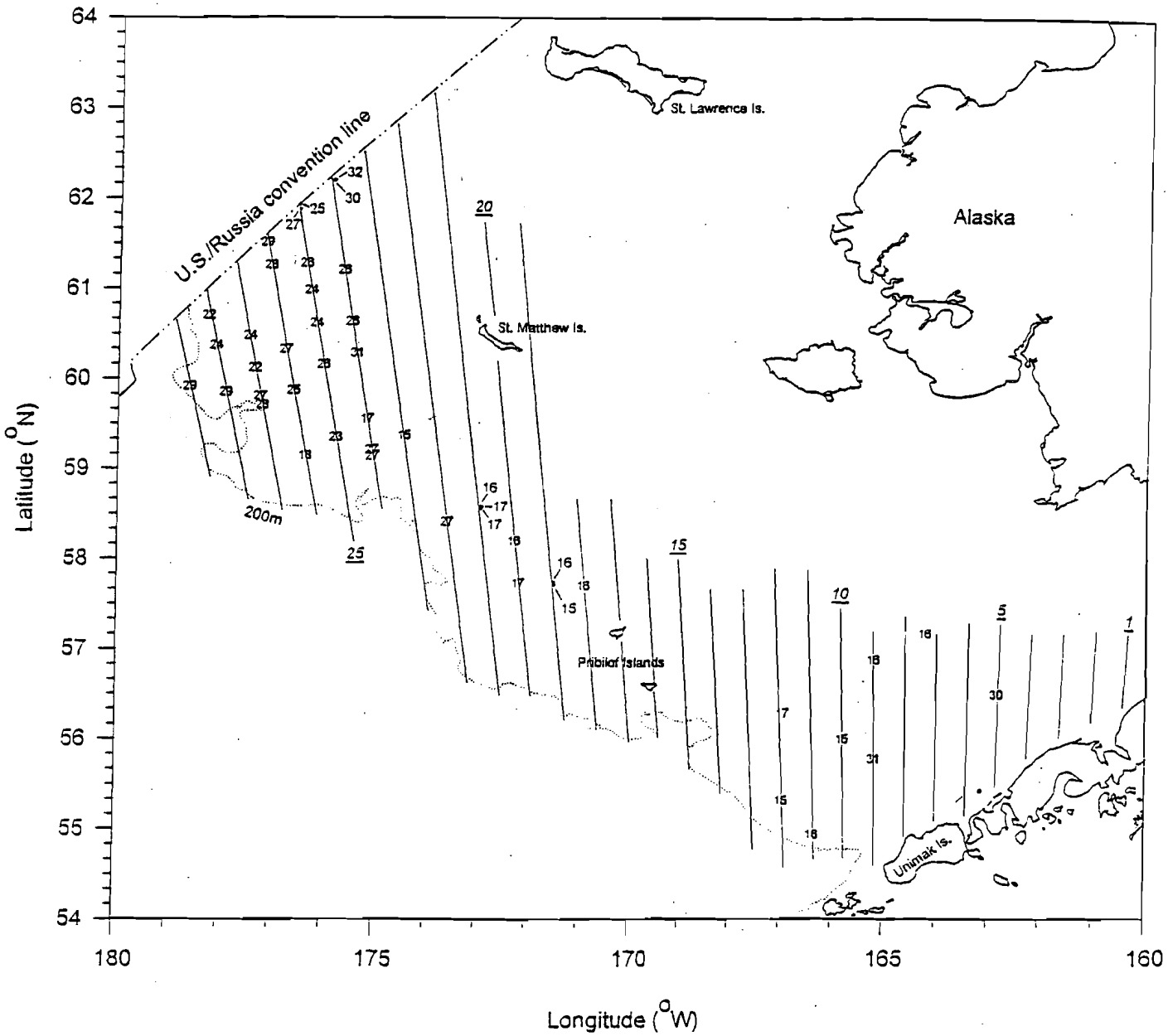

Figure 6. Transect lines with trawl haul average lengths (in cm) for pollock 35 cm and smaller (N>50) during the summer 1997 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope, MF97-08. Underlined numbers indicate transect sequence.

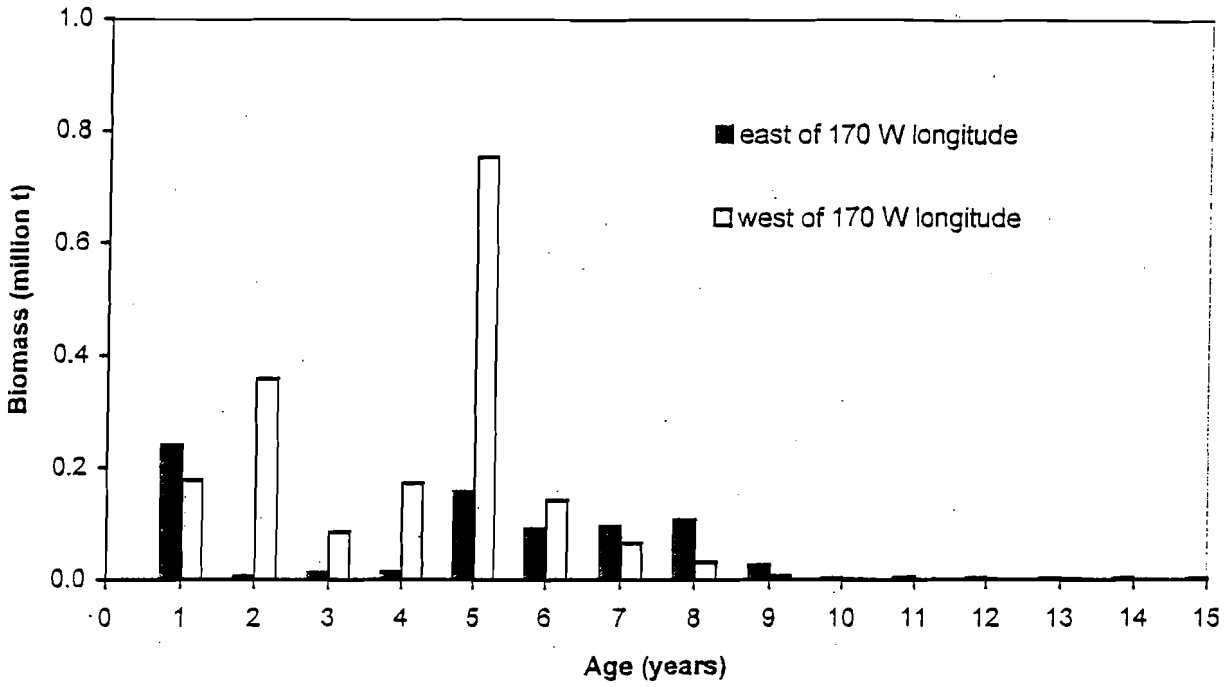

Figure 7. Preliminary estimate for pollock biomass at age from the 1997 hydroacoustic survey of the eastern Bering Sea shelf. Fish from near the surface to 3 m off bottom were included in this analysis.