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Echo Integration-trawl Survey Results for Walleye Pollock (*Theragra chalcogramma*) on the Bering Sea Shelf and Slope During Summer 1999 and 2000

by
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U.S. DEPARTMENT OF COMMERCE
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For convenience, the 1999 and 2000 echo integration-trawl survey reports have been bound together as one document. The following individual reports, however, should be cited as follows:

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PREFACE

This report contains methodology, results, and some discussion of two summer echo integration-trawl (EIT) surveys of walleye pollock (*Theragra chalcogramma*) on the eastern Bering Sea shelf and slope conducted in 1999 and 2000. This research was carried out by the Midwater Assessment and Conservation Engineering (MACE) Program at the Alaska Fisheries Science Center, Seattle, Washington, as part of a historical time series monitoring the midwater component of Bering Sea walleye pollock. While EIT surveys are completed in conjunction with the AFSC's Groundfish Assessment Program's annual bottom trawl surveys to separately assess the on-bottom component of Bering Sea pollock, bottom trawl results are not presented here. Although EIT survey design and timing were nearly the same between 1999 and 2000, each year's work had a slightly different scope and research team, thus the results are presented sequentially as two separate papers. To the extent possible, subheadings and sections used are the same for each year, but in some cases they differ.

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ABSTRACT

Walleye pollock (*Theragra chalcogramma)* abundance and distribution in midwater were assessed on the eastern Bering Sea shelf and slope between 7 June and 2 August 2000, using echo integration-trawl (EIT) survey techniques aboard the NOAA ship *Miller Freeman*. Pollock were surveyed from Port Moller, Alaska, to the U.S./Russia Convention Line, including some trackline that extended into the "horseshoe area" based on results from the summer 1999 EIT survey. Results showed that east of the Pribilof Islands (i.e., east of 170° long.), pollock were most concentrated north of Unimak Island, they decreased in abundance around the Pribilof Islands, and reached peak abundances west of the Pribilofs Islands (i.e., west of 170° long.) southwest of St. Matthew Island. East of the Pribilof Islands, the 1992 year class was most abundant by numbers, followed by the 1995 year class. West of the Pribilof Islands, the 1996 year class predominated, followed by 1998 and 1997 year classes. Estimated pollock abundance in midwater (14 m below the surface to 3 m off bottom) was 3.05 million metric tons (t) for the total survey area. Numbers of pollock were estimated to be 7.63 billion. East of 170°W long., estimated pollock abundance was 0.89 million t. West of 170°W long., estimated abundance was 2.16 million t. Thirteen percent of the total biomass was inside the Steller sea lion Conservation Area (SCA). Proportions of pollock biomass estimated east and west of 170°W long., and inside and outside the SCA, were similar to that observed during the four summer EIT surveys conducted since 1994.

CONTENTS

INTRODUCTION

Midwater abundance of eastern Bering Sea walleye pollock (*Theragra chalcogramma)* has been assessed in summer triennially between 1979 and 1994, and in 1996, 1997, 1999, and 2000 using echo integration-trawl survey (EIT) techniques. This National Marine Fisheries Service (NMFS) midwater time series, together with near-bottom pollock abundance and distribution data from annual NMFS summer bottom trawl surveys, is used in stock assessment models and ultimately assists NMFS and North Pacific Fishery Management Council in managing the commercial fishery. From 7 June to 2 August 2000, the Midwater Assessment and Conservation Engineering program (MACE) at the Alaska Fisheries Science Center (AFSC) conducted an EIT survey of pollock on the eastern Bering Sea shelf from Port Moller, Alaska, to the U.S./Russia Convention Line, aboard the NOAA ship *Miller Freeman*. The cruise began in Kodiak, Alaska, and ended in Dutch Harbor, Alaska.

The principal objective of the cruise was to collect echo integration data and trawl data necessary to determine the distribution, biomass, and biological composition of pelagic walleye pollock on the eastern Bering Sea shelf. In addition, pollock target strength (TS) data were collected for use in scaling echo integration data to estimates of absolute abundance. The 38-kHz and 120-kHz scientific acoustic systems were calibrated using standard sphere techniques. Physical oceanographic data, including temperature and salinity profiles at selected sites, were collected and sea surface parameters (e.g., temperature, salinity, light level, and productivity) were continuously monitored.

Secondary research objectives were to carry out scientific projects requested by MACE and other investigators (see Appendix II). They included the following: acoustic buoy work, line transect surveys for marine mammal abundance estimation, young-of-the-year walleye pollock investigations, collection of age-1 pollock for otolith chemistry studies, collection of northern fur seal prey species for a dietary study, collection of mature walleye pollock and Pacific cod specimens for AFSC's Groundfish Observer Program training, collection of age-1 walleye pollock for prey analysis, automated broadband identification of groundfish, and collection of video footage of walleye pollock behavior in the trawl codend.

METHODS

Itinerary (Alaska Daylight Time)

Leg 1

7 June	Embark scientists in Kodiak.
8-9 June	Acoustic system calibration in Ugak Bay, Alaska.
9-12 June	Transit to Bering Sea.
12 June-3 July	Echo integration-trawl survey of the EBS shelf (transects 1-18). "Touch and go" in Dutch Harbor on 20 June to exchange scientists.
4-5 July	In port Dutch Harbor, Alaska.

Leg 2

6 July	Acoustic system calibration in Captains Bay.
7 July-1 August	Echo integration-trawl survey of the EBS shelf (transects 19-29).
2 August	Acoustic system calibration in Captains Bay. End of cruise.

Acoustic Equipment

Acoustic data were collected with a Simrad EK 500 quantitative echo sounding system (Bodholt et al. 1989, Bodholt and Solli 1992) on the NOAA ship *Miller Freeman*, a 66-m stern trawler equipped for fisheries and oceanographic research. Two split-beam transducers (38 kHz and 120 kHz frequencies) were mounted on the bottom of the vessel's retractable centerboard extending 9 m below the water surface. System electronics were housed inside the vessel in a permanent laboratory space dedicated to acoustics. Echo integration data sampled with a horizontal resolution of about 9 m and a vertical resolution of 0.5 to 2.0 m, and target strength data were collected simultaneously at both frequencies. Scientists scrutinized these data using Simrad BI500 echo integration and target strength data analysis software (Foote et al. 1991, Simrad 1993) aided by digital echograms to partition the acoustic information into pollock, non-pollock fish, and undifferentiated invertebrate/fish mixture, and stored them in data files.

Trawl Gear

Midwater and near-bottom echosign was sampled using an Aleutian wing 30/26 trawl (AWT). This trawl had full-mesh wings constructed of nylon with polyethylene in the codend and aft section of the body. The headrope and footrope each measured 81.7 m. Mesh sizes tapered from 325.1 cm in the forward section of the net to 8.9 cm in the codend. The net was fitted with a 3.2-cm codend liner. The AWT was fished with 82.3 m of 1.9-cm diameter 8×19 non-rotational dandylines, and 340.2-kg or 226.8-kg tom weights on each side.

Fish on bottom were sampled with an 83/112 bottom trawl without roller gear (hereafter referred to as "bottom trawl"). Net mesh sizes ranged from 10.2 cm forward and 8.9 cm in the codend to 3.2 cm in the codend liner. Headrope and footrope lengths were 25.6 m and 34.1 m, respectively, and the breastlines measured 3.4 m and 3.2 m.

A Methot trawl was used to target age-0 pollock and macrozooplankton. Its mouth was a square frame measuring 2.27 m on each side. Mesh size was 2 mm × 3 mm in the body of the net, and 1 mm in the codend. A 1.83-m 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 four occasions, age-0 pollock and macrozooplankton were targeted with a Marinovich trawl. Meshes in the Marinovich trawl measured 7.6 cm forward, 3.2 cm in the codend, and 0.32 cm in the codend liner. Headrope and footrope lengths were each 9.1 m.

A bongo net system was used to sample zooplankton. The bongo net system consisted of a 60-cm bongo frame with paired 505-μ mesh nets and a 40-kg lead weight used as a depressor. It was deployed from the ship's starboard winch.

Five-m^2 "Fishbuster" trawl doors (1,247.4 kg) were used with the AWT, bottom trawl, and Marinovich trawl. To prevent the trawl doors from overspreading and damaging the Marinovich trawl when it was towed, a 15.24-m long, 2.5-cm diameter restrictor line was used. From each trawl door, two 16.8-m long, 1.9-cm diameter, 8×19 wire ropes connected to a single 82.3-m, 1.9-cm bridle. At the net end of the bridle, the restrictor was attached across to the single bridle on the other side. Two pairs of 18.3-m long, 1.3-cm diameter 6×19 wire ropes led aft from the restrictor line to the head and foot ropes.

Trawl depth and vertical openings of the AWT, bottom trawl, and Marinovich trawl were monitored with either a WESMAR third-wire or a Furuno wireless netsounder system attached to the headrope. Trawl depths of Methot trawls were monitored with a SCANMAR depth sensor and occasionally with a Net Mind depth sensor. Tow depth profiles and water temperature at depth for all trawls were obtained by attaching a small, retrievable micro-bathythermograph (MBT) (Brancker XL-200 or Sea-Bird SBE39 temperature and pressure recorder) to the net, or, with Methot trawls, to the frame. Vessel pitch and roll data were collected with the ship's inertial navigation and motion measurement system to monitor transducer motion. Water temperature and salinity profile data were collected at calibration and other selected sites with a Sea-Bird conductivity-temperature-depth (CTD) system. Sea surface oceanographic data and environmental data were collected and stored on the *Miller Freeman*'s Scientific Computing System (SCS).

Survey Design

The approximately 6,050 nmi survey trackline consisted of parallel, north-south transects that began near Port Moller, Alaska at about 160° 20'W long. (Fig. 1) and proceeded northwest to the U.S./Russia Convention Line. Transects were spaced 20 nmi apart and were chosen to coincide with lines of groundfish trawl stations sampled about 2 weeks earlier by bottom trawl survey vessels. Southern transect endpoints were either limited by the Alaska Peninsula and the Aleutian Island chain (transects 1 through 11) or were beyond the shelf break (transects 12 through 29). Southern endpoints of transects 9 through 12 were extended in order to cover more of the horseshoe area, based on results from the 1999 summer EIT survey. Northern endpoints of transects 1 through 20 were based initially on historical pollock distributions and extended northward if significant fish echosign was observed. Bottom depths at these endpoints ranged between 50 and 85 m. Since permission to enter the Russian Exclusive Economic Zone (EEZ) was not granted, northern extents of transects 21 through 29 ended at the U.S./Russia Convention Line. Endpoint depths along the convention line increased westward from 77 to 250 m.

The EIT survey was conducted during daylight hours. Day length ranged from about 16.5 to18.5 hours, depending on vessel latitude and date. Vessel speed during survey data collection averaged 11.8 knots. Daytime echo integration data from the 38-kHz system were used to provide estimates of pollock abundance. Nights were dedicated to additional trawling, collecting target strength data, and collecting Methot samples for the young-of-the-year walleye pollock study.

Trawl hauls were made to identify echosign and to provide biological samples (Figs. 1 and 2). Average trawling speed was about 3 knots. The average vertical net opening for the AWT was 25 m and it ranged from 18 to 38 m. Vertical net openings averaged 3.5 m and 4 m for the 83/112 and Marinovich trawls, respectively. Standard catch sorting and biological sampling procedures were used to determine weight and number by species for each haul (MACE Sampling Manual[1]). Pollock were sampled to determine sex, fork length (FL), body weight, age, maturity, and ovary weight of selected females. An electronic motion-compensating 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 centimeter (e.g., a fish measuring between 49.5 cm FL and 50.5 cm FL was recorded as 50 cm FL) and recorded with a Polycorder measuring device (a combination of bar code reader and hand-held computer, Sigler 1994), then

[1]Midwater Assessment and Conservation Engineering (MACE) Sampling Manual. 2001. Unpublished document. Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle WA 98115.

downloaded to a desktop computer. Maturity was determined by visual inspection and was categorized as immature, developing, pre-spawning, spawning, and post-spawning. 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.

Target strength data, which are used to scale echo integration data to estimates of absolute fish abundance, were collected on fish under suitable conditions (e.g., low fish density, single-species aggregations, unimodal size distribution, and calm seas). During these collection periods, repeated passes were made over an aggregation of pollock at speeds of less than 4 kts. Biological data were collected from trawl hauls made in conjunction with the acoustic data.

Calibrations using standard sphere techniques were made to monitor acoustic system performance. During calibrations, the *Miller Freeman* was anchored at bow and stern. Copper spheres with known backscattering characteristics were suspended below the transducers and acoustic returns were measured, following the procedure outlined by Foote et al. (1987). Sphere diameters were 60 and 23 mm for the 38-kHz and 120-kHz transducers, respectively. Split-beam target strength and echo-integration data from the copper spheres were collected to describe acoustic gain parameters and transducer beam pattern characteristics.

Data Analysis

Estimates of pollock abundance were derived by combining echo integration and trawl data. Echo integration data collected between 14 m from the surface and 0.5 m off the bottom or to 1,000 m, depending on bottom depth, were scrutinized for pollock and stored in a database. Pollock echosign data were classified into 2 types: one occurred as near-bottom layers, and the other occurred as discrete, midwater schools. Pollock length data sampled from 111 hauls were aggregated into 25 analytical strata based on echosign type, geographic proximity of hauls, and similarity in size-composition data. Average pollock backscattering strength along each 0.5 nmi of transect was multiplied by transect width to estimate area backscattering for transect segments. Area backscattering segments were summed to compute total pollock area backscattering for each analytical stratum. These values were scaled using a previously derived relationship between target strength and fish length (TS = 20 Log FL - 66; Traynor 1996) and the length composition data, to estimate numbers of pollock by size. Length-weight relationships observed from trawl data were applied to estimate pollock biomass for each length category. Two length-weight relationships, one for pollock east of 170°W long. and one for pollock west of 170°W long., were obtained by pooling trawl data (sexes combined) and minimizing the sum of squares using an iterative non-linear function in Microsoft Excel. Age-specific estimates of biomass and numbers were calculated using two age-length keys (east and west of 170°W long.) derived from observed trawl catch information. Biomass was estimated for the entire survey area covered in 2000. Within that estimate, biomass was also estimated for east and west of 170°W long., and for inside the Steller sea lion Conservation Area (SCA).

Error bounds on the acoustic data were derived using a one-dimensional (1D) geostatistical approach described in Petitgas (1993), Williamson and Traynor (1996), and Rivoirard et al. (2000). We chose geostatistical methods for computation of error (± 2 relative estimation error) because the approach accounted for the spatial structure observed and thus provided a more realistic estimate of error than one derived from the random sample variance. The 1D method required equal spacing between transects and no fewer than 10 transects (P. Petitgas, IFREMER, Nantes, France, pers. comm.). Sampling error bounds on the acoustic data were used to provide confidence intervals on the point estimate of biomass. These sampling error bounds quantified only acoustic data sampling variability; other sources of error (e.g., target strength, trawl sampling, echosign identification) are not included. These sampling error estimates should be treated as preliminary.

RESULTS AND DISCUSSION

Calibration

Four acoustic system calibrations were conducted: one at the start, one during, one at the end, and one 2 weeks after the cruise (Table 1). No significant differences in gain parameters or transducer beam pattern characteristics were observed for either frequency. Acoustic system settings used during EIT survey data collection were based on results from previous calibrations and on experience from prior surveys.

Target Strength

Target strength data were collected on pollock on 19 occasions (Table 2). Conditions were most favorable west of the Pribilof Islands as fewer jellyfish were present, and at night, as fish were less highly aggregated. We were able to make four collections on pollock during the day and we prioritized those when possible in order to build a daytime target strength database.

Oceanographic Conditions

Thirty-six CTD samples were collected either in association with specific hauls or at selected points along the survey trackline (Table 3 and Fig. 3). In addition, MBT casts provided temperature profiles from nearly all of the 175 opportunistic trawl stations (Tables 4 and 5). Continuous sampling of sea surface temperature revealed that surface temperatures ranged from 2.2° to 10.3°C. In June, from the Pribilof Islands eastward, coolest surface waters (< about 6°C) were along the northern margins of the survey area and warmest waters (> 8°C) were just northeast of the Pribilofs at about 169°W long. During July, west of the Pribilofs, coolest surface waters (< about 8°C) surrounded St. Matthew Island and covered the northern tip of transect 21 at about 63°N lat.; warmest surface waters (> 8°C) were observed in the western edges of the survey area, west of 174°W long. (Fig. 4). Surface salinity ranged between 30.5 and 32.9 ppt; lowest salinities were observed at the southern ends of transects 1 through 5 along the Alaska Peninsula, and northwest of St. Matthew Island near the northern ends of transects 19 through 24; highest salinities were centered at about 176°W long. between 59° and 60°N lat. (Fig. 5). West of the Pribilof Islands, where most pollock were observed, the thermocline depth was usually about 25 m. A CTD line along the U.S./Russia Convention Line (Fig. 6) illustrates the region of very cold water characterizing the northern area between transects 21 and 25. There, temperatures and salinities below the thermocline were between -2° and 0°C (Fig. 6) and between 32.0 and 32.6 ppt (Fig. 7), respectively. Elsewhere, temperatures observed during summer 2000 were warmer than they were in 1999. In 2000, the average surface temperature was 7.7°C, whereas it was 6.4°C in 1999. Bottom temperatures observed during the summer 2000 bottom trawl survey of groundfish (Fig. 8) showed that average bottom temperature was 2.2°C, much warmer than the 0.7°C observed in 1999 (T. Sample, Alaska Fisheries Science Center, pers. commun.).

Echosign

Four different types of echosign, two of which were pollock, were identified. The first type of echosign formed moderately dense layers rising from the bottom into midwater and was typically composed of adult pollock in the east. In the west, echosign with the same appearance was characteristic of a mixture of juvenile and adult pollock, mainly longer than 20 cm (2+ years old). The second type of echosign consisted of tightly packed, discrete, schools in the upper water column during the day, and was usually composed of juvenile pollock 16 to 35 cm in length, most likely age 2 or age 3. A third echosign type was used to categorize what was assumed to be unidentified (non-pollock) fish. The fourth type of echosign was attributed to a heterogenous, undifferentiated mixture of jellyfish, macrozooplankton, age-0 pollock, and individual fishes, and was classified as an invertebrate-fish species mixture. Since this mixture of backscatter cannot be easily scaled to biomass, its magnitude in any given location is not well known, and its representation here is not comparable to that for pollock biomass which has been properly scaled. Distribution of this mixture was different from that for pollock. Most was observed on transects 1 through 6 and due north of the Pribilof Islands on transects 16 to 18, with lower densities on transects 7 to 15, and 19 to 25 (Fig. 9). In most cases, this invertebrate-fish backscatter was observed where bottom depths were less than 100 m. This type of echosign was not observed west of about 176°30'W long.

Biological Sampling

Biological data and specimens were collected from 175 trawl hauls (Tables 4, 5, and 6). Adult and juvenile pollock (age 1+) were targeted with 115 AWT hauls and nine bottom trawl hauls (Fig. 1); age-0 pollock and zooplankton were targeted with 4 Marinovich hauls and 47 Methot hauls (Fig. 2). Biological data for additional projects were collected from 118 of the hauls (Table 7). Trawl durations ranged from 2 to 69 minutes, and catch weights ranged from 0 to 5,910 kg. Walleye pollock dominated midwater (Table 8) and bottom trawl (Table 9) catches, accounting for 94% and 71% of the catch by weight, respectively. In addition to pollock, bottom trawl catches contained substantial numbers of yellowfin sole (*Pleuronectes asper)* and rock sole (*Lepidopsetta* sp.). Nearly all of the Pacific ocean perch (*Sebastes alutus*) encountered were caught in a single AWT trawl (haul 81). Marinovich and Methot haul catches (Tables 10 and 11) were dominated by jellyfish (>99% and 94% by weight, respectively), and included significant numbers of larval fish which were probably age-0 pollock. Fourteen bongo net samples were collected (Table 12).

Among pollock sampled in midwater and bottom trawls, mean length per haul ranged from 12 cm to 56 cm (Fig. 10). Slightly more males than females were observed in the pollock catch, particularly in trawls made east of the Pribilof Islands (Fig. 11). Catches with 50 or more pollock averaged 53% male. The length to weight relationship for pollock found east of 170°W long. showed a more rapid increase in weight with increasing fish length than west of 170°W long. (Fig. 12). Using the best fit weight at length curves for fish lengths from 5 to 60 cm FL, fish weights were higher by 0.4 g (at 5 cm) to 20.6 g (at 42 cm) east of 170°W long. than west of 170°W long. This, together with historical observations that show differences in biological characteristics between fish east and west of 170°W long., leads to the use of two length-weight regressions in subsequent population analyses. The majority of pollock (51% of sexes combined) were observed to be in the developing stage, with fewer numbers of post-spawners (28%) and immature fish (20%; Fig. 13). A very small number of pollock were observed to be spawning or pre-spawning (about 1%). Ovary weights were collected from 24 pre-spawning females.

Of the 3,459 paired otolith specimens collected from walleye pollock, 2,253 were submitted for age-reading. All 850 otolith specimens collected east of 170°W long. were aged (Fig. 14). The number of otoliths from west of 170°W long. submitted for age reading (Fig. 15) was reduced by nearly half (from 2,609 to 1,403) using a random subsampling scheme that sought to preserve the shape of the overall specimen length-frequency distribution while retaining sufficient samples across the whole range of lengths sampled. Mean length at age was greater east of 170°W long. for pollock between the ages of about three and eight (Fig. 16).

Pollock Distribution and Abundance

Pollock were observed throughout the eastern Bering Sea shelf area surveyed (Fig. 17). East of the Pribilof Islands, highest pollock concentrations were encountered on transects 7 and 8, north of Unimak Island. Pollock densities were lower between Unimak Island and the Pribilof Islands. West of the Pribilof Islands, pollock density increased and peaked on transects 20 and 21 southwest of St. Matthew Island. In the far west, pollock were heavily concentrated in a few spots along the U.S./Russia Convention Line (transects 26 to 28). On transects with high abundance, pollock tended to be closer to bottom east of the Pribilofs (transects 1 to 16) than west of the Pribilofs (transects 17 to 29) (Fig. 18). On many transects pollock were distributed somewhat farther north in summer 2000 (Fig. 17) than in 1999 (Fig. 19), particularly west of the Pribilof Islands. More pollock were observed on eastern transects (e.g., east of 166°W long., transects 1 to 10) than in 1999, and pollock aggregations observed on western transects 26 and 27 were much less concentrated than in 1999.

Estimated pollock abundance in the midwater region (14 m below the surface to 3 m off bottom) in terms of biomass was 3.05 million metric tons (t) (Table 13). The 95% biomass confidence interval determined using the 1D analytical method was 2.87 to 3.24 million t. Estimated abundance in terms of numbers was 7.63 billion pollock (Table 14) with a 95% confidence interval of 7.15 to 8.11 billion. East of 170°W long., estimated pollock abundance was 0.89 million t (29% of biomass), representing 1.27 billion fish (Fig. 20a). West of 170°W long., estimated abundance was 2.16 million t (71% biomass) representing 6.36 billion fish. About thirteen percent of the total biomass was inside the SCA (Table 13). The proportions of estimated pollock biomass east and west of 170°W long., and inside and outside the SCA, were about the same in summer 2000 as for recent summer EIT surveys (Table 13). West of 170°W long., average length was 34 cm (Fig. 20a). East of 170°W long., excluding the SCA, average length was 45 cm (Fig. 20b). Inside the SCA, average length was 47 cm (Fig. 20b). The average length for the whole Bering Sea shelf population was 36 cm. Overall pollock abundance in midwater in 2000 was similar to that in 1999 (3.05 vs. 3.29 million t, Table 13). The cumulative distribution of biomass from east to west by transect (Fig. 21) was also similar between 1999 and 2000, but, as mentioned above, there were more pollock in the east section (transects 1 to 13) and fewer in the northwest section (transects 27 to 29) of the survey area in 2000.

Age composition estimates (Table 15) for the summer 2000 pollock population showed different patterns east and west of 170°W long. (Fig. 22). East of 170°W long., the 8-year-old 1992 year class comprised about 26% of population numbers followed in importance by the 1995 year class (22%), the 1996 year class (18%), and the 1994 year class (10%). West of 170°W longitude, the 1996 year class comprised most of the population (35%), followed by the 1998 and 1997 year classes (20% and 18% by numbers, respectively). Age data from the 2000 survey in conjunction with age data from previous EIT surveys (Table 14) illustrate patterns among strong year classes as estimated from midwater surveys. During survey years between 1991 and 2000, the 1989, 1992, and 1996 year classes have been the most dominant.

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Table 1. Summary of results of sphere calibrations conducted before, during, and after the summer 2000 pollock echo integration-trawl survey of the Bering Sea shelf and slope.

Date (GMT)	Location	Frequency (kHz)	Water temp (°C) at Transducer[1]	Water temp (°C) at Sphere	Sphere range from transducer (m)	TS Gain (dB)	SV Gain (dB)	Along 3 dB beam width (deg)	Angle offset Along	Angle offset Athwart
9 Jun	Ugak Bay, AK	38	7.9	5.6	28.7	25.7	-	6.95	-0.08	-0.01
		120	7.9	6.3	23.0	25.6	25.8	7.40	0.05	0.21
7 Jul	Captains Bay, AK	38	6.9	4.2	29.4	25.7	25.5	-	-	-
		120	6.9	4.5	23.6	25.4	25.5	7.31	-0.14	0.34
3 Aug	Captains Bay, AK	38	7.1	4.9	27.5	25.7	-	6.97	-0.08	0.00
		120	7.1	5.3	23.7	25.6	-	7.25	-0.18	0.20
20 Aug	Ugak Bay, AK	38	10.7	8.4	27.1	25.7	25.4	6.94	-0.07	0.02
		120	10.7	9.3	21.3	25.6	25.7	-	-	-
Jun-Jul	System settings	38	-	-	-	25.8	25.5	6.9	-0.08	0.03
	during surveys	120	-	-	-	25.3	25.4	7.1	-0.12	-0.21
	System SV threshold = -69 dB									

[1]The transducer was 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 , Strandpromenaden 50, P.O. Box 111 N-3191 Horten, Norway.

Table 2. Pollock target strength data collection during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Date (GMT)	Time (GMT)	Associated hauls	% pollock in catch (by weight)	Mean length	Comments[1]
2 Jul	9:53-12:37	42, 43	94.5, 99.9	43	night, jellyfish
8 Jul	16:43-18:24	45	74.8	44	day, jellyfish
10 Jul	12:41-13:27	49	22.6	---	night, 5 pollock, jellyfish
11 Jul	8:53-10:45	51, (244)	98.2	mix[2]	night
12 Jul	10:52-13:08	54, 55, 56, 57	96.1, 99.6 , 96.7, 99.7	39, 40, 40, 40	night
13 Jul	9:58-14:15	60	30.9	---	night, 21 pollock, sleeper shark
13 Jul	21:02-23:19	62	96.7	41	day
14 Jul	10:00-11:30	64, 65	99.6, 99.7	38, mix	night, drop TS
18 Jul	11:30-12:58	70, 71, 72	94.5, 57.3, 92.3	41, mix, mix	night; jellyfish, mixed species, jellyfish
19 Jul	9:21-13:41	77, 78	99.8, 100	41, 42	night
21 Jul	9:43-14:06	83, 84	100, 37.8	mix, 18	night, sleeper shark, two layers
23 Jul	10:01-14:35	90, 91, 92	98, 99, 83	37, 24, 32	night, jellyfish
23 Jul	17:58-21:20	93	89.1	38	day, jellyfish
25 Jul	8:18-13:51	99, 100, 101	96.2, 61.3, 94.8	25, 16, 24	night, jellyfish
25 Jul	23:20-04:38	102	55.5	49	day, jellyfish
27 Jul	9:50-13:09	110, 111	100, 99.9	34, 34	night
28 Jul	11:07-13:19	114	97.2	37	night
29 Jul	9:48-13:14	118, 119	98.7, 97.9	mix, mix	night
31 Jul	11:43-14:15	126, 127, 128	98.5, 99.2, 100	32, 37, 36	night

[1] If bycatch was greater than 5% by weight, principal bycatch species is indicated.

[2] "mix" indicates more than one length mode in the haul.

Table 3. Summary of conductivity-temperature-depth (CTD) casts conducted during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

CTD number	Date	Drop time (GMT)	Drop position Latitude (°N)		Longitude (°W)		Station	Bottom depth (m)	Associated haul	CTD serial number
501	9 Jun	18:42	57	29.23	152	50.11	Ugak Bay calibration	84	-	647
502	10 Jun	16:14	55	48.45	154	30.85	deepwater cast	870	-	647
503	15 Jun	7:35	57	12.82	162	45.70	Transect 5.0	56	-	647
504	15 Jun	11:32	57	11.60	162	44.49	Transect 5.0	56	-	647
505	16 Jun	9:25	55	13.31	164	0.90	Transect 7.0	57	-	647
506	16 Jun	13:43	55	13.28	164	0.91	Transect 7.0	59	-	647
507	16 Jun	14:27	55	13.48	164	1.12	Transect 7.0	59	-	647
509	17 Jun	11:55	56	20.21	164	36.00	Transect 8.0	88	203	2533
510	18 Jun	11:58	54	39.82	165	8.80	Transect 9.0	83	204	2533
511	19 Jun	7:34	57	20.08	165	19.50	Transect 9.1	69	205	2533
512	21 Jun	8:40	56	26.03	166	25.60	Transect 11.0	101	208	2533
513	22 Jun	8:47	57	0.00	167	4.90	Transect 12.0	75	Bongo 1	650
514	22 Jun	12:03	56	59.80	167	4.90	Transect 12.0	75	214	2533
515	23 Jun	1:38	54	59.99	166	56.36	Transect 12.0	156	Bongo 3	650
516	24 Jun	5:43	56	28.43	167	39.24	Transect 13.0	113	Bongo 5	650
518	7 Jul	5:10	53	51.75	166	34.75	Capt. Bay calibration	80	-	2533
519	9 Jul	12:00	59	58.12	171	55.65	Transect 19.0	67	-	647
520	13 Jul	2:43	56	39.92	171	58.01	Transect 20.0	126	-	2533
521	14 Jul	10:26	58	30.60	172	58.40	Transect 20.0	61	-	647
522	15 Jul	9:18	59	51.80	173	14.56	Transect 21.0	86	-	2533
523	16 Jul	8:25	63	10.43	173	59.61	Transect 21.1	77	-	2533
524	16 Jul	10:45	62	49.11	174	41.78	Transect 22.0	76	-	2533
525	19 Jul	22:50	56	55.60	173	14.71	Transect 22.0	146	-	647
526	22 Jul	9:04	61	21.96	175	0.71	Transect 23.0	89	-	2533
527	22 Jul	16:24	62	30.40	175	24.77	Transect 23.1	80	-	2533
528	22 Jul	19:01	62	13.38	175	58.79	Transect 24.0	91	-	2533
529	26 Jul	5:21	61	54.66	176	34.50	Transect 25.1	105	-	2533
530	26 Jul	7:48	61	35.52	177	10.33	Transect 26.0	117	-	2533
531	28 Jul	2:26	58	42.44	177	51.61	Transect 27.0	132	-	2533
532	29 Jul	4:11	61	14.45	177	45.76	Transect 27.1	114	-	2533
533	29 Jul	10:57	60	58.33	178	19.61	Transect 28.0	163	-	2533
534	30 Jul	10:51	58	38.76	177	27.90	Transect 28.1	>1500	-	2533
535	31 Jul	2:38	60	39.66	178	55.15	Transect 29.1	251	-	2533
536	2 Aug	2:38	53	52.08	166	34.52	Capt. Bay calibration	99	-	647

Table 4. Trawl stations and summary of catch data from the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

		Start Time (GMT)		Duration	Start Position		Depth (m)		Temp. (°C)		MBT	Pollock Catch		Other Catch
Haul No.	Gear Type[1]	Date	Time	(minutes)	Latitude (°N)	Longitude (°W)	Gear	Bottom	Gear	Surface	Profile #[2]	(kg)	(numbers)	(kg)
1	317	13 Jun	10:28	14	56 37.01	160 20.79	43	54	2.9	4.5	2	0.0	0	27.5
2	30	13 Jun	21:22	26	56 27.14	161 37.14	65	65	2.6	5.0	3	551.7	510	395.0
3	317	14 Jun	10:07	31	56 46.89	162 11.24	67	72	2.0	4.7	4	68.9	60	22.3
4	30	14 Jun	15:30	26	56 08.10	162 13.87	76	76	2.4	6.9	6	1,372.3	1,688	1052.7
5	305	15 Jun	1:09	30	56 14.09	162 49.18	38	81	2.0	7.4	7	0.0	0	84.8
6	317	15 Jun	18:56	17	56 24.73	163 24.06	76	84	1.8	7.3	8	74.5	91	89.2
7	30	15 Jun	20:35	15	56 24.74	163 24.05	83	83	1.8	7.3	9	2,394.9	2,961	185.1
8	317	16 Jun	7:52	35	55 14.15	164 00.99	49	58	4.9	6.7	10	541.7	733	668.3
9	317	16 Jun	20:17	30	56 08.93	164 00.69	87	90	2.1	7.1	11	1,464.3	1,896	65.7
10	317	17 Jun	18:51	20	55 53.42	164 35.55	95	95	2.8	6.4	306	868.8	1,419	141.2
11	30	17 Jun	23:29	30	55 15.52	164 35.27	101	101	4.3	6.2	307	910.0	1,157	1050.0
12	317	18 Jun	8:42	38	54 28.37	165 09.30	74	116	5.1	5.2	308	9.6	9	15.4
13	317	18 Jun	17:07	9	54 47.81	165 09.70	108	117	5.3	5.3	309	826.6	1,041	55.1
14	317	20 Jun	6:22	16	54 23.25	165 43.81	114	147	4.7	5.7	19	1,520.0	1,610	0.0
15	317	21 Jun	5:10	15	56 23.51	166 24.64	63	101	4.7	6.3	20	0.6	1	258.8
16	317	21 Jun	7:19	25	56 27.22	166 26.13	92	100	2.6	6.2	21	1,038.7	1,584	70.9
17	317	22 Jun	1:23	15	57 11.59	167 05.37	64	72	2.6	6.0	26	64.9	87	19.8
18	317	22 Jun	3:57	13	57 11.09	167 06.32	65	72	2.7	5.8	27	169.0	235	37.9
19	305	22 Jun	7:10	15	56 52.12	167 04.71	22	79	5.3	6.4	310	0.0	0	137.4
20	30	22 Jun	17:09	20	56 25.18	167 02.17	110	110	3.2	6.4	313	1,019.0	1,616	240.1
21	317	23 Jun	19:53	40	55 36.23	167 34.04	131	136	3.5	6.7	316	36.2	51	4.5
22	317	24 Jun	1:22	48	56 19.08	167 38.11	123	128	3.3	7.6	317	4,378.4	7,141	11.6
23	317	25 Jun	1:43	25	58 04.68	168 26.98	63	69	1.9	5.3	322	344.0	476	49.9
24	317	25 Jun	8:52	35	57 00.52	168 19.72	75	81	2.6	6.8	323	635.3	1,118	40.4
25	317	25 Jun	14:57	30	57 00.57	168 19.72	76	80	2.6	6.8	326	343.5	529	60.4
26	317	25 Jun	20:23	8	56 24.98	168 15.94	129	134	3.3	6.9	327	115.6	142	0.3
27	317	25 Jun	22:57	15	56 25.76	168 15.96	128	131	3.3	7.6	30	1,352.7	2,128	7.3
28	317	26 Jun	18:02	30	56 10.04	168 50.02	255	268	3.6	7.5	32	0.0	0	22.3
29	317	27 Jun	2:25	30	57 05.39	168 56.63	69	78	2.8	10.4	330	78.9	141	162.3
30	30	27 Jun	5:33	20	57 05.62	168 56.83	78	78	2.8	10.2	331	598.2	1,141	294.1
31	317	28 Jun	17:09	15	56 43.14	169 31.40	71	79	3.5	8.3	333	2,523.8	5,578	96.2
32	305	29 Jun	5:03	20	56 20.03	169 27.29	31	148	5.0	8.9	334	0.0	0	40.2
33	317	29 Jun	16:41	14	55 58.85	170 00.89	302	310	3.5	7.9	335	43.9	40	0.0
34	317	29 Jun	22:17	40	55 58.76	170 01.42	149	278	3.6	7.6	39	36.4	39	0.4
35	30	30 Jun	3:43	25	56 32.94	170 04.58	105	105	3.5	8.0	336	1,063.2	1,174	170.7
36	317	30 Jun	7:06	20	56 47.22	170 08.18	83	92	3.9	7.7	337	1,112.5	1,999	67.5
37	317	30 Jun	19:10	26	57 25.68	170 14.08	61	68	3.8	7.4	40	3,018.4	4,405	451.6

Table 4. Continued.

Haul No.	Gear Type[1]	Start Time (GMT) Date	Start Time (GMT) Time	Duration (minutes)	Start Position Latitude (°N)	Start Position Longitude (°W)	Depth (m) Gear	Depth (m) Bottom	Temp. (°C) Gear	Temp. (°C) Surface	MBT Profile #[2]	Pollock Catch (kg)	Pollock Catch (numbers)	Other Catch (kg)
38	305	1 Jul	1:23	16	58 05.01	170 20.42	42	75	2.8	7.6	--	2.0	3	82.1
39	317	1 Jul	5:08	20	58 28.95	170 24.11	66	75	1.8	7.3	41	2,111.0	3,254	49.0
40	317	1 Jul	19:01	10	57 57.24	170 55.02	82	86	2.7	7.6	339	1,318.0	2,336	367.0
41	317	1 Jul	23:56	15	57 20.52	170 52.30	73	83	3.2	7.5	45	982.6	1,510	197.4
42	317	2 Jul	8:45	14	56 47.12	170 46.03	66	110	3.7	7.7	46	589.5	1,027	34.4
43	317	2 Jul	13:14	12	56 47.31	170 46.09	89	110	3.1	7.7	47	639.1	1,156	0.6
44	317	8 Jul	7:06	20	56 58.85	171 24.05	99	111	3.7	8.4	50	2,756.1	5,010	26.9
45	317	8 Jul	19:02	20	57 12.37	171 26.30	91	103	3.2	8.7	51	474.6	770	160.0
46	317	8 Jul	23:46	15	57 49.00	171 32.62	55	99	2.9	9.4	52	2,212.5	3,910	67.5
47	317	9 Jul	8:21	28	58 49.52	171 43.35	47	92	5.7	9.0	54	1,234.2	11,392	285.8
48	317	9 Jul	10:23	30	58 47.83	171 43.08	86	92	1.7	9.2	55	1,575.4	6,885	64.6
49	317	10 Jul	14:09	20	60 58.94	172 48.48	61	67	1.2	7.4	58	9.6	5	32.9
50	317	11 Jul	4:03	66	59 19.75	172 30.40	85	88	1.2	8.6	341	1,219.7	1,635	35.8
51	317	11 Jul	9:40	26	59 05.04	172 26.46	87	98	1.7	8.6	342	581.9	1,190	10.4
52	317	11 Jul	20:05	4	58 24.08	172 18.46	84	103	2.4	8.7	345	1,377.7	4,733	69.4
53	317	11 Jul	22:12	3	58 27.19	172 19.23	93	102	2.4	8.6	346	1,416.8	2,901	63.2
54	317	12 Jul	4:39	20	57 49.18	172 11.33	75	107	3.7	8.7	347	418.2	893	17.1
55	317	12 Jul	6:29	8	57 47.25	172 09.28	99	107	2.9	8.7	348	2,411.0	4,926	9.0
56	317	12 Jul	9:02	25	57 46.10	172 07.11	44	107	5.5	8.8	59	249.0	529	8.5
57	317	12 Jul	13:54	15	57 47.12	172 09.11	87	108	3.0	8.7	349	5,894.4	12,271	15.6
58	317	12 Jul	19:16	25	57 17.20	172 04.75	102	109	3.4	8.7	350	1,271.2	1,825	4.9
59	317	12 Jul	22:09	29	57 16.53	172 04.56	73	109	4.5	8.4	351	4.7	6	0.0
60	317	13 Jul	11:50	23	57 16.90	172 40.36	104	115	3.2	8.9	352	20.6	21	46.1
61	317	13 Jul	17:07	38	57 27.00	172 43.76	110	119	3.0	8.8	353	1,500.0	2,318	0.0
62	317	14 Jul	0:32	35	57 55.30	172 49.68	75	112	3.1	8.9	354	211.1	413	7.1
63	317	14 Jul	5:57	11	58 33.11	172 57.75	62	112	3.9	8.7	355	393.7	1,869	0.3
64	317	14 Jul	7:34	12	58 30.26	172 56.68	86	111	2.8	8.7	60	1,105.3	2,935	4.7
65	317	14 Jul	12:52	8	58 30.16	172 56.15	92	111	2.8	8.6	356	605.7	1,940	1.9
66	317	14 Jul	18:23	18	58 57.44	173 02.72	92	108	2.3	8.5	357	700.4	2,240	5.9
67	317	15 Jul	1:12	15	59 24.54	173 09.29	91	100	2.0	8.7	358	438.5	1,042	464.8
68	317	15 Jul	7:08	13	59 41.58	173 12.38	87	95	1.5	8.4	359	1,010.4	1,886	27.8
69	30	15 Jul	12:54	15	60 18.26	173 20.72	62	62	1.3	7.8	360	20.9	1,476	243.8
70	317	18 Jul	7:00	11	59 45.45	173 54.80	95	105	1.9	9.4	363	1,238.5	2,456	71.5
71	317	18 Jul	10:05	15	59 41.08	173 52.74	106	106	2.0	9.4	364	27.3	70	20.3
72	317	18 Jul	13:37	8	59 41.69	173 51.03	93	105	2.0	9.2	365	331.6	806	27.7
73	317	18 Jul	18:07	2	59 22.66	173 47.84	98	111	2.2	9.1	366	944.7	5,331	50.3
74	317	19 Jul	0:00	11	58 37.71	173 37.85	122	127	2.9	8.9	367	827.1	1,899	1.7
75	317	19 Jul	2:25	17	58 45.20	173 38.55	96	126	2.8	9.1	368	1,588.5	9,278	21.5

Table 4. Continued.

Haul No.	Gear Type[1]	Start Time (GMT) Date	Start Time (GMT) Time	Duration (minutes)	Start Position Latitude (°N)	Start Position Longitude (°W)	Depth (m) Gear	Depth (m) Bottom	Temp. (°C) Gear	Temp. (°C) Surface	MBT Profile #[2]	Pollock Catch (kg)	Pollock Catch (numbers)	Other Catch (kg)
76	317	19 Jul	8:48	2	57 58.40	173 28.66	80	120	3.0	8.9	369	423.9	875	0.0
77	317	19 Jul	10:24	20	57 55.24	173 27.12	99	121	3.0	8.8	370	443.3	856	0.8
78	317	19 Jul	14:13	14	57 55.28	173 26.99	98	121	3.0	8.7	371	681.7	1,258	0.0
79	317	19 Jul	19:10	43	57 20.69	173 18.43	65	122	4.4	8.9	372	0.0	9	7.2
80	317	20 Jul	8:29	26	57 32.54	174 00.62	145	161	3.4	9.1	373	0.0	0	0.0
81	317	20 Jul	10:59	10	57 38.43	174 11.73	237	243	3.0	9.4	374	0.0	0	418.4
82	317	21 Jul	4:12	60	58 56.36	174 21.55	122	130	2.6	9.4	376	713.2	1,102	6.5
83	317	21 Jul	10:01	21	59 15.52	174 26.48	88	122	2.3	9.2	61	261.9	1,085	0.0
84	317	21 Jul	11:57	20	59 16.43	174 26.75	63	121	3.6	9.3	62	18.4	292	30.2
85	317	21 Jul	16:49	28	59 33.37	174 31.34	112	120	2.0	9.3	377	712.7	2,164	2.1
86	317	21 Jul	19:21	8	59 43.65	174 33.95	99	116	1.9	9.3	378	2,107.8	9,050	42.2
87	317	21 Jul	23:35	10	60 05.40	174 39.70	96	107	1.6	9.9	379	311.6	920	26.5
88	317	22 Jul	4:48	46	60 49.37	174 51.71	90	96	0.8	9.4	380	678.2	948	149.4
89	30	23 Jul	4:54	20	60 34.62	175 28.45	110	110	1.3	9.2	382	1,521.6	3,527	178.4
90	317	23 Jul	7:29	24	60 22.63	175 24.97	98	113	1.5	9.3	383	627.1	1,985	12.5
91	317	23 Jul	10:23	3	60 12.98	175 22.15	94	115	1.8	9.4	384	235.4	1,975	2.3
92	317	23 Jul	14:24	10	60 22.70	175 24.97	101	112	1.5	9.3	385	229.7	805	47.0
93	317	23 Jul	20:46	32	59 51.78	175 16.06	100	122	1.7	9.5	386	317.1	799	38.8
94	317	24 Jul	1:45	17	59 27.07	175 08.90	111	133	1.8	9.9	387	1,638.6	5,400	41.4
95	317	24 Jul	6:43	69	58 57.88	175 00.65	127	131	2.4	10.0	388	580.0	743	11.3
96	317	24 Jul	19:19	32	59 05.88	175 41.56	124	137	1.6	9.7	389	347.1	365	1.2
97	317	24 Jul	23:45	18	59 33.10	175 49.80	126	138	1.7	9.8	390	1,574.0	5,024	16.0
98	317	25 Jul	2:49	7	59 48.71	175 54.69	130	137	1.7	9.8	391	824.9	4,665	67.2
99	317	25 Jul	8:16	28	60 23.66	176 05.53	108	123	1.3	9.7	392	255.3	1,843	10.2
100	317	25 Jul	12:23	16	60 22.14	176 05.12	63	123	3.2	9.8	393	22.6	636	14.3
101	317	25 Jul	13:45	6	60 23.03	176 05.35	114	123	1.3	9.7	394	361.0	2,064	20.0
102	317	26 Jul	1:13	42	61 49.74	176 33.05	100	106	-0.2	9.3	395	239.1	303	193.5
103	317	26 Jul	9:50	17	61 34.65	177 09.46	66	117	1.5	9.6	396	644.2	2,463	17.1
104	317	26 Jul	11:08	11	61 34.67	177 09.32	103	117	0.4	9.5	397	1,385.6	5,796	0.4
105	317	26 Jul	13:26	3	61 37.48	177 03.59	64	115	1.6	9.3	398	39.5	141	21.2
106	317	26 Jul	14:34	5	61 37.53	177 03.33	74	115	0.7	9.3	399	565.1	2,812	10.4
107	317	26 Jul	19:04	7	61 06.00	176 58.83	111	122	1.1	9.4	400	352.1	1,186	48.1
108	317	26 Jul	23:55	4	60 34.17	176 50.04	129	136	1.4	9.7	401	616.9	3,234	6.1
109	317	27 Jul	3:11	5	60 18.45	176 43.45	130	138	1.3	9.5	402	2,178.2	7,451	1.8
110	317	27 Jul	8:11	10	59 43.74	176 31.05	106	140	1.0	9.6	403	1,160.0	4,142	0.0
111	317	27 Jul	13:46	17	59 43.45	176 27.79	108	140	1.5	9.6	404	486.2	1,646	0.5
112	317	27 Jul	18:26	7	59 13.06	176 21.25	120	138	1.4	9.3	405	514.7	2,083	0.0
113	317	28 Jul	9:49	12	59 47.66	177 11.85	115	142	1.7	9.3	406	395.4	1,590	6.5

Table 4. Continued.

Haul no.	Gear type[1]	Start time (GMT) Date	Time	Duration (minutes)	Start position Latitude (°N)	Longitude (°W)	Depth (m) Gear	Bottom	Temp. (°C) Gear	Surface	MBT Profile #[2]	Pollock catch (kg)	(numbers)	Other catch (kg)
114	317	28 Jul	13:54	30	59 42.20	177 09.73	105	164	2.4	9.4	407	242.9	677	7.1
115	317	28 Jul	18:23	27	60 09.45	177 21.22	125	138	0.8	9.6	408	1,110.0	4,517	0.0
116	317	29 Jul	0:38	11	60 57.58	177 38.42	124	137	1.1	9.9	63	1,181.3	3,425	8.7
117	317	29 Jul	7:23	42	61 01.61	178 10.76	114	157	0.8	9.7	409	1,447.4	11,380	12.6
118	317	29 Jul	10:45	21	60 58.25	178 16.12	120	159	1.1	9.2	410	121.5	683	1.6
119	317	29 Jul	13:57	25	60 58.24	178 16.09	137	159	1.2	9.4	411	93.9	512	2.0
120	317	29 Jul	17:06	5	60 51.08	178 17.75	51	166	3.4	9.5	412	566.2	4,330	1.6
121	317	29 Jul	20:23	12	60 38.67	178 12.98	136	161	1.5	9.8	413	4,858.6	21,145	1.4
122	317	30 Jul	1:52	11	60 05.50	178 01.60	137	147	n/a	9.2	--	1,827.4	7,160	2.6
123	317	30 Jul	19:17	4	59 43.25	178 34.53	152	431	2.6	9.2	415	244.9	531	0.0
124	317	30 Jul	21:46	5	59 54.47	178 37.79	131	142	1.5	9.0	416	1,287.1	8,380	0.1
125	317	31 Jul	5:51	32	60 49.16	178 13.07	112	165	1.0	9.8	417	1,246.8	12,931	3.2
126	317	31 Jul	9:59	2	60 57.28	177 37.38	49	137	4.0	9.8	418	266.0	1,094	4.0
127	317	31 Jul	10:56	15	60 58.86	177 39.28	117	137	1.2	9.7	419	466.3	1,209	3.7
128	317	31 Jul	14:46	23	60 58.75	177 39.16	127	138	0.6	9.7	420	777.5	1,950	0.0

[1]Gear type codes: 317 = Aleutian wing trawl, 30 = 83-112 bottom trawl, 305 = Marinovich trawl.

[2]MBT (micro bathythermograph) recorder type: profiles 2-63 = Brancker XL-200, profiles 306-420 = SeaBird SBE39.

Table 5. Methot trawl stations and summary of catch data from the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

	Start Time (GMT)		Duration	Start Position		Depth (m)		Temp. (°C)		MBT	Gadoid Catch		Other Catch
Haul No.	Date	Time	(minutes)	Latitude (°N)	Longitude (°W)	Gear	Bottom	Gear	Surface	Profile #[1]	(kg)	(numbers)	(kg)
201	14 Jun	11:59	13	56 40.23	162 10.80	62	73	2.1	5.5	5	0.0	0	7.1
202	17 Jun	9:46	10	56 40.21	164 36.03	69	76	1.9	6.9	12	<0.01	98	7.8
203	17 Jun	12:15	14	56 20.18	164 35.35	78	88	1.9	7.1	13	<0.01	31	11.7
204	18 Jun	12:19	20	54 39.55	165 08.88	81	84	5.1	5.3	15	<0.01	4	22.4
205	19 Jun	6:52	10	57 20.03	165 13.91	60	68	1.5	5.9	511	0.0	0	9.5
206	19 Jun	9:51	15	57 19.78	165 51.37	60	69	2.0	5.7	17	0.0	0	38.3
207	19 Jun	11:14	15	57 10.49	165 51.29	64	71	1.8	6.0	18	<0.01	82	12.4
208	21 Jun	10:07	45	56 19.99	166 25.14	90	105	3.3	6.3	22	<0.01	55	0.9
209	21 Jun	11:17	8	56 20.00	166 24.49	36	105	3.9	6.7	23	<0.01	18	7.8
210	21 Jun	12:01	14	56 19.95	166 25.08	85	105	3.3	6.3	24	0.01	74	1.2
211	21 Jun	12:40	17	56 20.10	166 25.15	98	100	3.3	6.3	25	<0.01	40	11.6
212	22 Jun	10:08	20	57 00.24	167 05.91	67	75	2.8	6.5	28	0.0	0	1.3
213	22 Jun	10:55	17	57 00.06	167 05.40	35	75	2.8	6.3	311	0.02	253	15.9
214	22 Jun	11:37	8	56 59.96	167 05.30	68	75	2.8	6.1	312	<0.01	24	4.8
215	23 Jun	5:06	28	54 59.99	166 56.04	139	155	4.2	6.3	314	0.0	0	1.1
216	23 Jun	5:58	17	54 59.92	166 56.08	49	155	5.4	6.3	315	0.0	0	1.4
217	24 Jun	4:15	26	56 29.04	167 40.38	111	113	3.4	7.7	318	0.01	134	4.2
218	24 Jun	5:04	19	56 28.23	167 38.99	66	113	4.8	7.7	319	0.0	0	3.8
219	24 Jun	10:17	24	56 27.80	167 38.00	102	114	3.3	7.2	320	0.0	0	0.5
220	24 Jun	10:59	19	56 28.11	167 38.47	53	114	3.3	7.2	321	0.0	0	8.4
221	24 Jun	11:48	28	56 29.04	167 40.39	101	112	3.3	7.3	29	0.01	117	1.9
222	25 Jun	10:42	16	56 59.85	168 19.49	76	82	2.5	6.8	324	<0.01	49	7.3
223	25 Jun	11:32	15	56 59.67	168 19.66	76	82	2.5	7.0	325	0.01	140	7.9
224	26 Jun	9:02	17	55 51.29	168 48.76	101	150	4.0	7.5	328	0.0	0	0.6
225	26 Jun	9:49	15	55 50.18	168 44.08	102	147	3.8	7.2	329	0.0	0	0.3
226	26 Jun	10:54	20	55 49.50	168 33.03	102	143	4.1	7.1	31	<0.01	50	1.1
227	28 Jun	10:43	22	57 04.35	169 49.97	60	61	3.9	8.1	332	0.0	0	0.8
228	28 Jun	11:39	19	57 04.12	169 49.65	33	61	4.2	8.7	33	0.0	0	21.6
229	28 Jun	13:06	13	57 00.36	169 33.47	54	63	3.8	8.8	34	0.0	0	4.4
230	29 Jun	2:57	30	56 19.99	169 26.74	134	149	3.2	8.5	35	0.01	82	13.8
231	29 Jun	3:51	20	56 19.97	169 26.76	43	149	5.8	8.5	36	0.17	1,330	12.8
232	29 Jun	9:48	29	56 20.08	169 27.23	132	152	3.3	9.3	37	0.01	53	0.9
233	29 Jun	10:33	21	56 20.12	169 27.73	40	152	4.1	8.5	38	0.01	58	23.0

Table 5. Continued.

Haul No.	Start Time (GMT) Date	Time	Duration (minutes)	Start Position Latitude (°N)	Longitude (°W)	Depth (m) Gear	Bottom	Temp. (°C) Gear	Surface	MBT Profile #[1]	Gadoid Catch (kg)	(numbers)	Other Catch (kg)
234	1 Jul	7:28	10	58 39.81	170 26.33	68	75	1.6	7.0	42	0.0	0	25.2
235	1 Jul	9:46	16	58 39.72	171 05.40	76	84	1.5	6.8	43	<0.01	1	20.8
236	1 Jul	11:57	17	58 20.33	171 01.26	83	85	2.2	7.2	44	<0.01	6	18.7
237	2 Jul	23:22	29	56 05.24	170 02.78	102	125	3.6	7.5	48	0.01	49	8.0
238	3 Jul	0:09	25	56 05.26	170 01.26	61	125	3.4	7.4	49	0.0	0	15.2
239	9 Jul	2:02	22	57 49.72	171 32.67	38	98	4.6	8.9	53	0.12	915	7.7
240	9 Jul	12:31	40	58 40.19	171 42.97	86	94	2.1	8.8	56	<0.01	3	27.5
241	10 Jul	7:21	14	61 43.86	172 58.17	56	65	-1.6	8.4	57	0.0	0	4.3
242	10 Jul	23:29	24	59 45.59	172 35.35	26	82	4.3	7.9	340	0.0	0	34.2
243	11 Jul	12:15	19	59 00.17	172 44.58	97	103	2.2	8.6	343	0.67	9	0.8
244	11 Jul	13:53	20	59 03.59	172 25.30	96	97	1.8	8.5	344	<0.01	23	22.1
245	15 Jul	20:22	20	60 56.55	173 29.10	66	75	0.1	7.8	361	0.0	0	54.5
246	17 Jul	22:20	10	61 13.91	174 17.05	67	80	-1.5	8.5	362	0.0	0	9.4
247	20 Jul	23:01	41	58 17.52	174 11.57	125	136	3.3	9.4	375	0.01	16	3.2

[1]MBT (micro bathythermograph) recorder type: profiles 5-57 = Brancker XL-200, profiles 311-375 = SeaBird SBE39, and profile 511 = SeaBird CTD.

Table 6. Inventory (numbers of fish) of pollock biological samples and measurements collected during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Haul	Length sample	Maturity sample	Otoliths specimens	Length/weight sample	Ovary weight sample
1	-	-	-	-	-
2	303	33	33	33	-
3	60	18	18	18	-
4	399	85	43	85	1
5	-	-	-	-	-
6	91	36	36	36	-
7	324	71	32	71	-
8	458	77	56	77	-
9	387	64	48	64	-
10	299	62	35	62	-
11	396	40	40	40	-
12	9	9	9	9	-
13	331	67	40	67	1
14	347	37	37	37	-
15	1	-	-	-	-
16	368	57	57	57	-
17	87	-	-	-	-
18	235	48	35	48	-
19	-	-	-	-	-
20	390	79	40	79	-
21	50	69	36	69	-
22	417	56	35	56	-
23	349	40	40	40	-
24	425	47	35	47	-
25	346	52	39	52	2
26	142	-	-	-	-
27	430	60	35	60	-
28	-	-	-	-	-
29	141	-	-	-	-
30	584	47	36	47	-
31	352	62	35	62	-
32	-	-	-	-	-
33	40	40	40	40	-
34	39	39	39	39	-
35	365	34	34	34	-

Table 6. Continued.

Haul	Length sample	Maturity sample	Otoliths specimens	Length/weight sample	Ovary weight sample
36	481	48	35	48	-
37	422	51	37	51	4
38	3	-	-	-	-
39	412	45	35	45	-
40	323	55	38	55	-
41	358	38	35	38	-
42	341	35	35	35	-
43	367	55	-	55	-
44	456	43	35	43	-
45	362	112	38	112	-
46	458	54	35	54	-
47	505	56	40	56	-
48	370	63	36	63	-
49	5	4	4	4	-
50	525	58	35	58	-
51	623	88	56	88	3
52	419	69	40	69	-
53	348	75	37	75	-
54	576	71	34	71	3
55	420	53	-	53	-
56	344	-	-	-	-
57	476	104	-	104	1
58	386	54	35	54	-
59	6	6	6	6	-
60	21	21	21	21	1
61	325	56	38	56	-
62	387	99	34	99	-
63	463	74	35	74	-
64	520	58	35	58	-
65	566	110	-	110	-
66	408	89	45	89	-
67	532	55	35	55	-
68	376	43	35	43	-
69	110	17	17	17	1
70	529	38	35	38	-
71	70	70	-	70	-
72	521	89	-	89	-

Table 6. Continued.

Haul	Length sample	Maturity sample	Otoliths specimens	Length/weight sample	Ovary weight sample
73	386	66	35	66	-
74	513	59	36	59	-
75	388	66	36	66	-
76	416	42	34	42	-
77	427	41	35	41	-
78	364	109	-	109	-
79	-	-	-	-	-
80	-	-	-	-	-
81	-	-	-	-	-
82	405	41	36	41	-
83	501	62	47	62	-
84	292	66	-	66	-
85	317	70	35	70	-
86	436	66	36	66	-
87	357	45	35	45	-
88	356	39	35	39	1
89	618	52	35	52	-
90	337	57	35	57	-
91	395	73	46	73	-
92	348	78	-	78	-
93	391	101	37	101	1
94	571	65	35	65	-
95	412	49	35	49	1
96	365	72	72	72	3
97	394	56	35	56	-
98	552	65	35	65	-
99	389	56	35	56	-
100	349	113	-	113	-
101	321	100	1	100	-
102	303	119	57	119	1
103	353	50	35	50	-
104	402	69	-	69	-
105	141	-	-	-	-
106	515	94	-	94	-
107	328	72	37	72	-
108	481	71	35	71	-
109	473	63	35	63	-

Table 6. Continued.

Haul	Length sample	Maturity sample	Otoliths specimens	Length/weight sample	Ovary weight sample
110	315	101	35	101	-
111	391	104	-	104	-
112	421	68	41	68	-
113	477	85	85	85	-
114	337	61	-	61	-
115	578	73	35	73	-
116	475	56	35	56	-
117	474	68	47	68	-
118	338	76	50	76	-
119	408	104	-	104	-
120	665	73	35	73	-
121	498	75	41	75	-
122	534	57	35	57	-
123	451	80	44	80	-
124	401	73	36	73	-
125	335	-	-	-	-
126	325	-	-	-	-
127	339	1	1	1	-
128	392	93	-	93	-
243	1	-	-	-	-
Totals	43,730	6,880	3,459	6,880	24

Table 7. Biological samples collected from trawls and other research conducted for ancillary projects during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Haul	Young-of-the-year pollock study[1]	Age-1 pollock otolith chemistry	Northern fur seal prey species	Observer program training specimens	Age-1 pollock prey analysis	Broadband sonar species recognition[2]	Age-0 pollock distribution	Marine mammal Pacific cod study	Pollock behavior codend video[2]
1	-	-	-	-	-	-	-	-	-
2	-	-	X[3]	X	-	-	-	X	-
3	-	-	-	-	-	-	-	-	-
4	-	-	X	-	X	-	-	X	-
5	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-
7	-	-	X	-	-	-	-	X	-
8	-	-	-	X	-	-	-	-	-
9	-	-	-	-	X	-	-	-	-
10	-	-	X	-	-	-	-	-	-
11	-	-	X	X	-	-	-	-	-
12	-	-	X	X	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-
16	-	-	X	X	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-
18	-	-	-	X	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-
20	-	X	-	-	-	-	-	-	-
21	-	-	-	X	-	-	-	-	-
22	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-
26	-	X	-	-	-	-	-	-	-
27	-	-	-	-	X	-	-	-	-
28	-	-	X	X	-	-	-	-	-
29	-	-	-	-	-	-	-	-	-
30	-	X	-	X	X	-	-	-	-
31	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	X	-	-
33	-	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-	-
35	-	-	-	X	X	-	-	-	-
36	-	-	-	-	-	-	-	-	-

Table 7. Continued.

Haul	Young-of-the-year pollock study[1]	Age-1 pollock otolith chemistry	Northern fur seal prey species	Observer program training specimens	Age-1 pollock prey analysis	Broadband sonar species recognition[2]	Age-0 pollock distribution	Marine mammal Pacific cod study	Pollock behavior codend video[2]
37	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-	-
45	-	-	-	-	-	X	-	-	-
46	-	-	-	-	-	X	-	-	-
47	-	-	-	-	-	X	-	-	-
48	-	-	-	-	-	X	-	-	-
49	-	-	-	-	-	-	-	-	-
50	-	-	X	-	-	X	-	X	-
51	-	X	-	-	X	-	-	-	-
52	-	-	-	-	-	X	-	-	-
53	-	-	-	-	-	X	-	-	-
54	-	-	-	-	-	X	-	-	-
55	-	-	-	-	-	X	-	-	-
56	-	-	-	-	-	X	-	-	-
57	-	-	-	-	-	-	-	-	-
58	-	-	-	-	-	X	-	-	-
59	-	-	-	-	-	X	-	-	-
60	-	-	-	-	-	-	-	-	-
61	-	-	-	-	-	X	-	-	-
62	-	-	-	-	-	-	-	-	-
63	-	-	X	-	-	X	-	-	-
64	-	-	-	-	-	X	-	-	-
65	-	X	-	-	X	-	-	-	-
66	-	-	X	-	-	X	-	-	-
67	-	-	-	-	-	X	-	-	X
68	-	-	-	-	-	X	-	-	-
69	-	X	X	-	X	X	-	-	-
70	-	-	-	-		X	-	-	X
71	-	-	-	-	X	-	-	-	-
72	-	X	-	-	X	-	-	-	-
73	-	-	-	-	-	X	-	-	X

Table 7. Continued.

Haul	Young-of-the-year pollock study[1]	Age-1 pollock otolith chemistry	Northern fur seal prey species	Observer program training specimens	Age-1 pollock prey analysis	Broadband sonar species recognition[2]	Age-0 pollock distribution	Marine mammal Pacific cod study	Pollock behavior codend video[2]
74	-	-	-	-	-	X	-	-	-
75	-	-	-	-	-	X	-	-	-
76	-	-	-	-	-	X	-	-	-
77	-	-	-	-	-	-	-	-	-
78	-	-	-	-	-	-	-	-	-
79	-	X	-	-		X	-	-	X
80	-	-	-	-	-	X	-	-	-
81	-	-	-	-	-	X	-	-	-
82	-	-	-	-	-	X	-	-	-
83	-	X	-	-	X	-	-	-	-
84	-	-	-	-	-	X	-	-	-
85	-	-	-	-	-	X	-	-	X
86	-	-	-	-	-	X	-	-	-
87	-	-	-	-	-	X	-	-	-
88	-	-	X	X	-	X	-	-	-
89	-	-	-	-	X	X	-	-	-
90	-	X	-	-	-	X	-	-	-
91	-	X	-	-	X	-	-	-	-
92	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	X	-	-	-
94	-	-	-	-	-	X	-	-	-
95	-	-	-	-	-	-	-	-	-
96	-	-	-	-	-	X	-	-	X
97	-	-	X	-	-	-	-	-	-
98	-	-	-	-	-	X	-	-	-
99	-	-	-	-	X	X	-	-	-
100	-	X	-	-	X	-	-	-	-
101	-	-	-	-	-	-	-	-	-
102	-	-	-	-	-	X	-	-	-
103	-	-	-	-	-	X	-	-	-
104	-	-	-	-	-	X	-	-	-
105	-	-	-	-	-	-	-	-	-
106	-	-	-	-	-	-	-	-	-
107	-	-	-	-	-	X	-	-	X
108	-	-	-	-	-	X	-	-	-
109	-	-	-	-	-	X	-	-	-
110	-	-	-	-	-	-	-	-	-

Table 7. Continued.

Haul	Young-of-the-year pollock study[1]	Age-1 pollock otolith chemistry	Northern fur seal prey species	Observer program training specimens	Age-1 pollock prey analysis	Broadband sonar species recognition[2]	Age-0 pollock distribution	Marine mammal Pacific cod study	Pollock behavior cod-end video[2]
111	-	-	-	-	-	-	-	-	-
112	-	-	-	-	-	X	-	-	-
113	-	X	-	-	X	-	-	-	-
114	-	-	-	-	-	-	-	-	-
115	-	-	-	-	X	X	-	-	X
116	-	-	-	-	-	X	-	-	X
117	-	X	-	-	X	X	-	-	X
118	-	X	-	-	X	-	-	-	-
119	-	-	-	-	-	-	-	-	-
120	-	-	-	-	-	X	-	-	-
121	-	-	-	-	-	X	-	-	-
122	-	-	-	-	-	X	-	-	-
123	-	-	-	-	-	X	-	-	-
124	-	-	-	-	-	X	-	-	-
125	-	X	-	-	X	X	-	-	-
126	-	-	-	-	-	-	-	-	-
127	-	-	-	-	-	-	-	-	-
128	-	-	-	-	-	-	-	-	-
201	-	-	-	-	-	-	-	-	-
202	-	-	-	-	-	-	X	-	-
203	-	-	-	-	-	-	X	-	-
204	-	-	-	-	-	-	X	-	-
205	-	-	-	-	-	-	-	-	-
206	-	-	-	-	-	-	-	-	-
207	-	-	-	-	-	-	X	-	-
208	X	-	-	-	-	-	-	-	-
209	X	-	-	-	-	-	-	-	-
210	X	-	-	-	-	-	-	-	-
211	-	-	-	-	-	-	X	-	-
212	X	-	-	-	-	-	-	-	-
213	X	-	-	-	-	-	-	-	-
214	-	-	-	-	-	-	X	-	-
215	X	-	-	-	-	-	-	-	-
216	X	-	-	-	-	-	-	-	-
217	X	-	-	-	-	-	-	-	-
218	X	-	-	-	-	-	-	-	-
219	X	-	-	-	-	-	-	-	-

Table 7. Continued.

Haul	Young-of-the-year pollock study[1]	Age-1 pollock otolith chemistry	Northern fur seal prey species	Observer program training specimens	Age-1 pollock prey analysis	Broadband sonar species recognition[2]	Age-0 pollock distribution	Marine mammal Pacific cod study	Pollock behavior codend video[2]
220	X	-	-	-	-	-	-	-	-
221	-	-	-	-	-	-	X	-	-
222	-	-	-	-	-	-	X	-	-
223	-	-	-	-	-	-	X	-	-
224	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	X	-	-
226	-	-	-	-	-	-	X	-	-
227	X	-	-	-	-	-	-	-	-
228	-	-	-	-	-	-	-	-	-
229	-	-	-	-	-	-	-	-	-
230	-	-	-	-	-	-	-	-	-
231	-	-	-	-	-	-	-	-	-
232	-	-	-	-	-	-	-	-	-
233	-	-	-	-	-	-	-	-	-
234	-	-	-	-	-	-	-	-	-
235	-	-	-	-	-	-	-	-	-
236	-	-	-	-	-	-	-	-	-
237	X	-	-	-	-	-	-	-	-
238	X	-	-	-	-	-	-	-	-
239	-	-	-	-	-	X	X	-	-
240	-	-	-	-	-	X	X	-	-
241	-	-	-	-	-	X	-	-	-
242	-	-	-	-	-	X	-	-	-
243	-	-	-	-	-	X	X	-	-
244	-	-	-	-	-	X	-	-	-
245	-	-	-	-	-	X	-	-	-
246	-	-	-	-	-	X	-	-	-
247	-	-	-	-	-	X	X	-	-

[1] leg 1 only

[2] leg 2 only

[3] "X" indicates a collection was made, but numbers were not specified

Table 8. Catch by species from 115 Aleutian Wing Trawl midwater hauls conducted during the 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Common name	Scientific name	Weight (kg)	Percent	Numbers
walleye pollock	*Theragra chalcogramma*	98,038.1	94.2%	272,372
chrysaora jellyfish	*Chrysaora* sp.	2,907.0	2.8%	-
jellyfish unident.	Scyphozoa	2,315.7	2.2%	-
Pacific ocean perch	*Sebastes alutus*	437.8	0.4%	805
Pacific sleeper shark	*Somniosus pacificus*	157.9	0.2%	4
Pacific cod	*Gadus macrocephalus*	89.7	0.1%	27
smooth lumpsucker	*Aptocyclus ventricosus*	47.6	<0.1%	22
flathead sole	*Hippoglossoides elassodon*	22.1	<0.1%	48
rock sole sp.	*Lepidopsetta* sp.	14.8	<0.1%	44
Alaska skate	*Bathyraja parmifera* (=*Raja parmifera*; =*B.rosispinis*)	11.3	<0.1%	3
yellowfin sole	*Pleuronectes asper*	7.1	<0.1%	17
Pacific herring	*Clupea pallasi*	5.1	<0.1%	18
yellow Irish lord	*Hemilepidotus jordani*	4.1	<0.1%	5
Alaska plaice	*Pleuronectes quadrituberculatus*	3.6	<0.1%	2
chinook salmon	*Oncorhynchus tshawytscha*	3.4	<0.1%	2
Pacific lamprey	*Lampetra tridentata*	2.2	<0.1%	4
starry flounder	*Platichthys stellatus*	1.8	<0.1%	1
sockeye salmon	*Oncorhynchus nerka*	1.6	<0.1%	1
sturgeon poacher	*Podothecus acipenserinus*	1.5	<0.1%	13
eulachon	*Thaleichthys pacificus*	0.8	<0.1%	14
prowfish	*Zaprora silenus*	0.7	<0.1%	2
Atka mackerel	*Pleurogrammus monopterygius*	0.6	<0.1%	1
arrowtooth flounder	*Atheresthes stomias*	0.5	<0.1%	4
callogorgian soft coral	*Callogorgia* sp.	0.4	<0.1%	-
bigmouth sculpin	*Hemitripterus bolini*	0.3	<0.1%	1
pandalid shrimp unident.	Pandalidae	0.2	<0.1%	33
poacher unident.	Agonidae	0.2	<0.1%	2
Pacific spiny lumpsucker	*Eumicrotremus orbis*	0.1	<0.1%	1
capelin	*Mallotus villosus*	<0.1	<0.1%	6
shrimp unident.	Decapoda	<0.1	<0.1%	4
fish larvae unident.	Teleostei	<0.1	<0.1%	12
lumpsucker unident.	Cyclopteridae	<0.1	<0.1%	1
Totals		104,076.3		273,469

Table 9. Catch by species from nine 83/112 bottom hauls conducted during the 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Common name	Scientific name	Weight (kg)	Percent	Numbers
walleye pollock	*Theragra chalcogramma*	9,451.9	71.3%	11,723
yellowfin sole	*Pleuronectes asper*	899.7	6.8%	2,517
rock sole sp.	*Lepidopsetta* sp.	497.6	3.8%	2,156
Pacific cod	*Gadus macrocephalus*	296.0	2.2%	108
arrowtooth flounder	*Atheresthes stomias*	212.5	1.6%	798
Alaska skate	*Bathyraja parmifera*	200.1	1.5%	34
flathead sole	*Hippoglossoides elassodon*	194.3	1.5%	699
jellyfish unident.	Scyphozoa	164.5	1.2%	-
hermit crab unident.	Paguridae	152.9	1.2%	1,766
triton unident.	*Fusitriton* sp.	126.9	1.0%	1,763
sea anemone unident.	Actiniaria	114.4	0.9%	485
unsorted shab		108.2	0.8%	-
bairdi Tanner crab	*Chionoecetes bairdi*	92.4	0.7%	155
snail unident.	*Neptunea* sp.	75.5	0.6%	514
sponge unident.	Porifera	72.4	0.5%	3
starfish unident.	Asteroidea	62.9	0.5%	686
red king crab	*Paralithodes camtschatica*	59.4	0.4%	27
great sculpin	*Myoxocephalus polyacanthocephalus*	58.6	0.4%	21
rex sole	*Glyptocephalus zachirus*	53.0	0.4%	136
basketstarfish unident.	*Gorgonocephalus caryi*	49.8	0.4%	175
Alaska plaice	*Pleuronectes quadrituberculatus*	45.8	0.3%	42
opilio Tanner crab	*Chionoecetes opilio*	43.1	0.3%	140
sea star unident.	*Evasterias* sp.	34.7	0.3%	-
bigmouth sculpin	*Hemitripterus bolini*	33.9	0.3%	8
empty gastropod shells		28.6	0.2%	93
blue king crab	*Paralithodes platypus*	21.6	0.2%	18
chrysaora jellyfish	*Chrysaora* sp.	17.4	0.1%	-
snail unident.	Gastropoda	13.0	0.1%	46
green sea urchin	*Strongylocentrotus droebachiensis*	9.1	0.1%	82
Pacific halibut	*Hippoglossus stenolepis*	8.5	0.1%	2
sturgeon poacher	*Podothecus acipenserinus*	8.4	0.1%	86
eulachon	*Thaleichthys pacificus*	7.1	0.1%	161
shortfin eelpout	*Lycodes brevipes*	6.7	0.1%	124
scallop unident.	Pectinidae	6.5	< 0.1%	24
yellow Irish lord	*Hemilepidotus jordani*	5.1	< 0.1%	14
Pacific lyre crab	*Hyas lyratus*	4.5	< 0.1%	197
barnacle unident.	Thoracica	4.1	< 0.1%	31
searcher	*Bathymaster signatus*	3.1	< 0.1%	11
hairy triton	*Fusitriton oregonensis*	2.5	< 0.1%	21
snail (gastropod) eggs		1.8	< 0.1%	4
starry flounder	*Platichthys stellatus*	1.6	< 0.1%	1

Table 9. Continued.

Common name	Scientific name	Weight (kg)	Percent	Numbers
crab unident.	*Hyas* sp.	1.2	< 0.1%	18
whelk unident.	*Buccinum* sp.	1.2	< 0.1%	116
Aleutian skate	*Bathyraja aleutica*	1.1	< 0.1%	11
butter sole	*Isopsetta isolepis* (=*Pleuronectes isolepis*)	0.9	< 0.1%	2
chiton unident.	Polyplacophora	0.8	< 0.1%	21
sea clod	*Molgula retortiformis*	0.8	< 0.1%	17
Pacific herring	*Clupea pallasi*	0.8	< 0.1%	5
empty bivalve shells		0.7	< 0.1%	-
shrimp unident.	Decapoda	0.6	< 0.1%	262
tunicate unident.	Ascidiacea	0.5	< 0.1%	5
spinyhead sculpin	*Dasycottus setiger*	0.5	< 0.1%	2
snailfish unident.	*Liparis* sp.	0.4	< 0.1%	2
horsehair crab	*Erimacrus isenbeckii*	0.4	< 0.1%	1
bivalve unident.	Pelecypoda unident.	0.3	< 0.1%	3
eelpout unident.	Zoarcidae	0.3	< 0.1%	3
sea cucumber unident.	*Holothuroidea unident.*	0.2	< 0.1%	1
weathervane scallop	*Patinopecten caurinus* (=*Pecten caurinus*)	0.2	< 0.1%	1
sawback poacher	*Sarritor frenatus*	0.1	< 0.1%	7
Arctic lyre crab	*Hyas coarctatus* (=*Hyas coarctatus aleuticus*)	0.1	< 0.1%	3
sea urchin unident.	Echinoidea	0.1	< 0.1%	3
ribbed sculpin	*Triglops pingeli*	0.1	< 0.1%	3
dendronotid unident.	*Dendronotus* sp.	0.1	< 0.1%	3
invertebrate unident.		0.1	< 0.1%	1
northern sculpin	*Icelinus borealis*	0.1	< 0.1%	2
sea blob	*Synoicum* sp.	< 0.1	< 0.1%	1
darkfin sculpin	*Malacocottus zonurus*	< 0.1	< 0.1%	1
pygmy cancer crab	*Cancer oregonensis*	< 0.1	< 0.1%	9
candystripe shrimp	*Lebbeus* sp.	< 0.1	< 0.1%	6
scale worm unident.	Polynoidae	< 0.1	< 0.1%	1
rusty moonsnail	*Natica russa*	< 0.1	< 0.1%	5
polychaete worm unident.	Polychaeta	< 0.1	< 0.1%	4
coral unident.	Gorgonacea	< 0.1	< 0.1%	2
argid unident.	*Argis* sp.	< 0.1	< 0.1%	3
leech unident.	Hirudinea unident.	< 0.1	< 0.1%	3
bryozoan unident.	Bryozoa	< 0.1	< 0.1%	2
nudibranch unident.	Nudibranchia	< 0.1	< 0.1%	1
Totals		13,261.7		25,401

Table 10. Catch by species from 4 Marinovich hauls conducted during the 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Common name	Scientific name	Weight (kg)	Percent	Numbers
chrysaora jellyfish	*Chrysaora* sp.	342.2	98.8%	-
jellyfish unident.	Scyphozoa	2.3	0.7%	-
walleye pollock	*Theragra chalcogramma*	2.0	0.6%	3
fish larvae unident.	Teleostei	< 0.1	< 0.1%	364
Totals		346.5		367

Table 11. Catch by species from 47 Methot hauls conducted during the 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Common name	Scientific name	Weight (kg)	Percent	Numbers
jellyfish unident.	Scyphozoa	273.8	52.6%	-
chrysaora jellyfish	*Chrysaora* sp.	214.4	41.2%	-
euphausiid unident.	Euphausiacea	26.3	5.1%	-
invertebrate unident.		3.5	0.7%	29
fish larvae unident.	Teleostei	1.0	0.2%	5,934
walleye pollock	*Theragra chalcogramma*	0.7	0.1%	1
lamprey unident.	Petromyzontidae	0.6	0.1%	1
sea anemone unident.	Actiniaria	0.3	0.0%	1
salps unident.	Thaliacea	0.2	0.0%	12
copepod unident.	Copepoda	0.1	0.0%	-
squid unident.	Teuthoidea	< 0.1	< 0.1%	37
pandalid shrimp unident.	Pandalidae	< 0.1	< 0.1%	5
amphipod unident.	Amphipoda	< 0.1	< 0.1%	19
flatfish larvae	Pleuronectiformes	< 0.1	< 0.1%	13
isopod unident.	Isopoda	< 0.1	< 0.1%	15
crangon shrimp unident.	*Crangon* sp.	< 0.1	< 0.1%	7
shrimp unident.	Decapoda	< 0.1	< 0.1%	3
Totals		520.8		6,077

Table 12. Bongo sampling stations from the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Bongo No.	Date	Time (GMT)	Transect No.	Latitude (°N)	Longitude (°W)	Bottom Depth (m)
1	22 Jun	8:47	12.0	57 00.00	167 04.92	75
2	22 Jun	9:24	12.0	57 00.08	167 05.17	75
3	23 Jun	1:41	12.0	55 00.02	166 56.22	156
4	23 Jun	2:24	12.0	54 59.99	166 56.79	156
5	24 Jun	5:46	13.0	56 28.52	167 39.23	113
6	24 Jun	6:24	13.0	56 28.17	167 39.15	114
7	24 Jun	12:31	13.0	56 29.33	167 40.31	112
8	24 Jun	13:03	13.0	56 29.86	167 40.33	112
9	29 Jun	1:36	16.0	56 20.13	169 27.69	148
10	29 Jun	2:12	16.0	56 20.02	169 27.38	149
11	29 Jun	11:18	16.0	56 19.99	169 28.21	149
12	29 Jun	11:56	16.0	56 19.84	169 27.96	152
13	2 Jul	22:08	17.0	56 05.12	170 02.27	125
14	2 Jul	22:41	17.0	56 05.25	170 02.62	125

Table 13. Distribution of pollock between areas from summer echo integration-trawl surveys on the Bering Sea shelf, 1994-2000. Data are estimated pollock biomass between 14 m below the surface and 3 m off bottom. 95% confidence intervals on the acoustic data are indicated.

Date		**Area** $(nmi)^2$	**Biomass (million metric tons, top) and percent of total (bottom)**			**Total Biomass**	**95% confidence intervals**
			SCA	**E170-SCA**	**W170**	**(million metric tons)**	
Summer 1994	Jul 9-Aug 19	78,251	0.312 10.8	0.399 13.8	2.18 75.4	2.89	2.61-3.16
Summer 1996	Jul 20-Aug 30	93,810	0.215 9.3	0.269 11.7	1.83 79.0	2.31	2.13-2.49
Summer 1997	Jul 17-Sept 4	102,770	0.246 9.5	0.527 20.3	1.82 70.2	2.59	2.40-2.78
Summer 1999	Jun 7-Aug 5*	103,670	0.299 9.1	0.579 17.6	2.41 73.2	3.29	2.93-3.64
Summer 2000	Jun 7- Aug 2*	106,140	0.393 12.9	0.498 16.3	2.16 70.8	3.05	2.87-3.24

* Note 4 weeks earlier than previous years' surveys

SCA = Sea lion Conservation Area
E170 - SCA = East of 170°W minus SCA
W170 = West of 170°W

Table 14. Estimated length composition (numbers, and biomass in metric tons) of pollock between 14 m below the surface and 3 m off bottom from Bering Sea shelf echo integration-trawl surveys, 1994-2000. No surveys were made in 1995 or 1998; 1999 estimates exclude fish from additional sampling in the "horseshoe area" between Unimak and 167 W.

Length	1994	1994	1996	1996	1997	1997	1999	1999	2000	2000
cm	numbers	biomass	numbers	biomass	numbers	biomass	numbers	biomass	numbers	biomass
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	31,270	<1
9	0	0	0	0	0	0	12,000	<1	31,270	<1
10	0	0	0	0	2,040,091	14	118,000	1	762,590	8
11	403,454	4	0	0	191,766	2	4,782,000	59	2,295,921	30
12	5,438,489	71	469,009	6	30,133,862	394	14,434,000	227	5,499,915	88
13	44,786,130	744	5,440,654	92	238,097,743	4,148	22,713,000	445	19,257,383	370
14	94,230,303	1,937	38,195,786	804	1,416,213,800	31,282	22,353,000	538	36,696,301	859
15	179,818,601	4,520	131,291,144	3,384	2,949,251,909	81,544	16,200,000	472	56,689,648	1,613
16	166,052,138	5,040	227,769,656	7,098	3,364,001,432	111,182	5,203,000	181	79,566,505	2,713
17	105,162,213	3,817	317,309,141	11,818	2,207,832,139	84,460	5,198,100	214	50,812,258	2,055
18	129,712,572	5,553	215,264,283	9,485	1,309,127,112	58,223	12,916,000	623	22,388,469	1,064
19	212,540,168	10,655	115,387,007	5,960	569,513,724	28,768	44,599,674	2,499	30,273,548	1,677
20	381,962,413	22,244	64,786,967	3,892	181,058,279	10,677	152,569,000	9,852	47,160,336	3,017
21	589,692,635	39,601	37,201,244	2,579	74,898,658	4,900	251,491,000	18,587	92,374,706	6,782
22	794,281,878	61,100	64,413,079	5,121	81,072,644	6,101	314,306,000	26,421	136,408,691	11,419
23	788,346,245	69,048	60,239,187	5,458	150,801,675	12,962	288,898,000	27,464	185,756,151	17,629
24	772,579,542	76,622	70,323,929	7,221	255,934,709	24,999	220,314,000	23,562	186,042,532	19,911
25	581,453,595	64,967	47,676,938	5,520	408,069,005	45,081	164,372,000	19,681	207,954,261	24,970
26	372,264,663	46,652	38,316,026	4,979	458,825,996	56,998	188,577,000	25,168	186,914,195	25,070
27	198,974,449	27,847	33,634,805	4,884	519,671,058	72,339	256,036,000	37,933	187,683,742	28,002
28	122,072,840	19,028	60,159,826	9,721	422,680,421	65,700	302,469,000	49,557	168,927,224	27,927
29	135,898,925	23,550	85,069,866	15,240	296,501,881	51,328	419,155,094	75,679	164,764,131	30,072
30	138,254,204	26,437	122,805,260	24,307	175,362,673	33,691	435,283,000	86,321	167,170,736	33,574
31	178,831,898	37,756	183,983,881	40,104	115,827,267	24,685	417,133,000	90,579	169,719,864	37,396
32	234,800,791	54,180	240,983,960	57,669	79,115,853	18,522	410,190,619	97,251	167,231,384	40,301
33	239,386,111	60,378	341,561,316	89,480	69,153,145	17,709	372,648,094	96,204	188,701,927	49,614
34	291,495,311	80,001	408,412,676	116,812	68,831,366	19,201	393,576,238	110,357	221,591,712	63,403
35	296,566,484	88,546	458,383,388	142,771	89,483,675	27,148	415,935,025	126,368	332,901,405	103,387
36	326,662,387	105,903	477,948,250	161,724	146,277,669	48,272	433,114,135	142,256	360,412,103	121,237
37	343,988,551	120,806	400,981,865	147,067	220,620,650	79,075	393,544,360	139,441	414,223,205	150,552
38	305,794,247	116,110	333,418,937	132,264	321,353,999	124,841	403,471,754	153,908	369,242,798	144,826
39	294,822,563	121,143	253,697,765	108,629	397,122,202	166,999	359,069,435	147,178	344,625,859	145,465
40	311,312,228	137,651	214,239,900	98,825	397,831,256	180,668	304,475,580	133,859	297,135,531	135,080
41	271,091,178	129,335	168,179,883	83,422	350,373,449	171,750	243,059,138	114,415	331,553,624	161,884
42	289,525,945	149,294	154,985,328	82,523	292,974,428	154,670	240,381,579	120,957	316,410,448	165,982
43	273,093,348	152,526	149,273,880	85,177	222,045,066	125,886	265,325,613	142,492	331,239,642	185,961
44	243,930,127	147,017	133,456,326	81,478	172,493,746	104,750	321,315,240	183,897	302,441,894	181,482

Table 14. Continued.

Length cm	1994 numbers	1994 biomass	1996 numbers	1996 biomass	1997 numbers	1997 biomass	1999 numbers	1999 biomass	2000 numbers	2000 biomass
45	256,581,267	166,444	117,958,530	76,937	125,076,374	81,320	328,569,201	200,114	290,084,757	185,345
46	216,089,020	149,720	103,478,353	71,999	93,201,588	64,736	304,970,590	197,389	249,821,384	169,854
47	177,931,447	131,130	98,391,677	72,930	74,746,108	55,323	238,840,411	164,067	235,521,411	170,024
48	148,147,507	115,921	94,287,281	74,352	59,369,545	46,750	182,908,334	133,183	176,807,001	135,575
49	73,109,657	60,566	83,667,405	70,102	45,505,504	38,100	122,899,083	94,742	143,241,238	116,332
50	66,743,098	58,531	79,868,730	71,016	40,225,664	35,728	88,162,787	71,872	106,265,645	91,389
51	33,152,175	30,462	72,517,408	68,346	33,097,316	31,145	60,415,087	52,026	78,541,506	71,352
52	30,346,604	29,789	60,208,703	60,080	31,717,275	31,560	42,151,711	38,303	48,154,149	46,186
53	18,152,585	18,463	50,892,246	53,710	29,586,587	31,087	33,020,441	31,630	35,746,972	36,163
54	15,675,954	16,856	38,438,723	42,859	23,911,828	26,500	26,896,129	27,130	22,092,858	23,496
55	18,572,945	21,296	25,630,381	30,163	19,765,603	23,075	16,140,838	17,129	16,578,028	18,562
56	11,047,085	13,207	14,067,686	17,456	14,582,953	17,914	9,257,989	10,327	12,576,400	14,788
57	9,522,816	11,943	7,648,570	9,998	10,614,767	13,712	9,400,500	11,013	8,923,442	11,004
58	4,849,080	6,368	7,684,916	10,573	8,598,728	11,671	5,680,904	6,984	6,411,859	8,300
59	2,955,222	4,167	3,016,960	4,365	5,980,507	8,530	3,238,590	4,174	5,131,895	6,962
60	3,472,708	5,001	4,712,509	7,163	3,450,368	5,155	3,039,256	4,104	1,869,386	2,656
61	6,625,433	10,199	2,877,304	4,591	4,579,765	7,172	2,401,173	3,394	2,301,794	3,421
62	1,394,820	2,285	1,790,793	2,998	1,554,685	2,550	2,120,946	3,135	1,724,802	2,679
63	710,356	1,196	284,053	498	2,010,470	3,448	616,704	953	1,571,382	2,551
64	485,146	844	590,027	1,084	470,101	843	573,697	925	979,239	1,660
65	1,858,892	3,382	850,982	1,637	811,152	1,531	927,283	1,562	635,580	1,122
66	771,212	1,467	349,784	704	315,348	617	1,421,100	2,497	702,264	1,296
67	970,292	1,929	658,978	1,386	1,268,513	2,622	477,890	876	26,661	52
68	1,455,438	3,021	0	0	193,823	413	297,000	567	272,851	551
69	0	0	0	0	586,331	1,351	294,000	585	590,851	1,244
70	1,925,093	4,349	0	0	99,347	230	0	0	0	0
71	485,146	1,142	107,149	267	0	0	1,000	3	0	0
72	970,292	2,380	0	0	0	0	107,000	238	147,985	351
73	485,146	1,239	0	0	48,456	126	156,000	362	0	0
74	0	0	0	0	0	0	0	0	141,040	362
75	485,146	1,340	0	0	0	0	36,000	90	0	0
76	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	485,146	1,503	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	387,000	1,118	0	0
80	0	0	0	0	0	0	0	0	0	0
Total	10,820,685,348	2,888,217	6,525,242,306	2,312,724	18,686,155,051	2,594,175	9,600,647,321	3,285,138	7,629,757,559	3,050,697

Table 15. Estimated age composition (numbers and biomass in metric tons) of pollock between 14 m below the surface and 3 m off bottom from summer Bering Sea shelf echo integration-trawl surveys 1991-2000.

age	1991 nos	1991 biomass	1994 nos	1994 biomass	1996 nos	1996 biomass	1997 nos	1997 biomass	1999 nos	1999 biomass	2000 nos	2000 biomass
1	639,267,538	23,287	610,179,216	17,145	972,336,344	36,729	12,359,975,135	417,793	111,865,503	3,292	257,922,016	8,133
2	5,942,329,255	761,659	4,781,070,859	425,278	446,396,599	35,346	2,745,213,184	369,889	1,587,614,967	156,582	1,272,329,433	143,993
3	967,026,421	177,102	1,336,016,997	312,406	520,371,331	118,661	386,231,751	99,481	3,596,956,974	847,384	1,184,944,489	284,609
4	214,547,946	74,684	1,655,749,641	641,253	2,686,481,600	888,844	490,934,742	188,606	1,683,593,411	640,179	2,480,024,776	974,384
5	224,129,227	117,402	1,898,148,804	1,067,206	820,736,359	395,993	1,921,457,657	920,972	582,565,536	271,735	899,713,749	488,555
6	133,045,368	82,075	296,098,661	187,194	509,295,056	341,780	384,350,572	235,012	273,945,610	164,348	243,888,620	156,027
7	119,732,088	89,228	71,188,880	50,142	434,354,034	359,912	205,223,678	161,266	1,169,058,192	751,526	233,993,126	166,648
8	38,685,293	31,354	65,181,763	55,332	84,868,860	72,471	142,456,226	139,477	400,235,038	278,937	725,124,366	540,835
9	37,037,006	35,670	31,894,001	30,906	16,722,781	16,254	32,713,336	34,217	104,643,576	84,612	190,427,626	148,987
10	14,667,193	16,855	23,150,815	26,354	6,274,944	6,567	3,876,643	4,441	66,873,683	62,513	84,693,969	76,349
11	16,038,739	19,283	8,533,707	10,512	5,698,888	6,906	4,934,766	6,117	14,464,537	14,229	35,625,884	39,005
12	5,275,012	7,041	19,274,752	27,856	12,145,110	17,082	2,010,470	3,448	6,471,546	7,184	18,077,578	16,696
13	7,862,405	8,275	4,794,652	6,731	1,307,937	1,532	2,209,210	4,493	1,670,280	1,497	1,166,461	1,251
14	4,588,258	4,401	5,660,366	7,679	4,783,178	7,035	2,281,822	3,817	0	0	1,355,107	2,564
15	2,035,526	2,040	1,158,244	2,111	2,385,493	3,807	2,020,927	2,876	135,694	175	81,161	115
16	1,459,803	1,913	7,917,902	12,521	540,919	905	0	0	135,694	175	263,280	292
17	380,810	375	3,945,915	4,804	0	0	0	0	0	0	0	0
18	679,082	632	0	0	540,919	905	0	0	421,866	711	123,926	253
19	0	0	718,233	798	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	262,924	277	0	0	0	0
21	380,810	375	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
Total	8,369,167,780	1,453,653	10,820,683,408	2,886,228	6,525,240,352	2,310,729	18,686,153,043	2,592,182	9,600,652,107	3,285,079	7,629,755,559	3,048,697

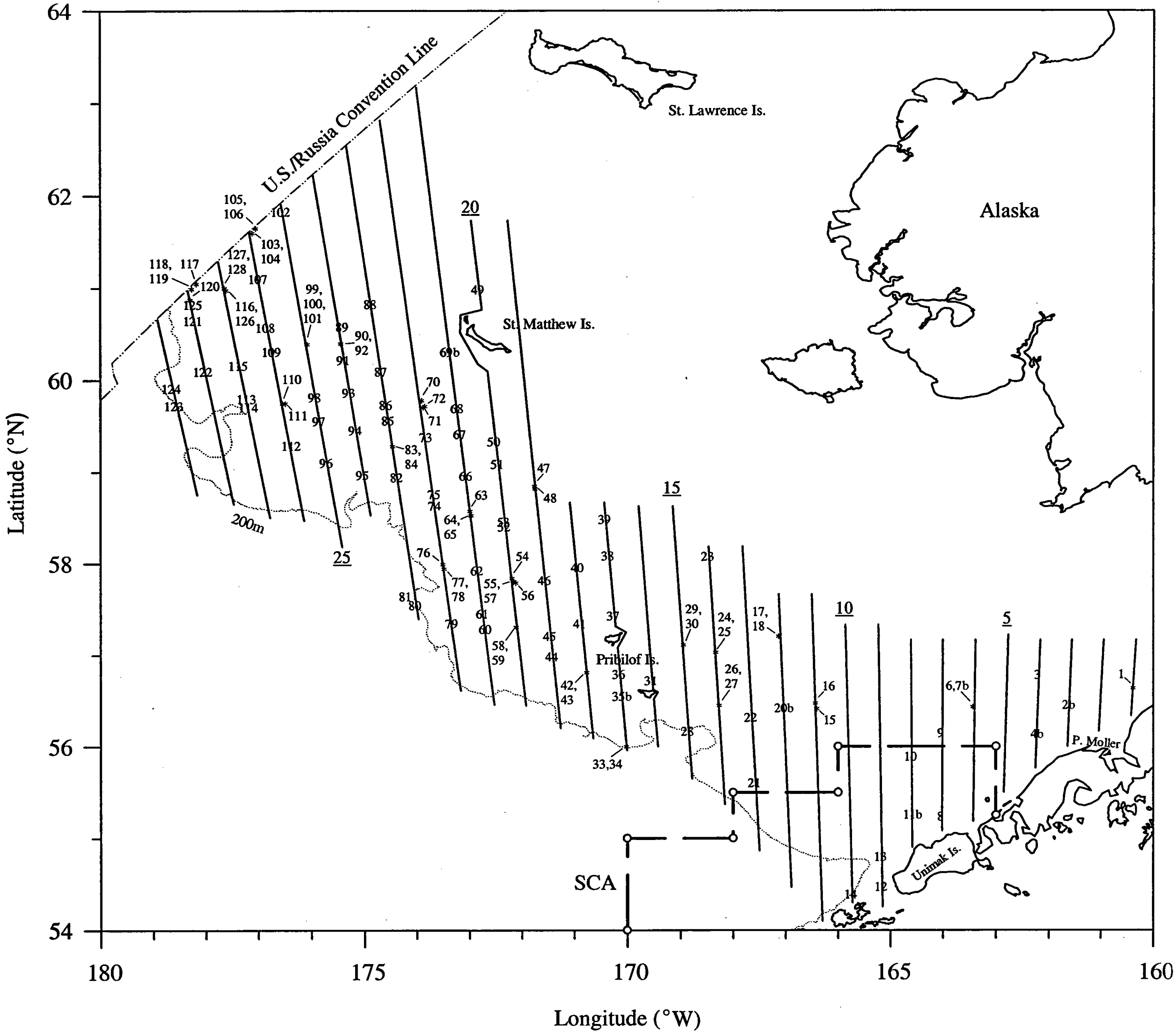


Figure 1. Transect lines with locations of midwater and bottom ("b") trawl hauls during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope. Underlined numbers indicate transect sequence, and the Sea lion Conservation Area (SCA) is outlined.

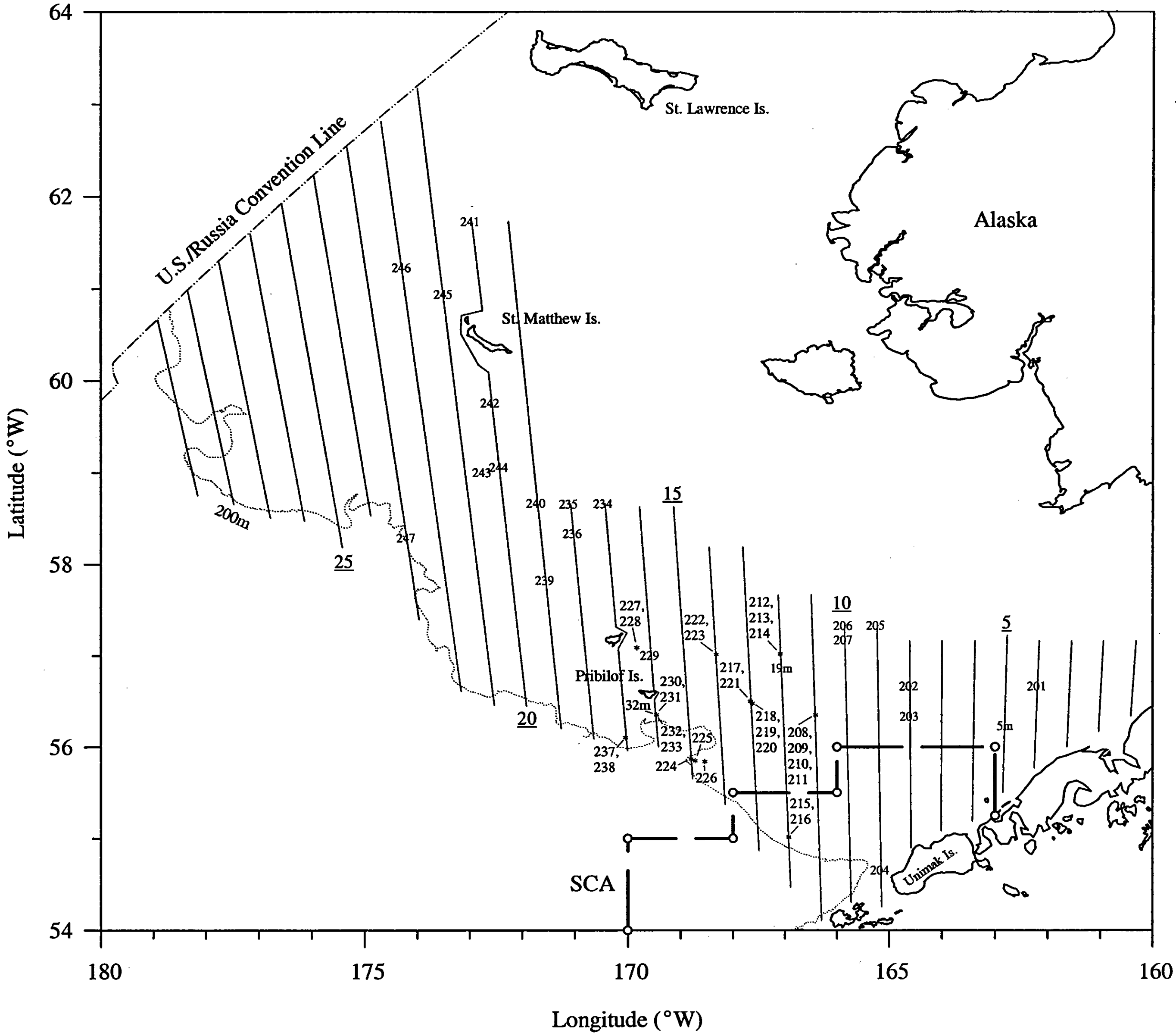


Figure 2. Transect lines with locations for Methot (201-247) and Marinovich ("m") trawl hauls during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope. Underlined numbers indicate transect sequence, and the Sea lion Conservation Area (SCA) is outlined.

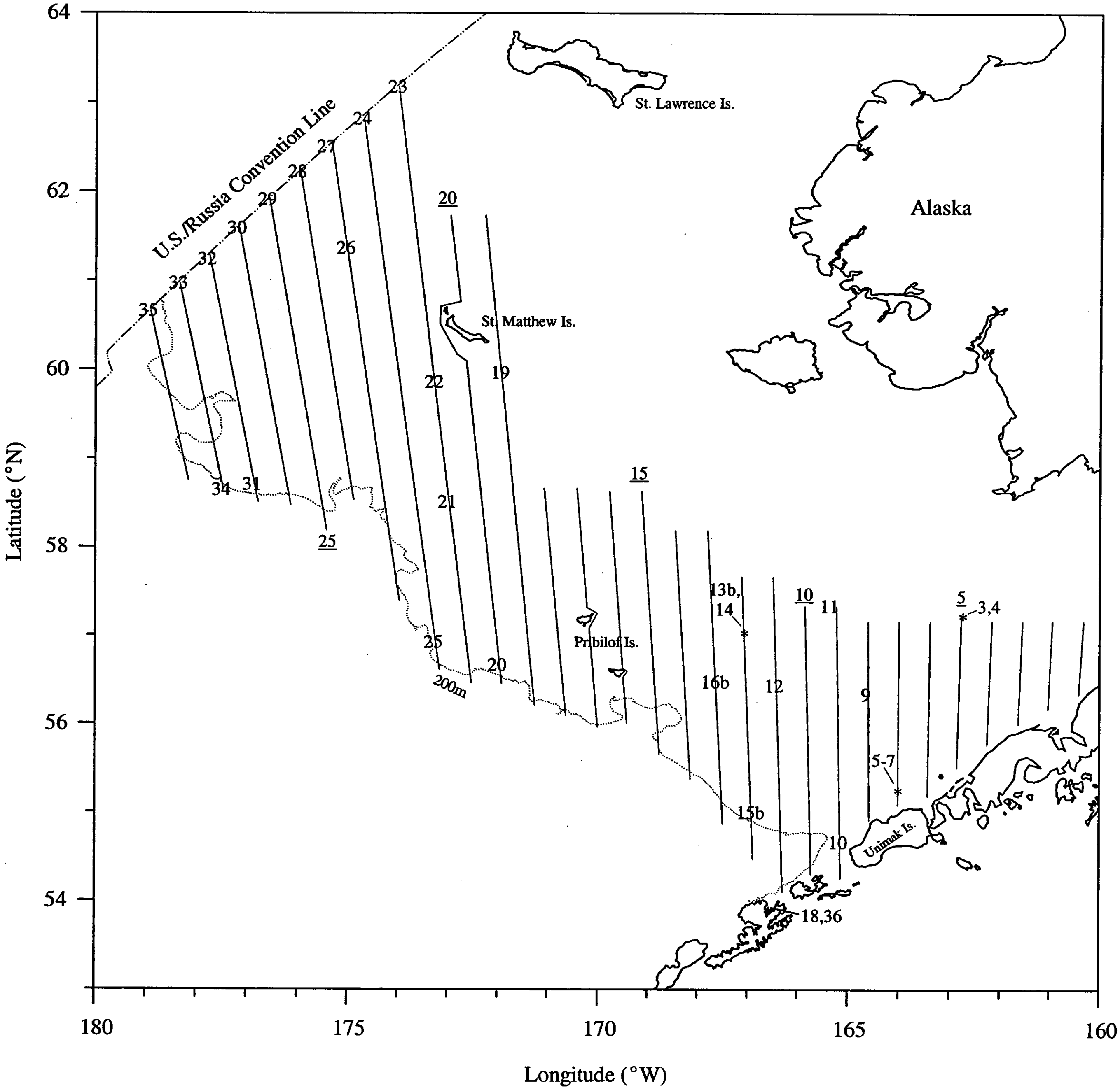


Figure 3. Transect lines with CTD cast locations during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope. Underlined numbers indicate transect sequence. "b" indicates a CTD done in conjunction with a Bongo net tow. CTD #1 was in Ugak Bay, Kodiak Island, and #2 was southwest of Kodiak Island. CTDs #8 and 17 were unsuccessful casts.

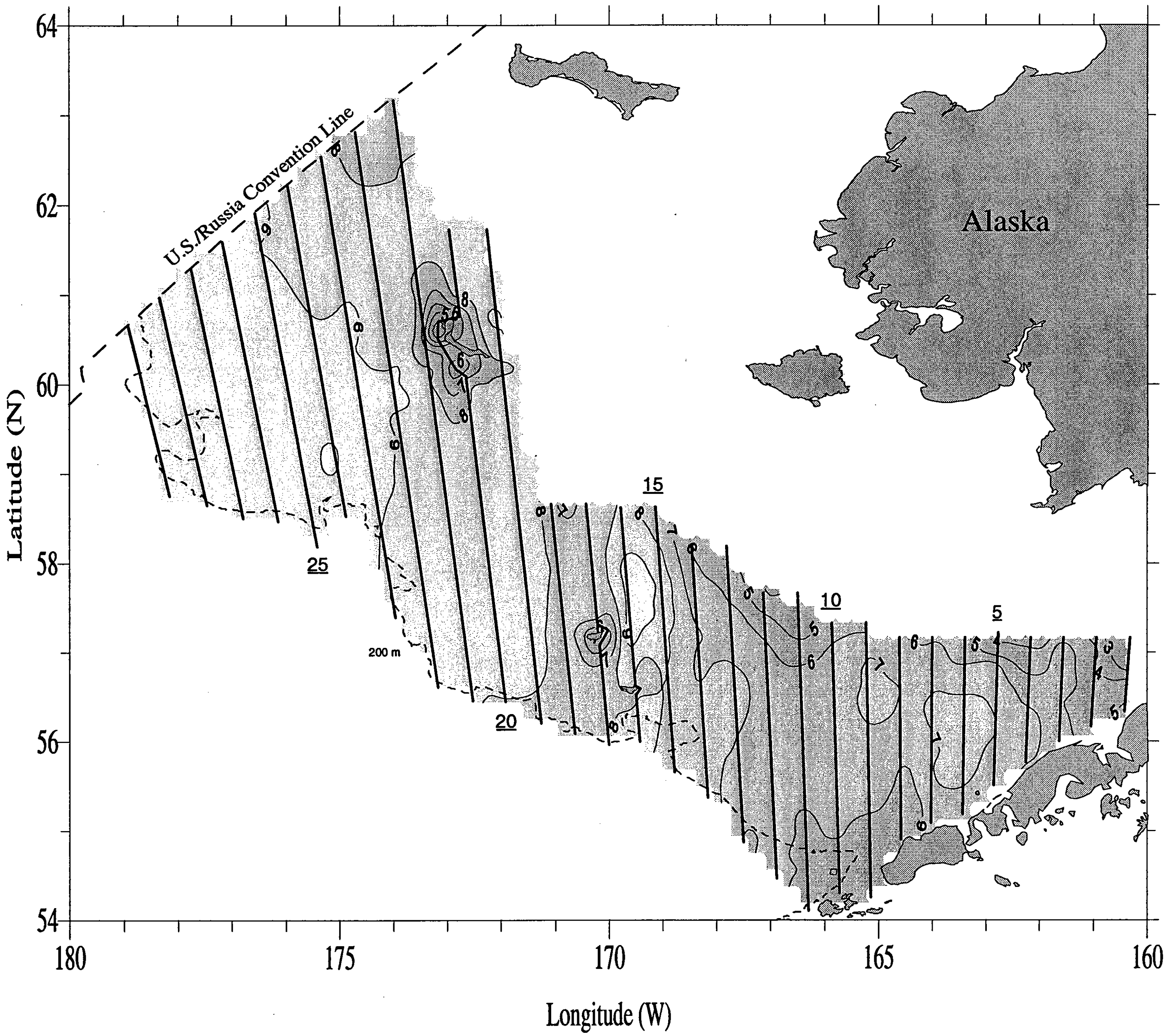


Figure 4. Transect lines with surface temperature contours (in degrees C) during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Underlined numbers indicate transect sequence.

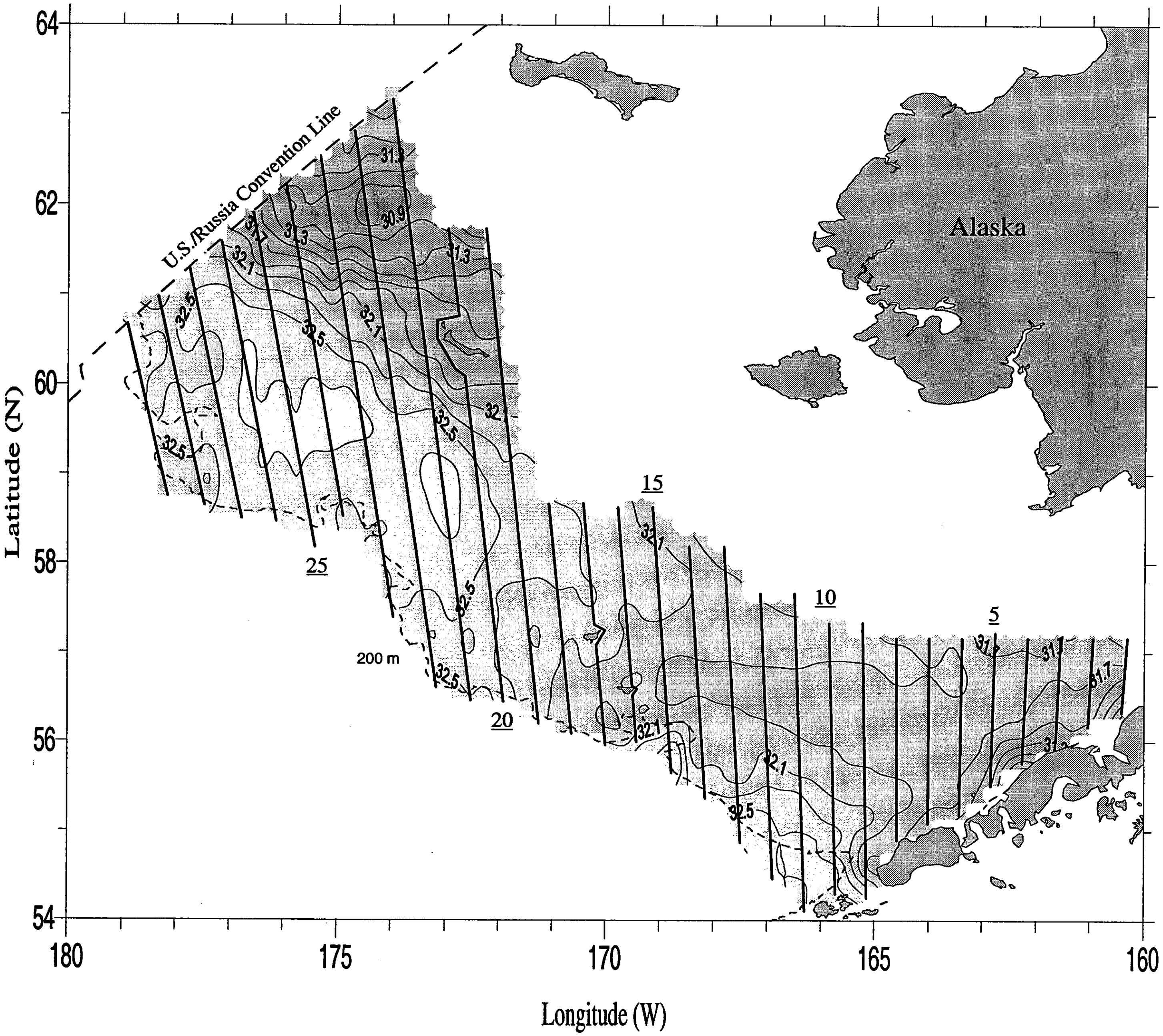


Figure 5. Transect lines with surface salinity contours (in ppt) during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Underlined numbers indicate transect sequence.

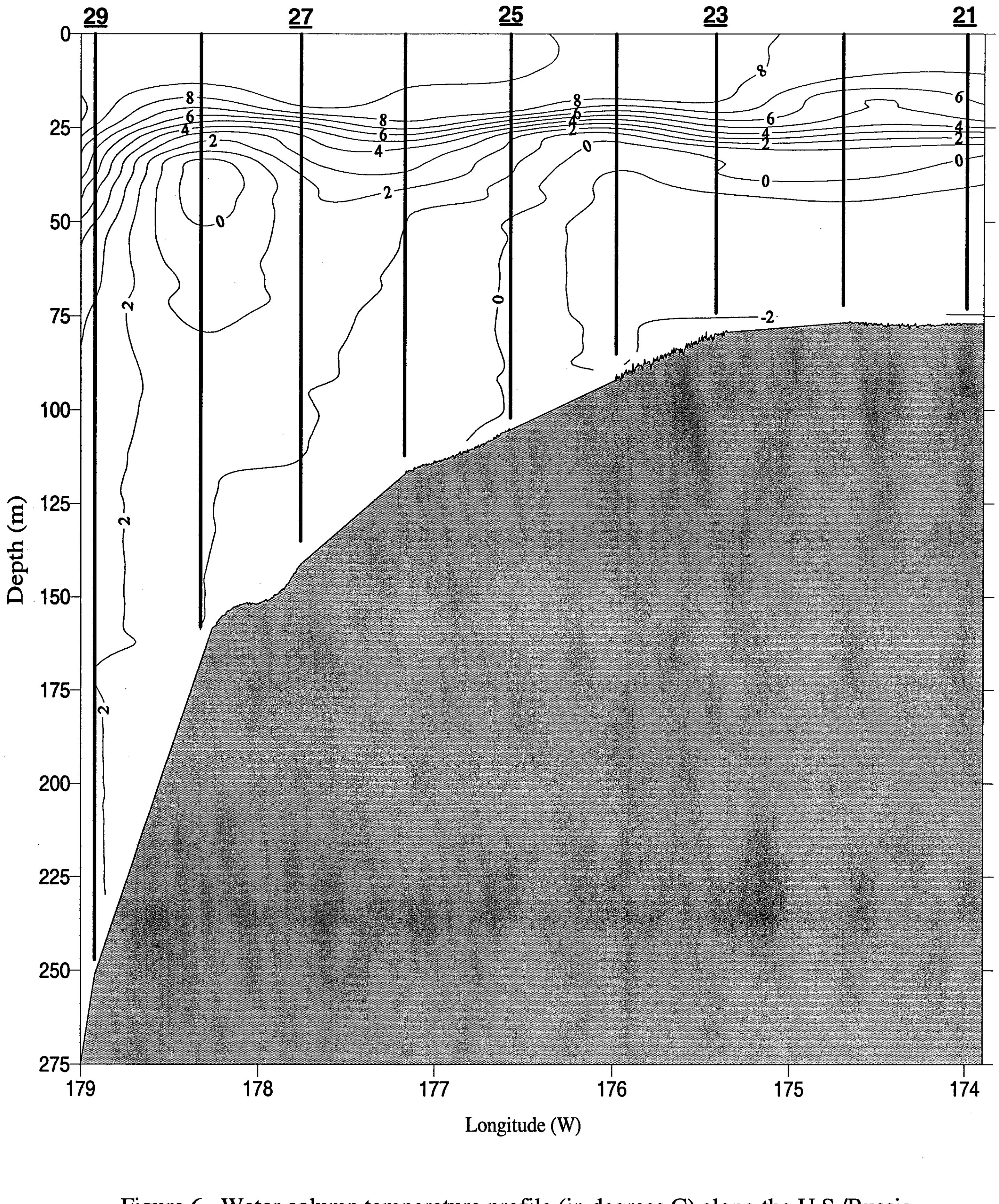


Figure 6. Water column temperature profile (in degrees C) along the U.S./Russia Convention Line during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Vertical lines represent CTD casts, and underlined numbers indicate associated transect endpoints.

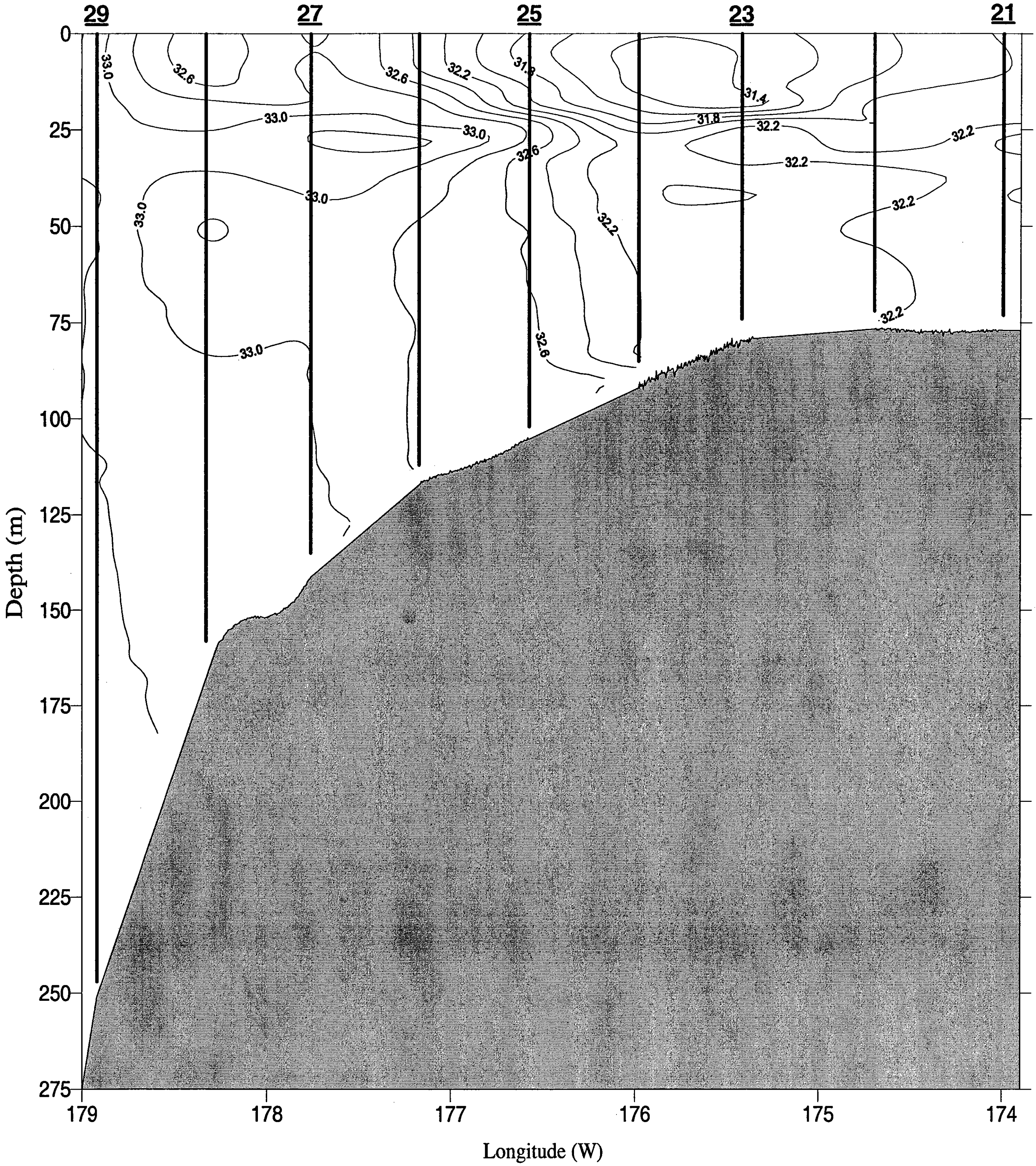


Figure 7. Water column salinity profile (in ppt) along the U.S./Russia Convention Line during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Vertical lines represent CTD casts, and underlined numbers indicate associated transect endpoints.

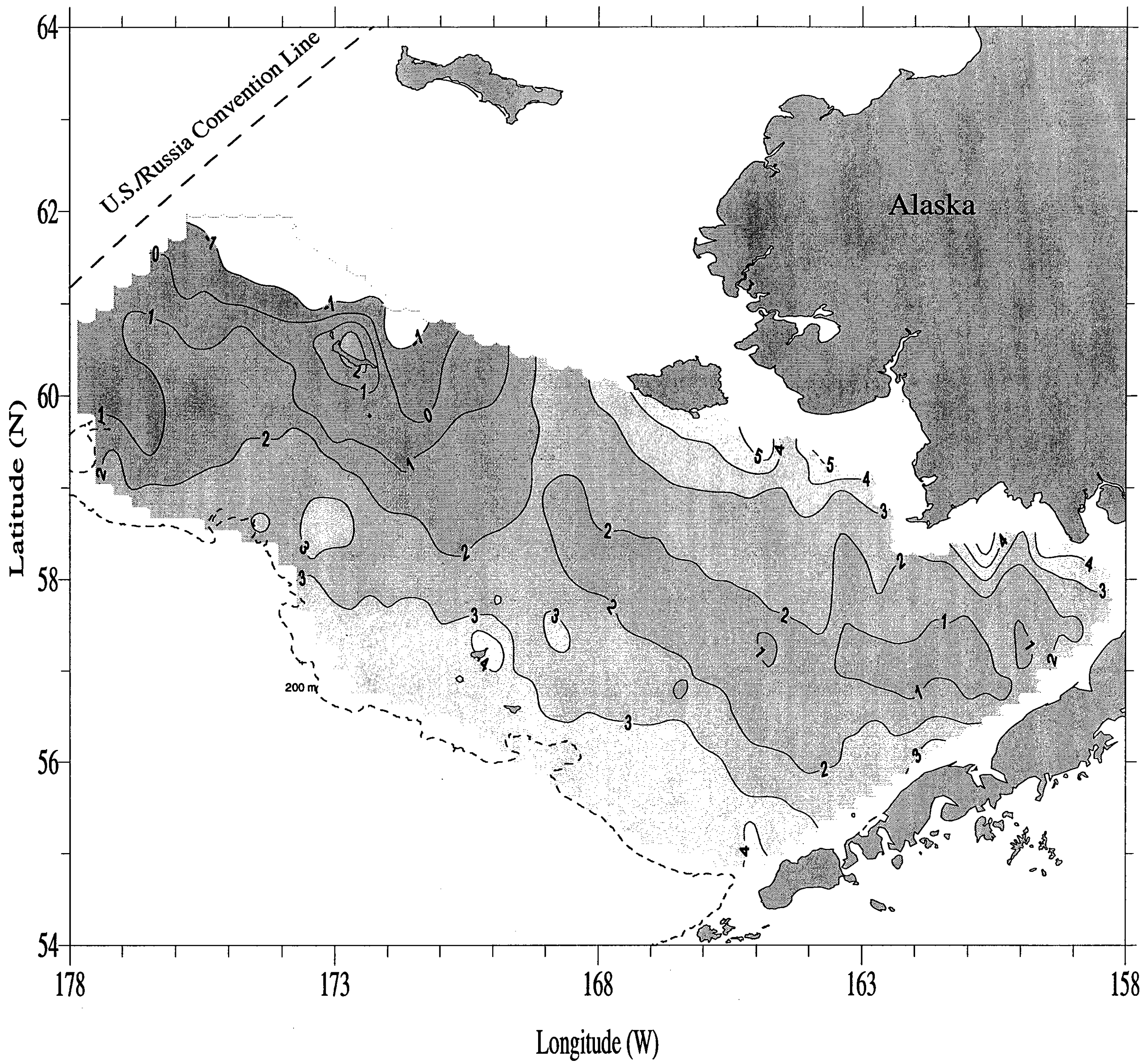


Figure 8. Bottom temperature (degrees C) contours during the summer 2000 eastern Bering Sea bottom trawl survey. Data from T. Sample (AFSC, RACE).

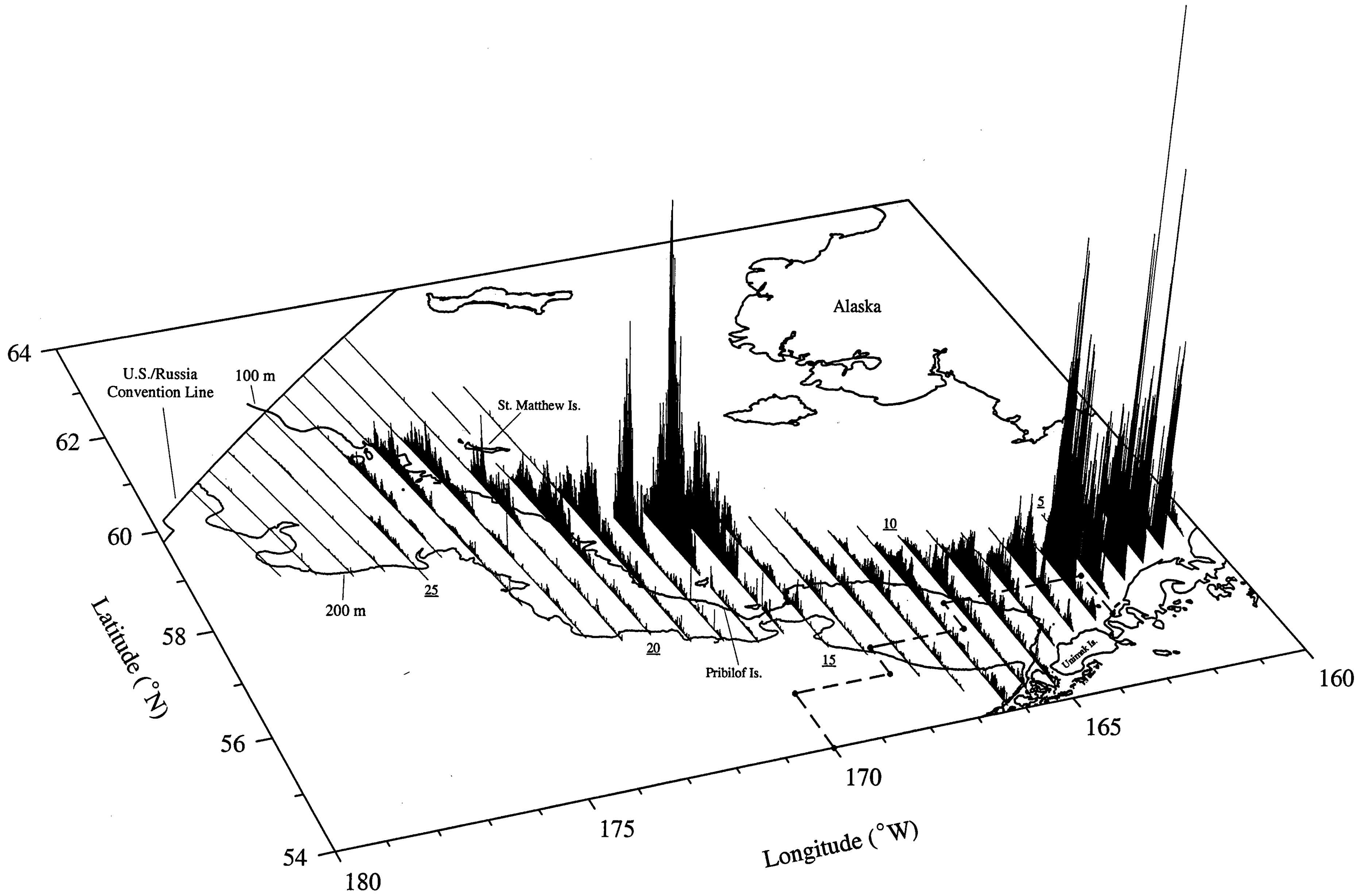


Figure 9. Acoustic backscatter attributed to an undifferentiated invertebrate-fish species mixture along trackline during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined, and the Sea lion Conservation Area (SCA) is outlined. Backscatter data are not scaled to biomass.

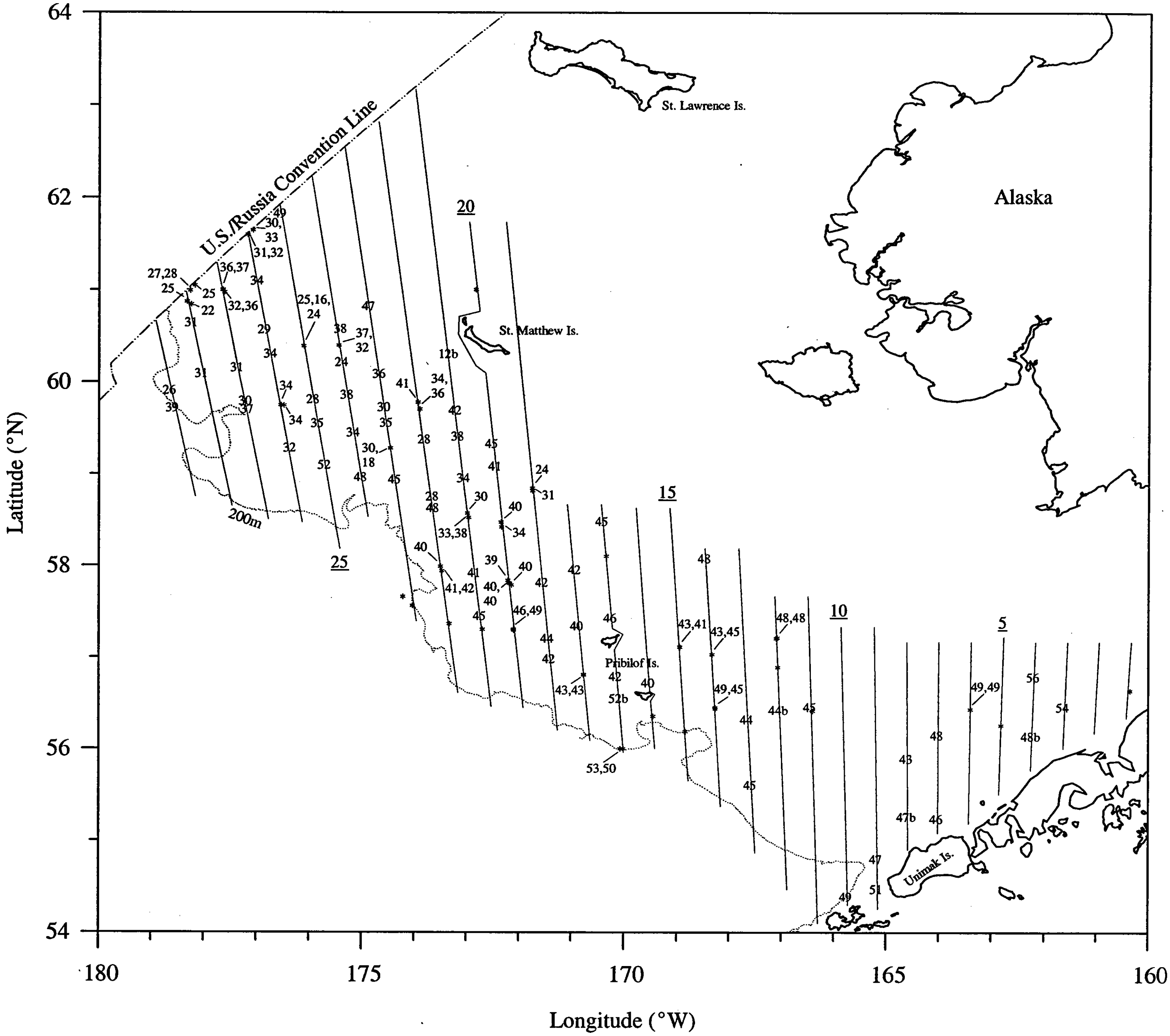


Figure 10. Transect lines with mean pollock lengths (cm) at AWT and 83/112 ("b") trawl haul locations during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope. Asterisks with adjacent numbers indicate trawl haul locations with multiple hauls; those without adjacent numbers indicate trawl haul locations where fewer than 50 pollock were sampled. Underlined numbers indicate transect sequence.

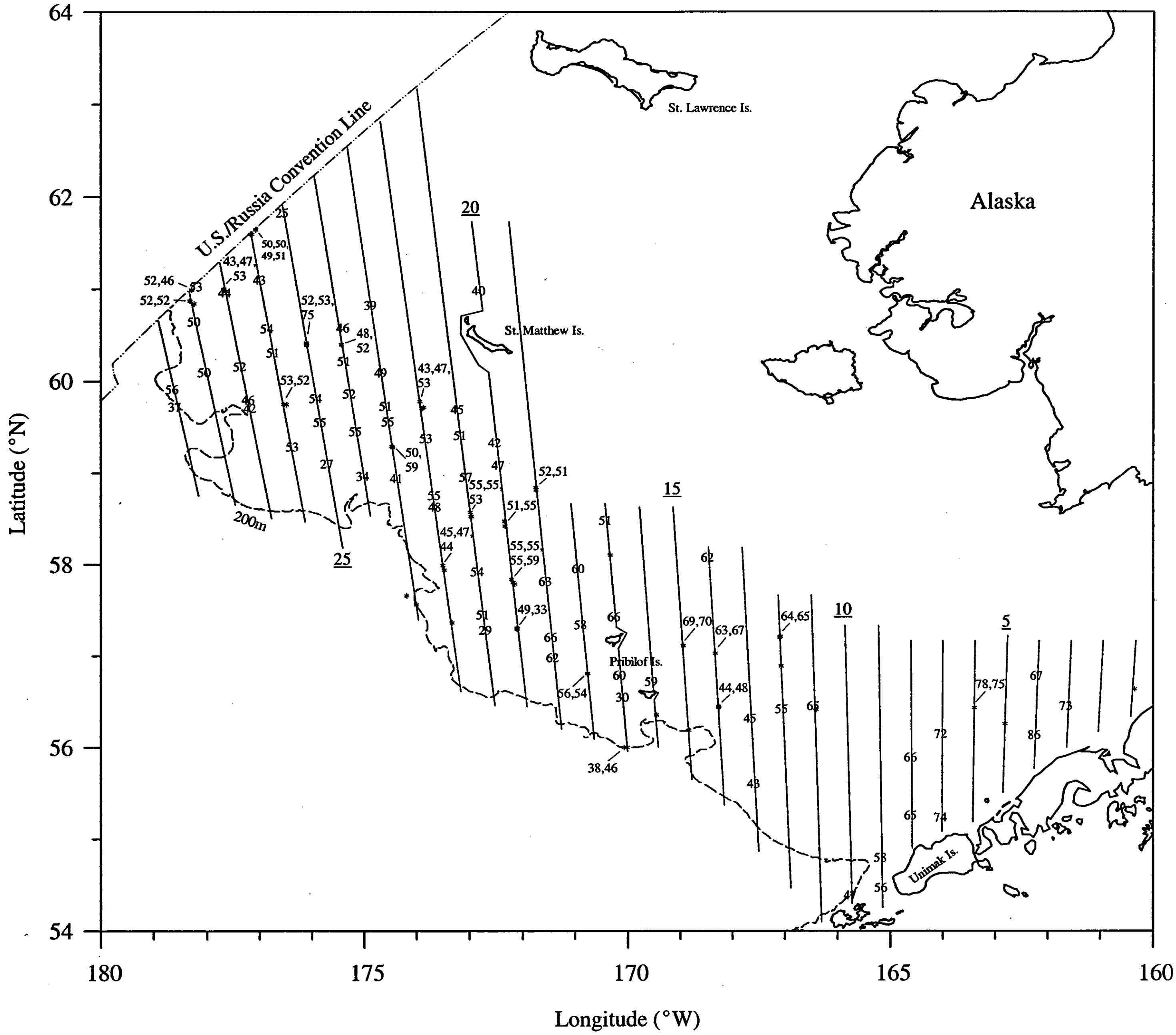


Figure 11. Transect lines and percent male pollock in the catch at haul locations during the summer 2000 pollock echo integration-trawl survey of the eastern Bering Sea shelf and slope. Asterisks with adjacent numbers indicate trawl haul locations with multiple hauls; those with no adjacent numbers indicate hauls where fewer than 50 pollock were sampled. Underlined numbers indicate transect sequence.

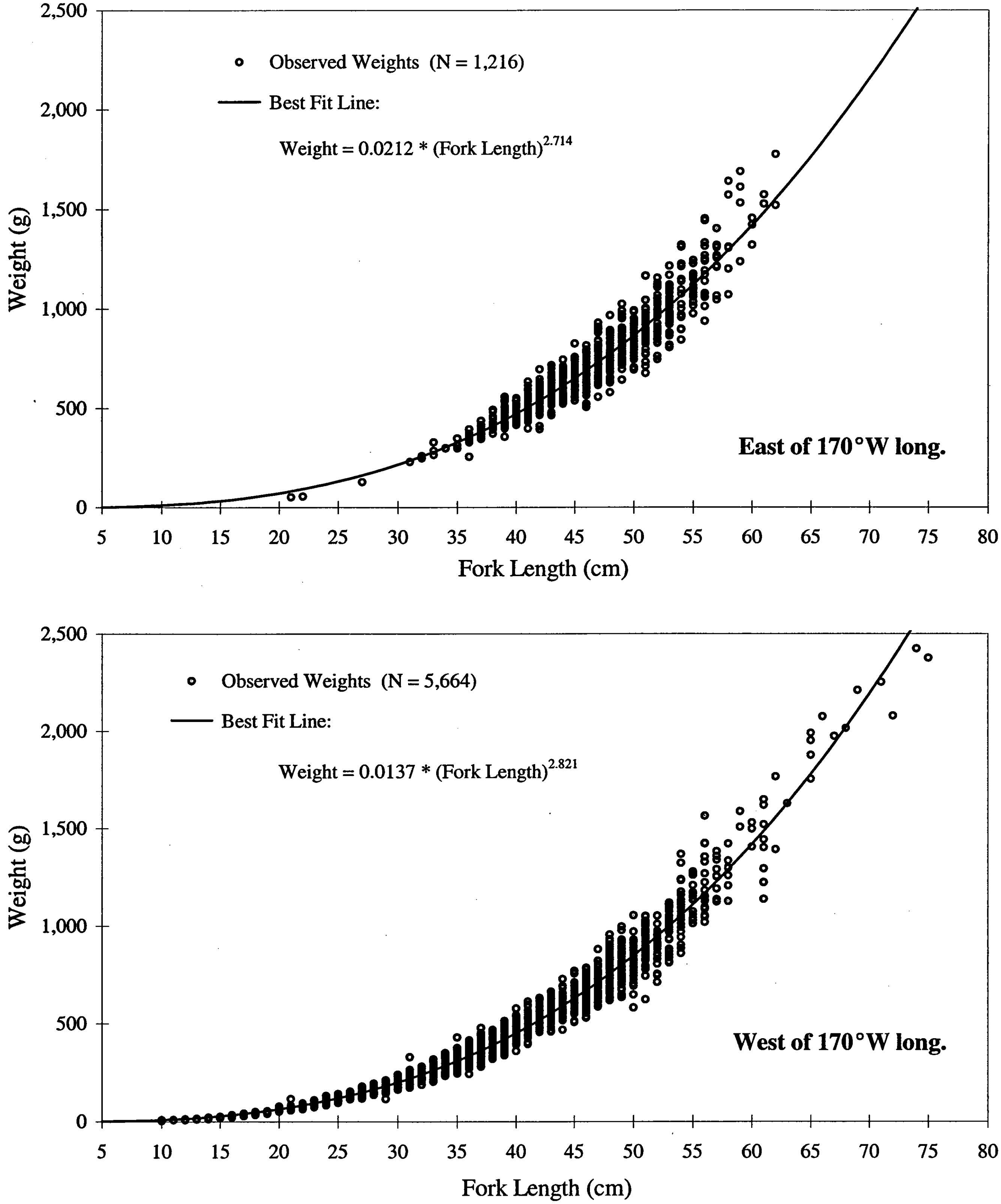


Figure 12. Length-weight regression curves for pollock sampled during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

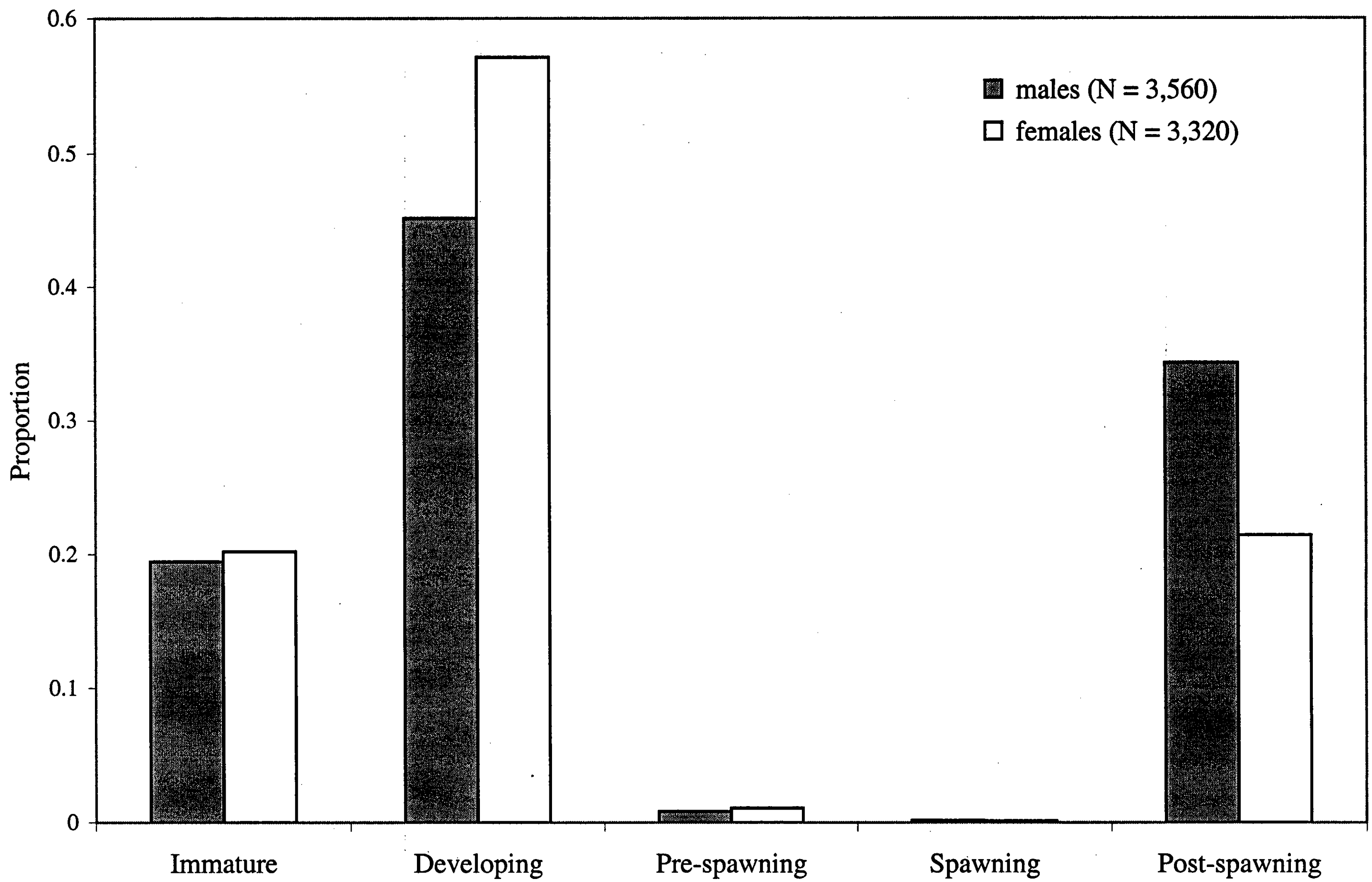


Figure 13. Maturity stages observed for male and female pollock during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

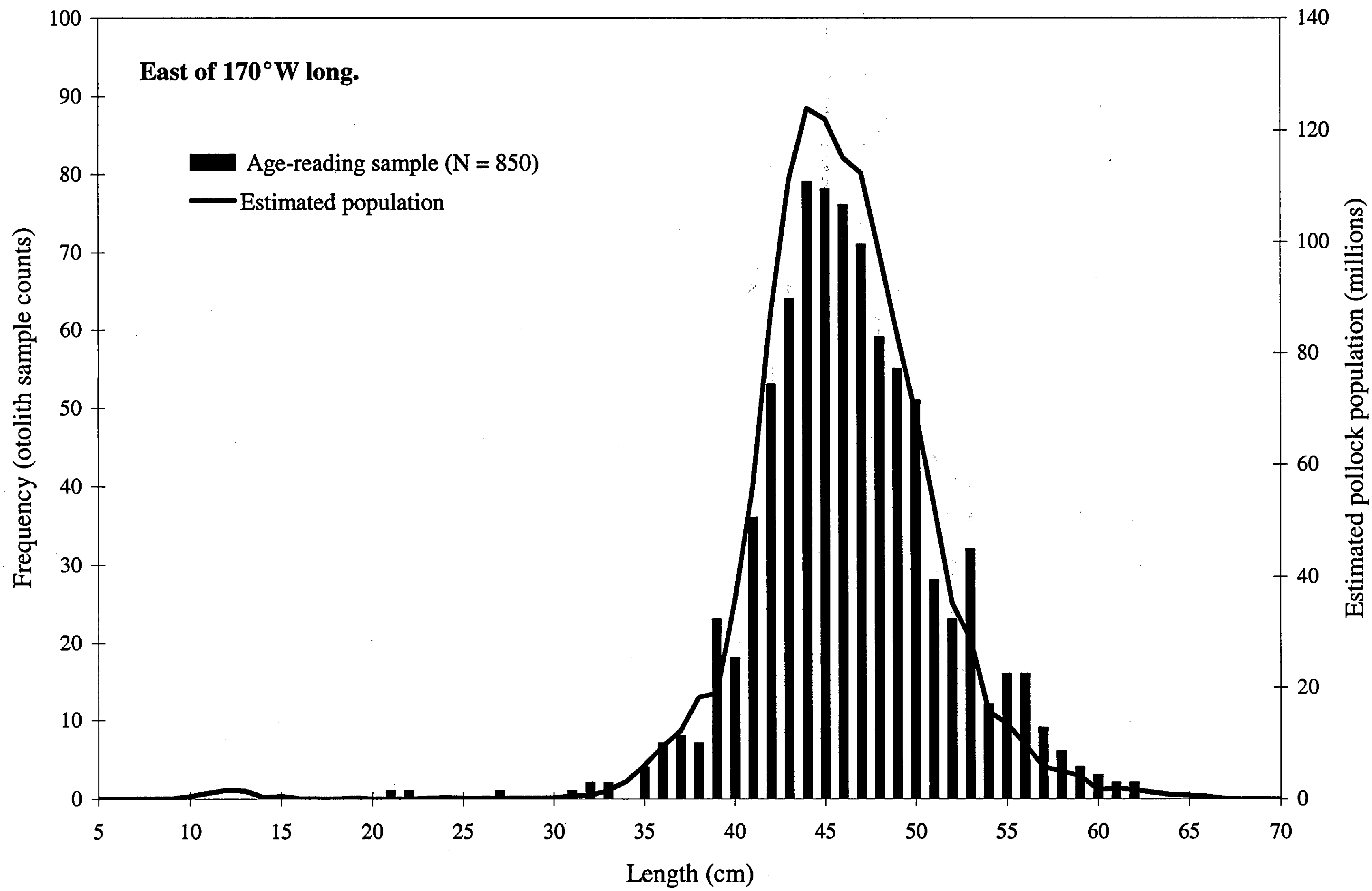


Figure 14. Length frequency distribution of pollock from which otolith specimens were submitted for age reading (bars, left Y-axis) and estimated population at length (solid line, right Y-axis) east of 170°W longitude during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

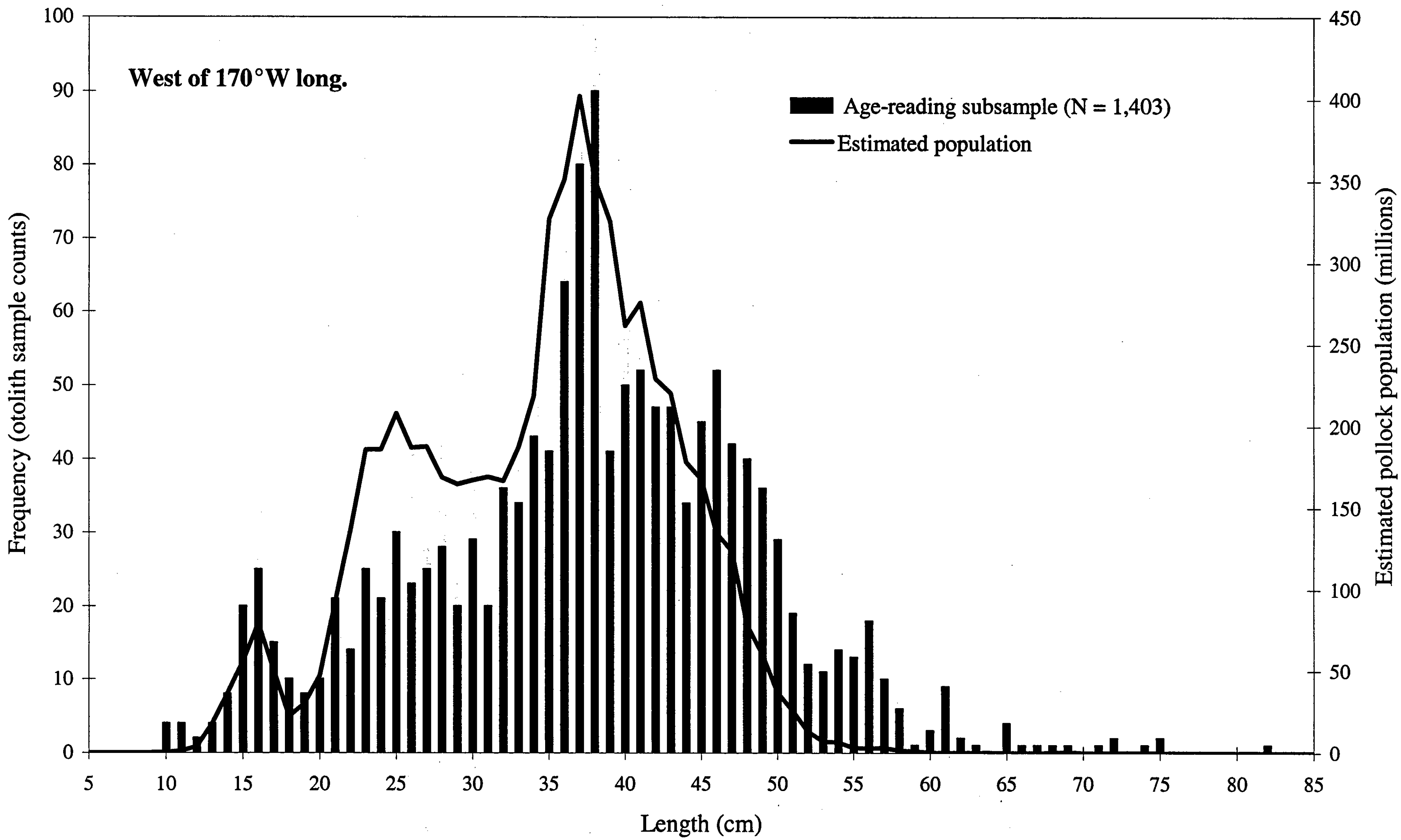


Figure 15. Length frequency distribution of pollock from which otolith specimens were subsampled for age reading (bars, left Y-axis), and estimated population at length (solid line, right Y-axis) west of 170°W longitude during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

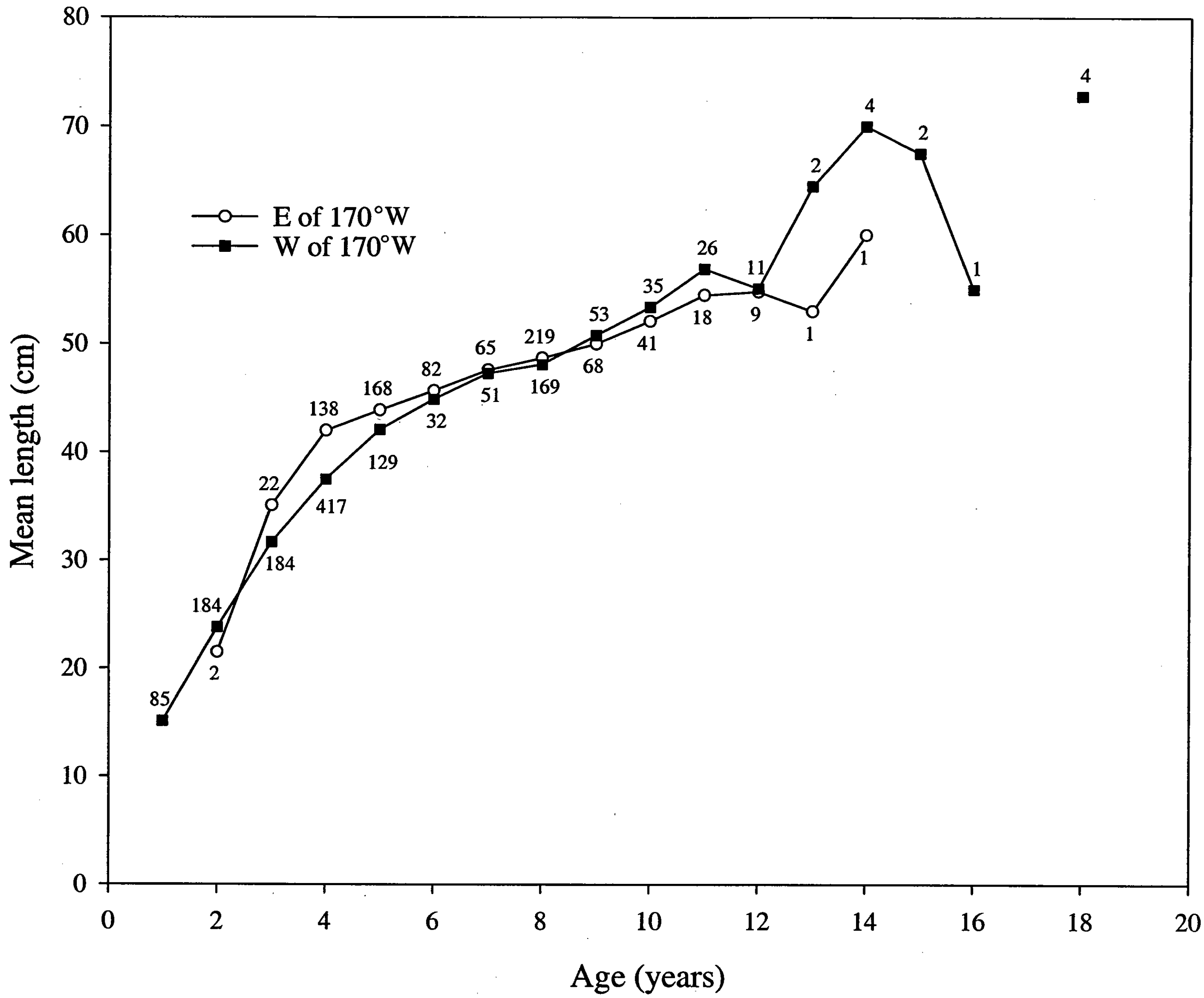


Figure 16. Mean lengths at age of walleye pollock collected during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf. Numbers indicate sample size.

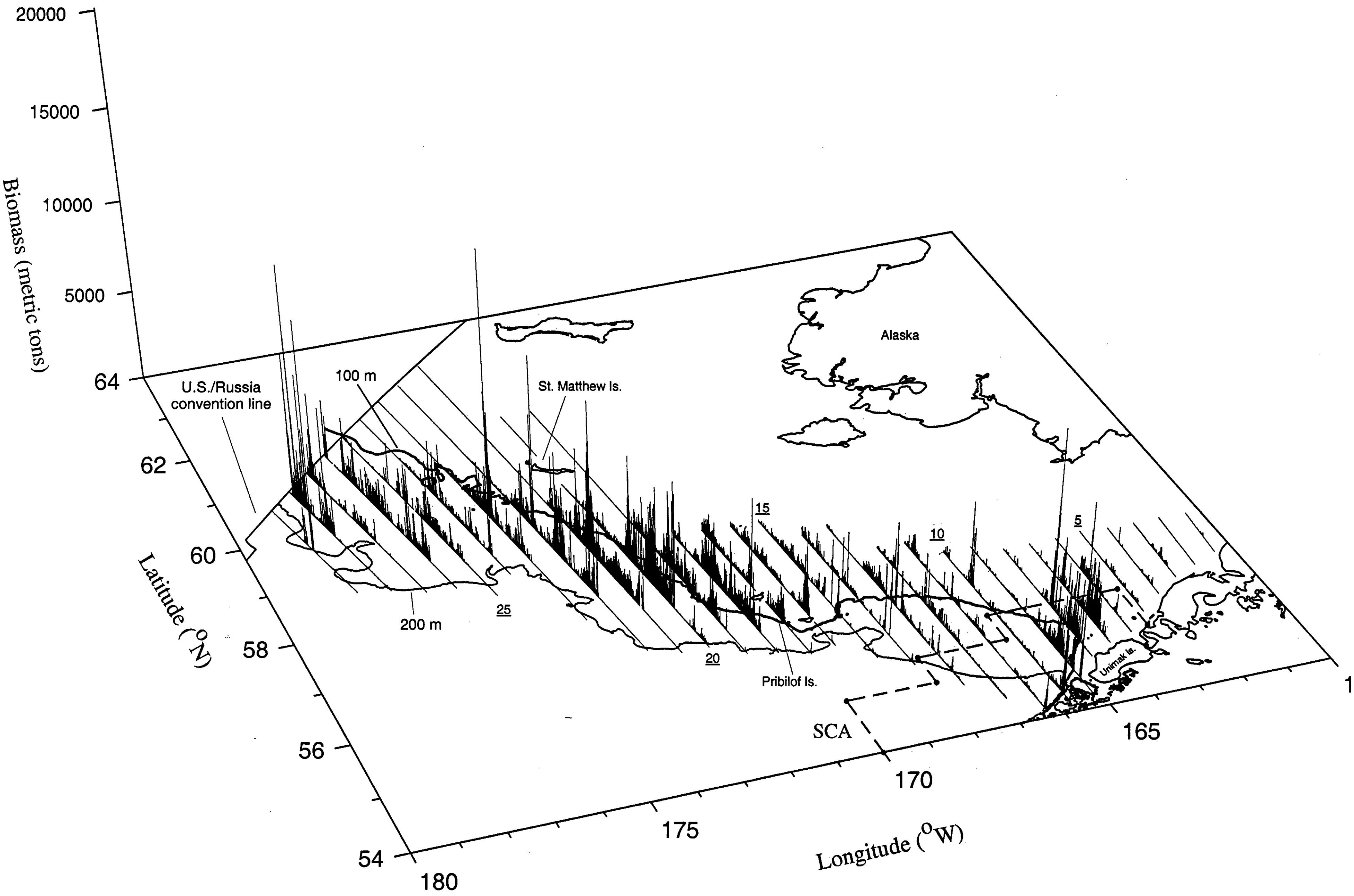


Figure 17. Estimated pollock biomass (tons) between 3 m off bottom and 14 m from the surface along trackline during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope. Transect numbers are underlined, and the sea lion conservation area (SCA) is outlined.

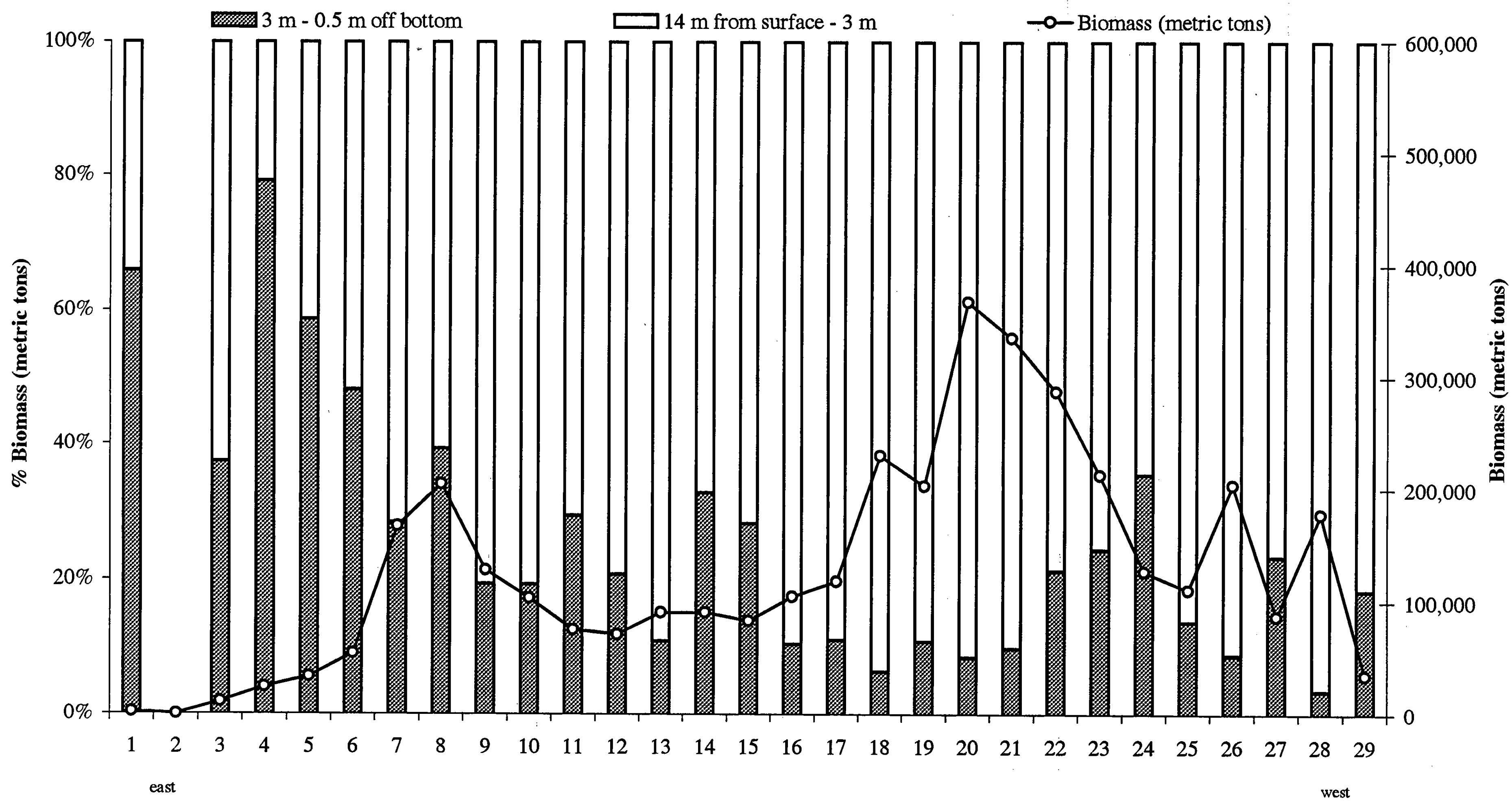


Figure 18. Vertical distribution of pollock (% biomass) and total pollock biomass (metric tons) by transect during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf.

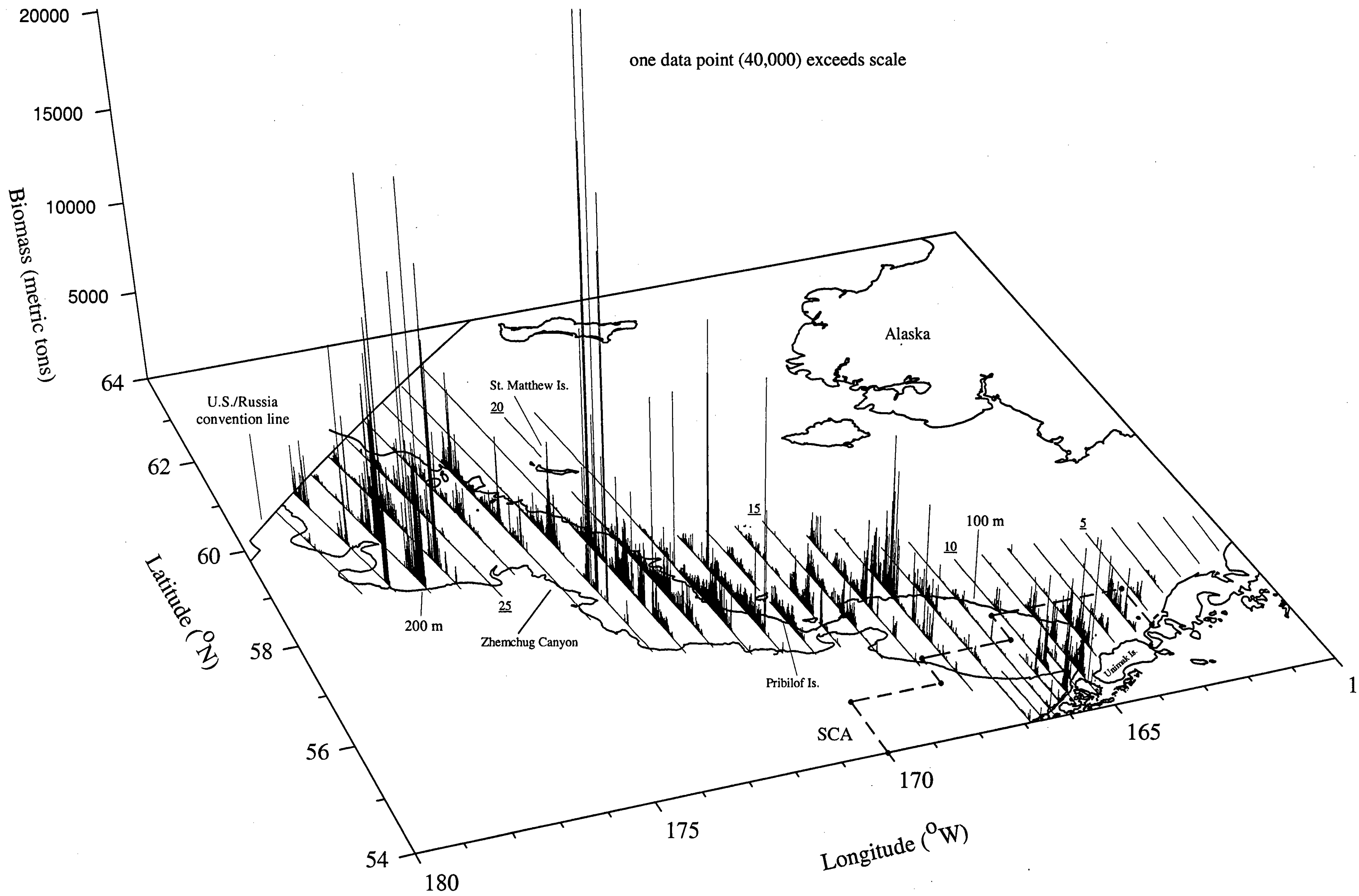
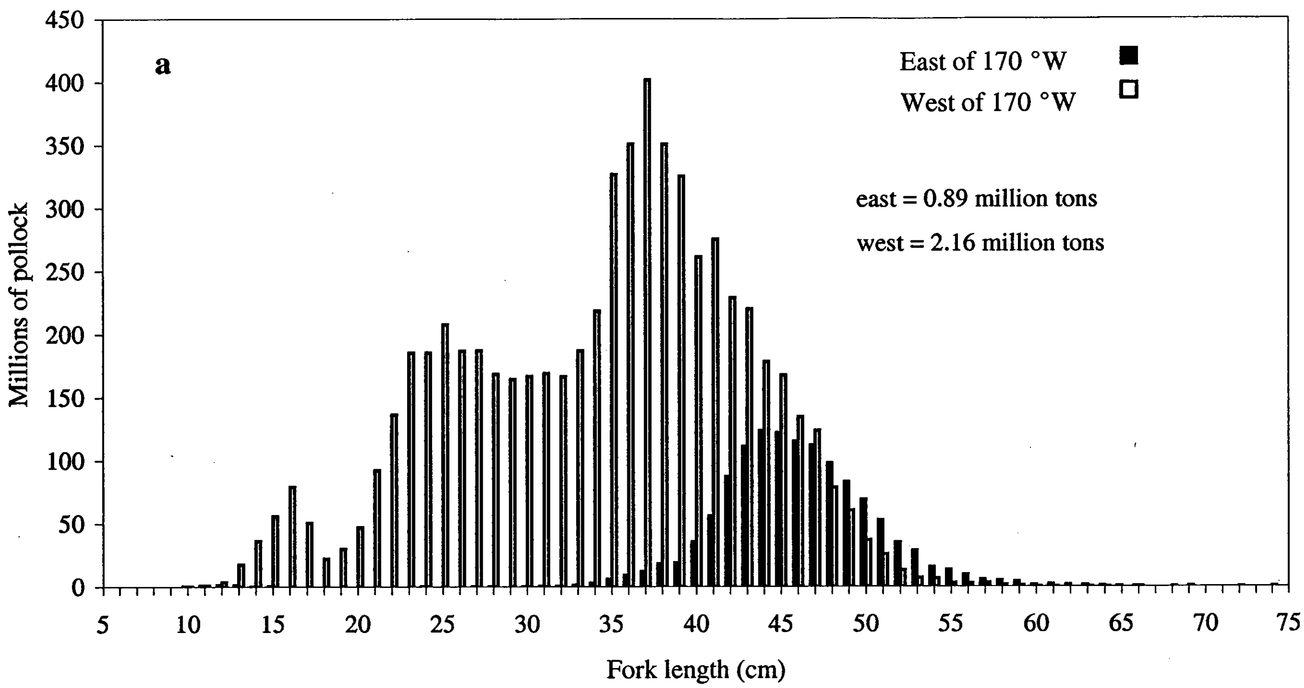


Figure 19. Estimated pollock biomass (tons) between 3 m off bottom and 14 m from the surface along trackline during the summer 1999 echo integration-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined, and the sea lion conservation area (SCA) is outlined.



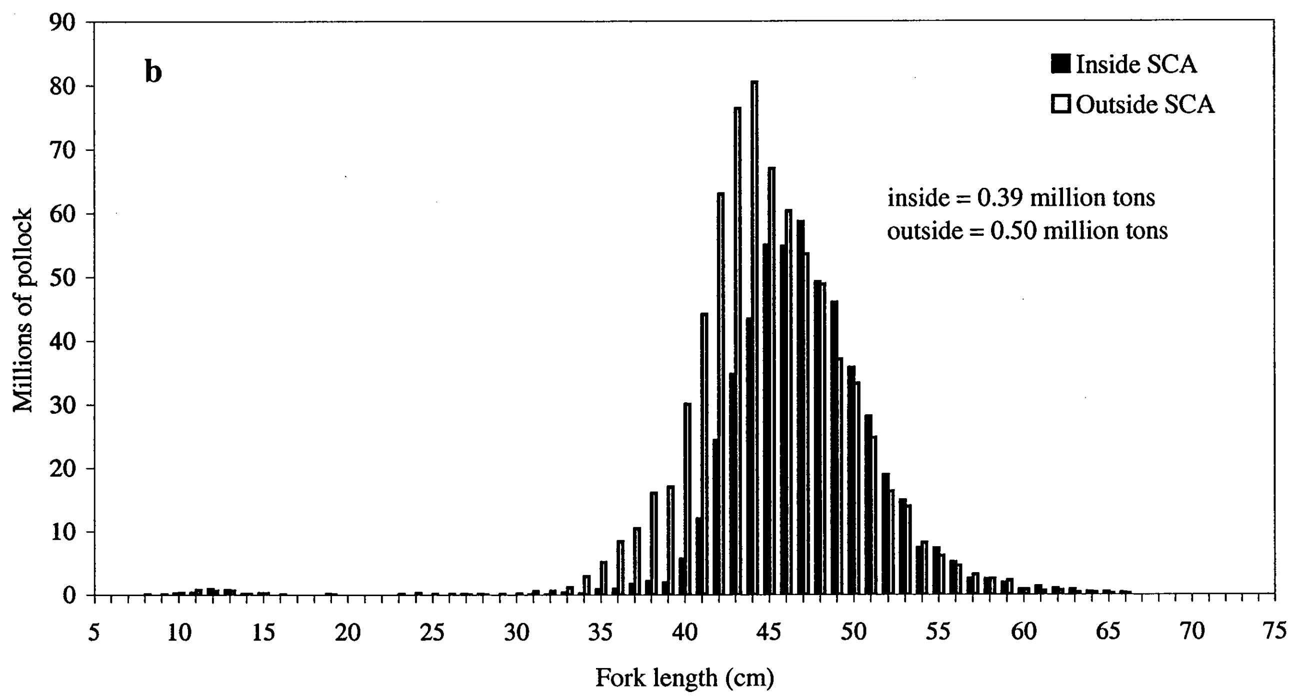


Figure 20. Estimated pollock length composition between 14 m from the surface and 3 m off bottom a) east and west of 170°W long. and b) east of 170°W long., inside and outside the sea lion conservation area (SCA) during the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope. Estimated biomass in each sub-area is indicated. Note y-axis differences.

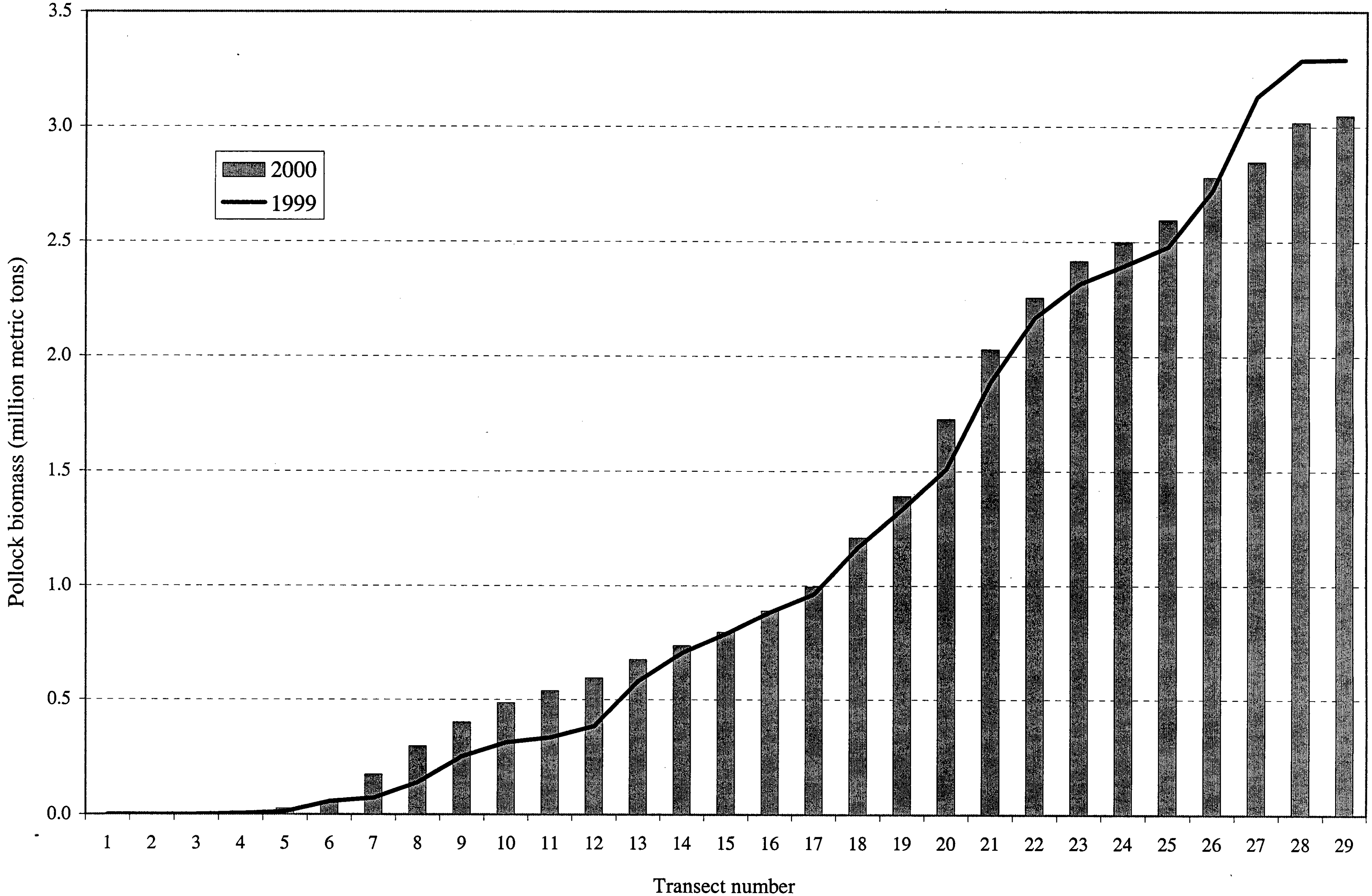


Figure 21. Cumulative biomass of walleye pollock by transect from 1999 and 2000 Bering Sea shelf echo integration-trawl surveys.

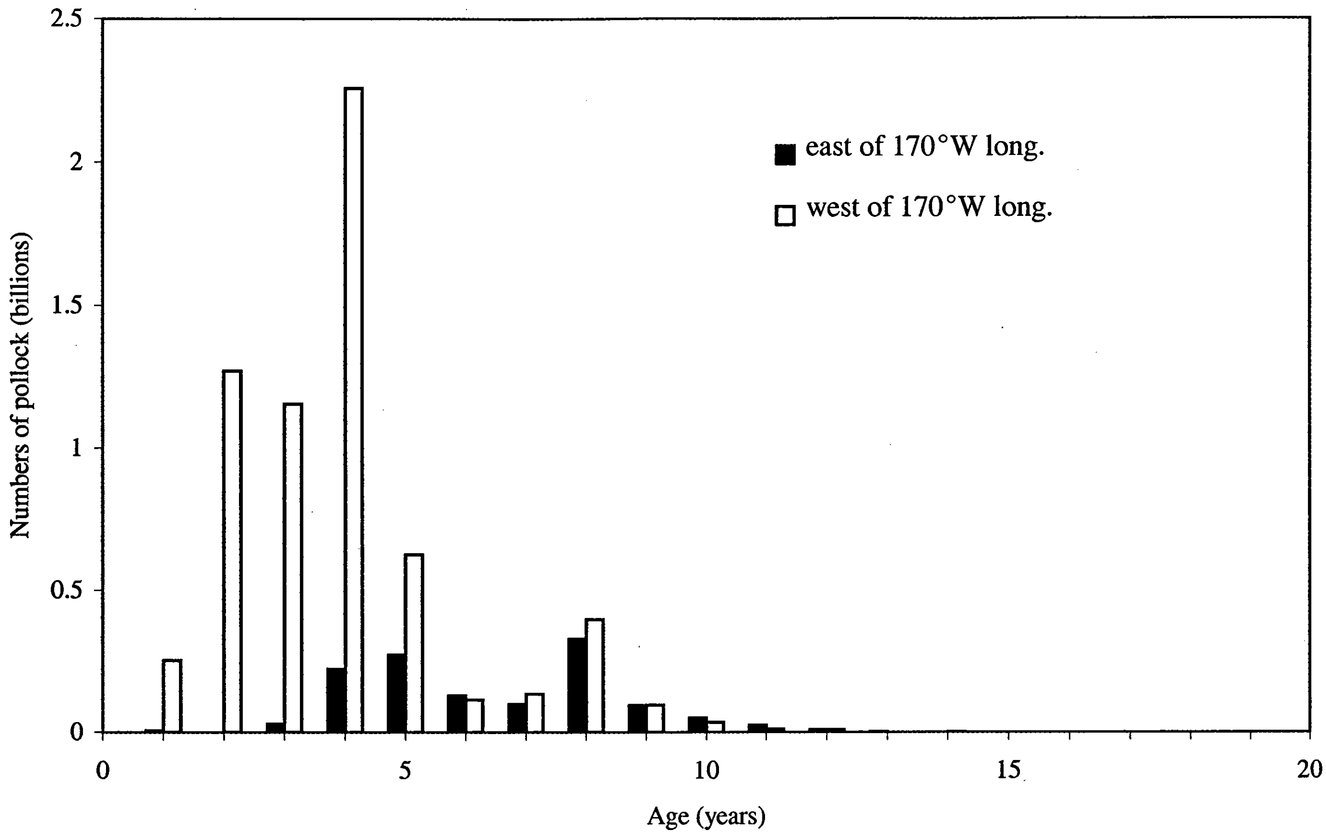


Figure 22. Estimated age composition for pollock between 14 m below the surface and 3 m off bottom east and west of 170°W long. from the summer 2000 echo integration-trawl survey of the eastern Bering Sea shelf and slope.

Appendix I

Scientific Personnel

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

Leg 1 (7 June-3 July)

Name	Sex/ Nationality	Position	Organization
William Karp	M/USA	Chief Scientist	MACE
John Horne	M/USA	Fish. Biologist	MACE
Denise McKelvey	F/USA	Fish. Biologist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE
Steve de Blois	M/USA	Fish. Biologist	MACE
Phil Porter	M/USA	Computer Spec.	MACE
Janice Waite	F/USA	Biologist	NMML
Todd Pusser	M/USA	Biologist	NMML
Lori Mazzuca	F/USA	Biologist	NMML
Chris Wilson	M/USA	Fish. Biologist	MACE (8-20 Jun)
Richard Towler	M/USA	Res. Consultant	UW (8-20 Jun)
Stephen Madden	M/USA	Contract. Officer	NOAA (20 Jun-3 Jul)
Janet Duffy-Andersen	F/USA	Fish. Biologist	FOCI (20 Jun-3 Jul)

Leg 2 (6 July-2 August)

Name	Sex/ Nationality	Position	Organization
Neal Williamson	M/USA	Chief Scientist	MACE
Taina Honkalehto	F/USA	Fish. Biologist	MACE
Kevin Landgraf	M/USA	Fish. Biologist	MACE

Steve de Blois	M/USA	Fish. Biologist	MACE
Bill Patton	M/USA	Fish. Biologist	MACE
Paul Walline	M/USA	Fish. Biologist	MACE
Alexander Nikolayev	M/Russia	Acoustician	TINRO
Mikhail Stepanenko	M/Russia	Fish. Biologist	TINRO
Greg Eglin	M/USA	Acoustician	SciFish

MACE - Midwater Assessment and Conservation Engineering Program, AFSC, Seattle WA

NMML - National Marine Mammal Laboratory, AFSC, Seattle WA

NOAA - National Oceanic and Atmospheric Administration, Seattle WA

FOCI - Fisheries Oceanography Coordinated Investigations Program, AFSC, Seattle WA

TINRO - Pacific Research Institute of Fisheries and Oceanography, Vladivostok, Russia

SciFish - Scientific Fishery Systems, Inc., Anchorage AK

UW - University of Washington, Seattle WA

Appendix II

Secondary Research Objectives–List of Contacts

1. Acoustic buoy work (leg 1, Chris Wilson, AFSC, 206-526-6435),
2. Marine mammal observations (leg 1, Janice Waite, NMML, 206-526-6554)
3. Young-of-the-year walleye pollock investigations (leg 1, Janet Duffy-Anderson, AFSC, 206-526-6465)
4. Collection of age-1 pollock for otolith chemistry studies (Kevin Bailey, AFSC, 206-526-4243)
5. Collection of northern fur seal prey species for a dietary study (Carolyn Kurle, NMML, 206-526-4036)
6. Collection of mature walleye pollock and Pacific cod specimens for Groundfish Observer Program training (Sheryl Corey, AFSC, 206-526-4227)
8. Collection of age-1 walleye pollock for prey analysis (Tina Wylie-Echeverria, Brigham Young University 801-356-3118)
9. Automated broadband identification of groundfish (leg 2, Greg Eglin, SciFish, 907-563-3747)
10. Collection of video footage of walleye pollock behavior in the trawl codend (leg 2, Craig Rose, AFSC, 206-526-4128).

RECENT TECHNICAL MEMORANDUMS

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