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Results of the Acoustic-Trawl Survey of Walleye Pollock (*Gadus chalcogrammus*) on the U.S. Bering Sea Shelf in June - August 2016 (DY1608)

by

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ABSTRACT

Eastern Bering Sea shelf walleye pollock (*Gadus chalcogrammus*) midwater abundance and distribution were assessed from Bristol Bay to the U.S.-Russia Convention Line between 12 June and 17 August 2016 using acoustic-trawl survey methods aboard the NOAA ship *Oscar Dyson*. Water column temperatures were warmer in 2016 (mean sea surface temperature 11.4°C) compared with temperatures during the previous survey effort in 2014 (mean 9.6°C), and much warmer than in prior cold years (2006-2012; means between 4.9° - 6.8°C). The walleye pollock biomass was distributed evenly across the shelf, from west of Port Moller, AK, to the U.S.-Russia border, primarily between 70- and 250-m isobaths. The estimated numbers of pollock in midwater (between 16 m from the sea surface and 3 m off bottom) were 10.78 billion fish with a biomass of 4.063 million metric tons (t). This was an 18% increase in biomass from the 2014 estimate (3.439 million t), more than twice that observed in 2012 (1.843 million t), and exceeding all other estimates since 1988. Pollock east of 170° W numbered 2.82 billion fish and weighed 1.521 million t (37% of the total shelf-wide biomass). Four-year-old pollock (41 cm mode fork length (FL)) composed 75% of the biomass east of 170° W and contributed to the increase in biomass compared to 2014. Pollock abundance west of 170° W was 7.954 billion fish weighing 2.542 million t (63% of total shelf-wide biomass). Most pollock were aged 2, 3 and 4 years (24, 33, and 40 cm mode FLs, respectively). The amount of pollock between 0.5 m and 3 m above the seafloor, for the 2016 survey was 1.44 billion fish weighing 0.766 million t. The geographic distribution of these near-bottom fish was similar to fish higher in the water column (i.e., 3 m off bottom to near the sea surface). That is, roughly one-third of this biomass was also observed east of 170° W. Both smaller (younger) and larger (older) pollock were observed near the seafloor, but rarely in midwater. The mean biomass-weighted depth of pollock for adults (≥ 30 cm FL, age-3+) was 78 m east of 170° W and 90 m west of 170° W. The mean weighted depth of juveniles (< 30 cm FL, ages 1 and 2) west of 170° W was 95 m. Euphausiids exhibited a patchy distribution over the surveyed area in 2016. The mean density estimate for 2016 was the lowest in the euphausiid time series, which started in 2004.

CONTENTS

INTRODUCTION

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center (AFSC) have conducted summer acoustic-trawl (AT) surveys to estimate the abundance and distribution of walleye pollock (*Gadus chalcogrammus*) on the eastern Bering Sea (EBS) shelf since 1979. Surveys were conducted triennially through 1994 and have been conducted either annually or biennially since 1994. They generally extend from seafloor depths of 50 m to 1,000 m, encompassing the middle (50 to 100 m isobaths) and outer (100 to 200 m isobaths) domains of the Bering Sea shelf. The 2016 AT survey was carried out between 12 June and 17 August aboard the NOAA ship *Oscar Dyson*. Its primary objective was to collect acoustic and trawl information to estimate walleye pollock midwater abundance and distribution within the U.S. portion of the Bering Sea shelf. The adjoining Russian portion of the EBS shelf was not surveyed as permission to survey that region was not granted in 2016. Additional survey sampling included conductivity-temperature-depth (CTD) probes to characterize the Bering Sea shelf oceanographic conditions, and supplemental trawls to improve acoustic species classification, and to obtain an index of euphausiid biomass using multiple acoustic frequency techniques.

This report estimates 2016 walleye pollock abundance and biomass by size and age from near the sea surface to 3 m off bottom. It also estimates abundance and biomass between 3 m and 0.5 m of the seafloor using a new method to quantify the acoustically observed pollock in this near-bottom layer (Lauffenburger et al. 2017). Other survey results presented include 1) acoustic system calibration, 2) physical oceanographic (temperature) spatial patterns, 3) pollock biomass spatial patterns, 4) non-pollock classified backscatter (38 kHz) spatial patterns, 5) pollock biomass-weighted vertical distributions, 6) AT survey time series of pollock abundance estimates, and 7) a preliminary distribution of the euphausiid biomass index.

METHODS

MACE scientists conducted the AT survey (cruise DY2016-08) aboard the NOAA ship *Oscar Dyson*, a 64-m stern trawler equipped for fisheries and oceanographic research. The vessel itinerary and scientific personnel list are presented in Appendices I and II.

Acoustic Equipment, Calibration, and Data Collection

Acoustic measurements were collected with a Simrad ER60 scientific echo sounding system (Simrad 2008, Bodholt and Solli 1992). Five split-beam transducers operating at 18, 38, 70, 120, and 200 kHz were mounted on the bottom of the vessel's retractable centerboard, which was extended 9.15 m below the water surface.

Standard sphere acoustic system calibrations were conducted at the start and end of the cruise to measure acoustic system performance. The vessel dynamic positioning system was used to maintain the vessel in a stationary position during calibrations. A tungsten carbide sphere (38.1 mm diameter) suspended below the centerboard-mounted transducers was used to calibrate the 38-, 70-, 120-, and 200-kHz systems. A 64 mm diameter copper sphere was used to calibrate the 18-kHz system. On-axis sensitivity (i.e., transducer gain and s_A correction) was estimated from measurements with the sphere placed in the center of the beam following the procedure described in Foote et al. (1987). Transducer beam characteristics (i.e., beam angles and angle offsets) were estimated by moving the sphere in a horizontal plane through the beam and fitting these data to a second order polynomial model of the beam pattern using the EK60's calibration utility (Simrad 2008, Jech et al. 2005). The equivalent beam angle (which is used to characterize the volume sampled by the beam) cannot be estimated from the calibration approach used (knowledge is required of the absolute position of the sphere, see Demer et al. 2015). Thus, the transducer-specific equivalent beam angle measured by the echosounder manufacturer, and corrected for the local sound speed (see Bodholt 2002), was used in data processing.

Acoustic (raw) data were collected at the five frequencies with Simrad ER60 (v. 2.4.3) software. Acoustic telegram data were also logged with Echoview EchoLog 500 (v. 4.70.1.14256) software as a backup. Ping rate for the EK60 system was variable depending on range to the seafloor, but was typically about 1.0 s^{-1}. Results presented in this report, including calibration, are based on 38 kHz raw echo integration data with a post-processing S_v threshold of –70 dB re 1 m^{-1}. Acoustic measurements were analyzed from 16 m below the surface to within 0.5 m off the sounder detected bottom using Echoview post-processing software (v. 7.1.11 64 bit). The sounder-detected bottom was calculated using the mean of sounder-detected bottom lines for all five frequencies (Jones et al. 2011) and then manually quality-checked.

Trawl Gear and Oceanographic Equipment

Midwater and near-bottom acoustic backscatter was sampled using an Aleutian wing 30/26 trawl (AWT). This trawl was constructed with full-mesh nylon wings and polyethylene mesh 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, where it was fitted with a single 12 mm (0.5 in stretched-mesh) codend liner. Near-bottom backscatter was sampled with an 83-112 Eastern bottom trawl without roller gear and fitted with a 12 mm codend liner. A twice-modified Marinovich midwater trawl with a 12 m headrope and footrope, 30 m bridle, 6 m vertical opening, and mesh sizes ranging from 6.35 cm (2.5 in; top and sides) to 1.91 cm (0.75 in; codend) with a 3 mm (1/8 in) liner was used to sample age-0 pollock and other small midwater fishes. The AWT, bottom trawl, and Marinovich were fished with 5 m^2 Fishbuster trawl doors each weighing 1,089 kg. Vertical net openings and depths were monitored with either a Simrad FS70 third-wire netsounder or a Furuno CN24 acoustic-link netsonde attached to the headrope. A Simrad ITI unit was also used as a backup. Tom weights used for midwater trawls weighed ~113 kg (250 lbs) for the AWT and ~45 kg (100 lbs) for the Marinovich. The AWT vertical net opening ranged from 16.5 to 30.9 m and averaged 23.2 m. The bottom trawl vertical net opening ranged from 1.8 to 4.5 m and averaged 3.5 m. The Marinovich trawl vertical opened ranged from 4.0 to 4.7 m and averaged 4.4 m. Detailed trawl gear specifications are described in Honkalehto et al. (2002).

A small mesh (12 mm) recapture (also called ‘pocket’) net was permanently attached 10 meshes aft on the 3rd bottom panel of the AWT intermediate to sample escapement. The net recaptures organisms that escape through the larger meshes of the trawl. Catch in the recapture net was recorded independently from the catch in the codend. These data are being used in ongoing work to estimate the trawl selectivity of the AWT and to gauge escapement of juvenile pollock and other small fishes (Williams et al. 2011). Recapture net data were not used to adjust trawl codend catches or other estimates reported here. The AWT also included a stereo camera-trawl (CamTrawl) system used on nearly all hauls (Williams et al. 2010a, b). The CamTrawl consists of two cameras, strobes, and associated electronics mounted within a frame attached to the midsection of an AWT just forward of the codend. It operates autonomously to collect stereo images to identify species and estimate their length as they pass through the trawl.

A Methot trawl was used to sample euphausiid backscatter. The Methot trawl had a rigid square frame measuring 2.3 m on each side, which formed the mouth of the net. Mesh sizes were 2 by 3 mm in the body of the net and 1 mm in the codend. A 1.8 m dihedral depressor was suspended below the frame and a 45 kg lead weight attached to the bottom of the frame to generate additional downward force. A calibrated General Oceanics flowmeter was attached in the mouth of the trawl. The number of flowmeter propeller revolutions and the total time the net was in the water were used to determine the volume of water filtered during hauling. The trawl was attached to a single cable fed through a stern-mounted A-frame. Real-time trawl depths were monitored using a Simrad ITI acoustic link temperature-depth sensor attached to the bottom of the Methot frame. All survey operations were conducted as specified in NOAA protocols for fisheries acoustics surveys and related sampling[1], and the acoustic units used are defined in MacLennan et al. (2002).

Physical oceanographic measurements were made throughout the cruise. Temperature-depth profiles were obtained at trawl sites with a Sea-Bird Electronics temperature-depth probe (SBE-39) attached to the trawl headrope. These temperature profile data were subsequently averaged by geographic area and 1-m vertical depth bins. Conductivity-temperature-depth (CTD)

[1] National Marine Fisheries Service (NMFS) 2013. NOAA protocols for fisheries acoustics surveys and related sampling (Alaska Fisheries Science Center), 23 p. Prepared by Midwater Assessment and Conservation Engineering Program, Alaska Fish. Sci. Center, Natl. Mar. Fish. Serv., NOAA. Available online: http://www.afsc.noaa.gov/RACE/midwater/AFSC%20AT%20Survey%20Protocols_Feb%202013.pdf.

measurements were made with a Sea-Bird SBE 911*plus* CTD at calibration sites and throughout the survey to describe EBS shelf temperature features associated with pollock and euphausiids. CTD casts were made at the closest point along a survey transect to each of 19 nominal station locations selected to provide a systematic, representative set of water column observations (P. Stabeno, PMEL, pers. commun.) to complement SBE profiles. A cast was also made wherever the ship stopped surveying for the night if it was more than 20 nautical miles (nmi) from another nighttime cast. This sampling strategy is repeatable each survey year with minimal impact on other survey operations. Salinity bottle samples (e.g., one bottle every other day, alternating at surface and bottom of cast) were collected from the casts to calibrate the CTD conductivity sensor. Sea surface temperature (SST) was measured continuously using the vessel's Furuno T-2000 SST system (±0.2° C), with the temperature probe located approximately 1.4 m below the vessel's waterline. SST was recorded using the ship's Scientific Computing System (SCS) and subsequently averaged at 1 nmi resolution. Other environmental data (not reported here) were also recorded using the SCS.

Survey Design

The survey design initially consisted of 29 north-south oriented parallel transects spaced 20 nmi apart over the Bering Sea shelf from 162° W (west of Port Moller, Alaska), across the U.S.-Russia Convention Line to about 178° 20 E, including the area around Cape Navarin, Russia (Fig. 1). To add an element of randomization to this systematic transect design, the longitudinal position of the first transect was altered by adding a signed, randomly chosen amount that was less than the inter-transect distance, and then subsequent transects were offset by 20 nmi from that point (Rivoirard et al. 2000). The initial plan was amended with the following two changes: 1) Russian transects were removed as the *Oscar Dyson* was not granted permission to survey in the Russian Exclusive Economic Zone (EEZ), and 2) sufficient pollock backscatter was observed on the first transect to warrant adding 2 additional transects to the east in Bristol Bay yielding a final design with 28 transects (Fig. 1). Echo integration (s_A, m^2 nmi^{-2}) and trawl information were collected during daylight hours (typically between 0600 and 2400 local time). Daytime Methot trawls targeted suspected macrozooplankton backscatter to classify this non-pollock backscatter and to support an acoustic-trawl estimate of Bering Sea euphausiid ('krill') density.

Nighttime hours were devoted to special projects, which included collection of additional physical oceanographic data, additional trawl hauls for species classification (e.g., the Marinovich trawl to sample age-0 pollock, Methot tows to either capture live euphausiid specimens for target strength (TS) measurements or to estimate euphausiid density throughout the water column), and work with other specialized sampling devices. The latter included 1) tests of a lowered TS measurement package (dropTS), 2) broadband acoustic system field tests to estimate fish size, and 3) fish behavior studies with two lowered camera systems. The lowered cameras were designed to observe fish reaction to camera size (large camera platform: ~ 30 kg in air, and small platform: ~5 kg in air) and strobe light color (red: ~660 nm vs. white: ~ 350 – 700 nm). In addition to these nighttime projects, two days were added to the survey to participate in field experiments with two autonomous sailing platforms (i.e., Saildrone) equipped with a 2-frequency echosounder system. The objective of one experiment was to evaluate the quality of the acoustic and other sensor data based on pairwise comparisons between the Saildrones and NOAA ship *Oscar Dyson.* For another experiment (i.e., northern fur seal (*Callorhinus ursinus*) study), Saildrone data were used to describe the northern fur seal prey field. Two Liquid Robotics wave gliders were also deployed for Pacific Marine Environmental Laboratory (PMEL) researchers during the survey.

Trawl haul catches were sampled to identify the species composition, length, and other biological characteristics of animals in acoustically observed aggregations. For hauls targeting walleye pollock, a portion of the catch was sampled to determine length and sex composition, sexual maturity, body weight, and to collect otoliths for age determination. If mixtures of juveniles and adults were encountered in a haul, the predominant size groups were sub-sampled separately. Approximately 50 to 400 individuals were randomly sampled for length by sex, and about 20 to 50 were sampled for body weight, maturity, and age. Fork lengths (FL) were measured to the nearest millimeter. An electronic motion-compensating scale (Marel M60) was used to weigh individual walleye pollock specimens to the nearest 2 g. Maturity was determined by visual gonad inspection and fish were categorized as immature, developing, mature/prespawning, spawning, or post-spawning[2]. Walleye pollock otoliths were collected and stored in individually marked vials of glycerol-thymol solution. Otoliths were read by AFSC scientists in the Age and Growth Program following the survey to determine ages.

Additional biological samples were taken from most species in the catch. For select species or broader taxonomic groups, 25-100 lengths, and 10-75 lengths paired with individual weights (i.e., length-weights), were taken depending on species and dominance in the catch. These included young-of-the-year (age-0) pollock, forage fishes (e.g., capelin, eulachon, herring, sand lance, northern smoothtongue, myctophids), Pacific cod, rockfishes, and large jellyfishes. For all other species except sessile invertebrates caught in bottom trawls, either 10 length-weights were collected (organisms weighing ≥ 5 g) or else 10 individuals were weighed in aggregate and then measured separately for lengths (organisms weighing < 5 g). Fork lengths were measured for all fish species, except for capelin, Pacific viperfish, and myctophids, which were measured for standard length (SL). Carapace lengths were measured for shrimp and bell diameters were collected for jellyfishes.

Pocket net catch data were recorded independently from the catch in the codend. Pocket net catches were sorted to species for fishes or broader taxonomic groups for invertebrates, subsampled if necessary, counted and weighed. Twenty or more length samples were taken for each fish species caught in pocket nets. Trawl station and biological measurements were digitally recorded directly into a database using the Catch Logger for Acoustic Midwater Surveys (CLAMS), a customized software program developed by MACE scientists.

CamTrawl images were viewed and annotated if necessary. An automated image processing routine was used to extract length estimates for pollock seen in the CamTrawl images (Chuang et al. 2011). Lengths obtained from CamTrawl were used primarily in comparisons with physically measured fish lengths from the codend to evaluate the accuracy of the imaged-based lengths.

[2] ADP Code Book. 2016. Unpublished document. Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle WA 98115.

For Methot trawl hauls, the catch was transferred to a ~ 0.5 × 1 m rectangular plastic tub. Large organisms such as jellyfishes and small fishes were removed, identified to the lowest taxonomic group possible, weighed, and body lengths or diameters (jellyfishes) measured. The remainder of the catch was placed on a 1-mm mesh screen to remove as much seawater as possible and weighed. A subsample of this zooplankton mixture was then weighed and sorted at sea into broad taxonomic groups, while a second subsample was weighed and preserved in a 5% buffered formalin solution for more detailed enumeration at the Polish Sorting Center in Szczecin, Poland. These results will be reported elsewhere.

Several special projects required additional sampling. Pollock ovaries were collected from all maturity stages of females for a reproductive biology study, along with gonad and liver weight measurements (M. Dorn/S. Neidetcher, AFSC). Whole age-0, age-1 pollock, and Pacific cod were collected for a study to identify potential misclassifications of Bering Sea age-0 pollock during age determination (A. Dougherty, AFSC). Tissue samples or whole fish (if small) were collected for selected species (pollock, Pacific herring, salmon, Pacific sand lance, Atka mackerel, northern smoothtongue, myctophids and gonatid squid) from inside and outside of the fur seal habitat area coinciding with the Saildrone survey. Pacific cod fin clips and otoliths were collected, as well as e-DNA samples for pollock and rockfish (M. Canino, AFSC). Pollock and Arctic cod (if observed) stomachs were collected for diet studies (T.Buckley/K. Aydin, AFSC).

<u>Data Analysis</u>

Walleye pollock abundance was estimated by combining acoustic and trawl information. Acoustic backscatter was classified as age-1+ walleye pollock (≥ 8 cm), non-pollock fishes, or an undifferentiated mixture (primarily plankton and small fishes), and integrated over 0.5 nmi elementary distance sampling units (EDSUs) horizontal by 10 m vertical resolution cells to within 0.5 m of the bottom. For a detailed explanation of the standard AT survey abundance estimation procedures (historically used to estimate midwater pollock, from near surface to 3 m off bottom), refer to Honkalehto et al. (2008). The following is a brief summary. Walleye pollock length compositions from 102 AT survey hauls were combined into 27 regional length strata based on geographic proximity, length composition similarities, and backscatter characteristics. For determination of mean weight-at-length for pollock, hauls were stratified into two separate length-weight strata east and west of 170°W, as walleye pollock weight-at-length is typically greater to the east than to the west of 170°W (Traynor and Nelson 1985, Honkalehto et al. 2002). Mean weight-at-length for each 1.0 cm-length interval was estimated from the trawl information when there were five or more fish for that length interval in a length-weight stratum. Within each length-weight stratum, for length intervals where < 5 individual fish weights were available, weight was estimated from a linear regression of the natural logs of the length and weight data from the 2016 summer AT survey hauls in that stratum, including a correction for bias attributable to back-transformation (De Robertis and Williams 2008). For each length stratum, walleye pollock numbers-at-length were estimated by dividing the acoustic measurements of area backscattering coefficient (s_A) by the mean backscattering cross section of pollock (σ_{bs}, MacLennan et al. 2002), which is derived by applying an acoustic target strength (TS) to length relationship of TS = 20 $\log_{10}$ (FL)-66 to the mean length frequency for the stratum (Foote and Traynor 1988, Traynor 1996). Biomass was estimated by multiplying numbers-at-length by the corresponding mean fish weight-at-length. Results by length were converted into abundance-at-age using age-length keys that proportion the number-at-length into the appropriate age classes based on aged specimens taken from the trawl catches. One age-length key was used for the area to the west, and another to the east, of 170° W. An improved method was used for estimating ages for instances where no age structures were available from the stratum sample for pollock in a particular length bin (see Jones et al. 2017, Appendix III). Total midwater population numbers and biomass were estimated by summing regional length stratum estimates. Walleye pollock distribution and abundance were also summarized by sub-areas east and west of 170° W and for the Steller sea lion Conservation Area (SCA; Fig. 1).

Historically, AT survey results on the U.S. EBS shelf have been presented for the water column which is defined as extending from a depth of 16 m down to 3 m off bottom. The water column did not extend deeper than 3 m above the seafloor because 1) greater contributions to the acoustic backscatter existed for non-pollock species within 3 m of the seafloor, and 2) the annual bottom trawl (BT) survey samples to a nominal depth of 2.5-3.0 m above the seafloor in the U.S.

EEZ (Conner and Lauth 2017, Ianelli et al. 2016, Lauth and Conner 2014). Recently, an approach was developed to estimate the acoustic contribution of pollock relative to other species in the diverse region between 0.5 and 3 m off bottom using a combination of AT and BT data (Lauffenburger et al. 2017). Species-specific parameters were fit using a regression model of simultaneously collected BT-survey acoustic backscatter and catch data. The pollock coefficient in the fitted regression model is used to estimate the contribution of pollock to AT survey backscatter and to compute numbers and biomass at length/age for that near-bottom depth layer, assuming the species composition at most locations does not vary substantially over the ~ 2 weeks between BT and AT surveys. The acoustic contribution of pollock between 0.5 and 3 m off bottom for each 0.5-nmi EDSU was computed for 2016 using the AT survey backscatter in that EDSU, distance-weighted mean catch composition from the closest (w/in 25 nmi) BT survey hauls (BT survey haul data not shown), and the pollock-specific best fit parameter (Lauffenburger et al. 2017). Numbers and biomass by length were computed following the standard AT survey abundance estimation procedures (see above), using length frequencies from the distance-weighted BT catch. A single pollock length-weight relationship was estimated from all BT survey hauls. Age compositions were computed using one age-length key for east of 170° W, and another for west of 170° W, based on the BT catch data. Total population numbers and biomass within this near-bottom depth zone were computed by summing EDSU estimates across the surveyed area.

The vertical distribution of pollock was computed by plotting the mean biomass in each 10 m depth bin, at the midpoint of each bin, relative to 1) the surface and 2) the sea floor. The overall mean weighted depth (mwd) and the mean weighted distance off the seafloor was computed for adult pollock (≥30 cm FL), and juvenile pollock (< 30 cm FL) east and west of 170° W in the U.S. EEZ as follows:

$$mwd = \frac{\sum_d (B_d \times d)}{\sum_d (B_d)},$$

where B is biomass (kg), and d is either depth or distance from the seafloor (m) for each depth bin-EDSU combination.

Relative errors in the standard midwater biomass and abundance estimates associated with spatial structure in the acoustic data were derived using a one-dimensional (1D) geostatistical method (Petitgas 1993, Williamson and Traynor 1996, Walline 2007). Relative estimation error is defined as the ratio of the square root of the estimation variance to the estimate of biomass. Geostatistical methods were used for error computation because they account for the observed spatial structure in fish distribution. These errors quantify the acoustic sampling variability (Rivoirard et al. 2000). Other sources of error (e.g., target strength, trawl sampling) were not included in the estimate. Error estimates are not yet available for the near-bottom layer biomass estimates.

RESULTS AND DISCUSSION

Calibration

Initial acoustic system settings for the survey were based on results from the 13 June calibration (Table 1). The end-of-cruise sphere calibration on 17 August showed little change in integration gain for the 38-kHz system, indicating that the system was stable throughout the survey. Acoustic data were processed using an average of the pre- and post-cruise (linearized) gain values. This resulted in a change of less than 0.1 % to backscatter values processed with pre-cruise gains.

Water Temperature

Temperature measurements during the 2016 survey produced an estimated mean SST of 11.4°C (range 7.4°-14.0°C; Fig. 2, upper panel). The estimate was nearly 2°C warmer than 2014 (mean SST 9.6°C, range 6.4°- 12.4°C) and much warmer than in relatively cold survey years 2006-2012 (means between 4.9° - 6.8°C). Seasonal warming of surface waters typically leads to maximum SST in late July-early August (Overland et al. 1999). The warmest SST observations occurred in a north-south band southeast of St. Matthew Island in mid-July. Temperatures were slightly cooler to the northwest near the survey end in early August. Bottom temperatures in 2016 measured by CTD casts were also much warmer than in recent years (mean bottom temperature 3.9° C, Fig. 2, lower panel). A region of bottom temperatures < 2° observed previously in the Bering Sea (i.e., termed cold-pool by Wyllie-Echeverria and Wooster 1998) was visible, but only on northern ends of transects from east of St. Matthew Island to the U.S.-Russia Convention

Line. Temperature-depth profiles from trawl headrope sensors indicate that the water column was vertically stratified throughout the EBS with a thermocline at roughly 20-40 m from the surface (Fig. 3). Temperatures below the thermocline in the northwest portion of the survey area were > 2°C. Temperatures in this layer were cooler, but > 0°C in 2014. However, temperatures were well below 0°C in recent cold years (2007-2012). The AFSC BT survey, which started earlier than the AT survey, measured similar surface and bottom temperature increases in 2016 compared with prior survey years (R. Lauth, AFSC, personal communication).

Trawl Sampling

Biological data and specimens were collected from 162 AT survey trawl hauls (Table 2, Fig. 1). The majority of these hauls (122) targeted backscatter during daytime for species classification: 104 with an AWT, 4 with a bottom trawl, 11 with a Methot trawl, and 3 with a Marinovich trawl. The remaining 40 hauls were either nighttime Marinovich tows (3) targeting age-0 pollock or Methot tows (37) targeting euphausiids. Catch data for some of these hauls assisted with backscatter classification. CamTrawl image data were successfully collected for 93 AWT hauls. Biological information collected for walleye pollock and other species is presented by haul in Tables 3-7.

Walleye pollock was the most abundant species in AWT midwater haul catches by weight (89.5%) and by number (93.7%), followed by northern sea nettle jellyfish (*Chrysaora melanaster*; 8.2% by weight and 3.6% by number; Table 3). Pollock was the most abundant species (80.9% by weight and 73.6% by number) in AT survey bottom trawl catches, followed by rock sole (*Lepidopsetta* spp.; 4.9% by weight and 8.6% by number; Table 4). *Aequoria* spp. (42.4%), northern sea nettles (34.7%), lion's mane (*Cyanea capillata*; 14.3%) and *Aurelia* spp. (4.8%) jellyfish dominated the catch by weight in Marinovich hauls, while euphausiids (55.6%) and age-0 pollock (26.0%) dominated the catch numerically (Table 5). Finally, Methot hauls were dominated by weight by northern sea nettles (57.9%), euphausiids (20.5%), and moon jellyfish (*Aurelia labiata*; 9.5%), and numerically by euphausiids (90.8%; Table 6).

Nearly 38,500 lengths were measured and over 6,400 specimen weights were collected for all species during the AT survey (Tables 3-6). Of those, over 35,000 lengths, 4,700 weights, and

2,300 otoliths were for walleye pollock (Table 7). Most pollock (89% of males and females) sampled were in the developing maturity stage (Fig. 4). Two females (0.1%) were in a spawning stage of maturity (1 east and 1 west of 170° W). Walleye pollock mean weight-at-length for fish greater than 50 cm tended to be less in 2016 than those in 2004-2014 (Fig. 5).

Acoustic Backscatter and Abundance Estimates

About 52% of the summed acoustic backscatter observed between 16 m below the surface and 3 m off bottom (the midwater layer) during the 2016 survey was attributed to adult or juvenile walleye pollock. This was similar to the percentage of pollock observed in 2014 (45%) and 2012 (56%), but less than that observed in 2010 (82%; Honkalehto and McCarthy 2015; Honkalehto et al. 2013, 2012). Most pollock were observed in a variety of aggregations including near-bottom layers, small dense schools (cherry balls) in midwater, and diffuse aggregations of individual fish. The remaining non-pollock midwater backscatter was attributed to an undifferentiated plankton-fishes mixture (46%), or in a few isolated areas, to rockfishes (*Sebastes* spp.) or other fishes (2%). The near-bottom analysis (Lauffenburger et al. 2017) attributed ~ 71% of the backscatter in the near-bottom zone to pollock.

Estimated numbers and biomass of walleye pollock in midwater to within 3 m of bottom along the U.S. Bering Sea shelf were 10.78 billion fish weighing 4.063 million t (Tables 8-10). This 2016 biomass estimate represents ~18% increase compared to 2014 (3.439 million t), and more than twice the biomass observed in 2012 (1.843 million t). It is the largest estimate in the acoustic-trawl survey time series since the late 1980s. The relative estimation error for the U.S. EEZ midwater walleye pollock biomass estimate was 0.021 (Table 8). This was the lowest estimation error since 1994, when these sampling errors were first computed, and suggests pollock were relatively more uniformly distributed (less patchy) in 2016. Midwater pollock were observed throughout the surveyed area between the 50- and 200-m isobaths (Fig. 6, top panel). East of 170° W, pollock abundance was 2.823 billion fish, weighing 1.521 million t (37% of total midwater biomass, Fig. 7). This was the highest pollock biomass observed east of the Pribilof Islands in the AT survey time series since 1994. In the U.S. EEZ west of 170° W, pollock numbered 7.954 billion and weighed 2.542 million t, which was 63% of total midwater biomass (Table 8, Fig. 7). Pollock biomass increased inside the SCA, where the entire survey and SCA estimates correlate well ($r^2 = 0.79$ $p < 0.001$) for the 1994-2016 survey time series (Table 8). Biomass inside the SCA was about half what was outside the SCA.

Estimated numbers and biomass of pollock in the near-bottom layer of the water column (0.5 m to 3 m off bottom) were 1.44 billion fish weighing 0.766 million t (Tables 11,12). The relative estimation error for the near-bottom walleye pollock biomass estimate was 0.038, slightly higher than the midwater estimation error. The geographical distribution was generally similar to that in the midwater layer; 37% of the biomass was east of 170° W and 63% was west (Fig. 8). However, smaller-scale differences were detected between the near-bottom and midwater layers. For example, there were relatively fewer pollock in the outer edges of the outer shelf domain (100 to 200 m isobaths) between the Aleutian Chain and the Pribilof Islands (horseshoe area; Fig. 6). Additionally, only ~ 10% of the total near-bottom biomass was observed within the SCA compared to about 50% for the midwater layer (Fig. 6, bottom panel). Finally, near-bottom biomass was relatively higher on the outer southeast edge of Zhemchug Canyon, and lower along the 100-m isobath compared to that seen with the midwater layer. This may have occurred because pollock biomass in the midwater layer was dominated by juvenile pollock, which are observed less frequently near the sea floor (Fig. 6).

Moderate pollock biomass was observed at the northern ends of several transects between the Pribilof Islands and the region surrounding St. Matthew Island (e.g., transects 14-18; Fig. 6). Thus, detectable pollock backscatter was anticipated to continue northward beyond the area that the AT survey typically covers, perhaps due to the warm temperatures. Unfortunately, these transects could not be extended northward due to time constraints so it is likely that some pollock biomass existed but was not assessed north of the AT survey area in 2016. Analyses of acoustic data collected during the summer 2017 Northern Bering Sea BT survey and Saildrone acoustic data collected in this northern area couple of weeks earlier in 2017 were used to assess the potential contribution of pollock (Mordy et al. 2017, Alex De Robertis, pers. commun.). Sufficient backscatter presumed to be pollock, combined with CPUE information from the BT survey in the northern area not covered by the AT survey suggested that additional AT survey time be requested in 2018 to extend survey transects northward.

Pollock Length and Age Composition

Pollock length compositions differed between midwater and near bottom layers, and modal lengths tended to decline to the west. East of 170° W, midwater pollock ranged between 11 and 69 cm FL with a mode of 41 cm (Fig. 7). In the U.S. EEZ west of 170° W, pollock ranged from 13 to 68 cm FL with multiple modes observed at 24, 33 and 40 cm FL (Fig. 7). Within the central region of the surveyed area (i.e., middle shelf; not shown), fish were characterized by having a modal length of 33 cm. Very few fish larger than 50 cm or smaller than 20 cm were observed in midwater in 2016. Near-bottom pollock also exhibited a tendency towards smaller fish to the west. East of 170° W these fish ranged from 10 to 77 cm FL, with most fish between 37 and 55 cm, and modes at 40 and 48 cm FL (Fig. 8). West of 170° W the near-bottom pollock lengths exhibited a mode at 46 cm FL, and smaller modes at 23 and 14 cm.

Pollock age information in 2016 resembled the patterns seen in the length data. In the midwater layer, fish numbers were dominated by 3-year-olds (2013 year class) and closely followed by 4-year-olds (2012 year class; Table 13). Four-year-olds were dominant in terms of biomass (49% vs. 29% for 4- and 3-year-olds, respectively; Table 13). Estimated numbers of 4-year-old pollock surpassed previous estimates in the Bering Sea shelf AT survey time series, with the exception of the 4-year-olds (1978 year class) in 1982. East of 170° W, 4-year-olds dominated population numbers (representing 75% of the biomass east of 170° W; Fig. 9). Four-year-old pollock were also more abundant east than west of 170° W, maintaining an eastward shift in distribution of pollock biomass that was observed in 2014 when these fish were 2 years old (Table 8). West of 170° W, pollock aged as 3- and 4-year-old fish dominated population numbers (43% and 34% of biomass west of 170° W, respectively; Fig. 9). Although a single age group dominated numbers of near-bottom pollock east of 170° W, this was not the case west of 170° W (Fig. 10). Four-year-old fish were numerically dominant near bottom (24%), although the 8-year-old 2008 year class contributed slightly more biomass (23%) than did 4-year-olds (22%; Tables 14, 15).

Length and Weight at Age

Mean length- and weight-at-age of pollock were plotted against data from AT surveys between 2004 and 2014 (Fig. 11). The results show similar patterns to the mean weight-at-length plot (Fig. 5); east of 170° W, fish age 5 and older appear to be shorter (Fig. 11a) and lighter (Fig. 11b) in 2016 than in the earlier surveys. As is typical for EBS shelf pollock, length-at-age tended to be greater in the east than in the west, even though data were collected up to a month earlier east of 170° W. This east west difference supports the use of two age-length keys to convert abundance-at-length to abundance-at-age (see Methods). Comparing mean weight-at-ages for 2016 with those from 2006-2014 showed relatively greater weights-at-age east than west of 170° W for fish < 10 years old for both data sets.

Pollock Vertical Distribution

Vertical distribution of adult and juvenile pollock exhibited subtle difference to one another (Fig. 12). The estimated mean biomass-weighted depth for adult pollock (≥ 30 cm FL) was 78 m in the region east of 170° W and 90 m in the region west of 170° W, slightly shallower (7 m east and 6 m west) compared to 2014. Note that bottom depths gradually increase to the west, which could partially explain the difference in mean depth between areas. The mean biomass-weighted depth for juveniles (< 30 cm FL, ~ages 1 and 2) west of 170° W (relatively few juveniles were observed E of 170° W) was 95 m, roughly 4 m deeper than adults (91 m). However, the juveniles were distributed farther off bottom than adults. More than 89% of adults across the shelf were found within 50 m of the bottom (mean weighted depth off bottom 26 m; 27 m east and 24.5 m west of 170° W), whereas for juveniles in the western stratum (i.e., west of 170° W), the proportion within 50 m of bottom was less (81%; mean off-bottom depth 34 m). This may occur (i.e., juveniles deeper but farther off-bottom) because of differences in bathymetry in the survey area. That is, greater proportions of juveniles compared to adults generally tended to occur farther to the west in this western stratum where bottom depths are relatively deeper (Fig. 6). Finally, although adult biomass increased towards the bottom, juvenile biomass peaked at about 20-40 m off bottom and then decreased towards the seafloor.

Historical Population Trends

Spatial distribution of pollock biomass and non-pollock backscatter were evaluated over the period 2004-2016. Earlier spatial patterns (1999-2002) when the survey was also conducted in early summer (June-July) are presented elsewhere (e.g., Honkalehto et al. 2008, 2009, 2010, 2012, 2013; Honkalehto and McCarthy 2015). Pollock population numbers and biomass estimates were also examined from 1994 to highlight patterns emerging with the addition of results from the most recent surveys (e.g., 2012, 2014, 2016).

Pollock spatial distribution trends in midwater were compared for 2004 through 2016 survey years. While pollock backscatter was relatively widely distributed throughout the survey area in 2004 (Fig. 13), densities were lower and more concentrated west of 170° W from 2006 to 2012. In 2014, pollock backscatter increased east of the Pribilof Islands, resulting in a spatial distribution pattern similar to 2004. This spatial pattern continued with even higher backscatter densities in 2016. Spatial distribution patterns for near-bottom pollock backscatter between 2004 and 2016 suggest that from 2004 through 2012, pollock were most concentrated in the central portion of the survey area near the Pribilof Islands (Fig. 14). In 2014 and 2016, pollock backscatter increased and expanded across the entire survey area, with the exception of portions of the outer shelf area.

Temporal patterns in pollock numbers and biomass at length and age since 1994 were examined for both midwater and near-bottom pollock (Figs. 15-18, and Tables 13-15). Since 2014, the 2012 year class (40-41cm, 4-year-olds in 2016, the second most abundant in the time series since 1994) and the 2013 year class (33-35 cm, 3-year-olds in 2016), have grown to dominate the midwater abundance. Older year classes have generally contributed less of the total abundance in the AT survey since about 2006 compared to early years (1994+). For example, the 2008 year class (~48-52 cm, 8-year-olds) in 2016, though present, only made up about 8% of the total numbers.

The EBS pollock population tends to depend on the success of strong year classes at roughly a 3-5 year frequency (Ianelli et al. 2017). Years with good recruitment are evident in recent AT survey results (e.g., 1997, 2007-2010, 2014) by the presence of relatively large numbers of 1-2 year olds (Table 13, Figs. 15, 17). In all survey years examined, the near bottom stratum appears to comprise mainly pollock over 40 cm (typically ages 4 to 10+) and 8 to 19 cm (age-1 pollock; Table 14, Figs. 16, 18). In 2016, the 2008 year class made up 23% of the total near-bottom biomass and the 2012 year class made up 22%; there were relatively few age 1 pollock.

Pollock biomass estimates for the stock portion in midwater, near-bottom, and combined were plotted for the U.S. EEZ survey area between 1994 and 2016 (Fig. 19). The midwater biomass averaged 2.54 million t. The near-bottom biomass averaged 0.64 million t, which represented about 21% of the average combined biomass of 3.17 million t. The near-bottom biomass ranged from 12% (2010) to 30% in (2009) of the combined biomass over the time series. The near bottom estimate was 16% of the combined estimate of 4.8 million t in 2016. When these new, near-bottom survey estimates were added to the midwater estimates, the combined values were 14 to 43% higher than midwater estimates alone over the 1994-2016 time series.

The non-pollock portion of observed midwater acoustic backscatter at 38 kHz ("non-pollock backscatter") is assumed to represent a temporally-varying mixture of largely unidentified zooplankton and fishes. This backscatter has varied spatially over the AT survey time series. Most non-pollock backscatter (at 38 kHz) has been observed in the upper part of the water column above the thermocline (Honkalehto et al. 2008). Non-pollock backscatter observed in midwater in 2016, a very warm year, consisted of two large patches covering a broad region at the north ends of transects from south of St. Matthew Island eastward into Bristol Bay (Fig. 20). Non-pollock backscatter observed in 2004 covered large portions of the survey area on the middle shelf from the Alaska Peninsula to Cape Navarin, Russia. It diminished during years of relatively cold Bering Sea conditions between 2006 and 2010. Concentrations were observed in some years (e.g., 2007, 2008, 2012, and 2014) near the Pribilof Islands. This backscatter information should be interpreted with caution because the exact biological composition of the scatterers is unknown.

An Acoustic Index of Euphausiid Biomass in the EBS

Euphausiids, principally *Thysanoessa inermis* and *T. raschii*, are among the most important prey items for walleye pollock in the Bering Sea (e.g., Livingston 1991, Lang et al. 2000, Brodeur et al. 2002). Acoustic data at four frequencies (18, 38, 120, and 200 kHz) and Methot trawl sampling (2004-2016) were used to classify euphausiid backscatter and create an index of euphausiid biomass on the Bering Sea shelf from 2004 to the present (De Robertis et al. 2010, Ressler et al. 2012). In 2016, 10 Methot trawls targeted suspected euphausiid backscatter during daytime and 38 oblique Methot trawls were conducted at night as part of a study of euphausiid acoustical properties and net avoidance. Preliminary results show the spatial distribution and relative magnitude of the euphausiid backscatter was patchy across the survey area, with highest backscatter densities appearing near submarine canyon edges (Pribilof, Zhemchug, Pervenets, and Navarin canyons), near Unimak Pass, and across shallower regions of the southeastern shelf (Fig. 21). The total amount of euphausiid backscatter observed in 2016 was the lowest value of the entire euphausiid time series (Fig. 22).

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TABLES AND FIGURES

Table 1. -- Simrad ER60 38 kHz acoustic system description and settings used during the summer 2016 acoustic-trawl surveys of walleye pollock in the eastern Bering Sea, results from standard sphere acoustic system calibrations conducted in association with the surveys, and final analysis parameters.

		System settings	13 June Captain's Bay Unalaska	16 Aug. Captain's Bay Unalaska	Final analysis parameters
Echosounder		Simrad ER60	--	--	Simrad ER60
Transducer		ES38B	--	--	ES38B
Frequency (kHz)		38	--	--	38
Transducer depth (m)		9.15	--	--	9.15
Pulse length (ms)		0.512	--	--	0.512
Transmitted power (W)		2000	--	--	2000
Angle sensitivity	Along	22.76	--	--	22.76
	Athwart	21.37	--	--	21.37
2-way beam angle (dB)		-20.74	--	--	-20.74
Gain (dB)		21.80	21.80	21.84	21.82
s_A correction (dB)		-0.57	-0.57	-0.61	-0.59
Integration gain (dB)		21.23	21.22	21.23	21.23
3 dB beamwidth	Along	6.76	6.76	6.74	6.75
	Athwart	7.19	7.19	7.21	7.20
Angle offset	Along	-0.02	-0.02	-0.04	-0.03
	Athwart	-0.04	-0.04	-0.06	-0.05
Post-processing sv threshold (dB)		-70	--	--	--
Measured standard sphere TS (dB)		--	-42.16	-42.21	--
Sphere range from transducer (m)		--	20.70	18.87	--
Absorption coefficient (dB/m)		0.0100	0.0098	0.0094	0.0100
Sound velocity (m/s)		1470.0	1473.8	1485.3	1470.0
Water temp at transducer (°C)		--	7.4	10.6	--

Note: Gain and beam pattern terms are defined in the Operator Manual for Simrad ER60 Scientific echosounder application, which is available from Simrad Strandpromenaden 50, Box 111, N-3191 Horten, Norway.

Table 2. -- Trawl stations and catch data summary from the summer 2016 eastern Bering sea shelf walleye pollock acoustic trawl survey

Haul	area	Gear[a]	Date	Time	Duration	Start position		Depth (m)		Temp. (°C)		Walleye pollock		Other
no.		type	(GMT)	(GMT)	(minutes)	Lat. (N)	Long. (W)	footrope	bottom	headrope	surface[b]	(kg)	number	(kg)
1	U.S. east of 170°	Methot	14-Jun	9:23	1.23	57 9.79	-162 4.81	19.1	56.79	6.27	10.8			
2	U.S. east of 170°	Methot	14-Jun	10:25	0.27	57 9.95	-162 5.30	51.4	56.84	6.21	10.7			5.3
3	U.S. east of 170°	Methot	14-Jun	12:02	0.23	57 9.95	-162 5.27	51.2	57.21	6.18	10.7			7.5
4	U.S. east of 170°	AWT	14-Jun	18:42	34.93	56 35.60	-162 7.31	65.5	75.99	5.2	11.3	57.1	88	171.4
5	U.S. east of 170°	AWT	14-Jun	23:19	30.57	56 14.24	-162 9.24	73.7	78.67	5.18	11	81.6	136	229.6
6	U.S. east of 170°	Methot	15-Jun	8:31	5.1	56 30.17	-161 32.81	21.7	66.33	7.39	10.6			
7	U.S. east of 170°	Methot	15-Jun	9:29	0.18	56 30.14	-161 32.98	61.7	65.86	5.74	10.6			13.5
8	U.S. east of 170°	Methot	15-Jun	11:06	0.08	56 30.13	-161 33.17	59.6	66	5.74	10.6			9.4
9	U.S. east of 170°	83/112	15-Jun	21:19	27.07	56 45.19	-160 55.97	67.2	67.14	5.79	11.7	5.4	7	31.5
10	U.S. east of 170°	83/112	16-Jun	3:58	12.78	56 13.37	-161 32.78	60.9	60.88	5.77	11.2	3,151.5	5,073	548.5
11	U.S. east of 170°	Methot	16-Jun	9:53	0.35	55 49.14	-162 45.66	61.5	68.6	5.52	10.9			
12	U.S. east of 170°	AWT	16-Jun	16:39	18.83	55 46.66	-162 47.08	54.0	65.87	5.76	10.7	47.8	85	2,133.2
13	U.S. east of 170°	AWT	17-Jun	5:51	11.92	56 53.00	-163 18.46	55.4	68.66	4.94	11.4	2.8	6	118.0
14	U.S. east of 170°	StereoDropCam	17-Jun	8:29	9.35	56 42.47	-163 20.21			5.68				
15	U.S. east of 170°	Methot	17-Jun	9:31	0.18	56 42.77	-163 19.51	69.6	73.36	4.82	11.2			7.5
16	U.S. east of 170°	Methot	17-Jun	10:59	0.27	56 42.79	-163 19.42	68.5	73.42	4.8	11.1			25.7
17	U.S. east of 170°	AWT	17-Jun	15:34	7.08	56 39.86	-163 18.39	71.7	75.65	4.8	10.9	133.8	244	82.4
18	U.S. east of 170°	AWT	17-Jun	20:18	9.95	56 7.22	-163 21.22	82.0	86.41	4.66	10.6	157.4	286	502.4
19	U.S. east of 170°	AWT	18-Jun	0:52	44.33	55 42.95	-163 19.87	76.3	84.35	5.07	10.8	562.3	983	287.1
20	U.S. east of 170°	Methot	18-Jun	8:25	0.17	55 16.21	-163 54.05	59.3	65.27	6.55	10.6			38.7
21	U.S. east of 170°	Methot	18-Jun	10:19	0.38	55 16.24	-163 54.01	59.1	65.51	6.54	10.6			
22	U.S. east of 170°	StereoDropCam	18-Jun	11:56	1.62	55 16.18	-163 53.95			6.54				
23	U.S. east of 170°	AWT	18-Jun	21:42	14.48	56 6.10	-163 56.29	69.4	89.28	5.06	10.6	119.8	210	390.5
24	U.S. east of 170°	83/112	19-Jun	3:50	19.15	56 45.01	-163 55.87	72.6	73.79	4.76	10.8	392.8	748	245.7
25	U.S. east of 170°	AWT	19-Jun	18:22	20.8	56 41.29	-164 31.80	66.6	74.67	4.92	10.2	433.7	727	51.9
26	U.S. east of 170°	AWT	19-Jun	23:05	1.92	56 13.82	-164 31.54	84.0	88.53	4.65	10.2	393.6	736	177.5
27	U.S. east of 170°	Methot	20-Jun	3:00	25.43	56 4.31	-164 32.00	85.4	90.45	4.7	10.2			16.8
28	U.S. east of 170°	AWT	20-Jun	7:29	10.55	55 51.64	-164 30.51	82.9	94.94	4.88	9.9	449.2	902	4.3
29	U.S. east of 170°	Methot	20-Jun	10:58	0.3	55 50.94	-164 31.93	30.4	94.96	7.07	10			
30	U.S. east of 170°	Methot	20-Jun	17:04	14.88	55 27.45	-164 32.02	95.4	101.32	5.51	9.9			1.1
31	U.S. east of 170°	AWT	20-Jun	22:18	21.57	55 7.10	-164 30.41	64.5	73.38	6.5	9.9	312.5	617	176.1
32	U.S. east of 170°	Methot	21-Jun	8:38	0.33	54 40.19	-165 5.92	67.4	79.48	6.95	8.6			21.4
33	U.S. east of 170°	Methot	21-Jun	10:11	0.37	54 40.15	-165 6.04	69.2	79.95	7.22	8.6			29.0
34	U.S. east of 170°	StereoDropCam	21-Jun	12:19	1.03	54 40.34	-165 5.91			7.25				
35	U.S. east of 170°	AWT	21-Jun	17:59	3.62	54 57.41	-165 5.83	83.5	105.19	6.77	8.8	179.7	347	7.7
36	U.S. east of 170°	AWT	21-Jun	21:38	2.33	55 16.09	-165 7.96	86.2	110	6.45	9.6	769.0	1493.92	6.2
37	U.S. east of 170°	AWT	22-Jun	3:06	0.93	55 42.94	-165 8.72	92.6	104.53	5.92	10.2	128.1	254	7.4

Table 2. -- Cont.

Haul no.	Area	Gear[a] type	Date (GMT)	Time (GMT)	Duration (minutes)	Start position Lat. (N)	Start position Long. (W)	Depth (m) footrope	Depth (m) bottom	Temp. (°C) headrope	Temp. (°C) surface[b]	Walleye pollock (kg)	Walleye pollock number	Other (kg)
38	U.S. east of 170°	Methot	22-Jun	8:57	0.3	56 19.11	-165 8.37	81.4	88.2	4.63	10.2			5.7
39	U.S. east of 170°	Methot	22-Jun	10:38	0.23	56 19.2	-165 8.502	81.5	88.0	4.63	10.3			14.7
40	U.S. east of 170°	StereoDropCam	22-Jun	12:06	1.23	56 19.12	-165 8.388		88.0	4.63	10.2			
41	U.S. east of 170°	AWT	22-Jun	16:55	8.57	56 46.31	-165 8.646	67.3	75.7	4.61	10.2	33.8	65	29.6
42	U.S. east of 170°	AWT	23-Jun	2:33	0.3	57 3.498	-165 46.73	59.2	71.0	4.32	9.8	13.8	29	44.6
43	U.S. east of 170°	AWT	23-Jun	4:11	18.55	57 3.204	-165 46.22	59.6	71.4	4.3	9.7	105.1	233	17.9
44	U.S. east of 170°	AWT	23-Jun	18:01	15.33	56 11.12	-165 44.33	80.4	97.4	5.22	9.9	377.7	755	13.0
45	U.S. east of 170°	Methot	25-Jun	8:30	25.82	54 51.77	-166 11.03	44.8	153.7	8.07	9.1			1.8
46	U.S. east of 170°	Methot	25-Jun	10:38	0.43	54 51.58	-166 11.14	144.8	153.1	4.72	9.1			3.2
47	U.S. east of 170°	StereoDropCam	25-Jun	12:34	1.28	54 51.26	-166 11.98		154.5	4.72	9.2			
48	U.S. east of 170°	AWT	25-Jun	18:56	8.63	55 34.19	-166 18.72	106.6	126.2	5.04	9.9	600.8	1163	1.1
49	U.S. east of 170°	Methot	26-Jun	8:41	0.23	57 43.03	-166 26.18	58.0	65.9	4.67	9.9			5.1
50	U.S. east of 170°	Methot	26-Jun	10:23	0.27	57 42.97	-166 25.97	59.1	66.0	4.67	9.9			6.9
51	U.S. east of 170°	AWT	26-Jun	21:07	16.08	56 34.38	-166 57.01	87.1	100.6	4.96	9.8	394.1	842	1.0
52	U.S. east of 170°	AWT	27-Jun	1:59	8.75	56 5.958	-166 56.24	114.2	128.4	4.74	10.2	302.1	564	13.0
53	U.S. east of 170°	Methot	27-Jun	8:40	0.23	55 13.06	-166 53.39	137.0	143.2	4.66	10.2			5.9
54	U.S. east of 170°	Methot	27-Jun	10:31	0.28	55 13.04	-166 53.27	136.6	143.0	4.66	10.2			6.7
55	U.S. east of 170°	StereoDropCam	27-Jun	12:18	3.98	55 12.89	-166 52.85		142.6	4.66	10.2			
56	U.S. east of 170°	Methot	28-Jun	1:09	30.45	55 22.48	-167 29.55	131.8	143.6	4.7	10			2.0
57	U.S. east of 170°	Methot	28-Jun	2:54	30.43	55 22.41	-167 29.56	131.3	143.5	4.66	10.2			3.0
58	U.S. east of 170°	StereoDropCam	28-Jun	4:23	15.95	55 22.03	-167 29.35		143.2	4.64	10.1			
59	U.S. east of 170°	AWT	28-Jun	6:43	3.52	55 29.01	-167 30.11	107.2	139.4	4.91	10.6	674.6	1089	1.6
60	U.S. east of 170°	Methot	28-Jun	9:07	0.23	55 32.12	-167 30.46	128.4	137.9	4.68	10.5			2.0
61	U.S. east of 170°	Methot	28-Jun	10:51	0.27	55 31.99	-167 30.43	131.0	137.7	4.66	10.2			1.3
62	U.S. east of 170°	StereoDropCam	28-Jun	12:20	1.33	55 32.08	-167 29.98		137.6	4.68	10.3			
63	U.S. east of 170°	AWT	28-Jun	18:11	9.27	55 57.74	-167 33.26	114.2	132.8	4.78	10.4	475.1	903	2.4
64	U.S. east of 170°	AWT	29-Jun	1:05	10.17	56 32.4	-167 36.29	96.2	108.5	5.09	10.3	834.0	1647	5.6
65	U.S. east of 170°	AWT	29-Jun	7:16	41.55	57 9.798	-167 39.85	60.9	74.8	5.15	10	106.0	197	12.5
66	U.S. east of 170°	Methot	29-Jun	10:31	0.3	57 9.408	-167 39.12	69.4	75.3	4.44	10			3.6
67	U.S. east of 170°	Methot	29-Jun	12:12	0.28	57 9.27	-167 39.08	64.0	75.3	4.43	9.9			2.4
68	U.S. east of 170°	83/112	30-Jun	2:41	13.3	57 16.88	-168 17.65	74.1	75.1	4.57	10.5	247.7	392	72.9
69	U.S. east of 170°	Methot	30-Jun	8:42	0.25	56 26.69	-168 12.34	120.6	129.4	4.72	10.6			2.2
70	U.S. east of 170°	Methot	30-Jun	10:18	0.35	56 26.69	-168 12.11	122.4	129.6	4.71	10.5			4.0
71	U.S. east of 170°	StereoDropCam	30-Jun	12:02	1.9	56 26.78	-168 11.71		129.3	4.72	10.4			
72	U.S. east of 170°	AWT	30-Jun	16:24	5.92	56 21.09	-168 12.86	116.6	148.4	4.71	10.2	641.3	1211	5.7
73	U.S. east of 170°	AWT	30-Jun	21:05	4	55 54.28	-168 10.34	136.3	142.0	4.42	9.9	711.6	1132	5.0
74	U.S. east of 170°	AWT	1-Jul	6:23	16.9	55 53.96	-168 44.56	151.5	155.3	4.06	9.8	413.3	538	6.0
75	U.S. east of 170°	Methot	1-Jul	9:44	0.08	55 54.03	-168 44.68	143.5	157.5	4.05	9.7			0.6

Table 2. -- Cont.

Haul no.	Area	Gear[a] type	Date (GMT)	Time (GMT)	Duration (minutes)	Start position Lat. (N)	Start position Long. (W)	Depth (m) footrope	Depth (m) bottom	Temp. (°C) headrope	Temp. (°C) surface[b]	Walleye pollock (kg)	Walleye pollock number	Other (kg)
76	U.S. east of 170°	Methot	1-Jul	11:33	0.32	55 54.04	-168 44.77	147.2	157.7	4.15	9.7			0.5
77	U.S. east of 170°	AWT	1-Jul	20:07	26.57	56 34.49	-168 50.67	98.8	106.7	4.77	10.9	776.5	1,463	10.9
78	U.S. east of 170°	StereoDropCam	2-Jul	7:39	1.5	58 20.38	-169 2.01		67.5	4.28	11.9			
79	U.S. east of 170°	Methot	2-Jul	9:10	0.28	58 20.12	-169 2.12	59.4	67.6	4.28	11.9			17.0
80	U.S. east of 170°	StereoDropCam	2-Jul	10:20	0.5	58 20.05	-169 1.79		67.6	4.3	11.4			
81	U.S. east of 170°	Methot	2-Jul	11:08	0.4	58 19.97	-169 2.19	61.2	67.7	4.28	11.8			20.2
82	U.S. east of 170°	AWT	8-Jul	12:15	20.53	58 35.44	-169 42.32	62.8	67.2	4.22	12.1	286.3	925	116.9
83	U.S. east of 170°	AWT	9-Jul	2:36	9.72	56 46.92	-169 27.89	70.2	76.6	5.99	10.9	339.1	573	1.4
84	U.S. east of 170°	AWT	9-Jul	16:42	15.85	56 1.33	-169 57.20	126.6	133.7	4.57	11	322.4	560	16.1
85	U.S. west of 170°	AWT	9-Jul	22:13	10.08	56 31.82	-170 0.85	87.0	100.3	6.37	9	842.4	1,685	3.0
86	U.S. west of 170°	AWT	11-Jul	8:51	18.37	57 49.47	-170 14.13	66.7	73.7	4.53	12	238.7	490	239.6
87	U.S. west of 170°	Marinovich	11-Jul	19:51	31.58	58 29.29	-170 20.33	14.1	73.9	11.21	12.8			15.8
88	U.S. west of 170°	AWT	11-Jul	23:35	30.63	58 47.98	-170 21.73	70.3	72.1	3.29	12.7	127.1	322	9.0
89	U.S. west of 170°	AWT	12-Jul	4:15	18.83	59 9.50	-170 26.74	73.0	68.9	3.34	12.9	173.6	691	147.7
90	U.S. west of 170°	AWT	12-Jul	8:06	24.53	59 29.35	-170 29.29	60.9	67.2	3.56	13.1	532.6	1,847	33.9
91	U.S. west of 170°	AWT	12-Jul	23:38	27.67	59 24.31	-171 8.50	72.6	74.4	2.67	13.3	472.7	1,508	130.6
92	U.S. west of 170°	AWT	13-Jul	8:33	24.43	58 1.31	-170 54.20	73.3	84.9	4.22	13.4	1,276.2	2,965	5.0
93	U.S. west of 170°	Marinovich	13-Jul	18:44	38.25	57 25.38	-170 48.15	20.0	81.3	9.74	12.4			13.7
94	U.S. west of 170°	AWT	14-Jul	1:42	7.67	56 37.41	-170 40.15	123.3	114.3	4.79	12.3	122.4	249	1.8
95	U.S. west of 170°	AWT	14-Jul	5:31	10.67	56 15.39	-170 36.47	111.0	122.9	4.71	11.9	1,246.5	2,390	6.5
96	U.S. west of 170°	AWT	14-Jul	8:25	4.13	56 9.49	-170 35.84	115.5	169.7	4.64	11.8	715.2	1,167	5.1
97	U.S. west of 170°	AWT	14-Jul	16:40	22.75	56 20.26	-171 13.41	135.3	139.5	4.51	11.6	365.6	569	8.2
98	U.S. west of 170°	AWT	14-Jul	22:04	9.43	56 47.34	-171 18.11	109.8	115.2	4.9	11.8	795.2	1,661	1.2
99	U.S. west of 170°	Marinovich	15-Jul	9:48	34.03	58 48.82	-171 18.70	17.3	114.4	10.26	11.8			18.1
100	U.S. west of 170°	AWT	15-Jul	18:41	8.25	57 18.82	-171 24.35	94.4	99.3	5.09	12.2	308.2	682	4.4
101	U.S. west of 170°	AWT	16-Jul	8:35	14.35	58 2.93	-171 32.30	81.0	96.6	3.45	12.9	1,186.9	3,276	0.1
102	U.S. west of 170°	Marinovich	16-Jul	9:52	30.75	58 3.78	-171 29.81	19.7	95.8	10.08	12.9			
103	U.S. west of 170°	Marinovich	16-Jul	11:10	32.45	58 4.40	-171 24.69	20.0	94.4	10.39	12.9	0.0	1	1.7
104	U.S. west of 170°	Marinovich	16-Jul	18:01	10.35	58 30.85	-171 36.67	18.7	93.3	9.48	13.2			13.0
105	U.S. west of 170°	AWT	16-Jul	21:08	9.32	58 32.30	-171 37.13	85.2	92.9	2.37	13.2	679.6	1,739	4.9
106	U.S. west of 170°	AWT	17-Jul	1:28	33.23	59 2.74	-171 42.68	79.2	84.5	2.44	14.2	567.5	1,572	25.0
107	U.S. west of 170°	AWT	17-Jul	10:00	47.37	59 49.54	-171 52.36	70.2	74.9	2	13.8	206.2	442	4.3
108	U.S. west of 170°	AWT	17-Jul	21:19	9.98	59 13.02	-172 23.79	83.8	89.8	1.96	13.3	985.7	2,710	18.3
109	U.S. west of 170°	AWT	18-Jul	3:11	10.98	58 40.45	-172 17.32	91.1	101.0	2.38	14	811.8	2,670	4.6
110	U.S. west of 170°	AWT	18-Jul	8:35	14.92	58 6.29	-172 10.39	91.8	103.3	4.07	13.8	416.2	1,086	-
111	U.S. west of 170°	Methot	18-Jul	21:04	25.88	57 6.97	-171 59.13		112.8		13.4			3.8
112	U.S. west of 170°	Methot	18-Jul	22:33	30.52	57 7.06	-171 59.16	103.7	112.7	4.77	13.4			13.4
113	U.S. west of 170°	AWT	19-Jul	1:36	16.98	57 1.43	-171 58.12	110.8	115.6	4.85	13.5	239.3	465	1.5
114	U.S. west of 170°	AWT	19-Jul	6:36	15.8	56 31.57	-171 51.64	142.9	161.3	4.46	12.8	456.4	631	3.7
115	U.S. west of 170°	AWT	19-Jul	16:55	8.27	56 37.25	-172 30.71	162.3	195.2	4.29	12.5	218.0	322	0.4

Table 2. -- Cont.

Haul no.	Area	Gear[a] type	Date (GMT)	Time (GMT)	Duration (minutes)	Start position Lat. (N)		Long. (W)		Depth (m) footrope	bottom	Temp. (°C) headrope	surface[b]	Walleye pollock (kg)	number	Other (kg)
116	U.S. west of 170°	AWT	20-Jul	17:56	8.77	57	2.76	-172	34.64	109.9	119.6	4.78	12.6	296.0	668	0.2
117	U.S. west of 170°	AWT	21-Jul	1:41	8.82	58	7.96	-172	48.37	95.7	106.6	3.58	13.1	1,067.1	2871	-
118	U.S. west of 170°	AWT	21-Jul	8:51	12.33	59	1.40	-172	59.15	79.3	105.7	3.9	12.8	870.8	2681	0.0
119	U.S. west of 170°	AWT	21-Jul	21:27	39.6	59	57.52	-173	12.11	71.5	76.9	1.54	12.7	440.6	780	9.1
120	U.S. west of 170°	AWT	22-Jul	8:31	60.9	60	34.00	-174	4.70	78.3	88.7	1.04	11.1	411.4	713	1.0
121	U.S. west of 170°	AWT	22-Jul	21:17	11.5	59	39.76	-173	48.41	98.1	104.1	1.79	12.7	768.6	2110	3.5
122	U.S. west of 170°	AWT	23-Jul	1:11	6.63	59	18.38	-173	43.03	98.7	109.6	2.79	12.8	1,029.0	3263	0.3
123	U.S. west of 170°	AWT	23-Jul	8:18	7.28	58	29.84	-173	31.83	101.6	120.6	4.35	12.1	320.5	912	7.0
124	U.S. west of 170°	Methot	23-Jul	10:03	0.08	58	28.12	-173	30.07	110.0	119.3	4.13	12.2			3.0
125	U.S. west of 170°	Methot	23-Jul	10:55	0.6	58	28.15	-173	30.01	109.7	119.2	4.13	12.1			2.2
126	U.S. west of 170°	AWT	23-Jul	19:19	5.5	57	56.35	-173	23.89	109.2	118.6	4.15	12.1	783.3	1948	5.1
127	U.S. west of 170°	AWT	24-Jul	1:29	22.33	57	9.87	-173	13.14	109.6	124.6	4.67	11.9	560.4	1087	6.8
128	U.S. west of 170°	AWT	24-Jul	6:38	7.85	56	40.13	-173	5.44		146.4	4.51	12.1	505.7	800	4.1
129	U.S. west of 170°	AWT	31-Jul	6:56	25.75	57	17.53	-173	52.28	234.5	241.0	3.97	12	13.5	16	121.4
130	U.S. west of 170°	AWT	31-Jul	19:47	34.72	57	41.37	-173	58.52	98.8	121.8	4.5	12.1	10.0	15	527.8
131	U.S. west of 170°	AWT	1-Aug	2:07	26.12	58	17.21	-174	7.50	124.7	129.9	4.33	12.4	550.9	896	10.5
132	U.S. west of 170°	AWT	1-Aug	7:59	1.83	58	58.13	-174	18.16	93.5	128.9	3.56	12.6	379.8	1386	1.2
133	U.S. west of 170°	AWT	1-Aug	17:59	23.1	59	16.04	-174	22.58	78.2	119.7	4.96	12.4	451.6	1783	6.7
134	U.S. west of 170°	AWT	1-Aug	23:20	9.35	59	48.07	-174	30.46	97.2	112.2	2.58	12.5	726.5	2743	3.9
135	U.S. west of 170°	AWT	2-Aug	7:33	55.77	61	3.09	-174	54.41	81.4	93.4	1.07	12.1	1,463.6	3517	9.1
136	U.S. west of 170°	AWT	2-Aug	19:20	25.4	61	30.97	-174	59.94	77.5	87.0	-0.75	11.4	1,380.3	3146	4.2
137	U.S. west of 170°	AWT	3-Aug	8:12	12.62	61	22.78	-175	38.52	79.8	97.6	0.79	11.4	225.3	1821	1.3
138	U.S. west of 170°	Methot	3-Aug	11:29	0.57	61	21.10	-175	40.43	90.6	98.1	0.88	11.4	0.4	3	8.7
139	U.S. west of 170°	Methot	3-Aug	12:38	0.92	61	21.81	-175	39.95	87.7	97.9	0.81	11.4			9.1
140	U.S. west of 170°	AWT	3-Aug	21:04	16.02	60	30.20	-175	21.90	90.1	108.8	1.64	12.1	739.2	1954	1.7
141	U.S. west of 170°	AWT	4-Aug	2:38	2.42	59	59.66	-175	14.57	110.3	117.4	2.46	12.7	506.2	2027	2.4
142	U.S. west of 170°	AWT	4-Aug	6:15	6.83	59	39.31	-175	8.58	99.8	126.8	2.73	12.6	492.9	2495	24.4
143	U.S. west of 170°	AWT	4-Aug	18:18	2.9	59	11.63	-175	0.56	109.6	131.1	2.87	12.1	370.8	1509	3.0
144	U.S. west of 170°	AWT	4-Aug	22:03	11.12	58	54.58	-174	55.70	110.8	129.8	3.51	12.3	566.7	1525	11.9
145	U.S. west of 170°	AWT	5-Aug	2:13	24.37	58	42.94	-174	52.84	152.6	158.3	3.74	12.4	989.9	1636	0.4
146	U.S. west of 170°	Methot	5-Aug	10:50	0.47	58	44.57	-174	52.34	141.7	147.4	3.69	12.4			3.2
147	U.S. west of 170°	Methot	5-Aug	12:00	0.4	58	44.60	-174	52.52	139.1	146.9	3.68	12.5	0.6	1	6.2
148	U.S. west of 170°	AWT	5-Aug	20:44	10.2	58	53.27	-175	34.68	111.9	129.7	2.55	12.1	2,160.0	7144	0.6
149	U.S. west of 170°	AWT	6-Aug	3:46	4.43	59	31.66	-175	46.14	121.5	137.3	2.45	12.3	610.9	4395	1.3
150	U.S. west of 170°	AWT	6-Aug	8:18	11.2	59	48.44	-175	51.35	107.8	135.0	2.66	12.3	397.9	2670	3.1
151	U.S. west of 170°	StereoDropCam	6-Aug	11:15	15.3	59	49.22	-175	51.22		134.5		12.3			
152	U.S. west of 170°	StereoDropCam	6-Aug	11:45	15.27	59	49.26	-175	51.52		134.6	2.49	12.3			
153	U.S. west of 170°	StereoDropCam	6-Aug	12:22	15.28	59	49.25	-175	52.05		134.7		12.3			
154	U.S. west of 170°	StereoDropCam	6-Aug	12:56	14.75	59	49.24	-175	52.56							
155	U.S. west of 170°	AWT	6-Aug	21:35	13.25	60	37.25	-176	6.23	104.2	118.3	2.02	12.1	917.5	2823	3.9

Table 2. -- Cont.

Haul	Area	Gear[a]	Date	Time	Duration	Start position				Depth (m)		Temp. (°C)		Walleye pollock		Other
no.		type	(GMT)	(GMT)	(minutes)	Lat. (N)		Long. (W)		footrope	bottom	headrope	surface[b]	(kg)	number	(kg)
156	U.S. west of 170°	AWT	7-Aug	4:46	13.2	61	25.57	-176	21.94	99.6	107.2	1.06	11.4	432.3	2,364	4.1
157	U.S. west of 170°	AWT	7-Aug	10:08	30.43	61	43.41	-176	27.61	57.8	105.6	0.67	11	415.8	1,971	7.1
158	U.S. west of 170°	AWT	7-Aug	19:22	17.5	61	5.556	-176	56.63	106.2	120.9	1.86	12.2	533.2	2,103	3.8
159	U.S. west of 170°	AWT	8-Aug	1:24	5.2	60	48.83	-176	50.93	109.5		2.14		494.3	2,388	2.9
160	U.S. west of 170°	AWT	8-Aug	7:38	2.42	60	12.68	-176	38.3	101.6	138.5	2.38	12.2	371.5	2,036	9.4
161	U.S. west of 170°	StereoDropCam	8-Aug	10:11	15.22	60	14.29	-176	38.17		138.1		12.2			
162	U.S. west of 170°	StereoDropCam	8-Aug	10:37	15.23	60	14.25	-176	37.45		137.9		12.2			
163	U.S. west of 170°	StereoDropCam	8-Aug	11:10	15.22	60	14.21	-176	36.59		137.0	2.29	12.1			
164	U.S. west of 170°	StereoDropCam	8-Aug	11:38	15.22	60	14.19	-176	35.79		136.4	2.46	12.1			
165	U.S. west of 170°	StereoDropCam	8-Aug	13:03	15.22	60	12.4	-176	37.71		137.6	1.67	12.1			
166	U.S. west of 170°	StereoDropCam	8-Aug	13:35	15.32	60	12.26	-176	36.6		137.1	1.71	12.0			
167	U.S. west of 170°	StereoDropCam	8-Aug	14:28	15	60	12.27	-176	39.1							
168	U.S. west of 170°	StereoDropCam	8-Aug	14:59	15.22	60	11.84	-176	39.22		138.4		11.9			
169	U.S. west of 170°	AWT	8-Aug	19:42	31.13	59	39.81	-176	27.29	91.6	137.0	2.62	11.8	1,512.9	6,370	2.0
170	U.S. west of 170°	AWT	9-Aug	1:00	2.92	59	8.472	-176	16.42	121.0	139.0	2.51	11.7	410.6	980	0.0
171	U.S. west of 170°	AWT	9-Aug	6:53	48.72	58	39.06	-176	6.99	138.8	145.5	2.92	11.4	89.7	117	10.2
172	U.S. west of 170°	StereoDropCam	9-Aug	10:52	15.28	58	39.05	-176	7.872		145.3	2.95	11.4			
173	U.S. west of 170°	StereoDropCam	9-Aug	11:28	15.23	58	38.78	-176	8.088		146.7		11.4			
174	U.S. west of 170°	StereoDropCam	9-Aug	12:06	15.27	58	38.98	-176	7.74		145.6		11.4			
175	U.S. west of 170°	StereoDropCam	9-Aug	12:58	15.25	58	38.69	-176	7.914		147.1	2.96	11.4			
176	U.S. west of 170°	Methot	9-Aug	18:08	26.52	58	42.53	-176	48.18	101.0	131.1	3.31	11.7			3.5
177	U.S. west of 170°	Methot	9-Aug	19:50	26.5	58	42.33	-176	49.27	122.2	131.9	3.17	11.6			11.5
178	U.S. west of 170°	AWT	10-Aug	2:45	7.15	59	7.626	-176	56.51	126.3	146.0	3.35	11.9	1,499.3	3,774	0.7
179	U.S. west of 170°	AWT	10-Aug	7:51	25.12	59	43.01	-177	8.802	109.8	160.7	2.81	12	144.6	445	18.4
180	U.S. west of 170°	StereoDropCam	10-Aug	10:54	15.27	59	42.26	-177	8.112		160.2		12.1			
181	U.S. west of 170°	StereoDropCam	10-Aug	11:23	15.25	59	42.22	-177	7.536		159.2	3.33	12.1			
182	U.S. west of 170°	StereoDropCam	10-Aug	11:57	15.25	59	42.15	-177	6.882		157.5		12.1			
183	U.S. west of 170°	StereoDropCam	10-Aug	12:30	15.25	59	42.04	-177	6.21		157.0		12.1			
184	U.S. west of 170°	StereoDropCam	10-Aug	13:18	15.23	59	41.83	-177	6.87		159.9	3.23	12.1			
185	U.S. west of 170°	StereoDropCam	10-Aug	13:55	15	59	41.6	-177	6.498							
186	U.S. west of 170°	StereoDropCam	10-Aug	14:27	15	59	41.33	-177	6.348							
187	U.S. west of 170°	StereoDropCam	10-Aug	14:58	15.28	59	41.05	-177	6.366		162.7		12.1			
188	U.S. west of 170°	AWT	10-Aug	19:57	38.1	60	13.58	-177	21.37	123.8	140.2	1.77	12.0	633.7	2,644	10.5
189	U.S. west of 170°	AWT	11-Aug	1:36	21.58	60	52.39	-177	35.09	122.3	135.8	1.45	12.0	547.5	2,445	14.8
190	U.S. west of 170°	AWT	11-Aug	5:50	8.98	61	12.94	-177	41.92	117.0	140.8	1.50	12.1	777.1	4,582	19.3
191	U.S. west of 170°	StereoDropCam	11-Aug	8:55	15.25	61	12.64	-177	40.85		140.8		12.1			
192	U.S. west of 170°	StereoDropCam	11-Aug	9:22	15.25	61	12.83	-177	41.27		140.9	1.53	12.1			
193	U.S. west of 170°	StereoDropCam	11-Aug	10:03	15.25	61	12.66	-177	40.93		140.7	1.55	12.1			
194	U.S. west of 170°	StereoDropCam	11-Aug	10:33	15.2	61	12.91	-177	41.39		141.0		12.1			

Table 2. -- Cont.

Haul no.	Area	Gear[a] type	Date (GMT)	Time (GMT)	Duration (minutes)	Start position Lat. (N)	Start position Long. (W)	Depth (m) footrope	Depth (m) bottom	Temp. (°C) headrope	Temp. (°C) surface[b]	Walleye pollock (kg)	Walleye pollock number	Other (kg)
195	U.S. west of 170°	StereoDropCam	11-Aug	11:04	15.23	61 13.16	-177 41.95		141.3		12.1			
196	U.S. west of 170°	StereoDropCam	11-Aug	11:31	15.22	61 13.47	-177 42.44		141.5		12.1			
197	U.S. west of 170°	StereoDropCam	11-Aug	12:33	15.22	61 12.81	-177 41.44		140.8	1.54	12.0			
198	U.S. west of 170°	StereoDropCam	11-Aug	13:06	15.2	61 13.20	-177 42.2		141.2	1.54	12.1			
199	U.S. west of 170°	AWT	11-Aug	18:26	2.07	60 43.93	-178 13.64	125.2	166.1	2.17	11.4	430.7	2,655	0.31
200	U.S. west of 170°	AWT	11-Aug	23:25	16.67	60 20.56	-178 2.178	144.2	154.2	2.02	11.9	298.1	1,297	0.23
201	U.S. west of 170°	AWT	12-Aug	6:08	13.08	59 48.07	-177 50.24	122.4	144.9	2.14	11.7	425.3	1,314	7.17
202	U.S. west of 170°	StereoDropCam	12-Aug	9:18	15.25	59 39.26	-177 46.88		231.8		11.7			
203	U.S. west of 170°	StereoDropCam	12-Aug	10:05	15.27	59 39.04	-177 46.21		218.2	3.55	11.7			
204	U.S. west of 170°	StereoDropCam	12-Aug	10:53	15.25	59 39.01	-177 46.55		228.0	3.58	11.7			
205	U.S. west of 170°	Methot	12-Aug	22:46	27.97	58 46.11	-177 26.54	130.2	137.8	3.53	11.1			1.51
206	U.S. west of 170°	Methot	13-Aug	0:29	28.6	58 45.65	-177 26.38	135.2	139.0	3.41	11.1			2.60
207	U.S. west of 170°	StereoDropCam	13-Aug	10:32	15.23	59 17.09	-178 10.85		288.8		11.3			
208	U.S. west of 170°	StereoDropCam	13-Aug	11:09	15.23	59 17.08	-178 11.3		282.1	4.01	11.4			
209	U.S. west of 170°	StereoDropCam	13-Aug	11:46	15.23	59 17.13	-178 11.84		282.8	4.04	11.4			
210	U.S. west of 170°	StereoDropCam	13-Aug	12:27	15.2	59 17.22	-178 12.56		301.6		11.4			
211	U.S. west of 170°	StereoDropCam	13-Aug	13:22	15.27	59 16.88	-178 10.17		274.1		11.3			
212	U.S. west of 170°	StereoDropCam	13-Aug	14:04	15	59 17.09	-178 11.29							
213	U.S. west of 170°	StereoDropCam	13-Aug	14:48	15.23	59 17.26	-178 12.41		304.0	3.93	11.3			
214	U.S. west of 170°	StereoDropCam	13-Aug	15:49	15.38	59 17.18	-178 11.51		291.9	3.95	11.3			
215	U.S. west of 170°	StereoDropCam	13-Aug	16:39	15.22	59 17.35	-178 11.97		301.2		11.3			
216	U.S. west of 170°	AWT	14-Aug	2:15	18.08	60 38.18	-178 49.74	214.9	232.7	2.74	12.2	302	591	62.18
217	U.S. west of 170°	AWT	14-Aug	20:50	20.48	61 7.45	-173 28.83	68.6	75.2	0.90	11.8	109	208	15.13

[a]AWT = Aleutian wing trawl, 83-112 = eastern bottom trawl, Methot = Methot trawl, Marinovich = small mesh midwater trawl
[b]shipboard sensor at 1.4 m depth.

Table 3.--Catch by species, and numbers of individual length and weight measurements taken from 104 Aleutian wing (midwater) trawls during the summer 2016 acoustic-trawl survey of walleye pollock on the eastern Bering Sea shelf.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock (age 1+)	*Gadus chalcogrammus*	53,654.4	89.5	151,758	93.7	33,919	4,560
northern sea nettle	*Chrysaora melanaster*	4,913.3	8.2	5,842	3.6	695	326
northern rockfish	*Sebastes polyspinis*	497.1	0.8	1,012	0.6	216	35
Pacific herring	*Clupea pallasi*	264.2	0.4	1,667	1.0	227	155
chum salmon	*Oncorhynchus keta*	201.2	0.3	94	0.1	94	93
smooth lumpsucker	*Aptocyclus ventricosus*	126.2	0.2	63	<0.1	63	39
Pacific ocean perch	*Sebastes alutus*	117.3	0.2	153	0.1	153	55
Pacific cod	*Gadus macrocephalus*	52.5	0.1	18	<0.1	18	17
lion's mane	*Cyanea capillata*	45.9	0.1	266	0.2	125	115
Aequorea spp.	Aequoreidae (family)	18.6	<0.1	83	0.1	24	24
dusky rockfish	*Sebastes variabilis*	6.5	<0.1	4	<0.1	4	4
fried egg jellyfish	*Phacellophora camtchatica*	6.3	<0.1	16	<0.1		
yellowfin sole	*Limanda aspera*	5.8	<0.1	12	<0.1	12	12
jellyfish unident.	Scyphozoa (class)	4.8	<0.1	615	0.4		
northern rock sole	*Lepidopsetta polyxystra*	2.8	<0.1	5	<0.1	5	5
magistrate armhook squid	*Berryteuthis magister*	1.7	<0.1	4	<0.1	4	4
Alaska plaice	*Pleuronectes quadrituberculatus*	1.5	<0.1	1	<0.1	1	1
sturgeon poacher	*Podothecus acipenserinus*	1.1	<0.1	16	<0.1	16	16
Atka mackerel	*Pleurogrammus monopterygius*	1.0	<0.1	1	<0.1	1	1
rock sole sp.	*Lepidopsetta* spp.	1.0	<0.1	2	<0.1	2	2
flathead sole	*Hippoglossoides elassodon*	0.6	<0.1	1	<0.1	1	1
lamprey unidentified	Petromyzontidae (family)	0.6	<0.1	1	<0.1	1	1
capelin	*Mallotus villosus*	0.5	<0.1	36	<0.1	36	36
arrowtooth flounder	*Atheresthes stomias*	0.4	<0.1	1	<0.1	1	1
moon jelly	*Aurelia labiata*	0.3	<0.1	77	<0.1	38	8
eulachon	*Thaleichthys pacificus*	0.3	<0.1	5	<0.1	5	5
moon jelly unidentified	*Aurelia* spp.	0.3	<0.1	20	<0.1	6	6
eelpout unidentified	Zoarcidae (family)	0.2	<0.1	1	<0.1	1	1
hydrozoans unidentified	Hydrozoa (class)	0.1	<0.1	28	<0.1		
walleye pollock (age 0)	*Gadus chalcogrammus*	0.1	<0.1	179	0.1	127	
helmet jellyfish	*Periphylla periphylla*	0.1	<0.1	6	<0.1		
salps unidentified	Salpa (order)	<0.1	<0.1	6	<0.1		
comb jelly unidentified	Ctenophora (phylum)	<0.1	<0.1	3	<0.1		
prowfish	*Zaprora silenus*	<0.1	<0.1	12	<0.1	12	9
squid unident.	Teuthoidea (order)	<0.1	<0.1	2	<0.1	2	1
amphipod unident.	Amphipoda (order)	<0.1	<0.1	20	<0.1		
Greenland turbot	*Reinhardtius hippoglossoides*	<0.1	<0.1	1	<0.1	1	1
purple-orange sea star	*Pisaster ochraceus*	<0.1	<0.1	1	<0.1		
Pacific sand lance	*Ammodytes hexapterus*	<0.1	<0.1	3	<0.1	2	0
Gadid larvae	Gadidae (family)	<0.1	<0.1	4	<0.1	4	0
Isopod unidentified	Isopoda (order)	<0.1	<0.1	2	<0.1		
Total		59,926.4		162,041		35,689	5,534

Table 4.-- Catch by species, and numbers of individual length and weight measurements taken from four 83-112 bottom trawls during the summer 2016 acoustic-trawl survey of walleye pollock on the eastern Bering sea shelf.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock (age 1+)	*Gadus chalcogrammus*	3797.4	80.9	6221	73.6	1249	163
rock sole spp.	*Lepidopsetta* spp.	230.5	4.9	731	8.6	63	22
yellowfin sole	*Limanda aspera*	212.3	4.5	671	7.9	73	23
Pacific cod	*Gadus macrocephalus*	152.7	3.3	43	0.5	30	30
northern sea nettle	*Chrysaora melanaster*	83.3	1.8	192	2.3	101	37
Pacific sleeper shark	*Somniosus pacificus*	51.0	1.1	1	<0.1	1	1
purple-orange sea star	*Asterias amurensis*	44.7	1.0	240	2.8		
Alaska skate	*Bathyraja parmifera*	27.5	0.6	5	0.1	2	2
arrowtooth flounder	*Atheresthes stomias*	25.7	0.5	55	0.7	36	14
flathead sole	*Hippoglossoides elassodon*	11.8	0.3	40	0.5	24	24
hermit crab unident.	Paguridae (family)	8.0	0.2	59	0.7		
Alaska plaice	*Pleuronectes quadrituberculatus*	7.8	0.2	11	0.1	11	11
whelk unident.	Buccinidae (family)	6.2	0.1	52	0.6		
great sculpin	*Myoxocephalus polyacathocepha*	6.2	0.1	4	<0.1	4	4
Pacific halibut	*Hippoglossus stenolepis*	5.8	0.1	4	<0.1	1	1
sea anemone unident.	Actiniaria (order)	5.4	0.1	18	0.2		
red king crab	*Paralithodes camtschaticus*	5.4	0.1	4	0.1	1	1
basketstar	*Gorgonocephalus eucnemis*	5.3	0.1	11	0.1		
Tanner crab	*Chionoecetes bairdi*	2.9	0.1	6	0.1	3	3
Aequorea spp.	Aequoreidae (family)	2.0	<0.1	13	0.2	3	3
bivalve unident.	Bivalvia (class)	1.9	<0.1	38	0.5		
Pacific lyre crab	*Hyas lyratus*	0.7	<0.1	4	0.1		
Kamchatka flounder	*Atheresthes evermanni*	0.5	<0.1	2	<0.1	2	2
tunicate unident.	Ascidiacea (class)	0.5	<0.1	10	0.1		
sturgeon poacher	*Podothecus acipenserinus*	0.4	<0.1	4	<0.1	4	4
lion's mane	*Cyanea capillata*	0.1	<0.1	2	<0.1	2	2
graceful decorator crab	*Oregonia gracilis*	0.1	<0.1	4	<0.1		
lyre crab unident.	*Hyas* spp.	<0.1	<0.1	1	<0.1		
Amphipod unident.	Amphipoda (order)	<0.1	<0.1	1	<0.1		
Total		4,696.0		8,449		1,610.0	347

Table 5. -- Catch by species, and numbers of individual length and weight measurements taken from six Marinovich (midwater) trawls during the summer 2016 acoustic-trawl survey of walleye pollock on the eastern Bering Sea shelf.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
Aequorea spp.	Aequoreidae (family)	26.4	42.4	130	1.0	14	14
northern sea nettle	*Chrysaora melanaster*	21.6	34.7	44	0.3	14	14
lion's mane	*Cyanea capillata*	8.9	14.3	12	0.1	12	12
Aurelia spp.	Aureliinae (subfamily)	3.0	4.8	189	1.4	7	7
walleye pollock (age 0)	*Gadus chalcogrammus*	0.8	1.3	3,449	26.0	83	
euphausiid unident.	Euphausiidae (family)	0.6	0.9	7,392	55.6		
jellyfish unident.	Scyphozoa (class)	0.4	0.7	121	0.9		
crustacean unident.	Crustacea (subphylum)	0.3	0.5	1,808	13.6		
snailfish unident.	Liparidae (family)	0.1	0.1	9	0.1	1	1
fish larvae unident.	Actinopterygii (class)	<0.1	<0.1	93	0.7		
comb jelly unident.	Ctenophora (phylum)	<0.1	<0.1	2	<0.1		
walleye pollock (age 1+)	*Gadus chalcogrammus*	<0.1	<0.1	1	<0.1	1	1
prowfish	*Zaprora silenus*	<0.1	<0.1	3	<0.1	3	2
squid unident.	Teuthoidea (order)	<0.1	<0.1	7	0.1	7	0
amphipod unident.	Amphipoda (order)	<0.1	<0.1	27	0.2		
gadid larvae unident.	Gadidae (family)	<0.1	<0.1	3	<0.1	3	0
Total		62.3		13,290		145	51

Table 6. -- Catch by species, and numbers of individual length and weight measurements taken from 48 Methot trawls during the summer 2016 acoustic-trawl survey of walleye pollock on the eastern Bering Sea shelf.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
northern sea nettle	*Chrysaora melanaster*	205.1	57.9	696	0.1	295	212
euphausiid unident.	Euphausiidae (family)	72.7	20.5	1,235,844	90.8		
moon jelly	*Aurelia labiata*	33.6	9.5	152	<0.1	57	24
Aequorea jellyfish unident.	*Aequorea* spp.	15.5	4.4	192	<0.1	159	154
jellyfish unident.	Scyphozoa (class)	7.8	2.2	6,443	0.5	15	2
coelenterate unident.	Cnidaria (phylum)	3.2	0.9	3,075	0.2	20	-
fried egg jellyfish	*Phacellophora camtchatica*	2.6	0.7	2	<0.1	2	2
helmet jellyfish	*Periphylla periphylla*	2.3	0.6	348	<0.1	172	78
copepod unident.	Copepoda (subclass)	2.2	0.6	87,765	6.5		
lion's mane	*Cyanea capillata*	1.8	0.5	27	<0.1	27	27
fish larvae unident.	Actinopterygii (class)	1.1	0.3	4,539	0.3		
walleye pollock (age 1+)	*Gadus chalcogrammus*	1.0	0.3	4	<0.1	4	4
walleye pollock (age 0)	*Gadus chalcogrammus*	0.9	0.3	6,565	0.5	119	
Alaska plaice	*Pleuronectes quadrituberculatus*	0.8	0.2	1	<0.1	1	1
crab unident.	Decapoda (order)	0.8	0.2	10,683	0.8		
comb jelly unident.	Ctenophora (phylum)	0.7	0.2	35	<0.1	26	26
hermit crab unident.	Paguridae	0.5	0.1	18	<0.1		
amphipod unident.	Amphipoda (order)	0.4	0.1	773	0.1		
flatfish larvae	Pleuronectifomes (order)	0.3	0.1	894	0.1		

Table 6.-- Continued.

Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
shrimp unident.	Decapoda (order)	0.3	0.1	902	0.1		
Aurelia jellyfish unident.	*Aurelia* sp.	0.2	0.1	36	<0.1		
basketstar	*Gorgonocephalus eucnemis*	0.1	<0.1	1	<0.1		
crustacean unident.	Crustacea (subphylum)	0.1	<0.1	391	<0.1		
squid unident.	Teuthoidea (order)	0.1	<0.1	277	<0.1	1	-
flatfish unident.	Pleuronectiformes (order)	0.1	<0.1	145	<0.1		
echiuroid worm unident.	Echiura (phylum)	0.1	<0.1	73	<0.1		
Fusitriton sp.	*Fusitriton* sp.	0.1	<0.1	3	<0.1		
humpy shrimp	*Pandalus goniurus*	0.1	<0.1	60	<0.1		
starfish unident.	Asteroidea (class)	<0.1	<0.1	1	<0.1		
bat star	*Asterina miniata*	<0.1	<0.1	16	<0.1		
bivalve unident.	Bivalvia (class)	<0.1	<0.1	5	<0.1		
Pacific sand lance	*Ammodytes hexapterus*	<0.1	<0.1	55	<0.1	2	-
flatworm unident.	Platyhelminthes (phylum)	<0.1	<0.1	123	<0.1		
worm unident.	Annelida (phylum)	<0.1	<0.1	89	<0.1		
Tanner crab	*Chionoecetes* sp.	<0.1	<0.1	12	<0.1		
fish eggs unident.		<0.1	<0.1	142	<0.1		
brittlestar unident.	Ophiuroidea (class)	<0.1	<0.1	133	<0.1		
fish unident.	Actinopterygii (class)	<0.1	<0.1	31	<0.1		
polychaete tubes	Polychaeta (class)	<0.1	<0.1	14	<0.1		
prowfish	*Zaprora silenus*	<0.1	<0.1	3	<0.1	3	3
snail unident.	Gastropoda (class)	<0.1	<0.1	4	<0.1		
hydrozoan unident.	Hydrozoa (class)	<0.1	<0.1	5	<0.1		
unsorted shells, etc.		<0.1	<0.1	14	<0.1		
pandalid shrimp unident.	Pandalidae (family)	<0.1	<0.1	5	<0.1		
crangonid shrimp unident.	*Crangon* sp.	<0.1	<0.1	3	<0.1	3	-
dungeness crab	*Cancer magister*	<0.1	<0.1	2	<0.1		
empty bivalve shells	Bivalvia (class)	<0.1	<0.1	1	<0.1		
gadidae larvae	Gadidae (family)	<0.1	<0.1	4	<0.1	4	-
gammarid amphipod uniden	Gammaridae (family)	<0.1	<0.1	4	<0.1		
lyre crab unident.	*Hyas* sp.	<0.1	<0.1	1	<0.1		
prickleback unident.	Stichaeidae (family)	<0.1	<0.1	1	<0.1	1	-
smooth lumpsucker	*Aptocyclus ventricosus*	<0.1	<0.1	1	<0.1		
Total		354.3		1,360,611		924	536

Table 7. -- Number of walleye pollock biological samples and measurements collected during the summer 2016 acoustic-trawl survey of the eastern Bering Sea shelf.

Haul	Walleye pollock age 1+						Age-0 walleye pollock
no.	Lengths	Weights	Maturity	Otoliths	Ovaries	Gonad wts	lengths
4	88	60	60	30	17	15	
5	137	50	50	30	12	0	1
9	7	7	7	7	2	1	
10	424	50	50	33	11	1	
12	95	50	50	30	13	1	10
13	6	6	6	6	4	2	
16							10
17	244	50	50	30	16	0	
18	306	50	50	30	16	1	20
19	362	50	50	32	10	2	4
23	210	50	50	30	21	3	
24	426	51	51	31	14	4	
25	451	52	52	32	14	5	
26	434	50	50	30	17	0	
28	369	50	50	30	10	0	
31	376	50	50	22	9	0	
35	347	50	50	20	7	0	
36	412	50	50	20	10	0	
37	256	50	50	20	10	0	2
41	75	49	49	20	11	0	10
42	29	1	1	1	1	0	
43	233	50	50	22	12	3	
44	317	50	50	20	9	0	
48	339	50	50	20	10	0	
49							20
51	358	50	50	20	6	0	
52	411	55	55	24	15	10	
59	404	50	50	20	14	0	
63	401	51	51	22	16	3	
64	385	50	50	20	13	1	
65	197	50	50	20	13	7	
66							18
67							20
68	392	55	55	30	12	12	
72	371	50	50	20	10	2	
73	330	52	52	30	22	5	
74	350	50	50	30	22	5	
77	313	53	53	23	12	1	
81							20
82	423	72	57	35	19	0	
83	354	50	50	20	11	10	
84	327	32	31	20	8	0	
85	311	47	47	20	13	0	
86	490	49	49	19	6	2	
87							20
88	322	50	50	23	8	2	
89	377	54	54	25	14	1	11

Table 7. -- Cont.

Haul	Walleye pollock						Age-0 walleye pollock
no.	Lengths	Weights	Maturity	Otoliths	Ovaries	Gonad wts	lengths
90	368	54	54	29	13	3	
91	434	52	52	26	20	1	20
92	361	53	53	23	7	0	
93							20
94	254	49	49	19	8	0	6
95	301	55	55	18	11	0	
96	329	50	50	20	14	1	
97	218	24	24	20	8	0	
98	232	31	31	20	7	0	
99							25
100	221	33	33	20	13	0	6
101	382	70	50	30	14	1	
103							8
104							10
105	251	34	34	20	8	0	
106	369	42	42	21	6	2	
107	339	56	54	30	16	0	
108	351	49	49	19	8	1	2
109	353	41	40	20	11	0	
110	318	43	42	22	12	1	
111							7
112							4
113	347	40	40	20	7	3	13
114	385	40	40	20	13	7	
115	253	30	30	20	11	0	2
116	242	38	38	20	9	0	2
117	329	40	40	20	8	2	
118	372	41	41	20	8	1	
119	220	29	29	20	7	1	
120	361	40	40	20	15	4	
121	239	32	32	17	6	1	
122	431	40	40	20	9	1	
123	326	40	40	20	5	0	
126	268	31	31	20	12	0	
127	324	40	40	20	11	0	
128	284	41	41	20	9	0	
129	17	16	16	0	0	0	1
130	15	15	15	15	10	1	
131	313	40	40	20	10	8	6
132	379	40	40	20	8	0	
133	407	50	50	30	15	0	
134	384	50	46	26	8	0	
135	386	40	40	20	11	5	
136	516	50	50	30	16	3	
137	504	40	40	20	8	1	
138							20
140	377	40	40	20	11	1	3
141	341	40	40	20	9	0	

Table 7. -- Cont.

Haul no.	Walleye pollock Lengths	Weights	Maturity	Otoliths	Ovaries	Gonad wts	Age-0 walleye pollock lengths
142	366	40	40	20	13	0	
143	542	52	51	30	9	0	
144	344	40	40	23	15	0	
145	303	40	40	20	12	1	
148	433	40	40	20	14	2	
149	434	40	40	20	6	0	
150	316	42	42	22	14	1	
155	397	40	40	20	6	1	
156	437	48	43	20	9	0	
157	339	40	39	20	7	0	
158	391	42	41	21	10	1	
159	349	42	42	22	11	1	
160	387	40	40	20	12	0	
169	416	44	44	25	17	2	
170	301	40	40	20	8	0	2
171	117	40	40	30	21	12	
178	372	40	40	22	14	2	
179	377	40	40	20	10	0	
188	418	49	49	28	12	0	
189	370	56	44	24	12	1	1
190	426	42	42	22	14	2	2
199	515	41	41	21	7	0	
200	340	40	40	20	8	0	
201	349	41	41	21	14	1	
216	358	40	40	20	15	0	
217	211	39	39	21	8	0	3
Total	35,168	4,723	4,659	2,394	1,200	175	329

Table 8. -- Walleye pollock biomass from summer acoustic-trawl surveys on the U.S. EEZ portion of the Bering Sea shelf, 1994-2016. Data for the Steller sea lion Conservation Area (SCA), east of 170°W minus the SCA (E170-SCA), and the U.S. west of 170°W (W170) are estimated pollock biomass between near surface and 3 m off bottom. Relative estimation error for the biomass is indicated.

Date		Area	Biomass, million metric tons (top) and percent of total (bottom)			Total biomass	Relative estimation error
		$(nmi)^2$	SCA	E170-SCA	W170	(million metric tons)	
1994	9 Jul-19 Aug	78,251	0.312	0.399	2.176	2.886	0.047
			10.8	13.8	75.4		
1996	20 Jul-30 Aug	93,810	0.215	0.269	1.826	2.311	0.039
			9.3	11.7	79.0		
1997	17 Jul-4 Sept	102,770	0.246	0.527	1.818	2.592	0.037
			9.5	20.3	70.1		
1999	7 Jun-5 Aug	103,670	0.299	0.579	2.408	3.285	0.055
			9.1	17.6	73.3		
2000	7 Jun-2 Aug	106,140	0.393	0.498	2.158	3.049	0.032
			12.9	16.3	70.8		
2002	4 Jun -30 Jul	99,526	0.647	0.797	2.178	3.622	0.031
			17.9	22.0	60.1		
2004	4 Jun -29 Jul	99,659	0.498	0.516	2.293	3.307	0.037
			15.1	15.6	69.3		
2006	3 Jun -25 Jul	89,550	0.131	0.254	1.175	1.560	0.039
			8.4	16.3	75.3		
2007	2 Jun -30 Jul	92,944	0.084	0.168	1.517	1.769	0.045
			4.7	9.5	85.8		
2008	2 Jun -31 Jul	95,374	0.085	0.029	0.883	0.997	0.076
			8.5	2.9	88.6		
2009	9 Jun -7 Aug	91,414	0.070	0.018	0.835	0.924	0.088
			7.6	2.0	90.4		
2010	5 Jun -7 Aug	92,849	0.067	0.113	2.143	2.323	0.060
			2.9	4.8	92.3		
2012	7 Jun -10 Aug	96,852	0.142	0.138	1.563	1.843	0.042
			7.7	7.5	84.8		
2014	12 Jun -13 Aug	94,361	0.426	1.000	2.014	3.439	0.046
			12.4	29.1	58.6		
2016	12 Jun -17 Aug	100,674	0.516	1.005	2.542	4.063	0.021
			12.7	24.7	62.6		

Table 9. -- Numbers-at-length estimates (millions) of walleye pollock between near surface and 3 m off bottom from acoustic- trawl surveys in the U.S. EEZ, 1994-2016.

Length (cm)	**1994**	**1996**	**1997**	**1999**	**2000**	**2002**	**2004**	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**	**2014**	**2016**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0.03	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0.01	0.03	0	0	0	0	0	4.42	0	0.23	0	0
10	0	0	2.04	0.12	0.76	0.01	0.24	0	30.12	0	45.53	0	0.12	0.22	0
11	0.40	0	0.19	4.78	2.30	0.77	0.20	5.29	259.94	0.74	221.44	0.92	0.83	15.20	0.58
12	5.44	0.47	30.13	14.43	5.50	4.70	2.56	59.83	662.11	2.82	768.23	8.56	3.05	73.28	0.58
13	44.79	5.44	238.10	22.71	19.26	21.36	2.38	144.42	1329.33	6.70	1112.48	65.31	5.75	471.20	2.85
14	94.23	38.20	1416.21	22.35	36.70	100.48	4.08	117.62	1497.63	9.47	1087.89	259.44	9.52	915.69	2.87
15	179.82	131.29	2949.25	16.20	56.69	194.98	1.84	84.56	803.62	6.13	1046.86	508.46	14.37	1131.56	9.43
16	166.05	227.77	3364.00	5.20	79.57	178.72	1.80	27.81	563.27	4.38	535.32	799.69	14.04	922.81	5.99
17	105.16	317.31	2207.83	5.20	50.81	99.74	1.76	10.15	304.17	7.78	266.25	698.61	11.66	560.93	5.97
18	129.71	215.26	1309.13	12.92	22.39	33.47	1.12	2.90	114.52	49.99	84.01	304.04	8.78	294.77	4.43
19	212.54	115.39	569.51	44.60	30.27	40.07	4.34	4.73	133.95	128.23	82.88	155.46	24.43	102.72	11.32
20	381.96	64.79	181.06	152.57	47.16	61.90	8.40	10.85	117.76	264.22	55.95	175.31	78.52	70.99	20.72
21	589.69	37.20	74.90	251.49	92.37	162.63	23.15	17.43	145.33	402.13	77.20	228.58	188.37	101.82	56.09
22	794.28	64.41	81.07	314.31	136.41	289.69	34.90	31.71	147.44	440.61	106.28	374.84	311.68	209.38	121.39
23	788.35	60.24	150.80	288.90	185.76	485.72	47.06	37.50	129.53	568.91	135.13	629.53	391.40	434.88	163.12
24	772.58	70.32	255.93	220.31	186.04	734.73	48.21	33.77	142.76	447.11	112.14	938.65	357.38	1019.60	194.86
25	581.45	47.68	408.07	164.37	207.95	859.82	39.35	30.25	91.73	357.46	114.43	1170.05	290.16	1729.30	152.78
26	372.26	38.32	458.83	188.58	186.91	832.36	32.49	24.95	65.22	241.72	114.22	1174.04	224.05	1977.02	121.10
27	198.97	33.63	519.67	256.04	187.68	718.04	25.99	21.77	49.83	115.47	129.48	931.46	192.24	1520.76	111.38
28	122.07	60.16	422.68	302.47	168.93	516.42	29.43	25.52	32.98	79.93	139.98	578.26	207.61	950.43	140.09
29	135.90	85.07	296.50	419.16	164.76	491.26	69.82	29.78	21.87	104.00	181.74	273.70	261.16	486.46	166.61
30	138.25	122.81	175.36	435.28	167.17	507.57	90.09	35.24	18.40	129.13	205.96	131.43	304.50	324.20	282.41
31	178.83	183.98	115.83	417.13	169.72	592.86	148.82	42.19	16.21	119.63	253.04	89.40	279.21	216.79	455.19

Table 9. -- Cont.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
32	234.80	240.98	79.12	410.19	167.23	539.68	151.19	45.36	35.23	135.96	243.92	103.67	223.70	164.12	621.05
33	239.39	341.56	69.15	372.65	188.70	533.40	180.25	51.47	46.64	117.44	197.30	114.41	188.73	151.82	737.69
34	291.50	408.41	68.83	393.58	221.59	421.17	185.43	68.74	61.27	112.26	149.26	129.05	200.60	121.32	718.79
35	296.57	458.38	89.48	415.94	332.90	291.90	237.90	82.66	74.85	82.94	100.61	162.44	246.99	165.12	685.40
36	326.66	477.95	146.28	433.11	360.41	239.36	302.68	111.93	64.09	40.17	76.70	233.18	311.10	182.14	521.07
37	343.99	400.98	220.62	393.54	414.22	218.57	430.24	118.70	79.64	28.85	50.97	288.73	381.18	233.20	417.38
38	305.79	333.42	321.35	403.47	369.24	222.31	476.40	124.99	75.28	23.58	34.05	382.43	397.66	247.01	471.25
39	294.82	253.70	397.12	359.07	344.63	218.51	539.43	118.56	83.27	32.67	26.29	400.38	363.86	245.55	679.86
40	311.31	214.24	397.83	304.48	297.14	209.21	499.73	126.41	106.70	23.19	20.55	359.88	304.71	214.08	933.56
41	271.09	168.18	350.37	243.06	331.55	200.43	511.11	140.54	113.05	24.95	15.78	278.88	200.56	182.09	904.75
42	289.53	154.99	292.97	240.38	316.41	179.46	475.59	154.29	141.30	26.81	18.00	196.02	127.26	192.21	658.92
43	273.09	149.27	222.05	265.33	331.24	186.32	453.93	163.58	191.31	38.14	14.29	127.23	78.63	242.26	409.12
44	243.93	133.46	172.49	321.32	302.44	185.26	388.07	178.01	189.44	39.27	11.12	86.81	63.74	257.74	273.54
45	256.58	117.96	125.08	328.57	290.08	197.15	339.54	170.87	210.76	44.81	11.44	57.23	58.98	266.42	192.79
46	216.09	103.48	93.20	304.97	249.82	183.59	247.30	158.64	213.99	50.85	13.24	36.97	55.40	242.74	133.80
47	177.93	98.39	74.75	238.84	235.52	182.87	196.13	146.34	185.68	54.78	12.35	21.51	57.10	184.11	101.77
48	148.15	94.29	59.37	182.91	176.81	168.36	150.84	130.84	150.01	54.71	21.23	11.68	50.86	148.74	77.14
49	73.11	83.67	45.51	122.90	143.24	154.43	113.57	105.90	128.80	47.05	22.51	7.53	42.00	111.65	58.81
50	66.74	79.87	40.23	88.16	106.27	133.48	78.29	88.25	101.90	41.79	20.42	6.85	30.46	78.56	48.30
51	33.15	72.52	33.10	60.42	78.54	117.74	64.53	73.93	73.22	39.74	19.56	6.24	21.95	54.24	32.00
52	30.35	60.21	31.72	42.15	48.15	91.92	56.33	62.45	52.96	29.92	20.66	3.61	17.31	43.54	21.75
53	18.15	50.89	29.59	33.02	35.75	88.43	41.08	45.82	41.04	23.84	15.37	2.75	12.90	30.24	15.89
54	15.68	38.44	23.91	26.90	22.09	62.98	30.20	35.31	32.46	21.89	13.54	1.69	11.94	19.01	9.48
55	18.57	25.63	19.77	16.14	16.58	44.34	19.12	23.01	23.25	16.11	16.29	3.16	7.02	14.93	6.81
56	11.05	14.07	14.58	9.26	12.58	40.16	14.43	19.33	16.43	12.38	9.96	2.24	4.88	10.64	5.19
57	9.52	7.65	10.61	9.40	8.92	24.16	8.83	14.93	13.02	10.47	8.63	3.51	4.24	10.08	4.78
58	4.85	7.68	8.60	5.68	6.41	18.77	5.83	10.63	7.51	9.21	9.24	3.05	4.61	6.47	0.91
59	2.96	3.02	5.98	3.24	5.13	11.26	6.16	8.11	4.76	8.31	5.28	2.79	3.07	7.71	1.00
60	3.47	4.71	3.45	3.04	1.87	10.58	4.00	5.39	3.72	7.39	4.50	3.20	4.16	5.58	1.02
61	6.63	2.88	4.58	2.40	2.30	7.11	2.89	4.60	1.86	4.09	2.37	4.29	2.88	6.04	0.65
62	1.39	1.79	1.55	2.12	1.72	3.92	1.95	2.07	1.13	4.94	2.41	1.76	3.00	3.41	0.54
63	0.71	0.28	2.01	0.62	1.57	2.18	2.07	1.17	1.09	2.62	1.70	1.26	1.18	3.48	0.47
64	0.49	0.59	0.47	0.57	0.98	1.74	0.08	1.98	1.06	2.12	1.21	1.55	2.04	1.74	0.38

Table 9. -- Cont.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
65	1.86	0.85	0.81	0.93	0.64	1.74	0.30	0.73	0.48	1.48	1.42	1.16	1.55	2.34	0.50
66	0.77	0.35	0.32	1.42	0.70	1.16	0.55	0.85	0.60	0.67	1.15	1.26	0.72	0.71	0.00
67	0.97	0.66	1.27	0.48	0.03	0.27	0.35	0.27	0.35	0.58	0.50	1.13	0.00	0.40	0.66
68	1.46	0	0.19	0.30	0.27	0.17	0.19	0.02	0.21	0.51	0.30	1.36	0.55	0.64	0.19
69	0	0	0.59	0.29	0.59	0	0	0	0.02	0.12	0.44	0.14	0.00	0.24	0.41
70	1.93	0	0.10	0	0	0.43	0	0.02	0.30	0.21	0.04	0.36	0.40	0.76	0
71	0.49	0.11	0	<0.01	0	0.01	0	0.14	0.21	0.06	0	0	0	0.10	0
72	0.97	0	0	0.11	0.15	0	0	0.46	0	0.42	0	0.17	0	0.27	0
73	0.49	0	0.05	0.16	0	0	0	0.02	0	0.04	0	0.83	0	0	0
74	0	0	0	0	0.14	0	0	0	0.06	0.05	0	0.17	0.31	0.08	0
75	0	0	0	0.04	0	0	0	0	0	0.03	0.03	0.00	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	0.07	0
78	0.49	0	0	0	0	0	0	0	0	0	0	0.14	0	0	0
79	0	0	0	0.39	0	0	0	0.08	0	0.06	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	10,821	6,525	18,686	9,601	7,630	12,122	6,835	3,396	9,207	4,704	8,075	12,549	6,667	17,384	10,777

Table 10. -- Estimated numbers at length (millions) for walleye pollock observed between 0.5 and 3 m off bottom in the U.S. EEZ from summer Bering Sea shelf acoustic-trawl surveys 1994-2016. Trace amounts are indicated as 'tr'.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.15	0.26	0.22	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00
5	0.05	0.00	0.00	0.00	0.07	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
6	0.00	0.00	0.08	0.10	0.00	0.10	0.02	0.02	0.00	0.00	0.00	tr	0.03	0.00	0.00
7	tr	0.00	0.11	0.00	0.01	0.01	0.39	0.06	tr	0.00	0.00	0.00	0.14	0.00	0.00
8	0.09	0.92	0.44	0.10	0.33	0.35	0.04	0.19	0.13	0.04	0.05	0.02	0.11	0.02	0.00
9	0.88	4.08	6.84	2.63	1.96	1.59	0.34	1.00	0.56	0.08	1.13	0.07	0.67	1.11	0.00
10	13.03	37.16	32.57	12.69	8.24	4.64	0.77	4.64	3.27	0.36	4.08	0.03	2.53	6.33	0.23
11	28.49	121.09	79.98	44.72	15.70	12.39	1.44	6.49	12.07	1.63	8.04	0.26	12.77	16.65	3.52
12	63.41	145.52	97.58	68.11	25.88	18.35	4.02	8.22	24.95	3.64	10.54	1.44	18.51	37.89	10.13
13	83.06	177.62	237.62	69.64	39.47	27.83	8.46	10.68	45.71	7.92	13.36	5.06	18.26	62.17	21.66
14	127.92	159.40	153.21	99.56	49.93	34.16	11.85	15.18	46.91	10.38	14.40	11.40	23.25	70.96	26.64
15	104.39	129.86	159.02	96.64	30.19	42.07	10.37	13.45	27.54	6.56	7.62	12.94	14.79	47.90	21.82
16	59.46	69.41	96.58	77.00	26.56	32.11	14.81	6.00	13.91	3.07	6.67	5.34	12.98	37.71	19.59
17	49.82	41.29	46.86	44.04	10.29	16.30	7.09	1.73	7.94	1.35	2.78	5.44	4.66	19.43	12.59
18	27.53	5.53	24.20	13.93	3.72	8.04	7.49	1.83	3.80	1.42	1.56	1.42	2.12	9.49	8.61
19	28.49	2.93	5.01	15.85	2.28	2.24	3.78	0.95	1.79	1.96	1.68	0.80	1.86	2.46	9.41
20	19.29	3.93	3.42	20.10	4.76	2.78	3.24	1.10	1.74	1.84	1.70	0.52	2.94	1.45	12.44
21	40.13	4.59	3.39	25.97	6.79	3.93	2.66	1.11	0.48	1.06	2.07	0.78	4.08	2.50	13.32
22	18.76	9.01	4.65	31.27	5.78	6.48	4.19	1.59	0.92	0.92	2.75	0.72	3.98	2.02	19.38
23	15.32	6.39	6.66	24.80	5.66	7.11	3.99	1.07	0.71	0.43	2.21	0.63	3.40	4.35	14.15
24	10.55	7.32	10.02	18.75	6.61	9.64	4.67	1.81	1.16	0.68	2.09	1.06	3.93	4.20	10.09
25	10.14	8.99	7.91	15.21	5.40	8.62	2.99	0.83	1.37	0.48	2.29	1.07	3.17	6.49	8.31
26	11.49	9.72	8.94	14.33	5.32	7.75	2.51	1.35	1.86	0.75	2.01	1.06	3.20	4.87	8.60
27	6.44	8.91	10.69	13.92	3.89	6.24	3.42	1.27	1.68	1.09	2.53	0.65	3.95	7.53	7.74
28	11.09	8.67	7.05	18.88	4.55	5.74	2.88	1.09	2.43	1.02	3.17	1.51	3.87	3.81	9.71
29	9.03	6.48	6.49	12.20	3.99	7.61	2.50	1.28	1.13	1.29	4.56	0.89	5.21	4.40	8.11
30	12.13	6.19	7.21	10.65	4.47	6.54	3.60	1.11	1.87	1.29	4.28	0.71	4.54	3.89	12.15
31	12.99	7.71	6.22	10.32	3.90	7.56	4.21	1.30	1.13	1.27	4.25	1.15	5.10	3.23	12.93
32	9.13	7.58	4.88	12.99	5.44	12.35	3.44	1.78	1.30	1.47	4.21	0.95	6.97	2.76	11.90
33	9.21	8.93	5.08	10.51	6.51	11.44	2.23	1.79	1.12	1.47	4.56	0.94	7.67	1.85	12.54
34	11.37	6.86	17.36	13.30	9.61	12.66	2.20	2.69	2.55	0.91	5.33	1.39	12.48	3.56	12.23

Table 10. -- Continued.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
35	15.20	7.51	11.32	14.82	9.86	8.43	2.57	3.37	2.89	1.04	7.84	2.15	18.87	8.30	10.58
36	17.87	7.63	34.56	18.08	14.33	19.79	3.24	5.16	3.96	2.61	11.78	3.94	31.19	12.38	12.59
37	19.76	6.90	66.30	22.78	15.17	18.15	3.90	5.94	6.09	2.25	14.15	6.39	32.89	18.87	17.00
38	24.18	10.14	75.50	33.27	19.04	36.75	8.20	10.68	6.61	5.35	12.60	10.67	48.98	26.37	33.48
39	28.02	10.21	100.85	32.23	18.07	31.03	12.00	9.35	10.20	5.75	13.52	16.94	41.19	43.34	49.54
40	34.07	12.88	79.46	29.71	25.68	42.99	27.34	16.91	13.10	8.02	14.15	24.83	43.00	40.88	74.47
41	34.47	18.12	61.74	33.18	29.38	37.39	31.90	14.06	17.13	8.78	13.62	20.35	29.34	77.53	79.15
42	38.62	22.55	53.81	47.50	43.52	48.51	51.03	24.12	25.93	19.38	12.32	20.84	28.86	85.65	81.58
43	57.55	24.57	35.42	61.91	40.16	46.53	58.04	25.85	30.65	14.37	12.80	19.77	18.22	155.03	80.14
44	62.51	27.12	26.62	74.45	49.42	55.99	76.71	29.30	37.93	23.83	11.22	15.44	26.44	158.94	79.45
45	72.92	30.43	25.05	78.98	58.49	49.02	65.76	26.92	51.20	24.15	13.78	12.57	21.72	210.24	80.74
46	65.02	31.57	29.32	78.97	73.76	56.52	71.06	31.46	44.80	38.68	14.46	14.39	32.60	169.21	76.94
47	56.31	31.28	31.18	66.56	66.27	55.05	65.90	26.80	43.17	32.91	17.82	9.44	25.29	157.77	75.67
48	48.14	40.93	35.51	70.86	62.10	57.73	72.37	30.60	45.51	42.73	22.46	8.96	27.55	108.00	73.90
49	33.67	32.60	29.11	49.61	42.91	52.05	64.89	22.91	39.67	34.13	24.11	9.71	23.60	86.83	63.11
50	27.81	23.64	36.47	44.87	41.14	48.50	62.41	25.55	40.57	30.74	22.95	13.23	23.75	69.94	52.63
51	26.33	30.82	30.51	43.37	33.10	41.53	46.67	16.21	38.26	29.96	22.80	11.86	16.55	64.12	43.41
52	22.42	26.71	33.99	34.52	32.30	41.21	44.97	17.35	32.61	28.90	21.08	14.78	16.65	46.44	33.68
53	16.27	21.63	33.47	30.55	20.62	32.04	36.17	13.72	24.46	20.89	22.44	13.77	14.15	40.43	26.18
54	14.84	22.16	29.57	30.36	17.71	24.73	29.46	11.94	25.79	18.09	21.49	17.92	15.12	33.88	22.33
55	19.96	18.92	31.02	24.94	13.72	21.70	23.44	9.49	15.07	15.63	14.19	12.91	12.11	25.13	15.19
56	15.48	17.58	28.83	22.38	12.81	19.06	21.07	8.74	15.46	14.50	14.74	12.67	12.24	20.67	12.00
57	17.97	15.95	24.81	23.15	10.59	11.21	14.95	7.01	11.37	11.25	11.59	11.01	9.44	17.17	9.16
58	14.50	14.99	25.30	16.35	9.26	12.01	10.43	6.18	8.71	9.46	10.59	10.83	9.94	19.33	7.03
59	12.45	14.41	23.53	13.26	7.52	8.38	8.52	4.76	7.74	6.73	6.52	6.95	9.08	14.12	5.11
60	11.29	10.99	21.36	12.57	5.84	7.79	7.06	3.55	5.31	6.81	7.61	8.05	8.18	10.03	3.56
61	10.63	14.45	19.49	12.85	4.83	4.61	5.60	3.44	3.63	3.98	8.03	5.87	6.76	8.88	2.58
62	8.67	9.34	14.92	8.39	4.69	5.86	4.29	2.39	4.41	4.74	5.70	5.56	7.31	8.11	3.03
63	8.66	8.93	11.10	5.69	3.36	3.58	2.91	2.46	3.16	3.94	3.43	4.25	4.90	4.78	2.91
64	5.73	9.41	12.61	5.09	3.58	3.39	1.84	1.86	2.47	2.43	3.70	4.41	5.19	4.27	1.60
65	5.43	7.31	11.20	5.12	2.16	2.86	1.23	1.07	1.75	2.11	4.89	2.71	2.67	3.65	1.06
66	3.16	6.63	7.79	4.16	1.48	1.99	0.94	1.09	1.37	1.95	3.81	1.98	3.16	3.07	1.28
67	3.19	3.16	7.30	2.56	0.99	1.35	0.56	0.73	1.12	1.33	2.46	1.46	2.44	1.44	0.75
68	2.36	3.33	6.04	2.84	1.31	1.37	0.62	0.67	0.68	1.21	1.62	1.41	2.35	0.85	0.24
69	1.18	2.49	5.04	2.27	1.11	0.60	0.23	0.40	0.46	0.53	1.61	0.87	1.19	1.54	0.64

Table 10. -- Continued.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
70	1.17	2.62	1.87	1.76	0.37	1.16	0.28	0.35	0.93	0.65	1.34	0.65	1.63	0.77	0.31
71	2.03	1.58	1.80	1.59	0.24	0.09	0.27	0.15	0.35	0.37	0.99	0.29	0.87	0.36	0.51
72	0.83	1.61	2.87	1.12	0.76	0.18	0.15	0.09	0.28	0.35	0.89	0.73	0.68	0.63	0.29
73	0.46	0.88	2.69	1.24	0.57	0.08	0.13	0.09	0.23	0.27	0.94	0.11	0.55	0.63	0.33
74	0.39	1.09	0.92	1.53	0.29	0.04	0.11	0.13	0.21	0.31	0.58	0.25	0.25	0.02	0.13
75	0.24	0.28	1.38	0.52	0.06	0.18	0.11	0.05	0.05	0.17	0.51	0.13	0.38	0.17	0.12
76	0.34	0.42	0.58	0.25	0.11	0.05	0.02	0.02	0.15	0.12	0.19	0.06	0.20	0.13	0.07
77	0.16	0.35	0.26	0.39	0.08	0.00	0.02	0.05	0.05	0.05	0.29	0.03	0.01	0.01	0.04
78	0.18	0.46	0.16	0.18	0.25	0.11	0.07	0.01	0.01	0.05	0.32	0.03	0.06	0.04	0.00
79	0.10	0.11	0.05	0.27	0.06	0.06	0.04	tr	0.08	0.03	0.09	0.03	0.06	0.15	0.00
80	0.11	0.47	0.42	0.02	0.02	0.09	0.08	0.03	0.01	0.05	0.15	0.05	0.01	0.00	0.00
81	tr	0.04	0.04	0.10	0.03	tr	0.00	tr	0.04	0.01	0.06	0.01	tr	0.00	0.00
82	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.01	tr	tr	0.00	0.00
83	0.00	0.00	0.00	0.08	0.01	0.00	0.01	0.00	0.01	tr	tr	0.00	0.00	0.00	0.00
84	0.00	0.00	0.28	0.00	0.00	0.00	0.03	0.00	0.00	0.00	tr	tr	0.00	0.00	0.00
85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	tr	0.00	0.00	0.00
86	0.00	0.00	0.00	0.00	tr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	tr	0.00	0.00	0.00
88	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00
91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	tr	0.00	0.00	0.00	0.00	0.00
92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	1,656	1,613	2,174	1,866	1,097	1,229	1,059	515	836	536	554	420	825	2,129	1,442

Table 11. -- Biomass-at-length estimates (metric tons) of walleye pollock between near surface and 3 m off bottom on the Bering Sea shelf from acoustic-trawl surveys in the U.S. EEZ, 1994-2016.

Length (cm)	**1994**	**1996**	**1997**	**1999**	**2000**	**2002**	**2004**	**2006**	**2007**	**2008**	**2009**	**2010**	**2012**	**2014**	**2016**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0
9	0	0	0	<1	<1	0	0	0	0	0	24	0	1	0	0
10	0	0	14	1	8	0	2	0	200	0	336	0	1	2	0
11	4	0	2	59	30	9	2	54	2,469	7	2,003	9	8	139	7
12	71	6	394	227	88	75	30	762	7,313	34	9,219	112	36	840	9
13	744	92	4,148	445	370	428	36	2,366	19,068	104	17,136	1,064	86	7,104	51
14	1,937	804	31,282	538	859	2,488	81	2,176	25,781	168	21,613	5,436	165	17,128	63
15	4,520	3,384	81,544	472	1,613	5,841	48	1,997	17,771	145	25,658	12,983	319	26,458	222
16	5,040	7,098	111,182	181	2,713	6,393	57	815	14,870	125	16,147	25,180	357	26,150	166
17	3,817	11,818	84,460	214	2,055	4,231	67	365	9,873	254	10,147	26,219	357	18,947	208
18	5,553	9,485	58,223	623	1,064	1,664	50	123	4,401	1,923	3,671	13,313	307	11,997	173
19	10,655	5,960	28,768	2,499	1,677	2,284	210	235	6,200	5,880	4,185	7,577	1,146	4,750	498
20	22,244	3,892	10,677	9,852	3,017	4,072	498	626	6,392	14,049	3,204	10,002	4,154	3,863	1,049
21	39,601	2,579	4,900	18,587	6,782	12,242	1,595	1,133	9,810	24,584	5,259	15,444	11,763	6,377	3,409
22	61,100	5,121	6,101	26,421	11,419	24,828	2,730	2,413	11,643	31,976	8,715	29,774	22,304	15,711	8,791
23	69,048	5,458	12,962	27,464	17,629	47,351	4,265	3,277	11,513	48,149	12,534	56,840	33,139	39,878	13,107
24	76,622	7,221	24,999	23,562	19,911	81,309	4,887	3,259	14,551	42,932	11,518	97,422	34,485	107,266	18,447
25	64,967	5,520	45,081	19,681	24,970	107,760	4,475	3,176	10,266	38,541	14,070	137,766	31,345	208,239	16,101
26	46,652	4,979	56,998	25,168	25,070	117,666	4,347	3,107	8,010	29,360	15,332	154,353	27,161	267,901	14,415
27	27,847	4,884	72,339	37,933	28,002	113,478	3,876	2,946	6,844	15,725	20,391	136,592	26,428	228,940	15,162
28	19,028	9,721	65,700	49,557	27,927	89,827	4,813	3,917	5,073	12,102	23,816	95,619	31,668	156,028	21,374
29	23,550	15,240	51,328	75,679	30,072	92,941	12,745	5,050	3,697	17,423	35,978	49,597	44,989	86,420	28,102
30	26,437	24,307	33,691	86,321	33,574	104,158	17,942	6,561	3,462	23,802	44,259	25,366	57,178	64,579	51,903
31	37,756	40,104	24,685	90,579	37,396	132,640	32,663	9,236	3,428	24,696	60,686	19,576	59,223	46,661	94,484
32	54,180	57,669	18,522	97,251	40,301	131,538	36,257	10,767	8,606	30,634	63,679	24,976	51,591	39,050	143,530
33	60,378	89,480	17,709	96,204	49,614	141,718	48,265	13,252	12,233	29,302	56,444	30,732	47,159	39,535	186,315
34	80,001	116,812	19,201	110,357	63,403	122,045	53,459	19,248	17,643	29,881	46,340	38,481	54,640	34,538	198,797
35	88,546	142,771	27,148	126,368	103,387	92,414	74,135	25,252	23,484	24,798	33,904	52,816	72,975	51,898	207,856
36	105,903	161,724	48,272	142,256	121,237	82,291	103,401	36,989	21,662	13,229	27,902	82,376	100,285	62,907	174,036
37	120,806	147,067	79,075	139,441	150,552	81,503	156,813	41,377	29,517	10,234	19,593	110,112	134,105	86,816	152,411
38	116,110	132,264	124,841	153,908	144,826	88,680	188,084	47,836	30,240	9,163	14,455	160,201	148,383	99,388	192,868
39	121,143	108,629	166,999	147,178	145,465	93,405	229,225	49,056	35,953	13,611	11,726	178,105	146,555	105,423	305,474
40	137,651	98,825	180,668	133,859	135,080	95,675	230,733	55,427	48,709	10,622	9,876	173,381	132,499	99,352	454,727

Table 11. -- Cont.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
41	129,335	83,422	171,750	114,415	161,884	98,165	252,339	65,790	54,826	11,866	8,172	143,345	93,497	91,794	471,196
42	149,294	82,523	154,670	120,957	165,982	94,168	253,443	78,528	72,602	13,379	9,940	107,271	63,506	102,788	363,575
43	152,526	85,177	125,886	142,492	185,961	104,975	261,967	87,505	105,904	20,806	8,596	73,519	41,934	139,170	234,856
44	147,017	81,478	104,750	183,897	181,482	110,994	239,860	102,839	111,390	22,429	6,934	53,494	36,511	156,242	165,797
45	166,444	76,937	81,320	200,114	185,345	125,772	222,131	103,984	131,381	27,203	7,500	37,336	36,256	171,248	122,806
46	149,720	71,999	64,736	197,389	169,854	124,740	171,216	102,312	143,460	32,686	9,387	26,169	36,036	165,883	89,126
47	131,130	72,930	55,323	164,067	170,024	132,267	142,845	100,258	131,598	37,569	9,438	15,750	40,265	132,669	69,365
48	115,921	74,352	46,750	133,183	135,575	129,623	115,709	94,693	112,575	38,443	16,576	9,524	39,020	112,824	57,571
49	60,566	70,102	38,100	94,742	116,332	126,481	92,215	81,175	101,538	36,199	18,743	6,433	33,595	89,084	45,699
50	58,531	71,016	35,728	71,872	91,389	115,778	67,512	73,481	85,481	34,038	18,222	6,199	25,604	66,638	38,869
51	30,462	68,346	31,145	52,026	71,352	108,641	58,478	63,585	64,652	33,569	18,440	6,300	19,684	48,778	27,148
52	29,789	60,080	31,560	38,303	46,186	89,753	53,394	56,209	49,596	26,625	20,583	3,889	16,239	42,644	19,215
53	18,463	53,710	31,087	31,630	36,163	91,552	41,489	44,479	39,922	23,325	15,872	2,942	13,233	30,283	14,888
54	16,856	42,859	26,500	27,130	23,496	68,832	31,998	36,086	34,719	22,249	14,241	1,945	13,440	20,268	9,119
55	21,296	30,163	23,075	17,129	18,562	51,122	21,285	25,029	26,503	17,789	17,943	3,908	8,339	16,845	7,338
56	13,207	17,456	17,914	10,327	14,788	48,961	17,136	21,089	19,415	15,024	12,046	3,032	6,059	12,796	5,537
57	11,943	9,998	13,712	11,013	11,004	30,986	11,453	17,519	16,742	13,074	11,371	4,615	5,545	12,308	5,613
58	6,368	10,573	11,671	6,984	8,300	25,335	7,517	13,507	9,953	12,444	11,563	4,159	6,376	8,237	1,264
59	4,167	4,365	8,530	4,174	6,962	15,953	8,825	10,892	6,815	11,544	8,251	4,250	4,169	10,857	1,458
60	5,001	7,163	5,155	4,104	2,656	15,550	6,038	7,784	5,687	11,354	7,402	5,271	6,400	8,005	1,554
61	10,199	4,591	7,172	3,394	3,421	11,003	4,574	6,869	2,990	6,534	4,100	7,381	4,387	9,196	1,038
62	2,285	2,998	2,550	3,135	2,679	6,415	3,214	3,241	1,874	8,250	4,373	2,936	5,028	5,838	908
63	1,196	498	3,448	953	2,551	3,683	3,585	1,937	1,934	4,528	3,241	2,241	2,028	5,604	821
64	844	1,084	843	925	1,660	3,109	139	3,360	1,958	3,835	2,423	2,844	3,478	3,009	703
65	3,382	1,637	1,531	1,562	1,122	3,223	562	1,314	928	2,717	2,978	2,325	2,921	4,148	955
66	1,467	704	617	2,497	1,296	2,202	1,097	1,587	1,212	1,303	2,525	2,802	1,432	1,446	0
67	1,929	1,386	2,622	876	52	505	717	519	734	1,201	1,150	2,522	0	864	1,384
68	3,021	0	413	567	551	352	406	46	464	1,072	729	3,292	1,192	1,422	424
69	0	0	1,351	585	1,244	0	0	0	45	273	1,096	343	0	556	938
70	4,349	0	230	0	0	945	0	51	720	493	101	911	947	1,845	0
71	1,142	267	0	3	0	33	0	322	538	132	0	0	0	253	0
72	2,380	0	0	238	351	0	0	1,084	0	1,016	0	453	0	707	0
73	1,239	0	126	362	0	0	0	57	0	112	0	2,365	0	0	0
74	0	0	0	0	362	0	0	0	181	135	0	492	858	232	0
75	1,340	0	0	90	0	0	0	0	0	90	86	11	0	0	0
76	0	0	0	0	0	0	0	0	0	0	0	457	0	0	0
77	0	0	0	0	0	0	0	0	0	0	0	0	0	220	0
78	1,503	0	0	0	0	0	0	0	0	0	0	494	0	0	0
79	0	0	0	1,118	0	0	0	245	0	181	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2,886,223	2,310,728	2,592,178	3,285,138	3,048,697	3,622,072	3,306,935	1,560,174	1,769,019	996,939	923,843	2,322,643	1,842,792	3,438,986	4,062,918

Table 12. -- Estimated biomass at length (metric tons) for walleye pollock observed between 0.5 and 3 m off bottom in the U.S. EEZ from summer Bering Sea shelf acoustic-trawl surveys 1994-2016. "0" indicates <1 metric ton.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	0	0	0	0	-	-	-	-	0	-	-
5	0	-	-	-	0	0	0	-	-	-	-	-	0	-	-
6	-	-	0	0	-	0	0	0	-	-	0	0	0	-	-
7	0	-	0	-	0	0	1	0	0	-	0	-	0	-	-
8	0	4	2	0	1	1	0	1	0	0	0	0	0	0	-
9	4	23	37	16	10	8	2	4	2	0	5	0	3	5	-
10	91	281	242	103	53	28	5	28	20	2	25	0	15	38	2
11	266	1,215	789	476	143	104	12	52	97	13	64	2	102	133	31
12	769	1,891	1,247	931	281	200	42	82	249	36	105	16	185	409	122
13	1,262	2,927	3,856	1,132	586	415	128	137	592	103	174	69	234	923	321
14	2,558	3,273	3,102	1,872	870	611	211	251	743	165	230	200	360	1,264	502
15	2,484	3,453	3,987	2,227	640	915	216	265	536	135	154	281	297	1,044	489
16	1,729	2,124	2,893	2,407	729	881	407	152	351	74	164	141	318	1,007	538
17	1,704	1,550	1,668	1,639	327	519	233	51	246	40	83	170	137	615	423
18	1,149	249	1,028	611	145	296	292	65	136	51	57	54	72	371	335
19	1,384	149	253	812	104	102	174	40	76	82	69	35	78	112	437
20	1,089	232	211	1,086	247	148	171	54	86	91	85	27	140	77	679
21	2,665	308	230	1,638	402	251	163	63	27	61	120	48	232	154	839
22	1,426	716	354	2,320	395	469	287	104	61	61	183	50	252	143	1,357
23	1,322	573	582	2,121	441	563	310	80	54	33	169	51	254	353	1,170
24	1,032	753	1,037	1,780	592	896	419	155	101	59	183	97	345	388	941
25	1,128	1,043	926	1,649	560	879	309	80	135	47	225	111	314	677	851
26	1,440	1,267	1,156	1,769	615	910	283	147	207	83	229	125	349	613	1,047
27	894	1,307	1,552	1,894	499	801	435	155	213	134	318	85	485	1,050	1,075
28	1,758	1,385	1,132	2,946	672	799	422	150	341	142	450	223	546	560	1,491
29	1,597	1,157	1,170	2,127	648	1,241	409	194	176	199	717	152	831	720	1,320
30	2,331	1,199	1,448	2,059	796	1,194	640	188	324	221	756	131	768	705	2,308
31	2,771	1,690	1,380	2,213	770	1,502	848	242	226	240	813	228	953	646	2,721
32	2,120	1,836	1,151	3,058	1,173	2,669	745	366	274	307	896	210	1,436	608	2,588
33	2,332	2,331	1,317	2,694	1,563	2,714	549	404	260	338	1,067	229	1,818	448	3,268
34	3,136	1,970	4,945	3,756	2,562	3,390	578	664	647	228	1,369	371	3,280	942	3,443
35	4,547	2,340	3,476	4,574	2,867	2,443	753	910	804	287	2,203	626	5,391	2,397	3,183

Table 12. -- Continued.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
36	5,867	2,590	11,715	6,057	4,501	6,447	981	1,519	1,202	783	3,610	1,251	9,866	4,215	3,871
37	6,959	2,489	24,608	8,254	5,262	6,435	1,322	1,902	2,010	734	4,719	2,462	11,192	6,742	6,099
38	9,219	3,990	30,196	12,948	7,064	13,712	2,915	3,707	2,368	1,895	4,813	4,147	18,028	10,485	12,907
39	11,650	4,262	43,474	13,424	7,085	12,668	4,680	3,687	3,962	2,204	5,308	7,152	16,392	18,675	20,708
40	15,201	5,884	36,710	13,153	11,230	19,253	11,465	7,289	5,502	3,326	6,171	11,532	18,296	18,761	33,999
41	16,650	8,788	30,629	15,737	13,627	17,722	14,596	6,508	8,101	4,111	6,757	10,085	13,231	37,534	38,838
42	20,428	11,926	28,668	24,245	21,670	24,332	24,600	11,869	13,008	9,426	6,424	10,998	14,311	44,705	41,286
43	32,746	13,697	19,880	33,399	21,205	25,070	31,153	13,611	17,029	7,693	7,125	11,573	9,505	86,891	44,107
44	38,574	16,526	16,012	42,782	27,898	31,990	43,530	16,630	21,475	13,703	6,771	9,477	14,553	95,200	45,795
45	48,328	19,802	16,078	47,810	34,486	29,607	39,782	16,102	32,489	15,087	8,421	8,102	12,889	134,118	49,256
46	45,753	21,795	20,212	50,938	47,304	37,090	45,207	20,166	30,164	25,121	9,850	9,749	20,691	114,064	48,923
47	42,070	23,164	22,800	45,087	43,574	37,807	45,305	18,383	29,839	22,835	12,789	6,910	17,134	112,902	51,215
48	37,768	33,066	28,073	51,065	43,979	42,207	51,523	21,482	34,659	31,146	17,665	6,877	19,496	81,734	51,701
49	28,003	27,536	24,640	38,068	31,686	40,808	49,093	17,321	31,232	26,263	19,500	7,975	18,001	69,602	46,803
50	24,617	21,222	32,957	36,503	32,197	39,259	50,379	20,439	34,703	25,437	19,914	11,434	19,008	58,711	41,297
51	24,723	29,651	29,374	36,856	27,173	35,550	40,127	13,692	33,932	25,696	20,751	10,794	14,387	57,806	36,004
52	22,651	27,182	34,403	31,294	28,155	37,961	40,458	15,589	30,873	27,418	20,580	14,258	14,819	43,669	29,422
53	17,336	23,313	35,894	29,093	19,497	31,555	34,587	13,178	24,114	20,822	22,472	14,069	13,618	40,524	23,720
54	17,047	24,959	33,822	30,534	16,899	25,167	29,925	12,202	27,218	18,518	23,318	19,526	14,894	35,814	22,039
55	24,147	22,629	37,153	26,382	14,228	23,406	24,596	10,058	16,745	17,026	15,856	14,576	12,870	27,990	15,857
56	19,945	22,333	36,860	25,382	13,813	21,686	23,867	9,680	18,253	17,005	17,702	15,318	13,310	24,004	12,966
57	24,466	21,450	33,959	27,491	12,091	13,447	17,705	8,381	14,006	13,523	14,723	13,723	11,037	20,846	10,542
58	20,858	21,477	37,021	20,726	10,994	15,454	12,780	7,601	11,222	12,252	14,058	14,461	12,099	25,259	8,410
59	18,208	21,531	36,018	17,224	9,627	11,198	11,245	6,173	10,715	8,869	9,177	9,807	11,586	19,441	6,712
60	17,571	16,808	34,229	17,484	7,913	10,925	9,598	4,982	7,558	9,640	11,032	12,007	11,181	14,538	4,629
61	17,383	23,873	33,296	18,798	6,710	6,802	8,377	4,879	5,408	5,938	12,742	9,077	9,842	13,201	3,650
62	14,642	16,268	26,934	13,185	6,975	8,977	6,411	3,668	7,047	7,684	9,005	9,231	11,209	13,076	4,604
63	15,515	15,911	19,502	9,176	5,346	5,909	4,661	3,880	5,454	6,500	5,871	7,477	7,788	8,085	4,635
64	10,766	17,569	23,687	8,914	5,813	5,787	3,047	3,067	4,373	4,175	6,604	8,180	8,741	7,698	2,678
65	10,692	14,293	22,026	9,025	3,724	5,301	2,144	1,901	3,255	3,870	9,273	5,220	4,787	6,724	1,857
66	6,517	13,567	16,029	7,673	2,699	3,661	1,703	2,046	2,738	3,637	7,675	4,016	5,861	6,167	2,333
67	6,876	6,747	15,712	4,930	1,943	2,708	1,078	1,406	2,261	2,735	5,056	3,084	4,843	2,896	1,426
68	5,330	7,438	13,590	5,696	2,589	2,754	1,276	1,370	1,500	2,496	3,439	3,114	4,728	1,806	469
69	2,790	5,815	11,846	4,753	2,316	1,291	477	878	1,020	1,164	3,581	1,993	2,489	3,214	1,335
70	2,757	6,371	4,577	3,850	832	2,515	601	763	2,277	1,474	3,141	1,595	3,433	1,677	681
71	5,213	4,018	4,616	3,610	558	199	620	345	839	919	2,514	713	2,022	851	1,152

Table 12. -- Continued.

Length (cm)	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
72	2,236	4,262	7,661	2,651	1,806	441	342	223	755	919	2,259	1,870	1,731	1,460	687
73	1,297	2,430	7,483	3,044	1,405	204	327	241	622	729	2,591	303	1,380	1,677	805
74	1,138	3,118	2,677	3,912	733	106	284	331	601	831	1,649	697	661	60	338
75	723	828	4,144	1,387	154	478	308	130	144	463	1,486	374	1,022	504	328
76	1,070	1,292	1,821	705	295	133	45	46	471	359	566	183	576	408	191
77	523	1,120	844	1,123	225	1	60	137	167	149	928	108	26	25	122
78	612	1,546	545	547	755	330	223	32	36	158	1,064	106	197	133	-
79	358	389	191	850	188	199	135	1	260	86	285	99	192	505	-
80	419	1,704	1,544	61	51	290	265	99	19	162	538	176	34	-	-
81	8	155	141	342	115	0	-	3	160	29	211	32	7	-	-
82	58	-	-	-	-	-	-	-	109	219	23	6	2	-	-
83	-	-	-	295	30	-	40	-	44	13	1	-	-	-	-
84	-	-	1,186	-	-	-	105	-	-	-	12	14	-	-	-
85	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
86	-	-	-	-	1	-	-	-	-	-	-	-	-	42	-
87	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-
88	-	-	2,051	-	-	-	-	-	-	-	-	-	-	-	-
89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-	-	169	-	-	-	-	-
91	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-
92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	742,694	634,030	998,659	856,371	577,108	683,790	702,991	312,681	508,925	408,651	400,938	319,675	453,160	1,290,842	765,876

Table 13. -- Estimated numbers-at-age (millions, top panel) and biomass-at-age (thousand metric tons, bottom panel) for walleye pollock observed between near surface and 3 m off bottom in the U.S. EEZ from summer Bering Sea shelf acoustic-trawl surveys 1994-2016. Trace amounts are indicated as 'tr'.

Age	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
1	610.2	972.3	12,360.0	111.9	257.9	634.8	15.8	455.6	5588.5	36.5	5127.9	2525.5	66.9	4438.3	38.9
2	4,781.1	446.4	2,745.2	1,587.6	1,272.3	4,850.4	275.1	208.6	1026.2	2905.3	797.5	6395.2	1963.1	8614.9	954.0
3	1,336.0	520.4	386.2	3,597.0	1,184.9	3,295.1	1,189.3	282.0	319.7	1031.6	1675.9	973.5	1640.6	941.3	4369.1
4	1,655.7	2,686.5	490.9	1,683.6	2,480.0	1,155.0	2,933.9	610.1	430.1	144.4	202.8	2183.5	2444.1	1100.7	4129.4
5	1,898.1	820.7	1,921.5	582.6	899.7	507.2	1,442.1	695.3	669.2	106.9	40.1	383.6	202.6	892.3	560.7
6	296.1	509.3	384.4	273.9	243.9	756.8	416.6	551.8	588.8	170.2	44.0	46.3	246.1	974.6	231.5
7	71.2	434.4	205.2	1,169.1	234.0	436.7	199.2	319.7	305.7	132.4	62.0	6.2	63.6	316.9	230.5
8	65.2	84.9	142.5	400.2	725.1	91.4	194.0	110.1	166.2	70.7	55.5	7.4	13.1	66.9	200.5
9	31.9	16.7	32.7	104.6	190.4	110.3	68.3	53.0	60.2	58.2	32.6	6.8	8.3	21.5	48.6
10	23.2	6.3	3.9	66.9	84.7	205.4	33.5	40.3	18.8	15.0	21.2	6.5	6.5	5.8	7.0
11	8.5	5.7	4.9	14.5	35.6	52.1	24.8	23.3	20.2	15.1	8.2	6.0	6.6	2.7	5.2
12	19.3	12.1	2.0	6.5	18.1	17.9	19.8	16.2	5.7	6.9	3.8	2.6	2.0	1.8	1.0
13	4.8	1.3	2.2	1.7	1.2	3.1	12.1	8.6	1.7	4.5	2.0	1.9	2.5	2.8	0.0
14	5.7	4.8	2.3	0.0	1.4	5.9	5.8	9.9	2.1	1.9	1.2	1.3	0.6	1.2	0.0
15	1.2	2.4	2.0	0.1	0.1	0.0	4.3	5.0	1.8	0.9	0.1	1.1	0.2	1.5	0.8
16	7.9	0.5	0.0	0.1	0.3	0.0	0.0	3.8	0.2	2.0	0.0	0.3	0.3	0.2	0.2
17	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.6	0.0	0.3	0.3	tr	0.0
18	0.0	0.5	0.0	0.4	0.1	0.0	0.0	0.1	0.0	0.6	tr	0.4	0.0	tr	0.0
19	0.7	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.6	0.4	tr	0.1	0.0	tr	0.0
20	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.0	0.0	0.0
21+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	tr	0.0	tr	0.0	tr	0.0
Total	10,821	6,525	18,686	9,601	7,630	12,122	6,834	3,396	9,207	4,704	8075.5	12,549	6,667	17,384	10,777

Age	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
1	17.1	36.7	417.8	3.3	8.1	21.2	0.4	8.8	103.4	0.8	104.4	80.0	1.6	112.0	1.2
2	425.3	35.3	369.9	156.6	144.0	645.1	31.6	21.2	89.5	242.7	78.5	750.4	182.3	1159.2	98.8
3	312.4	118.7	99.5	847.4	284.6	843.7	329.3	68.8	89.3	220.7	399.6	215.4	333.3	210.5	1165.2
4	641.3	888.8	188.6	640.2	974.4	458.2	1349.4	230.7	188.0	58.7	84.1	963.2	922.9	434.0	1994.2
5	1,067.2	396.0	921.0	271.7	488.6	286.0	820.9	366.4	389.8	61.5	23.4	216.8	112.1	488.4	293.1
6	187.2	341.8	235.0	164.3	156.0	514.5	288.7	359.8	404.3	117.3	35.7	33.4	183.2	676.9	143.1
7	50.1	359.9	161.3	751.5	166.6	351.6	153.0	244.1	240.9	106.6	56.0	5.8	54.1	241.8	159.8
8	55.3	72.5	139.5	278.9	540.8	85.6	166.3	93.2	144.8	69.4	57.0	9.9	14.1	66.7	151.9
9	30.9	16.3	34.2	84.6	149.0	111.0	62.4	49.5	58.4	56.4	36.8	10.7	10.7	24.5	38.2
10	26.4	6.6	4.4	62.5	76.3	212.5	33.1	39.2	20.7	18.9	25.1	10.5	9.9	7.4	8.0
11	10.5	6.9	6.1	14.2	39.0	59.6	25.3	23.3	22.3	18.9	10.7	10.1	8.8	4.0	6.7
12	27.9	17.1	3.4	7.2	16.7	19.7	21.9	18.7	7.1	8.6	5.5	4.9	3.4	3.1	1.3
13	6.7	1.5	4.5	1.5	1.3	4.6	12.7	10.4	2.1	6.2	3.4	3.7	4.1	5.3	0.0
14	7.7	7.0	3.8	0.0	2.6	8.5	6.2	12.7	3.7	3.2	2.5	2.5	1.0	2.2	0.0
15	2.1	3.8	2.9	0.2	0.1	0.0	5.7	5.9	2.2	1.1	0.3	2.1	0.4	2.6	1.1
16	12.5	0.9	0.0	0.2	0.3	0.0	0.0	4.3	0.3	3.3	0.0	0.7	0.5	0.3	0.4
17	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.9	0.0	0.6	0.5	tr	0.0
18	0.0	0.9	0.0	0.7	0.3	0.0	0.0	0.3	0.0	1.1	tr	1.2	0.0	tr	0.0
19	0.8	0.0	0.0	0.0	0.0	0.0	0.0	2.5	1.0	0.5	tr	0.2	0.0	tr	0.0
20	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.2	0.0	0.0	0.0
21+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1	0.0	tr	0.0	0.1	0.0
Total	2,886	2,311	2,592	3,285	3,049	3,622	3,307	1,560	1,769	997	924	2,323	1,843	3,439	4,063

Table 14. -- Estimated numbers at age (millions) for walleye pollock observed between 0.5 and 3 m off bottom in the U.S. EEZ from summer Bering Sea shelf acoustic-trawl surveys 1994-2016. Trace amounts are indicated as 'tr'.

Age	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	529.9	827.9	866.8	495.3	202.4	161.6	67.3	69.1	186.8	34.4	68.9	42.4	110.5	312.5	134.9
2	188.0	120.3	135.8	192.4	49.7	93.5	38.4	8.4	14.4	9.5	18.3	8.9	25.6	40.2	83.8
3	88.5	31.8	54.3	120.1	45.1	90.0	27.6	9.3	25.4	15.4	58.2	10.1	52.3	28.2	126.9
4	162.8	54.6	44.7	126.1	108.0	139.9	188.6	44.0	47.7	21.6	78.5	111.4	266.1	60.4	347.0
5	353.6	94.2	408.9	69.3	112.1	153.4	192.3	88.1	124.5	54.0	36.6	62.2	77.0	226.4	154.8
6	93.0	124.2	162.1	123.6	82.7	178.5	150.5	106.8	140.6	117.4	50.1	26.8	120.6	795.0	116.6
7	37.4	150.7	107.8	379.0	74.4	101.7	88.5	70.5	101.2	102.5	66.9	27.0	49.5	423.2	161.7
8	30.7	56.8	147.9	126.0	224.4	48.9	88.7	34.8	74.6	65.4	55.3	29.5	22.6	103.3	219.8
9	24.3	21.9	42.4	75.4	87.2	52.1	52.6	21.8	37.5	43.6	44.1	31.0	16.6	57.3	47.1
10	44.0	21.9	24.0	74.8	49.4	99.0	35.0	18.2	20.5	17.0	23.0	22.5	22.3	25.7	23.8
11	21.8	16.7	25.9	33.8	24.6	51.5	34.1	9.5	17.1	15.0	17.0	20.0	18.5	9.8	12.8
12	31.9	27.3	33.1	14.0	17.5	27.5	57.2	5.5	13.1	12.1	7.5	10.5	15.9	12.1	4.9
13	15.8	12.6	36.7	8.6	5.8	17.1	25.3	7.9	7.5	6.4	8.0	6.1	13.7	11.3	3.6
14	12.0	20.0	16.4	7.8	3.2	6.3	6.7	9.9	7.5	3.7	4.3	3.6	4.5	6.5	2.2
15	8.8	7.9	24.1	4.1	4.2	1.5	5.1	4.9	8.7	4.9	3.8	2.2	3.9	5.4	2.1
16	7.5	11.9	16.1	3.6	1.7	1.1	1.0	2.9	4.8	6.2	3.7	1.0	1.3	4.3	0.0
17	3.8	6.0	18.8	4.9	2.0	0.8	0.1	2.0	1.0	3.1	2.6	0.7	0.7	3.5	0.3
18	0.0	4.3	2.6	1.3	1.3	1.3	0.1	0.3	1.6	1.3	2.7	1.8	0.4	1.7	0.0
19	0.0	2.2	2.6	4.5	0.1	1.2	0.0	0.4	0.6	2.1	1.8	0.9	1.0	1.0	0.0
20	0.2	0.0	2.4	0.9	0.2	0.4	0.1	0.1	0.2	0.4	1.7	0.4	0.5	0.4	0.0
21	0.3	0.0	0.0	0.1	0.1	0.3	tr	0.0	0.1	0.0	0.7	0.3	1.0	0.2	0.0
22	0.0	0.0	0.0	0.0	0.0	0.5	tr	0.0	0.0	0.1	0.1	0.3	0.2	0.2	0.0
23	0.0	0.0	0.0	0.0	tr	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.4	0.0
24	0.0	0.0	0.0	0.0	0.0	tr	0.0	0.1	0.0	0.0	0.1	0.1	tr	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Total	1,656	1,613	2,173	1,866	1,096	1,228	1,059	515	836	536	554	420	825	2,129	1,442

Table 15. -- Estimated biomass at age (thousand metric tons) for walleye pollock observed between 0.5 and 3 m off bottom in the U.S. EEZ from summer Bering Sea shelf acoustic-trawl surveys 1994-2016. Trace amounts are indicated as 'tr'.

Age	1994	1996	1997	1999	2000	2002	2004	2006	2007	2008	2009	2010	2012	2014	2016
0	tr	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	11.3	15.8	17.0	10.3	3.5	3.1	1.6	1.1	3.0	0.6	1.1	0.9	1.7	6.0	3.3
2	14.9	7.7	10.2	14.9	3.6	6.8	4.3	0.6	1.5	0.6	1.6	0.8	2.1	4.7	7.5
3	22.1	5.4	14.5	25.8	10.1	24.9	8.9	1.4	7.7	3.6	15.1	2.7	12.2	8.9	31.6
4	83.1	19.7	17.3	51.4	44.5	59.6	98.8	17.0	23.5	9.6	35.9	54.6	105.2	25.4	170.8
5	230.4	55.5	186.3	32.7	58.4	87.5	116.0	47.8	74.5	30.8	23.4	41.0	45.4	124.2	86.9
6	68.9	91.4	110.8	74.9	48.3	119.8	107.9	68.2	103.9	82.5	38.9	22.2	86.4	538.3	75.2
7	29.1	137.7	93.5	262.4	50.4	72.4	70.0	53.2	85.0	83.7	62.8	27.8	42.1	309.1	116.3
8	32.5	56.8	152.6	108.6	164.2	40.6	72.4	29.6	68.8	58.9	55.6	33.0	22.0	100.1	174.3
9	32.4	25.7	55.2	76.9	70.5	49.0	50.1	20.3	37.1	42.9	47.4	36.3	20.3	60.7	40.9
10	56.7	28.5	30.8	77.1	46.8	95.2	33.5	19.1	22.7	18.9	30.1	28.7	27.3	29.7	23.2
11	30.8	25.8	38.8	39.6	27.5	51.2	35.0	10.3	19.4	18.4	22.5	25.7	24.1	13.7	15.0
12	46.8	44.7	53.6	17.1	20.1	31.0	59.4	6.7	15.4	14.8	11.8	15.0	20.9	16.5	7.3
13	24.4	21.4	62.0	14.9	7.7	20.9	28.1	10.1	10.4	9.0	13.3	9.8	19.6	16.5	5.7
14	20.8	35.8	28.8	13.3	4.4	9.1	8.8	12.5	10.2	5.5	7.5	6.2	7.5	9.7	3.8
15	17.0	13.0	42.1	7.0	7.1	2.2	6.3	6.4	11.9	7.2	6.4	3.9	6.6	8.6	3.6
16	12.5	23.8	29.8	6.1	3.0	1.9	1.4	3.9	6.8	9.8	7.3	1.8	2.4	6.6	0.0
17	7.6	12.1	37.2	9.6	3.6	1.5	0.1	2.7	2.1	4.9	5.6	1.6	1.4	5.1	0.5
18	0.0	9.1	5.5	2.2	2.2	2.1	0.2	0.6	2.8	2.5	5.5	3.5	0.8	2.6	0.0
19	0.0	4.1	5.5	9.6	0.3	2.3	0.0	0.7	1.1	3.2	3.5	1.9	1.7	1.8	0.0
20	0.6	0.0	5.0	1.6	0.5	0.7	0.1	0.2	0.3	0.8	3.0	0.9	1.1	0.8	0.0
21	0.8	0.0	0.0	0.3	0.2	0.7	0.0	0.1	0.2	0.0	1.8	0.6	1.9	0.4	0.0
22	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.2	0.2	0.5	0.6	0.3	0.0
23	0.0	0.0	0.0	0.0	tr	0.3	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.8	0.0
24	0.0	0.0	0.0	0.0	0.0	tr	0.0	0.2	0.0	0.0	0.2	0.2	0.1	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Total	742.7	634.0	996.6	856.4	577.1	683.8	703.0	312.7	508.9	408.5	400.9	319.7	453.2	1290.8	765.9

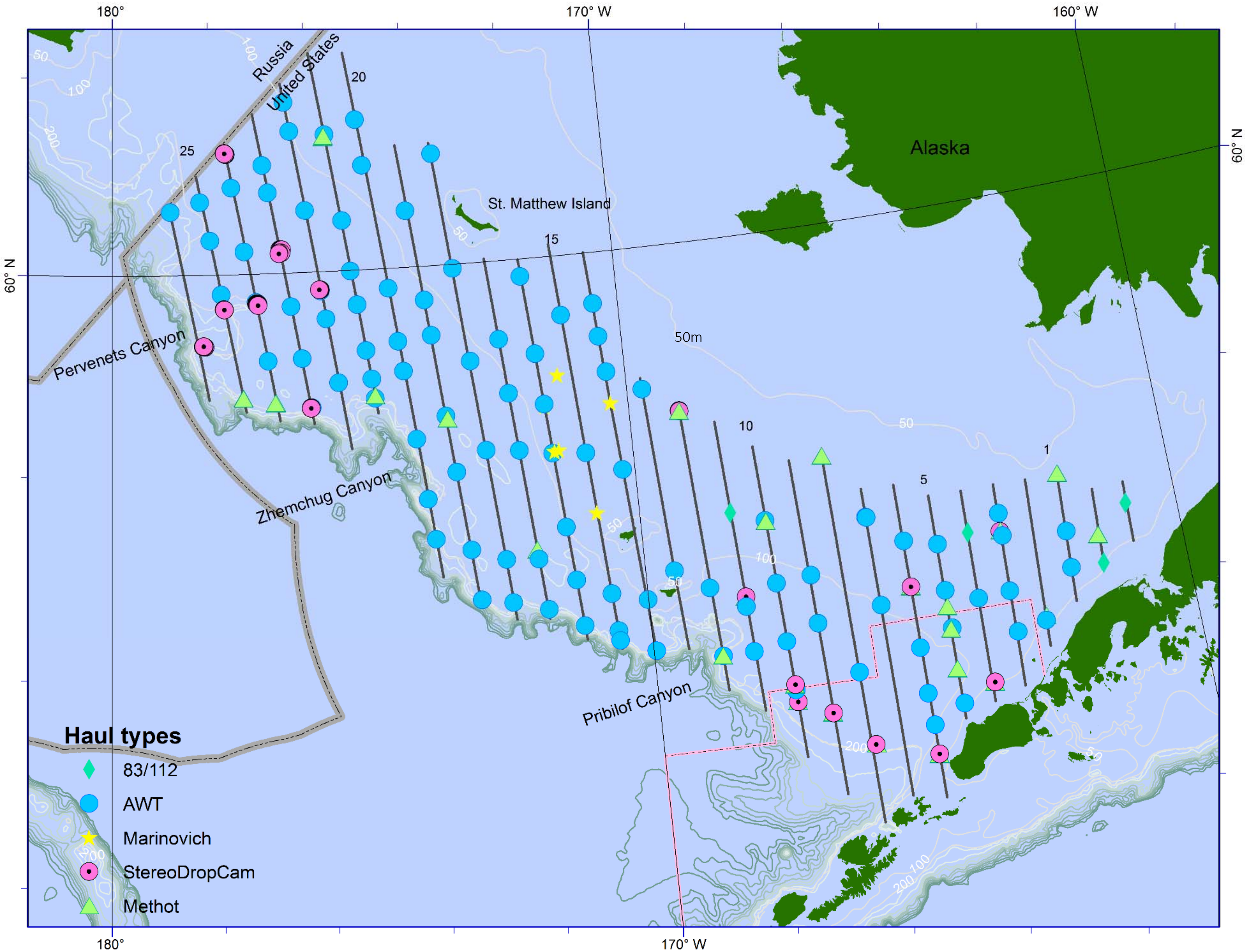
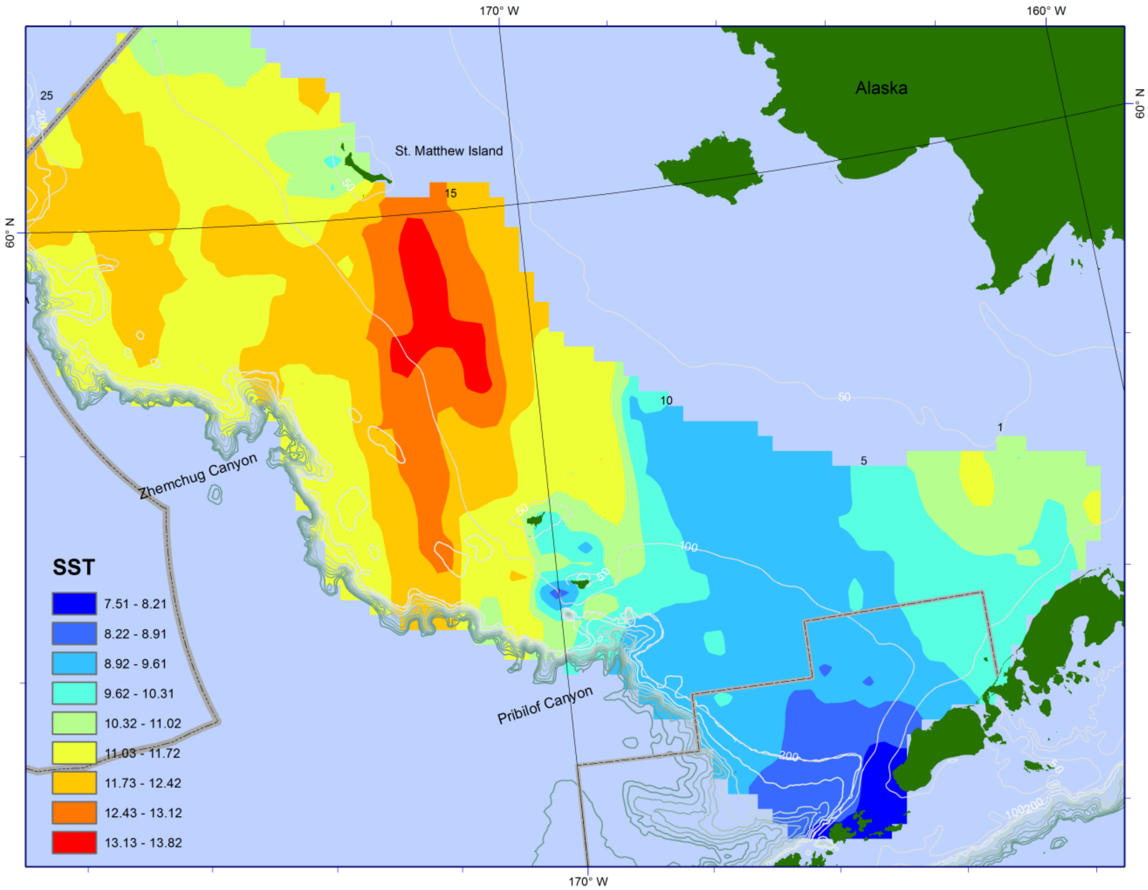


Figure 1.-- Transect lines with locations of Aleutian wing trawls, 83-112 trawls, Marinovich, stereo camera and Methot trawls during the summer 2016 acoustic-trawl survey of walleye pollock on the eastern Bering Sea shelf. Transect numbers are noted above transects. Steller sea lion conservation area is outlined in pink.



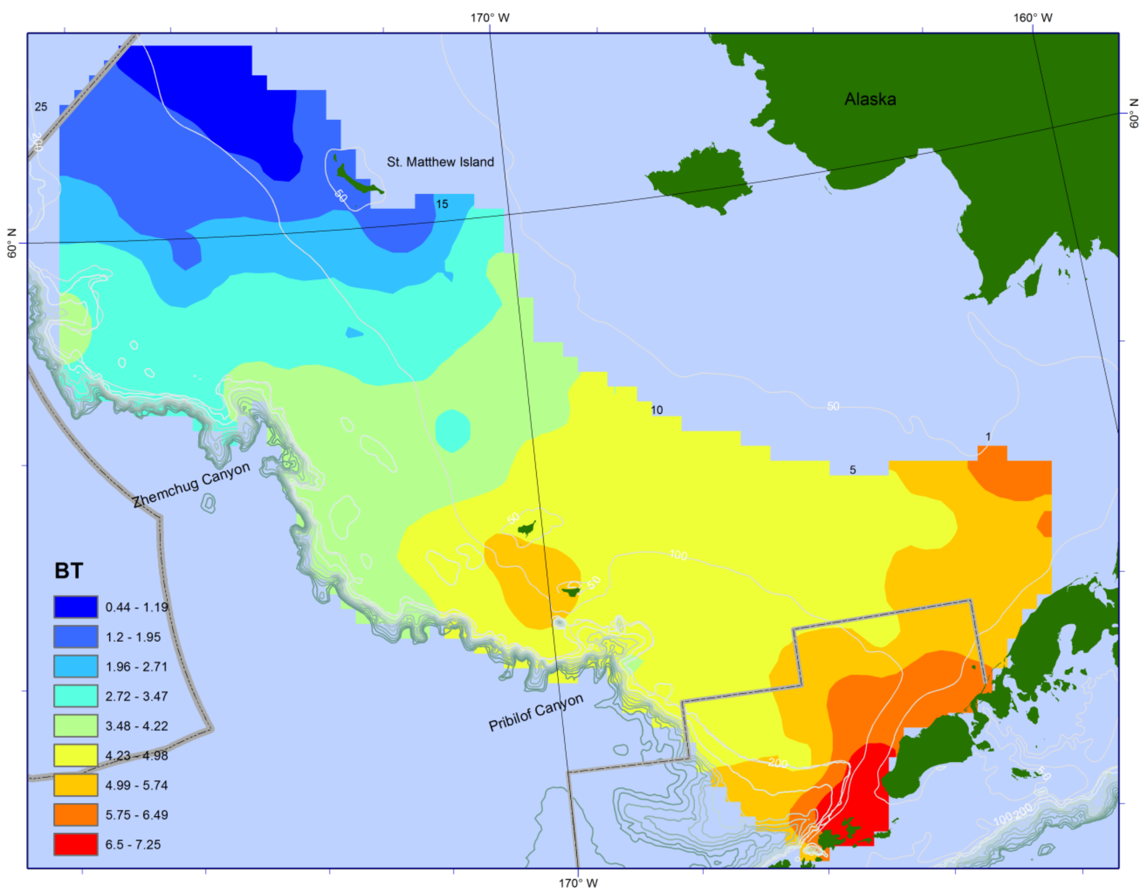


Figure 2. -- Temperature (°C) a) measured at the sea surface using shipboard surface temperature sensors along survey transects averaged at 10 nautical mile resolution, and b) at the bottom using conductivity-temperature-depth profilers (CTDs, n = 56), during the summer 2016 acoustic-trawl survey of the eastern Bering Sea shelf.

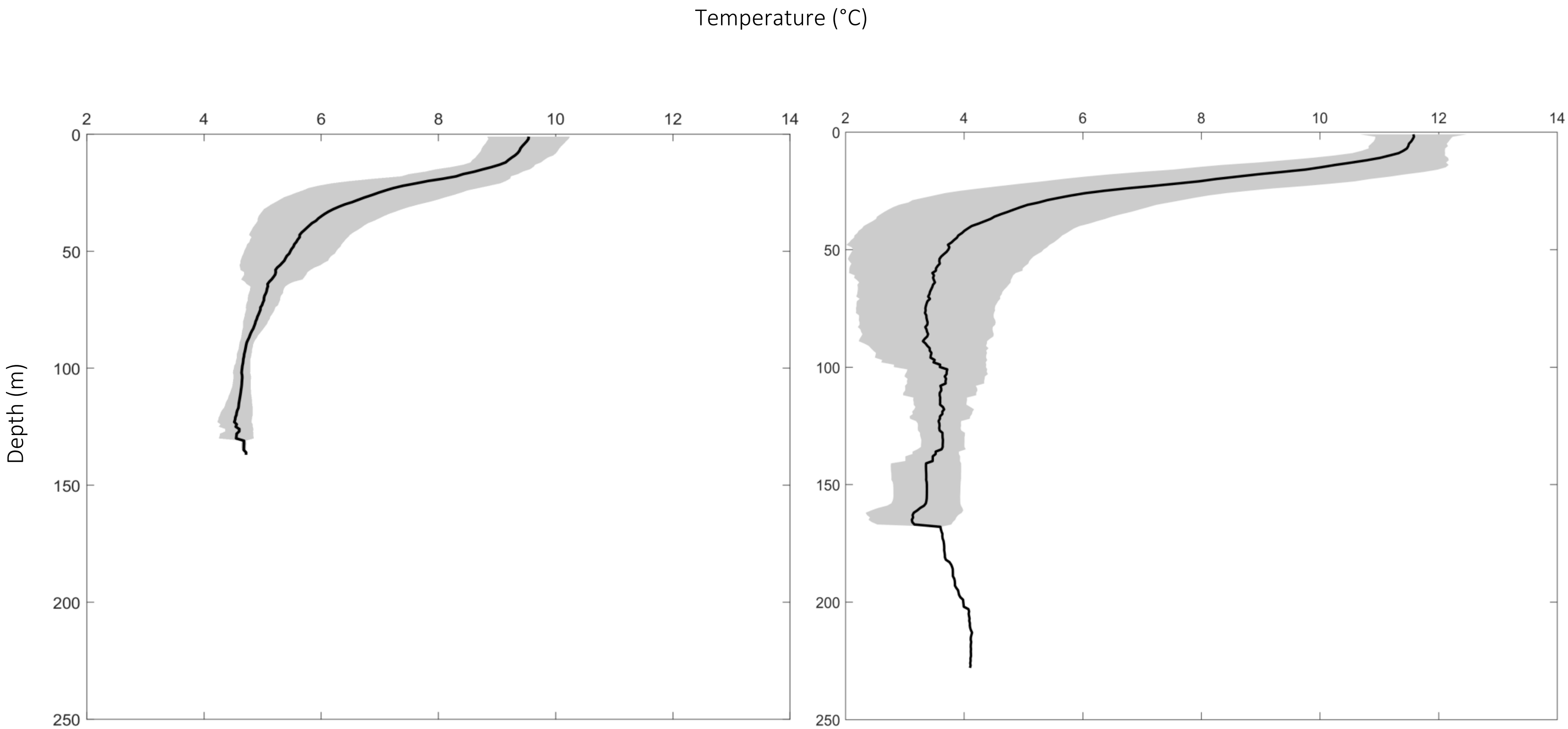


Figure 3. -- Mean water temperature (°C; solid line) by 1-m depth intervals for trawl haul locations during the summer 2016 eastern Bering Sea acoustic-trawl survey. Data were collected with a Sea-Bird Electronics temperature-depth probe (SBE-39) attached to the trawl headrope. Gray region represents minimum and maximum temperatures observed. Profiles are shown for trawls east of 170 °W (n = 84; left) and west of 170 °W in the U.S. EEZ (n = 132; right).

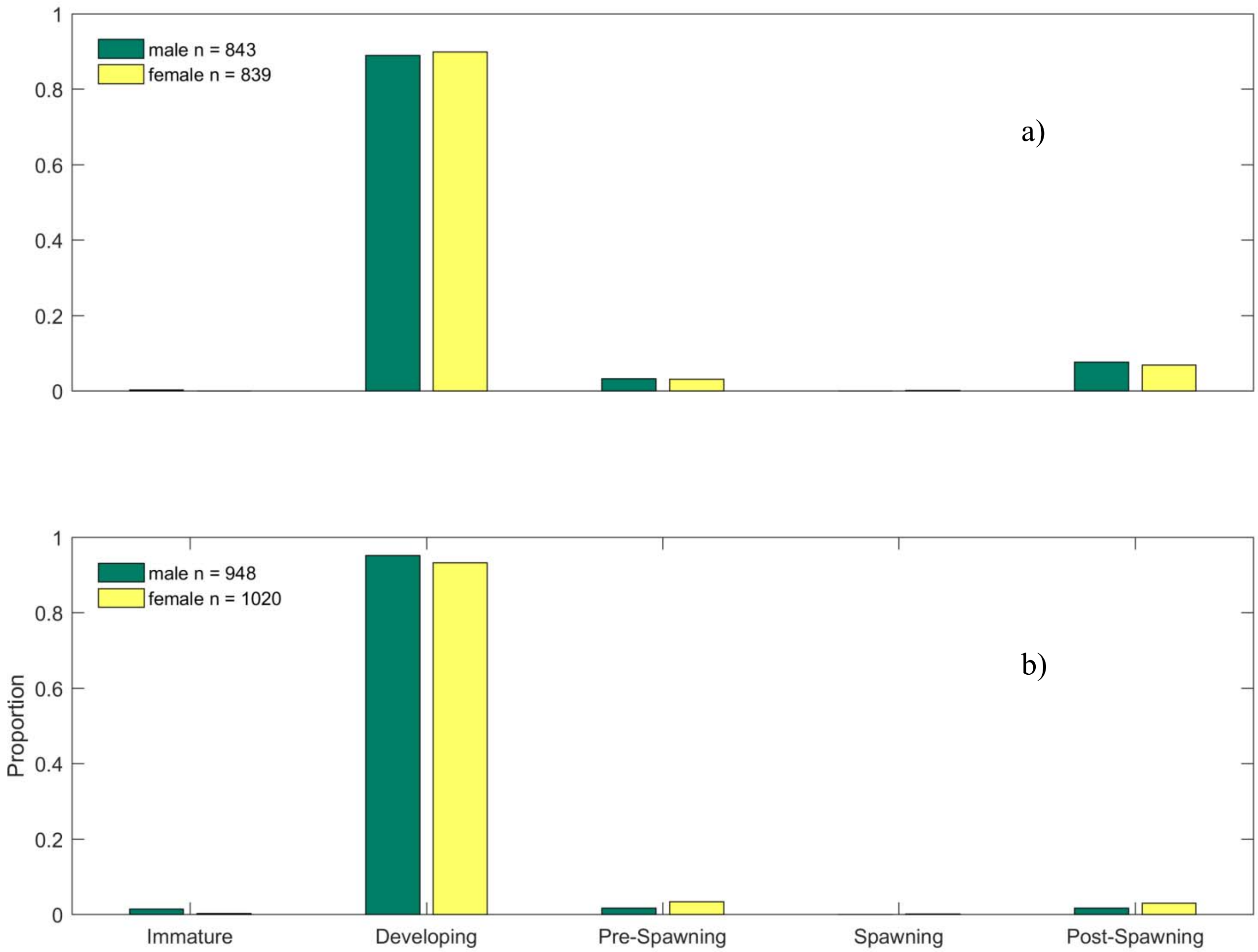


Figure 4. -- Maturity stages by sex for walleye pollock ≥ 34 cm observed during the summer 2016 eastern Bering Sea shelf acoustic-trawl survey a) east of 170° W, and b) in U.S. waters west of 170° W.

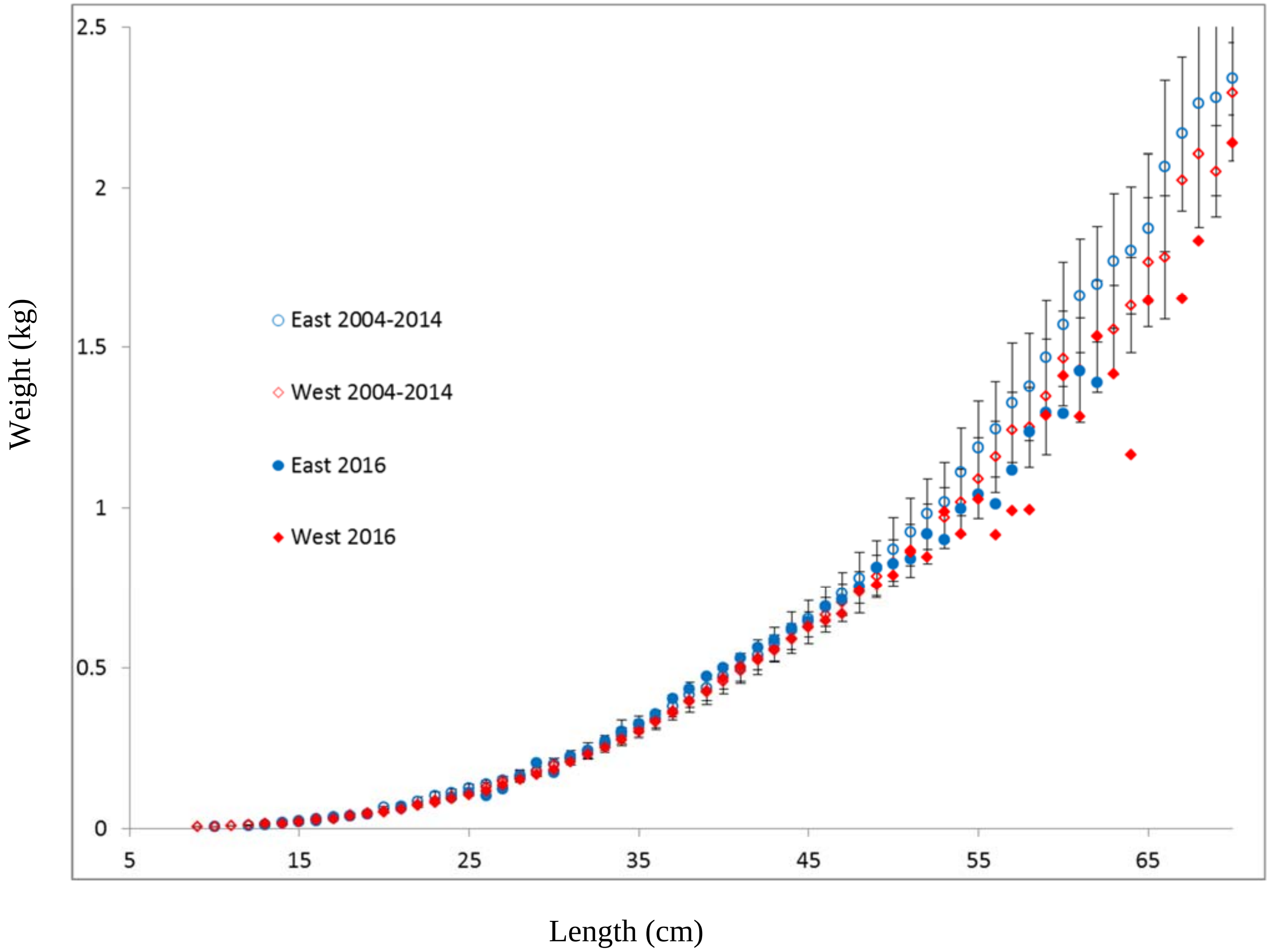


Figure 5. -- Mean weight-at-length for walleye pollock measured in the U.S. EEZ east and west of 170°W during the summer 2016 eastern Bering Sea shelf acoustic-trawl survey, plotted against mean values for 2004, 2006-2010, 2012, and 2014. Error bars represent ± 1 standard deviation around the 2004-2014 data points.

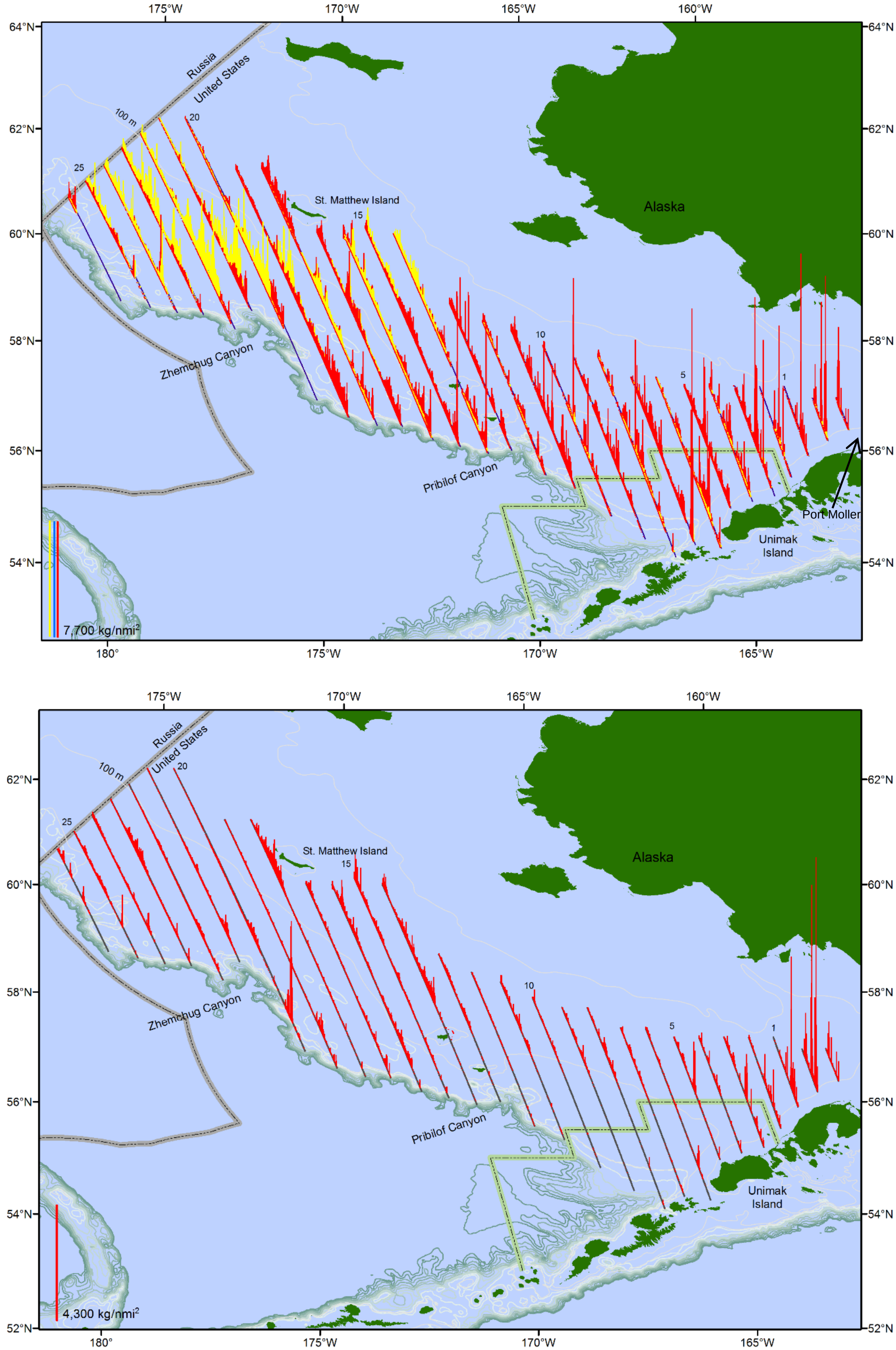
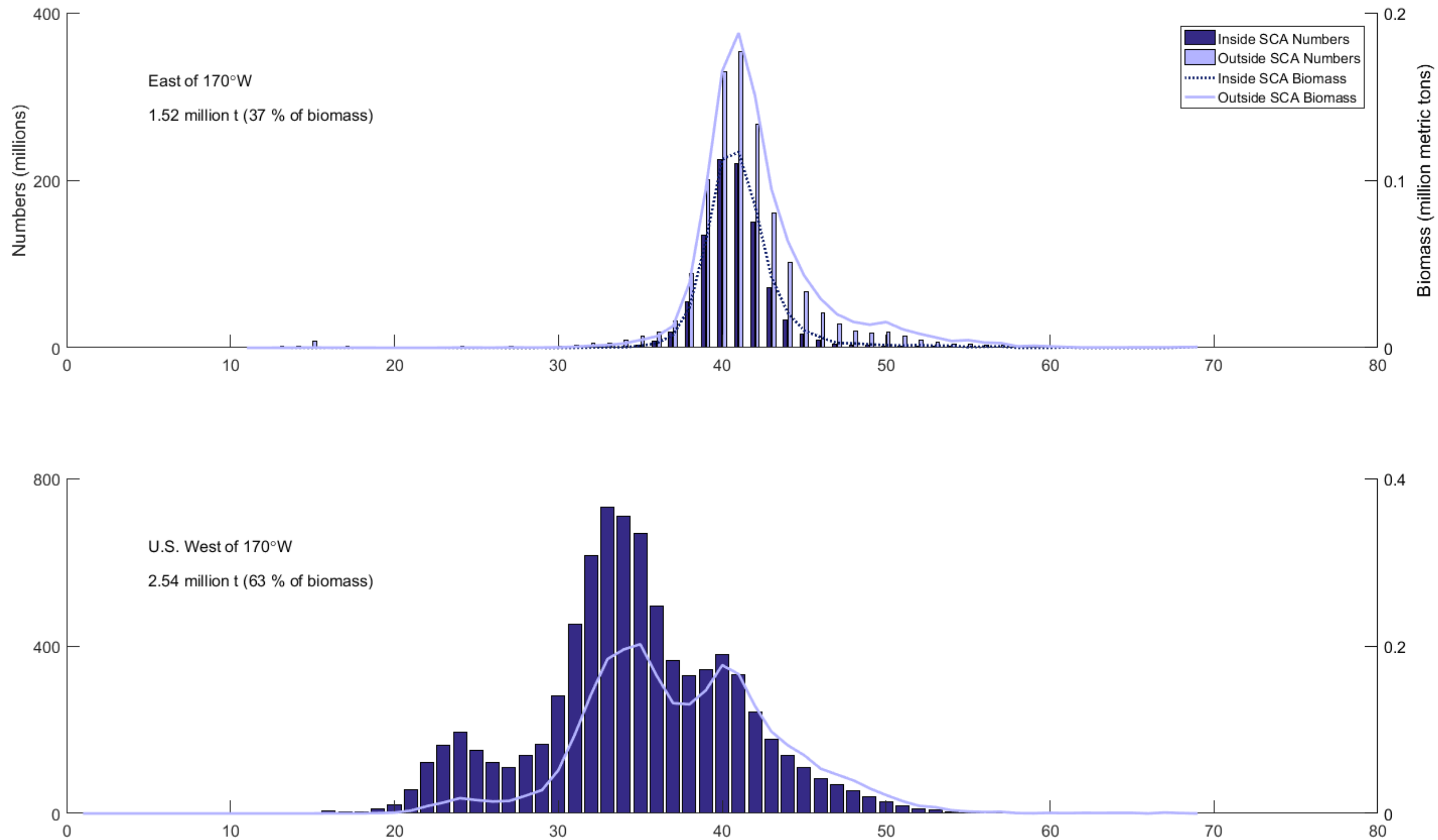
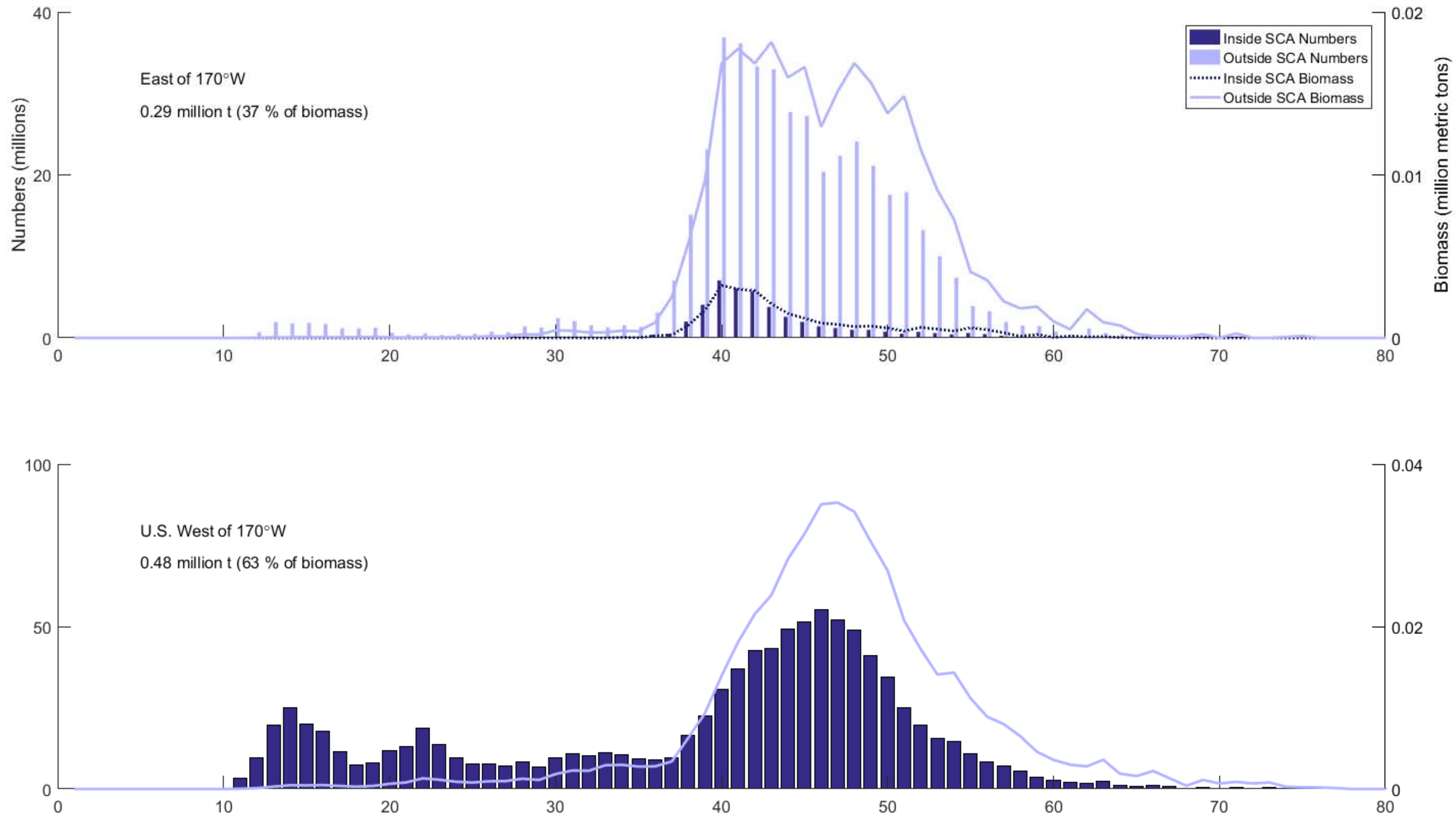


Figure 6.–Estimated walleye pollock biomass per sq. nmi for the summer 2016 acoustic-trawl survey. Top panel: 16 m from surface to 3 m off bottom. Age 1 fish (blue), age 2 and 3 fish (yellow), and age 4+ fish (red) are indicated. Bottom panel: 3m off bottom to 0.5m off bottom for all ages. The Steller sea lion Conservation Area (SCA) is outlined in green.



Length (cm)

Figure 7. -- Population numbers (histogram bars) and biomass (lines) at length (cm) estimated for walleye pollock between 16 m from the surface and 3 m off the bottom from the summer 2016 eastern Bering Sea shelf acoustic-trawl survey in two geographic regions.



Length (cm)

Figure 8. -- Population numbers (histogram bars) and biomass (lines) at length (cm) estimated for walleye pollock between 3 m to 0.5 m off the bottom from the summer 2016 eastern Bering Sea shelf acoustic-trawl survey in two geographic regions.

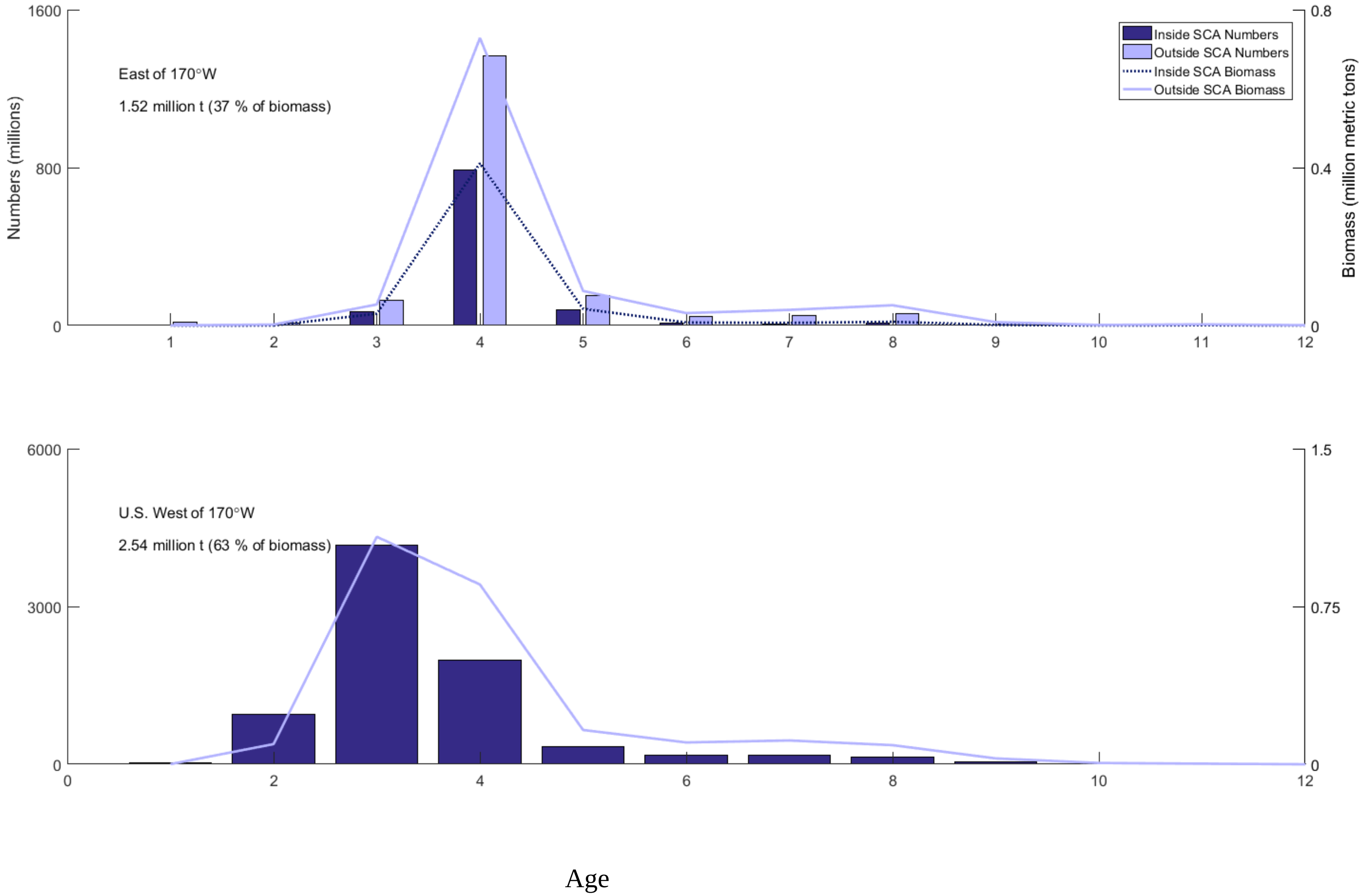


Figure 9. -- Population numbers (histogram bars) and biomass (lines) at age estimated for walleye pollock between 16 m from surface and 3 m off bottom for different geographic regions during the summer eastern Bering Sea shelf acoustic-trawl survey. Note: Y-axis scales differ.

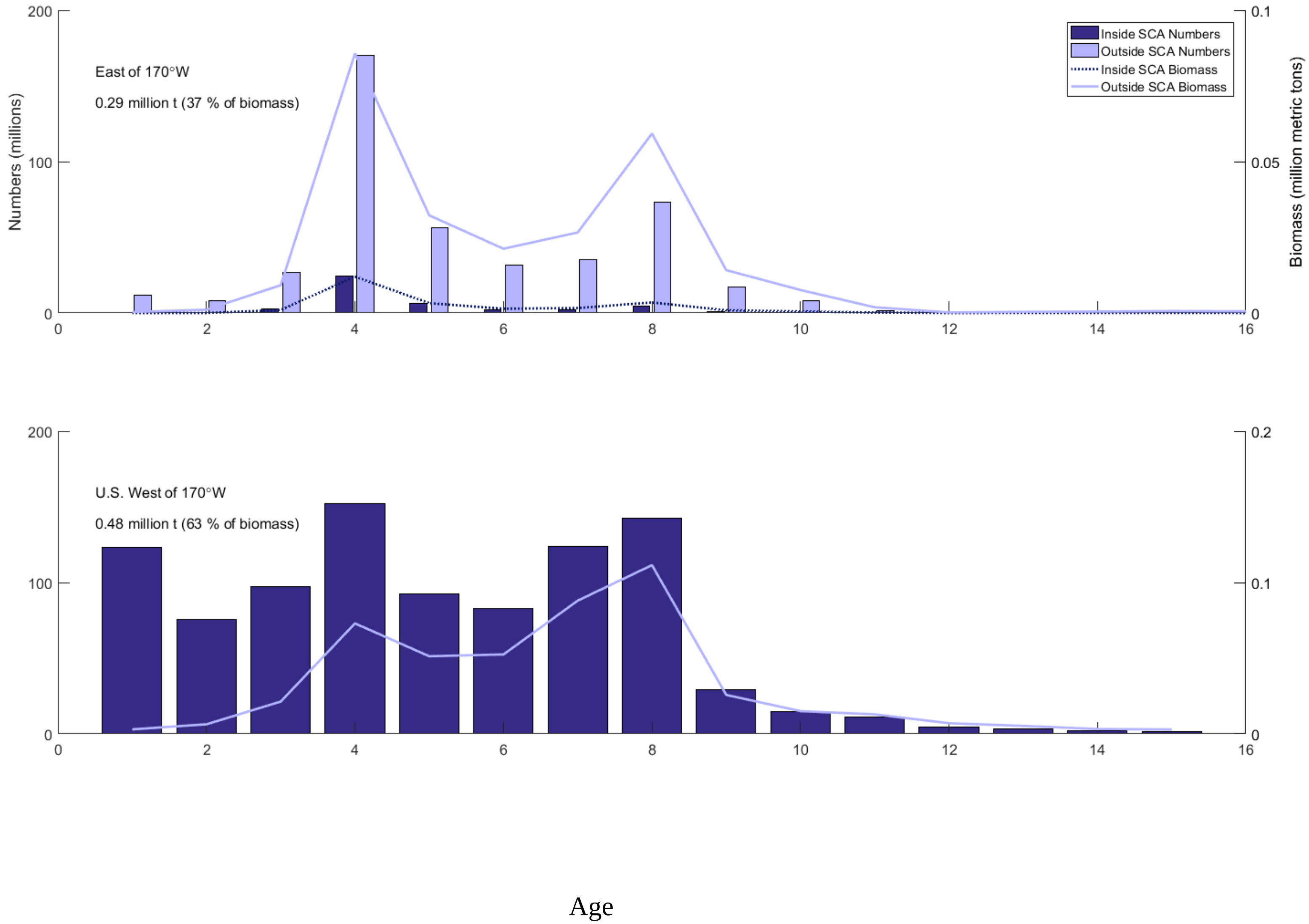


Figure 10.-- Population numbers (histogram bars) and biomass (lines) at age estimated for walleye pollock between 3 m to 0.5 m off bottom for different geographic regions during the summer eastern Bering Sea shelf acoustic-trawl survey. Note: Y-axis scales differ.

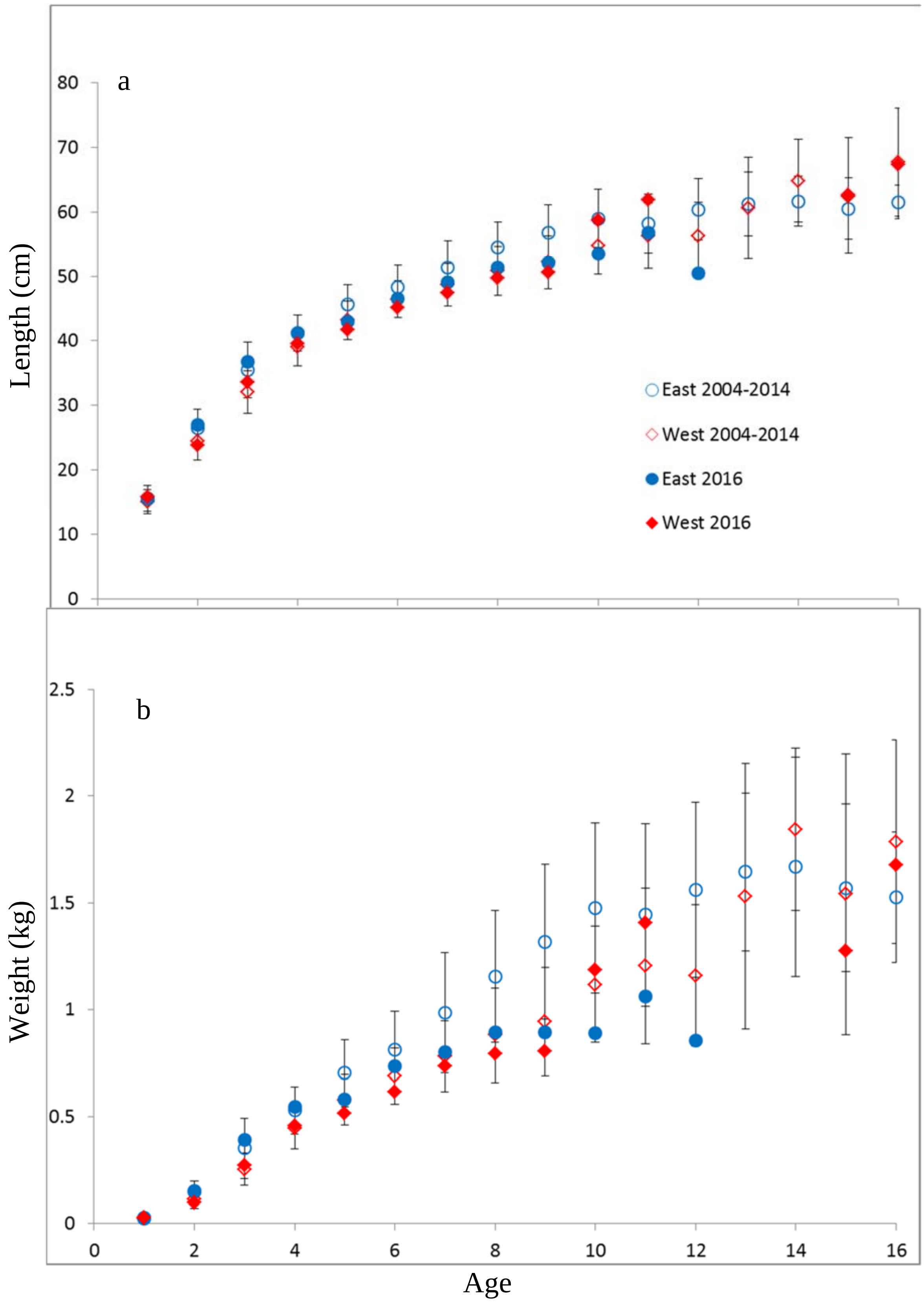


Figure 11. -- Mean a) length- and b) weight-at-age for walleye pollock in the U.S. EEZ east and west of 170°W for the summer 2016 eastern Bering Sea shelf acoustic-trawl survey, and mean estimates for 2004-2014 surveys combined. Error bars represent ± 1 standard deviation around the 2004-2014 means.

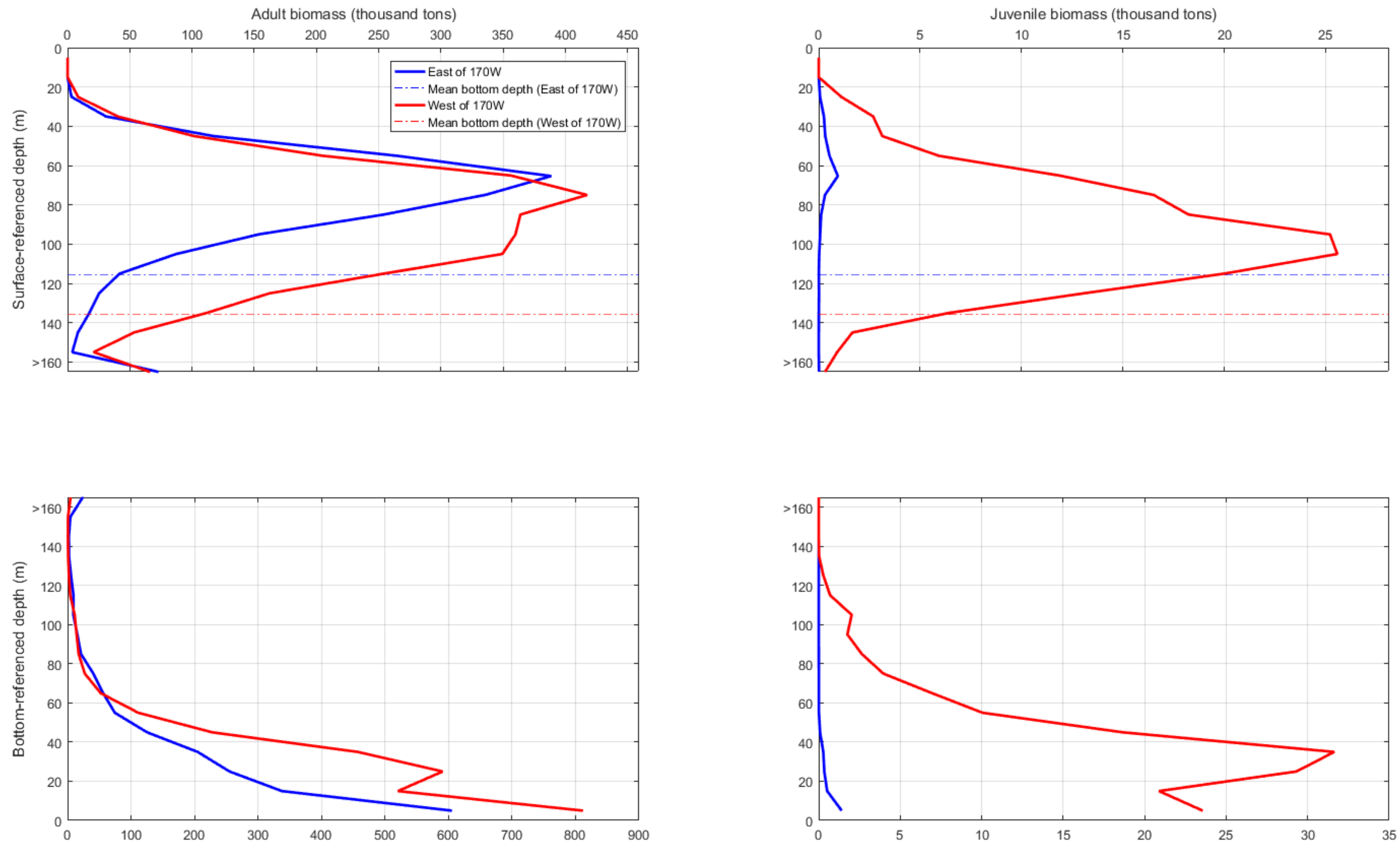


Figure 12.-- Depth distribution (m) of adult (≥ 30 cm FL) or juvenile (< 30 cm FL) walleye pollock biomass (thousand metric tons) east and west of 170°W longitude in the U.S. EEZ of the Bering Sea shelf during the summer 2016 acoustic-trawl survey. Depth is referenced to the surface (a, b) and to the bottom (c, d). Data were averaged in 10 m depth bins from near surface to within 0.5 m of the seafloor.

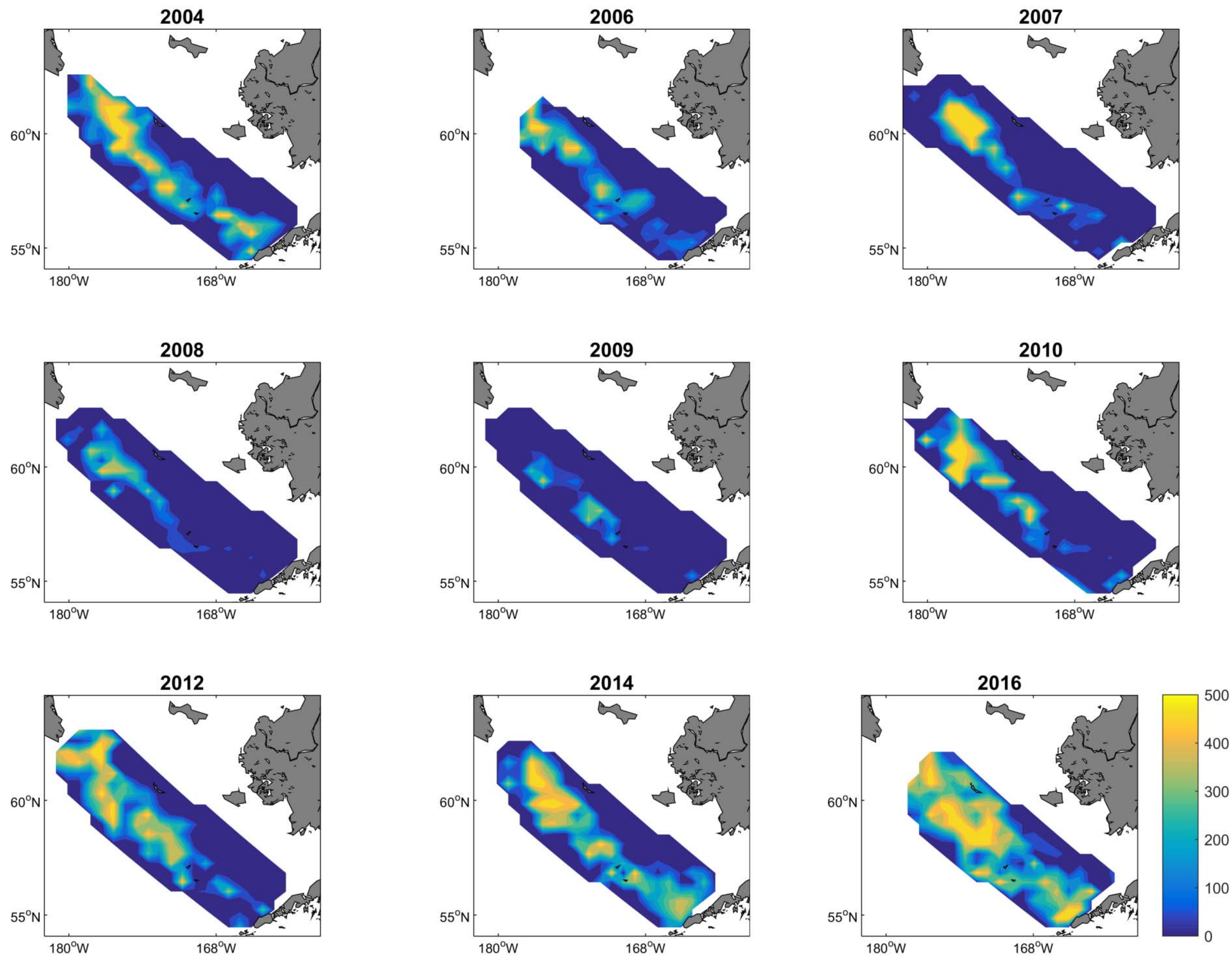


Figure 13.-- Walleye pollock backscatter (s_A, m^2 nmi^{-2}) between near surface and 3 m off bottom at 38 kHz observed along tracklines during summer eastern Bering Sea acoustic-trawl surveys conducted between 2004 and 2016.

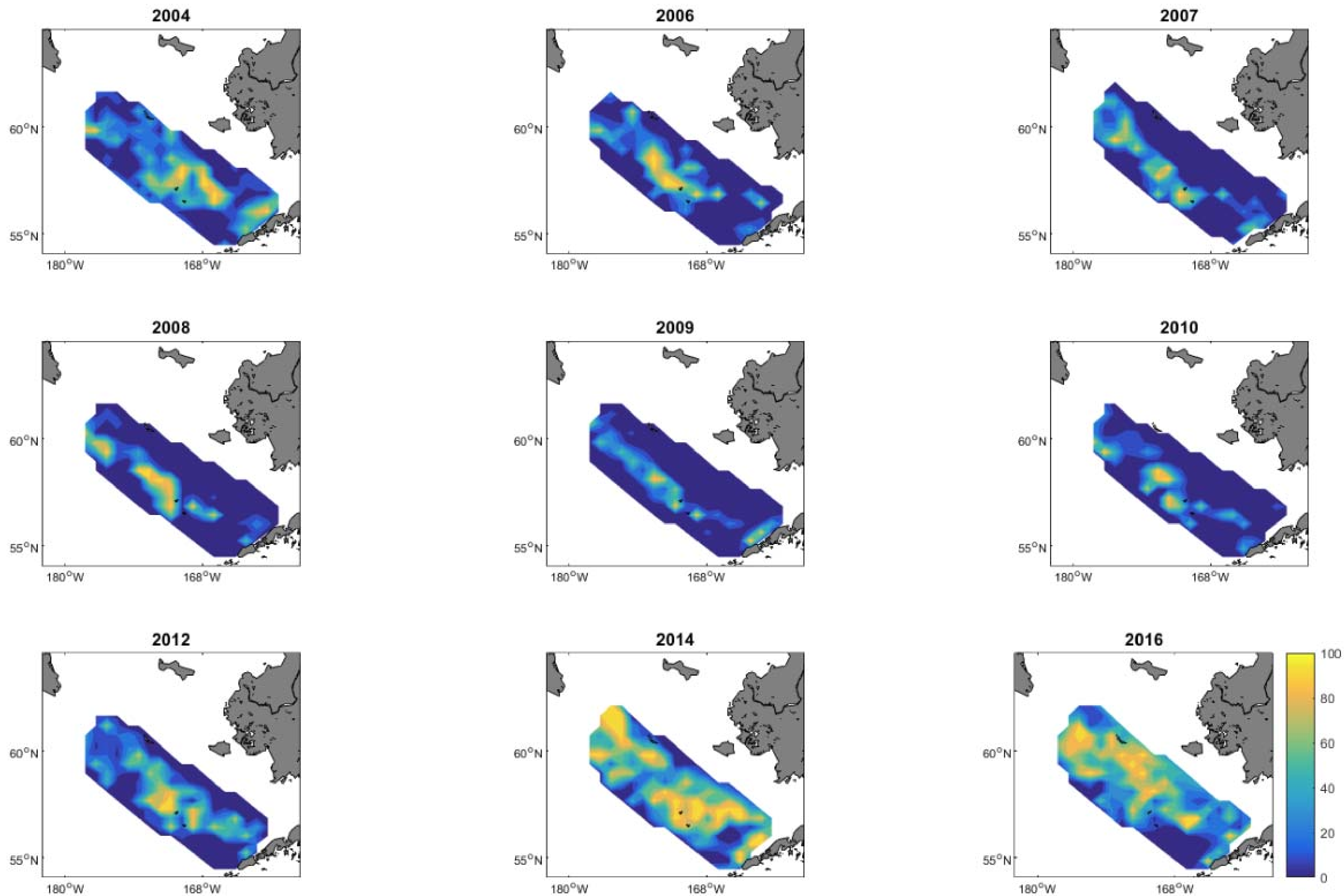


Figure 14. -- Walleye pollock backscatter (s_A, m^2 nmi^{-2}) between 3 m and 0.5 m off bottom at 38 kHz observed along tracklines during summer eastern Bering Sea acoustic-trawl surveys conducted between 2004 and 2016.

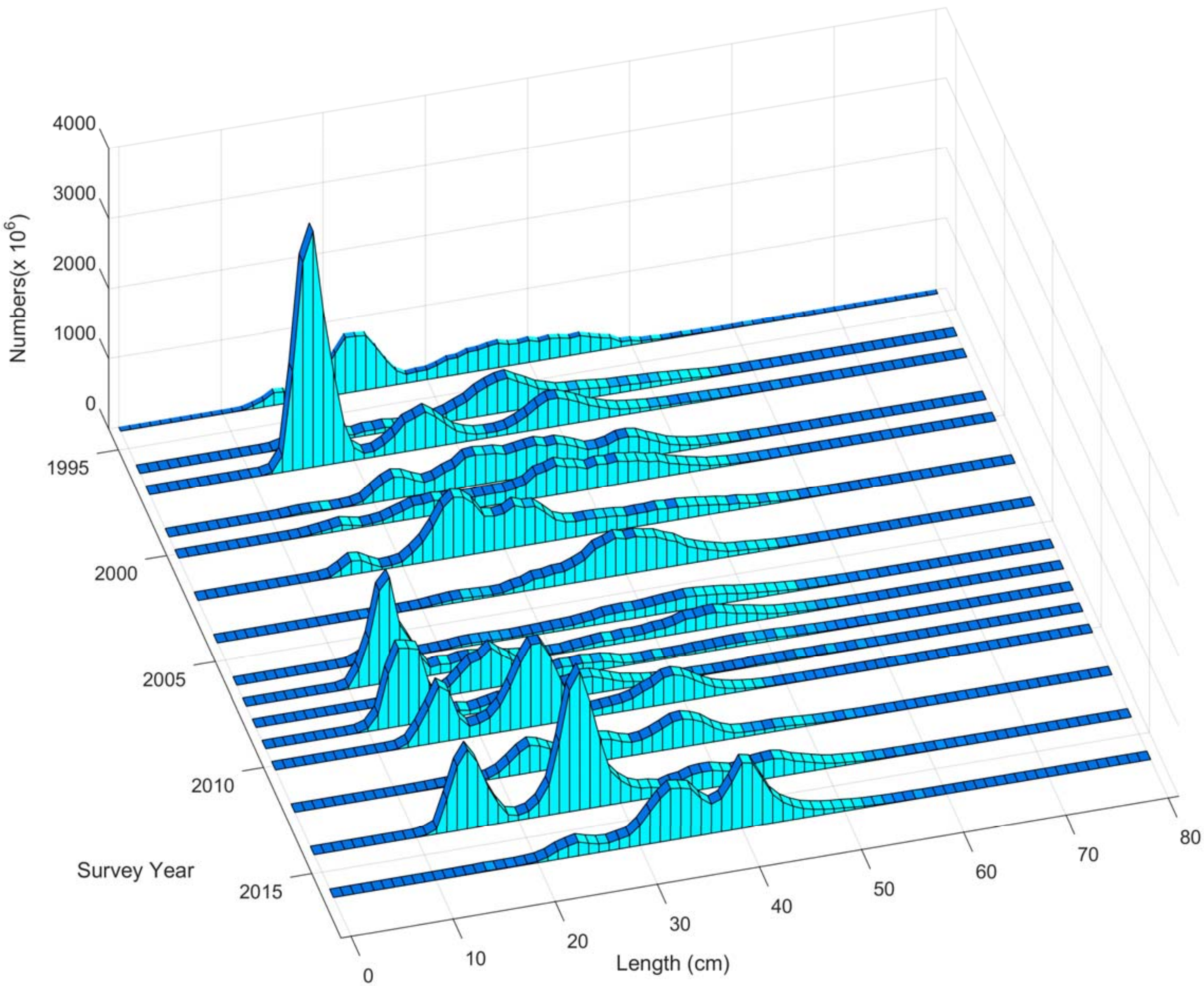


Figure 15. -- Historical numbers at length between near surface and 3 m off bottom in the U.S. EEZ for the summer eastern Bering Sea shelf acoustic-trawl surveys between 1994 and 2016.

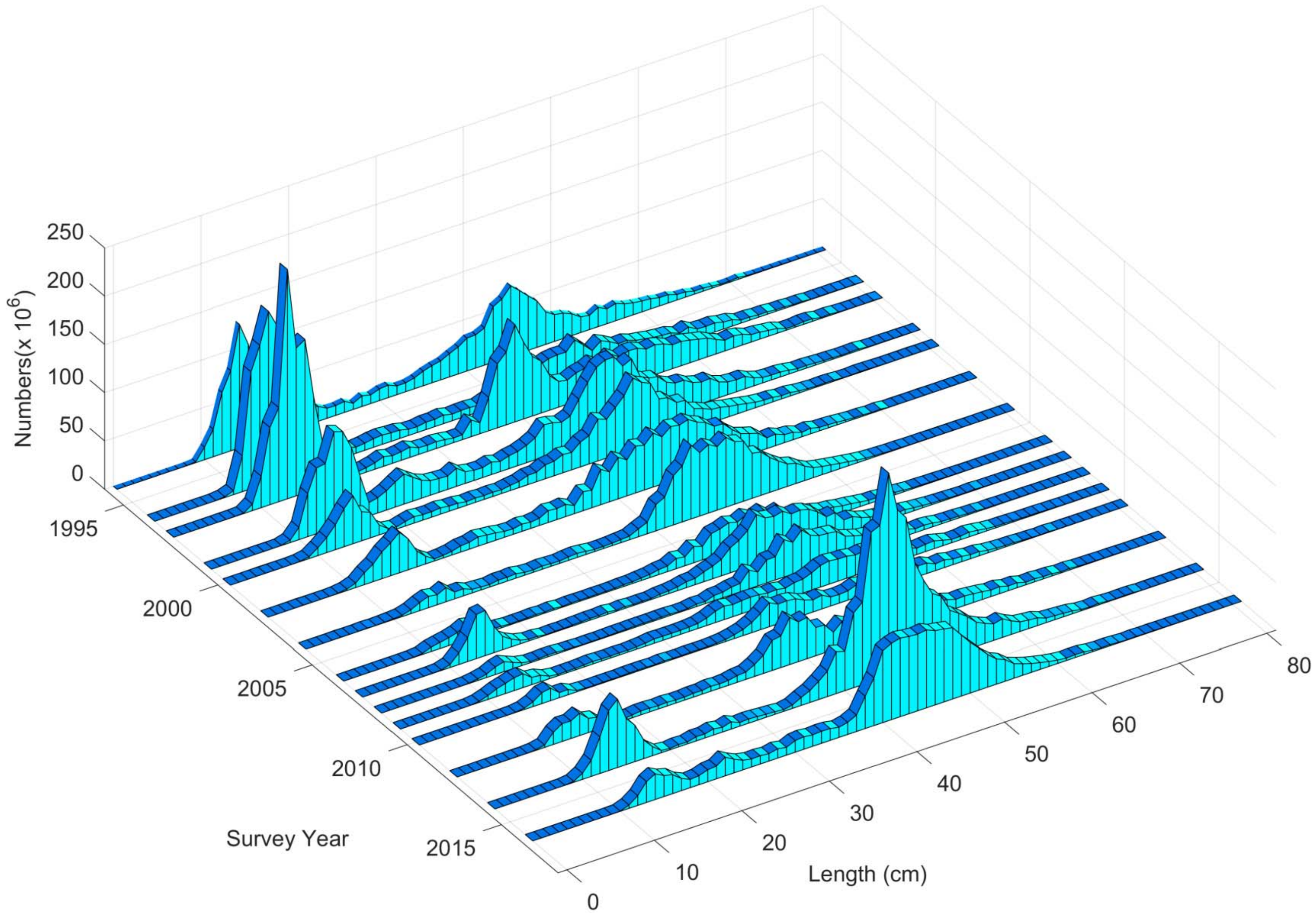


Figure 16. -- Historical numbers at length between 3 m and 0.5 m off bottom in the U.S. EEZ for the summer eastern Bering Sea shelf acoustic-trawl surveys between 1994 and 2016.

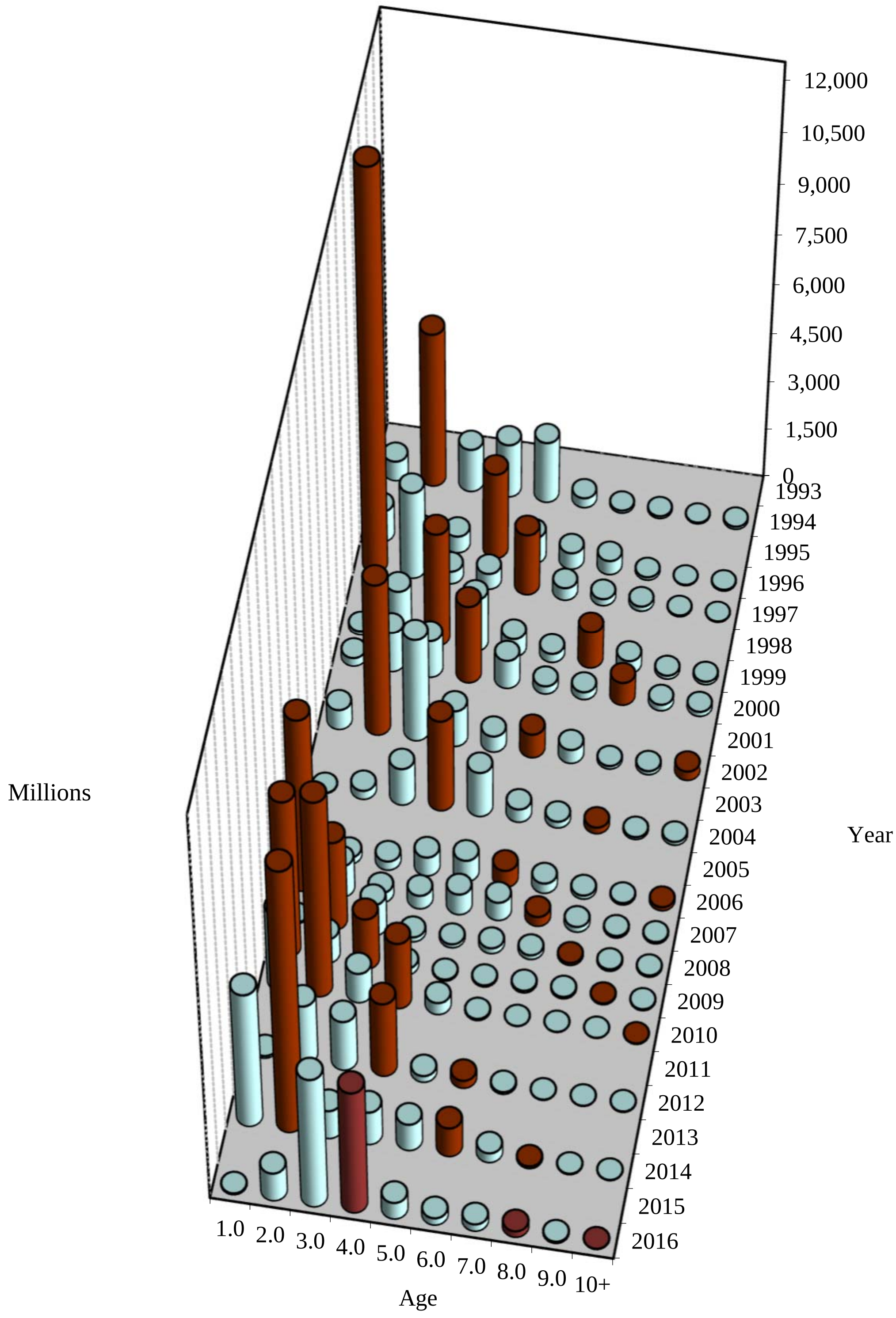


Figure 17. -- Historical numbers at age of walleye pollock between near surface and 3 m off bottom in the U.S. EEZ for summer eastern Bering Sea shelf acoustic-trawl surveys between 1994 and 2016. Strong year classes are indicated with dark columns.

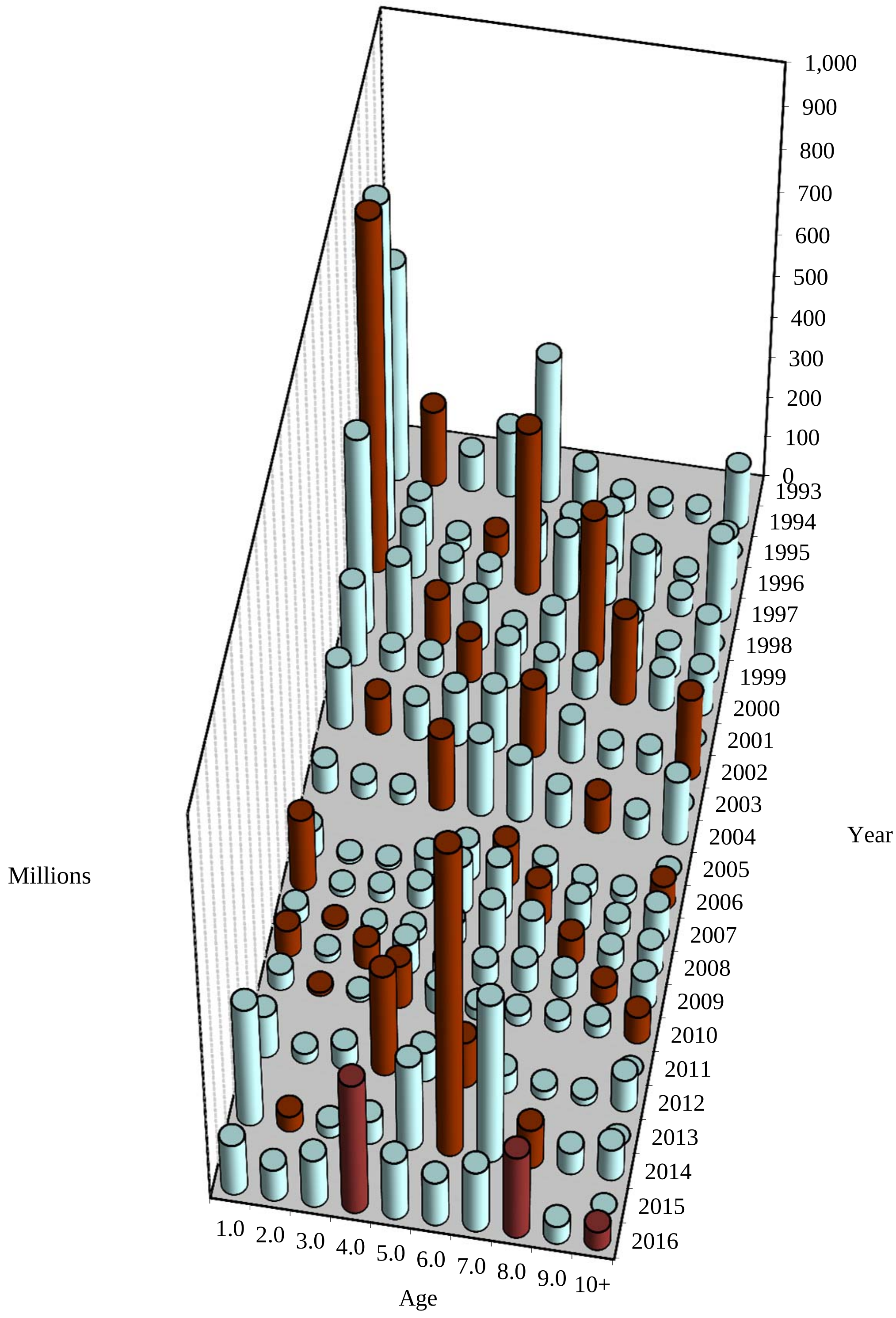


Figure 18. -- Historical numbers at age of walleye pollock between 3 m and 0.5 m off bottom bottom in the U.S. EEZ for summer eastern Bering Sea shelf acoustic-trawl surveys between 1994 and 2016. Strong year classes are indicated with dark columns.

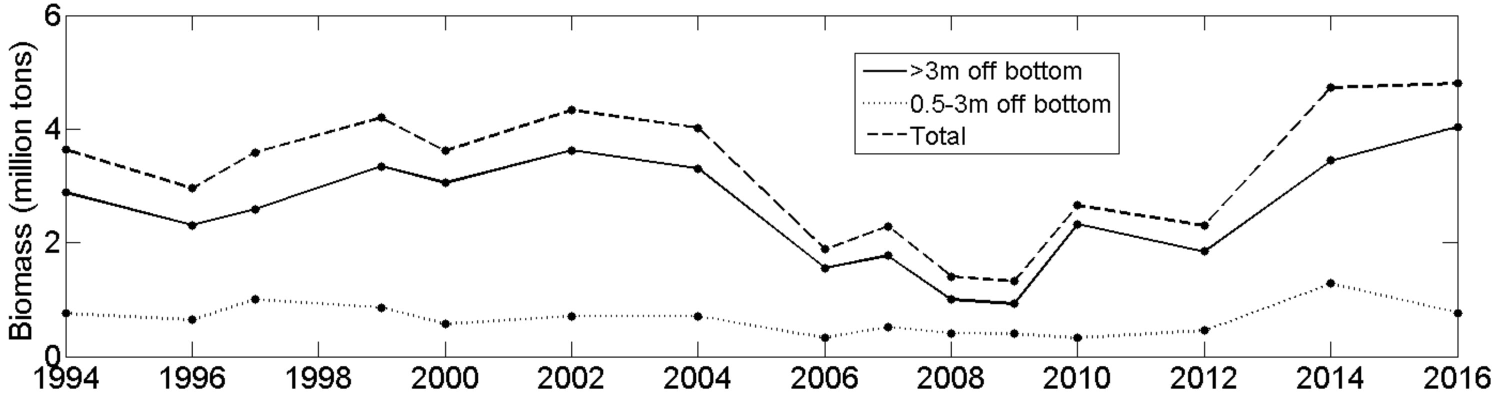


Figure 19. -- (Top panel) Pollock biomass by year in million metric tons for the region between the surface and 3 m above bottom (solid line), the region between 0.5 and 3 m above bottom (dotted line), and the sum of these two regions (dashed line). (Bottom panel) Percent increase from the region between the surface and 3 m above bottom to the total water column.

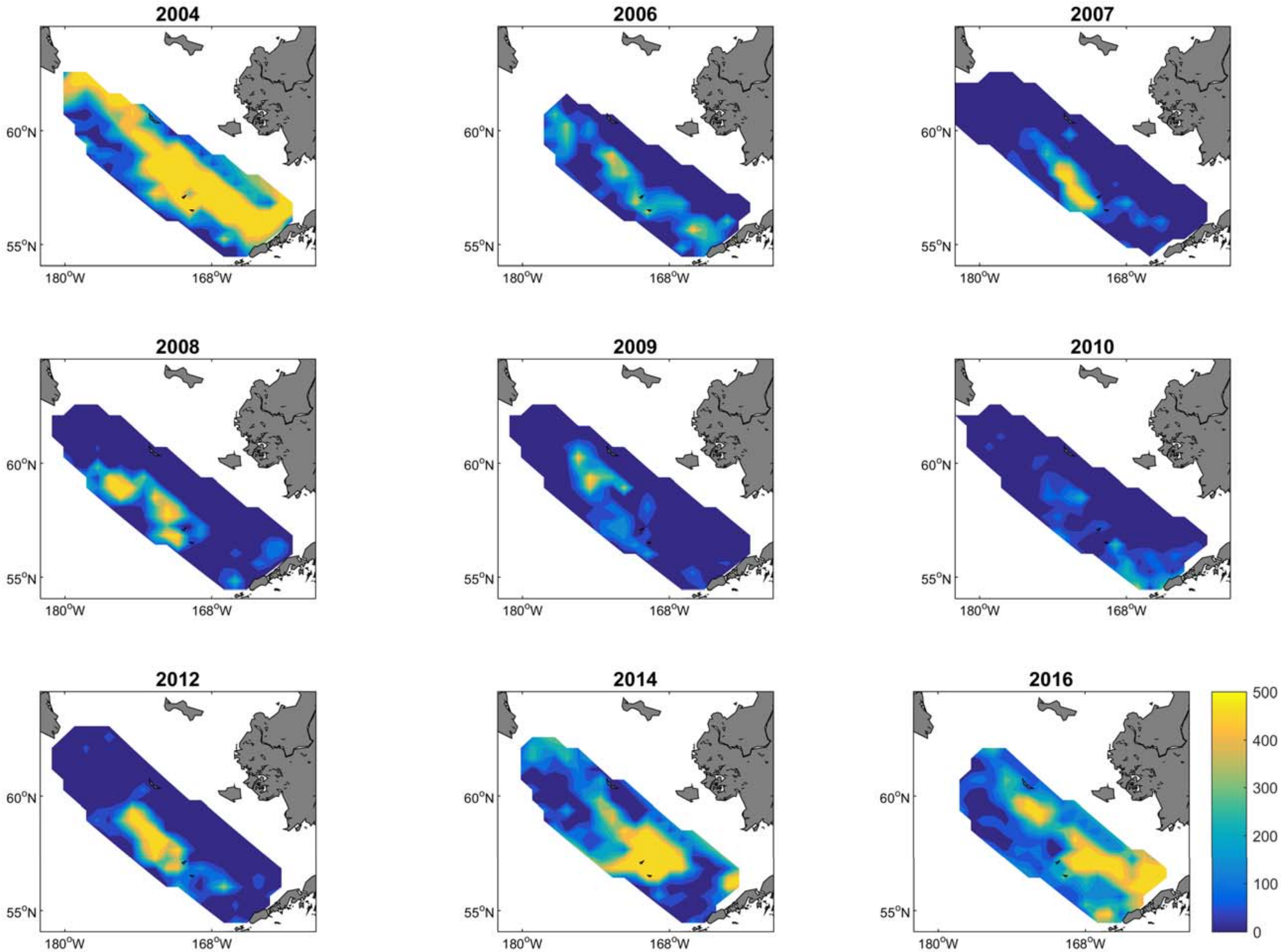


Figure 20.-- Non-pollock, non-fish backscatter (s_A, m^2 nmi^{-2}) from near surface to 3 m off bottom at 38 kHz frequency along tracklines during summer eastern Bering Sea acoustic-trawl surveys 2004-2016.

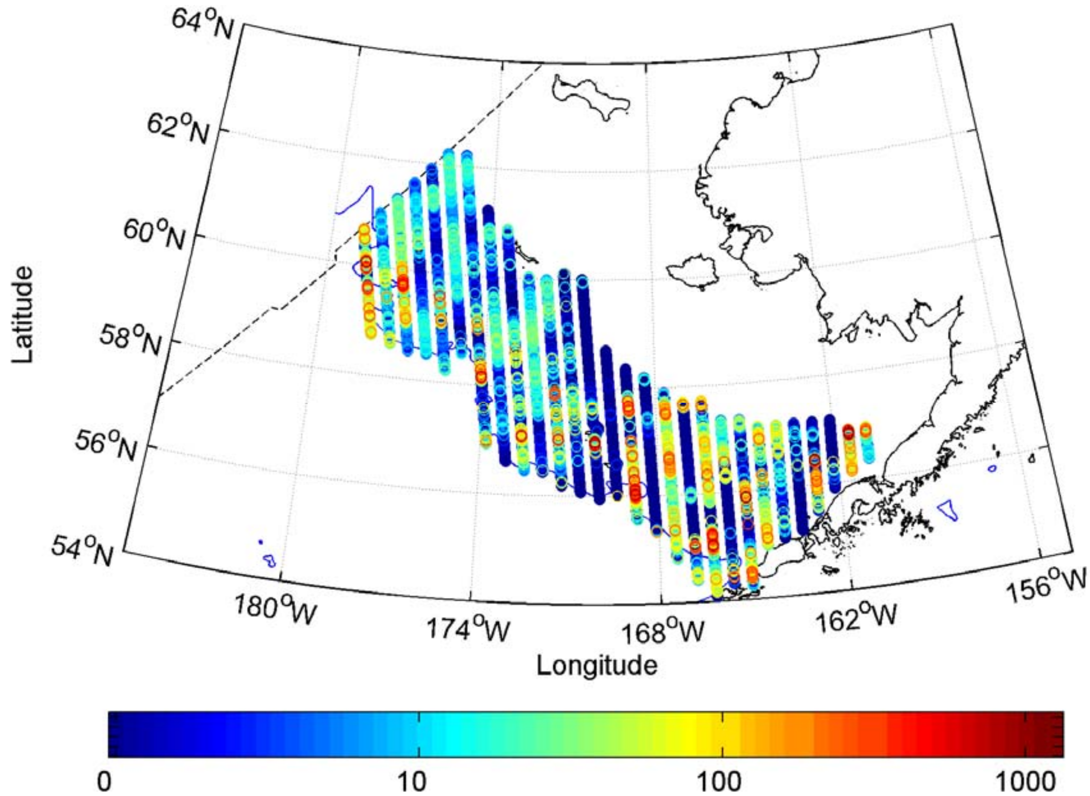


Figure 21. -- Preliminary map of the spatial distribution of euphausiid backscatter (s_A, m^2 nmi^{-2}) during the summer 2016 acoustic-trawl survey of the eastern Bering Sea shelf. Data are shown at 120 kHz.

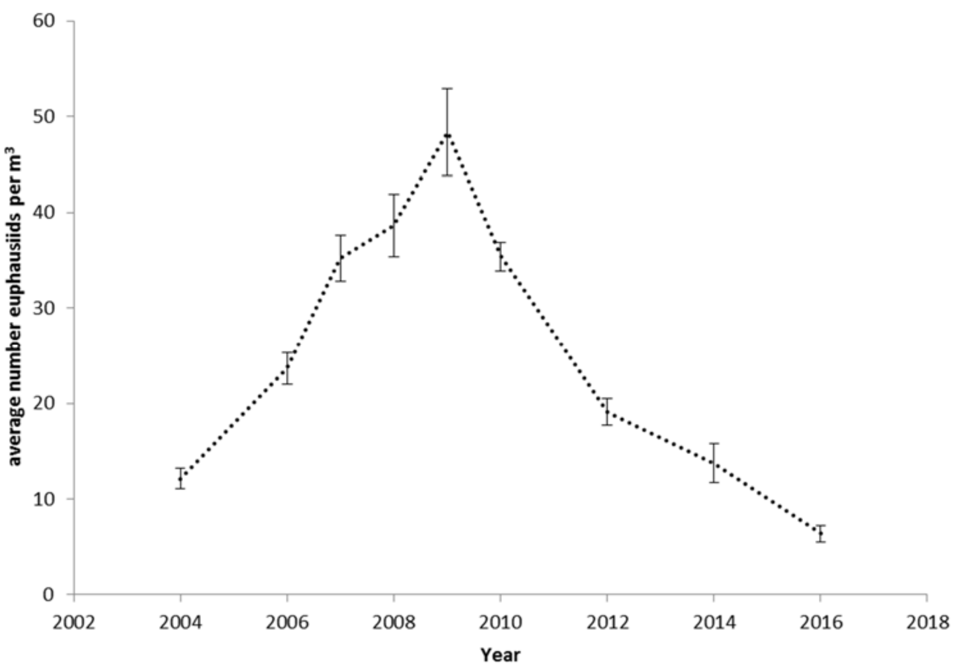


Figure 22. -- Acoustic estimate of average euphausiid abundance (no. m^3) from summer eastern Bering Sea acoustic-trawl surveys (2004-2016). Error bars are approximate 95% confidence intervals computed from geostatistical estimates of sampling error (Petitgas 1993).

Appendix I. -- Itinerary

Leg 1

12-14 June	Calibration in Captains Bay. Depart Dutch Harbor, AK. Transit to survey start area in Bristol Bay, eastern Bering Sea
14 Jun.-3 Jul.	Acoustic-trawl survey of the Bering Sea shelf (through transect 12). Transit to Unalaska Island, AK.
3-6 July	In port Dutch Harbor, AK.

Leg 2

6 – 7 July	Transit to survey resume point
7-23 July	Acoustic-trawl survey of the Bering Sea shelf (transects 13 – 19)
23-26 July	Transit to Unalaska Island
26-28 July	In port Dutch Harbor

Leg 3

29-30 July	Transit to survey resume point
30 Jul.-14 Aug.	Acoustic-trawl survey of the Bering Sea shelf (transects 20 - 26).
14-16 Aug.	Add northern extensions to transects 19 and 18. Transit to Unalaska Island.
16-17 Aug.	Acoustic sphere calibration in Captains Bay, Dutch Harbor. End of cruise.

Appendix II. -- Scientific Personnel

Leg 1 (12 June -3 July)

Name	Position	Organization	Nation
Darin Jones	Chief Scientist	AFSC	USA
Denise McKelvey	Fishery Biologist	AFSC	USA
Scott Furnish	Info. Tech. Specialist	AFSC	USA
Patrick Ressler	Fishery Biologist	AFSC	USA
Nate Lauffenburger	Fishery Biologist	AFSC	USA
Matthew Phillips	Observer	AIS	USA
Brandyn Lucca	Graduate Student	SBU	USA
Joe Warren	Guest Scientist	SBU	USA

Leg 2 (6 -25 July)

Chris Wilson	Chief Scientist	AFSC	USA
Alex De Robertis	Fishery Biologist	AFSC	USA
Chris Bassett	Info. Tech. Specialist	AFSC	USA
Robert Levine	Fishery Biologist	OAI	USA
Matthew Phillips	Observer	AIS	USA
Mike Gallagher	Fishery Biologist	AFSC	USA
Tom Weber	Guest Scientist	UNH	USA
Scott Loranger	Graduate Student	UNH	USA

Leg 3 (29 July -17 August)

Taina Honkalehto	Chief Scientist	AFSC	USA
Rick Towler	Info. Tech. Specialist	AFSC	USA
Darin Jones	Fishery Biologist	AFSC	USA
Anatoli Smirnov	Fishery Biologist	TINRO	Russia
Nate Lauffenburger	Fishery Biologist	AFSC	USA
Troy Buckley	Fishery Biologist	AFSC	USA
Matthew Phillips	Observer	AIS	USA
Denise McKelvey	Fishery Biologist	AFSC	USA
Brian Robb	Medical Officer	NOAA	USA

AFSC	Alaska Fisheries Science Center, Seattle WA
AIS	AIS, Inc., New Bedford, MA
OAI	Ocean Associates, Inc.
TINRO	Pacific Research Institute of Fisheries and Oceanography Vladivostok, Russia
NOAA	National Oceanic and Atmospheric Administration, Teacher at Sea Program
SBU	Stony Brook University, Southampton, NY
UNH	University of New Hampshire, Durham, NH