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Results of the Acoustic-Trawl Surveys of Walleye Pollock (*Gadus chalcogrammus*) in the Gulf of Alaska, February-March 2017 (DY2017-01, DY2017-02, and DY2017-03)

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Results of the Acoustic-Trawl Surveys of Walleye Pollock (*Gadus chalcogrammus*) in the Gulf of Alaska, February-March 2017 (DY2017-01, DY2017-02, and DY2017-03)

by

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ABSTRACT

Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering (RACE) Division conducted acoustic-trawl (AT) stock assessment surveys in the Gulf of Alaska (GOA) during late winter and early spring 2017 to estimate the distribution and abundance of walleye pollock (*Gadus chalcogrammus*) within several of their main spawning grounds. These pre-spawning pollock surveys covered the Shumagin Islands, Sanak Trough, and Morzhovoi and Pavlof bays (DY2017-01; 8-14 February), the Kenai Bays, Prince William Sound, and Hinchinbrook Trough and Middleton Island areas (DY2017-02; 2-9 March), and Shelikof Strait, the shelf break near Chirikof Island, and Marmot Bay (DY2017-03; 14-26 March). The Shumagin Islands area has been surveyed annually in winter since 2001 (except in 2004 and 2011) with prior surveys in 1994-1996. This survey has included Sanak Trough, and frequently Morzhovoi Bay and Pavlof Bay since 2002. The Kenai Peninsula bays have been surveyed twice (2010 and 2015), and Prince William Sound (PWS) has previously been surveyed three times (1984, 1990, and 2010) during the winter. Hinchinbrook Trough and Middleton Island have not been surveyed in the winter prior to this year. The Shelikof Strait area has been surveyed annually in winter since 1981 (except in 1982, 1999, and 2011). This survey has often included Marmot Bay and the shelf break east of Chirikof Island since 1989.

Both physical and biological results were available for all surveyed areas. Average surface water temperatures ranged from 2.9° C (Pavlof Bay) to 5.5° C (Middleton Island). Mean temperatures declined by 0.6° C in the Shumagin Islands and by 2.3° C in Shelikof Strait compared to 2016. Mean temperatures declined by 0.4° C in Kenai compared to the 2015 survey. The estimated abundance of walleye pollock for the winter 2017 Shumagin Islands survey was 53.5 million fish weighing 29,621 metric tons (t), with an additional 13.4 million fish weighing 7,117 t estimated for the Sanak, Morzhovoi, and Pavlof areas combined. Estimates for walleye pollock in 2017 for the Kenai Bays region were 136 million fish weighing 67,022 t, for PWS estimates were 192.8 million fish weighing 106,708 t, and for Hinchinbrook and Middleton Island areas 71.5 million fish weighing 37,799 t. The walleye pollock biomass estimate for the winter 2017 Shelikof Strait area was 3,192 million fish weighing 1,489,723 t, with an additional

29 million fish weighing 14,259 t estimated for the Marmot area and 7 million fish weighing 4,007t estimated for the Chirikof shelf break. Pollock between 35 and 50 cm fork length (FL), which is indicative of age-5 fish, contributed the majority of the biomass in all areas. A second abundance analysis was conducted in which backscatter was attributed to other species as well as to pollock. This only reduced the biomass of pollock by 5% or less, except in the two areas with the smallest estimates of pollock biomass (i.e., Sanak Trough and Chirikof Shelf break).

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INTRODUCTION

The Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center's (AFSC) Resource Assessment and Conservation Engineering (RACE) Division conducts annual acoustic-trawl (AT) stock assessment surveys in the Gulf of Alaska (GOA) during late winter and early spring. The goal of these surveys is to estimate the distribution and abundance of prespawning walleye pollock (*Gadus chalcogrammus*) within several of their main spawning grounds (i.e., pre-spawning surveys). The Shumagin Islands area has been surveyed annually since 2001 (except in 2004 and 2011) with prior surveys in 1994-1996, and Sanak Trough has been surveyed annually since 2002 (except in 2004 and 2011). Morzhovoi Bay was surveyed during 2006, 2007, 2010, 2013 and 2016, and Pavlof Bay was surveyed during 2002, 2010, and 2016. The Kenai Peninsula bays have been surveyed twice in winter (2010 and 2015), and Prince William Sound (PWS) has previously been surveyed in the winters of 1984, 1990, and 2010. Hinchinbrook Trough and Middleton Island areas, both offshore of Prince William Sound, have not been surveyed in the winter prior to this year. The Shelikof Strait area has been surveyed annually since 1981 except in 1982, 1999, and 2011. Marmot Bay has been surveyed in the winter 10 times (1989, 1990, 1992, 2007, 2009, 2010, 2013, 2014, 2015, and 2016). The GOA continental shelf break east of Chirikof Island to Barnabas Trough has been surveyed annually since 2002 (except in 2011, 2014, and 2016). This report presents the results from AT surveys conducted in the aforementioned areas of the GOA during February and March 2017.

METHODS

Three cruises were conducted to survey several GOA pollock spawning areas. The first cruise (DY2017-01) surveyed the Shumagin Islands area (i.e., Shumagin Trough, Stepovak Bay, Renshaw Point, Unga Strait, and West Nagai Strait; 8-11 February), Sanak Trough (11 February), Morzhovoi Bay (12 February), and Pavlof Bay (13-14 February). The second cruise (DY2017-02) covered the Kenai Bays (i.e., Port Dick, Nuka Bay, Nuka Passage, Harris Bay, Aialik Bay, Resurrection Bay, Auk Bay, Port Bainbridge, and Knight Passage; 2-5 March), PWS (5-7 March), and the outer PWS region (Hinchinbrook Trough and Middleton Island areas;

7-9 March). The third cruise (DY2017-03) covered the Shelikof Strait (18-24 March), Marmot Bay (14-15 and 26 March) and the Chirikof shelf break (24-25 March). Work was conducted aboard the NOAA ship *Oscar Dyson*, a 64-m stern trawler equipped for fisheries and oceanographic research. Surveys followed established AT methods as specified in NOAA protocols for fisheries acoustics surveys and related sampling.[1] The acoustic units used here are defined in MacLennan et al. (2002). Survey itineraries are listed in Appendix I and scientific personnel in Appendix II.

Acoustic Equipment, Calibration, and Data Collection

Acoustic measurements were collected with a Simrad EK60 scientific echosounding system (Simrad 2008, Bodholt and Solli 1992). System electronics were housed inside the vessel in a permanent laboratory space dedicated to acoustics. Five split-beam transducers (18-, 38-, 70-, 120-, and 200-kHz) were mounted on the bottom of the vessel's retractable centerboard, which extended 9 m below the water surface.

Two standard sphere acoustic system calibrations were conducted to measure acoustic system performance during the winter cruises: at the end of cruise DY2017-01 and at the end of cruise DY2017-03. Additionally, a calibration was also conducted in Puget Sound prior to the start of cruise DY2017-01. The vessel dynamic positioning system was used to maintain the vessel location 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. The tungsten carbide sphere was then replaced with a 64 mm diameter copper sphere to calibrate the 18-kHz system. A two-stage calibration approach was followed for each frequency. 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

[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

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 ER60'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 data were recorded at five split-beam frequencies using ER60 software (ver. 2.4.3). Acoustic telegram data were also logged with Echoview EchoLog 500 (ver. 4.70.1.14256) software as a backup. Acoustic measurements were collected from 16 m below the sea surface to within 0.5 m of the sounder-detected bottom or a maximum of 1,000 m in deep water. Data were analyzed using Echoview post-processing software (ver. 7.1.12).

Trawl Gear and Oceanographic Equipment

General trawl gear specifications for the sampling of acoustic backscatter are described below. Midwater backscatter was sampled with 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, which was fitted with a single 12 mm (0.5 in) codend liner. The AWT was fished with four 82.3 m (270 ft) non-rotational wire rope (1.9 cm (0.75 in) dia. 8H19) bridles, 226.8 kg (500 lb) or 340.2 kg (750 lb) tom weights on each side, and 5 m^2 Fishbuster trawl doors [1,247 kg (2,750 lb) each]. To gauge escapement of smaller fishes from the net (Williams et al. 2011), a small-mesh (12 mm) recapture net was permanently attached to the bottom panel of the AWT approximately 26 m (85 ft) forward of the codend. Stereo camera images of fishes passing into the AWT codend were recorded during hauls targeting backscatter shallower than 500 m depth using a stereo camera system attached to the net, forward of the codend (i.e., CamTrawl;

Williams et al. 2010b). Camera images were used to identify species, and for individual fish length measurements following procedures described in Williams et al. (2010a).

Midwater backscatter was also sampled with a poly Nor'eastern (PNE) bottom trawl, which is a 4-panel high-opening trawl equipped with roller gear and constructed with stretch mesh sizes that range from 13 cm (5 in) in the forward portion of the net to 8.9 cm (3.5 in) in the codend. The PNE codend was fitted with a single 12 mm (0.5 in) codend liner and was fished with the same 5 m^2 Fishbuster trawl doors.

Both trawls were monitored during fishing for trawl depth and vertical mouth openings. The AWT was monitored using a Simrad FS70 third-wire net netsonde attached to the trawl headrope. The vertical net opening ranged from 19 to 31 m (62-102 ft) and averaged 25 m (82 ft) while fishing. The AWT was fished at an approximate trawling speed of 1.7 m/sec (3.3 knots). The PNE was monitored using the Furuno (CN-24) attached to the headrope. The PNE was used only once in Shelikof Strait. The vertical net opening was 9.5 m for that deployment.

Physical oceanographic data collected during the cruises included temperature profiles obtained with a Sea-Bird Electronics temperature-depth probe (SBE-39) attached to the trawl headrope, and conductivity-temperature-depth (CTD) observations collected with a Sea-Bird CTD (SBE 911 plus) system at calibration sites. Sea surface temperature data were measured using the ship's Sea-Bird Electronics sea surface temperature system (SBE 38) located near the ship's bow, approximately 1.4 m below the surface. At times when the SBE-38 was not operating, sea surface temperatures were taken from the Furuno T-2000 temperature probe located amidships 1.4 m below the surface. During this winter season, the SBE 38 was used 90% of the time and the Furuno was used 10% of the time. These and other environmental data were recorded using the ship's Scientific Computing Systems (SCS). Surface water temperatures were plotted as 1 nautical mile (nmi) averages along the vessel's cruise track.

Survey Design

The survey design consisted of a series of predetermined transects in each survey area, parallel to one another except in areas where it was necessary to reorient transects to maintain a perpendicular alignment to the isobaths and to navigate around landmasses. Coverage and transect spacing were chosen to be consistent with previous surveys in each area. To add an element of randomization to this systematic transect design, the position of the first transect in each area was randomly jittered by an amount less than or equal to the intertransect distance, and then subsequent transects were laid out with uniform spacing from this point (Rivoirard et al. 2000). Survey activities were conducted 24 hours/day.

Trawl hauls were conducted to identify the species composition of acoustically observed fish aggregations and to determine biological characteristics of walleye pollock and other specimens. Catches were sorted to species. When large numbers of juvenile and adult walleye pollock were encountered, the predominant size groups were sampled separately (e.g., age-1 vs. large adults). Sex, length, body weight, maturity, age (otoliths), and gonad measurements were taken from a random subset of walleye pollock within each size group. Walleye pollock and other fishes were measured to the nearest 1 mm fork length (FL), and capelin (*Mallotus villosus*) were measured to the nearest 1 mm standard length (SL), with an electronic measuring board (Towler and Williams 2010). Gonadosomatic index [GSI: ovary weight/(ovary weight + body weight)] was calculated for pre-spawning females. Maturity was determined by visual inspection of the gonads and was categorized as immature, developing, mature (hereafter pre-spawning), spawning, or spent[2]. The ovary weight was determined for mature, pre-spawning females. An electronic motion-compensating scale (Marel M60) was used to weigh individual walleye pollock and selected ovaries to the nearest 2 g. Trawl station information and biological measurements were electronically recorded using the MACE Program's customized Catch Logger for Acoustic Midwater Surveys (CLAMS) software. Pocket net catches were logged in a manner similar to, but separate from, the codend catches.

[2] Groundfish Survey Codes. 2016. RACE Division, AFSC, NMFS, NOAA; 7600 Sand Point Way NE, Seattle, WA 98115. Available online: https://www.afsc.noaa.gov/RACE/groundfish/Groundfish_Survey_Codes.pdf.

For each trawl haul in cruise DY2017-01, sex and length measurements from an average of 275 randomly selected walleye pollock were collected, with an average of 54 individuals more extensively sampled for body weight, maturity, and age (Table 1). For each haul in cruise DY2017-02, sex and length measurements from an average of 320 randomly selected walleye pollock were collected, with an average of 50 individuals more extensively sampled for body weight, maturity, and age (Table 2). For each haul in cruise DY2017-03, sex and length measurements from an average of 305 randomly selected walleye pollock were collected, with an average of 55 individuals more extensively sampled for body weight, maturity, and age (Table 3). Age-1 pollock were not used in any maturity calculations.

Data Analysis

Walleye pollock abundance was estimated by combining acoustic and trawl information. Acoustic backscatter was classified as walleye pollock, rockfishes, unidentified fishes, or an undifferentiated mixture of primarily macrozooplankton, based on the depth distribution and appearance of the aggregations and on catch composition in nearby trawl hauls. The sounder-detected bottom was calculated using the mean of sounder-detected bottom lines for all five frequencies (Jones et al. 2011). Although acoustic data were recorded at five frequencies, the results of this report and the survey time series are based on the 38 kHz data. A minimum S_v threshold of –70 dB re 1 m^{-1} was applied to the 38 kHz acoustic data, which were then averaged at 0.5 nmi horizontal by 10 m vertical resolution and exported to a database. A two-part filter was applied based on the difficulty of separating pollock backscatter from co-occurring non-pollock targets which resonated in the 18 kHz, but were not caught in the trawls. This filter consisted of a frequency-response criterion, such that anything that was more than one standard deviation above the expected pollock response in the difference between 18 and 120 kHz was removed by the filter (4.8 dB**;** De Robertis et al. 2010). In addition, the integration threshold was changed from -70 to -60, which excluded low-intensity backscatter not attributable to pollock. This two-part filter was applied to 21% and 2% of the trackline in DY2017-01 and DY2017-02, respectively.

Within a surveyed area (e.g., Shumagin Islands, Sanak Trough, Shelikof Strait, Marmot Bay), the mean fish weight-at-length in each 1 cm length interval was estimated from the trawl information when six or more walleye pollock were measured within a length interval. Otherwise, weight-at-length was estimated using a linear regression of the natural logs of all length-weight data (De Robertis and Williams 2008). Walleye pollock length compositions were combined from trawl hauls into regional length strata based on geographic proximity, similarity of length composition, and backscatter characteristics. Surveyed areas were composed of 1-4 length strata.

Abundance for each length stratum was estimated as follows. The echosounder measures backscattering strength, which is integrated vertically to produce the nautical area scattering coefficient, s_A (units of m^2 nmi^{-2}; MacLennan et al. 2002).The acoustic return from an individual fish is referred to as its backscattering cross-section, σ_{bs} (m^2), or in more familiar (logarithmic) terms as its target strength, TS (dB re 1 m^2), where,

$$TS = 10 \log_{10} \sigma_{bs}. \qquad \text{Eqn (1)}$$

The estimated TS-to-length relationship for walleye pollock (Foote and Traynor 1988, Traynor 1996) is

$$TS = 20 \log_{10} L - 66, \qquad \text{Eqn (2)}$$

where L = fork length (FL) in centimeters. Biological information available from the trawl hauls includes:

P_i, the proportion of pollock by number at length i,

$\overline{W}_i$, mean weight-at-length i, and

$Q_{i,j}$ is the proportion of j-aged fish of length i.

For a given geographic length stratum, the abundance of pollock in the area (A, nmi^2) is estimated from the mean areal backscatter attributed to walleye pollock ($\bar{s}_A$, m^2 nmi^{-2}), the mean backscattering cross-section ($\bar{\sigma}_{bs}$, m^2) of pollock, and the biological information as follows:

$\bar{\sigma}_{bs} = \Sigma_i (P_i \times \sigma_{bs,i})$, where $\sigma_{bs,i} = 10^{((20 \log_{10} Li - 66)/10)}$ Eqn (3)

Numbers at length i: $N_i = P_i \times \bar{s}_A \times A / 4\pi\bar{\sigma}_{bs}$ Eqn (4)

Biomass at length i : $B_i = \bar{W}_i \times N_i$ Eqn (5)

Numbers at age j : $N_j = \Sigma_i Q_{i,j} \times N_i$ Eqn (6)

Biomass at age j : $B_j = \Sigma_i Q_{i,j} \times B_i$. Eqn (7)

The abundance in each survey area was estimated by adding the estimates for all the length strata in the area. Length-at-age data were used to convert abundance-at-length estimates to abundance-at-age (Jones et al. 2017).

In all areas where transects were parallel, relative estimation errors for the acoustic-based estimates were derived using a one-dimensional (1-D) geostatistical method (Petitgas 1993, Williamson and Traynor 1996, Walline 2007). "Relative estimation error" is defined as the ratio of the square root of the 1-D estimation variance ($variance_{sum}$) to the biomass estimate (i.e., the sum of biomass over all transects, $biomass_{sum}$, kg):

$$Relative\ estimation\ error_{1\text{-}D} = \frac{\sqrt{variance_{sum}}}{biomass_{sum}} . \qquad \text{(Eqn. 6)}$$

Since sampling resolution affects the variance estimate, and the 1-D method assumes equal transect spacing, estimation variance is determined separately in each area with unique transect spacing. Relative estimation error for the entire survey (among n survey areas with different transect spacings) was computed by summing the estimation variance for each area j, taking the square root, and then dividing by the sum of the biomass over all areas, assuming independence among estimation errors for each survey area (Rivoirard et al. 2000):

$$\textit{Relative estimation error}_{\textit{1-D survey}} = \frac{\sqrt{\sum_{j=1}^{n} variance_{sum\,j}}}{\sum_{j=1}^{n} biomass_{sum_j}} \quad . \qquad \text{(Eqn. 7)}$$

A two-dimensional (2-D) geostatistical method (Petigas 1993, Rivoirard et al. 2000) was used to derive relative estimation errors in a few survey areas where zig-zag transects were used. The 2-D method differs from the 1-D method in that it computes a variance (*variance*$_{mean}$) for the mean biomass density (*biomass*$_{mean}$, kg nmi^{-2}) rather than the biomass sum (kg) in each area. Mean biomass density is multiplied by the surveyed area (nmi^{2}) to obtain the biomass estimate for that area (kg); likewise, 2-D relative estimation error is obtained as:

$$\textit{Relative estimation error}_{\textit{2-D}} = \frac{variance_{mean_j} * area_j^2}{biomass_{mean_j} * area_j} \qquad \text{(Eqn. 8)}$$

and over several zig-zag survey areas as:

$$\textit{Relative estimation error}_{\textit{2-D survey}} = \frac{\sqrt{\sum_{j=1}^{n} variance_{mean_j} * area_j^2}}{\sum_{j=1}^{n} biomass_{mean_j} * area_j} \qquad \text{(Eqn. 9)}$$

Equations 8 and 9 are analogous to Equations 6 and 7 after accounting for unit conversions.

The biomass estimate for the entire survey was obtained by summing biomass for all areas. However, the variance for that sum includes only the 1-D relative estimation errors, as it is not appropriate to combine 1-D and 2-D variance estimates since they involve different assumptions and may not be strictly comparable (Petitgas 1993). For reference, 99% of the survey biomass total was observed in areas for which 1-D relative estimation errors were obtained.

Geostatistical methods were used to compute estimation error as a means to account for estimation uncertainty arising from the observed spatial structure in the fish distribution. These errors, however, quantify only transect sampling variability of the acoustic data (Rivoirard et al. 2000). Other sources of error (e.g., target strength, trawl sampling) were not evaluated.

Otoliths were used to estimate walleye pollock ages, and were collected from the Shumagin Islands (n = 211), Sanak Trough (n = 53), Morzhovoi Bay (n= 60), Pavlof Bay (n = 62); Kenai Bays (n = 402), Prince William Sound (n = 206), Hinchinbrook Trough and Middleton Island (n = 257); Shelikof Strait (n = 613), Chirikof Shelf break (n = 70), and Marmot Bay (n = 139) areas (Tables 1-3). The samples were stored in a 50% glycerol/thymol-water solution. Only otoliths from the Shelikof Strait survey area (Shelikof, Chirikof, and Marmot) were processed by AFSC Age and Growth Program researchers to determine ages at the time of this report.

RESULTS and DISCUSSION

Calibration

Pre- and post-survey calibration measurements of the 38-kHz transducer showed no significant differences in gain parameters or beam pattern characteristics between calibrations, confirming that the acoustic system was stable throughout the survey (Table 4). The difference in integration gain measured before and after the survey was < 0.1 dB, and the average of all results from both calibrations (averages calculated in the linear domain for dB quantities) were used in the final analysis (Table 4).

Shumagin Islands

Acoustic backscatter was measured along 723 km (390.4 nmi) of transects (Fig. 1). The survey transects were spaced 1.9 km (1.0 nmi) apart southeast of Renshaw Point and in the eastern half of Unga Strait, 3.7 km (2.0 nmi) apart in the western half of Unga Strait, 4.6 km (2.5 nmi) apart in Stepovak Bay and West Nagai Strait, and 9.3 km (5.0 nmi) apart in Shumagin

Trough. Bottom depths did not exceed 225 m, and transects generally did not extend into waters less than about 50 m depth.

Water Temperature

Surface water temperatures averaged 4.6° C throughout the Shumagin Islands survey area (Fig. 2), about 0.6 degrees lower than last year's average of 5.2° C. Mean water temperature ranged 0.9° C between the surface and deepest trawl depth across all hauls (Fig. 3).

Trawl Samples

Biological data and specimens were collected in the Shumagin Islands from six AWT hauls conducted in midwater (Tables 1, 5; Fig. 1) on backscatter attributed to walleye pollock (Fig. 4). Walleye pollock was the most abundant species caught by weight and numbers, contributing 98.4% and 99.7% to the total catch, respectively (Table 6).

The majority of walleye pollock in the Shumagin Islands in 2017 were between 35 and 50 cm fork length (FL), with a predominant length mode at 42 cm FL (Fig. 5). This size range accounted for 99.9% of the numbers and effectively 100% of the biomass of all pollock observed in this area. The size range is characteristic of age-5 walleye pollock, and suggests the continued success of the 2012 year class (Fig. 6). Smaller fish (< 15 cm FL) made up a very small portion of the biomass (< 0.1 %), and no pollock were observed between 15 and 33 cm FL (~ 2-3 year-olds). Large adults (≥ 56 cm) were also not observed (Fig. 5).

The maturity composition of males > 40 cm FL (n = 119) was 0% immature, 8% developing, 50% pre-spawning, 40% spawning, and 3% spent (Fig. 7a). The maturity composition of females > 40 cm FL (n = 136) was 0% immature, 7% developing, 85% pre-spawning, 4% spawning, and 4% spent (Fig. 7a). Findings from the 1994 Shelikof survey indicated that estimated walleye pollock biomass declined as the proportion of adult females in spawning and spent stages of maturity increased, suggesting that substantial emigration of adults from the surveyed area occurred following spawning and resulted in a negative bias to abundance estimates (Wilson 1994). Based on this, the high percentage of pre-spawning females and the low percentage of spawning and spent females in the 2017 Shumagin area suggests that survey timing was likely appropriate. Nearly all of the fish observed in this survey were > 37 cm FL and reproductively mature (Fig. 7b). The L_{50} could not be accurately calculated because of the lack of contrast in length and maturity status in the data set. The average GSI of pre-spawning females, based on 127 samples, was 0.09 $\pm$ 0.04 (mean + SD; Fig. 7c), similar to the average GSI from the 2016 survey (0.07 $\pm$ 0.03). Most 2017 GSI estimates were within 1 SD of the historical mean GSI of all surveys between 1994 and 2016 (0.12 $\pm$ 0.05).

Distribution and Abundance

Walleye pollock between 30 and 50 cm FL were present mainly in Unga Strait, near the mouth of Stepovak Bay, and in the northern portion of West Nagai Strait (Fig. 8). Adult pollock > 50 cm FL have historically been detected off Renshaw Point but were essentially absent in this area in 2017. The majority of the pollock were scattered throughout the water column between 50-150 m depth, within approximately 50 m of the bottom (Fig. 9), and occasionally formed small, very dense (i.e., “cherry ball”) schools.

The estimated amounts of pollock for the Shumagin area were 53.5 million fish weighing 29,621 t. The biomass estimate was 43% higher than the 2016 estimate (20,706 t; McCarthy et al. [2016]) and 39% of the historical mean of 75,901 t for this survey (Table 7a; Fig. 10). The relative estimation error of the biomass based on the 1-D geostatistical analysis was 9.8%.

Sanak Trough

Acoustic backscatter in Sanak Trough was measured along 167 km (89.9 nmi) of transects spaced 3.7 km (2 nmi) apart (Fig. 1). Bottom depths ranged from 45 m at the transect end points to 160 m along the deepest part of the southernmost transects.

Water Temperature

Surface water temperatures in the Sanak Trough survey area averaged 4.0° C overall (Fig. 2) which was a little more than half a degree cooler than temperatures recorded in 2016 but above the 3.4° C average for surveys in this area since 2003. Water temperature ranged 1.1° C between the surface and 118 m (max trawl haul depth) in Sanak (Fig. 11).

Trawl Samples

Biological data and specimens were collected in Sanak Trough from a single AWT haul (Tables 1, 5; Fig. 1) on backscatter attributed to walleye pollock (Fig. 4). Walleye pollock and Pacific cod, *Gadus macrocephalus*, were the most abundant species by weight, contributing 64.4% and 20.8% of the total catch, while eulachon *(Thaleichthys pacificus)* were the most abundant by numbers contributing 59.8% of the catch (walleye pollock only made up 10.3% of the total catch by numbers; Table 8). Walleye pollock ranged between 10 and 60 cm FL with a dominant length mode between 35 and 50 cm FL (Fig. 5). This mode accounted for 95% of the numbers and 99.9% of the biomass of all pollock observed in Sanak Trough and likely represents age-5 fish.

The maturity composition for males > 40 cm FL (n = 22) was 0% immature, 0% developing, 77% pre-spawning, 14% spawning, and 9% spent (Fig. 12a). The maturity composition for females > 40 cm FL (n = 31) was 0% immature, 9% developing, 73% pre-spawning, 0% spawning, and 18% spent (Fig. 12a). Nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature. Thus, the L_{50} could not be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 12b). The average GSI of pre-spawning females was 0.08 $\pm$ 0.04 (Fig. 12c), similar to last year (0.09 $\pm$ 0.03), but lower than the mean of 0.14 $\pm$ 0.05 for the time series from 2003 to 2016.

Distribution and Abundance

The majority of walleye pollock biomass was located in the southeastern portion of the surveyed trough (Fig. 8) and distributed throughout the water column below 50 m (Fig. 13).

The estimated amounts of pollock in Sanak were 1.8 million fish weighing 957 t. The biomass estimate was 27% of the 2016 estimate of 3,556 t, and represents only 2% of the historic mean of 39,812 t for this survey (Table 7a; Fig. 14). The relative estimation error based on the 1-D geostatistical analysis of the biomass was 19.6%.

Morzhovoi Bay

Acoustic backscatter was measured along 68 km (36.9 nmi) of transects in Morzhovoi Bay (Fig. 1). The transects were spaced 3.7 km (2 nmi) apart (Fig. 1). Bottom depths ranged from about 40 to 150 m.

Water Temperature

Surface water temperatures in the Morzhovoi Bay survey area averaged 3.1° C overall (Fig. 2). The value was 0.8 degrees cooler than temperatures recorded in 2016 and warmer than the 2.5° C average for surveys in this area since 2006. Mean water temperature ranged 0.8° C between the surface and 90 m (deepest trawl depth) at the two haul locations (Fig. 15, Table 5).

Trawl Samples

Biological data and specimens were collected in Morzhovoi Bay from two AWT hauls (Tables 1, 5; Fig. 1). Except for three Chinook salmon, walleye pollock was the only species caught, contributing 98.6% by weight and 99.7% by numbers (Table 9). Walleye pollock ranged between 29 and 55 cm FL in Morzhovoi Bay, and accounted for 99% of the numbers and 99.9% of the biomass in this area. More adults > 50 cm FL were observed in Morzhovoi Bay than in the Sanak and Shumagin regions (Fig. 5) and accounted for 10% of the pollock biomass in this area.

The maturity composition for males > 40 cm FL (n = 70) was 0% immature, 4% developing, 4% pre-spawning, 89% spawning, and 3% spent (Fig. 16a). The maturity composition for females longer than 40 cm FL (n = 24) was 0% immature, 17% developing, 58% pre-spawning, 4% spawning, and 21% spent (Fig. 16a). The fact that almost a quarter of the measured females were in spawning and spent stages of maturity suggests that the timing of the 2017 survey of Morzhovoi Bay was likely a bit late to coincide with the onset of spawning for fish in this area. Nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature. Thus, the L_{50} could not be accurately estimated because of the lack of contrast in length and maturity status in the data (Fig. 16b). The average GSI of pre-spawning females was 0.10 $\pm$ 0.05 (Fig. 16c), which is the same as measured in 2016 but somewhat lower than the historical average of 0.15 $\pm$ 0.06.

Distribution and Abundance

The majority of walleye pollock biomass in Morzhovoi Bay was located in the southern portion of the surveyed area (Fig. 8) and was concentrated around 85 m depth from the surface (Fig. 17).

The estimated amounts of pollock in Morzhovoi Bay were 6.8 million fish weighing 3,932 t. The biomass estimate was comparable to the estimates generated between 2007 and 2013 (mean = 2,259 t; standard deviation = 397 t; Fig. 14) and approximately a third of the estimate from either 2006 (11,700 t) or 2016 (11,412 t, Table 7a). The relative estimation error based on the 1-D geostatistical analysis of the biomass was 6.5%.

Pavlof Bay

Acoustic backscatter was measured along 65 km (34.8 nmi) of transects in Pavlof Bay. The transects were spaced 3.7 km (2 nmi) apart (Fig. 1), and the depths ranged from about 40 to 150 m.

Water Temperature

Surface water temperatures in the Pavlof Bay survey area averaged 2.9° C overall (Fig. 2), 1.5 degrees colder than last year's mean temperature of 4.4° C, and mean water temperature ranged 0.3° C between the surface and deepest trawl depth (98 m) at the two haul locations (Table 5, Fig. 18). No temperature data were collected in Pavlof Bay in 2002 or 2010.

Trawl Samples

Biological data and specimens were collected in Pavlof Bay from two AWT hauls (Tables 1, 5; Fig. 1). Walleye pollock was the most abundant species caught, contributing 99.8% by weight and 99.4% by numbers (Table 10). Walleye pollock ranged between 10 and 60 cm FL with a dominant length mode between 35 and 50 cm FL (Fig. 5). This mode accounted for 84% of the numbers and 99% of the biomass of all pollock observed in Pavlof Bay and likely represents age-5 fish. More pollock < 15 cm FL were detected in Pavlof than in any of the other areas, although very few of these presumed age-1 fish were seen during DY1701. This small size group represented 1% of the total number of fish caught in the DY1701 survey, and 0.4% of the biomass in Pavlof.

The maturity composition for males > 40 cm FL (n = 18) was 0% immature, 6% developing, 67% pre-spawning, 0% spawning, and 28% spent (Fig. 19a). The maturity composition for females > 40 cm FL (n = 22) was 0% immature, 9% developing, 77% pre-spawning, 0% spawning, and 14% spent (Fig. 19a). The fact that only a sixth of the measured females were in the spent stage of maturity suggests that the timing of the 2017 survey of Pavlof Bay was relatively well-timed to coincide with the onset of spawning for fish in this area. Nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature. The L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 19b). The average GSI of pre-spawning females was 0.10 $\pm$ 0.03 (Fig. 19c), similar to that observed in 2016 (0.11 + 0.04). No biological data were collected in Pavlof Bay in 2002 or 2010.

Distribution and Abundance

The majority of walleye pollock biomass in Pavlof Bay was generally located in the northwest portion of the surveyed area (Fig. 8) and was scattered throughout the water column between 40 to 100 m from the surface (Fig. 20). Greater densities of suspected pollock backscatter were observed farther north in the Bay in 2002, and minimal backscatter was measured throughout Pavlof Bay in 2010.

The estimated amounts of pollock in Pavlof Bay were 4.7 million fish weighing 2,228 t. The biomass estimate was very similar to the 2016 estimate of 2,130 t (Table 7a). The relative estimation error based on the 1-D geostatistical analysis of the biomass was 9.5%. A survey of Pavlof Bay was also conducted in 2002 and 2010, but an equipment malfunction and inclement weather, respectively, prevented trawling. No biomass estimates were made in those years.

Kenai Bays

The Kenai Bays, specifically Port Dick, Nuka Passage, Nuka Bay, Harris Bay, Aialik Bay, Resurrection Bay, Day Harbor, Port Bainbridge, and Knight Passage, were surveyed from 2 to 5 March (Fig. 21). Acoustic backscatter was measured along 552 km (298 nmi) of zig-zag transects. This was the third winter in which bays on the Kenai Peninsula were surveyed (the first was winter 2010, and the second was winter 2015). Bottom depths ranged from 65 m at the transect end points to 295 m along the deepest part of the southernmost transects.

Water Temperature

Surface water temperatures in the surveyed Kenai bays averaged 4.8° C overall, and ranged from 3.7° C to 5.9° C (Fig. 22). This was 0.4° C colder than temperatures recorded during winter 2015 (mean: 5.1° C). Water temperature at trawl locations ranged 1.8° C between the surface and deepest trawl depth (Fig. 23), and averaged 5.7° C at fishing depths (Table 11).

Trawl Samples

Biological data and specimens were collected in the Kenai bays from 11 AWTs (Tables 2, 11; Fig. 21) on backscatter attributed to walleye pollock (Fig. 24). Walleye pollock was the most abundant species, contributing 99.8% by weight and 81.1% by number (Table 12). Pacific glass shrimp (*Pasiphaea pacifica*) was the second most commonly caught species by number (13.8%). Walleye pollock ranged between 35 and 55 cm FL, in a unimodal distribution with the mode at 42 cm FL (Fig. 25a), which is characteristic of age-5 fish.

The maturity composition for males > 40 cm FL (n = 266) was 0% immature, 2% developing, 72% pre-spawning, 26% spawning, and 0% spent (Fig. 26a). The maturity composition for females > 40 cm FL (n = 181) was 0% immature, 2% developing, 94% pre-spawning, 4% spawning, and 0% spent (Fig. 26a). The fact that almost all of the females were prespawning indicates that survey timing was appropriate as it coincided with the onset of spawning for the majority of the fish that likely spawn in this area. All of the fish observed in this survey were > 35 cm FL and reproductively mature. The L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 26b). The average GSI of pre-spawning females was 0.09 ± 0.03 (Fig. 26c), which was slightly less than the historical mean GSI from the 2010 and 2015 surveys of the same region (0.11 ± 0.04).

Distribution and Abundance

The majority of the walleye pollock biomass (FL ≥ 30 cm) in the Kenai Region was located in Nuka Bay, Aialik Bay, Resurrection Bay (combined 32%), and Port Bainbridge (17%; Fig. 27). There was less than 1 ton of biomass estimated for fish < 30 cm. Most of the walleye pollock backscatter was located in schools in the upper water column, between 50 m and 150 m (Fig. 28).

The estimated amounts of pollock in the Kenai bays were 126 million fish weighing 67,022 t. The biomass estimate was less than the estimates from the winter 2015 and 2010 surveys (80,965 t and 111,200 t, respectively, Table 7b). Neither the 2015 nor the 2010 estimates included Knight Passage. Excluding Knight Passage from the 2017 biomass estimate (57,415 t) results in a biomass estimate that is 13% and 40% lower than that observed in 2015 and 2010, respectively. The relative estimation error based on the 2-D geostatistical analysis of the 2017 biomass was 5.3%.

Prince William Sound

Prince William Sound (PWS) was surveyed from March 5th through 9th. This was the fourth winter survey in PWS. The first survey was during winter 1984, the second was in 1990, and the most recent was in 2010 (Guttormsen and Jones 2010). Acoustic backscatter was measured along 533 km (288 nmi) of parallel transects spaced 4.6 km (2.5 nmi) apart (Fig. 21). Bottom depths ranged from 65 m at the transect end points to 750 m along the deepest part of the southernmost transects.

Water Temperature

Surface water temperatures in the surveyed areas of PWS averaged 4.7° C overall, and ranged from 3.6° C to 5.2° C (Fig. 22). Estimates were similar to surface water temperatures recorded during winter 2010. Water temperature at trawl locations ranged 1.8° C between the surface and deepest trawl depth (Fig. 29) and averaged 6.4° C at fishing depths (Table 11).

Trawl Samples

Biological data and specimens were collected in Prince William Sound from seven AWTs (Tables 2, 11; Fig. 21). Walleye pollock was the most abundant species by weight, contributing 97.8% by weight but only 29.8% by number (Table 13). Pacific glass shrimp (*Pasiphaea pacifica*) (36.5 %), and northern smoothtongue (30.2%) were the second and third most abundant species by number. Walleye pollock ranged between 35 and 65 cm FL, with a primary mode at 42 cm FL (indicative of age-5 fish), and a few older fish (Fig. 25b). This length distribution was nearly identical to that in the Kenai Bays, except for relatively greater contribution of fish between about 55 and 65 cm FL.

The maturity composition for males > 40 cm FL (n = 241) was 0% immature, 0% developing, 26% pre-spawning, 74% spawning, and 0% spent (Fig. 30a). The maturity composition for females > 40 cm FL (n = 106) was 0% immature, 1% developing, 83% pre-spawning, 15% spawning, and 1% spent (Fig. 30a). The fact that almost all of the females were prespawning indicates that survey timing was appropriate as it coincided with the onset of spawning for the majority of the fish that likely spawn in this area. Nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature. The L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 30b). The average GSI of pre-spawning females was 0.11 $\pm$ 0.03 (Fig. 30c), similar to the mean GSI in 2010 (0.13 $\pm$ 0.05; Guttormsen and Jones 2010).

Distribution and Abundance

The majority of the walleye pollock biomass in PWS was distributed along the eastern side of the main channel (Fig. 27). Most fish were detected around 350m deep and 100 m off bottom (Fig. 31). This spatial distribution is remarkably similar to that observed in the 2010 survey, although most fish in 2017 were age-5 compared to age-6 and age-7 in 2010 (Guttormsen and Jones 2010).

The estimated amounts of pollock in PWS were 195 million fish weighing 106,708 t. The biomass estimate was slightly less than the estimate from the winter 2010 GOA survey estimate of 111,200 t (Table 7b, Guttormsen and Jones, 2010). Less than 0.5 t were attributed to fish < 30 cm. The relative estimation error based on the 1-D geostatistical analysis of the biomass was 4.7%.

Hinchinbrook Trough and Middleton Island

Hinchinbrook Trough (i.e., south of Hinchinbrook Island to GOA Shelf) was surveyed from March 7th through 9th, and the shelf break near Middleton Island (zig-zag transects) was surveyed on 9 March (Fig. 21). This was the first winter spawning survey of these areas, although they were surveyed during summer 2015 (Jones et al, 2017). Acoustic backscatter was measured along 338 km (182 nmi) of parallel transects spaced 13.9 km (7.5 nmi) apart and along 151 km (82 nmi) of zig-zag transects (Fig. 21). Bottom depths ranged from 60 m along the transects closest to Hinchinbrook Island, to 925 m at the offshore end of the Middleton Island transect.

Water Temperature

Surface water temperatures in Hinchinbrook Trough averaged 5.2° C overall, and ranged from 4.1° C to 5.7° C (Fig. 22). Water temperature at trawl locations ranged 0.7° C between the surface and deepest trawl depth (Fig. 32) and averaged 5.9° C at fishing depths (Table 11). Surface water temperatures in the Middleton Island area averaged 5.5° C overall, and ranged from 4.4° C to 5.6° C (Fig. 22). Water temperature at trawl locations ranged 1.5° C between the surface and deepest trawl depth (Fig. 33), and averaged 4.9° C at fishing depths (Table 11).

Trawl Samples

Biological data and specimens were collected in the Hinchinbrook Trough and Middleton Island areas from six AWTs (four in Hinchinbrook and two in Middleton; Tables 3 and 11; Fig. 21). Walleye pollock was the most abundant species in Hinchinbrook, contributing 75.3% and 53.5% of the total catch by weight and number, respectively (Table 14). Pacific ocean perch (POP; *Sebastes alutus*) was the second most abundant species by weight (23.3 %) and third most abundant species by number (12.3%). Lanternfishes (family Myctophidae) were the second most abundant species by number (13.0 %). POP and lanternfishes were also abundant in the Middleton survey area, with POP contributing 55.5 % and 27.9% of the total catch by weight and number, respectively (Table 15). Lanternfishes were the most abundant species by number (29.5%). Walleye pollock in the Middleton area only composed 42.2 % and 28.2% of the total catch by weight and number, respectively (Table 15).

Walleye pollock in Hinchinbrook and Middleton ranged between 38 and 57 cm FL with a mode at 42 cm FL (Fig. 25c). This length distribution is similar to that observed in the rest of the region from the Kenai bays to Prince William Sound. As in those areas the majority of the biomass in this region was composed of fish with lengths characteristic of 5-year-olds (Jones et al. 2017).

The maturity composition in Hinchinbrook and Middleton for males > 40 cm FL (n = 115) was 0% immature, 1% developing, 42% pre-spawning, 56% spawning, and 2% spent (Fig. 34a). The maturity composition for females > 40 cm FL (n = 100) was 0% immature, 3% developing, 95% pre-spawning, 2% spawning, and 0% spent (Fig. 34a). The fact that almost all of the females were prespawning indicates that survey timing was appropriate as it coincided with the onset of spawning for the majority of the fish that likely spawn in this area. Nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature; the L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 34b). The average GSI of pre-spawning females was 0.09 $\pm$ 0.03 (Fig. 34c).

Distribution and Abundance

The majority of the adult walleye pollock biomass was located along the western ends of the northern transects in Hinchinbrook Trough. Relatively little biomass was also estimated east of Middleton Island in deep water (Fig. 27). Most of the walleye pollock backscatter in Hinchinbrook was located between 100 m and 200 m deep (Fig. 35). Pollock backscatter near Middleton Island was about 400 m deep, and between 200 and 300m off the bottom (Fig. 36).

The estimated amounts of pollock in Hinchinbrook and Middleton surveys combined were 71.4 million fish weighing 37,799 t (Table 7b). This was the first winter survey of these areas. The relative estimation error based on the 1-D geostatistical analysis of the biomass for

Hinchinbrook was 15.1%. The relative estimation error based on the 2-D geostatistical analysis of the biomass for Middleton was 37.3%.

Shelikof Strait

Acoustic backscatter was measured along 1,510 km (815 nmi) of transects spaced 13.9 km (7.5 nmi) apart (Fig. 37). Bottom depths in the survey area ranged from 45 to 335 m.

Water Temperature

Surface water temperatures in Shelikof Strait averaged 3.3° C overall (Fig. 38), and ranged from 0.8° C to 4.7° C. This was 2.3° C colder than 2016 and 0.3° C lower than the historic mean of the prior 34 surveys conducted in this area since 1981. Estimated mean water temperature at fishing depths was 4.8° C (Table 16). Mean estimates at haul locations varied nearly 3° C between the surface and deepest trawl depth across all hauls (Fig. 39).

Trawl Samples

Biological data and specimens were collected in the Shelikof Strait area from 16 AWT hauls and one PNE haul (Tables 3 and 16, Fig. 37) on backscatter attributed to walleye pollock (Fig. 40). Walleye pollock and eulachon were the most abundant species by weight and numbers in AWT hauls, contributing 95.1% and 4.5% by weight, and 47.5% and 45.9% by numbers, respectively (Table 17). Eulachon only contributed 1.2% by weight in the 2016 survey. In some years, however, eulachon contributed up to 47% of the total catch by weight (i.e., in 2008). Walleye pollock was the most abundant species in the single PNE haul done in the Shelikof Strait this year, contributing 99.8% of the total weight and 97.5% of the total numbers (Table 18).

The majority of walleye pollock in the Shelikof Strait were between 35 and 50 cm FL with a length mode centered around 42 cm FL (Fig. 41). This size range accounted for 90% of the numbers and 97% of the biomass of all pollock observed in this area. This size range indicates the continued success of the 2012 year class (Tables 19-20, Fig. 42). Smaller fish

(10-15 cm) made up a very small portion of the biomass (0.23%) and numbers (10%), and large adults ($\geq$ 51 cm) also contributed little (2.6%) to overall biomass in 2017 (Figs. 41-42).

The maturity composition in the Shelikof Strait area for males > 40 cm FL (n = 311) was 0% immature, 3% developing, 5% pre-spawning, 83% spawning, and 8% spent (Fig. 43a). The maturity composition of females > 40 cm FL (n = 404) was 0% immature, 5% developing, 63% pre-spawning, 7% spawning, and 26% spent (Fig. 43a). The larger fraction of spawning and spent females relative to pre-spawning females suggests that the survey began somewhat closer than preferred to the timing of peak spawning for the majority of fish that spawn in Shelikof. In 2016, the survey encountered only 10% of the females in spawning and spent conditions (Stienessen et al., 2017). With the exception of the age-1 fish, which are not included in maturity calculations, nearly all of the fish observed in this survey were > 35 cm FL and reproductively mature (Fig. 43b). The L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 43b). The average GSI from 275 pre-spawning females was 0.14 $\pm$ 0.05 (Fig. 43c). The estimate was more than that observed in 2016 (0.11 $\pm$ 0.04) and on par with the historical mean (0.14 $\pm$ 0.04).

Distribution and Abundance

Walleye pollock were observed throughout the surveyed area and were most abundant in the central part of the surveyed area (Fig. 44). They were detected in the midwater between 50 and 160 m depth, and as a thick, uniform layer around 210 m deep (Fig. 45). Dense midwater pollock aggregations of 35-50 cm FL pollock were encountered throughout the survey area (not shown). Spawning aggregations, historically observed in the northwestern part of the Strait, were not seen in 2017 (or in 2016), which is in contrast to previous years (Stienessen et al 2017).

The estimated amounts of pollock in Shelikof Strait were 3.2 billion fish weighing 1,489,723 t. The biomass estimate was more than twice the 2016 estimate and more than twice the historic mean of 665,474 t (Table 7c; Fig. 46). The 2017 biomass estimate approaches biomass values not seen since the mid-1980s (Table 7c, Fig. 46). The relative estimation error of the biomass based on the 1-D geostatistical analysis was 4.3%.

The progression of the strong 2012 year class is clearly visible in the time series of both biomass and numbers of fish in the survey area beginning in 2013 (Fig. 42). The size of the 2012 year class as 4-year-olds was over six times the historical mean for this age group (Tables 21-22; Stienessen et al. 2017). This year class continues to be strong as 5-year-olds, and in 2017 represented the highest number and biomass of age-5 fish detected since 1981 (Tables 21- 22). McKelvey (1996) showed that there was a strong relationship between the estimated number of age-1 fish from the Shelikof Strait AT survey and year-class strength for GOA pollock. The 2016 year class observed this winter (as 306 million age-1 fish; Table 21, Fig. 47) is considered a medium-sized year class based on the McKelvey (1996) index. Also noteworthy is the fact that no fish older than 10 years of age were encountered during catch processing in this survey, and fish aged 3- 6 years-old were shorter when compared to this age group from previous winter acoustic-trawl surveys of Shelikof and Marmot areas (Fig. 48).

Marmot Bay

Acoustic backscatter was measured along 322 km (174 nmi) of transects spaced 1.75 km (1.0 nmi) apart in inner Marmot Bay and Spruce Island Gully, and 3.7 km (2.0 nmi) apart in outer Marmot Bay. Inner Marmot Bay and Spruce Island Gully were surveyed 14-15 March, and outer Marmot Bay was surveyed 26 March (Fig. 49). Bottom depths ranged from 70 to 175 m.

Water Temperature

Surface water temperatures averaged 3.8° C throughout the Marmot Bay survey area (Fig. 50), nearly two degrees colder than last year's mean of 5.7° C. Mean water temperature ranged 0.35° C between the surface and deepest trawl depth across all hauls (Fig. 51) and averaged 3.8° C at fishing depths (Table 16).

Trawl Samples

Biological data and specimens were collected in Marmot Bay from 5 AWT hauls throughout the survey area (Table 3 and 16, Fig. 49). Walleye pollock and eulachon were the most abundant species by weight and numbers in AWT hauls, contributing 95.8% and 3.1% by weight, and 28.0% and 61.0% by numbers, respectively (Table 23). Historically, eulachon are more numerous in the catch than pollock in the Marmot area.

Walleye pollock ranged from 34 to 60 cm FL with a clear mode centered at 42 cm (Fig. 41). This size range accounted for 99.9% of the biomass of all pollock observed in this area. Smaller fish (< 34 cm FL) made up a very small portion of the biomass (< 0.1%; Figs. 41). There were no age-1 pollock caught in Marmot Bay for the second year in a row, and no adults (> 60 cm) captured in 2017 (Fig. 41).

The maturity composition in Marmot Bay for males > 40 cm FL (n = 128) was 0% immature, 2% developing, 4% pre-spawning, 41% spawning, and 53% spent (Fig. 52a). The maturity composition of females > 40 cm FL (n = 93) was 1% immature, 2% developing, 61% pre-spawning, 8% spawning, and 28% spent (Fig. 52a). The fact that 36% of the measured females were in spawning and spent stages of maturity suggests that the timing of the 2017 survey of Marmot Bay was likely late. The L_{50} cannot be accurately estimated because of the lack of contrast in length and maturity status in the data set (Fig. 52b). This is partly due to the dominance of the 2012 year class and the fact almost all the fish from that year class were mature. The average GSI for pre-spawning females was 0.11 + 0.03, which was virtually the same as in 2016 and 2015, and was slightly below the historical mean of 0.13 + 0.04 (Fig. 52c).

Distribution and Abundance

Most pollock biomass occurred in aggregations in Spruce Gully and on the first two transects of outer Marmot (Fig. 53). These aggregations were near the bottom in deeper water (Fig. 54). The aggregations often included a diffuse mixture of pollock, juvenile herring, and eulachon.

The estimated amounts of pollock for Marmot Bay were 29 million fish weighing 14,259 t. The biomass estimate was about a third of last year’s estimate of 37,161 (Table 7c). This estimate was slightly less than the historic mean for this survey (15,740 t, Fig. 55). The relative estimation error of the biomass in Marmot Bay based on the 1-D geostatistical analysis was 7.9%.

Chirikof Shelf Break

Acoustic backscatter was measured along 307 km (166 nmi) of transects spaced 13.9 km (7.5 nmi) apart along the Chirikof Shelf Break (Fig. 37). Bottom depths ranged from 50 to 910 m.

Water Temperature

Surface water temperatures averaged 4.6° C throughout the Chirikof Shelf Break survey area (Fig. 38), nearly two degrees colder than the mean of 5.5° C measured in 2015. Mean water temperature ranged 0.2° C between the surface and deepest trawl depth across all hauls, and the average temperature at the fishing depths was 5.3° C (Fig. 56).

Trawl Samples

Biological data and specimens were collected along the Chirikof Shelf Break from four AWT hauls (Tables 3, 16; Fig. 37). Walleye pollock and Pacific ocean perch (POP; *Sebastes alutus*) were the most abundant species by weight in AWT hauls, contributing 58.1% and 40.5% of the total catch, respectively (Table 24). Lanternfishes (family Myctophidae) and walleye pollock were the most abundant species by numbers in AWT hauls, contributing 39.4% and 32.3% of the total numbers, respectively (Table 24). Historically, more pollock by weight have been caught in this area (e.g., pollock were 75% by weight in 2015).

Walleye pollock ranged from 38 to 57 cm FL (Fig. 41). No larger or smaller fish were observed the survey. The size range was narrower this year than in 2015.

The maturity composition in Chirikof for males > 40 cm FL (n = 15) was 0% immature, 60% developing, 7% pre-spawning, 13% spawning, and 20% spent (Fig. 57a). The maturity composition of females > 40 cm FL (n = 57) was 0% immature, 0% developing, 14% pre-spawning, 0% spawning, and 86% spent (Fig. 57a). The high percentage of spent adult females suggests that peak spawning had likely occurred, and that survey timing was too late for this area. The female L50 was not accurately estimated because of the paucity of shorter, immature fish. The average GSI for pre-spawning females was 0.09 + 0.03, which was lower than the historical mean (0.16 + 1.03, Fig. 57c).

Distribution and Abundance

Walleye pollock schools composing the majority of pollock biomass in Chirikof were scattered sparsely along the shelf break, mainly in shallow waters (60-100 m depth; Figs. 44, 58). POP were seen in dense aggregations in deeper water off the shelf. The estimated amounts of walleye pollock for Chirikof were 7.3 million fish weighing 4,007 t. The biomass estimate was less than one-third of the 2015 estimate (12,685 t), 60,000 t less than the 2013 estimate, and much less than the historic mean for this survey (37,890 t; Table 7c). The relative estimation error of the biomass based on the 1-D geostatistical analysis was 24.0 %.

Special Projects

Several collections of specimens were made to support studies by other investigators. Ovaries were collected from pre-spawning walleye pollock to investigate interannual variation in fecundity of mature females (contact Sandi Neidetcher for more information: Sandi.Neidetcher@noaa.gov). Ovaries were also collected from female walleye pollock of all maturity stages for a histological study (contact Sandi Neidetcher for more information: Sandi.Neidetcher@noaa.gov). Pacific ocean perch ovaries and otoliths were collected to study reproductive trends in POP (contact Christina Conrath for more information: Christina.Conrath@noaa.gov). Spawning walleye pollock were collected and spawned, and the fertilized eggs were transported to Seattle to examine genomic evidence of localized adaptation and for developing a model to estimate the growth of walleye pollock larvae (contact Steve Porter for more information: Steve.Porter@noaa.gov). Results for all special projects will be reported elsewhere.

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TABLES AND FIGURES

Table 1.-- Numbers of walleye pollock measured and biological samples collected during the winter 2017 acoustic-trawl surveys of the Shumagin Trough (hauls 1-6), Sanak Trough (haul 7), Morzhovoi Bay (hauls 8-9) and Pavlov Bay (Hauls 10-11)

		Walleye pollock				
Haul no.	Catch lengths	CamTrawl lengths	Weights	Maturities	Otoliths	Ovary weights
1	298	-	55	55	30	34
2	268	93	52	52	35	30
3	308	94	51	44	42	-
4	329	55	60	60	33	27
5	325	157	38	38	35	25
6	314	16	61	60	36	27
7	56	4	56	53	53	23
8	290	51	64	64	39	3
9	157	16	50	50	21	10
10	361	156	74	35	45	17
11	320	51	29	25	17	9
Totals	3,026	693	590	536	386	205

Table 2.-- Numbers of walleye pollock measured and biological samples collected during the winter 2017 acoustic-trawl surveys of the Kenai Bays (hauls 1-11), Prince William Sound (hauls 12-18), Hinchinbrook Trough (hauls 19-22) and Middleton

	Walleye pollock					
Haul no.	Catch lengths	CamTrawl lengths	Weights	Maturities	Otoliths	Ovary weights
1	306	162	53	52	37	15
2	521	114	50	50	50	11
3	302	141	47	47	30	12
4	473	300	50	47	33	13
5	389	300	48	48	48	22
6	404	97	52	48	52	23
7	277	122	52	51	29	9
8	322	203	55	55	30	30
9	308	111	33	29	33	3
10	346	53	31	30	31	19
11	292	-	52	52	29	14
12	315	14	58	58	30	17
13	344	-	51	51	30	15
14	300	-	48	48	30	18
15	299	-	55	52	33	10
16	385	-	67	66	33	14
17	320	-	61	61	30	28
18	311	-	55	55	20	8
19	387	-	53	52	51	11
20	365	-	57	50	55	13
21	319	-	53	51	53	33
22	86	-	56	41	46	26
23	4	-	4	3	4	1
24	312	-	48	48	48	21
Totals	7,687	1,617	1,189	1,145	865	386

Table 3. -- Numbers of walleye pollock measured and biological samples collected during the winter 2017 acoustic-trawl surveys of Marmot Bay (hauls 1-2 and hauls 24-26), Shelikof Strait (hauls 3-19), and the Chirikof shelf break (hauls 20-23).

Walleye pollock						
Haul no.	Catch lengths	CamTrawl lengths	Weights	Maturities	Otoliths	Ovary weights
1	383	102	58	50	55	12
2	57	2	57	57	30	45
3	316	62	59	49	35	40
4	497	65	64	54	35	33
5	400	83	61	51	36	20
6	388	76	67	57	35	20
7	357	24	67	57	36	21
8	---[1]	213	---[1]	---[1]	---[1]	---[1]
9	343	116	52	50	32	31
10	377	62	68	58	35	18
11	356	117	51	50	31	38
12	382	279	62	52	37	8
13	364	216	60	50	45	28
14	340	169	50	50	41	15
15	341	-	74	60	45	12
16	368	149	65	50	45	19
17	314	241	50	50	40	33
18	312	45	66	51	45	47
19	342	60	60	60	40	47
20	8	-	8	8	8	5
22	310	34	53	53	40	44
23	22	-	22	22	22	17
24	156	27	50	50	27	15
25	301	184	51	51	27	20
26	275	13	55	50	0	0
Totals	7,309	2,339	1,330	1,190	822	588

[1] CamTrawl haul, in which the codend was left open, provides species identification and fish length estimates.

Table 4. -- Simrad ER60 38 kHz acoustic system description and settings used during the winter 2017 Gulf of Alaska acoustic-trawl surveys of walleye pollock. Also presented are results from standard sphere acoustic system calibrations conducted in association with the survey, and final values used to calculate biomass and abundance data.

	Winter 2017 system settings	14 Feb Volcano Bay Alaska	27 Mar Izut Bay Alaska	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)	1.024	--	--	1.024
Transmitted power (W)	2000	--	--	2000
Angle sensitivity along	22.83	--	--	22.83
Angle sensitivity athwart	21.43	--	--	21.43
2-way beam angle (dB re 1 steradian)	-20.77	--	--	-20.77
Gain (dB)	22.51	22.64	22.60	22.62
Sa correction (dB)	-0.62	-0.62	-0.64	-0.63
Integration gain (dB)	21.89	22.02	21.96	21.99
3 dB beamwidth along	6.77	6.73	6.80	6.77
3 dB beamwidth athwart	7.15	7.14	7.27	7.21
Angle offset along	-0.05	-0.08	-0.09	-0.09
Angle offset athwart	-0.05	-0.09	-0.10	-0.10
Post-processing S_v threshold (dB re 1 m^{-1})	-70	--	--	-70
Standard sphere TS (dB re 1 m^2)	--	-41.84	-41.98	--
Sphere range from transducer (m)	--	20.15	32.29	--
Absorption coefficient (dB/m)	0.0099	0.0095	0.0100	0.0099
Sound velocity (m/s)	1466	1457.5	1463.0	1466
Water temp at transducer (ºC)	--	5.3	5.0	--

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 5. -- Trawl station and catch data summary from the winter 2017 acoustic-trawl survey of walleye pollock in the Shumagin Islands, Sanak Trough, Morzhovoi Bay, and Pavlof Bay.

Haul No.	Area	Gear type[1]	Date (GMT)	Time (GMT)	Duration (minutes)	Start position Latitude (N)	Start position Longitude (W)	Depth (m) Footrope	Depth (m) Bottom	Water temp. (°C) Headrope	Water temp. (°C) Surface[2]	Catch Pollock (kg)	Catch Pollock Number	Catch Other (kg)
1	Shumagins	AWT	9-Feb	10:51:51	20.6	55.24	-159.28	110.8	120.5	4.7	4.7	372.5	725	-
2	Shumagins	AWT	10-Feb	3:13:58	45.7	55.63	-159.83	88.0	129.6	5.0	4.6	603.4	1181	0.8
3	Shumagins	AWT	10-Feb	8:26:33	3.0	55.53	-159.94	135.3	159.0	5.5	4.8	2631.0	4948	-
4	Shumagins	AWT	10-Feb	20:15:20	2.8	55.42	-160.56	98.8	131.2	4.6	4.6	3990.0	6588	-
5	Shumagins	AWT	11-Feb	1:54:12	10.4	55.28	-160.16	75.2	134.4	4.8	4.7	2155.0	3907	-
6	Shumagins	AWT	11-Feb	9:49:30	23.6	55.01	-160.49	128.8	138.7	4.7	4.8	232.7	406	164.1
7	Sanak	AWT	12-Feb	7:02:26	56.8	54.48	-162.35	133.2	149.9	5.2	4.3	28.5	56	15.8
8	Morzhovoi	AWT	12-Feb	14:25:40	9.4	54.84	-163.11	83.2	98.5	3.0	2.8	430.8	736	-
9	Morzhovoi	AWT	12-Feb	19:59:23	13.2	54.92	-162.97	111.3	128.2	3.8	3.0	87.6	157	7.2
10	Pavlof	AWT	14-Feb	0:24:16	26.5	55.31	-161.73	97.6	123.2	3.2	3.2	738.3	1927	< 0.1
11	Pavlof	AWT	14-Feb	21:59:34	22.3	55.41	-161.67	100.9	109.1	3.1	2.3	327.3	598	2.5

[1]Gear type: AWT = Aleutian wing trawl

[2]Temperature from hull-mounted sensor, may differ from SBE readings

Table 6. -- Catch by species, and numbers of length and weight measurements taken from individuals, during the six Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in the Shumagin Islands.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	9,984.5	98.4	17,755	99.7	1,842	317
salmon shark	*Lamna ditropis*	161.0	1.6	1	0.0	1	1
Pacific cod	*Gadus macrocephalus*	2.2	0.0	1	0.0	1	1
northern sea nettle	*Chrysaora melanaster*	1.5	0.0	2	0.0	2	1
eulachon	*Thaleichthys pacificus*	0.2	0.0	13	0.1	13	8
smelt unidentified	Osmeridae (family)	0.0	0.0	34	0.2	5	0
isopod unidentified	Isopoda (order)	0.0	0.0	3	0.0	0	0
Total		10,149.5		17,809		1,864	328

Table 7a. -- Estimates of walleye pollock biomass (in metric tons) and relative estimation error for the Shumagins region

Year	Shumagin Islands		Sanak Trough		Marmot Bay		Morzhovoi Bay		Pavlof Bay	
	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error
1981										
1982										
1983										
1984										
1985										
1986										
1987										
1988										
1989					2,400	no est.				
1990					no estimate	--				
1991					no survey	--				
1992					no estimate	--				
1993					no survey	--				
1994	112,000 [1]				no survey	--				
1995	290,100				no survey	--				
1996	117,700 [2]				no survey	--				
1997	no survey				no survey	--				
1998	no survey				no survey	--				
1999	no survey				no survey	--				
2000	no survey				no survey	--				
2001	119,600				no survey	--				
2002	135,600	27.1%			no survey	--			no est.	no est.
2003	67,700	17.2%	80,500	21.6%	no survey	--			no survey	--
2004	no survey	--	no survey	--	no survey	--			no survey	--
2005	52,000	11.4%	65,500	7.4%	no survey	--			no survey	--
2006	37,300	10.1%	127,200	10.4%	no survey	--	11,700	15.1%	no survey	--
2007	20,000	8.6%	60,300	5.7%	3,600	5.0%	2,500	15.1%	no survey	--
2008	30,600	9.8%	19,800	6.7%	no survey	--	no survey	--	no survey	--
2009	63,300	10.8%	31,400	17.4%	19,800	no est.	no survey	--	no survey	--
2010	18,200	11.6%	26,700	11.6%	5,600	no est.	1,800	no est.	no est.	no est.
2011	no survey	--	no survey	--	no survey	--	no survey	--	no survey	--
2012	15,500	5.2%	24,300	15.6%	no survey	--	no survey	--	no survey	--
2013	91,300	17.3%	13,300	5.1%	19,900	4.1%	2,476	11.6%	no survey	--
2014	37,346	18.2%	7,319	9.0%	14,992	9.4%	no survey	--	no survey	--
2015	61,369	17.1%	17,863	10.0%	22,470	3.1%	no survey	--	no survey	--
2016	20,706	7.2%	3,556	6.9%	37,161	9.9%	11,412	12.0%.	2,130	14.7%
2017	**29,621**	**9.8%**	**957**	**19.6%**	**14,259**	**7.9%**	**3,932**	**6.5%**	**2,228**	**9.5%**

[1]Survey conducted after peak spawning had occurred.

[2]Partial survey.

Table 7b. -- Estimates of walleye pollock biomass (in metric tons) and relative estimation error for the Kenai bays region

Year	Kenai Bays		Prince William Sound		Hinchinbrook		Middleton	
	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error
1984	no estimate [1]		no estimate [1]					
1985								
1986								
1987								
1988								
1989								
1990	no estimate [1]		no estimate [1]					
1991								
1992								
1993								
1994								
1995								
1996								
1997								
1998								
1999								
2000								
2001								
2002								
2003								
2004								
2005								
2006								
2007								
2008								
2009								
2010	111,200 [2*]		111,500	11.6%				
2011	no survey		no survey	--				
2012	no survey	--	no survey	--				
2013	no survey	--	no survey	--				
2014	no survey	--	no survey	--				
2015	80,965 [*]	15.3%	no survey	--				
2016	no survey	--	no survey	--				
2017	**67,022**	**5.3%**	**106,708**	**4.7%**	**30,700**	**15.1%**	**7,099**	**37.3%**

[1]Kenai Bays and PWS surveyed in 1984 & 1990, but no estimate was made due to sounder unable to survey below 400m depth.

[2]No relative estimation error was calculated in 2010 due to geometry.

[*]Does not include Knight's Passage

Table 7c. -- Estimates of walleye pollock biomass (in metric tons) and relative estimation error for the Shelikof region

Year	Shelikof Strait		Chirikof shelf break		Marmot Bay	
	Biomass	Est. error	Biomass	Est. error	Biomass	Est. error
1981	2,785,800					
1982	no survey					
1983	2,278,200					
1984	1,757,200					
1985	1,175,300					
1986	585,800					
1987	no estimate [1]					
1988	301,700					
1989	290,500				2,400	no est.
1990	374,700				no estimate	--
1991	380,300				no survey	--
1992	713,400	3.6%			no estimate	--
1993	435,800	4.6%			no survey	--
1994	492,600	4.5%			no survey	--
1995	763,600	4.5%			no survey	--
1996	777,200	3.7%			no survey	--
1997	583,000	3.7%			no survey	--
1998	504,800	3.8%			no survey	--
1999	no survey	--			no survey	--
2000	448,600	4.6%			no survey	--
2001	432,800	4.5%			no survey	--
2002	256,700	6.9%	82,100	12.2%	no survey	--
2003	316,500	5.2%	30,900	20.7%	no survey	--
2004	326,800	9.2%	30,400	20.4%	no survey	--
2005	356,100	4.1%	77,000	20.7%	no survey	--
2006	293,600	4.0%	69,000	11.0%	no survey	--
2007	180,900	5.8%	36,600	6.7%	3,600	5.0%
2008	208,000	5.6%	22,100	9.6%	no survey	--
2009	266,000	5.9%	400	32.3%	19,800	no est.
2010	429,700	2.6%	9,300	15.0%	5,600	no est.
2011	no survey	--	no survey	--	no survey	--
2012	335,800	7.9%	21,200	16.4%	no survey	--
2013	891,261	5.3%	63,000	31.4%	19,900	4.1%
2014	842,138	4.7%	no survey	--	14,992	9.4%
2015	845,306	4.3%	12,685	14.2%	22,470	3.1%
2016	665,059	6.5%	no survey	--	37,161	9.9%
2017	**1,489,723**	**4.3%**	**4,007**	**24.0%**	**14,259**	**7.9%**

[1]Shelikof Strait surveyed in 1987, but no estimate was made due to mechanical problems.

Table 8. -- Catch by species, and numbers of length and weight measurements taken from individuals, during the one Aleutian Wing midwater trawl haul during the winter 2017 acoustic-trawl survey of walleye pollock in Sanak Trough.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	28.5	64.4	56	10.3	56	56
Pacific cod	*Gadus macrocephalus*	9.2	20.8	3	0.6	3	3
eulachon	*Thaleichthys pacificus*	2.9	6.6	324	59.8	75	0
Chinook salmon	*Oncorhynchus tshawytscha*	1.6	3.7	2	0.4	2	0
flathead sole	*Hippoglossoides elassodon*	0.8	1.7	7	1.3	7	0
northern rockfish	*Sebastes polyspinis*	0.6	1.4	1	0.2	1	1
hippolytid shrimp unidentified	Hippolytidae (family)	0.4	1.0	144	26.6	0	0
arrowtooth flounder	*Atheresthes stomias*	0.2	0.5	1	0.2	1	1
squid unidentified	Teuthida (order)	0.0	0.0	1	0.2	1	0
crangonid shrimp unidentified	Crangonidae (family)	0.0	0.0	3	0.6	0	0
Total		44.2		542		146	61

Table 9.-- Catch by species, and numbers of length and weight measurements taken from individuals, during the two Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Morzhovoi Bay.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	518.4	98.6	893	99.7	447	114
Chinook salmon	*Oncorhynchus tshawytscha*	7.2	1.4	3	0.3	3	3
Total		525.6		895		450	117

Table 10. -- Catch by species, and numbers of length and weight measurements taken from individuals, during the two Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Pavlof Bay.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	1,065.6	99.8	2,525	99.4	681	103
smooth lumpsucker	*Aptocyclus ventricosus*	2.4	0.2	2	0.1	2	0
capelin	*Mallotus villosus*	0.1	0.0	11	0.4	11	4
Pacific herring	*Clupea pallasii*	0.0	0.0	1	0.0	1	1
isopod unidentified	Isopoda (order)	0.0	0.0	1	0.0	0	0
Total		1,068.2		2,540		695	108

Table 11.-- Trawl station and catch data summary from the winter 2017 acoustic-trawl survey of walleye pollock in the Kenai Peninsula Bays, Prince William Sound (PWS), Hinchinbrook Entrance, and Middleton Island.

Haul			Date	Time	Duration	Start position		Depth (m)		Water temp. (°C)		Catch: Pollock		Catch: Other
No.	Area	Gear type[1]	(GMT)	(GMT)	(minutes)	Latitude (N)	Longitude (W)	Footrope	Bottom	Headrope	Surface[2]	(kg)	Number	(kg)
1	Kenai	AWT	2-Mar	15:48:54	15.4	59.27	-151.11	141.8	251.1	5.5	5.1	637.0	1200	1.5
2	Kenai	AWT	3-Mar	3:53:46	1.1	59.50	-150.40	87.5	209.8	5.3	5.1	4264.0	8146	-
3	Kenai	AWT	3-Mar	12:57:21	20.3	59.67	-149.89	92.3	205.5	5.8	4.7	1175.9	2210	0.4
4	Kenai	AWT	3-Mar	23:01:34	13.7	59.76	-149.70	204.0	288.6	---[3]	4.7	2029.1	3827	9.6
5	Kenai	AWT	4-Mar	1:23:02	4.3	59.76	-149.70	81.8	289.5	5.5	4.7	638.9	1254	0.0
6	Kenai	AWT	4-Mar	10:11:54	4.8	59.93	-149.39	123.2	227.9	5.0	4.6	1190.2	2236	0.2
7	Kenai	AWT	4-Mar	13:06:41	13.1	59.81	-149.47	256.0	275.9	6.6	4.4	1345.9	2496	12.1
8	Kenai	AWT	4-Mar	18:24:40	4.9	59.99	-149.16	97.4	193.0	5.4	4.8	1093.6	2056	-
9	Kenai	AWT	5-Mar	2:18:09	3.9	60.07	-148.35	237.0	269.5	6.7	4.8	1999.2	3572	9.8
10	Kenai	AWT	5-Mar	4:01:01	4.9	60.05	-148.36	93.3	269.5	5.1	4.8	1499.3	2795	0.7
11	Kenai	AWT	5-Mar	13:30:48	8.1	60.28	-147.99	325.1	578.6	6.5	4.0	794.3	1369	7.7
12	PWS	AWT	5-Mar	21:23:02	27.1	60.58	-147.98	376.7	563.6	6.4	3.8	615.1	1066	35.1
13	PWS	AWT	6-Mar	6:32:01	20.5	60.63	-147.67	541.8	684.8	6.2	4.3	695.3	1106	66.0
14	PWS	AWT	6-Mar	15:35:02	20.3	60.78	-147.42	382.3	441.4	6.3	4.6	438.8	798	14.7
15	PWS	AWT	6-Mar	22:47:22	4.5	60.70	-146.91	329.4	414.4	6.6	4.6	896.3	1651	15.5
16	PWS	AWT	7-Mar	4:52:27	2.3	60.61	-146.87	335.5	442.5	6.4	5.0	1085.6	1999	4.0
17	PWS	AWT	7-Mar	11:11:55	4.7	60.53	-146.80	333.1	416.3	6.5	4.7	910.1	1639	10.0
18	PWS	AWT	7-Mar	19:15:26	3.1	60.48	-146.97	329.8	410.9	6.5	5.0	2149.4	4054	9.6
19	Hinchinbrook	AWT	8-Mar	7:42:31	2.7	60.08	-147.12	222.0	247.6	5.9	5.0	1023.6	1971	4.7
20	Hinchinbrook	AWT	8-Mar	11:12:55	4.5	59.86	-147.09	187.9	204.2	6.3	5.1	735.7	1407	7.4
21	Hinchinbrook	AWT	8-Mar	21:41:44	25.5	59.64	-147.06	160.0	206.9	5.8	5.5	848.9	1653	0.4
22	Hinchinbrook	AWT	9-Mar	3:28:04	17.9	59.36	-147.34	149.9	167.8	5.6	5.2	20.9	86	9.4
23	Middleton	AWT	9-Mar	9:54:51	6.1	59.25	-146.55	312.1	478.9	5.4	5.6	1.7	4	1056.5
24	Middleton	AWT	9-Mar	18:05:54	8.1	59.42	-145.94	446.1	591.5	4.4	5.6	807.7	1540	52.4

[1]Gear type: AWT = Aleutian wing trawl

[2]Temperature from hull-mounted sensor, may differ from SBE readings

[3]Sbe data not collected during this haul

Table 12.-- Catch by species, and numbers of length and weight measurements taken from individuals, during the 10 Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in the Kenai Peninsula Bays.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	16,668.6	99.8	31,163.6	81.1	3,940	523
eulachon	*Thaleichthys pacificus*	13.1	0.1	597.5	1.6	139	63
Pacific cod	*Gadus macrocephalus*	7.5	0.0	1.0	0.0	1	1
Pacific glass shrimp	*Pasiphaea pacifica*	7.5	0.0	5,293.4	13.8	68	17
northern smoothtongue	*Leuroglossus schmidti*	6.9	0.0	1,220.7	3.2	95	36
smooth lumpsucker	*Aptocyclus ventricosus*	3.4	0.0	5.2	0.0	3	3
Pacific ocean perch	*Sebastes alutus*	1.9	0.0	2.5	0.0	1	1
blackmouth eelpout	*Lycodapus fierasfer*	0.4	0.0	44.2	0.1	7	7
squid unid.	Cephalopoda (class)	0.1	0.0	6.0	0.0	3	3
Pacific herring	*Clupea pallasii*	0.0	0.0	7.5	0.0	3	3
shrimp unid.	Malacostraca (class)	0.0	0.0	10.1	0.0	4	
capelin	*Mallotus villosus*	0.0	0.0	5.5	0.0	2	2
magistrate armhook squid	*Berryteuthis magister*	0.0	0.0	3.9	0.0	3	2
isopod unid.	Isopoda (order)	0.0	0.0	15.6	0.0	-	-
grenadier unid.	Macrouridae (family)	0.0	0.0	16.0	0.0	2	2
Alaskan pink shrimp	*Pandalus eous*	0.0	0.0	2.8	0.0	1	1
smelt unid.	Osmeridae (family)	0.0	0.0	7.0	0.0	4	4
lanternfish unid.	Myctophidae (family)	0.0	0.0	2.8	0.0	1	1
jellyfish unid.	Scyphozoa (class)	0.0	0.0	0.0	0.0	-	-
Total		16,709.4		38,405.4			

Table 13.-- Catch by species, and numbers of length and weight measurements taken from individuals, during the eight Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Prince William Sound.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	6,790.6	97.8	12,314	29.8	2,274	395
northern smoothtongue	*Leuroglossus schmidti*	83.9	1.2	12,469	30.2	246	70
shortraker rockfish	*Sebastes borealis*	20.6	0.3	3	0.0	3	3
Pacific glass shrimp	*Pasiphaea pacifica*	15.8	0.2	15,091	36.5	70	-
eulachon	*Thaleichthys pacificus*	12.5	0.2	531	1.3	89	43
Pacific cod	*Gadus macrocephalus*	7.1	0.1	1	0.0	1	1
spiny dogfish	*Squalus suckleyi*	5.4	0.1	3	0.0	3	3
smooth lumpsucker	*Aptocyclus ventricosus*	2.4	0.0	3	0.0	3	3
blackmouth eelpout	*Lycodapus fierasfer*	1.9	0.0	462	1.1	57	57
magistrate armhook squid	*Berryteuthis magister*	1.5	0.0	3	0.0	3	3
arrowtooth flounder	*Atheresthes stomias*	1.2	0.0	1	0.0	1	1
lanternfish unid.	Myctophidae (family)	1.1	0.0	253	0.6	20	20
Pacific herring	*Clupea pallasii*	0.8	0.0	24	0.1	14	14
squid unid.	Cephalopoda (class)	0.5	0.0	66	0.2	9	8
lamprey unid.	Petromyzontidae (family)	0.1	0.0	2	0.0	2	2
sculpin unid.	Cottidae (family)	0.1	0.0	38	0.1	9	9
Stenobrachius sp.	*Stenobrachius sp.*	0.1	0.0	57	0.1	3	3
sidestripe shrimp	*Pandalopsis dispar*	0.0	0.0	10	0.0	1	1
capelin	*Mallotus villosus*	0.0	0.0	2	0.0	2	2
Total		6,945.5		41,334		2,810	638

Table 14. -- Catch by species, and numbers of length and weight measurements taken from individuals, during the four Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Hinchinbrook Entrance.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	2629.2	99.2	5117	73.3	1157	219
eulachon	*Thaleichthys pacificus*	15.0	0.6	977	14.0	125	38
Pacific herring	*Clupea pallasii*	4.6	0.2	552	7.9	47	21
chinook salmon	*Oncorhynchus tshawytsch*	1.6	0.1	1	0.0	1	1
Pacific glass shrimp	*Pasiphaea pacifica*	0.2	0.0	92	1.3	19	-
northern smoothtongue	*Leuroglossus schmidti*	0.1	0.0	49	0.7	32	15
smelt unid.	Osmeridae (family)	0.1	0.0	130	1.9	61	32
blackmouth eelpout	*Lycodapus fierasfer*	0.1	0.0	10	0.1	10	10
magistrate armhook squid	*Berryteuthis magister*	0.1	0.0	2	0.0	2	2
Pacific lamprey	*Lampetra tridentata*	0.0	0.0	1	0.0	1	1
Pyrosoma atlanticum	*Pyrosoma atlanticum*	0.0	0.0	18	0.3	-	-
squid unid.	Cephalopoda (class)	0.0	0.0	10	0.1	10	5
Alaskan pink shrimp	*Pandalus eous*	0.0	0.0	4	0.1	4	
jellyfish unid.	Scyphozoa (class)	0.0	0.0	2	0.0	-	-
capelin	*Mallotus villosus*	0.0	0.0	2	0.0	2	2
isopod unid.	Isopoda (order)	0.0	0.0	8	0.1	-	-
lanternfish unid.	Myctophidae (family)	0.0	0.0	1	0.0	1	1
sculpin unid.	Cottidae (family)	0.0	0.0	1	0.0	1	1
amphipod unid.	Amphipoda (order)	0.0	0.0	1	0.0	1	1
euphausiid unid.	Euphausiacea (order)	0.0	0.0	3	0.0	-	-
Total		2651.1		6982		1,474	349

Table 15.-- Catch by species, and numbers of length and weight measurements taken from individuals, during the two Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock by Middleton Island.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	809.4	42.2	1,544	28.2	316	52
Pacific ocean perch	*Sebastes alutus*	1,064.8	55.5	1,529	27.9	139	68
rougheye rockfish	*Sebastes aleutianus*	17.8	0.9	10	0.2	10	10
lanternfish unidentified	Myctophidae (family)	14.3	0.7	1,617	29.5	70	20
robust clubhook squid	*Onykia robusta*	7.6	0.4	6	0.1	2	2
eulachon	*Thaleichthys pacificus*	1.8	0.1	59	1.1	58	20
Pacific glass shrimp	*Pasiphaea pacifica*	0.9	0.0	447	8.2	21	-
Pyrosome tunicate	*Pyrosoma atlanticum*	0.7	0.0	200	3.7	-	-
redstripe rockfish	*Sebastes proriger*	0.6	0.0	1	0.0	1	1
northern smoothtongue	*Leuroglossus schmidti*	0.3	0.0	49	0.9	43	18
fried egg jellyfish	*Phacellophora camtchatica*	0.0	0.0	1	0.0	1	1
viperfish unidentified	*Chauliodus sp.*	0.0	0.0	6	0.1	-	-
Pacific herring	*Clupea pallasii*	0.0	0.0	2	0.0	2	2
squid unidentified	Teuthida (order)	0.0	0.0	2	0.0	2	2
ribbon barracudina	*Arctozenus risso*	0.0	0.0	1	0.0	1	1
jellyfish unidentified	Medusozoa (subphylum)	0.0	0.0	3	0.1	-	-
amphipod unidentified	Amphipoda (order)	0.0	0.0	2	0.0	-	-
Total		1,918.4		5,479		666	197

Table 16. -- Trawl station and catch data summary from the winter 2017 acoustic-trawl survey of walleye pollock in Marmot Bay, Shelikof Strait, and the Chirikof shelf break

Haul			Date	Time	Duration	Start position		Depth (m)		Water temp. (°C)		Pollock		Other
No.	Area	Gear type[1]	(GMT)	(GMT)	(minutes)	Latitude (N)	Longitude (W)	Footrope	Bottom	Headrope	Surface[2]	(kg)	Number	(kg)
1	Marmot Bay	AWT	15-Mar	6:55:00	15.3	57.97	-152.30	199.3	223.3	3.9	3.8	819.9	1704	7.8
2	Marmot Bay	AWT	15-Mar	13:22:54	7.4	58.02	-152.52	173.0	203.7	3.9	3.5	37.5	57	21.1
3	Shelikof Strait	AWT	18-Mar	16:25:19	15.1	58.27	-153.21	154.2	213.5	4.8	3.6	852.7	1648	14.0
4	Shelikof Strait	AWT	19-Mar	0:07:18	20.3	58.11	-153.56	223.1	245.9	5.8	3.7	360.1	2180	298.4
5	Shelikof Strait	AWT	19-Mar	5:48:16	7.2	58.12	-154.09	251.6	262.8	5.9	1.1	1588.1	3538	76.4
6	Shelikof Strait	AWT	19-Mar	13:50:38	3.2	57.94	-154.40	233.2	249.3	5.1	1.2	1299.2	2635	32.7
7	Shelikof Strait	AWT	19-Mar	17:36:03	3.2	57.84	-154.13	200.7	213.8	6.0	2.4	407.5	887	87.1
8	Shelikof Strait	AWT	19-Mar	22:40:50	34.5	57.90	-154.69	199.9	263.0	4.9	2.9	---[3]	---[3]	---[3]
9	Shelikof Strait	AWT	20-Mar	3:18:41	2.9	57.81	-154.86	161.5	278.9	4.4	2.3	870.0	1638	2.3
10	Shelikof Strait	AWT	20-Mar	13:11:23	10.7	57.61	-155.15	129.2	260.0	5.5	3.3	647.0	1561	23.4
11	Shelikof Strait	AWT	20-Mar	18:27:26	5.2	57.39	-154.95	106.7	219.2	3.7	3.4	377.2	749	1.0
12	Shelikof Strait	AWT	21-Mar	3:31:09	2.7	57.27	-155.43	246.4	258.9	5.8	3.6	1597.4	3849	93.8
13	Shelikof Strait	AWT	21-Mar	21:44:40	13.4	56.74	-155.53	177.2	243.9	3.6	3.1	784.8	1737	7.1
14	Shelikof Strait	AWT	22-Mar	4:23:42	3.1	56.72	-155.98	187.0	304.6	---[4]	3.1	842.0	1776	2.0
15	Shelikof Strait	PNE	22-Mar	10:18:30	7.9	56.61	-156.15	227.0	268.5	4.6	3.4	315.3	653	0.7
16	Shelikof Strait	AWT	22-Mar	16:49:41	7.4	56.47	-156.12	247.1	274.2	5.6	3.4	933.7	1997	4.1
17	Shelikof Strait	AWT	23-Mar	0:35:19	6.5	56.25	-156.37	136.5	261.4	3.4	3.6	1405.5	2676	0.5
18	Shelikof Strait	AWT	23-Mar	14:48:58	24.8	55.76	-156.51	121.8	242.9	3.6	3.4	517.8	1182	2.9
19	Shelikof Strait	AWT	24-Mar	0:26:31	38.7	55.48	-156.49	153.1	212.2	4.2	3.3	448.0	871	18.1
20	Chirikof shelf break	AWT	24-Mar	19:08:08	25.2	55.85	-154.19	332.1	613.4	4.7	4.3	4.3	8	24.9
21	Chirikof shelf break	AWT	25-Mar	2:15:35	10.0	55.95	-153.91	329.2	363.7	5.1	5.2	0.0	0.0	6.6
22	Chirikof shelf break	AWT	25-Mar	14:36:01	30.5	56.31	-153.01	84.0	120.4	4.0	4.1	299.4	604	0.0
23	Chirikof shelf break	AWT	25-Mar	20:59:58	8.0	56.36	-152.51	313.3	574.6	5.3	5.2	11.2	22	195.6
24	Marmot Bay	AWT	26-Mar	16:23:09	3.4	57.95	-151.96	154.6	196.4	3.6	3.5	71.7	156	48.4
25	Marmot Bay	AWT	26-Mar	21:34:55	8.4	57.92	-152.14	113.6	127.6	3.5	3.3	689.8	1458	1.7
26	Marmot Bay	AWT	27-Mar	1:30:25	13.4	57.97	-152.28	241.5	277.4	4.1	3.5	230.5	489	2.8

[1]Gear type: AWT = Aleutian wing trawl, PNE = Poly NorEastern bottom trawl

[2]Temperature from hull-mounted sensor, may differ from SBE readings

[3]CamTrawl haul, in which the codend was left open, provides species identification and fish length estimates.

[4]Water temperature data was not collected on this haul.

Table 17. -- Catch by species, and numbers of length and weight measurements taken from individuals, during 16 Aleutian Wing midwater trawl hauls in the winter 2017 acoustic-trawl survey of walleye pollock in the Shelikof

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	12,930.9	95.1	28,923	47.5	5,456	902
eulachon	*Thaleichthys pacificus*	617.9	4.5	27,900	45.9	505	166
Pacific ocean perch	*Sebastes alutus*	16.0	0.1	21	0.0	21	21
chinook salmon	*Oncorhynchus tshawytscha*	9.9	0.1	8	0.0	8	8
Pacific herring	*Clupea pallasii*	5.0	0.0	430	0.7	143	72
smooth lumpsucker	*Aptocyclus ventricosus*	4.4	0.0	4	0.0	4	4
shrimp unid.	Malacostraca (class)	2.6	0.0	890	1.5	16	1
northern smoothtongue	*Leuroglossus schmidti*	1.7	0.0	187	0.3	17	13
smelt unid.	Osmeridae (family)	1.4	0.0	1,252	2.1	31	6
lanternfish unid.	Myctophidae (family)	1.3	0.0	453	0.7	43	20
squid unid.	Cephalopoda (class)	1.2	0.0	134	0.2	20	18
Pacific glass shrimp	*Pasiphaea pacifica*	0.6	0.0	415	0.7	10	0
ragfish	*Icosteus aenigmaticus*	0.5	0.0	1	0.0	1	1
Alaskan pink shrimp	*Pandalus eous*	0.5	0.0	183	0.3	26	0
sablefish	*Anoplopoma fimbria*	0.5	0.0	3	0.0	1	1
arrowtooth flounder	*Atheresthes stomias*	0.3	0.0	2	0.0	2	2
flathead sole	*Hippoglossoides elassodon*	0.2	0.0	1	0.0	1	1
isopod unid.	Isopoda (order)	0.0	0.0	39	0.1	0	0
capelin	*Mallotus villosus*	0.0	0.0	1	0.0	1	1
blackmouth eelpout	*Lycodapus fierasfer*	0.0	0.0	1	0.0	1	1
jellyfish unid.	Scyphozoa (class)	0.0	0.0	1	0.0	1	0
Totals		13,595.0		60,847		6,308	1,238

Table 18. -- Catch by species, and numbers of length and weight measurements taken from individuals, during one PolyNoreastern bottom trawl haul in the winter 2017 acoustic-trawl survey of walleye pollock in the Shelikof Strait.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	315.3	99.8	653	97.5	341	74
egg yolk jelly	*Phacellophora camtschatica*	0.4	0.1	1	0.1	1	1
eulachon	*Thaleichthys pacificus*	0.2	0.1	9	1.3	9	9
Pacific herring	*Clupea pallasii*	0.0	0.0	4	0.6	4	4
northern smoothtongue	*Leuroglossus schmidti*	0.0	0.0	2	0.3	2	2
lanternfish unid.	Myctophidae (family)	0.0	0.0	1	0.1	1	1
Totals		316.0		670		358	91

Table 19. -- Numbers-at-length estimates (millions) from acoustic-trawl surveys of walleye pollock in the Shelikof Strait area.
No surveys were conducted in 1982, 1999, or 2011, and no estimate was produced for 1987 due to mechanical problems.

Length	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
5	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	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	0.0	0.0	0.0
6	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	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	0.0	0.0	0.0
7	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	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	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	<1	0.0	0.0	0.0	<1	0.0	0.0	0.0	0.0	0.0	<1	0.0	0.0	1.0	<1	0.0	0.0
9	0.0	0.0	0.0	21.0	60.0	0.0	4.0	1.0	1.0	<1	<1	4.0	163.0	0.0	3.0	4.0	29.0	4.0	0.0	0.0	<1	6.0	3.5	<1	6.6	1.2	1.3	<1	81.9	6.0	0.0	0.0	0.8
10	0.0	0.0	0.0	310.0	175.0	0.0	47.0	5.0	0.0	4.0	3.0	32.0	1120.0	3.0	3.0	16.0	372.0	33.0	0.0	1.0	10.0	106.0	36.3	3.7	25.0	16.1	9.6	1.5	800.6	65.0	0.8	0.0	13.3
11	2.0	0.0	1.0	581.0	206.0	4.0	133.0	16.0	4.0	27.0	16.0	51.0	3906.0	12.0	20.0	70.0	1162.0	87.0	0.0	8.0	15.0	476.0	61.5	14.0	161.4	73.5	20.3	7.7	1934.9	152.0	1.0	0.0	54.1
12	10.0	1.0	60.0	810.0	102.0	8.0	153.0	16.0	9.0	74.0	26.0	60.0	3779.0	20.0	21.0	140.0	1565.0	87.0	5.0	14.0	24.0	621.0	39.1	20.5	407.3	134.0	27.9	22.4	2239.6	185.0	1.6	0.0	114.7
13	26.0	1.0	0.0	278.0	32.0	4.0	50.0	9.0	4.0	79.0	13.0	33.0	1538.0	18.0	15.0	104.0	999.0	52.0	2.0	20.0	3.0	296.0	12.8	10.5	411.7	73.8	21.4	34.0	800.1	122.0	2.1	0.0	83.6
14	31.0	0.0	1.0	79.0	1.0	1.0	9.0	1.0	4.0	36.0	3.0	6.0	157.0	4.0	7.0	49.0	320.0	24.0	1.0	8.0	1.0	98.0	5.3	3.8	265.4	30.5	7.4	18.3	320.6	32.0	1.5	0.0	25.6
15	5.0	0.0	0.0	13.0	0.0	<1	3.0	<1	<1	6.0	1.0	<1	25.0	<1	1.0	10.0	30.0	2.0	1.0	1.0	<1	19.0	2.3	0.7	77.3	1.8	1.1	8.8	103.7	9.0	0.3	0.0	10.7
16	5.0	0.0	0.0	1.0	3.0	0.0	<1	0.0	<1	1.0	0.0	<1	1.0	5.0	<1	2.0	7.0	2.0	0.0	<1	<1	4.0	0.9	0.1	11.1	1.1	<1	2.3	34.0	3.0	0.2	0.0	3.3
17	1.0	1.0	0.0	<1	7.0	0.0	0.0	4.0	<1	0.0	0.0	0.0	1.0	51.0	<1	<1	1.0	20.0	0.0	<1	<1	<1	6.5	1.6	2.2	0.0	<1	0.0	8.4	35.0	0.0	0.0	0.0
18	5.0	1.0	0.0	1.0	41.0	1.0	<1	36.0	1.0	0.0	<1	1.0	4.0	249.0	1.0	<1	10.0	185.0	<1	0.0	<1	1.0	23.4	7.6	0.1	5.6	<1	0.0	<1	114.0	0.1	0.0	0.0
19	12.0	8.0	0.0	2.0	187.0	2.0	1.0	165.0	7.0	<1	<1	<1	16.0	634.0	1.0	1.0	32.0	808.0	3.0	1.0	1.0	2.0	75.4	24.3	4.7	6.6	9.1	10.8	0.6	492.0	0.7	0.0	0.0
20	70.0	70.0	0.0	6.0	444.0	8.0	2.0	341.0	12.0	1.0	4.0	2.0	39.0	945.0	8.0	3.0	81.0	1407.0	15.0	3.0	4.0	8.0	140.6	54.5	4.5	76.7	15.7	55.3	1.7	1014.0	1.3	0.0	0.0
21	280.0	177.0	<1	20.0	535.0	26.0	7.0	362.0	33.0	2.0	8.0	5.0	68.0	772.0	23.0	10.0	147.0	1043.0	36.0	11.0	10.0	20.0	203.1	60.2	19.9	179.0	36.2	155.6	3.9	967.0	9.1	0.0	0.0
22	733.0	221.0	1.0	75.0	431.0	32.0	17.0	198.0	48.0	5.0	17.0	7.0	92.0	441.0	50.0	16.0	196.0	460.0	29.0	15.0	20.0	29.0	161.3	41.6	38.1	347.2	63.5	183.9	12.7	488.0	16.6	<1	0.0
23	952.0	198.0	7.0	152.0	267.0	29.0	23.0	75.0	41.0	8.0	20.0	6.0	93.0	131.0	48.0	20.0	176.0	107.0	43.0	17.0	23.0	38.0	107.4	19.6	83.4	293.4	88.8	189.4	10.8	326.0	20.8	0.0	<1
24	695.0	142.0	15.0	151.0	136.0	9.0	19.0	21.0	23.0	10.0	14.0	5.0	73.0	54.0	48.0	21.0	68.0	20.0	56.0	16.0	18.0	30.0	66.2	9.0	117.0	181.4	49.9	142.3	15.4	102.0	17.2	<1	<1
25	389.0	37.0	21.0	75.0	46.0	4.0	11.0	7.0	23.0	6.0	7.0	4.0	53.0	18.0	89.0	10.0	30.0	22.0	128.0	11.0	12.0	16.0	27.4	6.1	75.9	79.7	26.9	64.6	19.1	58.0	16.8	<1	<1
26	219.0	28.0	12.0	36.0	23.0	11.0	5.0	1.0	59.0	5.0	5.0	2.0	36.0	9.0	208.0	8.0	11.0	31.0	239.0	8.0	9.0	7.0	13.7	7.4	35.6	19.6	16.3	33.5	28.7	29.0	38.9	<1	0.0
27	90.0	6.0	5.0	16.0	11.0	40.0	3.0	6.0	108.0	3.0	1.0	3.0	27.0	9.0	275.0	6.0	6.0	60.0	250.0	9.0	4.0	2.0	6.2	10.9	30.1	9.5	7.7	8.5	11.6	6.0	84.6	<1	0.0
28	70.0	6.0	6.0	6.0	9.0	107.0	3.0	3.0	142.0	3.0	1.0	1.0	17.0	11.0	268.0	5.0	10.0	85.0	210.0	23.0	2.0	3.0	3.1	15.1	19.4	13.6	9.2	10.2	11.0	8.0	167.6	<1	<1
29	83.0	3.0	9.0	3.0	15.0	158.0	6.0	9.0	123.0	8.0	1.0	1.0	5.0	22.0	205.0	10.0	13.0	91.0	124.0	52.0	3.0	1.0	5.4	23.1	13.3	5.6	27.7	1.5	9.2	1.0	280.6	<1	0.0
30	235.0	7.0	26.0	5.0	31.0	191.0	12.0	16.0	72.0	19.0	1.0	3.0	2.0	23.0	104.0	25.0	18.0	50.0	74.0	107.0	4.0	8.0	5.6	29.5	10.6	6.3	55.3	5.7	28.8	1.0	299.9	<1	0.0
31	420.0	3.0	48.0	6.0	34.0	129.0	23.0	19.0	32.0	25.0	2.0	6.0	6.0	15.0	59.0	42.0	32.0	37.0	42.0	153.0	7.0	8.0	5.6	23.2	27.1	8.9	90.5	1.9	45.9	1.0	270.6	1.9	0.0
32	492.0	24.0	67.0	4.0	38.0	92.0	27.0	17.0	22.0	37.0	3.0	7.0	4.0	15.0	31.0	78.0	37.0	15.0	25.0	185.0	16.0	2.0	5.6	23.1	38.1	13.1	107.7	4.8	48.6	2.0	208.9	3.2	0.9
33	490.0	65.0	68.0	11.0	29.0	85.0	24.0	11.0	8.0	48.0	5.0	11.0	8.0	13.0	21.0	102.0	34.0	14.0	29.0	145.0	25.0	10.0	6.5	18.7	42.3	24.3	91.3	6.1	79.7	4.0	142.4	10.6	0.0
34	499.0	141.0	53.0	22.0	18.0	89.0	28.0	10.0	8.0	67.0	6.0	6.0	6.0	6.0	16.0	99.0	28.0	7.0	20.0	122.0	41.0	3.0	8.0	15.6	31.4	23.7	66.1	6.1	89.2	3.0	66.1	21.9	1.2
35	592.0	195.0	27.0	27.0	12.0	63.0	37.0	8.0	7.0	85.0	10.0	7.0	11.0	4.0	11.0	103.0	22.0	6.0	17.0	77.0	56.0	10.0	4.8	12.4	31.5	18.7	31.6	5.8	133.0	4.0	49.0	50.6	<1
36	665.0	258.0	21.0	41.0	9.0	41.0	53.0	12.0	8.0	83.0	9.0	6.0	15.0	4.0	10.0	84.0	13.0	8.0	7.0	57.0	59.0	4.0	3.8	7.7	16.6	17.0	25.3	5.6	124.0	4.0	28.1	90.8	5.1
37	541.0	339.0	20.0	44.0	7.0	28.0	62.0	19.0	9.0	84.0	17.0	3.0	14.0	3.0	10.0	66.0	9.0	9.0	5.0	38.0	54.0	18.0	2.7	4.8	18.8	8.1	14.1	4.6	126.9	6.0	23.8	138.9	14.5
38	403.0	368.0	35.0	53.0	3.0	24.0	66.0	23.0	8.0	65.0	26.0	3.0	20.0	2.0	9.0	45.0	8.0	9.0	6.0	28.0	47.0	10.0	2.3	4.3	7.1	12.3	10.5	3.7	68.1	8.0	15.7	209.0	58.1
39	352.0	341.0	87.0	64.0	4.0	12.0	57.0	21.0	6.0	36.0	40.0	2.0	9.0	2.0	5.0	26.0	7.0	11.0	6.0	23.0	39.0	11.0	1.3	3.5	3.3	16.4	7.5	3.3	49.0	15.0	15.4	273.6	130.7

Table 19.--Continued.

Length	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
40	339.0	343.0	138.0	77.0	3.0	13.0	52.0	33.0	10.0	30.0	53.0	3.0	15.0	2.0	8.0	15.0	11.0	9.0	2.0	14.0	35.0	23.0	2.2	3.7	7.7	9.9	8.5	4.5	27.5	28.0	7.0	270.8	315.2
41	231.0	290.0	170.0	82.0	8.0	8.0	46.0	34.0	9.0	22.0	57.0	5.0	5.0	2.0	4.0	16.0	13.0	12.0	2.0	13.0	35.0	22.0	2.1	3.0	6.7	14.0	8.5	6.1	15.8	42.0	7.0	204.4	505.8
42	224.0	326.0	219.0	96.0	8.0	5.0	36.0	37.0	13.0	15.0	57.0	9.0	7.0	2.0	5.0	6.0	19.0	8.0	3.0	7.0	38.0	32.0	2.5	2.4	4.1	15.9	10.2	9.2	13.2	59.0	7.4	137.8	561.6
43	178.0	311.0	271.0	106.0	12.0	5.0	22.0	32.0	14.0	14.0	48.0	16.0	17.0	4.0	4.0	7.0	19.0	7.0	2.0	6.0	32.0	33.0	3.8	2.6	3.9	14.6	10.6	12.5	10.8	59.0	8.7	76.1	501.3
44	145.0	304.0	309.0	113.0	22.0	3.0	16.0	37.0	19.0	14.0	37.0	23.0	18.0	6.0	5.0	5.0	18.0	7.0	2.0	5.0	27.0	41.0	5.3	2.3	3.0	14.5	11.1	13.0	12.7	57.0	13.4	40.1	344.4
45	116.0	256.0	316.0	119.0	35.0	2.0	12.0	34.0	21.0	17.0	33.0	36.0	35.0	7.0	3.0	2.0	19.0	8.0	3.0	3.0	24.0	39.0	7.1	2.9	3.8	11.9	14.5	16.7	5.2	42.0	18.2	22.1	196.0
46	84.0	201.0	283.0	148.0	39.0	2.0	6.0	25.0	24.0	22.0	23.0	39.0	53.0	13.0	4.0	2.0	22.0	5.0	2.0	3.0	18.0	33.0	9.1	2.1	3.0	8.9	13.8	16.6	6.5	27.0	23.6	12.9	97.3
47	113.0	171.0	213.0	140.0	50.0	2.0	6.0	23.0	22.0	21.0	19.0	46.0	62.0	25.0	4.0	3.0	19.0	5.0	3.0	3.0	17.0	37.0	10.9	2.9	1.4	5.6	11.4	18.8	9.5	17.0	26.4	10.1	59.2
48	62.0	116.0	158.0	139.0	57.0	2.0	4.0	20.0	26.0	32.0	17.0	37.0	74.0	37.0	6.0	4.0	17.0	6.0	4.0	2.0	11.0	33.0	13.6	2.9	0.6	4.7	12.0	17.9	13.8	13.0	32.6	6.9	28.7
49	75.0	91.0	104.0	117.0	52.0	3.0	5.0	16.0	20.0	38.0	16.0	33.0	73.0	53.0	13.0	6.0	13.0	9.0	3.0	2.0	8.0	22.0	15.4	4.3	1.2	2.8	10.4	15.8	15.0	11.0	30.1	7.4	17.8
50	58.0	52.0	68.0	83.0	51.0	4.0	5.0	15.0	19.0	46.0	17.0	29.0	66.0	64.0	20.0	13.0	16.0	8.0	3.0	2.0	7.0	28.0	17.6	6.1	<1	2.9	12.3	16.6	15.0	14.0	24.9	8.8	13.1
51	50.0	49.0	40.0	52.0	42.0	4.0	4.0	8.0	20.0	40.0	15.0	24.0	51.0	69.0	30.0	18.0	10.0	5.0	4.0	2.0	5.0	14.0	19.5	7.7	<1	2.6	10.8	13.3	26.8	15.0	23.0	6.4	5.8
52	25.0	23.0	25.0	28.0	21.0	3.0	4.0	8.0	14.0	38.0	14.0	21.0	40.0	64.0	36.0	24.0	11.0	9.0	4.0	2.0	4.0	7.0	19.0	5.9	1.2	3.5	9.5	13.3	19.4	27.0	19.1	4.3	9.2
53	12.0	17.0	13.0	23.0	18.0	3.0	5.0	7.0	13.0	35.0	14.0	24.0	30.0	53.0	37.0	26.0	10.0	6.0	3.0	2.0	2.0	6.0	15.6	8.9	1.1	2.2	6.4	11.0	22.9	27.0	20.4	5.4	5.6
54	9.0	7.0	4.0	9.0	6.0	2.0	4.0	5.0	9.0	35.0	13.0	18.0	22.0	39.0	34.0	23.0	9.0	4.0	3.0	1.0	3.0	4.0	11.7	7.4	2.0	2.5	7.4	9.0	30.6	28.0	18.9	2.6	3.9
55	15.0	9.0	3.0	4.0	11.0	2.0	2.0	7.0	10.0	30.0	11.0	18.0	16.0	29.0	28.0	20.0	9.0	5.0	2.0	1.0	3.0	3.0	12.8	7.9	1.8	1.6	8.4	10.2	23.5	28.0	24.8	2.8	4.1
56	5.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	6.0	15.0	9.0	18.0	14.0	19.0	24.0	19.0	8.0	5.0	1.0	<1	2.0	2.0	6.5	5.8	3.5	2.6	6.1	8.1	30.5	32.0	21.3	2.3	2.2
57	7.0	2.0	1.0	2.0	<1	1.0	1.0	2.0	3.0	18.0	7.0	13.0	7.0	13.0	12.0	12.0	9.0	3.0	1.0	<1	1.0	1.0	4.5	4.9	1.0	1.7	5.2	8.2	21.7	24.0	20.9	2.7	1.1
58	3.0	1.0	1.0	1.0	1.0	<1	1.0	1.0	5.0	14.0	7.0	11.0	6.0	10.0	8.0	9.0	6.0	2.0	1.0	<1	1.0	1.0	3.1	4.4	2.3	1.3	6.3	8.3	19.1	19.0	21.2	2.6	1.5
59	1.0	1.0	<1	1.0	<1	<1	1.0	1.0	2.0	4.0	4.0	9.0	3.0	6.0	5.0	8.0	5.0	3.0	1.0	1.0	1.0	1.0	3.1	2.7	2.7	1.3	5.8	4.9	18.8	14.0	15.9	1.2	0.7
60	0.0	1.0	<1	2.0	1.0	0.0	1.0	1.0	2.0	2.0	3.0	7.0	2.0	5.0	3.0	4.0	2.0	3.0	<1	1.0	<1	1.0	1.8	1.9	1.8	1.3	3.6	4.6	21.9	13.0	15.3	0.9	1.6
61	0.0	1.0	<1	<1	1.0	<1	<1	<1	1.0	2.0	2.0	5.0	1.0	3.0	2.0	2.0	1.0	1.0	<1	1.0	<1	<1	1.6	1.6	2.6	1.3	5.5	2.4	9.7	9.0	9.0	1.3	0.1
62	0.0	0.0	1.0	1.0	<1	<1	<1	<1	<1	3.0	1.0	2.0	2.0	2.0	1.0	2.0	2.0	<1	<1	<1	<1	0.0	1.0	1.0	1.1	1.0	4.1	1.4	9.8	7.0	8.2	<1	0.1
63	0.0	0.0	1.0	1.0	<1	0.0	<1	<1	1.0	1.0	1.0	1.0	<1	1.0	1.0	2.0	1.0	1.0	<1	<1	<1	1.0	0.9	0.9	1.1	1.1	3.5	1.5	14.0	3.0	4.5	0.7	0.5
64	0.0	0.0	<1	0.0	<1	0.0	<1	<1	<1	<1	<1	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.4	0.7	4.0	1.0	3.2	4.0	1.8	0.0	0.0
65	0.0	0.0	0.0	0.0	<1	0.0	0.0	<1	1.0	0.0	<1	1.0	<1	<1	<1	<1	<1	<1	<1	0.0	<1	<1	<1	<1	<1	<1	3.5	1.0	2.3	2.0	2.8	0.0	0.0
66	0.0	0.0	0.0	<1	<1	0.0	<1	<1	0.0	<1	<1	<1	0.0	<1	<1	<1	<1	1.0	0.0	0.0	0.0	<1	<1	<1	0.6	1.1	2.5	<1	2.8	2.0	2.5	0.0	0.0
67	0.0	0.0	0.0	0.0	<1	<1	0.0	<1	<1	<1	<1	<1	0.0	<1	<1	0.0	<1	0.0	<1	<1	0.0	0.0	<1	<1	<1	0.6	2.7	<1	<1	1.0	0.6	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	0.0	0.0	<1	0.0	0.0	<1	<1	<1	0.0	<1	<1	0.0	<1	0.0	<1	<1	<1	<1	1.4	<1	0.8	1.0	1.1	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	1.0	0.0	<1	<1	0.0	<1	<1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	<1	<1	<1	0.0	0.0	<1	<1	0.0	0.0
70	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	<1	<1	1.0	<1	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	0.0	0.0	0.0	<1	0.0	0.0	0.0	0.0	0.0	0.0	<1	0.0	0.0	0.0	0.0	<1	0.0	<1	<1	0.0	1.1	<1	0.0	0.0	0.0
72	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	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	0.0	0.0	<1	0.0	0.0	0.0
73	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	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	<1	0.0	0.0	0.0
74	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	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	<1	0.0	0.0	0.0
75	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	0.0	<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	0.0	0.0
76	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	0.0	0.0	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
Total	10121.0	5211.0	2928.0	4259.0	3352.0	1266.0	1119.0	1782.0	1109.0	1339.0	740.0	729.0	11931.0	4024.0	1866.0	1425.0	5742.0	4931.0	1424.0	1224.0	780.0	2252.0	1239.6	575.0	2100.0	1832.0	1165.3	1244.8	7668.0	4885.0	2212.0	1633.0	3194.0

Table 20. -- Biomass-at-length estimates (thousands of metric tons) from acoustic-trawl surveys of walleye pollock in the Shelikof Strait area.
No surveys were conducted in 1982, 1999, or 2011, and no estimate was produced for 1987 due to mechanical problems.

Length	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
5	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	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	0.0	0.0	0.0
6	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	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	0.0	0.0	0.0
7	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	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	0.0	0.0	0.0
8	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	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	<1	0.0	0.0	<1	<1	0.0	0.0
9	0.0	0.0	0.0	< 1	< 1	0.0	< 1	< 1	< 1	< 1	< 1	< 1	1.0	0.0	< 1	< 1	< 1	< 1	0.0	0.0	< 1	< 1	< 1	< 1	<1	<1	<1	<1	<1	<1	0.0	0.0	<1
10	0.0	0.0	0.0	2.0	1.0	0.0	< 1	< 1	0.0	< 1	< 1	< 1	7.0	< 1	< 1	< 1	3.0	< 1	0.0	< 1	< 1	1.0	< 1	< 1	<1	<1	<1	<1	4.7	<1	<1	0.0	0.1
11	< 1	0.0	< 1	6.0	2.0	< 1	1.0	< 1	< 1	< 1	< 1	< 1	35.0	< 1	< 1	1.0	11.0	1.0	0.0	< 1	< 1	4.0	< 1	< 1	1.5	0.6	<1	<1	14.9	1.0	<1	0.0	0.4
12	< 1	< 1	1.0	10.0	1.0	< 1	2.0	< 1	< 1	1.0	< 1	1.0	44.0	< 1	< 1	1.0	20.0	1.0	< 1	< 1	< 1	7.0	< 1	< 1	4.5	1.4	<1	<1	21.3	2.0	<1	0.0	1.1
13	< 1	< 1	0.0	4.0	< 1	< 1	1.0	< 1	< 1	1.0	< 1	< 1	23.0	< 1	< 1	1.0	16.0	1.0	< 1	< 1	< 1	4.0	< 1	< 1	6.2	1.0	<1	<1	9.6	2.0	<1	0.0	1.1
14	1.0	0.0	< 1	2.0	< 1	< 1	< 1	< 1	< 1	1.0	< 1	< 1	3.0	< 1	< 1	1.0	7.0	< 1	< 1	< 1	< 1	2.0	< 1	< 1	4.6	0.5	<1	<1	4.8	1.0	<1	0.0	0.4
15	< 1	0.0	0.0	< 1	0.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.0	< 1	< 1	< 1	1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.7	<1	<1	<1	1.9	<1	<1	0.0	0.2
16	< 1	0.0	0.0	< 1	< 1	0.0	< 1	0.0	< 1	< 1	0.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	0.0	< 1	< 1	< 1	< 1	< 1	<1	<1	<1	<1	0.8	<1	<1	0.0	0.1
17	< 1	< 1	0.0	< 1	< 1	0.0	0.0	< 1	< 1	0.0	0.0	0.0	< 1	2.0	< 1	< 1	< 1	1.0	0.0	< 1	< 1	< 1	< 1	< 1	<1	0.0	<1	0.0	<1	1.0	<1	0.0	0.0
18	< 1	< 1	0.0	< 1	2.0	< 1	< 1	1.0	< 1	0.0	< 1	< 1	< 1	9.0	< 1	< 1	< 1	6.0	< 1	0.0	< 1	< 1	< 1	< 1	<1	<1	<1	0.0	<1	4.0	<1	0.0	0.0
19	1.0	< 1	0.0	< 1	8.0	< 1	< 1	7.0	< 1	< 1	< 1	< 1	1.0	27.0	< 1	< 1	2.0	33.0	< 1	< 1	< 1	< 1	3.3	1.1	<1	<1	<1	<1	<1	22.0	<1	0.0	0.0
20	4.0	4.0	0.0	< 1	23.0	< 1	< 1	16.0	1.0	< 1	< 1	< 1	2.0	48.0	< 1	< 1	5.0	68.0	1.0	< 1	< 1	< 1	7.1	2.8	<1	4.2	<1	3.1	<1	50.0	<1	0.0	0.0
21	18.0	11.0	< 1	1.0	33.0	1.0	< 1	21.0	2.0	< 1	< 1	< 1	4.0	46.0	1.0	1.0	10.0	59.0	2.0	1.0	1.0	1.0	12.0	3.6	1.3	11.2	2.2	9.6	<1	56.0	0.6	0.0	0.0
22	53.0	16.0	< 1	6.0	31.0	2.0	1.0	13.0	3.0	< 1	1.0	1.0	7.0	30.0	4.0	1.0	16.0	31.0	2.0	1.0	1.0	2.0	10.8	2.8	3.0	24.7	4.3	13.1	0.9	33.0	1.1	<1	0.0
23	78.0	16.0	1.0	14.0	22.0	2.0	2.0	6.0	3.0	1.0	2.0	1.0	8.0	10.0	4.0	2.0	17.0	8.0	4.0	1.0	2.0	3.0	8.4	1.6	6.9	23.3	7.0	15.5	0.9	25.0	1.6	0.0	<1
24	65.0	13.0	2.0	15.0	13.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	7.0	5.0	5.0	2.0	7.0	2.0	5.0	2.0	2.0	3.0	5.9	0.9	11.2	16.4	4.7	12.9	1.4	9.0	1.5	<1	<1
25	41.0	4.0	2.0	9.0	5.0	< 1	1.0	1.0	2.0	1.0	1.0	< 1	6.0	2.0	10.0	1.0	4.0	2.0	14.0	1.0	1.0	2.0	3.0	0.6	8.4	7.9	2.7	6.4	1.9	6.0	1.8	<1	<1
26	26.0	3.0	2.0	5.0	3.0	1.0	1.0	< 1	7.0	1.0	1.0	< 1	5.0	1.0	25.0	1.0	1.0	4.0	29.0	1.0	1.0	1.0	1.7	0.9	4.6	2.4	1.9	4.1	3.3	4.0	4.6	<1	0.0
27	12.0	1.0	1.0	2.0	2.0	5.0	< 1	1.0	14.0	< 1	< 1	< 1	4.0	1.0	38.0	1.0	1.0	8.0	35.0	1.0	< 1	< 1	< 1	1.5	4.2	1.3	1.0	1.2	1.5	1.0	11.1	<1	0.0
28	11.0	1.0	1.0	1.0	1.0	16.0	< 1	< 1	21.0	< 1	< 1	< 1	3.0	2.0	42.0	1.0	2.0	13.0	33.0	3.0	< 1	< 1	< 1	2.3	3.2	2.2	1.4	1.6	1.7	1.0	24.7	<1	<1
29	14.0	1.0	2.0	1.0	3.0	26.0	1.0	1.0	20.0	1.0	< 1	< 1	1.0	4.0	36.0	2.0	2.0	15.0	22.0	9.0	1.0	< 1	< 1	3.9	2.4	1.0	4.7	<1	1.6	<1	45.2	<1	0.0
30	44.0	1.0	5.0	1.0	6.0	35.0	2.0	3.0	13.0	4.0	< 1	1.0	< 1	4.0	20.0	5.0	4.0	9.0	15.0	20.0	1.0	2.0	1.1	5.5	2.1	1.3	10.6	1.1	5.6	<1	54.2	<1	0.0
31	86.0	1.0	10.0	1.0	7.0	27.0	5.0	4.0	7.0	5.0	< 1	1.0	1.0	3.0	13.0	9.0	8.0	8.0	9.0	32.0	1.0	2.0	1.2	4.8	6.2	1.9	18.9	<1	9.9	<1	54.7	<1	0.0
32	111.0	5.0	16.0	1.0	9.0	21.0	6.0	4.0	5.0	9.0	1.0	2.0	1.0	3.0	7.0	19.0	10.0	3.0	6.0	43.0	4.0	1.0	1.3	5.4	9.7	3.0	24.5	1.1	11.6	1.0	46.6	0.6	0.2
33	122.0	16.0	18.0	3.0	7.0	22.0	6.0	3.0	2.0	12.0	1.0	3.0	2.0	3.0	5.0	26.0	10.0	4.0	8.0	37.0	7.0	3.0	1.7	4.9	12.1	6.0	23.0	1.6	21.0	1.0	35.8	2.3	0.0
34	136.0	39.0	15.0	6.0	5.0	25.0	8.0	3.0	2.0	19.0	2.0	2.0	2.0	2.0	5.0	28.0	9.0	2.0	6.0	34.0	12.0	1.0	2.4	4.5	9.8	6.5	18.3	1.7	25.9	1.0	17.9	5.3	0.3
35	176.0	59.0	9.0	9.0	4.0	19.0	11.0	2.0	2.0	27.0	3.0	2.0	4.0	1.0	4.0	33.0	8.0	2.0	6.0	24.0	18.0	3.0	1.5	3.9	10.8	5.7	9.5	1.8	43.2	1.0	14.6	13.4	<1
36	216.0	84.0	7.0	14.0	3.0	14.0	18.0	4.0	3.0	29.0	3.0	2.0	5.0	1.0	3.0	29.0	5.0	3.0	2.0	19.0	20.0	1.0	1.3	2.7	6.2	5.6	8.6	1.9	42.7	1.0	9.4	26.4	1.6
37	191.0	121.0	7.0	17.0	2.0	11.0	23.0	7.0	3.0	32.0	6.0	1.0	5.0	1.0	4.0	25.0	4.0	3.0	2.0	14.0	21.0	7.0	1.0	1.8	7.7	3.1	5.2	1.7	49.4	2.0	8.6	44.1	5.0
38	154.0	142.0	14.0	21.0	1.0	10.0	26.0	9.0	3.0	26.0	11.0	1.0	8.0	1.0	4.0	19.0	4.0	4.0	2.0	11.0	20.0	4.0	< 1	1.8	3.2	5.0	4.2	1.5	28.9	3.0	6.5	72.3	21.4
39	146.0	143.0	38.0	28.0	2.0	5.0	25.0	9.0	3.0	16.0	18.0	1.0	4.0	1.0	2.0	12.0	3.0	5.0	3.0	10.0	18.0	5.0	< 1	1.6	1.6	7.4	3.5	1.4	21.9	7.0	6.8	102.5	51.5

Table 20-- Continued.

Length	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
40	152.0	155.0	66.0	37.0	1.0	6.0	24.0	15.0	5.0	15.0	26.0	2.0	7.0	1.0	4.0	7.0	6.0	4.0	1.0	7.0	17.0	12.0	1.2	1.9	4.5	4.8	4.2	2.1	16.7	13.0	3.5	108.3	134.8
41	112.0	142.0	87.0	42.0	4.0	4.0	23.0	17.0	4.0	11.0	30.0	3.0	3.0	1.0	2.0	8.0	7.0	6.0	1.0	7.0	19.0	13.0	1.2	1.7	4.2	7.6	4.7	3.2	8.7	21.0	3.7	88.1	233.6
42	117.0	172.0	121.0	53.0	4.0	3.0	20.0	20.0	7.0	9.0	32.0	5.0	4.0	1.0	3.0	3.0	11.0	5.0	2.0	4.0	22.0	19.0	1.5	1.4	2.6	9.1	6.0	5.1	7.7	32.0	4.2	63.9	276.7
43	100.0	176.0	161.0	63.0	7.0	3.0	13.0	19.0	9.0	9.0	29.0	10.0	10.0	2.0	2.0	4.0	13.0	5.0	1.0	4.0	20.0	21.0	2.5	1.6	2.8	9.1	6.8	7.6	6.8	35.0	5.2	37.4	260.1
44	87.0	185.0	197.0	72.0	14.0	2.0	10.0	24.0	12.0	9.0	24.0	16.0	12.0	4.0	3.0	3.0	13.0	5.0	1.0	3.0	19.0	27.0	3.7	1.6	2.3	10.0	7.6	8.3	8.6	36.0	8.7	21.5	192.0
45	75.0	167.0	215.0	81.0	24.0	2.0	8.0	23.0	15.0	12.0	23.0	26.0	24.0	5.0	2.0	2.0	15.0	6.0	2.0	2.0	17.0	27.0	5.2	2.3	3.2	8.9	11.1	11.7	3.8	29.0	13.0	12.7	116.2
46	58.0	140.0	206.0	107.0	29.0	2.0	4.0	19.0	18.0	17.0	18.0	31.0	39.0	10.0	3.0	1.0	17.0	4.0	2.0	3.0	15.0	24.0	7.3	1.6	2.2	7.0	11.3	12.5	5.2	20.0	18.1	7.8	63.2
47	83.0	127.0	166.0	108.0	40.0	1.0	5.0	18.0	18.0	17.0	16.0	39.0	49.0	20.0	3.0	3.0	16.0	4.0	2.0	3.0	14.0	29.0	9.7	2.6	1.3	4.9	9.9	15.0	8.0	13.0	21.6	6.5	41.4
48	49.0	92.0	131.0	115.0	49.0	2.0	3.0	17.0	22.0	29.0	15.0	34.0	63.0	32.0	6.0	4.0	15.0	6.0	3.0	2.0	10.0	28.0	12.2	2.7	0.6	4.4	11.1	15.0	12.5	11.0	28.5	4.7	21.6
49	63.0	77.0	92.0	102.0	47.0	2.0	4.0	15.0	19.0	36.0	15.0	32.0	66.0	48.0	13.0	6.0	13.0	8.0	3.0	2.0	8.0	19.0	15.2	4.2	1.3	2.9	10.6	14.9	14.6	10.0	28.2	5.6	15.4
50	51.0	46.0	63.0	78.0	49.0	4.0	4.0	15.0	19.0	47.0	17.0	30.0	63.0	62.0	20.0	13.0	16.0	8.0	3.0	2.0	8.0	28.0	18.4	6.3	<1	3.3	13.1	16.9	16.2	14.0	25.4	7.2	11.9
51	47.0	47.0	40.0	52.0	43.0	4.0	4.0	8.0	21.0	43.0	16.0	26.0	52.0	71.0	32.0	20.0	12.0	6.0	4.0	2.0	5.0	14.0	21.9	8.6	<1	2.9	12.5	14.4	30.0	16.0	24.6	5.3	5.3
52	25.0	23.0	26.0	29.0	24.0	3.0	4.0	8.0	15.0	44.0	15.0	24.0	43.0	70.0	41.0	27.0	13.0	10.0	5.0	2.0	5.0	8.0	23.0	7.1	1.6	4.6	11.8	15.4	23.6	32.0	21.4	3.7	9.2
53	13.0	19.0	15.0	26.0	21.0	4.0	5.0	8.0	15.0	43.0	17.0	29.0	34.0	62.0	45.0	32.0	12.0	8.0	4.0	2.0	3.0	7.0	20.2	11.3	1.5	3.1	8.7	13.0	29.9	34.0	24.8	5.1	5.7
54	11.0	8.0	5.0	10.0	7.0	3.0	5.0	6.0	12.0	45.0	17.0	23.0	26.0	48.0	44.0	30.0	13.0	6.0	4.0	1.0	4.0	5.0	16.3	9.9	2.9	3.7	10.1	11.3	42.5	36.0	24.1	2.7	4.2
55	18.0	11.0	4.0	5.0	14.0	3.0	2.0	9.0	14.0	41.0	15.0	24.0	20.0	38.0	38.0	27.0	12.0	7.0	3.0	2.0	4.0	4.0	19.2	11.5	2.8	2.7	12.6	14.1	32.6	38.0	32.7	3.0	4.6
56	6.0	2.0	2.0	3.0	3.0	2.0	2.0	3.0	9.0	22.0	13.0	27.0	19.0	27.0	35.0	28.0	12.0	8.0	2.0	< 1	3.0	3.0	10.4	8.8	5.7	4.3	9.7	12.2	46.4	47.0	30.6	2.5	2.7
57	10.0	3.0	2.0	3.0	< 1	1.0	2.0	4.0	5.0	28.0	11.0	21.0	10.0	20.0	19.0	18.0	13.0	5.0	2.0	< 1	1.0	1.0	7.7	8.5	1.7	2.9	9.1	12.0	34.3	36.0	31.1	2.9	1.2
58	4.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	7.0	24.0	12.0	19.0	10.0	15.0	13.0	15.0	11.0	4.0	2.0	1.0	2.0	2.0	5.5	7.7	4.3	2.4	11.2	14.4	32.9	30.0	33.9	3.0	2.0
59	1.0	1.0	< 1	2.0	1.0	1.0	1.0	2.0	3.0	8.0	7.0	16.0	4.0	11.0	8.0	13.0	8.0	6.0	2.0	2.0	1.0	1.0	5.8	4.8	4.9	2.7	10.6	8.5	33.2	24.0	26.1	1.5	0.9
60	0.0	1.0	< 1	3.0	1.0	0.0	1.0	2.0	4.0	4.0	5.0	13.0	3.0	9.0	5.0	8.0	4.0	6.0	1.0	1.0	< 1	1.0	3.8	3.6	3.7	2.5	7.0	8.2	41.9	25.0	26.8	1.1	2.4
61	0.0	1.0	1.0	< 1	1.0	< 1	1.0	1.0	1.0	4.0	3.0	9.0	3.0	5.0	4.0	4.0	2.0	3.0	1.0	1.0	< 1	< 1	3.6	3.2	5.6	2.7	11.2	4.3	19.3	16.0	16.7	1.6	0.2
62	0.0	0.0	2.0	1.0	1.0	1.0	< 1	< 1	1.0	5.0	2.0	4.0	3.0	3.0	2.0	3.0	3.0	1.0	1.0	< 1	< 1	0.0	2.2	2.2	2.5	2.2	8.5	2.8	20.5	13.0	15.6	<1	0.2
63	0.0	0.0	2.0	2.0	< 1	0.0	< 1	< 1	1.0	3.0	1.0	3.0	< 1	2.0	2.0	4.0	1.0	3.0	< 1	< 1	1.0	1.0	2.2	2.2	3.0	2.4	8.0	3.2	30.9	6.0	8.5	1.0	0.8
64	0.0	0.0	1.0	0.0	< 1	0.0	< 1	< 1	< 1	1.0	< 1	2.0	1.0	1.0	< 1	1.0	1.0	1.0	< 1	1.0	< 1	< 1	1.0	1.0	3.5	1.7	9.3	2.2	7.4	8.0	3.9	0.0	0.0
65	0.0	0.0	0.0	0.0	< 1	0.0	0.0	< 1	3.0	0.0	< 1	2.0	< 1	1.0	< 1	1.0	< 1	< 1	< 1	0.0	< 1	< 1	< 1	0.8	1.3	0.8	8.7	2.2	5.6	4.0	6.2	0.0	0.0
66	0.0	0.0	0.0	< 1	1.0	0.0	< 1	< 1	0.0	1.0	< 1	< 1	0.0	< 1	< 1	1.0	< 1	3.0	0.0	0.0	0.0	1.0	< 1	< 1	1.8	2.9	6.4	<1	7.1	4.0	5.5	0.0	0.0
67	0.0	0.0	0.0	0.0	1.0	1.0	0.0	< 1	< 1	1.0	< 1	1.0	0.0	< 1	< 1	0.0	< 1	0.0	< 1	< 1	0.0	0.0	< 1	< 1	1.2	1.6	7.5	1.0	1.1	1.0	1.5	0.0	0.0
68	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	< 1	0.0	0.0	< 1	1.0	< 1	0.0	1.0	< 1	0.0	< 1	0.0	< 1	< 1	<1	1.4	4.0	<1	2.3	1.0	2.9	0.0	0.0
69	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	2.0	0.0	< 1	< 1	0.0	< 1	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	<1	0.8	1.6	0.0	0.0	<1	<1	0.0	0.0
70	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<1	3.0	<1	3.0	<1	0.0	0.0	0.0
71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	0.0	< 1	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	0.0	0.0	< 1	0.0	0.8	2.1	0.0	3.5	<1	0.0	0.0	0.0
72	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	<1	0.0	0.0	0.0
73	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	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	1.4	<1	0.0	0.0	0.0
74	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	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	<1	0.0	0.0	0.0
75	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	0.0	< 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	0.0	0.0
76	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	0.0	0.0	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
Total	2786.0	2278.0	1757.0	1175.0	586.0	302.0	290.0	375.0	380.0	713.0	436.0	493.0	764.0	777.0	583.0	505.0	449.0	433.0	257.0	317.0	331.0	356.0	294.0	181.0	208.0	266.0	429.7	335.8	891.3	842.0	845.0	665.0	1489.7

Table 21. -- Numbers-at-age estimates (millions) from acoustic-trawl surveys of walleye pollock in the Shelikof Strait area.
No surveys were conducted in 1982, 1999, or 2011, and no estimate was produced for 1987 due to mechanical problems.

Age	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000
1	78.0	1.0	62.0	2,092.0	575.0	17.0	399.0	49.0	22.0	228.0	63.0	186.0	10,690.0	56.0	70.0	395.0	4,484.0
2	3,481.0	902.0	58.0	544.0	2,115.0	110.0	90.0	1,210.0	174.0	34.0	76.0	36.0	510.0	3,307.0	183.0	89.0	755.0
3	1,511.0	380.0	324.0	123.0	184.0	694.0	90.0	72.0	550.0	74.0	37.0	49.0	79.0	119.0	1,247.0	126.0	217.0
4	769.0	1,297.0	142.0	315.0	46.0	322.0	216.0	63.0	48.0	188.0	72.0	32.0	78.0	25.0	80.0	474.0	16.0
5	2,786.0	1,171.0	635.0	181.0	75.0	78.0	249.0	116.0	65.0	368.0	233.0	155.0	103.0	54.0	18.0	136.0	67.0
6	1,052.0	698.0	988.0	347.0	49.0	17.0	43.0	180.0	70.0	84.0	126.0	84.0	245.0	71.0	44.0	14.0	132.0
7	210.0	599.0	450.0	439.0	86.0	6.0	14.0	46.0	116.0	85.0	27.0	42.0	122.0	201.0	52.0	32.0	17.0
8	129.0	132.0	224.0	167.0	149.0	6.0	4.0	22.0	24.0	171.0	36.0	27.0	54.0	119.0	98.0	36.0	13.0
9	79.0	14.0	41.0	43.0	60.0	4.0	2.0	8.0	29.0	33.0	39.0	44.0	17.0	40.0	53.0	74.0	10.0
10	25.0	12.0	3.0	6.0	11.0	9.0	1.0	8.0	2.0	56.0	16.0	48.0	11.0	13.0	14.0	26.0	8.0
11	2.0	4.0	0.0	2.0	1.0	2.0	10.0	1.0	4.0	2.0	8.0	15.0	15.0	11.0	2.0	14.0	14.0
12	0.0	2.0	1.0	1.0	0.0	2.0	1.0	3.0	1.0	15.0	3.0	7.0	6.0	5.0	3.0	7.0	7.0
13	0.0	0.0	0.0	0.0	0.0	< 1	< 1	2.0	4.0	1.0	2.0	1.0	2.0	3.0	1.0	< 1	2.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	< 1	< 1	2.0	< 1	< 1	< 1	1.0	1.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	1.0	< 1	0.0	0.0	0.0	1.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	1.0	0.0	0.0	< 1	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	< 1	0.0	0.0	0.0	0.0	0.0
18	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	0.0	0.0
Total	10,122.0	5,212.0	2,928.0	4,260.0	3,351.0	1,267.0	1,119.0	1,781.0	1,109.0	1,339.0	740.0	728.0	11,932.0	4,024.0	1,865.0	1,425.0	5,743.0

Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017	Mean
1	289.0	8.0	48.0	53.0	1,626.1	161.7	53.5	1,368.0	331.9	90.0	94.9	6,324.3	575.7	7.4	0.0	306.1	953.1
2	4,104.0	163.0	94.0	94.0	157.5	836.0	231.7	391.2	1,204.5	305.6	851.5	149.4	3,640.2	103.9	2.0	0.0	812.6
3	352.0	1,107.0	205.0	58.0	55.5	40.7	174.9	249.6	110.2	531.6	43.5	803.3	19.1	1,635.8	79.0	9.9	354.4
4	61.0	97.0	800.0	159.0	34.6	11.5	29.7	53.2	98.7	84.5	76.9	60.9	295.3	72.2	1,446.9	124.3	236.4
5	42.0	16.0	56.0	357.0	172.7	17.4	10.1	12.0	60.2	78.9	95.8	68.8	86.9	152.5	43.4	2559.3	242.5
6	23.0	16.0	8.0	48.0	162.4	56.0	17.3	2.2	9.9	28.5	46.2	114.2	58.5	62.2	33.7	131.1	154.1
7	35.0	8.0	4.0	3.0	36.0	75.0	34.4	4.1	2.9	11.8	29.2	65.2	99.5	56.5	15.2	46.8	94.5
8	13.0	7.0	2.0	3.0	3.6	32.2	20.9	10.7	0.9	5.5	4.5	49.1	54.9	67.8	4.4	14.5	52.8
9	6.0	1.0	1.0	3.0	2.4	6.9	1.5	6.7	5.1	5.3	1.1	11.9	25.8	29.9	6.1	0.5	22.0
10	3.0	1.0	< 1	< 1	0.0	< 1	1.0	2.0	6.1	10.8	< 1	5.4	17.7	10.9	2.1	1.4	11.8
11	1.0	< 1	< 1	< 1	< 1	< 1	< 1	< 1	1.4	9.4	< 1	5.7	7.4	5.6	0.0	0.0	5.7
12	2.0	< 1	0.0	0.0	0.0	< 1	0.0	0.0	< 1	3.5	0.5	0.6	0.7	3.6	0.0	0.0	2.6
13	1.0	< 1	< 1	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	2.3	0.9	0.0	0.0	0.9
14	< 1	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.6	0.0	0.0	0.4
15	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.7	1.5	0.0	0.0	0.2
16	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	0.9	0.0	0.0	0.1
17	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	0.0	0.0
18	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	0.0	0.0
Total	4,932.0	1,424.0	1,220.0	777.0	2,251.7	1,240.0	576.0	2,099.6	1,831.8	1,165.3	1,244.6	7,668.0	4,884.7	2,212.0	1,633.0	3,194.0	2,941.0

Table 22. -- Biomass-at-age estimates (thousands of metric tons) from acoustic-trawl surveys of walleye pollock in the Shelikof Strait area.
No surveys were conducted in 1982, 1999, or 2011, and no estimate was produced for 1987 due to mechanical problems.

Age	1981	1983	1984	1985	1986	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017	Mean
1	1.0	< 1	1.0	24.0	4.0	< 1	4.0	< 1	< 1	3.0	1.0	2.0	114.0	1.0	1.0	4.0	57.0	2.0	< 1	< 1	< 1	18.1	1.5	< 1	19.2	3.7	0.9	1.3	58.7	7.0	0.1	0.0	3.4	13.7
2	309.0	71.0	6.0	54.0	139.0	8.0	8.0	67.0	12.0	3.0	6.0	3.0	46.0	180.0	15.0	8.0	63.0	214.0	13.0	8.0	8.0	13.2	54.9	14.6	38.6	94.0	24.1	67.6	18.9	210.9	9.8	<1	0.0	57.7
3	342.0	117.0	83.0	41.0	40.0	130.0	21.0	15.0	85.0	16.0	11.0	14.0	23.0	24.0	195.0	28.0	60.0	60.0	164.0	42.0	14.0	17.0	10.7	38.9	66.7	28.8	127.3	11.8	278.9	5.8	326.8	23.4	3.4	76.9
4	255.0	529.0	78.0	159.0	17.0	91.0	86.0	23.0	13.0	60.0	34.0	20.0	41.0	12.0	28.0	153.0	9.0	25.0	29.0	222.0	77.0	19.0	5.0	13.2	25.8	51.5	56.8	50.2	38.1	175.4	39.1	564.3	56.1	93.7
5	1068.0	650.0	373.0	109.0	56.0	31.0	111.0	61.0	33.0	144.0	136.0	127.0	83.0	50.0	13.0	53.0	54.0	27.0	12.0	25.0	179.0	132.5	14.4	8.5	9.6	44.2	86.3	88.9	79.6	61.8	134.1	24.1	1292.1	127.5
6	496.0	455.0	684.0	253.0	41.0	9.0	27.0	120.0	54.0	68.0	90.0	75.0	220.0	73.0	53.0	12.0	107.0	24.0	16.0	7.0	35.0	119.2	62.9	21.6	3.0	10.6	36.7	61.7	156.6	75.6	65.7	25.1	75.8	111.2
7	133.0	332.0	331.0	353.0	76.0	6.0	12.0	36.0	106.0	92.0	28.0	48.0	116.0	212.0	61.0	39.0	17.0	40.0	9.0	5.0	4.0	28.8	87.2	47.4	7.7	4.8	21.5	43.4	104.2	133.0	80.8	13.3	42.6	82.1
8	92.0	94.0	161.0	138.0	140.0	6.0	4.0	24.0	23.0	194.0	43.0	34.0	55.0	132.0	120.0	47.0	17.0	18.0	8.0	2.0	3.0	4.2	42.8	30.0	19.9	1.7	11.4	7.0	87.1	84.1	101.5	4.0	13.8	54.6
9	68.0	11.0	36.0	35.0	58.0	5.0	3.0	9.0	36.0	36.0	46.0	64.0	19.0	48.0	67.0	95.0	15.0	8.0	2.0	2.0	4.0	2.9	10.3	2.8	12.6	10.7	12.0	2.2	22.0	40.5	47.6	8.1	0.7	26.2
10	19.0	12.0	3.0	6.0	11.0	11.0	1.0	11.0	3.0	71.0	21.0	68.0	15.0	17.0	20.0	33.0	11.0	5.0	1.0	1.0	< 1	0.0	1.0	1.9	4.1	12.8	22.1	0.7	11.5	29.1	17.5	1.9	1.9	14.3
11	1.0	5.0	0.0	2.0	2.0	2.0	12.0	1.0	6.0	3.0	10.0	21.0	20.0	16.0	3.0	21.0	22.0	2.0	1.0	< 1	< 1	1.4	1.6	1.4	< 1	2.8	21.6	< 1	12.6	11.4	8.9	0.0	0.0	7.6
12	0.0	1.0	1.0	1.0	0.0	3.0	1.0	4.0	1.0	21.0	4.0	10.0	7.0	7.0	5.0	10.0	11.0	3.0	1.0	0.0	0.0	0.0	1.3	0.0	0.0	< 1	8.9	< 1	2.0	1.4	6.4	0.0	0.0	3.7
13	0.0	0.0	0.0	0.0	0.0	< 1	< 1	2.0	7.0	1.0	3.0	2.0	3.0	4.0	1.0	< 1	4.0	1.0	< 1	< 1	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	4.7	1.5	0.0	0.0	1.5
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	1.0	4.0	1.0	< 1	1.0	1.0	2.0	1.0	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.6	0.0	1.4	0.0	0.0	0.8
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	1.0	< 1	0.0	0.0	0.0	1.0	0.0	< 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	1.3	2.5	0.0	0.0	0.4
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	0.0	0.0	1.0	0.0	0.0	< 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	0.0	0.0	1.6	0.0	0.0	0.1
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 1	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	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	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	0.0	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	0.0	0.0	0.0	0.0
Total	2786.0	2278.0	1757.0	1175.0	586.0	302.0	290.0	375.0	380.0	713.0	436.0	493.0	764.0	777.0	583.0	505.0	449.0	433.0	257.0	316.0	327.0	356.1	293.6	180.9	208.0	266.0	429.7	335.8	891.3	842.0	845.0	665.0	1,489.7	665.0

Table 23. -- Catch by species, and numbers of length and weight measurements taken from individuals, during five Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Marmot Bay.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	1,849.4	95.8	3,864	28	1,172	271
eulachon	*Thaleichthys pacificus*	60.7	3.1	8,459	61	239	65
Pacific herring	*Clupea pallasii*	15.8	0.8	923	7	126	38
arrowtooth flounder	*Atheresthes stomias*	1.7	0.1	4	0	4	4
northern sea nettle	*Chrysaora melanaster*	0.9	0.0	1	0	1	1
northern rock sole	*Lepidopsetta polyxystra*	0.7	0.0	1	0	1	0
lanternfish unident.	Myctophidae (family)	0.7	0.0	73	1	35	10
Alaskan pink shrimp	*Pandalus eous*	0.5	0.0	178	1	20	0
smelt unident.	Osmeridae (family)	0.3	0.0	202	1	22	16
shrimp unident.	Malacostraca (class)	0.2	0.0	68	0	11	0
capelin	*Mallotus villosus*	0.2	0.0	20	0	1	1
isopod unident.	Isopoda (order)	0.0	0.0	4	0	0	0
Alaska eelpout	*Bothrocara pusillum*	0.0	0.0	1	0	1	0
Totals		1,931.1		13,798		1,633	406

Table 24. -- Catch by species, and numbers of length and weight measurements taken from individuals, during four Aleutian Wing midwater trawl hauls during the winter 2017 acoustic-trawl survey of walleye pollock along the Chirikof shelf break.

		Catch				Individual measurements	
Species name	Scientific name	Weight (kg)	%	Number	%	Length	Weight
walleye pollock	*Gadus chalcogrammus*	315.0	58.1	634	32.3	340	83
Pacific ocean perch	*Sebastes alutus*	219.4	40.5	371	18.9	115	101
lanternfish unident.	Myctophidae (family)	4.8	0.9	773	39.4	64	26
chinook salmon	*Oncorhynchus tshawytscha*	2.3	0.4	1	0.1	1	1
Atlantic pyrosome	*Pyrosoma atlanticum*	0.2	0.0	43	2.2	0	0
squid unident.	Cephalopoda (class)	0.1	0.0	10	0.5	2	2
Pacific glass shrimp	*Pasiphaea pacifica*	0.1	0.0	118	6.0	22	0
Pacific herring	*Clupea pallasii*	0.1	0.0	8	0.4	8	8
comb jelly unident.	Ctenophora (phylum)	0.0	0.0	3	0.2	3	0
northern smoothtongue	*Leuroglossus schmidti*	0.0	0.0	1	0.1	1	1
isopod unident.	Isopoda (order)	0.0	0.0	1	0.1	0	0
viperfish unident.	Stomiidae (family)	0.0	0.0	1	0.1	1	1
jellyfish unident.	Scyphozoa (class)	0.0	0.0	0	0.0	0	0
Total		542.0		1,965		557	223

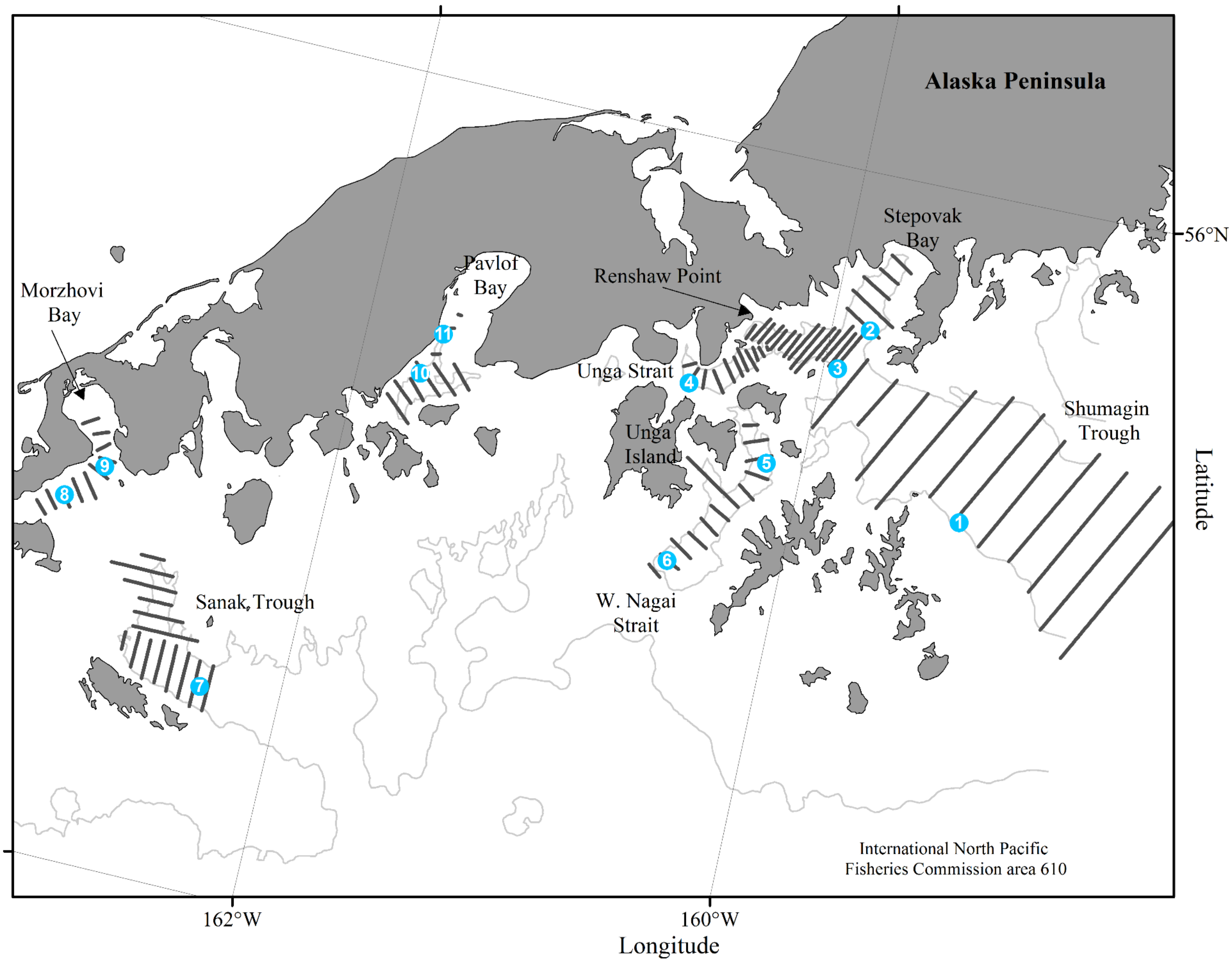


Figure 1. -- Transect lines and locations of Aleutian-wing trawl (AWT) hauls during the winter 2017 acoustic-trawl survey of walleye pollock in the Shumagin Islands and Sanak Trough.

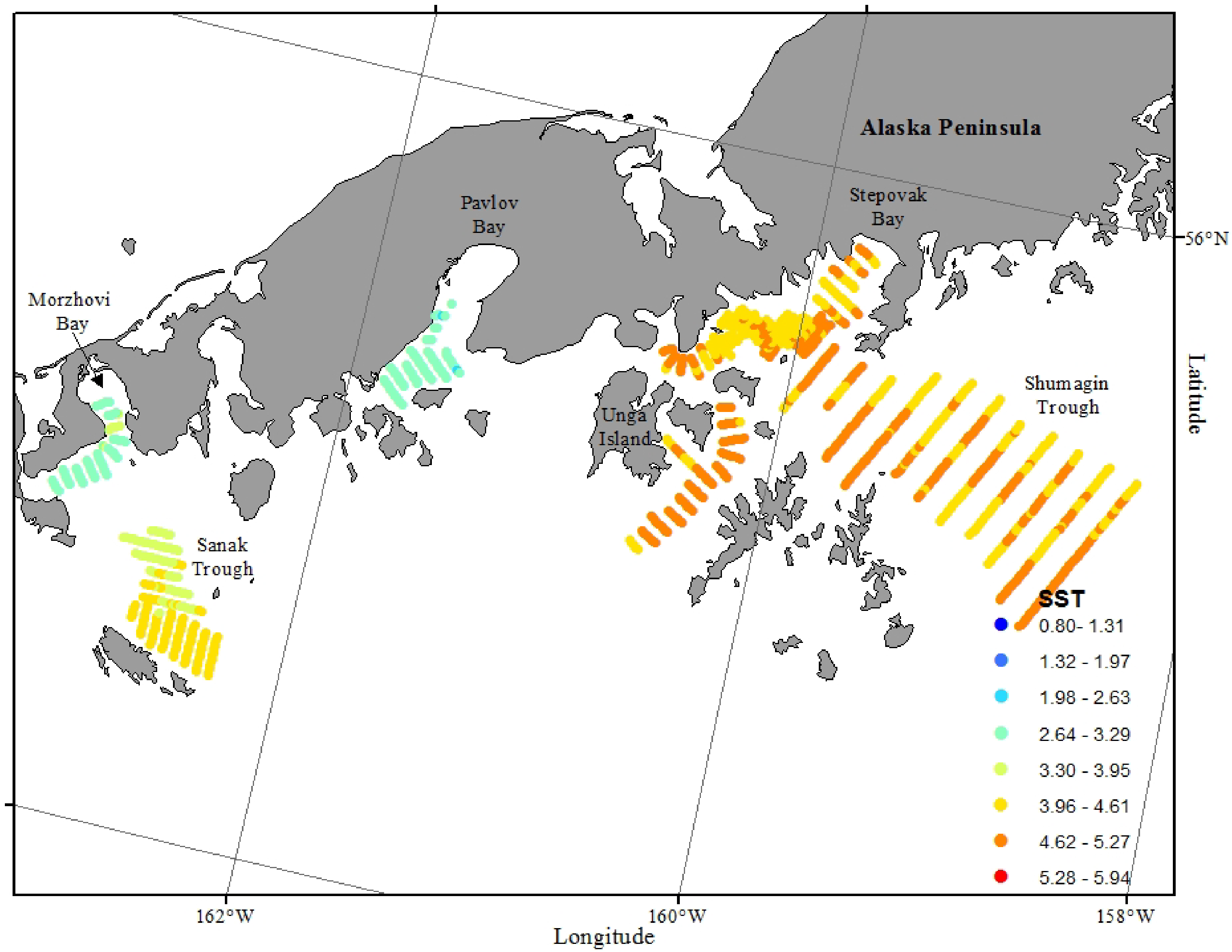


Figure 2. -- Surface water temperatures (°C) recorded at 5-second intervals during the 2017 acoustic-trawl survey of the Shumagin Islands. Temperatures were primarily from the ship's bow-mounted Seabird SBE-38 temperature sensor. At times when the SBE-38 was not operating, temperatures were from the mid-ship Furuno T-2000 temperature probe located 1.4 m below the surface.

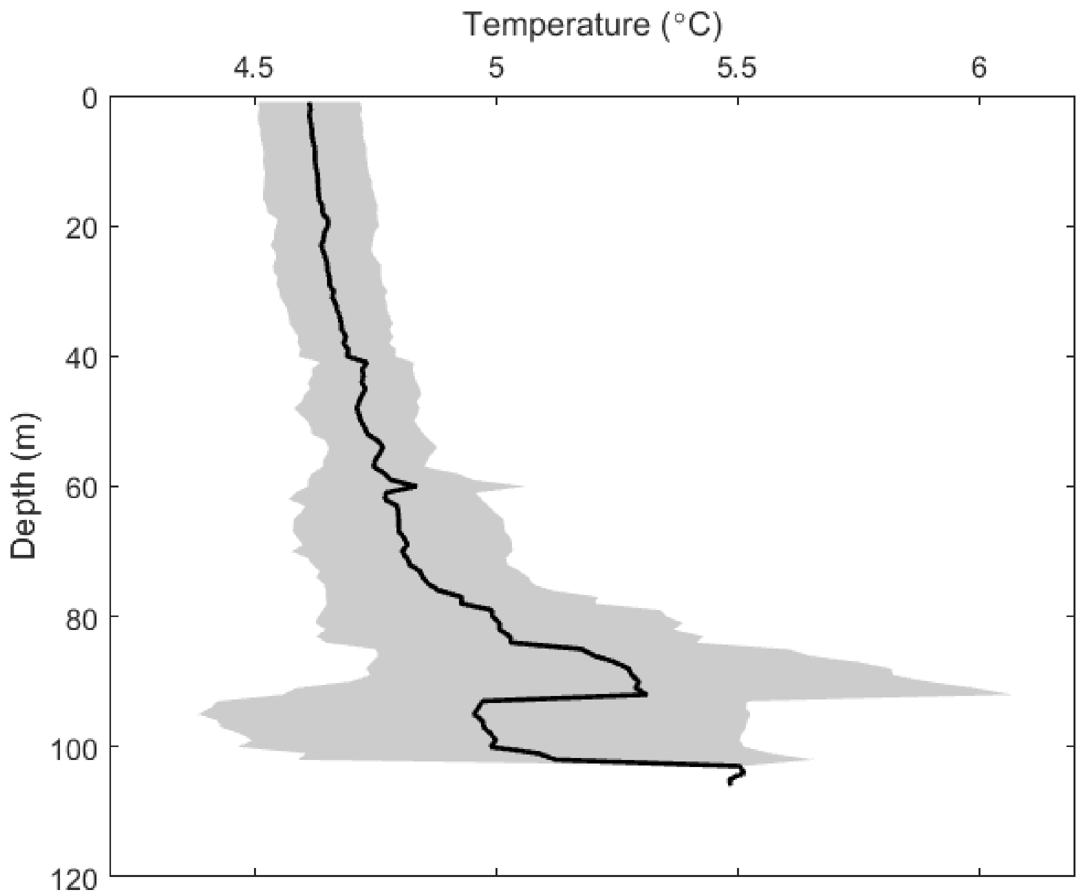


Figure 3. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the six trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in the Shumagin Trough region. The shaded area represents ± one standard deviation from the mean.

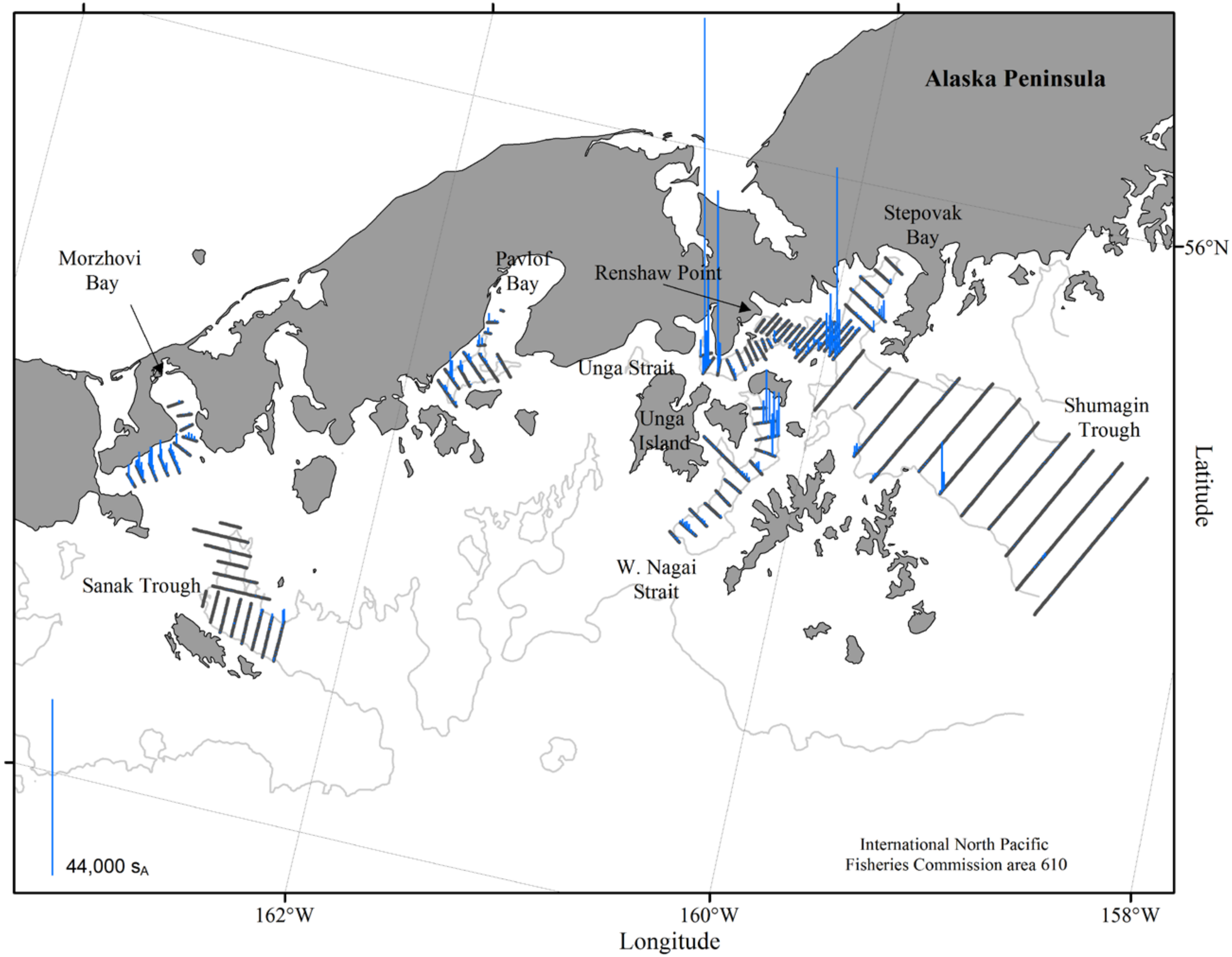


Figure 4.-- Backscatter (s_A) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic trawl survey of the Shumagin Islands, Sanak Trough, and Morzhovoi and Pavlof bays.

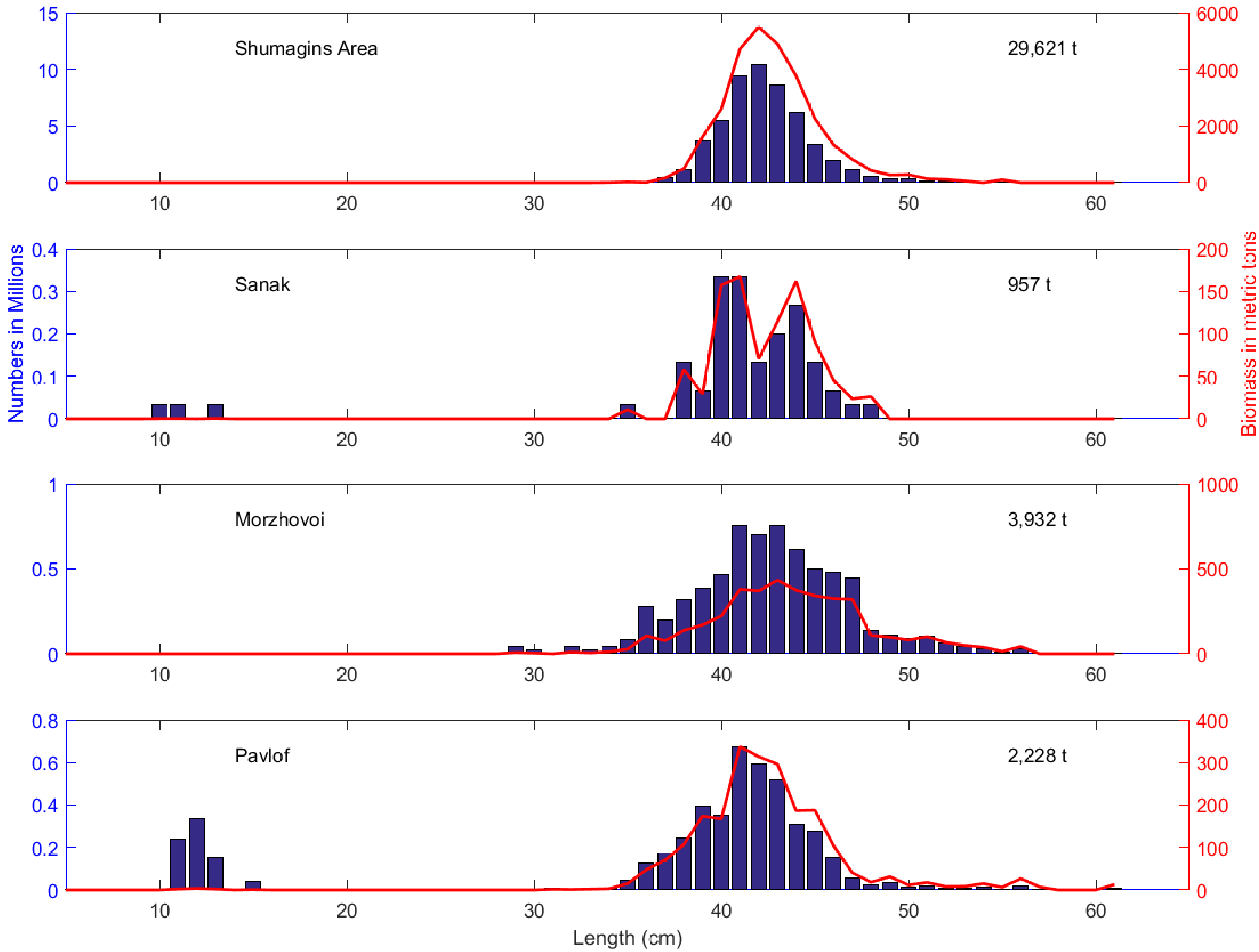
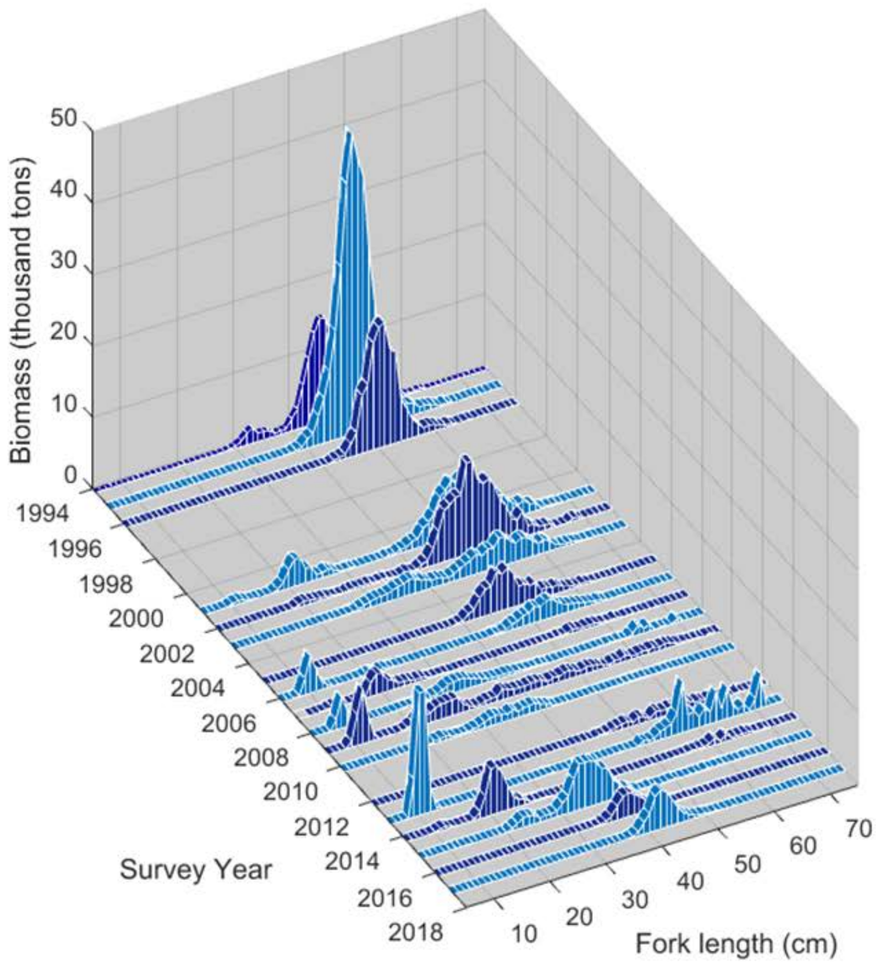


Figure 5. -- Length distributions of walleye pollock are shown with bars (numbers) and biomass estimates are shown with a solid red line (metric tons, t) for the 2017 acoustic-trawl survey of Shumagin Islands, Sanak Trough, and Morzhovoi and Pavlov bays. Note differences in vertical axes among panels.



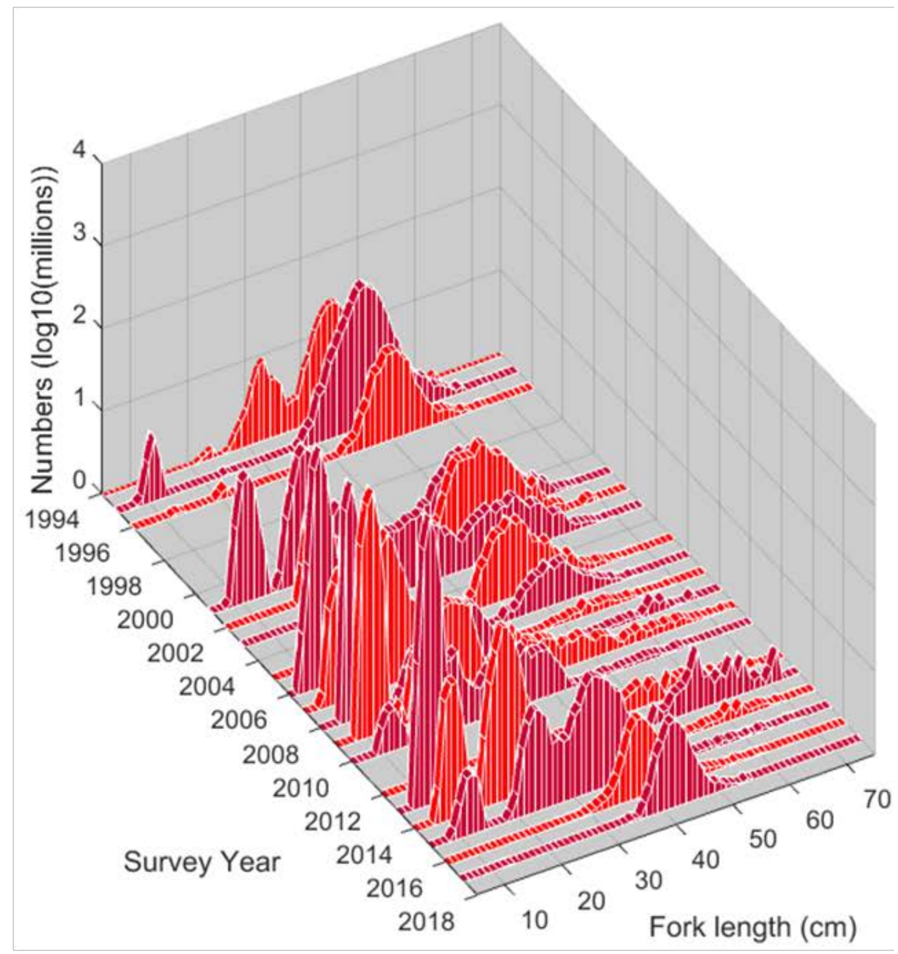


Figure 6. -- Walleye pollock biomass in thousands of metric tons (left) and numbers in log10(millions) (right) at length from the Shumagin Islands acoustic-trawl surveys since 1994. No surveys were conducted in 1997-2000, 2004, or 2011.

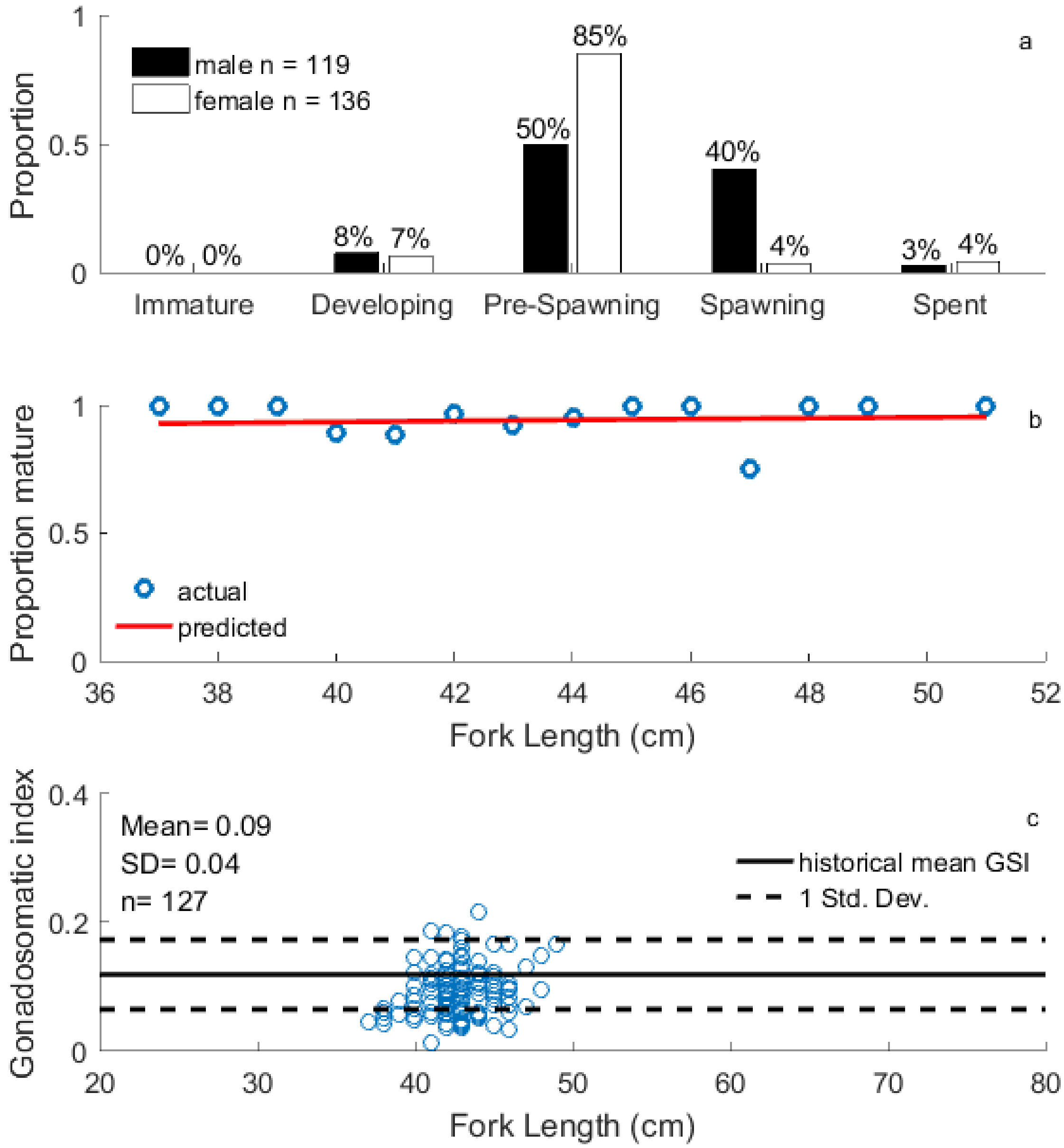


Figure 7. -- Maturity composition for male and female walleye pollock greater than 40 cm FL within each stage (a); proportion mature (i.e. pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of the Shumagin Islands (c). Note: these graphs do not include data from age-1 fish.

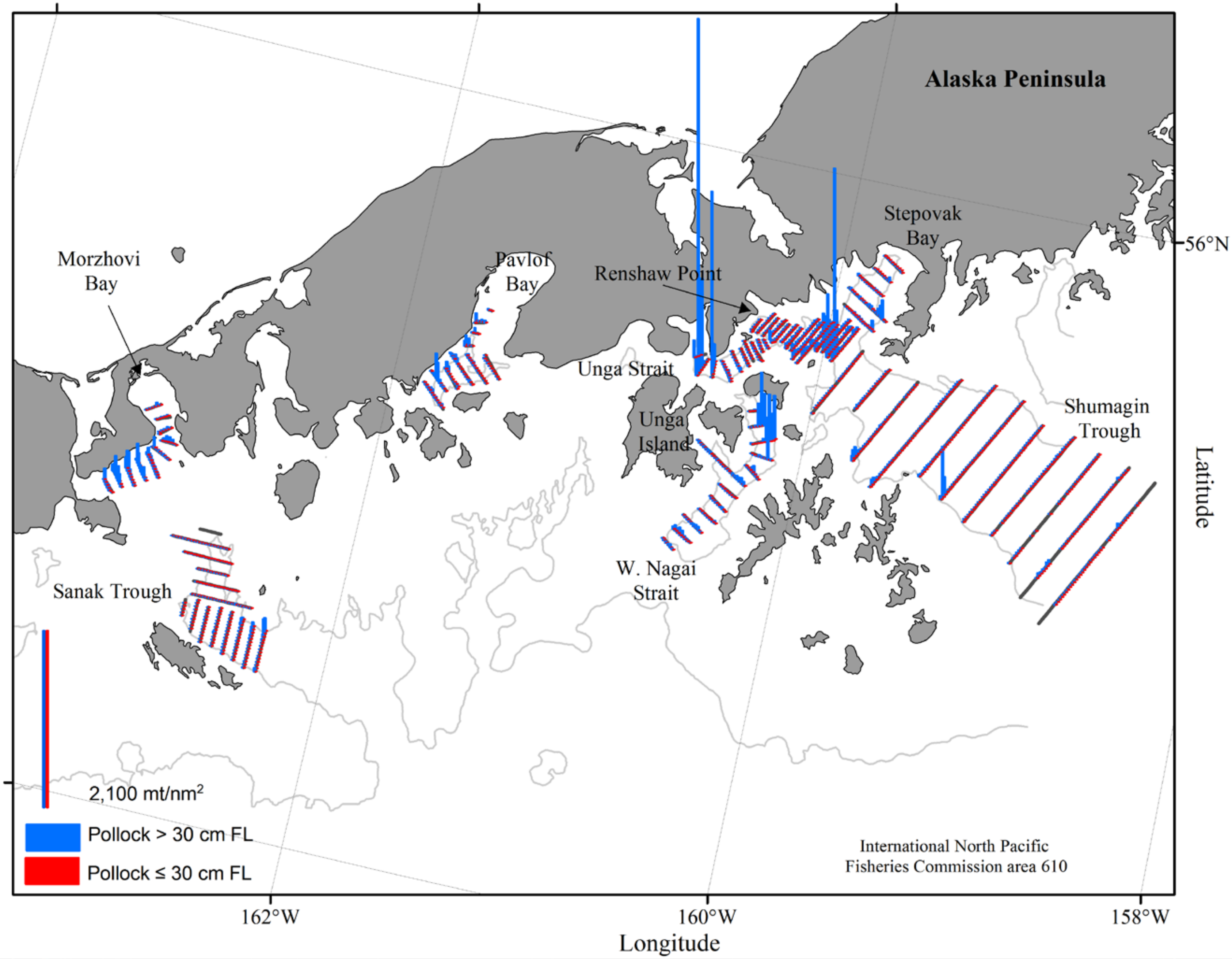


Figure 8. -- Biomass (t/nmi^2) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of the Shumagin Islands, Sanak Trough, and Morzhovoi and Pavlof bays.

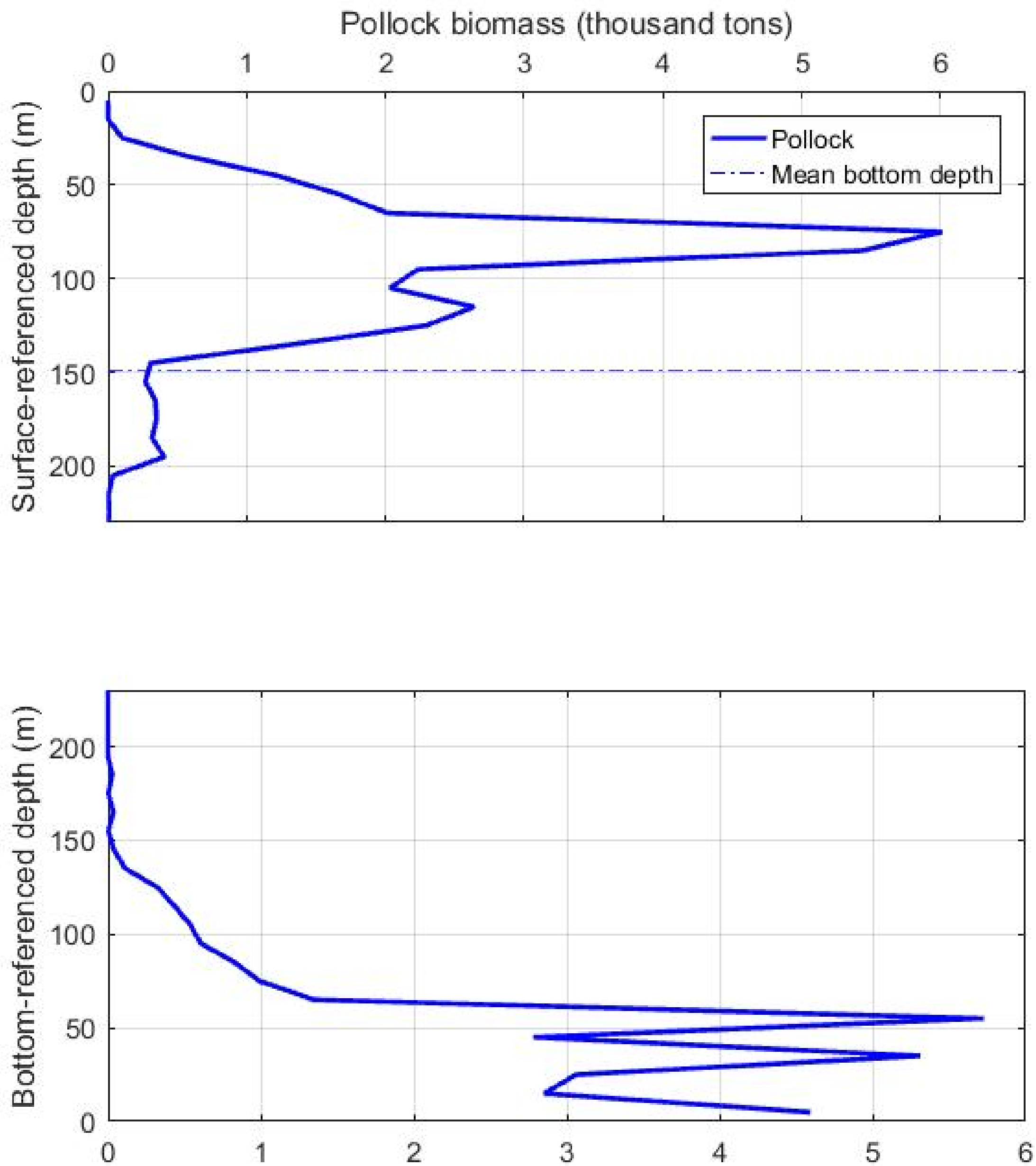


Figure 9. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in the Shumagin Islands during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

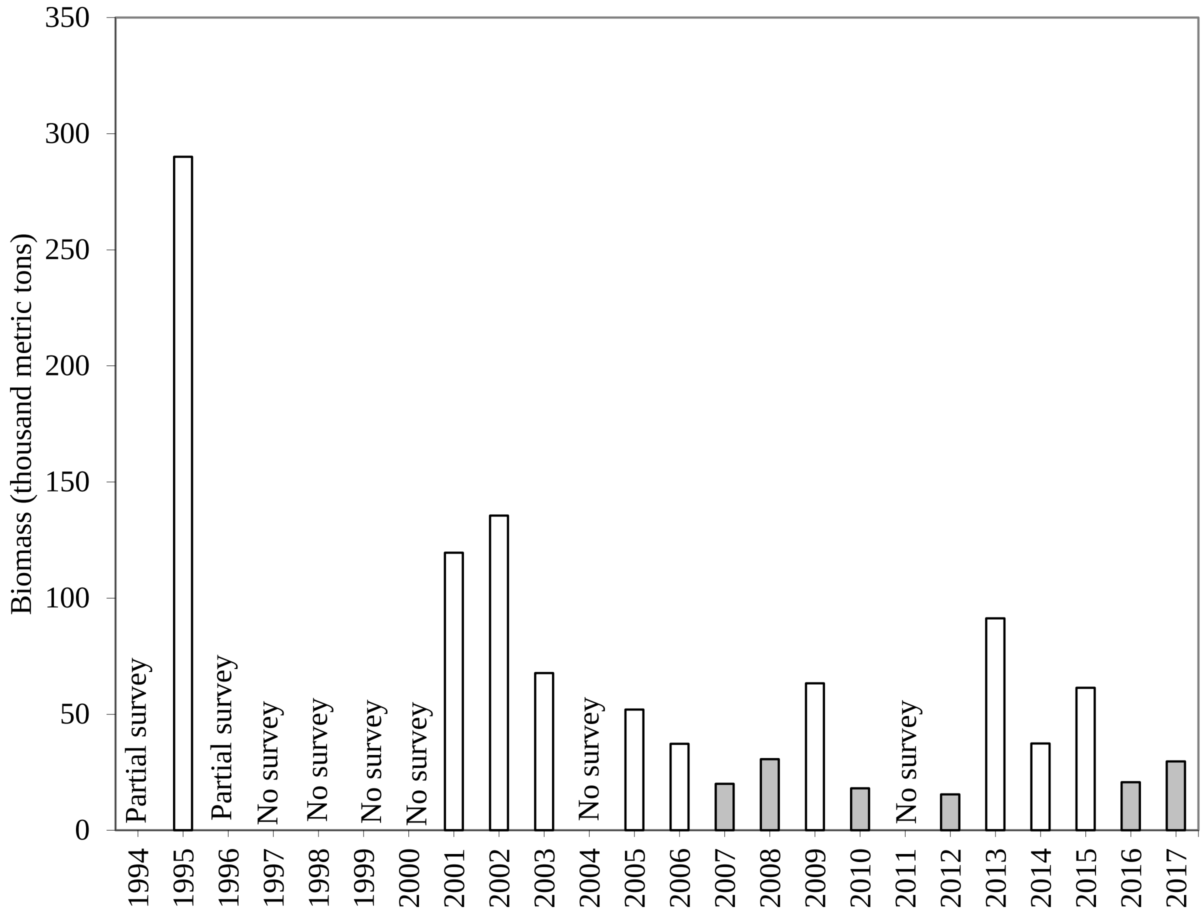


Figure 10. -- Summary of walleye pollock biomass estimates (thousand metric tons) based on acoustic-trawl surveys of the Shumagin Islands area.

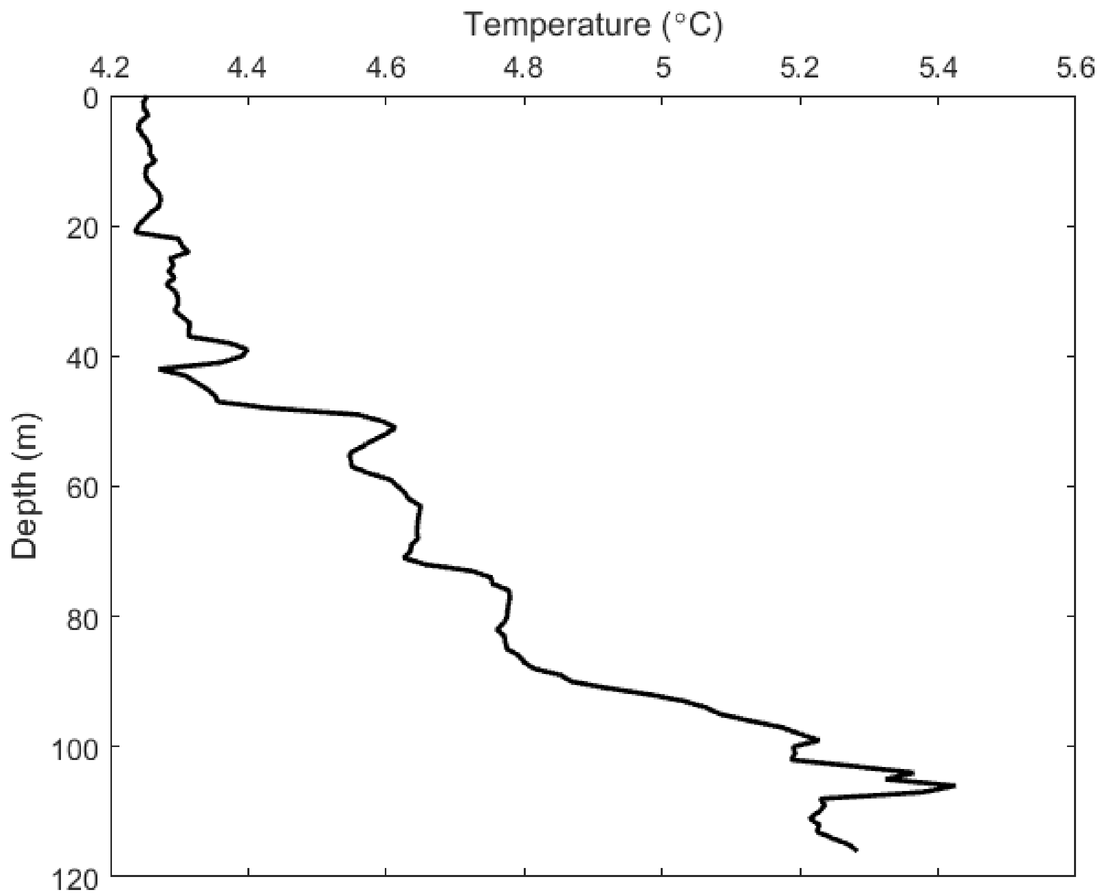


Figure 11. -- Water temperature (°C; solid line) by 1-m depth intervals for the 1 trawl haul location observed during the winter 2017 acoustic-trawl survey of walleye pollock in Sanak Trough.

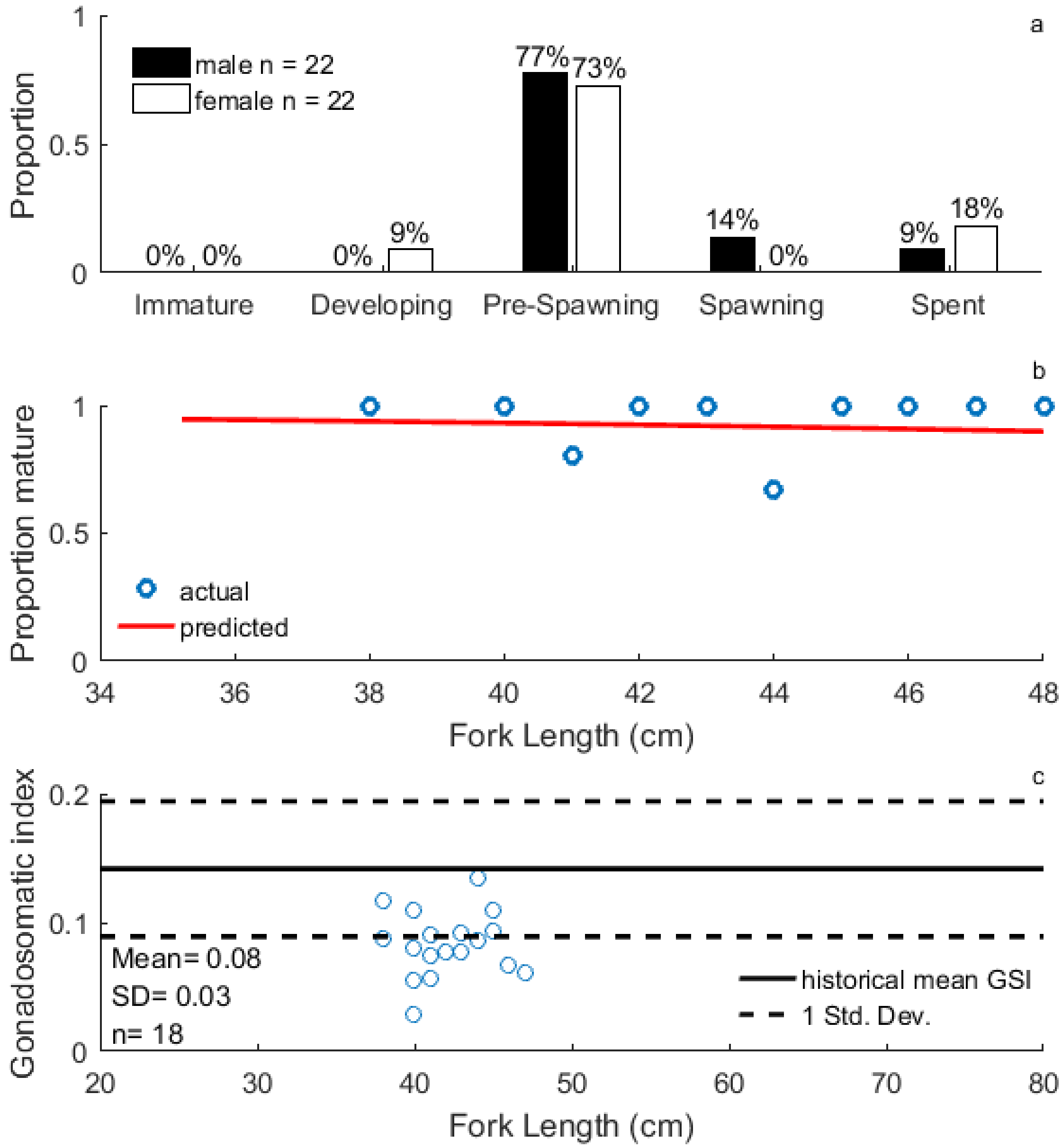


Figure 12. -- Maturity composition for male and female walleye pollock > 40 cm FL within each stage (a); proportion mature (i.e. pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of the Sanak Trough (c). Note: these graphs do not include data from age-1 fish.

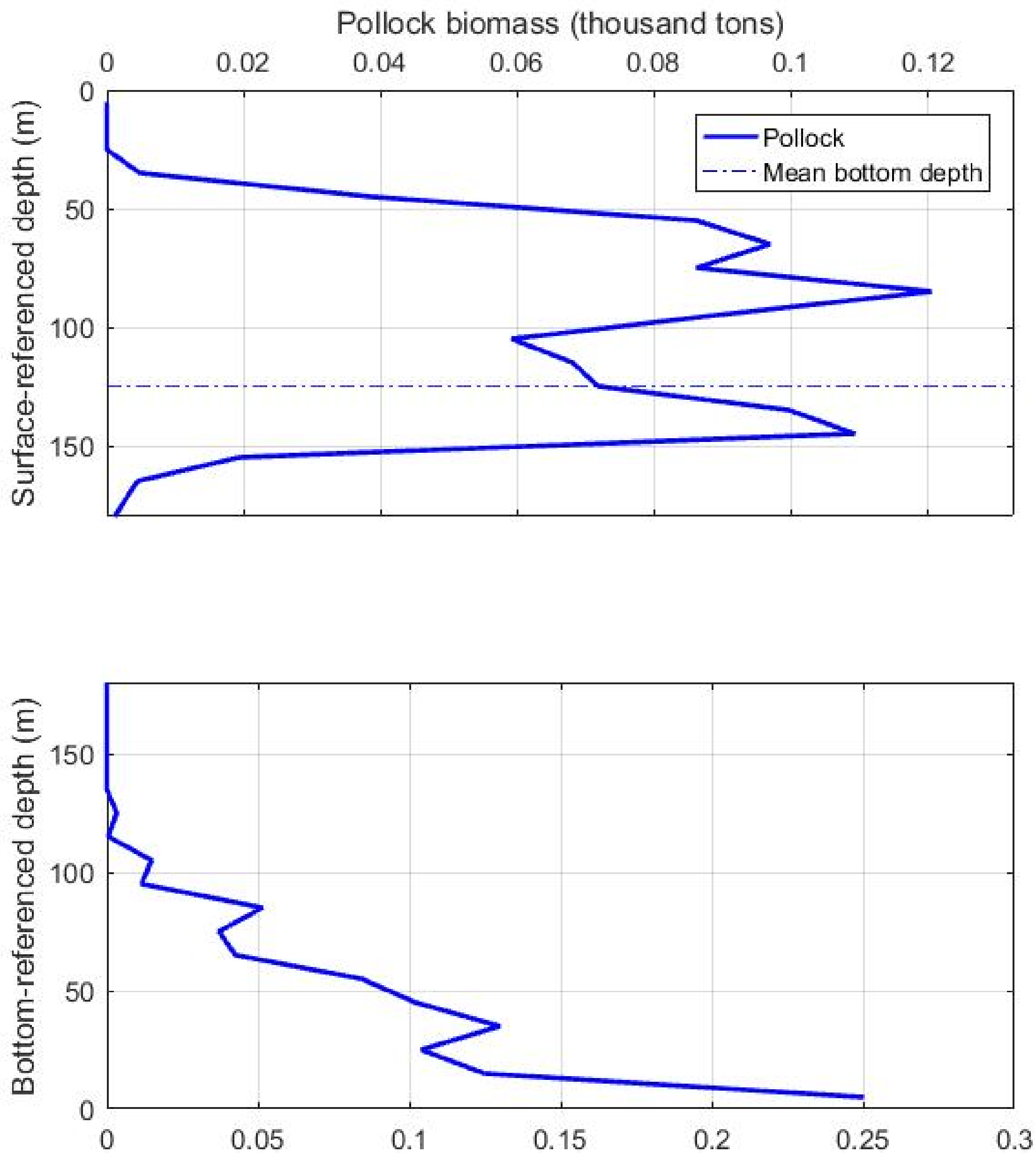


Figure 13. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in the Sanak Trough during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

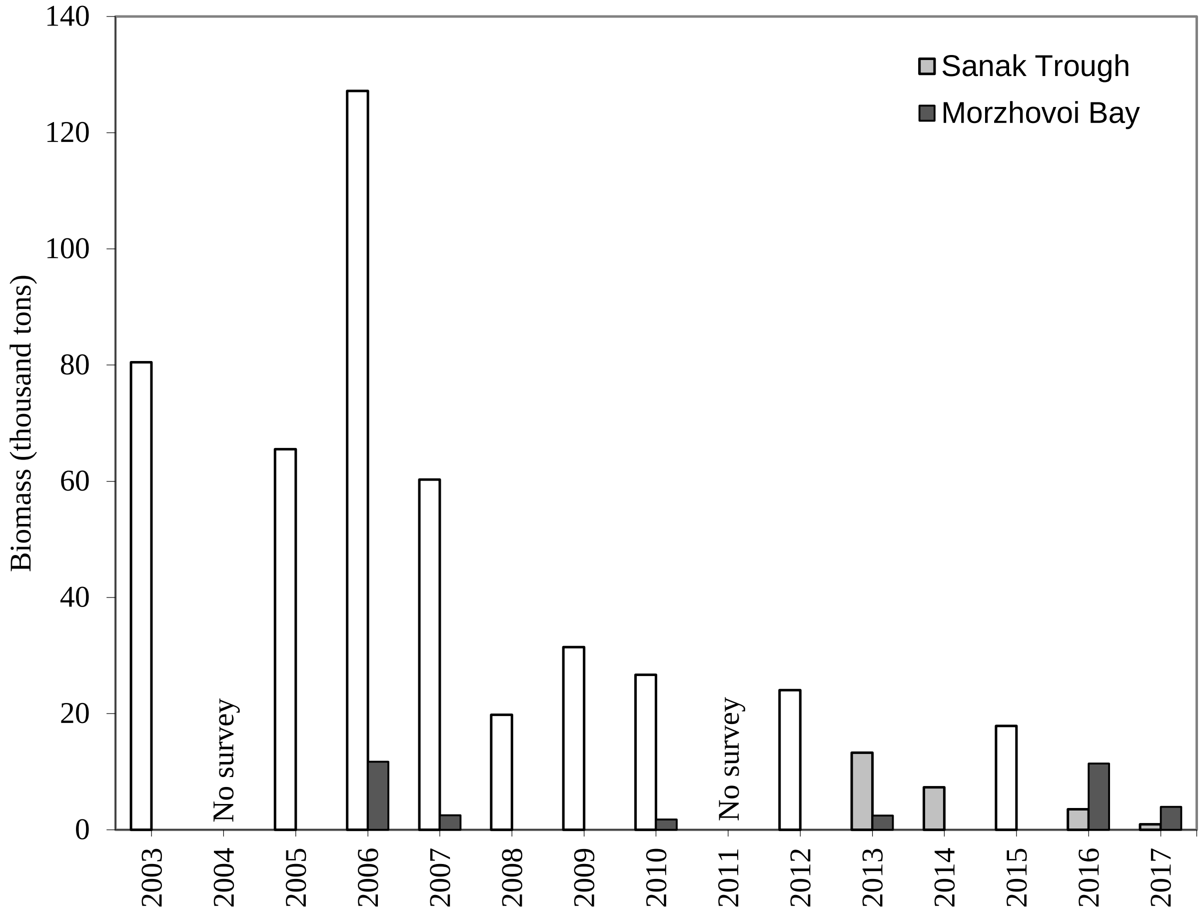


Figure 14. -- Summary of walleye pollock biomass estimates (thousand metric tons) based on acoustic-trawl surveys of the Sanak Trough and Morzhovi Bay areas.

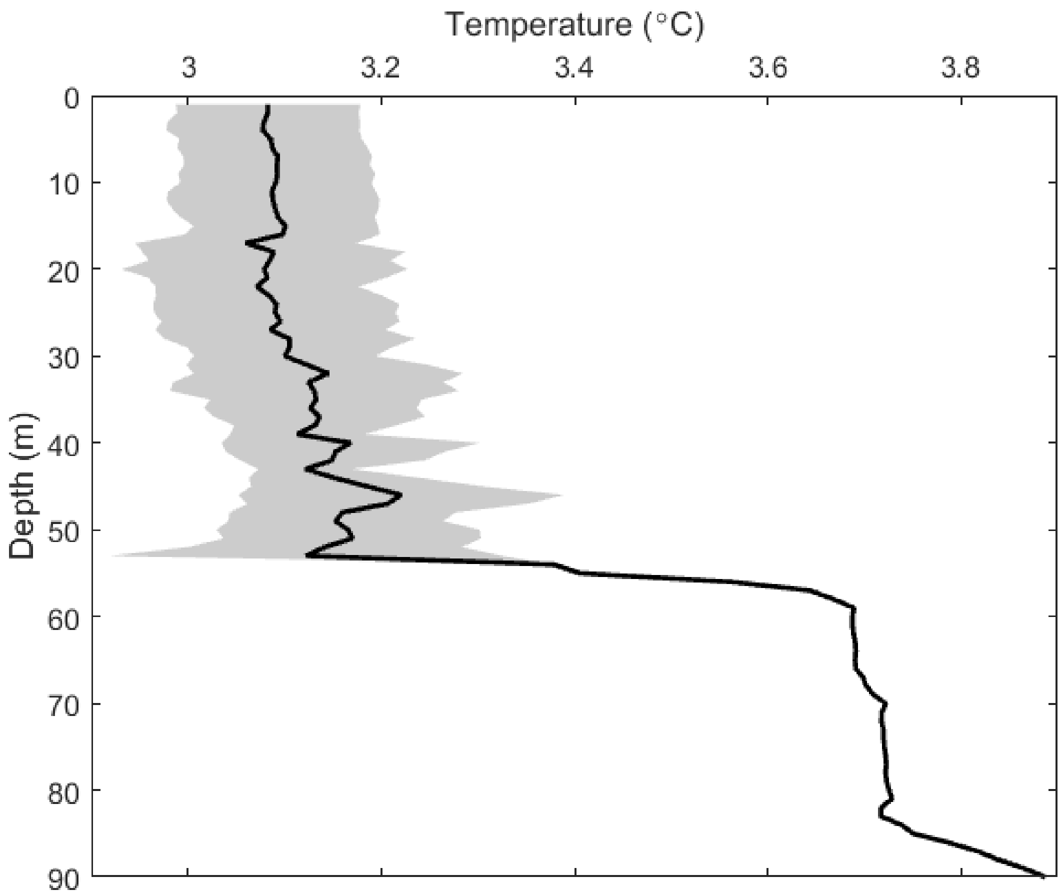


Figure 15. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the two trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in Morzhovoi Bay. The shaded area represents ± one standard deviation from the mean.

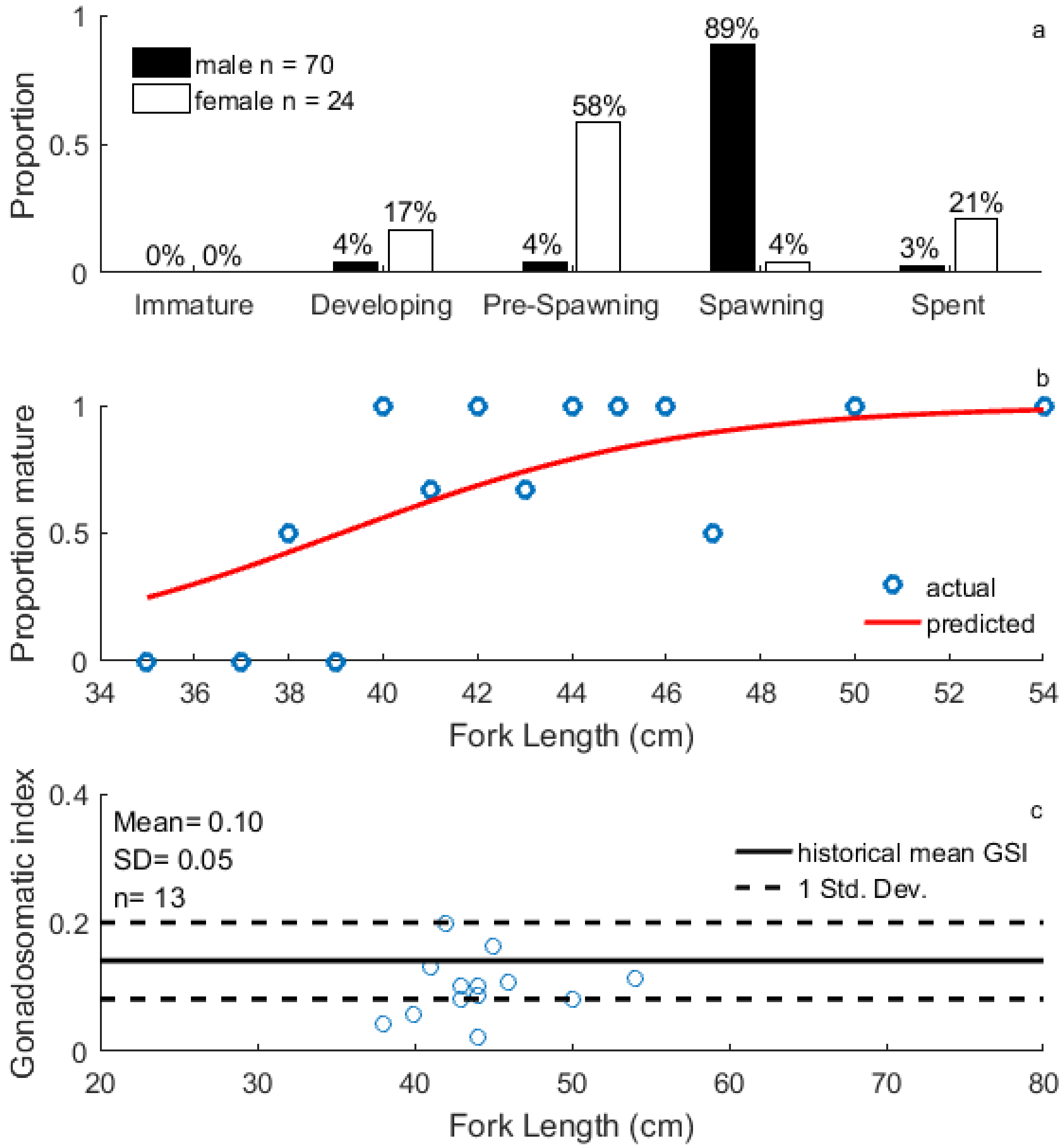


Figure 16. -- Maturity composition for male and female walleye pollock greater than 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of Morzhovoi Bay (c). Note: these graphs do not include data from age-1 fish.

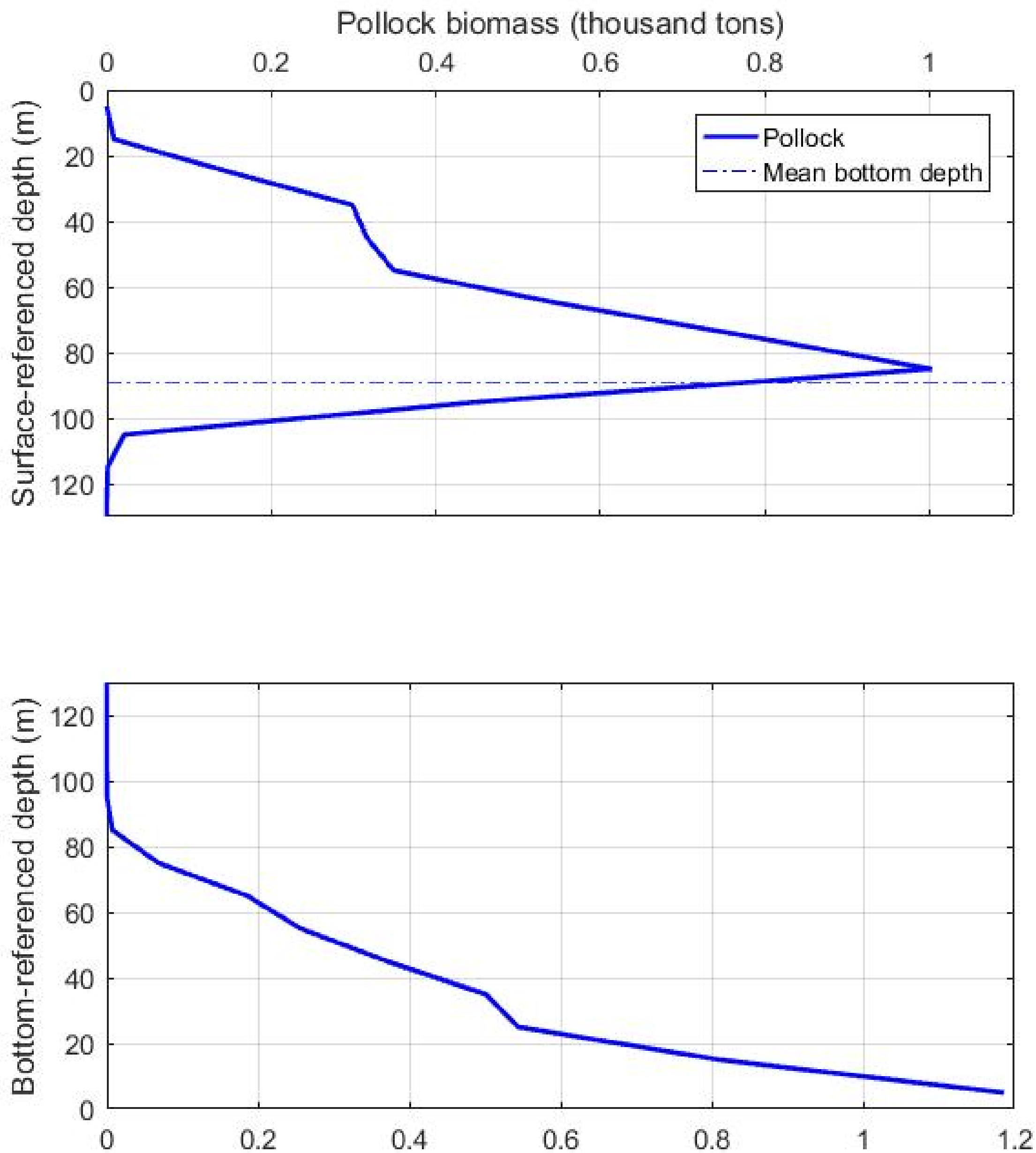


Figure 17. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in Morzhovoi Bay during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and from the bottom and is averaged in 10 m depth bins.

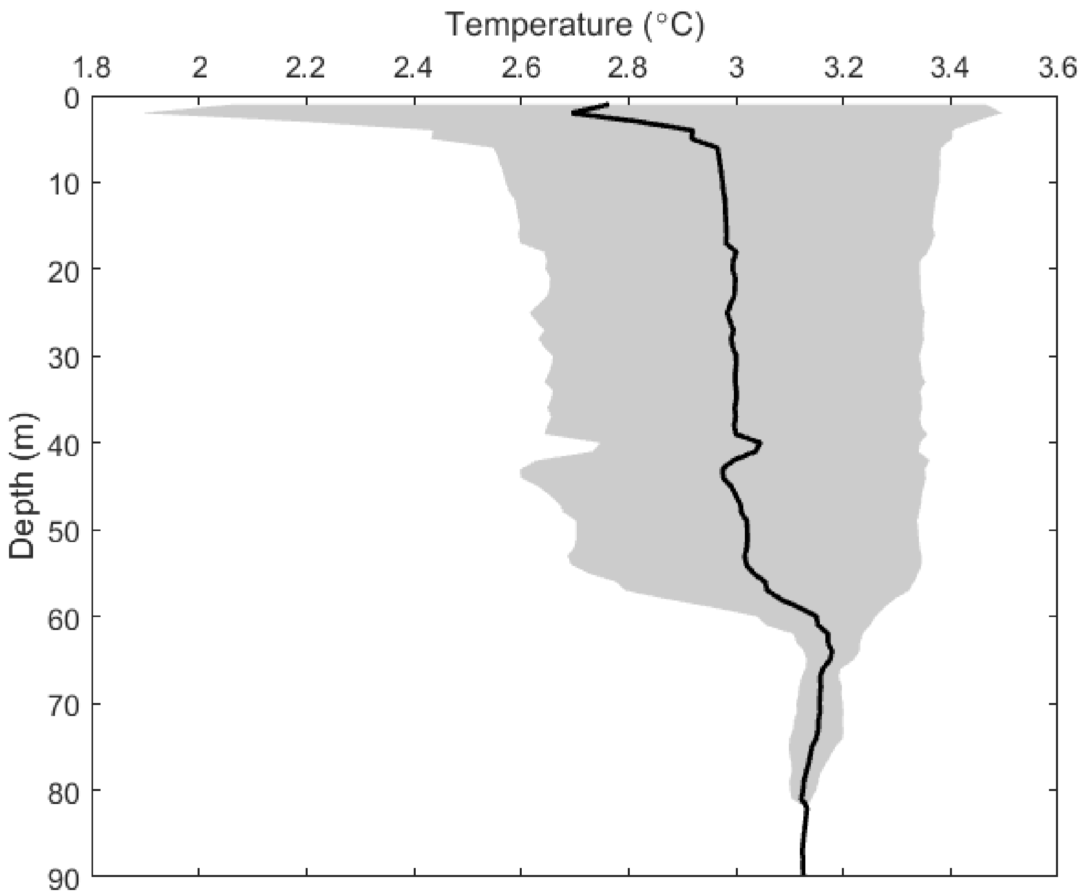


Figure 18. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the two trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in Pavlov Bay. The shaded area represents ± one standard deviation from the mean.

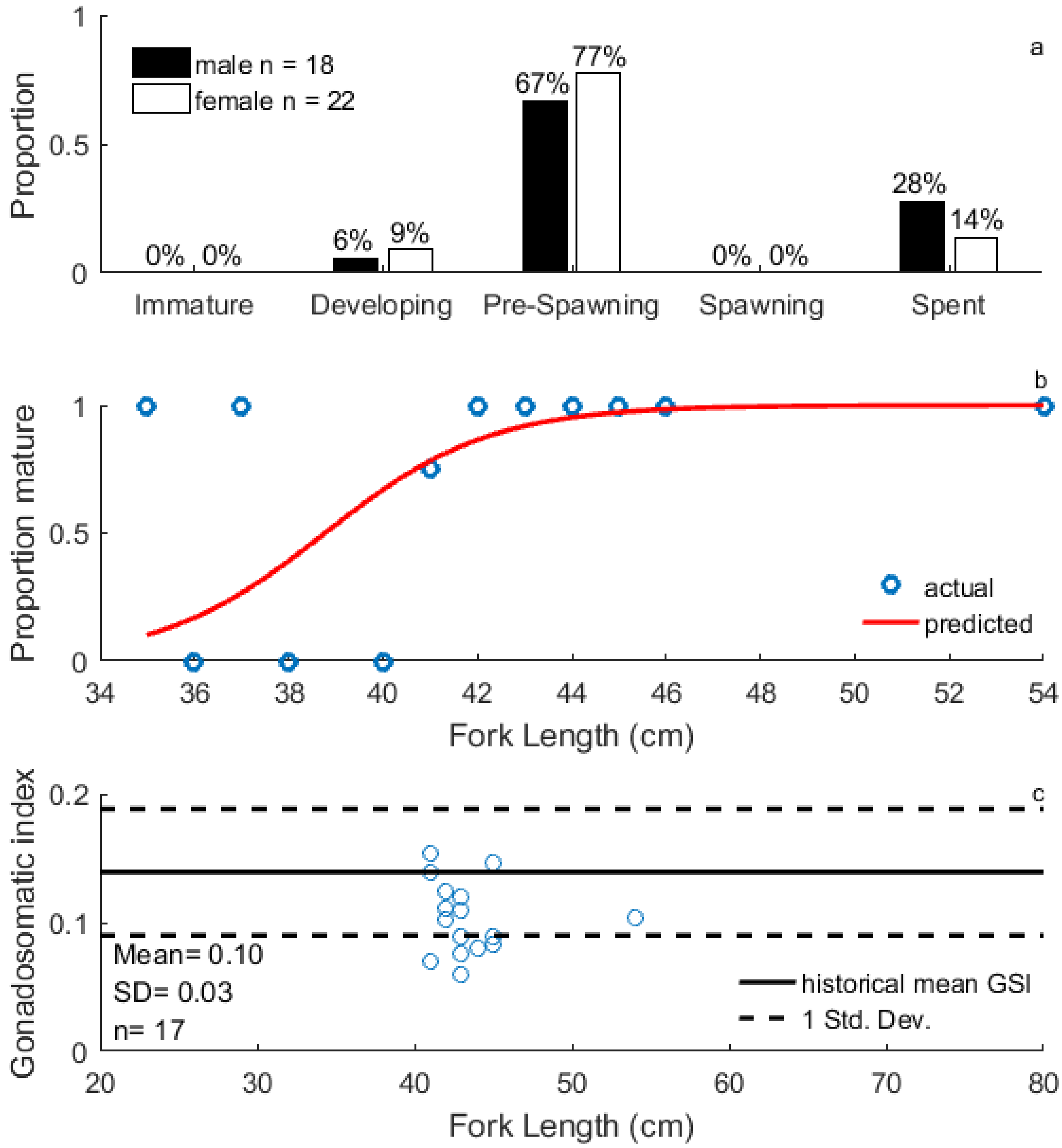


Figure 19. -- Maturity composition for male and female walleye pollock greater than 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of Pavlov Bay (c). Note: these graphs do not include data from age-1 fish.

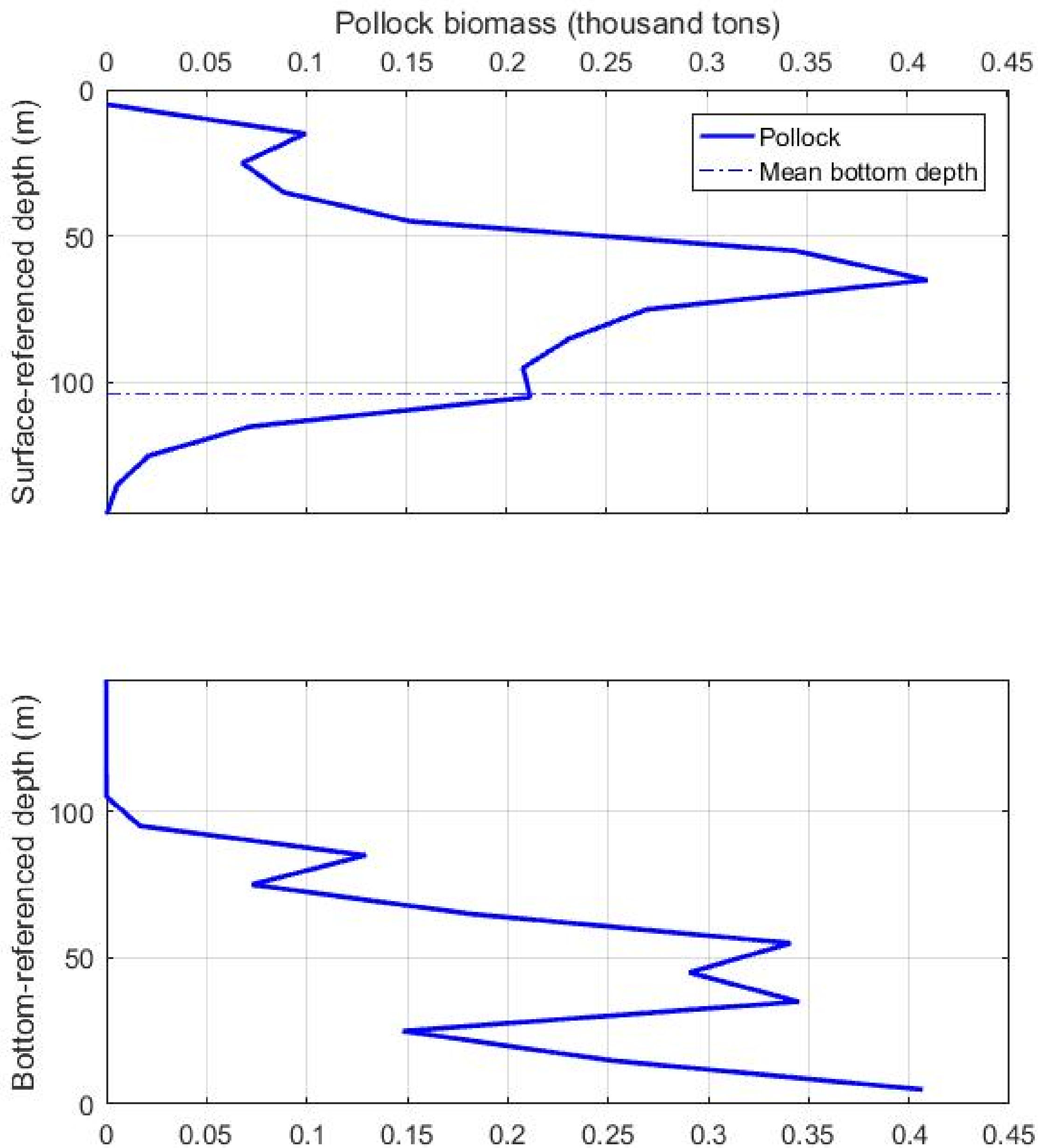


Figure 20. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in Pavlov Bay during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

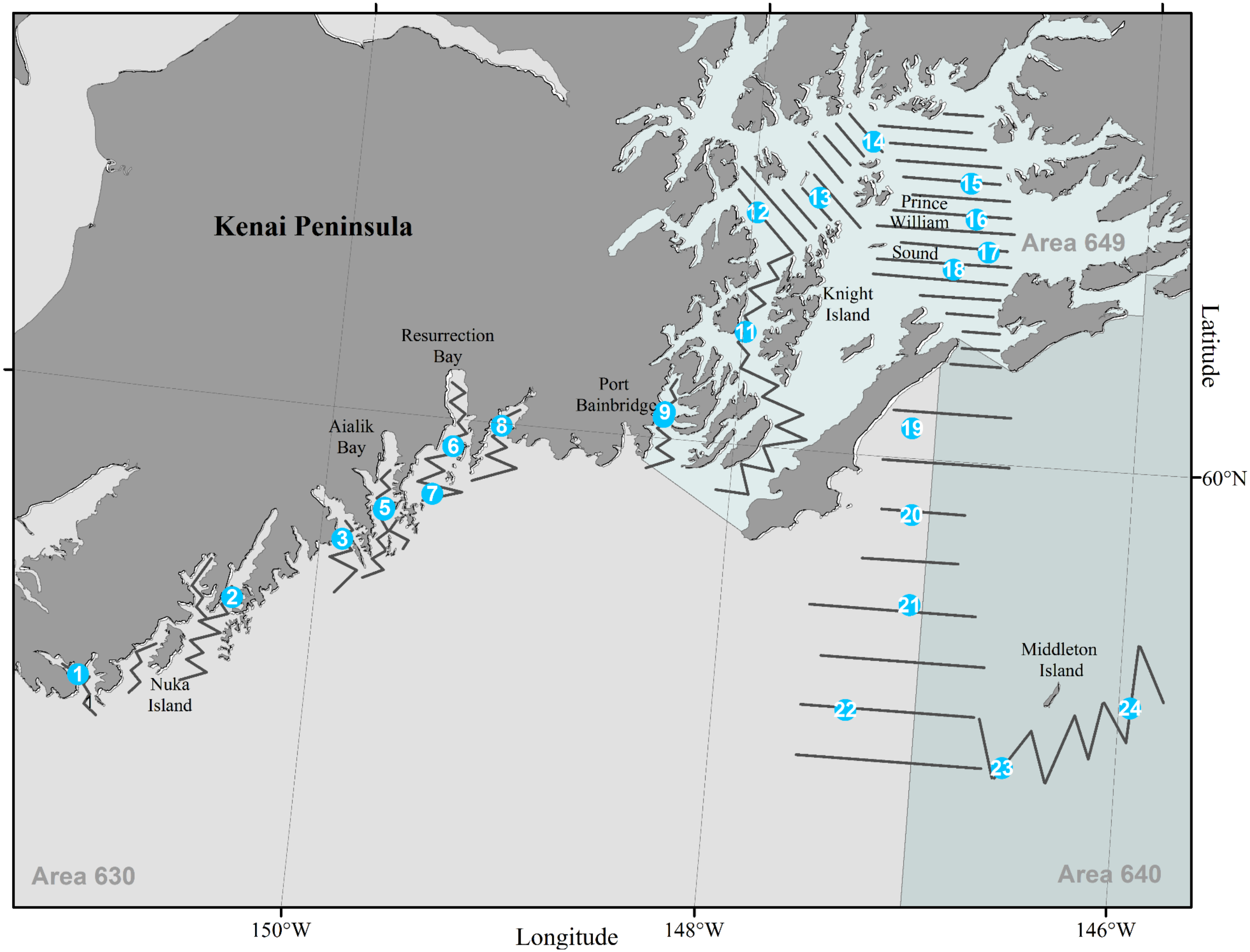


Figure 21. -- Transect lines and locations of Aleutian-wing trawl (AWT) hauls during the winter 2017 acoustic-trawl survey of walleye pollock in the Kenai bays and Prince William Sound area. International North Pacific Fisheries Commission areas 630, 649, and 640 are shown on map

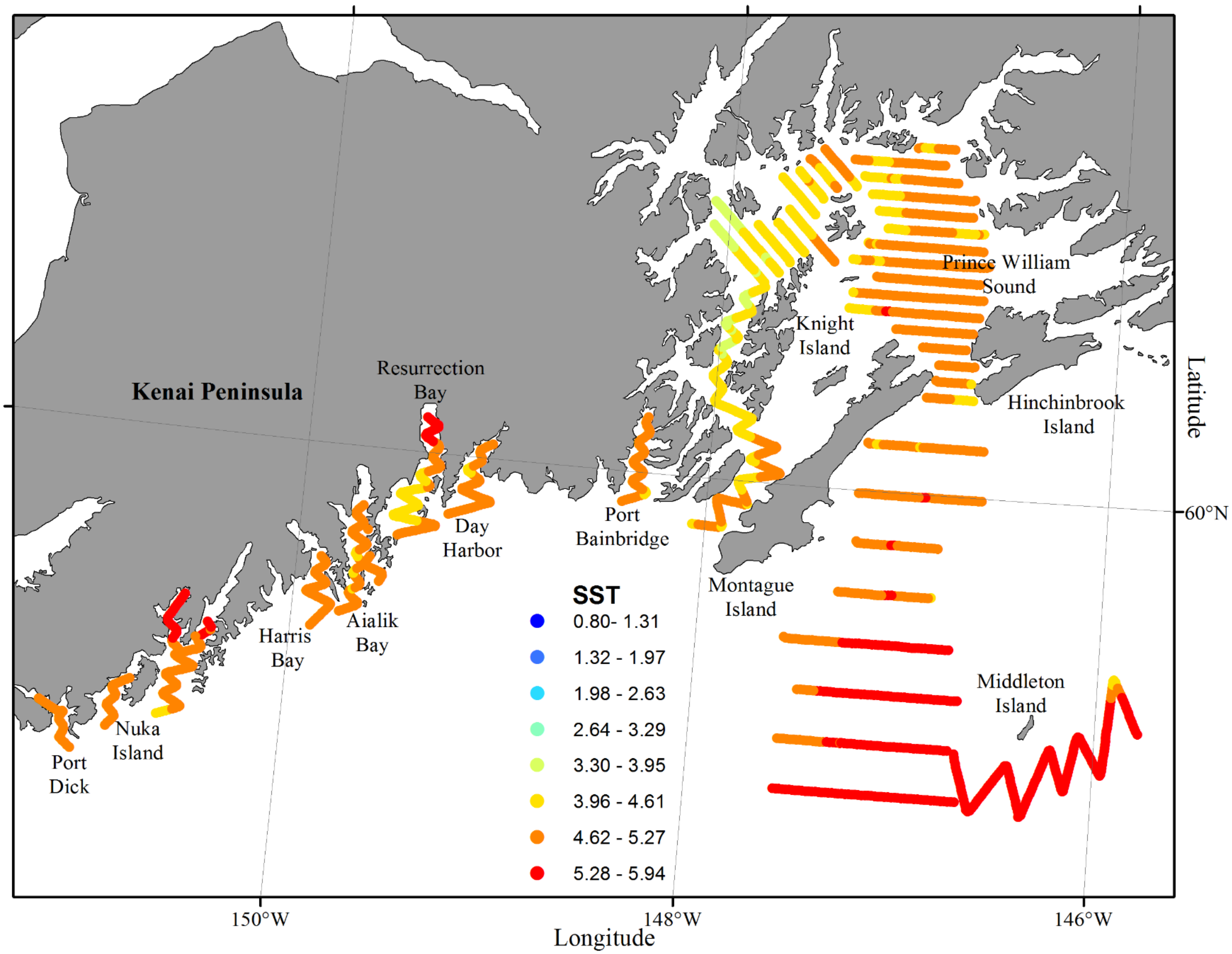


Figure 22. -- Surface water temperatures (°C) recorded at 5-second intervals during the 2017 acoustic-trawl survey of the Kenai Bays and Prince William Sound. Temperatures are primarily from the ship's bow-mounted Seabird SBE-38 temperature sensor. At times when the SBE-38 was not operating, temperatures are from the mid-ship Furuno T-2000 temperature probe located 1.4 m below the surface.

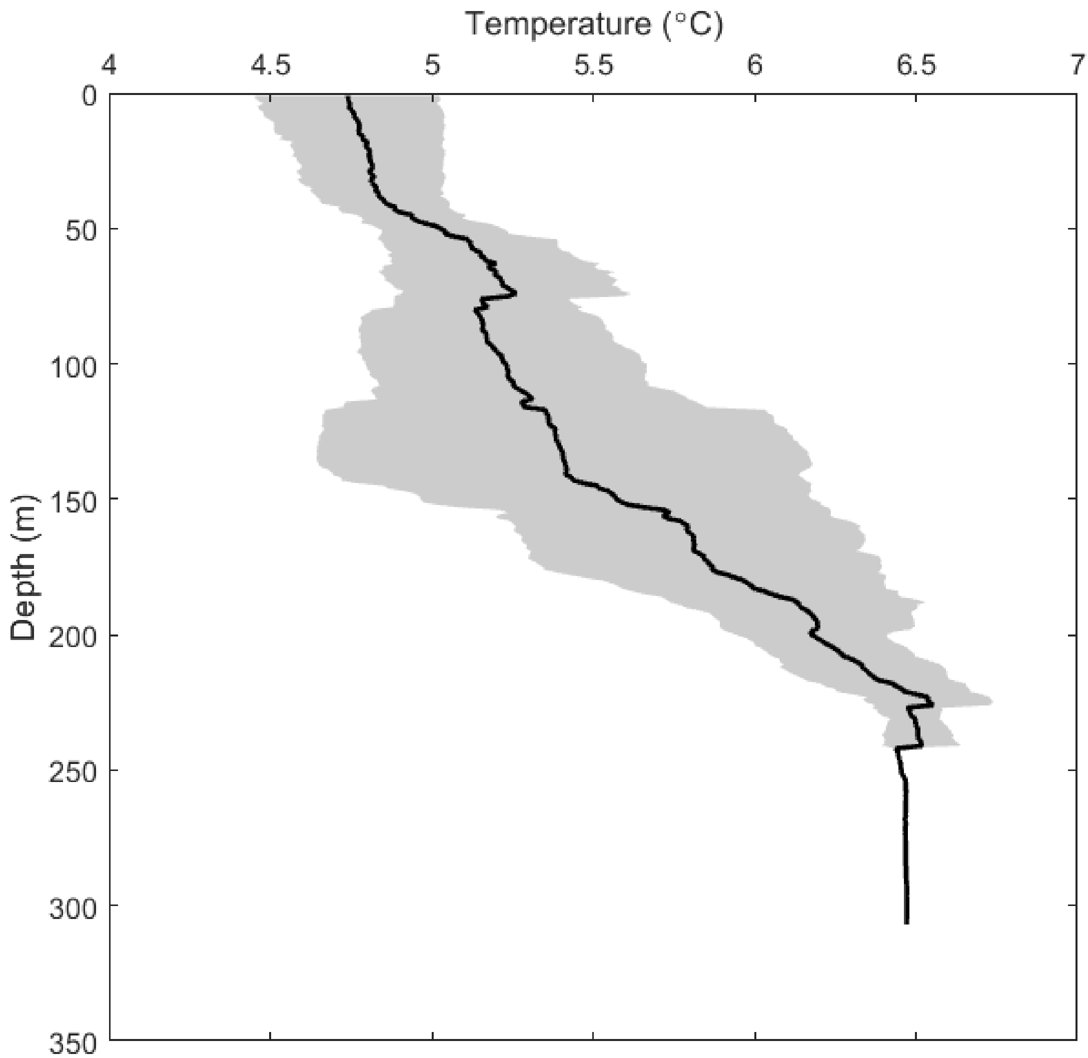


Figure 23. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the 11 trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in the Kenai Bays region. The shaded area represents ± one standard deviation from the mean.

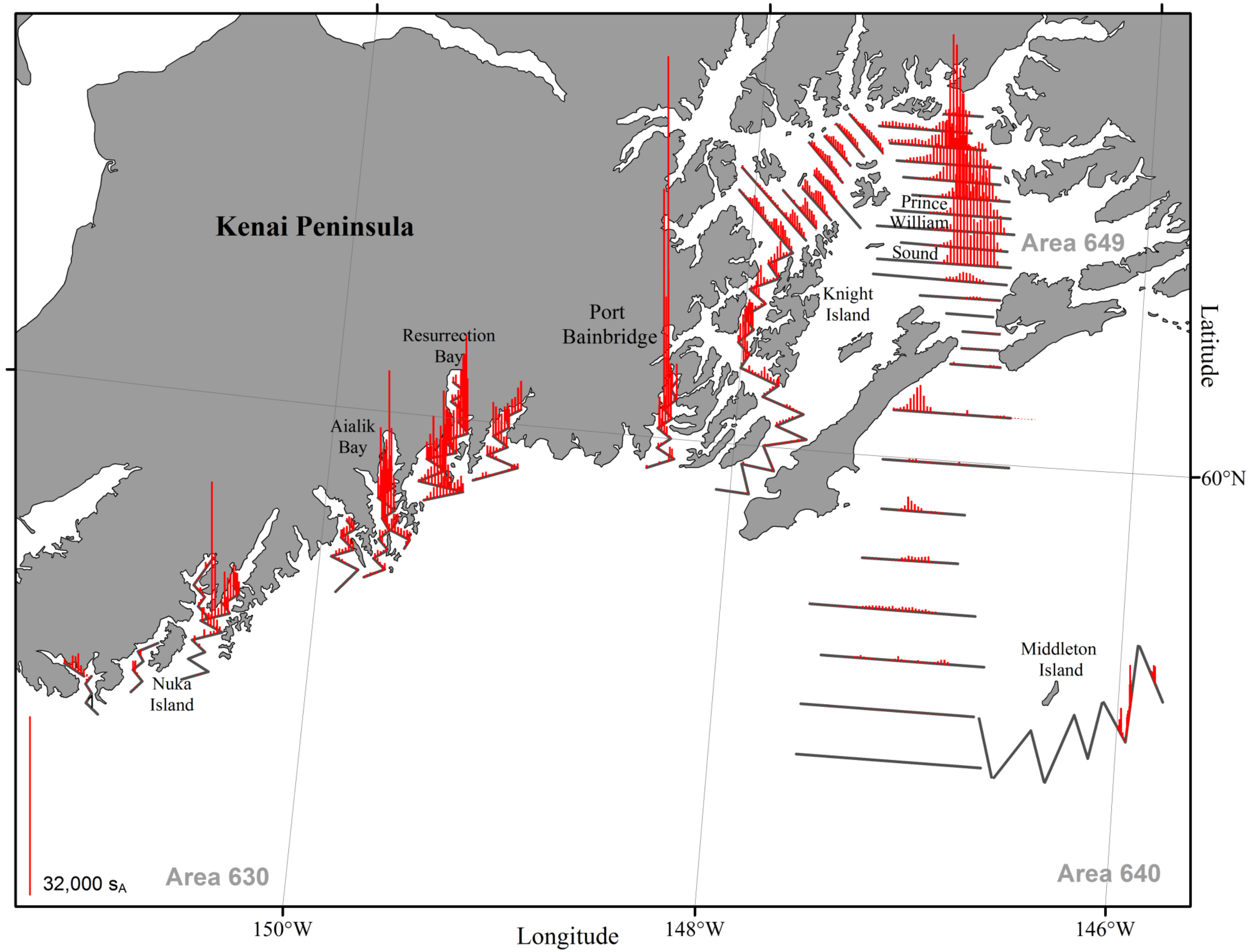


Figure 24. – Backscatter (s_A) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of the Kenai bays and Prince William Sound area.

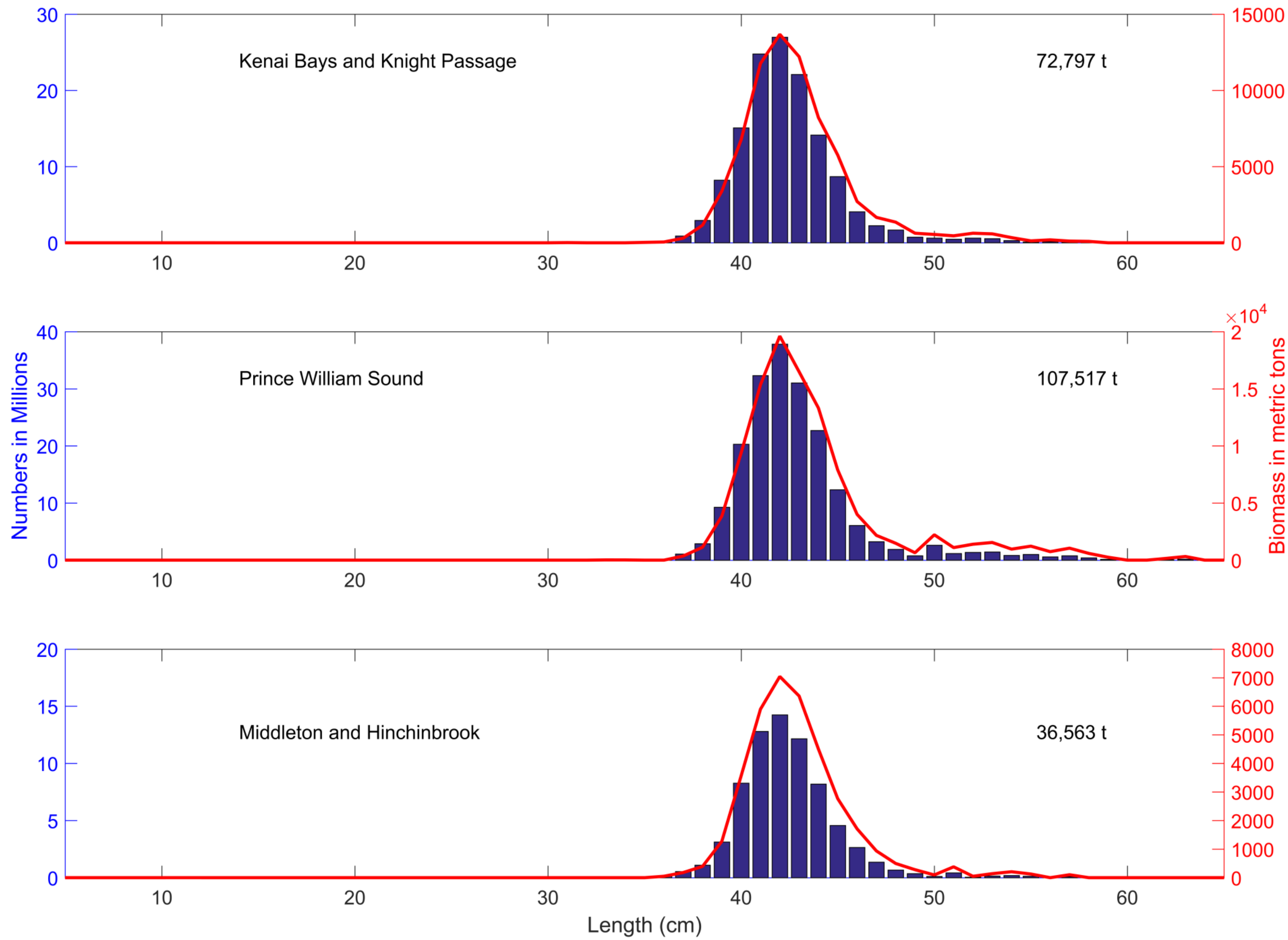


Figure 25. -- Length distribution of walleye pollock shown with blue bars (numbers) and biomass estimate in red line (metric tons,t) for the 2017 acoustic-trawl survey of the Kenai Bays, Prince William Sound, and the Middleton Island region. Note differences in vertical axes among panels.

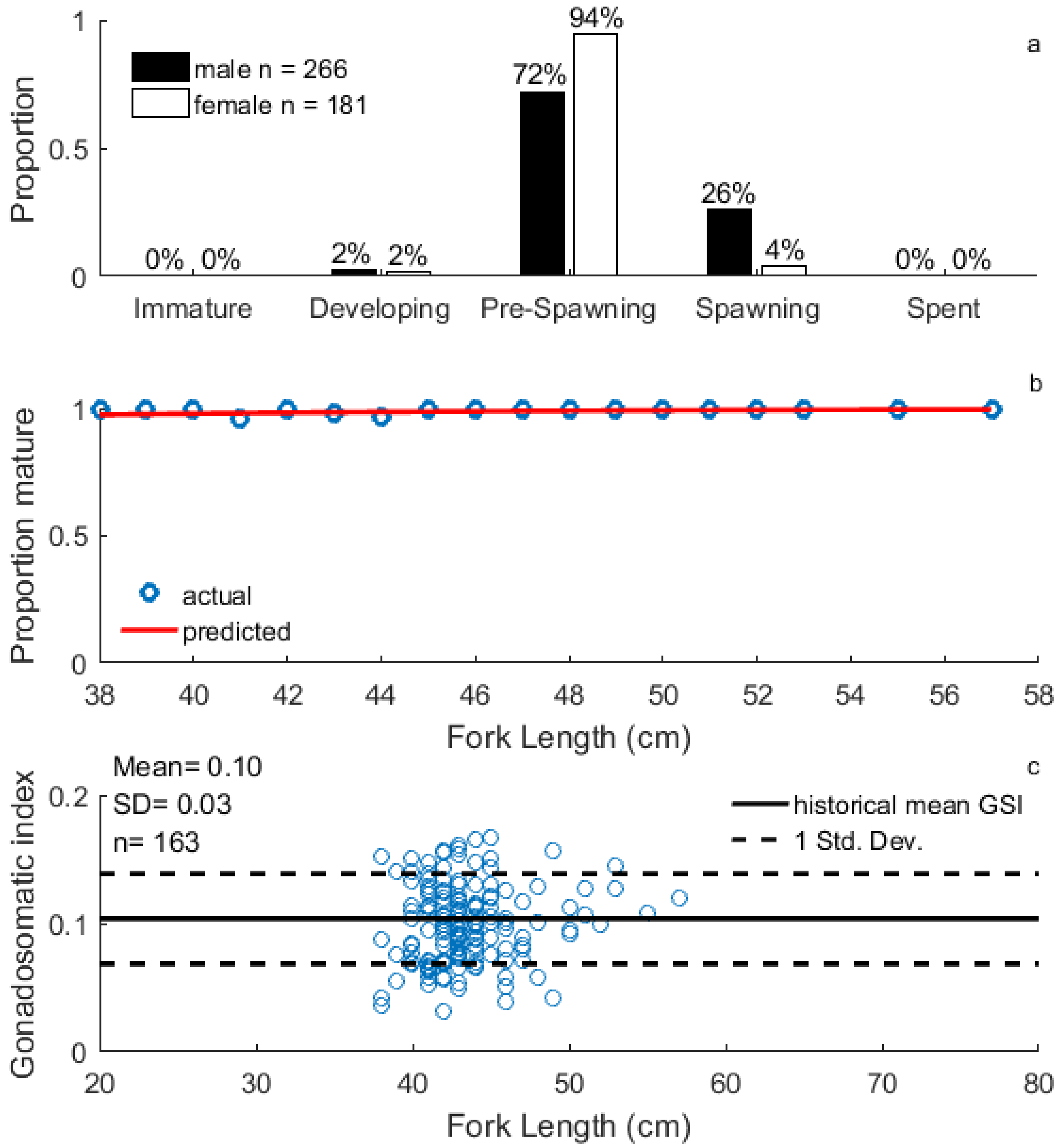


Figure 26. -- Maturity composition for male and female walleye pollock > 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of the Kenai bays (c). Note: these graphs do not include data from age-1 fish.

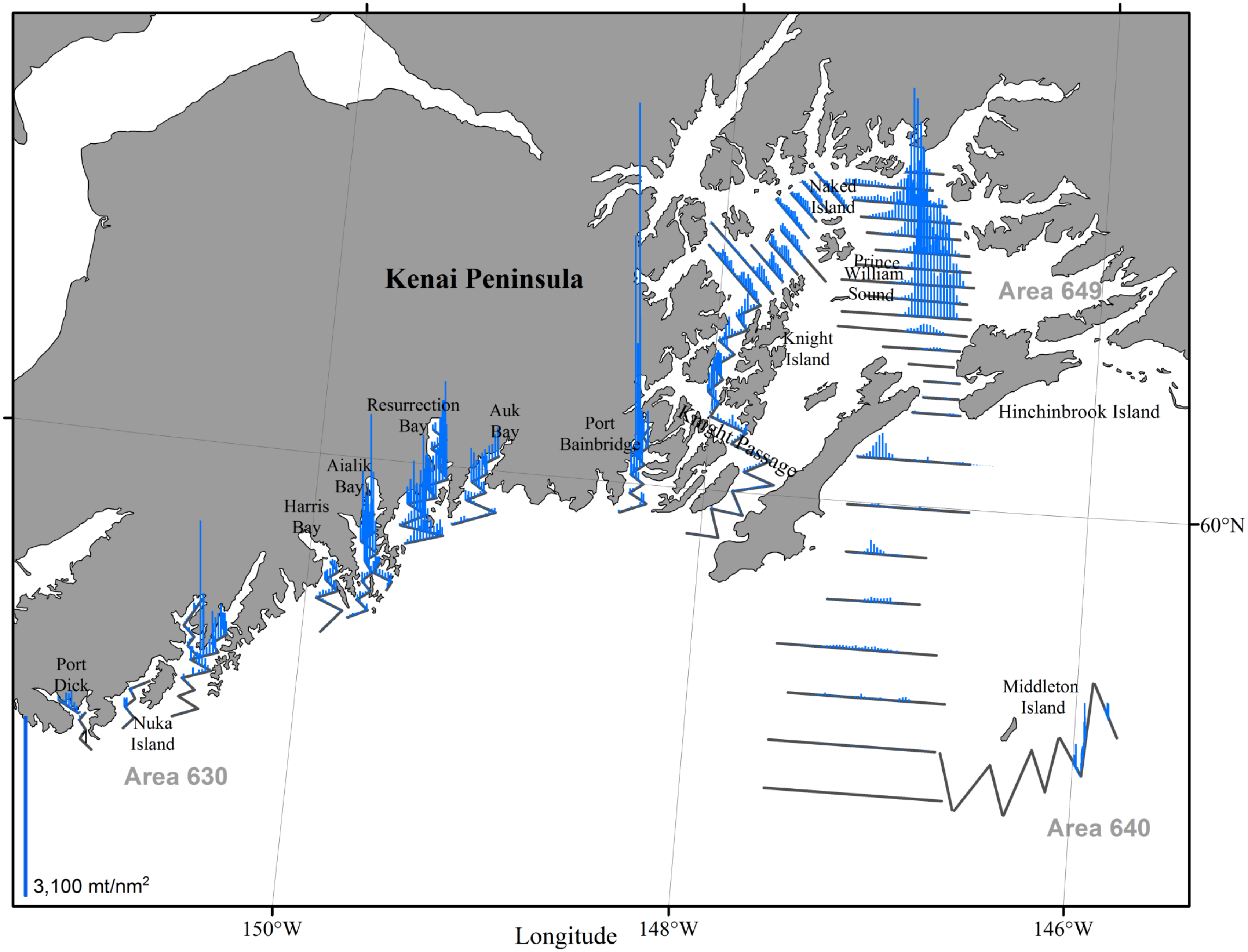


Figure 27. -- Biomass (t/nmi^2) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of the Kenai bays and Prince William Sound.

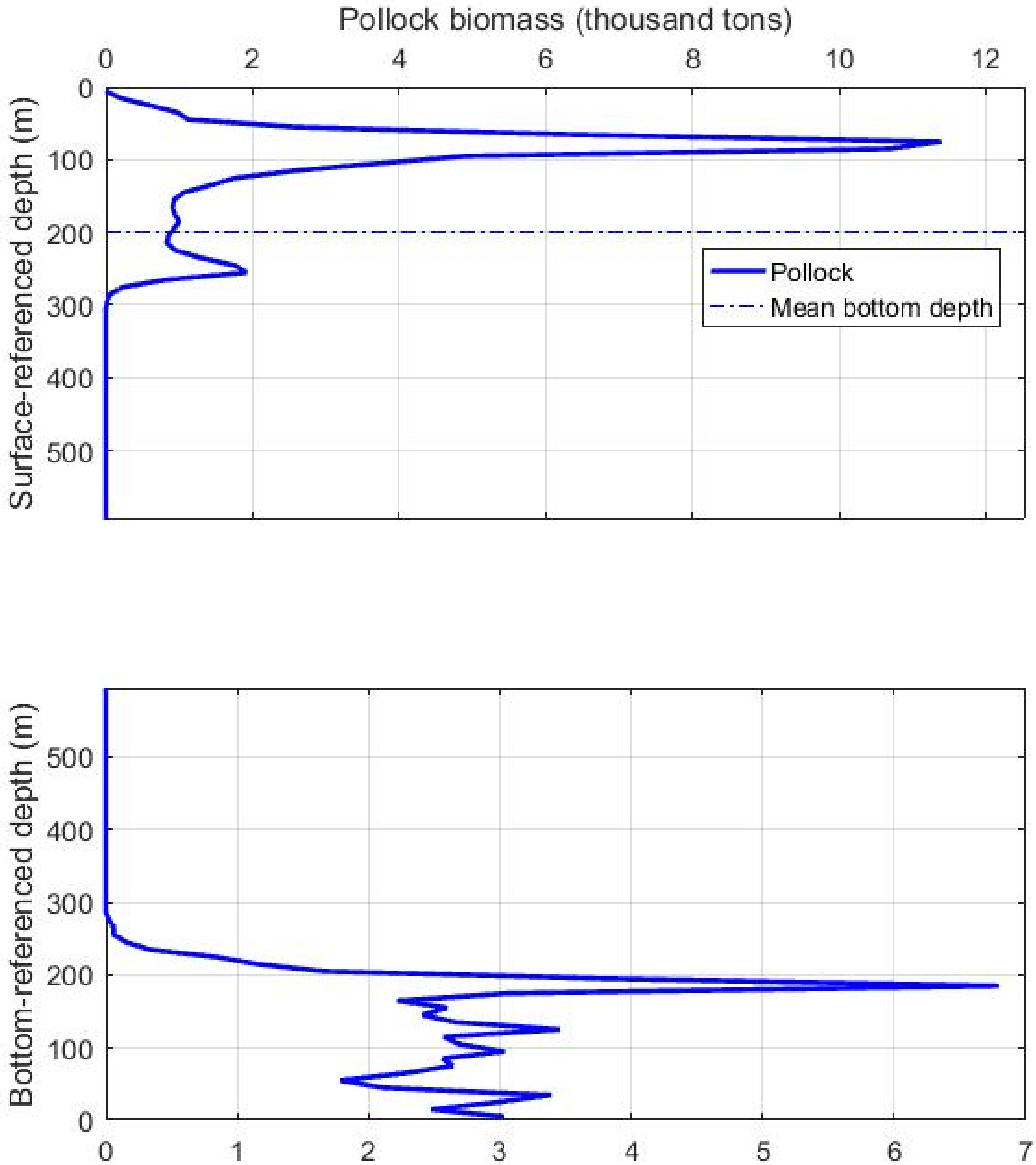


Figure 28. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in the Kenai bays during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

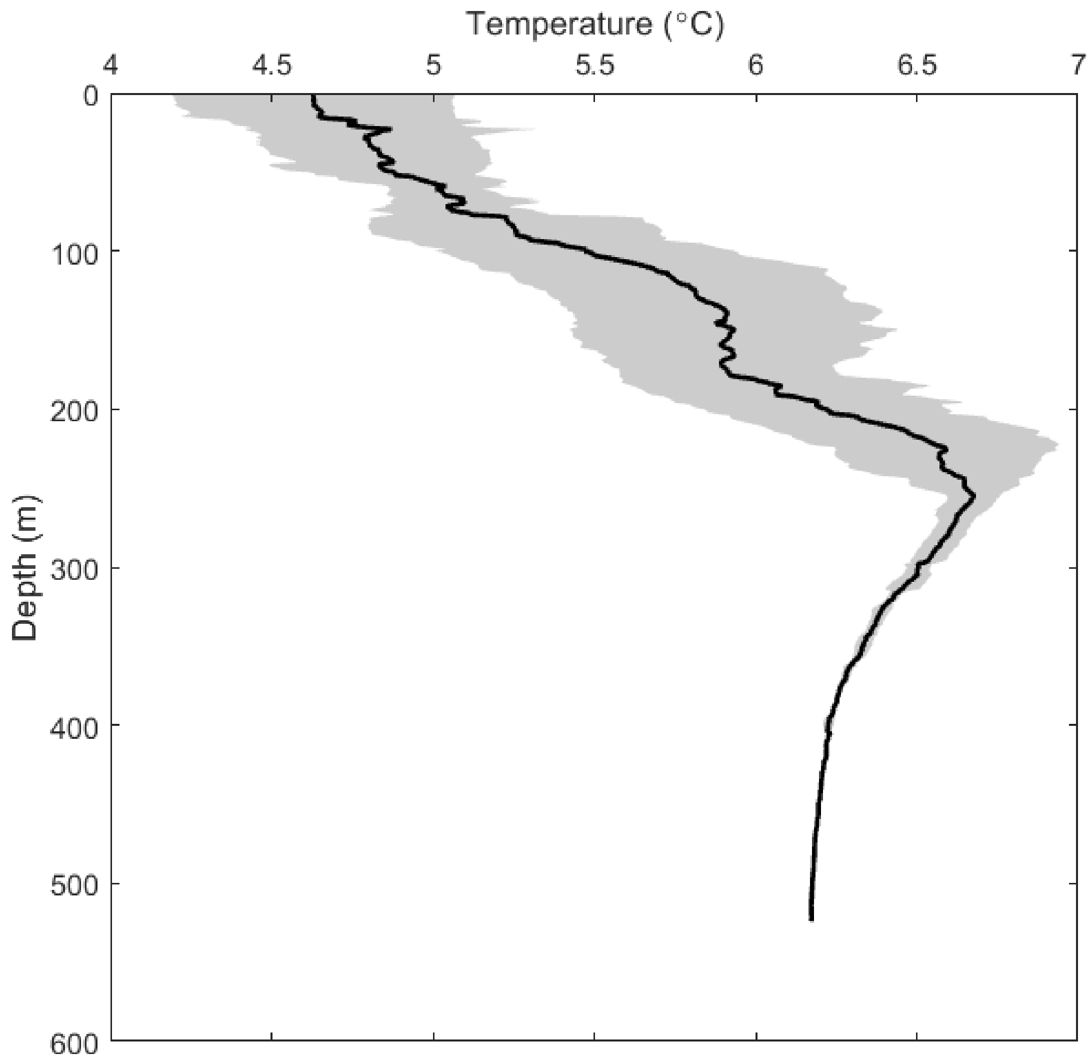


Figure 29. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the seven trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in the Prince William Sound region. The shaded area represents ± one standard deviation from the mean.

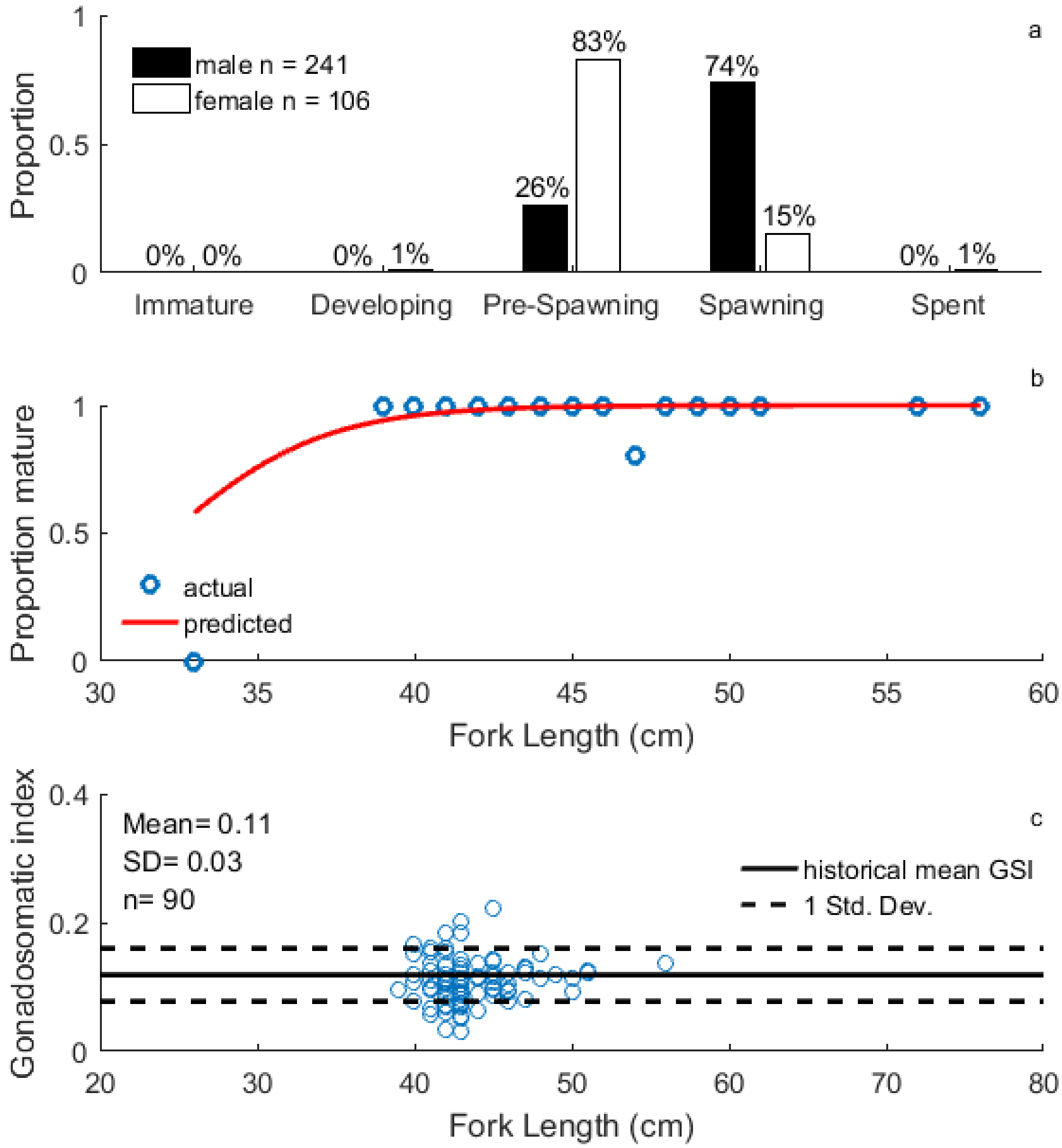


Figure 30. -- Maturity composition for male and female walleye pollock > 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of Prince William Sound (c). Note: these graphs do not include data from age-1 fish.

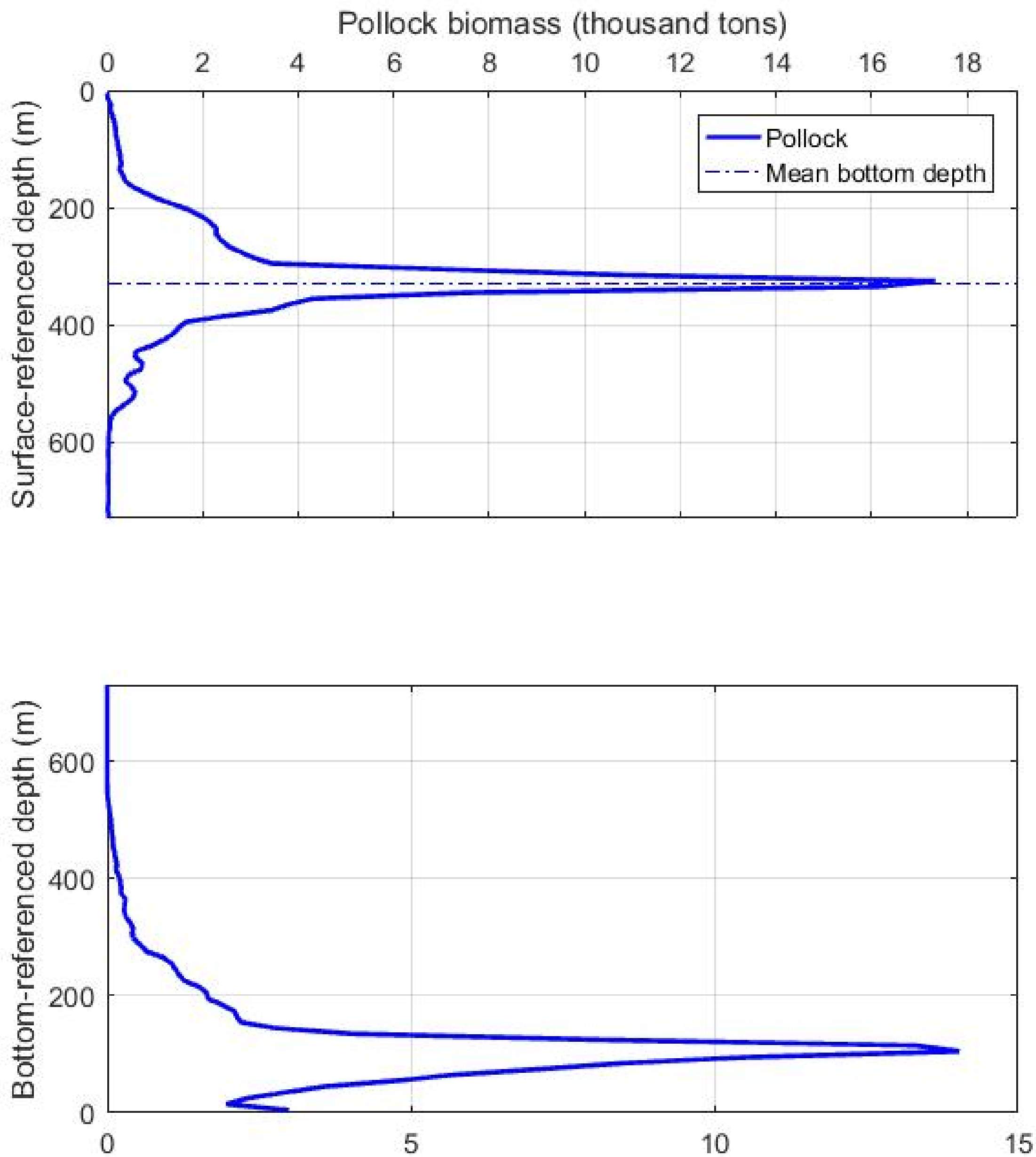


Figure 31. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in Prince William Sound during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

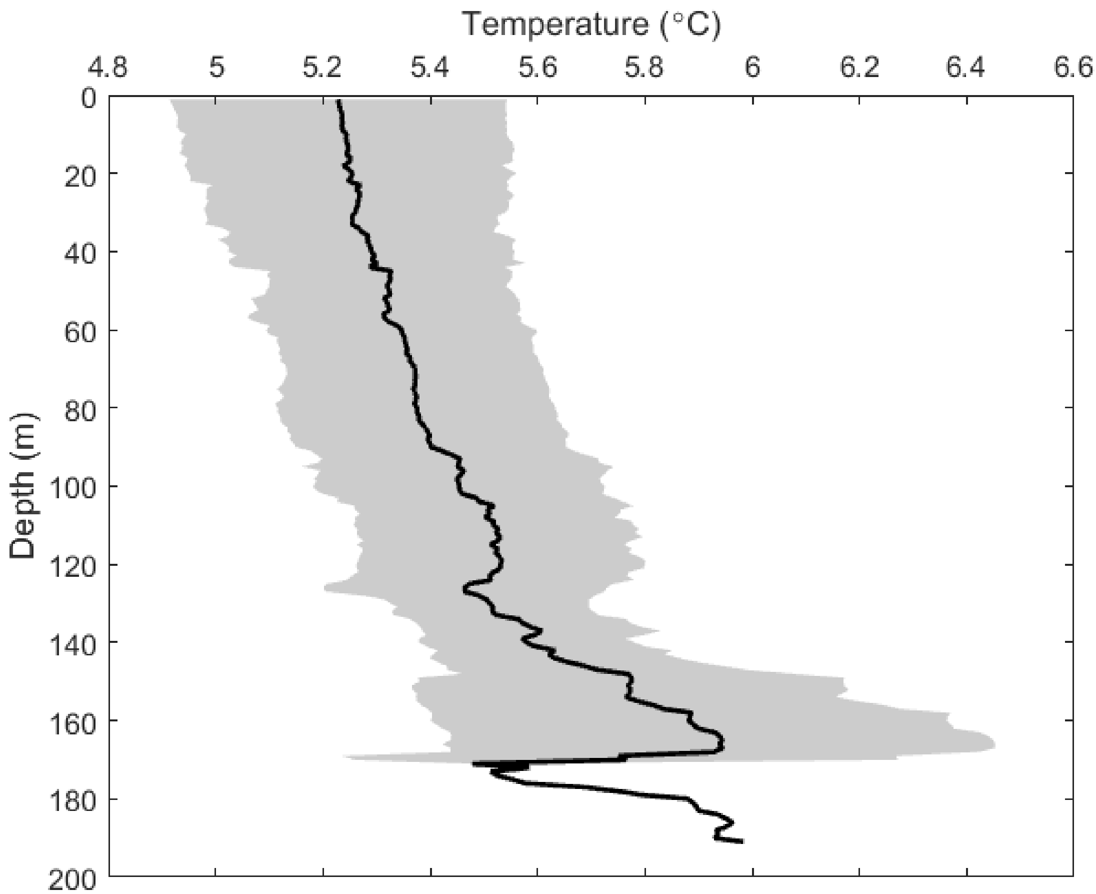


Figure 32. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the four trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in the Hinchinbrook Island region. The shaded area represents one standard deviation.

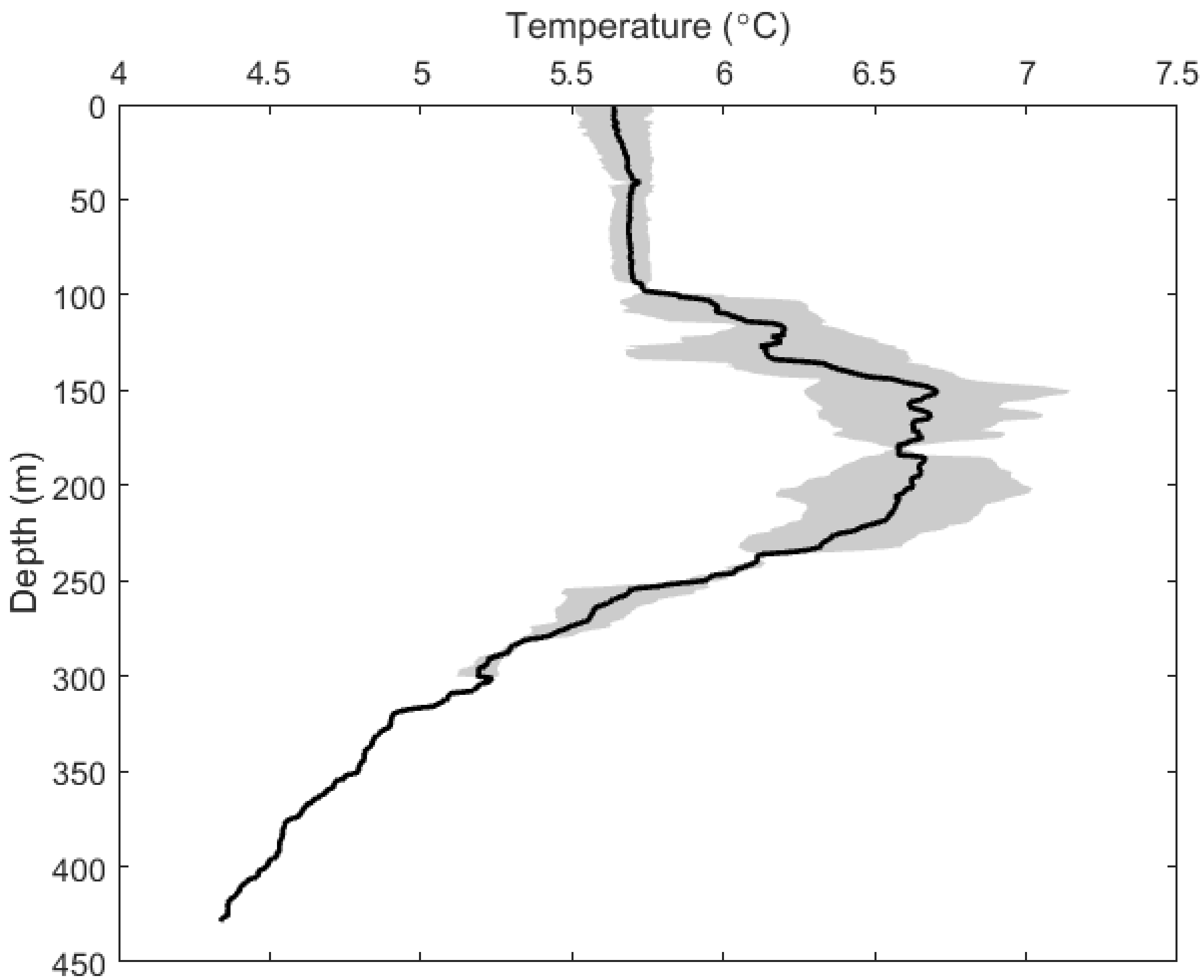


Figure 33. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the two trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock near Middleton Island. The shaded area represents one standard deviation.

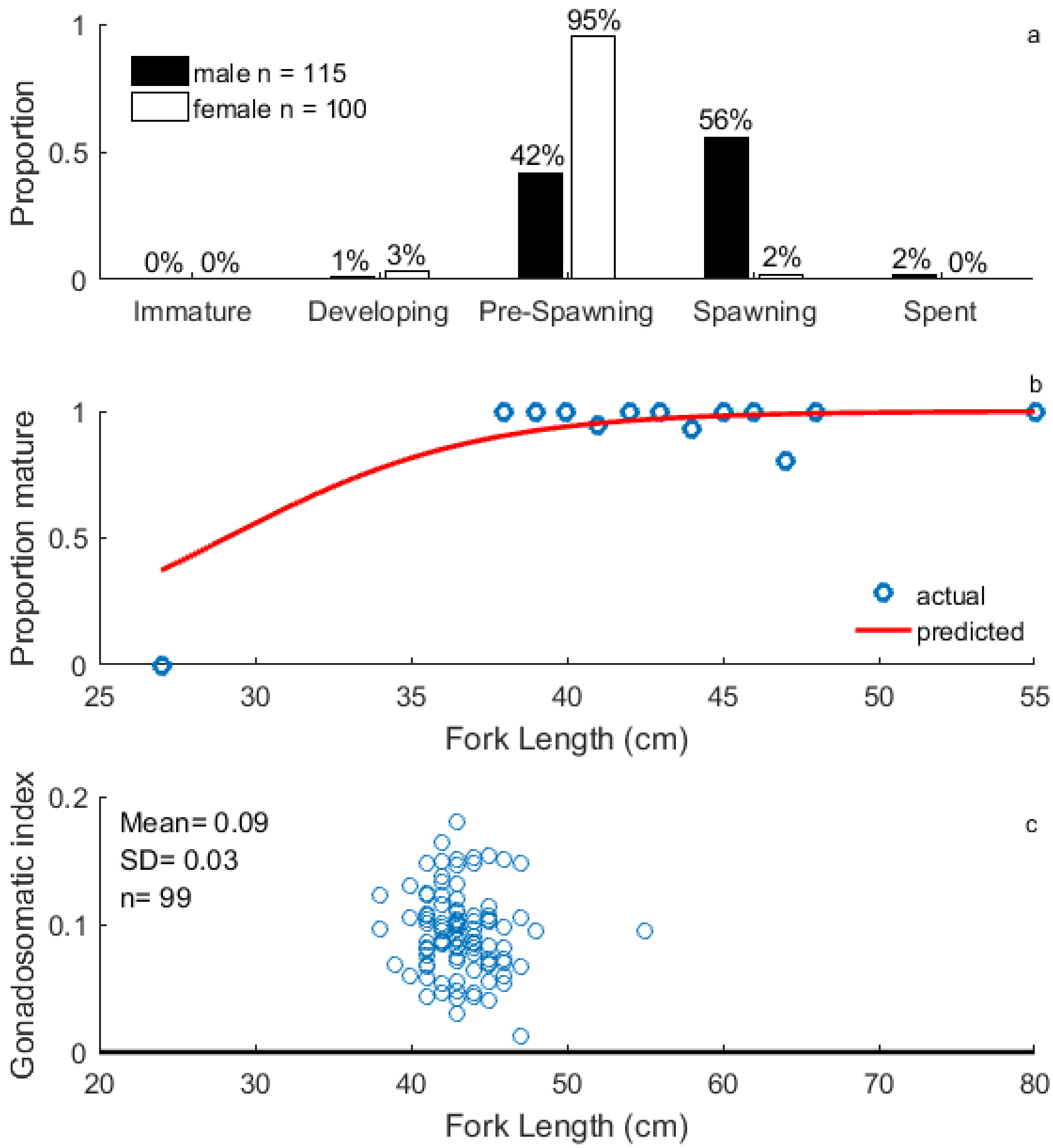


Figure 34. -- Maturity composition for male and female walleye pollock > 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean at Middleton Island ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of Hinchenbrook Island and Middleton Island (c). Note: these graphs do not include data from age-1 fish.

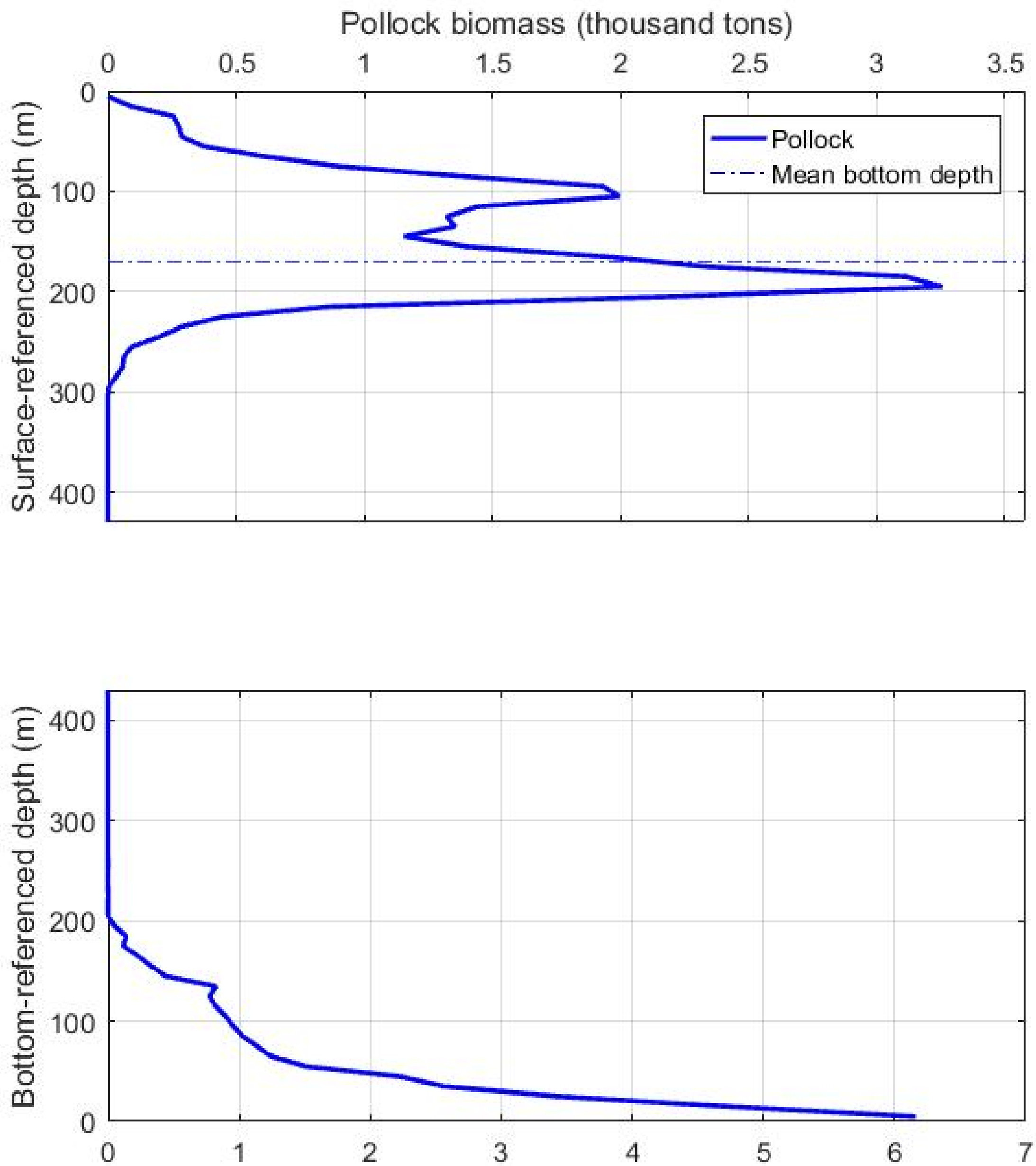


Figure 35. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed near Hinchinbrook Entrance during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

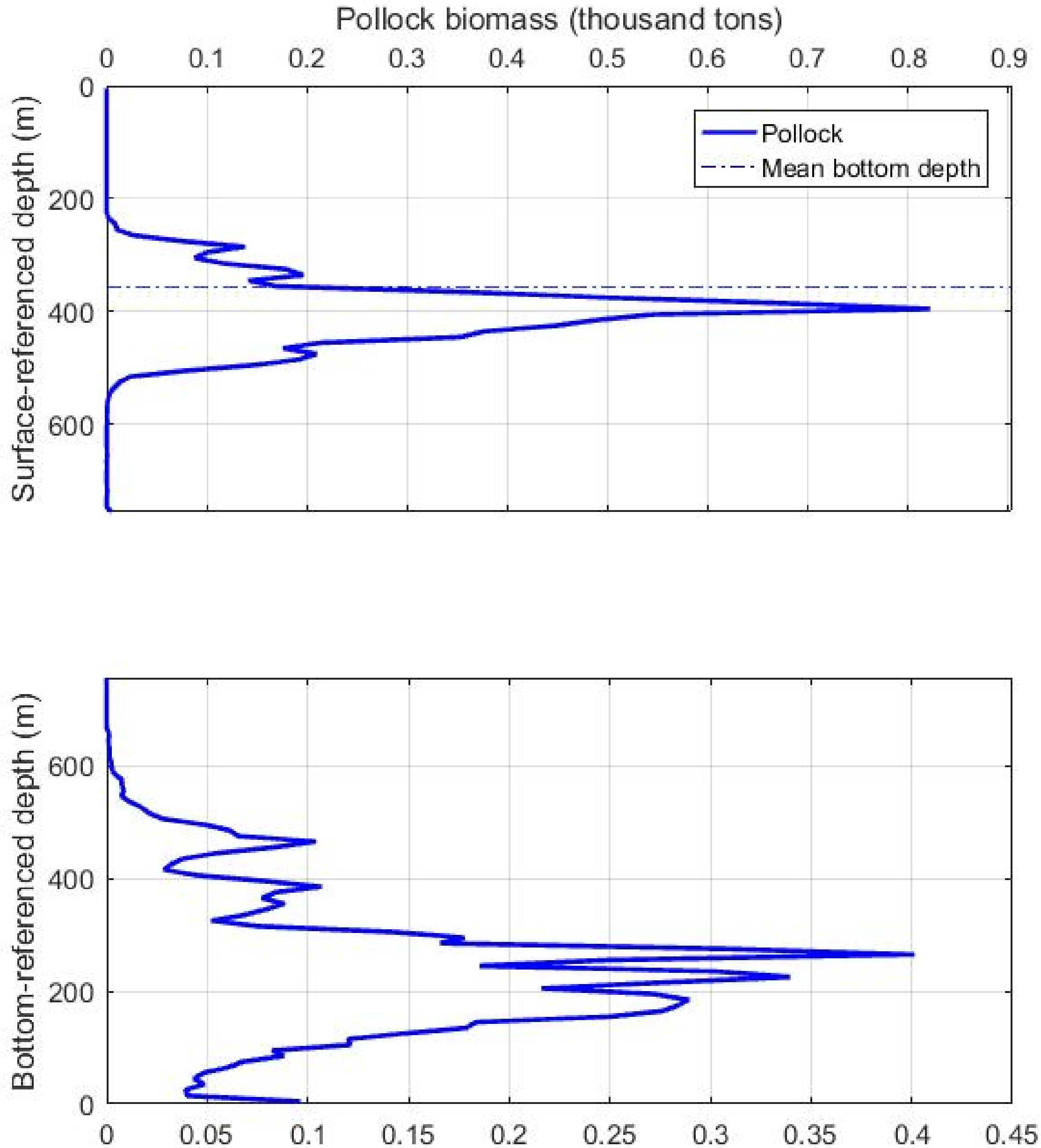


Figure 36. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed near Middleton Island during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

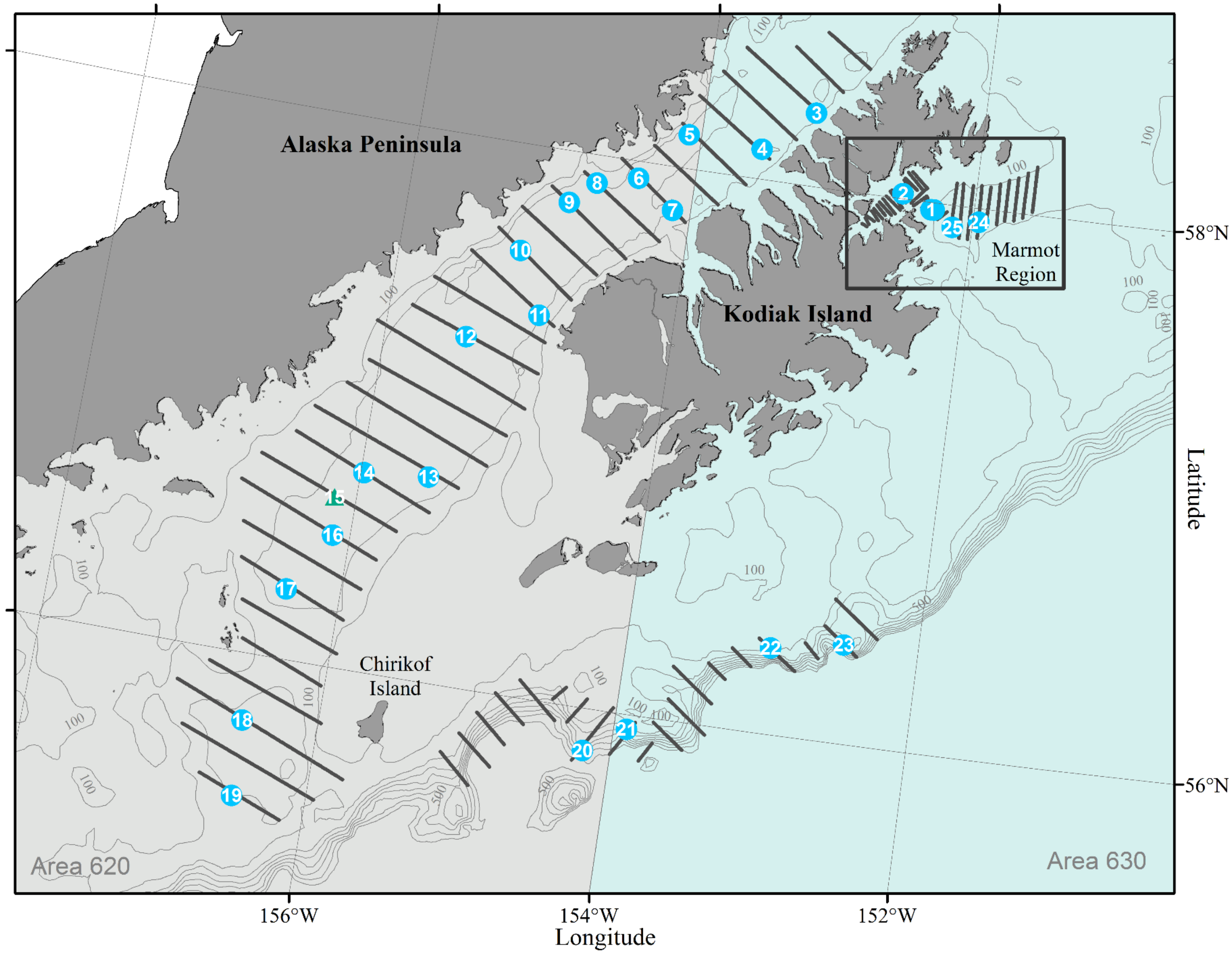


Figure 37. -- Transect lines and locations of Aleutian-wing trawl (AWT; blue circle) and poly-Nor'eastern trawl (PNE; green circle) hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Marmot Bay, Shelikof Strait, and the Chirikof shelf break. International North Pacific Fisheries Commission areas 620 and 630 are shown on map. Haul numbers are on top of haul symbols. Box indicates area enlarged in Figure 49.

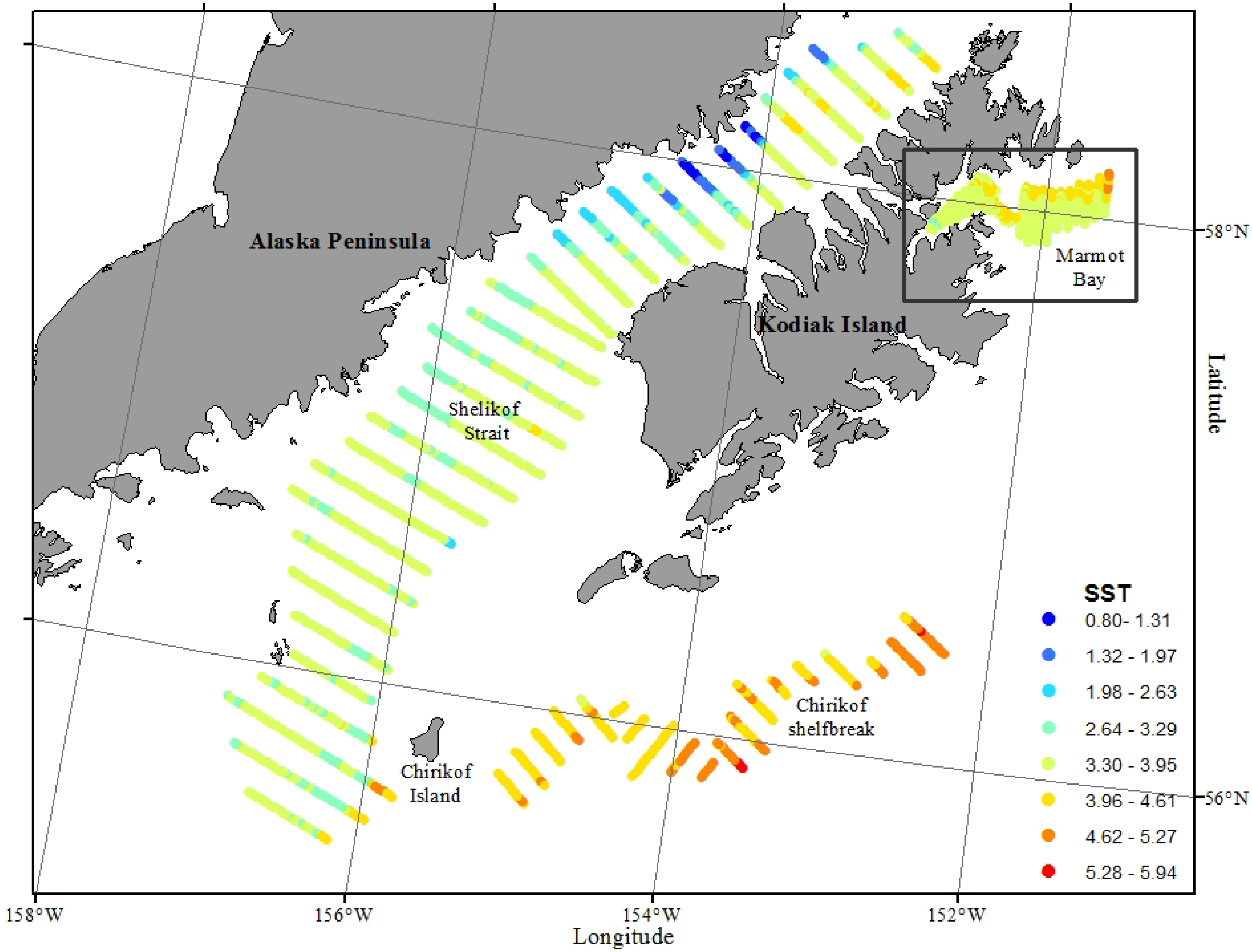


Figure 38. -- Surface water temperatures (°C) recorded at 5-second intervals during the 2017 acoustic-trawl survey of Shelikof Strait, Chrikof shelfbreak, and Marmot Bay. Temperatures are primarily from the ship's bow-mounted Seabird SBE-38 temperature sensor. At times when the SBE-38 was not operating, temperatures are from the mid-ship Furuno T-2000 temperature probe located 1.4 m below the surface. Box indicates area enlarged in Figure 50.

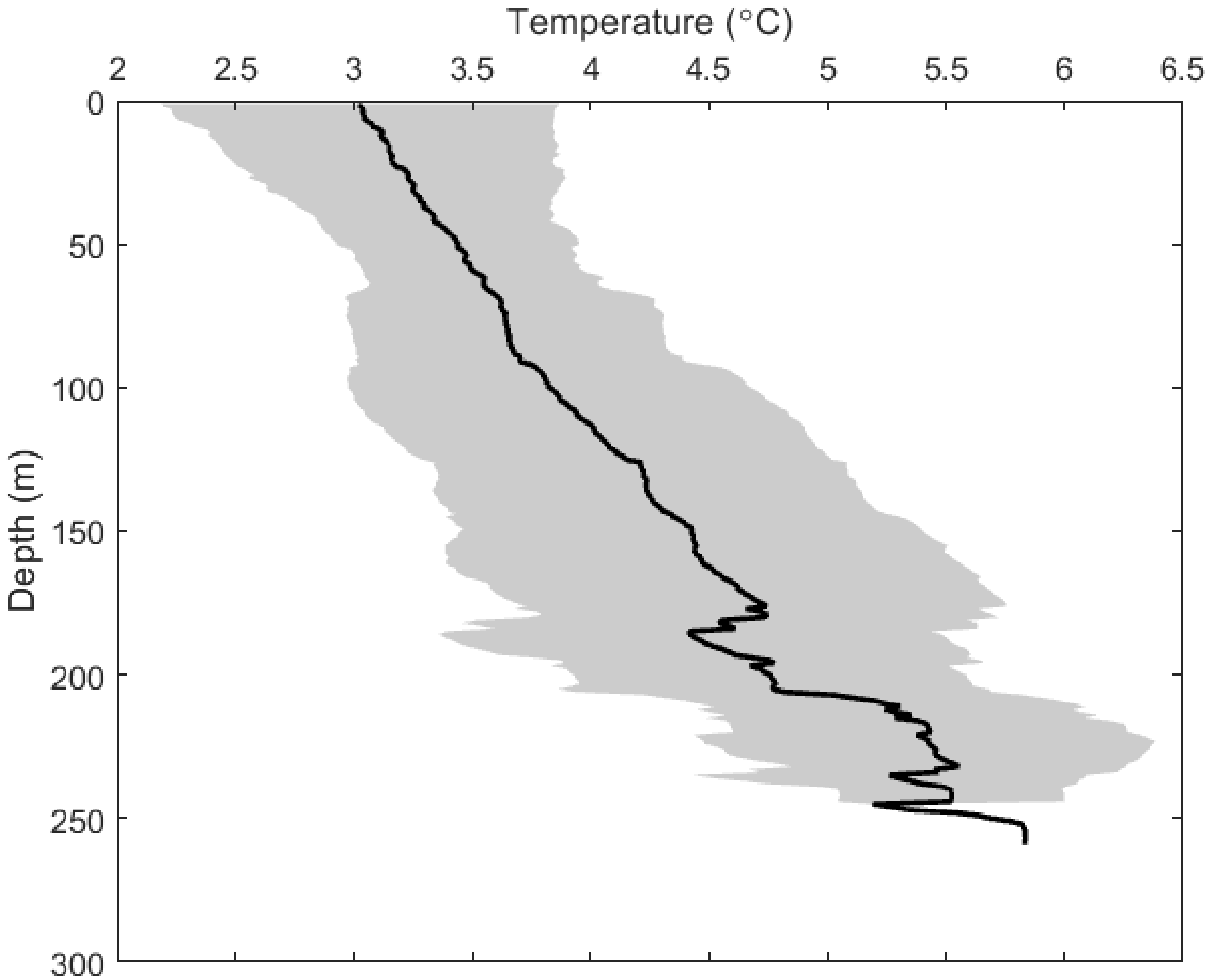


Figure 39. -- Mean water temperature (°C; solid line) by 1-m depth intervals for 16 of the trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in Shelikof Strait. The shaded area represents ± one standard deviation from the mean.

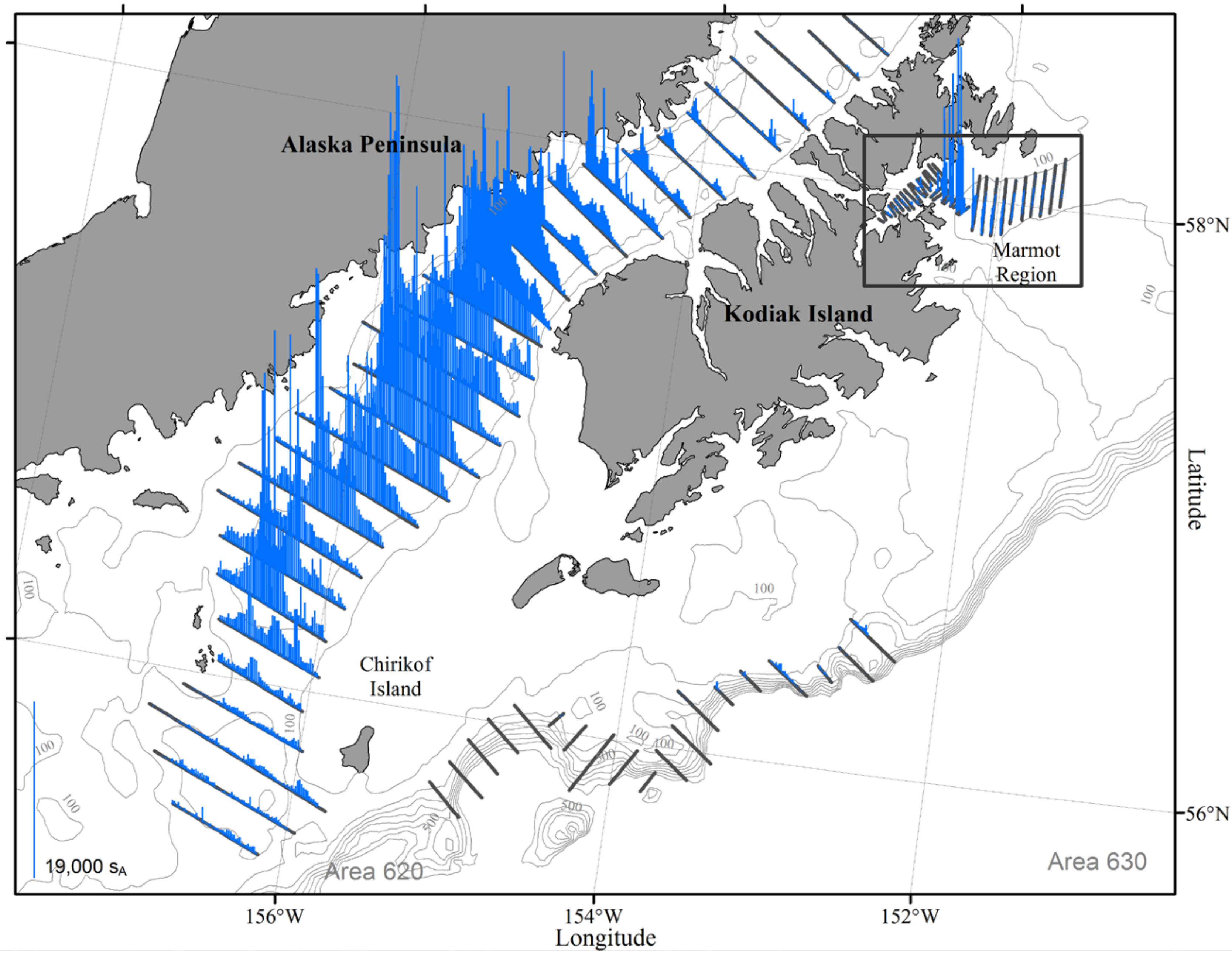


Figure 40. -- Backscatter (s_A) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of the Shelikof Strait and Marmot Bay. The Marmot Bay region is shown in Figure 49.

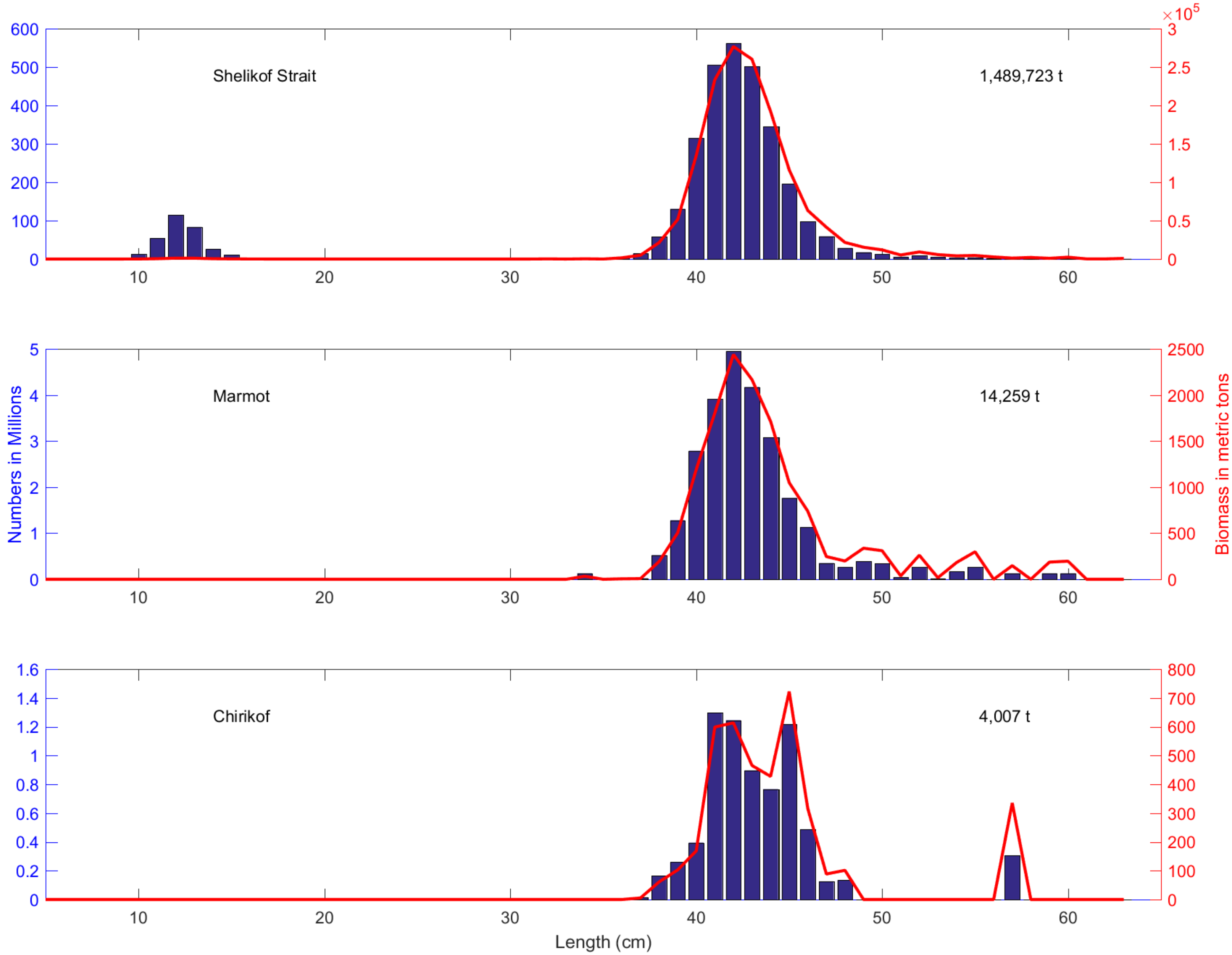
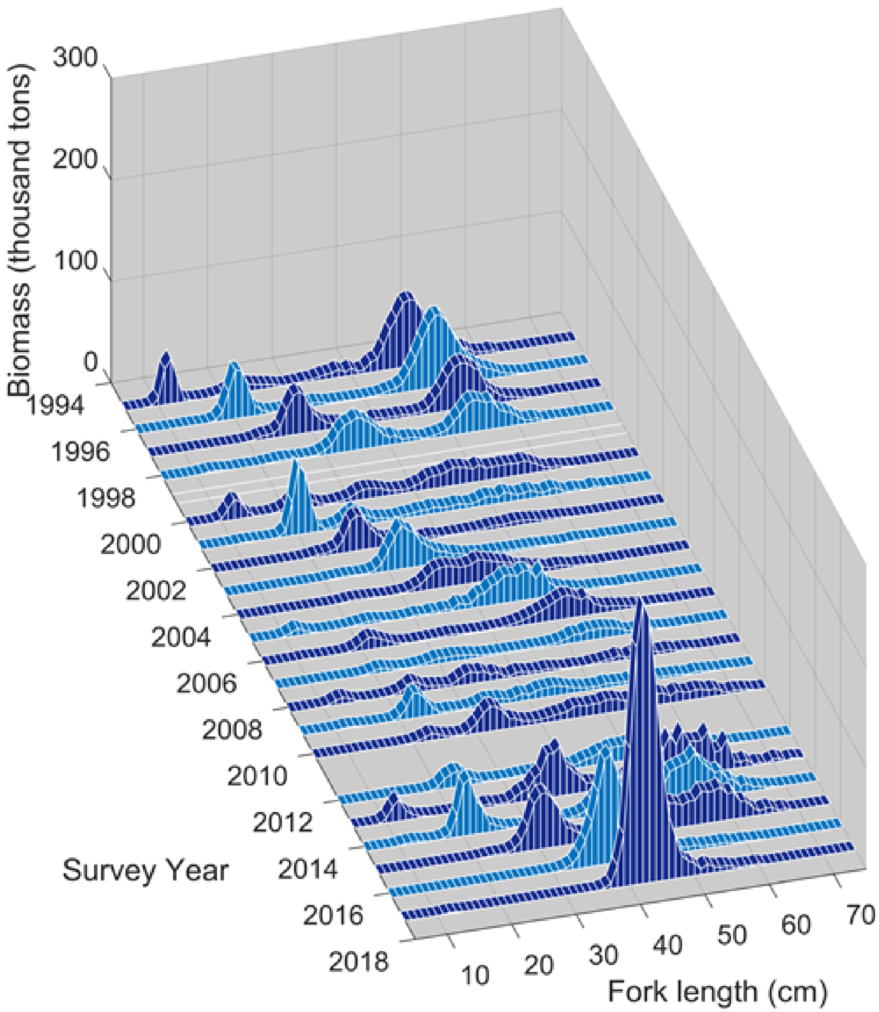


Figure 41. -- Length distribution of walleye pollock shown with blue bars (numbers) and biomass estimate in red line (metric tons, t) for the 2017 acoustic-trawl survey of the Shelikof Strait, Marmot Bay, and Chirikof shelf break. Note differences in vertical axes among panels.



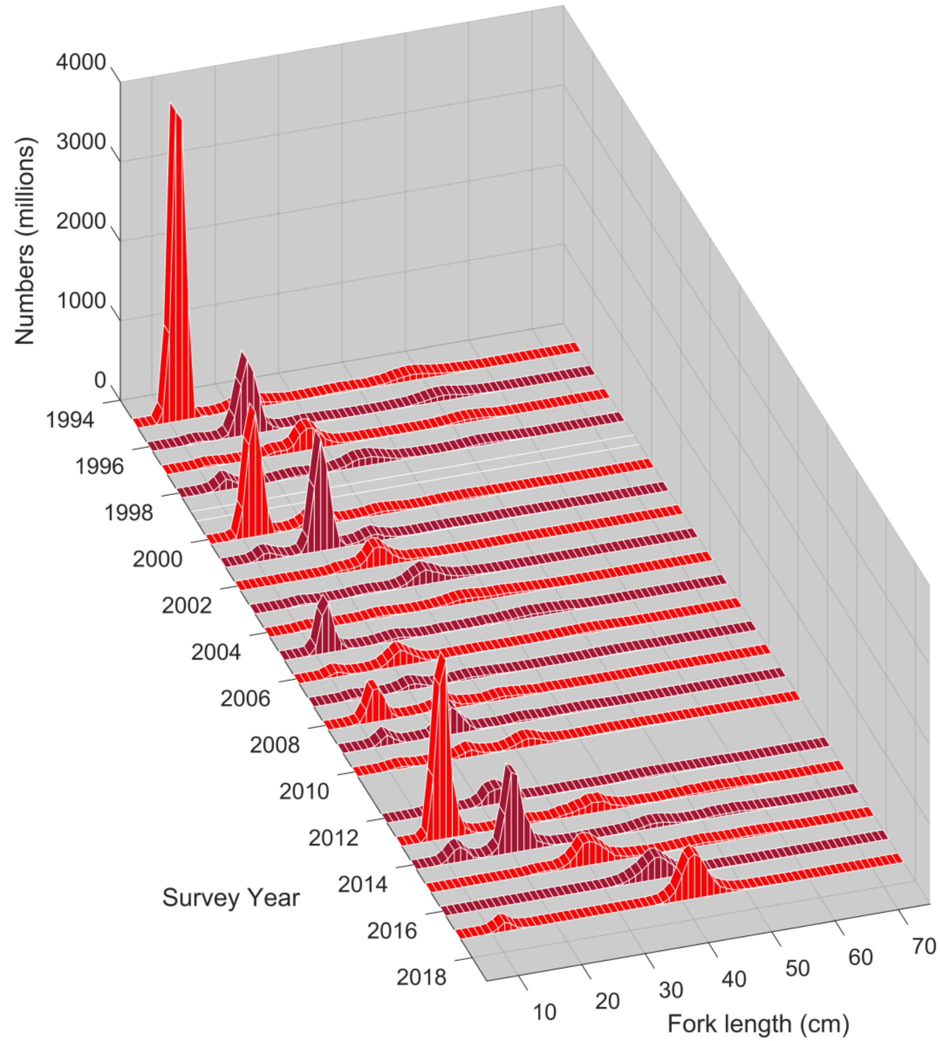


Figure 42. -- Walleye pollock biomass in thousands of metric tons (left) and numbers in millions (right) at length from Shelikof Strait acoustic-trawl surveys since 1994. No surveys were conducted in 1998 or 2011.

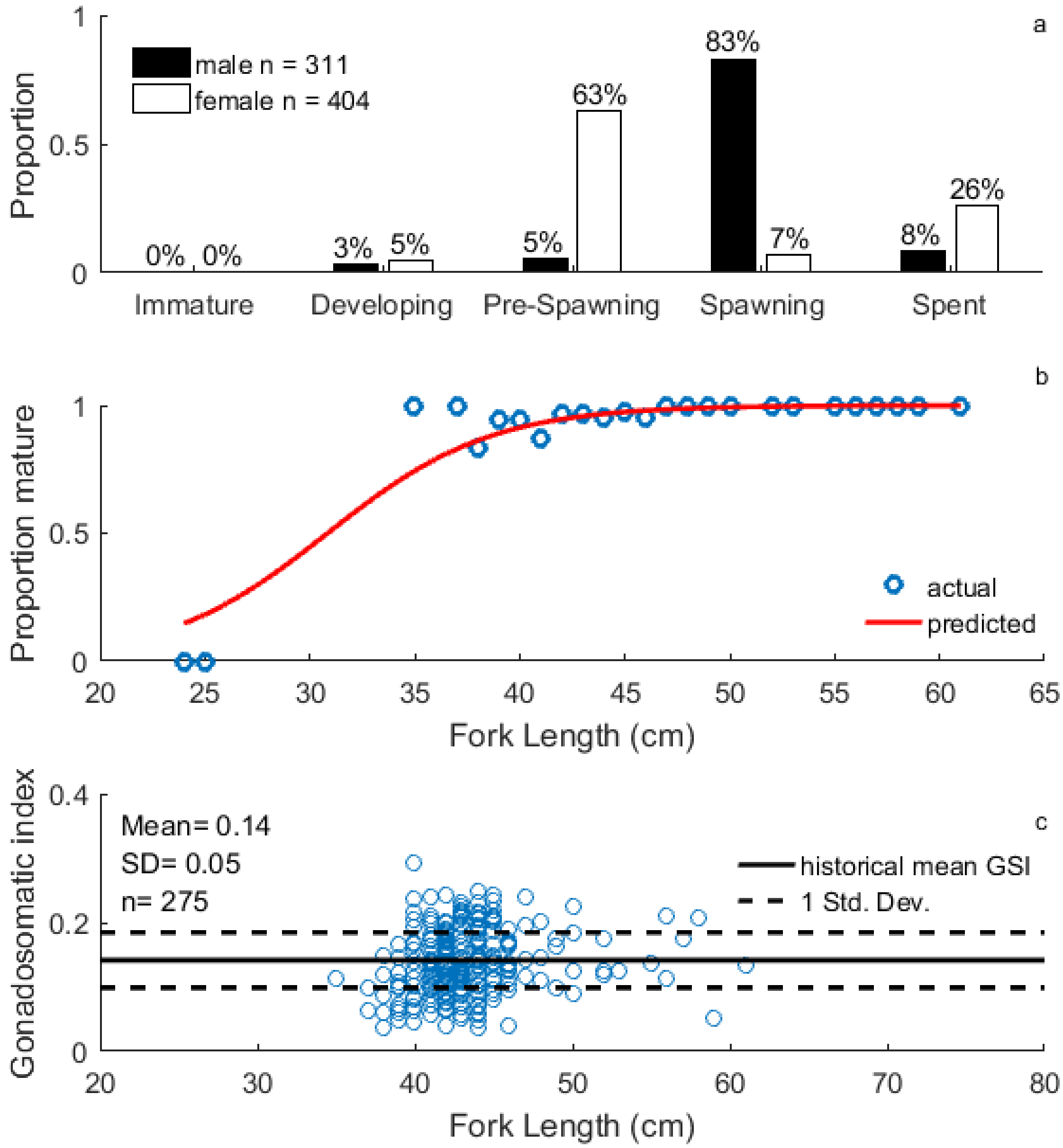


Figure 43. -- Maturity composition for male and female walleye pollock greater than 40 cm FL within each stage (a); proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock (b); gonadosomatic index (with historic survey mean ± 1 std. dev.) for pre-spawning females examined during the 2017 acoustic-trawl survey of the Shelikof region (c). Note: these graphs do not include data from age-1 fish.

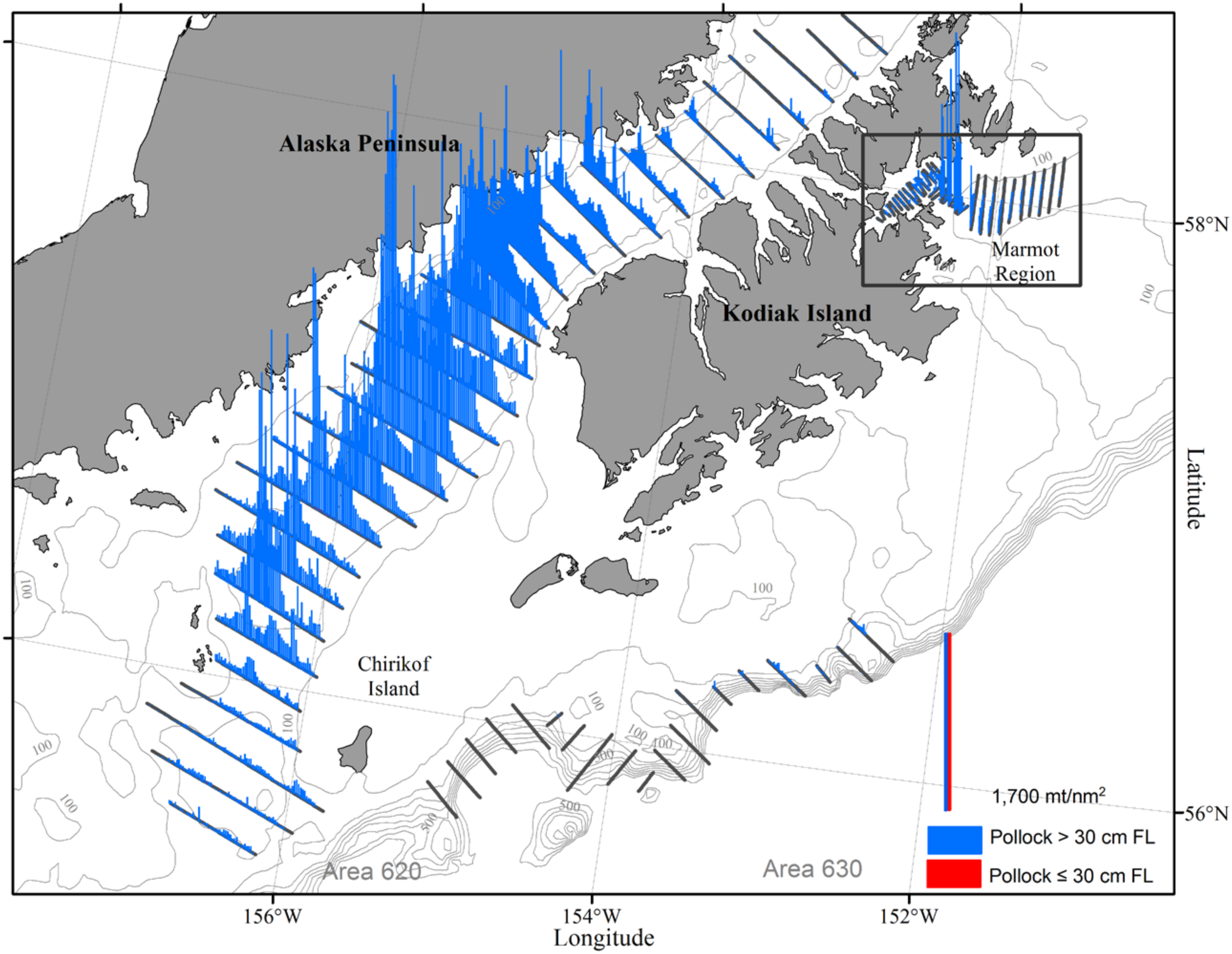


Figure 44. -- Biomass (t/nmi^2) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of Shelikof Strait, Marmot Bay, and Chirikof shelf break. Box indicates area enlarged in Figure 53.

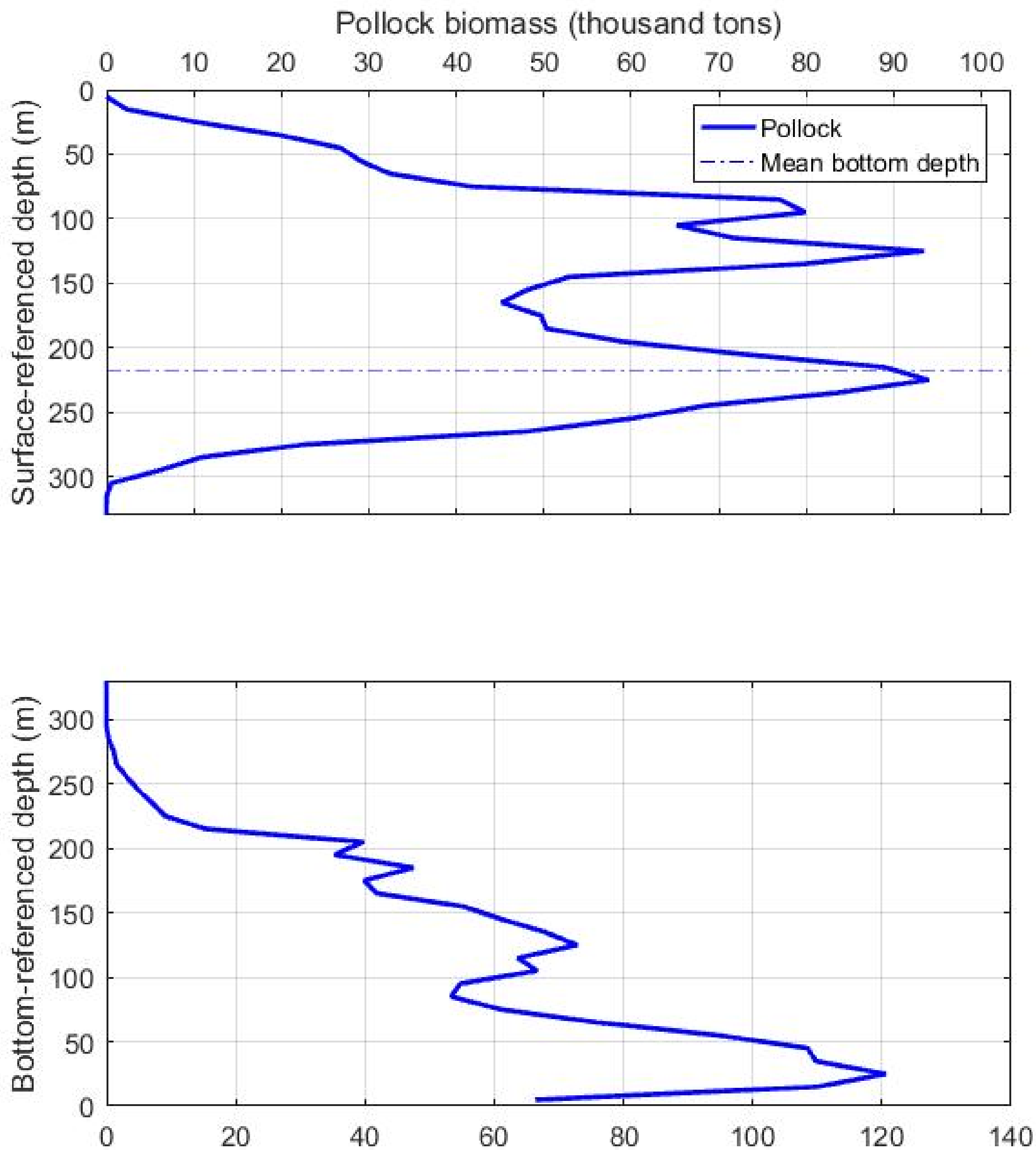


Figure 45. -- Depth distribution (m) of walleye pollock biomass in thousands of metric tons (t) observed in the Shelikof Strait during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

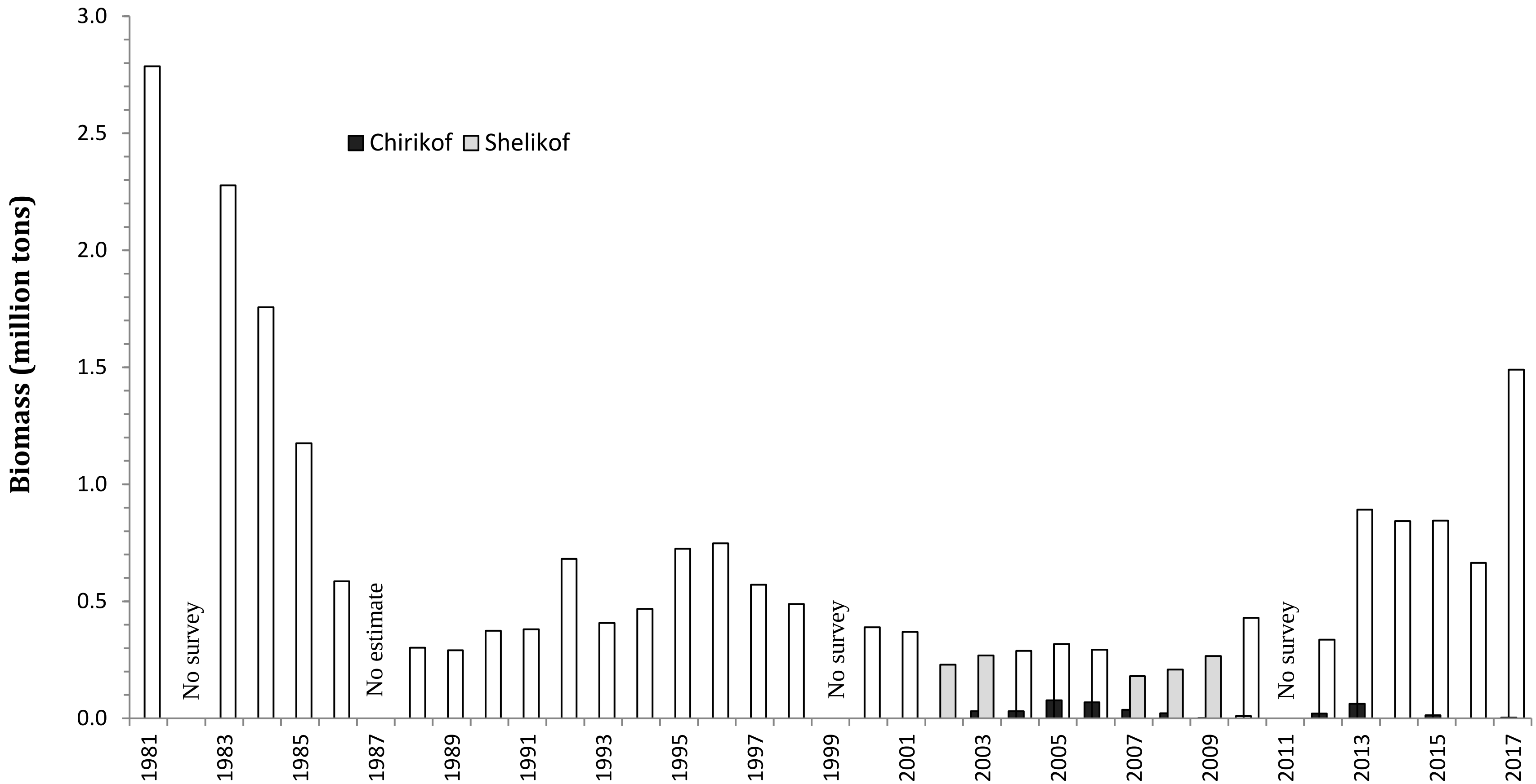


Figure 46. -- Summary of walleye pollock biomass estimates (million metric tons) for Shelikof Strait and Chirikof Island shelf break based on acoustic-trawl surveys.

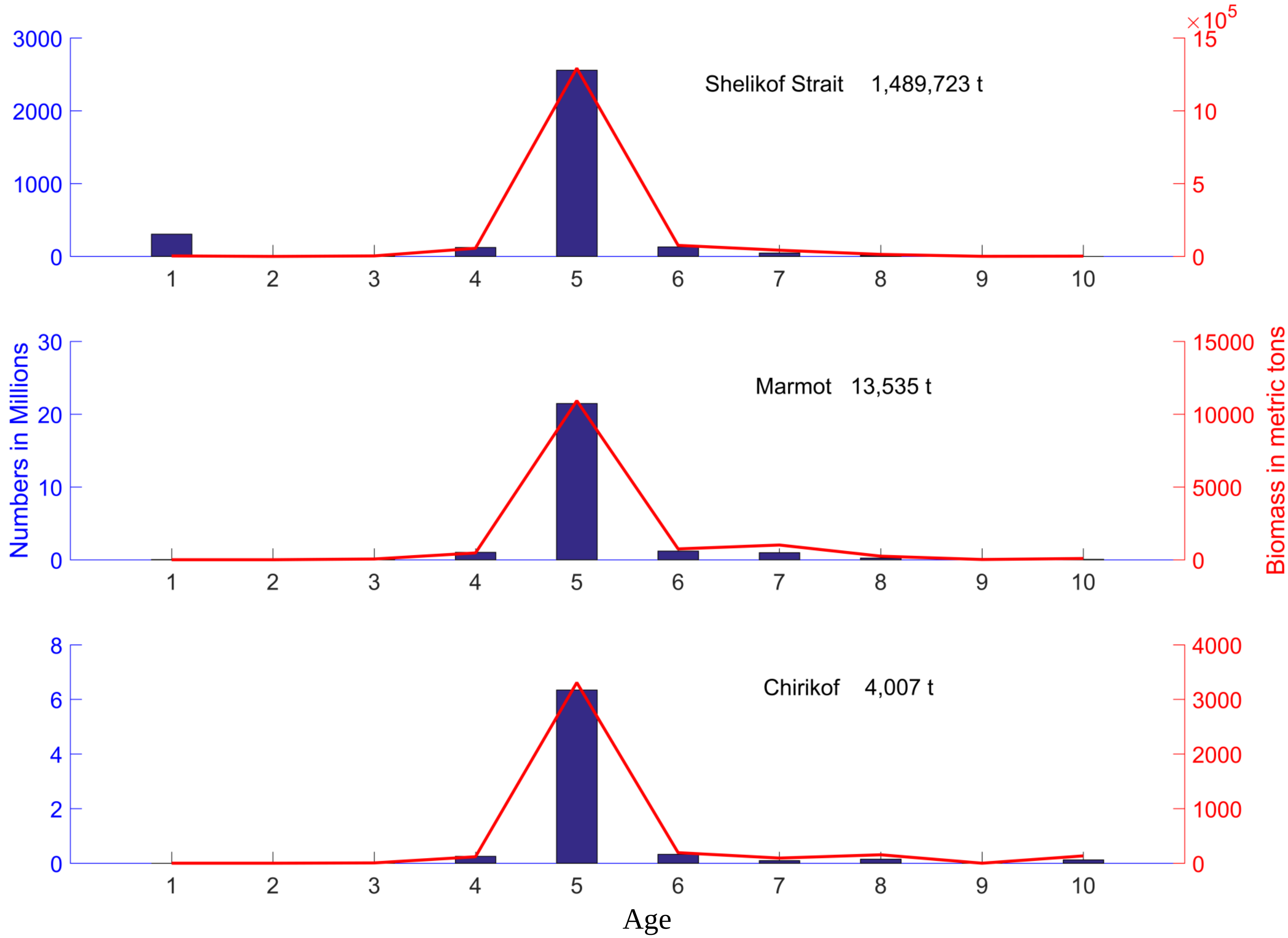


Figure 47. -- Age distribution of walleye pollock are shown with bars (numbers) and biomass estimate shown with solid red line (metric tons, t) for the 2017 acoustic-trawl survey of Marmot Bay, Shelikof Strait, and the Chirikof shelf break.

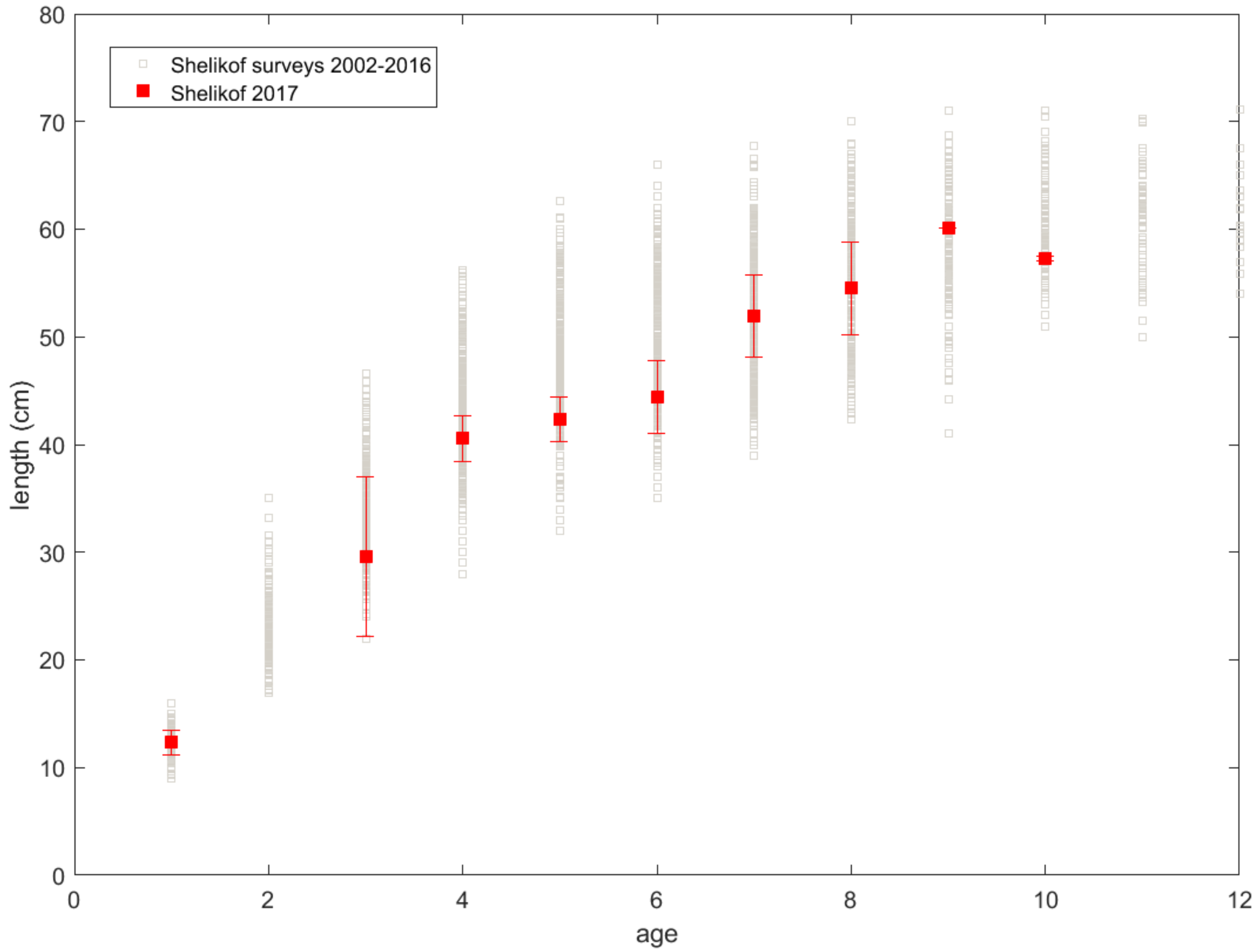


Figure 48. -- Walleye pollock average length at age from historic winter Shelikof (2002-2010, 2012-2016) and Marmot (2007, 2009-2010, 2013-2016) acoustic-trawl surveys compared with walleye pollock average length at age for winter 2017. Bars show +/- 1 standard deviation for the historic data.

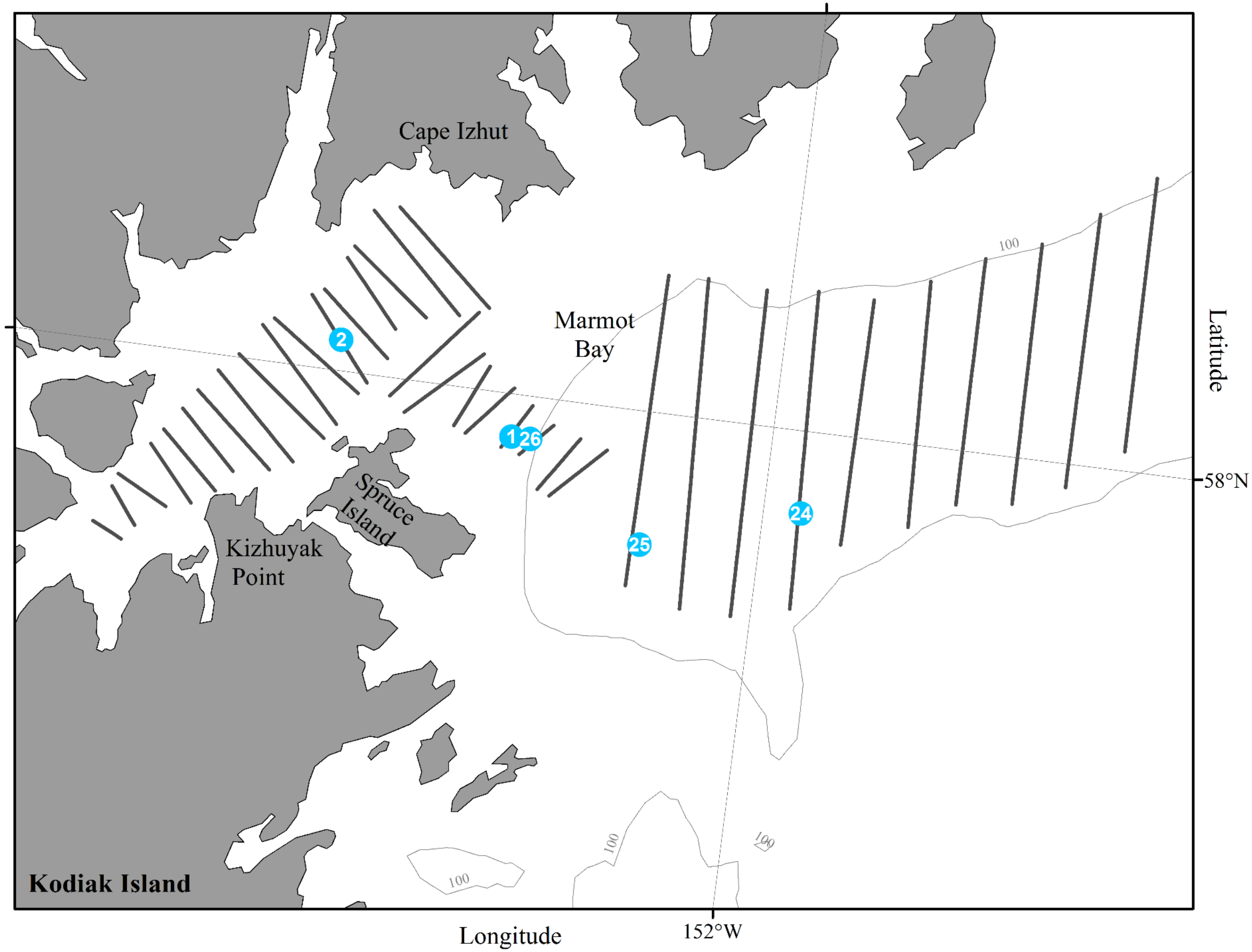


Figure 49. -- Transect lines and locations of Aleutian-wing trawl (AWT) hauls during the winter 2017 acoustic-trawl survey of walleye pollock in Marmot Bay and Izhut Bay. Figure represents area enlarged from Figure 38.

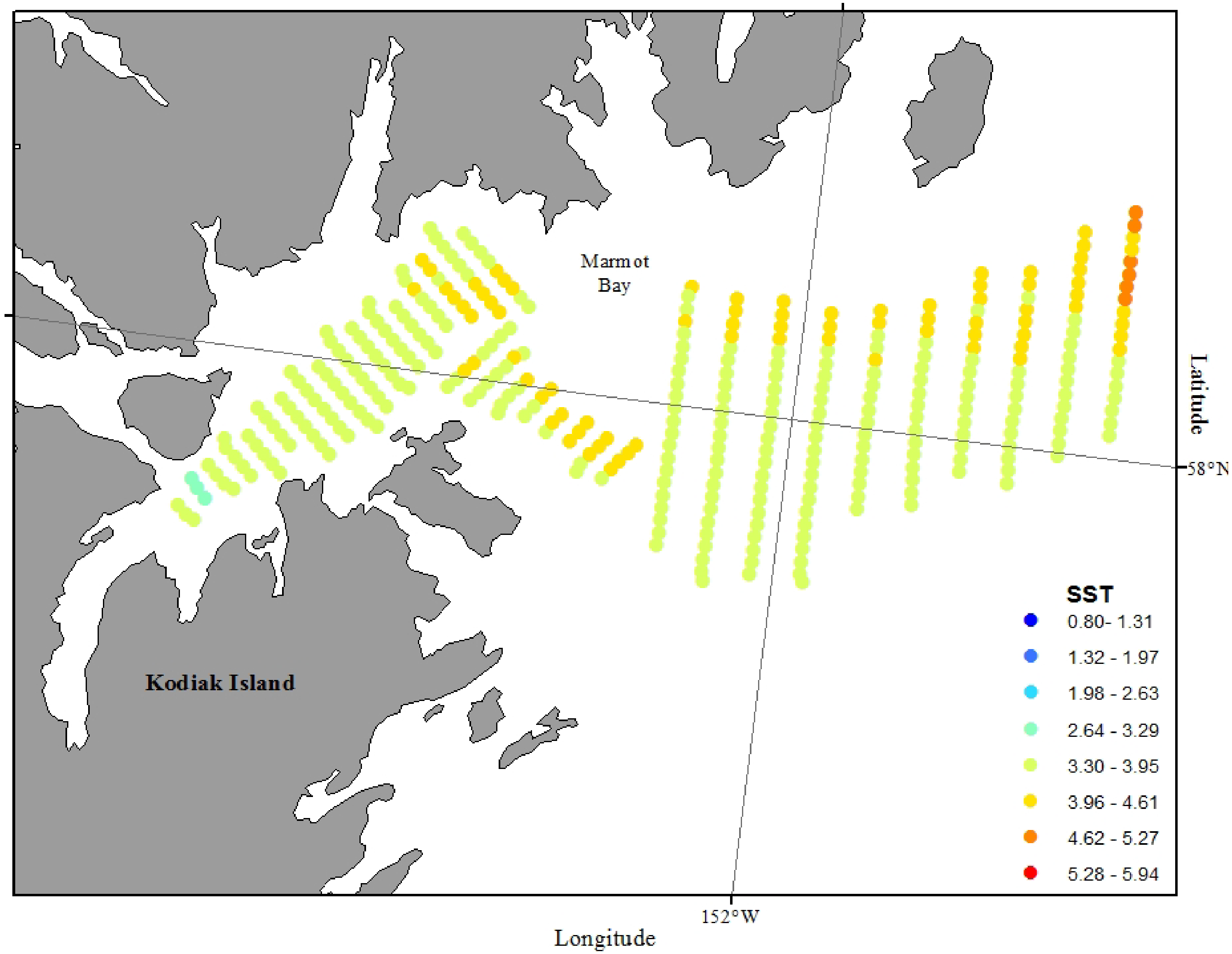


Figure 50. -- Surface water temperatures (°C) recorded at 5-second intervals during the 2017 acoustic-trawl survey of Marmot Bay. Temperatures are primarily from the ship's bow-mounted Seabird SBE-38 temperature sensor. At times when the SBE-38 was not operating, temperatures are from the mid-ship Furuno T-2000 temperature probe located 1.4 m below the surface.

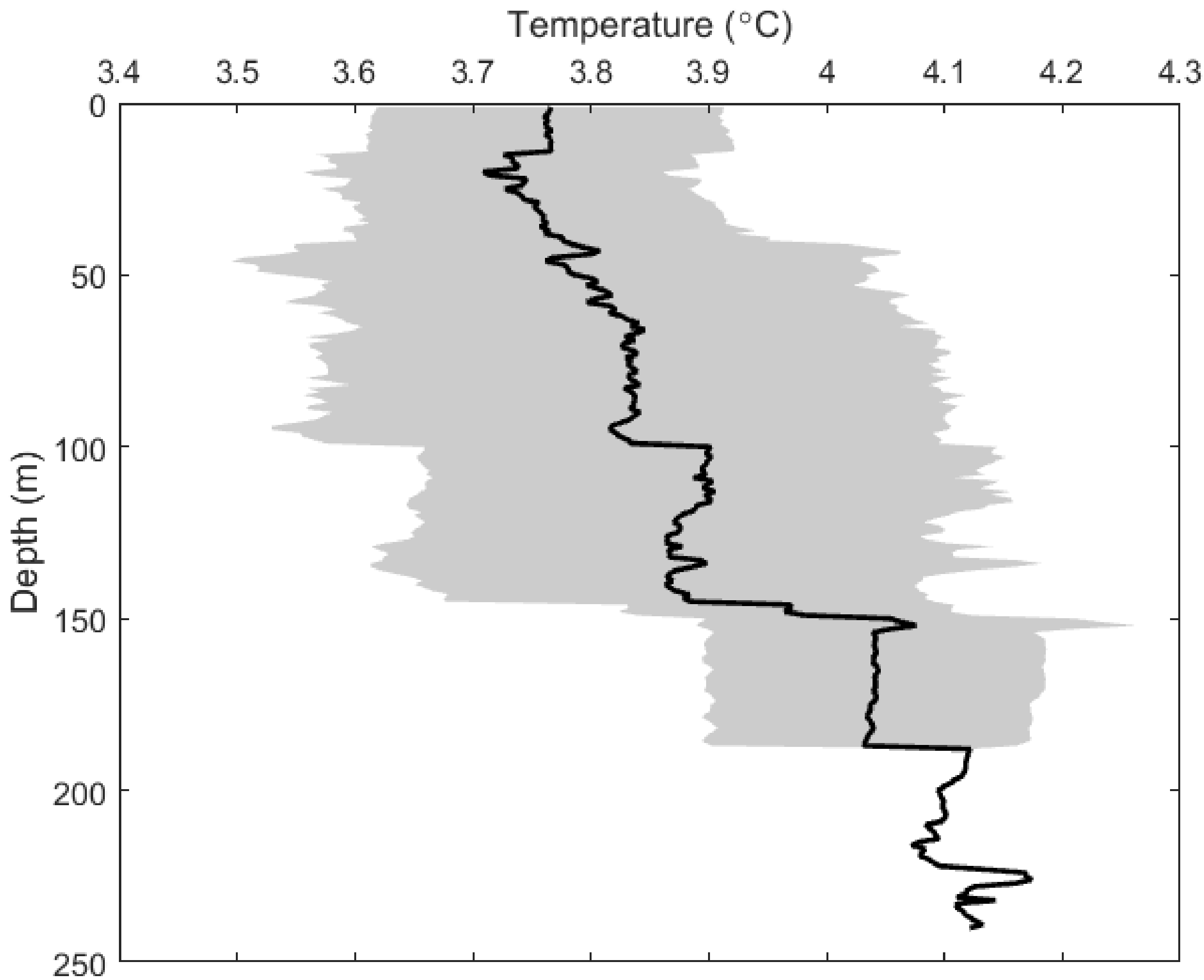


Figure 51. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the five trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in Marmot Bay. The shaded area represents ± one standard deviation from the mean.

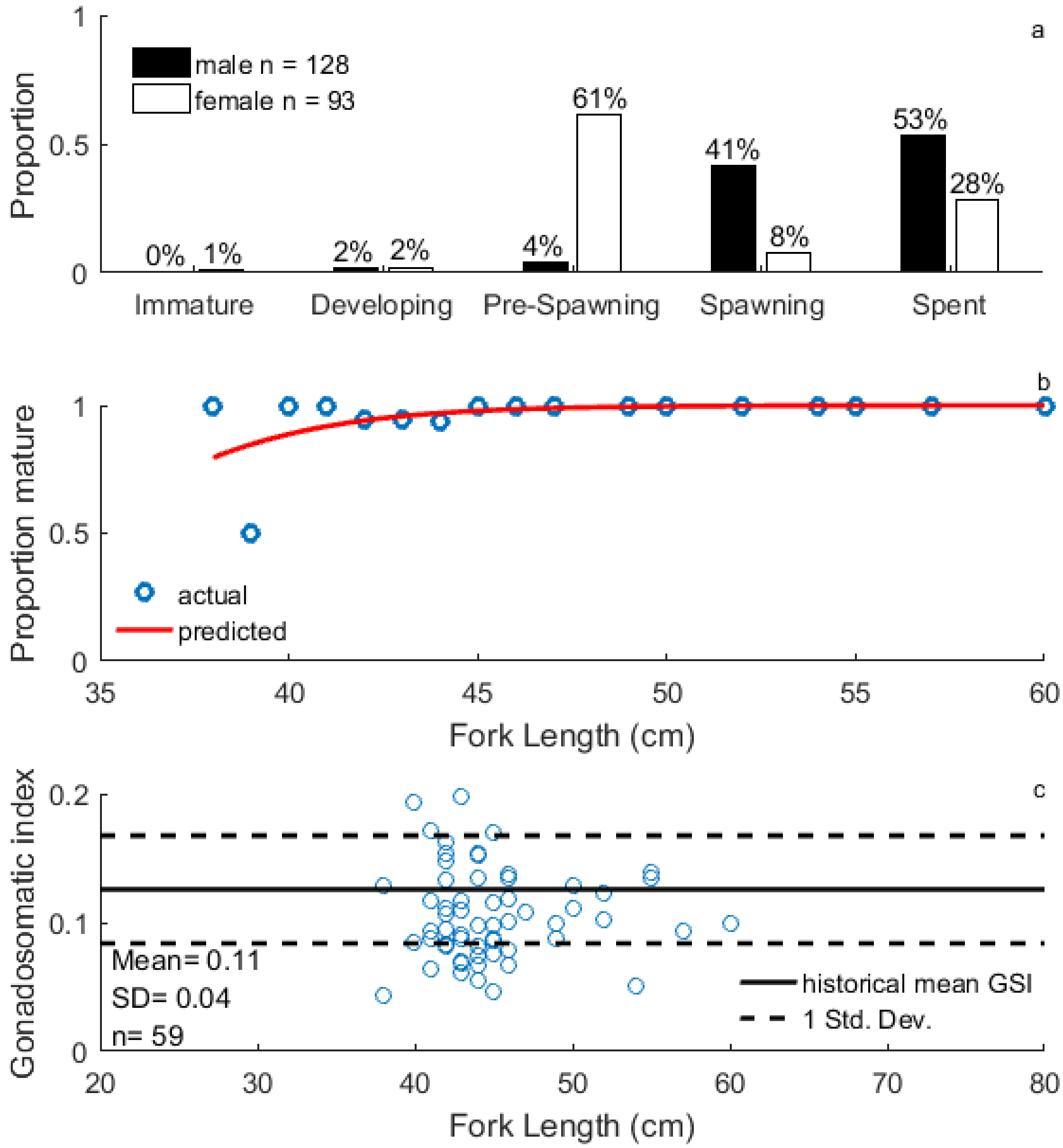


Figure 52. -- Maturity stages and percentage of fish > 40 cm FL within each stage for (a) male and female walleye pollock; (b) proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock; (c) gonadosomatic index (with historic survey mean, and minimum and maximum of historic survey means) for pre- spawning females examined during the 2017 acoustic-trawl survey of the Marmot region. Note: these graphs do not include data from age-1 fish.

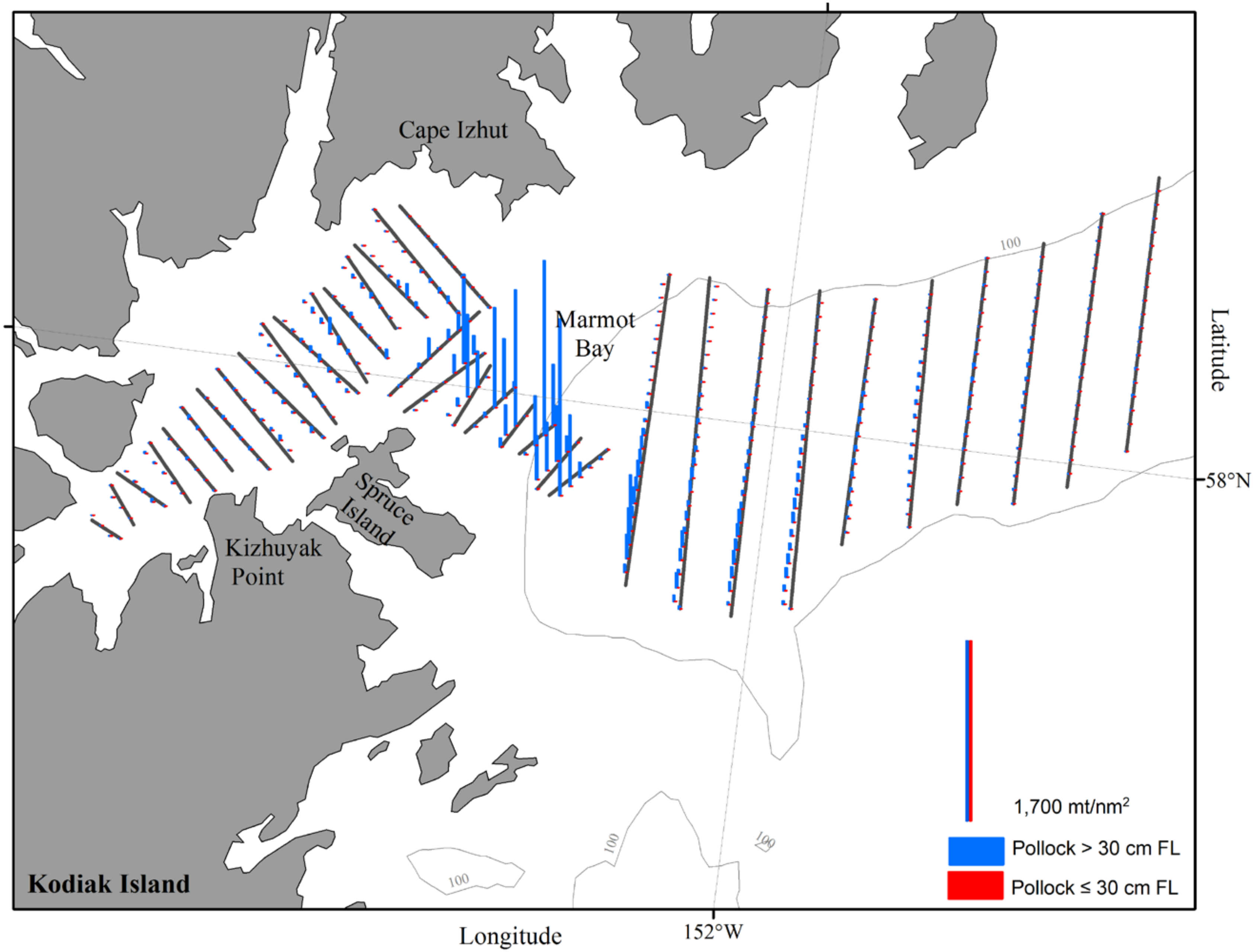


Figure 53. -- Biomass (t/nmi^2) attributed to walleye pollock (vertical lines) along tracklines surveyed during the winter 2017 acoustic-trawl survey of Marmot Bay.

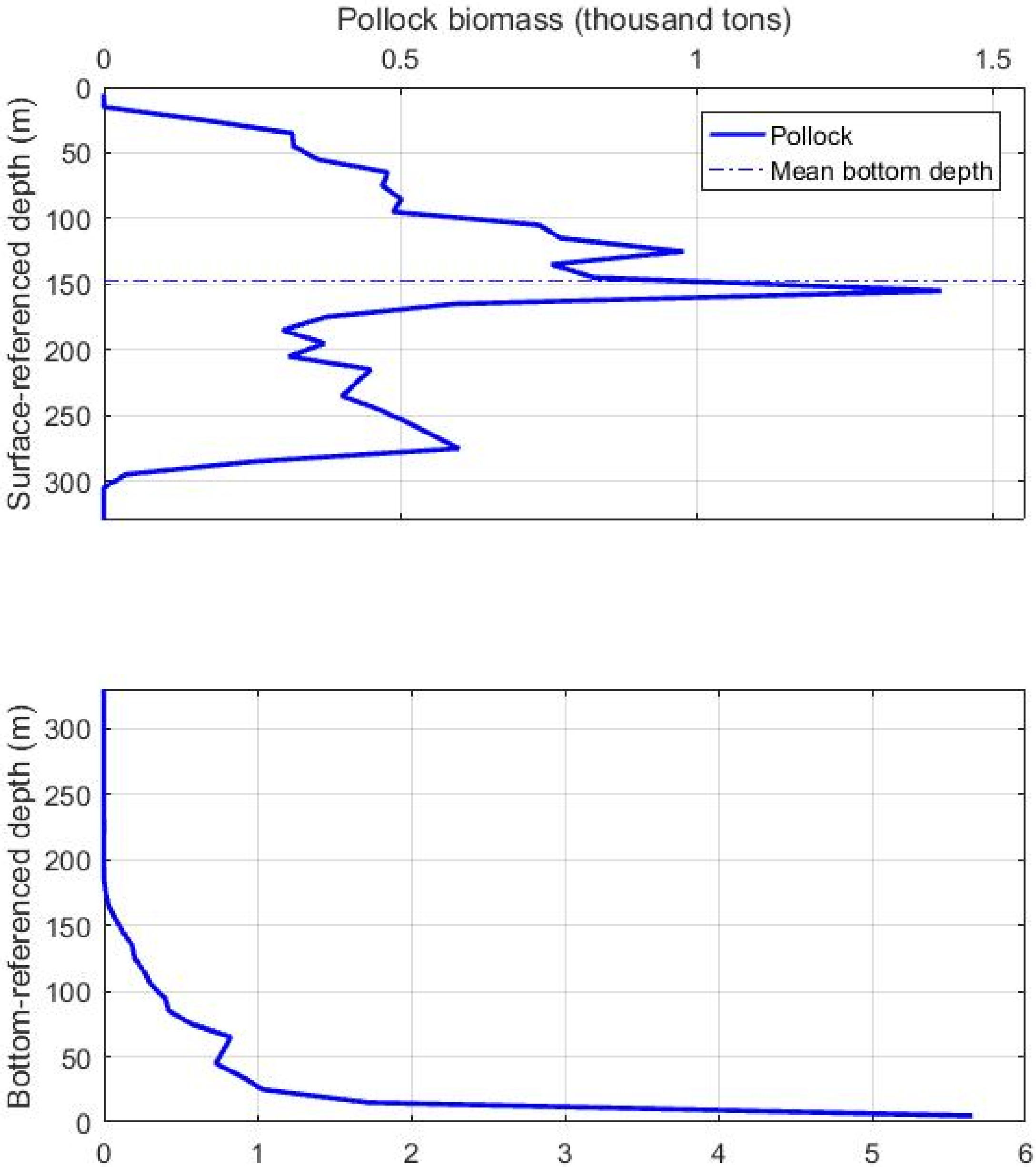


Figure 54. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed in Marmot Bay during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

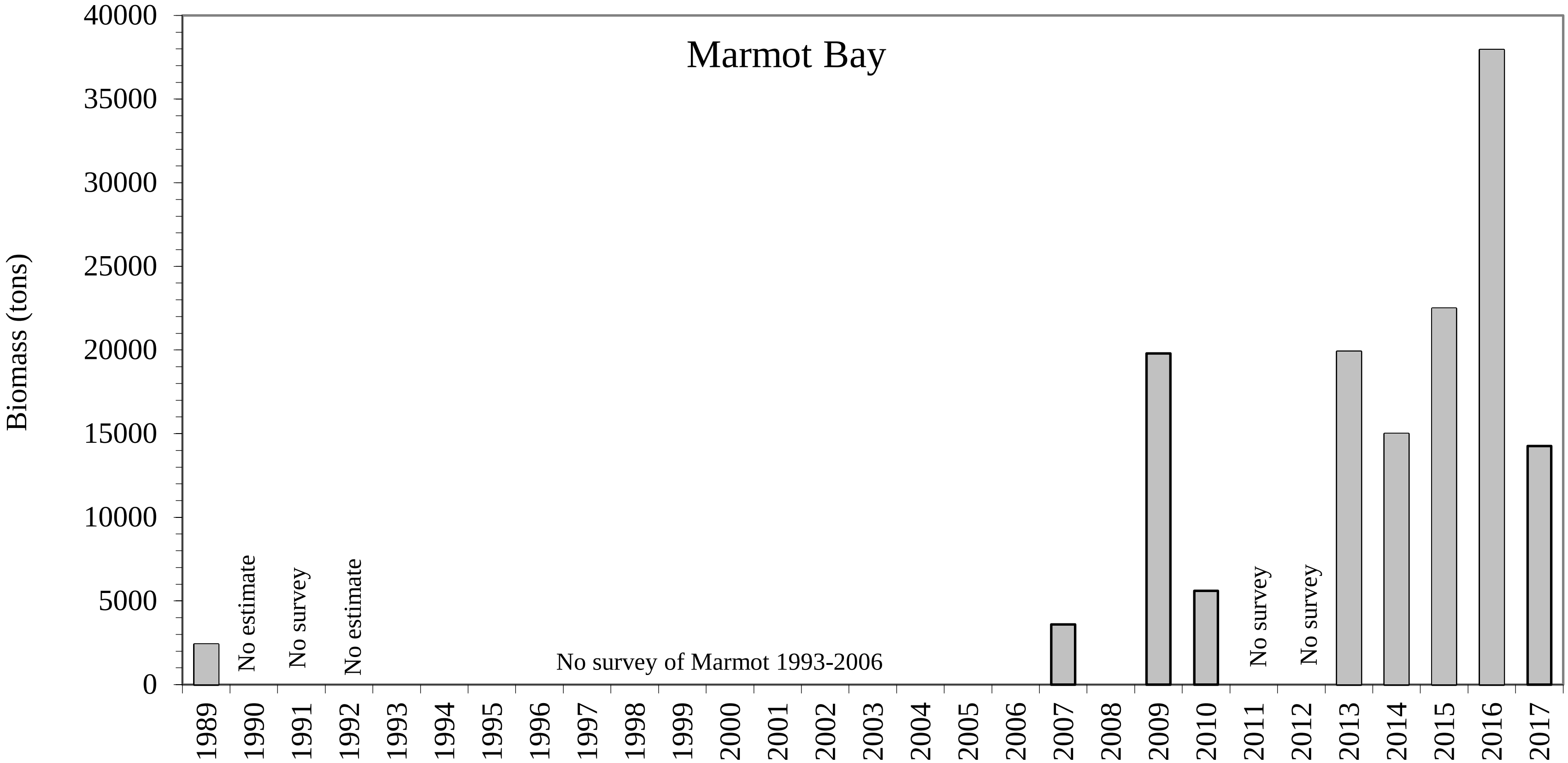


Figure 55. -- Summary of walleye pollock biomass estimates (metric tons) based on acoustic-trawl surveys of Marmot Bay.

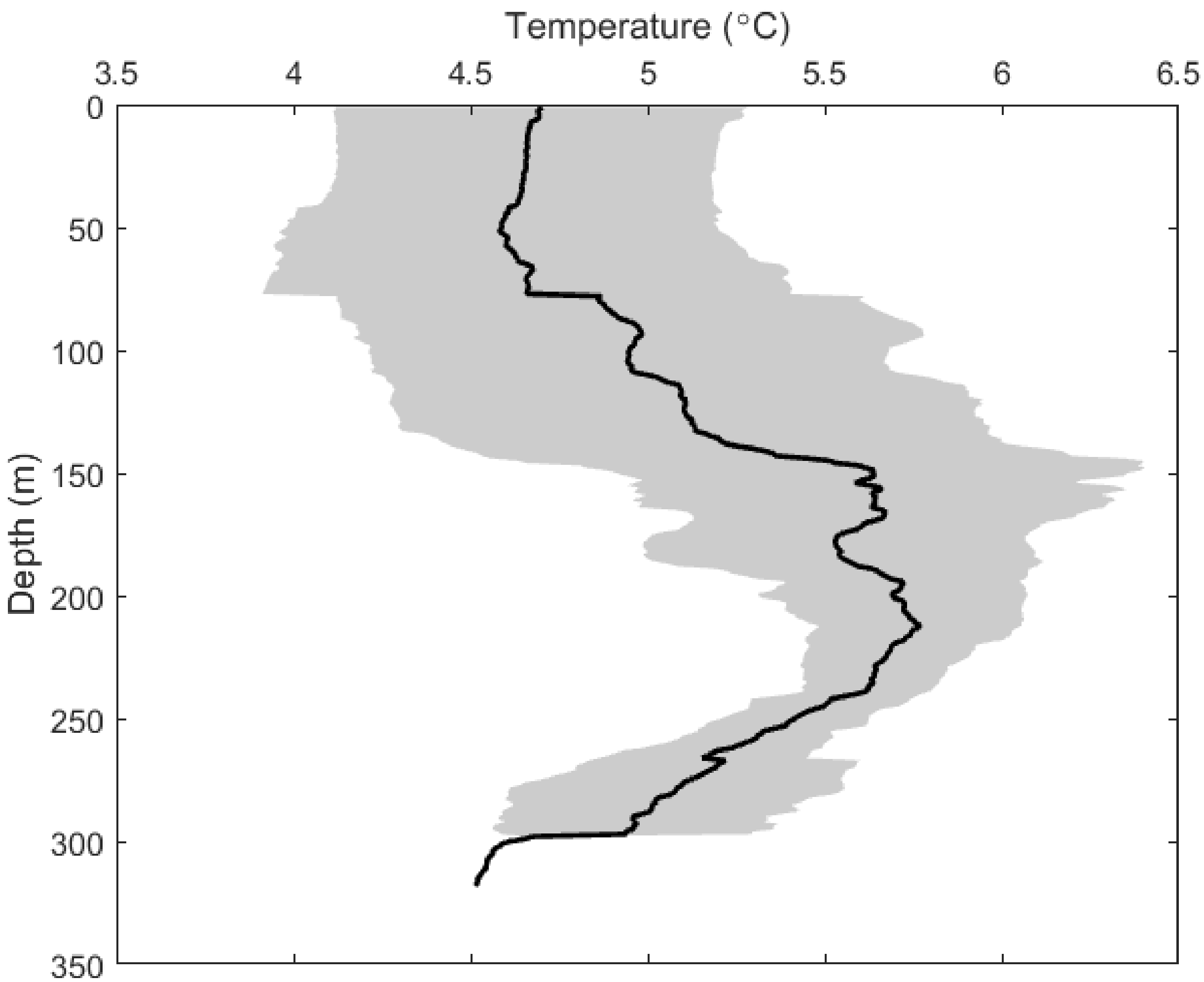


Figure 56. -- Mean water temperature (°C; solid line) by 1-m depth intervals for the 4 trawl haul locations observed during the winter 2017 acoustic-trawl survey of walleye pollock in the Chirikof shelf break region. Shaded area represents one standard deviation.

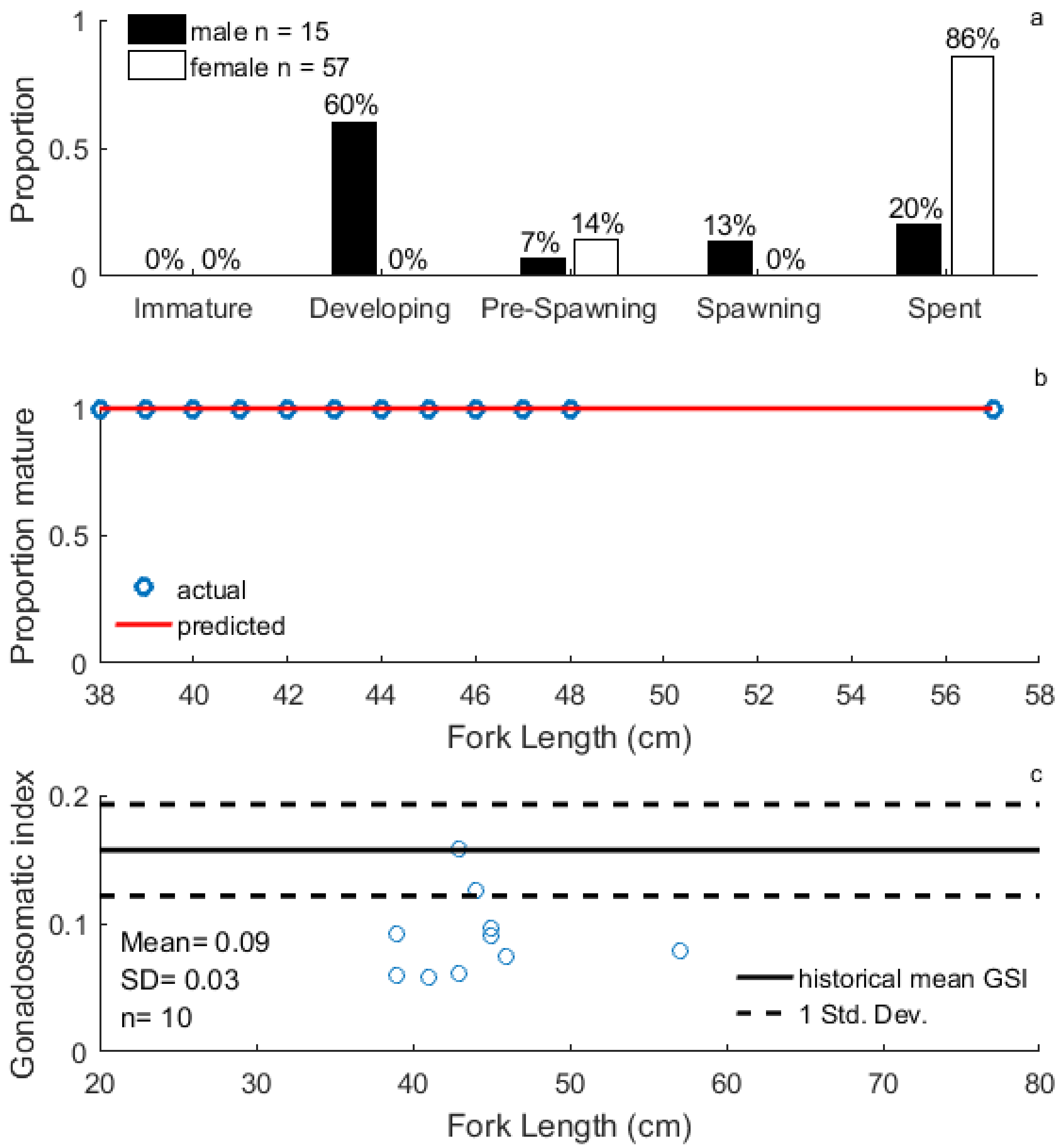


Figure 57. -- Maturity stages and percentage of fish > 40 cm FL within each stage for (a) male and female walleye pollock; (b) proportion mature (i.e., pre-spawning, spawning, or spent) by 1-cm size group for female walleye pollock; (c) gonadosomatic index (with historic survey mean, and minimum and maximum of historic survey means) for pre- spawning females examined during the 2017 acoustic-trawl survey of the Chirikof shelf break region. Note: these graphs do not include data from age-1 fish.

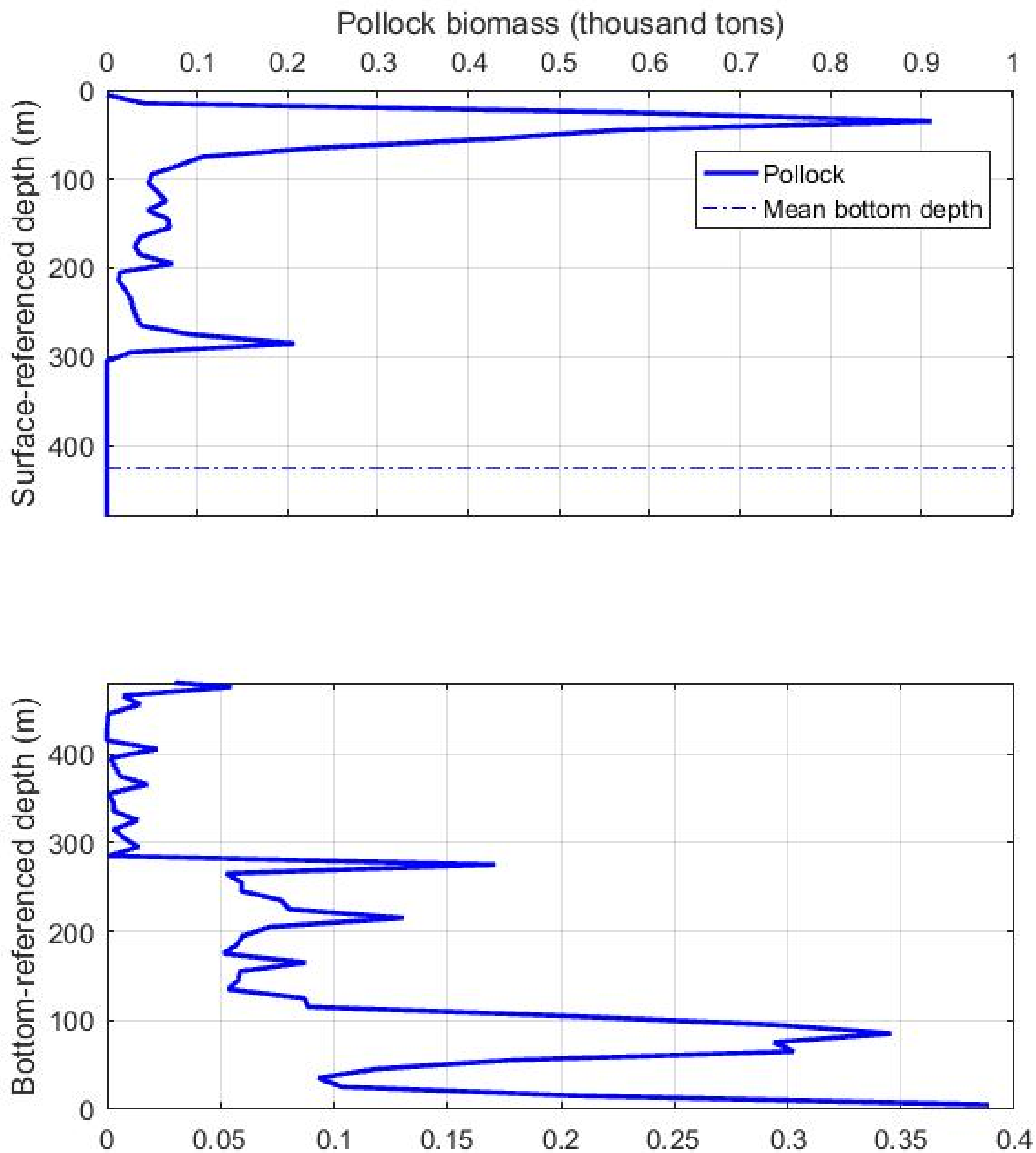


Figure 58. -- Depth distribution (m) of walleye pollock biomass in thousands of tons (t) observed on the Chirikof Shelf break during the winter 2017 acoustic-trawl survey. Depth is referenced to the surface and to the bottom and is averaged in 10 m depth bins.

APPENDIX I. ITINERARY

DY2017-01

Shumagin Islands\Sanak Trough\Morzhovoi Bay\Pavlof Bay

7 Feb.	Depart Kodiak, AK.
8-11 Feb.	Acoustic-trawl survey of Shumagin Islands.
11 Feb.	Acoustic-trawl survey of Sanak Trough.
12 Feb.	Acoustic-trawl survey of Morzhovoi Bay.
13-14 Feb.	Acoustic-trawl survey of Pavlof Bay.
14-15 Feb.	Acoustic sphere calibration in Volcano Bay, AK.
16 Feb.	Arrive Kodiak, AK. End cruise.

DY2017-02

Kenai Bays/ PWS/ Hinchinbrook/Middleton

1 Mar.	Depart Kodiak, AK.
2-5 Mar.	Acoustic-trawl survey of the Kenai Bays.
5-9 Mar.	Acoustic-trawl survey of Prince William Sound.
10 Mar.	Arrive Kodiak, AK. End cruise.

DY2017-03

Shelikof Strait\Marmot Bay

14 Mar.	Depart Kodiak, AK.
14-15 Mar.	Acoustic-trawl survey of Spruce Gully and inner Marmot Bay.
18-24 Mar.	Acoustic trawl survey of Shelikof Strait.
24-25 Mar.	Acoustic trawl survey of Chirikof Shelf Break.
26 Mar.	Acoustic-trawl survey of outer Marmot Bay.
27 Mar.	Acoustic sphere calibration in Izhut Bay, AK.
28 Mar.	Arrive Kodiak, AK. End cruise.

APPENDIX II. SCIENTIFIC PERSONNEL

DY2017-01

Shumagin Islands\Sanak Trough\Morzhovoi Bay\Pavlof Bay

Name	Position	Organization
Alex De Robertis	Chief Scientist	AFSC-RACE
Sarah Stienessen	Fishery Biologist	AFSC-RACE
Darin Jones	Fishery Biologist	AFSC-RACE
Scott Furnish	IT Spec.	AFSC-RACE
Abigail McCarthy	Fishery Biologist	AFSC-RACE
Nathan Lauffenburger	Fishery Biologist	AFSC-RACE
Mike Levine	Fishery Biologist	AFSC-RACE
Matthew Phillips	Fishery Biologist	AIS

DY2017-02

Kenai Bays and PWS

Name	Position	Organization
Taina Honkalehto	Chief Scientist	AFSC-RACE
Chris Wilson	Fishery Biologist	AFSC-RACE
Matthew Phillips	Fishery Biologist	AIS
Mike Levine	Fishery Biologist	AFSC-RACE
Nathan Lauffenburger	Fishery Biologist	AFSC-RACE
Heather Kenney	Fishery Biologist	AFSC-RACE
Elisa Russ	Fishery Biologist	ADFG

DY2017-03

Shelikof Strait\Marmot Bay\Chirikof Shelf Break

Name	Position	Organization
Darin Jones	Chief Scientist	AFSC-RACE
Denise McKelvey	Fishery Biologist	AFSC-RACE
Scott Furnish	IT Spec.	AFSC-RACE
Matthew Phillips	Fishery Biologist	AIS
Mike Levine	Fishery Biologist	AFSC-RACE
Kresimir Williams	Fishery Biologist	AFSC-RACE
Steve Porter	Fishery Biologist	AFSC-RACE
Chris Bassett	Fishery Biologist	AFSC-RACE

AFSC – Alaska Fisheries Science Center, National Marine Fisheries Service, Seattle, WA

RACE – Resource Assessment and Conservation Engineering Division

AIS—AIS Scientific and Environmental Services, Inc.

ADFG—Alaska Department of Fish and Game