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June 2025

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center

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Abstract

In 2024, the Groundfish and Shellfish Assessment Programs in the Resource Assessment and Conservation Engineering Division of the National Marine Fisheries Service's Alaska Fisheries Science Center conducted the 42nd eastern Bering Sea groundfish and shellfish bottom trawl survey. The survey covers the eastern Bering Sea continental shelf (bottom depths between 20 and 200 m) from the Alaska coastline to the U.S.-Russia Maritime Boundary between the Alaska Peninsula and roughly 62°N. Survey sampling was conducted aboard two chartered, commercial stern trawlers, the 43.9 m FV *Alaska Knight* and 49.4 m FV *Northwest Explorer*, across 350 stations in the eastern Bering Sea. The 2024 mean bottom and surface temperatures in the eastern Bering Sea, 2.5°C and 5.8°C, were near the time-series averages of 2.5°C and 6.7°C, respectively. The estimated total biomass was 15 million metric tons (t) in 2024, an increase from 11.8 million t in 2023, and greater than the five-year average of 13.7 million t. A total of 92 fish taxa and 215 invertebrate taxa were identified. This report compares the distribution and relative abundance of 37 fish species and two invertebrate taxa with side-by-side maps from the 2024 eastern Bering Sea shelf bottom trawl survey and past surveys. Changes in the abundance of some species between the 2023 and 2024 surveys may represent distributional shifts, as species capable of long-distance movement may be more abundant in northern latitudes during recent warm years. These same species may have shifted south again as the seasonal sea ice cover during the winters of 2020-2023 became more extensive. This annual variation underscores the need to continue regular survey monitoring of Bering Sea fish and invertebrate populations, as well as their responses to a changing climate.

Contents

Introduction

In 2024, the Resource Assessment and Conservation Engineering (RACE) Division of the National Marine Fisheries Service's (NMFS') Alaska Fisheries Science Center (AFSC) conducted the 42nd eastern Bering Sea groundfish and shellfish bottom trawl survey from June to August 2024. The survey collects information about fish and invertebrate populations and environmental conditions to support fisheries stock assessment and management. The eastern Bering Sea shelf survey has occurred annually (except in 2020 due to the COVID-19 pandemic) since 1982 and is the longest-running, standardized time series of fish and invertebrate data in the region (Conner and Lauth 2017).

The data collected during the survey are vital for managing fisheries resources and ecosystem monitoring. Fishery-independent abundance estimates, in addition to other biological and oceanographic information collected, are used by the AFSC, the North Pacific Fishery Management Council (NPFMC), and the Alaska Department of Fish and Game (ADF&G). These organizations use the survey data products to manage groundfish and crab stocks and conduct ecosystem forecast modeling, which are requirements of the Bering Sea and Aleutian Island (BSAI) Fishery Management Plan (FMP) established under the Magnuson-Stevens Fishery Conservation and Management Act[1].

The most recent modeling results on the status of these commercial groundfish[2] and crab[3] stocks are reported in the annual Stock Assessment and Fishery Evaluation report prepared by the NPFMC. Detailed information on bottom trawl survey results for commercial crab species, including Tanner crab (*Chionoecetes bairdi*), snow crab (*Chionoecetes opilio*), red king crab (*Paralithodes camtschaticus*), blue king crab (*Paralithodes platypus*), and hair crab (*Erimacrus isenbeckii*) are discussed and analyzed separately in the AFSC Shellfish Assessment Program's annual data report (Zacher et al. 2024). Commercial crab stocks are managed by the ADF&G with federal oversight by NMFS.

This Technical Memorandum compares results from the 2024 survey with results from the prior year's survey in the same region (Markowitz et al. 2024). Technical Memoranda reporting past survey data can be found on the NOAA[4] and AFSC websites[5].

[1] https://www.fisheries.noaa.gov/topic/laws-policies

[2] https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation

[3] https://www.npfmc.org/about-the-council/plan-teams/bsai-crab-planning-team/ and https://www.npfmc.org/library/safe-reports/

[4] https://repository.library.noaa.gov/

[5] https://www.fisheries.noaa.gov/resource/publication-database/alaska-fisheries-science-center-technical-memorandums and https://www.fisheries.noaa.gov/alaska/science-data/groundfish-assessment-program-bottom-trawl-surveys

History of Bering Sea Shelf Bottom Trawl Surveys

Federal government agencies have conducted bottom trawl surveys of the eastern Bering Sea continental shelf since the 1940s. These early surveys were often exploratory efforts to locate commercial fisheries resources (Zimmermann et al. 2009) and led to the development of a red king crab fishery. Bottom trawl surveys by the United States continued into the 1970s, with private industry involvement, to study the biology, distribution, abundance, and best fishing practices for red king crab (Zimmermann et al. 2009). The first large-scale survey of the Bering Sea shelf was conducted in 1975 under contract from the U.S. Bureau of Land Management. The purpose was to collect baseline data for assessing the potential impact of growth in the offshore oil industry on Bering Sea groundfish and crab fishery resources (Pereyra et al. 1976). During the 1975 baseline survey, sampling was conducted across the shelf between the 20 m and 200 m isobaths from the Alaska Peninsula north to approximately 62°N.

In subsequent years, the areal coverage of the annual survey was reduced. However, in 1979, a comprehensive survey of the Bering Sea shelf was undertaken in cooperation with the Japan Fisheries Agency (Bakkala and Wakabayashi 1985). That survey encompassed the entire region sampled in the 1975 baseline study and included the upper continental slope waters between St. Matthew and St. Lawrence islands.

Following the 1979 survey, annual bottom trawl surveys have resampled the areas and stations established during the 1975 survey, with slight modifications in sampling design in some years. Beginning in 1979 and continuing triennially until 1991, the survey was extended to include the continental slope and the area between St. Matthew and St. Lawrence islands. After a hiatus from 1992 to 1999, due to lack of funding, the Bering Sea slope survey resumed in 2002 as an independent, standardized bottom trawl survey series that was conducted on a quasi-biennial basis, dependent on funding, until 2016 (Hoff 2016, Hoff and Britt 2011, Stauffer 2004).

The current eastern Bering Sea shelf survey design has been used since 1982. This design standardized survey gear (Stauffer 2004), collection methods, and temporal stationarity, in addition to implementing a systematic survey grid design that includes 330 regularly spaced (37.04 × 37.04 kilometer; 20 × 20 nautical mile, nmi) stations (Figs. **1** and **2**; Bakkala et al. (1985)). A total of 26 additional "corner stations" were established near both the Pribilof Islands in 1981 and St. Matthew Island in 1983. These stations were placed at the corners of four standard station grids to better sample dwindling blue king crab populations in the area.

Two major changes to the total station count have occurred since the survey design was established in 1982. First, beginning in 1987, 20 regularly spaced stations that comprise Strata 82 and 90 (Fig. **1**) were added to monitor more northerly distributions of snow crab and walleye pollock, bringing the total eastern Bering Sea station count to 376. Annual sampling of the northwestern strata has continued since 1987 because the region encompasses major portions of the commercially exploited Bering Sea groundfish and crab populations that require management actions under the Bering Sea-Aleutian Islands Fisheries Management Plan (BSAI FMP). Second, in the interest of maximizing the efficient use of survey resources, the 26 corner stations established near the Pribilof Islands and St. Matthew Island were discontinued after 2023 following an analysis by DeFilippo et al. (2023). The analysis indicated that the removal of these corner stations in high-density sampling areas would lead to negligible impacts on the precision and accuracy of groundfish and crab biomass estimates. The eastern Bering Sea shelf survey area now consists of 350 total stations and no additional high-density sampling areas.

The northern Bering Sea shelf survey was initiated by the AFSC as part of the Loss of Sea Ice (LOSI) Research Plan to monitor long-term climate trends in the transition zone between the temperate waters of the eastern Bering Sea and the Arctic waters of the Chukchi Sea, where climate change can have a significant effect on physical and biological ecosystem processes (Hollowed et al. 2007; Hunt et al. 2011; Stabeno, Kachel, et al. 2012; Stevenson and Lauth 2012, 2019). Although LOSI funding for the northern Bering Sea extension was discontinued after the 2010 northern Bering Sea shelf survey, the survey resumed biennially in 2017 to monitor the effects of changing ocean conditions on fish and crab distributions (Sigler et al. 2015). The northern Bering Sea shelf survey consists of 144 bottom trawl stations extending the eastern Bering Sea shelf survey grid northward to the Bering Strait and the U.S.-Russia Maritime Boundary, and includes all of Norton Sound and the Chirikov Basin (Fig. **2**). The standard northern Bering Sea shelf survey was conducted in 2010, 2017, 2019, 2021, 2022, and 2023 (Lauth 2011; Lauth et al. 2019; Markowitz et al. 2022; Markowitz et al. 2022a, 2022b; Markowitz et al. 2023, 2024). In 2018, a rapid-response survey was conducted in the northern Bering Sea using a different sampling design than the standard northern Bering Sea shelf survey. Therefore, the survey results from the 2018 northern Bering Sea rapid-response survey are not directly comparable to the results from other standard northern Bering Sea shelf surveys. In 2020, no Bering Sea shelf surveys were conducted due to the COVID-19 pandemic.

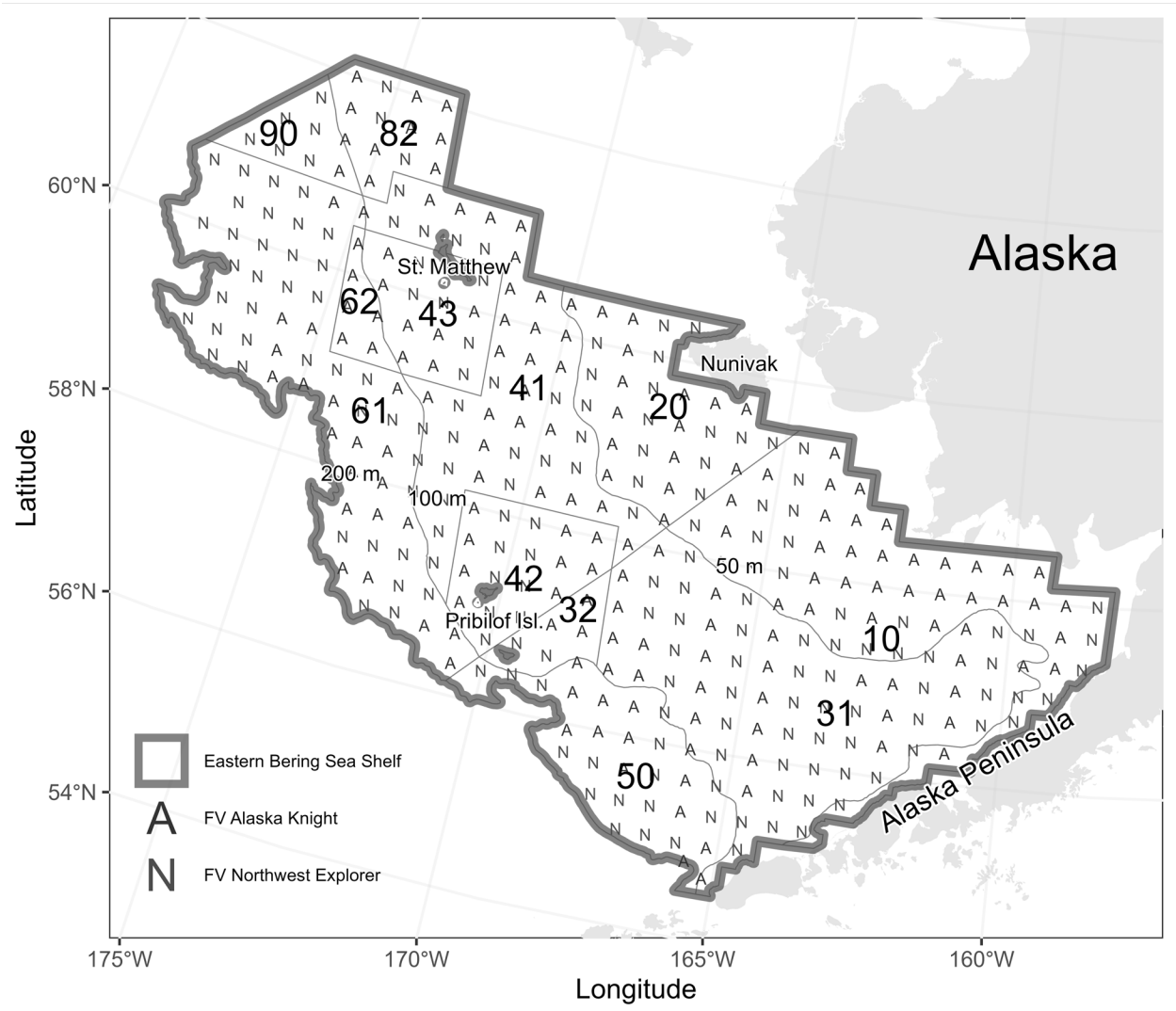

Figure 1. -- Stratification scheme used for data analysis of the 2024 eastern Bering Sea shelf survey. The map also depicts the stations sampled by the FV *Alaska Knight* (A) and FV *Northwest Explorer* (N).

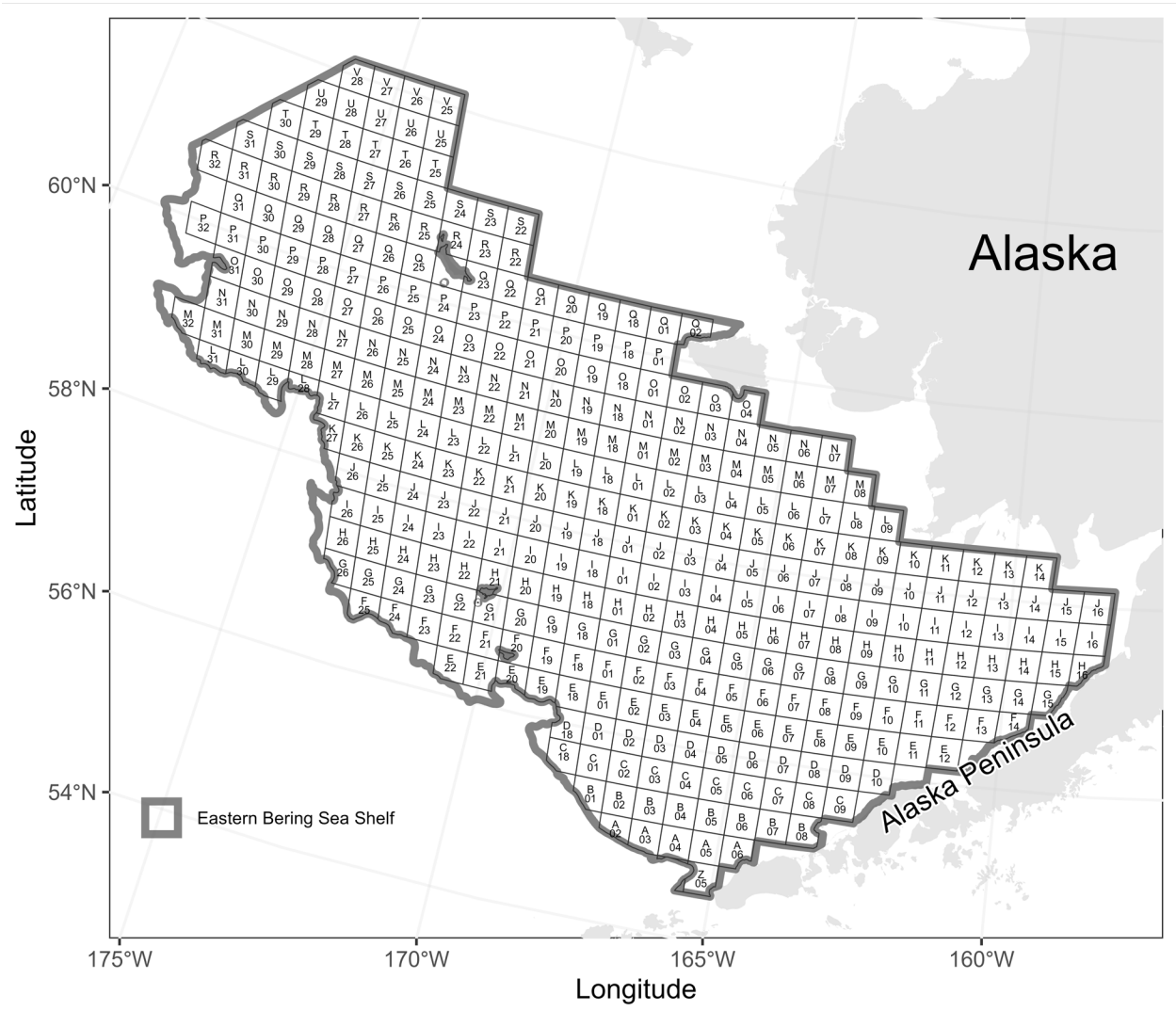

Figure 2. -- Sampling grid and station identifiers for the 2024 eastern Bering Sea shelf survey.

Methods

Survey Area and Sampling Design

The standardized eastern Bering Sea shelf survey consists of a systematic design with 350 fixed sampling stations arranged on a regularly spaced 37.04 × 37.04 km grid (20 × 20 nmi; Fig. **2**). In 2024, following analysis by DeFilippo et al. (2023), the 26 previously sampled 'corner stations' were removed from the survey grid (see History of Bering Sea Shelf Bottom Trawl Surveys section). The northern Bering Sea shelf survey was not conducted in 2024.

Survey Vessels and Sampling Gear

The 2024 eastern Bering Sea shelf survey was conducted aboard the chartered, commercial stern-trawlers FV *Alaska Knight* and FV *Northwest Explorer* (Fig. **3**). Both vessels are house-forward trawlers with stern ramps. The overall length of the FV *Alaska Knight* is 43.9 m (144 ft) and the FV *Northwest Explorer* is 49.4 m (162 ft). All fishing operations were conducted in compliance with national and regional protocols detailed in Stauffer (2004). Trawl sampling was conducted using 83-112 eastern otter trawls, each with a 25.3 m (83 ft) headrope and 34.1 m (112 ft) footrope (Fig. **4**). The net was attached to tail chains with 54.9 m (180 ft or 30 fm) paired dandylines. Each lower dandyline had a 0.61 m (2 ft) chain extension connected to the lower wing edge to improve bottom tending. Steel "V" doors measuring 1.8 × 2.7 m (6 × 9 ft) and weighing 816 kg (1,800 pounds) each were used for spreading the net opening while the trawl was fishing on the seafloor.

Figure 3. -- Fishing vessels FV *Alaska Knight* (left) and FV *Northwest Explorer* (right) contracted to conduct the 2024 eastern Bering Sea shelf survey.

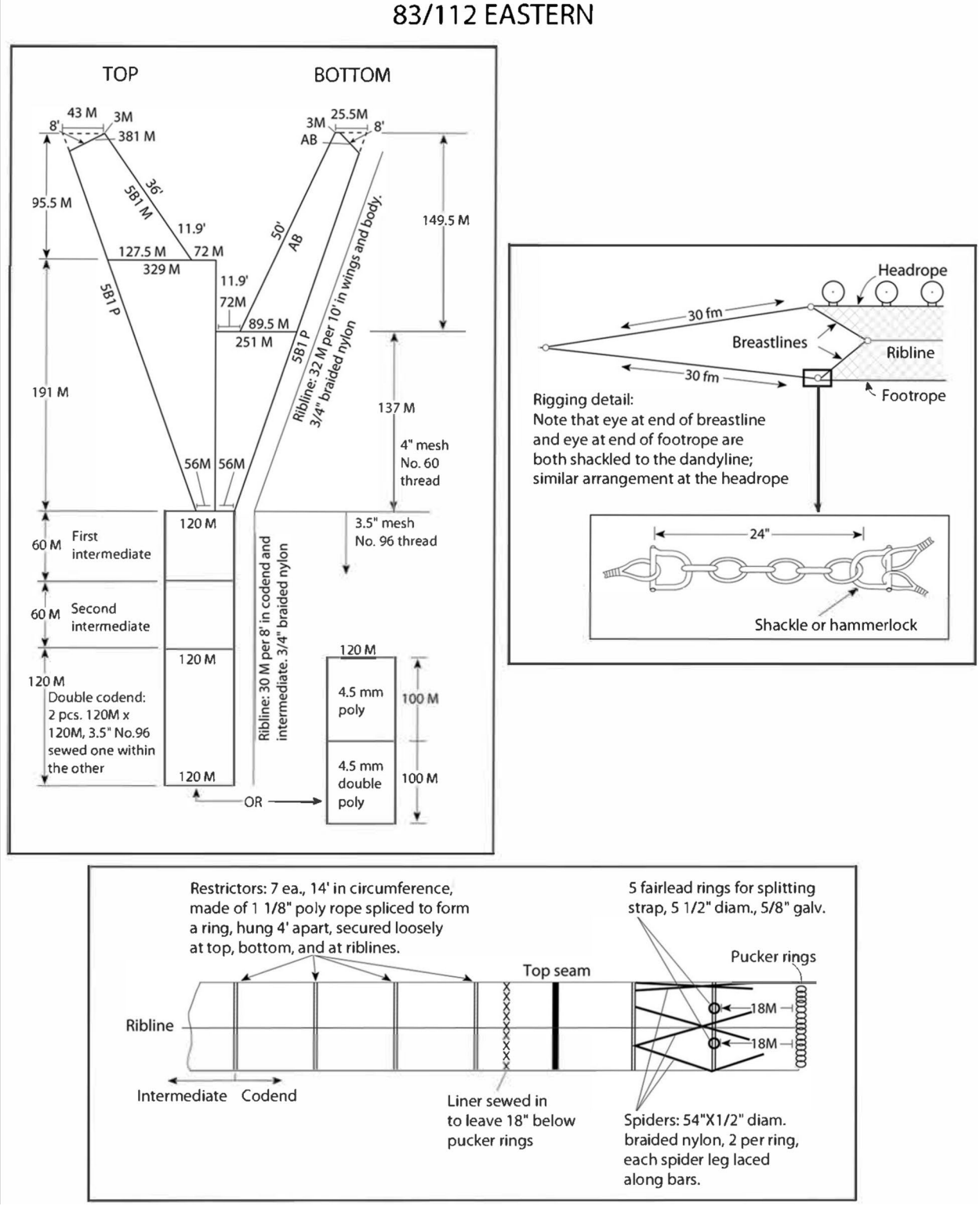

Figure 4. -- Schematic diagram of the 83-112 eastern otter trawl gear used during the 2024 eastern Bering Sea shelf survey.

The Marport Deep Sea Technologies Inc. net mensuration system was used to record net spread and net height. Net spread was measured as the horizontal distance between two sensors attached at wing tips immediately forward of the junction of the upper breastline and the dandyline. Net height was measured from the headrope to the seafloor. Mean net spread values for estimating area swept per tow were calculated according to methods described by Lauth and Kotwicki (2014). A customized Onset HOBO Pendant G Data Logger (accelerometer) in custom housing was attached to the center of the footrope and used as a bottom contact sensor in order to determine tow duration based on footrope contact with the seafloor.

Temperature and depth profiles were recorded using a Sea-Bird SBE-39 temperature-depth recorder (Sea-Bird Electronics Inc., Bellevue, WA) attached to the headrope of the trawl. Observations were made at 3-second intervals at each station. Average bottom depth was calculated by adding the average net height to the average depth of the headrope while the net was in contact with the seafloor.

The net mensuration system failed to record data for 11 tows on the FV *Alaska Knight* and 30 tows on the FV *Northwest Explorer*. To estimate missing net width values, the *mgcv* R package (Wood 2004) was used to relate mean net width with the inverse scope (m) and mean net height (m) from valid tows following the relationship investigated by Rose and Walters (1990), where w is the net width (m), h is the net height (m), s is the scope, and ϵ represents the modeled error

$$w \sim s^{-1} + h + \frac{h}{s} + \epsilon$$

$$\epsilon \sim N(0, \sigma^2).$$

Sampling Logistics and Stratification Scheme

Scientists boarded the chartered vessels in Dutch Harbor, Alaska, and transited to eastern Bristol Bay to begin sampling. From Bristol Bay, the survey proceeded westward, completing north-south columns of grid cells to the shelf edge (Fig. **1**). The east-to-west survey progression is based on an understanding of historical trends in fish movement and is intended to ensure the survey moves in the opposite direction of the seasonal on-shelf (eastward) migration patterns typical of yellowfin sole and other species. This strategy reduces the likelihood of encountering a portion of these populations multiple times (Nichol et al. 2019, Smith and Bakkala 1982). Both vessels started sampling on June 2, 2024. Sampling ended on August 5, 2024 for the FV *Northwest Explorer* and on July 30, 2024 for the FV *Alaska Knight*.

The survey footprint covered bathymetric depths ranging from 20 m to 200 m. For design-based index catch analysis, this footprint was separated into 12 strata by the 50 m and 100 m isobaths and a biogeographic boundary line running from the southwest to the northeast (Fig. **1**; Halliday and Sassano (1988)). The stratum boundaries correspond with different oceanographic domains and biological communities (Coachman 1986). This stratification scheme reflects some differences observed in Bering Sea groundfish distributions across the oceanographic domains and was designed to reduce the variances of population and biomass estimates (Bakkala 1993). Overall sampling density across the eastern Bering Sea shelf was one station per 1,409 km^2, and within-stratum sampling density ranged from one station per 1,077 km^2 (stratum 62) to one per 1,769 km^2 (stratum 32; Table **1**). For some analyses (e.g., abundance-at-length), strata were combined by depth-region, resulting in eight subareas: 10, 20, 30 (31+32), 40 (41+42+43), 50, 60 (61+62), 82, and 90 (Fig. **1**; Table **1**).

Table 1. -- Stratum areas and sampling densities used during the 2024 eastern Bering Sea shelf survey. Stratum area calculations were updated in 2022.

Stratum		Representative area (km²)	Stations in stratum	Stations successfully sampled	Sampling density (km²/stations successfully sampled)
Eastern Bering Sea Shelf					
Inner Shelf	10	78,706	58	58	1,357
(0-50 m)	20	41,193	31	31	1,329
Middle Shelf	31	94,978	69	69	1,376
(51-100 m)	32	8,847	5	5	1,769
	41	62,310	44	44	1,416
	42	24,122	18	18	1,340
	43	21,064	13	13	1,620
	82	17,954	12	12	1,496
Outer Shelf	50	38,039	26	26	1,463
(101-200 m)	61	87,777	60	60	1,463
	62	6,462	6	6	1,077
	90	11,539	8	8	1,442
Total		492,990	350	350	1,409

Catch Sampling Procedures

Standard catch sampling procedures used in these Bering Sea shelf surveys are described in detail by Wakabayashi et al. (1985) and Stauffer (2004). In summary, samples were collected by trawling near the center of each grid square for a target fishing time of 30 minutes at a speed of 1.54 m/sec (3 knots). If the center of the grid cell was not considered trawlable due to obstructions visible on the depth sounder or a known history of obstructions, the nearest trawlable site within the same grid square was used. Hauls that resulted in significant gear damage contained debris (e.g., derelict crab pots) or had visible changes in net mensuration data during the haul were redeployed to obtain a successful sample.

Catches estimated to be less than approximately 1,000 kg were fully sorted and enumerated, while larger catches were weighed in aggregate or volumetrically measured and subsampled before sorting. The goal of subsampling is to obtain a representative sample, which requires some variation in catch processing methods among hauls. After sorting subsampled catches, individual species present in low numbers were weighed and counted in aggregate, while species present in high numbers were weighed in aggregate, and further subsampled to obtain counts. These secondary subsample counts were extrapolated to the subsample weight for the species. All subsample weights and numbers were then expanded proportionally to the total catch. Fish and invertebrate species were sorted and identified to the lowest reliable taxonomic level.

All commercial crab species were typically sorted from the entire catch and weighed. Other select species, including Pacific halibut (*Hippoglossus stenolepis*), Greenland turbot (*Reinhardtius hippoglossoides*), rockfish (*Sebastes* spp.), Atka mackerel (*Pleurogrammus monopterygius*), prowfish (*Zaprora silenus*), Bering wolffish (*Anarhichas orientalis*), Pacific cod (*Gadus macrocephalus*), large skates, some sculpins, sharks, and any other large, rare species that were not represented in the subsample, were often completely sorted from the catch and weighed.

For all hauls, subsampling for length measurements was based on the fish species size range, targeting 100 specimens collected per species. For each fish in a length subsample, sex was determined and then the length (generally fork or total, depending on the species) was measured to the nearest 1.0 cm. For Pacific halibut on the FV *Northwest Explorer*, the first 10 fish were retained for biological sampling and all others were measured to fork length upon capture, then immediately released in an effort to reduce mortality. Pacific halibut weights were estimated using an International Pacific Halibut Commission (IPHC) length-weight regression (Webster and Stewart 2023).

Sagittal otoliths were collected from nine fish species (Table **2**). Otolith samples were collected following a random-by-haul sampling method. Otoliths were preserved in a glycerol-thymol solution for age determination by the Age and Growth Program of the AFSC's Resource Ecology and Fisheries Management (REFM) Division[6]. Weight and length were collected for each fish from which otoliths were taken. For walleye pollock, age structure sampling effort was further divided into low-density and high-density regions based on historical population densities and an isobath of approximately 70 m.

Stomachs were collected from nine fish species and preserved in 10% formalin for later analysis by laboratory diet analysis the Food Habits Lab of the AFSC's REFM Division[7] (Table **3**). Arrowtooth flounder and Kamchatka flounder (*Atheresthes* spp.) stomachs were collected together because they occupy a similar trophic niche in the Bering Sea (Yang and Livingston 1986).

Table 2. -- Otolith collection types and target counts during the 2024 eastern Bering Sea shelf survey.

Common name	Target collection number per haul
random-by-haul	
Arrowtooth flounder	3 individuals. Collect none when <10.
Flathead sole	3 individuals. Collect none when <10.
Greenland turbot	8 adults and 1 juvenile. Collect all when <8. Collect juveniles only when the juvenile code is used for lengthing.
Kamchatka flounder	8 individuals. Collect none when <10.
Northern rock sole	4 individuals. Collect none when <10.
Pacific halibut	10 individuals on the FV *Northwest Explorer*. Collect all when <10.
Pacific cod	4 adults and 1 juvenile. Collect all when <4. Collect juveniles only when the juvenile code is used for lengthing.
Walleye pollock	3 adults and 1 juvenile in low-density area, and 5 adults and 1 juvenile in high-density area. Collect none when <20. Collect juveniles only when the juvenile code is used for lengthing.
Yellowfin sole	3 individuals. Collect none when <10.

[6] https://www.fisheries.noaa.gov/alaska/science-data/age-and-growth-research-alaska

[7] https://www.fisheries.noaa.gov/alaska/science-data/resource-ecology-and-ecosystem-modeling

Table 3. -- Stomach collection target size category bins (cm) used to collect each fish species during the 2024 eastern Bering Sea shelf survey.

Common name	Target collection size categories per haul
Alaska skate	all sizes
Arrowtooth flounder	1-29; 30-49; 50+ cm
Arrowtooth flounder and Kamchatka flounder	1-29; 30-49; 50+ cm
Northern rock sole	all sizes
Pacific halibut	1-49; 50-69; 70+ cm only collected on the FV *Alaska Knight*
Pacific cod	1-29; 30-59; 60+ cm
Sablefish	1-54; 55+ cm
Walleye pollock	1-24; 25-39; 40-54; 55+ cm
Yellowfin sole	all sizes

Catch Data Analysis

The standard sampling procedures are described in detail by Wakabayashi et al. (1985) and Stauffer (2004). Some species were grouped by family for catch data analysis because of their limited commercial value or an inability to identify to lower taxonomic level while in the field.

Mean catch per unit effort (CPUE) for each species was calculated in kilograms per square kilometer (kg/km^2) and number of fish per square kilometer (no/km^2) for each stratum (Alverson and Pereyra 1969, Lauth and Kotwicki 2014). Area swept (km^2) was computed as the linear distance towed, multiplied by the mean net width (m; Alverson and Pereyra (1969); Lauth and Kotwicki (2014)). Mean CPUE was calculated for individual strata and summed proportionally for the overall survey area. Design-based biomass (t) and population (count) estimates were calculated for each stratum by multiplying the stratum mean CPUE by the stratum area. Stratum estimates were then summed for total survey area estimates.

For size composition estimates, the proportion of fish at each centimeter length interval (from subsamples at each station), weighted by CPUE (no/km^2), was expanded to the stratum population. Stratum abundance-at-length estimates were summed for the total estimated size composition for the survey area.

Age estimates were obtained from otolith samples by the AFSC's Age and Growth Program for all fish except for Pacific halibut, which were processed by the IPHC. The most current information about age, growth, and population analyses are presented in the 2024 NPFMC Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region[8].

Scientific Collections and Research Projects

Thirty-two scientific and research projects were conducted on the 2024 eastern Bering Sea shelf survey. Projects were selected through an annual request for proposals in January 2024 (Table **4**). Data for these projects were collected at sea and disseminated to the requesting principal investigator(s). For details about a project or collection, please contact the principal investigator(s) identified in Table **4**.

[8] https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation

Table 4. -- Non-core scientific collections and research projects undertaken during the 2024 eastern Bering Sea shelf survey, sorted by principal investigator and agency.

Project title	Principal investigator	Agency[1]
Population genetics and opportunistic age structure sampling of Pacific sleeper shark and salmon shark	Cindy Tribuzio	AFSC-ABL
Characterization of isotopic niche space of two co-occurring species, Pacific cod and walleye pollock	Matthew Rogers	AFSC-ABL
Pollock collection for FMA observer program	Adriana Myers	AFSC-FMA
Yellowfin sole collection for FMA observer program	Adriana Myers	AFSC-FMA
Crab training specimen collection	Gregory Stephens	AFSC-FMA
Blood and mucus collection for stress physiology research	Bianca Prohaska	AFSC-RACE
Fat-meter fish condition index in walleye pollock and Pacific cod	Bianca Prohaska	AFSC-RACE
Juvenile yellowfin sole essential fish habitat	Cynthia Yeung	AFSC-RACE
Juvenile snow crab live collections	Erin Fedewa	AFSC-RACE
Snow crab condition	Erin Fedewa	AFSC-RACE
Bristol bay red king crab tagging	Leah Zacher	AFSC-RACE
Collection of prowfish in the Bering Sea and Aleutian Islands	Melanie Paquin	AFSC-RACE
Shrimp condition and lipid biomarkers as a metric of ecosystem variability and groundfish prey resources in the Bering Sea	Michelle Stowell	AFSC-RACE
Feasibility of collecting eDNA concurrently with the bottom trawl survey	Ned Laman	AFSC-RACE
Specimen collection for outreach events	Nicole Charriere	AFSC-RACE
Experimental calibration of reducing tow time from 30 to 15 minutes in Bering Sea shelf surveys.	Rebecca Haehn	AFSC-RACE
Observer collection	Sarah Friedman	AFSC-RACE
Eastern Bering Sea slope test tows	Sean Rohan	AFSC-RACE
Observing fishing gear interactions using trawl cameras	Sean Rohan	AFSC-RACE
Pacific cod satellite tagging	Susanne McDermott	AFSC-RACE
Visual maturity collection	Susanne McDermott	AFSC-RACE
Live crab collection for ocean acidification	W. Christopher Long	AFSC-RACE
National weather service (NWS) voluntary observing ship (VOS) meteorological data collection	Emily Markowitz	AFSC-RACE & NWS-VOS
Arctic cod and saffron cod age and growth collection	Esther Goldstein	AFSC-REFM
Evaluation of seasonal and ontogenetic movement in Pacific cod and walleye pollock	Sara Schaal	AFSC-REFM
Spatial variation in body condition of juvenile Pacific cod in the eastern Bering Sea	Steven Barbeaux	AFSC-REFM
IPHC sampling on the AFSC bottom trawl surveys	Kayla Ualesi	IPHC
Collecting Pacific lamprey in Alaska waters during AFSC surveys	Laurie Weitkamp	NWFSC
NWFSC and UW vouchered specimen collection	Krista Nichols	NWFSC & UW
Crab for bycatch reduction project (pilot study)	Noelle Yochum	Trident Seafoods
Assessing genetic diversity and population structure of sand lance in the North Pacific Basin	Drikus Kuyper	UAF
Harmful algal bloom (HAB) toxins in Alaskan food webs	Gay Sheffield	UAF

[1]AFSC-FMA - Alaska Fisheries Science Center's Fisheries Monitoring & Assessment Division; IPHC - International Pacific Halibut Commission; NWFSC - Northwest Fisheries Science Center; AFSC-RACE - Alaska Fisheries Science Center's Resource Assessment & Conservation Engineering Division; AFSC-REFM - Alaska Fisheries Science Center's Resource Ecology & Fisheries Management Division; UAF - University of Alaska Fairbanks; UW - University of Washington; AFSC-ABL - Alaska Fisheries Science Center's Auke Bay Laboratories; NWS-VOS - National Weather Service Voluntary Observing Ship Program

Survey Modernization

Research is ongoing to support the transition of the eastern Bering Sea shelf survey to a more modern and comprehensive survey design. In conjunction with the survey, two trawling experiments were conducted in support of these modernization efforts. For the first experiment, vessels conducted side-by-side 30- and 15-minute tows with the standard survey gear (83-112 eastern otter trawl) to evaluate the effects of tow duration on catchability and selectivity. In the second experiment, vessels conducted side-by-side tows to compare the catchability and selectivity of trawl gear and protocols historically used on the eastern Bering Sea shelf and the eastern Bering Sea slope survey. The experiment also aimed to determine whether the shelf gear can be used to sample the upper continental slope from 200 to 400 m bottom depth. The objectives of these experiments and an overview of 2024 field sampling results are described below.

Evaluating effects of reduced tow duration on catchability and selectivity

The AFSC Groundfish Assessment Program and Shellfish Assessment Program are planning to reduce the survey's standard tow duration from 30 minutes to 15 minutes, as recommended by a 2012 Center for Independent Experts (CIE) review of the survey (Hall 2012). Reducing tow duration will improve both at-sea operations and the data products generated from the survey. Benefits include reducing the proportion of large, subsampled catches, mitigating potential subsampling errors and biases, reducing ergonomic injuries to survey scientists and vessel crew caused by processing large catches, and increasing time that can be allocated to additional research projects that support stock assessment and management needs (e.g., life history studies, environmental monitoring).

In 2024, tow duration comparison samples were targeted in areas with high densities of red king crab, snow crab, and Tanner crab to expand crab sample sizes from tow-duration experiments conducted in 1995 (Goddard 1997) and 1998 (Somerton et al. 2002, Somerton and Otto 1999), and samples conducted during recent surveys in 2021, 2022, and 2023. Vessels conducted pairs of side-by-side tows in which one vessel towed with the net on the bottom for 30 minutes and the other for 15 minutes. During the tows, vessels were positioned as close together as safely possible (typically within 0.5 nmi), deployed their gear at the same time, and towed in the same direction. Tows were conducted and catches were processed according to standard survey protocols (Stauffer 2004).

The 2024 survey successfully completed 38 pairs of 15- and 30-minute tows (76 total hauls across both vessels) that will be used to evaluate the effects of tow duration on catchability and selectivity (Fig. **5**). Data from the 2024 study will be combined with data from past tow duration experiments to evaluate whether there are differences in catch rates between 15- and 30-minute tows. Intercalibration factors (e.g., Miller (2013), Kotwicki et al. (2017), and Webster et al. (2020)) will be estimated for species that have differences in catchability or selectivity.

Combining fisheries-independent surveys of the eastern Bering Sea shelf and slope

The eastern Bering Sea continental slope survey historically collected data used for stock assessment and management of stocks that inhabit the continental slope (e.g., arrowtooth flounder, Kamchatka flounder, and Greenland turbot). Intended as a biennial survey beginning in 2002, the survey has not been conducted since 2016 because of logistical challenges and a lack of available funding. The cancellation of the survey has led to gaps in monitoring of slope-dwelling species.

To fill the coverage gap on the slope, the future design of the eastern Bering Sea shelf survey may include sampling on the upper continental slope. Therefore, it is necessary to determine whether the shelf survey gear can be successfully deployed on the upper continental slope and develop an operating model that can be used to simulate and evaluate potential survey designs. The objectives of this project (NPRB Project #2213) are to evaluate whether the shelf survey gear can be used to sample the upper continental slope (200–400 m bottom depth), to obtain information about catchability and selectivity relationships between eastern Bering Sea shelf and slope gear, and to support the operating model needed to support the exploration of survey designs.

In 2024, the eastern Bering Sea shelf survey completed 35 pairs (70 total hauls across both vessels) of successful side-by-side comparison tows between the shelf (83-112 and 1,800 lb. 6 × 9' V doors) and the slope bottom trawl gear (Poly Nor'Eastern with mudsweep gear footrope and 2,200 lb. 6' × 9' V doors (Fig. **6**). During the comparison tows, the FV *Alaska Knight* towed the Poly Nor'Eastern following eastern Bering Sea slope survey protocols (i.e., 2.5 knot target speed, trawl winches using autotrawl) and the FV *Northwest Explorer* towed the 83-112 following shelf survey protocol (3 knot target speed, trawl winches locked). Data from the 35 successful pairs of tows conducted in 2024 will supplement data from 5 pairs of successful tows conducted on the eastern Bering Sea slope in 2023 to yield a total sample size of 40 paired tows. Nearly all of the hauls (97.1%) attempted on the slope using the shelf gear were successful.

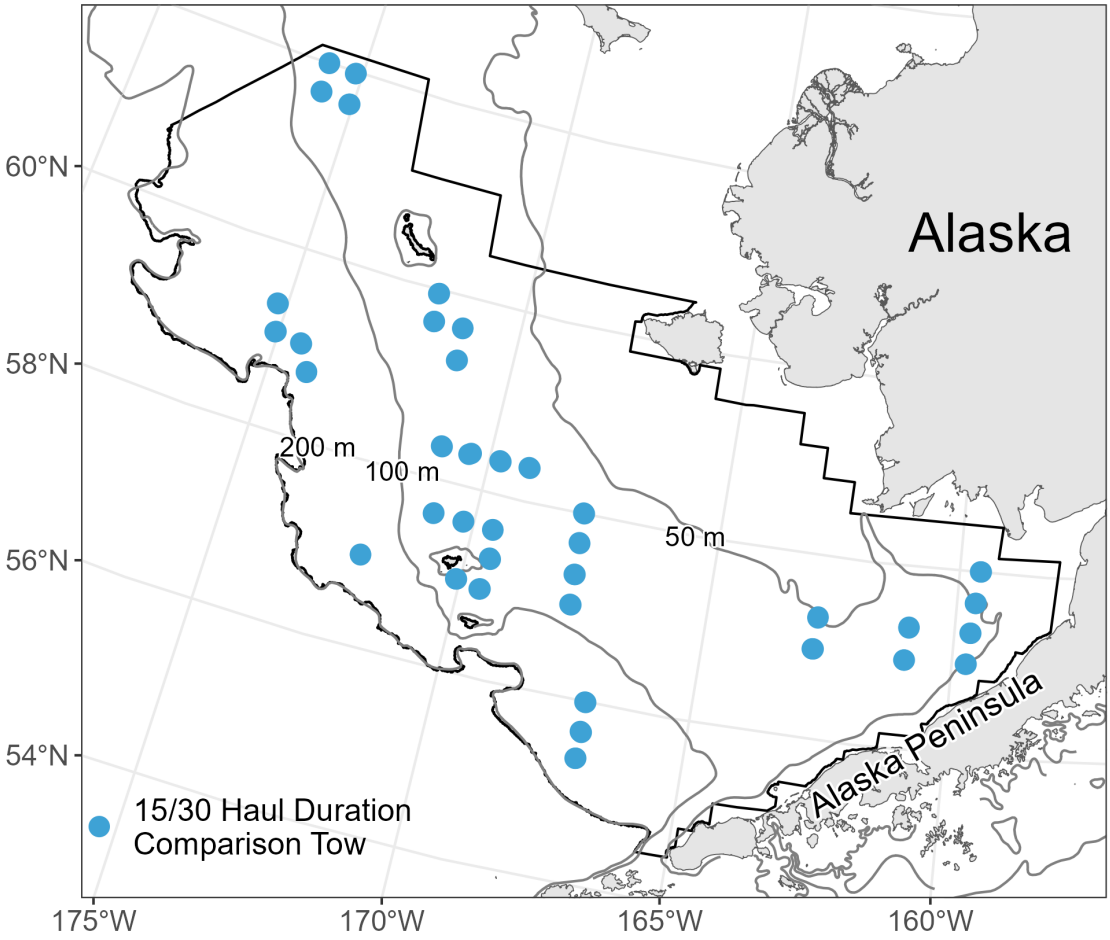

Figure 5. -- Locations of haul duration comparison tows in 2024. Each symbol denotes a pair of successful side-by-side 15-minute and 30-minute tows (n = 38).

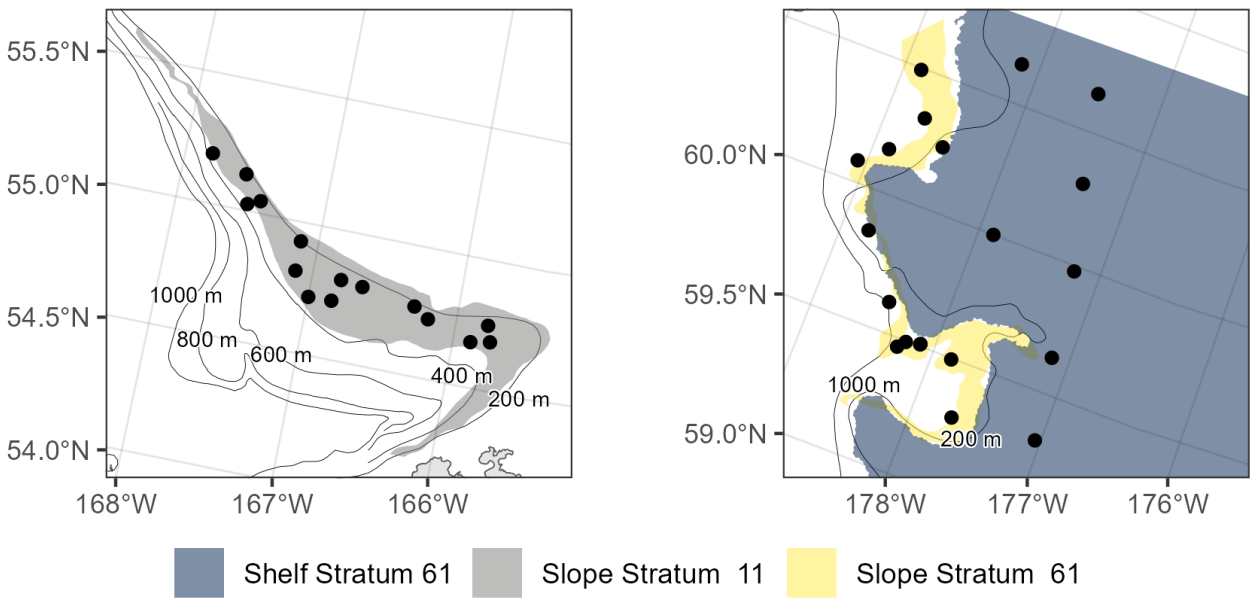

Figure 6. -- Locations of comparison tows between eastern Bering Sea shelf and eastern Bering Sea slope survey gears in 2024. Symbols denote a pair of successful side-by-side tows between the shelf survey gear (83-112 Eastern otter trawl deployed by the FV *Northwest Explorer*) and slope survey gear (Poly'noreastern with mudsweep footrope deployed by the FV *Alaska Knight*; n = 35). Shading denotes survey strata targeted for sampling (eastern Bering Sea slope stratum 11, eastern Bering Sea slope stratum 61, eastern Bering Sea shelf stratum 61).

Results and Discussion

Ocean Temperatures and the Cold Pool

Bottom (Figs. **7** and **8**) and surface (Figs. **9** and **10**) water temperatures varied spatially and among years due to variation in atmospheric and oceanic conditions that influence temperature patterns in the eastern Bering Sea (Stabeno et al. 2012). The warmest bottom temperatures were typically observed in the inner domain (< 50 m; Fig. **1**) along the Alaska mainland where the water column is fully mixed during summer, which allows solar heat transfer throughout the water column (Coachman 1986). The coldest bottom temperatures typically occurred in the middle domain (50–100 m) where strong two-layer stratification during the summer inhibits heat transfer to the bottom layer, which allows a seasonal 'cold pool' to persist from spring through the end of fall. Surface temperatures generally increased from the interior of Bristol Bay to the northwestern outer shelf and into Norton Sound. These surface temperature patterns reflect seasonal warming that occurs as the survey progresses from Bristol Bay, to the outer shelf, and into Norton Sound over the duration of the survey (Cokelet 2016, Rohan et al. 2022).

The mean bottom temperature on the eastern Bering Sea shelf was 2.5°C in 2024, which was equal to the time series average from 1982 to 2024 and 0.2°C warmer than 2023 (Fig. **11**). The near-average bottom temperatures observed from 2022 to 2024 are a continuing departure from recent warm years (2016–2021) that included four of the five warmest years in the 42-year time series. Over the history of the eastern Bering Sea shelf survey (1982–2024), annual mean summer bottom temperatures have ranged from 0.7°C

to 4.4°C and surface temperatures have ranged from 3.9°C to 9.5°C. The 2024 mean eastern Bering Sea shelf surface temperature (5.8°C) was colder than the times-series average surface temperature (6.7°C) and the mean surface temperature in 2023 (6.3°C).

The cold pool area is defined as the extent (km^2) of the eastern Bering Sea shelf survey area with bottom temperatures less than or equal to 2°C (Rohan et al. 2022). The size and location of the cold pool is primarily influenced by the extent of seasonal sea ice cover during the preceding winter and spring and the timing of sea ice retreat during spring (Stabeno and Bell 2019). The cold pool is primarily found in the middle domain (50–100 m), which is fully mixed during the winter and has two-layer stratification during the summer. Years of extensive sea ice that persists into spring have a larger cold pool that can extend into Bristol Bay and as far south as the Alaska Peninsula. Years with smaller sea ice extent result in smaller cold pools that are limited to the northern edge of the eastern Bering Sea shelf survey area. The cold pool area is strongly correlated ($r^2 = 0.94$) with mean bottom temperature on the shelf.

The cold pool covered 31.7% (156,800 km^2) of the eastern Bering Sea shelf survey area in 2024 and was entirely located north of 57.5°N (Figs. **8** and **12**). The cold pool was 12.7% (22,750 km^2) smaller than in 2023. The size of the cold pool was similar to other near-average temperature years (i.e., 2011, 2017, 2022, 2023) and smaller than the time series mean (36.6%; 180,406 km^2). The extent of isotherms for bottom temperatures ≤ 0°C (28,450 km^2) and ≤ -1°C (6,650 km^2) were 54.4% and 75.0% smaller than in 2023, respectively, which is more typical of the extent observed in warm years such as 2005, 2014, and 2016. Unlike previous near-average years, the 2024 cold pool did not have a continuous tongue extending east of 169°W in the middle domain along the inner front. During the 42-year time series, the cold pool area has ranged from a minimum of 6,150 km^2 in 2018 to a maximum of 385,975 km^2 in 1999, respectively, comprising 1.2% to 78.2% of the total eastern Bering Sea shelf survey area.

Interannual variation in bottom temperature and cold pool area influences the distribution (Kotwicki and Lauth 2013, Stevenson et al. 2022, Stevenson and Lauth 2019, Thorson et al. 2020), migration (Nichol et al. 2019), recruitment (Cooper et al. 2020), and biological productivity (Grüss et al. 2021) of fishes and crabs in the Bering Sea. The size of the cold pool also affects the availability of demersal species to bottom-trawl surveys by mediating migration between the eastern Bering Sea shelf, northern Bering Sea, western Bering Sea, and the deeper waters of the continental slope (O'Leary et al. 2022, Zador et al. 2011). Subarctic fish species tend to avoid areas with bottom temperatures below 0°C or 1°C, depending on the species (Baker 2021, Eisner et al. 2020), and cold temperatures may provide a habitat refuge for cold-adapted species (Fedewa et al. 2020).

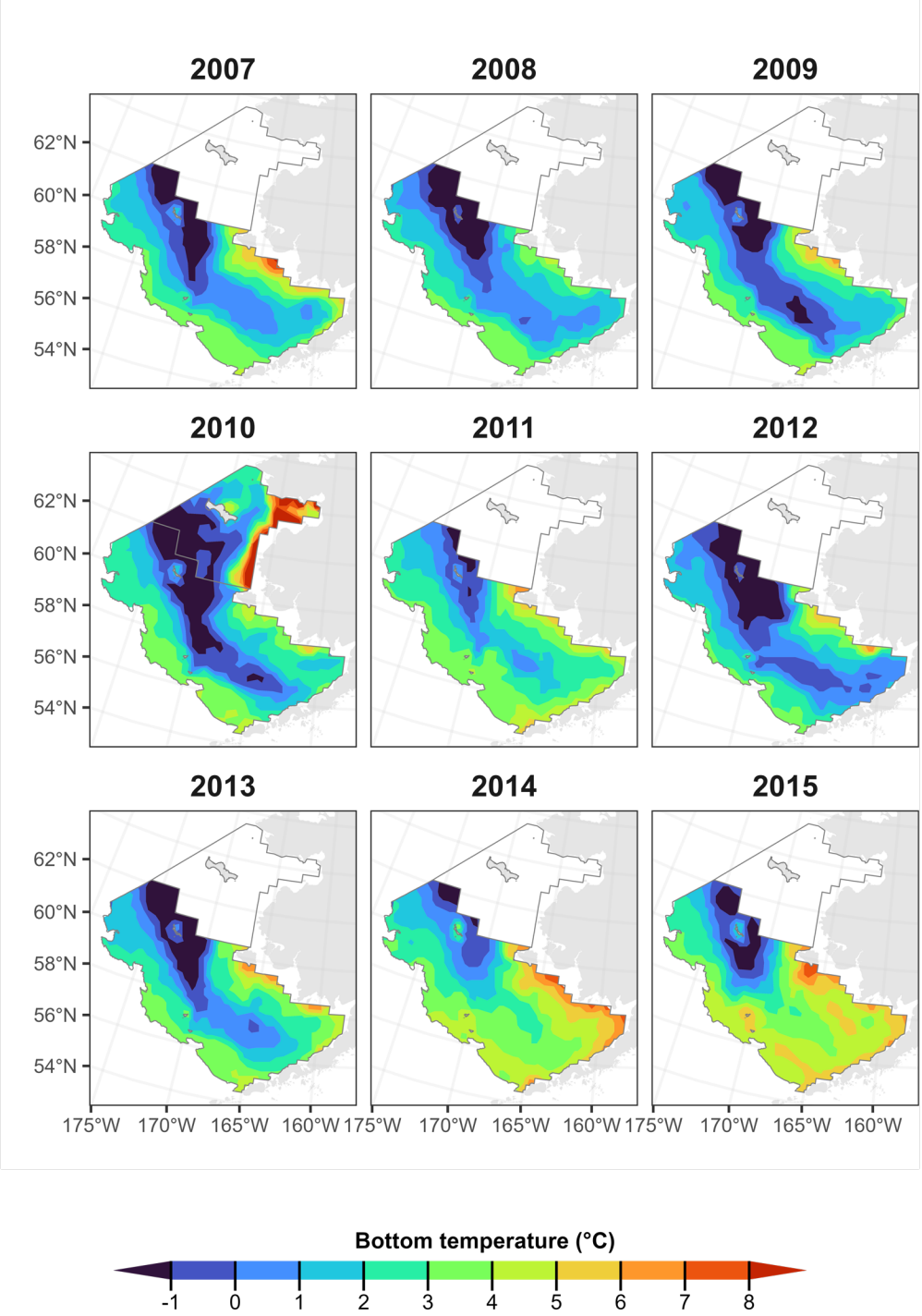

Figure 7. -- Bottom temperatures (°C) during the 2007-2015 eastern Bering Sea shelf survey.

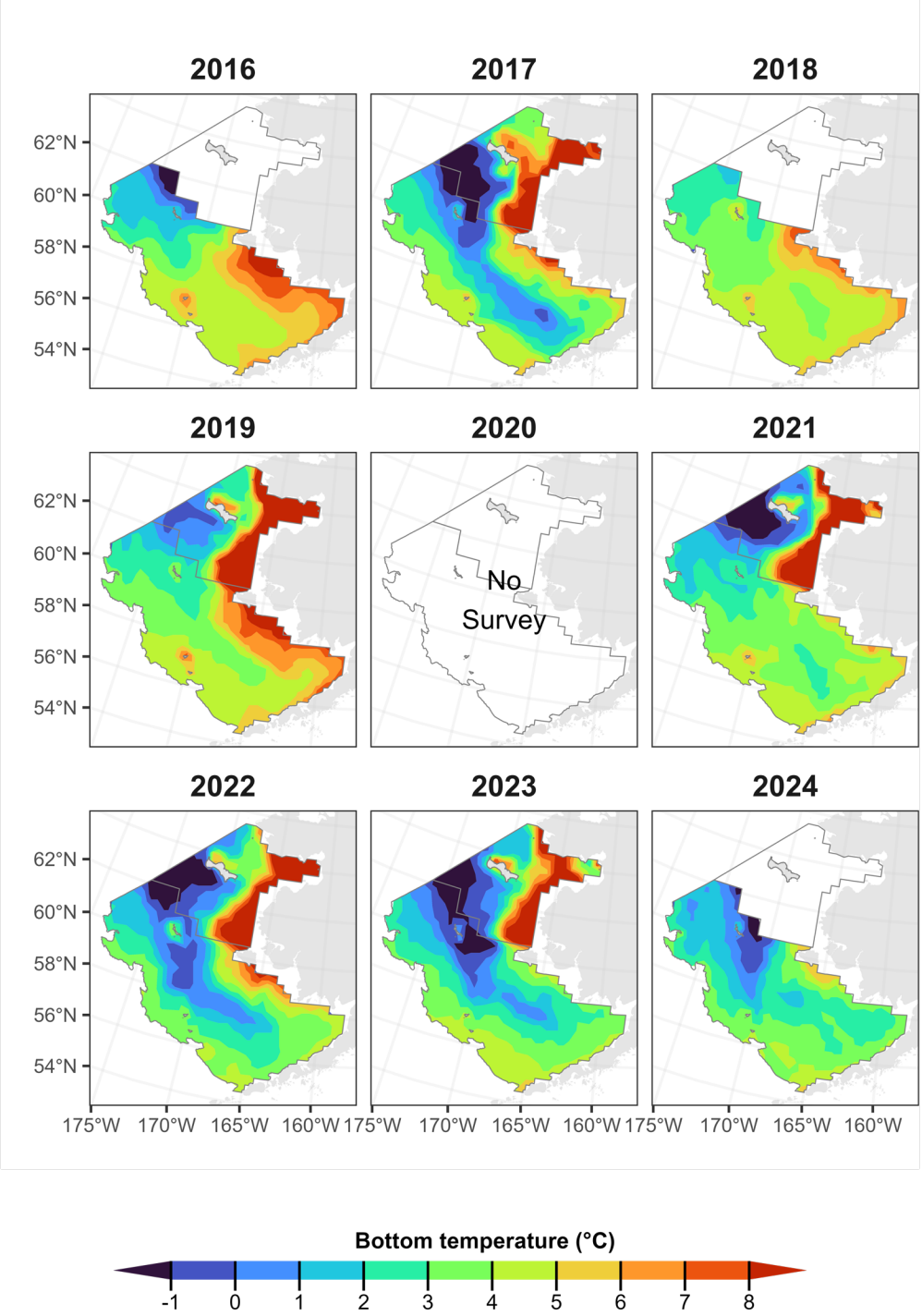

Figure 8. -- Bottom temperatures (°C) during the 2016-2024 eastern Bering Sea shelf survey.

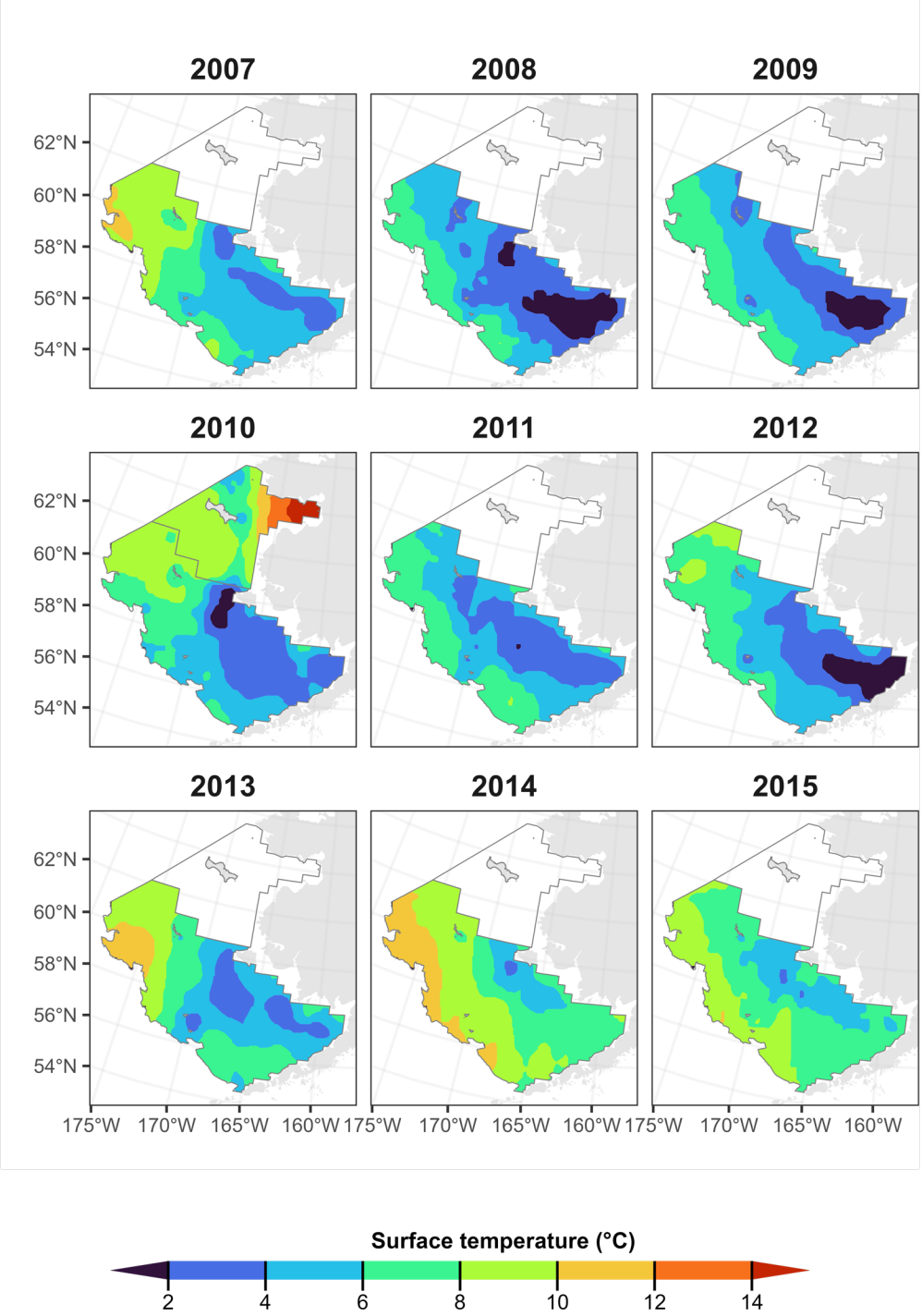

Figure 9. -- Surface temperatures (°C) during the 2007-2015 eastern Bering Sea shelf survey.

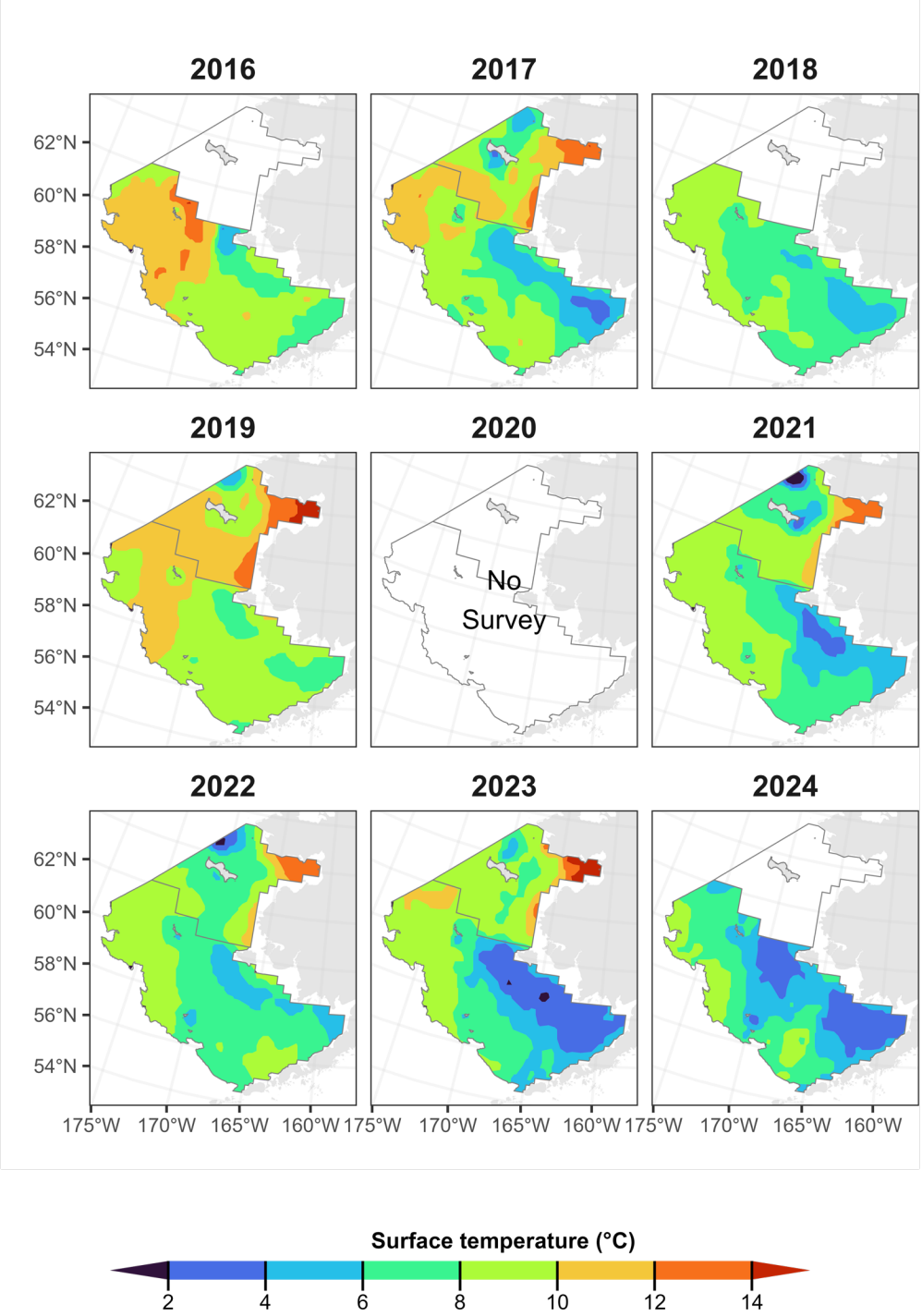

Figure 10. -- Surface temperatures (°C) during the 2016-2024 eastern Bering Sea shelf survey.

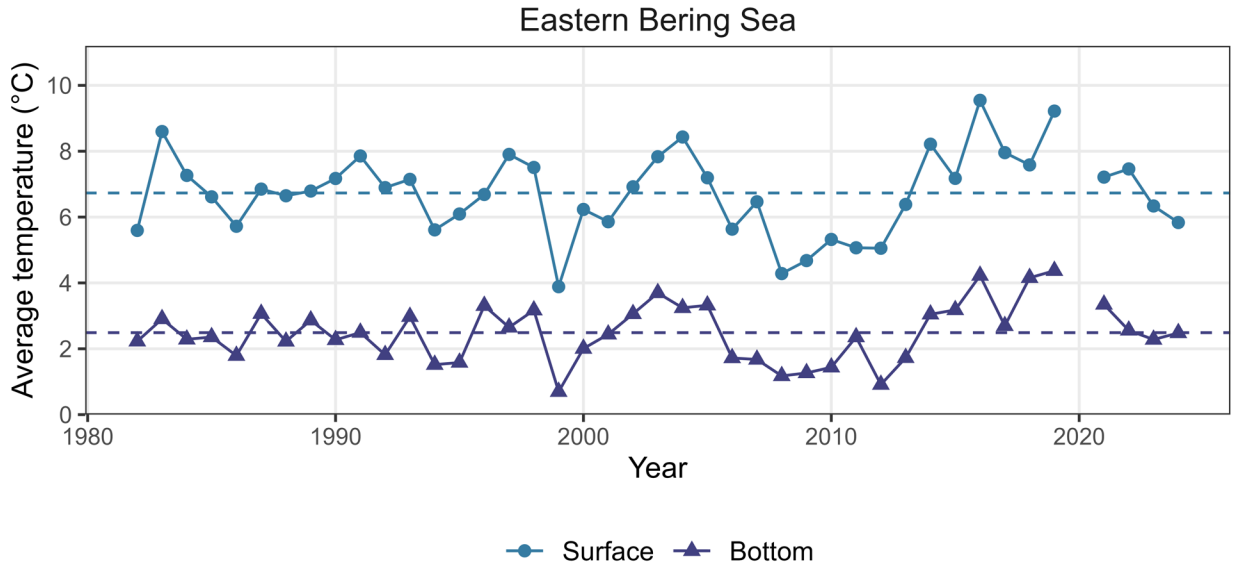

Figure 11. -- Average summer surface and bottom (points and solid lines), and time series average surface and bottom (dashed lines) temperatures (°C) on the eastern Bering Sea shelf, based on data collected during the eastern Bering Sea shelf survey from 1982 to 2024.

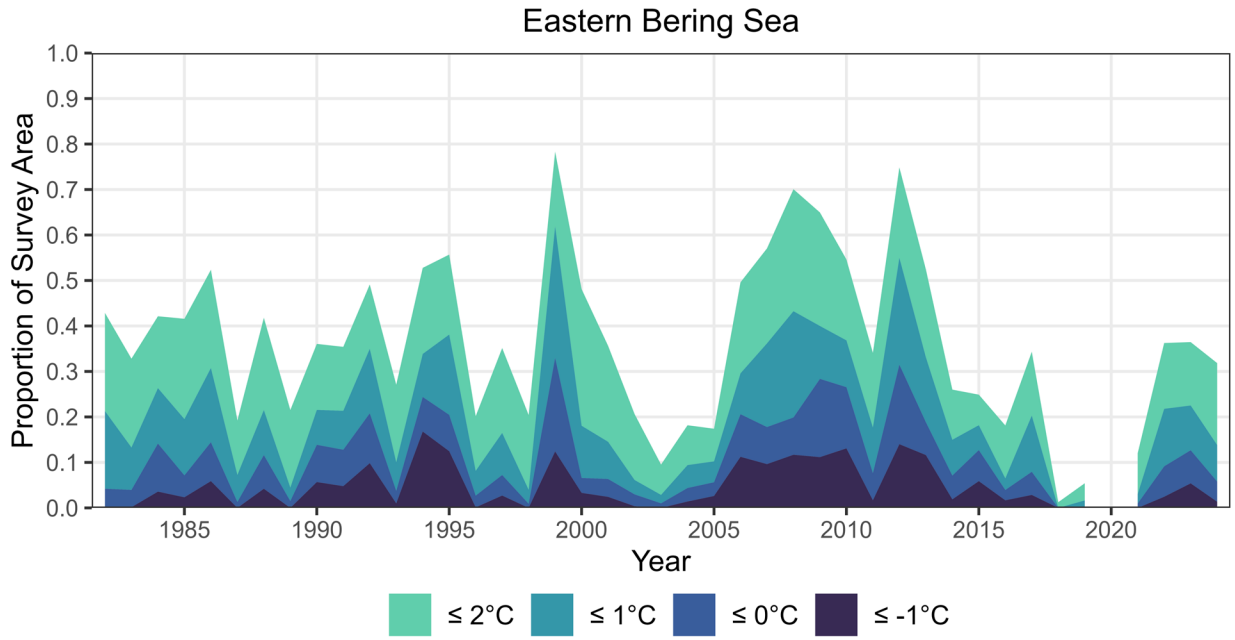

Figure 12. -- Annual extent of the summer cold pool on the eastern Bering Sea, based on observations from the eastern Bering Sea shelf survey. The extent of the cold pool is shown as a percentage of the total survey area. Shading denotes near-bottom temperatures ≤ 2°C, ≤ 1°C, ≤ 0°C, and ≤ -1°C.

Survey Data and Specimen Collections

Survey teams collected 125,263 length measurements, 6,070 otolith age structure samples, 4,917 stomach samples, 114 fat-meter condition samples, and six fish for satellite tagging during the 2024 eastern Bering Sea trawl survey (Table **5**). Other special collections are listed in Table **4**.

Table 5. -- Biological data collected during the 2024 eastern Bering Sea shelf survey.

Eastern Bering Sea	Length measurements	Otolith age structure samples	Stomach samples	Fat-meter condition samples	Satellite tags deployed
Alaska plaice	8,014	-	-	-	-
Alaska skate	3,171	-	426	-	-
Aleutian skate	50	-	-	-	-
Arctic cod	13	-	-	-	-
Arrowtooth flounder	7,846	429	-	-	-
Arrowtooth flounder and Kamchatka flounder	-	-	619	-	-
Bering flounder	1,402	-	-	-	-
Bering skate	190	-	-	-	-
Big skate	33	-	-	-	-
Bigmouth sculpin	130	-	-	-	-
Blackspotted rockfish	6	-	-	-	-
Butter sole	278	-	-	-	-
Butterfly sculpin	4	-	-	-	-
Chum salmon	1	-	-	-	-
Dover sole	9	-	-	-	-
Dusky rockfish	5	-	-	-	-
Flathead sole	14,322	594	-	-	-
Great sculpin	594	-	-	-	-
Greenland turbot	53	52	-	-	-
Hybrid starry flounder X Alaska plaice	4	-	-	-	-
Kamchatka flounder	1,133	255	-	-	-
Longhead dab	1,024	-	-	-	-
Longnose skate	1	-	-	-	-
Northern rock sole	17,619	755	648	-	-
Northern rockfish	10	-	-	-	-
Pacific cod	11,106	1,320	913	55	6
Pacific halibut	2,086	656	285	-	-
Pacific ocean perch	330	-	-	-	-
Plain sculpin	1,094	-	-	-	-
Prowfish	3	-	-	-	-
Rex sole	1,295	-	-	-	-
Rougheye rockfish	22	-	-	-	-
Sablefish	58	-	12	-	-
Saffron cod	4	-	-	-	-
Sakhalin sole	15	-	-	-	-
Sand sole	7	-	-	-	-

Eastern Bering Sea	Length measurements	Otolith age structure samples	Stomach samples	Fat-meter condition samples	Satellite tags deployed
Shorthorn sculpin	31	-	-	-	-
Southern rock sole	329	-	-	-	-
Spiny dogfish	1	-	-	-	-
Starry flounder	628	-	-	-	-
Walleye pollock	36,137	1,530	1,416	59	-
Whitebrow skate	1	-	-	-	-
Yellow Irish lord	531	-	-	-	-
Yellowfin sole	15,673	479	598	-	-
Total	**125,263**	**6,070**	**4,917**	**114**	**6**

Species Composition

A total of 92 fish taxa representing 25 families and 61 genera were identified during the 2024 eastern Bering Sea shelf survey (Appendix Table A **105**). Of these 92 taxa, 85 were identified to species level, while the remaining taxa were identified to the lowest taxonomic level (most often genus) by field scientists. Similarly, 215 different invertebrate taxa representing 11 phyla were identified on the 2024 survey; 121 taxa were identified to species level (Appendix Table A **106**). The lack of species-level identifications among invertebrates was due to a variety of factors that are outlined in Stevenson and Hoff (2009) and Stevenson et al. (2016).

Biomass, Abundance, and Catch per Unit Effort

The total biomass of demersal organisms in the eastern Bering Sea shelf was estimated at 15 million t and the proportion of fishes (79%; Table **6**) was higher than invertebrates (21%; Table **7**). The total estimated biomass increased from 11.8 million t in 2023 to 15 million t in 2024. Large increases in biomass were observed for snow crab (276.8%), Tanner crab (148.6%), worms (78.8%), walleye pollock (73.6%), and snailfishes (73.2%; Table **8**). Large decreases in biomass were observed for starry flounder (-29.7%), Pacific halibut (-26.5%), jellyfish (-20.3%), purple-orange sea star (-9.6%), and plain sculpin (-5.2%; Table **8**). While exhaustive efforts are made to standardize catch processing and data collection, variation in catchability may cause some differences in these results between years (Kotwicki and Ono 2019). The ten most-abundant fish taxa in the eastern Bering Sea shelf accounted for 16% of total mean fish and invertebrate CPUE and 21.1% of total mean fish CPUE.

Table 6. --Total taxon biomass estimates (t), ± 95% confidence limits (CL), and biomass estimates by stratum for fish taxa collected during the 2024 eastern Bering Sea shelf survey. The 'proportion' column represents the estimated taxon biomass divided by the total fish estimated biomass (11,857,370 t).

Taxon		Estimated fish biomass across survey		Estimated fish biomass by stratum											
		Biomass ± 95% CL	Proportion	10	20	31	32	41	42	43	50	61	62	82	90
Agonidae (poachers)		23,343 ± 6,928	0.0020	4,422	3,090	3,614	3,433	1,178	6,923	27	184	468	4	1	0
Cottidae (sculpins)		145,072 ± 42,413	0.0122	22,295	10,612	10,116	16,721	10,483	18,458	6,294	2,145	40,895	4,043	1,588	1,421
Cyclopteridae (lumpsuckers)		139 ± 210	<0.0001	0	0	0	0	0	0	0	0	139	0	0	0
Gadidae (cods)	Pacific cod	635,840 ± 72,842	0.0536	85,138	28,717	146,355	26,753	81,680	63,801	36,300	23,806	108,649	10,606	13,813	10,223
	walleye pollock	5,476,067 ± 1,043,195	0.4618	276,197	182,626	533,296	203,782	539,674	329,018	149,002	323,743	2,835,497	34,552	35,409	33,272
	other	29 ± 22	<0.0001	1	8	0	0	4	0	0	0	6	0	9	1
	total	6,111,936 ± 1,062,634	0.5155	361,335	211,351	679,650	230,535	621,358	392,819	185,303	347,549	2,944,152	45,157	49,231	43,496
Hexagrammidae (greenlings)		672 ± 874	<0.0001	178	2	478	0	0	0	13	0	0	0	0	0
Liparidae (snailfishes)		3,873 ± 2,700	0.0003	0	6	0	0	486	85	1,736	58	735	81	392	293
Osmeridae (smelts)		626 ± 222	<0.0001	308	8	58	0	4	0	0	245	0	0	3	0
Pleuronectidae (flatfishes)	Alaska plaice	349,579 ± 75,627	0.0295	96,646	78,765	83,638	2,711	66,851	6,471	1,760	0	1,779	0	10,958	0
	Bering flounder	10,370 ± 5,168	0.0009	0	59	0	0	2,471	1	296	0	89	45	6,495	913
	Kamchatka flounder	28,362 ± 5,693	0.0024	33	0	3,777	369	993	552	1,663	5,188	13,542	1,386	269	590
	Pacific halibut	125,145 ± 17,702	0.0106	36,164	22,993	31,002	2,823	5,005	7,748	1,224	7,675	8,505	217	1,720	68
	arrowtooth flounder	582,469 ± 110,727	0.0491	5,842	58	219,060	22,317	8,105	24,582	625	128,673	170,234	2,888	37	49
	flathead sole	723,996 ± 187,340	0.0611	22,759	859	156,272	9,937	19,610	63,751	5,163	49,847	388,267	3,101	2,711	1,717
	northern rock sole	1,439,739 ± 243,088	0.1214	731,101	120,119	320,089	35,204	33,532	189,804	7,234	78	1,955	57	552	15
	yellowfin sole	1,503,618 ± 255,179	0.1268	773,817	163,163	421,218	2,901	80,805	60,405	416	0	10	5	867	11
	other	146,694 ± 53,352	0.0124	49,189	6,743	37,127	35	7	0	4	20,052	33,532	0	5	0
	total	4,914,931 ± 505,685	0.4145	1,715,551	392,760	1,272,184	76,295	217,741	353,316	18,387	211,514	620,035	7,699	24,996	4,453
Rajidae (skates)	Alaska skate	407,133 ± 44,397	0.0343	78,831	49,843	61,199	11,272	34,449	29,361	7,471	35,998	78,404	5,737	8,202	6,367
	other	51,803 ± 21,351	0.0044	2,701	0	21,963	194	313	1,086	10	10,731	14,807	0	0	0
	total	458,936 ± 51,222	0.0387	81,532	49,843	83,161	11,465	34,762	30,446	7,480	46,729	93,211	5,737	8,202	6,367
Scorpaenidae (rockfishes)	Pacific ocean perch	50,664 ± 64,705	0.0043	0	0	19	0	0	0	0	1,624	49,019	0	0	2
	other	1,533 ± 1,744	0.0001	0	0	36	0	0	0	0	1,243	254	0	0	0
	total	52,197 ± 64,715	0.0044	0	0	55	0	0	0	0	2,867	49,273	0	0	2
Stichaeidae (pricklebacks)		15 ± 13	<0.0001	0	0	10	0	0	0	0	1	4	0	0	0
Zoarcidae (eelpouts)		72,078 ± 19,012	0.0061	31	21	9,267	7	6,725	916	4,952	212	35,613	4,418	3,726	6,190
Other fish		223,583 ± 55,111	0.0189	31,549	15,357	25,674	16,999	22,597	18,458	19,626	5,640	45,303	4,055	15,675	2,650
Total fish		**11,857,370 ± 1,244,239**	**1.0000**	**2,194,905**	**672,439**	**2,074,152**	**338,735**	**904,488**	**802,964**	**237,523**	**614,999**	**3,786,812**	**67,151**	**100,843**	**62,361**

Table 7. -- Total taxon biomass estimates (t), ± 95% confidence limits (CL), and biomass estimates by stratum for invertebrate taxa collected during the 2024 eastern Bering Sea shelf survey. The 'proportion' column represents the estimated taxon biomass divided by the total invertebrate estimated biomass (3,167,655 t).

Taxon		Estimated invertebrate biomass across survey		Estimated invertebrate biomass by stratum											
		Biomass ± 95% CL	Proportion	10	20	31	32	41	42	43	50	61	62	82	90
Ascidiacea		127,721 ± 55,777	0.0403	6,065	3,098	47,442	1,438	41,234	26,892	1,509	42	1	0	0	0
Coelenterata		217,150 ± 48,450	0.0686	6,834	948	44,465	5,106	25,028	46,593	14,784	20,615	39,508	1,822	8,265	3,182
Crustacea	shrimps	5,372 ± 2,529	0.0017	28	106	30	0	146	2	159	145	4,021	586	46	105
	other	1,058,229 ± 116,582	0.3341	41,864	18,653	241,087	17,770	262,065	196,937	89,711	29,994	125,670	9,859	15,801	8,818
	total	1,063,601 ± 116,571	0.3358	41,891	18,759	241,117	17,770	262,211	196,939	89,870	30,138	129,690	10,445	15,847	8,924
Echinodermata	Asteroidea (sea stars)	958,088 ± 157,401	0.3025	296,694	133,069	208,286	8,202	89,060	58,360	8,193	840	133,052	4,858	4,808	12,667
	Echinoidea (sea urchins)	36,485 ± 28,377	0.0115	41	0	6,962	510	134	1,434	3,355	19,945	3,975	88	0	41
	Holothuroidea (sea cucumbers)	23,652 ± 28,376	0.0075	809	0	3,540	13,864	1	2,083	3,305	22	27	0	0	0
	Ophiuroidea (brittle stars)	296,022 ± 84,152	0.0935	12,531	2,009	79,264	4,849	19,077	22,087	12,007	15,045	124,753	597	3,286	518
	total	1,314,247 ± 179,633	0.4149	310,075	135,077	298,053	27,425	108,271	83,964	26,860	35,851	261,807	5,543	8,093	13,227
Mollusca	Gastropoda (snails)	401,965 ± 72,565	0.1269	14,304	10,016	126,634	1,655	67,443	46,714	20,292	11,063	83,579	13,360	1,920	4,987
	Pelecypoda (bivalves)	15,771 ± 16,707	0.0050	9,257	201	4,417	67	290	234	74	361	843	13	8	5
	octopuses	2,236 ± 1,279	0.0007	0	0	88	0	18	0	40	524	1,482	83	0	0
	squids	138 ± 103	<0.0001	0	0	0	0	0	0	0	15	122	0	0	0
	total	420,109 ± 77,020	0.1326	23,561	10,217	131,138	1,723	67,751	46,948	20,407	11,963	86,025	13,457	1,928	4,992
Porifera (sponges)		13,101 ± 12,112	0.0041	161	202	11,531	95	139	12	87	253	585	35	0	0
Other invertebrates		11,726 ± 5,720	0.0037	573	15	629	1	872	289	651	34	8,396	171	79	17
Total invertebrates		**3,167,655 ± 264,805**	**1.0000**	**389,160**	**168,316**	**774,376**	**53,557**	**505,506**	**401,637**	**154,168**	**98,896**	**526,013**	**31,474**	**34,212**	**30,340**

Table 8. -- Total estimated biomass (t) and the percent change between the 2023 and 2024 eastern Bering Sea shelf surveys for predominant fish and invertebrate taxa. Taxa are listed in descending order of percent change from 2023 to 2024. Percent changes denoted with '-' indicate that fewer than 100 individuals were caught on the survey in 2023 or 2024.

Common name	2021	2022	2023	2024	Change (2024, 2023)
Snow crab	103,687	105,290	88,269	332,635	276.8%
Tanner crab	42,859	38,485	50,361	125,174	148.6%
Worms	8,600	8,559	6,600	11,799	78.8%
Walleye pollock	3,030,988	4,153,971	3,154,668	5,476,067	73.6%
Snailfishes	769	630	2,236	3,873	73.2%
Bering flounder	9,511	6,237	6,813	10,370	52.2%
Great sculpin	51,319	69,097	45,918	61,076	33.0%
Eelpouts	37,776	45,571	55,297	72,078	30.3%
Hermit crabs	381,438	460,462	372,306	480,841	29.2%
Arrowtooth flounder	457,569	521,615	462,575	582,469	25.9%
Flathead sole	674,745	703,375	594,851	723,996	21.7%
Pacific herring	67,886	228,447	54,795	66,282	21.0%
Clams	14,989	14,062	13,069	15,761	20.6%
Red king crab	38,259	46,605	45,356	52,101	14.9%
Kamchatka flounder	32,856	29,699	24,875	28,362	14.0%
Yellowfin sole	1,633,968	2,039,968	1,393,379	1,503,618	7.9%
Northern rock sole	1,041,169	1,294,581	1,380,684	1,439,739	4.3%
Sea urchins	22,086	39,107	31,116	31,368	0.8%
Basket sea stars	286,345	265,984	253,039	249,470	-1.4%
Alaska plaice	335,034	385,294	358,845	349,579	-2.6%
Alaska skate	468,113	463,017	418,483	407,133	-2.7%
Pacific cod	616,380	647,400	663,075	635,840	-4.1%
Plain sculpin	37,180	39,123	26,716	25,338	-5.2%
Purple-orange sea star	971,398	1,018,067	815,015	736,479	-9.6%
Jellyfish	74,120	126,347	146,492	116,757	-20.3%
Pacific halibut	131,864	149,064	170,238	125,145	-26.5%
Starry flounder	83,295	92,652	81,383	57,240	-29.7%
Arctic cod	-	51	1	19	-
Saffron cod	3	21	3	10	-
Shorthorn sculpin	2,180	560	546	1,330	-
Blue king crab	3,849	4,419	2,753	2,347	-
Greenland turbot	10,690	7,869	5,857	4,959	-
Prickleback	13	26	41	15	-

Summary of Results for Selected Fish and Invertebrate Fauna of the Eastern Bering Sea Shelf

Summary results for 39 abundant taxa caught during the eastern Bering Sea shelf surveys are presented below. Plots of biomass and abundance time series, spatial distribution, abundance-at-length estimates, and stratum-level CPUE (kg/km^2 and no/km^2) tables are provided for each taxon. The spatial distribution maps are presented as inverse-distance-weighted interpolations of CPUE (kg/km^2), which uses a weighted average of nearby measured stations to estimate values at unmeasured locations between stations. Similar interactive maps of these highlighted taxa and others are available through the NOAA Distribution Mapping and Analysis Portal[9]. More information on how to find, download, and interact with the data used to produce this report is available in the Data Sources section. Taxa are presented in alphabetical order by common name.

[9] https://apps-st.fisheries.noaa.gov/dismap/

Alaska Plaice (*Pleuronectes quadrituberculatus*)

Between 2023 and 2024, the estimated biomass of Alaska plaice decreased by 3% on the 2024 eastern Bering Sea Shelf survey (Tables **9** and **10**; Figs. **13** and **14**) and the population was estimated at 634 million individuals (Tables **9** and **11**; Fig. **13**).

Alaska plaice were primarily present throughout the inner and middle domain of the survey area (Fig. **14**). In 2024, the highest concentrations in the eastern Bering Sea were located southwest of Nunivak Island and along the Alaska Peninsula. The spatial distribution of the population in 2024 was similar to distributions in the previous two years. Length modes around 32 cm for males and 33 cm for females were observed in 2024 (Fig. **15**). Overall, the size and sex composition of Alaska plaice varies by depth in the eastern Bering Sea. While males are more prevalent in the shallower (0-50 m) inner domain and females more prevalent in the middle (50-100 m) and deeper (100-200 m) outer domains (Zhang et al. 1998), both sexes show average length increases with depth (Bakkala et al. 1985).

Table 9. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Alaska plaice (*Pleuronectes quadrituberculatus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	202 of 350 (57.7%)
Bottom Depth (m)	21 — 119
Bottom Temperature (°C)	-1.3 — 5.7
Surface Temperature (°C)	2 — 8.7
Population	634 million
Biomass (t)	349,579
Percent of Total Catch Biomass	2.3%
Percent Change in Biomass	3% decrease from 2023

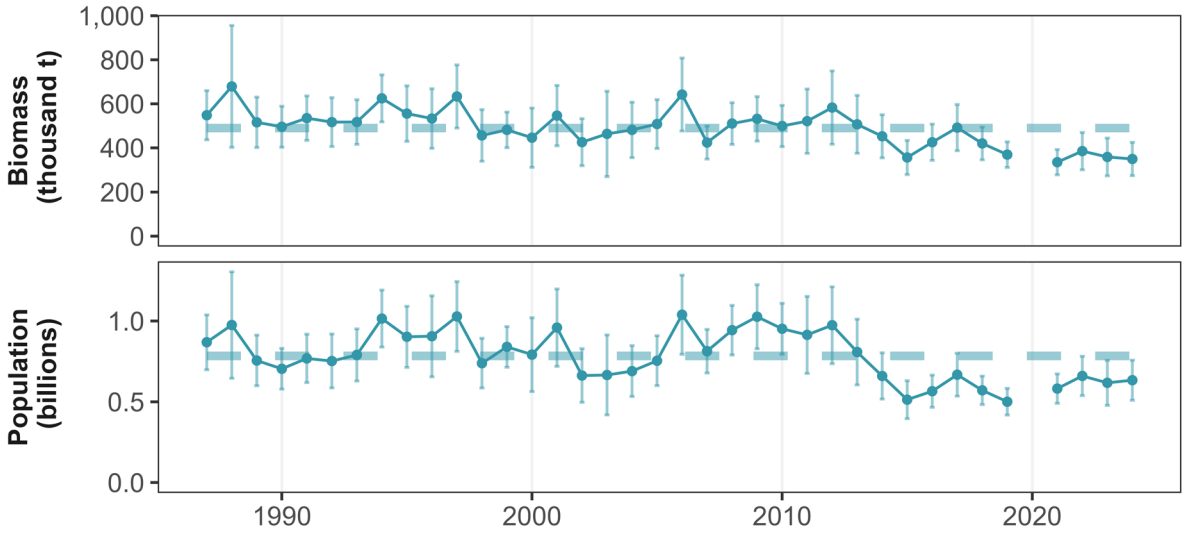

Figure 13. -- Time series of Alaska plaice (*Pleuronectes quadrituberculatus*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

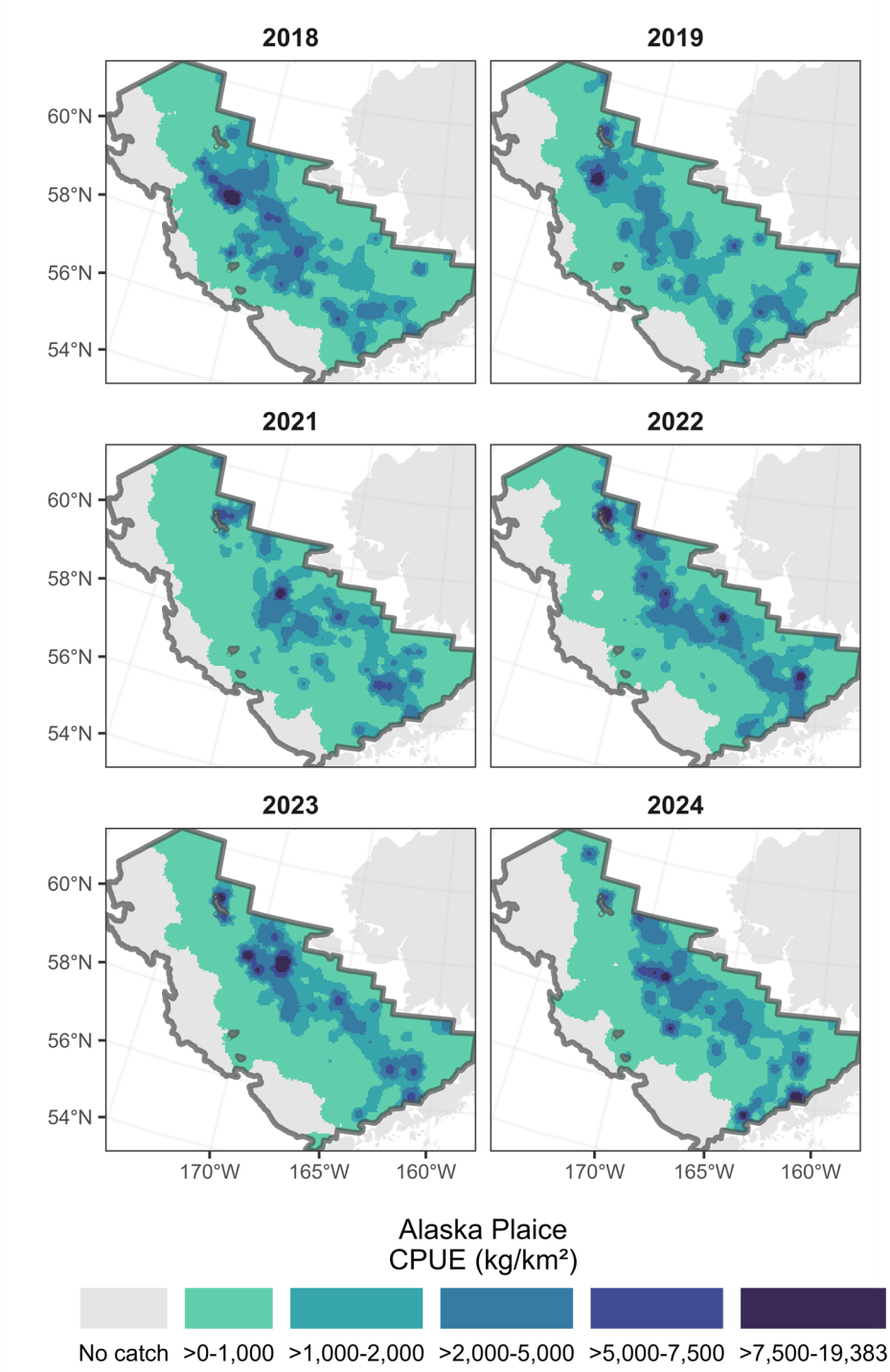

Figure 14. -- CPUE (kg/km^2) distribution of Alaska plaice (*Pleuronectes quadrituberculatus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

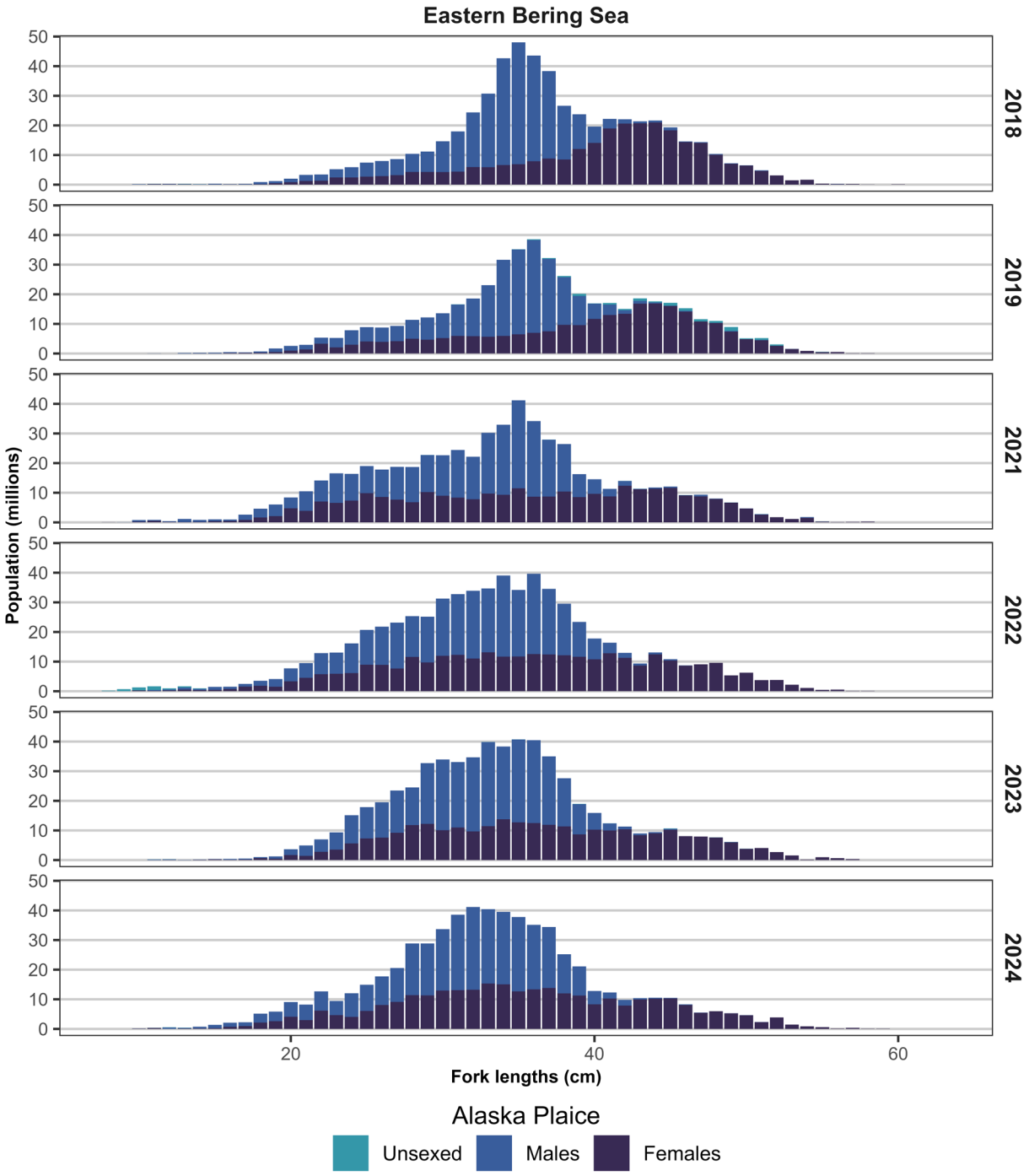

Figure 15. -- Total abundance-at-length estimates of Alaska plaice (*Pleuronectes quadrituberculatus*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 10. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (thousand t) with SD (t), 95% lower (LCL; thousand t) and upper (UCL; thousand t) confidence limits, and number of hauls in which Alaska plaice (*Pleuronectes quadrituberculatus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (Kt)	Biomass SD (t)	95% LCL (Kt)	95% UCL (Kt)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	1,227.94	233.73	96.65	18,396	59.85	133.44	57
20	1,912.09	354.60	78.77	14,607	49.55	107.98	31
31	880.60	219.86	83.64	20,882	41.87	125.40	45
32	306.47	255.79	2.71	2,263	0.00	7.24	3
41	1,072.88	301.19	66.85	18,767	29.32	104.39	33
42	268.27	131.31	6.47	3,168	0.14	12.81	10
43	83.55	39.34	1.76	829	0.10	3.42	10
50	-	-	-	-	-	-	-
61	20.27	13.15	1.78	1,154	0.00	4.09	5
62	-	-	-	-	-	-	-
82	610.32	474.76	10.96	8,524	0.00	28.00	8
90	-	-	-	-	-	-	-
Total	**709.10**	**76.70**	**349.58**	**37,813**	**273.95**	**425.21**	**202**

Table 11. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Alaska plaice (*Pleuronectes quadrituberculatus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	3,539.80	599.88	184,174.84	373,030.31	278,602.58	47,213.87	57
20	3,605.07	520.95	105,585.58	191,423.42	148,504.50	21,459.46	31
31	1,004.67	221.38	53,369.41	137,474.69	95,422.05	21,026.32	45
32	192.12	159.54	0.00	4,522.42	1,699.61	1,411.40	3
41	1,454.86	414.19	39,035.49	142,269.17	90,652.33	25,808.42	33
42	303.50	158.76	0.00	14,980.33	7,321.12	3,829.61	10
43	85.66	41.97	36.24	3,572.49	1,804.36	884.06	10
50	-	-	-	-	-	-	-
61	9.21	5.83	0.00	1,832.18	808.24	511.97	5
62	-	-	-	-	-	-	-
82	513.62	365.97	0.00	22,362.56	9,221.39	6,570.58	8
90	-	-	-	-	-	-	-
Total	**1,286.10**	**126.00**	**509,799.10**	**758,273.26**	**634,036.18**	**62,118.54**	**202**

Alaska Skate (*Arctoraja parmifera*)

Previous scientific name: *Bathyraja parmifera*

Between 2023 and 2024, the estimated biomass of Alaska skate decreased by 3% on the 2024 eastern Bering Sea Shelf survey (Tables **12** and **13**; Figs. **16** and **17**) and the population was estimated at 102.9 million individuals (Tables **12** and **14**; Fig. **16**).

Length modes at approximately 97 cm for males and 99 cm for females were observed in 2024 (Fig. **18**). The survey program adopted methods to reliably distinguish skates in 1999 (note truncated time series in Fig. **16**).

Table 12. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Alaska skate (*Arctoraja parmifera*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	338 of 350 (96.6%)
Bottom Depth (m)	21 — 192
Bottom Temperature (°C)	-1.6 — 5.7
Surface Temperature (°C)	2 — 8.9
Population	102.9 million
Biomass (t)	407,133
Percent of Total Catch Biomass	2.7%
Percent Change in Biomass	3% decrease from 2023

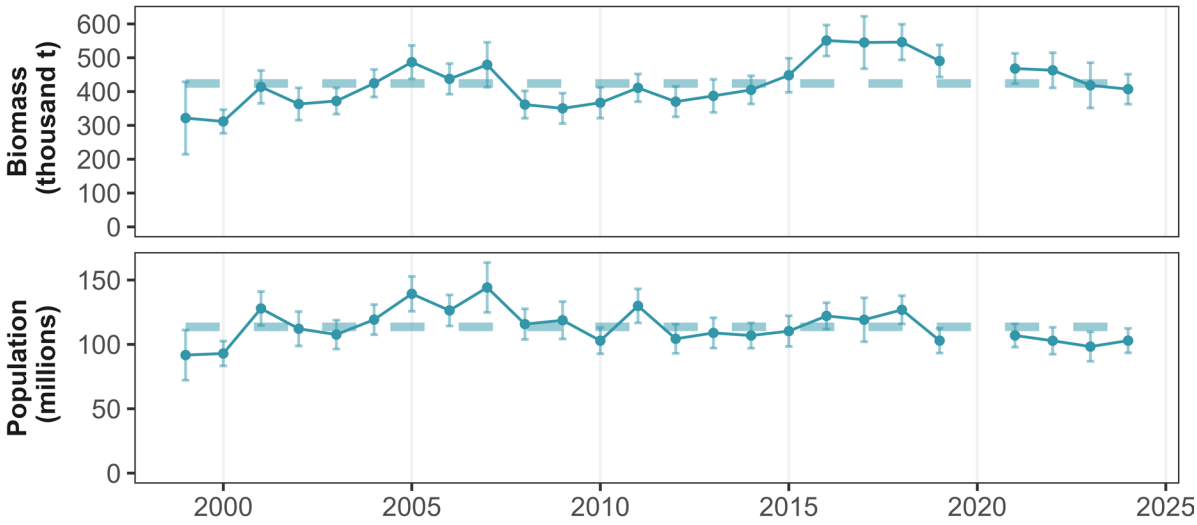

Figure 16. -- Time series of Alaska skate (*Arctoraja parmifera*) biomass (thousand t) and population (millions) from the 1999-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

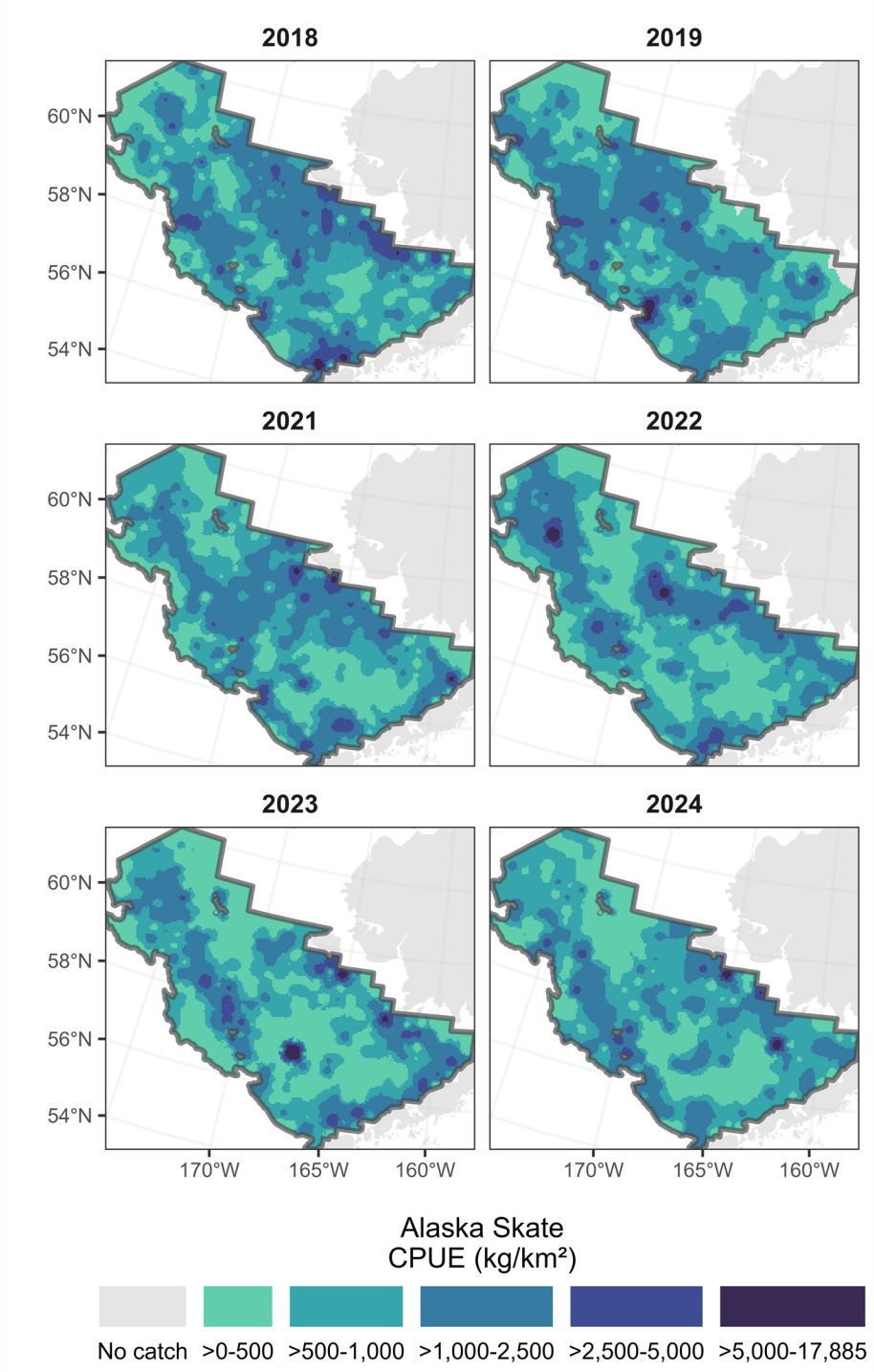

Figure 17. -- CPUE (kg/km^2) distribution of Alaska skate (*Arctoraja parmifera*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

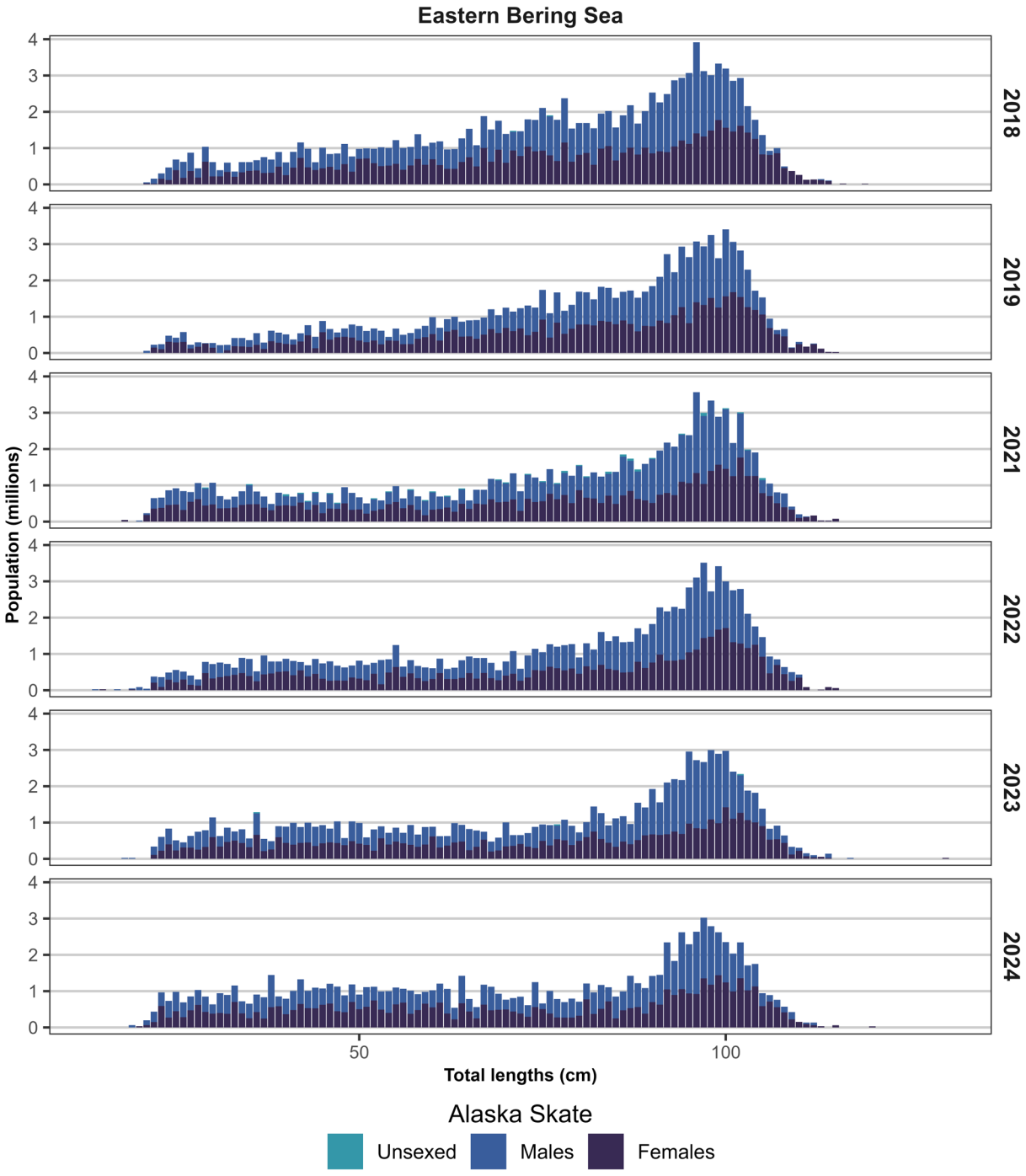

Figure 18. -- Total abundance-at-length estimates of Alaska skate (*Arctoraja parmifera*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 13. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (thousand t) with SD (t), 95% lower (LCL; thousand t) and upper (UCL; thousand t) confidence limits, and number of hauls in which Alaska skate (*Arctoraja parmifera*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (Kt)	Biomass SD (t)	95% LCL (Kt)	95% UCL (Kt)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	1,001.59	162.40	78.83	12,782	53.27	104.39	55
20	1,209.98	223.93	49.84	9,224	31.39	68.29	31
31	644.34	70.03	61.20	6,651	47.90	74.50	67
32	1,274.12	741.85	11.27	6,563	0.00	24.40	5
41	552.87	81.53	34.45	5,080	24.29	44.61	39
42	1,217.17	214.07	29.36	5,164	19.03	39.69	18
43	354.68	97.16	7.47	2,047	3.38	11.56	12
50	946.35	129.19	36.00	4,914	26.17	45.83	26
61	893.22	96.43	78.40	8,464	61.48	95.33	59
62	887.80	242.63	5.74	1,568	2.60	8.87	6
82	456.86	66.73	8.20	1,198	5.81	10.60	12
90	551.81	69.87	6.37	806	4.75	7.98	8
Total	**825.84**	**45.03**	**407.13**	**22,198**	**362.74**	**451.53**	**338**

Table 14. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (thousands), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which Alaska skate (*Arctoraja parmifera*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	216.35	36.46	11.29	22.77	17.03	2,869.50	55
20	270.96	36.48	8.16	14.17	11.16	1,502.72	31
31	212.15	20.32	16.29	24.01	20.15	1,929.92	67
32	235.80	122.94	0.00	4.26	2.09	1,087.64	5
41	173.42	23.26	7.91	13.70	10.81	1,449.60	39
42	260.98	33.41	4.68	7.91	6.30	805.80	18
43	138.89	31.84	1.58	4.27	2.93	670.65	12
50	136.79	16.40	3.96	6.45	5.20	623.94	26
61	233.43	19.26	17.11	23.87	20.49	1,690.98	59
62	275.38	62.07	0.98	2.58	1.78	401.05	6
82	141.59	19.14	1.85	3.23	2.54	343.72	12
90	213.57	47.53	1.37	3.56	2.46	548.40	8
Total	**208.79**	**9.61**	**93.46**	**112.40**	**102.93**	**4,735.89**	**338**

Arctic Cod (*Boreogadus saida*)

Between 2023 and 2024, the estimated biomass of Arctic cod increased to 19 t, extrapolated from 14 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **15** and **16**; Figs. **19** and **20**) and the population was estimated at 436,209 individuals (Tables **15** and **17**; Fig. **19**).

Table 15. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Arctic cod (*Boreogadus saida*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	8 of 350 (2.3%)
Bottom Depth (m)	21 — 135
Bottom Temperature (°C)	-1.6 — 4.9
Surface Temperature (°C)	3.1 — 7.2
Population	436,209
Biomass (t)	19
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Increased from 1 to 14 individuals in 2024

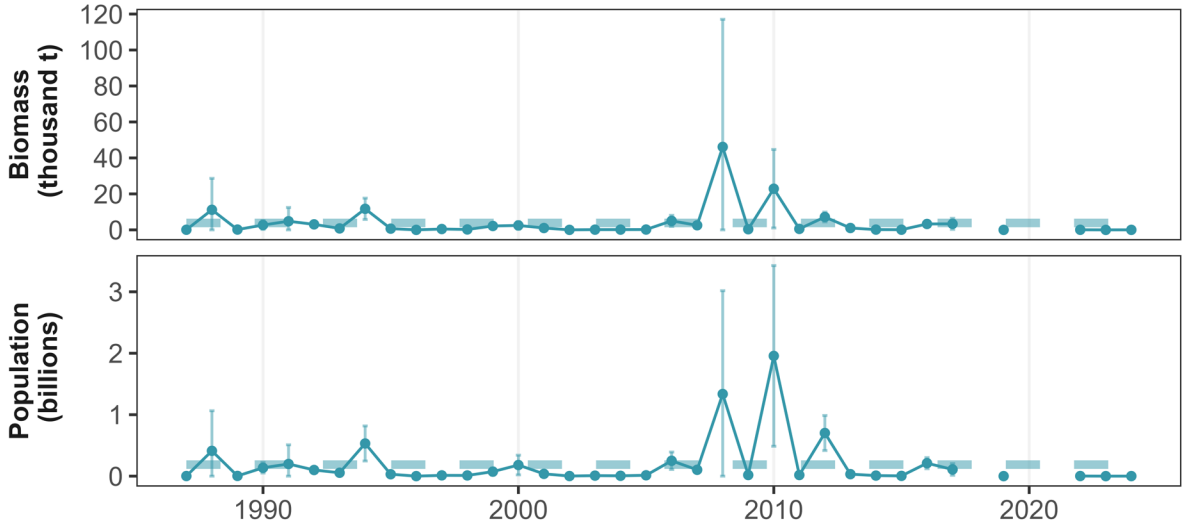

Figure 19. -- Time series of Arctic cod (*Boreogadus saida*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

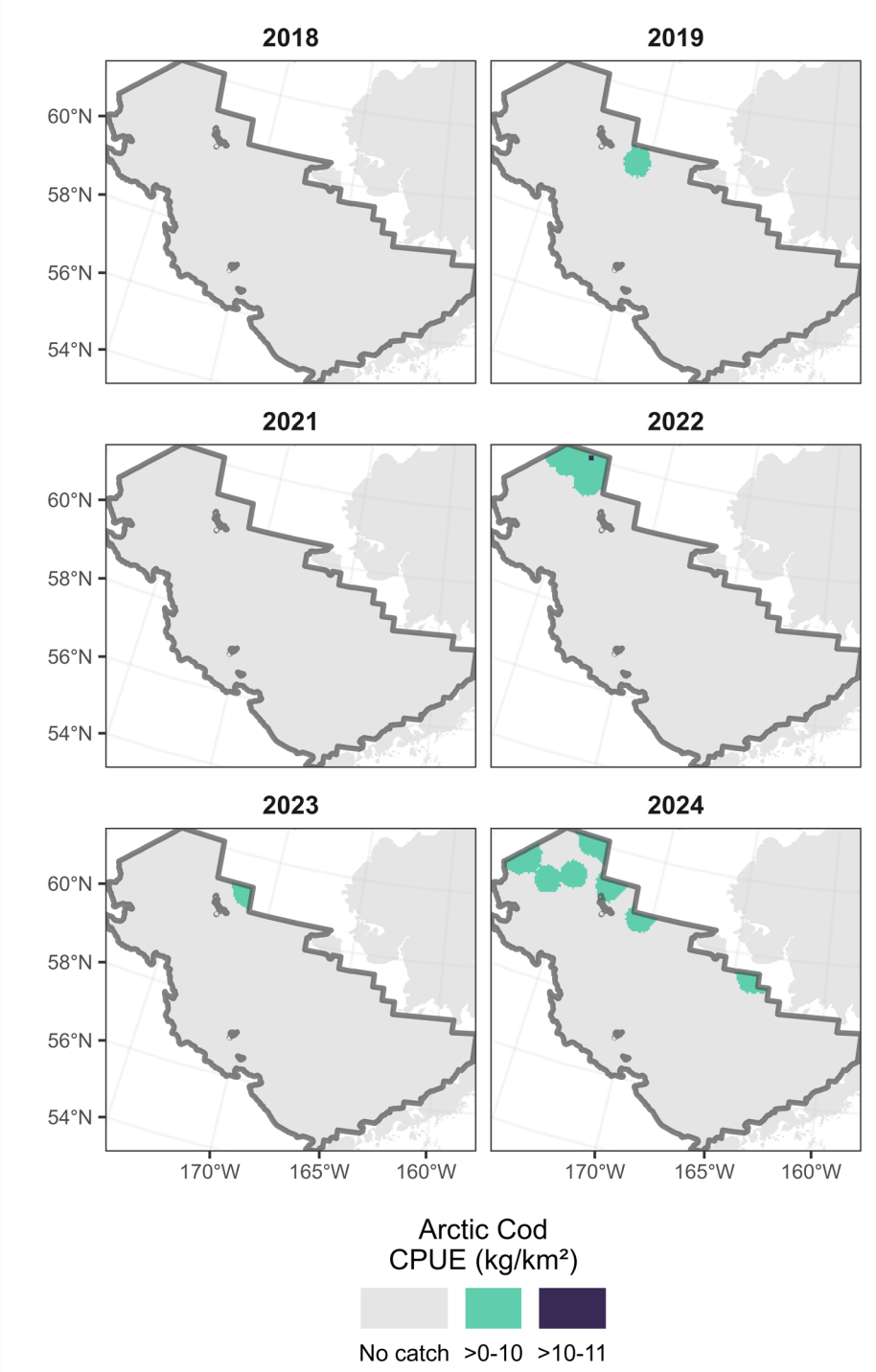

Figure 20. -- CPUE (kg/km^2) distribution of Arctic cod (*Boreogadus saida*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 16. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Arctic cod (*Boreogadus saida*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	0.01	0.01	0	0	0	1	1
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	0.04	0.03	3	2	0	7	2
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	0.07	0.07	6	6	0	18	1
62	-	-	-	-	-	-	-
82	0.48	0.29	9	5	0	19	3
90	0.08	0.08	1	1	0	3	1
Total	**0.04**	**0.02**	**19**	**8**	**2**	**35**	**8**

Table 17. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Arctic cod (*Boreogadus saida*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	0.45	0.45	0.00	106.88	35.63	35.63	1
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	1.40	1.04	0.00	216.87	87.13	64.87	2
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	0.35	0.35	0.00	91.07	30.36	30.36	1
62	-	-	-	-	-	-	-
82	14.11	8.33	0.00	552.61	253.38	149.61	3
90	2.58	2.58	0.00	89.14	29.71	29.71	1
Total	**0.88**	**0.35**	**91.73**	**780.69**	**436.21**	**172.24**	**8**

Arrowtooth Flounder (*Atheresthes stomias*)

Between 2023 and 2024, the estimated biomass of arrowtooth flounder increased by 26% on the 2024 eastern Bering Sea Shelf survey (Tables **18** and **19**; Figs. **21** and **22**) and the population was estimated at 926.4 million individuals (Tables **18** and **20**; Fig. **21**).

Arrowtooth flounder generally inhabit deeper waters as adults, but primarily occupy the shelf waters until age four. As individuals mature, they begin to recruit to the upper continental slope waters (Spies et al. 2018). Thus, the shelf survey estimates are not synoptically inclusive of the entire population. The majority of arrowtooth flounder the total estimated biomass occurs in the middle and outer domains (Fig. **22**). As with all previous years, females outnumbered males at a rate of approximately 2:1, with females attaining larger average sizes (Fig. **23**). This disparity in sex ratio has been attributed to sex-specific differences in natural mortality rates, but the issue requires further research (Spies et al. 2018, Zimmermann and Goddard 1996). The length mode for arrowtooth flounder was approximately 40 cm for females and 41 cm for males in the eastern Bering Sea, with a relative increase in the number of individuals detected below 20 cm and above 40 cm, compared to 2023 (Fig. **23**).

Arrowtooth flounder and Kamchatka flounder are congeners and can be difficult to distinguish in the field based on morphology (Yang 1988). However, since the survey program adopted methods to reliably distinguish between the two species in 1992 (note truncated time series in Fig. **21**), arrowtooth flounder and Kamchatka flounder are discussed separately in this report. Arrowtooth flounder and Kamchatka flounder typically occupy similar areas (Baker and Hollowed 2014). In 2024, arrowtooth flounder were mainly prevalent in the southern end of the eastern Bering Sea shelf survey area and northwestern edge of the outer domain, while Kamchatka flounder were most abundant along the northwestern edge (Fig. **22** and **45**). Arrowtooth flounder are much more abundant than Kamchatka flounder in the eastern Bering Sea shelf survey area.

Table 18. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for arrowtooth flounder (*Atheresthes stomias*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	206 of 350 (58.9%)
Bottom Depth (m)	45 — 192
Bottom Temperature (°C)	0.8 — 5.4
Surface Temperature (°C)	2.5 — 8.9
Population	926.4 million
Biomass (t)	582,469
Percent of Total Catch Biomass	3.9%
Percent Change in Biomass	26% increase from 2023

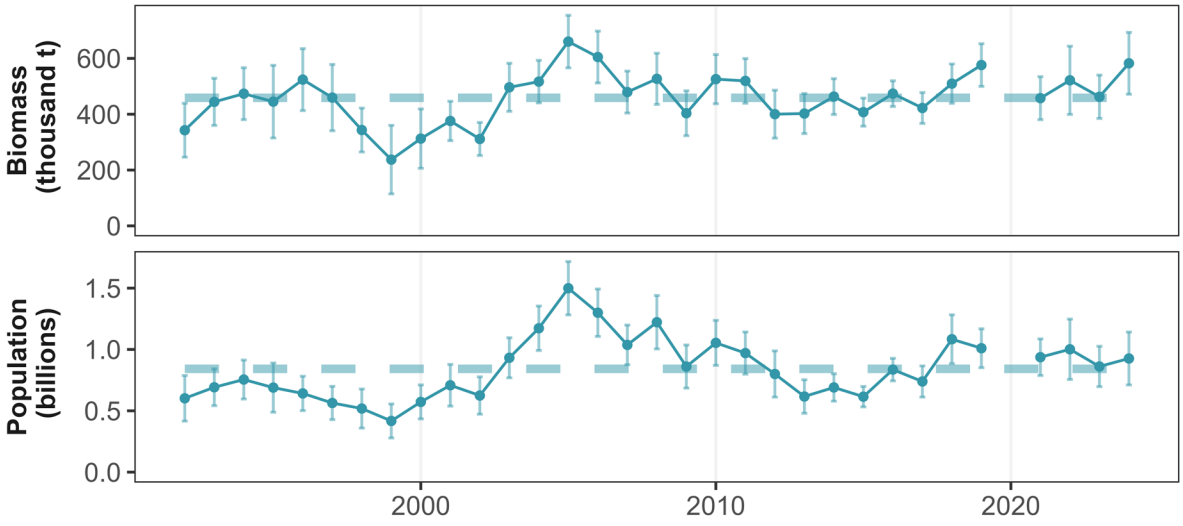

Figure 21. -- Time series of arrowtooth flounder (*Atheresthes stomias*) biomass (thousand t) and population (billions) from the 1992-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

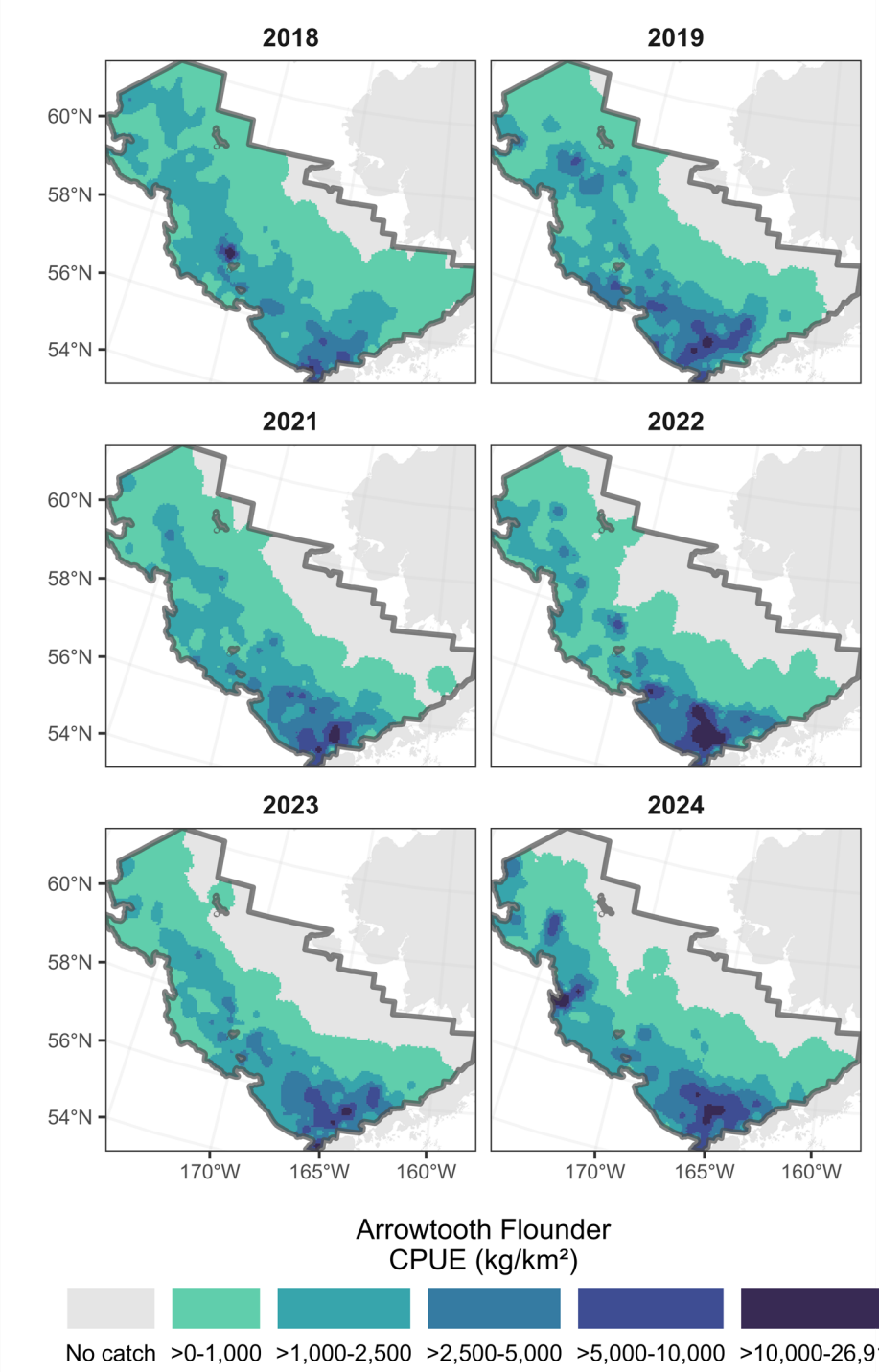

Figure 22. -- CPUE (kg/km^2) distribution of arrowtooth flounder (*Atheresthes stomias*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

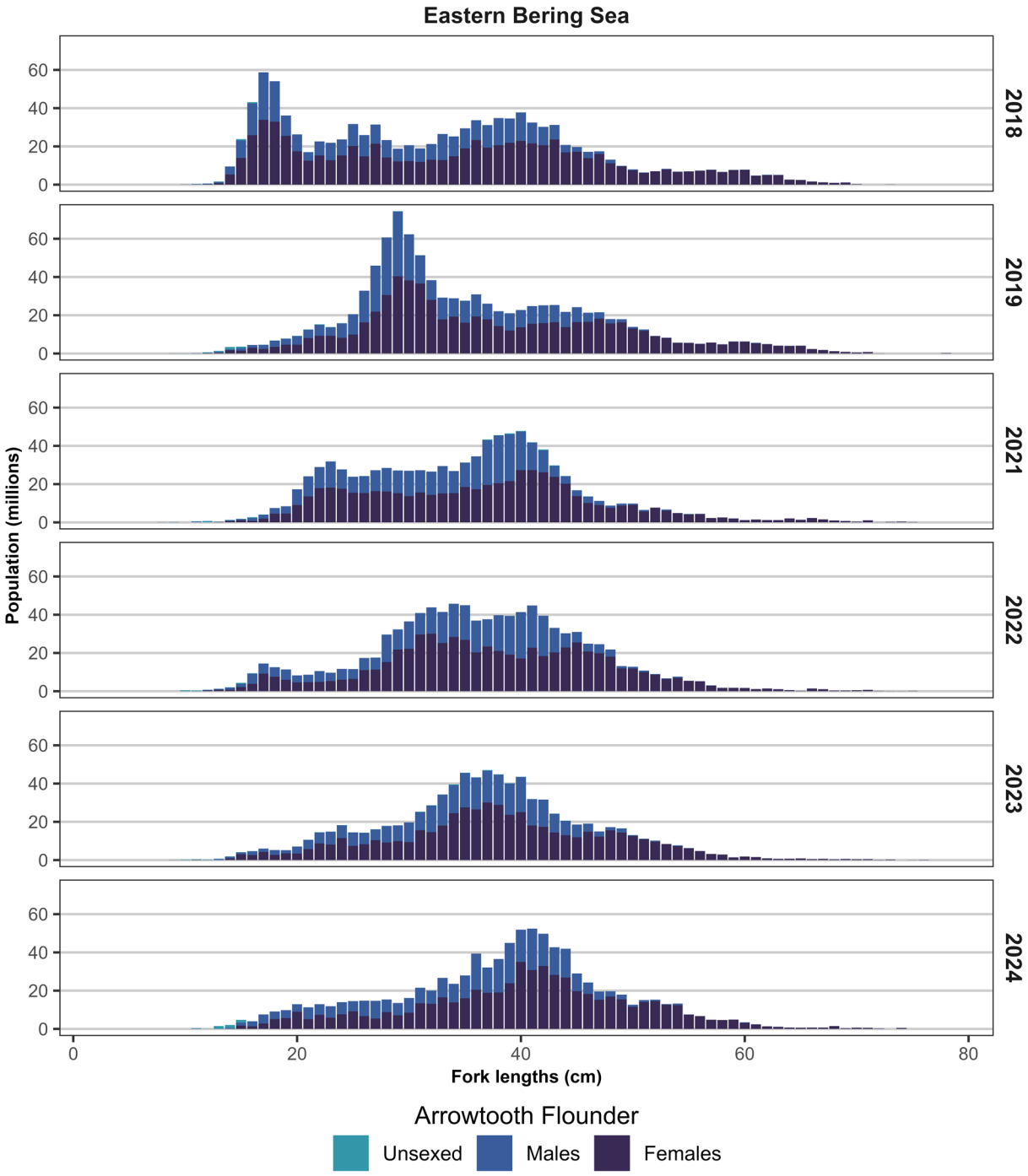

Figure 23. -- Total abundance-at-length estimates of arrowtooth flounder (*Atheresthes stomias*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 19. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which arrowtooth flounder (*Atheresthes stomias*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	74.23	41.22	5,842	3,244	0	12,330	11
20	1.41	1.40	58	58	0	173	2
31	2,306.42	365.60	219,060	34,724	149,613	288,508	65
32	2,522.59	722.10	22,317	6,388	9,540	35,093	5
41	130.07	62.08	8,105	3,869	368	15,842	11
42	1,019.08	305.82	24,582	7,377	9,829	39,336	17
43	29.65	23.54	625	496	0	1,616	4
50	3,382.66	495.19	128,673	18,837	90,999	166,346	26
61	1,939.39	423.24	170,234	37,151	95,932	244,536	57
62	447.01	283.74	2,888	1,833	0	6,555	6
82	2.04	2.04	37	37	0	110	1
90	4.23	4.23	49	49	0	146	1
Total	**1,181.50**	**112.30**	**582,469**	**55,363**	**471,742**	**693,195**	**206**

Table 20. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which arrowtooth flounder (*Atheresthes stomias*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	120.11	77.66	0.00	21,677.90	9,453.55	6,112.18	11
20	2.87	2.24	0.00	302.81	118.07	92.37	2
31	3,674.57	641.95	227,061.36	470,948.72	349,005.04	60,971.84	65
32	4,588.92	1,839.28	8,053.77	73,140.12	40,596.95	16,271.59	5
41	144.96	76.31	0.00	18,542.85	9,032.62	4,755.12	11
42	1,370.40	380.73	14,688.91	51,425.07	33,056.99	9,184.04	17
43	24.48	17.79	0.00	1,264.88	515.64	374.62	4
50	5,857.56	830.03	159,668.31	285,962.06	222,815.18	31,573.44	26
61	2,948.09	919.77	97,304.96	420,244.42	258,774.69	80,734.86	57
62	457.15	306.25	0.00	6,911.54	2,953.87	1,978.84	6
82	1.75	1.75	0.00	94.08	31.36	31.36	1
90	5.31	5.31	0.00	183.99	61.33	61.33	1
Total	**1,879.18**	**218.90**	**710,584.64**	**1,142,245.91**	**926,415.27**	**107,915.32**	**206**

Bering Flounder (*Hippoglossoides robustus*)

Between 2023 and 2024, the estimated biomass of Bering flounder increased by 52% on the 2024 eastern Bering Sea Shelf survey (Tables **21** and **22**; Figs. **24** and **25**) and the population was estimated at 48.9 million individuals (Tables **21** and **23**; Fig. **24**).

In 2024, the distribution of Bering flounder in the eastern Bering Sea was similar to 2023, with all specimens found north of 56°N latitude and west of Nunivak Island in both the middle and inner domains. The highest densities occurred northwest of St. Matthew Island (Fig. **25**) in the northernmost portion of the eastern Bering Sea. The 2024 size distribution indicated a higher proportion of juvenile Bering flounder biomass in the eastern Bering Sea compared to 2023. Length modes were 23 cm for males and 30 cm for females. More individuals larger than 30 cm were observed in 2024 than in 2023 (Fig. **26**).

Bering flounder and flathead sole are congeners and can be difficult to distinguish in the field based on morphology. Consequently, the accuracy of their identification in commercial fishery data is unknown and the two species are combined into a single stock assessment by the NPFMC (Kapur 2023). However, since the survey program has methods to reliably distinguish between the two species, flathead sole and Bering flounder are discussed separately in this report. Despite many similarities, the two species have differing geographic distributions and environmental associations (Figs. **25** and **37**). Bering flounder tend to occupy arctic regions and shallow waters, while flathead sole are more subarctic/boreal and found in deeper waters (Baker and Hollowed 2014).

Table 21. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Bering flounder (*Hippoglossoides robustus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	65 of 350 (18.6%)
Bottom Depth (m)	43 — 142
Bottom Temperature (°C)	-1.6 — 2.6
Surface Temperature (°C)	2 — 7.7
Population	48.9 million
Biomass (t)	10,370
Percent of Total Catch Biomass	0.1%
Percent Change in Biomass	52% increase from 2023

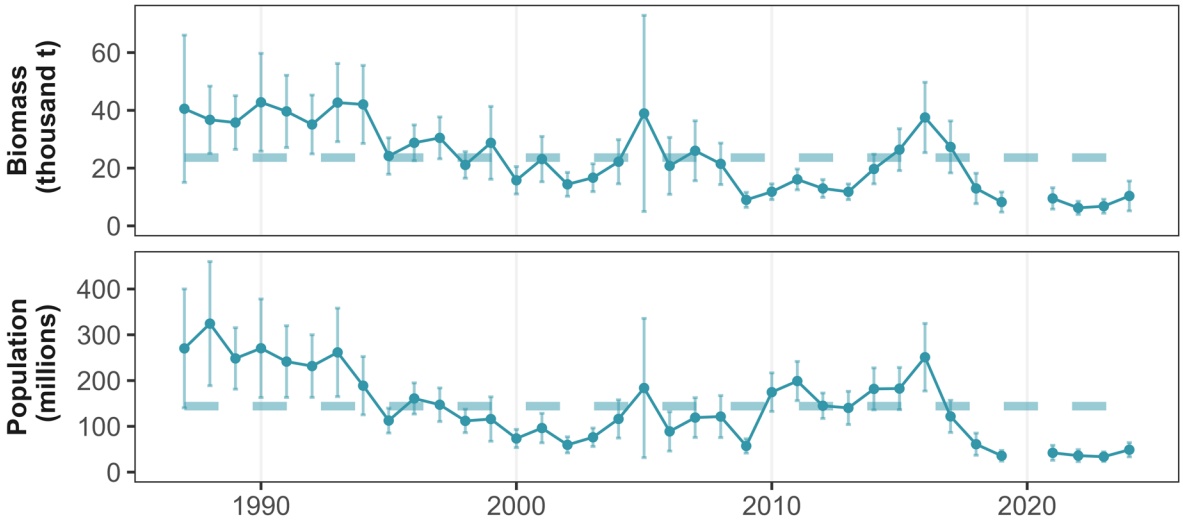

Figure 24. -- Time series of Bering flounder (*Hippoglossoides robustus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

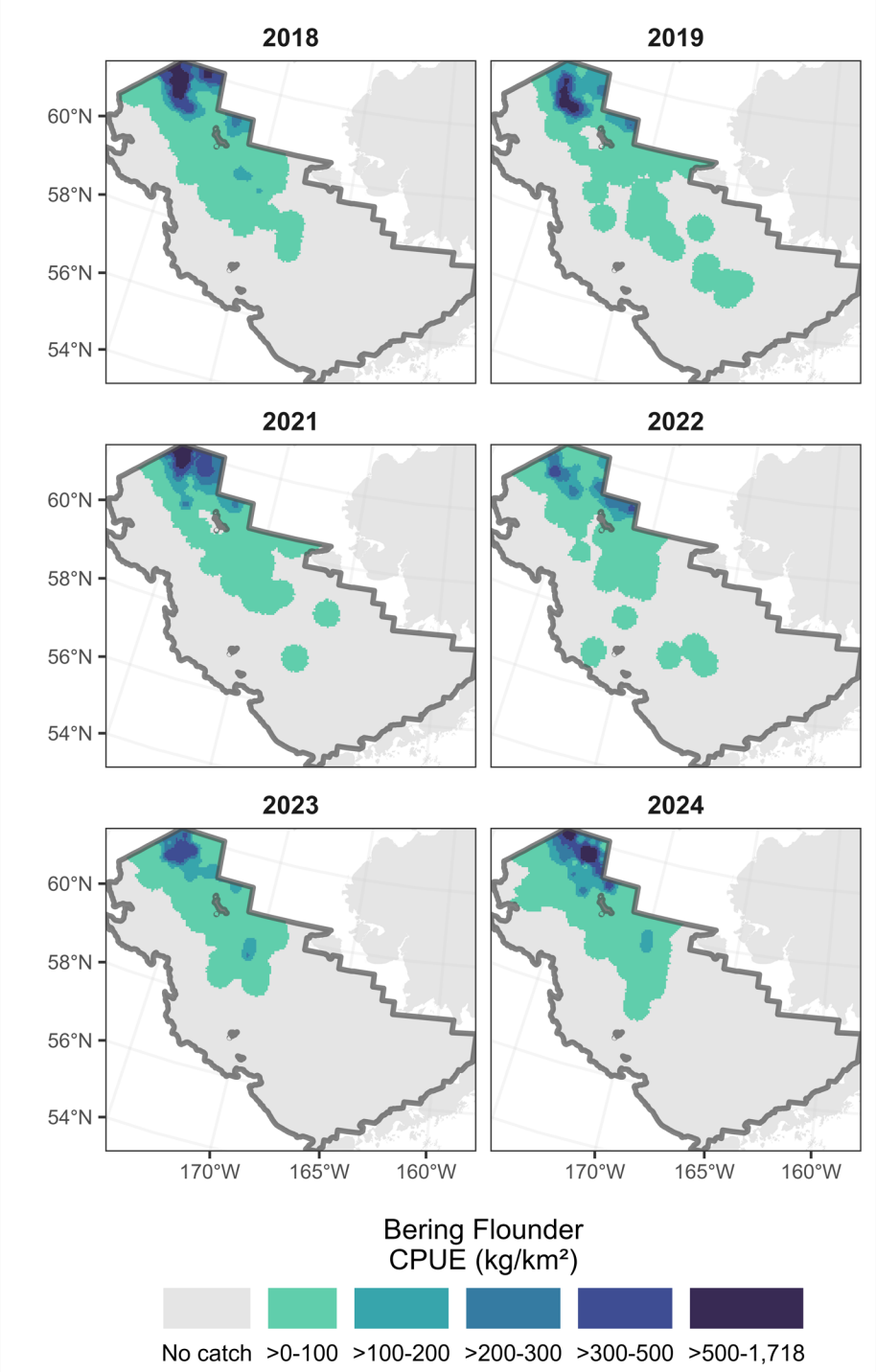

Figure 25. -- CPUE (kg/km^2) distribution of Bering flounder (*Hippoglossoides robustus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

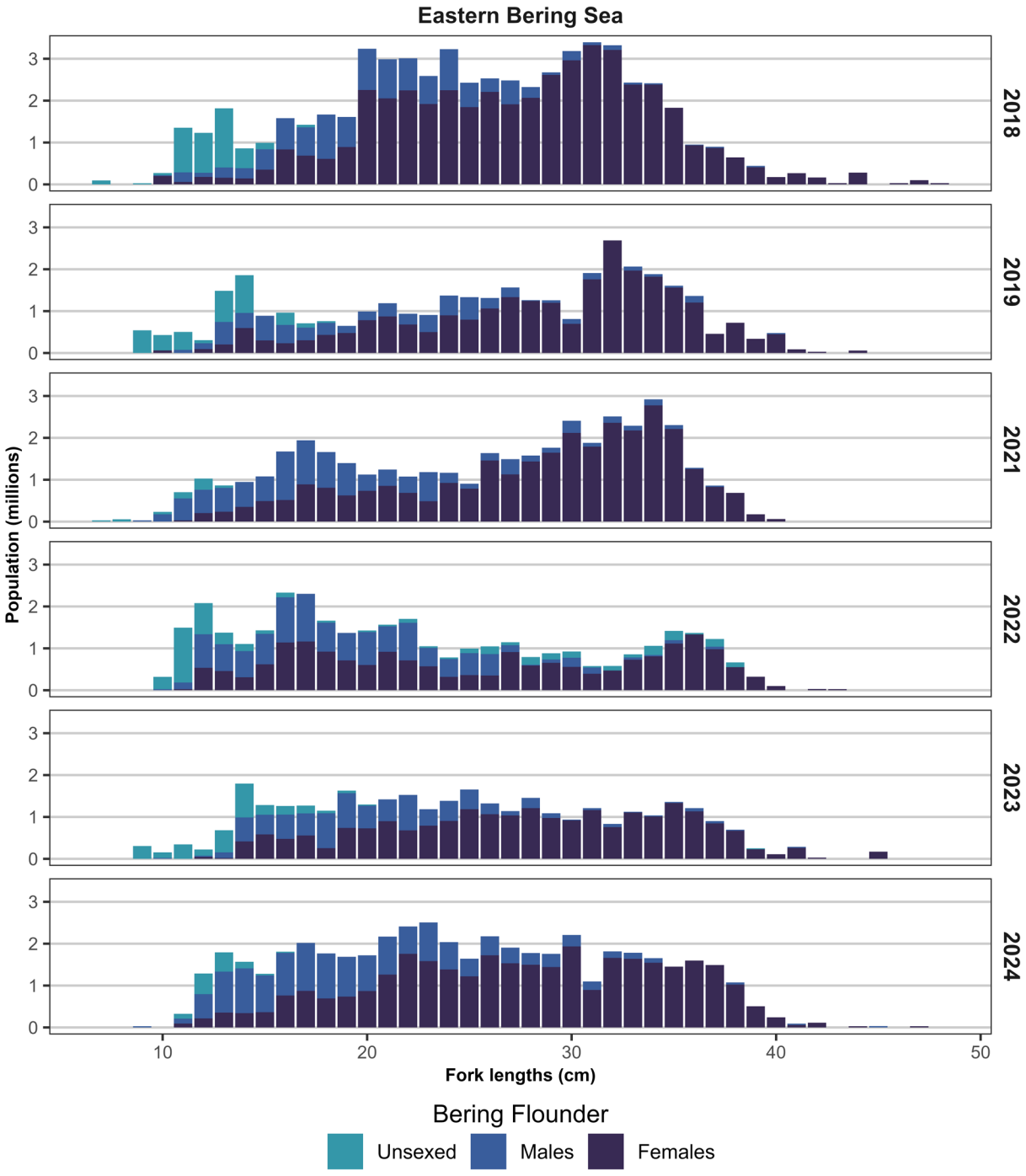

Figure 26. -- Total abundance-at-length estimates of Bering flounder (*Hippoglossoides robustus*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 22. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Bering flounder (*Hippoglossoides robustus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	1.44	0.84	59	35	0	129	4
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	39.65	11.53	2,471	718	1,034	3,907	26
42	0.05	0.05	1	1	0	4	1
43	14.05	5.96	296	125	45	547	10
50	-	-	-	-	-	-	-
61	1.01	0.62	89	54	0	198	5
62	6.94	6.94	45	45	0	134	1
82	361.78	135.88	6,495	2,439	1,616	11,374	12
90	79.15	37.61	913	434	45	1,781	6
Total	**21.03**	**5.24**	**10,370**	**2,584**	**5,202**	**15,538**	**65**

Table 23. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Bering flounder (*Hippoglossoides robustus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	13.60	8.95	0.00	1,297.71	560.07	368.82	4
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	249.22	56.65	8,469.59	22,588.25	15,528.92	3,529.66	26
42	1.28	1.28	0.00	92.74	30.91	30.91	1
43	95.90	34.45	568.83	3,471.25	2,020.04	725.61	10
50	-	-	-	-	-	-	-
61	5.98	3.58	0.00	1,153.72	524.60	314.56	5
62	38.20	38.20	0.00	740.50	246.83	246.83	1
82	1,344.27	349.65	11,579.47	36,689.58	24,134.53	6,277.53	12
90	508.86	241.54	297.50	11,445.98	5,871.74	2,787.12	6
Total	**99.23**	**15.77**	**33,366.79**	**64,468.50**	**48,917.65**	**7,775.43**	**65**

Bering Skate (*Bathyraja interrupta*)

Between 2023 and 2024, the estimated biomass of Bering skate decreased by 4% on the 2024 eastern Bering Sea Shelf survey (Tables **24** and **25**; Figs. **27** and **28**) and the population was estimated at 7.1 million individuals (Tables **24** and **26**; Fig. **27**).

Length modes of 76 cm for males and 80 cm for females were observed in 2024 (Fig. **29**). The survey program adopted methods to reliably distinguish skates in 1999 (note truncated time series in Fig. **27**).

Table 24. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Bering skate (*Bathyraja interrupta*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	74 of 350 (21.1%)
Bottom Depth (m)	68 — 192
Bottom Temperature (°C)	1 — 5.4
Surface Temperature (°C)	4.2 — 8.8
Population	7.1 million
Biomass (t)	13,048
Percent of Total Catch Biomass	0.1%
Percent Change in Biomass	4% decrease from 2023

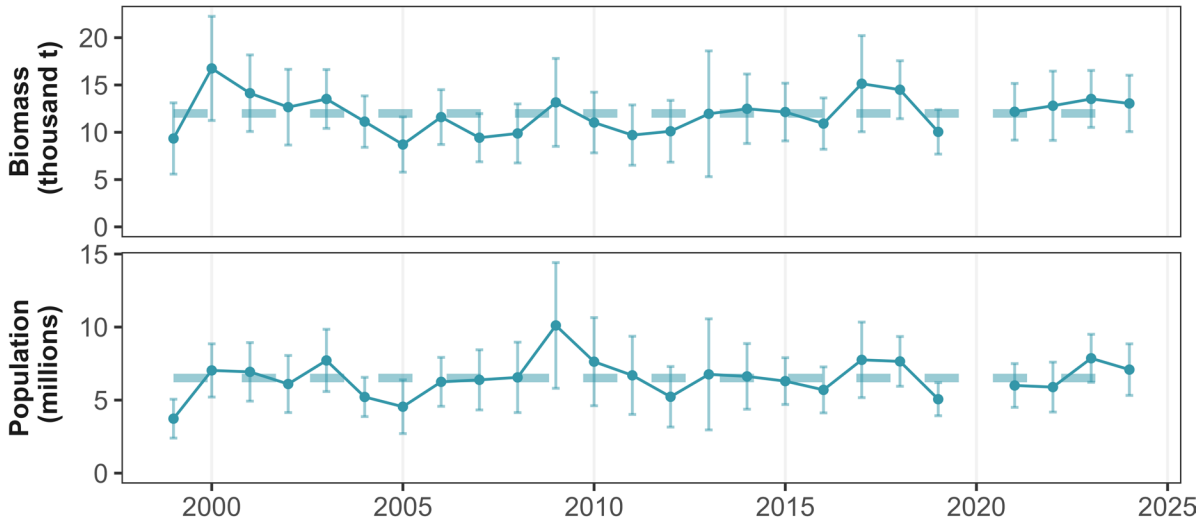

Figure 27. -- Time series of Bering skate (*Bathyraja interrupta*) biomass (thousand t) and population (millions) from the 1999-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

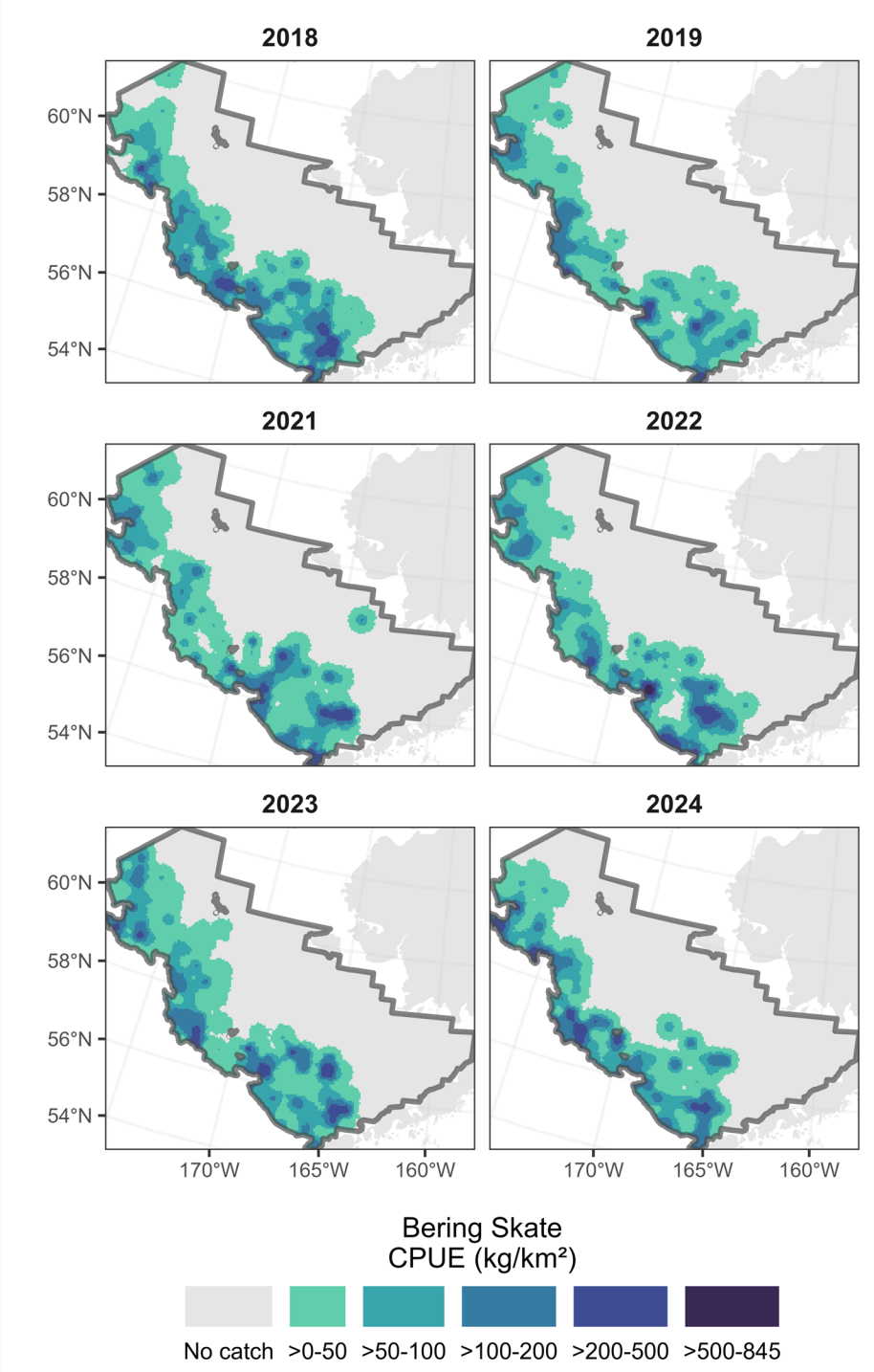

Figure 28. -- CPUE (kg/km^2) distribution of Bering skate (*Bathyraja interrupta*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

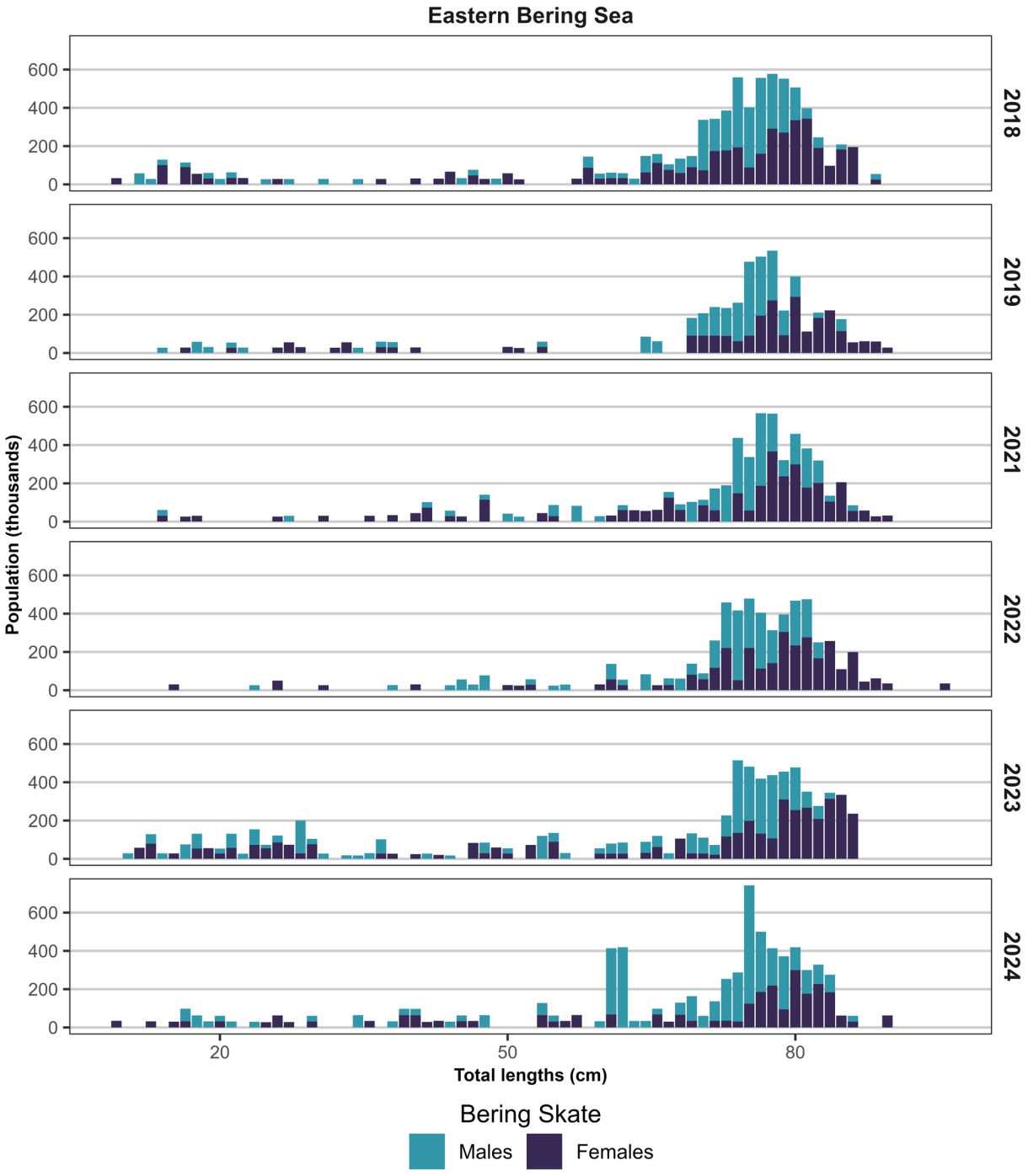

Figure 29. -- Total abundance-at-length estimates of Bering skate (*Bathyraja interrupta*) by sex (males and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 25. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Bering skate (*Bathyraja interrupta*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	24.21	7.01	2,300	666	968	3,631	13
32	21.90	21.90	194	194	0	581	1
41	4.72	4.72	294	294	0	883	1
42	30.91	19.71	746	476	0	1,697	3
43	-	-	-	-	-	-	-
50	86.36	15.46	3,285	588	2,109	4,461	20
61	70.98	11.88	6,230	1,042	4,145	8,315	36
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**26.47**	**3.03**	**13,048**	**1,492**	**10,064**	**16,032**	**74**

Table 26. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Bering skate (*Bathyraja interrupta*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	11.75	3.38	473.95	1,757.96	1,115.95	321.00	13
32	8.55	8.55	0.00	227.01	75.67	75.67	1
41	1.99	1.99	0.00	371.41	123.80	123.80	1
42	12.58	8.14	0.00	696.23	303.57	196.33	3
43	-	-	-	-	-	-	-
50	53.17	10.99	1,186.01	2,858.90	2,022.46	418.22	20
61	39.25	7.58	2,114.87	4,775.78	3,445.33	665.23	36
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**14.38**	**1.79**	**5,320.35**	**8,853.22**	**7,086.78**	**883.22**	**74**

Bigmouth Sculpin (*Hemitripterus bolini*)

Between 2023 and 2024, the estimated biomass of bigmouth sculpin increased by 2% on the 2024 eastern Bering Sea Shelf survey (Tables **27** and **28**; Figs. **30** and **31**) and the population was estimated at 4.6 million individuals (Tables **27** and **29**; Fig. **30**).

Table 27. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for bigmouth sculpin (*Hemitripterus bolini*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	69 of 350 (19.7%)
Bottom Depth (m)	68 — 192
Bottom Temperature (°C)	0.5 — 4.1
Surface Temperature (°C)	4.2 — 8.9
Population	4.6 million
Biomass (t)	23,110
Percent of Total Catch Biomass	0.2%
Percent Change in Biomass	2% increase from 2023

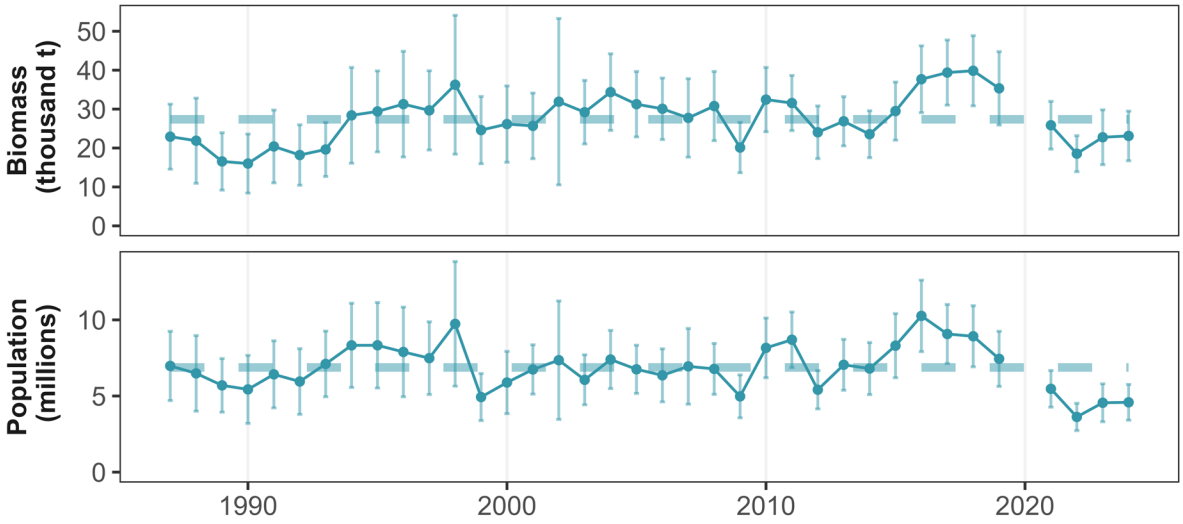

Figure 30. -- Time series of bigmouth sculpin (*Hemitripterus bolini*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

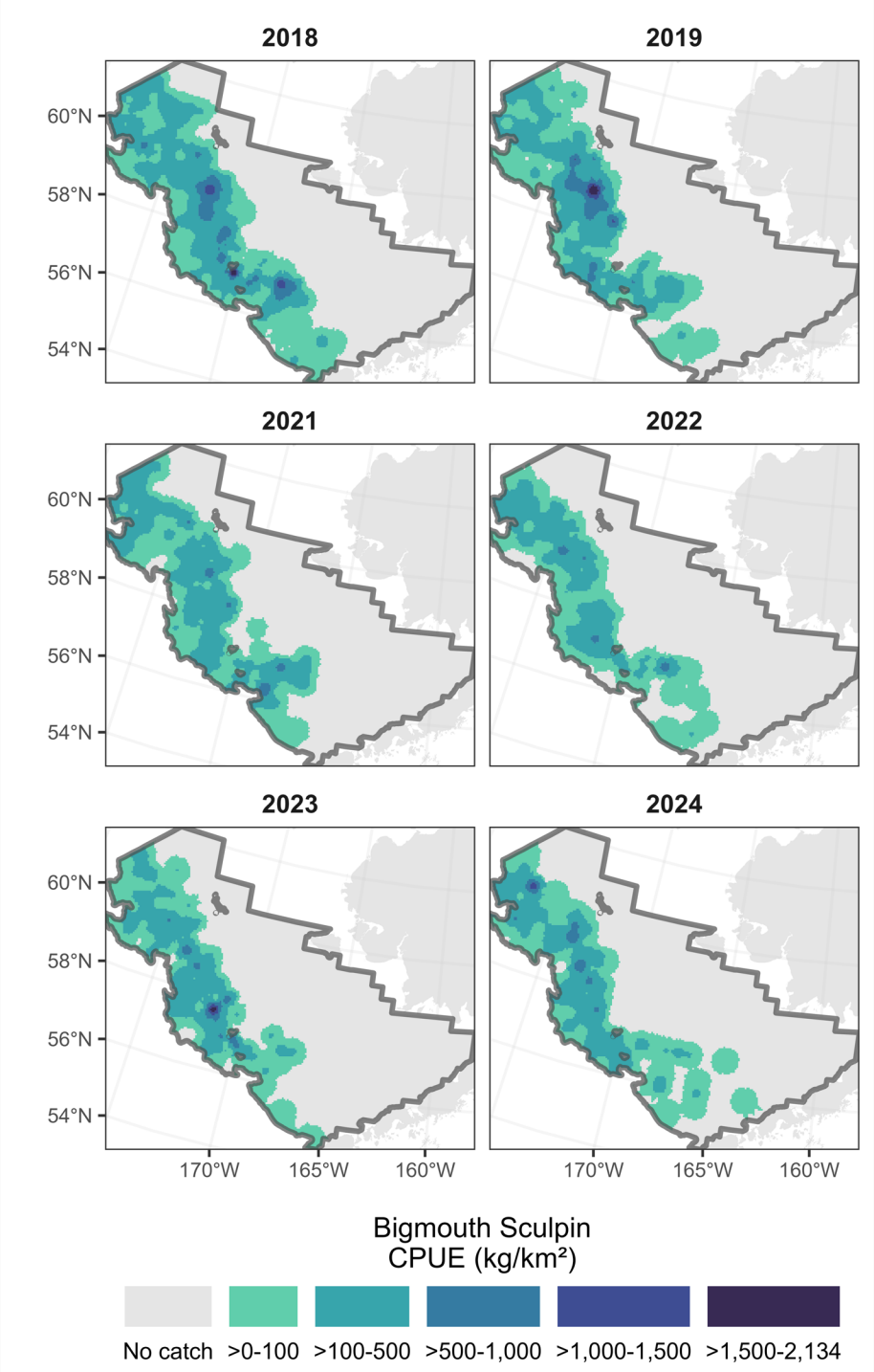

Figure 31. -- CPUE (kg/km^2) distribution of bigmouth sculpin (*Hemitripterus bolini*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 28. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which bigmouth sculpin (*Hemitripterus bolini*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	7.72	3.76	733	357	19	1,447	7
32	94.28	43.40	834	384	66	1,602	3
41	38.95	17.71	2,427	1,103	220	4,634	6
42	37.47	21.02	904	507	0	1,918	3
43	33.09	21.25	697	448	0	1,592	3
50	27.87	14.65	1,060	557	0	2,174	6
61	162.77	30.10	14,287	2,642	9,003	19,572	36
62	317.69	147.19	2,053	951	151	3,955	4
82	-	-	-	-	-	-	-
90	9.94	9.94	115	115	0	344	1
Total	**46.88**	**6.47**	**23,110**	**3,187**	**16,735**	**29,485**	**69**

Table 29. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which bigmouth sculpin (*Hemitripterus bolini*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	2.95	1.31	31.27	529.29	280.28	124.51	7
32	17.95	8.47	8.89	308.63	158.76	74.94	3
41	6.25	2.69	53.45	725.12	389.29	167.92	6
42	7.35	3.99	0.00	369.78	177.31	96.23	3
43	8.55	4.76	0.00	380.61	180.11	100.25	3
50	6.78	2.72	51.17	464.49	257.83	103.33	6
61	31.46	5.61	1,775.62	3,746.81	2,761.22	492.80	36
62	54.25	22.88	54.82	646.25	350.53	147.86	4
82	-	-	-	-	-	-	-
90	2.58	2.58	0.00	89.14	29.71	29.71	1
Total	**9.30**	**1.19**	**3,410.49**	**5,759.61**	**4,585.05**	**587.28**	**69**

Butterfly Sculpin (*Hemilepidotus papilio*)

Between 2023 and 2024, the estimated biomass of butterfly sculpin increased to 47 t, extrapolated from 9 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **30** and **31**; Figs. **32** and **33**) and the population was estimated at 451,777 individuals (Tables **30** and **32**; Fig. **32**).

Table 30. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for butterfly sculpin (*Hemilepidotus papilio*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	4 of 350 (1.1%)
Bottom Depth (m)	59 — 75
Bottom Temperature (°C)	-1.6 — 0.6
Surface Temperature (°C)	3.8 — 6.1
Population	451,777
Biomass (t)	47
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Increased from 3 to 9 individuals in 2024

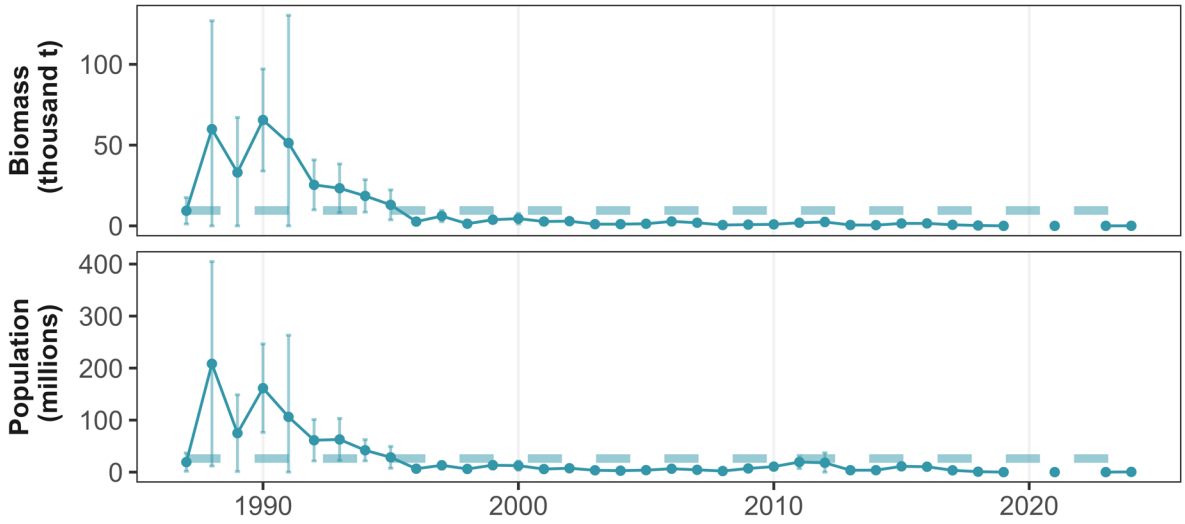

Figure 32. -- Time series of butterfly sculpin (*Hemilepidotus papilio*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

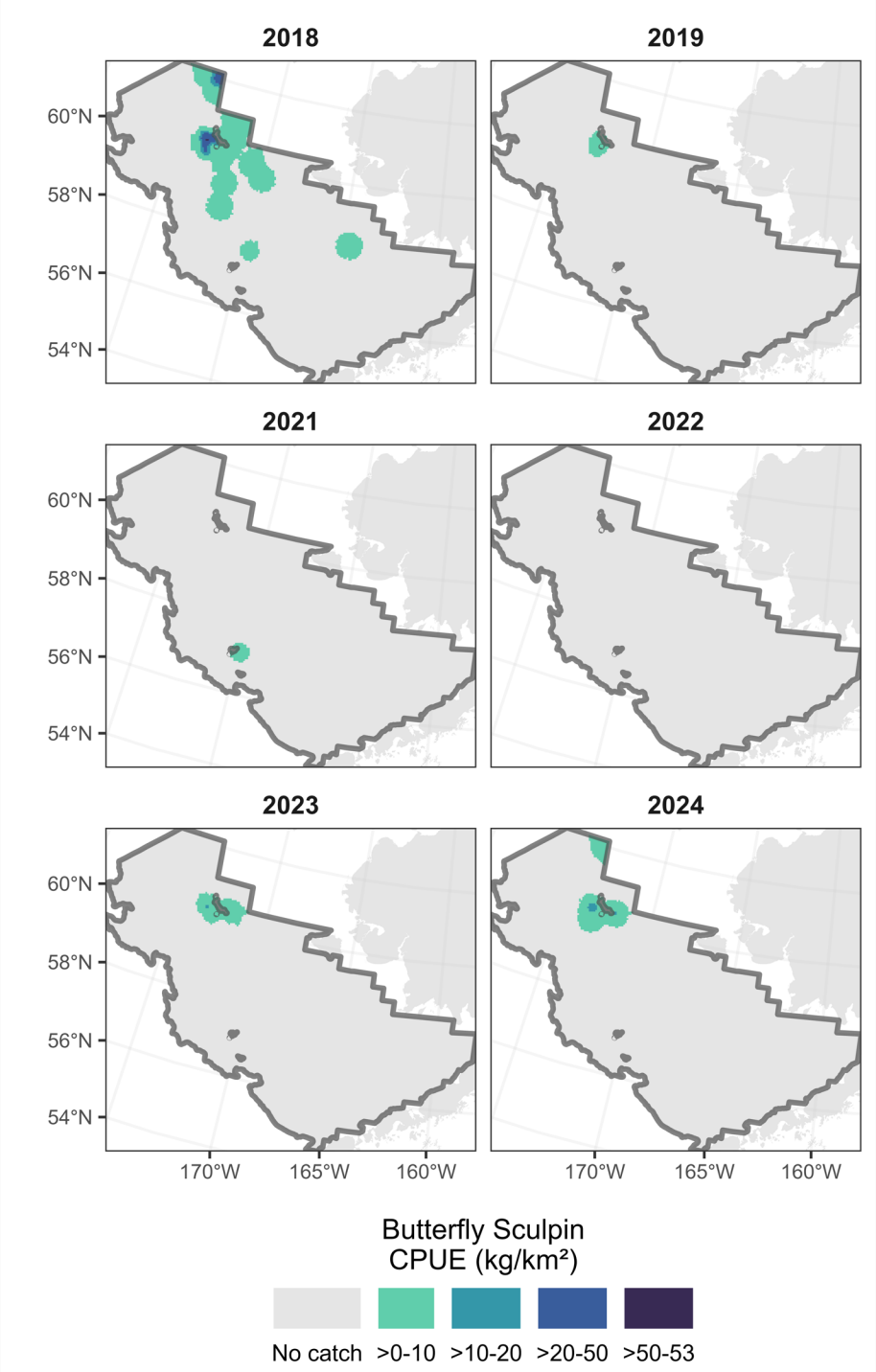

Figure 33. -- CPUE (kg/km^2) distribution of butterfly sculpin (*Hemilepidotus papilio*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 31. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which butterfly sculpin (*Hemilepidotus papilio*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	2.19	1.31	46	28	0	101	3
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	0.04	0.04	1	1	0	2	1
90	-	-	-	-	-	-	-
Total	**0.10**	**0.06**	**47**	**28**	**0**	**102**	**4**

Table 32. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which butterfly sculpin (*Hemilepidotus papilio*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	19.86	11.89	0.00	919.31	418.41	250.45	3
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	1.86	1.86	0.00	100.09	33.36	33.36	1
90	-	-	-	-	-	-	-
Total	**0.92**	**0.51**	**0.00**	**957.10**	**451.78**	**252.66**	**4**

Eulachon (*Thaleichthys pacificus*)

Between 2023 and 2024, the estimated biomass of eulachon decreased by 63% on the 2024 eastern Bering Sea Shelf survey (Tables **33** and **34**; Figs. **34** and **35**) and the population was estimated at 6.2 million individuals (Tables **33** and **35**; Fig. **34**).

Table 33. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for eulachon (*Thaleichthys pacificus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	24 of 350 (6.9%)
Bottom Depth (m)	43 — 155
Bottom Temperature (°C)	2 — 4.2
Surface Temperature (°C)	2.1 — 8.8
Population	6.2 million
Biomass (t)	308
Percent of Total Catch Biomass	<0.01%
Percent Change in Biomass	63% decrease from 2023

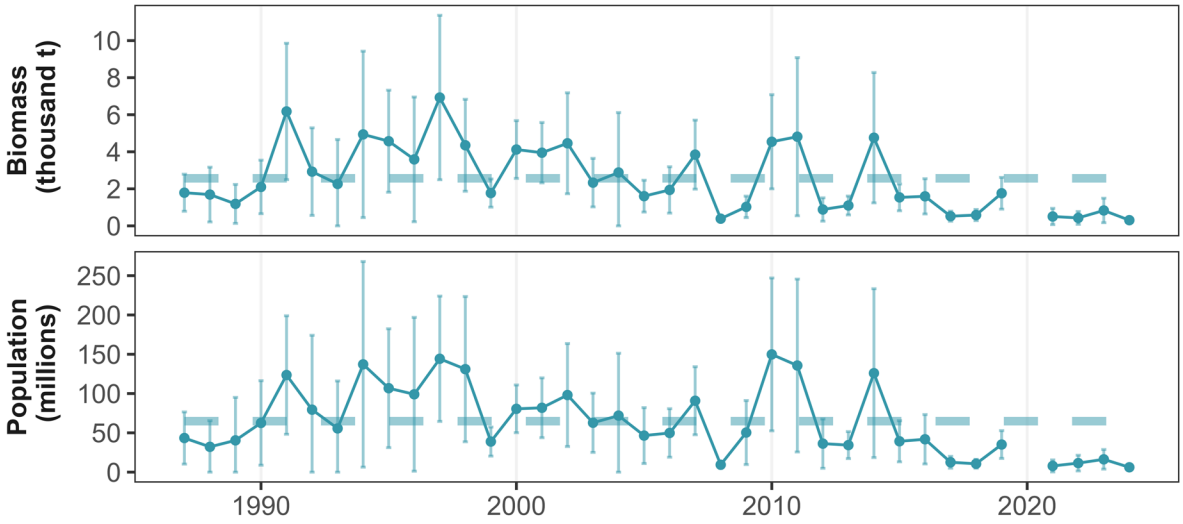

Figure 34. -- Time series of eulachon (*Thaleichthys pacificus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

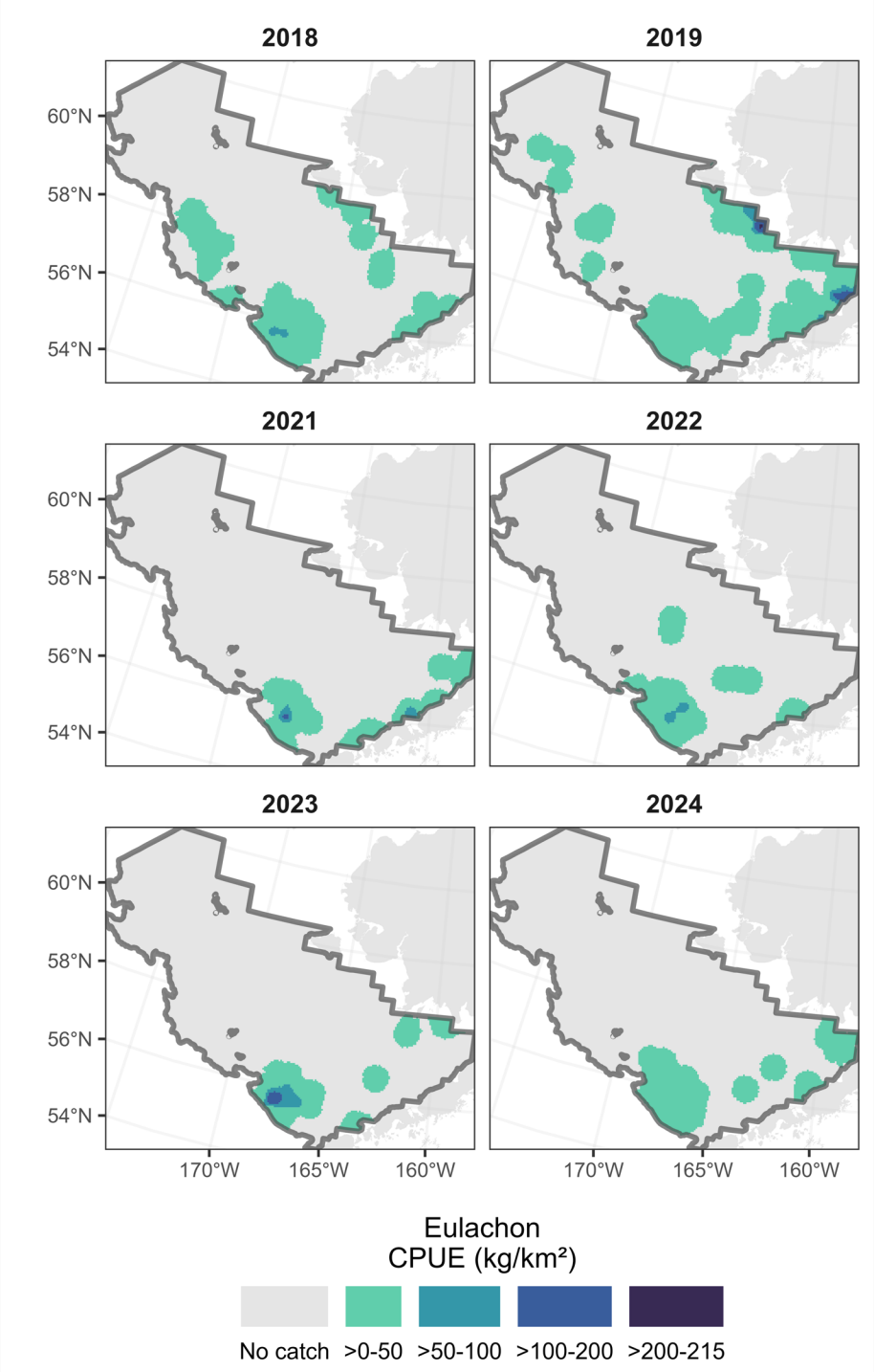

Figure 35. -- CPUE (kg/km^2) distribution of eulachon (*Thaleichthys pacificus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 34. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which eulachon (*Thaleichthys pacificus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	0.12	0.09	10	7	0	24	2
20	-	-	-	-	-	-	-
31	0.55	0.31	52	29	0	110	6
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	6.45	1.75	245	66	113	378	16
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**0.62**	**0.15**	**308**	**73**	**162**	**453**	**24**

Table 35. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which eulachon (*Thaleichthys pacificus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	3.27	2.61	0.00	667.78	257.63	205.08	2
20	-	-	-	-	-	-	-
31	7.62	4.94	0.00	1,662.05	723.44	469.31	6
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	136.30	37.88	2,302.61	8,066.80	5,184.71	1,441.05	16
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**12.51**	**3.10**	**3,107.06**	**9,224.48**	**6,165.77**	**1,529.36**	**24**

Flathead Sole (*Hippoglossoides elassodon*)

Between 2023 and 2024, the estimated biomass of flathead sole increased by 22% on the 2024 eastern Bering Sea Shelf survey (Tables **36** and **37**; Figs. **36** and **37**) and the population was estimated at 2.3 billion individuals (Tables **36** and **38**; Fig. **36**).

In 2024, flathead sole were found at higher densities in the deeper water of the outer shelf, with the highest concentration located in the northwestern area of the outer domain (Fig. **37**). The size distribution of flathead sole was more unimodal than previous years, with most males observed at approximately 32 cm and females observed at 37 cm (Fig. **38**).

As previously mentioned, flathead sole and Bering flounder are congeneric (Yang 1988), and the program has methods to reliably distinguish between the two species. However, the accuracy of their identification in commercial fishery data is unknown and the two species are combined into a single stock assessment by the NPFMC (Kapur 2023). While the two species co-occur (Figs. **25** and **37**), Bering flounder tend to inhabit shallower arctic regions, while flathead sole are found in deeper and more subarctic/boreal waters (Baker and Hollowed 2014).

Table 36. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for flathead sole (*Hippoglossoides elassodon*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	285 of 350 (81.4%)
Bottom Depth (m)	31 — 192
Bottom Temperature (°C)	-0.7 — 5.4
Surface Temperature (°C)	2 — 8.9
Population	2.3 billion
Biomass (t)	723,996
Percent of Total Catch Biomass	4.8%
Percent Change in Biomass	22% increase from 2023

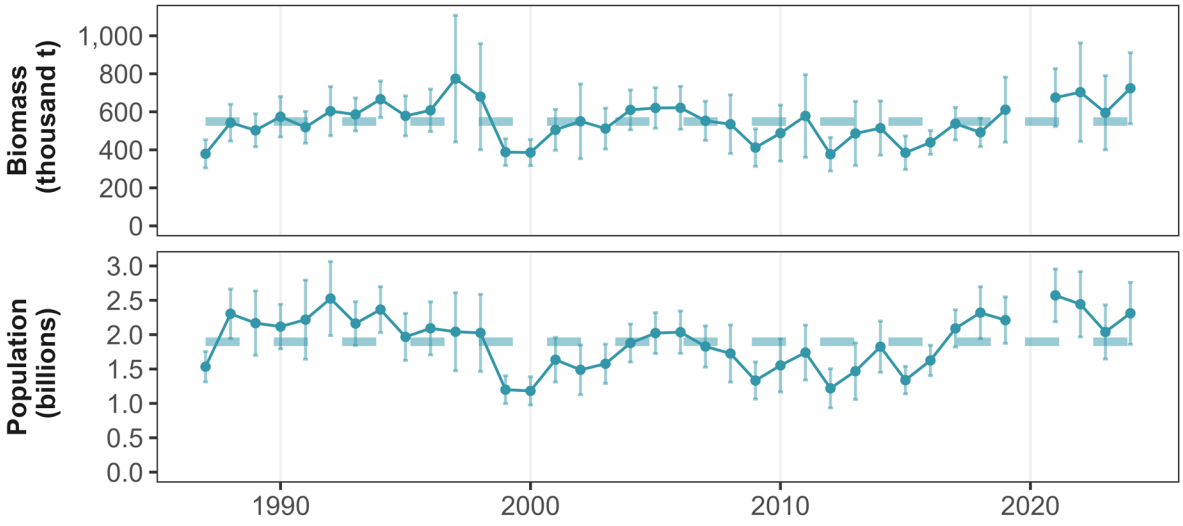

Figure 36. -- Time series of flathead sole (*Hippoglossoides elassodon*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

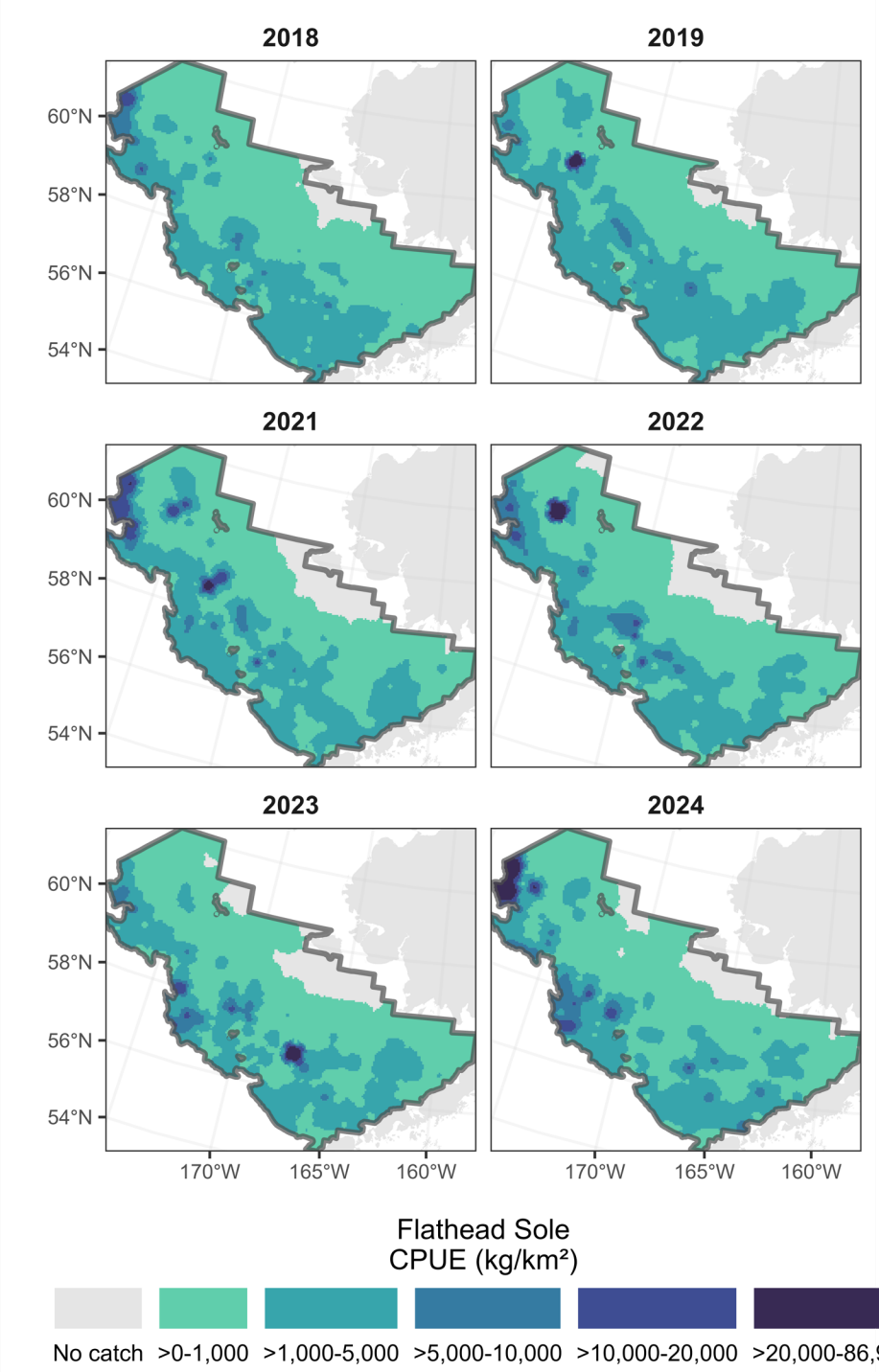

Figure 37. -- CPUE (kg/km^2) distribution of flathead sole (*Hippoglossoides elassodon*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

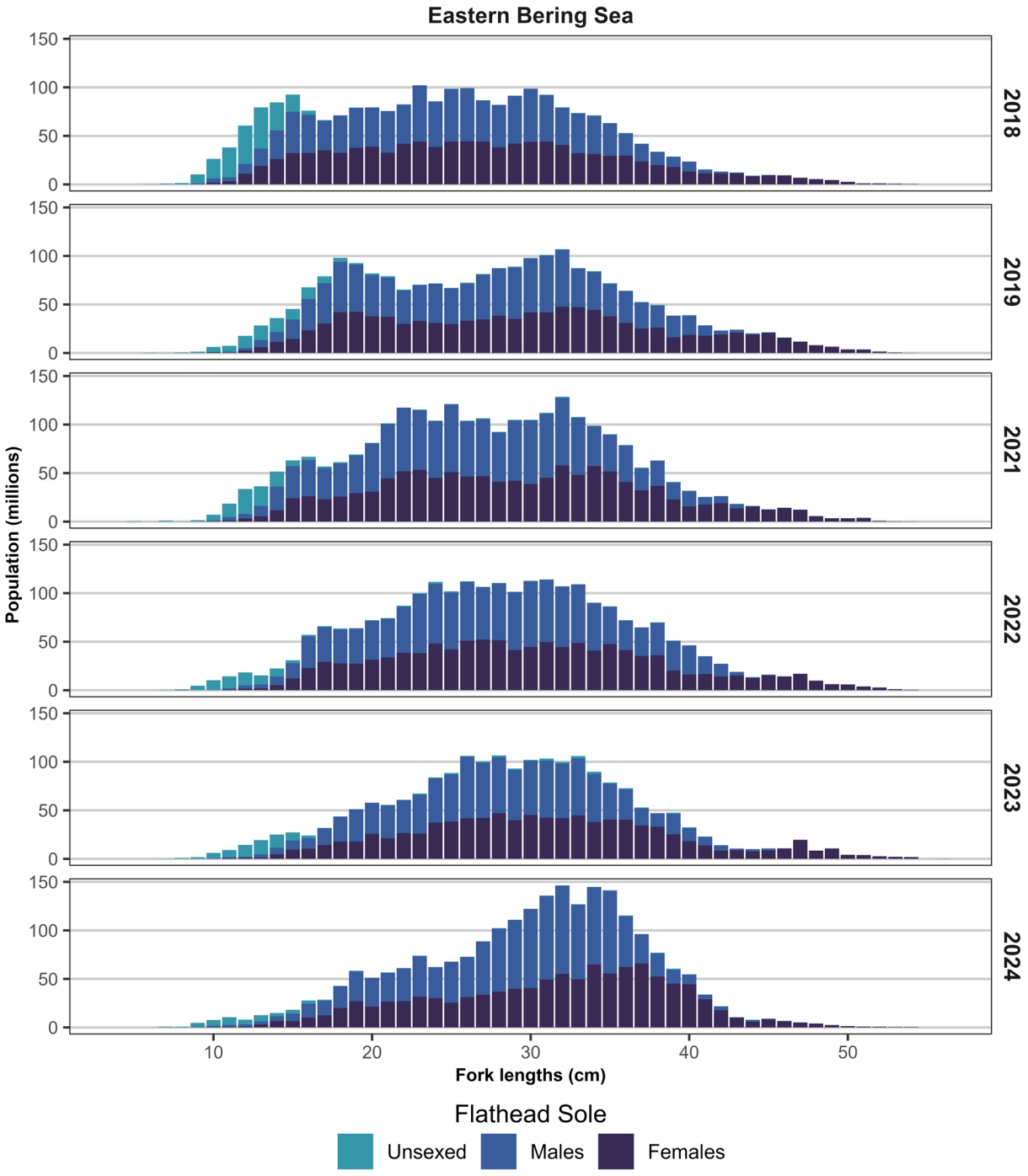

Figure 38. -- Total abundance-at-length estimates of flathead sole (*Hippoglossoides elassodon*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 37. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which flathead sole (*Hippoglossoides elassodon*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	289.17	52.21	22,759	4,109	14,541	30,977	34
20	20.86	7.38	859	304	251	1,467	14
31	1,645.34	249.10	156,272	23,660	108,953	203,591	69
32	1,123.22	556.80	9,937	4,926	85	19,788	5
41	314.72	91.25	19,610	5,686	8,239	30,981	28
42	2,642.85	938.44	63,751	22,637	18,477	109,026	16
43	245.14	203.20	5,163	4,280	0	13,724	10
50	1,310.43	132.17	49,847	5,028	39,792	59,902	26
61	4,423.33	991.59	388,267	87,039	214,189	562,344	60
62	479.92	446.93	3,101	2,888	0	8,877	6
82	151.03	37.61	2,711	675	1,361	4,062	9
90	148.80	39.78	1,717	459	799	2,635	8
Total	**1,468.58**	**190.00**	**723,996**	**93,670**	**536,655**	**911,336**	**285**

Table 38. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (thousands), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which flathead sole (*Hippoglossoides elassodon*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	544.15	102.81	26.64	59.01	42.83	8,091.85	34
20	42.99	12.77	0.72	2.82	1.77	525.98	14
31	5,376.59	860.25	347.25	674.07	510.66	81,704.94	69
32	3,442.77	1,477.09	4.32	56.59	30.46	13,067.39	5
41	707.87	218.12	16.93	71.29	44.11	13,591.11	28
42	5,916.98	2,054.08	43.63	241.83	142.73	49,548.85	16
43	716.41	584.59	0.00	39.72	15.09	12,313.69	10
50	8,582.19	1,019.58	248.89	404.02	326.46	38,783.60	25
61	13,438.20	2,264.64	782.00	1,577.13	1,179.56	198,783.35	60
62	1,024.00	927.78	0.00	18.61	6.62	5,994.87	6
82	308.95	75.08	2.85	8.24	5.55	1,348.00	9
90	456.19	137.68	2.09	8.44	5.26	1,588.71	8
Total	**4,687.91**	**457.02**	**1,860.48**	**2,761.70**	**2,311.09**	**225,306.26**	**284**

Great Sculpin (*Myoxocephalus polyacanthocephalus*)

Between 2023 and 2024, the estimated biomass of great sculpin increased by 33% on the 2024 eastern Bering Sea Shelf survey (Tables **39** and **40**; Figs. **39** and **40**) and the population was estimated at 22.6 million individuals (Tables **39** and **41**; Fig. **39**).

Table 39. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for great sculpin (*Myoxocephalus polyacanthocephalus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	163 of 350 (46.6%)
Bottom Depth (m)	23 — 176
Bottom Temperature (°C)	-0.7 — 4.7
Surface Temperature (°C)	2.1 — 8.8
Population	22.6 million
Biomass (t)	61,076
Percent of Total Catch Biomass	0.4%
Percent Change in Biomass	33% increase from 2023

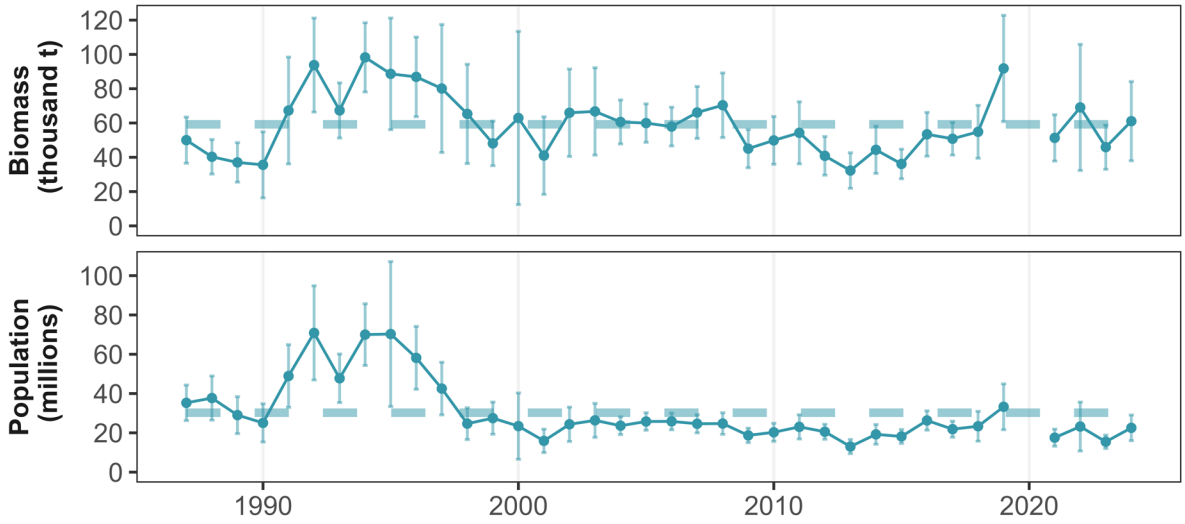

Figure 39. -- Time series of great sculpin (*Myoxocephalus polyacanthocephalus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

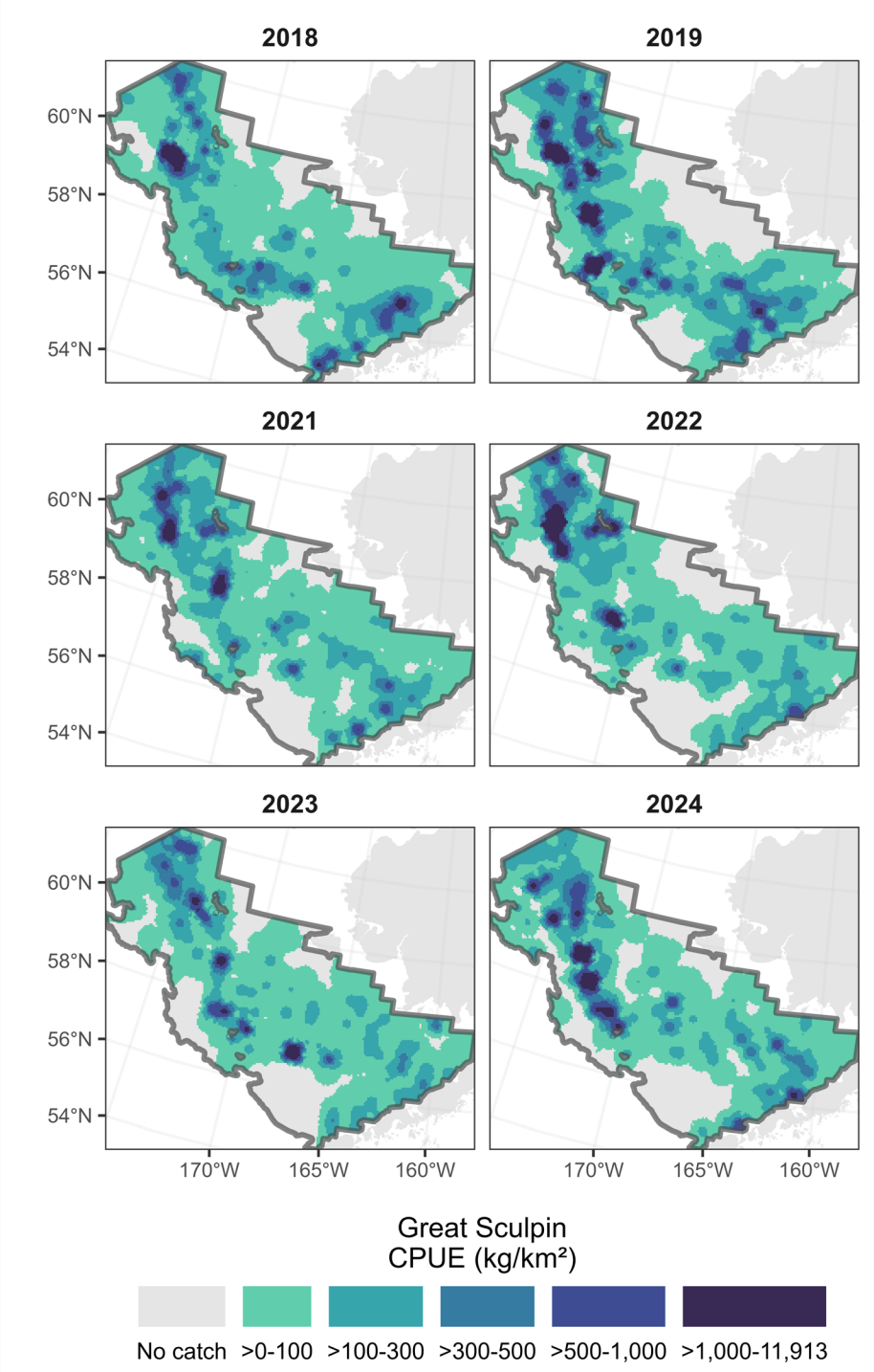

Figure 40. -- CPUE (kg/km^2) distribution of great sculpin (*Myoxocephalus polyacanthocephalus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 40. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which great sculpin (*Myoxocephalus polyacanthocephalus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	83.41	26.43	6,565	2,081	2,404	10,726	37
20	11.23	3.74	462	154	154	771	10
31	91.43	19.16	8,684	1,820	5,044	12,323	35
32	55.88	29.77	494	263	0	1,021	3
41	112.92	38.09	7,036	2,373	2,290	11,783	16
42	224.48	101.42	5,415	2,446	522	10,308	11
43	199.20	93.26	4,196	1,964	267	8,125	10
50	7.46	7.46	284	284	0	851	1
61	268.33	119.04	23,553	10,449	2,655	44,451	20
62	244.29	90.14	1,579	582	414	2,743	5
82	86.82	34.28	1,559	615	328	2,790	7
90	108.34	28.04	1,250	324	603	1,897	8
Total	**123.89**	**23.42**	**61,076**	**11,545**	**37,986**	**84,167**	**163**

Table 41. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which great sculpin (*Myoxocephalus polyacanthocephalus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	49.16	11.20	2,105.96	5,632.02	3,868.99	881.51	37
20	11.76	3.61	187.44	781.49	484.46	148.51	10
31	37.63	7.55	2,140.63	5,007.37	3,574.00	716.68	35
32	22.08	9.81	21.79	368.84	195.31	86.76	3
41	37.18	12.34	779.54	3,853.94	2,316.74	768.60	16
42	52.74	21.42	238.64	2,305.62	1,272.13	516.74	11
43	79.13	24.39	639.49	2,694.21	1,666.85	513.68	10
50	4.32	4.32	0.00	492.57	164.19	164.19	1
61	75.17	32.24	938.78	12,256.98	6,597.88	2,829.55	20
62	69.32	21.62	168.49	727.32	447.90	139.71	5
82	46.16	14.98	290.88	1,366.55	828.71	268.92	7
90	98.30	19.25	690.07	1,578.58	1,134.33	222.13	8
Total	**45.74**	**6.61**	**16,034.92**	**29,068.06**	**22,551.49**	**3,258.28**	**163**

Greenland Turbot (*Reinhardtius hippoglossoides*)

Between 2023 and 2024, the estimated biomass of Greenland turbot decreased to 4,959 t, extrapolated from 53 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **42** and **43**; Figs. **41** and **42**) and the population was estimated at 1.6 million individuals (Tables **42** and **44**; Fig. **41**).

In 2024, Greenland turbot were encountered exclusively in the northwest portion of the middle and outer domains near the U.S.-Russia Maritime Boundary (Fig. **42**). Greenland turbot are typically most abundant on the upper continental slope outside of the standard eastern Bering Sea shelf survey area, although juveniles may spend several years on the continental shelf before moving to deeper water (Sohn et al. 2010, Vestfals et al. 2016). Length modes for Greenland turbot are difficult to distinguish, though appear to be 20 and 70 cm for males and 80-85 cm for females in 2024 (Fig. **43**).

Table 42. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Greenland turbot (*Reinhardtius hippoglossoides*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	26 of 350 (7.4%)
Bottom Depth (m)	73 — 147
Bottom Temperature (°C)	-0.2 — 2.1
Surface Temperature (°C)	5.8 — 8.9
Population	1.6 million
Biomass (t)	4,959
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Decreased from 130 to 53 individuals in 2024

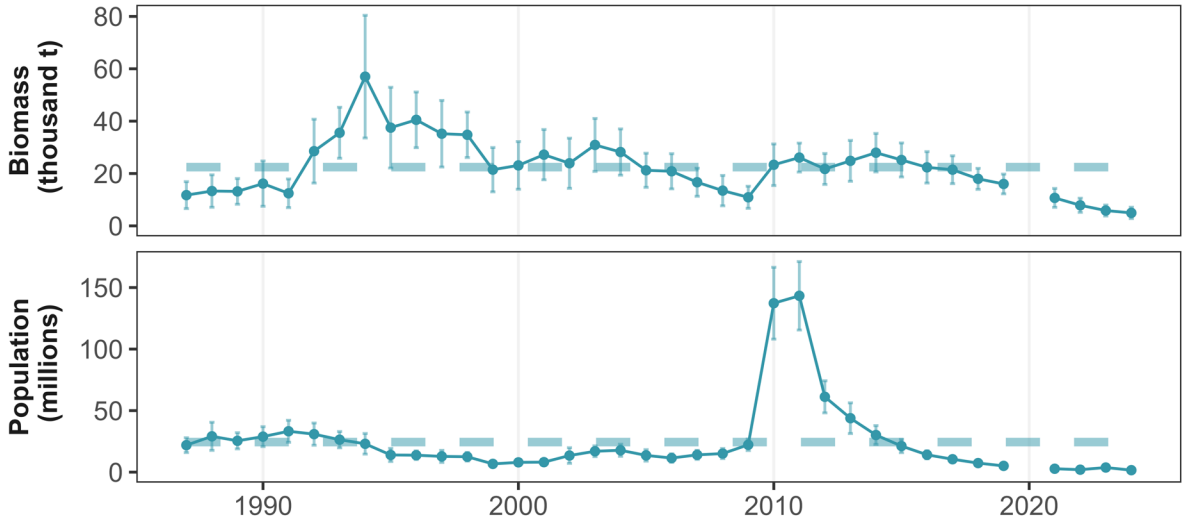

Figure 41. -- Time series of Greenland turbot (*Reinhardtius hippoglossoides*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

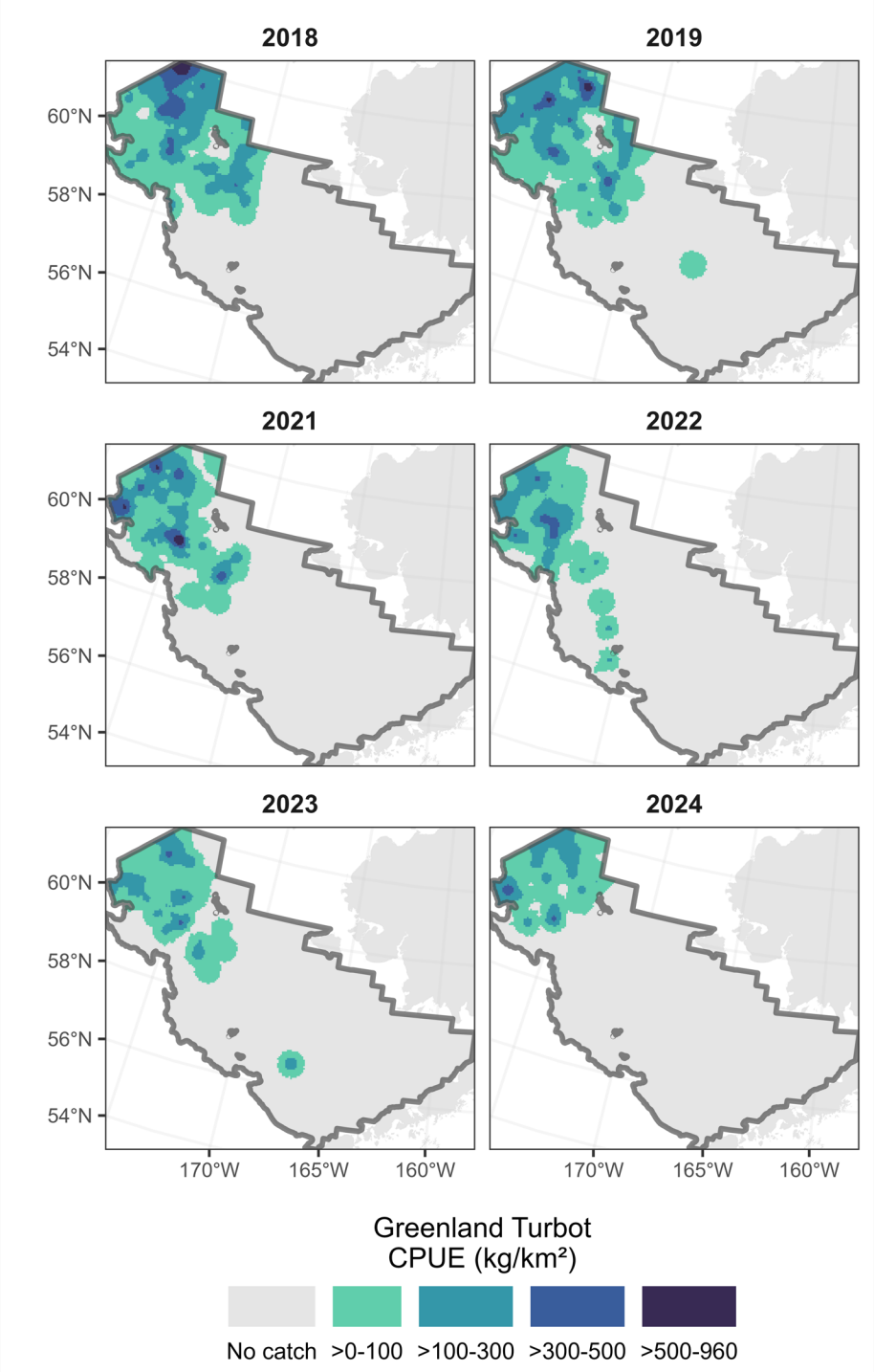

Figure 42. -- CPUE (kg/km^2) distribution of Greenland turbot (*Reinhardtius hippoglossoides*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

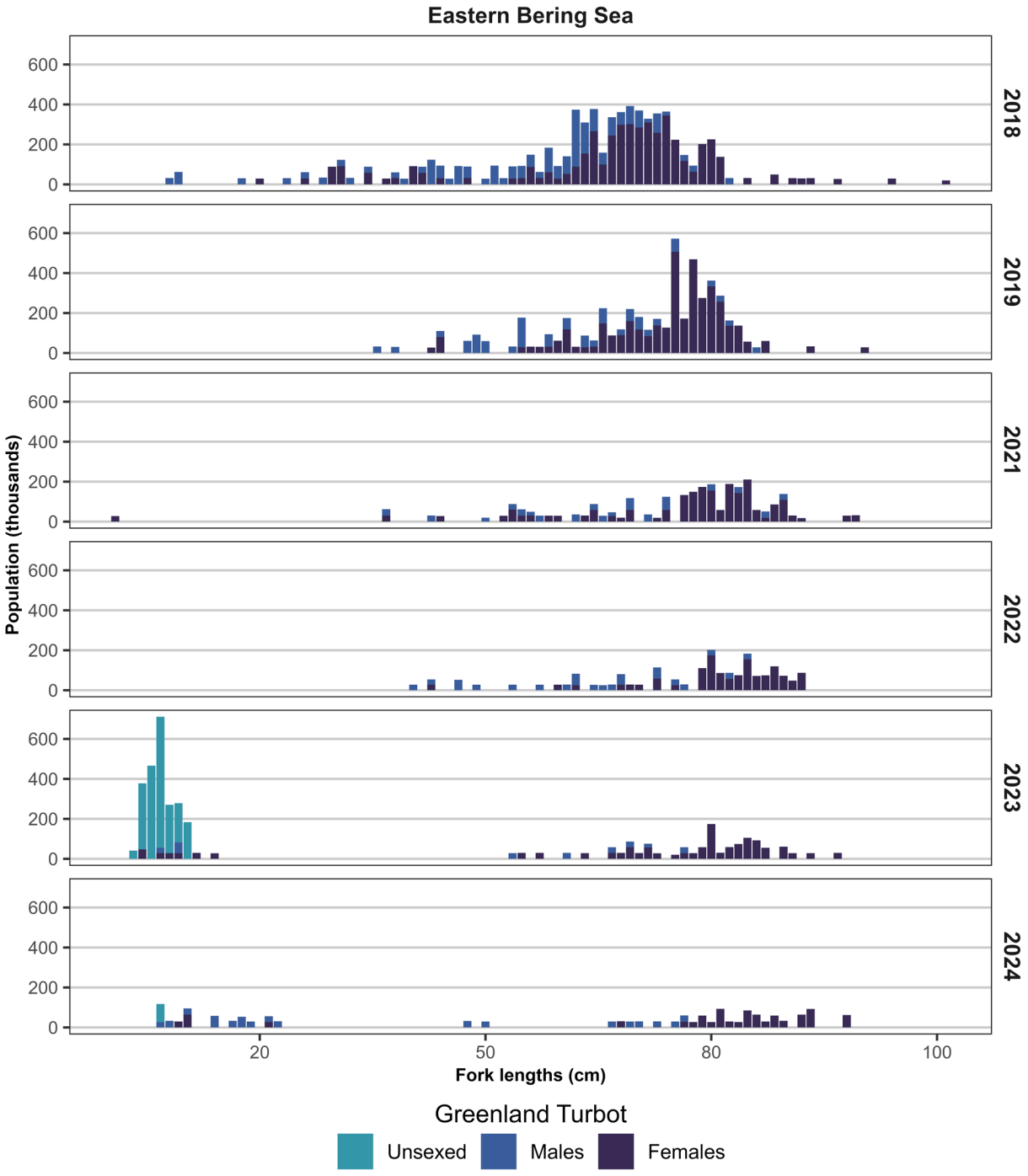

Figure 43. -- Total abundance-at-length estimates of Greenland turbot (*Reinhardtius hippoglossoides*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 43. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Greenland turbot (*Reinhardtius hippoglossoides*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	5.82	4.13	363	257	0	877	3
42	-	-	-	-	-	-	-
43	0.11	0.11	2	2	0	7	1
50	-	-	-	-	-	-	-
61	24.17	9.67	2,122	849	424	3,819	8
62	-	-	-	-	-	-	-
82	77.06	28.10	1,383	505	374	2,393	8
90	94.39	32.01	1,089	369	350	1,828	6
Total	**10.06**	**2.20**	**4,959**	**1,085**	**2,789**	**7,130**	**26**

Table 44. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Greenland turbot (*Reinhardtius hippoglossoides*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	2.96	1.83	0.00	412.28	184.72	113.78	3
42	-	-	-	-	-	-	-
43	1.57	1.57	0.00	99.51	33.17	33.17	1
50	-	-	-	-	-	-	-
61	4.63	1.90	73.11	739.70	406.40	166.65	8
62	-	-	-	-	-	-	-
82	33.94	9.81	257.15	961.43	609.29	176.07	8
90	31.29	8.70	160.34	561.73	361.03	100.35	6
Total	**3.23**	**0.58**	**1,018.81**	**2,170.42**	**1,594.62**	**287.90**	**26**

Kamchatka Flounder (*Atheresthes evermanni*)

Between 2023 and 2024, the estimated biomass of Kamchatka flounder increased by 14% on the 2024 eastern Bering Sea Shelf survey (Tables **45** and **46**; Figs. **44** and **45**) and the population was estimated at 69.1 million individuals (Tables **45** and **47**; Fig. **44**).

The Kamchatka flounder sex ratio was roughly 1:1, with length modes at approximately 18 and 26 cm for both males and females (Fig. **46**). There was a greater number of small Kamchatka flounder (< 20 cm) observed in the eastern Bering Sea than in previous years and a greater proportion of individuals observed between 20 and 30 cm than in 2023 and 2022 (Fig. **46**).

As previously mentioned, Kamchatka flounder and arrowtooth flounder are congeneric (Yang 1988). The survey program adopted methods to reliably distinguish between the two species in 1992 (note truncated time series in Fig. **44**). While the two species typically occupy similar areas (Baker and Hollowed 2014), Kamchatka flounder in 2024 occupied areas in the middle and outer domain and were most abundant along the northwestern edge (Fig. **45**), while arrowtooth flounder were mainly found in the southern end of the eastern Bering Sea and northwestern edge of the outer domain (Fig. **22**). Kamchatka flounder are much less abundant than arrowtooth flounder in the eastern Bering Sea.

Table 45. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Kamchatka flounder (*Atheresthes evermanni*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	135 of 350 (38.6%)
Bottom Depth (m)	64 — 192
Bottom Temperature (°C)	0.5 — 4.4
Surface Temperature (°C)	3.5 — 8.8
Population	69.1 million
Biomass (t)	28,362
Percent of Total Catch Biomass	0.2%
Percent Change in Biomass	14% increase from 2023

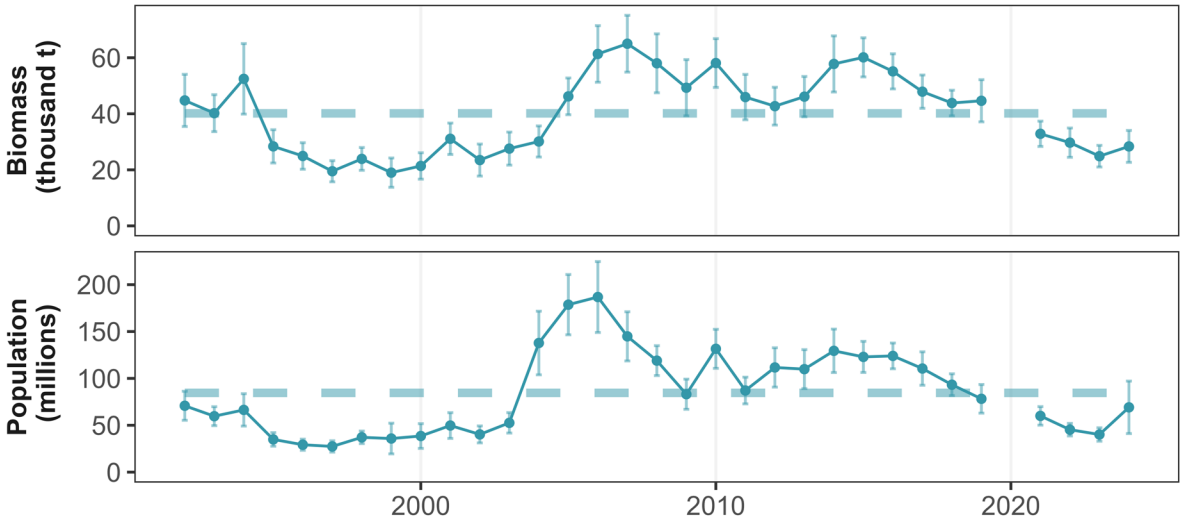

Figure 44. -- Time series of Kamchatka flounder (*Atheresthes evermanni*) biomass (thousand t) and population (millions) from the 1992-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

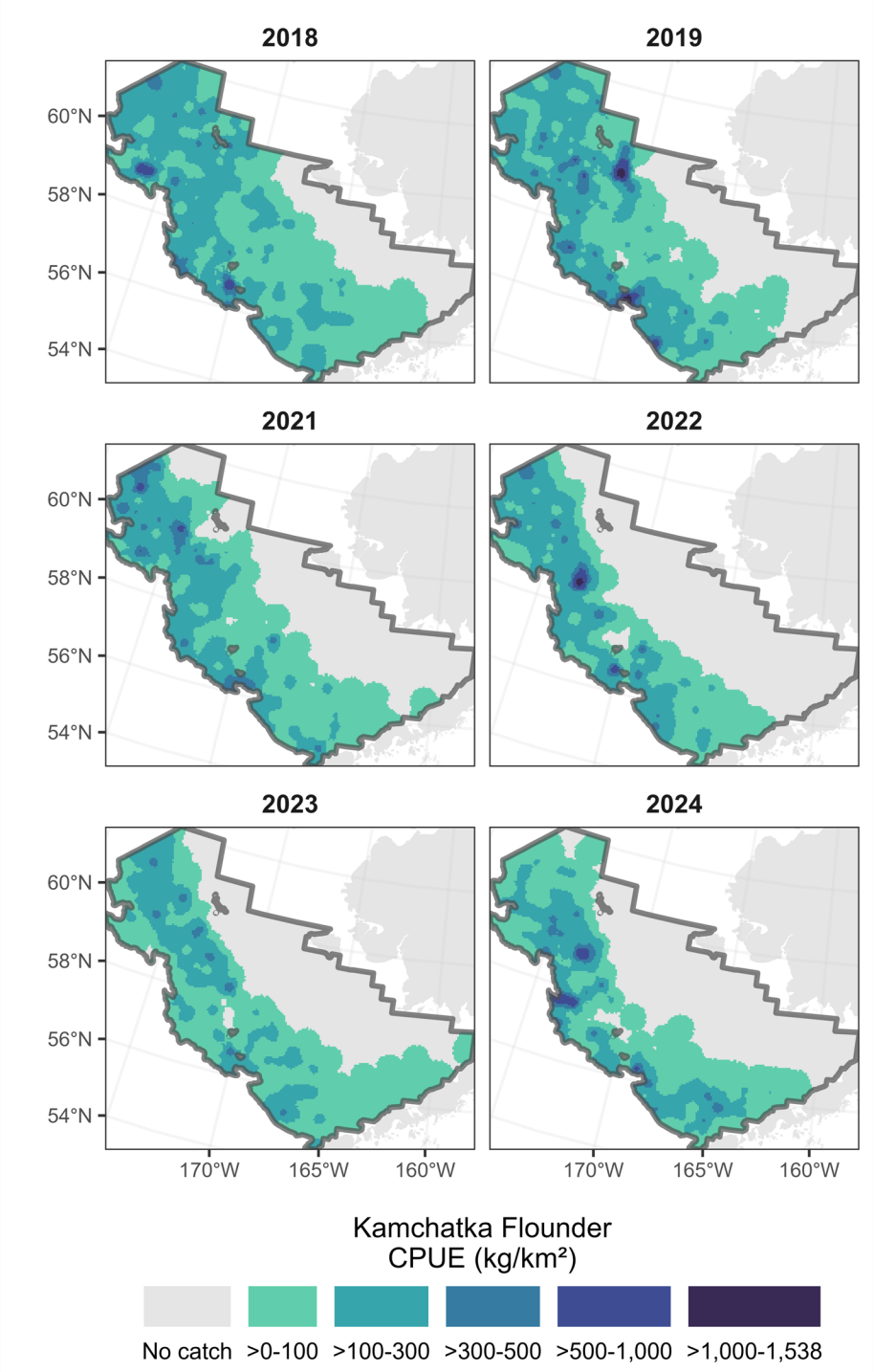

Figure 45. -- CPUE (kg/km^2) distribution of Kamchatka flounder (*Atheresthes evermanni*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

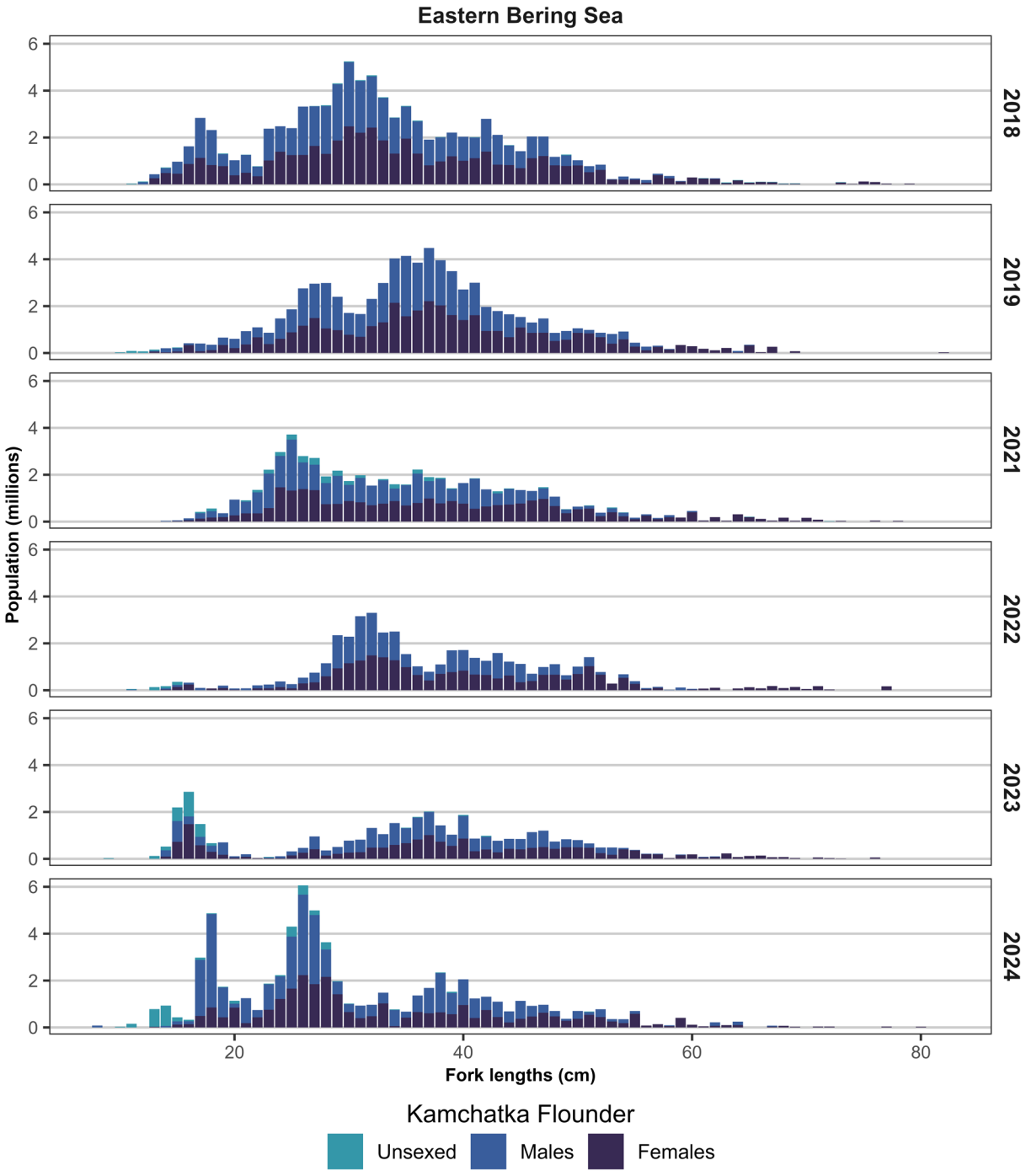

Figure 46. -- Total abundance-at-length estimates of Kamchatka flounder (*Atheresthes evermanni*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 46. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Kamchatka flounder (*Atheresthes evermanni*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	0.41	0.41	33	33	0	98	1
20	-	-	-	-	-	-	-
31	39.77	9.47	3,777	899	1,978	5,576	34
32	41.67	28.24	369	250	0	868	2
41	15.94	10.19	993	635	0	2,263	4
42	22.90	11.16	552	269	14	1,091	4
43	78.96	35.25	1,663	743	178	3,148	5
50	136.40	27.85	5,188	1,059	3,069	7,307	23
61	154.28	25.37	13,542	2,227	9,089	17,996	48
62	214.46	29.21	1,386	189	1,008	1,763	6
82	14.99	11.84	269	213	0	694	2
90	51.10	17.36	590	200	189	990	6
Total	**57.53**	**5.77**	**28,362**	**2,846**	**22,670**	**34,055**	**135**

Table 47. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Kamchatka flounder (*Atheresthes evermanni*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	5.44	5.44	0.00	1,284.88	428.30	428.29	1
20	-	-	-	-	-	-	-
31	173.61	48.32	7,309.74	25,669.02	16,489.38	4,589.82	34
32	142.20	120.77	0.00	3,394.81	1,257.98	1,068.42	2
41	13.76	8.99	0.00	1,977.57	857.60	559.98	4
42	45.97	23.74	0.00	2,254.53	1,108.99	572.77	4
43	52.08	22.94	130.66	2,063.33	1,096.99	483.17	5
50	401.64	117.43	6,343.65	24,211.86	15,277.76	4,467.05	23
61	349.01	140.80	5,916.36	55,353.18	30,634.77	12,359.21	48
62	205.05	42.26	778.88	1,871.04	1,324.96	273.04	6
82	8.97	7.09	0.00	415.61	161.10	127.25	2
90	42.59	13.42	181.69	801.26	491.47	154.89	6
Total	**140.22**	**28.40**	**41,123.17**	**97,135.42**	**69,129.30**	**14,003.06**	**135**

Longhead Dab (*Myzopsetta proboscidea*)

Previous scientific name: *Limanda proboscidea*

Between 2023 and 2024, the estimated biomass of longhead dab decreased by 48% on the 2024 eastern Bering Sea Shelf survey (Tables **48** and **49**; Figs. **47** and **48**) and the population was estimated at 65 million individuals (Tables **48** and **50**; Fig. **47**).

Table 48. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for longhead dab (*Myzopsetta proboscidea*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	38 of 350 (10.9%)
Bottom Depth (m)	21 — 55
Bottom Temperature (°C)	2 — 5.7
Surface Temperature (°C)	2.1 — 7
Population	65 million
Biomass (t)	6,328
Percent of Total Catch Biomass	<0.01%
Percent Change in Biomass	48% decrease from 2023

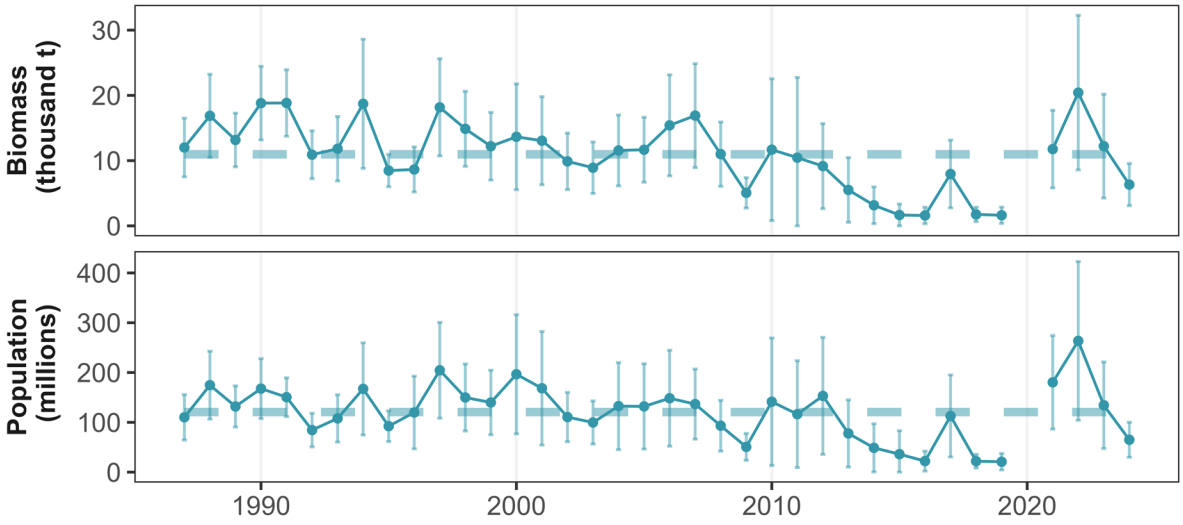

Figure 47. -- Time series of longhead dab (*Myzopsetta proboscidea*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

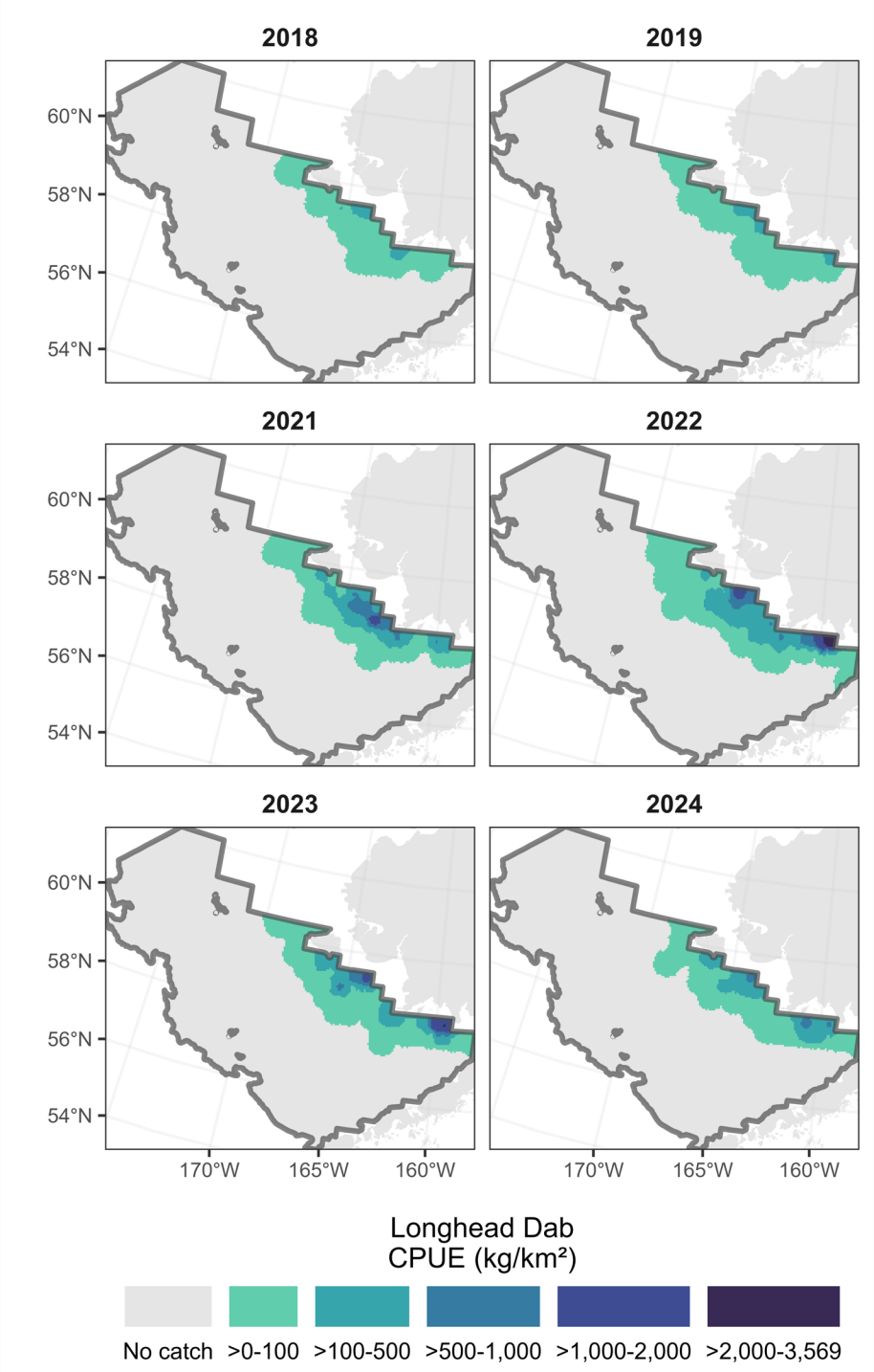

Figure 48. -- CPUE (kg/km^2) distribution of longhead dab (*Myzopsetta proboscidea*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 49. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which longhead dab (*Myzopsetta proboscidea*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	70.42	20.06	5,543	1,579	2,386	8,700	26
20	19.07	8.41	785	346	93	1,478	12
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**12.84**	**3.28**	**6,328**	**1,616**	**3,096**	**9,560**	**38**

Table 50. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (millions), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which longhead dab (*Myzopsetta proboscidea*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (M)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	681.50	209.85	20.60	86.67	53.64	16.52	26
20	275.95	147.43	0.00	23.51	11.37	6.07	12
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**131.86**	**35.70**	**29.81**	**100.20**	**65.01**	**17.60**	**38**

Marbled Eelpout (*Lycodes raridens*)

Between 2023 and 2024, the estimated biomass of marbled eelpout increased to 1,740 t, extrapolated from 79 individuals caught on the 2024 eastern Bering Sea Shelf survey (Table **51**; Figs. **49** and **50**) and the population was estimated at 2.2 million individuals (Table **51**; Fig. **49**).

Table 51. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for marbled eelpout (*Lycodes raridens*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	5 of 350 (1.4%)
Bottom Depth (m)	62 — 96
Bottom Temperature (°C)	-1.3 — 1.1
Surface Temperature (°C)	5.9 — 6.3
Population	2.2 million
Biomass (t)	1,740
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Increased from 2 to 79 individuals in 2024

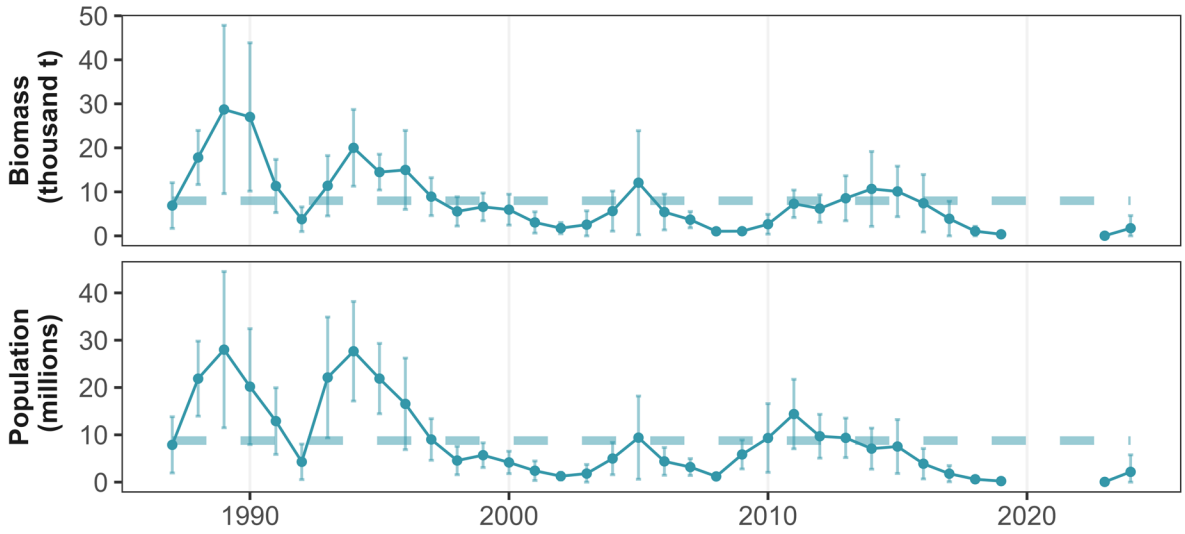

Figure 49. -- Time series of marbled eelpout (*Lycodes raridens*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

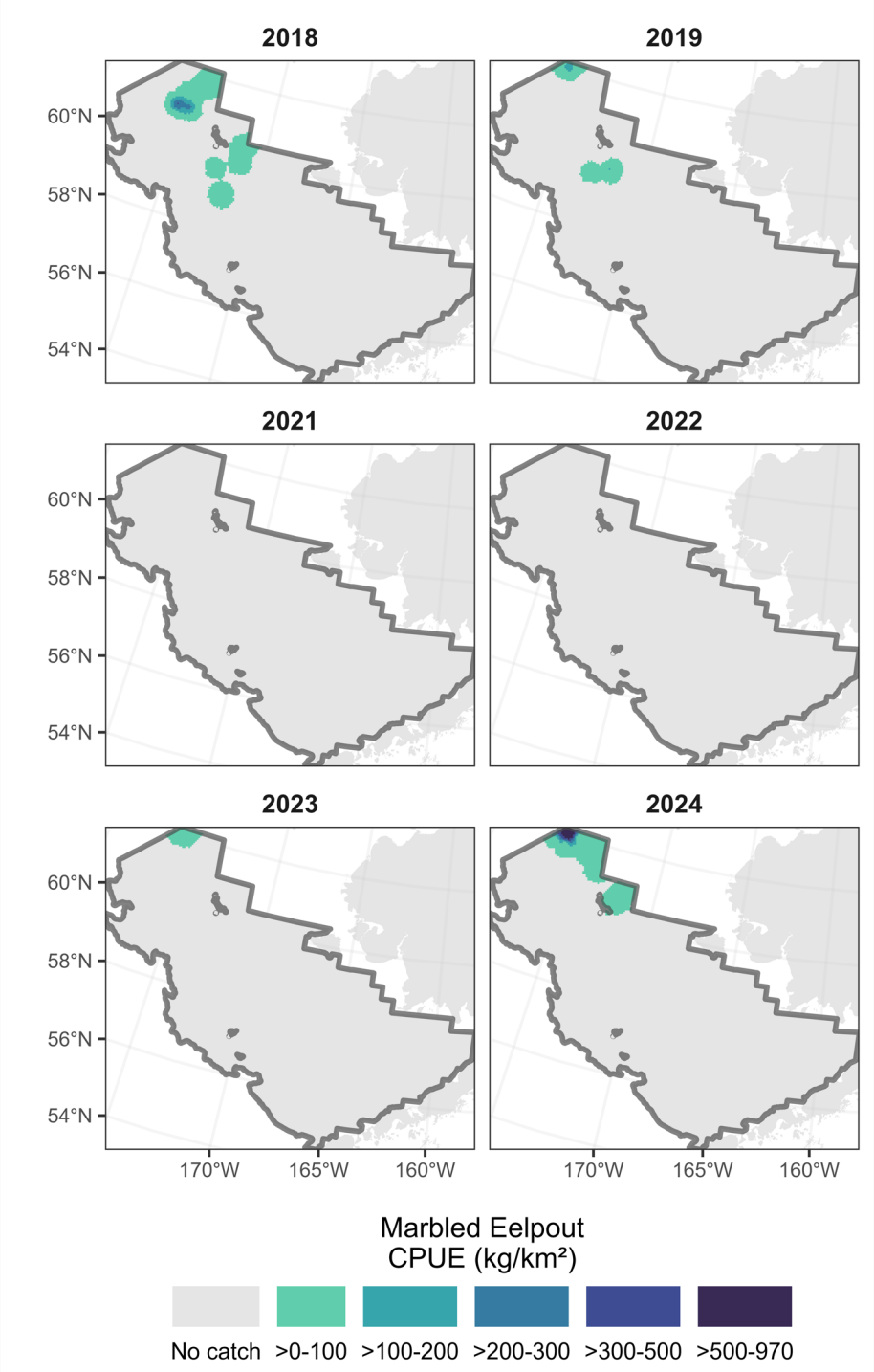

Figure 50. -- CPUE (kg/km^2) distribution of marbled eelpout (*Lycodes raridens*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Neptune Whelks (*Neptunea heros* and *Neptunea ventricosa*)

Previous common name: Neptune snail, Northern Neptune snail

Between 2023 and 2024, the estimated biomass of Neptune whelks increased by 29% on the 2024 eastern Bering Sea Shelf survey in (Table **52**; Figs. **51** and **52**) and the population was estimated at 793.6 million individuals (Table **52**; Fig. **51**).

Table 52. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Neptune whelks (*Neptunea heros* and *Neptunea ventricosa*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	152 of 350 (43.4%)
Bottom Depth (m)	25 — 135
Bottom Temperature (°C)	-1.6 — 4.3
Surface Temperature (°C)	2 — 8.4
Population	793.6 million
Biomass (t)	102,204
Percent of Total Catch Biomass	0.7%
Percent Change in Biomass	29% increase from 2023

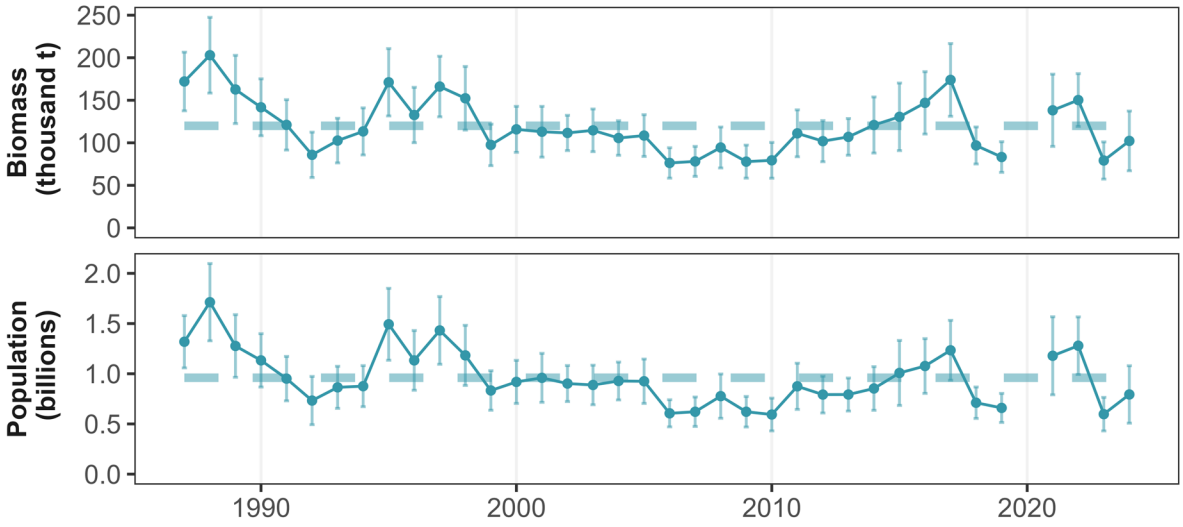

Figure 51. -- Time series of Neptune whelks (*Neptunea heros* and *Neptunea ventricosa*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

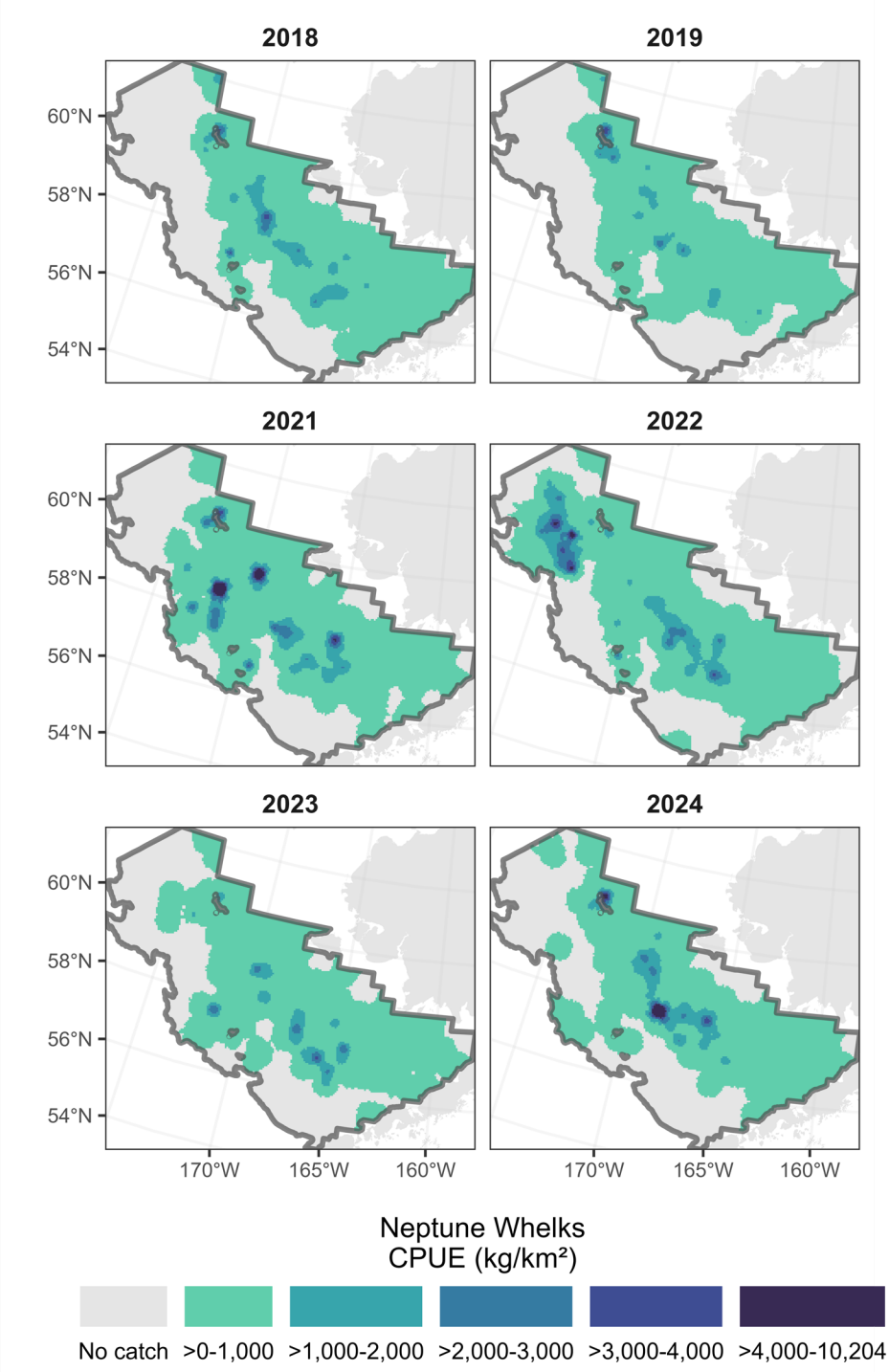

Figure 52. -- CPUE (kg/km^2) distribution of Neptune whelks (*Neptunea heros* and *Neptunea ventricosa*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Northern Rock Sole (*Lepidopsetta polyxystra*)

Between 2023 and 2024, the estimated biomass of northern rock sole increased by 4% on the 2024 eastern Bering Sea Shelf survey (Tables **53** and **54**; Figs. **53** and **54**) and the population was estimated at 7.4 billion individuals (Tables **53** and **55**; Fig. **53**).

The distribution of northern rock sole in 2024 was similar to the distribution in 2023. The highest densities in the eastern Bering Sea were observed in the southeast portion of the inner domain, along the Alaska Peninsula and in the vicinity of the Pribilof Islands (Fig. **54**). The distribution of northern rock sole appears to be correlated with the extent of the cold pool, as relatively low densities of northern rock sole were observed where bottom temperatures were < 1°C in the middle and outer domains (Fig. **54**; and Tables **54** and **55**). In colder years, such as 2010, when the cold pool was large and touched the western tip of Nunivak Island (Figs. **7** and **8**), the highest concentrations of rock sole were in the southwest part of the eastern Bering Sea shelf.

The length modes in the eastern Bering Sea were similar to those seen in 2023, approximately 18 and 30 cm for males and females (Fig. **55**). More small individuals (11-13 cm) were observed than in 2023 (Fig. **55**).

While spawning and feeding migrations for northern rock sole are poorly understood, they are believed to use active tidal stream transport during nighttime hours (Nichol and Somerton 2009) to migrate from shallow summer feeding grounds to deep winter and spring spawning grounds (Fadeev 1965, Shubnikov and Lisovenko 1964).

Northern and southern rock sole (not presented in this report) are congeners and can be difficult to distinguish in the field based on morphology. The survey program adopted methods to reliably distinguish between the two species in 1996 (note truncated time series in Fig. **53**). Despite belonging to the same genus, having a similar appearance, and co-occurring, the two species have differing geographic distributions (Fig. **54**). Southern rock sole are distributed in the southeastern corner of the Bering sea and northern rock sole are distributed across the eastern Bering Sea.

Table 53. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for northern rock sole (*Lepidopsetta polyxystra*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	268 of 350 (76.6%)
Bottom Depth (m)	21 — 176
Bottom Temperature (°C)	-1.3 — 5.7
Surface Temperature (°C)	2 — 8.7
Population	7.4 billion
Biomass (t)	1.4 million
Percent of Total Catch Biomass	9.6%
Percent Change in Biomass	4% increase from 2023

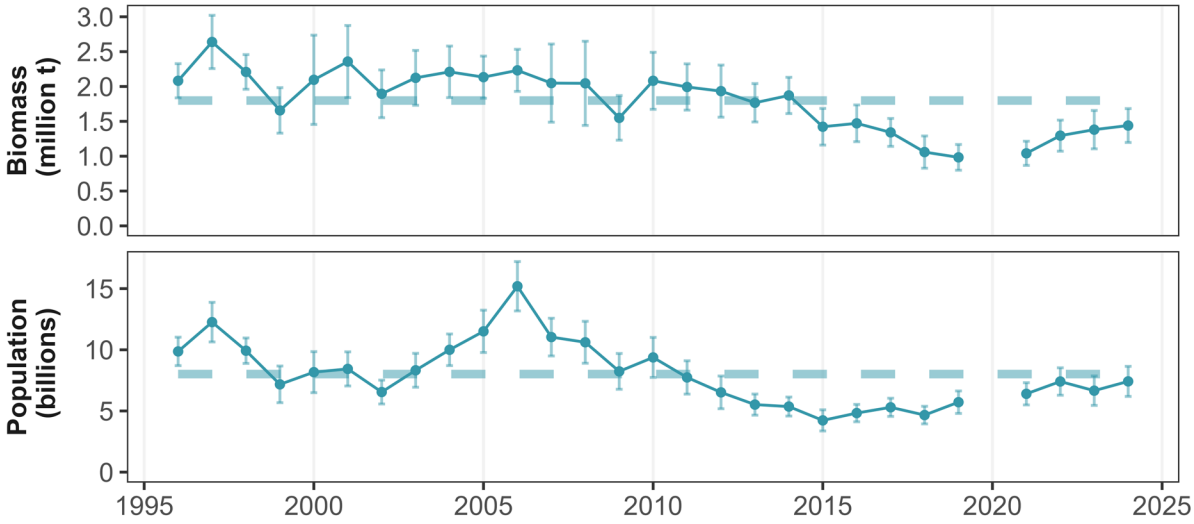

Figure 53. -- Time series of northern rock sole (*Lepidopsetta polyxystra*) biomass (million t) and population (billions) from the 1996-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

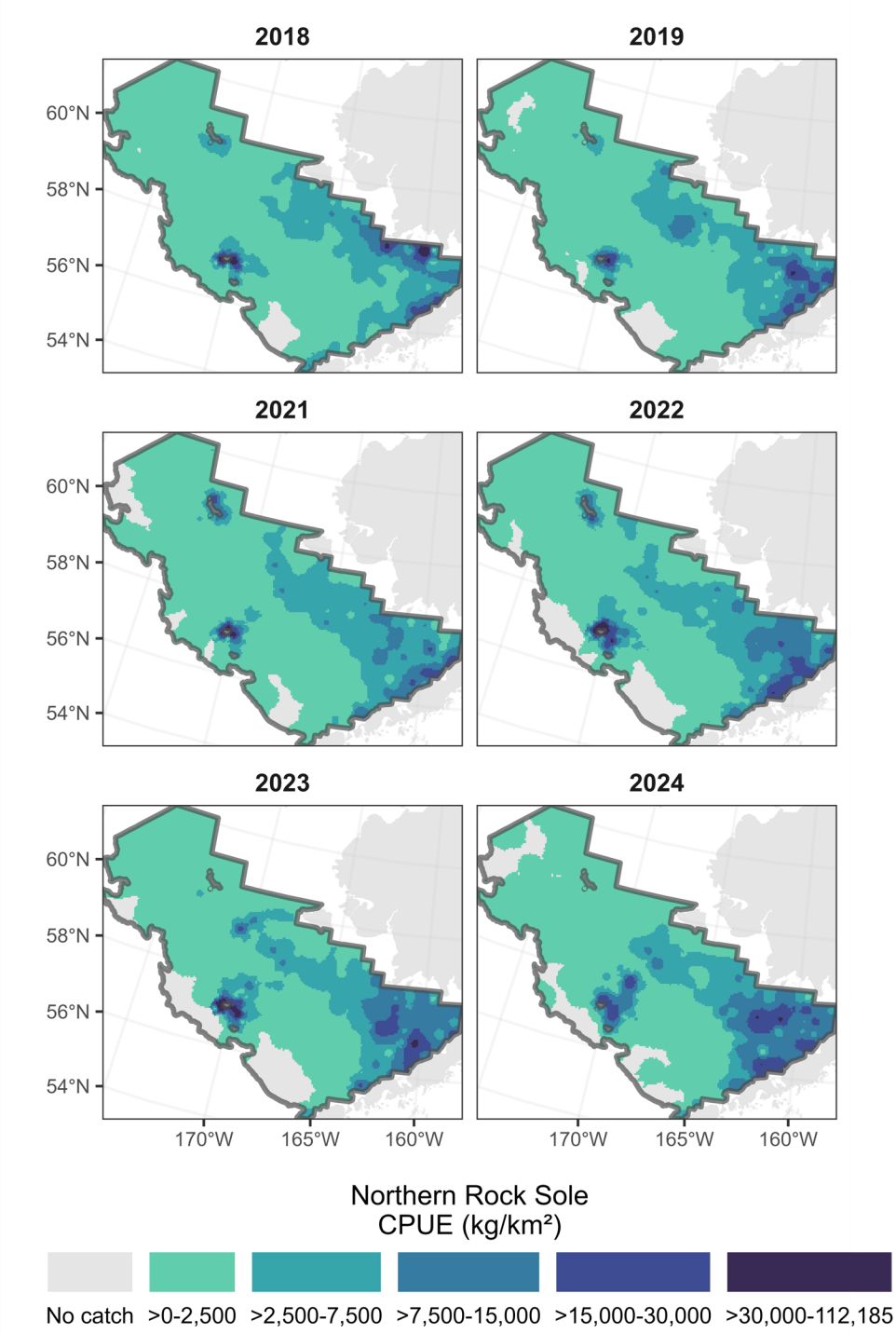

Figure 54. -- CPUE (kg/km^2) distribution of northern rock sole (*Lepidopsetta polyxystra*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

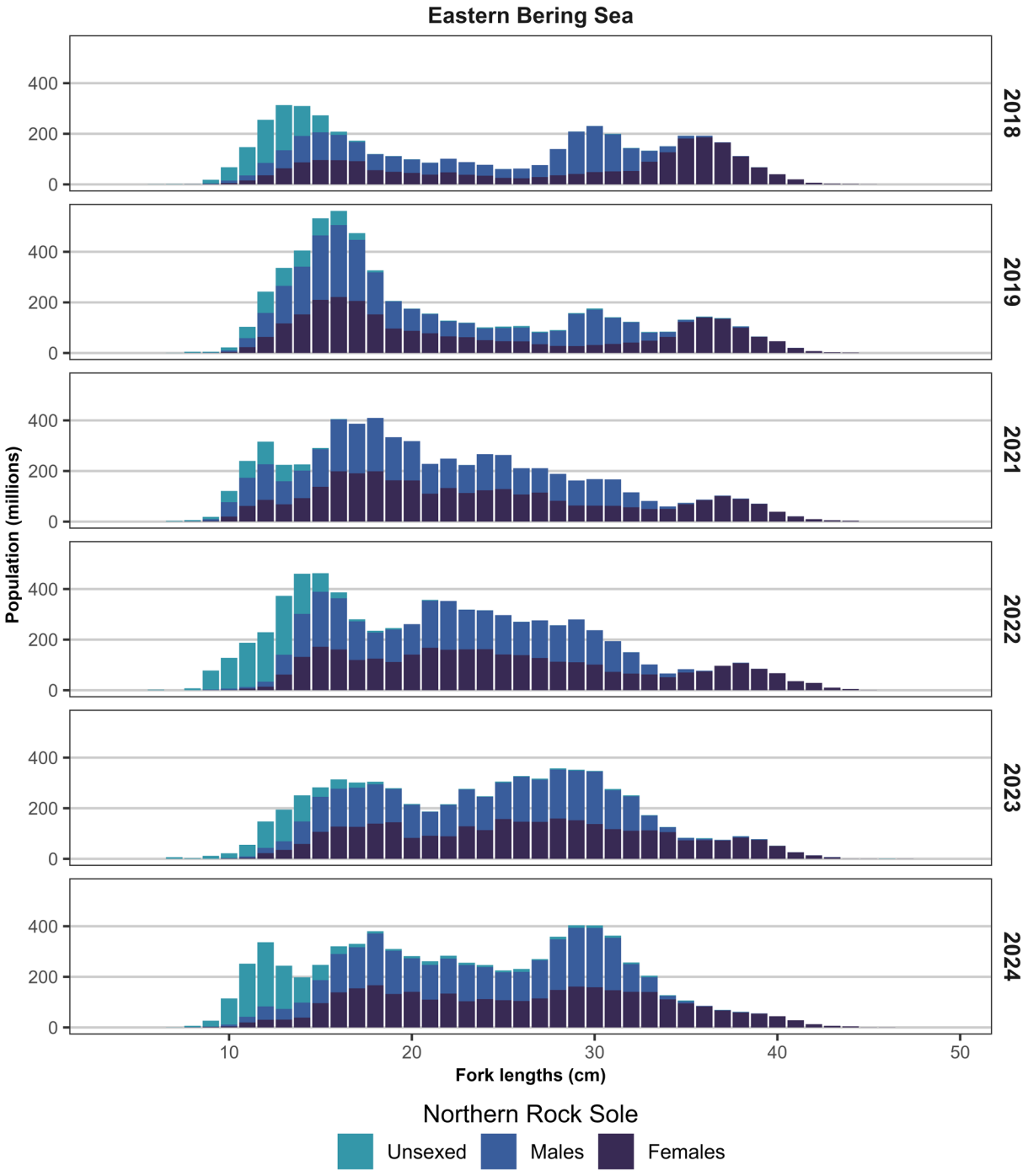

Figure 55. -- Total abundance-at-length estimates of northern rock sole (*Lepidopsetta polyxystra*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 54. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which northern rock sole (*Lepidopsetta polyxystra*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	9,289.06	984.59	731,101	77,493	576,116	886,087	58
20	2,915.98	516.32	120,119	21,269	77,581	162,656	31
31	3,370.12	694.68	320,089	65,980	188,128	452,049	66
32	3,979.28	2,416.60	35,204	21,379	0	77,962	5
41	538.15	172.86	33,532	10,771	11,990	55,075	41
42	7,868.47	2,408.92	189,804	58,108	73,587	306,021	16
43	343.43	164.38	7,234	3,463	309	14,159	12
50	2.04	1.34	78	51	0	179	4
61	22.27	7.67	1,955	673	609	3,302	21
62	8.85	7.21	57	47	0	150	2
82	30.72	5.85	552	105	341	762	11
90	1.34	1.34	15	15	0	46	1
Total	**2,920.42**	**246.54**	**1,439,739**	**121,544**	**1,196,651**	**1,682,827**	**268**

Table 55. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which northern rock sole (*Lepidopsetta polyxystra*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	56,468.65	5,997.78	3,500,284.04	5,388,522.39	4,444,403.21	472,059.59	58
20	17,523.80	3,322.00	448,173.99	995,549.96	721,861.97	136,843.99	31
31	15,628.92	3,417.15	835,300.12	2,133,522.63	1,484,411.38	324,555.63	66
32	11,768.11	6,566.12	0.00	220,286.62	104,109.32	58,088.65	5
41	1,609.34	562.04	30,236.77	170,318.94	100,277.86	35,020.54	41
42	22,455.16	6,737.58	216,616.57	866,715.46	541,666.02	162,524.72	16
43	721.64	322.31	1,622.42	28,778.26	15,200.34	6,788.96	12
50	6.06	3.73	0.00	514.45	230.39	142.03	4
61	51.35	16.89	1,541.68	7,472.17	4,506.92	1,482.62	21
62	18.65	14.83	0.00	312.16	120.49	95.83	2
82	63.09	10.75	746.91	1,518.60	1,132.76	192.92	11
90	2.58	2.58	0.00	89.14	29.71	29.71	1
Total	**15,046.86**	**1,247.06**	**6,188,371.15**	**8,647,529.58**	**7,417,950.36**	**614,789.61**	**268**

Pacific Capelin (*Mallotus villosus*)

Between 2023 and 2024, the estimated biomass of Pacific capelin increased by 4% on the 2024 eastern Bering Sea Shelf survey (Tables **56** and **57**; Figs. **56** and **57**) and the population was estimated at 15.2 million individuals (Tables **56** and **58**; Fig. **56**).

Table 56. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Pacific capelin (*Mallotus villosus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	56 of 350 (16.0%)
Bottom Depth (m)	21 — 92
Bottom Temperature (°C)	-1.6 — 5.7
Surface Temperature (°C)	2.1 — 7
Population	15.2 million
Biomass (t)	318
Percent of Total Catch Biomass	<0.01%
Percent Change in Biomass	4% increase from 2023

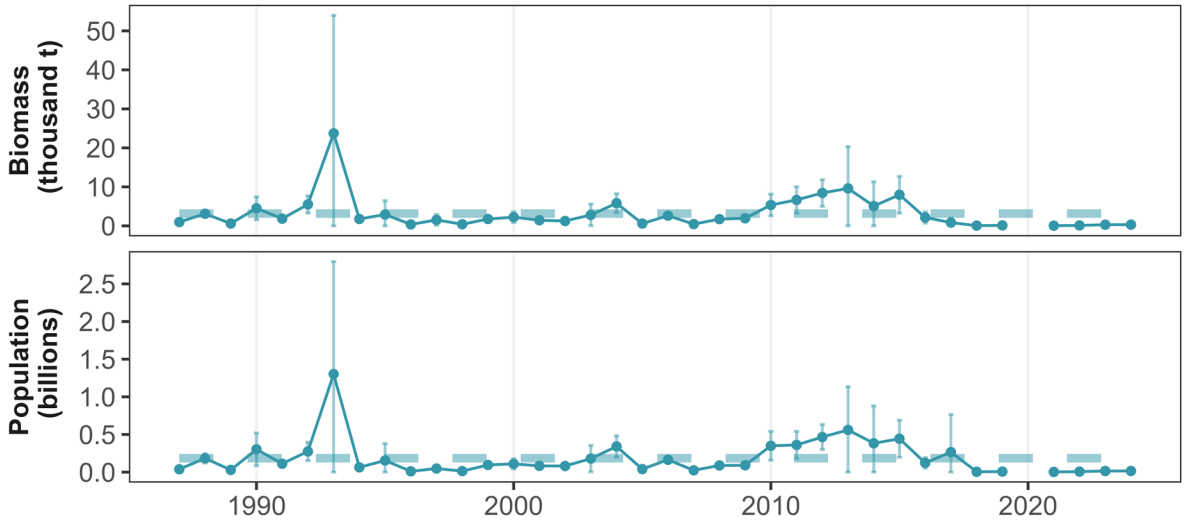

Figure 56. -- Time series of Pacific capelin (*Mallotus villosus*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

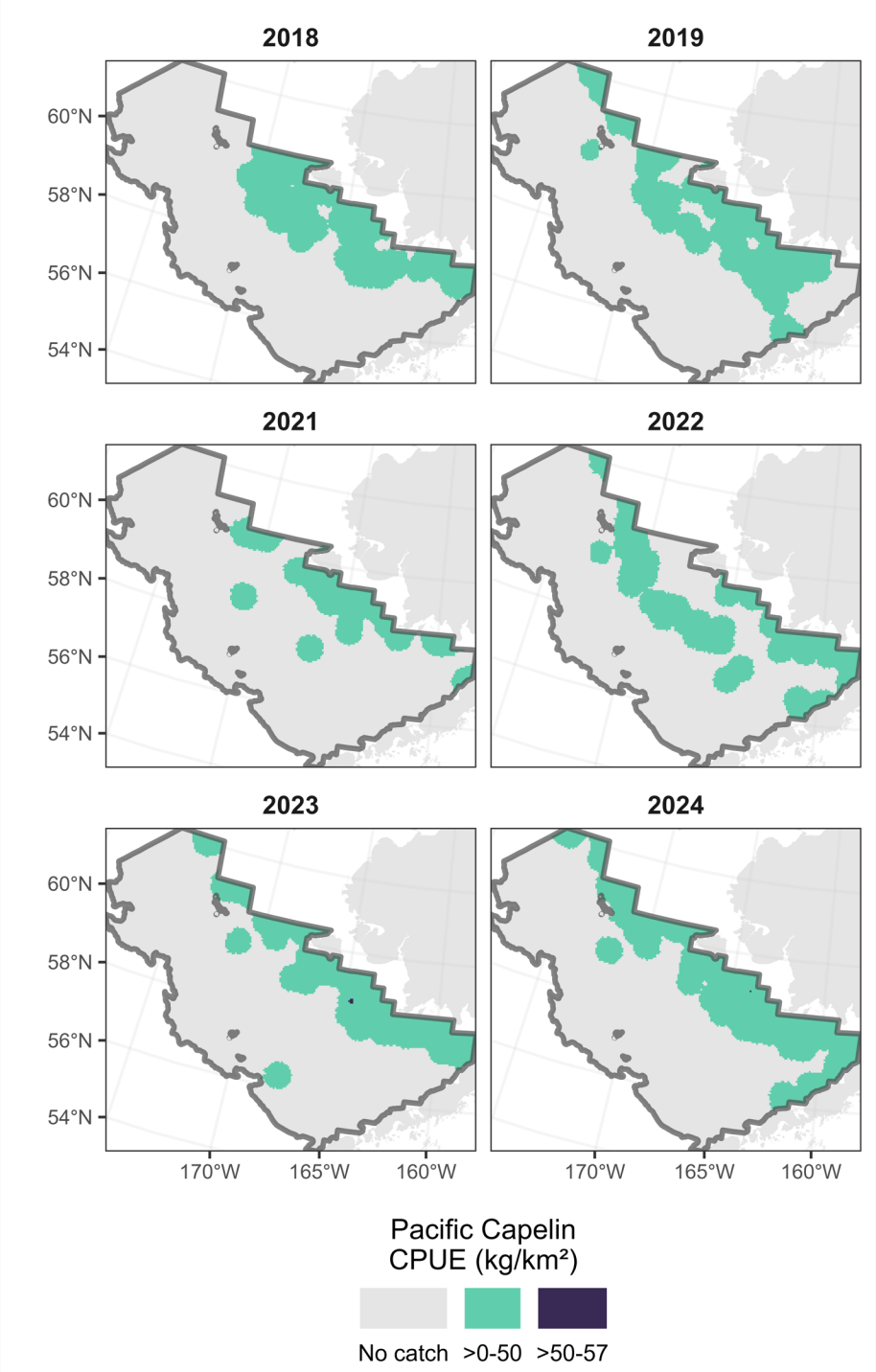

Figure 57. -- CPUE (kg/km^2) distribution of Pacific capelin (*Mallotus villosus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 57. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Pacific capelin (*Mallotus villosus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	3.78	1.06	298	84	130	465	35
20	0.19	0.09	8	4	1	15	8
31	0.05	0.04	5	4	0	13	2
32	-	-	-	-	-	-	-
41	0.06	0.02	4	1	1	6	7
42	-	-	-	-	-	-	-
43	0.02	0.02	0	0	0	1	1
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	0.17	0.12	3	2	0	7	3
90	-	-	-	-	-	-	-
Total	**0.65**	**0.17**	**318**	**84**	**150**	**486**	**56**

Table 58. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Pacific capelin (*Mallotus villosus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	178.12	47.40	6,558.70	21,479.88	14,019.29	3,730.30	35
20	10.47	4.21	84.33	778.25	431.29	173.48	8
31	2.25	1.60	0.00	518.33	214.00	152.17	2
32	-	-	-	-	-	-	-
41	4.42	1.68	65.58	485.02	275.30	104.86	7
42	-	-	-	-	-	-	-
43	1.58	1.58	0.00	99.69	33.23	33.23	1
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	10.66	7.46	0.00	459.23	191.34	133.94	3
90	-	-	-	-	-	-	-
Total	**30.76**	**7.59**	**7,681.57**	**22,647.34**	**15,164.45**	**3,741.44**	**56**

Pacific Cod (*Gadus macrocephalus*)

Between 2023 and 2024, the estimated biomass of Pacific cod decreased by 4% on the 2024 eastern Bering Sea Shelf survey (Tables **59** and **60**; Figs. **58** and **59**) and the population was estimated at 436.5 million individuals (Tables **59** and **61**; Fig. **58**).

Since 2019, Pacific cod biomass and abundance have stabilized around the long-term mean, likely as annual temperatures in the eastern Bering Sea have also returned to the long-term average. In 2024, Pacific cod biomass was spread throughout the eastern Bering Sea region. Some of the highest concentrations of Pacific cod were encountered to the northwest and to the east of the Pribilof islands and the southwest portion of the middle domain near the Alaska Peninsula. Pacific cod size composition in the eastern Bering Sea is relatively uniform, though the three modes around 22 cm, 36 cm, and 51 cm for males and 23 cm, 36 cm, and 53 cm for females seen in 2023 persisted for 2024 (Fig. **60**).

Pacific cod migration between the eastern and northern Bering Sea shelf survey areas is likely related to interannual variability in temperature patterns. Satellite tagging studies indicate high mobility from the Gulf of Alaska to the northern Bering Sea (Nielsen et al. 2023). It is speculated that, during the recent warm stanza (2014 - 2021), higher-than-average bottom temperatures in the southeastern shelf created thermal corridors (between 1° and 6°C) for Pacific cod to move into the middle and inner domains, where they likely fed on capelin, pacific herring, and smelt that were also found in high density in the inner domain (Ciannelli and Bailey 2005). This led to a decrease in Pacific cod abundance in the eastern Bering Sea, along with a concomitant increase of same-sized Pacific cod in the adjacent northern Bering Sea, suggesting a northward migration (Stevenson and Lauth 2019). These migrations to the northern Bering Sea were potentially already taking place prior to 2017, as high densities of Pacific cod were observed along the northern edge of the eastern Bering Sea shelf survey area from 2014 to 2016 (Conner et al. 2017, Conner et al. 2017, Conner and Lauth 2017).

Since 2017 and 2019, when abundance peaked in the northern Bering Sea, Pacific cod have begun to decline to the north and have begun to increase in the eastern Bering Sea (Fig. **59**). This peak in northern Bering Sea abundance was likely facilitated by the three warm years preceding 2017, when Pacific cod abundance and biomass were relatively high, with large aggregations in the middle and inner domains, close to the border between the eastern and northern Bering Sea shelf survey areas.

Table 59. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Pacific cod (*Gadus macrocephalus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	335 of 350 (95.7%)
Bottom Depth (m)	21 — 192
Bottom Temperature (°C)	-1.3 — 5.7
Surface Temperature (°C)	2 — 8.9
Population	436.5 million
Biomass (t)	635,840
Percent of Total Catch Biomass	4.2%
Percent Change in Biomass	4% decrease from 2023

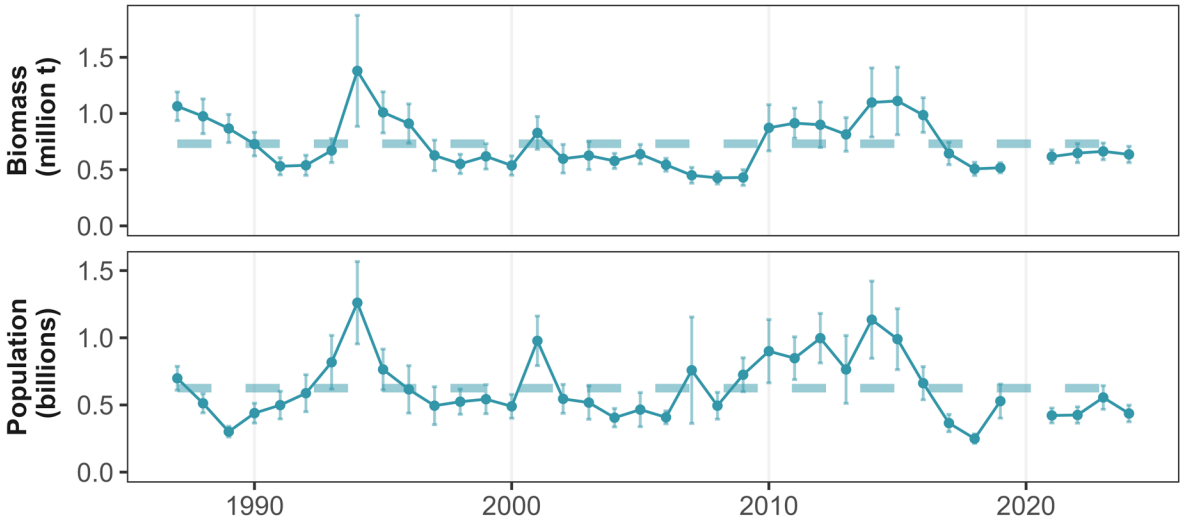

Figure 58. -- Time series of Pacific cod (*Gadus macrocephalus*) biomass (million t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

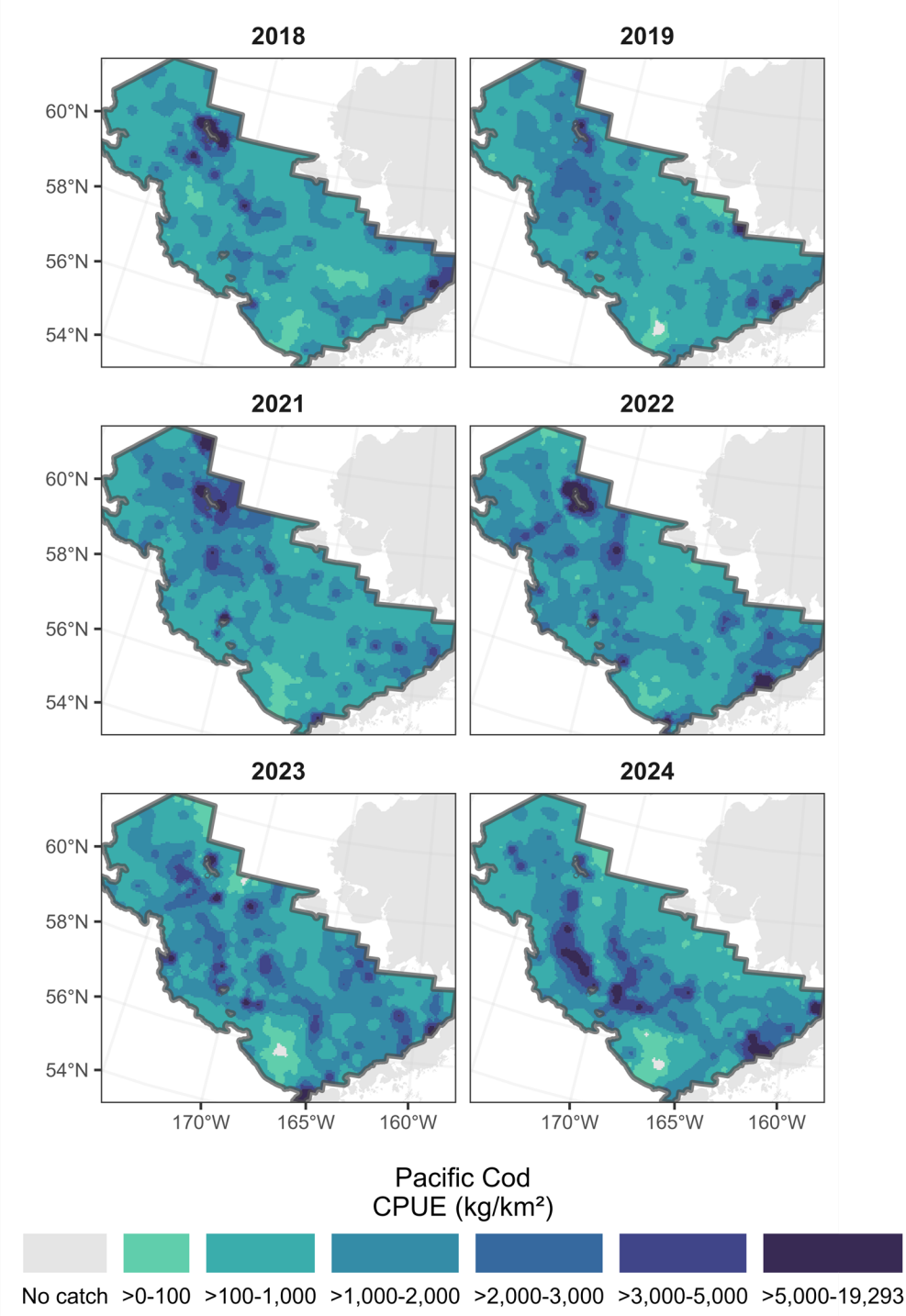

Figure 59. -- CPUE (kg/km^2) distribution of Pacific cod (*Gadus macrocephalus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

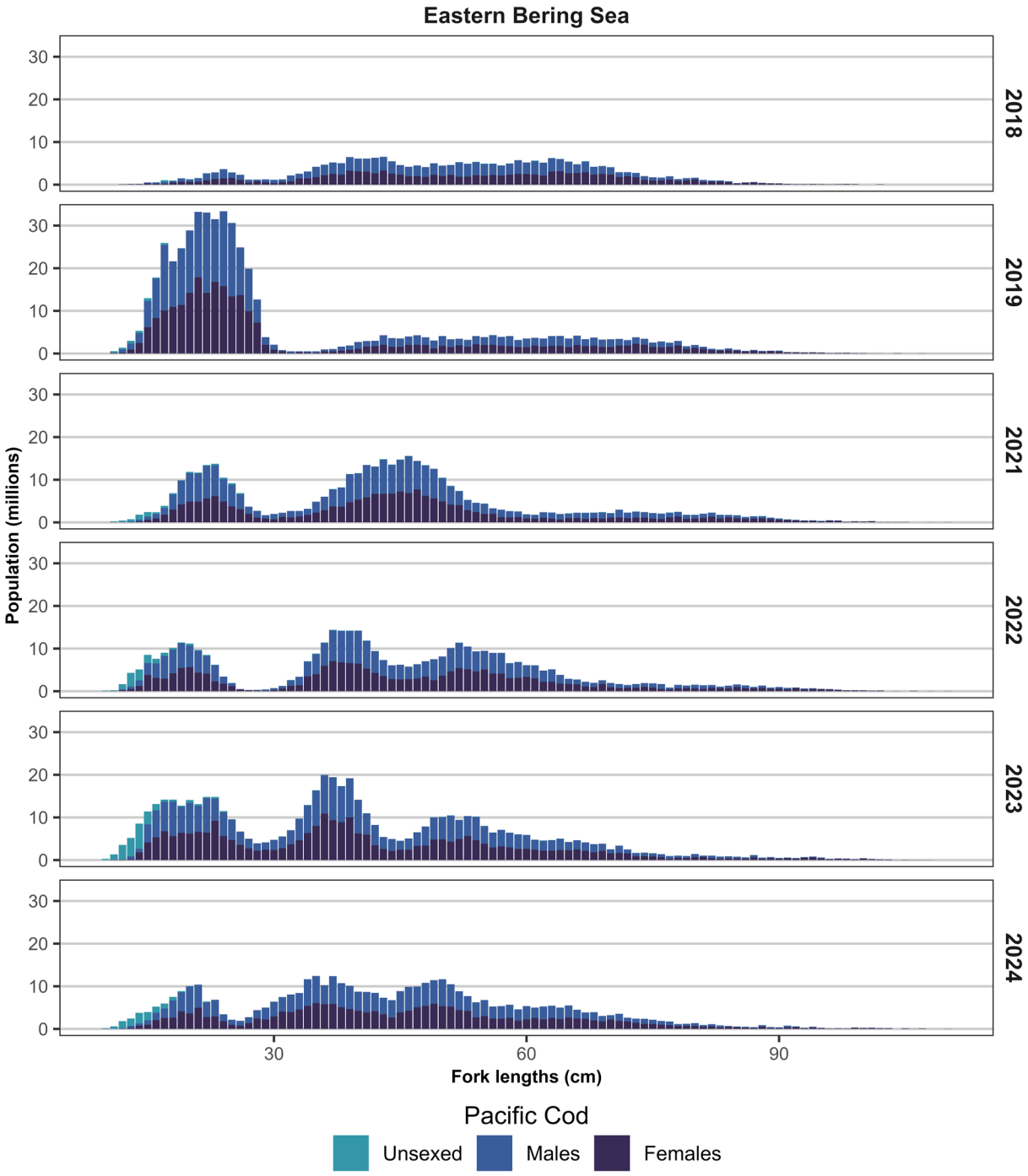

Figure 60. -- Total abundance-at-length estimates of Pacific cod (*Gadus macrocephalus*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 60. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (thousand t) with SD (t), 95% lower (LCL; thousand t) and upper (UCL; thousand t) confidence limits, and number of hauls in which Pacific cod (*Gadus macrocephalus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (Kt)	Biomass SD (t)	95% LCL (Kt)	95% UCL (Kt)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	1,081.72	218.20	85.14	17,173	50.79	119.48	56
20	697.14	95.95	28.72	3,952	20.81	36.62	31
31	1,540.92	154.46	146.35	14,671	117.01	175.70	67
32	3,024.01	745.33	26.75	6,594	13.57	39.94	5
41	1,310.86	227.25	81.68	14,160	53.36	110.00	44
42	2,644.93	596.44	63.80	14,387	35.03	92.58	18
43	1,723.36	427.42	36.30	9,003	18.29	54.31	13
50	625.83	162.25	23.81	6,172	11.46	36.15	16
61	1,237.79	166.81	108.65	14,642	79.37	137.93	60
62	1,641.37	129.66	10.61	838	8.93	12.28	6
82	769.38	200.84	13.81	3,606	6.60	21.02	11
90	885.92	136.80	10.22	1,579	7.07	13.38	8
Total	**1,289.76**	**73.88**	**635.84**	**36,421**	**563.00**	**708.68**	**335**

Table 61. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (thousands), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which Pacific cod (*Gadus macrocephalus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	1,026.32	153.72	56.58	104.98	80.78	12,098.99	56
20	759.39	141.72	19.61	42.96	31.28	5,837.81	31
31	1,275.19	178.92	87.13	155.10	121.12	16,993.35	67
32	1,285.34	238.41	7.15	15.59	11.37	2,109.11	5
41	838.28	179.41	29.88	74.59	52.23	11,178.90	44
42	1,949.47	539.69	20.99	73.06	47.03	13,018.40	18
43	1,608.34	594.34	8.84	58.92	33.88	12,519.04	13
50	289.00	79.83	4.92	17.07	10.99	3,036.68	16
61	387.38	57.84	23.85	44.16	34.00	5,076.59	60
62	584.79	53.32	3.09	4.47	3.78	344.50	6
82	370.91	72.75	4.05	9.27	6.66	1,306.19	11
90	295.82	58.36	2.07	4.76	3.41	673.46	8
Total	**885.47**	**62.92**	**374.49**	**498.57**	**436.53**	**31,018.26**	**335**

Pacific Halibut (*Hippoglossus stenolepis*)

Between 2023 and 2024, the estimated biomass of Pacific halibut decreased by 26% on the 2024 eastern Bering Sea Shelf survey (Tables **62** and **63**; Figs. **61** and **62**) and the population was estimated at 65.1 million individuals (Tables **62** and **64**; Fig. **61**).

Management of Pacific halibut stocks is the purview of the International Pacific Halibut Commission (IPHC), and their stock assessments include all available fisheries and scientific survey data from both the United States and Canada, in addition to data from an IPHC longline survey (Stewart and Martell 2015).

To ensure a majority of the halibut caught at sea could be released alive, many of these animals were deliberately left unsexed and unweighed by survey teams. In instances when an IPHC secretariat was present on board the vessel or NOAA scientists collected specimen data on behalf of IPHC, subsampled halibut were lengthed, weighed, and sexed at minimum prior to otolith collection.

The distribution of Pacific halibut in the 2024 Bering Sea shelf survey area was similar to that observed in 2023, with the greatest densities south of Nunavik Island (Fig. **62**) and southwest of Cape Newenham. Three length modes of 25, 39, and 60 cm were observed Pacific halibut (unsexed; Fig. **63**) in the eastern Bering Sea.

Table 62. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Pacific halibut (*Hippoglossus stenolepis*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	247 of 350 (70.6%)
Bottom Depth (m)	21 — 192
Bottom Temperature (°C)	-1.2 — 5.6
Surface Temperature (°C)	2.1 — 8.8
Population	65.1 million
Biomass (t)	125,145
Percent of Total Catch Biomass	0.8%
Percent Change in Biomass	26% decrease from 2023

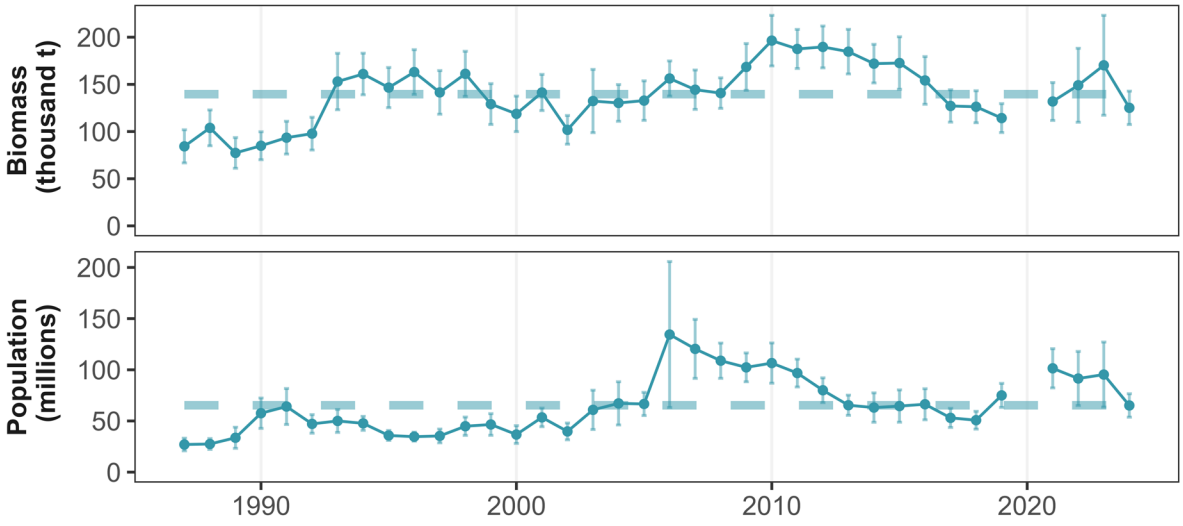

Figure 61. -- Time series of Pacific halibut (*Hippoglossus stenolepis*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

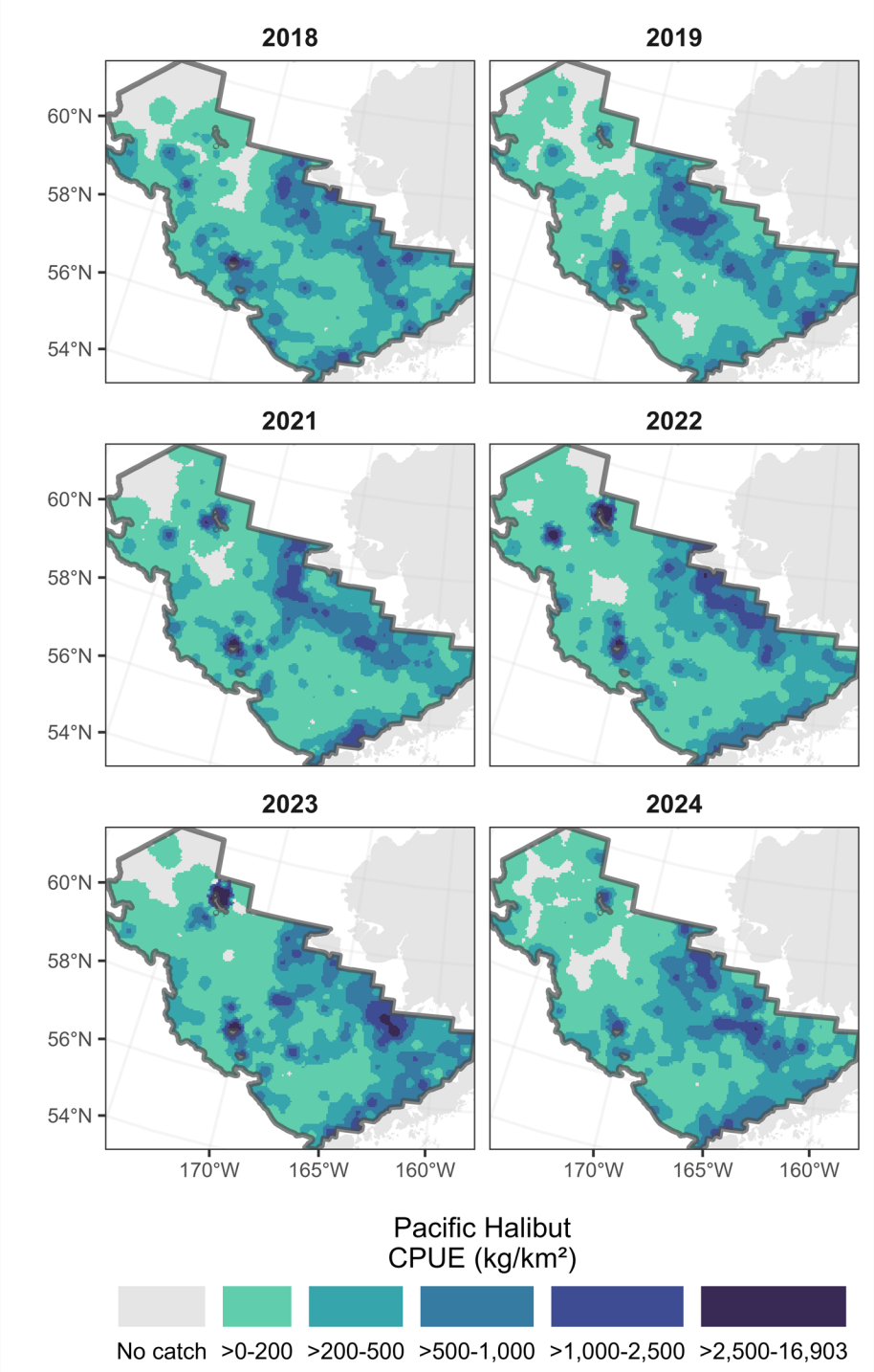

Figure 62. -- CPUE (kg/km^2) distribution of Pacific halibut (*Hippoglossus stenolepis*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

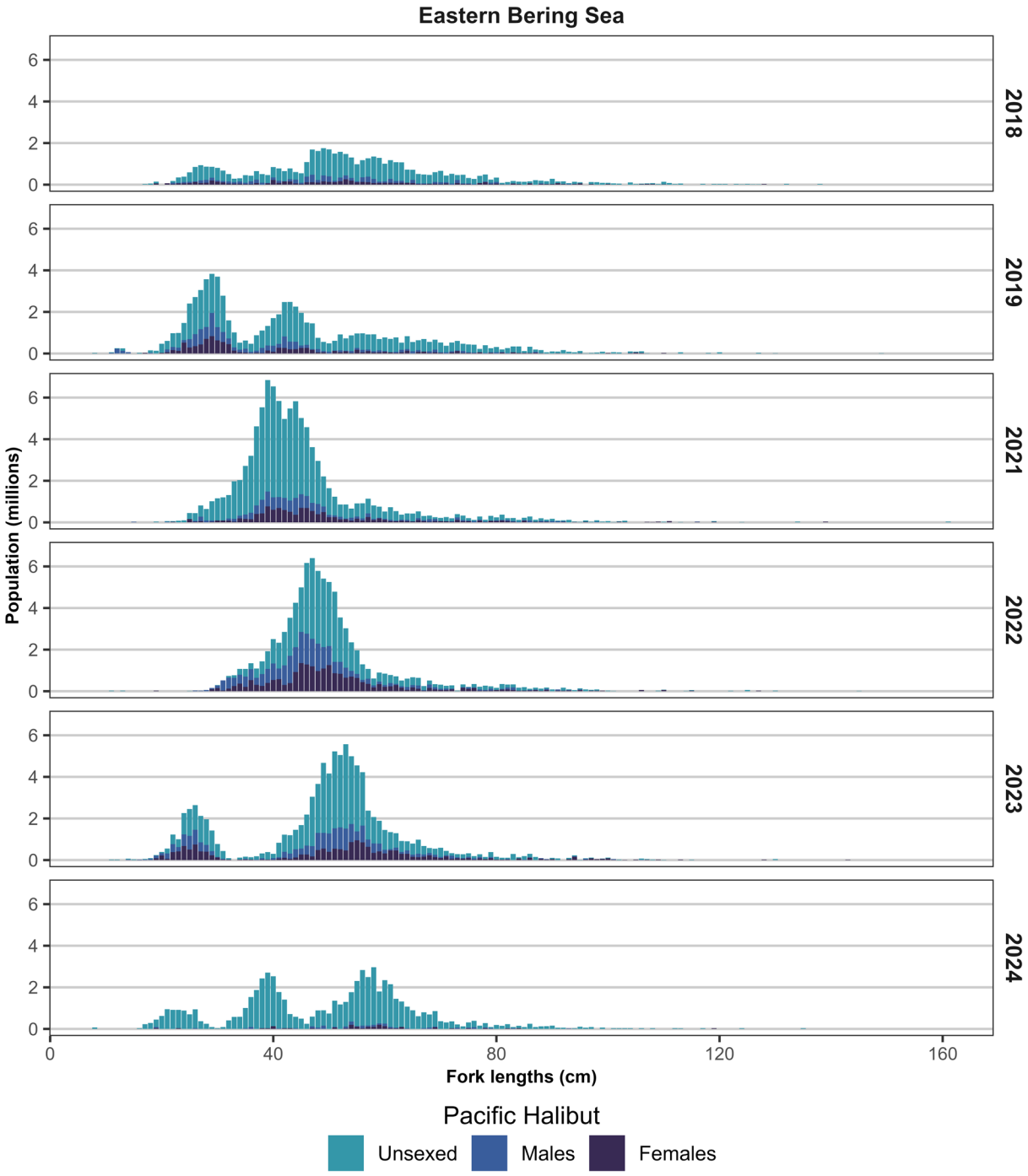

Figure 63. -- Total abundance-at-length estimates of Pacific halibut (*Hippoglossus stenolepis*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 63. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Pacific halibut (*Hippoglossus stenolepis*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	459.48	68.44	36,164	5,387	25,390	46,937	55
20	558.18	91.53	22,993	3,770	15,453	30,534	28
31	326.41	37.58	31,002	3,569	23,863	38,141	63
32	319.07	114.89	2,823	1,016	790	4,855	5
41	80.32	36.61	5,005	2,281	442	9,567	21
42	321.21	120.02	7,748	2,895	1,958	13,539	15
43	58.09	28.36	1,224	597	29	2,418	7
50	201.77	43.59	7,675	1,658	4,359	10,992	18
61	96.90	19.95	8,505	1,751	5,003	12,008	28
62	33.63	33.63	217	217	0	652	1
82	95.79	68.73	1,720	1,234	0	4,188	5
90	5.93	5.93	68	68	0	205	1
Total	**253.85**	**17.95**	**125,145**	**8,851**	**107,443**	**142,847**	**247**

Table 64. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Pacific halibut (*Hippoglossus stenolepis*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	355.94	61.39	18,350.75	37,679.02	28,014.88	4,832.07	55
20	257.35	41.84	7,154.37	14,047.97	10,601.17	1,723.40	28
31	150.56	19.76	10,546.37	18,053.88	14,300.12	1,876.88	63
32	138.22	51.35	314.13	2,131.41	1,222.77	454.32	5
41	34.67	13.39	491.90	3,828.34	2,160.12	834.11	21
42	117.59	46.45	595.70	5,077.36	2,836.53	1,120.42	15
43	29.66	12.31	106.08	1,143.29	624.68	259.30	7
50	47.20	11.44	925.07	2,665.68	1,795.37	435.15	18
61	35.92	7.17	1,894.53	4,411.30	3,152.91	629.19	28
62	10.78	10.78	0.00	208.90	69.63	69.63	1
82	18.21	8.46	23.34	630.57	326.95	151.81	5
90	2.67	2.67	0.00	92.36	30.79	30.79	1
Total	**132.12**	**11.60**	**53,702.57**	**76,569.30**	**65,135.93**	**5,716.68**	**247**

Pacific Herring (*Clupea pallasii*)

Between 2023 and 2024, the estimated biomass of Pacific herring increased by 21% on the 2024 eastern Bering Sea Shelf survey (Tables **65** and **66**; Figs. **64** and **65**) and the population was estimated at 315.9 million individuals (Tables **65** and **67**; Fig. **64**).

Table 65. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Pacific herring (*Clupea pallasii*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	96 of 350 (27.4%)
Bottom Depth (m)	21 — 105
Bottom Temperature (°C)	-1.2 — 5.7
Surface Temperature (°C)	2 — 8.3
Population	315.9 million
Biomass (t)	66,282
Percent of Total Catch Biomass	0.4%
Percent Change in Biomass	21% increase from 2023

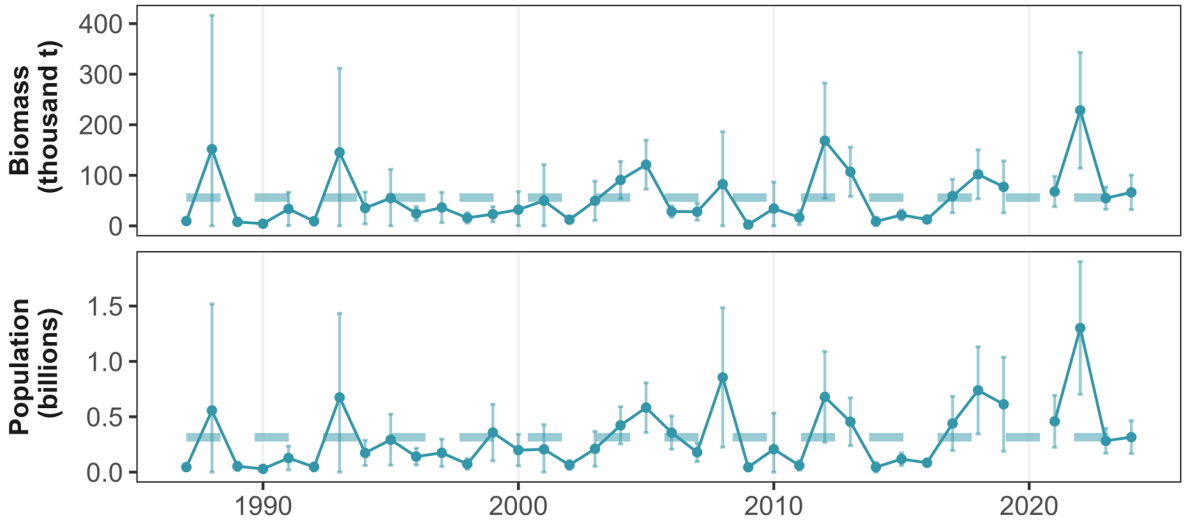

Figure 64. -- Time series of Pacific herring (*Clupea pallasii*) biomass (thousand t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

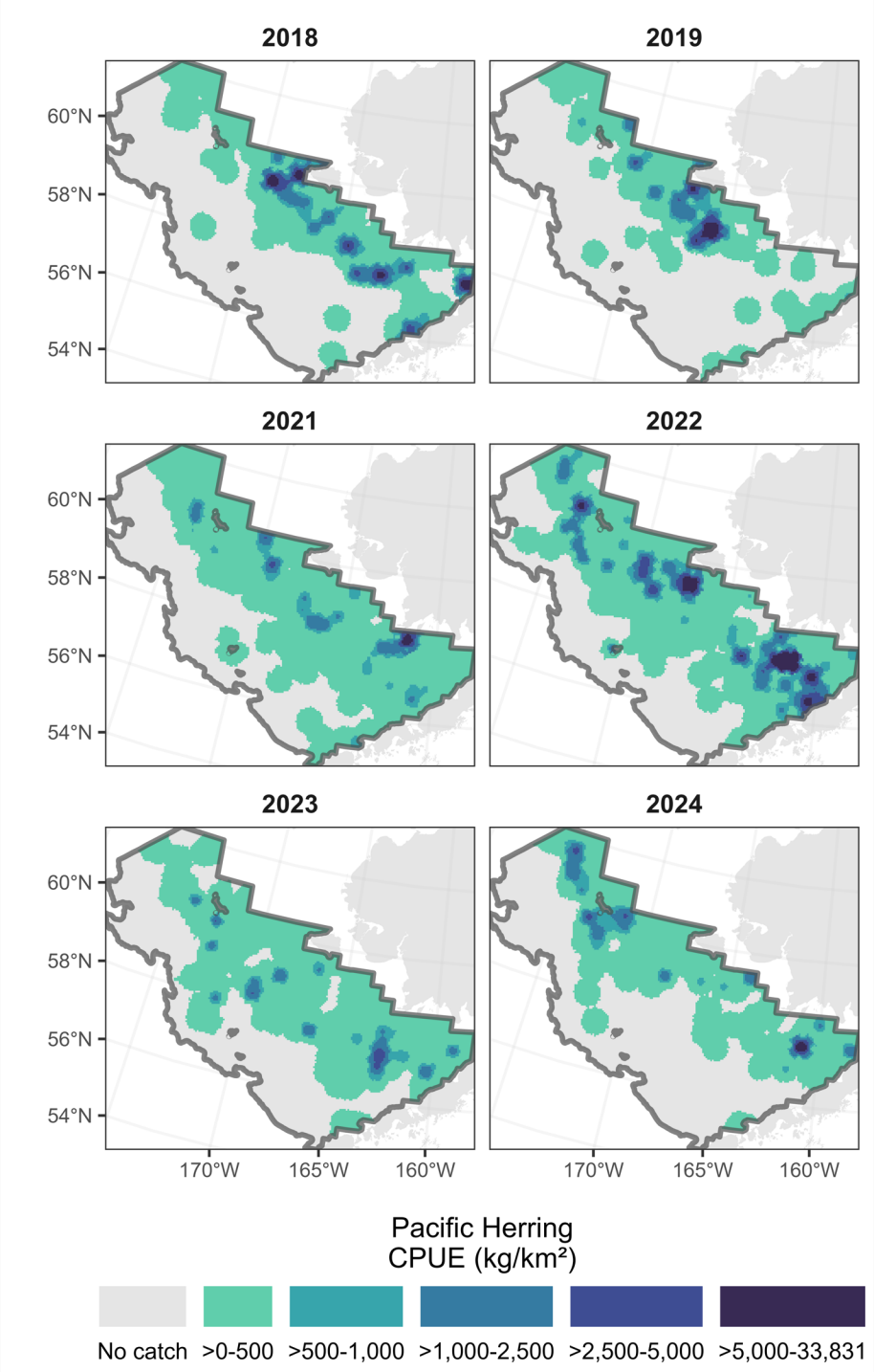

Figure 65. -- CPUE (kg/km^2) distribution of Pacific herring (*Clupea pallasii*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 66. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Pacific herring (*Clupea pallasii*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	114.61	48.50	9,020	3,818	1,385	16,655	26
20	105.39	60.92	4,341	2,509	0	9,360	15
31	156.62	143.40	14,875	13,620	0	42,116	11
32	-	-	-	-	-	-	-
41	188.60	71.77	11,751	4,472	2,808	20,695	24
42	-	-	-	-	-	-	-
43	632.82	266.95	13,329	5,623	2,084	24,575	8
50	-	-	-	-	-	-	-
61	1.38	1.03	121	90	0	302	2
62	-	-	-	-	-	-	-
82	707.62	334.11	12,704	5,998	707	24,701	9
90	12.04	12.04	139	139	0	417	1
Total	**134.45**	**34.78**	**66,282**	**17,147**	**31,989**	**100,576**	**96**

Table 67. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Pacific herring (*Clupea pallasii*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	776.08	369.51	2,916.17	119,246.89	61,081.53	29,082.68	26
20	547.63	300.54	0.00	47,319.01	22,558.85	12,380.08	15
31	547.01	528.16	0.00	152,281.53	51,953.95	50,163.79	10
32	-	-	-	-	-	-	-
41	1,067.93	430.69	12,870.66	120,215.26	66,542.96	26,836.15	24
42	-	-	-	-	-	-	-
43	2,873.06	1,240.96	8,238.66	112,795.56	60,517.11	26,139.23	8
50	-	-	-	-	-	-	-
61	4.43	3.29	0.00	965.62	388.69	288.47	2
62	-	-	-	-	-	-	-
82	2,921.31	1,375.61	3,053.83	101,842.36	52,448.09	24,697.13	9
90	39.10	39.10	0.00	1,353.36	451.12	451.12	1
Total	**640.87**	**150.83**	**167,225.82**	**464,658.78**	**315,942.30**	**74,358.24**	**95**

Pacific Ocean Perch (*Sebastes alutus*)

Between 2023 and 2024, the estimated biomass of Pacific ocean perch increased by 168% on the 2024 eastern Bering Sea Shelf survey (Tables **68** and **69**; Figs. **66** and **67**) and the population was estimated at 71.6 million individuals (Tables **68** and **70**; Fig. **66**).

Table 68. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Pacific ocean perch (*Sebastes alutus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	13 of 350 (3.7%)
Bottom Depth (m)	84 — 192
Bottom Temperature (°C)	0.9 — 5.4
Surface Temperature (°C)	5.6 — 8.7
Population	71.6 million
Biomass (t)	50,664
Percent of Total Catch Biomass	0.3%
Percent Change in Biomass	168% increase from 2023

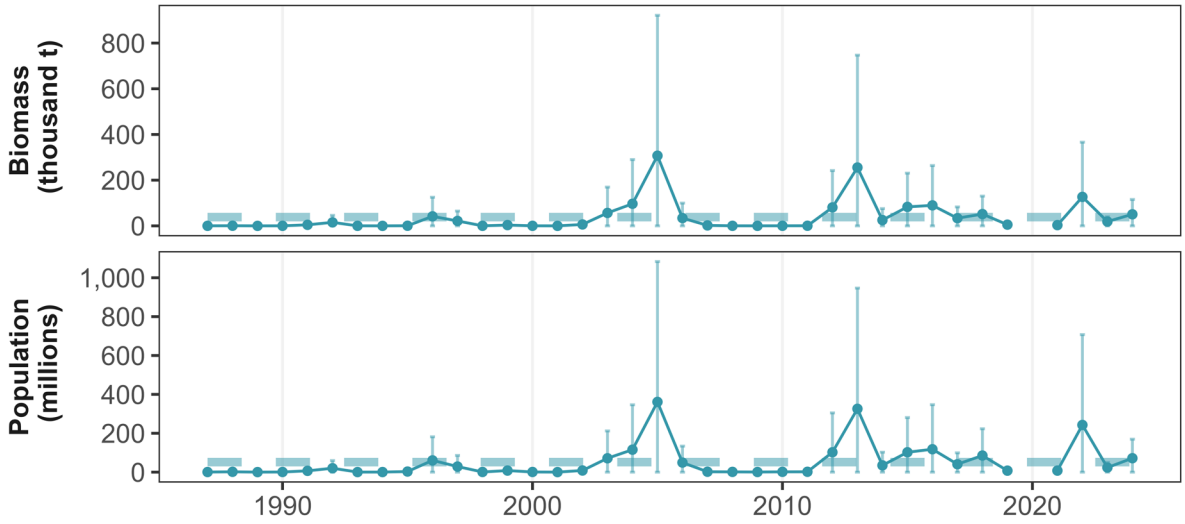

Figure 66. -- Time series of Pacific ocean perch (*Sebastes alutus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

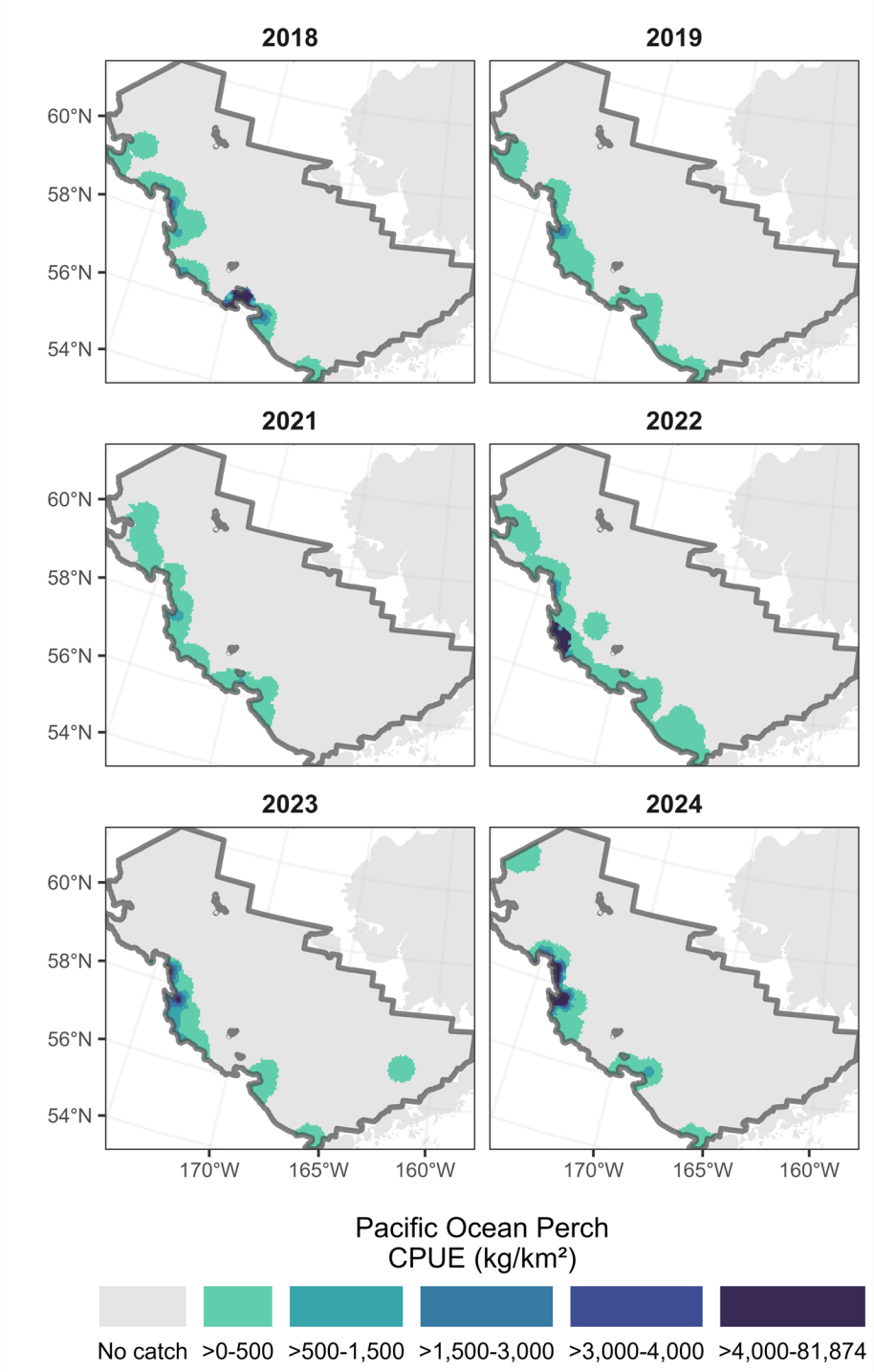

Figure 67. -- CPUE (kg/km^2) distribution of Pacific ocean perch (*Sebastes alutus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 69. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Pacific ocean perch (*Sebastes alutus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	0.20	0.20	19	19	0	58	1
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	42.69	38.07	1,624	1,448	0	4,520	3
61	558.45	368.21	49,019	32,320	0	113,659	8
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	0.14	0.14	2	2	0	5	1
Total	**102.77**	**65.63**	**50,664**	**32,352**	**0**	**115,369**	**13**

Table 70. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Pacific ocean perch (*Sebastes alutus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	0.30	0.30	0.00	84.89	28.30	28.30	1
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	38.87	32.69	0.00	3,965.39	1,478.73	1,243.33	3
61	798.34	556.40	0.00	167,753.54	70,075.60	48,838.97	8
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	2.58	2.58	0.00	89.14	29.71	29.71	1
Total	**145.26**	**99.10**	**0.00**	**169,321.96**	**71,612.33**	**48,854.81**	**13**

Plain Sculpin (*Myoxocephalus jaok*)

Between 2023 and 2024, the estimated biomass of plain sculpin decreased by 5% on the 2024 eastern Bering Sea Shelf survey (Tables **71** and **72**; Figs. **68** and **69**) and the population was estimated at 38.2 million individuals (Tables **71** and **73**; Fig. **68**).

Table 71. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for plain sculpin (*Myoxocephalus jaok*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	82 of 350 (23.4%)
Bottom Depth (m)	21 — 68
Bottom Temperature (°C)	-1.6 — 5.7
Surface Temperature (°C)	2 — 7
Population	38.2 million
Biomass (t)	25,338
Percent of Total Catch Biomass	0.2%
Percent Change in Biomass	5% decrease from 2023

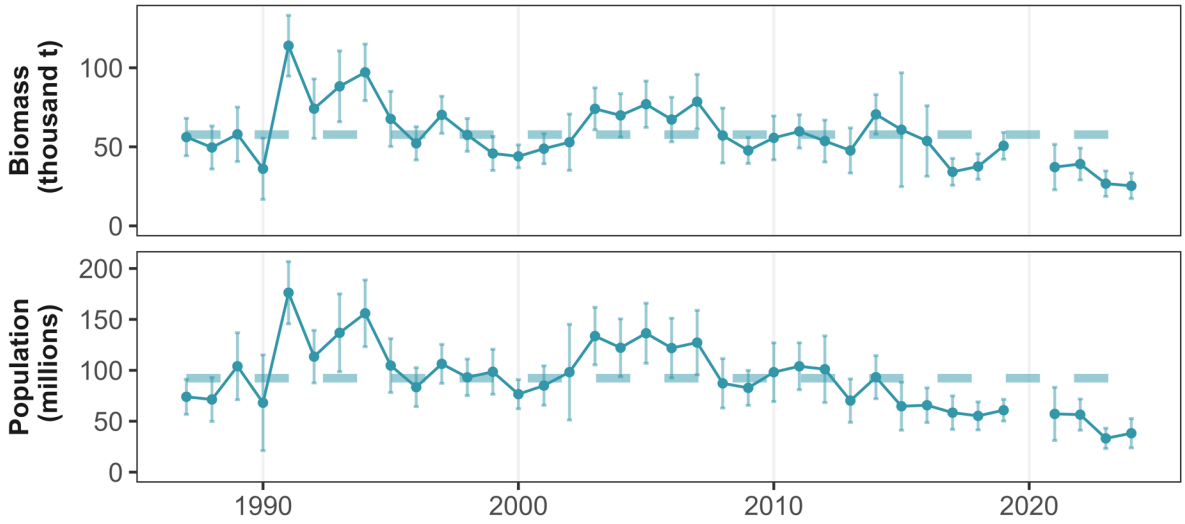

Figure 68. -- Time series of plain sculpin (*Myoxocephalus jaok*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

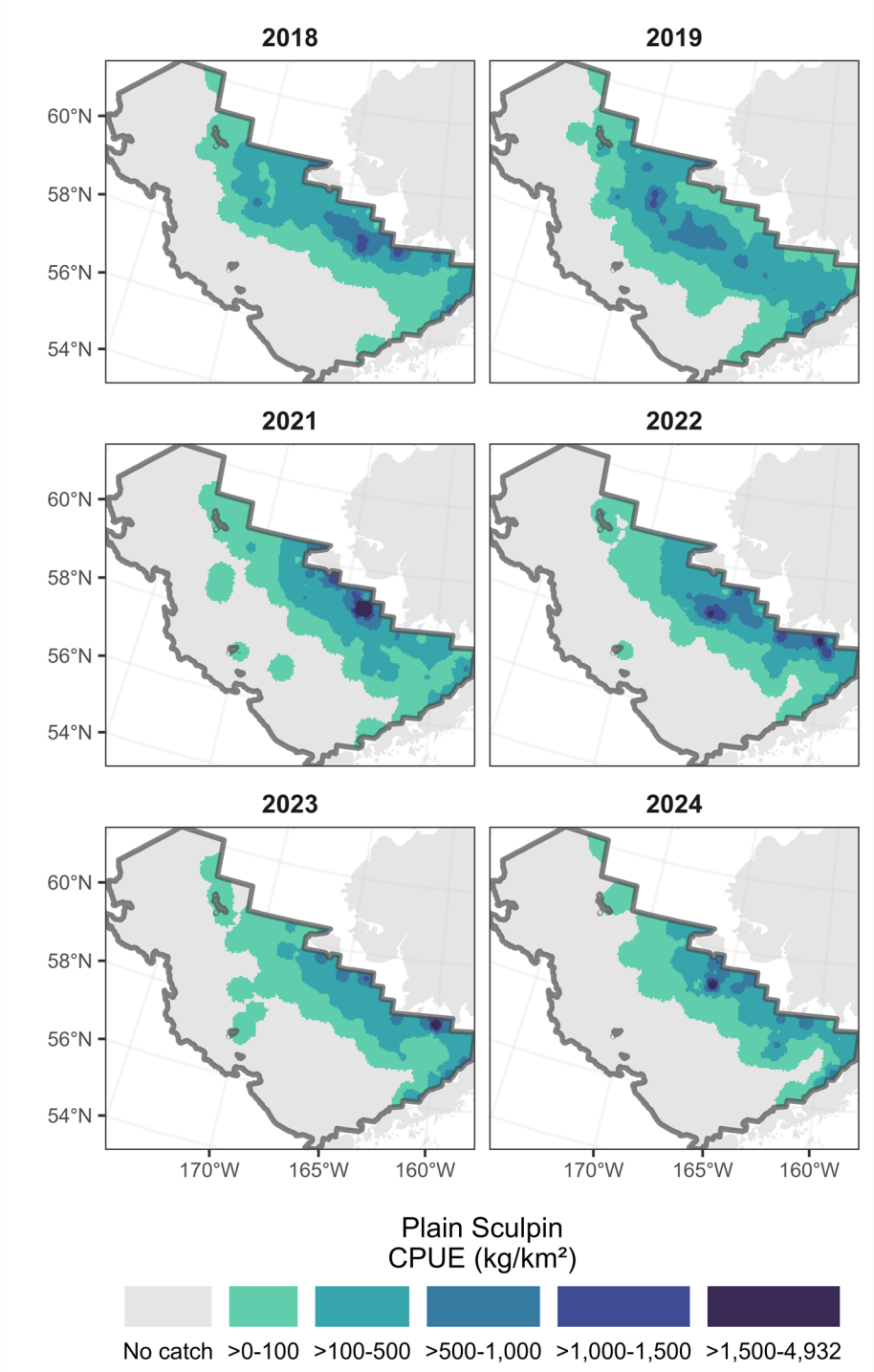

Figure 69. -- CPUE (kg/km^2) distribution of plain sculpin (*Myoxocephalus jaok*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 72. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which plain sculpin (*Myoxocephalus jaok*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	189.73	30.43	14,933	2,395	10,142	19,724	47
20	243.78	78.45	10,042	3,231	3,579	16,505	27
31	1.18	0.84	112	80	0	272	2
32	-	-	-	-	-	-	-
41	3.86	1.80	241	112	16	465	5
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	0.54	0.54	10	10	0	29	1
90	-	-	-	-	-	-	-
Total	**51.40**	**8.16**	**25,338**	**4,025**	**17,288**	**33,387**	**82**

Table 73. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which plain sculpin (*Myoxocephalus jaok*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	272.71	59.53	12,092.27	30,834.62	21,463.44	4,685.59	47
20	398.28	132.34	5,503.43	27,309.28	16,406.35	5,451.46	27
31	0.98	0.73	0.00	231.65	93.42	69.12	2
32	-	-	-	-	-	-	-
41	3.12	1.44	15.46	373.81	194.63	89.59	5
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	1.86	1.86	0.00	100.09	33.36	33.36	1
90	-	-	-	-	-	-	-
Total	**77.47**	**14.58**	**23,812.47**	**52,569.96**	**38,191.21**	**7,189.37**	**82**

Purple-Orange Sea Star (*Asterias amurensis*)

Between 2023 and 2024, the estimated biomass of purple-orange sea star decreased by 10% on the 2024 eastern Bering Sea Shelf survey (Tables **74** and **75**; Figs. **70** and **71**) and the population was estimated at 10.2 billion individuals (Tables **74** and **76**; Fig. **70**).

Table 74. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for purple-orange sea star (*Asterias amurensis*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	226 of 350 (64.6%)
Bottom Depth (m)	21 — 155
Bottom Temperature (°C)	-1.3 — 5.7
Surface Temperature (°C)	2 — 8.7
Population	10.2 billion
Biomass (t)	736,479
Percent of Total Catch Biomass	4.9%
Percent Change in Biomass	10% decrease from 2023

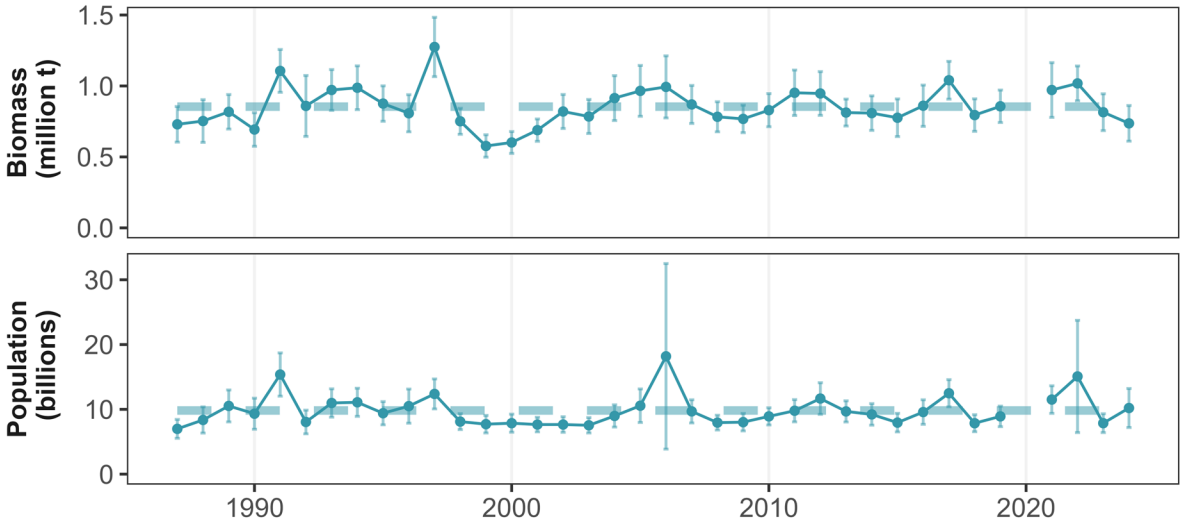

Figure 70. -- Time series of purple-orange sea star (*Asterias amurensis*) biomass (million t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

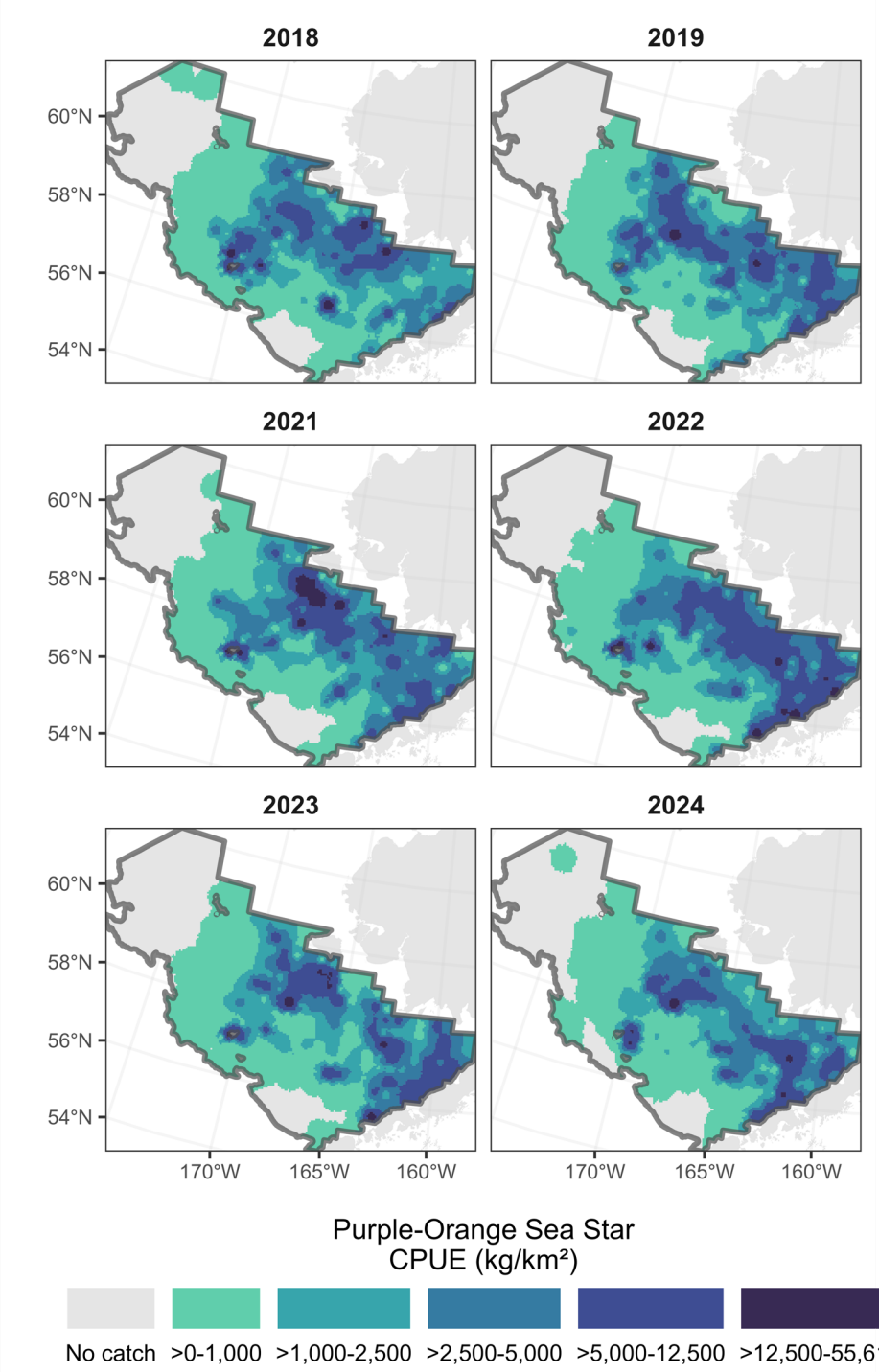

Figure 71. -- CPUE (kg/km^2) distribution of purple-orange sea star (*Asterias amurensis*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 75. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which purple-orange sea star (*Asterias amurensis*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	3,729.05	410.86	293,497	32,337	228,823	358,172	58
20	3,230.04	436.21	133,056	17,969	97,118	168,993	31
31	1,845.20	328.29	175,254	31,181	112,892	237,616	60
32	604.11	251.16	5,344	2,222	900	9,788	5
41	1,255.19	526.28	78,211	32,793	12,625	143,796	35
42	2,080.68	947.09	50,190	22,846	4,499	95,882	16
43	13.19	4.80	278	101	76	480	7
50	3.94	2.28	150	87	0	324	5
61	5.62	2.27	493	199	95	891	8
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	0.49	0.49	6	6	0	17	1
Total	**1,493.90**	**127.37**	**736,479**	**62,794**	**610,890**	**862,067**	**226**

Table 76. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which purple-orange sea star (*Asterias amurensis*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	45,533.67	6,927.10	2,493,354.97	4,674,161.74	3,583,758.35	545,201.69	58
20	45,638.89	7,273.91	1,280,741.40	2,479,284.92	1,880,013.16	299,635.88	31
31	24,732.99	5,280.08	1,346,112.90	3,352,090.61	2,349,101.76	501,494.43	60
32	6,569.63	2,754.48	9,383.55	106,855.95	58,119.75	24,368.10	5
41	12,420.55	5,479.54	91,064.60	1,456,784.99	773,924.80	341,430.10	35
42	64,366.84	50,896.69	0.00	4,008,136.53	1,552,664.53	1,227,736.00	16
43	43.17	17.69	164.21	1,654.43	909.32	372.56	7
50	63.60	38.45	0.00	5,344.20	2,419.29	1,462.45	5
61	45.62	25.58	0.00	8,495.90	4,004.65	2,245.63	8
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	5.13	5.13	0.00	177.47	59.16	59.16	1
Total	**20,700.17**	**3,051.46**	**7,196,297.63**	**13,213,651.90**	**10,204,974.76**	**1,504,338.57**	**226**

Rex Sole (*Glyptocephalus zachirus*)

Between 2023 and 2024, the estimated biomass of rex sole increased by 53% on the 2024 eastern Bering Sea Shelf survey (Tables **77** and **78**; Figs. **72** and **73**) and the population was estimated at 111.4 million individuals (Tables **77** and **79**; Fig. **72**).

Table 77. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for rex sole (*Glyptocephalus zachirus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	80 of 350 (22.9%)
Bottom Depth (m)	35 — 192
Bottom Temperature (°C)	1.2 — 5.4
Surface Temperature (°C)	3 — 8.8
Population	111.4 million
Biomass (t)	59,845
Percent of Total Catch Biomass	0.4%
Percent Change in Biomass	53% increase from 2023

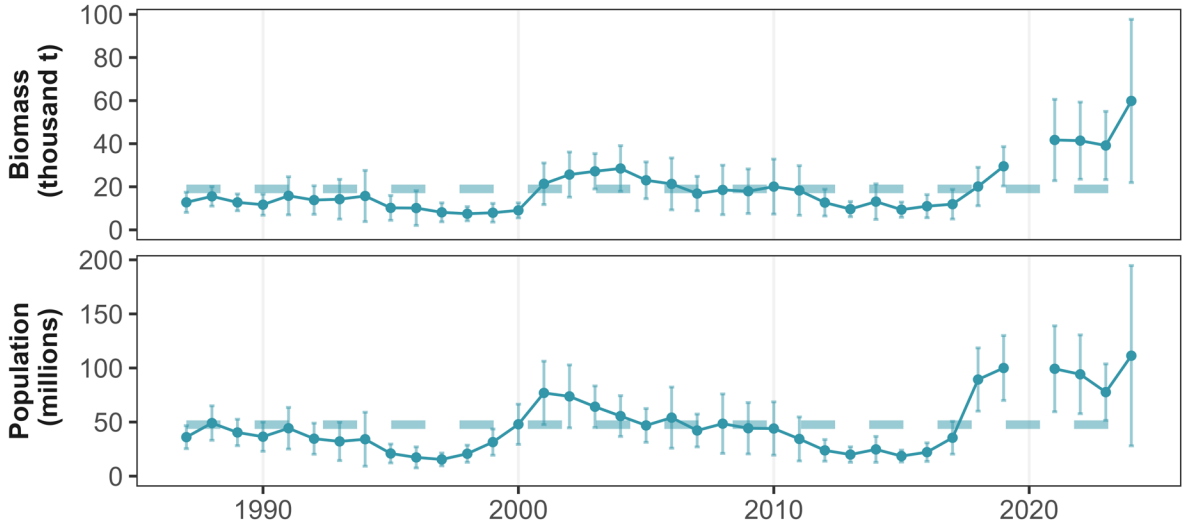

Figure 72. -- Time series of rex sole (*Glyptocephalus zachirus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

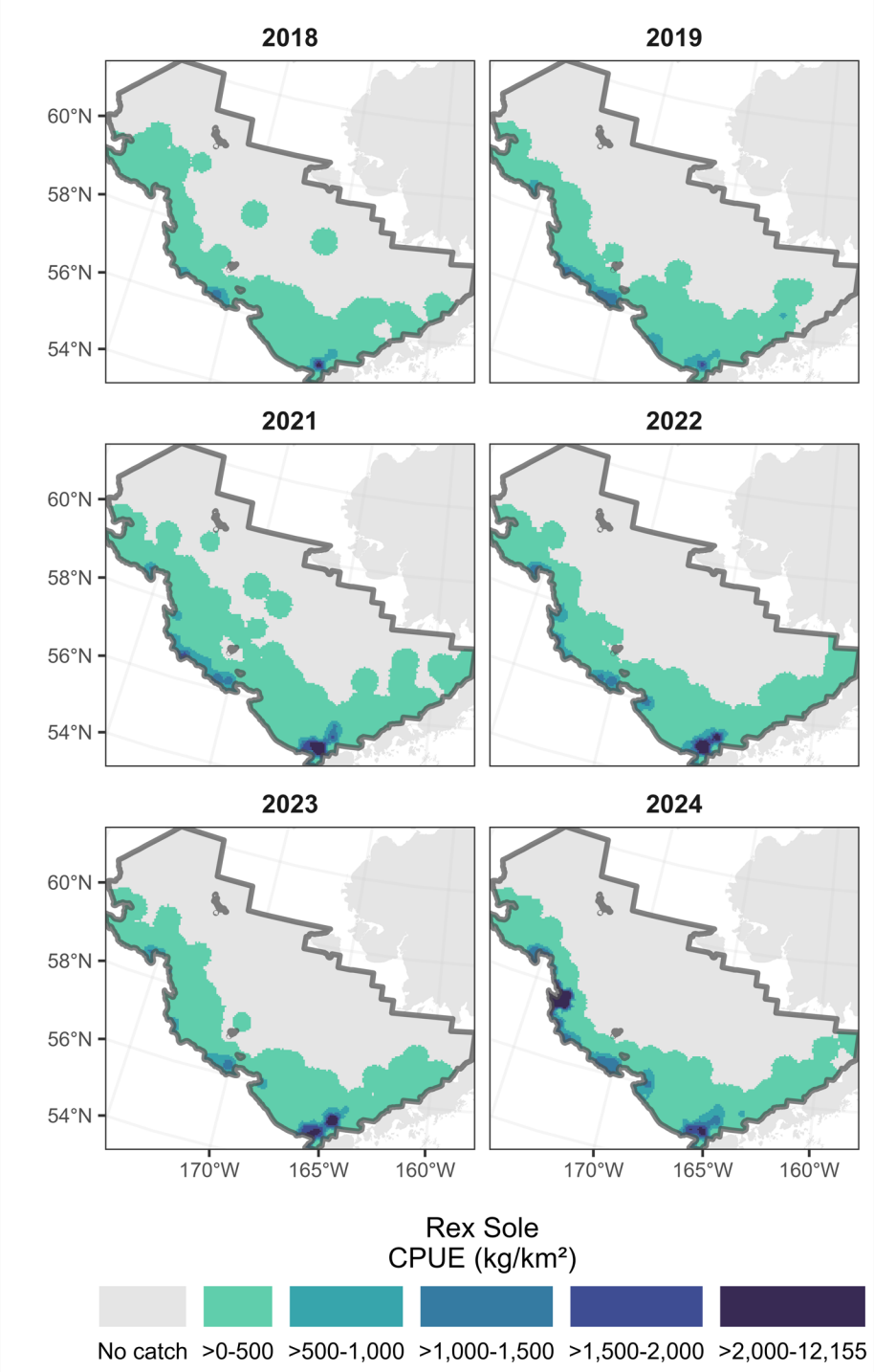

Figure 73. -- CPUE (kg/km^2) distribution of rex sole (*Glyptocephalus zachirus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 78. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which rex sole (*Glyptocephalus zachirus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	2.11	1.41	166	111	0	388	3
20	-	-	-	-	-	-	-
31	65.88	24.40	6,257	2,318	1,622	10,892	23
32	3.91	3.91	35	35	0	104	1
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	521.98	130.69	19,856	4,971	9,913	29,798	25
61	382.01	206.52	33,532	18,127	0	69,786	28
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**121.39**	**38.42**	**59,845**	**18,939**	**21,966**	**97,724**	**80**

Table 79. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which rex sole (*Glyptocephalus zachirus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	2.96	1.82	0.00	519.96	232.94	143.51	3
20	-	-	-	-	-	-	-
31	90.51	30.57	2,789.34	14,403.35	8,596.34	2,903.50	23
32	40.22	40.22	0.00	1,067.44	355.81	355.81	1
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	892.89	194.67	19,154.21	48,774.83	33,964.52	7,405.15	25
61	777.04	466.02	0.00	150,017.54	68,205.98	40,905.78	28
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**225.88**	**84.53**	**28,008.21**	**194,702.99**	**111,355.60**	**41,673.69**	**80**

Saffron Cod (*Eleginus gracilis*)

Alternate common name: tomcod

Between 2023 and 2024, the estimated biomass of saffron cod increased to 10 t, extrapolated from 7 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **80** and **81**; Figs. **74** and **75**) and the population was estimated at 212,949 individuals (Tables **80** and **82**; Fig. **74**).

Table 80. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for saffron cod (*Eleginus gracilis*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	3 of 350 (0.9%)
Bottom Depth (m)	21 — 93
Bottom Temperature (°C)	0.9 — 4.9
Surface Temperature (°C)	2.1 — 6.8
Population	212,949
Biomass (t)	10
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Increased from 4 to 7 individuals in 2024

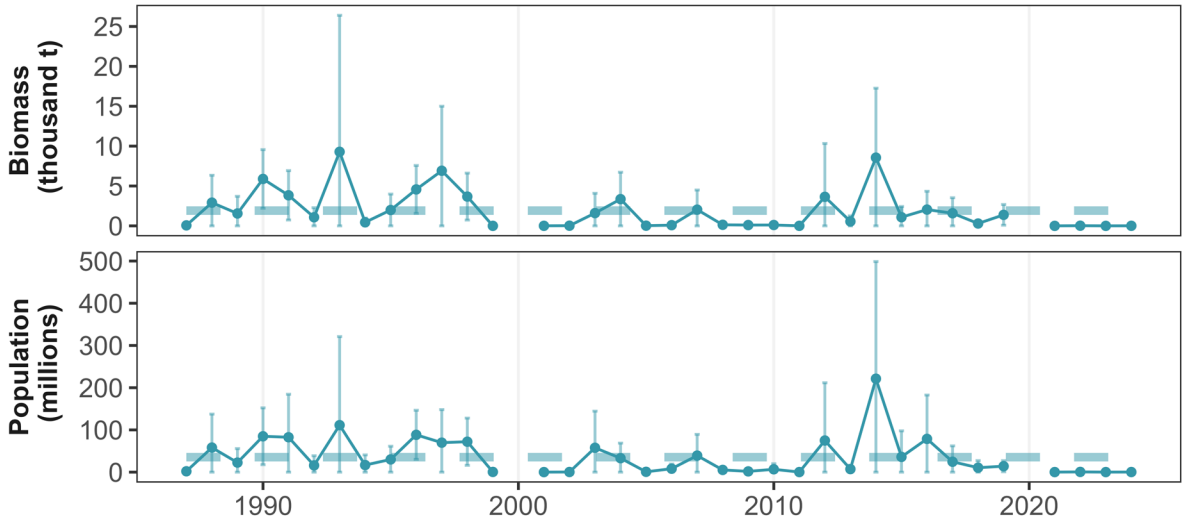

Figure 74. -- Time series of saffron cod (*Eleginus gracilis*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

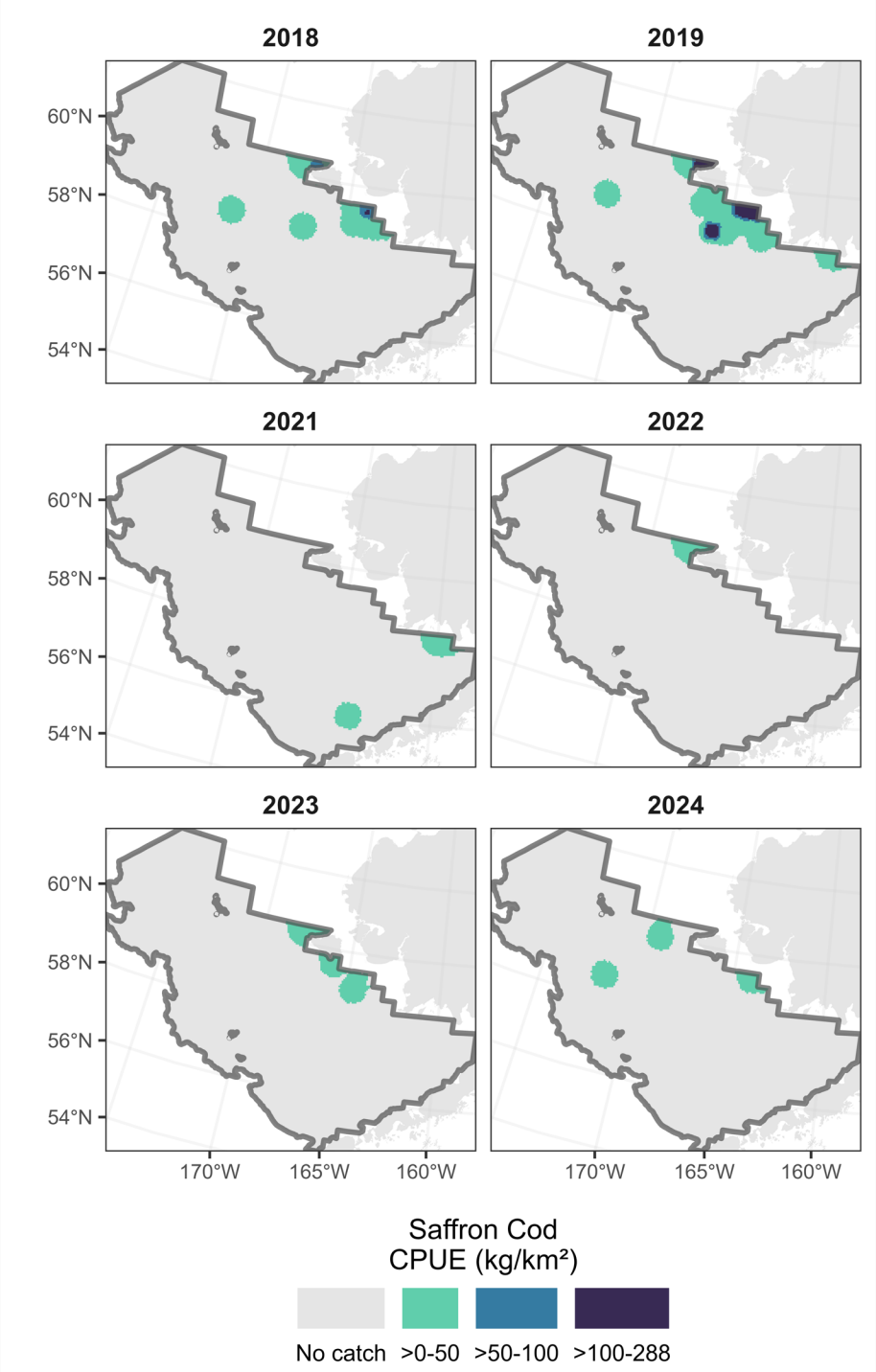

Figure 75. -- CPUE (kg/km^2) distribution of saffron cod (*Eleginus gracilis*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 81. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which saffron cod (*Eleginus gracilis*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	0.01	0.01	1	1	0	2	1
20	0.17	0.17	7	7	0	21	1
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	0.03	0.03	2	2	0	6	1
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**0.02**	**0.01**	**10**	**7**	**0**	**24**	**3**

Table 82. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which saffron cod (*Eleginus gracilis*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	0.45	0.45	0.00	106.88	35.63	35.63	1
20	3.59	3.59	0.00	443.62	147.87	147.87	1
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	0.47	0.47	0.00	88.35	29.45	29.45	1
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**0.43**	**0.31**	**0.00**	**522.81**	**212.95**	**154.93**	**3**

Sakhalin Sole (*Limanda sakhalinensis*)

Between 2023 and 2024, the estimated biomass of Sakhalin sole decreased to 16 t, extrapolated from 15 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **83** and **84**; Figs. **76** and **77**) and the population was estimated at 495,735 individuals (Tables **83** and **85**; Fig. **76**).

Table 83. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for Sakhalin sole (*Limanda sakhalinensis*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	10 of 350 (2.9%)
Bottom Depth (m)	62 — 83
Bottom Temperature (°C)	-1.6 — 0.7
Surface Temperature (°C)	5 — 6.7
Population	495,735
Biomass (t)	16
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Decreased from 18 to 15 individuals in 2024

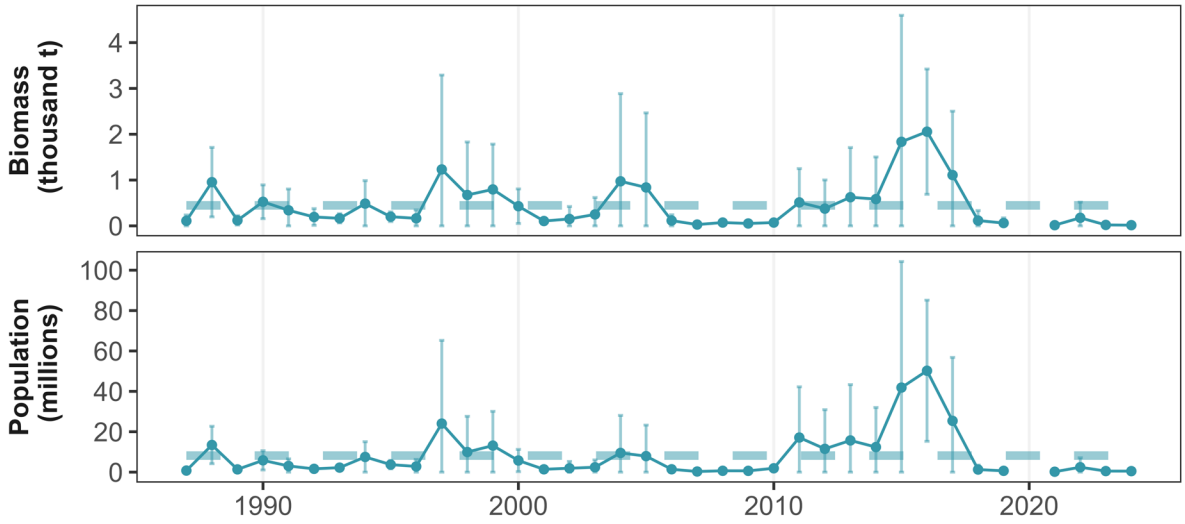

Figure 76. -- Time series of Sakhalin sole (*Limanda sakhalinensis*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

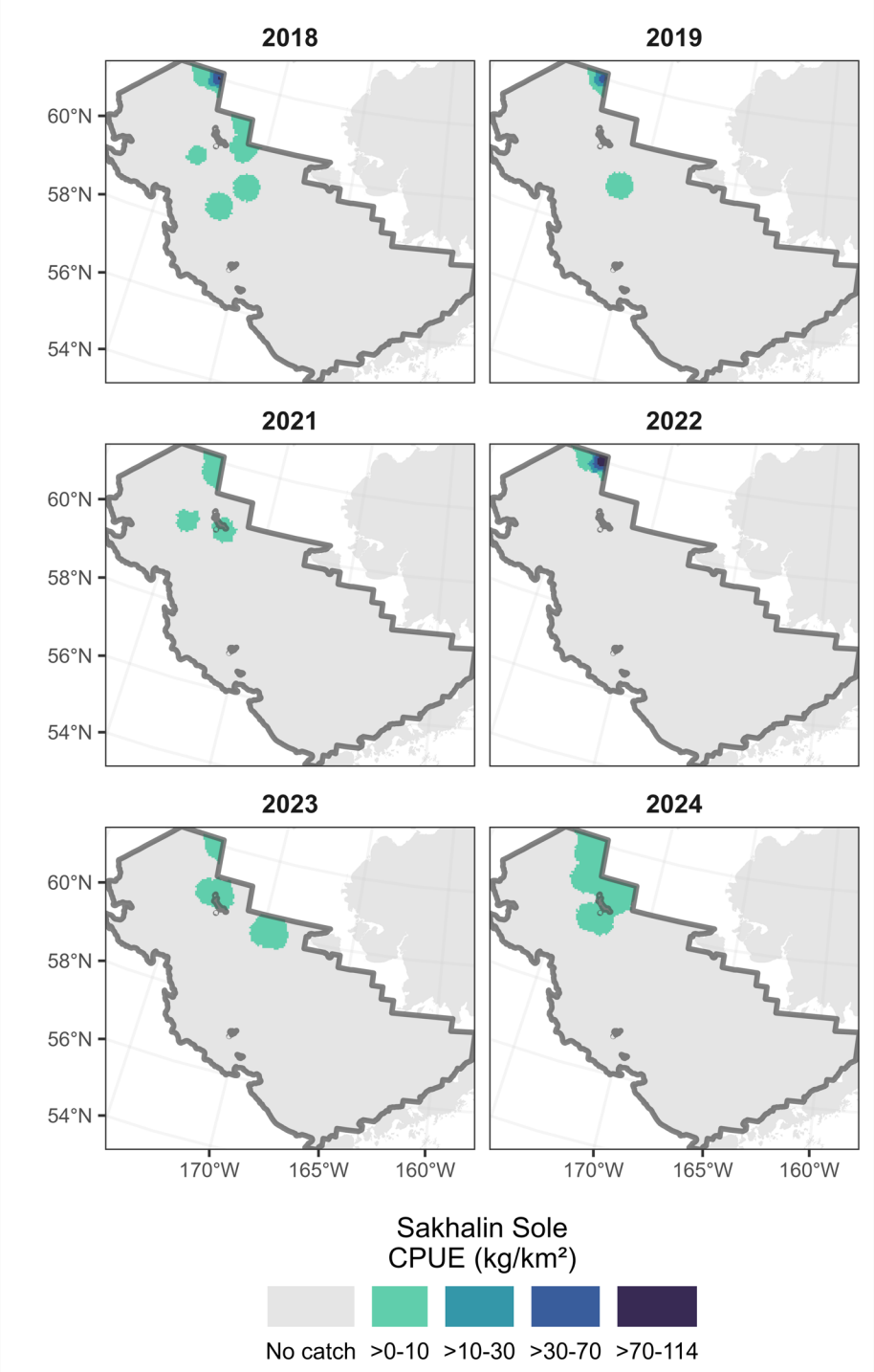

Figure 77. -- CPUE (kg/km^2) distribution of Sakhalin sole (*Limanda sakhalinensis*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 84. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which Sakhalin sole (*Limanda sakhalinensis*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	0.11	0.06	7	4	0	14	4
42	-	-	-	-	-	-	-
43	0.19	0.17	4	4	0	11	2
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	0.26	0.14	5	3	0	10	4
90	-	-	-	-	-	-	-
Total	**0.03**	**0.01**	**16**	**6**	**4**	**27**	**10**

Table 85. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which Sakhalin sole (*Limanda sakhalinensis*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	2.40	1.24	0.00	303.92	149.49	77.22	4
42	-	-	-	-	-	-	-
43	5.62	3.88	0.00	281.74	118.34	81.70	2
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	12.69	6.28	2.43	453.39	227.91	112.74	4
90	-	-	-	-	-	-	-
Total	**1.01**	**0.32**	**177.31**	**814.16**	**495.74**	**159.21**	**10**

Shortfin Eelpout (*Lycodes brevipes*)

Between 2023 and 2024, the estimated biomass of shortfin eelpout increased by 16% on the 2024 eastern Bering Sea Shelf survey in (Table **86**; Figs. **78** and **79**) and the population was estimated at 541.3 million individuals (Table **86**; Fig. **78**).

Table 86. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for shortfin eelpout (*Lycodes brevipes*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	97 of 350 (27.7%)
Bottom Depth (m)	68 — 176
Bottom Temperature (°C)	-0.2 — 4.2
Surface Temperature (°C)	4.6 — 8.9
Population	541.3 million
Biomass (t)	44,202
Percent of Total Catch Biomass	0.3%
Percent Change in Biomass	16% increase from 2023

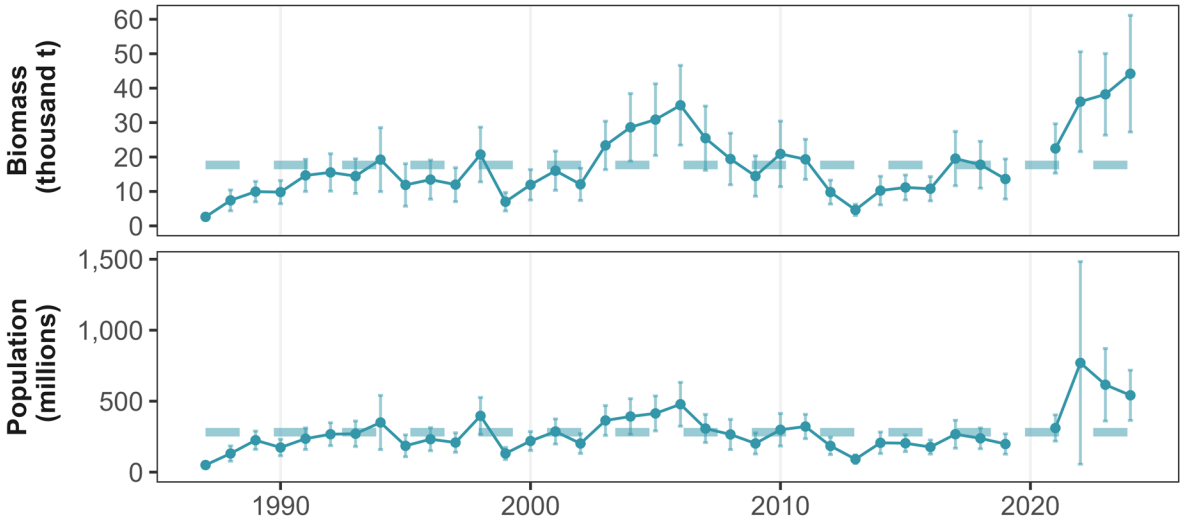

Figure 78. -- Time series of shortfin eelpout (*Lycodes brevipes*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

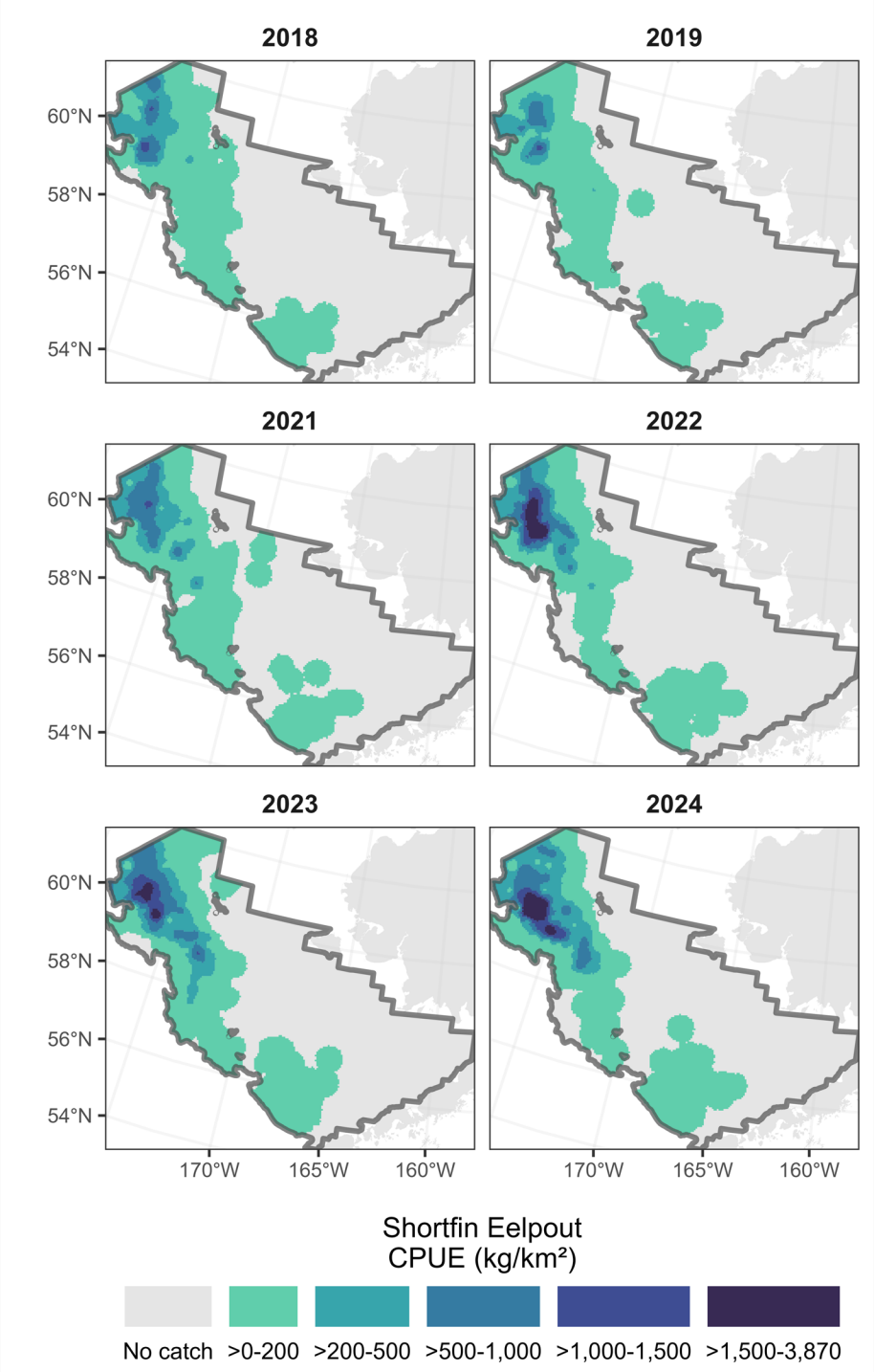

Figure 79. -- CPUE (kg/km^2) distribution of shortfin eelpout (*Lycodes brevipes*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Shorthorn Sculpin (*Myoxocephalus scorpius*)

Previous scientific name: *Myoxocephalus verrucosus*

Previous common name: warty sculpin

Between 2023 and 2024, the estimated biomass of shorthorn sculpin increased to 1,330 t, extrapolated from 31 individuals caught on the 2024 eastern Bering Sea Shelf survey (Tables **87** and **88**; Figs. **80** and **81**) and the population was estimated at 1.3 million individuals (Tables **87** and **89**; Fig. **80**).

Table 87. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for shorthorn sculpin (*Myoxocephalus scorpius*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	7 of 350 (2.0%)
Bottom Depth (m)	44 — 75
Bottom Temperature (°C)	-0.7 — 2.5
Surface Temperature (°C)	3.6 — 6.1
Population	1.3 million
Biomass (t)	1,330
Percent of Total Catch Biomass	<0.01%
Survey catch totals	Increased from 16 to 31 individuals in 2024

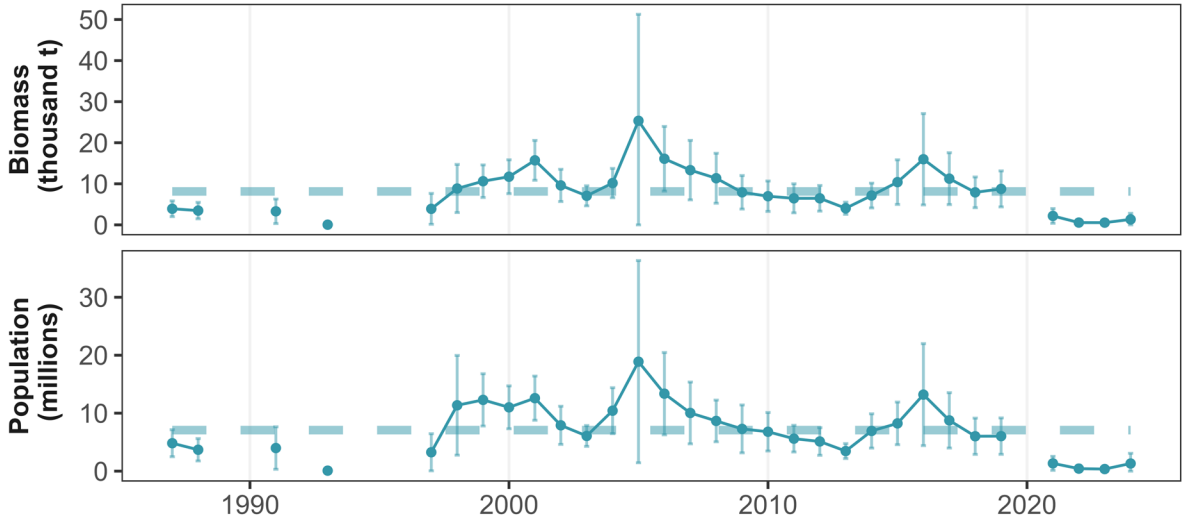

Figure 80. -- Time series of shorthorn sculpin (*Myoxocephalus scorpius*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

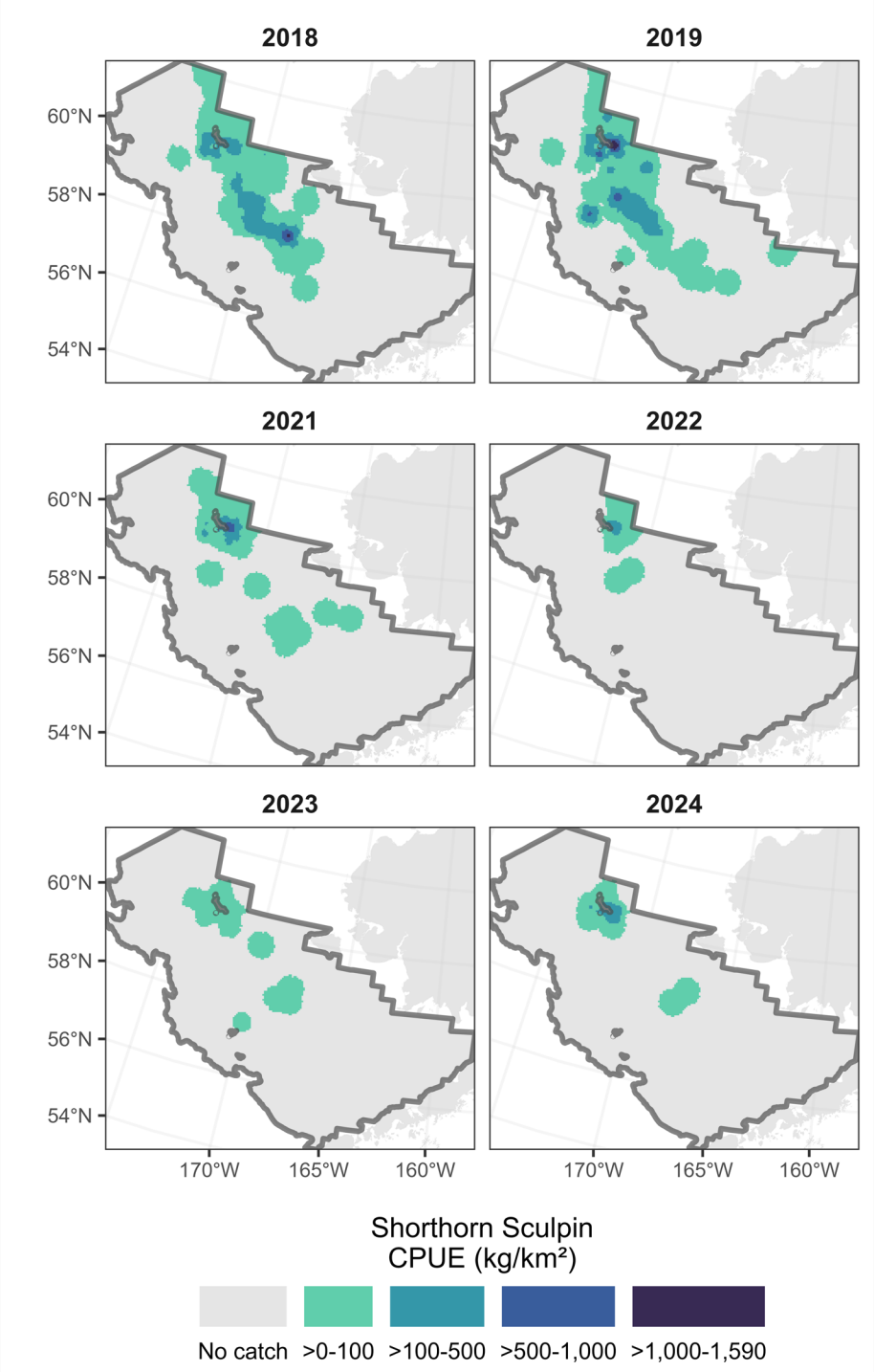

Figure 81. -- CPUE (kg/km^2) distribution of shorthorn sculpin (*Myoxocephalus scorpius*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 88. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which shorthorn sculpin (*Myoxocephalus scorpius*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	0.74	0.74	31	31	0	92	1
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	1.90	1.34	119	83	0	285	2
42	-	-	-	-	-	-	-
43	56.07	35.05	1,181	738	0	2,658	4
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**2.70**	**1.51**	**1,330**	**744**	**0**	**2,817**	**7**

Table 89. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which shorthorn sculpin (*Myoxocephalus scorpius*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	0.74	0.74	0.00	91.01	30.34	30.34	1
31	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-
41	1.05	0.73	0.00	156.94	65.44	45.75	2
42	-	-	-	-	-	-	-
43	57.93	41.74	0.00	2,978.81	1,220.25	879.28	4
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**2.67**	**1.79**	**0.00**	**3,078.01**	**1,316.03**	**880.99**	**7**

Snailfishes (Liparidae)

Between 2023 and 2024, the snailfishes biomass estimate increased by 73% on the 2024 eastern Bering Sea Shelf survey in (Table **90**; Figs. **82**) and the population was estimated at 13.1 million individuals (Table **90**; Fig. **82**).

Table 90. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for snailfishes (Liparidae) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	77 of 350 (22.0%)
Bottom Depth (m)	31 — 176
Bottom Temperature (°C)	-1.6 — 5.4
Surface Temperature (°C)	3.1 — 8.9
Population	13.1 million
Biomass (t)	3,873
Percent of Total Catch Biomass	<0.01%
Percent Change in Biomass	73% increase from 2023

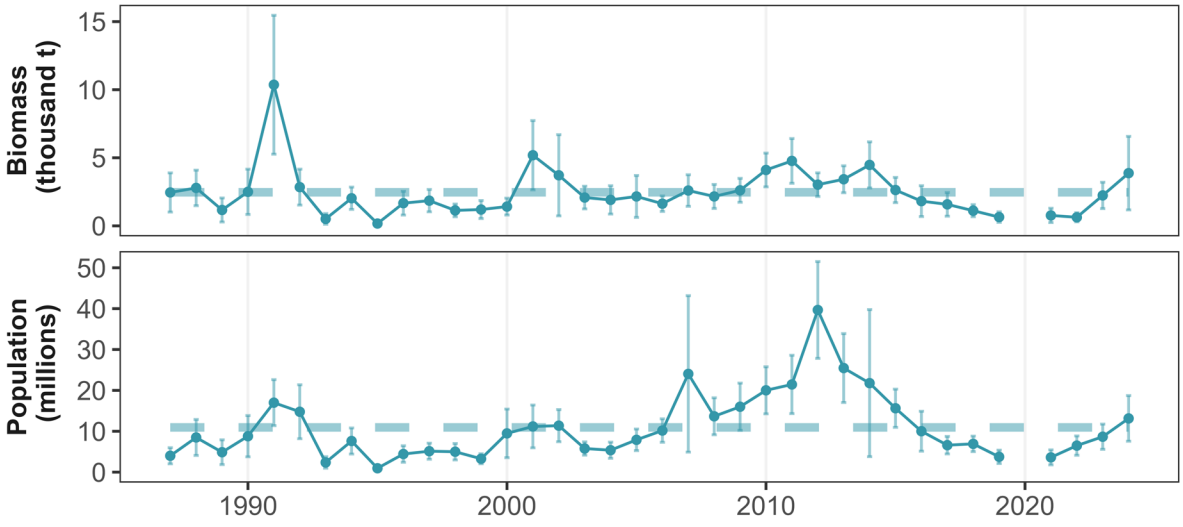

Figure 82. -- Time series of snailfishes (Liparidae) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

Starry Flounder (*Platichthys stellatus*)

Between 2023 and 2024, the estimated biomass of starry flounder decreased by 30% on the 2024 eastern Bering Sea Shelf survey (Tables **91** and **92**; Figs. **83** and **84**) and the population was estimated at 38.7 million individuals (Tables **91** and **93**; Fig. **83**).

Table 91. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for starry flounder (*Platichthys stellatus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	57 of 350 (16.3%)
Bottom Depth (m)	21 — 84
Bottom Temperature (°C)	2 — 5.6
Surface Temperature (°C)	2.1 — 6.8
Population	38.7 million
Biomass (t)	57,240
Percent of Total Catch Biomass	0.4%
Percent Change in Biomass	30% decrease from 2023

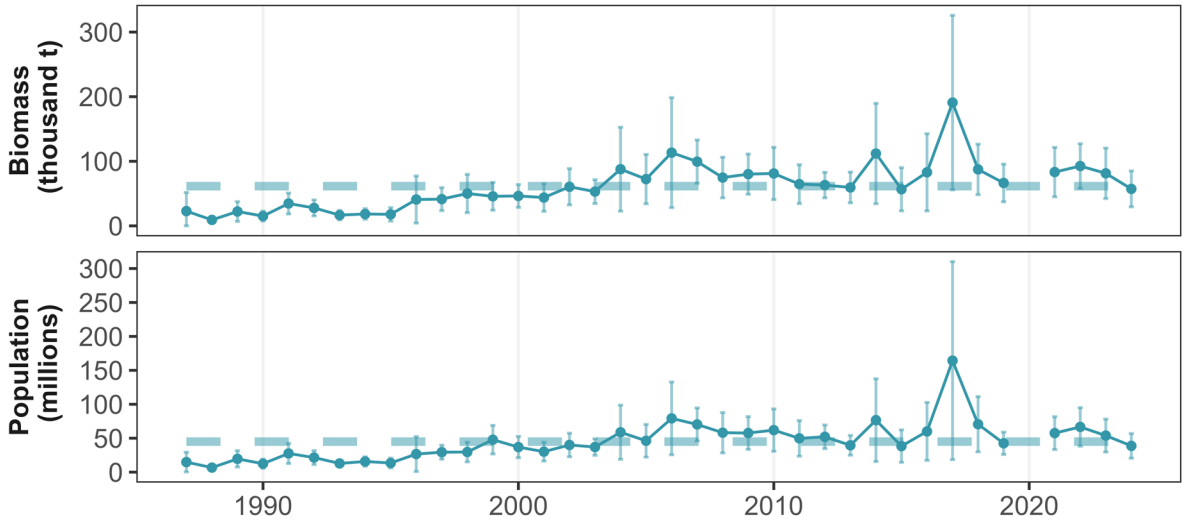

Figure 83. -- Time series of starry flounder (*Platichthys stellatus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

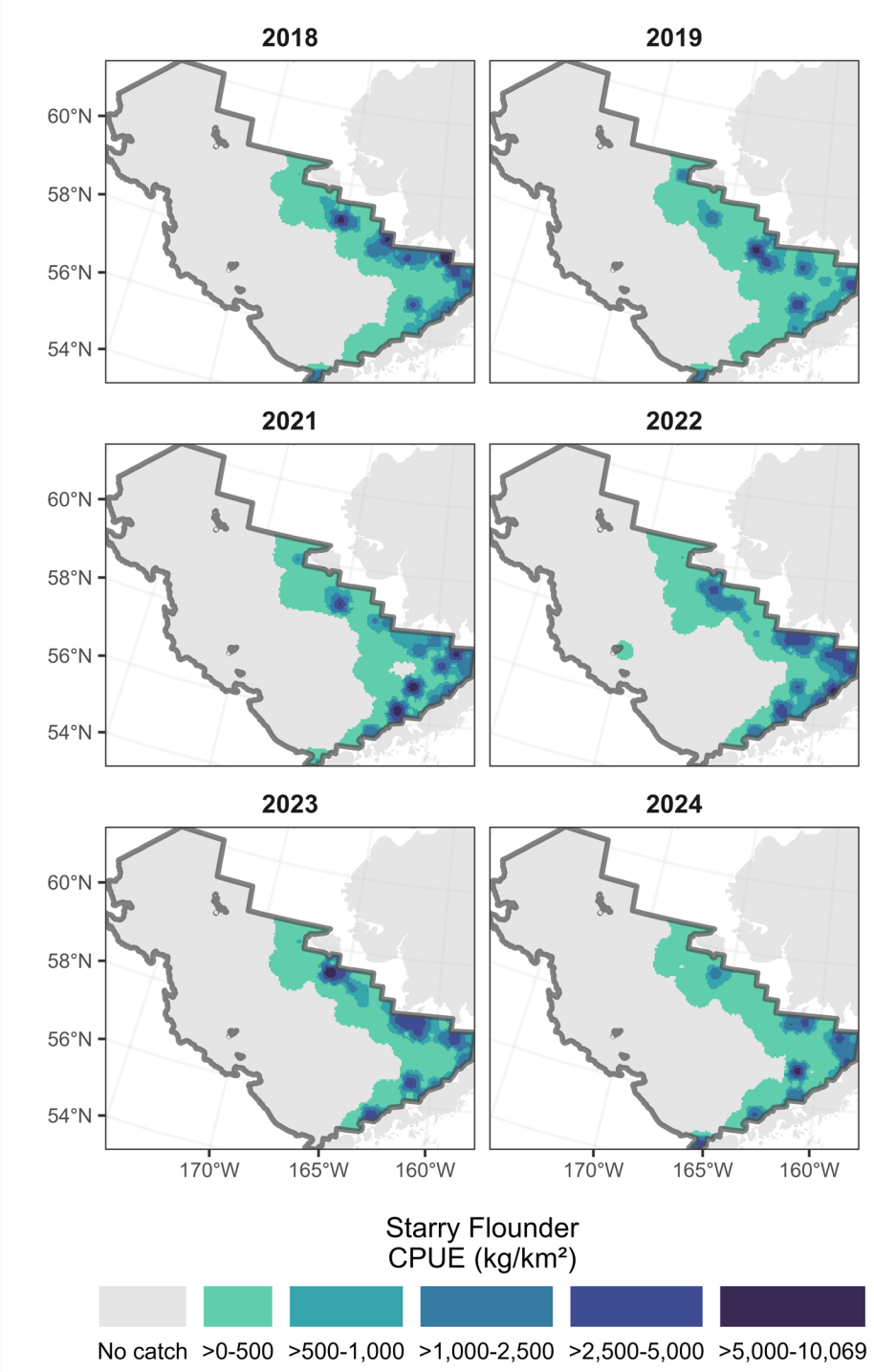

Figure 84. -- CPUE (kg/km^2) distribution of starry flounder (*Platichthys stellatus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 92. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (thousand t) with SD (thousand t), 95% lower (LCL; thousand t) and upper (UCL; thousand t) confidence limits, and number of hauls in which starry flounder (*Platichthys stellatus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (Kt)	Biomass SD (Kt)	95% LCL (Kt)	95% UCL (Kt)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	461.18	116.98	36.30	9.21	17.88	54.71	34
20	143.71	60.74	5.92	2.50	0.92	10.92	15
31	158.17	106.66	15.02	10.13	0.00	35.28	8
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**116.11**	**28.23**	**57.24**	**13.92**	**29.41**	**85.07**	**57**

Table 93. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (millions), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which starry flounder (*Platichthys stellatus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (M)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	355.89	96.47	12.82	43.20	28.01	7.59	34
20	90.02	35.31	0.80	6.62	3.71	1.45	15
31	73.50	50.60	0.00	16.59	6.98	4.81	8
32	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-
42	-	-	-	-	-	-	-
43	-	-	-	-	-	-	-
50	-	-	-	-	-	-	-
61	-	-	-	-	-	-	-
62	-	-	-	-	-	-	-
82	-	-	-	-	-	-	-
90	-	-	-	-	-	-	-
Total	**78.50**	**18.47**	**20.49**	**56.91**	**38.70**	**9.10**	**57**

Sturgeon Poacher (*Podothecus accipenserinus*)

Between 2023 and 2024, the estimated biomass of sturgeon poacher increased by 57% on the 2024 eastern Bering Sea Shelf survey in (Table **94**; Figs. **85** and **86**) and the population was estimated at 379.7 million individuals (Table **94**; Fig. **85**).

Table 94. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for sturgeon poacher (*Podothecus accipenserinus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	195 of 350 (55.7%)
Bottom Depth (m)	21 — 129
Bottom Temperature (°C)	-1 — 5.7
Surface Temperature (°C)	2 — 8.4
Population	379.7 million
Biomass (t)	22,385
Percent of Total Catch Biomass	0.1%
Percent Change in Biomass	57% increase from 2023

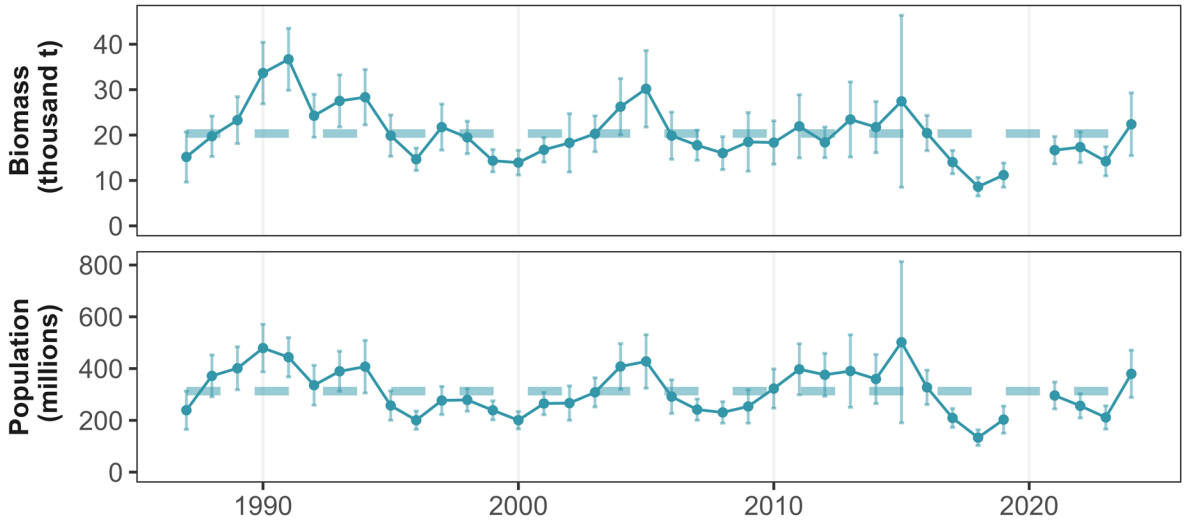

Figure 85. -- Time series of sturgeon poacher (*Podothecus accipenserinus*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

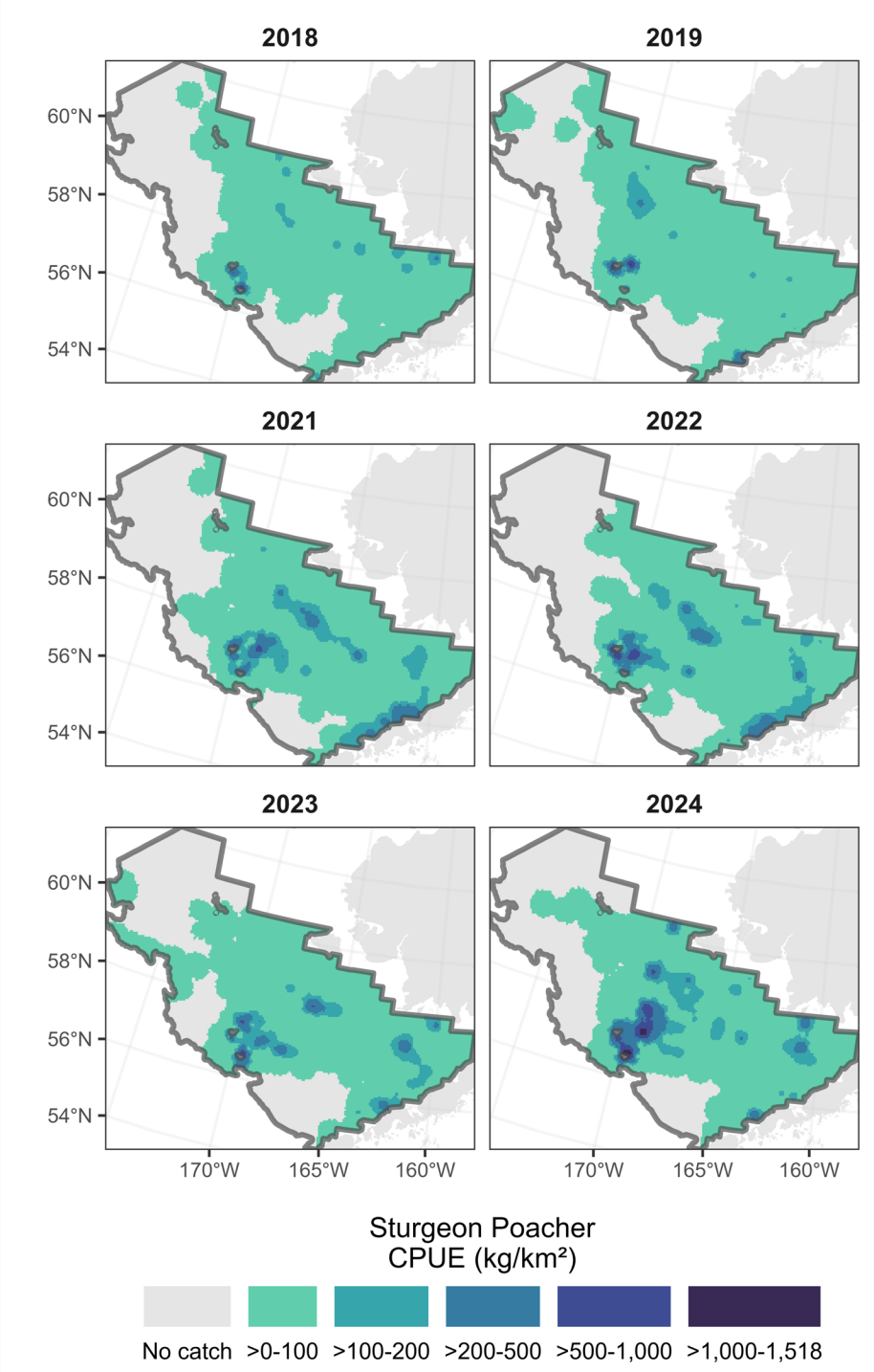

Figure 86. -- CPUE (kg/km^2) distribution of sturgeon poacher (*Podothecus accipenserinus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Walleye Pollock (*Gadus chalcogrammus*)

Between 2023 and 2024, the estimated biomass of walleye pollock increased by 74% on the 2024 eastern Bering Sea Shelf survey (Tables **95** and **96**; Figs. **87** and **88**) and the population was estimated at 10.3 billion individuals (Tables **95** and **97**; Fig. **87**).

During colder years (2006 to 2013), the highest densities of pollock were along the outer half of the eastern Bering Sea shelf (> 70 m) and the lowest densities of pollock were along the inner shelf. During the recent warm stanza (2014 to 2021), pollock were more widely distributed across the shelf when compared to cold years. In these instances, high catch densities sometimes reached into the inner domain close to Nunivak Island and up against the northern edge of the standard eastern Bering Sea shelf survey area. These distribution patterns are consistent with shoreward and northward feeding migrations typical of pollock during the spring and summer (Kotwicki et al. 2005).

In 2024, the overall distribution of pollock was relatively consistent with previous years, but more concentrated in the northwestern outer shelf, with a significant increase in biomass (Fig. **88**). The total abundance of adult fish > 40 cm was much higher when compared to 2023, with length modes around 43 cm for males and 44 cm for females. The total abundance of juvenile fish (< 20 cm) was also much higher in 2024 than in 2023, with a mode of 14 cm for unsexed individuals. Pollock in the 20-35 cm size range (representing 2-3 year-olds) were also present in higher abundances than in previous years, with a length mode around 24 cm (Fig. **89**). Individuals in the 20-30 cm size range are historically absent or rare in survey catch samples in the eastern Bering Sea, because they likely occupy a position high above the seafloor where they are unavailable to the survey trawl (Kotwicki et al. 2015). Their vertical availability depends on environmental factors and can be affected by bottom depth, light conditions, and fish density (Kotwicki et al. 2014, 2015).

Table 95. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for walleye pollock (*Gadus chalcogrammus*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	348 of 350 (99.4%)
Bottom Depth (m)	21 — 192
Bottom Temperature (°C)	-1.6 — 5.7
Surface Temperature (°C)	2 — 8.9
Population	10.3 billion
Biomass (t)	5.5 million
Percent of Total Catch Biomass	36.4%
Percent Change in Biomass	74% increase from 2023

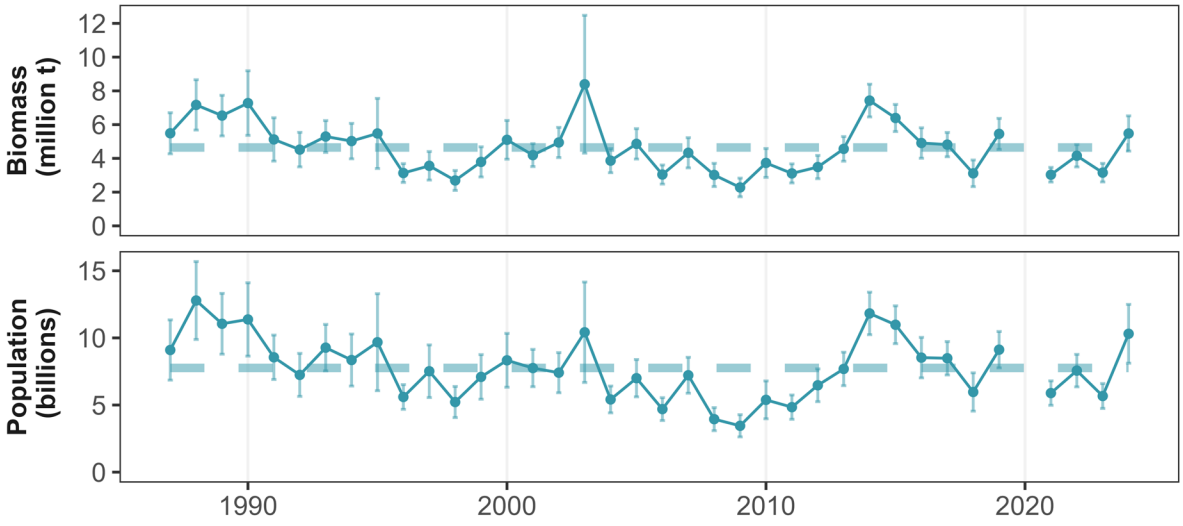

Figure 87. -- Time series of walleye pollock (*Gadus chalcogrammus*) biomass (million t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

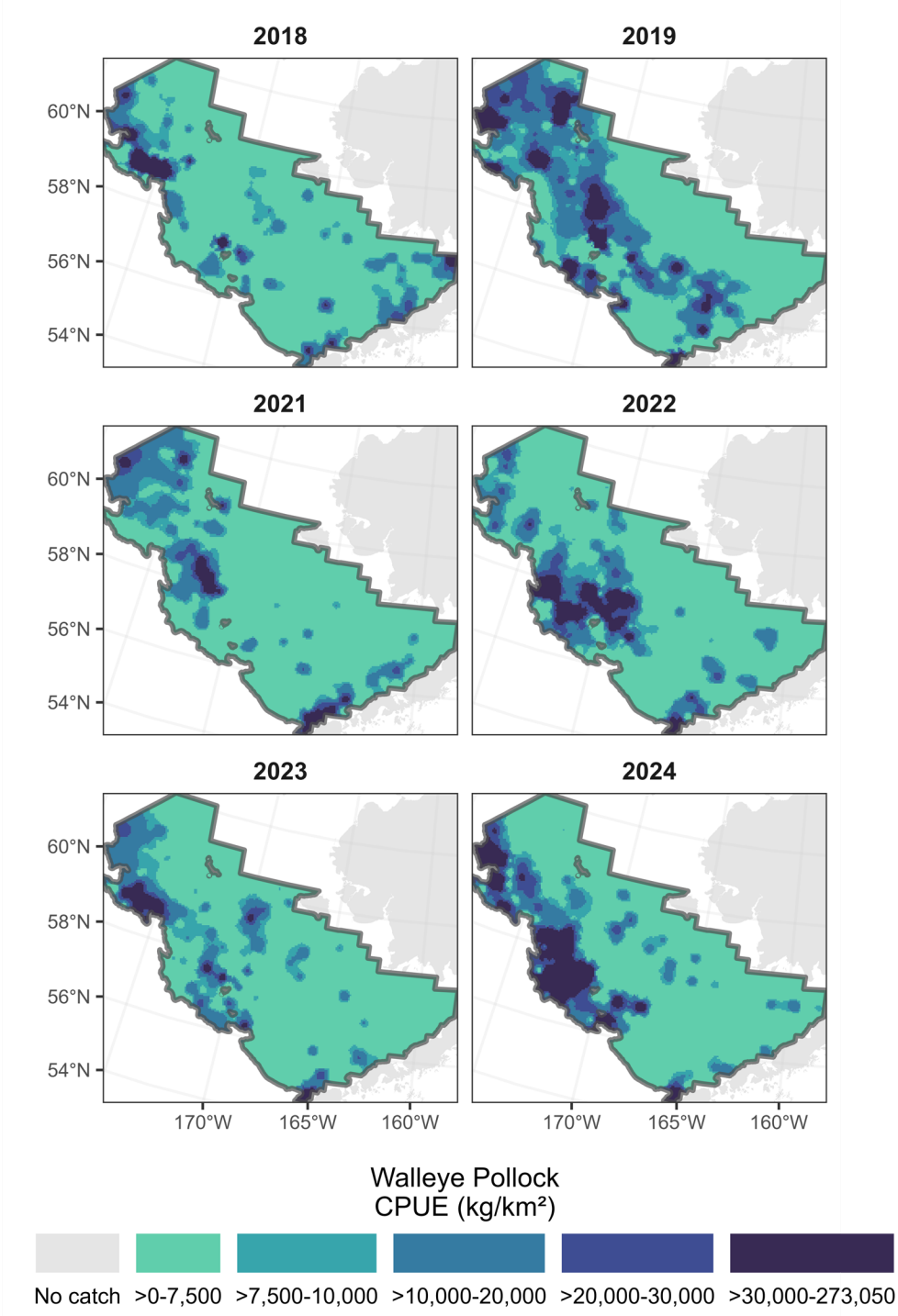

Figure 88. -- CPUE (kg/km^2) distribution of walleye pollock (*Gadus chalcogrammus*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

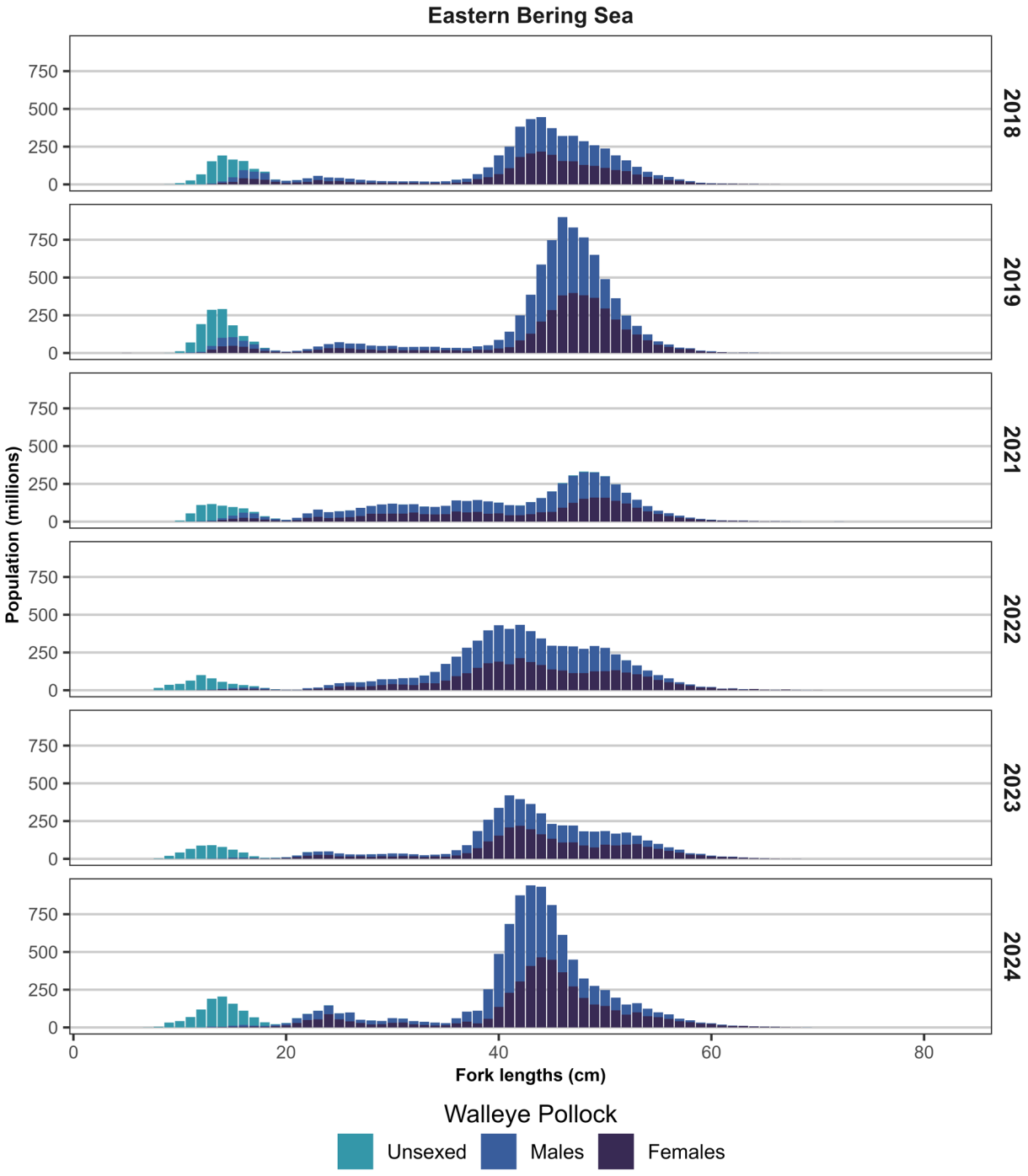

Figure 89. -- Total abundance-at-length estimates of walleye pollock (*Gadus chalcogrammus*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 96. -- Mean CPUE (thousand kg/km²) with standard deviation (SD; kg/km²), estimated biomass (thousand t) with SD (thousand t), 95% lower (LCL; thousand t) and upper (UCL; thousand t) confidence limits, and number of hauls in which walleye pollock (*Gadus chalcogrammus*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (Kkg/km²)	CPUE SD (kg/km²)	Biomass (Kt)	Biomass SD (Kt)	95% LCL (Kt)	95% UCL (Kt)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	3.51	584.52	276.20	46.01	184.19	368.21	58
20	4.43	782.86	182.63	32.25	118.13	247.12	31
31	5.61	1,955.52	533.30	185.73	161.83	904.76	69
32	23.03	7,989.79	203.78	70.68	62.41	345.15	5
41	8.66	2,586.09	539.67	161.14	217.40	861.95	44
42	13.64	5,298.53	329.02	127.81	73.39	584.64	18
43	7.07	1,123.66	149.00	23.67	101.67	196.34	13
50	8.51	4,446.81	323.74	169.15	0.00	662.05	24
61	32.30	4,525.09	2,835.50	397.20	2,041.10	3,629.89	60
62	5.35	702.49	34.55	4.54	25.47	43.63	6
82	1.97	553.88	35.41	9.94	15.52	55.30	12
90	2.88	640.46	33.27	7.39	18.49	48.05	8
Total	**11.11**	**1,058.03**	**5,476.07**	**521.60**	**4,432.87**	**6,519.26**	**348**

Table 97. -- Mean CPUE (thousand no/km²) with standard deviation (SD; no/km²), estimated population (millions) with SD (millions), 95% lower (LCL; millions) and upper (UCL; millions) confidence limits, and number of hauls in which walleye pollock (*Gadus chalcogrammus*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (Kno/km²)	CPUE SD (no/km²)	95% LCL (M)	95% UCL (M)	Population (M)	Population SD (M)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	4.66	938.43	219.27	514.71	366.99	73.86	58
20	8.60	1,414.48	237.77	470.84	354.31	58.27	31
31	9.08	3,258.29	243.14	1,481.01	862.08	309.47	69
32	48.91	21,498.05	52.36	813.10	432.73	190.19	5
41	16.72	4,789.07	444.94	1,638.57	1,041.76	298.41	44
42	28.32	11,914.56	108.30	1,257.91	683.11	287.40	18
43	15.11	2,285.87	221.98	414.58	318.28	48.15	13
50	12.15	6,558.76	0.00	961.13	462.15	249.49	24
61	62.71	10,306.61	3,695.28	7,314.01	5,504.65	904.68	60
62	12.41	1,160.88	65.17	95.18	80.17	7.50	6
82	5.50	1,699.72	37.80	159.86	98.83	30.52	12
90	8.92	4,595.33	0.00	208.94	102.89	53.03	8
Total	**20.91**	**2,221.35**	**8,117.73**	**12,498.14**	**10,307.93**	**1,095.10**	**348**

Wattled Eelpout (*Lycodes palearis*)

Between 2023 and 2024, the estimated biomass of wattled eelpout increased by 53% on the 2024 eastern Bering Sea Shelf survey in (Table **98**; Figs. **90** and **91**) and the population was estimated at 150.4 million individuals (Table **98**; Fig. **90**).

Table 98. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for wattled eelpout (*Lycodes palearis*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	144 of 350 (41.1%)
Bottom Depth (m)	54 — 147
Bottom Temperature (°C)	-1.2 — 4.2
Surface Temperature (°C)	3 — 8.8
Population	150.4 million
Biomass (t)	26,135
Percent of Total Catch Biomass	0.2%
Percent Change in Biomass	53% increase from 2023

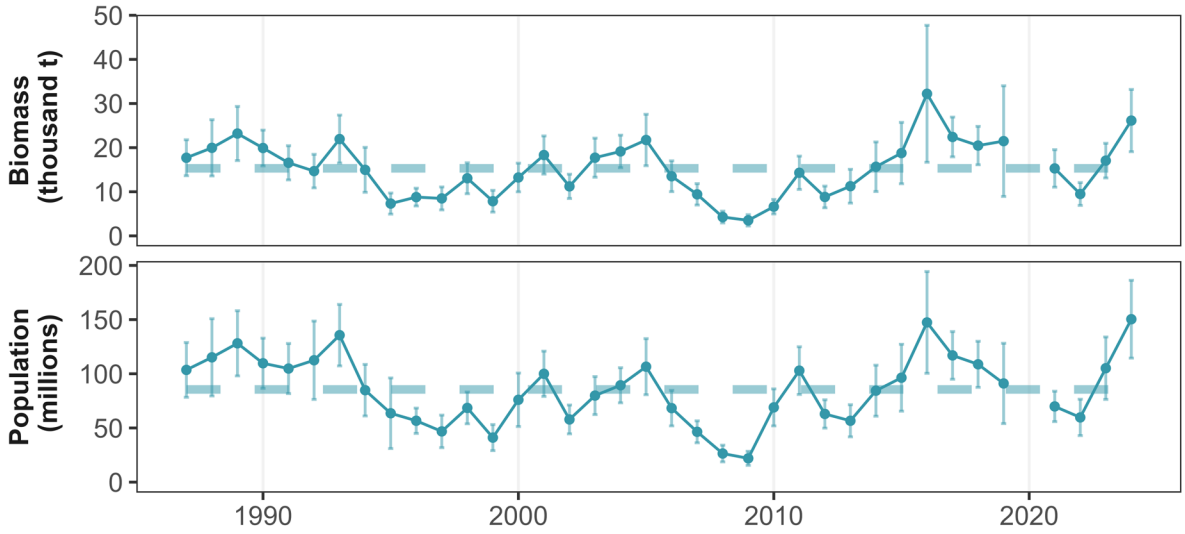

Figure 90. -- Time series of wattled eelpout (*Lycodes palearis*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

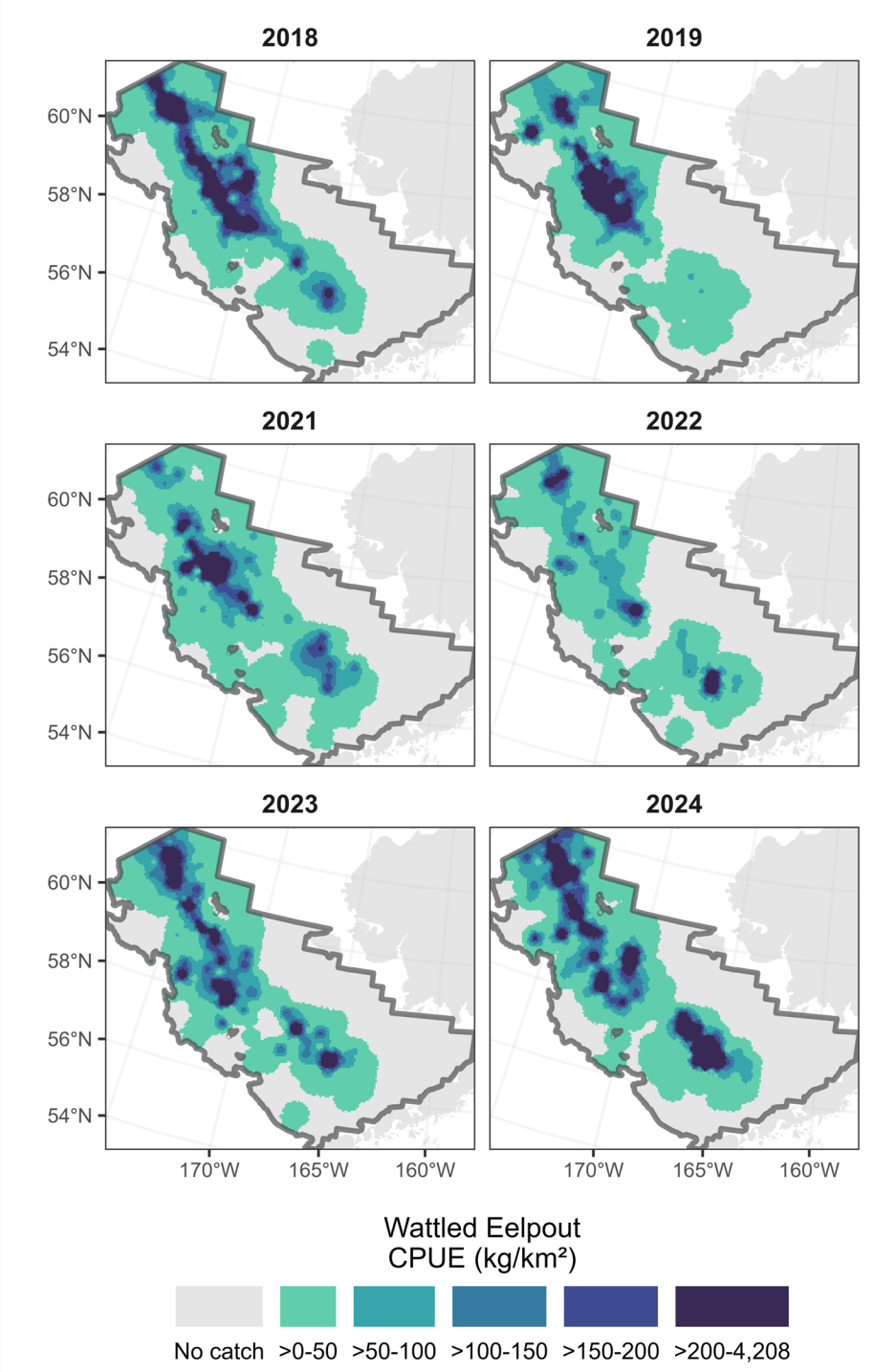

Figure 91. -- CPUE (kg/km^2) distribution of wattled eelpout (*Lycodes palearis*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Yellow Irish Lord (*Hemilepidotus jordani*)

Between 2023 and 2024, the estimated biomass of yellow Irish lord increased by 35% on the 2024 eastern Bering Sea Shelf survey (Tables **99** and **100**; Figs. **92** and **93**) and the population was estimated at 44.3 million individuals (Tables **99** and **101**; Fig. **92**).

Table 99. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for yellow Irish lord (*Hemilepidotus jordani*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	44 of 350 (12.6%)
Bottom Depth (m)	55 — 176
Bottom Temperature (°C)	0.4 — 4
Surface Temperature (°C)	2.5 — 8.9
Population	44.3 million
Biomass (t)	28,370
Percent of Total Catch Biomass	0.2%
Percent Change in Biomass	35% increase from 2023

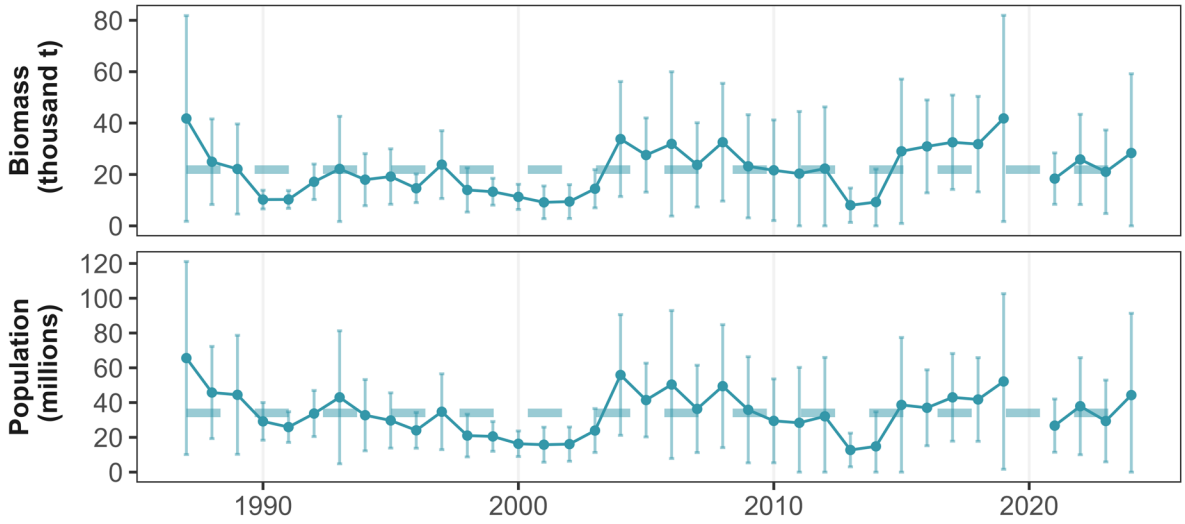

Figure 92. -- Time series of yellow Irish lord (*Hemilepidotus jordani*) biomass (thousand t) and population (millions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

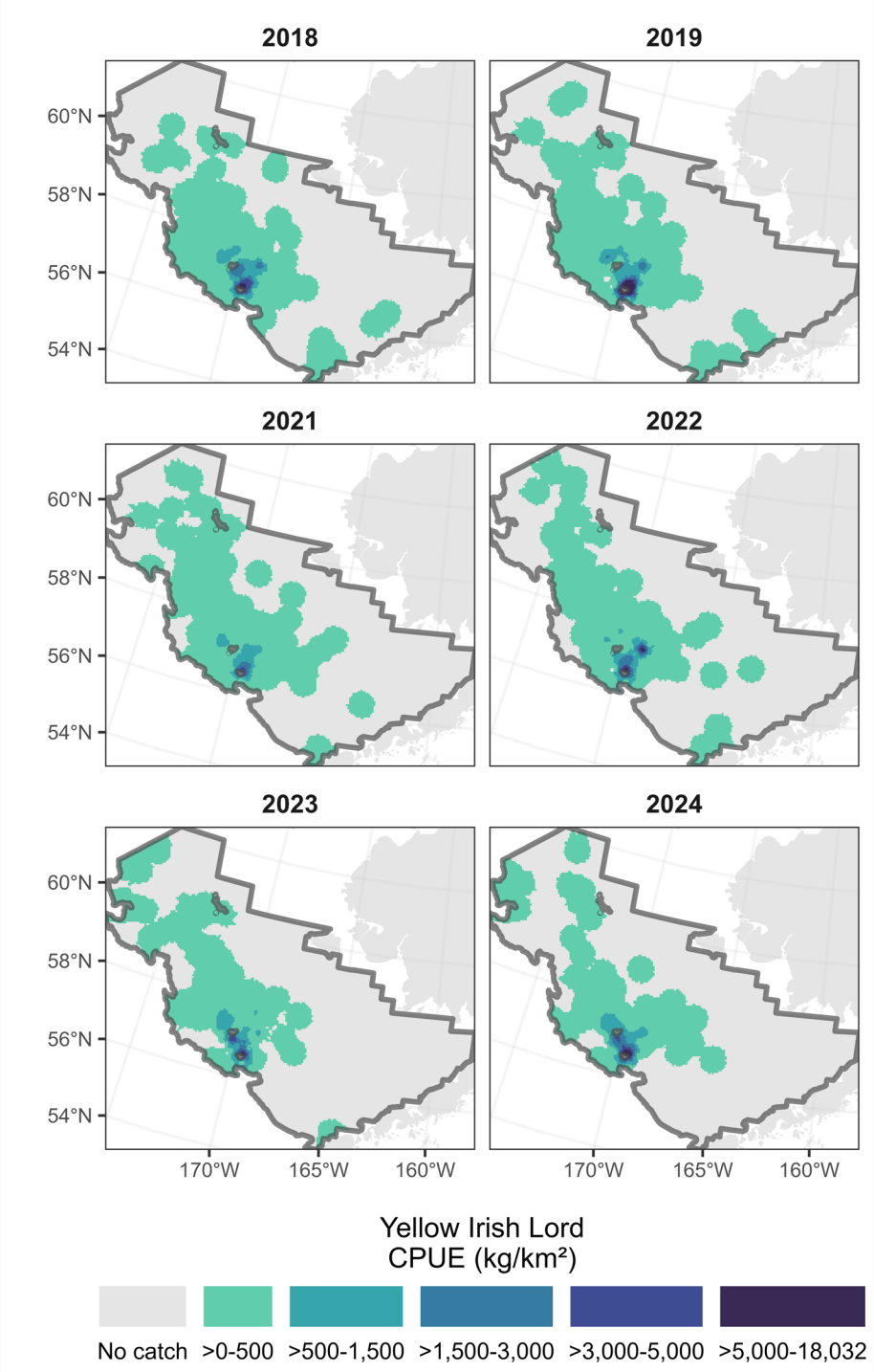

Figure 93. -- CPUE (kg/km^2) distribution of yellow Irish lord (*Hemilepidotus jordani*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

Table 100. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which yellow Irish lord (*Hemilepidotus jordani*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	1.69	0.77	161	73	15	306	6
32	1,652.45	1,650.80	14,619	14,604	0	43,827	3
41	9.63	4.91	600	306	0	1,211	9
42	493.02	202.61	11,893	4,887	2,118	21,668	11
43	1.75	1.19	37	25	0	87	2
50	-	-	-	-	-	-	-
61	8.12	3.01	713	264	185	1,240	11
62	51.40	51.40	332	332	0	996	1
82	0.95	0.95	17	17	0	51	1
90	-	-	-	-	-	-	-
Total	**57.55**	**31.26**	**28,370**	**15,409**	**0**	**59,189**	**44**

Table 101. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which yellow Irish lord (*Hemilepidotus jordani*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-
31	2.72	1.20	31.03	486.49	258.76	113.86	6
32	2,520.35	2,509.30	0.00	66,694.99	22,296.82	22,199.09	3
41	15.81	8.66	0.00	2,064.20	984.88	539.66	9
42	754.65	318.68	2,829.54	33,578.15	18,203.84	7,687.15	11
43	6.16	4.72	0.00	328.65	129.74	99.46	2
50	-	-	-	-	-	-	-
61	14.94	5.55	337.90	2,285.57	1,311.73	486.92	11
62	167.33	167.33	0.00	3,243.61	1,081.20	1,081.20	1
82	1.83	1.83	0.00	98.45	32.82	32.82	1
90	-	-	-	-	-	-	-
Total	**89.86**	**47.73**	**0.00**	**91,357.76**	**44,299.80**	**23,528.98**	**44**

Yellowfin Sole (*Limanda aspera*)

Between 2023 and 2024, the estimated biomass of yellowfin sole increased by 8% on the 2024 eastern Bering Sea Shelf survey (Tables **102** and **103**; Figs. **94** and **95**) and the population was estimated at 5.6 billion individuals (Tables **102** and **104**; Fig. **94**).

In 2024, similar to previous years, the yellowfin sole population in the eastern Bering Sea was distributed along the inner and middle domain between Norton Sound and the Alaska Peninsula. The highest densities were observed along the Alaska coast south of Nunivak Island and along the Alaska Peninsula (Fig. **95**). High densities continue to be observed near Togiak Bay and the spawning grounds in Kuskokwim Bay and Bristol Bay.

In 2024 the abundance-at-length in the eastern Bering Sea was similar to 2023, but fewer individuals in the 20 to 25 cm size range were encountered. The length mode was also similar to the previous year at approximately 28 cm for males and females (Fig. **96**).

Yellowfin sole support one of the largest commercial flatfish fisheries in the world (Wilderbuer et al. 2018) and is the most abundant flatfish species in the eastern Bering Sea (Table **6**). The cross-shelf distribution of yellowfin sole, and the availability of sexually mature males and females to the summer Bering Sea bottom trawl survey, varies from year to year because of temperature-mediated differences in the timing of their spring-summer spawning migration into shallow waters (Nichol et al. 2019).

Most spawning activity occurs at bottom depths less than 30 m (Nichol 1995). Size segregation among spawning and non-spawning portions of the population can also affect the spatial distribution of yellowfin sole (Nichol et al. 2019). This segregation occurs because length or age at sexual maturity differs for males and females (Nichol 1998) and sexually immature individuals undergo a gradual (multi-year) ontogenetic migration away from the nearshore that differs from the annual spawning migrations of mature individuals (Nichol 1997). Interannual differences in the proportion of the yellowfin sole population that is available to the eastern Bering Sea shelf survey, as well as the sex and size composition of this available population, may bias survey estimates. The bottom temperature and the survey start date are both used in the stock assessment model to adjust the catchability parameter (Nichol et al. 2019, Wilderbuer et al. 2018).

Table 102. -- Summary of 2024 catch presence, temperature ranges, and extrapolated biomass and population estimates for yellowfin sole (*Limanda aspera*) in the eastern Bering Sea shelf survey area.

	Eastern Bering Sea Shelf
Stations Present	213 of 350 (60.9%)
Bottom Depth (m)	21 — 137
Bottom Temperature (°C)	-1.6 — 5.7
Surface Temperature (°C)	2 — 8.4
Population	5.6 billion
Biomass (t)	1.5 million
Percent of Total Catch Biomass	10.0%
Percent Change in Biomass	8% increase from 2023

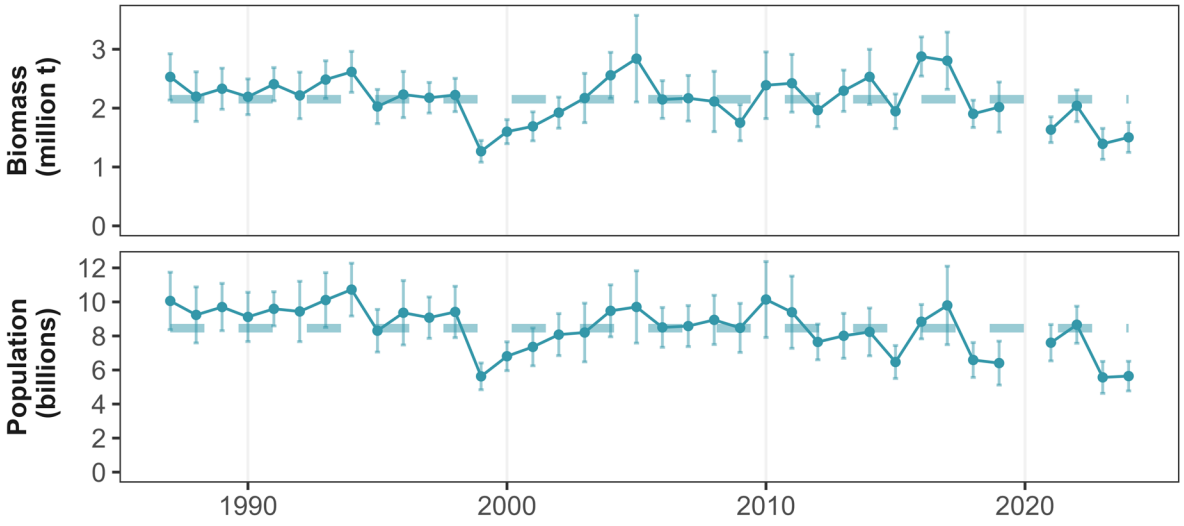

Figure 94. -- Time series of yellowfin sole (*Limanda aspera*) biomass (million t) and population (billions) from the 1987-2024 eastern Bering Sea shelf survey (points and solid lines). Dashed lines represent time-series average and error bars represent estimated 95% confidence intervals.

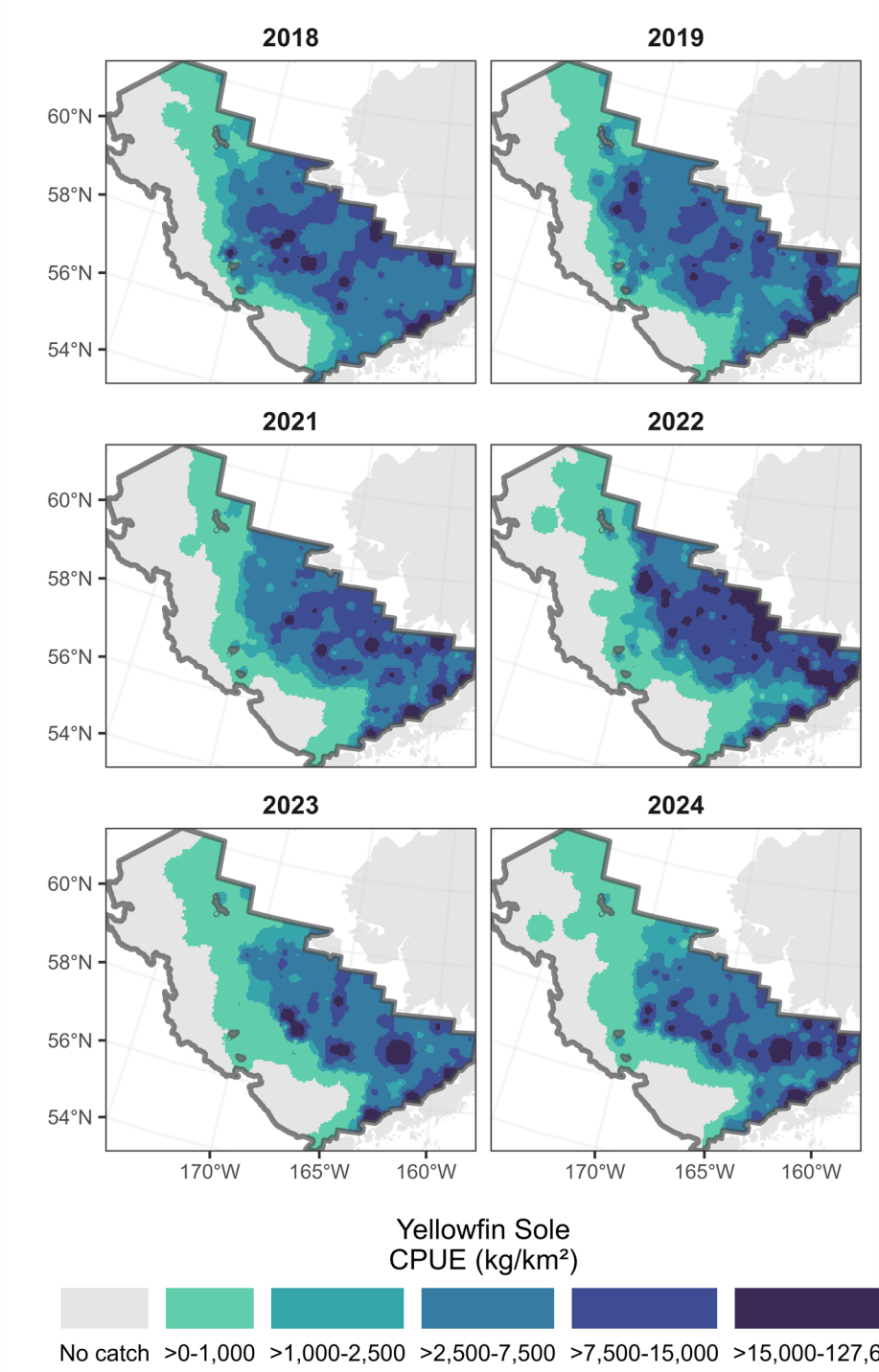

Figure 95. -- CPUE (kg/km^2) distribution of yellowfin sole (*Limanda aspera*) from the 2018-2019 and 2021-2024 eastern Bering Sea shelf survey.

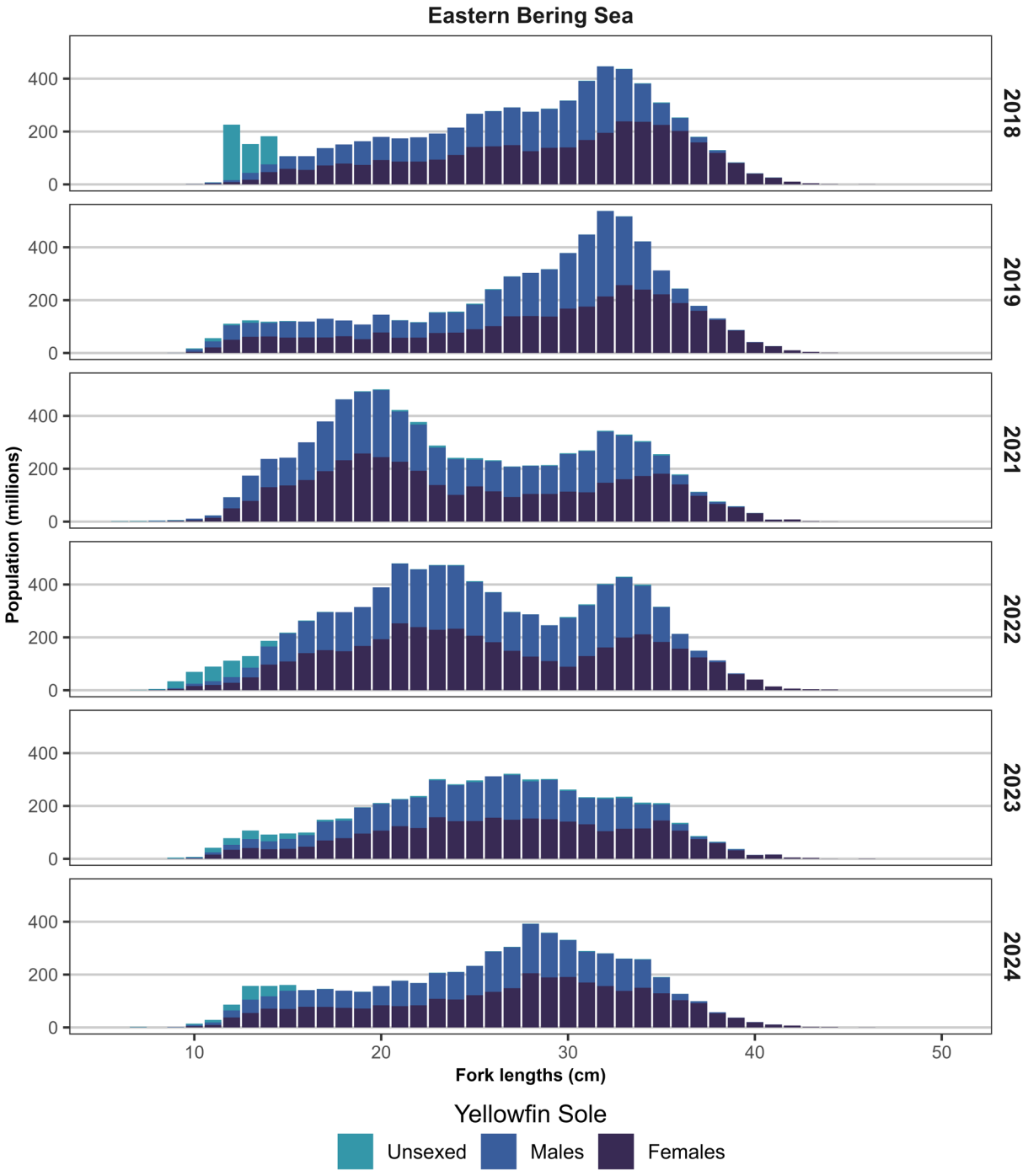

Figure 96. -- Total abundance-at-length estimates of yellowfin sole (*Limanda aspera*) by sex (unsexed, males, and females) in centimeters (cm) encountered during the 2018-2024 eastern Bering Sea shelf surveys. Length distributions are scaled to the total estimated population size.

Table 103. -- Mean CPUE (kg/km²) with standard deviation (SD; kg/km²), estimated biomass (t) with SD (t), 95% lower (LCL; t) and upper (UCL; t) confidence limits, and number of hauls in which yellowfin sole (*Limanda aspera*) were weighed during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (kg/km²)	CPUE SD (kg/km²)	Biomass (t)	Biomass SD (t)	95% LCL (t)	95% UCL (t)	Hauls w/ weights
Eastern Bering Sea Shelf							
10	9,831.78	1,077.06	773,817	84,771	604,275	943,358	58
20	3,960.92	517.02	163,163	21,298	120,568	205,759	31
31	4,434.88	858.32	421,218	81,522	258,174	584,263	51
32	327.90	197.58	2,901	1,748	0	6,397	4
41	1,296.82	486.28	80,805	30,300	20,205	141,405	35
42	2,504.14	1,357.42	60,405	32,744	0	125,893	15
43	19.75	12.96	416	273	0	962	7
50	-	-	-	-	-	-	-
61	0.12	0.12	10	10	0	31	1
62	0.74	0.74	5	5	0	14	1
82	48.27	25.76	867	463	0	1,792	9
90	0.96	0.96	11	11	0	33	1
Total	**3,050.00**	**258.81**	**1,503,618**	**127,590**	**1,248,439**	**1,758,798**	**213**

Table 104. -- Mean CPUE (no/km²) with standard deviation (SD; no/km²), estimated population (thousands) with SD (thousands), 95% lower (LCL; thousands) and upper (UCL; thousands) confidence limits, and number of hauls in which yellowfin sole (*Limanda aspera*) were encountered during the 2024 eastern Bering Sea shelf survey.

Stratum	CPUE mean (no/km²)	CPUE SD (no/km²)	95% LCL (K)	95% UCL (K)	Population (K)	Population SD (K)	Hauls w/ counts
Eastern Bering Sea Shelf							
10	39,419.07	3,725.96	2,515,996.76	3,689,012.88	3,102,504.82	293,254.03	58
20	24,150.58	4,030.19	662,807.37	1,326,873.20	994,840.29	166,016.46	31
31	12,404.72	2,614.01	681,632.89	1,674,729.94	1,178,181.42	248,274.26	51
32	399.29	220.00	0.00	7,425.04	3,532.42	1,946.31	4
41	3,260.10	1,323.28	38,228.88	368,044.30	203,136.59	82,453.86	35
42	6,516.11	3,650.49	0.00	333,297.51	157,182.43	88,057.54	15
43	62.20	34.76	0.00	2,774.51	1,310.09	732.21	7
50	-	-	-	-	-	-	-
61	0.59	0.59	0.00	155.68	51.89	51.89	1
62	3.52	3.52	0.00	68.22	22.74	22.74	1
82	128.81	63.50	32.48	4,592.64	2,312.56	1,140.04	9
90	2.56	2.56	0.00	88.73	29.58	29.58	1
Total	**11,446.69**	**883.61**	**4,771,880.63**	**6,514,329.01**	**5,643,104.82**	**435,612.10**	**213**

Data Sources

Groundfish Assessment Program's Bering Sea team and the Shellfish Assessment Program conduct the Bering Sea shelf surveys each summer. The haul-level data collected from the survey are extrapolated to catch-per-unit-effort (CPUE), population-level abundance, population-level abundance by size class, and population-level biomass estimates. Those estimates are presented in this document, which was generated using R and R Markdown. R is a programming language and environment for statistical computing and graphics. R Markdown provides a framework for reproducible, transparent, and documentable report writing. For results of previous surveys, please refer to the AFSC technical memoranda listed on the NOAA[10], the AFSC website[11], and Groundfish Assessment Program website[12].

Many of the data sources and tools used to develop the figures and content of this document have been developed by members across the AFSC's Groundfish Assessment Program. These tools and public-serving data products aim to provide transparency and accessibility to Bering Sea ecosystem data. The *akgfmaps*[13] R package (v4.0.3), developed by Sean Rohan, was used for producing the species distribution plots and other maps in this document. The *coldpool*[14] R package (v3.4.3), developed by Sean Rohan and Lewis Barnett, uses reproducible interpolation techniques to better understand changes in surface temperature, bottom temperature, and the cold pool in the Bering Sea (Rohan et al. 2022). The *gapindex*[15] R package (v3.0.2), developed by Zack Oyafuso and Margaret Siple, calculates design-based indices of abundance and composition for all AFSC Groundfish Assessment Program bottom trawl surveys.

The catch, environmental, and location data collected and calculated from the survey can be directly accessed and downloaded from the Fisheries One Stop Shop data platform (FOSS). The FOSS web-based data portal allows users to select, view, and download data from the eastern Bering Sea shelf survey, northern Bering Sea shelf survey, and other surveys conducted by AFSC's Resource Assessment and Conservation Engineering Division. The catch, environmental, location data and biomass, population, size composition, and age composition estimates collected and calculated from the survey can be accessed and downloaded from the Alaska Fisheries Information Network (AKFIN[16]; Alaska Fisheries Information Network (AKFIN) (2024)) with a user log in provided by AKFIN. Data from NOAA surveys are used in the NOAA Fisheries Distribution Mapping and Analysis Portal (DisMAP[17]) that provides public access to maps and other information about the distributions of marine species in U.S. Marine Ecosystems.

To learn more about the sustained participation of fishing communities that are substantially dependent on or engaged in North Pacific groundfish and crab fisheries, please review the AFSC's Annual Community Engagement and Participation Overview (ACEPO) for Federal Groundfish and Crab Fisheries of the North

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[10] https://repository.library.noaa.gov/

[11] https://www.fisheries.noaa.gov/resource/publication-database/alaska-fisheries-science-center-technical-memorandums

[12] https://www.fisheries.noaa.gov/alaska/science-data/groundfish-assessment-program-bottom-trawl-surveys

[13] https://github.com/afsc-gap-products/akgfmaps

[14] https://github.com/afsc-gap-products/coldpool

[15] https://github.com/afsc-gap-products/gapindex

[16] https://www.psmfc.org/program/alaska-fisheries-information-network-akfin

[17] https://apps-st.fisheries.noaa.gov/dismap

Pacific[18]. Additionally, the AFSC's Human Dimensions of Fisheries Data Explorer[19] provides access to data, data visualizations, and other tools for understanding the economic and socio-cultural dimensions of Alaska fisheries.

[18] https://shinyfin.psmfc.org/acepo/

[19] https://reports.psmfc.org/akfin

Acknowledgments

Recognition and appreciation are extended to the captains and crews of the FV *Alaska Knight* and FV *Northwest Explorer*. Without their expertise, goodwill, and sacrifice, this survey would not be possible. Thank you to United States Seafoods and B&N Fisheries Company for providing the vessels and always maintaining safety as a top priority. Great appreciation is also extended to all the scientists, researchers, contractors, interns, and volunteers who worked tirelessly aboard each vessel to complete the survey in a safe and successful manner. The survey would not have been possible without the major contributions from other AFSC groups including the net shed, the research survey support team, the data management group, and the administrative team. Finally, appreciation is extended to Rebecca Haehn-Tam, Rebecca Howard, and Shannon Nardi for reviewing this document. Their excellent comments and suggestions greatly improved this work.

We would like to thank the many communities of the Bering Sea region and their members who have helped contribute to this document. The knowledge, experiences, and insights of the people of Alaska have been instrumental in expanding the scope of our science and knowledge to encompass the many issues that face this important ecosystem. We appreciate feedback from those residing in the region who are willing to share their insights, including identifying species of interest or concern that should be included in this document, and participating in an open dialog about how we can improve our collective knowledge of the ecosystem and the region.

NOAA Fisheries' Alaska Fisheries Science Center's work is conducted in the waters and along the coastlines of Alaska, which include the traditional homelands and waters of the Inupiat, Yupiit, Siberian Yupiit, Unangax, Alutiiq/Sugpiaq, Eyak, Dena'ina Athabascan, Tlingit, Haida, and Tsimshian who have stewarded their lands and waters since time immemorial. We are indebted to these peoples for their wisdom and knowledge of their lands and waters.

This document was prepared in the greater Seattle area, which is located on the traditional lands of the Coast Salish people, including the Duwamish people, past and present. We are grateful for their continued sharing of vision, wisdom, values, and leadership.

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Appendix A: List of taxa encountered in the eastern Bering Sea shelf

Appendix A lists all fish and invertebrate taxa encountered during the eastern Bering Sea shelf bottom trawl survey.

List of Tables

- Appendix **A-105**: Fish taxa encountered during the 2024 eastern Bering Sea shelf survey listed alphabetically by family.
- Appendix **A-106**: Invertebrate taxa encountered during the 2024 eastern Bering Sea shelf survey listed alphabetically by phylum.

Appendix Table A-105.-- Fish taxa encountered during the 2024 eastern Bering Sea shelf survey listed alphabetically by family.

Family	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
Agonidae	*Aspidophoroides monopterygius*	Aleutian alligatorfish	56	40	145	69.1	56.3	60.7
	Bathyagonus alascanus	gray starsnout	2	88	120	104.0	55.3	56.7
	Leptagonus decagonus	Atlantic poacher	1	79	79	79.0	62.0	62.0
	Occella dodecaedron	Bering poacher	32	18	53	34.3	57.7	60.3
	Percis japonica	dragon poacher	1	105	105	105.0	60.0	60.0
	Podothecus accipenserinus	sturgeon poacher	195	18	127	56.6	55.0	60.3
	Podothecus veternus	veteran poacher	2	73	95	84.0	56.7	60.0
	Sarritor frenatus	sawback poacher	56	66	190	103.6	54.8	61.7
Ammodytidae	*Ammodytes* sp.	sand lance unid.	12	20	49	33.0	57.3	59.7
Anarhichadidae	*Anarhichas orientalis*	Bering wolffish	3	23	82	46.3	54.7	60.3
Anoplopomatidae	*Anoplopoma fimbria*	sablefish	13	94	157	125.7	54.8	56.7
Arhynchobatidae	*Bathyraja aleutica*	Aleutian skate	18	95	190	139.2	54.8	59.6
	Bathyraja aleutica egg case	Aleutian skate egg case	3	128	144	134.3	55.0	55.4
	Bathyraja interrupta	Bering skate	74	66	190	119.2	54.7	60.7
	Bathyraja interrupta egg case	Bering skate egg case	14	109	190	142.0	54.8	58.7
	Bathyraja minispinosa	whitebrow skate	1	190	190	190.0	58.7	58.7
Bathymasteridae	*Bathymaster signatus*	searcher	18	77	190	125.7	55.3	60.7
Clupeidae	*Clupea pallasii*	Pacific herring	96	18	103	57.2	55.3	62.0
Cottidae	*Artediellus pacificus*	hookhorn sculpin	5	60	72	66.6	56.7	57.4
	Gymnocanthus detrisus	purplegray sculpin	1	68	68	68.0	61.7	61.7
	Gymnocanthus galeatus	armorhead sculpin	1	65	65	65.0	60.0	60.0
	Gymnocanthus pistilliger	threaded sculpin	42	18	82	38.5	54.7	60.0
	Hemilepidotus jordani	yellow Irish lord	44	53	174	87.9	56.3	61.7
	Hemilepidotus papilio	butterfly sculpin	4	57	73	63.0	60.0	62.0
	Icelinus borealis	northern sculpin	32	51	135	81.2	56.6	60.3
	Icelus spatula	spatulate sculpin	28	59	153	95.6	55.0	61.0
	Icelus spiniger	thorny sculpin	49	64	190	121.1	56.0	61.3
	Myoxocephalus jaok	plain sculpin	82	18	66	38.5	56.3	62.0
	Myoxocephalus polyacanthocephalus	great sculpin	163	20	174	73.1	55.0	62.0
	Myoxocephalus scorpius	shorthorn (=warty) sculpin	7	42	73	57.0	58.3	60.7
	Triglops macellus	roughspine sculpin	16	84	135	107.5	55.0	56.7
	Triglops pingelii	ribbed sculpin	14	40	144	71.6	56.0	60.3

Family	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Triglops scepticus	spectacled sculpin	5	143	190	163.8	54.8	58.7
Cyclopteridae	*Aptocyclus ventricosus*	smooth lumpsucker	2	128	140	134.0	60.0	60.7
Gadidae	*Boreogadus saida*	Arctic cod	8	18	133	76.8	59.3	62.0
	Eleginus gracilis	saffron cod	3	18	91	51.0	58.6	60.0
	Gadus chalcogrammus	walleye pollock	348	18	190	79.2	54.7	62.0
	Gadus macrocephalus	Pacific cod	335	18	190	78.2	54.7	62.0
	Microgadus proximus	Pacific tomcod	2	28	32	30.0	59.0	60.3
Hemitripteridae	*Blepsias bilobus*	crested sculpin	1	66	66	66.0	59.3	59.3
	Hemitripterus bolini	bigmouth sculpin	69	66	190	113.0	55.3	61.0
Hexagrammidae	Hexagrammidae	greenling unid.	1	73	73	73.0	60.0	60.0
	Hexagrammos decagrammus	kelp greenling	4	64	89	73.2	56.0	57.6
	Hexagrammos stelleri	whitespotted greenling	5	18	37	25.4	58.2	59.3
	Pleurogrammus monopterygius	Atka mackerel	2	73	82	77.5	54.7	60.0
Liparidae	*Careproctus phasma*	monster snailfish	47	61	145	101.9	58.3	62.0
	Careproctus rastrinus	salmon snailfish	2	105	113	109.0	61.3	61.3
	Careproctus scottae	peachskin snailfish	31	61	174	111.0	55.3	62.0
	Crystallichthys cyclospilus	blotched snailfish	2	128	157	142.5	54.8	59.0
	Liparidae	snailfish unid.	2	29	57	43.0	59.4	60.3
	Liparis gibbus	variegated snailfish	26	28	128	73.1	57.7	62.0
	Liparis sp.		1	28	28	28.0	60.3	60.3
Osmeridae	*Mallotus villosus*	Pacific capelin	56	18	90	41.4	56.3	62.0
	Thaleichthys pacificus	eulachon	24	40	153	110.5	55.0	58.0
Pleuronectidae	*Atheresthes evermanni*	Kamchatka flounder	135	62	190	109.6	55.0	61.7
	Atheresthes stomias	arrowtooth flounder	206	43	190	96.6	54.7	61.0
	Glyptocephalus zachirus	rex sole	80	32	190	113.9	54.7	59.7
	Hippoglossoides elassodon	flathead sole	285	29	190	87.8	54.7	62.0
	Hippoglossoides robustus	Bering flounder	65	41	140	76.6	58.0	62.0
	Hippoglossus stenolepis	Pacific halibut	247	18	190	72.1	54.7	62.0
	Isopsetta isolepis	butter sole	23	35	82	57.4	54.7	58.3
	Lepidopsetta bilineata	southern rock sole	6	49	84	70.8	55.0	56.6
	Lepidopsetta polyxystra	northern rock sole	268	18	174	66.8	54.7	62.0
	Limanda aspera	yellowfin sole	213	18	135	56.2	55.0	62.0
	Limanda sakhalinensis	Sakhalin sole	10	60	81	69.1	60.0	62.0

Family	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Microstomus pacificus	Dover sole	7	73	135	102.7	55.0	56.7
	Myzopsetta proboscidea	longhead dab	38	18	53	31.1	58.0	60.3
	Platichthys stellatus	starry flounder	57	18	82	39.3	54.7	60.3
	Platichthys stellatus X Pleuronectes quadrituberculatus hybrid	hybrid starry flounder X Alaska plaice	4	26	65	40.8	57.0	59.4
	Pleuronectes quadrituberculatus	Alaska plaice	202	18	117	56.7	55.3	62.0
	Psettichthys melanostictus	sand sole	2	49	51	50.0	55.3	55.7
	Reinhardtius hippoglossoides	Greenland turbot	26	71	145	103.5	59.4	62.0
Psychrolutidae	*Dasycottus setiger*	spinyhead sculpin	63	81	190	120.8	55.0	61.0
	Malacocottus zonurus	darkfin sculpin	2	130	190	160.0	56.0	58.7
Ptilichthyidae	*Ptilichthys goodei*	quillfish	1	88	88	88.0	56.7	56.7
Rajidae	*Arctoraja parmifera*	Alaska skate	338	18	190	79.9	54.7	62.0
	Arctoraja parmifera egg case	Alaska skate egg case	41	43	174	97.6	54.8	60.7
	Beringraja binoculata	big skate	13	47	94	69.0	54.7	57.3
	Beringraja rhina	longnose skate	1	174	174	174.0	59.6	59.6
Salmonidae	*Oncorhynchus keta*	chum salmon	1	97	97	97.0	56.7	56.7
Sebastidae	*Sebastes aleutianus*	rougheye rockfish	1	133	133	133.0	55.7	55.7
	Sebastes alutus	Pacific ocean perch	13	82	190	140.0	54.7	61.0
	Sebastes melanostictus	blackspotted rockfish	2	130	132	131.0	56.0	56.0
	Sebastes polyspinis	northern rockfish	5	130	155	140.2	55.7	58.7
	Sebastes variabilis	dusky rockfish	3	85	157	124.0	54.8	56.3
Squalidae	*Squalus suckleyi*	spiny dogfish	1	116	116	116.0	58.0	58.0
Stichaeidae	*Leptoclinus maculatus*	daubed shanny	12	69	135	96.8	55.0	59.3
	Lumpenus fabricii	slender eelblenny	1	29	29	29.0	59.7	59.7
	Lumpenus sagitta	snake prickleback	1	51	51	51.0	55.3	55.3
	Poroclinus rothrocki	whitebarred prickleback	4	116	125	119.8	56.3	58.0
Trichodontidae	*Trichodon trichodon*	Pacific sandfish	7	20	40	33.4	56.7	58.3
Zaproridae	*Zaprora silenus*	prowfish	3	85	190	130.7	56.3	58.7
Zoarcidae	*Lycodes brevipes*	shortfin eelpout	97	66	174	111.8	55.0	61.7
	Lycodes palearis	wattled eelpout	144	52	145	85.2	56.0	62.0
	Lycodes raridens	marbled eelpout	5	60	94	78.2	60.7	62.0

Appendix Table A-106.-- Invertebrate taxa encountered during the 2024 eastern Bering Sea shelf survey listed alphabetically by phylum.

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
Annelida	Annelida	worm unid.	3	73	94	83.3	60.0	61.7
	Aphrodita negligens		5	94	134	115.0	55.0	60.3
	Aphroditidae	sea mouse unid.	29	91	190	130.8	55.7	60.7
	Chaetopterus sp.	parchment tubeworms	3	111	118	115.3	56.3	56.7
	Echiura	echiuroid worm unid.	1	59	59	59.0	57.0	57.0
	Eunoe depressa	depressed scale worm	34	40	133	87.7	56.7	61.0
	Eunoe nodosa	giant scale worm	54	43	139	89.6	56.0	62.0
	Eunoe sp.		18	39	109	67.1	55.3	60.0
	Hirudinea	leech unid.	3	52	132	97.3	56.3	59.0
	Notostomum cyclostomum	striped sea leech	19	50	153	92.1	56.3	62.0
	Polychaeta	polychaete worm unid.	3	60	73	66.7	56.7	57.3
	Polychaeta tubes		23	58	134	98.9	55.7	62.0
	Serpulidae	serpulid worm	2	153	190	171.5	56.3	58.7
	Sipuncula	peanut worm unid.	9	23	122	75.6	55.7	62.0
		tube worm unid.	1	61	61	61.0	60.3	60.3
Arthropoda	Amphipoda	amphipod unid.	1	133	133	133.0	55.7	55.7
	Argis sp.		60	23	190	94.8	55.0	62.0
	Chionoecetes bairdi	Tanner crab	236	29	190	90.7	54.7	61.0
	Chionoecetes hybrid	hybrid Tanner crab	97	40	174	91.1	55.0	62.0
	Chionoecetes opilio	snow crab	201	40	174	90.7	55.0	62.0
	Chirona evermanni	giant barnacle	8	61	157	106.8	54.8	60.3
	Chorilia longipes	longhorned decorator crab	1	190	190	190.0	58.7	58.7
	Crangon sp.		85	18	190	92.3	55.0	62.0
	Elassochirus cavimanus	purple hermit	21	69	190	124.4	54.7	59.0
	Elassochirus tenuimanus	widehand hermit crab	6	49	85	64.3	55.0	57.3
	Erimacrus isenbeckii	horsehair crab	46	34	153	57.5	56.0	61.0
	Glebocarcinus oregonensis	Oregon rock crab	17	51	99	75.6	55.3	57.3
	Hyas coarctatus	circumboreal toad crab	75	34	120	58.1	56.7	62.0
	Hyas lyratus	Pacific lyre crab	118	29	190	86.4	54.8	60.7
	Isopoda	isopod unid.	1	64	64	64.0	57.0	57.0
	Labidochirus splendescens	splendid hermit	151	29	190	84.2	54.8	62.0
	Lithodes aequispinus	golden king crab	1	174	174	174.0	58.3	58.3
	Metacarcinus magister	Dungeness crab	2	49	51	50.0	55.3	55.7

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Oregonia gracilis	graceful decorator crab	29	24	120	64.8	54.7	61.0
	Pagurus aleuticus	Aleutian hermit	138	44	174	99.5	54.7	60.0
	Pagurus capillatus	hairy hermit crab	105	18	155	84.1	55.7	60.0
	Pagurus confragosus	knobbyhand hermit	99	32	190	102.6	54.8	59.3
	Pagurus ochotensis	Alaskan hermit	112	18	92	45.6	54.7	60.3
	Pagurus rathbuni	longfinger hermit	93	58	174	101.1	57.3	62.0
	Pagurus trigonocheirus	fuzzy hermit crab	184	34	174	79.4	55.0	62.0
	Pandalus eous	Alaskan pink shrimp	72	44	190	123.6	54.8	61.3
	Pandalus goniurus	humpy shrimp	32	28	133	88.5	56.3	62.0
	Pandalus jordani	ocean shrimp	4	135	144	139.5	55.0	55.7
	Pandalus sp.		3	23	73	41.7	56.7	60.3
	Paralithodes camtschaticus	red king crab	102	23	88	49.2	56.0	60.3
	Paralithodes platypus	blue king crab	8	43	96	71.4	59.7	61.3
	Polycheles sp.		1	64	64	64.0	57.3	57.3
	Rocinela angustata	sea cockroach	1	132	132	132.0	55.7	55.7
	Spirontocaris lamellicornis	Dana blade shrimp	1	61	61	61.0	60.3	60.3
	Telmessus cheiragonus	helmet crab	25	18	35	26.9	57.0	60.3
	Thoracica	barnacle unid.	24	29	174	84.8	56.3	60.3
		empty barnacle shells	1	190	190	190.0	58.7	58.7
Brachiopoda	Brachiopoda	lampshell unid.	3	65	190	136.0	56.3	60.0
Bryozoa	*Alcyonidium pedunculatum*	fruit leather bryozoan	7	35	66	50.4	57.3	58.7
	Bryozoa	bryozoan unid.	20	29	190	68.0	56.7	61.7
	Bugula sp.		2	62	67	64.5	60.0	61.0
	Rhamphostomella costata	ribbed bryozoan	4	57	78	67.5	57.0	60.3
	Serratiflustra serrulata	leafy bryozoan	4	37	55	47.5	57.7	60.0
Chordata	*Aplidium* sp.		3	65	70	67.3	59.7	60.0
	Ascidiacea	tunicate unid.	1	73	73	73.0	56.7	56.7
	Boltenia ovifera	sea onion	50	20	85	55.5	56.3	60.7
	Halocynthia aurantium	sea peach	19	52	81	64.8	57.0	60.4
	Halocynthia sp.	sea peach unid.	15	59	77	67.7	57.0	59.7
	Styela rustica	sea potato	65	40	95	61.3	55.7	61.0
	Thaliacea	salp unid.	7	46	153	112.0	55.0	57.7
		compound ascidian unid.	39	34	155	64.3	56.3	60.4
Cnidaria	Actiniaria	sea anemone unid.	78	34	190	105.5	55.3	62.0
	Actiniidae	actinid sea anemones unid.	4	101	133	114.2	57.3	59.0
	Aurelia labiata		8	40	77	57.1	56.7	59.7
	Aurelia sp.		13	37	190	94.3	56.0	61.3
	Balticina willemoesi		4	111	120	116.5	56.3	57.0

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Chrysaora melanaster		263	20	174	85.2	55.0	62.0
	Cyanea capillata	lion's mane jelly	1	153	153	153.0	56.3	56.3
	Gersemia sp.	sea raspberry	50	23	88	57.7	56.7	62.0
	Hydroidolina	hydroid unid.	42	18	101	55.2	56.3	62.0
	Hydrozoa		1	20	20	20.0	59.3	59.3
	Liponema brevicorne	tentacle-shedding anemone	43	66	190	125.1	54.8	60.0
	Metridium farcimen	gigantic anemone	7	66	108	85.1	55.7	58.3
	Metridium sp.		77	28	153	71.1	55.0	60.3
	Pennatuloidea	sea whip or sea pen unid.	20	51	144	106.0	55.0	57.3
	Phacellophora camtschatica	egg yolk jelly	3	144	174	157.0	56.0	58.3
	Scyphozoa	jellyfish unid.	14	45	190	101.7	55.0	58.7
	Stomphia coccinea	swimming anemone	9	101	138	127.8	58.3	61.3
	Stomphia sp.		38	65	145	102.5	55.3	62.0
	Urticina crassicornis	mottled anemone	9	29	88	59.3	55.4	58.3
	Urticina sp.		10	29	91	61.7	56.0	58.7
	Zoanthidae A sp.	hot dog zoanthid	1	174	174	174.0	58.3	58.3
Ctenophora	Ctenophora	comb jelly unid.	2	30	32	31.0	57.0	57.4
	Asterias amurensis	purple-orange sea star	226	18	153	61.3	55.0	61.3
	Ceramaster sp.		2	32	157	94.5	54.8	57.0
	Crossaster papposus	rose sea star	16	43	157	75.8	54.8	61.0
	Ctenodiscus crispatus	common mud star	73	76	190	117.9	55.0	61.7
	Cucumaria fallax	sea football	21	20	89	68.0	56.0	58.3
	Cucumaria sp.		1	53	53	53.0	57.3	57.3
	Diplopteraster multipes	pincushion sea star	12	65	190	113.2	54.8	58.7
	Dipsacaster borealis	northern sea star	2	157	174	165.5	54.8	58.3
	Dipsacaster sp.		1	155	155	155.0	58.7	58.7
	Echinacea	sea urchin unid.	13	53	190	131.1	56.3	59.3
Echinodermata	*Echinarachnius parma*	parma sand dollar	12	63	109	78.4	54.7	61.0
	Evasterias echinosoma	giant sea star	30	29	84	60.9	55.7	58.3
	Gorgonocephalus eucnemis	basketstar	216	35	190	80.7	55.0	62.0
	Henricia sp.		24	51	190	118.5	54.8	60.7
	Holothuroidea	sea cucumber unid.	2	37	57	47.0	60.0	60.3
	Leptasterias arctica		45	50	116	69.9	56.6	62.0
	Leptasterias groenlandica		16	64	155	87.1	58.0	62.0
	Leptasterias polaris		127	43	157	91.4	56.0	62.0
	Leptasterias sp.		2	106	117	111.5	57.7	57.7
	Leptychaster anomalus		21	86	190	120.1	55.0	59.7
	Leptychaster arcticus	North Pacific sea star	4	64	71	66.8	60.0	62.0

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Lethasterias nanimensis	blackspined sea star	73	50	155	81.4	56.0	60.7
	Molpadia intermedia	sweet sea potato	4	108	132	125.8	55.4	56.3
	Ophiura sarsii	notched brittlestar	59	58	140	82.4	56.3	62.0
	Ophiura sp.		31	61	113	86.4	58.0	62.0
	Ophiuroidea	brittlestar unid.	4	67	190	126.0	56.3	58.7
	Pedicellaster magister	majestic sea star	1	190	190	190.0	58.7	58.7
	Pisaster sp.		1	77	77	77.0	56.7	56.7
	Pseudarchaster parelii	scarlet sea star	2	117	157	137.0	54.8	57.7
	Pseudarchaster sp.		1	155	155	155.0	58.7	58.7
	Psolus sp.		5	57	73	63.2	60.0	60.7
	Pteraster obscurus	obscure sea star	34	61	145	102.2	55.7	62.0
	Pteraster sp.		4	109	190	152.8	54.8	58.7
	Pteraster tesselatus		1	153	153	153.0	56.3	56.3
	Pycnopodia helianthoides	sunflower sea star	3	51	79	69.0	55.3	55.7
	Solaster sp.		6	61	174	124.2	54.8	60.3
	Strongylocentrotus droebachiensis	green sea urchin	37	29	157	108.1	56.3	61.0
	Strongylocentrotus fragilis	orange-pink sea urchin	2	133	157	145.0	54.8	56.7
	Strongylocentrotus sp.		10	49	144	103.8	55.0	59.0
	Synallactes challengeri		2	143	190	166.5	57.7	58.7
Mollusca	*Aforia circinata*	keeled Aforia	45	90	174	116.5	55.0	61.3
	Arctomelon boreale		2	174	190	182.0	58.3	58.7
	Arctomelon sp.		1	157	157	157.0	54.8	54.8
	Aulacofusus herendeeni	thin-ribbed whelk	13	98	155	121.5	57.7	59.3
	Beringius behringii	Bering beringius	26	39	174	107.5	56.3	61.0
	Beringius sp.		38	44	140	101.7	55.3	61.3
	Berryteuthis magister	magistrate armhook squid	4	133	155	139.0	58.7	59.7
	Bivalvia	bivalve unid.	1	64	64	64.0	57.3	57.3
	Boreotrophon alaskanus	Alaskan trophon	1	133	133	133.0	61.0	61.0
	Boreotrophon beringi	Bering trophon	1	128	128	128.0	55.0	55.0
	Boreotrophon sp.		3	63	97	84.0	57.0	59.0
	Buccinum angulosum	angular whelk	68	58	145	95.9	57.6	62.0
	Buccinum angulosum transliratum	transect whelk	1	113	113	113.0	59.7	59.7
	Buccinum plectrum	sinuous whelk	23	28	157	82.3	54.8	60.7
	Buccinum polare	polar whelk	51	58	101	74.0	57.0	62.0
	Buccinum scalariforme	ladder whelk	125	23	174	96.8	56.0	62.0
	Buccinum sp.		13	43	190	87.2	58.0	61.3
	Chlamys rubida	reddish scallop	1	77	77	77.0	56.7	56.7
	Chlamys sp.		3	45	106	78.3	56.4	57.7
	Ciliatocardium ciliatum	hairy cockle	11	61	134	82.9	57.7	62.0

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Clinocardium sp.		7	60	100	81.1	58.7	61.0
	Clinopegma magnum	helmet whelk	51	61	140	94.1	56.6	62.0
	Colus sp.		24	61	157	100.7	55.0	62.0
	Cryptonatica aleutica	Aleutian moonsnail	7	43	83	69.4	58.7	62.0
	Cryptonatica russa	rusty moonsnail	19	61	108	87.8	55.7	62.0
	Cyclocardia sp.		2	49	53	51.0	56.3	57.7
	Decapodiformes	squid unid.	1	108	108	108.0	56.3	56.3
	Enteroctopus dofleini	giant octopus	21	85	174	131.3	54.8	60.7
	Euspira pallida	pale moonsnail	15	53	127	85.1	58.0	62.0
	Fusitriton oregonensis	Oregon triton	102	53	190	108.1	54.8	60.7
	Fusitriton sp.		1	82	82	82.0	54.7	54.7
	Gastropoda	snail unid.	1	111	111	111.0	56.7	56.7
	Gastropoda egg	snail egg	119	18	155	78.3	55.3	62.0
	Gonatopsis borealis	boreopacific armhook squid	1	134	134	134.0	58.7	58.7
	Grandicrepidula grandis	great slippersnail	1	60	60	60.0	57.3	57.3
	Hiatella arctica	Arctic Hiatella	3	59	81	70.0	57.0	59.7
	Latisipho hallii	shrew whelk	1	68	68	68.0	57.6	57.6
	Macoma nasuta	bent-nose Macoma	5	25	135	70.6	58.0	61.3
	Macoma sp.		1	60	60	60.0	57.0	57.0
	Mactromeris polynyma	Arctic surfclam	41	20	88	48.3	55.7	60.3
	Megangulus luteus	Alaska great-tellin	36	20	61	36.4	55.7	60.0
	Modiolus modiolus	northern horsemussel	4	59	95	73.5	56.0	57.3
	Musculus discors	discordant mussel	2	70	117	93.5	56.7	59.7
	Muusoctopus sibiricus		7	95	135	110.6	59.0	60.7
	Mytilidae	mussel unid.	2	64	117	90.5	57.7	61.0
	Mytilus sp.		4	62	73	68.5	61.0	62.0
	gastropod egg	moonsnail egg unid.	19	58	107	84.1	59.0	62.0
	Neoberingius frielei		2	144	153	148.5	55.0	55.4
	Neoiphinoe coronata	crowned hairysnail	1	94	94	94.0	59.7	59.7
	Neptunea borealis		38	43	157	91.5	57.0	62.0
	Neptunea heros		110	32	105	57.3	56.7	62.0
	Neptunea lyrata	lyre whelk	96	37	174	99.3	55.0	61.3
	Neptunea pribiloffensis	Pribilof whelk	128	59	190	108.1	55.0	61.3
	Neptunea ventricosa	fat whelk	116	23	133	57.5	55.7	62.0
	Nodulotrophon coronatus		1	71	71	71.0	57.0	57.0
	Nudibranchia	nudibranch unid.	40	57	135	84.3	55.6	62.0
	Octopodidae	octopus unid.	4	71	116	92.5	58.0	62.0
	Octopus sp.		1	133	133	133.0	58.7	58.7
	Onchidiopsis clarki	warty blobsnail	5	61	72	66.0	58.3	60.3
	Onchidiopsis sp.		4	57	73	64.0	60.0	60.3
	Patinopecten caurinus	weathervane scallop	19	77	135	104.2	55.3	57.3
	Plicifusus kroyeri		30	65	139	103.4	56.3	61.0

Phylum	Scientific name	Common name	#Hauls	Bottom depth (m)			Latitude	
				Min.	Max.	Avg.	N	S
	Plicifusus sp.		9	57	134	104.4	59.0	61.0
	Pododesmus macrochisma	abalone jingle	1	106	106	106.0	57.7	57.7
	Pyrulofusus deformis	warped whelk	38	51	174	96.1	54.8	60.3
	Pyrulofusus melonis		48	66	145	119.0	55.0	61.0
	Pyrulofusus sp.		2	68	108	88.0	57.0	57.3
	Rossia pacifica	eastern Pacific bobtail	9	108	190	138.8	56.3	59.6
	Serripes notabilis	oblique smoothcockle	57	26	143	74.7	55.0	62.0
	Siliqua alta	Alaska razor	21	18	50	29.7	58.0	60.3
	Tachyrhynchus erosus	eroded turretsnail	1	20	20	20.0	59.3	59.3
	Tellina sp.		3	89	113	100.0	59.3	60.3
	Trichotropis bicarinata	two-keel hairysnail	1	61	61	61.0	60.3	60.3
	Tritonia sp.		3	86	113	100.0	59.3	61.0
	Tritonia tetraquetra	rosy Tritonia	1	76	76	76.0	61.3	61.3
	Volutomitra sp.		1	127	127	127.0	60.0	60.0
	Volutopsius fragilis	fragile whelk	31	43	140	80.8	55.0	58.7
	Volutopsius sp.		18	58	144	85.9	55.0	61.3
	Volutopsius stefanssoni	shouldered whelk	3	61	117	98.0	56.7	60.3
	Yoldia aeolica	crisscrossed Yoldia	4	43	84	68.5	60.7	61.7
	Yoldia sp.		7	67	122	84.1	56.0	62.0
		empty bivalve shells	222	18	190	75.8	55.0	62.0
		empty gastropod shells	267	18	190	78.7	55.0	62.0
Platyhelminthes	Platyhelminthes	flatworm unid.	3	124	143	132.7	56.7	59.3
Porifera	*Aphrocallistes vastus*	clay pipe sponge	1	153	153	153.0	56.3	56.3
	Mycale sp.		1	190	190	190.0	58.7	58.7
	Polymastia sp.		1	153	153	153.0	56.3	56.3
	Porifera	sponge unid.	57	34	190	92.4	55.0	60.7
	Suberites montalbidus	stinky sponge	2	84	84	84.0	56.3	56.4
	Suberites sp.		3	49	109	75.7	55.0	56.7
		soft finger sponge	1	153	153	153.0	56.3	56.3
		vase sponge unid.	1	153	153	153.0	56.3	56.3
Other		unsorted catch and debris	9	29	153	85.7	56.3	61.7

Appendix B: List of population estimates by sex and size group for principal fish species in the eastern Bering Sea shelf

Appendix B presents population estimates by sex and size group from the 2024 eastern Bering Sea shelf bottom trawl survey for principal fish species.

List of Tables

Appendix Table B-107.-- Population estimates by sex and size for Alaska plaice (*Pleuronectes quadrituberculatus*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Females	Males	Unsexed	Total	Proportion	Cumulative proportion
100	97,136	31,725	0	128,861	0.0002	0.0002
110	315,930	0	65,146	381,076	0.0006	0.0008
120	0	473,895	97,136	571,031	0.0009	0.0017
130	131,819	194,272	97,136	423,227	0.0007	0.0024
140	128,861	600,888	0	729,749	0.0012	0.0035
150	255,101	1,110,836	0	1,365,937	0.0022	0.0057
160	711,936	1,369,943	0	2,081,879	0.0033	0.0090
170	952,871	1,269,197	0	2,222,068	0.0035	0.0125
180	2,162,027	2,996,589	0	5,158,616	0.0081	0.0206
190	2,605,317	3,218,395	0	5,823,712	0.0092	0.0298
200	4,092,159	4,993,437	0	9,085,596	0.0143	0.0441
210	2,945,941	5,276,716	0	8,222,657	0.0130	0.0571
220	6,152,539	6,523,357	0	12,675,896	0.0200	0.0771
230	4,672,842	4,752,753	0	9,425,595	0.0149	0.0919
240	4,072,933	7,977,905	0	12,050,838	0.0190	0.1110
250	6,045,442	8,853,879	0	14,899,321	0.0235	0.1344
260	8,081,186	9,637,253	0	17,718,439	0.0279	0.1624
270	9,110,489	11,461,796	0	20,572,285	0.0324	0.1948
280	11,412,392	17,417,166	0	28,829,558	0.0455	0.2403
290	11,305,338	17,561,447	0	28,866,785	0.0455	0.2858
300	12,961,704	20,705,695	0	33,667,399	0.0531	0.3389
310	13,082,935	25,489,866	0	38,572,801	0.0608	0.3998
320	13,223,629	27,937,569	0	41,161,198	0.0649	0.4647
330	15,322,728	25,111,061	0	40,433,789	0.0638	0.5285
340	15,023,994	24,497,263	0	39,521,257	0.0623	0.5908
350	12,673,355	25,100,153	0	37,773,508	0.0596	0.6504
360	13,339,984	21,788,103	0	35,128,087	0.0554	0.7058
370	13,824,691	20,580,523	0	34,405,214	0.0543	0.7600
380	11,971,234	13,221,316	0	25,192,550	0.0397	0.7998
390	11,243,640	9,856,529	0	21,100,169	0.0333	0.8331
400	8,307,246	4,520,027	0	12,827,273	0.0202	0.8533
410	10,279,713	2,022,504	0	12,302,217	0.0194	0.8727
420	7,871,574	1,921,624	0	9,793,198	0.0154	0.8881
430	9,947,115	429,806	0	10,376,921	0.0164	0.9045
440	10,189,711	340,970	0	10,530,681	0.0166	0.9211
450	10,323,632	174,042	0	10,497,674	0.0166	0.9377
460	8,092,704	189,795	0	8,282,499	0.0131	0.9507
470	5,441,625	54,534	0	5,496,159	0.0087	0.9594
480	5,990,189	0	0	5,990,189	0.0094	0.9688
490	5,248,258	29,094	0	5,277,352	0.0083	0.9772
500	4,609,425	29,094	0	4,638,519	0.0073	0.9845
510	2,300,758	30,499	0	2,331,257	0.0037	0.9882
520	3,867,388	0	0	3,867,388	0.0061	0.9943
530	1,442,822	0	0	1,442,822	0.0023	0.9965
540	878,220	0	0	878,220	0.0014	0.9979
550	589,844	0	0	589,844	0.0009	0.9989

Length (cm)	Females	Males	Unsexed	Total	Proportion	Cumulative proportion
560	149,040	0	0	149,040	0.0002	0.9991
570	387,536	0	0	387,536	0.0006	0.9997
580	104,263	0	0	104,263	0.0002	0.9999
590	84,032	0	0	84,032	0.0001	1.0000
Total	**304,025,248**	**329,751,516**	**259,418**	**634,036,182**	**1.0000**	**1.0000**

Appendix Table B-108.-- Population estimates by sex and size for Alaska skate (*Arctoraja parmifera*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Females	Males	Unsexed	Total	Proportion	Cumulative proportion
190	0	64,058	0	64,058	0.0006	0.0006
200	32,298	0	0	32,298	0.0003	0.0009
210	65,264	131,781	0	197,045	0.0019	0.0029
220	148,694	286,405	0	435,099	0.0042	0.0071
230	590,992	376,429	0	967,421	0.0094	0.0165
240	270,987	462,133	0	733,120	0.0071	0.0236
250	444,822	534,966	0	979,788	0.0095	0.0331
260	281,428	411,002	0	692,430	0.0067	0.0398
270	472,887	381,753	0	854,640	0.0083	0.0481
280	619,577	414,363	0	1,033,940	0.0100	0.0582
290	427,267	425,281	0	852,548	0.0083	0.0665
300	379,418	257,451	0	636,869	0.0062	0.0727
310	398,164	544,553	0	942,717	0.0092	0.0818
320	376,156	517,626	0	893,782	0.0087	0.0905
330	701,275	452,879	0	1,154,154	0.0112	0.1017
340	386,868	333,014	0	719,882	0.0070	0.1087
350	251,925	402,576	0	654,501	0.0064	0.1151
360	424,392	480,609	0	905,001	0.0088	0.1239
370	247,245	586,299	0	833,544	0.0081	0.1320
380	557,051	888,131	0	1,445,182	0.0140	0.1460
390	584,507	269,609	0	854,116	0.0083	0.1543
400	365,077	424,972	0	790,049	0.0077	0.1620
410	480,057	528,231	0	1,008,288	0.0098	0.1718
420	645,016	681,863	0	1,326,879	0.0129	0.1847
430	531,953	477,159	0	1,009,112	0.0098	0.1945
440	529,591	566,398	0	1,095,989	0.0106	0.2051
450	624,899	448,422	0	1,073,321	0.0104	0.2155
460	658,432	545,748	0	1,204,180	0.0117	0.2272
470	447,516	678,795	0	1,126,311	0.0109	0.2382
480	418,566	466,118	0	884,684	0.0086	0.2468
490	703,978	480,146	0	1,184,124	0.0115	0.2583
500	503,431	401,720	0	905,151	0.0088	0.2671
510	568,278	542,249	0	1,110,527	0.0108	0.2779
520	744,436	376,374	0	1,120,810	0.0109	0.2888
530	492,119	500,844	0	992,963	0.0096	0.2984
540	400,863	597,809	0	998,672	0.0097	0.3081
550	634,060	463,725	0	1,097,785	0.0107	0.3188
560	682,667	384,164	0	1,066,831	0.0104	0.3291
570	375,838	637,686	0	1,013,524	0.0098	0.3390
580	479,216	439,544	0	918,760	0.0089	0.3479
590	655,542	325,364	0	980,906	0.0095	0.3574
600	554,112	466,809	0	1,020,921	0.0099	0.3674
610	681,957	525,048	0	1,207,005	0.0117	0.3791
620	383,756	677,056	0	1,060,812	0.0103	0.3894
630	224,127	317,121	0	541,248	0.0053	0.3946
640	666,960	755,313	0	1,422,273	0.0138	0.4085

Length (cm)	Females	Males	Unsexed	Total	Proportion	Cumulative proportion
650	438,752	344,395	0	783,147	0.0076	0.4161
660	249,068	311,222	0	560,290	0.0054	0.4215
670	627,469	548,646	0	1,176,115	0.0114	0.4329
680	470,224	652,114	0	1,122,338	0.0109	0.4438
690	486,641	443,508	0	930,149	0.0090	0.4529
700	495,858	268,916	0	764,774	0.0074	0.4603
710	438,928	369,471	0	808,399	0.0079	0.4682
720	381,721	466,030	0	847,751	0.0082	0.4764
730	295,377	318,382	0	613,759	0.0060	0.4824
740	559,690	687,247	0	1,246,937	0.0121	0.4945
750	504,075	159,060	0	663,135	0.0064	0.5009
760	384,212	622,770	0	1,006,982	0.0098	0.5107
770	273,573	510,046	0	783,619	0.0076	0.5183
780	272,038	425,296	0	697,334	0.0068	0.5251
790	273,355	523,257	0	796,612	0.0077	0.5328
800	323,509	386,685	0	710,194	0.0069	0.5397
810	771,968	440,437	0	1,212,405	0.0118	0.5515
820	373,092	591,552	0	964,644	0.0094	0.5609
830	514,372	655,286	0	1,169,658	0.0114	0.5722
840	717,352	389,692	0	1,107,044	0.0108	0.5830
850	247,838	603,834	0	851,672	0.0083	0.5913
860	471,189	521,391	0	992,580	0.0096	0.6009
870	532,645	888,464	0	1,421,109	0.0138	0.6147
880	562,124	656,651	0	1,218,775	0.0118	0.6266
890	378,193	708,170	0	1,086,363	0.0106	0.6371
900	698,477	721,922	0	1,420,399	0.0138	0.6509
910	627,492	821,519	0	1,449,011	0.0141	0.6650
920	1,047,408	1,296,482	0	2,343,890	0.0228	0.6878
930	894,211	937,776	0	1,831,987	0.0178	0.7056
940	1,055,577	1,565,408	0	2,620,985	0.0255	0.7310
950	934,648	1,356,548	0	2,291,196	0.0223	0.7533
960	921,003	1,715,827	0	2,636,830	0.0256	0.7789
970	1,350,905	1,672,889	0	3,023,794	0.0294	0.8083
980	1,176,301	1,611,302	0	2,787,603	0.0271	0.8354
990	1,436,794	1,185,843	0	2,622,637	0.0255	0.8608
1000	1,239,277	1,112,972	0	2,352,249	0.0229	0.8837
1010	991,057	1,042,590	0	2,033,647	0.0198	0.9035
1020	1,357,619	985,294	0	2,342,913	0.0228	0.9262
1030	1,021,350	686,645	0	1,707,995	0.0166	0.9428
1040	1,128,138	620,604	0	1,748,742	0.0170	0.9598
1050	587,428	356,006	0	943,434	0.0092	0.9690
1060	711,577	180,384	0	891,961	0.0087	0.9776
1070	556,242	204,336	0	760,578	0.0074	0.9850
1080	417,184	153,694	0	570,878	0.0055	0.9906
1090	224,376	201,028	0	425,404	0.0041	0.9947
1100	153,757	0	0	153,757	0.0015	0.9962
1110	93,154	39,535	0	132,689	0.0013	0.9975
1120	60,259	73,221	0	133,480	0.0013	0.9988
1130	35,580	0	0	35,580	0.0003	0.9991

Length (cm)	Females	Males	Unsexed	Total	Proportion	Cumulative proportion
1150	61,232	0	0	61,232	0.0006	0.9997
1200	29,280	0	0	29,280	0.0003	1.0000
Total	**50,967,253**	**51,963,943**	**0**	**102,931,196**	**1.0000**	**1.0000**

Appendix Table B-109.-- Population estimates by sex and size for arrowtooth flounder (*Atheresthes stomias*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
90	0	0	42,686	42,686	0.0000	0.0000
110	95,086	0	299,918	395,004	0.0004	0.0005
120	0	0	47,598	47,598	0.0001	0.0005
130	94,350	0	1,374,455	1,468,805	0.0016	0.0021
140	430,630	0	1,607,809	2,038,439	0.0022	0.0043
150	1,577,134	1,689,810	1,451,557	4,718,501	0.0051	0.0094
160	2,576,975	1,320,180	143,666	4,040,821	0.0044	0.0138
170	4,755,828	2,811,476	0	7,567,304	0.0082	0.0219
180	3,916,504	5,183,259	0	9,099,763	0.0098	0.0318
190	4,183,293	5,654,699	0	9,837,992	0.0106	0.0424
200	3,948,083	8,940,464	0	12,888,547	0.0139	0.0563
210	6,180,037	5,099,044	0	11,279,081	0.0122	0.0685
220	5,602,865	7,355,977	0	12,958,842	0.0140	0.0825
230	5,981,069	5,855,573	0	11,836,642	0.0128	0.0952
240	6,331,967	7,634,551	0	13,966,518	0.0151	0.1103
250	5,357,723	9,191,731	0	14,549,454	0.0157	0.1260
260	8,066,021	6,687,857	0	14,753,878	0.0159	0.1419
270	9,274,062	5,425,832	0	14,699,894	0.0159	0.1578
280	6,663,092	8,728,357	0	15,391,449	0.0166	0.1744
290	6,457,954	7,127,576	0	13,585,530	0.0147	0.1891
300	7,663,287	8,506,566	0	16,169,853	0.0175	0.2065
310	8,136,951	13,408,069	0	21,545,020	0.0233	0.2298
320	6,918,162	13,153,389	0	20,071,551	0.0217	0.2515
330	10,228,067	16,492,194	0	26,720,261	0.0288	0.2803
340	9,739,714	13,823,767	0	23,563,481	0.0254	0.3057
350	11,928,240	16,053,857	0	27,982,097	0.0302	0.3359
360	18,885,470	20,469,298	0	39,354,768	0.0425	0.3784
370	13,212,043	18,907,303	0	32,119,346	0.0347	0.4131
380	17,517,430	19,050,167	0	36,567,597	0.0395	0.4526
390	21,105,141	23,837,938	0	44,943,079	0.0485	0.5011
400	16,871,336	35,012,689	0	51,884,025	0.0560	0.5571
410	21,658,590	30,772,629	0	52,431,219	0.0566	0.6137
420	16,866,306	32,917,444	0	49,783,750	0.0537	0.6674
430	14,466,930	28,236,250	0	42,703,180	0.0461	0.7135
440	15,087,913	26,846,107	0	41,934,020	0.0453	0.7588
450	9,194,345	19,731,667	123,473	29,049,485	0.0314	0.7901
460	5,976,777	18,265,454	61,736	24,303,967	0.0262	0.8164
470	4,255,266	15,273,946	0	19,529,212	0.0211	0.8374
480	2,642,494	16,973,992	61,736	19,678,222	0.0212	0.8587
490	2,457,866	15,491,773	0	17,949,639	0.0194	0.8781
500	1,030,526	11,604,672	0	12,635,198	0.0136	0.8917
510	1,023,232	14,061,706	0	15,084,938	0.0163	0.9080
520	637,057	14,621,337	61,736	15,320,130	0.0165	0.9245
530	347,353	12,661,382	0	13,008,735	0.0140	0.9386
540	890,710	12,418,266	0	13,308,976	0.0144	0.9529
550	82,439	7,512,897	0	7,595,336	0.0082	0.9611

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
560	0	6,706,723	0	6,706,723	0.0072	0.9684
570	0	4,814,740	0	4,814,740	0.0052	0.9736
580	0	4,672,864	0	4,672,864	0.0050	0.9786
590	0	4,909,277	0	4,909,277	0.0053	0.9839
600	268,413	3,193,743	0	3,462,156	0.0037	0.9876
610	0	2,413,954	0	2,413,954	0.0026	0.9903
620	0	1,318,164	0	1,318,164	0.0014	0.9917
630	207,620	961,768	0	1,169,388	0.0013	0.9929
640	0	702,146	0	702,146	0.0008	0.9937
650	0	651,028	0	651,028	0.0007	0.9944
660	0	724,841	0	724,841	0.0008	0.9952
670	0	703,562	0	703,562	0.0008	0.9959
680	0	1,468,914	0	1,468,914	0.0016	0.9975
690	0	383,630	0	383,630	0.0004	0.9979
700	0	620,368	0	620,368	0.0007	0.9986
710	0	593,710	0	593,710	0.0006	0.9992
720	60,793	162,482	0	223,275	0.0002	0.9995
740	0	472,688	0	472,688	0.0005	1.0000
Total	**320,853,144**	**600,285,747**	**5,276,370**	**926,415,261**	**1.0000**	**1.0000**

Appendix Table B-110.-- Population estimates by sex and size for Bering flounder (*Hippoglossoides robustus*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
90	29,542	0	0	29,542	0.0006	0.0006
110	115,397	95,216	114,475	325,088	0.0066	0.0073
120	579,236	215,474	494,445	1,289,155	0.0264	0.0336
130	980,635	353,547	458,989	1,793,171	0.0367	0.0703
140	1,068,229	342,242	155,696	1,566,167	0.0320	0.1023
150	877,758	363,755	38,773	1,280,286	0.0262	0.1285
160	1,015,545	764,123	29,861	1,809,529	0.0370	0.1655
170	1,147,258	871,816	0	2,019,074	0.0413	0.2068
180	1,074,782	691,991	0	1,766,773	0.0361	0.2430
190	947,561	738,108	0	1,685,669	0.0345	0.2775
200	855,942	867,808	0	1,723,750	0.0353	0.3127
210	906,407	1,263,147	0	2,169,554	0.0444	0.3571
220	653,263	1,757,260	0	2,410,523	0.0493	0.4064
230	925,489	1,583,153	0	2,508,642	0.0513	0.4577
240	653,605	1,384,857	0	2,038,462	0.0417	0.4994
250	422,419	1,219,378	0	1,641,797	0.0336	0.5330
260	456,588	1,720,707	0	2,177,295	0.0445	0.5775
270	371,871	1,532,970	0	1,904,841	0.0390	0.6165
280	280,739	1,497,668	0	1,778,407	0.0364	0.6529
290	314,010	1,442,974	0	1,756,984	0.0359	0.6888
300	274,006	1,935,679	0	2,209,685	0.0452	0.7340
310	201,631	894,613	0	1,096,244	0.0224	0.7565
320	151,928	1,662,499	0	1,814,427	0.0371	0.7936
330	144,640	1,637,917	0	1,782,557	0.0365	0.8300
340	110,433	1,544,834	0	1,655,267	0.0339	0.8639
350	0	1,452,481	0	1,452,481	0.0297	0.8936
360	0	1,597,071	0	1,597,071	0.0327	0.9263
370	0	1,490,155	0	1,490,155	0.0305	0.9568
380	50,755	1,024,472	0	1,075,227	0.0220	0.9787
390	0	504,946	0	504,946	0.0103	0.9891
400	0	243,267	0	243,267	0.0050	0.9941
410	31,406	59,206	0	90,612	0.0019	0.9959
420	0	112,738	0	112,738	0.0023	0.9982
440	0	27,924	0	27,924	0.0006	0.9988
450	31,500	0	0	31,500	0.0006	0.9994
470	0	27,924	0	27,924	0.0006	1.0000
Total	**14,672,575**	**32,921,920**	**1,292,239**	**48,886,734**	**1.0000**	**1.0000**

Appendix Table B-111.-- Population estimates by sex and size for Bering skate (*Bathyraja interrupta*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
160	0	34,426	0	34,426	0.0049	0.0049
190	0	31,987	0	31,987	0.0045	0.0094
210	0	30,121	0	30,121	0.0043	0.0136
220	66,085	31,987	0	98,072	0.0138	0.0275
230	62,554	0	0	62,554	0.0088	0.0363
240	32,029	0	0	32,029	0.0045	0.0408
250	28,415	31,987	0	60,402	0.0085	0.0493
260	31,140	0	0	31,140	0.0044	0.0537
280	29,544	0	0	29,544	0.0042	0.0579
290	0	27,697	0	27,697	0.0039	0.0618
300	0	62,885	0	62,885	0.0089	0.0707
310	0	28,415	0	28,415	0.0040	0.0747
330	29,544	30,844	0	60,388	0.0085	0.0832
370	63,866	0	0	63,866	0.0090	0.0922
380	0	33,961	0	33,961	0.0048	0.0970
400	32,029	0	0	32,029	0.0045	0.1015
410	33,654	63,866	0	97,520	0.0138	0.1153
420	33,654	63,518	0	97,172	0.0137	0.1290
430	0	29,280	0	29,280	0.0041	0.1331
440	0	34,426	0	34,426	0.0049	0.1380
450	30,080	0	0	30,080	0.0042	0.1422
460	30,080	32,399	0	62,479	0.0088	0.1511
470	0	33,961	0	33,961	0.0048	0.1558
480	63,866	0	0	63,866	0.0090	0.1649
530	63,866	63,866	0	127,732	0.0180	0.1829
540	30,981	31,140	0	62,121	0.0088	0.1916
550	0	33,686	0	33,686	0.0048	0.1964
560	0	65,220	0	65,220	0.0092	0.2056
580	32,474	0	0	32,474	0.0046	0.2102
590	346,827	67,401	0	414,228	0.0585	0.2686
600	419,136	0	0	419,136	0.0591	0.3278
610	34,016	0	0	34,016	0.0048	0.3326
620	33,961	0	0	33,961	0.0048	0.3374
630	30,844	67,368	0	98,212	0.0139	0.3512
640	0	30,707	0	30,707	0.0043	0.3556
650	62,797	66,596	0	129,393	0.0183	0.3738
660	129,169	34,426	0	163,595	0.0231	0.3969
670	60,420	0	0	60,420	0.0085	0.4054
680	102,382	34,426	0	136,808	0.0193	0.4247
690	218,306	35,580	0	253,886	0.0358	0.4606
700	256,643	30,951	0	287,594	0.0406	0.5011
710	618,339	123,972	0	742,311	0.1047	0.6059
720	314,423	185,458	0	499,881	0.0705	0.6764
730	195,169	218,718	0	413,887	0.0584	0.7348
740	277,048	94,577	0	371,625	0.0524	0.7873
750	119,885	299,202	0	419,087	0.0591	0.8464

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
760	123,837	176,222	0	300,059	0.0423	0.8887
770	100,773	227,169	0	327,942	0.0463	0.9350
780	91,979	183,604	0	275,583	0.0389	0.9739
790	0	62,037	0	62,037	0.0088	0.9827
800	30,150	30,150	0	60,300	0.0085	0.9912
830	0	62,580	0	62,580	0.0088	1.0000
Total	**4,259,965**	**2,826,816**	**0**	**7,086,781**	**1.0000**	**1.0000**

Appendix Table B-112.-- Population estimates by sex and size for flathead sole (*Hippoglossoides elassodon*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
70	0	0	679,082	679,082	0.0003	0.0003
80	0	0	686,649	686,649	0.0003	0.0006
90	724,937	0	4,045,138	4,770,075	0.0021	0.0027
100	1,066,925	663,935	5,884,215	7,615,075	0.0033	0.0059
110	1,808,678	761,922	8,049,554	10,620,154	0.0046	0.0105
120	2,090,205	939,273	5,075,263	8,104,741	0.0035	0.0141
130	3,271,309	3,033,391	6,401,579	12,706,279	0.0055	0.0196
140	4,777,453	6,750,885	3,315,220	14,843,558	0.0064	0.0260
150	7,627,767	6,532,200	4,075,845	18,235,812	0.0079	0.0339
160	14,419,958	10,087,446	3,353,755	27,861,159	0.0121	0.0459
170	15,041,560	12,481,545	1,166,124	28,689,229	0.0124	0.0583
180	22,582,611	20,014,373	205,242	42,802,226	0.0185	0.0769
190	31,125,991	27,006,452	213,976	58,346,419	0.0252	0.1021
200	29,922,468	21,343,731	51,460	51,317,659	0.0222	0.1243
210	29,891,791	26,565,449	181,500	56,638,740	0.0245	0.1488
220	33,919,795	27,051,166	130,040	61,101,001	0.0264	0.1752
230	41,912,044	31,732,974	257,302	73,902,320	0.0320	0.2072
240	32,011,286	30,105,987	102,921	62,220,194	0.0269	0.2341
250	42,463,540	25,396,934	0	67,860,474	0.0294	0.2635
260	41,541,847	31,213,561	26,788	72,782,196	0.0315	0.2950
270	54,820,256	33,613,149	338,328	88,771,733	0.0384	0.3334
280	65,442,429	36,778,495	0	102,220,924	0.0442	0.3776
290	70,760,102	39,812,950	375,084	110,948,136	0.0480	0.4257
300	81,317,603	40,736,357	181,500	122,235,460	0.0529	0.4785
310	86,367,289	49,283,932	232,961	135,884,182	0.0588	0.5373
320	90,936,865	55,097,027	375,084	146,408,976	0.0634	0.6007
330	77,002,192	49,651,571	323,624	126,977,387	0.0549	0.6556
340	79,582,233	64,873,352	478,005	144,933,590	0.0627	0.7183
350	85,068,086	55,617,256	698,708	141,384,050	0.0612	0.7795
360	52,103,806	62,324,554	1,022,332	115,450,692	0.0500	0.8295
370	30,026,693	65,889,183	323,624	96,239,500	0.0416	0.8711
380	23,642,462	52,339,928	1,125,253	77,107,643	0.0334	0.9045
390	14,169,375	45,086,715	1,355,088	60,611,178	0.0262	0.9307
400	10,232,124	44,427,438	130,040	54,789,602	0.0237	0.9544
410	4,800,601	29,105,371	0	33,905,972	0.0147	0.9691
420	3,882,430	17,812,146	193,584	21,888,160	0.0095	0.9786
430	569,305	9,935,553	0	10,504,858	0.0045	0.9831
440	1,824,674	5,872,020	193,584	7,890,278	0.0034	0.9865
450	609,501	8,398,193	0	9,007,694	0.0039	0.9904
460	30,912	6,639,942	51,460	6,722,314	0.0029	0.9933
470	62,610	5,080,443	0	5,143,053	0.0022	0.9956
480	0	4,003,992	0	4,003,992	0.0017	0.9973
490	0	2,466,314	0	2,466,314	0.0011	0.9984
500	30,190	1,390,422	51,460	1,472,072	0.0006	0.9990
510	0	865,992	0	865,992	0.0004	0.9994
520	0	649,172	0	649,172	0.0003	0.9996

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
530	0	437,578	0	437,578	0.0002	0.9998
540	0	388,141	0	388,141	0.0002	1.0000
Total	**1,189,481,903**	**1,070,258,410**	**51,351,372**	**2,311,091,685**	**1.0000**	**1.0000**

Appendix Table B-113.-- Population estimates by sex and size for Greenland turbot (*Reinhardtius hippoglossoides*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
140	26,704	0	90,827	117,531	0.0737	0.0737
150	32,818	0	0	32,818	0.0206	0.0943
160	0	29,861	0	29,861	0.0187	0.1130
170	31,500	63,993	0	95,493	0.0599	0.1729
200	58,204	0	0	58,204	0.0365	0.2094
220	33,169	0	0	33,169	0.0208	0.2302
230	53,409	0	0	53,409	0.0335	0.2637
240	29,786	0	0	29,786	0.0187	0.2824
260	29,578	26,788	0	56,366	0.0353	0.3177
270	31,359	0	0	31,359	0.0197	0.3374
480	32,174	0	0	32,174	0.0202	0.3576
500	29,578	0	0	29,578	0.0185	0.3761
640	30,039	0	0	30,039	0.0188	0.3949
650	0	30,897	0	30,897	0.0194	0.4143
660	29,713	0	0	29,713	0.0186	0.4330
670	30,450	0	0	30,450	0.0191	0.4521
690	30,450	0	0	30,450	0.0191	0.4711
710	30,039	0	0	30,039	0.0188	0.4900
720	31,359	28,620	0	59,979	0.0376	0.5276
730	0	26,788	0	26,788	0.0168	0.5444
740	0	59,104	0	59,104	0.0371	0.5815
750	0	26,788	0	26,788	0.0168	0.5983
760	0	93,079	0	93,079	0.0584	0.6566
770	0	29,578	0	29,578	0.0185	0.6752
780	0	26,788	0	26,788	0.0168	0.6920
790	0	85,363	0	85,363	0.0535	0.7455
800	0	64,158	0	64,158	0.0402	0.7857
810	0	30,039	0	30,039	0.0188	0.8046
820	0	59,633	0	59,633	0.0374	0.8420
830	0	32,818	0	32,818	0.0206	0.8626
850	0	64,429	0	64,429	0.0404	0.9030
860	0	92,790	0	92,790	0.0582	0.9612
900	0	61,944	0	61,944	0.0388	1.0000
Total	**570,329**	**933,458**	**90,827**	**1,594,614**	**1.0000**	**1.0000**

Appendix Table B-114.-- Population estimates by sex and size for Kamchatka flounder (*Atheresthes evermanni*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
80	80,659	0	0	80,659	0.0012	0.0012
100	0	0	27,789	27,789	0.0004	0.0016
110	0	0	157,569	157,569	0.0023	0.0038
130	0	29,103	755,840	784,943	0.0114	0.0152
140	63,777	0	869,190	932,967	0.0135	0.0287
150	137,500	120,876	172,180	430,556	0.0062	0.0349
160	125,242	138,801	63,974	328,017	0.0047	0.0397
170	2,393,717	488,486	95,961	2,978,164	0.0431	0.0828
180	3,986,458	851,560	31,987	4,870,005	0.0704	0.1532
190	1,276,219	430,630	31,987	1,738,836	0.0252	0.1784
200	163,459	848,295	128,261	1,140,015	0.0165	0.1948
210	1,063,833	186,937	0	1,250,770	0.0181	0.2129
220	310,973	434,063	0	745,036	0.0108	0.2237
230	1,085,967	755,728	28,421	1,870,116	0.0271	0.2508
240	960,810	1,216,859	56,842	2,234,511	0.0323	0.2831
250	2,215,723	1,658,915	426,313	4,300,951	0.0622	0.3453
260	3,434,992	2,229,162	397,893	6,062,047	0.0877	0.4330
270	2,948,518	1,845,124	198,946	4,992,588	0.0722	0.5052
280	1,163,632	2,159,693	313,290	3,636,615	0.0526	0.5578
290	534,437	1,418,149	28,421	1,981,007	0.0287	0.5865
300	335,485	657,438	28,421	1,021,344	0.0148	0.6013
310	535,303	398,550	0	933,853	0.0135	0.6148
320	491,082	476,553	0	967,635	0.0140	0.6288
330	458,385	1,024,982	0	1,483,367	0.0215	0.6502
340	682,040	59,282	28,421	769,743	0.0111	0.6614
350	251,057	421,174	0	672,231	0.0097	0.6711
360	711,764	653,936	0	1,365,700	0.0198	0.6908
370	1,085,929	602,288	0	1,688,217	0.0244	0.7153
380	1,671,459	647,469	28,421	2,347,349	0.0340	0.7492
390	904,725	562,923	56,842	1,524,490	0.0221	0.7713
400	1,095,568	956,669	0	2,052,237	0.0297	0.8010
410	837,701	401,506	0	1,239,207	0.0179	0.8189
420	567,361	744,722	0	1,312,083	0.0190	0.8379
430	653,110	444,924	0	1,098,034	0.0159	0.8537
440	472,017	215,435	0	687,452	0.0099	0.8637
450	760,260	371,100	0	1,131,360	0.0164	0.8801
460	458,606	464,280	0	922,886	0.0134	0.8934
470	335,613	629,850	0	965,463	0.0140	0.9074
480	229,237	471,781	0	701,018	0.0101	0.9175
490	89,674	281,509	0	371,183	0.0054	0.9229
500	334,500	368,374	0	702,874	0.0102	0.9330
510	117,092	532,992	28,421	678,505	0.0098	0.9429
520	335,760	441,296	0	777,056	0.0112	0.9541
530	104,313	251,205	0	355,518	0.0051	0.9592
540	170,461	183,124	0	353,585	0.0051	0.9644
550	123,747	581,085	0	704,832	0.0102	0.9746

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
560	0	78,411	0	78,411	0.0011	0.9757
570	0	141,576	0	141,576	0.0020	0.9777
580	35,001	59,215	0	94,216	0.0014	0.9791
590	0	410,785	0	410,785	0.0059	0.9850
600	0	115,845	0	115,845	0.0017	0.9867
610	0	44,901	0	44,901	0.0006	0.9874
620	148,434	70,916	0	219,350	0.0032	0.9905
630	0	98,766	0	98,766	0.0014	0.9920
640	150,193	99,031	0	249,224	0.0036	0.9956
670	38,517	34,662	0	73,179	0.0011	0.9966
680	0	69,088	0	69,088	0.0010	0.9976
690	0	31,092	0	31,092	0.0004	0.9981
710	0	32,399	0	32,399	0.0005	0.9986
720	0	34,662	0	34,662	0.0005	0.9991
770	0	34,426	0	34,426	0.0005	0.9996
800	0	30,981	0	30,981	0.0004	1.0000
Total	**36,130,310**	**29,043,584**	**3,955,390**	**69,129,284**	**1.0000**	**1.0000**

Appendix Table B-115.-- Population estimates by sex and size for northern rock sole (*Lepidopsetta polyxystra*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Females	Unsexed	Males	Total	Proportion	Cumulative proportion
50	0	139,781	0	139,781	0.0000	0.0000
70	72,038	451,006	0	523,044	0.0001	0.0001
80	532,595	5,355,226	390,658	6,278,479	0.0008	0.0009
90	2,199,240	23,792,772	844,478	26,836,490	0.0036	0.0046
100	4,557,129	103,367,962	6,746,691	114,671,782	0.0155	0.0200
110	19,851,724	210,041,506	22,153,849	252,047,079	0.0340	0.0540
120	30,436,325	253,241,048	52,923,057	336,600,430	0.0454	0.0994
130	31,004,255	171,345,076	41,874,580	244,223,911	0.0329	0.1323
140	39,012,854	100,095,929	59,170,415	198,279,198	0.0267	0.1590
150	96,142,353	59,921,995	91,049,194	247,113,542	0.0333	0.1923
160	138,324,766	30,179,024	152,276,295	320,780,085	0.0432	0.2356
170	154,744,108	13,225,132	162,093,798	330,063,038	0.0445	0.2801
180	166,870,182	9,180,505	204,487,511	380,538,198	0.0513	0.3314
190	132,410,789	7,394,404	170,522,881	310,328,074	0.0418	0.3732
200	140,500,044	8,942,741	132,608,541	282,051,326	0.0380	0.4112
210	109,568,338	14,802,026	137,473,215	261,843,579	0.0353	0.4465
220	133,663,002	11,079,546	138,534,140	283,276,688	0.0382	0.4847
230	103,379,951	8,918,621	143,549,250	255,847,822	0.0345	0.5192
240	111,941,759	7,910,516	126,748,893	246,601,168	0.0332	0.5524
250	107,672,629	7,441,834	110,217,149	225,331,612	0.0304	0.5828
260	104,336,917	11,499,182	115,434,484	231,270,583	0.0312	0.6140
270	114,684,253	5,185,241	150,494,274	270,363,768	0.0364	0.6505
280	148,166,514	10,370,483	199,756,692	358,293,689	0.0483	0.6988
290	161,409,797	9,950,846	232,277,414	403,638,057	0.0544	0.7532
300	158,653,721	10,466,958	234,286,312	403,406,991	0.0544	0.8075
310	147,034,228	8,330,152	207,390,005	362,754,385	0.0489	0.8564
320	140,698,599	6,241,585	109,940,529	256,880,713	0.0346	0.8911
330	140,072,181	5,725,473	58,928,469	204,726,123	0.0276	0.9187
340	110,765,316	3,120,792	13,737,267	127,623,375	0.0172	0.9359
350	94,724,626	3,612,786	8,187,172	106,524,584	0.0144	0.9502
360	83,333,067	0	2,097,707	85,430,774	0.0115	0.9618
370	67,120,894	1,032,224	1,027,525	69,180,643	0.0093	0.9711
380	59,064,630	1,056,343	1,548,438	61,669,411	0.0083	0.9794
390	54,370,018	0	1,014,265	55,384,283	0.0075	0.9869
400	44,244,371	0	0	44,244,371	0.0060	0.9928
410	28,546,906	0	0	28,546,906	0.0038	0.9967
420	12,832,112	0	0	12,832,112	0.0017	0.9984
430	6,413,731	0	0	6,413,731	0.0009	0.9993
440	4,346,830	0	0	4,346,830	0.0006	0.9999
450	445,293	0	0	445,293	0.0001	0.9999
460	477,525	0	0	477,525	0.0001	1.0000
480	120,894	0	0	120,894	0.0000	1.0000
Total	**3,204,746,504**	**1,123,418,715**	**3,089,785,148**	**7,417,950,367**	**1.0000**	**1.0000**

Appendix Table B-116.-- Population estimates by sex and size for Pacific cod (*Gadus macrocephalus*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
100	0	31,075	92,571	123,646	0.0003	0.0003
110	29,743	0	569,084	598,827	0.0014	0.0017
120	142,670	30,673	1,662,375	1,835,718	0.0042	0.0059
130	504,039	216,994	1,732,335	2,453,368	0.0056	0.0115
140	507,829	750,213	2,502,414	3,760,456	0.0086	0.0201
150	984,137	999,426	1,977,214	3,960,777	0.0091	0.0292
160	1,740,158	2,076,196	1,422,720	5,239,074	0.0120	0.0412
170	2,210,921	2,576,494	1,151,723	5,939,138	0.0136	0.0548
180	4,045,915	2,620,689	840,519	7,507,123	0.0172	0.0720
190	4,499,185	4,120,989	257,551	8,877,725	0.0203	0.0923
200	6,316,140	3,653,509	62,292	10,031,941	0.0230	0.1153
210	5,439,476	4,962,117	0	10,401,593	0.0238	0.1391
220	3,456,393	2,784,107	197,072	6,437,572	0.0147	0.1539
230	3,879,247	2,927,259	31,762	6,838,268	0.0157	0.1695
240	1,625,153	1,808,193	0	3,433,346	0.0079	0.1774
250	1,206,147	944,875	0	2,151,022	0.0049	0.1823
260	1,149,844	750,631	0	1,900,475	0.0044	0.1867
270	1,391,057	1,380,771	0	2,771,828	0.0063	0.1930
280	1,980,876	2,417,830	0	4,398,706	0.0101	0.2031
290	2,798,970	2,213,807	0	5,012,777	0.0115	0.2146
300	3,506,301	2,907,229	0	6,413,530	0.0147	0.2293
310	3,411,608	4,064,350	0	7,475,958	0.0171	0.2464
320	4,103,293	3,962,970	0	8,066,263	0.0185	0.2649
330	3,853,617	4,567,510	0	8,421,127	0.0193	0.2842
340	6,286,028	5,370,032	0	11,656,060	0.0267	0.3109
350	6,358,043	6,053,406	0	12,411,449	0.0284	0.3393
360	4,502,977	5,758,850	0	10,261,827	0.0235	0.3628
370	6,527,742	5,841,890	0	12,369,632	0.0283	0.3912
380	5,611,960	5,112,053	0	10,724,013	0.0246	0.4157
390	5,427,756	4,660,158	0	10,087,914	0.0231	0.4388
400	4,494,497	4,259,641	0	8,754,138	0.0201	0.4589
410	4,804,083	3,878,099	0	8,682,182	0.0199	0.4788
420	4,294,864	4,164,842	0	8,459,706	0.0194	0.4981
430	3,908,585	3,421,666	0	7,330,251	0.0168	0.5149
440	4,100,875	2,649,536	0	6,750,411	0.0155	0.5304
450	5,000,312	3,863,565	0	8,863,877	0.0203	0.5507
460	5,607,779	4,270,211	0	9,877,990	0.0226	0.5733
470	4,864,286	5,082,580	0	9,946,866	0.0228	0.5961
480	5,391,736	5,397,049	0	10,788,785	0.0247	0.6208
490	5,521,319	5,896,302	0	11,417,621	0.0262	0.6470
500	6,317,162	5,331,883	0	11,649,045	0.0267	0.6737
510	5,250,836	5,216,797	0	10,467,633	0.0240	0.6977
520	4,432,180	4,415,969	0	8,848,149	0.0203	0.7179
530	3,493,459	4,217,643	0	7,711,102	0.0177	0.7356
540	3,560,341	2,694,912	0	6,255,253	0.0143	0.7499
550	3,774,778	3,013,833	0	6,788,611	0.0156	0.7655

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
560	2,841,692	2,416,353	0	5,258,045	0.0120	0.7775
570	2,941,637	2,423,085	0	5,364,722	0.0123	0.7898
580	3,069,487	2,584,777	0	5,654,264	0.0130	0.8028
590	2,669,706	1,935,279	0	4,604,985	0.0105	0.8133
600	3,118,316	2,247,990	0	5,366,306	0.0123	0.8256
610	2,431,011	2,570,787	0	5,001,798	0.0115	0.8371
620	3,028,458	2,217,545	0	5,246,003	0.0120	0.8491
630	2,890,421	2,562,348	0	5,452,769	0.0125	0.8616
640	2,701,669	2,307,439	0	5,009,108	0.0115	0.8730
650	2,849,257	2,665,962	0	5,515,219	0.0126	0.8857
660	2,075,868	2,434,438	0	4,510,306	0.0103	0.8960
670	1,512,023	2,365,753	0	3,877,776	0.0089	0.9049
680	1,905,991	2,011,125	0	3,917,116	0.0090	0.9139
690	1,270,038	1,781,022	0	3,051,060	0.0070	0.9209
700	1,047,340	2,188,306	0	3,235,646	0.0074	0.9283
710	1,655,943	1,883,437	0	3,539,380	0.0081	0.9364
720	885,626	1,742,348	0	2,627,974	0.0060	0.9424
730	998,891	1,415,274	0	2,414,165	0.0055	0.9479
740	1,219,041	1,168,517	0	2,387,558	0.0055	0.9534
750	1,008,593	1,144,706	0	2,153,299	0.0049	0.9583
760	889,787	970,450	0	1,860,237	0.0043	0.9626
770	909,135	848,896	0	1,758,031	0.0040	0.9666
780	471,944	682,530	0	1,154,474	0.0026	0.9693
790	466,837	731,194	0	1,198,031	0.0027	0.9720
800	641,292	713,097	0	1,354,389	0.0031	0.9751
810	432,307	493,809	0	926,116	0.0021	0.9772
820	476,032	646,736	0	1,122,768	0.0026	0.9798
830	492,443	329,165	0	821,608	0.0019	0.9817
840	216,055	482,058	0	698,113	0.0016	0.9833
850	161,643	401,942	0	563,585	0.0013	0.9846
860	220,449	278,852	0	499,301	0.0011	0.9857
870	218,028	195,526	0	413,554	0.0009	0.9867
880	368,882	510,066	0	878,948	0.0020	0.9887
890	288,212	160,253	0	448,465	0.0010	0.9897
900	211,056	168,086	0	379,142	0.0009	0.9906
910	372,947	392,915	0	765,862	0.0018	0.9923
920	172,241	424,403	0	596,644	0.0014	0.9937
930	90,195	180,717	0	270,912	0.0006	0.9943
940	178,973	317,732	0	496,705	0.0011	0.9955
950	88,337	154,791	0	243,128	0.0006	0.9960
960	0	87,561	0	87,561	0.0002	0.9962
970	0	118,904	0	118,904	0.0003	0.9965
980	0	97,637	0	97,637	0.0002	0.9967
990	32,357	297,076	0	329,433	0.0008	0.9975
1000	0	226,117	0	226,117	0.0005	0.9980
1010	65,756	209,269	0	275,025	0.0006	0.9986
1020	88,231	91,842	0	180,073	0.0004	0.9990
1030	0	150,728	0	150,728	0.0003	0.9994
1050	29,351	89,922	0	119,273	0.0003	0.9996

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
1060	29,858	0	0	29,858	0.0001	0.9997
1070	0	93,496	0	93,496	0.0002	0.9999
1100	0	31,605	0	31,605	0.0001	1.0000
Total	**218,047,673**	**205,982,690**	**12,499,632**	**436,529,995**	**1.0000**	**1.0000**

Appendix Table B-117.-- Population estimates by sex and size for Pacific halibut (*Hippoglossus stenolepis*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
80	0	0	75,266	75,266	0.0012	0.0012
160	0	0	31,299	31,299	0.0005	0.0016
170	0	0	225,726	225,726	0.0035	0.0051
180	0	0	288,189	288,189	0.0044	0.0095
190	62,598	31,299	353,768	447,665	0.0069	0.0164
200	0	0	624,133	624,133	0.0096	0.0260
210	0	0	945,674	945,674	0.0145	0.0405
220	0	0	917,558	917,558	0.0141	0.0546
230	0	31,299	882,198	913,497	0.0140	0.0686
240	0	0	884,657	884,657	0.0136	0.0822
250	0	0	700,558	700,558	0.0108	0.0929
260	31,299	0	912,742	944,041	0.0145	0.1074
270	0	0	371,353	371,353	0.0057	0.1131
280	0	0	248,798	248,798	0.0038	0.1170
290	0	0	91,203	91,203	0.0014	0.1184
300	0	0	30,295	30,295	0.0005	0.1188
310	0	0	94,484	94,484	0.0015	0.1203
320	0	0	411,215	411,215	0.0063	0.1266
330	0	0	579,815	579,815	0.0089	0.1355
340	0	0	584,815	584,815	0.0090	0.1445
350	28,296	0	975,725	1,004,021	0.0154	0.1599
360	94,513	0	1,436,591	1,531,104	0.0235	0.1834
370	0	0	1,867,791	1,867,791	0.0287	0.2121
380	0	31,299	2,394,684	2,425,983	0.0372	0.2493
390	0	31,007	2,677,026	2,708,033	0.0416	0.2909
400	0	130,077	2,402,202	2,532,279	0.0389	0.3298
410	29,508	0	1,745,766	1,775,274	0.0273	0.3570
420	0	33,739	1,375,293	1,409,032	0.0216	0.3787
430	0	33,739	679,945	713,684	0.0110	0.3896
440	35,027	0	552,590	587,617	0.0090	0.3986
450	0	0	492,163	492,163	0.0076	0.4062
460	0	0	247,690	247,690	0.0038	0.4100
470	88,890	32,942	467,700	589,532	0.0091	0.4190
480	63,674	0	824,455	888,129	0.0136	0.4327
490	158,584	0	735,827	894,411	0.0137	0.4464
500	0	0	737,995	737,995	0.0113	0.4577
510	40,291	65,066	1,249,299	1,354,656	0.0208	0.4785
520	0	0	1,174,893	1,174,893	0.0180	0.4966
530	91,952	28,647	1,181,169	1,301,768	0.0200	0.5166
540	161,332	196,558	1,406,458	1,764,348	0.0271	0.5436
550	33,739	102,995	2,168,015	2,304,749	0.0354	0.5790
560	122,303	33,012	2,676,601	2,831,916	0.0435	0.6225
570	64,539	100,454	2,326,118	2,491,111	0.0382	0.6607
580	98,896	97,574	2,767,805	2,964,275	0.0455	0.7063
590	65,987	198,503	1,530,963	1,795,453	0.0276	0.7338
600	126,562	129,865	2,084,685	2,341,112	0.0359	0.7698

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
610	65,116	33,012	2,050,292	2,148,420	0.0330	0.8027
620	28,647	28,647	1,391,750	1,449,044	0.0222	0.8250
630	0	97,538	1,219,953	1,317,491	0.0202	0.8452
640	32,320	0	1,040,347	1,072,667	0.0165	0.8617
650	0	0	898,115	898,115	0.0138	0.8755
660	0	0	613,053	613,053	0.0094	0.8849
670	33,617	0	765,918	799,535	0.0123	0.8972
680	67,479	0	629,646	697,125	0.0107	0.9079
690	28,296	81,902	745,683	855,881	0.0131	0.9210
700	0	0	367,697	367,697	0.0056	0.9267
710	0	0	315,480	315,480	0.0048	0.9315
720	0	28,647	337,097	365,744	0.0056	0.9371
730	61,562	0	150,502	212,064	0.0033	0.9404
740	0	0	127,091	127,091	0.0020	0.9423
750	28,647	29,557	251,132	309,336	0.0047	0.9471
760	80,605	0	310,964	391,569	0.0060	0.9531
770	0	0	158,864	158,864	0.0024	0.9555
780	33,012	33,012	212,347	278,371	0.0043	0.9598
790	30,981	0	61,935	92,916	0.0014	0.9612
800	0	0	189,537	189,537	0.0029	0.9641
810	0	0	149,709	149,709	0.0023	0.9664
820	0	28,647	200,051	228,698	0.0035	0.9699
830	31,007	0	58,563	89,570	0.0014	0.9713
840	0	30,981	121,014	151,995	0.0023	0.9736
850	0	0	91,315	91,315	0.0014	0.9750
860	0	0	246,413	246,413	0.0038	0.9788
870	0	0	91,580	91,580	0.0014	0.9802
880	0	0	124,276	124,276	0.0019	0.9821
890	0	0	131,240	131,240	0.0020	0.9842
900	0	0	153,922	153,922	0.0024	0.9865
910	0	0	60,280	60,280	0.0009	0.9874
920	0	0	59,998	59,998	0.0009	0.9884
930	29,321	0	0	29,321	0.0005	0.9888
940	0	0	32,616	32,616	0.0005	0.9893
950	0	0	107,123	107,123	0.0016	0.9910
960	0	0	58,846	58,846	0.0009	0.9919
970	0	0	88,997	88,997	0.0014	0.9932
990	0	0	62,932	62,932	0.0010	0.9942
1010	0	0	30,623	30,623	0.0005	0.9947
1020	0	0	30,704	30,704	0.0005	0.9951
1030	0	0	32,760	32,760	0.0005	0.9956
1040	0	0	30,275	30,275	0.0005	0.9961
1060	0	0	30,819	30,819	0.0005	0.9966
1080	0	0	32,399	32,399	0.0005	0.9971
1120	0	0	33,014	33,014	0.0005	0.9976
1130	0	0	29,035	29,035	0.0004	0.9980
1170	0	0	31,027	31,027	0.0005	0.9985
1190	0	33,739	0	33,739	0.0005	0.9990
1240	0	0	32,272	32,272	0.0005	0.9995

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
1350	0	0	31,185	31,185	0.0005	1.0000
Total	**1,948,600**	**1,733,757**	**61,453,586**	**65,135,943**	**1.0000**	**1.0000**

Appendix Table B-118.-- Population estimates by sex and size for walleye pollock (*Gadus chalcogrammus*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
70	0	0	695,979	695,979	0.0001	0.0001
80	0	0	4,440,298	4,440,298	0.0004	0.0005
90	0	0	32,225,566	32,225,566	0.0031	0.0036
100	0	0	42,262,192	42,262,192	0.0041	0.0077
110	531,280	0	68,244,640	68,775,920	0.0067	0.0144
120	812,695	406,079	117,974,143	119,192,917	0.0116	0.0260
130	3,854,465	1,216,078	185,344,926	190,415,469	0.0185	0.0444
140	2,537,229	2,467,536	199,329,172	204,333,937	0.0198	0.0643
150	7,465,932	4,595,699	145,474,640	157,536,271	0.0153	0.0795
160	11,762,419	5,360,668	93,898,902	111,021,989	0.0108	0.0903
170	6,695,300	6,217,509	54,113,073	67,025,882	0.0065	0.0968
180	6,429,314	4,769,648	23,029,521	34,228,483	0.0033	0.1001
190	8,443,401	8,220,137	4,610,981	21,274,519	0.0021	0.1022
200	14,004,193	13,229,542	2,461,734	29,695,469	0.0029	0.1051
210	30,833,803	29,185,680	1,351,311	61,370,794	0.0060	0.1110
220	39,160,780	49,157,746	1,646,758	89,965,284	0.0087	0.1198
230	56,501,950	53,445,026	1,196,433	111,143,409	0.0108	0.1305
240	57,623,351	87,202,602	1,331,355	146,157,308	0.0142	0.1447
250	39,121,806	54,030,820	975,683	94,128,309	0.0091	0.1539
260	58,597,809	40,440,636	380,575	99,419,020	0.0096	0.1635
270	21,272,509	29,532,588	0	50,805,097	0.0049	0.1684
280	25,933,581	20,029,044	392,342	46,354,967	0.0045	0.1729
290	20,971,576	21,962,444	62,376	42,996,396	0.0042	0.1771
300	30,564,926	30,699,758	300,287	61,564,971	0.0060	0.1831
310	25,768,619	32,433,882	600,575	58,803,076	0.0057	0.1888
320	21,100,110	20,825,067	0	41,925,177	0.0041	0.1928
330	21,181,188	16,514,888	0	37,696,076	0.0037	0.1965
340	18,974,872	13,043,718	0	32,018,590	0.0031	0.1996
350	14,346,701	14,396,069	0	28,742,770	0.0028	0.2024
360	34,062,486	27,129,922	0	61,192,408	0.0059	0.2083
370	65,992,801	38,825,347	0	104,818,148	0.0102	0.2185
380	84,287,168	26,608,655	0	110,895,823	0.0108	0.2293
390	195,695,541	56,812,729	0	252,508,270	0.0245	0.2537
400	352,388,146	135,386,798	62,376	487,837,320	0.0473	0.3011
410	455,457,736	229,783,444	62,376	685,303,556	0.0665	0.3676
420	570,345,453	304,843,147	0	875,188,600	0.0849	0.4525
430	533,926,446	407,140,334	0	941,066,780	0.0913	0.5438
440	468,261,072	464,017,232	0	932,278,304	0.0904	0.6342
450	362,606,068	448,077,511	0	810,683,579	0.0786	0.7128
460	248,536,488	364,934,175	30,875	613,501,538	0.0595	0.7724
470	177,981,233	271,455,779	62,376	449,499,388	0.0436	0.8160
480	128,446,006	195,629,222	30,875	324,106,103	0.0314	0.8474
490	123,568,687	151,669,233	0	275,237,920	0.0267	0.8741
500	104,977,414	142,277,769	0	247,255,183	0.0240	0.8981
510	84,069,590	113,406,979	0	197,476,569	0.0192	0.9173
520	66,789,332	85,351,180	0	152,140,512	0.0148	0.9320

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
530	60,251,644	100,438,777	0	160,690,421	0.0156	0.9476
540	49,445,739	74,592,732	0	124,038,471	0.0120	0.9596
550	31,816,759	67,832,517	30,875	99,680,151	0.0097	0.9693
560	29,775,608	56,603,397	0	86,379,005	0.0084	0.9777
570	17,483,876	40,975,174	0	58,459,050	0.0057	0.9834
580	12,574,931	34,512,237	0	47,087,168	0.0046	0.9879
590	7,428,675	25,128,929	0	32,557,604	0.0032	0.9911
600	5,376,433	22,477,794	0	27,854,227	0.0027	0.9938
610	4,629,853	13,868,772	30,875	18,529,500	0.0018	0.9956
620	3,160,663	9,596,409	0	12,757,072	0.0012	0.9968
630	1,280,298	9,596,990	30,875	10,908,163	0.0011	0.9979
640	979,899	6,457,390	0	7,437,289	0.0007	0.9986
650	824,011	4,913,502	0	5,737,513	0.0006	0.9992
660	763,214	3,448,706	0	4,211,920	0.0004	0.9996
670	225,898	1,525,329	0	1,751,227	0.0002	0.9997
680	271,225	668,528	0	939,753	0.0001	0.9998
690	58,224	554,948	0	613,172	0.0001	0.9999
700	62,142	352,268	0	414,410	0.0000	0.9999
710	90,202	213,667	0	303,869	0.0000	1.0000
720	0	79,217	0	79,217	0.0000	1.0000
730	0	99,751	0	99,751	0.0000	1.0000
750	0	29,986	0	29,986	0.0000	1.0000
760	42,761	92,957	0	135,718	0.0000	1.0000
770	0	31,447	0	31,447	0.0000	1.0000
Total	**4,828,423,531**	**4,496,823,744**	**982,684,965**	**10,307,932,240**	**1.0000**	**1.0000**

Appendix Table B-119.-- Population estimates by sex and size for yellowfin sole (*Limanda aspera*) from the 2024 eastern Bering Sea shelf survey.

Length (cm)	Males	Females	Unsexed	Total	Proportion	Cumulative proportion
70	672,959	0	1,526,856	2,199,815	0.0004	0.0004
80	292,962	0	0	292,962	0.0001	0.0004
90	1,345,919	0	0	1,345,919	0.0002	0.0007
100	4,659,977	4,797,030	4,776,744	14,233,751	0.0025	0.0032
110	9,792,611	9,204,546	9,504,575	28,501,732	0.0051	0.0083
120	26,655,665	37,712,560	22,115,988	86,484,213	0.0153	0.0236
130	50,895,583	54,473,996	51,936,773	157,306,352	0.0279	0.0515
140	47,121,099	70,881,076	39,166,534	157,168,709	0.0279	0.0793
150	68,674,770	69,912,119	21,954,400	160,541,289	0.0284	0.1078
160	62,773,167	78,165,372	637,323	141,575,862	0.0251	0.1328
170	67,726,195	77,331,348	759,699	145,817,242	0.0258	0.1587
180	65,043,314	74,051,066	192,962	139,287,342	0.0247	0.1834
190	62,791,094	71,454,437	759,699	135,005,230	0.0239	0.2073
200	72,968,905	83,747,100	0	156,716,005	0.0278	0.2351
210	95,676,022	80,702,917	771,848	177,150,787	0.0314	0.2665
220	84,056,948	83,619,787	578,886	168,255,621	0.0298	0.2963
230	97,335,005	108,121,766	1,681,979	207,138,750	0.0367	0.3330
240	103,397,903	105,746,788	1,103,093	210,247,784	0.0373	0.3702
250	110,720,061	122,115,382	331,245	233,166,688	0.0413	0.4116
260	152,810,432	134,615,448	662,490	288,088,370	0.0511	0.4626
270	154,960,398	148,333,202	1,546,867	304,840,467	0.0540	0.5166
280	186,796,039	205,039,404	1,022,660	392,858,103	0.0696	0.5862
290	167,712,417	189,238,308	1,546,867	358,497,592	0.0635	0.6498
300	139,249,480	190,664,605	1,408,584	331,322,669	0.0587	0.7085
310	116,933,392	169,957,220	2,071,074	288,961,686	0.0512	0.7597
320	122,741,046	156,562,182	1,160,943	280,464,171	0.0497	0.8094
330	121,067,031	138,454,124	993,735	260,514,890	0.0462	0.8556
340	106,392,233	150,104,892	2,099,999	258,597,124	0.0458	0.9014
350	60,238,630	128,930,461	1,794,508	190,963,599	0.0338	0.9352
360	23,318,225	103,125,116	414,849	126,858,190	0.0225	0.9577
370	6,784,614	92,022,739	939,056	99,746,409	0.0177	0.9754
380	3,947,089	53,552,160	385,924	57,885,173	0.0103	0.9856
390	870,103	36,400,819	192,962	37,463,884	0.0066	0.9923
400	932,377	19,310,585	192,962	20,435,924	0.0036	0.9959
410	445,934	10,849,894	0	11,295,828	0.0020	0.9979
420	0	7,292,964	0	7,292,964	0.0013	0.9992
430	272,433	1,949,240	0	2,221,673	0.0004	0.9996
440	0	1,510,486	0	1,510,486	0.0003	0.9998
450	0	219,091	0	219,091	0.0000	0.9999
460	0	362,403	0	362,403	0.0001	1.0000
470	268,078	0	0	268,078	0.0000	1.0000
Total	**2,398,340,110**	**3,070,532,633**	**174,232,084**	**5,643,104,827**	**1.0000**	**1.0000**

Appendix C: Data Changes

The AFSC Groundfish Assessment Program (GAP) team are stewards of the haul-by-haul catch and effort data, as well as the following survey products: CPUE, biomass, abundance, age composition, and size composition data. Improvements are made to these data and products as necessary and include fixing previously missed errors from past years and incorporating new metadata. 2024 marks the second year of the team disseminating the new production data to AKFIN and other partners (see Markowitz et al. (2024)).

The 2024 survey data products are generated by the *gapindex* R package (v3.0.2; https://github.com/afsc-gap-products/gapindex) and distributed from tables stored in the AFSC GAP_PRODUCTS Oracle schema. These data are accompanied by extensive documentation, metadata, and user examples (https://afsc-gap-products.github.io/gap_products/).

The generation of survey products continues to be user-centric. GAP produced both the new and historical tables for the 2024 post-survey stock assessment season, one more year than originally planned, to help users transition their workflows and code. For the 2025 post-survey stock assessment season, GAP will depreciate the historical tables.

Updates to individual historical records in data tables

Since the 2023 eastern Bering Sea data report was published (April 2024; Markowitz et al. (2024)), there have been several updates to the GAP_PRODUCTS tables (see documentation[20]). Data used in this report were updated as of December 10, 2024.

Erroneous use of the juvenile pollock code (species code 21741; the paired code for regular pollock code 21740 that assists with length-class-based population and biomass extrapolations) when a regular code should have been used for catch processing was corrected for several hauls. This led to unexpected null-filled frequency records in length composition tables resulting from incomplete records of juvenile walleye pollock in internal length tables. Incorrect use of pollock juvenile codes were identified by determining where, in the station catch data, the presence of both regular and juvenile walleye pollock (species codes 21740 and 21741, respectively) occurred in a single haul's catch without a non-subsampled weight for either or both codes. This implies that the pollock in these hauls were 100% processed and the juvenile pollock code should not have been used. In instances where the juvenile code was also carried into the lengths for that catch, 1) juvenile lengths were reassigned to the regular walleye pollock code, 2) juvenile length counts were added to adult subsample counts, 3) the juvenile subsample weights were added to adult subsample weights, and 4) the juvenile catch record was deleted once the erroneous juvenile counts and weights were merged with the adult catch record. Note that in cases where the adult pollock non-subsampled weight was also null, given the data constraints, juvenile lengths do not get expanded thus alleviating concern about affecting size and age compositions in those cases. These errors occurred in one 2021 northern Bering Sea shelf survey haul aboard the FV *Vesteraalen*, one 2023 northern Bering Sea shelf survey haul aboard the FV *Northwest Explorer*, and one 2023 eastern Bering Sea haul aboard the FV *Northwest Explorer*.

Unintended duplicate length records were present in the length tables for eastern Bering Sea abundance hauls. These duplicate records were a result of internal data tables and improper concatenation of juvenile

[20] https://afsc-gap-products.github.io/gap_products/content/intro-news.html

and adult records, causing multiple rows of the same species. The records were identified and corrected for all 24 instances.

Changes to the CPUE and biomass tables occurred because 1) *Scleratinia* are now grouped in the same species code as Order Scleractinia (excluding cup corals), 2) *Pteraster* species are now grouped to genus *Pteraster* (species code 81310), 3) basketstars (species code 83020) are now removed from brittle star aggregation (species code 83000), 4) *Muusoctopus leioderma* (species code 78012) and *Muusoctopus oregonensis* (species code 78455) aggregated into the *Muusocotpus* sp. (78014) genus (also affecting relevant size composition estimates), 5) Nemertean worms have become disaggregated from Phylum Nemertea (species code 92500), and 6) error threshold for comparing changes is now to the hundredth of a percent (also affecting relevant size composition estimates).

Additional changes to size composition estimates occurred in the 2010 eastern Bering Sea survey, where two Bering skate (species code 435) lengths were converted to unidentified skate (species code 400).

Aged otolith data and changes to size composition estimates have been added for eastern Bering Sea Kamchatka flounder (2015, 2022, 2023, 2024), Greenland turbot (2022, 2023, 2024), Alaska plaice (2021), flathead sole (2022, 2023), yellowfin sole (2023), northern rock sole (2023), Pacific cod (2023), and walleye pollock (2024). In the northern Bering Sea, new aged otolith data was added for Pacific cod (2023) and yellowfin sole (2023).

Species time-series cutoffs

All species time-series cutoff changes made for the 2023 survey season data release (as described in Markowitz et al. (2024)) have now been appropriately implemented. As species identification guides improve and species taxonomy is better defined[21], the survey team has established guidelines for when the time series of some species should begin. Species complexes for Kamchatka flounder and arrowtooth flounder (previously combined as species code 10111), and *Bathyraja* sp. (previously combined as species code 405), have been properly grouped in the production workflow to account for historical identification issues. More information on historical identification confidence for these and other species can be found in Stevenson and Hoff (2009) and Stevenson et al. (2016) and is further discussed in Laman et al. (2022).

Species identification aggregations

As species identification guides improve and species taxonomy is better defined, the survey team has established guidelines for when species should be aggregated into higher taxonomic groups within the production data. GAP taxonomists have developed minimum ID guidelines for on-deck/in-field identification and production data for difficult-to-identify species (most invertebrate and some fish genera). These aggregations can be found in the newly created GAP_PRODUCTS.TAXON_GROUPS table, where records with the same GROUP_CODE are now aggregated. The GROUP_CODE in this table is then transferred to the SPECIES_CODE field in GAP_PRODUCTS.CPUE/BIOMASS/SIZECOMP/AGECOMP tables. The GAP_PRODUCTS.TAXON_GROUPS table would be used if a user wanted to know what SPECIES_CODE values were contained in a particular taxon aggregation GROUP_CODE, or whether a SPECIES_CODE codes for a taxonomic aggregation. Note that the historic field “SPECIES_CODE” is

[21] https://www.fisheries.noaa.gov/resource/document/groundfish-survey-species-code-manual-and-data-codes-manual

inclusive of codes that indicate levels of taxonomic hierarchy lower than the binomial species level (e.g., genera, family, order).

This guideline is different from the establishment of species time-series cutoffs (as noted above and in Markowitz et al. (2024)) where commercially important species that were previously inconsistently distinguished from congeners were later taxonomically separated into two species; those differences are now accessible and preserved in the data tables. Taxonomic groupings and other identification-level aggregations are available upon request.

Species taxonomy

In an effort to clear a backlog in updates and improvements to the GAP species registry, scientific species names were updated from 2023 to 2024. Updates were made by comparing the 2024 GAP catalog of species taxonomy with the World Register of Marine Species (WoRMS; https://www.marinespecies.org/) and Integrated Taxonomic Information System (ITIS; https://www.itis.gov/) databases. A summary of these changes is available upon request.

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