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The 2023 Longline Survey of the Gulf of Alaska and Eastern Bering Sea on the FV *Alaskan Leader*: Cruise Report AL-23-01

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U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
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NOAA FISHERIES

The 2023 Longline Survey of the Gulf of Alaska and Eastern Bering Sea on the FV *Alaskan Leader*: Cruise Report AL-23-01

K. Siwicke and P. Malecha

Auke Bay Laboratories
Alaska Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
17109 Point Lena Loop Road
Juneau, AK 99801

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ABSTRACT

In 2023, the Alaska Fisheries Science Center completed the 46th annual longline survey in the eastern Bering Sea and Gulf of Alaska. The survey sampled demersal waters of the upper continental slope and shelf and provided stock assessment information related to sablefish (*Anoplopoma fimbria*) and several other groundfish species. The primary objectives of the survey were to determine 1) relative abundance of groundfish species through a standardized longline survey, 2) age composition of sablefish through otolith collection, and 3) movement patterns of selected groundfish species through a tag and recapture program. This report provides a summary of raw data and details of operations from the 2023 longline survey as well as trends observed on the survey over the last 20 years.

CONTENTS

INTRODUCTION

On 28 August 2023, the Alaska Fisheries Science Center (AFSC) completed the 46th annual longline survey of Alaska sablefish (*Anoplopoma fimbria*) and other groundfish resources of the upper continental slope and shelf (Fig. 1). This survey was designed to continue the time series (1979–1994) of the Gulf of Alaska (GOA) portion of the Japan-U.S. cooperative longline survey that was initiated in 1978 (the first year was experimental) and discontinued after 1994 (Sigler and Zenger 1989, Kimura and Zenger 1997). The National Marine Fisheries Service (NMFS) has surveyed the GOA annually since 1988 following a preliminary survey conducted in 1987 (Kimura and Zenger 1997). Since 1996, the eastern and central Aleutian Islands (AI) have been surveyed in even years and the eastern Bering Sea (BS) has been surveyed in odd years (Rutecki et al. 2016). The GOA (Western - WGOA, Central - CGOA, and Eastern - EGOA which is further divided into West Yakutat - WY and East Yakutat/Southeast – EYSE) and the BS region were sampled in 2023 (Fig. 1). The purpose of this document is to provide detailed survey operations, summarize raw survey data, and compare historical and current observations. Data generated from the longline survey are used for calculating relative population numbers and weights and is used for assessing stock status of Alaska groundfish. Stock Assessment and Fishery Evaluation reports can be found at: https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports, and population indices are available by management area and station for a subset of species at: https://www.fisheries.noaa.gov/resource/map/alaska-longline-survey-data-map.

METHODS

Survey Objectives

1. Collect relative abundance and size composition data of the most commercially important groundfish species: sablefish, shortspine thornyhead (*Sebastolobus alascanus*), Greenland turbot (*Reinhardtius hippoglossoides*), Pacific cod (*Gadus macrocephalus*), rougheye rockfish (*Sebastes aleutianus*), blackspotted rockfish (*S. melanostictus*), and shortraker rockfish (*S. borealis*).

2. Collect relative abundance and size composition data of other groundfish species caught during the survey including arrowtooth flounder (*Atheresthes stomias*), Kamchatka flounder (*A. evermanni*), grenadiers (Macrouridae), skates (Rajidae), and spiny dogfish (*Squalus acanthias*).
3. Collect sablefish otoliths to study the age composition of the population.
4. Tag and release sablefish, shortspine thornyhead, and Greenland turbot throughout the cruise to determine movement patterns.
5. Conduct special projects related to groundfish biology, stock assessment, and marine mammal interactions.

Vessel and Gear

Survey operations in 2023 were conducted using the FV *Alaskan Leader*, a chartered U.S. freezer longline vessel. The 46-m (150-ft) long vessel carried standard longline hauling gear and was equipped with radios, radars, GPS receivers, a processing line, plate freezers, and refrigerated holds. Vessel personnel generally consisted of a captain, mate, two engineers, cook, two scientists, two contract biologists, six deckhands, and five processors.

Gear configuration was standardized and has been consistent for all survey years starting in 1988 (Sigler and Zenger 1989). Each longline set consisted of a flag and buoy array at each end followed sequentially by varying lengths by depth of 9.5-mm diameter nylon buoy line, a 92-m (50-fm) section of 9.5-mm (0.375-in) polypropylene floating line, a 16-kg (35-lb) piece of chain (to dampen the effect of wave surge on the buoy line), 92 m (50 fm) of 9.5-mm nylon line, a 27-kg (60-lb) halibut anchor, and 366 m (200 fm) of 9.5-mm (0.375-in) nylon running line. Units of gear (hereafter referred to as skates) were 100-m (55-fm) long and contained 45 size 13/0 kirbed circle hooks. Hooks were attached to 38-cm (15-in) gangions that were secured to beckets tied into the groundline at 2-m (6.5-ft) intervals. Five meters (16 ft) of groundline were left bare at each skate end. Gangions were constructed of medium lay #60 thread nylon, becket material was medium lay #72 thread nylon, and groundline was medium lay 9.5-mm (0.375-in) diameter nylon. The groundline was weighted with 3.2-kg (7-lb) lead balls between each skate. Hooks were hand baited with chopped squid (*Illex* sp.) at a rate of about 5.7 kg (12.5 lb) per 100 hooks. Squid eyes and tentacles were not used for bait. Additional details on AFSC longline

survey protocols can be found at: https://www.fisheries.noaa.gov/resource/document/survey-protocol-alaska-sablefish-longline-survey.

Operations

The 2023 charter began on 28 May in Dutch Harbor, Alaska, and ended on 28 August in Dutch Harbor. The charter period was divided into six legs (Table 1). The regions sampled during each leg were as follows: Leg 1, along the upper continental slope of the BS region; Leg 2, from the western end of Umnak Island and extending eastward to Sand Point; Leg 3, off Dixon Entrance near the U.S.-Canada boundary toward Yakutat; Leg 4, between Yakutat and Seward including a 3-day experiment; Leg 5, from Seward to Kodiak; and Leg 6, from Kodiak to Dutch Harbor (Fig. 1). In 2023, gully stations 122 and 123 in the CGOA were not sampled due to weather.

The longline survey has gone through changes throughout its history, and a brief history from Rutecki et al. (2016) follows. From 1988 to 1990 the survey period was from 26 June to 12 September. The survey periods in 1991 through 1994 were about 18 days later than in 1988 through 1990. The 1991–1994 surveys were delayed to avoid the commercial trawl fishery that started 45 days later than in 1988 through 1990. Starting in 1995, the survey period was moved back to near the 1988–1990 time periods because of the extensive increase in length of the fishing season resulting from the implementation of the Individual Fishing Quota (IFQ) system in the sablefish and Pacific halibut (*Hippoglossus stenolepis*) longline fisheries. Beginning in 1998, the order in which the stations were sampled was changed to avoid conflicting with an early July rockfish fishery in the CGOA. Instead of continuing to sample in an easterly direction from Sand Point to Dixon Entrance, the survey vessel transited to Dixon Entrance at the end of Leg 2 during early July and resumed sampling in a westerly direction going from Dixon Entrance to Sand Point. Sampling order has been the same since 1998. From 2009 to present, the survey starting and ending dates were several days earlier than previous years. This was done to accommodate the vessel's schedule and to finish the survey prior to the fall Pacific cod fishing start date.

The gear was set from shallow to deep and was retrieved in the same order, except on occasions when the groundline parted or sea conditions dictated that it be pulled from the

opposite direction. Setting began at about 0630 hours Alaska Daylight Time. Retrieval began at about 0930 hours (i.e., minimum soak time of 3 hours) and was completed by about 1730 hours. At each station along the upper continental slope, two baited groundlines were laid end-to-end; the total groundline set each day was 18 km (9.7 nautical miles [nmi]) long and contained 180 skates and 8,100 hooks (note that 160 skates [7,200 hooks] was the amount of gear fished in a typical day prior to 2020). A single groundline of 90 skates was set at each station in the gullies. Specific information regarding longline survey protocols and additional details about the survey gear can be found at: https://www.fisheries.noaa.gov/resource/document/survey-protocol-alaska-sablefish-longline-survey.

Data Collection

Catch data were recorded on hand-held ruggedized computers. During gear retrieval a biologist stationed at the vessel's rail recorded the species of each hooked fish and the condition of each unoccupied hook (baited or ineffective [i.e., absent, straightened, broken, or tangled]). Time of day was recorded as each hook was tabulated, and depth was entered at the beginning of the first, last, and every fifth skate, in addition to when crossing into a new depth stratum (0–100 m, 101–200 m, 201–300 m, 301–400 m, 401–600 m, 601–800 m, 801–1,000 m, and 1,001–1,200 m).

Length data were collected with a barcode-configured measuring board and barcode readers connected to ruggedized computers. Length was recorded by depth stratum for sablefish, Pacific cod, grenadiers, arrowtooth flounder, Kamchatka flounder, Greenland turbot, shortspine thornyhead, spiny dogfish, rougheye rockfish, blackspotted rockfish, shortraker rockfish, and multiple other rockfish species. Length and catch data for rougheye and blackspotted rockfish were combined, as these fish were not distinguished by species. Lengths of sablefish, giant grenadier (*Albatrossia pectoralis*), spiny dogfish, and Pacific cod were recorded by sex. Sablefish, shortspine thornyhead, and Greenland turbot were randomly tagged at a rate of 4.4% of the gear by selecting these species caught on skates 10, 30, 50, and 70 of each set. Catch and length frequency data were transferred to a computer for quality control and storage in a database before being backed up on an external drive. As in previous surveys, the charter vessel was allowed to retain species of value (except prohibited species such as salmon, halibut, and crab) once the scientific data were recorded.

Trend Analysis

In an effort to understand annual longline survey data in the context of longer term trends, several metrics are presented as a time series for up to 20 years. The proportion of skates that had killer whale depredation, sperm whale presence, and sperm whale depredation are shown for stations that are included in abundance indices (i.e., relative population numbers or RPN) and those that are not (i.e., most gully stations). Subsurface temperature has been recorded on the AFSC longline survey since 2005, and a detailed analysis shows that there has been slight warming across all regions in recent years (Siwicke 2022). This information was updated with 2023 temperature data. To detect changes in sablefish catch rates, we used catch per unit effort (CPUE), or the number of sablefish caught divided by the number of effective hooks per skate. The mean and standard deviation are calculated across all depths within each region but separated by stations that are included in abundance index calculations and those that are not. To detect changes in the size of sablefish over time, the mean and standard deviation of male and female fork length are also calculated across all depths within each region but separated by stations that are included in abundance index calculations and those that are not. Sablefish data were raw observations and not scaled by the depth-stratified area sizes as is done for data used in stock assessments.

Trends in catch data, including the return of baited or empty hooks, at the regional and depth strata level were used to help understand how various species catches may interact with one another through time. We included stations that are used for RPN calculations, skates that had 5 or fewer ineffective hooks, and skates that did not have killer whale depredation. For each region and depth strata combination, the mean and standard deviation of CPUE are determined for sablefish, Pacific cod, Pacific halibut, rougheye/blackspotted/shortraker rockfish, shortspine thornyhead, giant grenadier, hooks with bait, empty hooks, and all other species combined into an "Other spp." category. These are then standardized in each region-depth strata combination as follows:

$$I_{i,y} = \frac{C_{i,y} - \mu_i}{\sigma_i},$$

where $C_{i,y}$ is the CPUE of species i in year y, μ_i is the 20-year mean CPUE of species i, σ_i is the 20-year CPUE standard deviation of species i, and $I_{i,y}$ is the standardized CPUE for species i in

year *y*. The standardized data will each have a mean of 0 and a standard deviation of 1. If mean CPUE for a species in a region-depth stratum combination was less than 0.025 (i.e., < 2.5% catch rate), standardized CPUE was not included on the subsequent plot. The "Other spp." category was also not shown on the standardized CPUE plot as the numerous species in this group made it uninformative.

RESULTS AND DISCUSSION

In 2023, a total of 16 stations along the upper continental slope of the BS region and 47 stations along the upper continental slope of the GOA were sampled at a rate of one station per day (Fig. 1). Surveyed depths ranged from approximately 200 to 1,000 m, although at some stations depths less than 200 m or more than 1,000 m were sampled. In addition, 22 stations were sampled in shallow cross-shelf gullies at the rate of 1 (two sets of 90 skates) or 2 stations (each 1 set of 90 skates) per day, including Shelikof Trough, Amatuli Gully, W-grounds, Yakutat Valley, Spencer Gully, Ommaney Trench, and Dixon Entrance. Stations spanned a variety of management areas and habitat types, and not all are used in abundance index calculations for stock assessments, notably cross-shelf gully stations (Table 2).

One-hundred fifty longline hauls were set during normal survey operations in 2023 (Table 3); six additional hauls (three longline and three collapsible slinky pot sets) were completed during three days of experimental fishing on Leg 4 in July. During normal survey operations, sablefish was the most frequently caught species, followed by giant grenadier, Pacific cod, shortspine thornyhead, rougheye/blackspotted rockfish, and Pacific halibut (Table 4). Catch of the most abundant species by station is presented in Table 5. Sablefish was also the highest catch by estimated weight, followed by giant grenadier, Pacific cod, and Pacific halibut (Table 6). Length and sex were recorded by region and depth stratum for 67,824 sablefish with a greater proportion of females being caught (Fig. 2). Lengths were also recorded for 6,918 shortspine thornyhead, 6,510 giant grenadier, 4,407 rougheye/blackspotted rockfish, 3,976 shortraker rockfish, and 3,361 Pacific cod, among others.

A total of 5,985 sablefish, 189 shortspine thornyhead, and 4 Greenland turbot were tagged with external numbered tags and released during the survey. Otoliths and length-weight data were collected from 3,568 sablefish. The survey caught 47 previously tagged sablefish (including 1 from the Alaska Department of Fish and Game and 10 from Fisheries and Oceans Canada), of which 5 were re-tagged and released. Information on previously tagged fish can be found at: https://www.fisheries.noaa.gov/resource/map/alaska-groundfish-tagging-map.

Killer whale (*Orcinus orca*) depredation on the catch occurred at 12 stations in the BS, 3 stations in the WGOA, and 3 stations in the CGOA (Table 7). Since 1990, data from the portions of the gear affected by killer whale depredation during domestic longline surveys have been excluded from stock assessment abundance calculations. The proportion of skates from stations used in abundance calculations in 2023 that were excluded due to killer whale depredation was at or near recent levels in the BS, WGOA, and CGOA (Fig. 3).

Sperm whale (*Physeter macrocephalus*) observations have been recorded during the longline survey since 1998 (Hill et al. 1999). Sperm whales were observed during survey operations at 19 stations in 2023, which includes slope and gully stations (Table 8). Sperm whale depredation is defined as sperm whales being present with the occurrence of damaged sablefish. Sperm whales were observed at seven stations in the CGOA with depredation evident at two, three stations in the WY region with depredation evident at two, and nine stations in the EYSE region with depredation evident at eight. Sperm whale depredation is directly estimated using an Alaska-wide Generalized Linear Mixed Model (GLMM) with year, depth strata, station, management area, and total number of effective hooks as explanatory variables (Hanselman et al. 2018). While longline survey catch reported herein have not been adjusted for sperm whale depredation, the sablefish stock assessment model estimates a depredation coefficient to inflate sablefish catches at survey stations with sperm whale depredation evidence. The proportion of skates that included this inflation factor was slightly higher in 2023 compared to the previous year, though all regions were at or below historical averages (Fig. 3).

NMFS has requested the assistance of the fishing fleet to avoid annual longline survey stations since the inception of sablefish IFQ management in 1995. We request that fishermen stay at least 5 nm away from each survey station for 7 days before and 3 days after the planned sampling date (3 days allow for survey delays). Survey calendars were mailed to each IFQ holder

before the beginning of each fishing season until 2020, and starting in 2021 the survey calendar was made available online (https://www.fisheries.noaa.gov/resource/document/alaska-sablefish-longline-survey-station-schedule) to reduce printing and mailing expenses. While the survey is being conducted, the skipper of the vessel makes announcements on the radio detailing the planned set locations for the upcoming days. Vessels encountered near survey stations are contacted by the survey vessel captain and interviewed to determine potential effects on survey catches and these interactions are noted. Beginning in 1998, we also revised the longline survey schedule to avoid the July 1 rockfish trawl fishery opening as well as other short fisheries.

Fishermen cooperation, distribution of the survey schedule to IFQ permit holders, radio announcements from the survey vessel, and discussions of a regulatory rolling closure have had intermittent success at reducing the annual number of longline survey/fishery interactions. During the past several surveys, fishing vessels have been contacted by the survey vessel when they were spotted close to survey stations. Typically, vessels have been aware of the survey and have not been fishing close to survey locations. Vessels usually are willing to communicate where they had set and/or are willing to change their fishing locations to accommodate the survey. Even with communication, there are some instances where survey gear was fished nearby commercial fishing gear or where commercial fishing had recently occurred. There are generally few interactions during the 90-day survey. In 2023, there were eight instances of vessel interactions that may have impacted survey catch or required the survey vessel to move the day's sets from their originally intended locations. In the GOA, there were 5 interactions with pot boats (3 in EYSE, 1 in WY, and 1 in the CGOA) and 3 interactions with longline vessels (1 in the WGOA and 2 in the CGOA). There were no vessel interactions in the BS.

Gear damage and loss occurs during survey operations and may have impacts on catch. In 2023, the gear parted at 12 stations (8, 13, 18, 86, 88, 93, 97, 103, 104, 107, 108, and 135). When gear parted, it was retrieved by hauling from the opposite end of the set. Gear loss included 5 skates at station 8 and 2 skates at station 135 (Table 3).

In 2023, several special projects were conducted. Three days of comparisons between hook and line and slinky pots were completed for the third year (see Sullivan et al. 2022 for results from the 2021 survey). Spiny dogfish samples continued to be collected for refining ageing and maturity determination methods. A third year of sablefish eye collections from across

the survey region was completed to examine isotopic growth layers of the eye lens of adult sablefish to obtain individual chronologies (young-of-year to time of collection) of their dietary and migratory behavior. Additionally, eye samples were collected to conduct eye lens-based age validation of sablefish, shortraker rockfish, and yelloweye rockfish, which will involve application of the radiocarbon chronometer, as well as a novel approach based on amino acid racemization. Furthermore, DNA from these fish will be used to construct draft epigenetic clocks with validated age estimates from eye lens core C^{14} analysis. Rockfish tissue samples were collected from shortspine thornyhead, shortraker rockfish, blackspotted rockfish, and rougheye rockfish to improve our understanding of stock structure and investigate the genetic basis of sex determination for these species. Temperature profiles were used to continue a time series starting in 2005 and analyzed through 2021 in Siwicke (2022), showing a continuation of above-average subsurface temperature in the BS and WGOA and a decline to mean temperatures in the CGOA and EGOA for 2023 (Fig. 4).

Trends in sablefish CPUE and mean lengths observed on the AFSC longline survey vary somewhat between stations included in RPN calculations and those that are not (the latter are mostly gully stations described in Table 2 which are generally shallower and referred to as "Other Station" in plots). Sablefish CPUE remained high in 2023 for RPN stations in every region sampled, showing a more stabilized trend compared to large increases in recent years (Fig. 5). At non-RPN stations, the CPUE has declined in the CGOA, EYSE, and WY regions (Fig. 5). Across sexes and areas, trends in male and female sablefish lengths at RPN stations dropped slightly from 2022 (Fig. 6). Mean lengths at non-RPN stations in WY and EYSE for males and females were at a time series low in 2018 and gradually increased beginning in 2019, while mean lengths at RPN stations have a similar trend that lag by a year (Fig. 6). The combination of smaller mean lengths with higher CPUEs could indicate that strong sablefish year classes were encountered on the survey beginning in 2016 (Figs. 5 and 6).

Catch trends vary by depth and region, with sablefish somewhat ubiquitous, Pacific halibut common in shallower depths throughout, Pacific cod dominating shallower depths in western regions, giant grenadier dominant at deeper depths particularly in western regions, and various rockfish species and thornyheads more common deeper than 300 m (Figs. 7–12). The dominant longline survey CPUE trends in recent years are increasing to above average for

sablefish and decreasing to below average for most other species, though in many instances these trends have stabilized (Figs. 7–12).

It is a desirable trait for a longline survey to have some bait returning on each skate, as this means the unit of gear is not saturated and the assumption that catch linearly relates to abundance is less likely to be violated. After very low levels of bait returning in 2022, the rate of baits returning in 2023 increased in most areas and depths towards long-term means (Figs. 7–12). There is often an inverse relationship with baits and empty hooks, and there was a decline in empty hooks returning in 2023 (Figs. 7–12). This can result from numerous causes that are difficult to identify and have different implications. For example, an increase in baits lost during setting or a high abundance of a small aggressive fish that quickly remove baits from hooks may preclude other fish from locating or competing for the baits. Alternatively, a high abundance of benthic invertebrates (e.g., crab or sea stars) could be consuming baits over several hours, thus, baited hooks would still be sufficiently available to capture fish over an extended period. While the former examples are problematic, the latter example may not be. As such, further investigations into gear saturation and hook competition will remain a topic of interest.

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Table 1. -- Leg numbers, dates, and personnel for the 2023 AFSC longline survey.

Leg	Dates	Personnel	Affiliation
1	28 May–15 Jun	Katy Echave	AFSC – ABL
		Andrew Dimond	AFSC – ABL
		Jessica Miller	Contract Biologist
		Maria McNaughton	Contract Biologist
2	15 Jun–30 Jun	Dan Goethel	AFSC – ABL
		Matt Cheng	UAF
		Jessica Miller	Contract Biologist
		Maria McNaughton	Contract Biologist
3	30 Jun–20 Jul	Kevin Siwicke	AFSC – ABL
		Kelly Cates	AKRO
		Jessica Miller	Contract Biologist
		Maria McNaughton	Contract Biologist
4*	20 Jul–3 Aug	Jane Sullivan	AFSC – ABL
		Brenna Groom	AFSC – REFM
		Jessica Miller	Contract Biologist
		Maria McNaughton	Contract Biologist
5	4 Aug–16 Aug	Cindy Tribuzio	AFSC – ABL
		Kristen Omori	AFSC – ABL
		Maria McNaughton	Contract Biologist
		Eve Cullerton	Contract Biologist
6	16 Aug–28 Aug	Pat Malecha	AFSC – ABL
		Ben Williams	AFSC – ABL
		Maria McNaughton	Contract Biologist
		Eve Cullerton	Contract Biologist

* Included 3 days of experimental comparison of pot and longline gear.

AFSC – ABL – Alaska Fisheries Science Center – Auke Bay Laboratories
AFSC – REFM – Alaska Fisheries Science Center – Resource Ecology and Fisheries Management Division
UAF – University of Alaska Fairbanks
AKRO – Alaska Regional Office

Table 2. -- Stations fished in 2023 AFSC longline survey. “Management area” refers to the North Pacific Fishery Management Council sablefish management areas, “Habitat” refers to the station habitat type (“Slope” = Upper continental slope, “Gully” = Shallow cross-shelf gully, and “Deep gully” = Deep cross-shelf gully), and “Abundance” indicates whether or not station data were used in stock assessment abundance index calculations.

Station	Management area	Habitat	Abundance
1	Bering Sea	Slope	Yes
2	Bering Sea	Slope	Yes
4	Bering Sea	Slope	Yes
6	Bering Sea	Slope	Yes
8	Bering Sea	Slope	Yes
10	Bering Sea	Slope	Yes
12	Bering Sea	Slope	Yes
13	Bering Sea	Slope	Yes
15	Bering Sea	Slope	Yes
17	Bering Sea	Slope	Yes
18	Bering Sea	Slope	Yes
20	Bering Sea	Slope	Yes
22	Bering Sea	Slope	Yes
32	Bering Sea	Slope	Yes
33	Bering Sea	Slope	Yes
34	Bering Sea	Slope	Yes
62	Western Gulf of Alaska	Slope	Yes
63	Western Gulf of Alaska	Slope	Yes
64	Western Gulf of Alaska	Slope	Yes
65	Western Gulf of Alaska	Slope	Yes
66	Western Gulf of Alaska	Slope	Yes
67	Western Gulf of Alaska	Slope	Yes
68	Western Gulf of Alaska	Slope	Yes
69	Western Gulf of Alaska	Slope	Yes
70	Western Gulf of Alaska	Slope	Yes
71	Western Gulf of Alaska	Slope	Yes
72	Central Gulf of Alaska	Slope	Yes
73	Central Gulf of Alaska	Slope	Yes
74	Central Gulf of Alaska	Slope	Yes
75	Central Gulf of Alaska	Slope	Yes

76	Central Gulf of Alaska	Slope	Yes
77	Central Gulf of Alaska	Slope	Yes
78	Central Gulf of Alaska	Slope	Yes
79	Central Gulf of Alaska	Slope	Yes
80	Central Gulf of Alaska	Slope	Yes
81	Central Gulf of Alaska	Slope	Yes
82	Central Gulf of Alaska	Slope	Yes
83	Central Gulf of Alaska	Slope	Yes
84	Central Gulf of Alaska	Slope	Yes
85	Central Gulf of Alaska	Slope	Yes
86	Central Gulf of Alaska	Slope	Yes
87	Central Gulf of Alaska	Gully	No
88	Central Gulf of Alaska	Slope	Yes
89	Eastern Gulf of Alaska	Slope	Yes
90	Eastern Gulf of Alaska	Slope	Yes
91	Eastern Gulf of Alaska	Slope	Yes
92	Eastern Gulf of Alaska	Slope	Yes
93	Eastern Gulf of Alaska	Slope	Yes
94	Eastern Gulf of Alaska	Slope	Yes
95	Eastern Gulf of Alaska	Slope	Yes
96	Eastern Gulf of Alaska	Slope	Yes
97	Eastern Gulf of Alaska	Slope	Yes
98	Eastern Gulf of Alaska	Slope	Yes
99	Eastern Gulf of Alaska	Slope	Yes
100	Eastern Gulf of Alaska	Slope	Yes
101	Eastern Gulf of Alaska	Slope	Yes
102	Eastern Gulf of Alaska	Slope	Yes
103	Eastern Gulf of Alaska	Gully	No
104	Eastern Gulf of Alaska	Slope	Yes
105	Eastern Gulf of Alaska	Slope	Yes
106	Eastern Gulf of Alaska	Slope	Yes
107	Eastern Gulf of Alaska	Slope	Yes
108	Eastern Gulf of Alaska	Slope	Yes
120	Central Gulf of Alaska	Gully	No
121	Central Gulf of Alaska	Gully	No
128	Central Gulf of Alaska	Gully	No

129	Central Gulf of Alaska	Gully	No
130	Central Gulf of Alaska	Gully	No
131	Central Gulf of Alaska	Gully	No
132	Central Gulf of Alaska	Gully	No
133	Central Gulf of Alaska	Gully	No
134	Central Gulf of Alaska	Gully	No
135	Central Gulf of Alaska	Gully	No
136	Eastern Gulf of Alaska	Gully	No
137	Eastern Gulf of Alaska	Gully	No
138	Eastern Gulf of Alaska	Gully	No
139	Eastern Gulf of Alaska	Gully	No
142	Eastern Gulf of Alaska	Deep gully	Yes
143	Eastern Gulf of Alaska	Deep gully	Yes
144	Eastern Gulf of Alaska	Deep gully	Yes
145	Eastern Gulf of Alaska	Deep gully	Yes
148	Eastern Gulf of Alaska	Deep gully	Yes
149	Eastern Gulf of Alaska	Deep gully	Yes
523	Central Gulf of Alaska	Slope	No
535	Central Gulf of Alaska	Slope	No

Table 3. -- Set information by station and haul for the 2023 AFSC longline survey. Positions are in decimal degrees (DD) format and depths are in meters (m).

Station	Haul	Date	Skates retrieved	Start latitude	Start longitude	End latitude	End longitude	Start depth	End depth
17	1	05/30	90	56.04	-169.62	56.01	-169.75	203	568
17	2	05/30	90	55.99	-169.85	55.99	-169.72	711	575
12	3	05/31	90	56.62	-172.35	56.59	-172.42	200	514
12	4	05/31	90	56.57	-172.43	56.52	-172.48	638	684
8*	5	06/02	90	57.63	-174.16	57.70	-174.23	151	400
8*	6	06/01	85	57.71	-174.25	57.78	-174.31	412	588
2	7	06/02	90	58.62	-176.64	58.58	-176.77	148	497
2*	8	06/02	90	58.57	-176.79	58.56	-176.93	606	880
1*	9	06/03	90	58.78	-177.58	58.81	-177.71	156	209
1*	10	06/03	90	58.82	-177.72	58.84	-177.83	378	626
4*	11	06/04	90	58.50	-175.67	58.49	-175.80	222	392
4*	12	06/04	90	58.48	-175.83	58.51	-175.95	439	621
6	13	06/05	90	58.33	-174.32	58.40	-174.36	170	392
6	14	06/05	90	58.40	-174.38	58.38	-174.49	548	450
10*	15	06/06	90	56.83	-173.38	56.90	-173.41	204	487
10*	16	06/06	90	56.91	-173.42	56.97	-173.47	503	642
13*	17	06/07	90	56.47	-171.45	56.46	-171.59	200	512
13*	18	06/07	90	56.46	-171.61	56.46	-171.73	394	606
15	19	06/08	90	56.16	-170.67	56.14	-170.77	138	281
15	20	06/08	90	56.13	-170.79	56.16	-170.90	418	596
18	21	06/09	90	56.24	-169.18	56.19	-169.27	172	635
18*	22	06/09	90	56.18	-169.29	56.12	-169.39	656	600
20	23	06/10	90	55.81	-168.81	55.84	-168.92	242	605
20*	24	06/10	90	55.85	-168.94	55.91	-169.02	488	772
22*	25	06/11	90	55.46	-168.01	55.43	-168.14	158	268
22*	26	06/11	90	55.42	-168.16	55.39	-168.28	286	602
34*	27	06/12	90	53.29	-168.80	53.31	-168.85	772	662
34*	28	06/12	90	53.31	-168.89	53.35	-168.98	618	843
33*	29	06/13	90	53.60	-168.33	53.61	-168.20	734	120
33*	30	06/13	90	53.61	-168.19	53.62	-168.07	115	585
32*	31	06/14	90	53.77	-167.33	53.71	-167.38	142	400
32*	32	06/14	90	53.71	-167.40	53.68	-167.47	282	616
62	33	06/16	90	52.66	-169.01	52.61	-169.10	132	664

62	34	06/16	90	52.62	-169.11	52.55	-169.19	362	706
63	35	06/17	90	52.97	-168.14	52.92	-168.20	108	348
63	36	06/17	90	52.91	-168.21	52.85	-168.25	334	542
64*	37	06/18	90	53.20	-166.85	53.13	-166.89	196	300
64*	38	06/18	90	53.12	-166.90	53.05	-166.95	320	725
65	39	06/19	90	53.58	-165.69	53.51	-165.72	120	314
65	40	06/19	90	53.50	-165.74	53.44	-165.79	292	490
66	41	06/20	90	53.74	-164.47	53.68	-164.56	135	318
66	42	06/20	90	53.68	-164.58	53.65	-164.68	312	425
67	43	06/22	90	53.97	-163.27	53.90	-163.33	112	402
67	44	06/22	90	53.90	-163.35	53.86	-163.44	390	698
68*	45	06/23	90	54.13	-161.64	54.09	-161.74	128	282
68*	46	06/23	90	54.09	-161.78	54.06	-161.87	471	735
69	47	06/24	90	54.32	-161.06	54.26	-161.15	168	398
69	48	06/24	90	54.27	-161.17	54.21	-161.22	370	787
70	49	06/25	90	54.37	-160.24	54.30	-160.30	142	315
70	50	06/25	90	54.30	-160.29	54.22	-160.33	328	650
71*	51	06/26	90	54.51	-159.26	54.44	-159.31	138	290
71*	52	06/26	90	54.44	-159.33	54.38	-159.42	280	615
72	53	06/27	90	54.63	-158.58	54.56	-158.64	124	384
72	54	06/27	90	54.57	-158.66	54.50	-158.71	302	767
73	55	06/28	90	54.85	-157.74	54.79	-157.83	182	346
73	56	06/28	90	54.78	-157.83	54.71	-157.87	370	526
74	57	06/29	90	55.24	-156.68	55.17	-156.75	154	302
74	58	06/29	90	55.16	-156.74	55.09	-156.78	347	455
75	59	06/30	90	55.64	-155.85	55.57	-155.86	148	210
75	60	06/30	90	55.57	-155.87	55.49	-155.83	210	212
108	61	07/05	90	54.46	-133.92	54.50	-134.02	274	592
108	62	07/05	90	54.50	-134.01	54.54	-134.08	378	724
107	63	07/06	90	54.90	-134.29	54.95	-134.35	222	518
107	64	07/06	90	54.96	-134.36	55.00	-134.44	540	878
148	65	07/07	90	54.65	-132.84	54.60	-132.95	149	381
149	66	07/07	90	54.60	-133.18	54.60	-133.03	351	418
106	67	07/08	90	55.34	-134.74	55.38	-134.83	468	690
106	68	07/08	90	55.38	-134.96	55.39	-134.84	938	558
105	69	07/09	90	55.56	-134.97	55.57	-135.06	248	605
105	70	07/09	90	55.58	-135.05	55.62	-135.11	420	642

144	71	07/10	90	55.93	-134.90	56.01	-134.91	190	370
145	72	07/10	90	56.04	-134.93	56.09	-135.02	356	324
104	73	07/11	90	55.98	-135.43	56.02	-135.54	342	670
104	74	07/11	90	56.03	-135.53	56.08	-135.62	596	847
103	75	07/12	90	56.38	-135.35	56.38	-135.49	156	192
103	76	07/12	90	56.39	-135.50	56.37	-135.64	190	328
102	77	07/13	90	56.85	-136.00	56.87	-136.10	222	814
102	78	07/13	90	56.89	-136.10	56.95	-136.12	815	892
101	79	07/14	90	57.19	-136.23	57.22	-136.34	214	762
101	80	07/14	90	57.22	-136.33	57.28	-136.38	738	778
100	81	07/15	90	57.62	-136.53	57.61	-136.66	220	718
100	82	07/15	90	57.63	-136.67	57.67	-136.76	542	714
142	83	07/16	90	57.92	-137.01	57.92	-137.16	443	388
143	84	07/16	90	57.97	-137.21	57.97	-137.08	238	420
99	85	07/17	90	57.88	-137.38	57.89	-137.51	185	605
99	86	07/17	90	57.89	-137.52	57.90	-137.64	592	394
98	87	07/18	90	58.14	-138.73	58.16	-138.87	218	424
98	88	07/18	90	58.17	-138.86	58.19	-138.98	498	450
97	89	07/19	90	58.47	-139.47	58.46	-139.59	192	488
97	90	07/19	90	58.47	-139.60	58.42	-139.71	394	950
138	91	07/21	90	59.42	-140.94	59.43	-141.09	226	298
139	92	07/21	90	59.42	-141.17	59.35	-141.26	320	326
96	93	07/22	90	58.69	-140.64	58.68	-140.78	240	686
96	94	07/22	90	58.69	-140.79	58.73	-140.89	488	600
95	95	07/23	90	59.05	-141.34	59.04	-141.48	310	550
95	96	07/23	90	59.05	-141.49	59.05	-141.63	530	854
94	97	07/24	90	59.39	-142.17	59.42	-142.30	234	488
94	98	07/24	90	59.43	-142.29	59.47	-142.40	352	978
93	99	07/25	90	59.55	-142.57	59.58	-142.71	130	616
93	100	07/25	90	59.59	-142.69	59.57	-142.81	581	644
92	101	07/26	90	59.55	-143.66	59.55	-143.80	170	734
92	102	07/26	90	59.56	-143.80	59.59	-143.94	616	552
136	109	07/30	90	59.76	-143.71	59.75	-143.58	158	305
137	110	07/30	90	59.72	-143.50	59.67	-143.38	310	295
91	111	07/31	90	59.52	-144.72	59.48	-144.85	180	534
91	112	07/31	90	59.49	-144.86	59.45	-144.98	434	842
90	113	08/01	90	59.50	-145.53	59.52	-145.67	158	676

90	114	08/01	90	59.52	-145.69	59.52	-145.83	710	380
89	115	08/04	90	59.26	-146.86	59.22	-146.98	189	592
89	116	08/04	90	59.22	-146.99	59.17	-147.07	539	875
134	117	08/05	90	59.61	-146.97	59.55	-147.06	209	212
135	118	08/05	88	59.52	-147.16	59.46	-147.15	216	210
88	119	08/06	90	59.15	-147.60	59.08	-147.63	253	432
88	120	08/06	90	59.08	-147.64	59.00	-147.66	471	910
87	121	08/07	90	59.13	-148.65	59.05	-148.65	155	200
87	122	08/07	90	59.04	-148.65	58.97	-148.65	223	245
132	123	08/08	90	59.08	-149.40	59.03	-149.53	183	226
133	124	08/08	90	58.95	-149.50	58.92	-149.65	242	238
130	125	08/09	90	58.73	-149.19	58.77	-149.07	179	217
131	126	08/09	90	58.80	-149.04	58.84	-148.93	237	251
86	127	08/10	90	58.68	-148.34	58.60	-148.33	282	572
86	128	08/10	90	58.60	-148.32	58.52	-148.37	629	686
85	129	08/11	90	58.29	-148.62	58.22	-148.67	229	522
85	130	08/11	90	58.22	-148.66	58.16	-148.71	534	788
84	131	08/13	90	57.97	-149.17	57.92	-149.25	165	485
84	132	08/13	90	57.93	-149.26	57.85	-149.32	466	755
128*	133	08/14	90	57.98	-149.98	58.00	-149.84	260	221
129*	134	08/14	90	58.07	-150.06	58.08	-149.91	313	295
83	135	08/15	90	57.63	-149.93	57.55	-149.96	409	573
83	136	08/15	90	57.57	-149.97	57.50	-149.98	539	765
82	137	08/17	90	57.40	-150.58	57.32	-150.60	211	532
82	138	08/17	90	57.31	-150.63	57.24	-150.61	546	715
535	139	08/18	90	57.36	-150.67	57.28	-150.68	222	505
535	140	08/18	90	57.29	-150.69	57.21	-150.68	438	760
523	141	08/19	90	57.22	-151.04	57.14	-151.05	189	524
523	142	08/19	90	57.15	-151.07	57.07	-151.06	454	536
81	143	08/20	90	57.12	-151.22	57.04	-151.28	255	584
81	144	08/20	90	57.05	-151.30	56.97	-151.30	551	854
80*	145	08/21	90	56.48	-152.22	56.43	-152.29	141	545
80	146	08/21	90	56.42	-152.30	56.35	-152.33	503	669
79	147	08/22	90	56.30	-153.08	56.26	-153.18	280	669
79	148	08/22	90	56.27	-153.21	56.22	-153.29	479	555
78	149	08/23	90	55.99	-154.03	55.92	-154.03	241	524
78	150	08/23	90	55.92	-154.04	55.85	-154.04	489	920

77	151	08/24	90	56.05	-154.57	55.97	-154.57	231	537
77	152	08/24	90	55.97	-154.58	55.91	-154.57	550	876
76	153	08/25	90	55.77	-155.14	55.70	-155.18	157	319
76	154	08/25	90	55.69	-155.19	55.63	-155.27	336	586
120	155	08/26	90	55.79	-156.08	55.76	-156.21	191	240
121	156	08/26	90	55.73	-156.34	55.73	-156.34	242	249

*Station catch was entirely or partially impacted by killer whale depredation.

Table 4. -- Total catch in numbers of major species (>100 individuals) caught in the 2023 AFSC longline survey by management area: BS = Bering Sea, WGOA = Western Gulf of Alaska, WY = West Yakutat, and EYSE = East Yakutat and Southeastern Alaska.

Species common name	BS	WGOA	CGOA	WY	EYSE	Total
Sablefish	26,294	26,528	67,711	22,471	35,370	178,374
Giant grenadier	8,260	7,239	9,734	2,378	1,846	29,457
Pacific cod	4,722	2,348	1,217	203	421	8,911
Shortspine thornyhead	801	869	2,675	1,642	1,818	7,805
Rougheye/blackspotted rockfish	360	1,391	868	685	1,258	4,562
Pacific halibut	552	464	1,835	509	940	4,300
Shortraker rockfish	621	477	583	1,222	1,156	4,059
Arrowtooth flounder	539	190	1,234	115	215	2,293
Longnose skate	6	337	707	471	564	2,085
Aleutian/Bering/Alaska skate	884	132	420	43	67	1,546
Spiny dogfish	0	1	241	577	693	1,512
Pacific grenadier	12	18	913	275	183	1,401
Redbanded rockfish	0	34	356	125	733	1,248
Lips/jaws - depredation	588	74	28	16	49	755
Walleye pollock	519	83	35	3	3	643
Yelloweye rockfish	0	84	45	72	417	618
Greenland turbot	603	0	0	0	0	603
Whiteblotched skate	462	2	0	0	0	464
Skates unidentified	340	25	14	36	35	450
Sea anemone	26	50	185	22	94	377
Commander skate	337	11	0	0	21	369
Kamchatka flounder	344	1	0	0	0	345
Yellow Irish lord	198	6	0	0	0	204
Brittle star	22	42	107	2	7	180
Sea star	7	10	82	17	47	163
Sea pen/whip	10	4	117	16	4	151
Whitebrow skate	134	0	1	0	0	135
Basket star	7	6	94	13	14	134
Crinoid	0	4	112	0	2	118
Dover sole	1	0	65	17	33	116
Lingcod	0	0	10	55	41	106

Table 5. -- Catch in numbers by station for major species in the 2023 AFSC longline survey. SF = sablefish, PC = Pacific cod, GR = giant grenadier, PH = Pacific halibut, ATF = arrowtooth flounder, GT = Greenland turbot, RF = rougheye, blackspotted, and shortraker rockfish, ST = shortspine thornyhead, SK = skate, OS = Other Species.

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
1*	144	324	1,031	9	2	0	1	28	142	280
2*	1,705	322	1,475	20	22	63	3	19	107	203
4*	720	104	424	24	11	1	6	3	96	251
6	2,081	198	911	52	19	46	45	16	134	132
8*	887	564	743	22	13	21	66	37	39	163
10*	325	104	610	10	25	4	90	63	88	198
12	2,489	216	1,037	19	56	94	10	28	99	126
13*	376	212	748	6	1	0	129	112	38	172
15	2,479	414	354	47	97	13	104	110	40	352
17	1,657	554	239	33	112	49	45	107	62	71
18*	3,128	85	340	5	73	95	11	45	172	144
20*	3,745	95	184	13	2	122	16	19	34	123
22*	409	690	40	10	26	0	25	4	45	213
32*	503	175	24	11	50	16	243	128	90	228
33*	2,048	665	92	254	24	16	187	57	73	273
34*	3,598	0	8	17	6	63	0	25	75	96
62	2,994	128	767	10	6	0	238	98	26	50
63	3,202	429	705	44	20	0	282	132	21	56
64*	1,606	3	262	2	7	0	560	82	38	112
65	3,396	468	459	60	28	0	30	23	98	68
66	3,963	497	423	19	11	0	38	14	50	40
67	2,635	301	1,236	38	17	0	293	35	5	111
68*	1,508	186	516	84	31	0	347	197	41	64
69	2,582	41	1,129	21	22	0	27	133	23	16
70	2,670	171	769	121	26	0	23	86	47	42
71*	1,972	124	973	65	22	0	30	69	27	80
72	3,433	239	804	111	37	0	44	112	47	33
73	3,219	2	1,103	17	37	0	91	88	13	18
74	4,179	15	705	50	18	0	30	251	29	65
75	1,344	91	0	321	51	0	6	4	25	170
76	2,766	200	241	79	100	0	100	80	25	281
77	3,505	0	1,109	3	9	0	17	59	1	43

78	3,352	0	835	35	13	0	151	156	0	384
79	3,929	0	414	4	13	0	42	161	2	110
80*	2,784	93	186	113	31	0	114	199	20	178
81	3,525	0	754	1	13	0	55	66	1	152
82	3,033	15	649	23	30	0	40	94	2	58
83	2,350	0	809	2	3	0	9	124	2	111
84	2,863	68	364	66	21	0	42	111	23	210
85	3,052	0	354	15	10	0	67	153	16	102
86	2,443	0	336	88	27	0	203	179	9	26
87	1,786	257	0	259	141	0	19	48	112	105
88	2,587	1	292	5	11	0	101	119	22	234
89	3,388	43	497	32	7	0	105	116	32	225
90	1,548	133	313	86	5	0	436	73	71	75
91	2,382	25	266	64	24	0	237	145	33	78
92	2,831	1	370	30	2	0	60	90	32	52
93	3,282	0	364	96	1	0	11	246	20	114
94	1,691	0	148	35	17	0	220	269	56	106
95	2,602	0	224	11	2	0	458	221	34	60
96	2,323	0	196	4	8	0	262	128	32	131
97	2,757	6	171	43	2	0	322	179	36	238
98	1,654	0	310	2	3	0	440	38	2	58
99	2,195	1	166	16	5	0	91	45	11	112
100	2,792	9	235	9	6	0	53	40	5	83
101	2,292	38	260	46	8	0	122	57	11	76
102	1,758	1	182	6	15	0	64	73	13	70
103	613	238	0	558	50	0	11	17	150	954
104	2,917	0	109	6	0	0	312	154	14	33
105	2,757	13	108	30	4	0	144	156	23	161
106	2,916	0	97	0	1	0	172	159	6	135
107	1,858	2	81	4	3	0	203	194	30	60
108	1,630	0	86	2	1	0	228	157	11	170
120	1,532	63	0	159	24	0	0	4	15	108
121	2,017	6	0	90	44	0	6	4	14	73
128*	719	9	0	22	61	0	11	41	20	15
129*	1,858	0	0	4	69	0	17	13	13	17
130	428	34	0	109	71	0	4	52	63	30
131	979	0	0	50	87	0	30	157	45	49

132	731	88	0	32	61	0	7	66	36	61
133	817	1	0	40	113	0	2	117	41	24
134	1,152	0	0	4	45	0	8	19	54	121
135	620	2	0	40	51	0	69	57	75	111
136	346	0	0	28	10	0	8	96	46	30
137	382	0	0	47	7	0	45	127	30	12
138	419	1	0	51	26	0	52	70	55	96
139	1,277	0	0	25	6	0	13	61	69	372
142	1,810	0	12	4	3	0	31	70	20	102
143	2,013	0	29	28	12	0	16	34	30	47
144	479	14	0	82	13	0	102	164	62	64
145	1,948	0	0	6	6	0	93	102	49	43
148	1,330	99	0	79	76	0	6	117	73	203
149	1,651	0	0	19	7	0	4	62	77	26
523	3,410	22	348	31	22	0	47	61	2	35
535	3,298	11	431	62	21	0	119	80	1	30

*Station catch was entirely or partially impacted by killer whale depredation.

Table 6. -- Total estimated catch in weight (kg) of major species (>100 kg) caught in the 2023 AFSC longline survey by management area: AI = Aleutian Islands, WGOA = Western Gulf of Alaska, CGOA = Central Gulf of Alaska, WY = West Yakutat, and EYSE = East Yakutat/Southeast. Catch biomass was estimated by converting numbers caught to weight using species-specific length-weight relationships when length data were collected or proxy average weights from longline fisheries when survey length data were not available.

Species common name	AI	WGOA	CGOA	WY	EYSE	Total
Sablefish	53,304	53,600	150,821	61,685	85,676	405,086
Giant grenadier	26,598	16,487	25,811	6,705	5,236	80,837
Pacific cod	16,356	9,107	4,223	566	1,357	31,609
Pacific halibut	3,257	2,738	10,828	3,004	5,547	25,374
Longnose skate	45	2,512	5,271	3,511	4,205	15,544
Shortraker rockfish	1,063	673	927	2,225	1,706	6,594
Rougheye/blackspotted rockfish	524	1,698	1,119	1,080	2,151	6,572
Shortspine thornyhead	974	614	1,885	1,189	1,611	6,273
Arrowtooth flounder	677	252	2,536	250	344	4,059
Spiny dogfish	0	1	558	1,509	1,939	4,007
Whiteblotched skate	2,488	11	0	0	0	2,499
Skates unidentified	1,725	127	71	183	178	2,284
Redbanded rockfish	0	60	632	222	1,301	2,215
Yelloweye rockfish	0	242	130	208	1,203	1,783
Greenland turbot	1,753	0	0	0	0	1,753
Commander skate	1,074	35	0	0	67	1,176
Pacific grenadier	16	16	675	205	119	1,031
Walleye pollock	737	118	50	4	4	913
Lingcod	0	0	82	452	337	871
Kamchatka flounder	719	2	0	0	0	721
Whitebrow skate	383	0	3	0	0	386
Octopus	107	145	101	0	6	359
Pacific sleeper shark	0	116	0	0	116	232
Spotted ratfish	0	0	0	4	204	208
Dover sole	1	0	97	25	49	172
Yellow Irish lord	166	5	0	0	0	171
Pacific ocean perch	127	8	14	3	2	154
Silvergray rockfish	0	0	4	44	70	118
Sea anemone	7	14	51	6	26	104

Table 7. -- Stations and skates depredated by killer whales during the 2023 AFSC longline survey. Number of skates affected refers to skates determined to be depredated and removed from abundance calculations.

Station	Region	Number of skates affected	Number of skates retrieved
1	Bering Sea	164	180
2	Bering Sea	66	180
4	Bering Sea	152	180
8	Bering Sea	157	175
10	Bering Sea	151	180
13	Bering Sea	180	180
18	Bering Sea	22	180
20	Bering Sea	27	180
22	Bering Sea	136	180
32	Bering Sea	159	180
33	Bering Sea	137	180
34	Bering Sea	180	180
64	Western Gulf of Alaska	164	180
68	Western Gulf of Alaska	130	180
71	Western Gulf of Alaska	117	180
80	Central Gulf of Alaska	70	180
128*	Central Gulf of Alaska	36	90
129*	Central Gulf of Alaska	90	90

*Stations not included in abundance calculations.

Table 8. -- Stations that had sperm whales present during hauling operations in the 2023 AFSC longline survey. Depredation is defined as sperm whales being present with the occurrence of damaged fish on the line.

Station	Region	Present	Depredation
81	Central Gulf of Alaska	Yes	Yes
82	Central Gulf of Alaska	Yes	Yes
83	Central Gulf of Alaska	Yes	No
84	Central Gulf of Alaska	Yes	No
85	Central Gulf of Alaska	Yes	No
86	Central Gulf of Alaska	Yes	No
88	Central Gulf of Alaska	Yes	No
91	West Yakutat	Yes	No
92	West Yakutat	Yes	Yes
96	West Yakutat	Yes	Yes
97	East Yakutat/Southeast	Yes	Yes
98	East Yakutat/Southeast	Yes	Yes
100	East Yakutat/Southeast	Yes	Yes
101	East Yakutat/Southeast	Yes	Yes
102	East Yakutat/Southeast	Yes	Yes
104	East Yakutat/Southeast	Yes	Yes
105	East Yakutat/Southeast	Yes	Yes
106	East Yakutat/Southeast	Yes	Yes
108	East Yakutat/Southeast	Yes	No

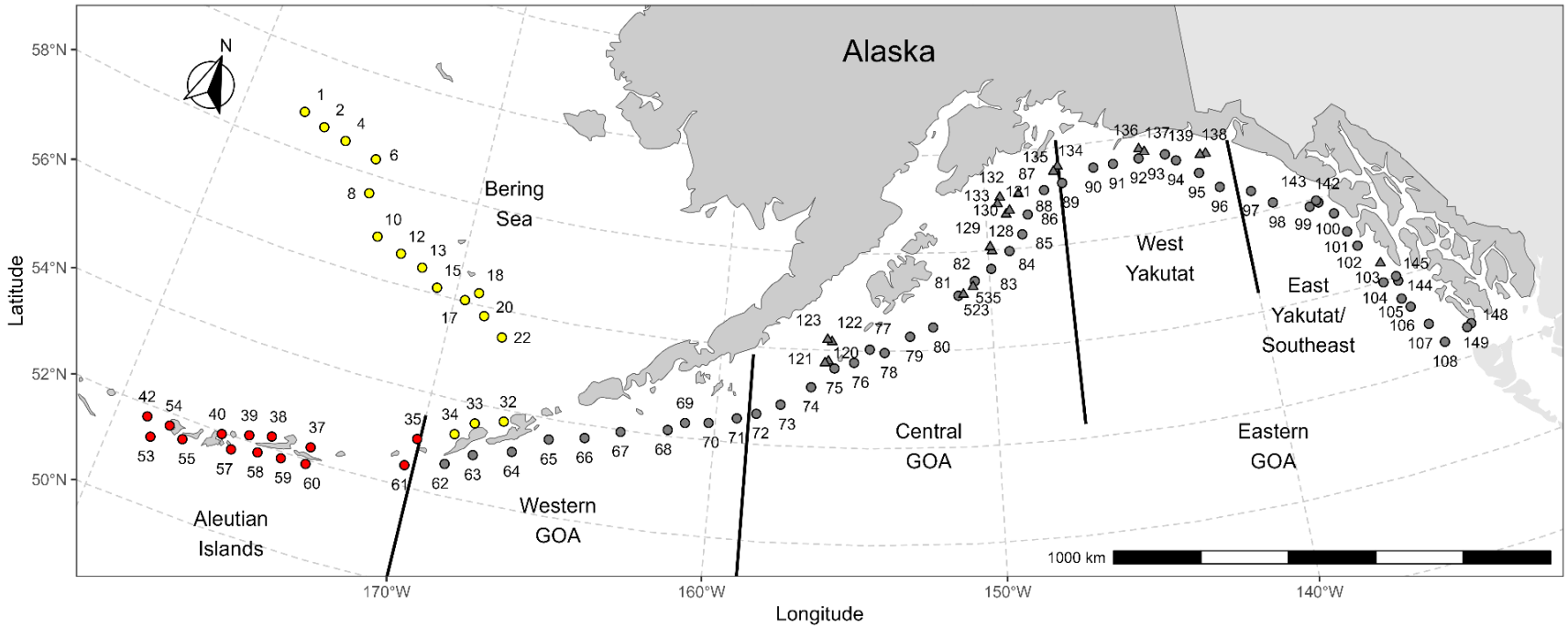

Figure 1. -- Map of NMFS-AFSC longline survey station locations. Bering Sea stations (yellow) are sampled in odd years, Aleutian Islands stations (red) are sampled in even years, and Gulf of Alaska (GOA) stations (grey) are sampled every year. Circles indicate stations included in abundance index (i.e., RPN) calculations while triangles indicate stations that are not.

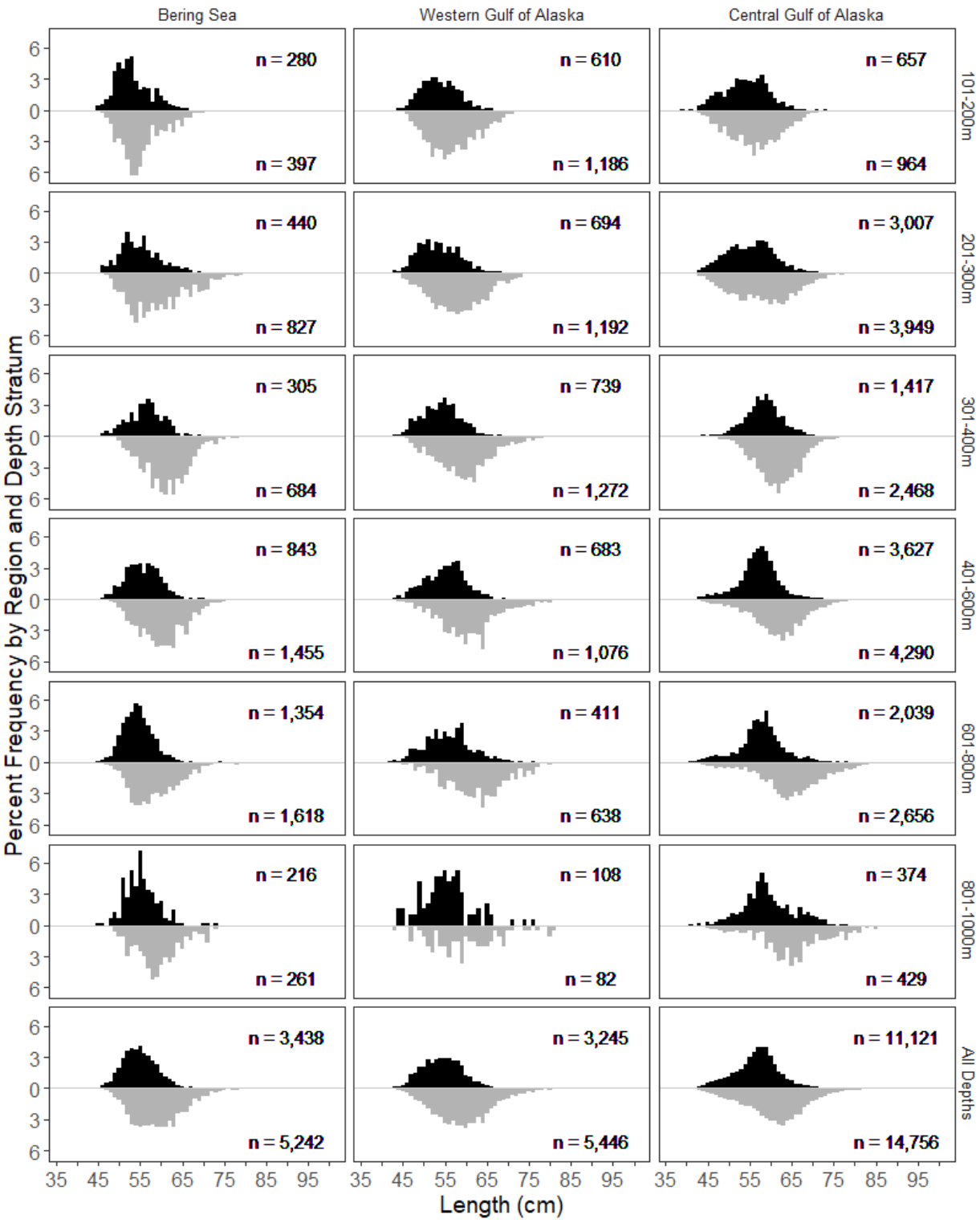

Figure 2. -- Size composition of sablefish measured during the 2023 AFSC longline survey by region and depth stratum. Males are shown in black and females are shown in grey below the x-axis.

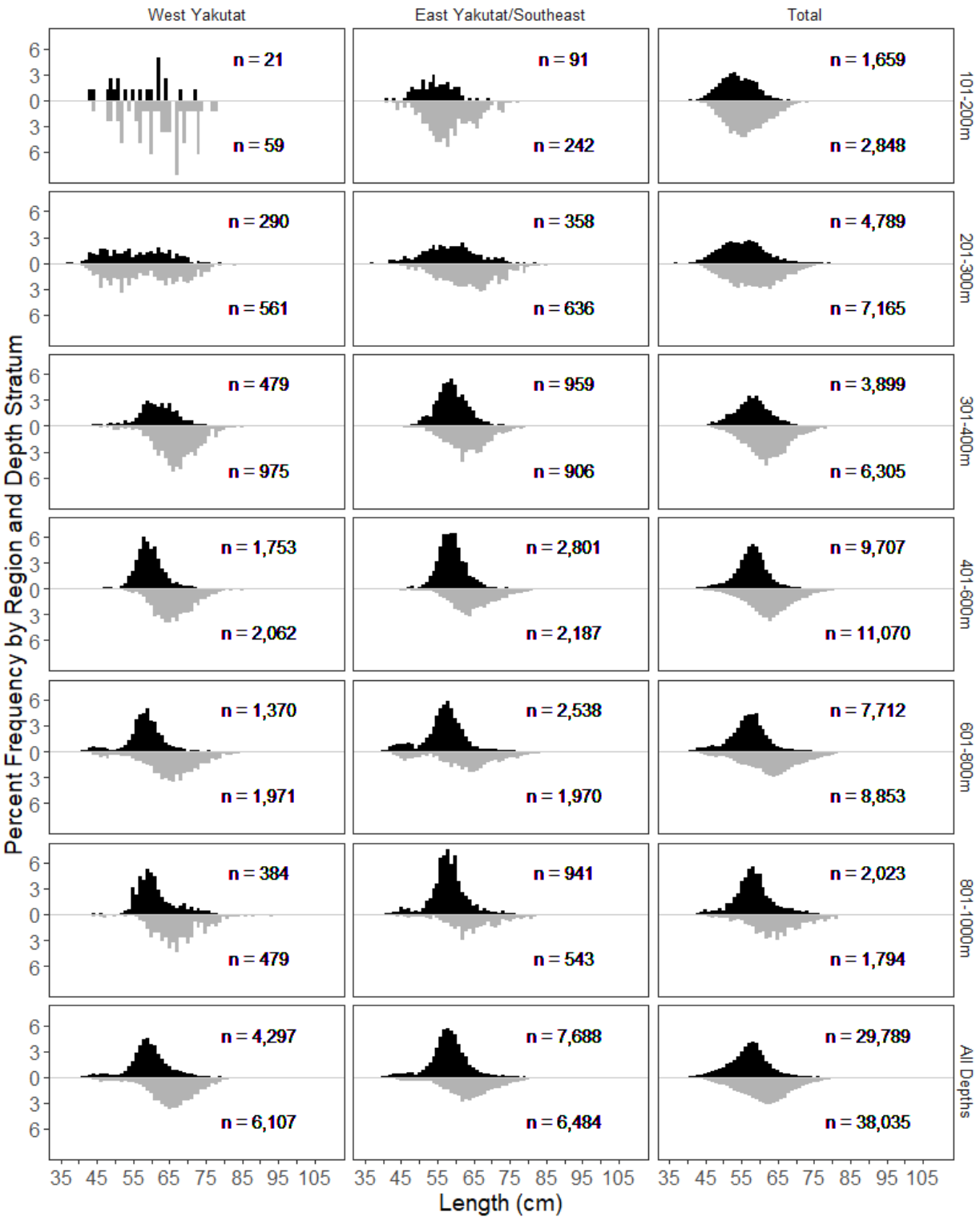

Figure 2. -- Continued.

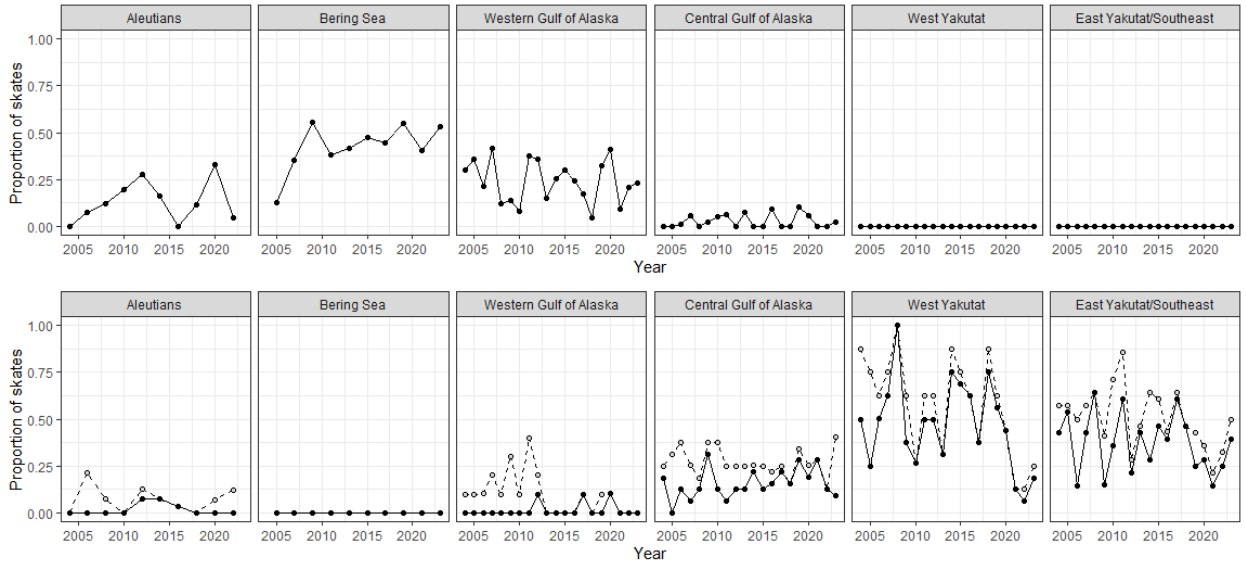

Figure 3. -- Trends in whale interactions on the AFSC longline survey, where the top panels show the proportion of skates with killer whale depredation which are removed from abundance calculations. The bottom panels show the proportion of skates with sperm whale presence (open circles and dashed line) and depredation (solid circles and line); these data are used to inflate catch rates to account for sperm whale losses as described in Hanselman et al. (2018).

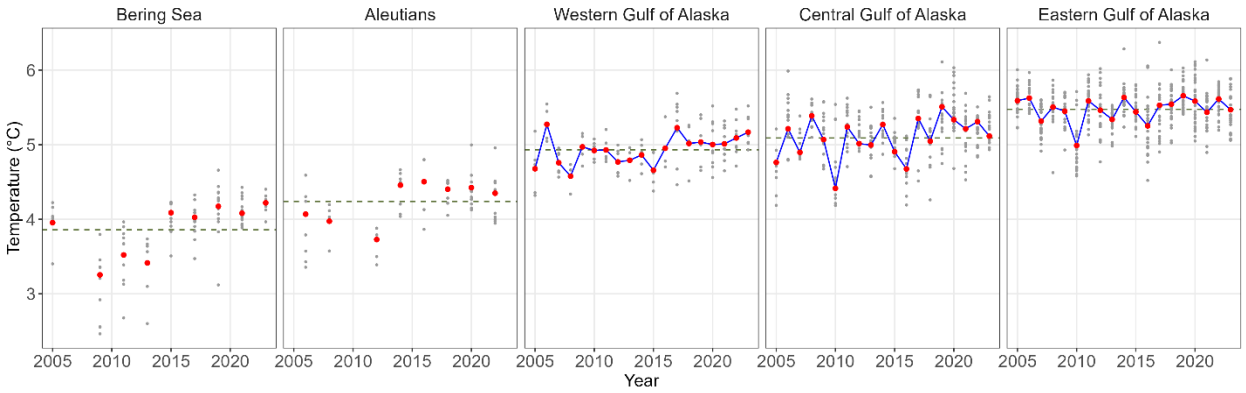

Figure 4. -- Regional subsurface temperature trends from the AFSC longline survey averaged from 1-m increments in the 246–255 m depth bin, where grey points are individual measurements and the red dots are area-weighted means. Horizontal dashed lines are regional time series means. For more details, see Siwicke (2022). The Eastern Gulf of Alaska is the combination of West Yakutat and East Yakutat/Southeast Alaska.

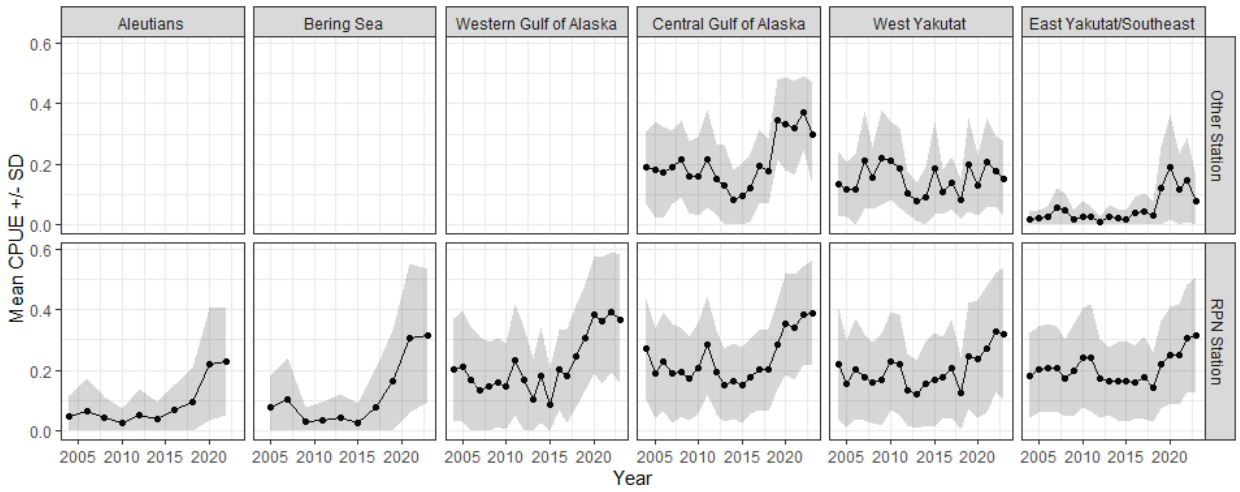

Figure 5. -- Trends in mean sablefish catch per unit effort (CPUE, number of sablefish per hook) from the AFSC longline survey by region and separated by station inclusion in abundance index calculations (top row "Other station" are not included and bottom row "RPN station" are included). Shading indicates +/- 1 standard deviation (SD).

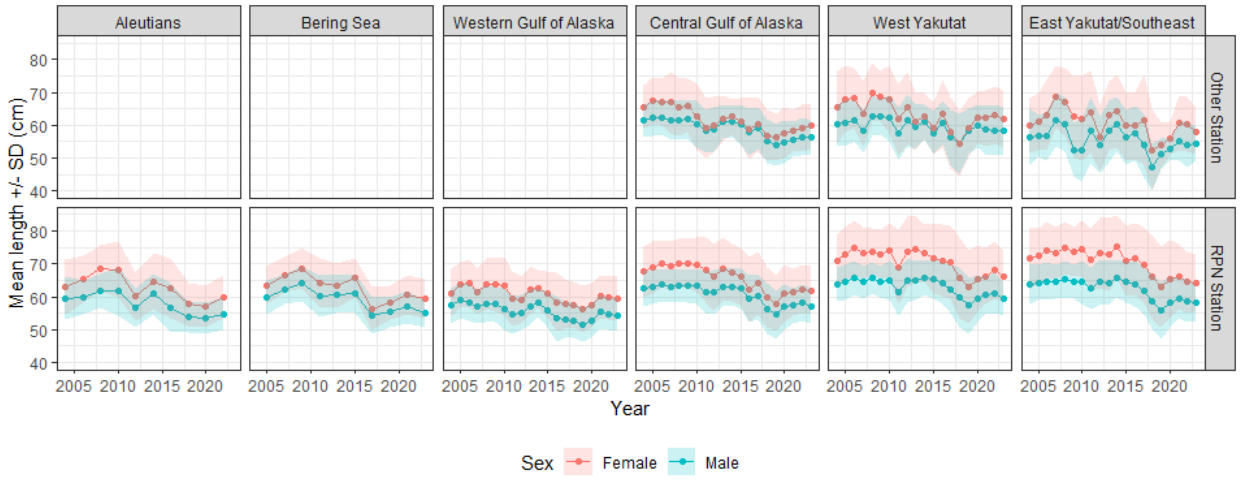

Figure 6. -- Trends in mean fork length of sablefish (female in red, male in blue) measured during the AFSC longline survey by region and separated by station inclusion in abundance index calculations (top row "Other station" are not included and bottom row "RPN station" are included). Shading indicates +/- 1 standard deviation (SD).

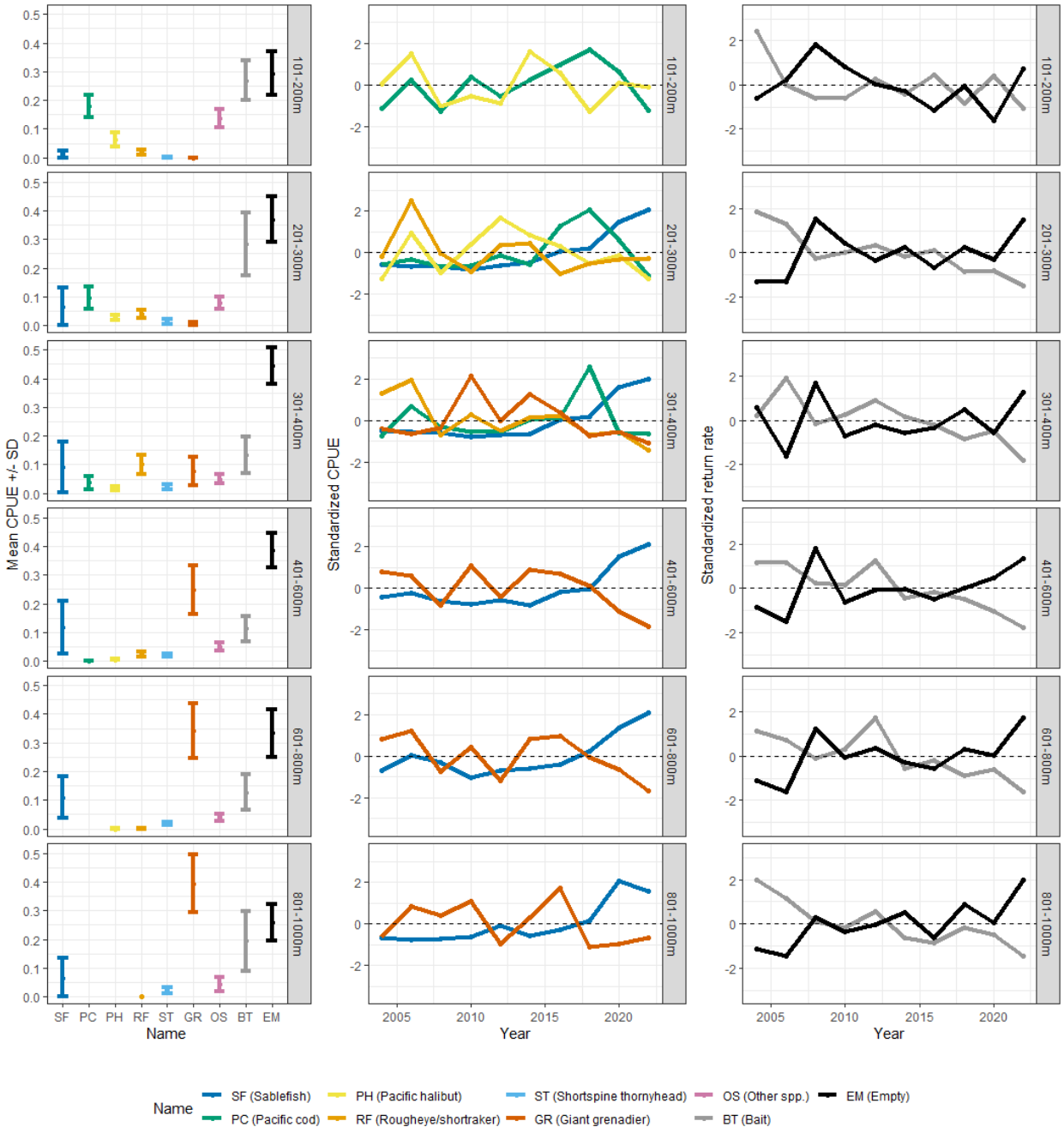

Figure 7. -- Aleutian Islands biennial catch trends by depth strata (2004–2022). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

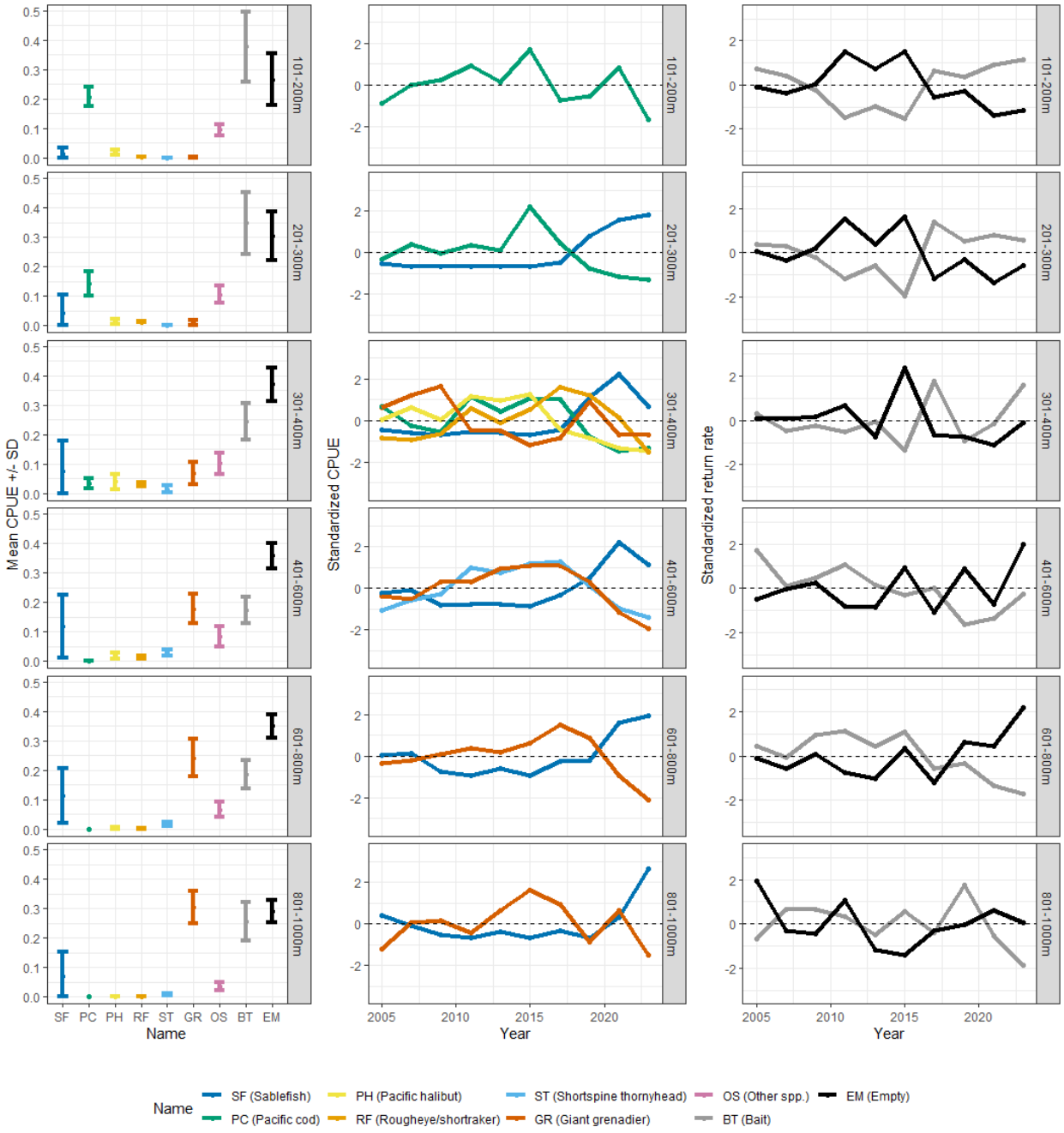

Figure 8. -- Eastern Bering Sea biennial catch trends by depth strata (2005–2023). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

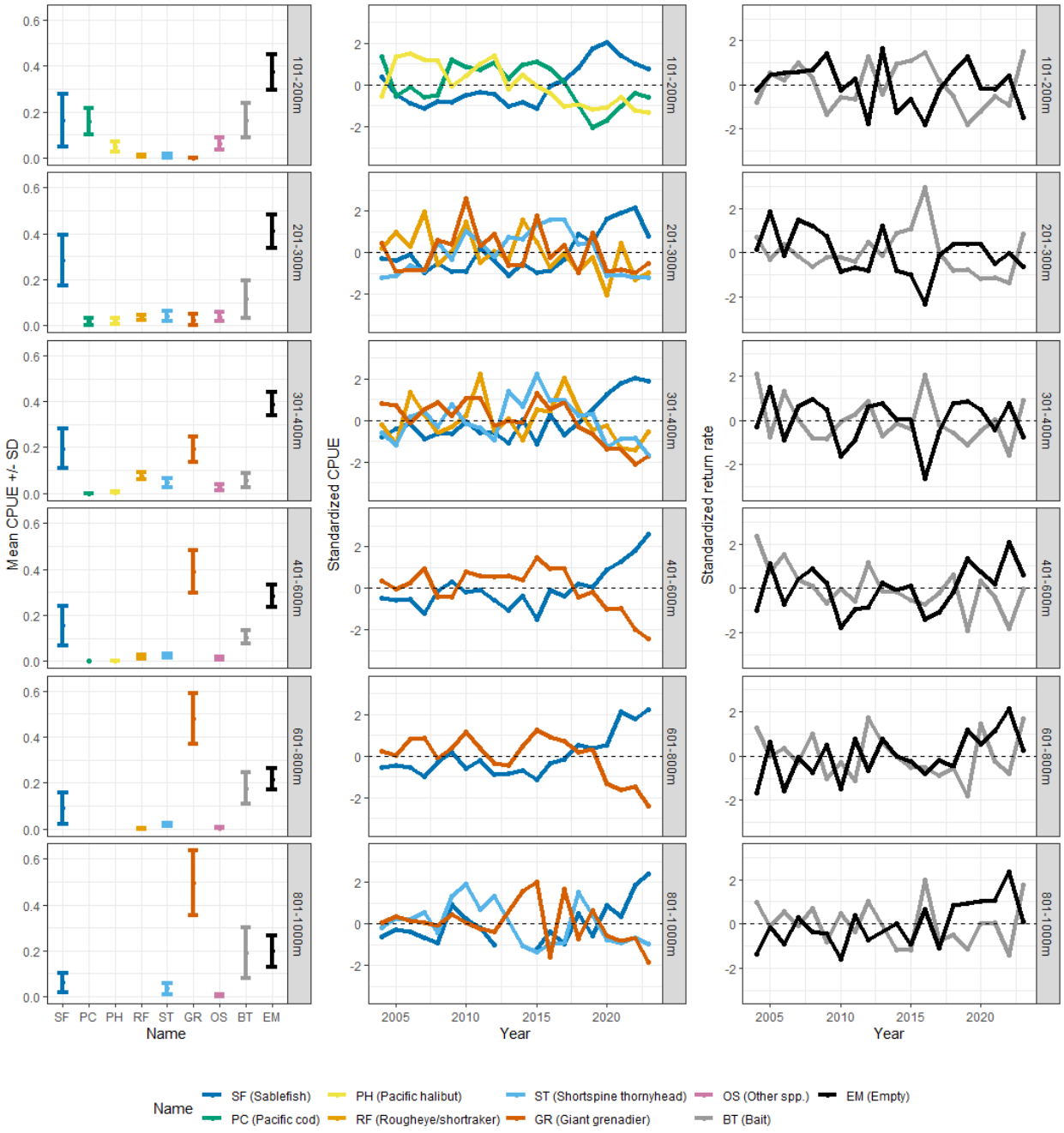

Figure 9. -- Western Gulf of Alaska annual catch trends by depth strata (2004–2023). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

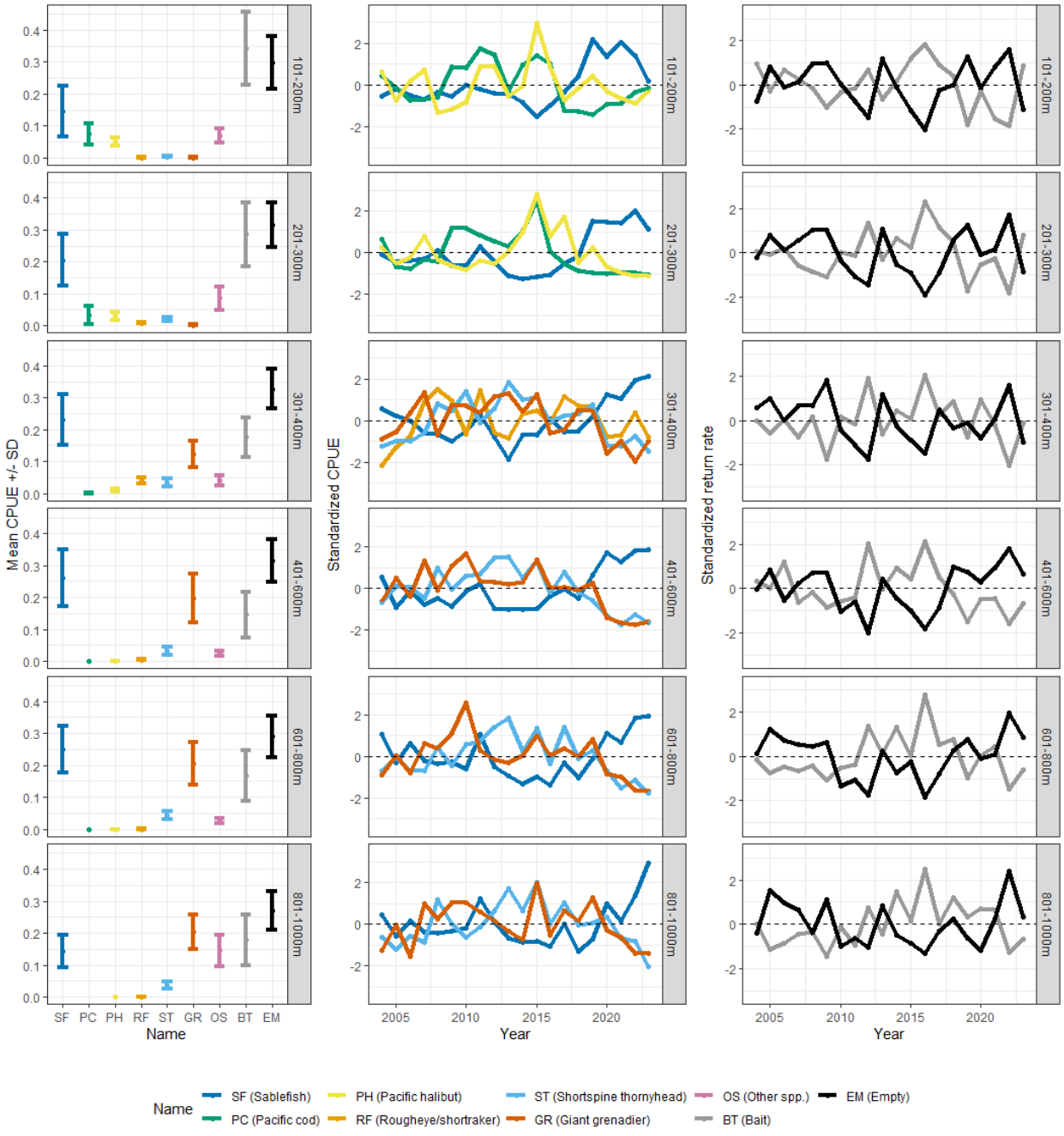

Figure 10. -- Central Gulf of Alaska annual catch trends by depth strata (2004–2023). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

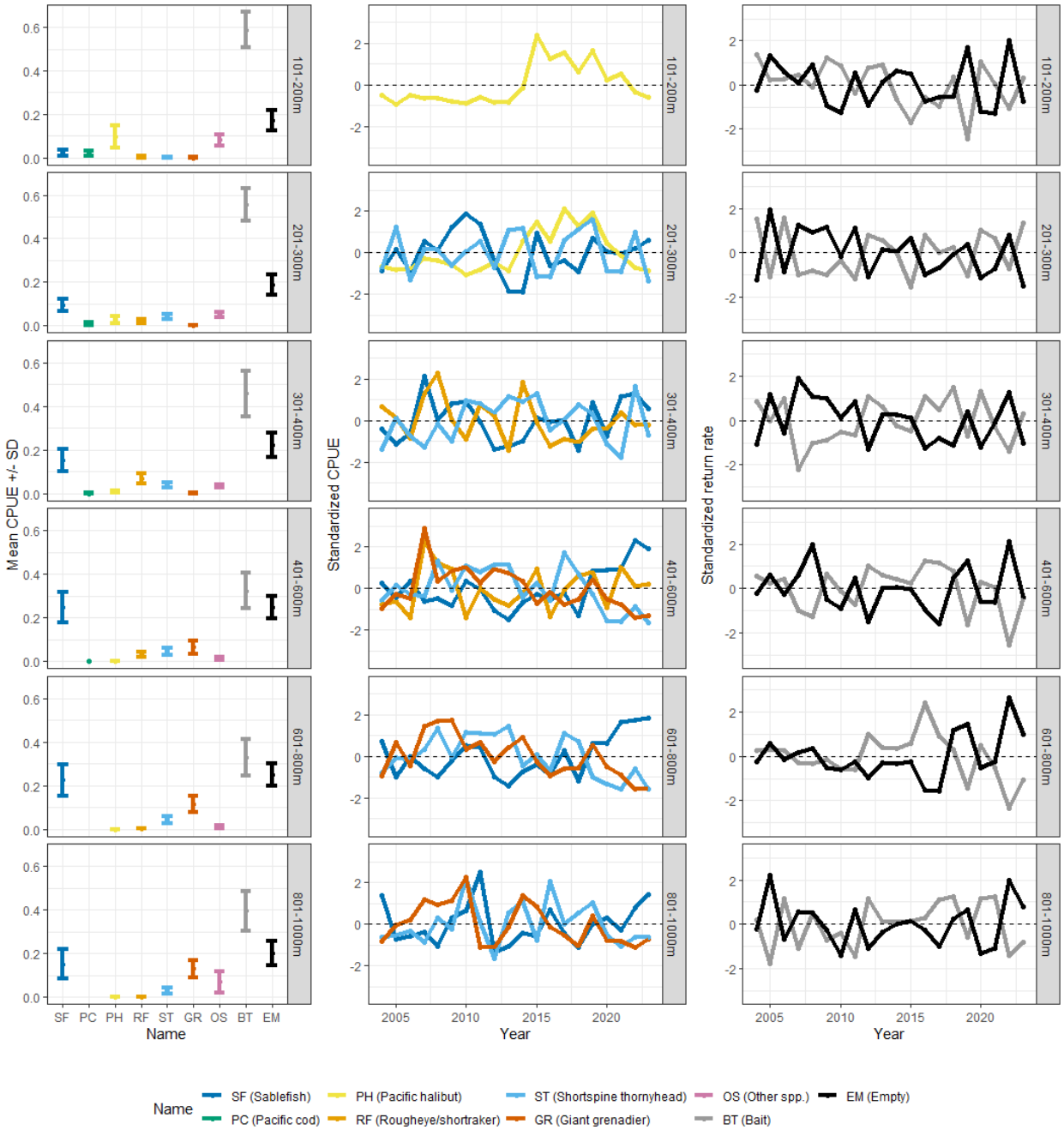

Figure 11. -- West Yakutat annual catch trends by depth strata (2004–2023). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

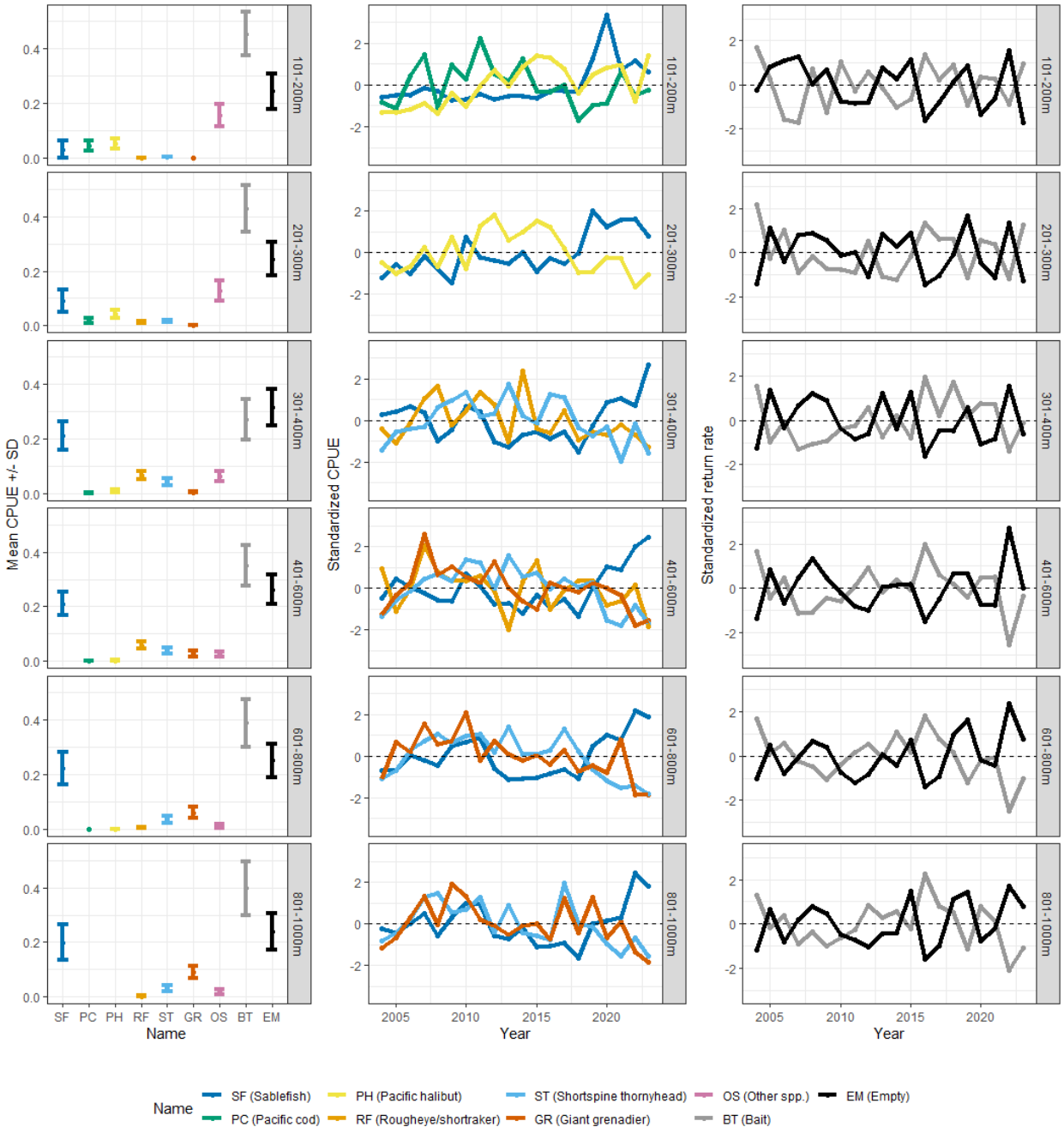

Figure 12. -- East Yakutat/Southeast annual catch trends by depth strata (2004–2023). The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate `of hooks returning empty and with bait.

U.S. Secretary of Commerce
Gina M. Raimondo

Under Secretary of Commerce for Oceans and Atmosphere
Dr. Richard W. Spinrad

Assistant Administrator, National Marine Fisheries Service.
Janet Coit

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National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA 98115-6349