NOAA Technical Memorandum NMFS-AFSC-467

The 2022 Longline Survey of the Gulf of Alaska and Eastern Aleutian Islands on the FV *Alaskan Leader*: Cruise Report AL-22-01

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March 2023

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
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This document should be cited as follows:

Siwicke, K. A., and Malecha, P. W. 2023. The 2022 longline survey of the Gulf of Alaska and eastern Aleutian Islands on the FV *Alaskan Leader*: Cruise Report AL-22-01. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-467, 37 p.

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The 2022 Longline Survey of the Gulf of Alaska and Eastern Aleutian Islands on the FV *Alaskan Leader*: Cruise Report AL-22-01

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ABSTRACT

In 2022, the Alaska Fisheries Science Center completed the 45th annual longline survey in the eastern Aleutian Islands 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 2022 longline survey as well as trends observed on the survey over the last 20 years.

CONTENTS

INTRODUCTION

On 28 August 2022, the Alaska Fisheries Science Center (AFSC) completed the 45th 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 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 AI region were sampled in 2022 (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 2022 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 fishermen, 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 Mustad 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 2022 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 (June 2 to 16), along the upper continental slope of the AI region; Leg 2 (June 17 to July 3), from the western end of Umnak Island and extending eastward to Sand Point; Leg 3 (July 5 to 20), off Dixon Entrance near the U.S.-Canada boundary toward Yakutat; Leg 4 (July 21 to August 3), between Yakutat and Seward including a 3-day experiment; Leg 5 (August 4 to 15), from Seward to Kodiak; and Leg 6 (August 16 to 26), from Kodiak to Dutch Harbor (Fig. 1). In 2022, the survey was delayed by two days at the start, and station 59 in the AI (Leg 1) was 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 Leg 1 in the AI fished 160 skates [7,200 hooks], which 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/blackspotted/ shortraker rockfish, and multiple other rockfish 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% (5% in the AI) 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 index (i.e., relative population numbers or RPN) calculations 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 2022 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 five 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 myriad species in this group made it uninformative.

RESULTS AND DISCUSSION

In 2022, a total of 13 stations along the upper continental slope of the AI 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, 24 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 used for stock assessments, notably cross-shelf gully stations (Table 2).

One hundred forty-six longline hauls were set (one was not recovered) during normal survey operations in 2022 (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, shortspine thornyhead, Pacific cod, 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 halibut, and Pacific cod (Table 6). Length and sex were recorded by region and depth stratum for 76,836 sablefish with a greater number of females being caught, especially at shallower depths and in the AI and WGOA (Fig. 2, note that 43 lengths from depths >1,000 m are not shown).

Lengths were also recorded for 9,512 shortspine thornyhead, 7,179 Giant grenadier, 7,110 rougheye rockfish, 4,995 Pacific cod, and 3,869 shortraker rockfish, among others.

A total of 5,422 sablefish, 434 shortspine thornyhead, and 3 Greenland turbot were tagged with external numbered tags and released during the survey. Otoliths and length-weight data were collected from 3,787 sablefish. The survey caught 42 previously tagged sablefish (including 3 from the Alaska Department of Fish and Game and 8 from Fisheries and Oceans Canada), of which 3 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 1 station in the AI and 4 stations in the WGOA (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 2022 that were excluded due to killer whale depredation was relatively low in the AI and near the 20-year average in the WGOA (Figure 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 13 stations in 2022, 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 two stations in the AI with no depredation evident, two stations in the CGOA with depredation evident at both, two stations in the WY region with depredation evident at one, and seven stations in the EYSE region with depredation evident at six. 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 relatively low in 2022, with WY the region historically most impacted by sperm whale depredation at a 20-year low (Figure 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 nmi 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 2022 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 7 interactions with pot boats (2 in EYSE, 2 in WY, and 3 in the CGOA) and 1 interaction with a longline vessel in the WGOA. There were no vessel interactions in the AI.

Gear damage and loss occurs during survey operations and may have impacts on catch. In 2022, the gear parted at 14 stations (35, 39, 40, 53, 60, 61, 85, 86, 90, 93, 97, 99, 101, 123). When gear parted, it was retrieved by hauling from the opposite end of the set. Gear loss

included 2 skates at station 35, 8 skates at station 60, and an entire set (80 skates) was lost at station 61 because of submerged buoys (Table 3).

In 2022, several special projects continued. Three days of comparisons between hook and line and slinky pots was completed for the second 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 second year of sablefish eyeball 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. Temperature profiles continue a time series starting in 2005 and analyzed through 2021 in Siwicke (2022), showing a continuation of above-average temperature in the AI and a slight increase in subsurface temperature for 2022 from 2021 in all GOA areas (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 (these are generally gully stations described in Table 2 and referred to as "Other Stations" in plots). Sablefish CPUE was at a 20-year high in 2022 for RPN stations in every region sampled, and the relative increase of this 20-year trend is highest in western regions, and slightly less in the CGOA, WY, and EYSE (Fig. 5). Interestingly at non-RPN stations, the CPUE has been relatively high the last 4 years in the CGOA and EYSE but more stochastic throughout the last 20 years in the WY region (Fig. 5). Across sexes and areas, trends in male and female sablefish lengths are similar with a recent decline to time series minimums in 2019 for RPN stations in the GOA regions (Fig. 6); at non-RPN stations which are generally shallower than RPN stations, overall lengths were smaller, and in WY and EYSE there appears to be a minimum mean length for males and females in 2018 and a gradual increase in 2019 preceding the same trend in RPN stations by 1 year (Fig. 6). The combination of smaller mean lengths with higher CPUEs indicates that strong sablefish year classes were being encountered on the survey beginning in 2016 (Figs. 5 and 6).

Catch trends vary by depths and regions, 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 and thornyheads more common deeper than 300 m (Figs. 7–12). The dominant

trend in recent years is that sablefish are relatively high, and most other species are relatively low; one exception is that the WY region only shows this divergence between 401 and 800 m (Figs. 7–12). Shortspine thornyheads had slight increases in 2022 from at or near 20-year lows in 2021 in the CGOA/WY/EYSE (Figs. 10–12). Giant grenadier have been on a downward trajectory since 2019 in most cases (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. However, as the number of hooks with bait returning declines there is generally an increase in the number of empty hooks returning, and this was evident across regions and depths in 2022 (Figs. 7–12). This logical inverse relationship 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 2022 AFSC longline survey.

Leg	Dates	Personnel	Affiliation
1	28 May–15 Jun	Kevin Siwicke	AFSC – ABL
		Andrew Dimond	AFSC – ABL
		Jessica Miller	Contract Biologist
		Derek Wright	Contract Biologist
2	15 Jun–3 Jul	Katy Echave	AFSC – ABL
		Sandi Neidetcher	AFSC – REFM
		Jessica Miller	Contract Biologist
		Akira Wong	Contract Biologist
3	3 Jul–20 Jul	Andrew Dimond	AFSC – ABL
		Ben Williams	AFSC – ABL
		Jessica Miller	Contract Biologist
		Akira Wong	Contract Biologist
4*	23 Jul–3 Aug	Jane Sullivan	AFSC – ABL
		Matt Cheng	UAF
		Jessica Miller	Contract Biologist
		Akira Wong	Contract Biologist
5	4 Aug–16 Aug	Kevin Siwicke	AFSC – ABL
		Madison Bargas	ADF&G
		Jessica Miller	Contract Biologist
		Akira Wong	Contract Biologist
6	16 Aug–28 Aug	Pete Hulson	AFSC – ABL
		Ben Williams	AFSC – ABL
		Jessica Miller	Contract Biologist
		Akira Wong	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
ADF&G – Alaska Department of Fish and Game

Table 2. -- Stations fished in 2022 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
35	Aleutian Islands	Slope	Yes
37	Aleutian Islands	Slope	Yes
38	Aleutian Islands	Slope	Yes
39	Aleutian Islands	Slope	Yes
40	Aleutian Islands	Slope	Yes
42	Aleutian Islands	Slope	Yes
53	Aleutian Islands	Slope	Yes
54	Aleutian Islands	Slope	Yes
55	Aleutian Islands	Slope	Yes
57	Aleutian Islands	Slope	Yes
58	Aleutian Islands	Slope	Yes
60	Aleutian Islands	Slope	Yes
61	Aleutian Islands	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	West Yakutat	Slope	Yes
90	West Yakutat	Slope	Yes
91	West Yakutat	Slope	Yes
92	West Yakutat	Slope	Yes
93	West Yakutat	Slope	Yes
94	West Yakutat	Slope	Yes
95	West Yakutat	Slope	Yes
96	West Yakutat	Slope	Yes
97	East Yakutat/Southeast	Slope	Yes
98	East Yakutat/Southeast	Slope	Yes
99	East Yakutat/Southeast	Slope	Yes
100	East Yakutat/Southeast	Slope	Yes
101	East Yakutat/Southeast	Slope	Yes
102	East Yakutat/Southeast	Slope	Yes
103	East Yakutat/Southeast	Gully	No
104	East Yakutat/Southeast	Slope	Yes
105	East Yakutat/Southeast	Slope	Yes
106	East Yakutat/Southeast	Slope	Yes
107	East Yakutat/Southeast	Slope	Yes
108	East Yakutat/Southeast	Slope	Yes
120	Central Gulf of Alaska	Gully	No
121	Central Gulf of Alaska	Gully	No
122	Central Gulf of Alaska	Gully	No
123	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	West Yakutat	Gully	No
137	West Yakutat	Gully	No
138	West Yakutat	Gully	No
139	West Yakutat	Gully	No
142	East Yakutat/Southeast	Deep Gully	Yes
143	East Yakutat/Southeast	Deep Gully	Yes
144	East Yakutat/Southeast	Deep Gully	Yes
145	East Yakutat/Southeast	Deep Gully	Yes
148	East Yakutat/Southeast	Deep Gully	Yes
149	East Yakutat/Southeast	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 2022 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
35	1	06/03	80	53.03	-170.10	53.05	-170.19	174	177
35	2	06/03	77	53.06	-170.20	53.08	-170.23	181	568
37*	3	06/04	80	52.28	-173.49	52.34	-173.49	142	610
37*	4	06/04	80	52.35	-173.49	52.40	-173.52	628	742
38	5	06/05	80	52.25	-174.84	52.31	-174.78	178	406
38	6	06/05	80	52.33	-174.76	52.34	-174.67	530	694
39	7	06/06	80	52.13	-175.57	52.15	-175.68	108	442
39	8	06/06	80	52.15	-175.68	52.18	-175.78	478	586
40	9	06/07	80	51.97	-176.45	52.00	-176.44	110	456
40	10	06/07	80	52.04	-176.41	52.07	-176.31	720	872
54	11	06/08	80	51.77	-178.16	51.75	-178.25	92	382
54	12	06/08	80	51.75	-178.27	51.73	-178.37	575	572
42	13	06/09	80	51.77	-178.97	51.73	-178.91	286	428
42	14	06/09	80	51.72	-178.90	51.67	-178.82	488	732
53	15	06/10	80	51.41	-178.63	51.36	-178.57	242	456
53	16	06/10	80	51.37	-178.45	51.36	-178.55	629	440
55	17	06/11	80	51.59	-177.61	51.55	-177.70	250	282
55	18	06/11	80	51.55	-177.71	51.53	-177.79	302	825
57	19	06/12	80	51.73	-176.00	51.66	-176.01	186	362
57	20	06/12	80	51.65	-176.02	51.59	-176.06	428	744
58	21	06/13	80	51.85	-175.13	51.79	-175.14	174	328
58	22	06/13	80	51.78	-175.12	51.71	-175.11	354	635
60	23	06/14	80	51.92	-173.50	51.88	-173.59	116	172
60	24	06/14	72	51.88	-173.60	51.87	-173.70	284	165
61	25	06/16	80	52.38	-170.32	52.37	-170.42	234	562
64	27	06/18	90	53.19	-166.85	53.12	-166.89	214	322
64	28	06/18	90	53.11	-166.90	53.04	-166.95	330	1130
62*	29	06/19	90	52.66	-169.01	52.61	-169.10	132	685
62*	30	06/19	90	52.62	-169.11	52.56	-169.19	220	450
63*	31	06/20	90	52.97	-168.13	52.92	-168.21	108	264
63	32	06/20	90	52.91	-168.21	52.84	-168.24	376	620
65	33	06/21	90	53.59	-165.68	53.51	-165.72	118	320
65	34	06/21	90	53.50	-165.74	53.43	-165.79	298	488
66	35	06/22	90	53.74	-164.47	53.68	-164.55	136	326
66	36	06/22	90	53.68	-164.57	53.63	-164.66	308	651

67	37	06/23	90	53.97	-163.27	53.90	-163.33	110	394
67	38	06/23	90	53.90	-163.34	53.86	-163.45	352	668
68	39	06/24	90	54.13	-161.64	54.09	-161.73	118	342
68	40	06/24	90	54.09	-161.75	54.06	-161.85	280	748
69*	41	06/25	90	54.32	-161.06	54.27	-161.15	154	368
69*	42	06/25	90	54.27	-161.17	54.21	-161.24	380	794
70	43	06/26	90	54.37	-160.24	54.30	-160.31	140	312
70*	44	06/26	90	54.30	-160.29	54.23	-160.33	306	620
71	45	06/27	90	54.51	-159.26	54.44	-159.32	138	286
71	46	06/27	90	54.44	-159.33	54.38	-159.43	278	585
72	47	06/28	90	54.63	-158.59	54.56	-158.65	125	380
72	48	06/28	90	54.56	-158.67	54.49	-158.73	330	846
73	49	06/29	90	54.85	-157.74	54.79	-157.82	182	338
73	50	06/29	90	54.79	-157.83	54.71	-157.87	362	540
74	51	06/30	90	55.24	-156.68	55.17	-156.75	150	294
74	52	06/30	90	55.17	-156.74	55.10	-156.77	340	486
75	53	07/01	89	55.64	-155.85	55.57	-155.85	148	212
75	54	07/01	90	55.57	-155.87	55.49	-155.83	210	212
148	55	07/06	90	54.65	-132.84	54.60	-132.94	144	378
149	56	07/06	90	54.60	-133.02	54.60	-133.12	410	408
108	57	07/07	90	54.47	-133.92	54.50	-134.03	261	718
108	58	07/07	90	54.50	-134.01	54.56	-134.08	384	685
107	59	07/08	90	54.90	-134.29	54.96	-134.36	224	380
107	60	07/08	90	54.97	-134.37	55.02	-134.45	448	788
106	61	07/09	90	55.35	-134.73	55.39	-134.84	292	624
106	62	07/09	90	55.40	-134.82	55.39	-134.95	354	792
105	63	07/10	90	55.56	-134.97	55.58	-135.06	245	574
105	64	07/10	90	55.59	-135.05	55.63	-135.13	438	512
144	65	07/11	90	55.94	-134.89	56.01	-134.91	212	370
145	66	07/11	90	56.04	-134.93	56.09	-135.02	356	334
104	67	07/12	90	55.99	-135.44	56.03	-135.54	320	634
104	68	07/12	90	56.04	-135.54	56.10	-135.63	569	876
103	69	07/13	90	56.39	-135.35	56.38	-135.50	155	192
103	70	07/13	90	56.38	-135.51	56.37	-135.64	194	488
102	71	07/14	90	56.85	-136.00	56.90	-136.10	238	671
102	72	07/14	90	56.90	-136.11	56.97	-136.14	763	990
101	73	07/15	90	57.19	-136.24	57.23	-136.35	212	791
101	74	07/15	90	57.23	-136.33	57.29	-136.38	765	838
100	75	07/16	90	57.62	-136.53	57.61	-136.66	225	750

100	76	07/16	90	57.62	-136.67	57.67	-136.75	610	662
142	77	07/17	90	57.92	-137.01	57.92	-137.14	442	398
143	78	07/17	90	57.97	-137.07	57.97	-137.21	426	255
99	79	07/18	90	57.88	-137.38	57.88	-137.53	206	700
99	80	07/18	90	57.89	-137.52	57.90	-137.64	541	592
98	81	07/19	90	58.14	-138.73	58.15	-138.85	228	682
98	82	07/19	90	58.16	-138.86	58.18	-138.97	460	703
97	83	07/20	90	58.47	-139.46	58.46	-139.60	194	497
97	84	07/20	90	58.46	-139.60	58.42	-139.64	427	572
138	85	07/22	90	59.42	-140.94	59.43	-141.09	227	301
139	86	07/22	89	59.41	-141.17	59.35	-141.26	321	325
96	87	07/23	90	58.69	-140.64	58.69	-140.78	229	578
96	88	07/23	90	58.69	-140.77	58.74	-140.90	414	561
95	89	07/24	90	59.05	-141.51	59.05	-141.35	598	287
95	90	07/24	90	59.05	-141.50	59.05	-141.65	552	943
94	91	07/25	90	59.39	-142.16	59.43	-142.30	228	417
94	92	07/25	91	59.47	-142.42	59.43	-142.29	978	340
93	93	07/26	90	59.55	-142.57	59.59	-142.70	130	593
93	94	07/26	90	59.59	-142.69	59.57	-142.83	573	649
92	95	07/27	90	59.55	-143.65	59.55	-143.80	167	759
92	96	07/27	90	59.56	-143.77	59.58	-143.91	661	605
136	103	07/31	90	59.76	-143.71	59.74	-143.57	157	303
137	104	07/31	90	59.72	-143.50	59.67	-143.39	311	296
91	105	08/01	90	59.52	-144.72	59.48	-144.85	184	499
91	106	08/01	90	59.48	-144.86	59.46	-144.97	468	732
90	107	08/02	90	59.50	-145.53	59.52	-145.66	158	576
90	108	08/02	90	59.53	-145.68	59.53	-145.83	523	392
134	109	08/03	90	59.60	-146.97	59.56	-147.05	209	209
135	110	08/03	90	59.52	-147.16	59.45	-147.15	215	209
89	111	08/05	90	59.27	-146.85	59.21	-146.94	192	657
89	112	08/05	90	59.22	-146.97	59.16	-147.08	606	1010
88	113	08/06	90	59.16	-147.60	59.08	-147.61	252	550
88	114	08/06	90	59.08	-147.63	59.00	-147.51	472	920
87	115	08/07	90	59.13	-148.65	59.05	-148.65	151	203
87	116	08/07	90	59.05	-148.64	58.97	-148.65	213	250
132	117	08/08	90	59.08	-149.41	59.04	-149.52	180	227
133	118	08/08	90	58.95	-149.51	58.92	-149.65	243	238
131	119	08/09	90	58.84	-148.93	58.80	-149.05	252	235
130	120	08/09	90	58.78	-148.92	58.73	-149.19	224	176

86	121	08/10	90	58.68	-148.34	58.61	-148.35	281	435
86	122	08/10	90	58.62	-148.33	58.55	-148.38	466	616
85	123	08/11	90	58.29	-148.62	58.22	-148.68	240	526
85	124	08/11	90	58.22	-148.66	58.14	-148.70	515	845
84	125	08/12	90	57.97	-149.17	57.92	-149.26	170	468
84	126	08/12	90	57.93	-149.26	57.85	-149.32	467	835
128	127	08/13	90	58.00	-149.84	57.98	-149.98	223	263
129	128	08/13	90	58.09	-149.94	58.07	-150.03	296	298
83	129	08/14	90	57.63	-149.92	57.56	-149.94	400	584
83	130	08/14	90	57.55	-149.96	57.48	-150.04	590	835
82	131	08/15	90	57.40	-150.57	57.32	-150.61	215	509
82	132	08/15	91	57.32	-150.61	57.25	-150.62	522	700
535	133	08/17	90	57.36	-150.67	57.28	-150.67	226	283
535	134	08/17	90	57.28	-150.69	57.21	-150.68	500	750
523	135	08/18	90	57.22	-151.04	57.14	-151.05	173	540
523	136	08/18	90	57.14	-151.05	57.06	-151.06	507	544
81	137	08/19	90	57.12	-151.23	57.05	-151.28	244	565
81	138	08/19	90	57.04	-151.30	56.97	-151.30	597	861
80	139	08/20	90	56.49	-152.22	56.42	-152.30	137	471
80	140	08/20	90	56.42	-152.32	56.35	-152.37	382	531
79	141	08/21	90	56.31	-153.08	56.26	-153.19	200	603
79	142	08/21	90	56.27	-153.21	56.22	-153.29	476	479
78	143	08/22	90	55.98	-154.03	55.92	-154.00	250	522
78	144	08/22	90	55.91	-154.03	55.85	-154.06	533	895
77	145	08/23	90	56.05	-154.58	55.98	-154.57	228	493
77	146	08/23	90	55.97	-154.58	55.91	-154.58	557	871
76	147	08/24	90	55.76	-155.14	55.69	-155.18	163	355
76	148	08/24	90	55.68	-155.20	55.62	-155.28	357	600
122	149	08/25	90	56.19	-155.96	56.19	-156.10	196	241
123	150	08/25	90	56.23	-156.12	56.25	-156.25	246	261
120	151	08/26	90	55.78	-156.08	55.78	-156.21	205	241
121	152	08/26	90	55.75	-156.21	55.73	-156.34	242	250

*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 2022 AFSC longline survey by management area: AI = Aleutian Islands, WGOA = Western Gulf of Alaska, WY = West Yakutat, and EYSE = East Yakutat and Southeastern Alaska.

Species common name	AI	WGOA	CGOA	WY	EYSE	Total
Sablefish	19,636	27,715	74,863	23,111	34,384	179,709
Giant grenadier	6,078	8,727	8,197	2,038	1,735	26,775
Shortspine thornyhead	1,185	1,223	3,910	3,006	2,903	12,227
Pacific cod	3,606	2,520	1,262	102	367	7,857
Rougheye/blackspotted rockfish	1,498	1,136	1,304	840	2,756	7,534
Pacific halibut	1,414	481	1,846	609	520	4,870
Shortraker rockfish	525	380	747	1,272	1,206	4,130
Arrowtooth flounder	497	226	1,846	245	300	3,114
Spiny dogfish	1	11	372	630	777	1,791
Pacific grenadier	2	87	1,101	506	36	1,732
Yellow Irish lord	1,407	12	0	0	0	1,419
Longnose skate	2	147	594	332	342	1,417
Redbanded rockfish	14	14	350	168	792	1,338
Aleutian/Bering/Alaska skate	392	141	432	63	77	1,105
Whiteblotched skate	989	1	0	0	3	993
Skates unidentified	364	11	14	10	10	409
Sea anemone	2	77	140	27	158	404
Yelloweye rockfish	0	93	28	69	171	361
Kamchatka flounder	342	1	0	0	0	343
Sea pen/whip	77	12	142	17	5	253
Commander skate	226	0	0	0	7	233
Crinoid	2	7	163	2	7	181
Brittle star	0	55	83	10	12	160
Dover sole	0	0	73	27	58	158
Sea star	6	8	45	19	75	153
Walleye pollock	23	101	24	3	2	153
Basket star	36	9	52	11	30	138
Gorgonian coral	106	9	2	0	19	136
Spotted ratfish	0	0	0	0	129	129
Sponge	88	32	3	0	3	126
Lips/jaws - depredation	25	33	16	12	36	122
Darkfin sculpin	113	1	0	0	0	114
Greenland turbot	113	0	0	0	0	113
Hydrocoral	80	15	8	1	5	109

Table 5. -- Catch in numbers by station for major species in the 2022 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
35	729	686	44	603	36	5	16	6	788	307
37*	2,212	242	753	21	14	15	5	14	183	90
38	2,603	187	681	42	50	39	72	116	21	59
39	2,303	282	398	271	172	7	15	26	52	245
40	1,561	171	672	70	116	27	45	69	58	99
42	1,319	213	710	51	0	3	368	64	191	128
53	1,734	19	357	23	2	0	335	398	9	123
54	1,334	541	259	67	19	16	179	68	115	1,018
55	1,717	247	554	39	0	1	69	137	36	195
57	1,293	145	556	36	24	0	41	40	17	96
58	978	206	786	107	46	0	148	128	11	145
60	1,166	667	79	53	15	0	712	11	78	341
61	687	0	229	31	3	0	18	108	90	59
62*	1,807	167	1,326	25	11	0	401	84	17	151
63*	3,203	144	834	15	47	0	369	193	13	98
64	3,518	0	211	1	1	0	147	132	8	117
65	3,092	637	688	73	34	0	18	41	37	100
66	3,613	275	396	6	13	0	48	68	15	59
67	2,445	374	1,097	39	14	0	157	43	8	114
68	2,826	314	664	104	37	0	211	337	13	86
69*	1,538	18	1,697	13	17	0	15	84	25	36
70*	2,175	422	1,086	175	23	0	45	133	13	55
71	3,498	169	728	30	29	0	105	108	12	37
72	2,535	168	1,079	57	30	0	106	141	11	41
73	2,957	13	691	15	28	0	91	214	8	29
74	3,226	8	429	12	7	0	24	331	4	57
75	2,268	128	0	268	54	0	1	1	21	42
76	3,423	46	257	45	131	0	99	167	1	125
77	3,550	0	860	0	20	0	51	151	1	82
78	3,056	0	297	113	30	0	59	217	3	472
79	4,106	0	370	6	26	0	110	155	1	34
80	1,996	32	502	185	83	0	376	246	9	113
81	3,000	0	664	3	63	0	62	136	2	310
82	3,578	2	386	19	26	0	52	82	3	35

83	2,726	0	600	0	4	0	6	153	0	300
84	2,919	18	297	44	22	0	44	105	9	173
85	3,760	0	357	4	44	0	37	186	7	63
86	2,721	0	237	64	99	0	194	365	10	42
87	2,997	274	0	196	198	0	15	92	118	170
88	2,671	0	410	57	93	0	346	284	28	131
89	2,555	23	461	47	21	0	76	220	19	323
90	2,046	15	237	61	9	0	295	94	14	146
91	2,487	41	204	52	30	0	283	406	16	132
92	3,015	15	326	78	10	0	64	225	23	69
93	3,323	1	188	86	6	0	70	313	7	81
94	1,887	0	144	33	24	0	292	304	42	216
95	2,695	0	316	34	34	0	530	484	61	78
96	2,371	0	162	12	16	0	354	280	26	66
97	2,393	9	98	48	10	0	135	301	24	240
98	2,673	0	167	4	5	0	233	99	5	38
99	1,694	0	232	2	11	0	167	77	10	151
100	3,215	7	108	7	6	0	43	131	3	64
101	2,632	9	356	9	22	0	100	102	8	73
102	2,653	3	267	7	11	0	40	208	7	54
103	1,157	181	3	282	82	0	42	23	64	671
104	2,984	0	93	3	0	0	290	228	6	32
105	2,568	14	143	22	3	0	531	160	19	184
106	2,074	0	45	3	5	0	699	271	5	65
107	1,142	3	56	5	3	0	720	188	24	131
108	1,484	1	127	1	1	0	633	181	14	146
120	1,444	21	0	80	53	0	1	1	11	51
121	1,568	2	0	92	43	0	1	12	3	73
122	1,720	190	0	85	51	0	0	4	17	56
123	1,615	9	0	47	72	0	0	0	10	93
128	1,840	7	0	30	38	0	10	36	19	25
129	1,406	0	0	7	42	0	5	66	30	9
130	1,298	52	0	63	150	0	5	110	32	112
131	1,681	9	0	30	87	0	22	149	31	28
132	1,059	277	0	50	105	0	4	135	31	154
133	1,260	0	0	42	84	0	1	81	91	68
134	784	1	0	2	31	0	52	65	53	109
135	1,346	2	0	14	30	0	166	53	58	103
136	397	7	0	98	15	0	89	163	27	184

137	738	0	0	28	11	0	8	339	35	22
138	441	0	0	46	46	0	45	127	28	234
139	1,156	0	0	34	23	0	6	51	45	131
142	1,684	0	29	3	1	0	20	108	3	3
143	1,718	1	9	10	63	0	37	112	15	106
144	730	24	0	54	23	0	138	236	50	118
145	1,230	0	0	14	17	0	115	212	22	202
148	962	115	0	35	35	0	8	148	69	316
149	1,391	0	2	11	2	0	11	118	29	58
523	3,677	3	540	53	45	0	41	80	0	36
535	2,676	0	221	163	57	0	70	92	0	33

*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 2022 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	40,778	56,775	168,521	68,393	86,756	421,223
Giant grenadier	20,236	23,167	24,418	6,189	5,865	79,875
Pacific halibut	8,344	2,838	10,893	3,594	3,069	28,738
Pacific cod	10,407	9,071	4,097	353	1,190	25,118
Rougheye/blackspotted	1,504	1,446	1,769	1,347	5,176	11,242
Longnose skate	15	1,096	4,428	2,475	2,550	10,564
Shortspine thornyhead	1,192	911	2,904	2,326	2,449	9,782
Shortraker rockfish	453	510	1,210	2,487	2,051	6,711
Arrowtooth flounder	766	376	4,136	592	560	6,430
Whiteblotched skate	5,327	5	0	0	16	5,348
Spiny dogfish	3	27	984	1,703	2,416	5,133
Redbanded rockfish	25	25	621	298	1,406	2,375
Skates unidentified	1,847	56	71	51	51	2,076
Pacific grenadier	3	196	1,091	469	30	1,789
Yellow Irish lord	1,179	10	0	0	0	1,189
Yelloweye rockfish	0	268	81	199	493	1,041
Kamchatka flounder	958	2	0	0	0	960
Commander skate	720	0	0	0	22	742
Lingcod	0	0	172	107	263	542
Spotted ratfish	0	0	0	0	470	470
Greenland turbot	414	0	0	0	0	414
Dover sole	0	0	109	40	86	235
Pacific sleeper shark	0	173	0	58	0	231
Walleye pollock	33	144	34	4	3	218
Mud skate	203	0	0	0	0	203
Octopus	88	76	13	0	0	177
Big skate	10	0	110	10	20	150
Silvergray rockfish	0	0	2	32	81	115
Sea anemone	1	21	39	7	44	112

Table 7. -- Stations and skates depredated by killer whales during the 2022 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 fished
37	Aleutian Islands	87	160
62	Western Gulf of Alaska	175	180
63	Western Gulf of Alaska	22	180
69	Western Gulf of Alaska	140	180
70	Western Gulf of Alaska	32	180

Table 8. -- Stations that had sperm whales present during hauling operations in the 2022 AFSC longline survey. Depredation is defined as sperm whales being present with the occurrence of damaged fish on the line.

Station	Region	Present	Depredation
54	Aleutian Islands	Yes	No
55	Aleutian Islands	Yes	No
78	Central Gulf of Alaska	Yes	Yes
84	Central Gulf of Alaska	Yes	Yes
89	West Yakutat	Yes	No
90	West Yakutat	Yes	Yes
98	East Yakutat/Southeast	Yes	Yes
99	East Yakutat/Southeast	Yes	Yes
102	East Yakutat/Southeast	Yes	No
103	East Yakutat/Southeast	Yes	Yes
106	East Yakutat/Southeast	Yes	Yes
107	East Yakutat/Southeast	Yes	Yes
144	East Yakutat/Southeast	Yes	Yes

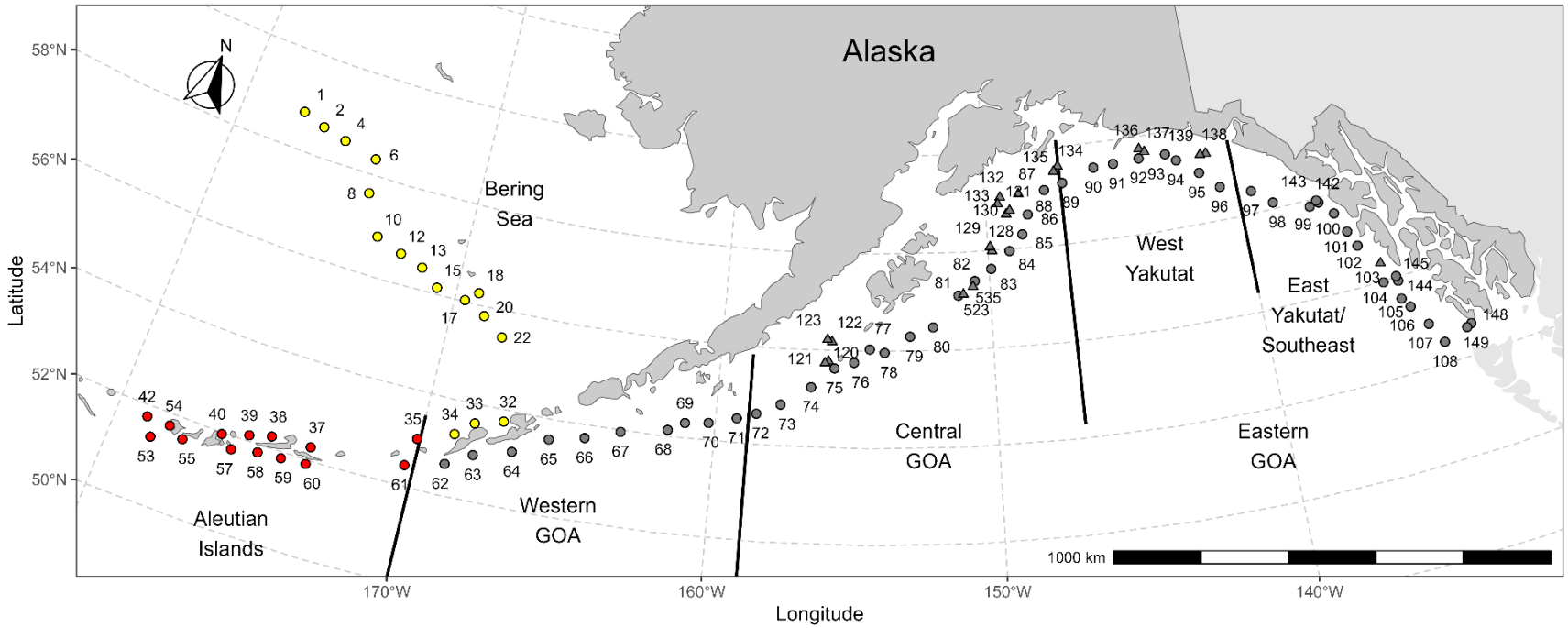

Figure 1. -- Map of NMFS-AFSC longline survey station locations. Bering Sea stations (yellow) are sampled in odd years, Aleutian Islands stations (red) are sampled in even years, and Gulf of Alaska (GOA) stations (grey) are sampled every year. Circles indicate stations included in abundance index (i.e.,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

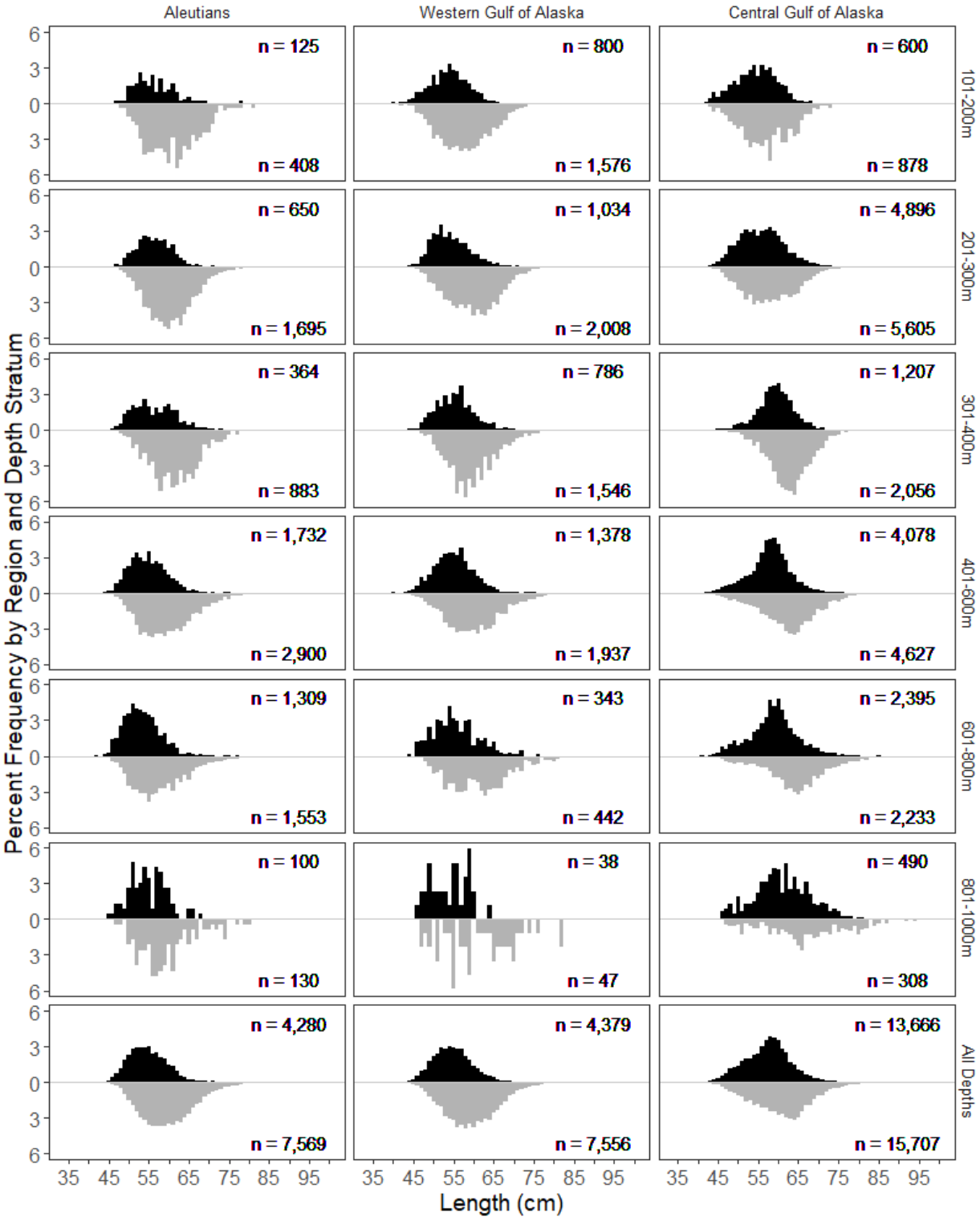

Figure 2. -- Size composition of sablefish measured during the 2022 AFSC longline survey by region and depth stratum. Males are shown in black and females are shown in grey below the x-axis.

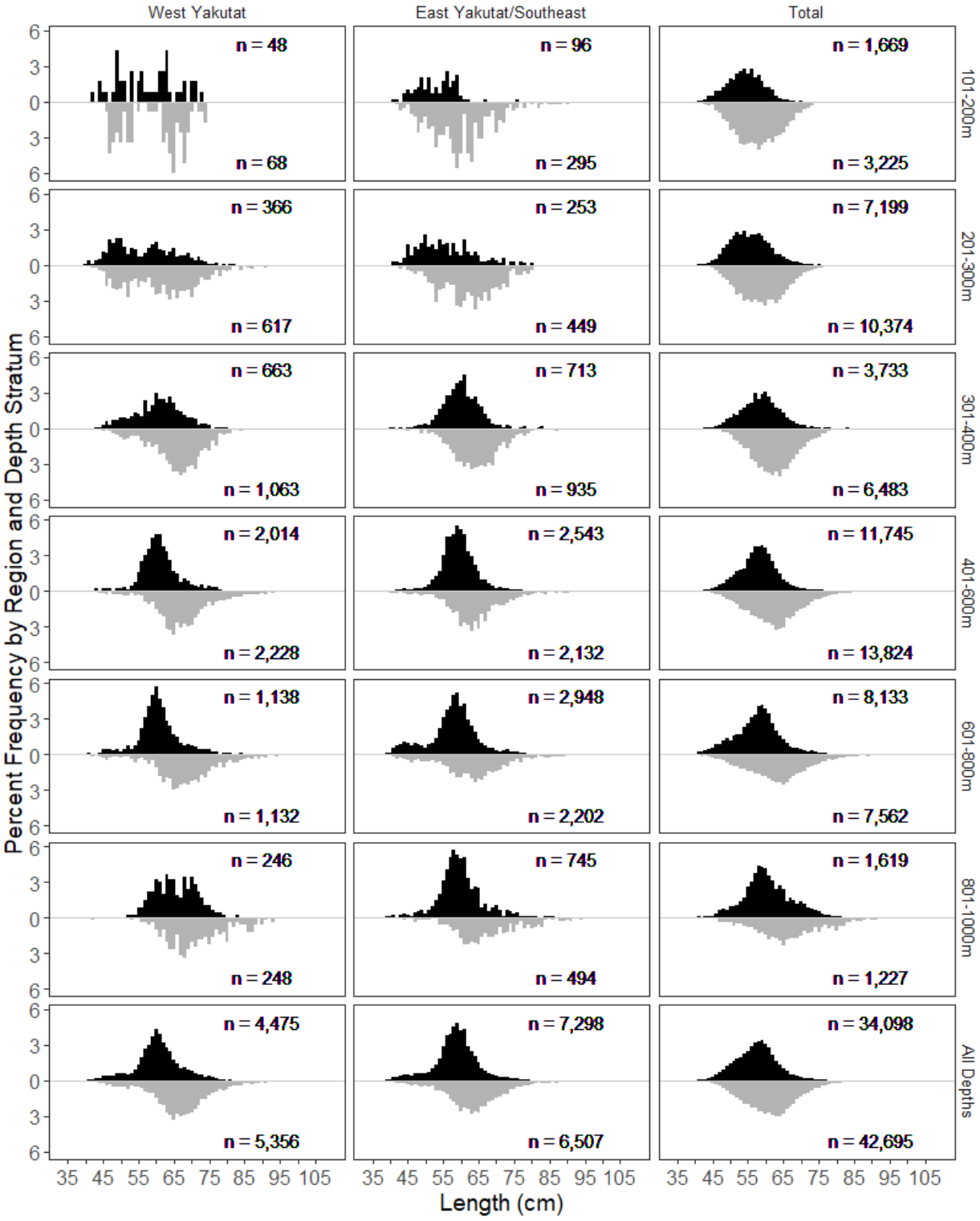

Figure 2. -- Continued.

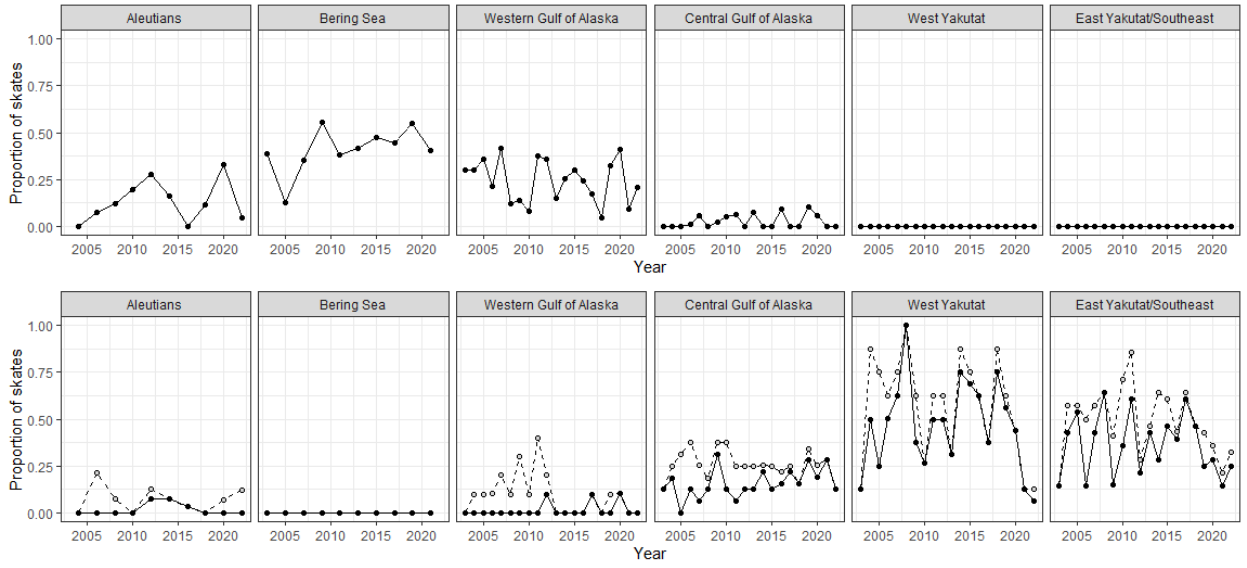

Figure 3. -- Trends in whale interactions on the AFSC longline survey, where the top panels show the proportion of skates with killer whale depredation which are removed from abundance calculations. The bottom panels show the proportion of skates with sperm whale presence (open circles and dashed line) 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).

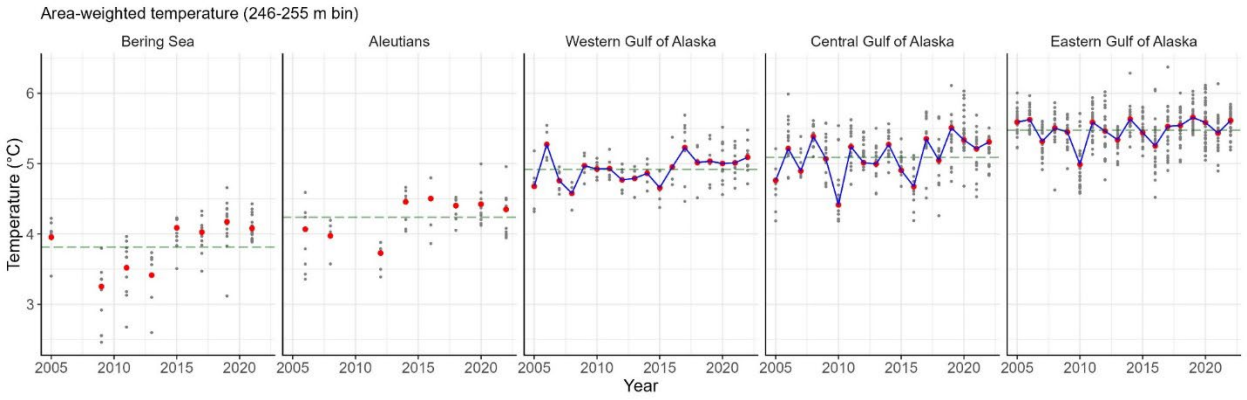

Figure 4. -- Regional subsurface temperature trends from the AFSC longline survey averaged from 1-m increments in the 246–255m depth bin, where grey points are individual measurements and the red dots are area-weighted means. Horizontal dashed lines are regional time series means. For more details, see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

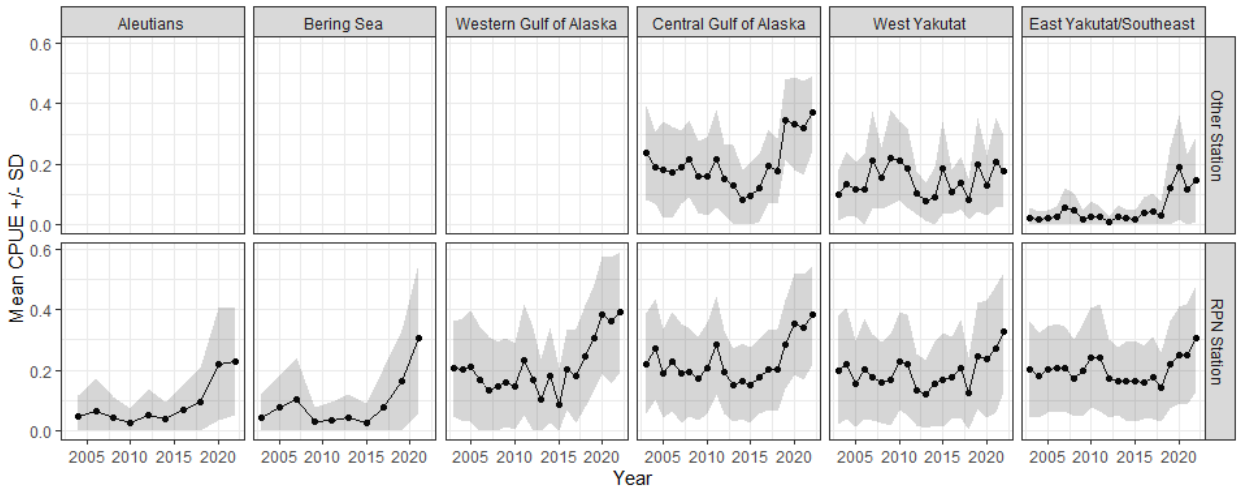

Figure 5. -- Trends in mean sablefish catch per unit effort (CPUE, number of sablefish per hook) from the AFSC longline survey by region and separated by station inclusion in abundance index calculations (top row "Other station" are not included and bottom row "RPN station" are included). Shading indicates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

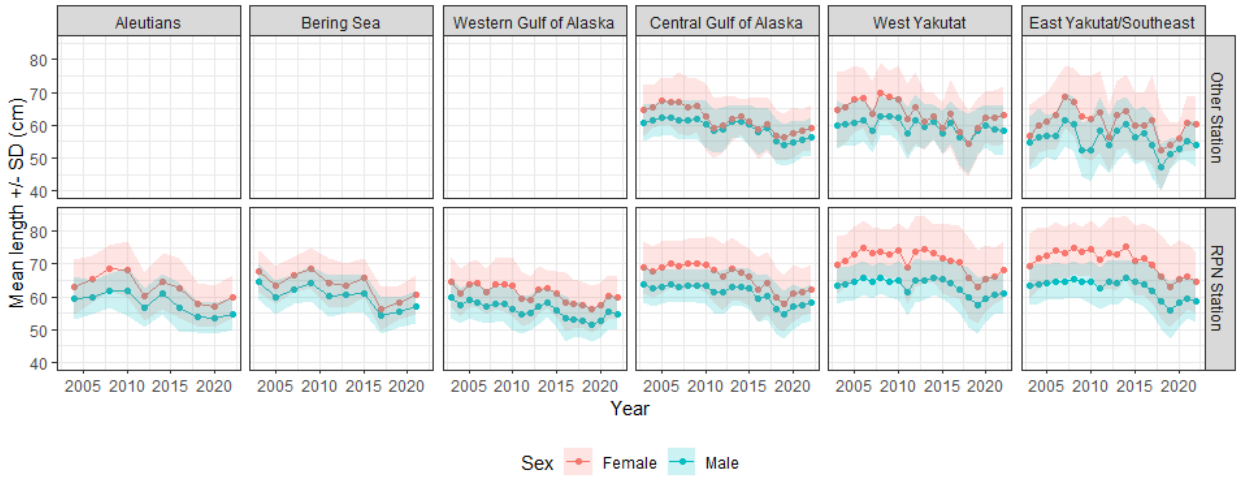

Figure 6. -- Trends in mean fork length of sablefish (female in red, male in blue) measured during the AFSC longline survey by region and separated by station inclusion in abundance index calculations (top row "Other station" are not included and bottom row "RPN station" are included). Shading indicates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

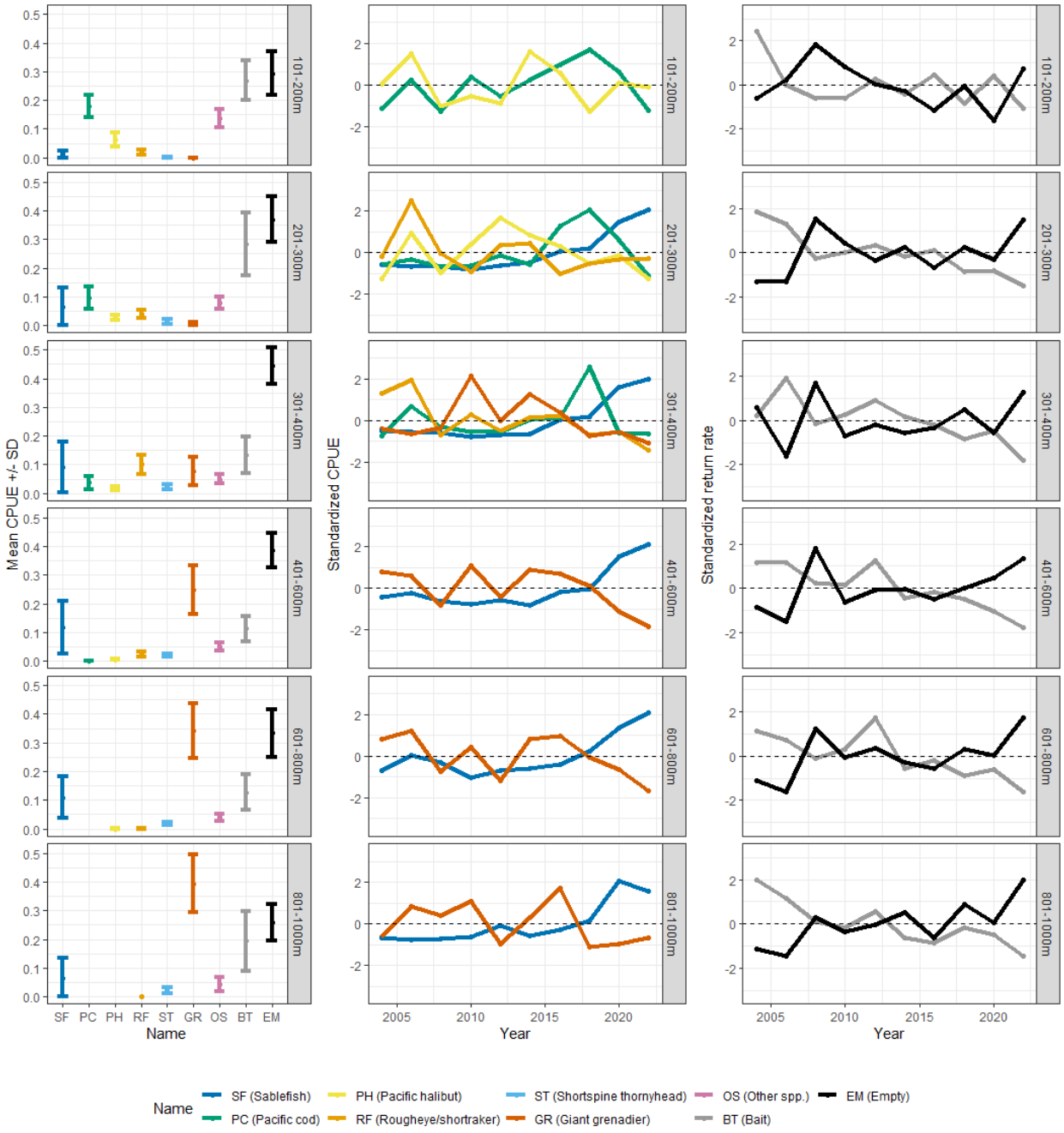

Figure 7. -- Aleutian Islands 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

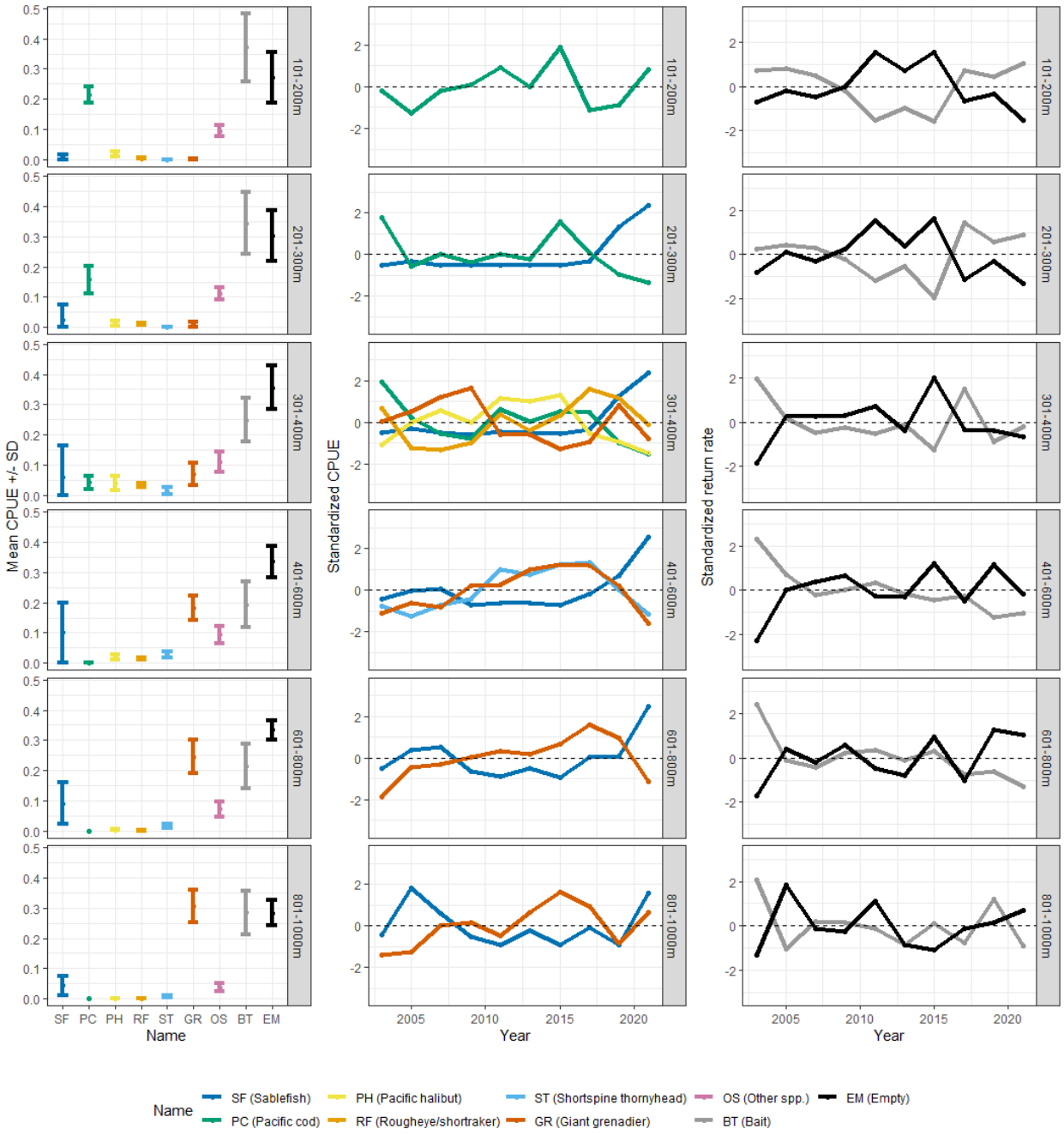

Figure 8. -- Eastern Bering Sea 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

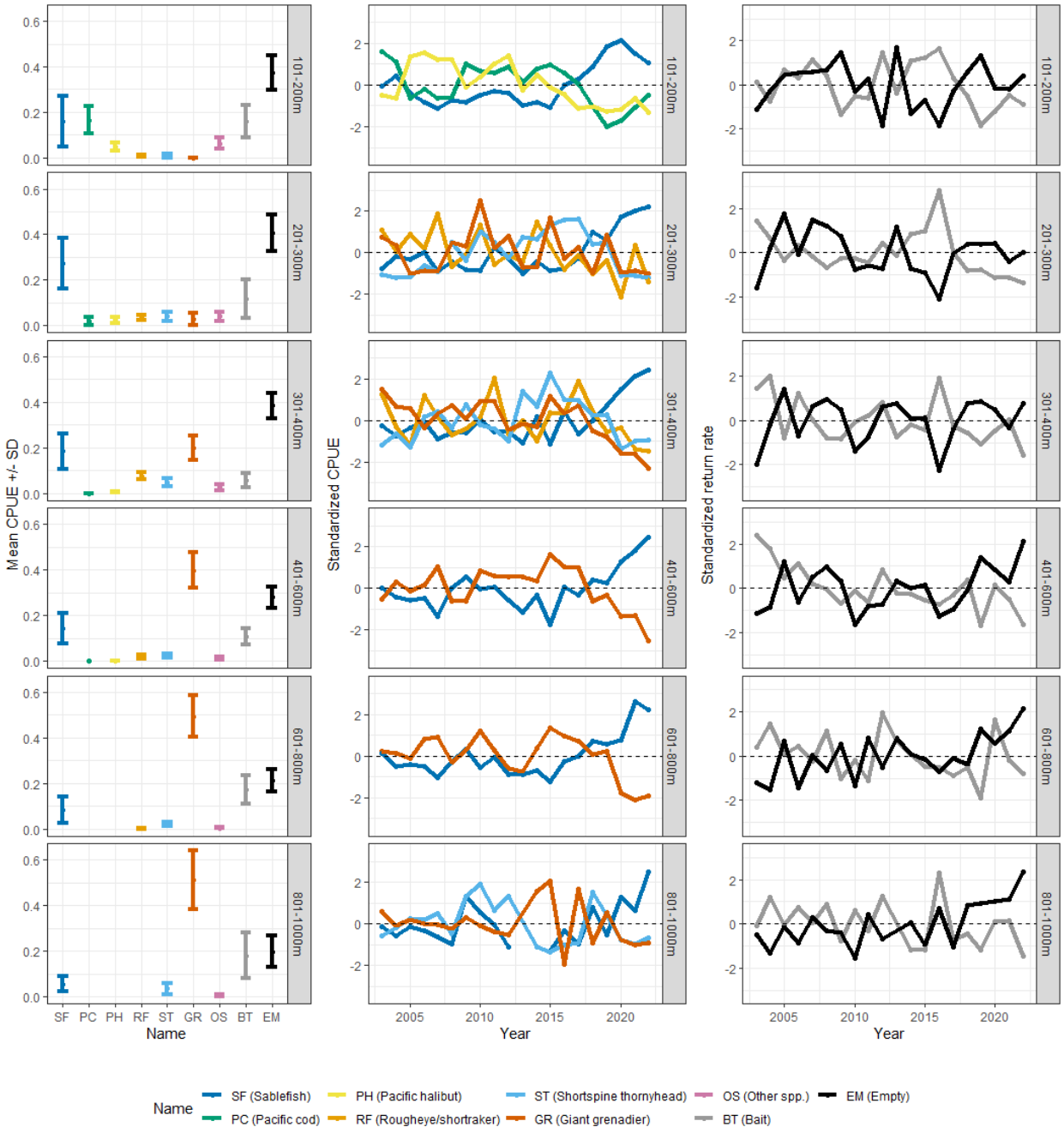

Figure 9. -- Western Gulf of Alaska 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

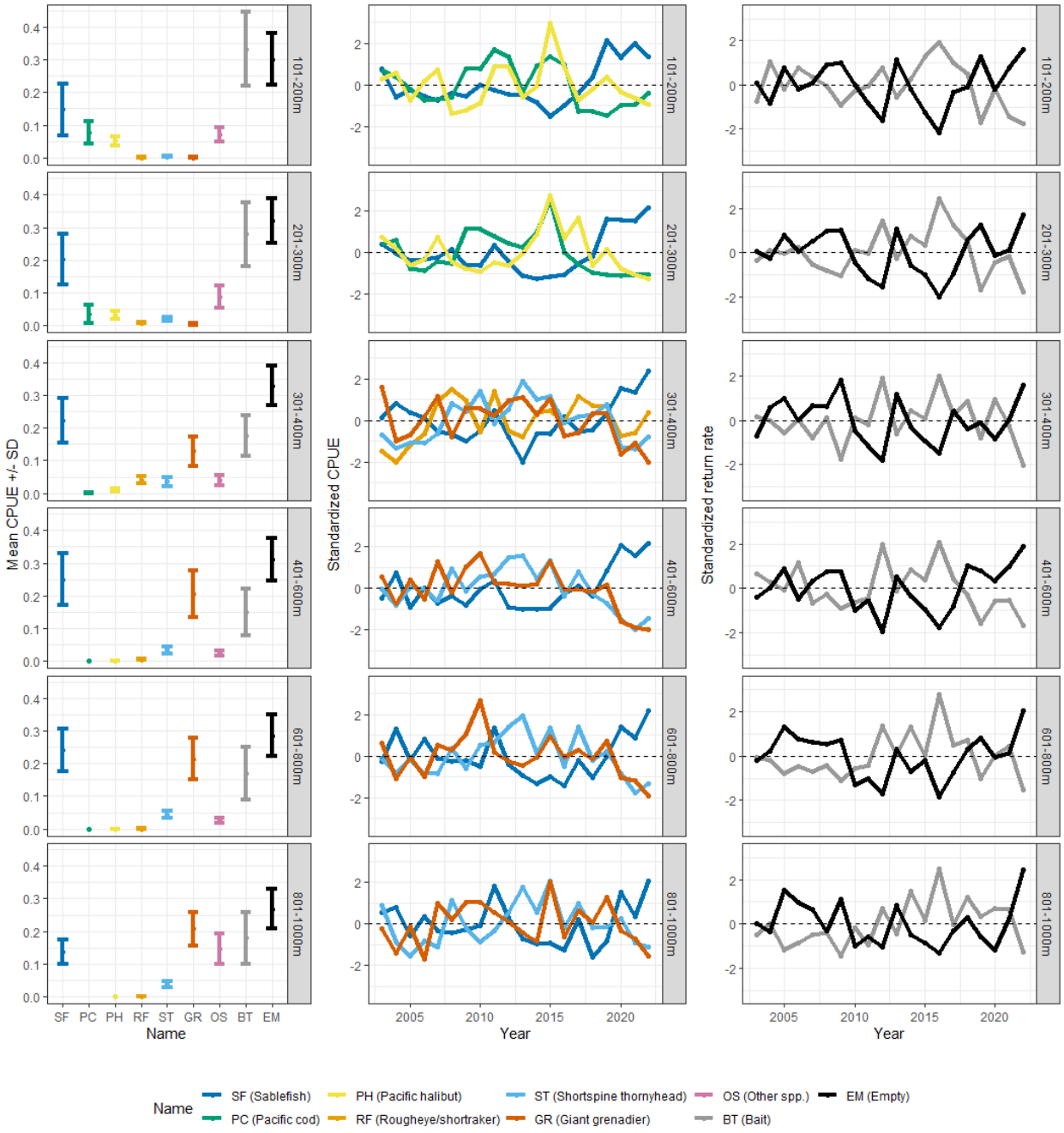

Figure 10. -- Central Gulf of Alaska 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

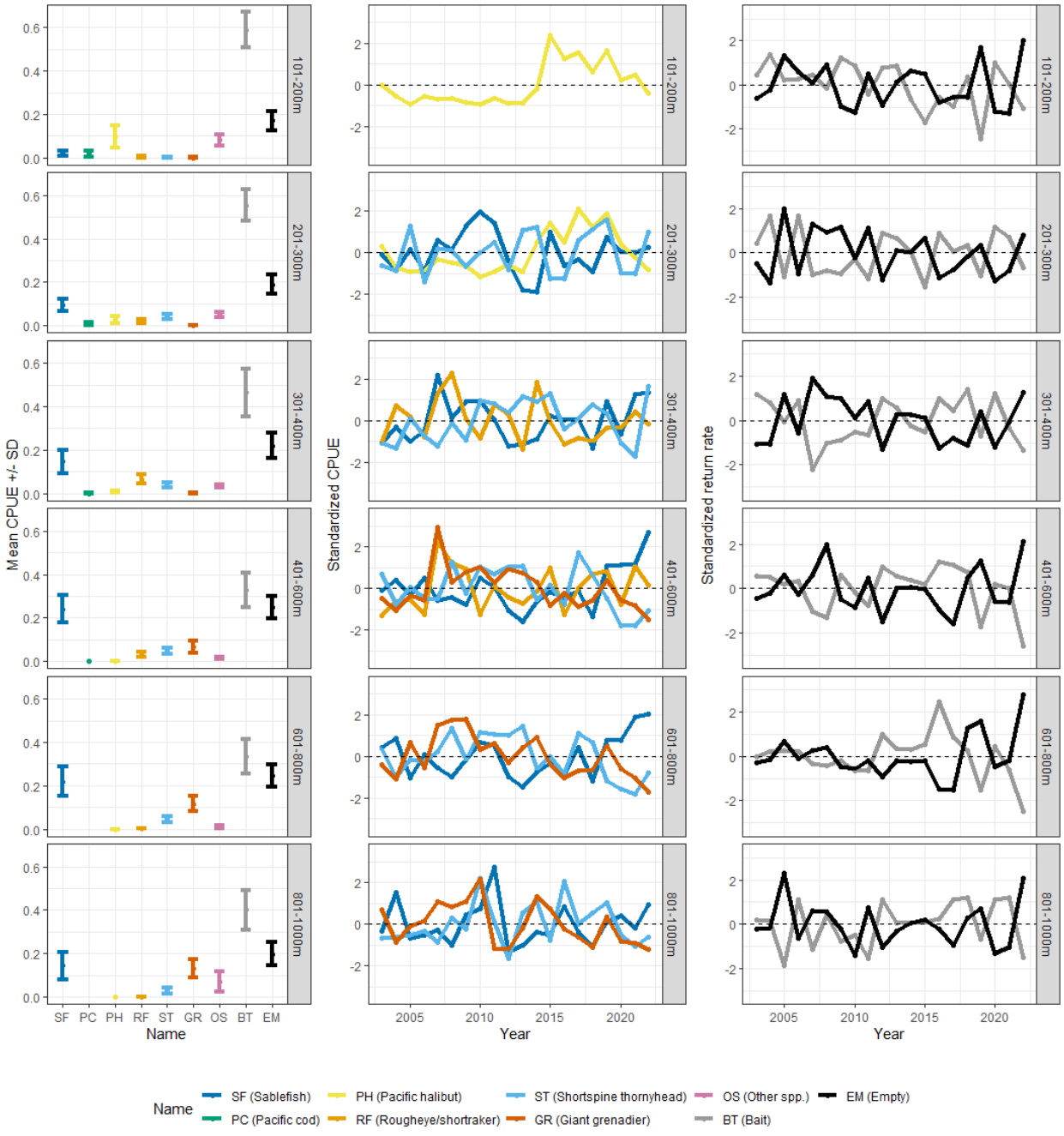

Figure 11. -- West Yakutat 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate of hooks returning empty and with bait.

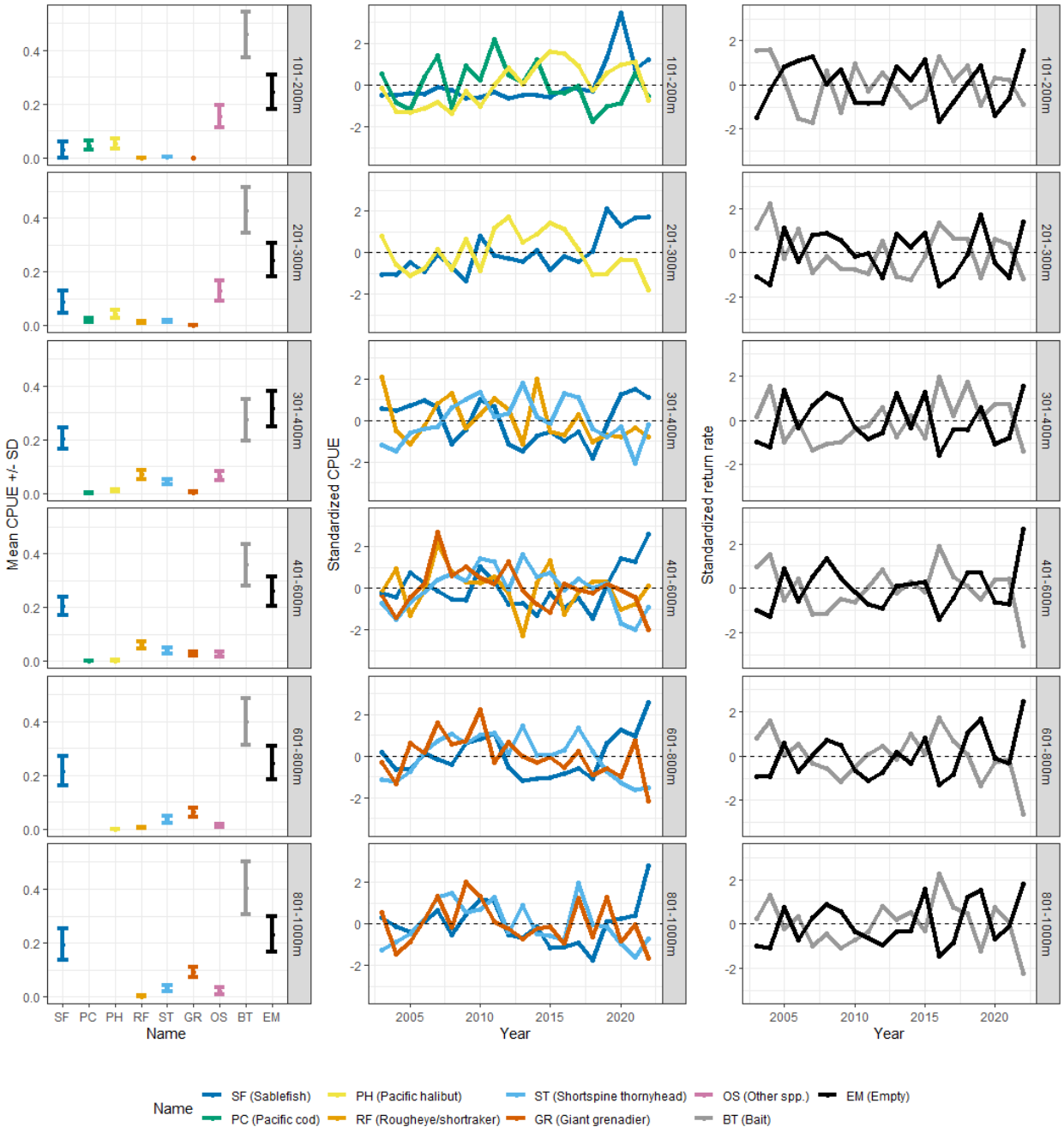

Figure 12. -- East Yakutat/Southeast 20-year catch trends by depth strata. The left column shows the mean catch per unit effort (CPUE) +/- 1 standard deviation (SD). The middle column shows the standardized (mean of 0, SD of 1) CPUE for species (except 'Other spp.') that had a mean CPUE > 0.025 (i.e., > 2.5% catch rate). The right column shows the standardized rate `of hooks returning empty and with bait.

U.S. Secretary of Commerce
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March 2023

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