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The 2019 Longline Survey of the Gulf of Alaska and Eastern Bering Sea on the FV *Ocean Prowler*: Cruise Report OP-19-01

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The 2019 Longline Survey of the Gulf of Alaska and Eastern Bering Sea on the FV *Ocean Prowler*: Cruise Report OP-19-01

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ABSTRACT

The Alaska Fisheries Science Center (AFSC) has annually completed a bottom longline survey in Alaska since 1978. The survey samples demersal waters of the upper continental slope and is primarily designed to assess the sablefish (*Anoplopoma fimbria*) stock, although several other groundfish species are caught in significant numbers. In 2019, the 42nd annual longline survey sampled stations in the eastern Bering Sea region and the Gulf of Alaska. The primary objectives of the survey were to determine 1) the relative abundance of groundfish species through a standardized longline survey, 2) the age composition of sablefish through otolith collection, and 3) movement patterns of selected groundfish species through a tag and release program.

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INTRODUCTION

On 28 August 2019, the Alaska Fisheries Science Center (AFSC) completed the 42nd annual longline survey of Alaska sablefish (*Anoplopoma fimbria*) and other groundfish resources of the upper continental slope (Fig. 1). This survey was designed to continue the time series (1978–1994) of the Gulf of Alaska portion of the Japan-U.S. cooperative longline survey that was discontinued after 1994. The National Marine Fisheries Service (NMFS) has surveyed the Gulf of Alaska annually since 1987. Since 1996, the eastern and central Aleutian Islands have been surveyed in even years and the eastern Bering Sea has been surveyed in odd years. The Gulf of Alaska and the eastern Bering Sea region were sampled in 2019. The purpose of this report is to summarize raw survey data and detail survey operations. Data generated from the longline survey will be used for calculating relative population numbers and weights. This information is available by management area and station at: https://apps-afsc.fisheries.noaa.gov/maps/longline/Map.php. Ultimately, the data will be used for assessing stock status of Alaska groundfish. Stock Assessment and Fishery Evaluation (SAFE) Reports can be found at: https://www.npfmc.org/safe-stock-assessment-and-fishery-evaluation-reports.

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: 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 migration patterns.
5. Conduct special projects related to groundfish biology, stock assessment, and marine mammal interactions.

Vessel and Gear

Survey operations in 2019 were conducted using the FV *Ocean Prowler*, a chartered U.S. longline vessel. The 47 m (155 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 consisted of a captain, an engineer, a cook, a quality-control technician, two contract biologists, six fishermen, and five processors.

Gear configuration was standardized and has been consistent for all survey years since 1988. 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 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 nylon running line. Units of

gear (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 (3/8-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.

Operations

The 2019 charter began on 26 May in Dutch Harbor, Alaska, and ended on 28 August in Dutch Harbor. The charter period was divided into seven legs (Table 1). The stations sampled during each leg were as follows: Leg 1, along the upper continental slope of the eastern Bering Sea 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, in the Yakutat vicinity (2-day experiment, see Appendix); Leg 5, between Yakutat and Cordova; Leg 6, from Cordova to Kodiak; and Leg 7, from Kodiak to Sand Point (Fig. 1).

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 central Gulf of Alaska. 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 desire to finish the survey as early as possible.

In 2019, a total of 16 stations along the upper continental slope of the eastern Bering Sea region and 47 stations along the upper continental slope of the Gulf of Alaska 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, 23 stations were sampled in gullies at the rate of 1 or 2 stations per day. The sampled gullies were Shelikof Trough, Amatuli Gully, W-grounds, Yakutat Valley, Spencer Gully, Ommaney Trench, and Dixon Entrance. One station (103) was sampled on the continental shelf off Baranof Island. Stations spanned a variety of management areas and habitat types, and not all were used in abundance index calculations reported for sablefish, notably gully stations on the continental shelf (Table 2). However, abundance calculations are performed for all species at all stations and are available at the station level for slope and gully stations.

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 and was completed by about 1930 hours. At each station along the upper continental slope, two baited groundlines were laid end-to-end; the total groundline set each day was 16 km (8.6 nautical miles [nmi]) long and contained 160 skates and 7,200 hooks, except in the eastern Bering Sea where 180 skates with 8,100 hooks were set. A single groundline of 80 skates was set at each station in the gullies, except Amatuli Gully (station 87) where 160 skates were set. Specific information regarding longline survey protocols and additional details about the survey gear can be found at: https://www.afsc.noaa.gov/ABL/MESA/pdf/LSprotocols.pdf.

Data Collection

Catch data were recorded on hand-held ruggedized computers. During gear retrieval a scientist 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, and multiple 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

tagged on every 20th skate beginning with skate 10 of every set. Pacific halibut were counted and released at the rail without measuring. Catch and length frequency data were transferred to a computer and electronic backup media twice a day. As in previous surveys, the charter vessel was allowed to retain most of the catch once the scientific data were recorded.

RESULTS AND DISCUSSION

One hundred fifty-four longline hauls were completed during normal survey operations in 2019 (Table 3); four additional hauls (91–94) were completed during a special 2-day experimental leg in July (see Appendix). During normal survey operations, sablefish was the most frequently caught species, followed by giant grenadier, shortspine thornyhead, Pacific cod, and rougheye/blackspotted rockfish (Table 4). Catch of the most abundant species by station is presented in Table 5. Sablefish was also the highest catch by weight, followed by giant grenadier, Pacific halibut, and Pacific cod (Table 6). Length composition of sablefish varied by region and depth stratum (Fig. 2).

A total of 5,399 sablefish, 735 shortspine thornyhead, and 10 Greenland turbot were tagged with external numbered tags and released during the survey. Otoliths and length-weight data were collected from 3,502 sablefish.

Killer whale (*Orcinus orca*) depredation on the catch occurred at 10 stations in the eastern Bering Sea, 4 stations in the western Gulf of Alaska, and 3 stations in the central Gulf of Alaska (Table 7). Since 1990, portions of the gear affected by killer whale depredation during domestic longline surveys have been excluded from the analysis of the survey data.

Sperm whale (*Physeter macrocephalus*) observations have been recorded during the longline survey since 1998. Sperm whales were observed during survey operations at 21 stations in 2019 (Table 8). Apparent sperm whale depredation is defined as sperm whales being present with the occurrence of damaged sablefish. Sperm whales were observed at eight stations in the central Gulf of Alaska, and depredation was evident at seven of those. Sperm whales were observed at six stations in the West Yakutat region, and depredation was evident at all six. Sperm whales were observed at seven stations in the East Yakutat/Southeast region, but depredation was only evident at five of those. Longline survey catch rates and abundance indices are not adjusted for sperm whale depredation in the survey.

NMFS has requested the assistance of the fishing fleet to avoid the annual longline survey stations since the inception of sablefish IFQ management in 1995. Fishermen are requested to 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 are mailed to each IFQ holder before the beginning of each fishing season. Additionally, the skipper of the survey vessel makes daily announcements on the radio detailing the planned set locations for the upcoming days. Vessels observed near stations are contacted by the survey vessel and are asked to report recent fishing activities that may affect survey catch rates. The vessels are also encouraged to avoid survey stations prior to the arrival of the survey vessel.

In 2019 there were a high number of recorded vessel interactions with the survey. Vessels were contacted or observed by the survey at three stations in the eastern Bering Sea and 12 in the Gulf of Alaska. Of these, three were bottom trawlers, one was a longliner targeting halibut, five were longliners targeting sablefish, and six were pot boats

targeting sablefish. At station 32, the standard survey sets were moved slightly to avoid gear already placed at the station by a sablefish pot fisherman. At station 103, the standard survey sets were moved to avoid gear set by two pot vessels. On a few other occasions, vessels appeared to be fishing (based on Automatic Identification System [AIS] observations) on or near survey stations a day or two prior to schedule, but vessels did not respond to our calls and were gone when we arrived on station. Vessel interactions with these survey stations was unconfirmed, and data were not removed from the abundance calculations at these locations.

Gear damage and loss occurs during survey operations and may have impacts on catch. In 2019, the gear parted at 10 stations (6, 62, 77, 80, 86, 89, 96, 104, 121, and 148). All gear was retrieved by hauling from the opposite end of the set except at stations 104, where two skates of gear were lost (Table 3).

Several special projects were conducted during the 2019 longline survey. Stereo cameras that were installed outboard of the hauling station collected imagery that will be used as a training dataset to develop machine learning for length measurements and species identification. Two pop-up satellite tags were deployed on sablefish (> 75 cm that were presumably mature females) in the eastern Bering Sea and were programmed to pop-up during the winter months in an attempt to identify spawning locations and behavior. Two temperature-depth recorders were attached to the longline to assess temperatures occurring at the gear depth. A genetics study to investigate the stock structure of shortspine thornyhead in Alaska waters was initiated, and collection of fin clips were frozen and brought back for laboratory analysis. Hooking injuries that sablefish incurred during capture by the longline survey were documented for sablefish

that were tagged and released, as relating those injuries to survival will help managers understand the effects of discarding sablefish.

An additional project focused on rockfish genomics in Alaska, where representative samples were collected for the purpose of constructing complete reference genomes and genomic data sets. In 2019, genomic samples were collected from 24 rougheye/black spotted rockfish, 24 shortraker rockfish, 12 shortspine thornyhead, 12 longspine thornyhead (*Sebastolobus altivelis*), 12 redbanded rockfish (*Sebastes babcocki*), 10 yelloweye rockfish (*S. ruberrimus*), 12 Pacific ocean perch (*S. alutus*), 12 rosethorn rockfish (*S. helvomaculatus*), 12 silvergray rockfish (*S. brevispinis*), 12 dusky rockfish (*S. ciliatus*), and 13 specimens from four additional species. Samples were collected from a broad geographic range when possible.

In Southeastern Alaska, the longline survey deployed a towed hydrophone for detection of sperm whales in support of a real-time sperm whale location and avoidance network project. The assembly consisted of two hydrophones encased in a 3.7-m (12-ft) long 5-cm (2-in) diameter tube that is towed via a 91-m (300-ft) long cable behind the survey vessel along the shelf/slope edge. Hydrophone signals were processed to detect the position of sperm whales. There were 14 deployments on the survey, and sperm whales were detected on numerous occasions.

In the Yakutat region, large female spiny dogfish (> 90 cm) were collected to compare ages estimated from bomb-derived radiocarbon levels in the eye lens to estimates derived from growth rings on their dorsal spine. The hope is that the radiocarbon method could be utilized for Pacific sleeper sharks (*Somniosus pacificus*), a long-lived species that is difficult to age. In 2019, 11 large spiny dogfish were collected.

Other rare observations on the 2019 survey included the presence of Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) at three stations in Southeast Alaska and the catch and release of a large male Pacific sleeper shark at station 89.

Table 1. -- Leg numbers, dates, and personnel for the 2019 AFSC longline survey.

Leg	Dates	Personnel	Affiliation
1	28 May–15 June	Katy Echave	AFSC – ABL
		Kevin Siwicke	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
2	15 June–3 July	Katy Echave*	AFSC – ABL
		Kari Fenske*	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
3	3 July–20 July	Pat Malecha	AFSC – ABL
		Jamal Moss	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
4**	20 July–23 July	Chris Lunsford	AFSC – ABL
		Wes Strasburger	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
5	23 July–3 August	Cindy Tribuzio	AFSC – ABL
		Kristen Omori	VIMS
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
6	4 August–16 August	Kalei Shotwell	AFSC – ABL
		Kevin Siwicke	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist
7	16 August–28 August	Pat Malecha	AFSC – ABL
		Lauren Kregel	Contract Biologist
		Todd Mihal	Contract Biologist

* Partial leg.

** 2-day experimental leg.

AFSC – ABL – Alaska Fisheries Science Center – Auke Bay Laboratories.

VIMS – Virginia Institute of Marine Science.

Table 2. -- Stations fished in 2019 AFSC longline survey. "Management area" refers to the North Pacific Fishery Management Council sablefish management areas, "Habitat" refers to the station habitat type, and "Abundance" indicates whether or not station catches were used in 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

Table 2. -- Continued.

Station #	Management area	Habitat	Abundance
86	Central Gulf of Alaska	Slope	Yes
87	Central Gulf of Alaska	Slope	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
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	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

Table 2. -- Continued.

Station #	Management area	Habitat	Abundance
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 2019 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
				Bering Sea					
17	1	5/30	90	56.04	-169.59	56.00	-169.70	207	353
17	2	5/30	90	55.99	-169.71	55.98	-169.84	529	796
12*	3	5/31	90	56.63	-172.36	56.58	-172.43	190	578
12*	4	5/31	90	56.56	-172.45	56.50	-172.51	632	714
8*	5	6/1	90	57.63	-174.16	57.69	-174.23	156	329
8*	6	6/1	90	57.70	-174.25	57.77	-174.30	480	826
2*	7	6/2	90	58.62	-176.64	58.58	-176.75	150	518
2*	8	6/2	90	58.57	-176.78	58.55	-176.91	596	941
1*	9	6/3	90	58.78	-177.57	58.81	-177.70	166	232
1*	10	6/3	90	58.82	-177.72	58.86	-177.84	366	548
4	11	6/4	90	58.50	-175.67	58.48	-175.81	214	452
4	12	6/4	90	58.48	-175.83	58.50	-175.95	441	757
6	13	6/5	90	58.33	-174.31	58.40	-174.35	168	348
6	14	6/5	90	58.41	-174.38	58.38	-174.49	421	499
10*	15	6/6	90	56.83	-173.37	56.90	-173.41	200	493
10*	16	6/6	90	56.91	-173.42	56.97	-173.48	467	681
13	17	6/7	90	56.46	-171.59	56.46	-171.58	196	492
13	18	6/7	90	56.46	-171.61	56.45	-171.74	400	673
15	19	6/8	90	56.16	-170.66	56.14	-170.77	142	333
15	20	6/8	90	56.13	-170.79	56.16	-170.91	446	576
18*	21	6/9	90	56.25	-169.16	56.19	-169.26	159	634
18*	22	6/9	90	56.18	-169.28	56.12	-169.38	634	718
20*	23	6/10	89	55.81	-168.79	55.84	-168.91	13	524
20*	24	6/10	90	55.85	-168.93	55.91	-169.01	495	764
22*	25	6/11	90	55.46	-168.00	55.43	-168.12	157	255
22*	26	6/11	90	55.42	-168.15	55.39	-168.26	280	571
34*	27	6/12	90	53.36	-168.99	53.31	-168.93	698	955
34*	28	6/12	90	53.30	-168.90	53.28	-168.81	436	646
33*	29	6/13	90	53.59	-168.33	53.61	-168.21	121	827
33*	30	6/13	90	53.60	-168.20	53.62	-168.09	120	759
32	31	6/14	90	53.70	-167.46	53.72	-167.37	289	532
32	32	6/14	90	53.72	-167.34	53.80	-167.32	393	446
				Gulf of Alaska					
63	33	6/16	80	52.97	-168.13	52.92	-168.20	111	404
63	34	6/16	80	52.92	-168.21	52.85	-168.21	288	722
62*	35	6/17	80	52.66	-169.00	52.61	-169.09	138	610
62*	36	6/17	80	52.56	-169.18	52.62	-169.00	323	433
64*	37	6/18	80	53.19	-166.85	53.13	-166.88	218	311

Table 3. -- Continued.

Station	Haul	Date	# Skates retrieved	Start latitude	Start longitude	End latitude	End longitude	Start depth	End depth
64*	38	6/18	80	53.12	-166.89	53.05	-166.93	332	736
65	39	6/19	80	53.59	-165.68	53.52	-165.72	121	252
65	40	6/19	80	53.51	-165.73	53.45	-165.78	295	464
66	41	6/20	80	53.74	-164.47	53.68	-164.55	139	311
66	42	6/20	80	53.68	-164.57	53.63	-164.65	318	668
67	43	6/21	80	53.97	-163.26	53.91	-163.32	118	341
67	44	6/21	80	53.90	-163.33	53.86	-163.42	359	657
68	45	6/22	80	54.13	-161.63	54.09	-161.71	125	161
68	46	6/22	80	54.09	-161.74	54.06	-161.84	291	694
69	47	6/23	80	54.31	-161.06	54.26	-161.14	176	382
69	48	6/23	80	54.26	-161.16	54.21	-161.21	391	877
70*	49	6/24	80	54.37	-160.23	54.30	-160.28	147	313
70*	50	6/24	80	54.30	-160.30	54.24	-160.32	290	609
71*	51	6/25	80	54.50	-159.26	54.44	-159.31	152	295
71*	52	6/25	80	54.44	-159.33	54.39	-159.41	159	536
72	53	6/26	80	54.63	-158.58	54.57	-158.63	134	407
72*	54	6/26	80	54.57	-158.66	54.51	-158.70	332	804
73	55	6/27	80	54.85	-157.73	54.80	-157.80	182	354
73	56	6/27	80	54.79	-157.83	54.73	-157.85	336	609
74*	57	6/28	80	55.24	-156.67	55.18	-156.73	141	355
74*	58	6/28	80	55.18	-156.74	55.12	-156.73	335	734
75	59	6/29	80	55.64	-155.85	55.57	-155.86	150	215
75*	60	6/29	80	55.56	-155.86	55.50	-155.83	218	217
148	61	7/5	80	54.65	-132.84	54.60	-132.93	141	382
149	62	7/5	79	54.60	-133.02	54.60	-133.15	410	393
108	63	7/6	80	54.46	-133.92	54.49	-134.01	359	544
108	64	7/6	80	54.50	-134.01	54.54	-134.07	367	765
107	65	7/7	80	54.90	-134.29	54.96	-134.35	223	488
107	66	7/7	80	54.96	-134.36	55.01	-134.43	406	726
106	67	7/8	80	55.35	-134.73	55.38	-134.82	336	627
106	68	7/8	80	55.40	-134.83	55.40	-134.93	722	745
105	69	7/9	80	55.56	-134.97	55.91	-135.05	250	514
105	70	7/9	80	55.59	-135.06	55.62	-135.13	464	555
144	71	7/10	80	55.93	-134.90	56.00	-134.91	197	356
145	72	7/10	80	56.04	-134.93	56.08	-135.01	369	372
104	73	7/11	78	55.98	-135.43	56.02	-135.53	311	656
104	74	7/11	80	56.03	-135.54	56.08	-135.61	593	836
103	75	7/12	80	56.38	-135.35	56.38	-135.47	157	187
103	76	7/12	80	56.38	-135.53	56.38	-135.65	192	377
102	77	7/13	80	56.85	-136.00	56.89	-136.09	213	677

Table 3. -- Continued.

Station	Haul	Date	# Skates retrieved	Start latitude	Start longitude	End latitude	End longitude	Start depth	End depth
102	78	7/13	80	56.91	-136.09	56.95	-136.12	598	881
101	79	7/14	80	57.19	-136.23	57.20	-136.33	216	655
101	80	7/14	86	57.22	-136.34	57.28	-136.38	743	937
100	81	7/15	80	57.62	-136.53	57.61	-136.64	200	718
100	82	7/15	80	57.62	-136.67	57.66	-136.75	586	697
142	83	7/16	80	57.92	-137.01	57.92	-137.13	400	446
143	84	7/16	80	57.97	-137.08	57.97	-137.21	239	422
99	85	7/17	80	57.88	-137.39	57.88	-137.49	205	682
99	86	7/17	80	57.89	-137.52	57.88	-137.62	714	693
98	87	7/18	80	58.14	-138.74	58.15	-138.85	283	773
98	88	7/18	80	58.16	-138.86	58.18	-138.96	471	515
97	89	7/19	80	58.46	-139.47	58.97	-139.60	196	506
97	90	7/19	80	58.46	-139.61	58.42	-139.69	467	636
138	95	7/24	80	59.41	-141.17	59.36	-141.25	319	323
139	96	7/24	80	59.42	-140.94	59.42	-141.07	202	290
96	97	7/25	80	58.69	-140.64	58.69	-140.77	232	541
96	98	7/25	80	58.69	-140.79	58.73	-140.90	491	640
95	99	7/26	80	59.05	-141.35	59.05	-141.48	302	516
95	100	7/26	80	59.05	-141.50	59.05	-141.62	560	834
94	101	7/27	80	59.39	-142.17	59.42	-142.29	236	457
94	102	7/27	80	59.43	-142.30	59.47	-142.40	429	950
93	103	7/28	80	59.55	-142.57	59.58	-142.68	130	591
93	104	7/28	80	59.60	-142.69	59.58	-142.79	571	628
137	105	7/29	80	59.67	-143.39	59.71	-143.49	296	313
136	106	7/29	80	59.74	-143.58	59.76	-143.71	159	303
92	107	7/30	80	59.56	-143.65	59.56	-143.78	170	677
92	108	7/30	80	59.56	-143.81	59.59	-143.93	636	660
91	109	7/31	80	59.52	-144.72	59.48	-144.84	182	522
91	110	7/31	80	59.49	-144.85	59.45	-144.96	434	788
90	111	8/1	80	59.51	-145.54	59.51	-145.66	159	650
90	112	8/1	80	59.53	-145.69	59.53	-145.81	525	585
89	113	8/2	80	59.26	-146.86	59.22	-146.95	196	598
89	114	8/2	80	59.22	-146.98	59.17	-147.07	573	927
134	115	8/5	80	59.61	-146.97	59.56	-147.04	207	210
135	116	8/5	80	59.52	-147.15	59.45	-147.15	209	216
88	117	8/6	80	59.15	-147.60	59.08	-147.61	281	536
88	118	8/6	80	59.07	-147.62	59.01	-147.62	523	893
87	119	8/7	80	59.12	-148.65	59.06	-148.67	159	187
87	120	8/7	82	59.04	-148.65	58.97	-148.65	226	243
132	121	8/8	80	59.08	-149.42	59.04	-149.52	185	226

Table 3. -- Continued.

Station	Haul	Date	# Skates retrieved	Start latitude	Start longitude	End latitude	End longitude	Start depth	End depth
133	122	8/8	80	58.95	-149.51	58.92	-149.62	237	242
130	123	8/9	80	58.73	-149.19	58.77	-149.08	180	217
131	124	8/9	80	58.80	-149.04	58.84	-148.94	234	251
86	125	8/10	80	58.69	-148.33	58.62	-148.33	284	466
86	126	8/10	80	58.62	-148.34	58.55	-148.35	427	831
85	127	8/11	80	58.29	-148.62	58.22	-148.67	231	502
85	128	8/11	80	58.21	-148.67	58.15	-148.70	546	823
84	129	8/12	80	57.97	-149.18	57.92	-149.25	175	486
84	130	8/12	80	57.91	-149.26	57.85	-149.33	511	921
128	131	8/13	80	58.00	-149.85	57.99	-149.80	223	267
129	132	8/13	80	58.08	-149.93	58.07	-150.03	297	299
83	133	8/14	80	57.63	-149.92	57.57	-149.95	403	552
83	134	8/14	80	57.56	-149.96	57.49	-149.98	564	848
82	135	8/15	80	57.39	-150.58	57.32	-150.59	227	519
82	136	8/15	80	57.32	-150.61	57.25	-150.60	523	743
535	137	8/17	80	57.35	-150.67	57.29	-150.68	234	478
535	138	8/17	80	57.27	-150.69	57.21	-150.68	486	743
523	139	8/18	80	57.22	-151.04	57.15	-151.05	209	551
523	140	8/18	80	57.14	-151.06	57.07	-151.05	380	580
81	141	8/19	80	57.11	-151.22	57.05	-151.28	265	527
81	142	8/19	80	57.04	-151.29	56.98	-151.29	579	846
80	143	8/20	80	56.49	-152.22	56.43	-152.29	135	510
80	144	8/20	80	56.42	-152.34	56.36	-152.34	495	715
79	145	8/21	80	56.30	-153.08	56.26	-153.17	266	593
79	146	8/21	80	56.27	-153.20	56.23	-153.27	446	721
78	147	8/22	80	55.99	-154.02	55.93	-154.02	253	465
78	148	8/22	80	55.85	-154.03	55.91	-154.02	550	945
77	149	8/23	80	56.04	-154.58	55.65	-154.58	234	502
77	150	8/23	80	55.97	-154.59	55.90	-154.58	548	884
76	151	8/24	80	55.76	-155.14	55.70	-155.17	168	334
76	152	8/24	80	55.69	-155.19	55.63	-155.25	346	600
122	153	8/25	80	56.19	-155.96	56.18	-156.10	197	240
123	154	8/25	80	55.23	-156.13	55.25	-156.25	246	265
120	155	8/26	80	55.79	-156.08	55.77	-156.19	198	239
121	156	8/26	80	55.75	-156.20	55.73	-156.32	242	250

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

Table 4. -- Total estimated catch in numbers of major species (>100 individuals) caught in the 2019 AFSC longline survey by management area: BS = Bering Sea, WGOA = western Gulf of Alaska, EGOA = eastern Gulf of Alaska, WY = west Yakutat, and EYSE = east Yakutat and Southeastern Alaska.

Species/Complex	BS	WGOA	CGOA	WY	EYSE	Total
Sablefish	14,372	18,326	52,637	16,744	22,345	124,424
Giant grenadier	19,313	13,934	22,235	4,543	3,477	63,502
Shortspine thornyhead	1,867	2,462	5,348	2,822	3,266	15,765
Pacific cod	6,588	632	680	55	188	8,143
Rougheye/blackspotted rockfish	1,013	1,813	1,169	1,023	2,383	7,402
Pacific halibut	940	554	3,305	1,373	757	6,929
Arrowtooth flounder	2,072	361	2,271	268	125	5,097
Shortraker rockfish	520	510	630	960	1,194	3,813
Aleutian/Bering/Alaska skate	1,956	89	1,036	117	127	3,325
Spiny dogfish	0	2	886	494	686	2,068
Longnose skate	0	94	542	334	398	1,368
Sea anemone	88	81	489	120	447	1,225
Lips or jaws - whale depredation	751	123	107	26	41	1,048
Walleye pollock	886	57	36	24	6	1,009
Popeye grenadier	5	2	712	165	22	906
Redbanded rockfish	0	56	147	130	520	853
Whiteblotched skate	596	2	0	0	1	599
Yelloweye rockfish	1	57	12	58	314	442
Greenland turbot	411	0	0	0	0	411
Dover sole	0	8	137	64	120	329
Yellow Irish lord	320	4	0	0	0	324
Kamchatka flounder	301	0	0	0	0	301
Spotted ratfish	0	0	0	0	207	207
Flathead sole	157	10	24	1	0	192
Northern rockfish	187	2	0	0	0	189
Basket star	39	3	116	3	9	170
Pacific ocean perch	83	15	18	30	6	152
Starfish	13	9	36	9	78	145
Brittle star	1	6	84	20	20	131
Sponge	17	52	24	5	29	127
Sea pen or sea whip	9	3	89	5	2	108

Table 5. -- Catch in numbers by station for major species in the 2019 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
				Bering Sea						
1*	11	955	1,413	5	3	0	16	51	182	443
2*	21	306	2,703	0	5	0	0	9	37	228
4	2,581	237	1,067	50	118	75	18	12	168	154
6	696	274	2,072	128	102	50	119	32	291	69
8*	11	704	1,241	13	21	0	52	92	155	125
10*	1,226	90	1,607	32	161	7	119	173	303	90
12*	291	143	2,361	6	34	15	22	103	110	108
13	1,158	265	2,642	121	236	50	312	213	202	99
15	817	725	1,469	89	202	26	127	283	91	462
17	928	393	631	42	378	73	45	135	69	89
18*	1,307	222	1,384	7	119	55	2	111	195	126
20*	1,368	231	251	25	49	7	59	118	129	157
22*	551	472	78	41	347	21	14	37	245	312
32	2,117	891	38	290	251	6	452	181	107	113
33*	447	680	231	59	21	6	176	195	113	418
34*	842	0	125	32	24	20	0	122	163	139
				Gulf of Alaska						
62*	954	87	2,373	13	21	0	468	183	7	84
63	1,732	156	1,992	59	78	0	282	310	17	37
64*	1,428	0	861	0	13	0	350	161	7	62
65	2,367	132	1,576	50	48	0	24	123	17	85
66	2,995	34	1,393	11	24	0	74	131	6	18
67	1,742	29	1,341	41	81	0	389	487	5	79
68	1,454	116	466	297	66	0	646	584	22	95
69	2,219	1	1,833	19	18	0	32	214	0	37
70*	1,385	73	1,250	32	4	0	15	98	4	97
71*	2,050	4	849	32	8	0	43	171	6	77
72*	1,826	74	1,916	57	41	0	52	151	8	46
73	2,041	4	1,455	24	49	0	69	198	1	41
74*	1,284	33	1,308	50	28	0	15	559	31	135
75*	2,807	62	24	97	38	0	8	10	6	50
76	2,505	75	574	75	145	0	72	264	85	199
77	1,416	3	1,765	25	27	0	63	250	5	115
78	1,031	1	2,175	55	125	0	177	290	4	394
79	2,345	0	965	52	45	0	102	300	3	9
80	1,722	28	914	288	74	0	176	481	1	145
81	2,526	0	1,448	55	89	0	38	207	3	140
82	2,519	3	1,018	124	41	0	66	165	0	17
83	1,950	0	2,283	1	11	0	5	213	8	117
84	2,122	36	987	231	27	0	82	202	16	247
85	1,922	0	863	68	79	0	69	423	14	69
86	580	5	604	174	38	0	360	384	4	88

Table 5. -- Continued.

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
87	2,706	39	0	338	107	0	3	50	25	105
88	1,880	0	1,771	8	19	0	189	246	1	128
89	1,761	14	890	70	18	0	28	283	14	185
90	889	18	402	212	7	0	268	68	43	97
91	2,276	20	348	187	54	0	94	359	5	118
92	2,435	2	780	91	22	0	57	166	2	79
93	2,009	0	626	200	6	0	18	372	3	92
94	1,675	0	343	99	48	0	261	398	1	127
95	1,643	0	510	60	10	0	434	348	4	106
96	1,269	0	644	29	25	0	723	318	2	146
97	760	2	303	43	17	0	475	281	1	219
98	838	0	410	3	2	0	296	45	0	127
99	1,461	0	319	10	9	0	108	139	0	80
100	1,898	3	490	9	4	0	39	199	1	94
101	2,019	3	354	49	8	0	148	228	0	60
102	1,360	0	520	6	1	0	66	213	3	86
103	881	84	5	380	30	0	26	36	2	830
104	1,380	0	158	8	1	0	555	246	2	97
105	1,906	3	237	36	0	0	316	309	13	150
106	1,697	0	197	0	4	0	373	320	5	91
107	1,326	2	154	17	1	0	807	255	8	209
108	1,519	0	219	6	2	0	179	168	11	128
120	1,541	91	0	194	131	0	0	0	88	19
121	1,355	1	0	204	167	0	0	10	132	16
122	806	159	0	223	159	0	0	0	218	41
123	1,204	5	0	187	219	0	0	0	182	14
128	1,399	10	0	124	127	0	3	60	9	19
129	1,497	0	0	120	68	0	4	94	13	30
130	1,155	13	0	52	26	0	1	82	9	84
131	1,314	1	0	74	54	0	8	91	9	87
132	1,369	27	0	121	84	0	1	47	38	107
133	1,306	1	0	52	73	0	5	98	22	96
134	442	0	0	5	15	0	14	61	30	410
135	777	4	0	39	25	0	112	78	110	563
136	528	1	0	91	10	0	44	111	16	405
137	293	0	0	56	4	0	4	126	5	74
138	509	0	0	214	28	0	26	206	11	106
139	1,457	0	0	64	36	0	26	67	12	111
142	914	0	59	9	2	0	12	185	2	11
143	1,486	0	52	24	7	0	7	103	5	60
144	285	5	0	55	10	0	84	194	5	127

Table 5. -- Continued.

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
145	705	0	0	13	5	0	83	167	16	250
148	926	86	0	77	21	0	2	95	26	368
149	984	0	0	12	1	0	1	83	39	128
523	2,691	1	1,185	89	95	0	47	151	5	49
535	2,599	4	980	99	45	0	58	183	2	14

*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 2019 AFSC longline survey by management area: BS = Bering Sea, WGOA = western Gulf of Alaska, EGOA = eastern Gulf of Alaska, WY = west Yakutat, and EYSE = east Yakutat and Southeastern Alaska. Weight (kg) derived from length-weight relationship when lengths available. For all others an average weight proxy from longline fisheries was applied to numbers caught.

Species/Complex	BS	WGOA	CGOA	WY	EYSE	Total
Sablefish	27,875	30,404	97,642	40,707	51,722	248,350
Giant grenadier	61,438	37,566	65,225	13,168	11,533	188,929
Pacific halibut	5,547	3,269	19,503	8,102	4,467	40,888
Pacific cod	29,222	2,004	2,477	143	547	34,393
Rougheye rockfish	2,217	2,422	1,539	1,433	4,416	12,026
Shortspine thornyhead	2,133	1,547	3,306	1,671	2,236	10,893
Arrowtooth flounder	3,997	737	4,831	625	236	10,427
Longnose skate	0	701	4,041	2,490	2,967	10,199
Shortraker rockfish	989	766	964	1,797	1,965	6,480
Spiny dogfish	0	6	1,810	1,038	1,917	4,771
Whiteblotched skate	3,210	11	0	0	5	3,226
Redbanded rockfish	0	99	261	231	923	1,514
Walleye pollock	1,259	81	51	34	9	1,434
Yelloweye rockfish	3	164	35	167	906	1,275
Greenland turbot	1,266	0	0	0	0	1,266
Spotted ratfish	0	0	0	0	754	754
Pacific sleeper shark	289	173	173	58	58	752
Kamchatka flounder	575	0	0	0	0	575
Lingcod	0	0	181	263	107	550
Dover sole	0	12	204	95	179	489
Octopus	69	271	13	0	0	353
Sea anemone	24	22	135	33	124	339
Big skate	0	0	299	0	0	299
Yellow Irish lord	268	3	0	0	0	272
Pacific ocean perch	128	23	28	46	9	235
Flathead sole	112	7	17	1	0	137
Northern rockfish	131	1	0	0	0	133
Coho salmon	0	0	51	34	34	120
Dusky rockfish	42	1	18	39	4	104

Table 7. -- Stations and skates depredated by killer whales during the 2019 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
1	Bering Sea	180	180
2	Bering Sea	180	180
8	Bering Sea	180	180
10	Bering Sea	166	180
12	Bering Sea	150	180
18	Bering Sea	97	180
20	Bering Sea	156	180
22	Bering Sea	111	180
33	Bering Sea	180	180
34	Bering Sea	180	180
62	Western Gulf of Alaska	129	160
64	Western Gulf of Alaska	160	160
70	Western Gulf of Alaska	141	160
71	Western Gulf of Alaska	90	160
72	Central Gulf of Alaska	80	160
74	Central Gulf of Alaska	160	160
75	Central Gulf of Alaska	21	160

Table 8. -- Stations that had sperm whales present during hauling operations in the 2019 AFSC longline survey. Depredation is defined as sperm whales being present with the occurrence of damaged fish on the line.

Station	Region	Depredation
70	Central Gulf of Alaska	No
77	Central Gulf of Alaska	Yes
82	Central Gulf of Alaska	Yes
84	Central Gulf of Alaska	Yes
85	Central Gulf of Alaska	Yes
86	Central Gulf of Alaska	Yes
88	Central Gulf of Alaska	Yes
131	Central Gulf of Alaska	Yes
90	West Yakutat	Yes
91	West Yakutat	Yes
93	West Yakutat	Yes
94	West Yakutat	Yes
95	West Yakutat	Yes
96	West Yakutat	Yes
97	East Yakutat/Southeast	Yes
98	East Yakutat/Southeast	Yes
99	East Yakutat/Southeast	Yes
101	East Yakutat/Southeast	No
103	East Yakutat/Southeast	Yes
104	East Yakutat/Southeast	Yes
107	East Yakutat/Southeast	No

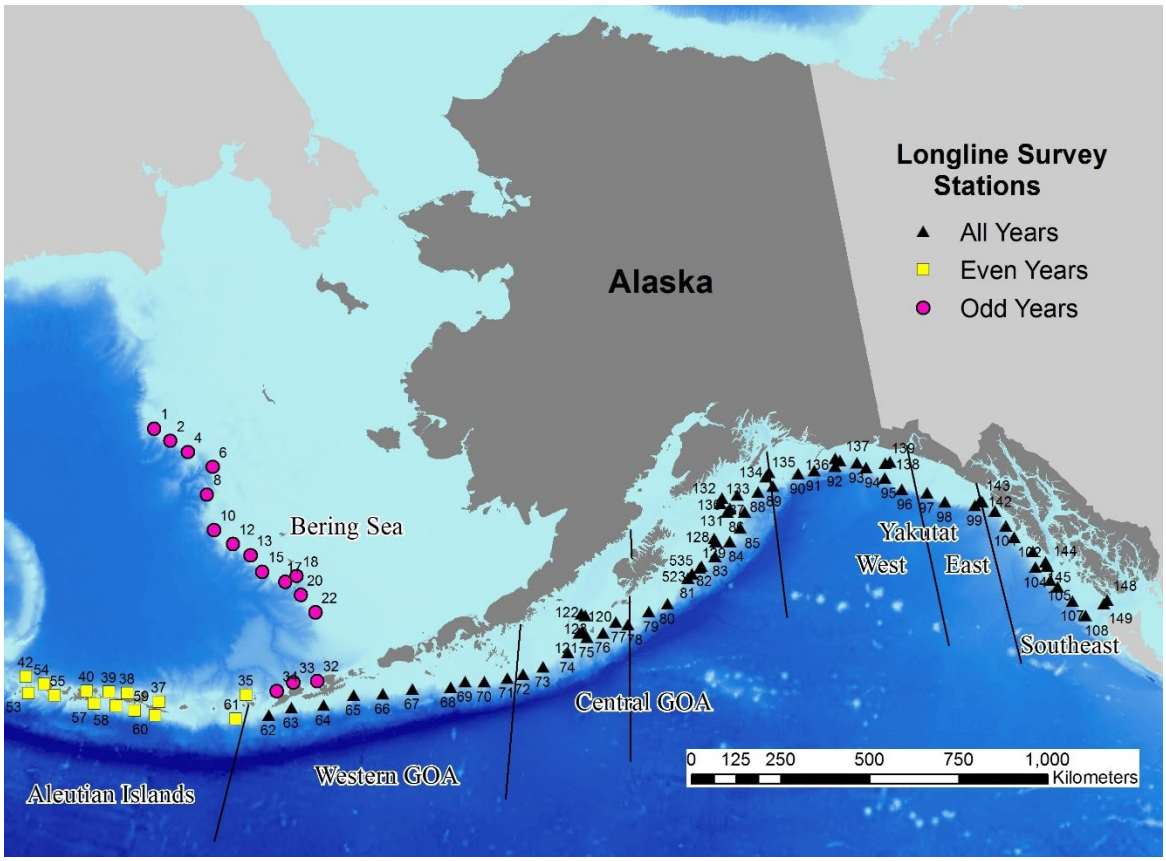

Figure 1. -- Map of AFSC longline survey station locations. Bering Sea stations are sampled in odd years; stations in the eastern and central Aleutian Islands are sampled in even years; Gulf of Alaska (GOA) stations are sampled every year.

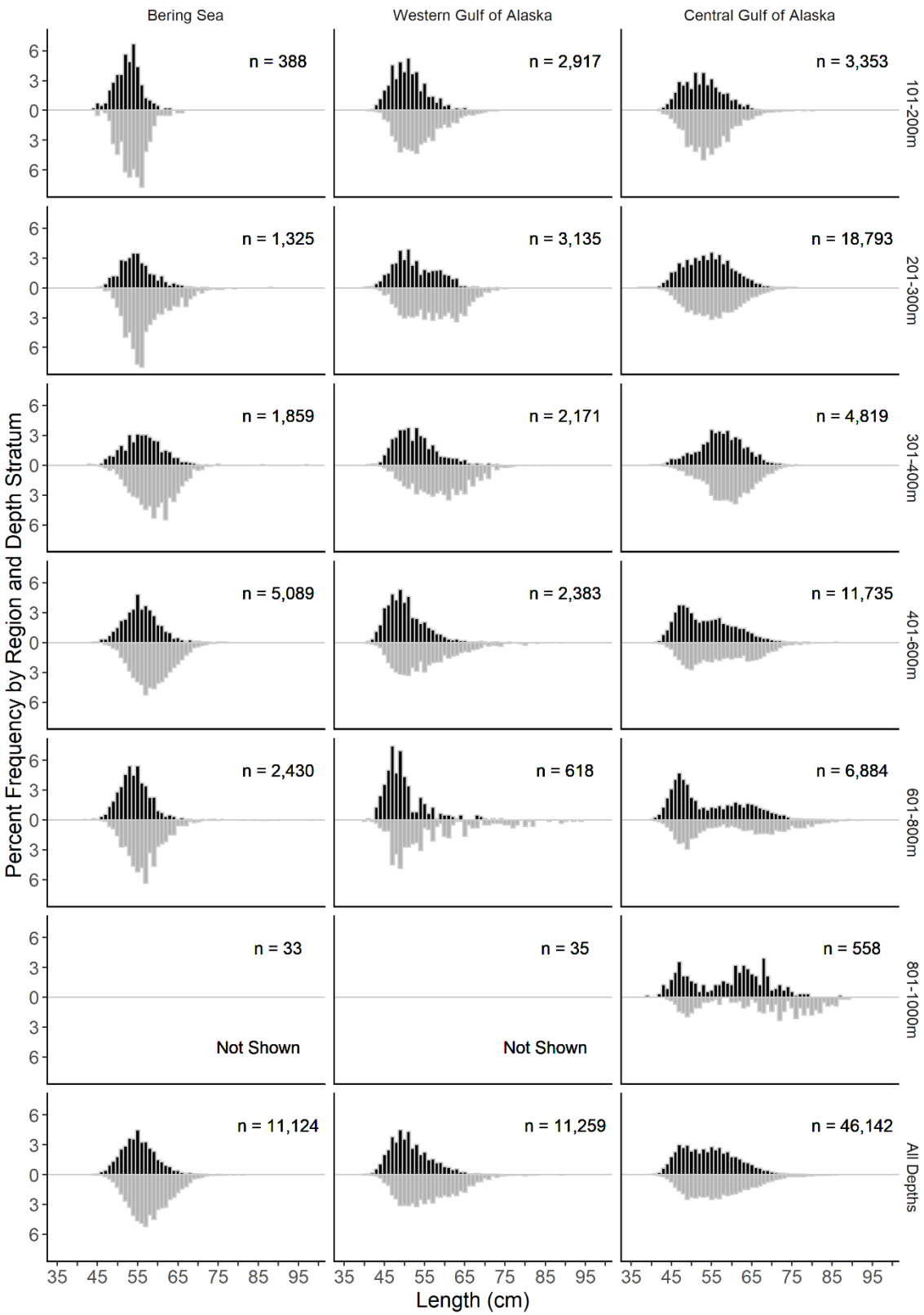

Figure 2. -- Size composition of sablefish measured during the 2019 AFSC longline survey by region and depth stratum. Males are shown in black and females are shown in grey below the x-axis.

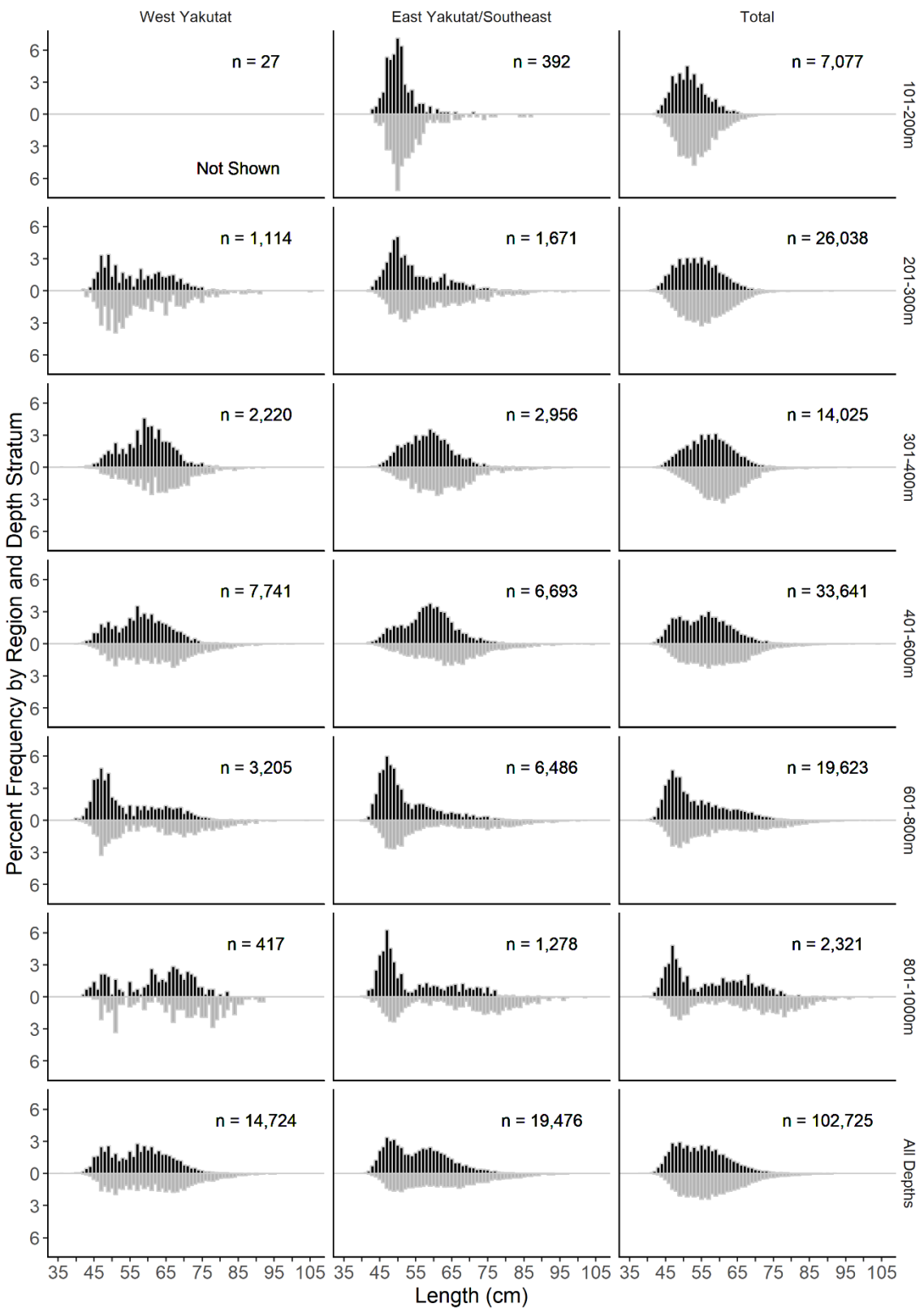

Figure 2. -- Continued.

APPENDIX: Squid Versus Pollock Bait

A 2-day experiment was conducted near Yakutat from 21 to 22 July to compare the catch rates of two types of bait, squid and walleye pollock (*Gadus chalcogrammus*). The longline survey has used squid bait since the survey's inception. However, there is some belief among sablefish fishers that pollock is a better bait because it attracts fewer grenadier. If true, hook competition between sablefish and grenadier may be reduced leaving more hooks available to sablefish. Furthermore, grenadiers are very rarely retained, so if pollock bait catches fewer grenadier, then bycatch and discards would also be reduced.

During the 2-day experiment, two sets were made each day for a total of four sets (Appendix Table A-1). The stations were located in the West Yakutat management region. The experimental sets were made between 449 and 672 m depth. Efforts were made to place the groundline in habitats similar to standard survey stations. Each set consisted of 80 skates. All gear characteristics were identical to standard survey sets except for the bait. Squid and pollock bait was interspersed within a set in groupings of 10 skates each (e.g., skates 1–10 were baited with pollock, skates 11–20 were baited with squid, skates 21–30 were baited with pollock, etc.). This resulted in a total of 80 skates baited with squid and 80 skates baited with pollock per station each day.

During the 2-day bait experiment, the only issue that may have affected catch rates and potentially complicate data analyses was that sperm whales were observed depredating on the longline on three of the four hauls (91, 92, and 94). On all sets of the 2019 2-day experiment combined, 3,366 sablefish, 681 shortspine thornyhead, and 504 giant grenadier were caught.

In addition to the bait experiment, a pilot study investigating alternative sampling gear for juvenile sablefish was carried out. Modified shrimp pots were used as traps, with floatation added to keep them at the surface. A total of 10 traps were set over night, connected with floating line and lighted. Five were baited and five were not baited. One juvenile sablefish (age-0, length of 14 cm) was caught in a baited trap, and other catch included jellyfish.

Appendix Table A-1. -- Set information by station and haul for the 2019 AFSC longline survey 2-day experiment. Positions in decimal degree (DD) format and depths in meters (m).

Station	Haul	Date	# Skates Retrieved	Start latitude	Start longitude	End latitude	End longitude	Start depth	End depth
999	91	7/21	80	58.74	-140.90	58.80	-140.96	459	459
999	92	7/21	80	58.81	-140.98	58.87	-141.01	557	605
998	93	7/22	80	59.19	-141.79	59.24	-141.89	514	530
998	94	7/22	80	59.24	-141.92	59.25	-142.04	564	618

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