

F/V *Alaskan Leader*
Cruise Report AL-10-01
Longline Survey of the Gulf of Alaska and Eastern Aleutian Islands
May 25-August 28, 2010

Prepared by

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On August 28, 2010, the Alaska Fisheries Science Center (AFSC) completed the thirty-second annual longline survey of Alaska sablefish (*Anoplopoma fimbria*) and other groundfish resources of the upper continental slope (Figure 1). This survey was designed to continue the time series (1979-94) 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, the eastern Aleutian Islands biennially since 1996, and the eastern Bering Sea biennially since 1997. The Gulf of Alaska and eastern Aleutian Islands were sampled in 2010.

OBJECTIVES

1. Determine the relative abundance and size composition of the most commercially important species: sablefish, shortspine thornyhead (*Sebastolobus alascanus*), Greenland turbot (*Reinhardtius hippoglossoides*), Pacific cod (*Gadus macrocephalus*), and rougheye and shortraker rockfishes (*Sebastes aleutianus* and *S. borealis*).
2. Determine the relative abundance and size composition of other groundfish species caught during the survey: arrowtooth flounder (*Atheresthes stomias*), grenadiers (Macrouridae), skates (Rajadidae), and spiny dogfish (*Squalus acanthias*).
3. Tag and release sablefish, shortspine thornyhead, and Greenland turbot throughout the cruise to determine migration patterns.
4. Implant Greenland turbot and lingcod (*Ophiodon elongates*) with electronic tags that record water temperature, depth, and time.
5. Collect sablefish otoliths to study the age composition of the population.

VESSEL AND GEAR

Survey operations were conducted using the F/V *Alaskan Leader*, a chartered U.S. 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, three sets of plate freezers, and refrigerated holds. Vessel personnel consisted of a captain, a mate, an engineer, a cook, a quality-control technician, two contract biologists, six fishermen and five processors.

Gear configuration is standardized and has been consistent for all survey years since 1988. Units of gear (skates) were 100 m (55 fm) long and contained 45 size 13/0 Mustad¹ circle hooks. Hooks were attached to 38 cm (15 in) gangions that were secured to becketts tied into the groundline at 2 m (6.5 ft) intervals. Five meters (16 ft) of groundline were left bare at each 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.

A set of gear consisted of a flag and buoy array at each end followed sequentially by varying lengths by depth of 9.5 mm diameter nylon buoyline, 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 buoyline), 92 m of 9.5 mm nylon line, a 27 kg (60 lb) halibut anchor, and 366 m (200 fm) of 9.5 mm nylon line. The groundline was weighted with 3.2 kg (7 lb) lead balls at the end of each skate. Hooks were hand baited with chopped squid (*Illex*) at a rate of about 5.7 kg (12.5 lb) per 100 hooks. Squid heads and tentacles were not used for bait.

Total groundline set each day was 16 km (8.6 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. Additional effort is placed in this region due to the lower densities of sablefish. Two eighty-skate groundlines laid end to end were set at each station along the upper continental slope. A single groundline of eighty skates was set at each station in the gullies except Amatuli Gully station 87 that consists of 160 skates. Specific information regarding longline survey protocols and details of the survey gear can be found at: <http://www.afsc.noaa.gov/ABL/MESA/pdf/LSprotocols.pdf>

OPERATIONS

The charter began on May 25 at Dutch Harbor, Alaska, and ended on August 28 at Dutch Harbor. The charter period was divided into seven legs (Table 1). During leg 1, the stations along the upper continental slope of the eastern Aleutian Islands were sampled (Figure 1). During leg 2 stations in the Gulf of Alaska were sampled near the western end of Umnak Island and extending eastward to Sand Point. At the conclusion of Leg 2, the vessel then transited the Gulf of Alaska to southeastern Alaska. Leg 3 began off Dixon

¹ Citation of the above brand name does not constitute U.S. government endorsement.

Entrance near the U.S.-Canada boundary and continued north and westward to Yakutat. During leg 4, a two-day experiment was conducted in the Yakutat vicinity (See Appendix A). During leg 5, the area between Yakutat and Cordova was sampled, and during leg 6 the area from Cordova to Kodiak was sampled. During leg 7, the area from Kodiak to Sand Point was sampled.

From 1988 to 1990 the survey period was from June 26 to September 12. The survey periods in 1991 through 1994 were 2-1/2 weeks 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 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 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. In 2009 to present the survey starting and ending dates were several days earlier than previous years. This was done to accommodate the vessel's scheduling needs to finish the survey as early as possible.

Survey Operations

A total of 14 stations along the upper continental slope of the eastern Aleutian Islands and 45 stations along the upper continental slope of the Gulf of Alaska were sampled at a rate of one station per day (Figure 1). Surveyed depths ranged from approximately 200 to 1,000 m, although at some stations depths less than 150 m or more than 1,000 m were sampled. In addition, twenty-seven stations were sampled in gullies at the rate of one or two 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. A list of stations and which management areas they correspond to, what type of habitat type they represent, and whether or not they were used in abundance index calculations is found in Table 2.

The gear was set from shallow to deep and was retrieved in the same order, except on occasions when groundlines parted or sea conditions dictated that it be pulled from the opposite direction. Setting began about 0630 hours Alaska Daylight Time. Retrieval began about 0930 hours and was completed by about 1930 hours.

Data Collection

Catch data were recorded on a hand-held electronic data logger. 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 when the first hook of each fifth skate was retrieved or when crossing into a new depth interval (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 bar code based measuring board and a bar code reader/data storage device. Length was measured by depth stratum for sablefish, Pacific cod, giant grenadier, Pacific grenadier, popeye grenadier, arrowtooth flounder, spiny dogfish, multiple rockfish species, and shortspine thornyheads. Lengths of sablefish, giant grenadier, spiny dogfish, and Pacific cod were recorded by sex. 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 the previous surveys, the charter vessel was allowed to retain most of the catch once the scientific data were recorded.

RESULTS

One hundred fifty-two longline hauls were completed in 2010 (Table 3). Sablefish was the most frequently caught species, followed by giant grenadier, Pacific cod, shortspine thornyhead, and arrowtooth flounder (Table 4). A total of 88,183 sablefish, with an estimated total round weight of 284,571 kg (627,372 lb), were caught during the survey (Table 5). These weights include a small number of fish lost at the rail and fish that were tagged and released. The estimated total round weights of sablefish and other major species retained during the survey and depredation experiment are presented in Table 6. These weights do not include fish that were tagged and released or not landed.

A total of 3,739 sablefish, 947 shortspine thornyhead, and 3 Greenland turbot were tagged with external floy tags and released during the survey. Electronic archival tags were implanted in 19 lingcod. Length-weight data and otoliths were collected from 2,203 sablefish.

Killer whales depredating on the catch occurred at three stations in the eastern Aleutian Islands, one station in the western Gulf of Alaska, and one station 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 observations have been recorded during the longline survey since 1998. Sperm whales were observed during survey operations at 20 stations in 2010 (Table 8). Sperm whales were observed depredating on the gear at two stations in the central Gulf of Alaska, two stations in the West Yakutat region, and six stations in the East Yakutat/Southeast region (Table 8). Apparent sperm whale depredation is defined as sperm whales being present with the occurrence of damaged sablefish. Longline survey catch rates and abundance indices are not adjusted for sperm whale depredation.

NMFS has requested the assistance of the fishing fleet to avoid the annual sablefish longline survey since the inception of sablefish IFQ management in 1995. We requested that fishermen stay at least five nautical miles away from each survey station for 7 days before and 3 days after the planned sampling date (3 days allow for survey delays). In 2010 there were three recorded interactions between survey operations and fishing vessels. Interactions occurred at station numbers 66, 89, and 93 by three separate longline vessels. In all three cases the vessels were contacted by the survey vessel and were encouraged to avoid survey stations.

Gear damage and loss occurs during survey operations and may have impacts on catch. In 2010 gear issues occurred at eight stations. Forty-seven skates were lost on the second set of station 35; the line parted on skate 26 of station 68 but all gear was retrieved; the line parted on the second sets of stations 54 (skate 131), 60 (skate 128), 71 (running line), 85 (skate 81), and 131 (skate 155) but all gear was retrieved from opposite end; one skate (80) was lost on the first set and all 80 skates were lost on the second set of station 61 due to strong currents sinking the buoy and flags.

For further information contact either

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C15700, Seattle, WA 98115-0070 -- Telephone (206) 526-4170.

Table 1. Leg numbers, dates, and personnel for the 2010 NMFS longline survey.

Leg	Dates	Personnel	Affiliation
1	May 25 - June 14	Larry Haaga Jason Wright Ken Orwig	RACE Contract Biologist Contract Biologist
2	June 14 - July 3	Cindy Tribuzio Megan Peterson Jason Wright Ken Orwig	ABL UAF Contract Biologist Contract Biologist
3	July 5 - July 19	Kalei Shotwell Doris Alcorn Jason Wright Ken Orwig	ABL ABL Contract Biologist Contract Biologist
4*	July 20 - July 22	Chris Lunsford Rick Bush Tyler Smith Peter VanTamlin Jason Wright Ken Orwig	ABL Contractor Contractor Contractor Contract Biologist Contract Biologist
5	July 23 - August 2	Doris Alcorn Kylie Jackson Jason Wright Ken Orwig	ABL Contractor Contract Biologist Contract Biologist
6	August 4 - August 15	Pat Malecha Jason Wright Ken Orwig	ABL Contract Biologist Contract Biologist
7	August 16- August 29	Dave Clausen Jason Wright Ken Orwig	ABL Contract Biologist Contract Biologist

ABL - Auke Bay Laboratories, Alaska Fisheries Science Center

RACE - Resource Assessment and Conservation Engineering Division, Alaska Fisheries Science Center

UAF – University of Alaska Fairbanks

* 2-day experiment

Table 2. Stations fished in 2010 NMFS longline survey. Sablefish management area refers to the North Pacific Fisheries Management Council areas, station type refers to station habitat type, and abundance calculations indicates whether or not station catches were used in abundance index calculations.

Station Number	Sablefish Management Area	Station Type	Abundance Calculations
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
54	Aleutian Islands	Slope	Yes
42	Aleutian Islands	Slope	Yes
53	Aleutian Islands	Slope	Yes
55	Aleutian Islands	Slope	Yes
57	Aleutian Islands	Slope	Yes
58	Aleutian Islands	Slope	Yes
59	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

Station Number	Sablefish Management Area	Station Type	Abundance Calculations
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	Shelf	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
124	Central Gulf of Alaska	Gully	No
125	Central Gulf of Alaska	Gully	No
126	Central Gulf of Alaska	Gully	No
127	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

<u>Station Number</u>	<u>Sablefish Management Area</u>	<u>Station Type</u>	<u>Abundance Calculations</u>
145	East Yakutat/Southeast	Deep Gully	Yes
148	East Yakutat/Southeast	Deep Gully	Yes
149	East Yakutat/Southeast	Deep Gully	Yes

Table 3. Set information by station and haul for the 2010 NMFS longline survey. Positions in decimal degree (DD) format.

Station	Haul	Date	# Skates Retrieved	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)
<u>Aleutian Islands</u>									
35	1	1-Jun	80	53.06	-170.18	53.03	-170.09	169	183
35	2	1-Jun	34	53.05	-170.19	53.08	-170.23	179	351
37	3	2-Jun	80	52.28	-173.49	52.33	-173.50	142	567
37	4	2-Jun	80	52.35	-173.51	52.41	-173.51	623	756
38	5	3-Jun	80	52.25	-174.85	52.31	-174.78	193	383
38	6	3-Jun	80	52.32	-174.77	52.34	-174.68	460	789
39	7	4-Jun	80	52.13	-175.58	52.15	-175.66	104	502
39	8	4-Jun	80	52.15	-175.68	52.17	-175.78	458	602
40	9	5-Jun	80	51.97	-176.45	52.03	-176.43	109	525
40	10	5-Jun	80	52.04	-176.41	52.07	-176.32	567	834
54	11	6-Jun	80	51.76	-178.16	51.74	-178.26	92	432
54	12	6-Jun	80	51.75	-178.28	51.73	-178.38	377	573
42	13	7-Jun	80	51.78	-178.97	51.73	-178.91	168	483
42	14	7-Jun	80	51.72	-178.90	51.67	-178.83	493	723
53	15	8-Jun	80	51.40	-178.62	51.34	-178.56	234	688
53	16	8-Jun	80	51.35	-178.55	51.37	-178.46	527	589
55	17	9-Jun	80	51.59	-177.61	51.55	-177.70	200	280
55	18	9-Jun	80	51.55	-177.71	51.53	-177.79	332	895
57	19	10-Jun	80	51.73	-175.99	51.67	-176.00	184	358
57	20	10-Jun	80	51.66	-175.98	51.61	-176.01	409	649
58	21	11-Jun	80	51.85	-175.12	51.79	-175.12	178	322
58	22	11-Jun	80	51.78	-175.10	51.71	-175.15	368	650
59	23	12-Jun	80	51.89	-174.33	51.83	-174.39	123	485
59	24	12-Jun	80	51.82	-174.41	51.78	-174.49	472	920
60	25	13-Jun	80	51.92	-173.50	51.88	-173.58	118	220
60	26	13-Jun	80	51.88	-173.59	51.87	-173.70	450	620
61	27	14-Jun	79	52.44	-170.32	52.40	-170.40	248	457
<u>Gulf of Alaska</u>									
65	29	16-Jun	80	53.59	-165.68	53.52	-165.71	120	251
65	30	16-Jun	80	53.52	-165.72	53.47	-165.75	275	555
63	31	17-Jun	80	52.96	-168.14	52.91	-168.21	109	436
63	32	17-Jun	80	52.76	-168.23	52.84	-168.25	120	664
62	33	18-Jun	80	52.66	-169.00	52.62	-169.08	134	644
62	34	18-Jun	80	52.57	-169.19	52.61	-169.11	334	727
64	35	19-Jun	80	53.19	-166.86	53.12	-166.90	216	314
64	36	19-Jun	80	53.12	-166.91	53.06	-166.97	323	740
66	37	20-Jun	80	53.74	-164.47	53.69	-164.55	142	287

Station	Haul	Date	# Skates Retrieved	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)
66	38	20-Jun	80	53.68	-164.57	53.63	-164.65	324	605
67	39	21-Jun	80	53.96	-163.28	53.90	-163.34	125	545
67	40	21-Jun	80	53.89	-163.36	53.86	-163.45	365	849
68	41	22-Jun	80	54.13	-161.65	54.09	-161.74	127	408
68	42	22-Jun	80	54.13	-161.65	54.06	-161.87	360	961
69	43	23-Jun	80	54.31	-161.07	54.26	-161.14	190	414
69	44	23-Jun	80	54.25	-161.16	54.21	-161.22	446	869
70	45	24-Jun	80	54.36	-160.24	54.29	-160.30	141	323
70	46	24-Jun	80	54.29	-160.31	54.23	-160.32	324	612
71	47	25-Jun	80	54.51	-159.26	54.44	-159.31	141	279
71	48	25-Jun	80	54.44	-159.33	54.38	-159.41	282	645
72	49	26-Jun	80	54.63	-158.59	54.56	-158.65	136	383
72	50	26-Jun	80	54.56	-158.66	54.50	-158.72	328	781
73	51	27-Jun	80	54.85	-157.74	54.79	-157.82	182	390
73	52	27-Jun	80	54.78	-157.83	54.71	-157.88	367	525
74	53	28-Jun	80	55.24	-156.68	55.17	-156.75	164	345
74	54	28-Jun	80	55.17	-156.76	55.10	-156.76	275	756
75	55	29-Jun	80	55.64	-155.85	55.57	-155.86	144	211
75	56	29-Jun	80	55.56	-155.86	55.49	-155.80	215	230
148	57	5-Jul	80	54.65	-132.84	54.61	-132.92	146	376
149	58	5-Jul	80	54.60	-133.02	54.60	-133.13	409	415
108	59	6-Jul	80	54.46	-133.92	54.49	-134.02	257	680
108	60	6-Jul	80	54.49	-134.01	54.55	-134.06	409	780
107	61	7-Jul	80	54.90	-134.29	54.95	-134.35	220	598
107	62	7-Jul	80	54.96	-134.36	55.01	-134.44	445	861
106	63	8-Jul	80	55.41	-134.74	55.39	-134.82	367	641
106	64	8-Jul	80	55.40	-134.83	55.39	-134.94	495	845
105	65	9-Jul	80	55.56	-134.97	55.57	-135.05	245	605
105	66	9-Jul	80	55.59	-135.06	55.63	-135.13	495	875
144	67	10-Jul	80	55.93	-134.90	56.01	-134.91	200	367
145	68	10-Jul	80	56.03	-134.93	56.09	-135.02	348	380
104	69	11-Jul	80	55.98	-135.44	56.01	-135.51	330	596
104	70	11-Jul	80	56.03	-135.54	56.08	-135.62	605	825
103	71	12-Jul	80	56.39	-135.35	56.38	-135.48	153	190
103	72	12-Jul	80	56.38	-135.49	56.37	-135.62	191	255
102	73	13-Jul	80	56.85	-136.00	56.89	-136.09	211	677
102	74	13-Jul	80	56.91	-136.10	56.98	-136.11	633	916
101	75	14-Jul	80	57.19	-136.24	57.20	-136.33	214	766
101	76	14-Jul	80	57.21	-136.34	57.27	-136.39	640	923
100	77	15-Jul	80	57.62	-136.54	57.61	-136.65	199	796

Station	Haul	Date	# Skates Retrieved	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)
100	78	15-Jul	80	57.62	-136.67	57.66	-136.76	648	939
142	79	16-Jul	80	57.92	-137.01	57.92	-137.15	389	444
143	80	16-Jul	80	57.97	-137.08	57.97	-137.23	193	416
99	81	17-Jul	80	57.88	-137.38	57.88	-137.49	180	789
99	82	17-Jul	80	57.88	-137.50	57.89	-137.62	605	911
98	83	18-Jul	80	58.14	-138.73	58.15	-138.85	241	825
98	84	18-Jul	80	58.16	-138.87	58.18	-138.97	545	846
97	85	19-Jul	80	58.47	-139.47	58.46	-139.59	195	586
97	86	19-Jul	80	58.46	-139.61	58.42	-139.68	431	828
96	87	24-Jul	80	58.68	-140.64	58.68	-140.77	245	625
96	88	24-Jul	80	58.69	-140.78	58.72	-140.88	500	661
95	89	25-Jul	80	59.05	-141.34	59.05	-141.48	300	540
95	90	25-Jul	80	59.05	-141.50	59.05	-141.63	560	793
138	91	26-Jul	80	59.42	-140.95	59.43	-141.18	230	300
139	92	26-Jul	80	59.41	-141.17	59.35	-141.26	320	325
94	93	27-Jul	80	59.39	-142.16	59.43	-142.29	230	419
94	94	27-Jul	80	59.43	-142.30	59.49	-142.40	325	850
136	95	28-Jul	80	59.76	-143.72	59.75	-143.58	155	300
137	96	28-Jul	80	59.72	-143.51	59.67	-143.41	296	315
92	97	29-Jul	80	59.56	-143.67	59.56	-143.80	170	597
93	99	30-Jul	80	59.55	-142.57	59.59	-142.69	130	605
93	100	30-Jul	80	59.60	-142.69	59.57	-142.80	575	645
91	101	31-Jul	80	59.52	-144.71	59.48	-144.84	187	485
91	102	31-Jul	80	59.48	-144.85	59.45	-144.97	467	775
90	103	1-Aug	80	59.50	-145.53	59.52	-145.67	157	850
90	104	1-Aug	80	59.52	-145.68	59.52	-145.81	600	835
89	105	2-Aug	80	59.26	-146.86	59.22	-146.97	191	590
89	106	2-Aug	80	59.22	-146.98	59.17	-147.08	560	805
134	107	5-Aug	80	59.61	-146.99	59.55	-147.06	210	216
135	108	5-Aug	80	59.52	-147.15	59.45	-147.15	209	218
88	109	6-Aug	80	59.16	-147.62	59.08	-147.61	224	505
88	110	6-Aug	80	59.08	-147.62	59.01	-147.63	500	900
87	111	7-Aug	80	59.13	-148.65	59.05	-148.65	155	210
87	112	7-Aug	80	59.04	-148.64	58.96	-148.65	225	250
132	113	8-Aug	80	59.08	-149.41	59.04	-149.52	184	225
133	114	8-Aug	80	58.95	-149.51	58.92	-149.65	235	242
130	115	9-Aug	80	58.73	-149.19	58.77	-149.07	180	220
131	116	9-Aug	80	58.80	-149.04	58.84	-148.93	233	255
86	117	10-Aug	80	58.69	-148.33	58.61	-148.33	265	500
86	118	10-Aug	80	58.61	-148.34	58.53	-148.34	475	900

Station	Haul	Date	# Skates Retrieved	Start Latitude	Start Longitude	End Latitude	End Longitude	Start Depth (m)	End Depth (m)
85	119	11-Aug	80	58.29	-148.61	58.22	-148.66	195	450
85	120	11-Aug	80	58.22	-148.67	58.14	-148.71	520	850
84	121	12-Aug	80	57.97	-149.17	57.93	-149.26	160	495
84	122	12-Aug	80	57.91	-149.27	57.85	-149.35	496	870
128	123	13-Aug	80	58.00	-149.84	57.99	-149.95	227	265
129	124	13-Aug	80	58.07	-150.04	58.08	-149.89	297	300
83	125	14-Aug	80	57.63	-149.92	57.56	-149.94	286	1204
83	126	14-Aug	80	57.56	-149.96	57.49	-149.99	555	875
82	127	15-Aug	80	57.40	-150.58	57.33	-150.59	200	500
82	128	15-Aug	80	57.33	-150.60	57.26	-150.60	475	705
81	129	17-Aug	80	57.12	-151.22	57.05	-151.27	250	525
81	130	17-Aug	80	57.05	-151.28	56.97	-151.27	525	840
80	131	18-Aug	80	56.49	-152.21	56.43	-152.29	135	550
80	132	18-Aug	80	56.42	-152.30	56.36	-152.35	470	850
79	133	19-Aug	80	56.30	-153.08	56.26	-153.19	230	475
79	134	19-Aug	80	56.27	-153.19	56.21	-153.30	530	720
78	135	20-Aug	80	55.98	-154.02	55.91	-154.02	250	575
78	136	20-Aug	80	55.91	-154.03	55.85	-154.07	560	950
77	137	21-Aug	80	56.04	-154.57	55.97	-154.57	233	550
77	138	21-Aug	80	55.97	-154.58	55.90	-154.58	550	880
76	139	22-Aug	80	55.77	-155.14	55.69	-155.18	150	325
76	140	22-Aug	80	55.69	-155.18	55.63	-155.27	340	595
126	141	23-Aug	80	57.35	-155.03	57.35	-155.17	230	245
127	142	23-Aug	80	57.35	-155.25	57.33	-155.39	245	255
124	143	24-Aug	80	56.99	-155.07	57.00	-155.21	175	235
125	144	24-Aug	80	57.00	-155.30	57.05	-155.40	250	265
122	145	25-Aug	80	56.19	-155.96	56.18	-156.09	190	239
123	146	25-Aug	80	56.23	-156.13	56.25	-156.26	244	260
120	147	26-Aug	80	55.79	-156.08	55.77	-156.20	200	235
121	148	26-Aug	80	55.75	-156.20	55.73	-156.32	241	252

Table 4. Catch in number by species for the 2010 NMFS longline survey. SF = sablefish, PC = Pacific cod, GR = giant grenadier, PH = Pacific halibut, ATF = arrowtooth flounder, GT = Greenland turbot, RF = rougheye and shortraker rockfish, ST = shortspine thornyheads, SK = skate, OS = Other Species.

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
Aleutian Islands										
35**	1	1428	0	662	52	0	27	0	298	356
37*	37	204	1393	28	44	19	11	36	332	221
38*	57	316	1261	61	74	12	163	329	76	167
39	215	425	2993	160	81	15	61	65	59	413
40	323	499	1310	75	99	33	50	106	90	101
42	125	225	2178	66	108	1	148	24	385	311
53	365	53	1989	9	111	10	183	537	145	136
54	208	916	643	189	468	8	654	43	273	618
55	194	358	1558	146	116	1	92	333	218	259
57	195	185	1344	97	61	2	114	59	288	195
58	201	158	1837	150	85	1	285	153	258	92
59	165	524	1356	188	84	0	281	91	158	719
60*	107	671	781	24	9	0	703	43	68	382
61**	59	3	9	71	20	2	21	32	148	180
Gulf of Alaska										
62*	224	405	1754	72	75	0	422	499	33	167
63	364	1026	793	444	197	0	563	508	264	256
64	1274	47	1767	104	360	0	413	292	161	29
65	935	389	849	227	411	0	57	447	164	216
66	1657	82	2434	72	126	0	40	184	41	98
67	753	422	2036	183	245	0	210	224	78	159
68	820	344	1752	156	107	0	460	134	45	79
69	1047	125	2605	46	155	0	69	432	22	52
70	1337	577	2226	160	112	0	43	108	29	124
71	1423	1182	1750	154	176	0	30	100	46	112
72	2010	245	1416	121	183	0	121	328	16	70
73	1138	177	1347	41	293	0	38	385	63	114
74	1532	124	981	79	405	0	56	446	31	165
75*	279	1014	0	432	205	0	10	1	85	289
76	1150	199	1749	58	215	0	112	159	97	466
77	1378	0	3481	0	3	0	12	243	4	165
78	662	0	3312	7	8	0	257	492	6	571
79	2279	0	1932	1	181	0	47	380	12	25
80	1321	32	1464	138	74	0	150	557	18	245
81	1711	0	2041	10	156	0	59	187	4	185
82	1703	6	1714	90	200	0	36	145	1	66

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
83	783	0	2929	0	1	0	1	182	1	197
84	1864	19	959	56	41	0	24	316	12	369
85	1900	0	999	13	177	0	78	405	4	170
86	974	0	1136	27	155	0	323	401	14	194
87	2546	24	0	109	230	0	13	200	64	147
88	2019	52	762	34	127	0	209	395	25	215
89	1593	49	720	37	161	0	51	447	8	72
90	1356	22	357	24	33	0	64	425	44	341
91	2156	168	590	43	90	0	41	299	29	138
92	986	2	66	0	21	0	18	137	1	25
93	2228	15	725	103	15	0	55	576	34	79
94	929	7	939	30	139	0	227	386	37	89
95	1746	0	625	19	16	0	362	574	36	81
96	1149	0	634	6	177	0	254	348	27	174
97	1065	3	627	5	141	0	221	479	41	118
98	1515	0	815	0	78	0	313	157	9	79
99	1756	0	343	2	29	0	176	283	18	214
100	1953	32	432	1	73	0	124	305	7	111
101	1424	51	1225	1	68	0	128	295	11	98
102	1026	1	634	1	91	0	125	340	13	130
103	206	221	0	318	106	0	1	28	71	918
104	1398	0	341	1	19	0	138	361	14	169
105	2089	45	384	76	47	0	136	371	30	229
106	2335	0	178	1	11	0	572	321	7	124
107	1706	4	88	11	54	0	757	246	12	161
108	1532	2	113	10	50	0	773	160	15	209
120	468	831	0	45	293	0	0	3	125	253
121	751	61	0	25	289	0	3	43	129	94
122	322	531	0	36	273	0	1	2	299	257
123	481	723	0	28	162	0	0	3	269	83
124	128	542	0	67	482	0	3	0	363	139
125	159	897	0	70	260	0	0	1	316	203
126	253	454	0	18	167	0	0	0	278	77
127	273	581	0	37	193	0	2	1	384	144
128	480	8	0	226	52	0	0	48	10	23
129	1072	1	0	209	127	0	6	48	21	34
130	663	12	0	56	91	0	2	99	17	16
131	1198	1	0	44	48	0	34	140	14	76
132	315	2	0	34	58	0	0	36	108	70
133	440	1	0	93	128	0	21	321	53	148
134	304	3	0	16	107	0	77	144	88	488
135	445	1	0	25	70	0	32	87	84	796

Station	SF	PC	GR	PH	ATF	GT	RF	ST	SK	OS
136	511	1	0	22	11	0	3	58	82	41
137	725	0	0	18	11	0	18	188	54	25
138	501	0	0	35	76	0	18	136	42	72
139	1297	0	0	24	71	0	17	101	66	33
142	1281	0	88	0	48	0	37	269	22	9
143	1800	3	17	8	104	0	16	156	20	51
144	302	23	0	50	212	0	175	334	41	158
145	1370	0	1	4	163	0	101	119	48	81
148	462	216	0	54	94	0	39	261	142	537
149	859	0	0	32	61	0	13	339	152	167
Total	511	1	0	22	11	0	3	58	82	41

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

** Station catch was partially impacted by gear loss.

Table 5. Mean length, round weight, mean dressed weight, number, and estimated total round weight of sablefish by station, for the 2010 NMFS longline survey.

Station	Mean Length	Mean Round Weight(kg) ¹	Mean Dressed Weight(lbs) ²	Number of Sablefish	Est. Total Round Weight(kg) ³
<u>Aleutian Islands</u>					
35**	35	NA	NA	NA	1
37*	37	58.81	2.14	2.97	37
38*	38	61.59	2.53	3.52	57
39	39	65.85	3.15	4.37	215
40	40	68.09	3.50	4.87	323
42	42	69.63	3.80	5.27	125
53	53	66.89	3.38	4.69	365
54	54	73.42	4.47	6.22	208
55	55	65.02	3.11	4.33	194
57	57	59.70	2.28	3.17	195
58	58	61.84	2.58	3.59	201
59	59	67.09	3.33	4.63	165
60*	60	65.73	3.16	4.40	107
61**	61	59.74	2.30	3.19	59
<u>Gulf of Alaska</u>					
62	55.44	1.78	2.48	224	399
63	61.47	2.57	3.56	364	934
64	54.89	1.69	2.35	1,274	2,154
65	60.31	2.35	3.26	935	2,193
66	56.02	1.91	2.65	1,657	3,160
67	61.85	2.61	3.62	753	1,963
68	63.07	2.83	3.93	820	2,321
69	63.43	2.92	4.05	1,047	3,055
70	58.99	2.21	3.08	1,337	2,960
71	62.61	2.71	3.76	1,423	3,854
72	62.29	2.62	3.64	2,010	5,264
73	62.44	2.68	3.72	1,138	3,047
74	63.13	2.71	3.76	1,532	4,153
75	52.14	1.56	2.17	279	436
76	65.71	3.10	4.31	1,150	3,565
77	64.95	3.00	4.17	1,378	4,135
78	67.64	3.43	4.76	662	2,270
79	66.67	3.23	4.48	2,279	7,355
80	67.86	3.46	4.80	1,321	4,568
81	65.64	3.08	4.28	1,711	5,269
82	64.01	2.81	3.91	1,703	4,791
83	67.28	3.34	4.63	783	2,612

Station	Mean Length	Mean Round Weight(kg) ¹	Mean Dressed Weight(lbs) ²	Number of Sablefish	Est. Total Round Weight(kg) ³
84	67.16	3.34	4.63	1,864	6,219
85	67.28	3.35	4.65	1,900	6,358
86	67.57	3.37	4.68	974	3,284
87	60.20	2.41	3.35	2,546	6,140
88	69.15	3.73	5.17	2,019	7,522
89	69.73	3.85	5.34	1,593	6,128
90	69.43	3.75	5.22	1,356	5,092
91	68.05	3.51	4.88	2,156	7,570
92	69.76	3.89	5.40	986	3,833
93	70.06	3.87	5.37	2,228	8,619
94	66.96	3.38	4.70	929	3,141
95	71.44	4.15	5.76	1,746	7,239
96	70.25	3.93	5.46	1,149	4,520
97	69.15	3.81	5.29	1,065	4,060
98	73.85	4.71	6.54	1,515	7,137
99	74.03	4.70	6.53	1,756	8,260
100	70.63	3.98	5.53	1,953	7,774
101	70.54	3.98	5.52	1,424	5,661
102	70.72	4.02	5.59	1,026	4,128
103	55.92	2.06	2.87	206	425
104	66.39	3.25	4.51	1,398	4,541
105	69.37	3.76	5.23	2,089	7,861
106	68.40	3.58	4.97	2,335	8,354
107	69.54	3.76	5.22	1,706	6,417
108	69.20	3.70	5.15	1,532	5,675
120	58.05	2.10	2.92	468	985
121	61.66	2.53	3.51	751	1,897
122	59.85	2.34	3.25	322	753
123	61.66	2.57	3.57	481	1,236
124	63.26	2.76	3.83	128	353
125	58.36	2.19	3.04	159	348
126	56.08	1.86	2.59	253	472
127	59.05	2.21	3.07	273	604
128	62.15	2.56	3.55	480	1,228
129	64.06	2.80	3.89	1,072	3,001
130	65.07	2.98	4.14	663	1,978
131	66.12	3.13	4.35	1,198	3,749
132	63.74	2.81	3.90	315	885
133	62.75	2.67	3.71	440	1,175
134	49.67	1.25	1.74	304	381

Station	Mean Length	Mean Round Weight(kg) ¹	Mean Dressed Weight(lbs) ²	Number of Sablefish	Est. Total Round Weight(kg) ³
135	50.92	1.39	1.93	445	620
136	60.58	2.64	3.66	511	1,348
137	63.39	2.75	3.82	725	1,992
138	61.75	2.72	3.78	501	1,365
139	68.48	3.53	4.91	1,297	4,584
142	63.33	2.71	3.76	1,281	3,466
143	61.82	2.57	3.57	1,800	4,628
144	69.32	3.89	5.40	302	1,173
145	69.06	3.75	5.21	1,370	5,135
148	62.66	2.71	3.76	462	1,252
149	59.09	2.20	3.06	859	1,890

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

** Station catch was partially impacted by gear loss.

¹ Mean weight was estimated by applying a length-weight relationship to the length frequency distribution from each station.

² Mean dressed weight was estimated using a recovery rate of 0.6 of round weight in pounds.

³ Estimated total round weight is the product of mean round weight and the number of hooked sablefish that came to the surface including a small percentage that were lost during landing and fish tagged and released.

Table 7. Total estimated catch in numbers (kg) of major species (>100 individuals) caught by management area in 2010 NMFS longline survey.

Species/Complex	East					Total
	Aleutian Islands	Western GOA	Central GOA	West Yakutat	Yakutat Southeast	
Sablefish	2,251	9,834	33,001	15,177	24,079	84,342
Giant grenadier	18,652	17,966	26,222	4,656	5,286	72,782
Shortspine thornyhead	1,851	2,928	6,197	3,675	4,824	19,475
Pacific cod	5,965	4,599	6,540	264	601	17,969
Arrowtooth flounder	1,412	1,964	5,454	821	1,449	11,100
Rougheye rockfish	1,340	1,672	1,327	534	2,772	7,646
Pacific halibut	1,926	1,618	2,245	361	575	6,725
Aleutian/Bering/Alaska Skate	1,385	564	2,373	114	140	4,576
Shorthead rockfish	1,453	634	399	594	1,073	4,152
Spiny dogfish	0	83	1,568	164	791	2,606
Walleye pollock	182	428	1,297	27	35	1,969
Pacific grenadier	184	5	1,184	368	149	1,890
Longnose skate	1	280	490	316	513	1,600
Yellow Irish lord	1,427	38	0	0	0	1,465
Redbanded rockfish	2	24	235	92	899	1,252
Sea anemone unident.	33	154	412	149	463	1,211
whiteblotched skate	701	2	0	0	0	703
Brittlestarfish	174	114	298	29	43	658
Darkfin sculpin	628	7	0	1	0	636
Sea pen or Sea Whip	19	6	508	19	44	596
Dover sole	0	17	373	100	75	565
Lips or Jaws - Whale Predation	214	81	43	46	53	437
commander skate	377	13	2	0	10	402
Invertebrate unident.	229	62	40	6	18	355
Spotted ratfish	0	0	0	0	349	349
mud skate	239	12	73	0	0	324
hydrocoral unident.	240	14	8	5	5	272
Starfish unident.	46	10	88	30	74	248
Gorgonian Coral unident.	181	27	6	1	14	229
Sponge, unidentified	118	78	20	1	7	224
Yelloweye rockfish	1	42	9	31	136	219
Pacific Ocean Perch	63	11	52	1	1	128
Flathead sole	11	1	110	2	1	125
Pacific flatnose	22	6	2	8	73	111
Greenland turbot	104	0	0	0	0	104

Table 6. Total estimated catch in weight (kg) of major species (>100 kg) caught by management area in 2010 NMFS longline survey. Weight derived from length-weight relationship when lengths available. For all others an average weight proxy was applied to numbers caught.

Species/Complex	Aleutian Islands	Western GOA	Central GOA	West Yakutat	East Yakutat Southeast	Total
Sablefish	7,263	22,993	96,650	55,431	87,838	270,175
Giant grenadier	65,520	56,822	77,869	12,900	15,076	228,187
Pacific cod	16,271	11,864	19,009	767	1,580	49,491
Pacific halibut	11,365	9,548	13,248	2,130	3,393	39,684
Arrowtooth flounder	3,945	3,104	8,895	1,431	2,380	19,755
Shortspine thornyhead	1,679	1,798	3,694	2,080	3,376	12,628
Longnose skate	7	2,087	3,653	2,356	3,824	11,928
Rougeye rockfish	1,546	2,221	1,559	547	4,685	10,558
Spiny dogfish	0	143	3,458	351	1,937	5,888
Shortraker rockfish	961	856	707	1,062	1,624	5,210
whiteblotched skate	3,776	11	0	0	0	3,787
Walleye pollock	259	608	1,843	38	50	2,798
Redbanded rockfish	4	43	417	163	1,596	2,223
Pacific grenadier	190	2	945	315	160	1,612
commander skate	1,202	41	6	0	32	1,281
Spotted ratfish	0	0	0	0	1,271	1,271
Yellow Irish lord	1,196	32	0	0	0	1,228
mud skate	809	41	247	0	0	1,097
Dover sole	0	25	555	149	112	840
Yelloweye rockfish	3	121	26	89	392	632
Greenland turbot	609	0	0	0	0	609
Darkfin sculpin	550	6	0	1	0	557
Skates unidentified	61	41	355	0	25	482
big skate	0	10	30	289	40	369
Pacific sleeper shark	0	58	173	0	116	347
Sea anemone unident.	9	43	114	41	128	335
Lingcod	0	0	8	131	82	222
Octopus	76	107	19	6	6	214
Pacific Ocean Perch	97	17	80	2	2	198
whitebrow skate	169	0	0	0	0	169
Silvergray rockfish	0	0	0	12	103	116
Sea pen or Sea Whip	4	1	96	4	8	113

Table 7. - Stations and skates that were depredated upon by killer whales in the 2010 NMFS longline survey. Start skate refers to skate where killer whales began affecting catch. End skate refers to the last skate that was affected.

Station	Region	Start Skate	End Skate
37	Aleutian Islands	1	160
38	Aleutian Islands	66	160
60	Aleutian Islands	1	160
62	Western Gulf of Alaska	36	160
75	Central Gulf of Alaska	30	160

Table 8. Stations that had sperm whales present during hauling operations in the 2010 NMFS longline survey. Depredation is defined as sperm whales being present with the occurrence of damaged fish on the line.

Station	Region	Depredation	Number of Whales
69	Western Gulf of Alaska	No	3
108	East Yakutat / Southeast	Yes	2
106	East Yakutat / Southeast	Yes	1
105	East Yakutat / Southeast	Yes	2
104	East Yakutat / Southeast	Yes	1
102	East Yakutat / Southeast	Yes	2
101	East Yakutat / Southeast	Yes	2
100	East Yakutat / Southeast	No	1
142	East Yakutat / Southeast	No	1
143	East Yakutat / Southeast	No	1
99	East Yakutat / Southeast	No	1
97	East Yakutat / Southeast	No	2
94	West Yakutat	Yes	4
96	West Yakutat	Yes	3
86	Central Gulf of Alaska	Yes	2
85	Central Gulf of Alaska	No	1
84	Central Gulf of Alaska	No	2
83	Central Gulf of Alaska	No	2
82	Central Gulf of Alaska	Yes	1
81	Central Gulf of Alaska	No	2

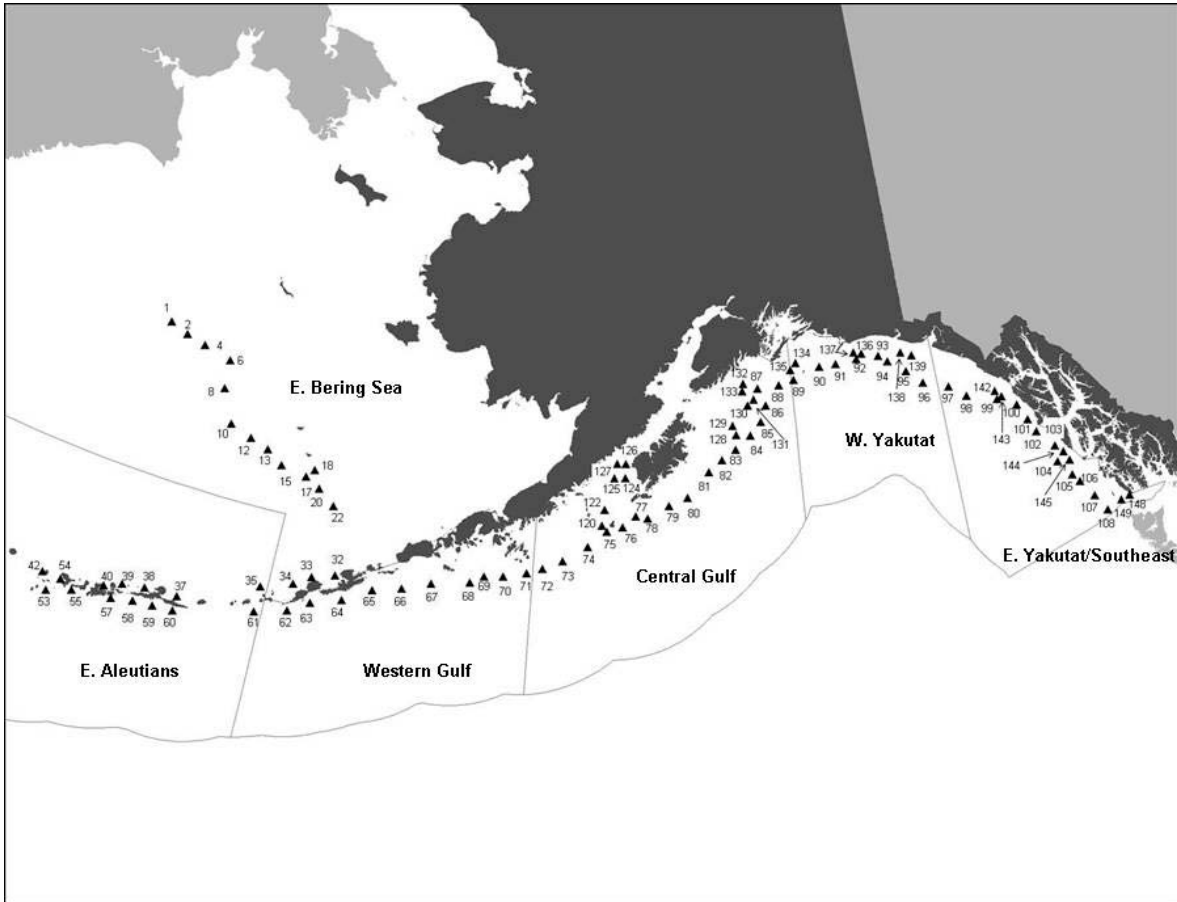


Figure 1. Map of NMFS longline survey station locations and corresponding management areas. Bering Sea stations are sampled in odd years; Aleutian Islands Region stations are sampled in even years; Gulf of Alaska stations sampled every year.

APPENDIX A: Electronic Data Collection and Hook Tension Device Experiment

Two special projects were conducted near Yakutat July 21-22 to test methods for improving the electronic data collection system and for testing hook tension devices. The two-day experiment included staff from the Alaska Fisheries Science Center, Finsight Consulting, and Andrew's Cooper Engineering. Several new data collection techniques were beta-tested for use in the 2011 survey. In addition, hook tension devices were tested on the longline to determine feasibility. More information on these devices and the data collection tools will be available in the future.

During the two-day experiment four sets were completed (Table A1).

Table A1. Set information by station and haul for the 2009 NMFS longline survey 2-day experiment. Positions in decimal degree (DD) format.

Haul	Date	Start Lat	Start Lon	End Lat	End Lon	Start Depth (m)	End Depth (m)
1	21-Jul	58.97	-141.17	58.97	-141.29	772	875
2	21-Jul	58.91	-141.07	58.96	-141.15	716	896
3	22-Jul	58.85	-141.04	58.91	-141.04	617	768
4	22-Jul	58.78	-140.98	58.84	-141.03	590	680