



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

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F/V Prowler

Cruise Report PR-88-01

Longline survey of the Gulf of Alaska

July 6 to September 17, 1988

Prepared by Harold H. Zenger, Jr.

On September 17, 1988, the NOAA Fisheries, Northwest and Alaska Fisheries Center (NWAFC), completed the second annual longline survey of sablefish (Anoplopoma fimbria) resources on the upper continental slope of the Gulf of Alaska. The survey area extended from the Islands of Four Mountains eastward to Dixon Entrance (Figure 1). As in the previous survey, the charter vessel was allowed to retain most of the catch once the scientific data were recorded.

OBJECTIVES

1. Determine the relative abundance and size composition of commercially important longline-caught species: sablefish, the principal species; Pacific cod (Gadus macrocephalus); shortspine thornyhead (Sebastolobus alascanus); and roughey and shortraker rockfishes (Sebastes aleutianus and S. borealis). The size composition of Pacific halibut (Hippoglossus stenolepis) was not studied.
2. Determine the relative abundance and size composition of other groundfish species: arrowtooth flounder (Atheresthes stomias), Greenland turbot (Reinhardtius hippoglossoides), and grenadiers (Macrouridae).



VESSEL AND GEAR

Survey operations were conducted using the F/V Prowler, a chartered U.S. longline vessel. The 35 m (115 ft) vessel carried standard longline hauling gear and was equipped with radios, radar, LORAN receivers and plotter, a processing line, two sets of plate freezers, and refrigerated holds. Vessel personnel consisted of a captain, eight fishermen and processors, and a cook.

Gear configuration was basically unchanged from last year's survey, although bait was changed from herring (Clupea pallasii) to squid (Illex spp.). 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 beckets tied into the groundline at 2 m (6.5 ft) intervals. Five m (16 ft) of groundline were left bare on each end. Gangions were constructed of medium lay #60 thread nylon, becket material was medium lay #60 thread on previously used skates and was medium lay #72 thread nylon on new skates, and groundline was medium lay 95 mm (3/8 in) nylon.

Each end of a set started with a flag and buoy array, followed by a buoyline, a 92 m (50 fm) section of polypropylene floating line, a 16 kg (35 lb) piece of chain at the bottom end to dampen the effect of surge on the buoyline, 92 m (50 fm) of nylon, a 27 kg (60 lb) halibut anchor, 366 m (200 fm) more of nylon, and the groundline weighted with 3.2 kg (7 lb) lead balls snapped on at the end of each skate. Hooks were hand baited with chopped squid (Illex spp.) at a rate of about 4.5 kg (10 lb) per 100 hooks.

Initial plans were to set 160 skates along a continuous groundline, buoys at each end, and two buoylines between. Without a second line hauler, the intermediate buoylines could not be retrieved conveniently, and therefore, the gear was set in two equal parts of 80 skates. The two sets were laid end to end. Thus, total groundline set each day was 16 km (8.6 nmi) long and contained 7,200 hooks.

The NWAFC supplied the longline gear except the flags, buoys, buoylines, and anchors, which were furnished by the charter vessel. The vessel also supplied bait and transportation of the gear from Seattle to Petersburg and return.

OPERATIONS

The cruise was divided into three parts of about 23 working or traveling days each. During Leg 1, the survey sampled from west

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

to east from the Islands of Four Mountains to Shelikof Strait. Leg 2 began near Chirikof Island and continued eastward to approximately Cape St. Elias. Leg 3 extended the survey to its southeastern limit near Dixon Entrance.

Seventy-four days were used to complete the survey that included 6 days lost to bad weather, a day to replace an ill crewman, a day to repair damaged fishing gear, 4 days off charter to unload and resupply the vessel and exchange scientific personnel, 5 days for running, and 57 days of survey sampling.

Survey operations

Sampling was conducted along the upper continental slope in the Gulf of Alaska at 47 preassigned stations at a rate of one station per day. Depths sampled during the survey ranged from about 100 m to just over 1,000 m, but often did not cover this full range at any given station (Table 1). In addition, three stations (54-56) were sampled in Shumagin Gully, four (48-51) in Shelikof Trough, one (57) in Albatross Gully, one (59) in Amatuli Trench, and one (60) in Spencer Gully to determine the abundance and size composition of sablefish and Pacific cod stocks in those deepwater areas of the continental shelf.

The gear was set from shallow to deep and was retrieved in the same order, except on infrequent occasions when groundlines parted or wind and sea conditions dictated that it be pulled from the opposite direction. Usually, setting began about 0630 and gear retrieval began about 0930.

Data collection

During gear retrieval a scientist at the rail recorded the species of each fish; the condition of each hook, whether absent, broken, or tangled; and whether bait remained on the hook. Time of day and depth were recorded when the first and last skates came aboard and at the beginning of every fifth skate.

Length measurements were taken for sablefish, Pacific cod, grenadiers, arrowtooth flounder, rockfish, and thornyheads. Only lengths of sablefish and Pacific cod were recorded by 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). Pacific halibut were counted and released at the rail.

RESULTS

One hundred and thirteen longline hauls (sets) were made (Table 1). Two hauls were made at all stations except station 60 (Spencer Gully). Four preassigned gully stations were not sampled due to time constraints. Generally, the gear performed well, although approximately 50 skates were lost at stations 14 and 43.

Sablefish was the most commonly caught species followed in abundance by Pacific cod, grenadiers, Pacific halibut, and arrowtooth flounder (Table 2). Consecutive stations 36-41 produced relatively large catches of sablefish. Catches of Pacific cod were highest at the Shumagin Gully and Shelikof Trough stations (49-54). In general, the catch rate of cod decreased in an easterly direction. The smallest mean sizes of sablefish were found at stations 14 and 15 and in Shumagin Gully and Shelikof Trough (stations 48-56). The largest mean sizes were found off southeastern Alaska (stations 35-47).

A total of 91,612 sablefish (estimated total round weight of 303,061 kg (668,250 lb) was recorded at the rail. The number of landed fish was slightly less due to drop-off and gaffing losses.

SCIENTIFIC PERSONNEL

Leg I (July 6-28)

Harold Zenger, Field Party Chief, NWAFC, RACE
David Molenaar, NWAFC, RACE
Michael Martin, NWAFC, RACE

Leg II (July 31-August 22)

Jim Long, Field Party Chief, NWAFC, RACE
Peter Munro, NWAFC, RACE
Michael Martin, NWAFC, RACE

Leg III (August 25-September 17)

Michael Sigler, Field Party Chief, NWAFC, ABL
Richard Haight, NWAFC, ABL
Larry Haaga, NWAFC, RACE

RACE - Resource Assessment and Conservation Engineering Division
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Table 1.--Haul number (set), preassigned station number, starting and ending positions, and depths for the 1988 NMFS domestic longline survey of the Gulf of Alaska, July 6 - September 17.

Haul no.	Station no.	Start		End		Start depth (m)	End depth (m)
		lat. (ddmm.m)	long. (dddmm.m)	lat. (ddmm.m)	long. (dddmm.m)		
1	1	5236.0	16931.1	5232.2	16931.8	135	396
2	1	5232.2	16931.9	5228.1	16931.6	385	480
3	2	5258.0	16808.6	5254.9	16812.7	115	389
4	2	5254.6	16812.7	5250.6	16813.5	407	945
5	3	5311.0	16655.0	5307.6	16654.4	220	300
6	3	5307.1	16654.4	5303.1	16657.2	313	550
7	4	5334.9	16541.4	5331.0	16543.6	122	167
8	4	5330.5	16543.7	5326.9	16544.8	337	726
9	5	5344.2	16428.0	5341.2	16432.6	133	282
10	5	5340.9	16433.3	5337.6	16437.4	293	778
11	6	5358.1	16316.1	5355.0	16320.7	119	223
12	6	5354.6	16321.3	5351.2	16326.9	278	685
13	7	5405.0	16204.0	5403.0	16210.0	133	359
14	7	5403.3	16211.0	5404.1	16215.9	369	870
15	8	5418.9	16103.6	5415.8	16107.5	152	387
16	8	5415.5	16108.0	5412.8	16112.5	396	793
17	9	5421.9	16014.4	5717.9	16015.8	144	306
18	9	5417.6	16016.0	5413.7	16018.1	333	637
19	10	5430.5	15915.4	5426.6	15917.5	130	244
20	10	5426.5	15917.7	5422.4	15920.7	257	846
21	11	5437.6	15834.6	5434.0	15838.3	122	298
22	11	5433.8	15838.4	5430.0	15842.7	328	715
23	54	5503.0	15830.9	5500.4	15836.2	187	209
24	54	5559.8	15837.9	5457.9	15843.7	104	163
25	55	5517.3	15800.4	5517.5	15807.4	88	113
26	55	5517.4	15808.0	5517.7	15814.0	113	130
27	12	5450.8	15744.6	5447.1	15747.9	159	352
28	12	5446.8	15748.2	5443.1	15751.5	372	563
29	13	5513.4	15640.3	5509.8	15642.5	163	400
30	13	5509.4	15642.7	5505.8	15645.1	411	748
31	56	5547.0	15730.3	5546.3	15737.9	104	122
32	56	5546.3	15738.2	5545.3	15745.1	122	131
33	49	5547.4	15604.6	5546.0	15600.0	204	239
34	49	5546.4	15612.3	5545.4	15619.8	239	256
35	48	5700.0	15456.0	5659.9	15503.4	83	181
36	48	5700.0	15511.2	5659.5	15503.7	181	237
37	51	5721.0	15513.7	5721.4	15506.1	241	250
38	51	5719.9	15522.4	5720.9	15514.4	248	257
39	16	5602.6	15434.5	5558.0	15434.0	178	407
40	16	5558.2	15433.7	5553.9	15434.2	463	822
41	50	5611.8	15550.3	5611.8	15556.5	67	178
42	50	5611.5	15557.2	5611.2	15604.0	189	241
43	14	5538.2	15550.5	5534.6	15550.9	122	206
44	14	5534.4	15550.7	5530.5	15550.9	207	224
45	15	5545.9	15507.7	5542.6	15510.1	141	219

Table 1.--continued

Haul no.	Station no.	Start		End		Start depth (m)	End depth (m)
		lat. (ddmm.m)	long. (dddmm.m)	lat. (ddmm.m)	long. (dddmm.m)		
46	15	5542.3	15510.3	5539.2	15512.5	226	419
47	17	5558.6	15401.1	5554.6	15400.9	213	467
48	17	5554.2	15401.0	5550.2	15400.9	502	880
49	18	5616.6	15302.5	5614.3	15309.1	228	494
50	18	5614.0	15310.1	5611.5	15315.5	576	778
51	19	5628.2	15204.7	5624.3	15207.6	130	306
52	19	5623.8	15208.2	5621.6	15214.2	415	641
53	57	5651.9	15141.9	5652.1	15134.4	165	409
54	57	5651.9	15149.8	5651.8	15142.3	76	159
55	20	5707.0	15113.0	5703.2	15115.1	226	480
56	20	5702.9	15114.9	5658.8	15116.5	496	800
57	21	5724.1	15034.0	5720.0	15036.8	196	374
58	21	5719.6	15037.3	5715.0	15035.2	394	600
59	22	5738.3	14954.3	5734.3	14956.8	357	530
60	22	5733.7	14956.8	5729.0	14958.3	556	861
61	23	5758.5	14909.7	5755.4	14914.7	152	465
62	23	5755.0	14914.9	5751.3	14919.6	472	828
63	24	5817.9	14836.8	5814.2	14839.6	213	437
64	24	5814.0	14839.7	5810.2	14841.4	457	745
65	25	5841.6	14820.4	5837.9	14820.1	285	344
66	25	5837.7	14819.8	5833.9	14818.4	385	874
67	59	5843.7	14912.0	5846.0	14905.5	172	220
68	59	5846.2	14905.4	5848.8	14859.4	224	1,243
69	26	5907.9	14839.0	5903.7	14838.3	146	183
70	26	5903.5	14839.5	5859.4	14839.2	185	241
71	27	5909.7	14736.2	5905.4	14736.8	220	474
72	27	5905.4	14736.8	5901.3	14737.4	470	772
73	28	5916.1	14651.0	5913.3	14655.4	194	561
74	28	5913.1	14656.0	5910.3	14701.3	594	848
75	30	5931.4	14442.6	5929.0	14449.1	196	519
76	30	5926.3	14455.7	5928.7	14449.3	504	930
77	29	5930.0	14531.0	5930.1	14538.9	156	607
78	29	5929.9	14540.0	5930.4	14548.9	902	667
79	31	5933.3	14338.6	5933.2	14346.4	163	661
80	31	5933.3	14347.6	5934.0	14354.7	759	907
81	32	5933.0	14233.6	5934.6	14239.2	124	593
82	32	5935.0	14240.0	5935.2	14246.9	580	607
83	33	5923.3	14209.8	5924.8	14216.6	230	363
84	33	5927.3	14223.1	5925.0	14217.2	437	833
85	34	5903.0	14120.1	5902.8	14127.3	282	432
86	34	5902.7	14128.0	5902.7	14135.9	463	817
87	35	5841.1	14038.1	5840.6	14045.1	232	617
88	35	5840.9	14045.6	5842.4	14052.0	535	604
89	36	5828.0	13928.2	5827.5	13935.3	194	463
90	36	5827.3	13936.1	5824.8	13941.6	504	685
91	37	5808.4	13843.8	5807.7	13849.5	193	722
92	37	5808.3	13850.6	5810.3	13855.9	722	672

Table 1.--continued

Haul no.	Station no.	Start		End		Start depth (m)	End depth (m)
		lat. (ddmm.m)	long. (dddmm.m)	lat. (ddmm.m)	long. (dddmm.m)		
93	38	5752.4	13723.4	5752.6	13730.7	202	620
94	38	5752.8	13732.0	5753.3	13737.5	667	759
95	60	5754.1	13653.4	5754.0	13700.4	463	450
96	60	5755.2	13700.8	5755.1	13707.9	450	409
97	39	5737.3	13632.2	5736.7	13637.6	176	720
98	39	5736.5	13638.3	5737.7	13644.2	763	991
99	40	5711.4	13614.6	5713.9	13619.2	211	594
100	40	5714.1	13620.2	5714.1	13626.2	524	1,074
101	41	5651.1	13600.0	5654.1	13605.0	211	585
102	41	5654.4	13607.0	5657.7	13607.5	580	756
103	42	5623.0	13521.1	5622.7	13528.0	148	181
104	42	5622.7	13528.3	5622.3	13535.1	183	207
105	44	5533.6	13458.6	5534.7	13503.8	237	511
106	44	5535.2	13504.5	5537.7	13509.1	485	741
107	45	5520.3	13443.9	5522.5	13448.5	309	550
108	45	5522.5	13449.5	5522.9	13455.9	646	809
109	46	5454.0	13417.2	5457.0	13421.4	220	500
110	46	5457.0	13422.2	5459.6	13426.5	546	859
111	47	5426.8	13356.3	5428.0	13401.0	270	778
112	47	5428.6	13401.7	5431.4	13404.4	774	1,101
113	43	5559.2	13526.8	5601.3	13533.5	332	798

Table 2.--Catch in number by species and station for the 1988 NMFS domestic longline survey, Gulf of Alaska, July 6 - September 17.

Station number	Sable fish	Pacific cod	Grenadier	Pacific halibut	Arrowtooth flounder	Greenland turbot	Rock fish	Short spine thorny head	Skate	Other spp ^a
1	529	684	798	314	124	0	196	299	144	47
2	987	446	803	324	53	0	170	80	13	6
3	1,161	420	39	171	263	2	288	199	29	3
4	1,098	724	849	87	244	0	17	80	33	13
5	1,492	560	526	46	141	0	44	85	15	23
6	641	582	222	214	38	0	135	65	1	91
7	1,546	469	725	73	178	0	102	185	2	35
8	1,697	388	1,251	55	69	0	28	64	2	40
9	2,208	556	614	33	179	0	26	58	5	17
10	1,385	982	339	32	82	0	142	68	6	16
11	1,756	822	590	67	130	1	89	49	3	7
12	2,355	422	716	35	105	1	75	67	0	27
13	2,227	43	1,252	49	85	0	10	170	0	76
14 ^b	294	1,193	0	263	265	0	13	0	2	12
15	1,097	1,143	34	162	165	0	43	26	10	80
16	2,280	101	471	59	361	0	148	42	9	4
17	1,665	112	965	47	161	1	83	137	18	5
18	2,009	4	601	22	202	2	31	90	9	4
19	1,094	498	569	326	71	0	112	43	1	11
20	1,943	43	853	13	99	0	14	63	5	16
21	1,619	182	152	114	161	0	32	52	14	10
22	2,120	0	346	5	19	0	12	83	0	6
23	1,451	62	623	641	44	0	77	54	5	1
24	1,698	165	330	31	109	0	73	161	6	3
25	1,318	80	272	115	119	0	96	53	6	8
26	2,037	590	0	82	151	0	2	5	17	83
27	2,026	5	393	44	132	0	45	33	0	4
28	1,488	66	897	100	26	0	10	47	3	1
29	1,651	209	682	43	26	0	168	73	86	16
30	1,538	210	199	70	59	0	15	42	7	12
31	2,304	154	408	29	58	0	37	62	5	7
32	2,056	151	12	149	7	0	78	69	6	35
33	1,084	86	92	56	114	0	155	65	18	5
34	1,474	0	33	30	66	0	262	73	15	3
35	1,509	6	213	70	78	0	167	28	12	1
36	2,244	12	157	65	45	0	197	18	4	37
37	2,184	1	266	47	22	0	230	50	3	13
38	2,691	0	86	18	18	0	122	23	0	5
39	2,724	73	93	37	28	0	69	33	5	12
40	2,319	11	134	44	45	0	120	31	2	5
41	2,493	13	176	111	32	0	42	33	7	17
42	631	264	6	438	97	0	327	1	21	166
43 ^b	1,174	2	7	18	0	0	99	133	3	3

Table 2.--continued

Station number	Sable fish	Pacific cod	Grenadier	Pacific halibut	Arrowtooth flounder	Greenland turbot	Rock fish	Short spine thorny head	Skate	Other spp ^a
44	1,907	58	37	70	16	0	86	18	4	13
45	1,990	16	13	3	15	0	229	43	3	11
46	2,174	3	96	20	7	2	207	38	3	9
47	1,718	0	264	1	8	0	173	63	3	7
48 ^c	1,365	795	0	379	486	0	0	0	73	18
49	1,882	1,074	2	113	180	0	37	0	112	17
50	753	1,144	0	693	145	0	1	0	115	13
51	1,538	1,187	0	223	251	0	1	0	53	35
54	1,211	1,047	0	380	99	0	1	0	35	24
55	336	2,076	0	527	31	0	0	0	9	10
56	247	2,947	0	547	172	0	0	0	14	35
57	516	252	24	950	115	0	51	13	26	54
59	1,517	130	1	116	223	0	11	50	169	66
60	3,161	0	24	0	33	0	10	51	3	3
Total	91,612	23,263	18,255	8,771	6,252	9	5,008	3,368	1,174	1,301

^a Other species: spiny dogfish, Pacific sleeper shark, blue shark, Pacific electric ray, spotted ratfish, flathead sole, Dover sole, rock sole, searcher, Pacific pomfret, sculpins, Pacific flatnose, walleye pollock, greenling, lingcod, coho salmon, chum salmon, giant wrymouth, tanner crab, scallops, snails, octopus, and starfish.

^b 110 effective skates.

^c Stations 48-60 were located on the continental shelf or in gullies.

Table 3.--Mean length, mean round weight, mean dressed weight, number, and estimated total round weight of sablefish, by station, for the 1988 NMFS domestic longline survey of the Gulf of Alaska, July 6 - September 17.

Station number	Mean length (cm)	Mean round weight (kg) ^a	Mean dressed weight (lb) ^b	Number of sablefish	Estimated total round weight (kg) ^c
1	68.1	3.5	4.6	529	1,852
2	67.4	3.3	4.4	987	3,257
3	66.2	3.2	4.2	1,161	3,715
4	66.8	3.3	4.4	1,098	3,623
5	64.4	2.9	3.8	1,492	4,327
6	66.3	3.2	4.2	641	2,051
7	67.6	3.4	4.5	1,546	5,256
8	65.5	3.1	4.1	1,697	5,261
9	64.2	2.9	3.8	2,208	6,403
10	65.5	3.0	4.0	1,385	4,155
11	67.2	3.3	4.4	1,756	5,795
12	66.5	3.2	4.2	2,355	7,536
13	67.5	3.3	4.4	2,227	7,349
14	61.9	2.5	3.3	294	735
15	62.6	2.6	3.4	1,097	2,852
16	66.9	3.3	4.4	2,280	7,524
17	66.5	3.2	4.2	1,665	5,328
18	68.1	3.5	4.6	2,009	7,032
19	68.3	3.5	4.6	1,094	3,829
20	66.4	3.2	4.2	1,943	6,218
21	63.7	2.8	3.7	1,619	4,533
22	66.1	3.2	4.2	2,120	6,784
23	65.2	3.0	4.0	1,451	4,353
24	65.8	3.1	4.1	1,698	5,264
25	65.7	3.1	4.1	1,318	4,086
26	67.4	3.3	4.4	2,037	6,722
27	67.8	3.4	4.5	2,026	6,888
28	67.4	3.4	4.5	1,488	5,059
29	68.4	3.6	4.8	1,651	5,944
30	67.3	3.4	4.5	1,538	5,229
31	67.9	3.5	4.6	2,304	8,064
32	66.2	3.2	4.2	2,056	6,579
33	64.4	3.0	4.0	1,084	3,252
34	65.5	3.1	4.1	1,474	4,569
35	70.0	3.8	5.0	1,509	5,734
36	69.4	3.7	4.9	2,244	8,303
37	70.9	4.0	5.3	2,184	8,736
38	71.1	4.0	5.3	2,691	10,764
39	70.2	3.9	5.2	2,724	10,624
40	67.9	3.5	4.6	2,319	8,117
41	71.7	4.1	5.4	2,493	10,221
42	64.8	3.0	4.0	631	1,893

Table 3.--continued

Station number	Mean length (cm)	Mean round weight (kg) ^a	Mean dressed weight (lb) ^b	Number of sablefish	Estimated total round weight (kg) ^c
43	67.5	3.4	4.5	1,174	3,992
44	68.2	3.5	4.6	1,907	6,675
45	66.3	3.2	4.2	1,990	6,368
46	69.0	3.6	4.8	2,174	7,826
47	69.0	3.6	4.8	1,718	6,185
48	63.0	2.7	3.6	1,365	3,686
49	62.8	2.6	3.4	1,882	4,893
50	61.9	2.5	3.3	753	1,883
51	64.6	2.9	3.8	1,538	4,460
54	61.6	2.4	3.2	1,211	2,906
55	58.6	2.1	2.8	336	706
56	58.6	2.1	2.8	247	519
57	63.2	2.7	3.6	516	1,393
59	66.9	3.3	4.4	1,517	5,006
60	67.5	3.4	4.5	3,161	10,747
				<u>91,612</u>	<u>303,061</u>

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

^b Mean dressed weight was estimated using a recovery rate of 0.6 of round weight.

^c Estimated total round weight is the product of mean round weight and the number of sablefish that came to the rail, including a small percentage that was lost during landing.

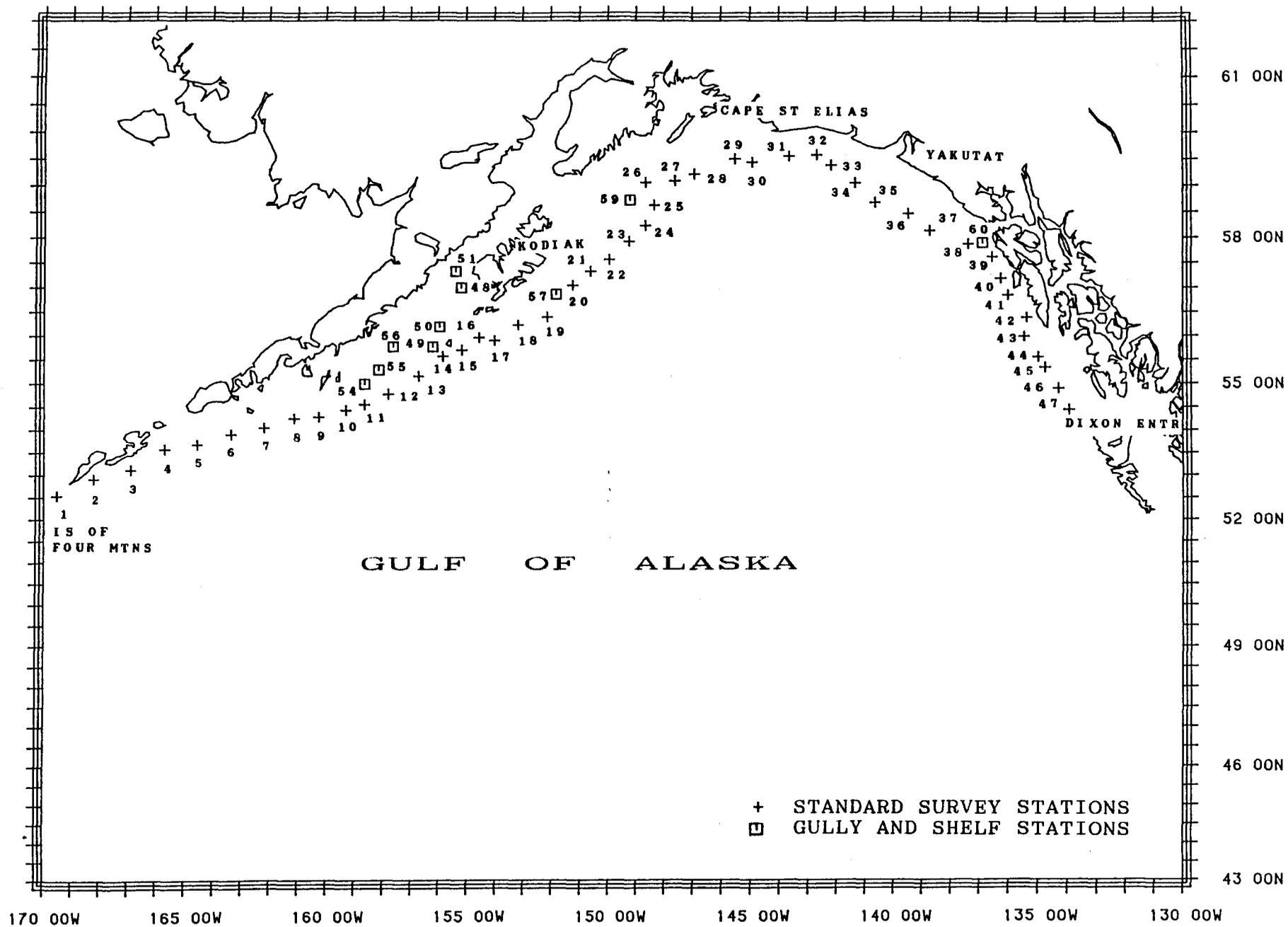


Figure 1.--Station locations for the 1988 NMFS GOA longline survey.