

## BOTTOM FISH SURVEY OFF THE OREGON COAST, APRIL-JUNE 1961

By C. R. Hitz and D. L. Alverson\*

### ABSTRACT

Bottom fish surveys were conducted in the spring of 1961 by the U. S. Bureau of Commercial Fisheries with the exploratory fishing vessel John N. Cobb off the Oregon coast in areas not commercially exploited. The surveys were designed to (1) find areas suitable for trawling within and beyond the depth range now fished by commercial trawlers, (2) evaluate the commercial potential of ground fishes inhabiting those areas, and (3) study the depth distribution of fishes and invertebrates found. Trawlable grounds and concentrations of commercially-valuable ground fishes were found.

### INTRODUCTION

From April 24 through June 15, 1961, an otter-trawl survey of the bottom fish faunas in selected areas off the Oregon coast was conducted from the Bureau's research vessel John N. Cobb. The survey was part of a long-range program initiated in 1950 to assess bottom fish stocks in the northeastern Pacific Ocean between southern Oregon and northwestern Alaska. Results of previous investigations have been reported by Ellson, Knake, and Dassow (1949); Ellson, Powell, and Hildebrand (1950); Alverson (1951, 1953); Greenwood (1958); Johnson (1959); and Hitz, Johnson, and Pruter (1961).

The survey was carried out in cooperation with the Oregon Fish Commission and the United States Atomic Energy Commission. Primary objectives were to (1) find areas suitable for trawling within and beyond the depth range exploited by commercial trawlers, (2) evaluate the commercial potential of ground fishes inhabiting areas found suitable for trawling, and (3) study depth distribution patterns of fishes and invertebrates found. Other objectives were to obtain samples of fishes and invertebrates for radiological analyses<sup>1/</sup> and to tag live flounders (Pleuronectidae) for migrations and growth studies.

### REGION INVESTIGATED

The region investigated includes the Continental Shelf and Continental Slope adjacent to the Oregon coast between the mouth of the Columbia River and the Siuslaw River. Work was conducted in two survey areas within that general region: (1) a portion of the Continental Shelf and Slope off central Oregon between Yaquina Head and the Siuslaw River at depths ranging from 35 to 300 fathoms, and (2) an area offshore in a southwesterly direction from the mouth of the Columbia River at depths ranging from 100 to 450 fathoms (fig. 1).

Major topographic features in the area investigated off central Oregon were Heceta Bank and Stonewall Bank. Heceta Bank is located west of the Siuslaw River, and Stonewall Bank is located approximately west of Newport, Ore. (fig. 1). A major topographical feature of the area surveyed off northern Oregon was the Astoria Canyon which approaches within 14 miles of the Columbia River mouth.

\*Fishery Biologists, Exploratory Fishing and Gear Research Base, U. S. Bureau of Commercial Fisheries, Seattle, Wash.

<sup>1/</sup>By the Laboratory of Radiation Biology, University of Washington.

## METHODS AND GEAR

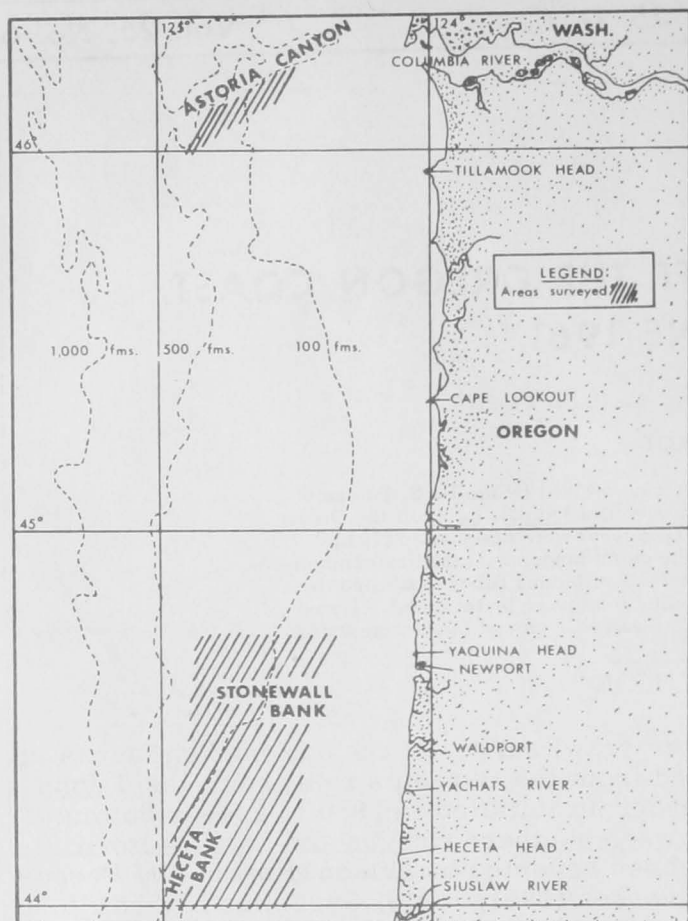


Fig. 1 - Region explored, Cruise 50, John N. Cobb.

catches were large (greater than 5,000 pounds), subsamples were normally taken to determine quantities and sizes of each species. Specimens that could not be identified aboard the vessel were preserved for later laboratory study.

At the end of each drag a sample of the bottom was taken with a Dietz-LaFond sampler and surface-to-bottom water temperatures were obtained from a bathythermograph cast. At depths greater than 150 fathoms a reversing thermometer was used to obtain bottom water temperatures.

A standard 400-mesh eastern otter trawl-net rigged according to commercial practice was used to sample fish populations (Greenwood, 1958). When chain drags were made, the net was removed and a  $\frac{3}{4}$ -inch chain, 42 feet in length, was attached between the otter doors. A wet-or dry-paper white-line echo sounder (38 kc., 220 v., 60 cycle/sec. having a maximum depth range of 1,750 fathoms) was used for sounding.

## RESULTS

**CENTRAL OREGON AREA:** Most of the bottom in the area surveyed off central Oregon was found to be extremely irregular and hard, but several trawlable grounds of soft bottom were located. Figure 2 shows the echo-sounding transects made and gives the interpreted substrate features. The trawlable bottom included the following grounds: (1) a relatively large area of approximately 100 square miles at depths ranging from 75 to 200 fathoms, west of Stonewall Bank, (2) an area of approximately 20 square miles at depths between 58 and 66 fathoms on the east side of Heceta Bank, (3) an area along the 100-fathom contour just west of Heceta Bank, (4) an area extending along the 100-fathom contour north of Heceta Bank and (5) a small deep-water area extending from about 90 to 300 fathoms, offshore from Waldport.

Bottom fish studies in relatively confined regions of abruptly changing bottom topography or rocky or hard bottom must be accompanied by echo-sounding surveys so that areas suitable for trawling can be located and defined. For such areas it is not practical to prescribe sampling stations. Methods used in this survey were similar to those described by Hitz, Johnson, and Pruter (1961). They included (1) conducting a detailed echo probe search of the region with a high-resolution, white-line echo sounder, (2) dragging a heavy chain over the bottom in areas suggested by the sounding as being free of snags or other hazards, and (3) dragging an otter-trawl net in areas apparently suitable for trawling.

At the beginning and end of each otter-trawl drag the position was determined by means of loran bearings. In most instances exploratory drags lasted 60 minutes and tagging drags lasted about 30 minutes. When catches were brought on board they were spilled into deck checkers and sorted by species. During the cruise, all species were identified and counted regardless of their commercial value so that a complete cataloging of all species taken was obtained. Length frequencies were recorded, and otoliths and scales were removed from selected species for subsequent age determinations. When

port. The grounds inside the 200-fathom contour line, which were not sounded, were considered to be fished normally by commercial trawlers.

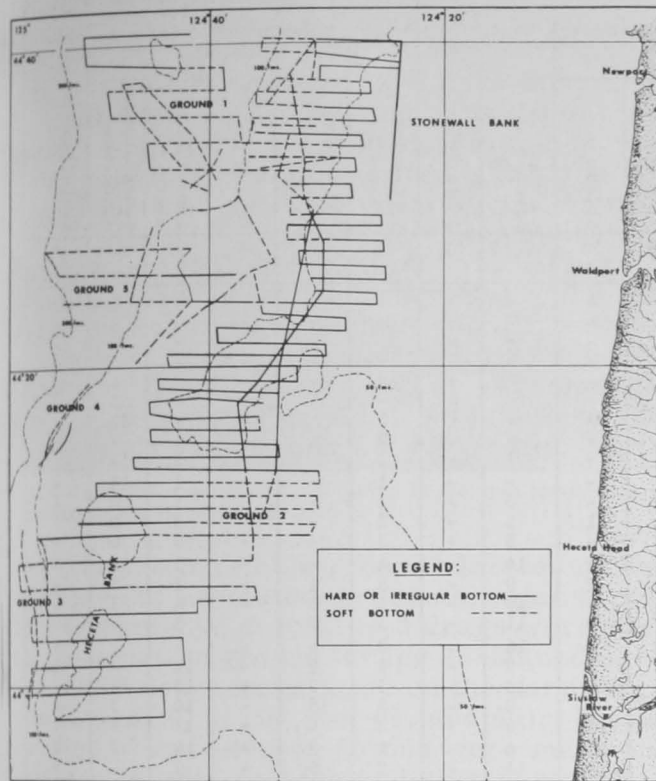


Fig. 2 - Sounding transects made off the central Oregon coast.

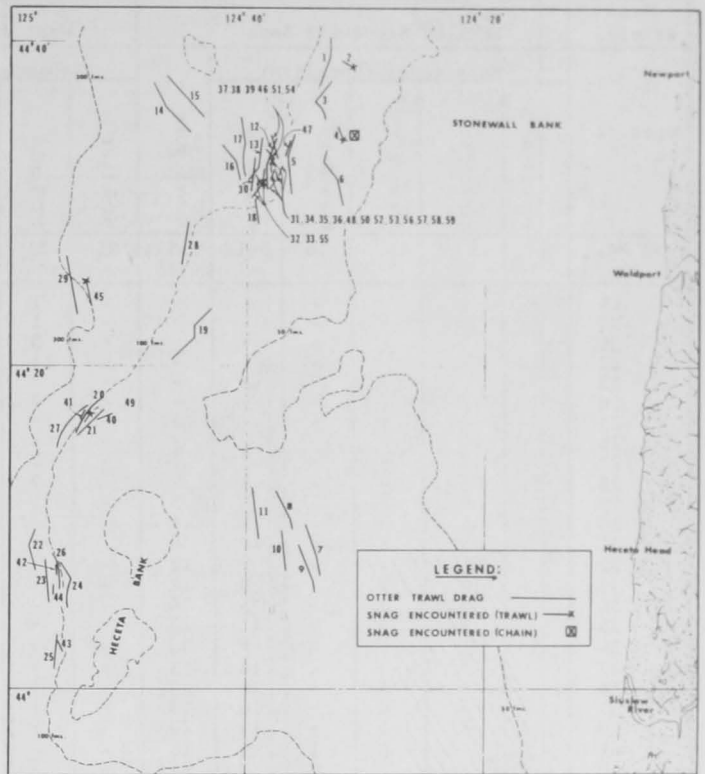


Fig. 3 - Location of net drags and snags encountered off the central Oregon coast.

Figure 3 shows the location of each drag made off central Oregon during this survey. Each drag is numbered and corresponds to the number in the fishing log provided in the appendix (available with the reprint of this article). The fishing log gives the pertinent data for each drag. Thirty-six drags were made in the trawlable area just west of Stonewall Bank (drags 1-6, 12-18, 30-39, 46-48, and 50-59). Of the total drags made on this ground, seven were unsatisfactory. Snags were encountered on two drags (drags 2 and 4) and the net was retrieved earlier than planned; the other five drags (drags 3, 6, 54, 55, and 59) were of the normal 60-minute duration, but considerable damage to the net resulted. Most of the gear damage and snags occurred in the shallower water around the 75-fathom contour adjacent to Stonewall Bank. Damage to the net that occurred on drags 54, 55, and 59 is believed to have been caused by outcroppings of coral.

Successful drags were made in very close proximity to those which resulted in gear damage. Good catches made of Dover sole (*Microstomus pacificus*), sablefish (*Anoplopoma fimbria*), Pacific ocean perch (*Sebastes alutus*), and red rockfish (*Sebastes sp.*) are listed in table 1. Length frequencies of several species taken in this area are shown in table 2.

Table 1 - Catch in Pounds of the Dominant Species Taken on the Trawlable Area Found on the West Side of Stonewall Bank

Drag No.	Depth in Fathoms	Minutes Towed	Dover Sole	Sablefish	Pacific Ocean Perch	Red Rockfish	Total Lbs. All Species
1	90	60	Trace <sup>1</sup>	Trace	-	40	270
5	100	60	75	Trace	138	50	500
12	120	90	192	-	944	290	1,836
13	150	80	246	76	525	1,100	2,070
14	180	90	66	Trace	28	200	350
15	180	90	320	410	Trace	260	1,125
16	180	60	400	1,440	Trace	415	2,600
17	160	90	52	160	40	125	440
18	100	35	Trace	650	262	41	1,435
30	120	60	200	-	2,000	100	2,675
31	120	20	500	-	50	-	665
32	130	22	-	100	400	70	620
33	130	22	350	25	1,000	-	1,440
34	115	15	300	75	300	-	765
35	115	15	300	150	200	-	800
36	114	20	200	70	350	-	770
37	112	20	450	40	150	-	765
38	115	20	100	50	200	-	420
39	117	20	400	50	150	-	710
46	116	20	100	75	50	-	325
47	110	20	250	100	50	Trace	510
48	115	20	350	450	75	-	1,130
50	115	20	500	200	400	-	1,450
51	100	15	100	150	150	20	540
52	110	17	125	150	300	100	835
53	115	15	100	200	100	-	530
56	115	20	150	250	200	70	810
57	112	20	200	250	100	20	590
58	112	30	150	300	250	90	1,140

<sup>1</sup>/Trace = less than 20 lbs.

In the area located on the east side of Heceta Bank, five exploratory drags were made (drags 7-11). All of the drags except one resulted in chaffed and town webbing, believed to

Table 2 - Representative Length Frequencies of Several Species Taken in Waters off the Oregon Coast

Area Sampled	West of Stonewall Bank						West side of Hecata Bank					West of Waldport			Southwest of the Columbia River				
	Sebastes (Rockfish)						Sebastes					Sablefish	Sebastes alascanus	Dover sole	Sablefish	Sebastes alutus	Sebastes alascanus	Sablefish	
Species	rubrivinctus	diploproa	crameri	flavidus	alutus	Dover sole	pinniger	saxicola	diploproa	alutus	Dover sole								Sebastes alascanus
Drag No.	12	13	14	18	5,12	5,12,14,15	21	21	22	20	42,43,44	22	29	29	29	60	63	62	
Total Length in Centimeters	19	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-
	20	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	-
	21	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	2	-
	22	-	-	-	-	-	-	11	2	-	-	-	-	-	-	-	-	4	-
	23	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	3	-
	24	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	4	-
	25	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	12	-
	26	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-
	27	-	17	-	-	2	1	-	3	-	-	1	-	-	-	-	-	13	-
	28	-	23	-	-	4	-	-	7	1	-	-	-	-	-	-	-	14	-
	29	-	30	-	-	4	5	-	25	2	-	3	-	-	-	-	-	4	-
	30	-	51	-	-	9	6	-	20	4	1	5	-	-	-	-	-	6	-
	31	-	33	-	-	10	4	-	9	7	-	5	-	-	-	-	-	6	-
	32	-	24	-	-	9	12	-	4	24	1	14	-	-	-	-	-	6	-
	33	-	10	3	-	8	12	-	-	14	2	9	-	-	-	-	-	3	-
	34	1	3	3	-	5	24	-	-	26	-	19	-	-	-	-	-	4	-
	35	-	2	3	-	11	23	-	-	17	-	11	-	-	-	-	-	5	-
	36	-	1	7	-	9	34	-	-	15	3	16	-	-	-	-	-	6	1
	37	-	2	3	-	18	15	-	-	7	1	7	-	-	-	-	-	11	-
	38	-	4	4	-	10	24	-	-	-	-	13	-	-	-	-	-	13	-
	39	-	4	4	-	18	18	-	-	1	5	9	-	-	-	-	-	10	3
	40	1	-	2	-	16	20	-	-	-	-	6	-	-	-	-	-	17	-
	41	-	-	8	1	9	16	-	-	-	25	4	-	-	-	-	-	16	2
	42	1	-	5	8	7	12	-	-	-	18	11	-	-	-	-	-	9	9
	43	1	-	4	3	9	7	1	-	-	5	6	1	-	-	-	-	7	1
	44	-	-	-	14	3	7	3	-	-	7	6	-	-	-	-	-	1	12
	45	4	-	-	14	2	2	3	-	-	4	5	-	-	-	-	-	1	7
	46	3	-	1	20	5	5	3	-	-	9	4	-	-	-	-	-	1	7
	47	1	-	-	16	2	2	5	-	-	9	4	-	-	-	-	-	1	6
	48	3	-	1	11	3	3	5	-	-	13	-	-	-	-	-	-	2	2
	49	1	-	-	4	2	6	-	-	-	9	-	-	-	-	-	-	2	2
	50	5	-	-	8	1	7	-	-	-	1	-	-	-	-	-	-	6	2
51	3	-	-	4	1	1	11	-	-	-	3	-	-	-	-	-	4	2	
52	3	-	-	4	-	-	3	-	-	-	6	-	-	-	-	-	6	2	
53	5	-	-	2	-	2	1	-	-	-	2	-	-	-	-	-	6	3	
54	4	-	-	-	-	-	8	-	-	-	2	-	-	-	-	-	8	3	
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81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
No. in Sample	39	210	48	109	161	260	57	88	118	126	154	51	51	71	104	120	102	71	
Av.L. cm.	49.2	29.8	38.8	46.5	36.4	37.61	49.5	27.8	33.6	42.9	36.8	58.0	35.3	39.4	57.3	37.9	28.3	46.6	
Av.L. in.	19.4	11.7	15.3	18.3	14.3	14.8	19.5	10.9	13.2	16.9	14.5	22.8	13.9	15.5	22.6	14.9	11.1	18.3	

have been caused by large boulders (fig. 4). The fish catch in that area was small, and the aggregate catches of all species did not exceed 300 pounds per drag.



Fig. 4 - Boulders commonly encountered in the area trawled on the east side of Heceta Bank.

The two trawlable grounds located on the west side of Heceta Bank were similar in bottom topography. A total of 8 drags were made on the southern ground (drags 22-26 and 42-44), and 6 drags were made on the northern one (drags 20, 21, 27, 40, 41, and 49). Large catches of up to 40,000 pounds were made on this ground with rockfishes being dominant. These catches of rockfish are shown in table 3. Representative length frequencies of rockfishes, Dover sole, and sablefish taken in the areas on the west side of Heceta Bank are shown in table 2. One 20-minute drag made



Fig. 5 - Eleven thousand pounds of Pacific ocean perch floating alongside the John N. Cobb.

Table 3 - Catch in Pounds of Rockfish Taken in the Areas Trawled on the West Side of Heceta Bank

Drag No.	Depth in Fathoms	Minutes Towed	Pacific Ocean Perch	Red Rockfish	Black Rockfish	Total Lbs. All Species
22	172-180	60	-	190	-	470
23	135-130	60	1,500	400	-	2,100
24	97-86	57	-	-	Trace	139
25	138-139	60	1,000	1,000	100	2,520
26	110-117	60	500	2,200	-	3,050
1/42	112	20	600	100	50	870
1/43	137	15	250	-	-	375
1/44	118	20	100	90	-	655
20	125-140	60	11,000	350	125	11,765
21	99-101	60	290	1,165	430	4,100
27	155-172	60	50	350	50	520
1/40	90-92	20	Trace	-	150	270
1/41	111-109	20	40,000	?	?	40,000

1/Tagging drags.

just northwest of Heceta Bank (drag 41) produced an estimated 40,000 pounds of Pacific ocean perch, the largest trawl catch ever made by the John N. Cobb. An attempt to repeat drag 41, resulted in considerable damage to the net (drag 49). Another large catch of 11,000 pounds of ocean perch (fig. 5) was taken in this area (drag 20).

Four drags were made in the small area west of Yachats River (drags 19, 28, 29, and 45). One of two shallower drags (drag 19 in 84-73 fathoms and drag 28 in 140-128 fathoms), drag number 28 provided good catches of Dover sole and Pacific ocean perch. In deeper water, 260 to 300 fathoms (drags 29 and 45), only one drag was successful (drag 29). That drag was dominated by sablefish. Length frequencies of the dominant species taken in those drags are provided in table 2.

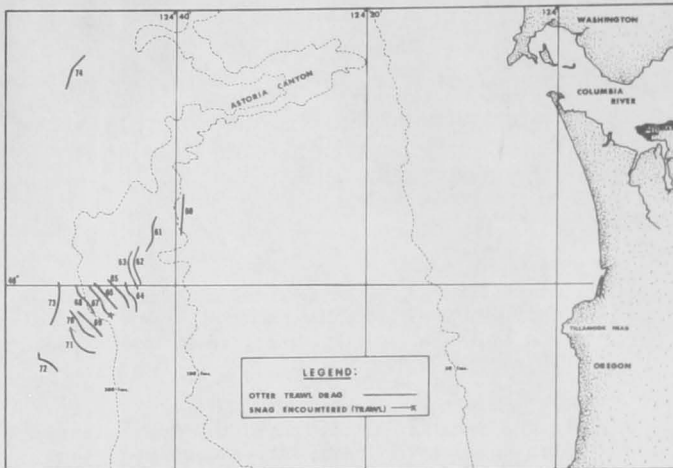


Fig. 6 - Location of net drags and snags encountered off the Columbia River.

**COLUMBIA RIVER AREA:** A track line was established off the south side of Astoria Canyon for future resurveying so that seasonal changes in distribution and abundance of fish and invertebrates could be evaluated. Locations of drags made off the Columbia River are shown in figure 6. Catches of Pacific ocean perch ranging from 1,200 to 3,500 pounds per drag were taken at depths between 123 and 220 fathoms (drags 61, 62, 63, and 64). Drags 65 and 66 (in 225 and 250 fathoms respectively) each produced catches of 1,000 pounds of Dover sole. Sablefish were commonly taken in drags 64 through 73 at depths ranging from 200 to 425 fathoms, with catches

rates in that depth increment ranging from 150 to 700 pounds per hour. Length frequencies of sablefish, Pacific ocean perch, and idiot rockfish (*Sebastolobus alascanus*) found in the area are given in table 2.

**INCIDENTAL SPECIES TAKEN:** In addition to commercial species, numerous unutilized species of fishes and invertebrates were taken. A complete list of species found (table 4), depth zone, is given in the appendix to the reprint of this article.

**TAGGING:** Biologists from the Oregon Fish Commission tagged 5,429 Dover sole during the survey in the central Oregon area. The sole were captured at depths ranging from 90 to 137 fathoms.

## SUMMARY AND CONCLUSIONS

In the spring of 1961, the Exploratory Fishing Section based at Seattle explored areas of the Oregon coast not under commercial exploitation. The surveys were conducted with the Bureau's exploratory vessel John N. Cobb, which was equipped with a high-resolution, low-frequency echo sounder, a chain that was attached between the otter doors and was dragged in place of a net, and a standard commercial otter trawl.

The order of procedure in surveying an area was to (1) run a series of echo sounding transects to determine the character of the bottom, (2) drag a heavy chain over areas suggested by sounding as being trawlable, and (3) drag a commercial otter-trawl net over those grounds on which the chain was successfully towed.

Trawlable grounds and concentrations of commercially-valuable ground fish were found in the areas surveyed. Although the bottom in the central Oregon area was found to be extremely irregular and numerous rocks and other snags were encountered during trawling, a number of successful drags were made without damage to the gear. In the few drags in shallower water in which no damage to the gear was noted, catches of fish were small with aggregate catches of all species not exceeding 300 pounds per drag. Most common species taken in the shallower drags were flatfishes, including Dover sole, English sole, and turbot. Exploratory drags made along the Continental Break and Continental Slope at depths from about 90 to 150 fathoms were more successful and numerous catches of Pacific ocean perch exceeding 1,000 pounds per drag were taken. Fair catches of Dover sole and sablefish occurred in some of the drags. In drags made in the area southwest of the mouth of the Columbia River, Pacific ocean perch, Dover sole, and sablefish were the dominant commercial species.

ies taken. Catches of Pacific ocean perch ranging from 1,000 to 3,500 pounds per 60 minutes of fishing were taken at depths between 123 and 220 fathoms. Good catches of Dover sole were made at depths from 225 to 250 fathoms. Sablefish were common at depths ranging from 200 to 425 fathoms.

APPENDIX

A detailed fishing log showing the fishing positions, time on bottom, catch particulars, and other pertinent data for each drag is available as an appendix to the reprint of this article. Write for Separate No. 677 which contains "Otter Trawl Fishing Log - M/V John N. Cobb - Cruise 50 - Off Central Oregon and the Mouth of the Columbia River."

LITERATURE CITED

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HOW THE LARGE MESH WORKS

