BOTTOM TRAWLING EXPLORATIONS OFF SOUTHEASTERN ALASKA, 1956-1957

By Melvin R. Greenwood*

SUMMARY

Explorations to determine quantities and species of bottom fish available to commercial trawling gear in the offshore waters of Southeastern Alaska between Dixon Entrance and Hazy Islands were conducted by the U. S. Bureau of Commercial Fisheries during the fall of 1956 and spring of 1957. The fall investigation was made by the Bureau's exploratory fishing vessel John N. Cobb, and the spring investigation was made by the Tordenskjold, a Seattle commercial trawler chartered by the Bureau for this work with Saltonstall-Kennedy Act funds.

A considerable amount of clear trawling bottom was found throughout the area investigated at depths ranging from 50 to 200 fathoms. Alaska coral growths were encountered on much of otherwise clear bottom, but did not pose a serious problem to fishing efficiency and gear damage was usually slight. In some areas, however, the bottom topography precluded any possibility of trawling.

Pacific ocean perch was the most abundant food species caught, and many catches of more than 1,000 pounds per hour were made during the spring operations. Arrow-toothed flounder and Alaska pollock dominated catches during the fall exploration, and together they comprised 60 percent of the aggregate catches made by the John N. Cobb. A limited number of shrimp-trawl drags made by the Tordenskjold revealed good signs of pink shrimp and side-stripe shrimp; however, additional work is necessary to accurately determine the offshore shrimp potential in this area.

Weather conditions during the fall exploration were adverse, with strong winds and large swells predominating. The weather was generally favorable during the spring exploration.

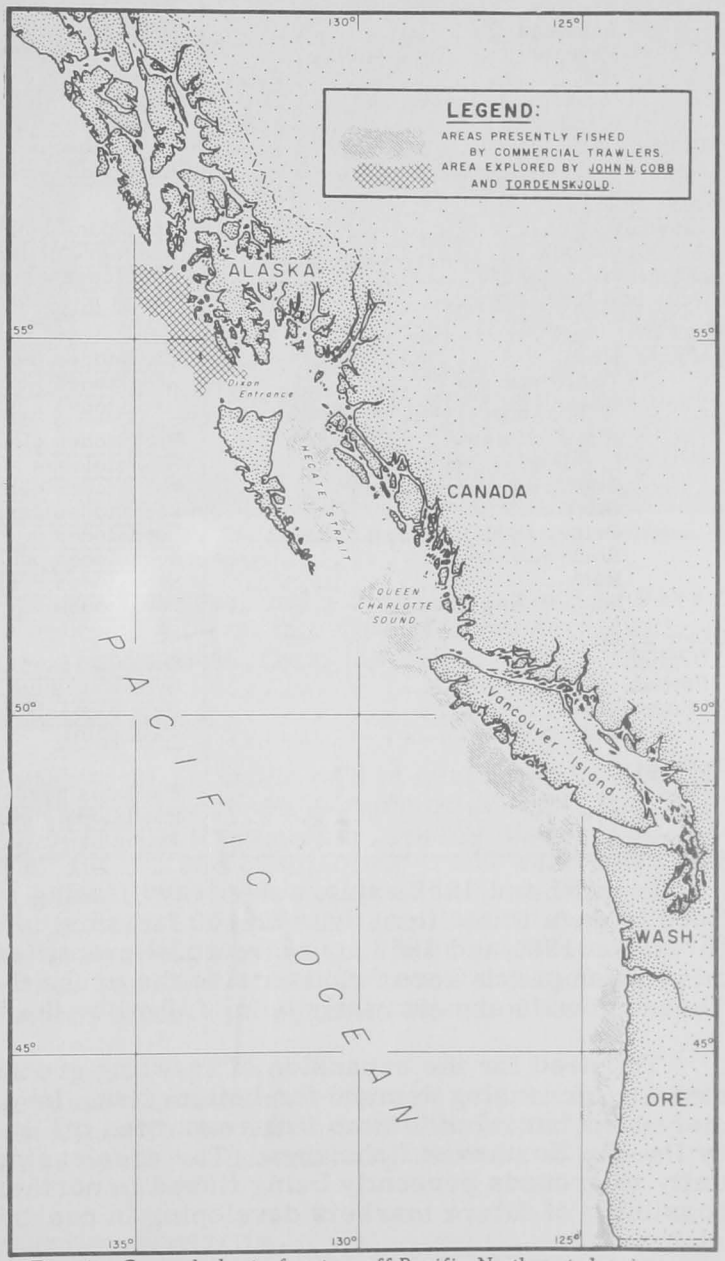

Fig. 1 - General chart of waters off Pacific Northwest showing present commercial bottom-fishing areas and the area explored by the John N. Cobb and Tordenskjold.

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BACKGROUND

Exploratory fishing to determine quantities and species of bottom fish available to commercial-type trawls in ocean waters off Southeastern Alaska between Dixon Entrance and Hazy Islands was conducted by the U. S. Bureau of Commercial Fisheries in 1956 and 1957. The exploratory activities were carried out from October 7 to November 7, 1956, and from May 23 to June 30, 1957. The Bureau's exploratory fishing vessel John N. Cobb was used for the earlier cruise and a chartered commercial trawler, the Tordenskjold, was used to carry out the work in 1957. Funds for the charter were provided by the Saltonstall-Kennedy Act of 1954.

List of Common and Scientific Names of Fish and Shrimp Caught During Bottom Trawling Explorations off Southeastern Alaska, 1956-1957

Common Names	Scientific Names
Flat Fish:	
Sole: Dover	Microstomus pacificus
English	Parophrys vetulus
Flathead	Hippoglossoides elassodon
Petrale	Eopsetta jordani
Rex	Glyptocephalus zachirus
Rock	Lepidopsetta bilineata
Slender	Lyopsetta exilis
Halibut	Hippoglossus stenolepis
Arrow-toothed flounder (turbot)	Atheresthes stomias
Round Fish:	
Lingcod	Ophiodon elongatus
Alaska pollock	Theragra chalcogramma
Sablefish (black cod)	Anoplopoma fimbria
True cod (gray cod)	Gadus macrocephalus
Rockfish:	
Black: Black	Sebastodes melanops
Yellow-tailed	Sebastodes flavidus
Pacific ocean perch	Sebastodes alutus
Red: Black-throated	Sebastodes aleutianus
Idiot (spiny-cheeked)	Sebastolobus alascanus
Green-striped	Sebastodes elongatus
Olive-backed	Sebastodes saxicola
Priest-fish	Sebastodes mystinus
Rock-salmon	Sebastodes paucispinis
Rosy	Sebastodes rosaceus
Spanish flag (banded)	Sebastodes nigrocinctus
Other Fish:	
Dogfish	Squalus acanthias
Ratfish	Hydrolagus colliei
Skate: Big	Raja binoculata
Long-nosed	Raja rhina
Shrimp:	
Pink	Pandalus borealis
Side-stripe	Pandalopsis dispar
Spot	Pandalus platyceros

The otter-trawl fishery of the Pacific Northwest began in the early 1920's in the waters within Puget Sound. Since its inception, the fishery has expanded to include grounds from off southern Oregon to northern Hecate Strait, British Columbia (fig. 1). The expansion of fishing grounds followed increased market demands for bottomfish and the inability of the original areas exploited to produce the quantities required.

In 1951 and 1952 exploratory trawl fishing was carried out aboard the John N. Cobb in deep water (mostly over 100 fathoms) off the Oregon and Washington coasts (Alverson 1951 and 1953). Commercial quantities of Dover sole, sablefish, and Pacific ocean perch were found outside the areas then being utilized by the fishery. These grounds are currently being fished by the Washington and Oregon trawl fleets.

The need for the expansion of trawling grounds is ever-present because of the steadily increasing demand for bottom fish. Investigations to determine the commercial potential of bottom fish resources off Southeastern Alaska were suggested by Pacific Northwest fishermen. The area explored was chosen because of its proximity to grounds presently being fished in northern Hecate Strait and because of the possibility of future markets developing in nearby Alaskan cities.

Fishing operations were carried out between latitudes 54°20' N. and 55°48' N. (Dixon Entrance to Hazy Islands) and from approximately 5 to 35 miles offshore at various depths from 56 to 208 fathoms. A total of 30 drags was made by the John N. Cobb in the fall and 85 drags by the Tordenskjold in the spring.

VESSELS USED

The general design of the John N. Cobb is that of a West Coast purse seiner, as are most vessels of the Pacific Northwest trawl fleet. The vessel has an over-all length of 93 feet with a beam of 25 feet and a mean-load draft of 9 feet (Ellson 1950). On a seine-type trawler, the net is set and towed from the stern and hauled over the starboard side.

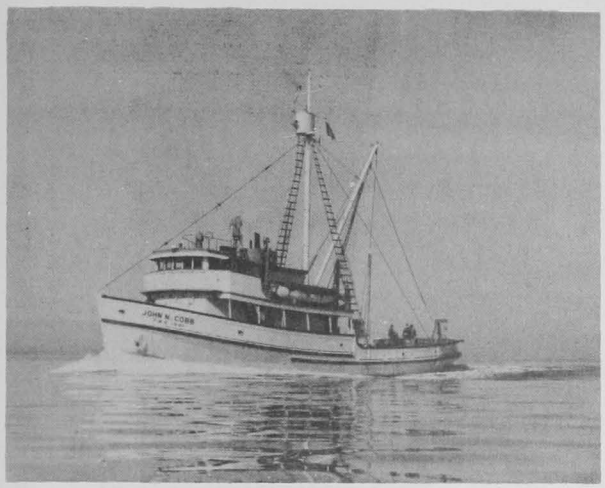


Fig. 2 - The exploratory fishing vessel John N. Cobb, a West Coast purse seine-type trawler.

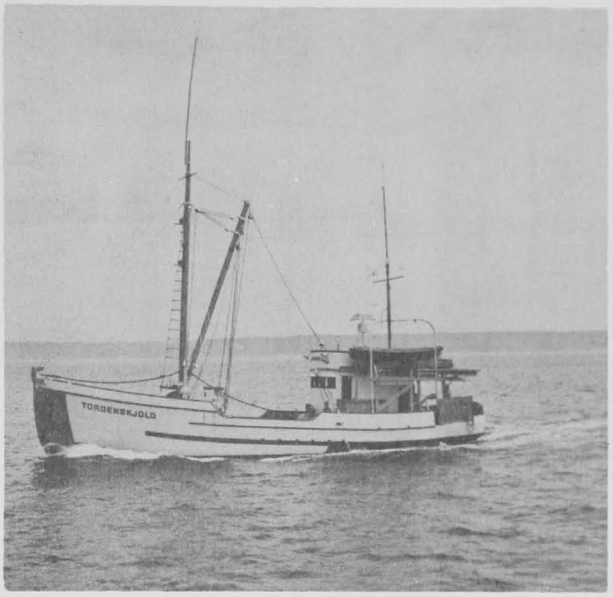


Fig. 3 - The chartered vessel, Tordenskjold, a schooner-type trawler.

The Tordenskjold, a schooner-type vessel, was designed and built for halibut fishing (Sundstrom 1957), but was rigged for trawling in 1942. This vessel has an over-all length of 75 feet, a beam of 18 feet, and a mean-load draft of 9 feet. The net is set and hauled over the starboard side on this type of schooner-trawler and, as in the case of seine-type trawlers, is towed from the stern.

FISHING GEAR

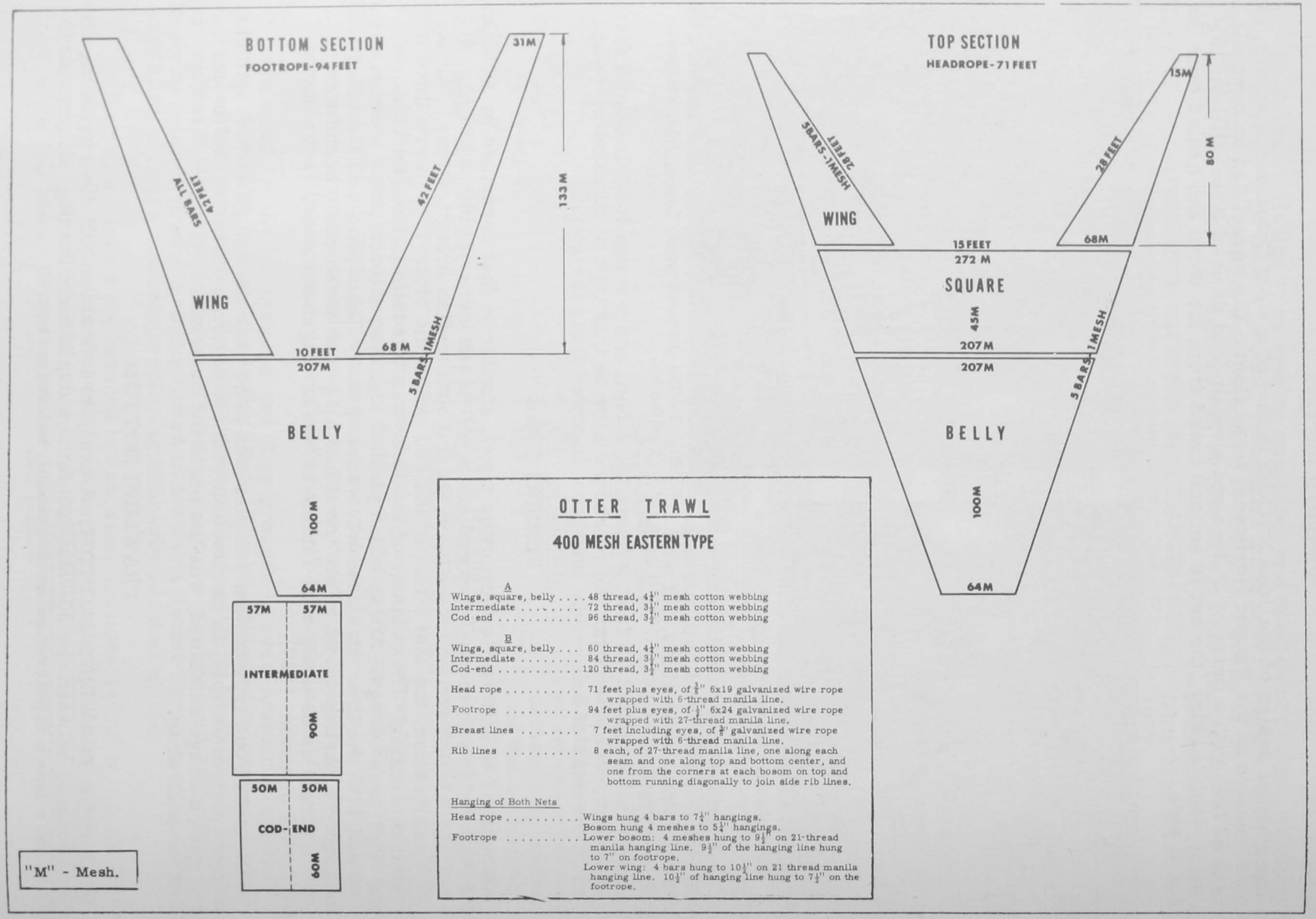
A standard 400-mesh western otter trawl, similar to that described by Alverson (1951), with a $4\frac{1}{2}$-inch mesh[1/] cod end and a 400-mesh eastern otter trawl (fig. 4) with a $3\frac{1}{2}$-inch mesh cod end were used for the bottom-fish investigations. During the 1957 exploration, the last 6 feet of the cod end of the otter-trawl were lined with $1\frac{1}{2}$-inch mesh netting. The purpose of the liner was to retain shrimp encountered during otter-trawl drags. Areas which yielded significant quantites of shrimp when the cod end with the liner was used were subsequently fished with a 43-foot flat Gulf of Mexico-type shrimp trawl. This trawl had a $1\frac{1}{2}$-inch mesh cod end and was towed from a single cable using a 25-fathom bridle arrangement ahead of the doors (Schaefers & Johnson 1957).

A Dietz-LaFond type bottom sampler was used near the end of each drag. The subsequent bottom sample, in conjunction with the contents of the net and/or the type of gear damage sustained, was the basis for determining the type of bottom recorded for each drag.

TRAWLING BOTTOM

SUITABLE TRAWLING BOTTOM: A considerable amount of clear trawling bottom was located between the 50- and 200-fathom depth contours (fig. 5). Abundant

1/All mesh sizes referred to in this report are stretched measure, including one knot.



OTTER TRAWL

400 MESH EASTERN TYPE

A	
Wings, square, belly	48 thread, $4\frac{1}{4}$" mesh cotton webbing
Intermediate	72 thread, $3\frac{1}{2}$" mesh cotton webbing
Cod end	96 thread, $3\frac{1}{2}$" mesh cotton webbing
B	
Wings, square, belly	60 thread, $4\frac{1}{4}$" mesh cotton webbing
Intermediate	84 thread, $3\frac{1}{2}$" mesh cotton webbing
Cod-end	120 thread, $3\frac{1}{2}$" mesh cotton webbing
Head rope	71 feet plus eyes, of $\frac{3}{8}$" 6x19 galvanized wire rope wrapped with 6-thread manila line.
Footrope	94 feet plus eyes, of $\frac{1}{2}$" 6x24 galvanized wire rope wrapped with 27-thread manila line.
Breast lines	7 feet including eyes, of $\frac{3}{8}$" galvanized wire rope wrapped with 6-thread manila line.
Rib lines	8 each, of 27-thread manila line, one along each seam and one along top and bottom center, and one from the corners at each bosom on top and bottom running diagonally to join side rib lines.

Hanging of Both Nets

Head rope	Wings hung 4 bars to $7\frac{1}{4}$" hangings. Bosom hung 4 meshes to $5\frac{1}{2}$" hangings.
Footrope	Lower bosom: 4 meshes hung to $9\frac{1}{2}$" on 21-thread manila hanging line. $9\frac{1}{2}$" of the hanging line hung to 7" on footrope. Lower wing: 4 bars hung to $10\frac{1}{4}$" on 21 thread manila hanging line. $10\frac{1}{4}$" of hanging line hung to $7\frac{1}{2}$" on the footrope.

Fig. 4 - Details of a standard 400-mesh eastern-type otter trawl used for bottom-fish explorations off Southeastern Alaska.

growths of Alaska coral[2/] were encountered over much of the grounds fished, but these areas proved productive in spite of the nuisance of the minor gear damage sometimes incurred.

Clear Trawling Bottom: One of the largest areas free of snags was located from 4 to 17 miles west of Baker Island. This area measures about 12 by 18 miles. The bottom is composed of green mud and sand, for the most part, with sand and gravel found in the shallower eastern portion of the area. No hang-ups were experienced within this area during 17 otter-trawl and 6 shrimp-trawl drags made at depths from 56 to 94 fathoms. Hazardous grounds, however, were encountered to the south, east, and west of the area.

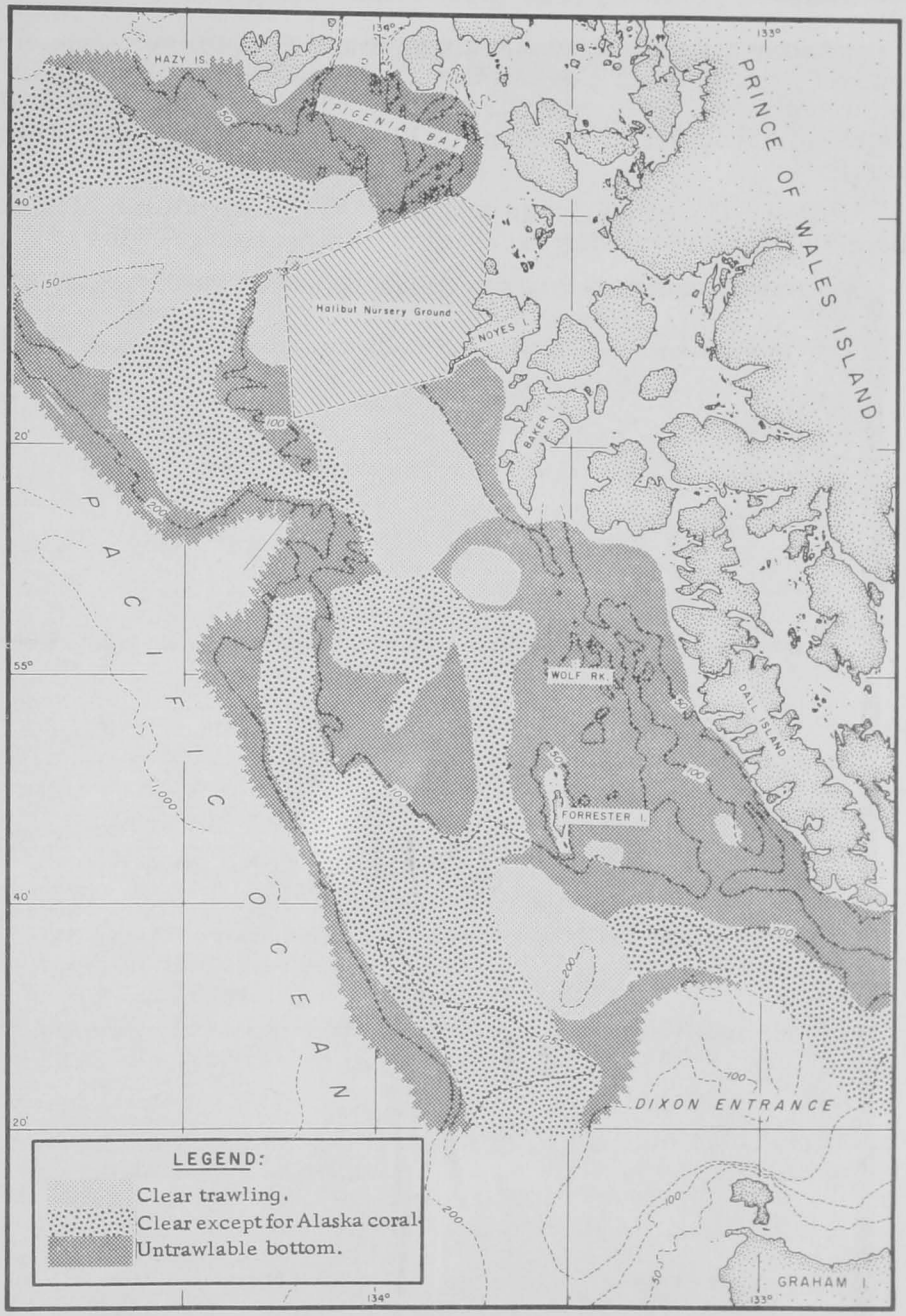


Fig. 5 - Chart depicting: (1) areas free of snags, (2) grounds where Alaska coral growths were encountered, and (3) areas unsuitable for trawling.

Another large area free of snags was located off Iphigenia Bay. This area is somewhat pear-shaped being about 5 to 10 miles wide inshore and from 15 to 20 miles wide in the deeper offshore part. The bottom topography is characterized by a trough or gully which extends offshore from Iphigenia Bay and fans out to form a deep basin at its outer extremity. Green mud and sand were found throughout the region with some gravel noted on the southeast slope of the basin and in parts of the gully. A total of 20 otter-trawl drags was made in this area at depths ranging from 87 to 165 fathoms with minor gear damage experienced during only two drags which were made on the north slope of the gully near Iphigenia Bay.

A small clear basin, about 6 miles in diameter, lies 5 to 11 miles south of Cape Bartolome. It is separated from the Baker Island clear grounds mentioned above by

2/Alaska coral is a soft coral and is related to the tropical soft corals (sea fans etc.). It is not similar to the stony corals normally encountered in tropical waters.

a narrow strip of uneven bottom. Two otter-trawl drags and 5 shrimp-trawl drags were made at depths from 84 to 93 fathoms in this basin without encountering obstructions.

Another small clear area was found next to the western boundary of the halibut nursery grounds off Noyes Island. The bottom in this region is composed of green mud and sand. Five otter-trawl drags made in this area at depths from 77 to 97 fathoms encountered no snags. Other areas found to be free of snags are shown in figure 5.

Alaska Coral: A large amount of the ocean bottom off Southeastern Alaska would be excellent for trawling except for considerable growths of Alaska coral. This growth

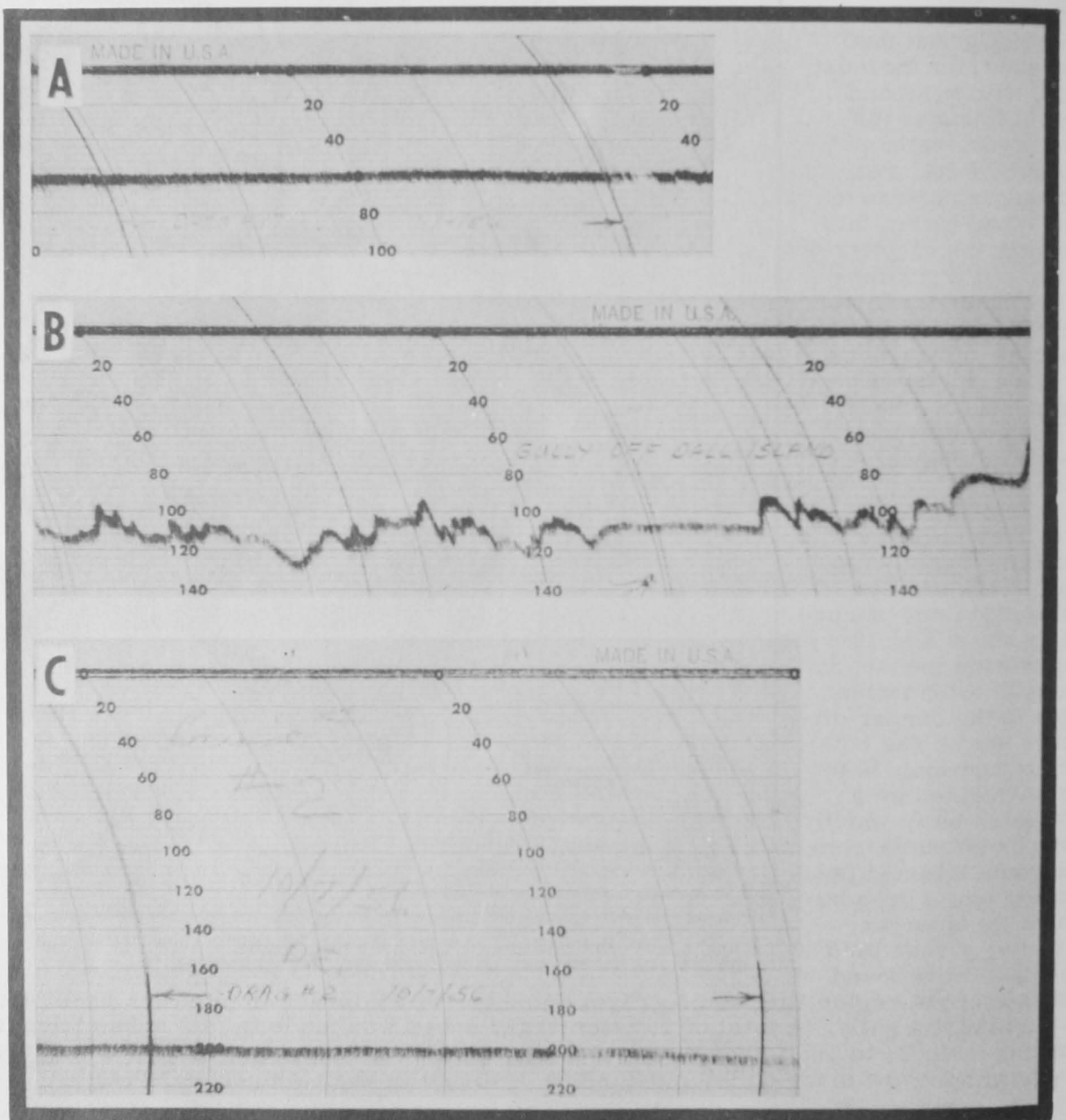


Fig. 6 - Depth recordings made aboard the John N. Cobb off Southeastern Alaska. (A) Tracing made during drag which hung up solid, probably on Alaska coral. (B) Typical bottom trace made in gully between Forrester and Dall Islands. (C) Tracing made in Dixon Entrance during drag which resulted in the loss of the complete net and one door.

is not easy to detect with commercial echo-sounding equipment (fig. 6-A), but is prominent enough to hang up a trawl and stop a vessel, even one the size of the John N. Cobb. Slight gear damage usually resulted from such hang-ups and occasionally no damage at all occurred to the net. Some hang-ups, however, resulted in damage requiring several manhours to repair the gear.

In addition to actual specimens taken in the net (fig. 7), the type of gear damage experienced gave further evidence that Alaska coral was the chief cause of snagging. The upper leading edge of the net, particularly on the wings, received the most wear; and broken hangings, lost floats, badly chafed "dandy lines," and chafing of the headrope were common types of damage suffered.

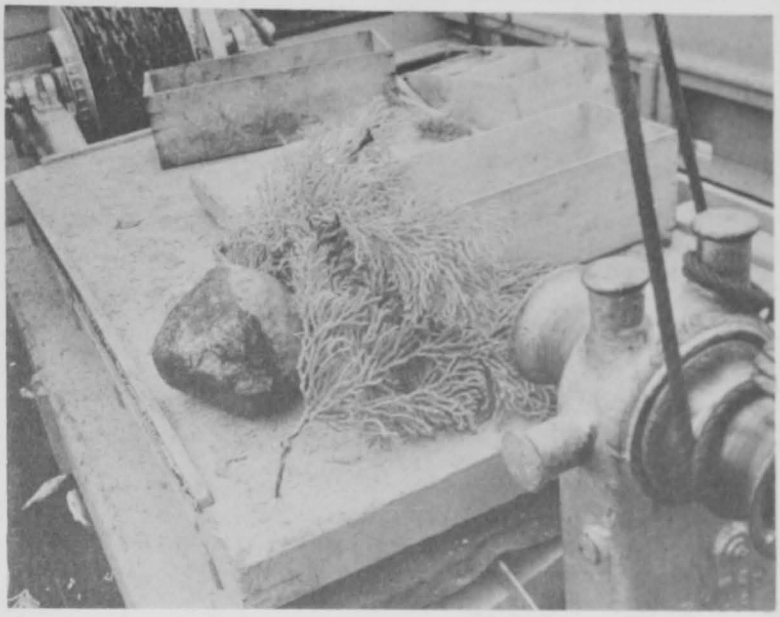


Fig. 7 - Alaska coral picked up during exploratory trawling by the Tordenskjold.

A substantial portion of the localities showing Alaska coral in figure 5 are trawlable, although a risk of incurring minor gear damage exists. It was sometimes found possible to work the gear free from coral snags and continue towing. Evidently the fishing ability of the net is not greatly affected by the presence of Alaska coral. Two drags which encountered snags yielded catches of 3,000 and 3,700 pounds of Pacific ocean perch. Several other drags which hung up solidly caught fish at rates in excess of 1,000 pounds an hour.

UNTRAWLABLE AREAS: Localities found unsuitable for trawl operation included: (1) all areas explored inside the 50-fathom depth contour, (2) Iphigenia Bay, (3) inside the 100-fathom depth contour immediately south of Hazy and Coronation Islands, (4) the 110-fathom edge off Cape Bartolome, and (5) the continental slope at depths ranging from about 200 to 400 fathoms. The gully and adjacent slopes between Forrester and Dall Islands also offered little in the way of suitable trawling bottom (fig. 6-B).

Although navigational charts and depth recordings (fig. 6-C) indicated favorable trawling bottom in Dixon Entrance east of Learmonth Bank at depths of over 100 fathoms, of the two drags made, one resulted in the loss of the complete net and one door. Because of strong currents, speed and directional control were difficult and it was apparent that not enough time was available to obtain significant results. A careful analysis of currents and tides would be necessary along with the possibility of having to wait for slack water to accomplish the actual trawling.

FISHING RESULTS

Positions of otter-trawl and shrimp-trawl drags made during the two cruises are shown diagrammatically in figures 8 and 9, and the catches and particulars for each drag are given in tables 2, 3, and 4. Drags in which snags or torn gear were encountered have been plotted on the charts for quick reference.

Pacific ocean perch were caught in commercial quantities during both explorations with the best catches in the spring; and several good catches of black rockfish

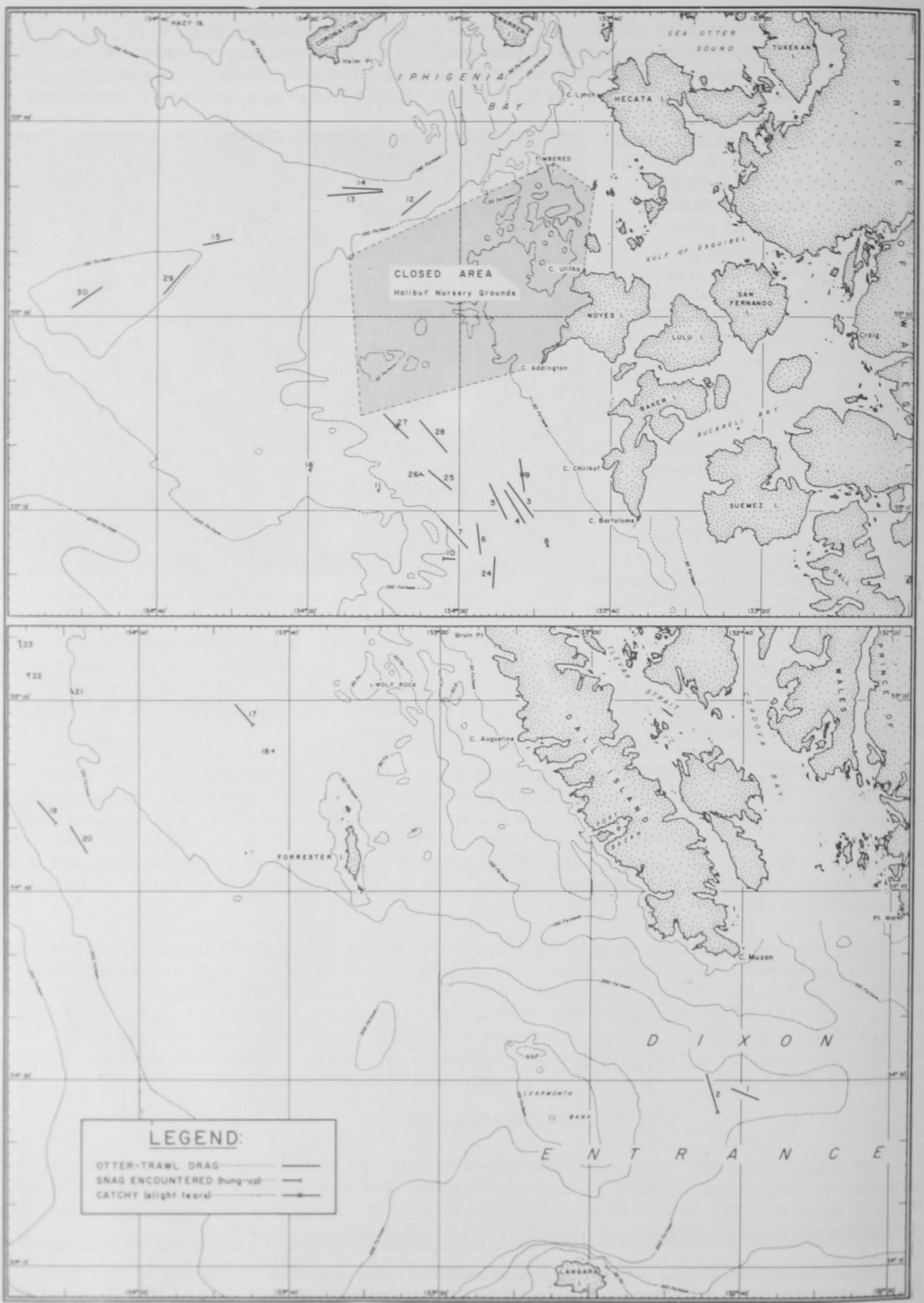


Fig. 8 - Exploratory otter-trawl drags made off Southeastern Alaska by the M/V John N. Cobb--October and November 1956.

Fig. 9 - Exploratory otter-trawl and shrimp-trawl drags made by the chartered vessel Tordenskjold--May and June 1957.

were made. Industrial species, namely arrow-toothed flounder[3/] and Alaska pollock dominated catches made during the fall investigation.

PACIFIC OCEAN PERCH: Pacific ocean perch was the most abundant food fish encountered and good catches were made throughout most of the area explored during the spring cruise. Thirty-six otter-trawl drags, fished an average of 53 minutes each, at depths ranging from 87 to 152 fathoms, yielded from 100 to 5,250 pounds of Pacific ocean perch per drag. These catches averaged 970 pounds per drag (table 1).

Table 1 - Pacific Ocean Perch Catches of 100 or More Pounds an Hour, Spring Exploration

General Area	Drag	Depth Range	Total Caught	Average Catch Per Drag	Total Trawl on Botton	Average Catch Per Hour	Percentage of Marketable Size	Marketable Size Per Hour
	No.	Fathoms	Lbs.	Lbs.	Minutes	Lbs.	Avg. %	Lbs.
Gully, off Iphigenia Bay	1, 2, 3, 7, 68, 82	87-122	9,975	1,665	360	1,665	81%	1,365
Basin, off Iphigenia Bay	5, 6, 8, 76, 77, 79, 80	105-152	3,585	510	387	555	86%	475
Edge, 30 miles off Cape Bartolome	74, 75	110-113	235	120	20	705	95%	670
Edge, 25 miles off Wolf Rock	46, 47, 48, 49, 50	106-116	8,050	1,610	300	1,610	91%	1,465
Edge, 15 miles off Forrester Island	19, 20, 21, 22, 23, 25, 26, 27, 37	110-139	7,625	845	515	890	95%	845
Spit, south of Forrester Island	28, 29, 30, 32, 33, 34, 35	112-140	5,500	785	315	1,050	93%	975
TOTALS AND AVERAGES	36 drags	87-152	34,970	970	1,897	1,105	89%	985

The best catches of Pacific ocean perch were made in the following localities: (1) the gully outside of Iphigenia Bay at depths from 87 to 122 fathoms; (2) off Wolf Rock and Forrester Island at depths from 106 to 139 fathoms; and (3) on the spit south of Forrester Island at depths from 112 to 140 fathoms.

A number of Pacific ocean perch catches contained a notable amount of small fish. Pacific ocean perch were considered of marketable size when measuring $10\frac{1}{2}$ inches or over. Fish smaller than this are not generally accepted by Pacific Coast processors. Small Pacific ocean perch were prevalent in the drags made off Iphigenia Bay. The marketable portion of catches in this area contained fish that averaged about 1 pound each. Catches made off Wolf Rock contained fewer small fish, with the average size of the marketable fish being about $1\frac{1}{2}$ pounds each. The marketable-size fish caught south of Forrester Island averaged nearly 2 pounds each.

BLACK ROCKFISH: Black rockfish (mostly Sebastodes melanops) were caught in commercial quantities in the area west of the halibut nursery grounds off Noyes Island at depths from 84 to 90 fathoms. Two 1-hour drags (numbers 69 and 81) made by the Tordenskjold in this area caught a total of 4,000 pounds of black rockfish. Other drags which yielded catches of black rockfish at a rate of 1,200 pounds or more an hour included one drag (number 32) made by the Tordenskjold south of Forrester Island in 112 to 113 fathoms and another drag (number 15) made by the John N. Cobb at depths from 131 to 141 fathoms off Iphigenia Bay.

3/Commonly referred to as turbot by Pacific Coast fishermen.

Smaller amounts of black rockfish were taken in many tows made by both the Tordenskjold and the John N. Cobb indicating their wide distribution throughout the area investigated. Black rockfish caught during the explorations ranged in weight from $2\frac{1}{2}$ to 6 pounds and averaged $3\frac{1}{4}$ pounds.

OTHER ROCKFISH: Miscellaneous species of red rockfish were taken during both seasons in small amounts ranging up to an aggregate total of 380 pounds an hour. Most of the catches of red rockfish were taken at depths exceeding 100 fathoms.

Fig. 10 - Spilling the last lift of a good catch of marketable size Pacific ocean perch aboard the Tordenskjold.

FLAT FISH: Catches of Dover sole, English sole, petrale sole, and rock sole were made in amounts up to 250, 60, 150, and 175 pounds an hour, respectively. Flat fish were generally more available during the fall exploration than during the spring. Flat fish were most prevalent on the flat off Baker Island, west of Iphigenia Bay, and west of Forrester Island.

ROUND FISH: Sablefish were taken in 9 drags in amounts of 50 to 580 pounds an hour. Except for 1 catch (drag number 20 in the fall) the sablefish caught were less than marketable size, averaging about 1 pound each. True cod in amounts ranging from 50 to 175 pounds an hour were caught in 7 drags during the spring cruise. Only 2 drags made during the fall yielded catches of true cod exceeding 50 pounds an hour. Lingcod catches were insignificant during both cruises.

Fig. 11 - Second split of a "2 splits and a lift" catch of mostly arrow-toothed flounder aboard the John N. Cobb.

ARROW-TOOTHED FLOUNDER AND ALASKA POLLOCK: Arrow-toothed flounder and pollock dominated catches made during the fall cruise. Although these species are not normally marketed as food fish along the Pacific Coast, their use as animal food has increased considerably during the past few years. Arrow-toothed flounder comprised 36 percent and pollock 24 percent by weight of the aggregate catches made by the John N. Cobb. These species were most prevalent on the grounds explored off Baker Island and northward.

OTHER INDUSTRIAL FISH: Ratfish was taken over much of the area covered during both phases of the explorations but was not caught in significant amounts.

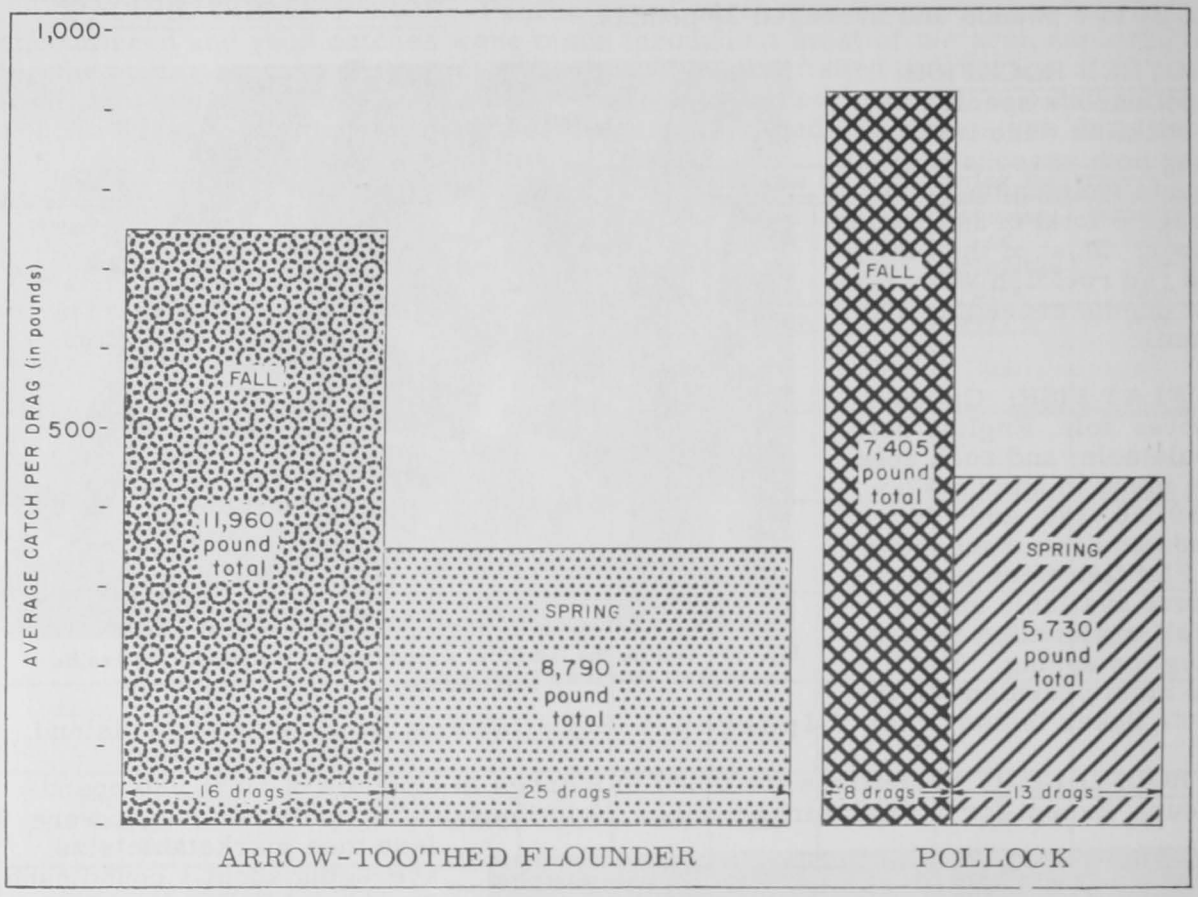


Fig. 12 - Arrow-toothed flounder and pollock catches of 100 or more pounds an hour made during explorations off Southeastern Alaska--1956 and 1957.

Dogfish and skate catches were small, amounting to less than 35 pounds in any single drag.

SHRIMP: No attempt was made to ascertain the shrimp potential during the fall cruise, and only a few shrimp drags were made in the spring as the main objective of the explorations was to define the quantities and the types of bottom fishes available. Catches made in the spring with the lined otter trawl revealed some quantity of pink, side-stripe, or spot shrimp throughout the area explored. Pink shrimp were caught at depths ranging from 68 to 157 fathoms, side-stripe shrimp at depths from 77 to 190 fathoms, and spot shrimp at depths between 88 and 140 fathoms. The Gulf shrimp

Fig. 13 - Catch of mostly pink shrimp caught 7 miles south of Cape Bartolome. Note the scarcity of miscellaneous fish.

trawl, used in areas where the otter trawl gave promising signs, made catches of up to 340 pounds of pink shrimp per 30-minute tow (drag number 62). The best shrimp catches were made in the small basin south of Cape Bartolome (fig. 13).

WEATHER

Weather conditions encountered during the two seasons were entirely different. An almost continuous wave of storms buffeted the Southeastern Alaska coast with winds clocked up to 75 knots during the fall of 1956. Between storms, a heavy southwesterly swell often made exploratory fishing impracticable. Air temperatures, recorded at the beginning of each drag, ranged from 40° F. to 50° F. and averaged 45.0° F.

During the spring exploration of 1957, the weather was mostly favorable. Other than moderate afternoon and evening winds, only 3 brief storms were encountered. Air temperatures recorded during the spring dragging operations ranged from 44° F. to 61° F. and averaged 51.5° F.

APPENDIX

Detailed fishing logs are not included in the Review, but are available upon request as an appendix to the reprint of this article. Request Separate No. 532. The reprint which contains the appendix includes these tables:

Table 2 - Fishing Log of Otter-Trawl Drags Made off Southeastern Alaska from Dixon Entrance to Iphigenia Bay--October, November 1956--U. S. F. W. S. M/V John N. Cobb.

Table 3 - Fishing Log of Otter-Trawl Drags Made off Southeastern Alaska from Dixon Entrance to Hazy Islands--May, June 1957--U. S. F. W. S. Chartered Vessel Tordenskjold.

Table 4 - Fishing Log of Shrimp-Trawl Drags Made off Southeastern Alaska from Dixon Entrance to Baker Island--June 1957--U. S. F. W. S. Chartered Vessel Tordenskjold.

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