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BOTTOM TRAWLING EXPLORATION IN THE STRAIT OF JUAN DE FUCA--FEBRUARY TO MARCH 1956

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SUMMARY

Bottom fish exploration in the Strait of Juan de Fuca was carried out during February and March 1956 by the U. S. Fish and Wildlife Service's exploratory fishing vessel John N. Cobb. The rough bottom of the Strait caused considerable gear damage, especially in the western part, but some clear trawling areas were found. Results were generally poor from a commercial fishing standpoint with noncommercial fish, mostly dogfish and ratfish, dominating the catches in all areas. Some fair showings of lingcod and true cod were found, with smaller catches of rockfish and flatfish. Four species of commercial shrimp were caught over a large area in beam trawls, but only in small quantities. Winter weather conditions did not seriously interfere with the fishing operations.

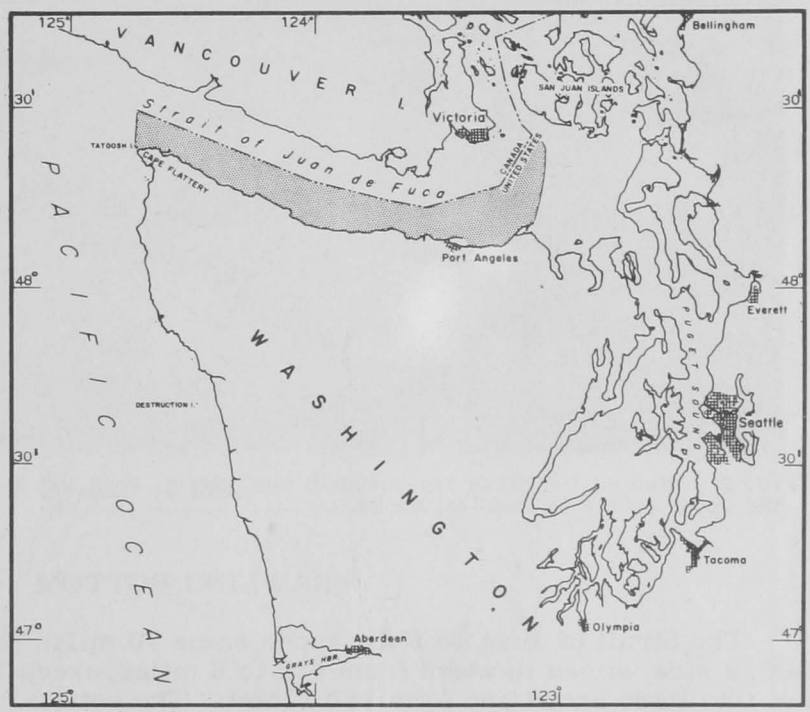

FIG. 1 - NORTHERN COAST OF WASHINGTON. SHADED AREA IN THE STRAIT OF JUAN DE FUCA WAS EXPLORED BY THE JOHN N. COBB.

INTRODUCTION

The Service's exploratory fishing vessel John N. Cobb explored with bottom trawls the United States side of the Strait of Juan de Fuca, from February 15 to March 9, 1956. Objectives were to determine the trawlability of the bottom and to determine species and quantities of bottom fish available to commercial fishing methods at that time of year.

Limited trawling had been carried out in certain parts of the Strait in the past, but this was the first attempt at systematic coverage. Past experience of commercial fishermen indicated that the Strait was generally hazardous for trawling, especially in the western reaches; however, the exact extent of trawlable bottom was not known. If some productive trawling ground was found in the Strait it could be used, especially by the smaller vessels, during periods of bad weather on the offshore grounds or to "top off" a trip on the way home.

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GEAR USED

A standard 400-mesh western otter trawl with a $4\frac{1}{2}$-inch stretched-mesh cod end was used on all drags for bottom fish. (Specifications for this trawl are described by Alverson 1951.)

A 20-foot beam trawl with bags of 36-thread $1\frac{1}{2}$-inch mesh and 15-thread $1\frac{1}{4}$-inch mesh cotton webbing, 150 meshes deep, was used for shrimp. (Details of the beam trawl are described by Ellson and Livingstone 1952.)

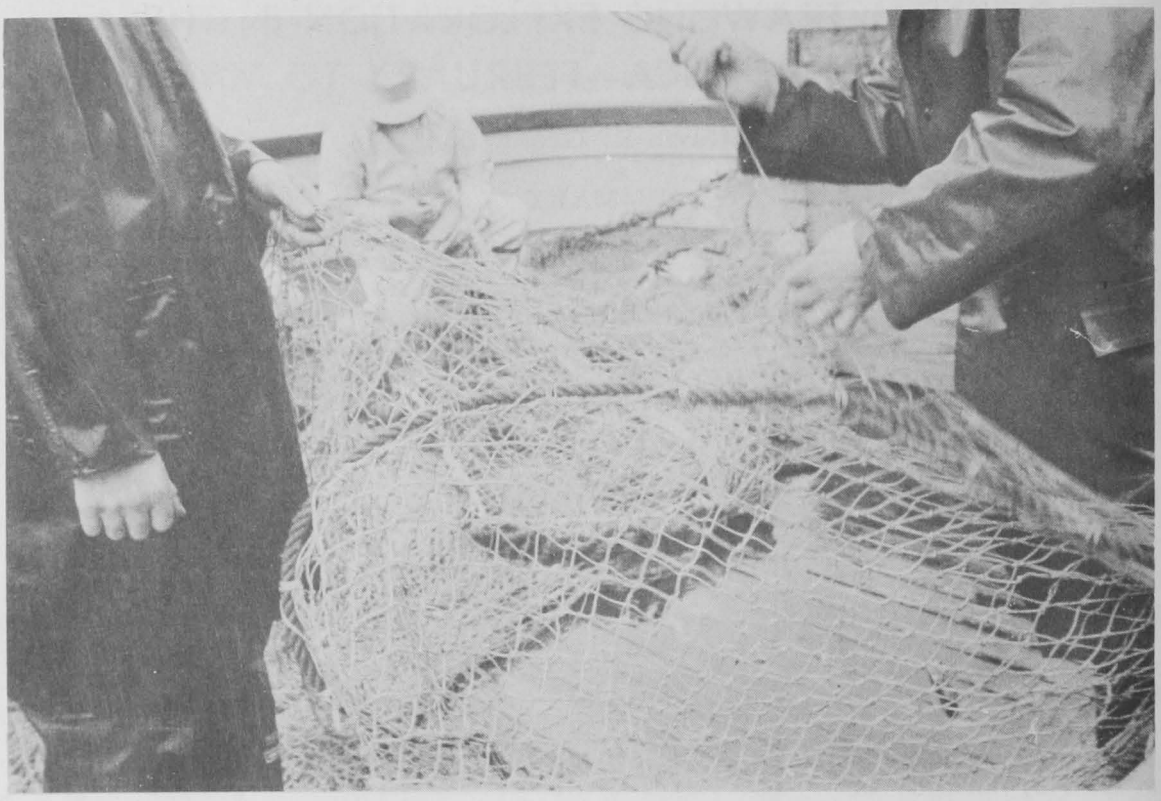

FIG. 2 - MENDING THE OTTER TRAWL ABOARD THE JOHN N. COBB WAS A FREQUENT CHORE, RESULTING FROM THE ROUGH BOTTOM IN MUCH OF THE STRAIT.

TRAWLING BOTTOM

The Strait of Juan de Fuca spans some 70 miles from end to end, and the United States side varies in width from 4.5 to 8 miles, except the eastern part which spreads out into Haro Strait and Admiralty Inlet. The bottom cross-sectional profile is roughly U-shaped with the slope usually dropping off rather abruptly to 50 or 60 fathoms (100 fathoms in the western end) and then more gradually to the greatest depths. As a result, nearly all drags were made in water over 50 fathoms deep. The greatest depths in the strait range from about 155 fathoms at the western end to about 70 fathoms north of Green Point. North of Dungeness Spit the water again deepens to about 95 fathoms.

The bottom of the well-traveled Strait was found to be strewn with debris. Among items commonly picked up in the otter trawl were clinkers, old tires, discarded vessel fittings, and pieces of water-soaked wood of various sizes. Bottom samples taken with a snapper-type sampler in connection with the fishing operations showed considerable variation in bottom types, even within relatively contained areas. Mud, sand, gravel, shell, stone and rocky bottom areas were widespread.

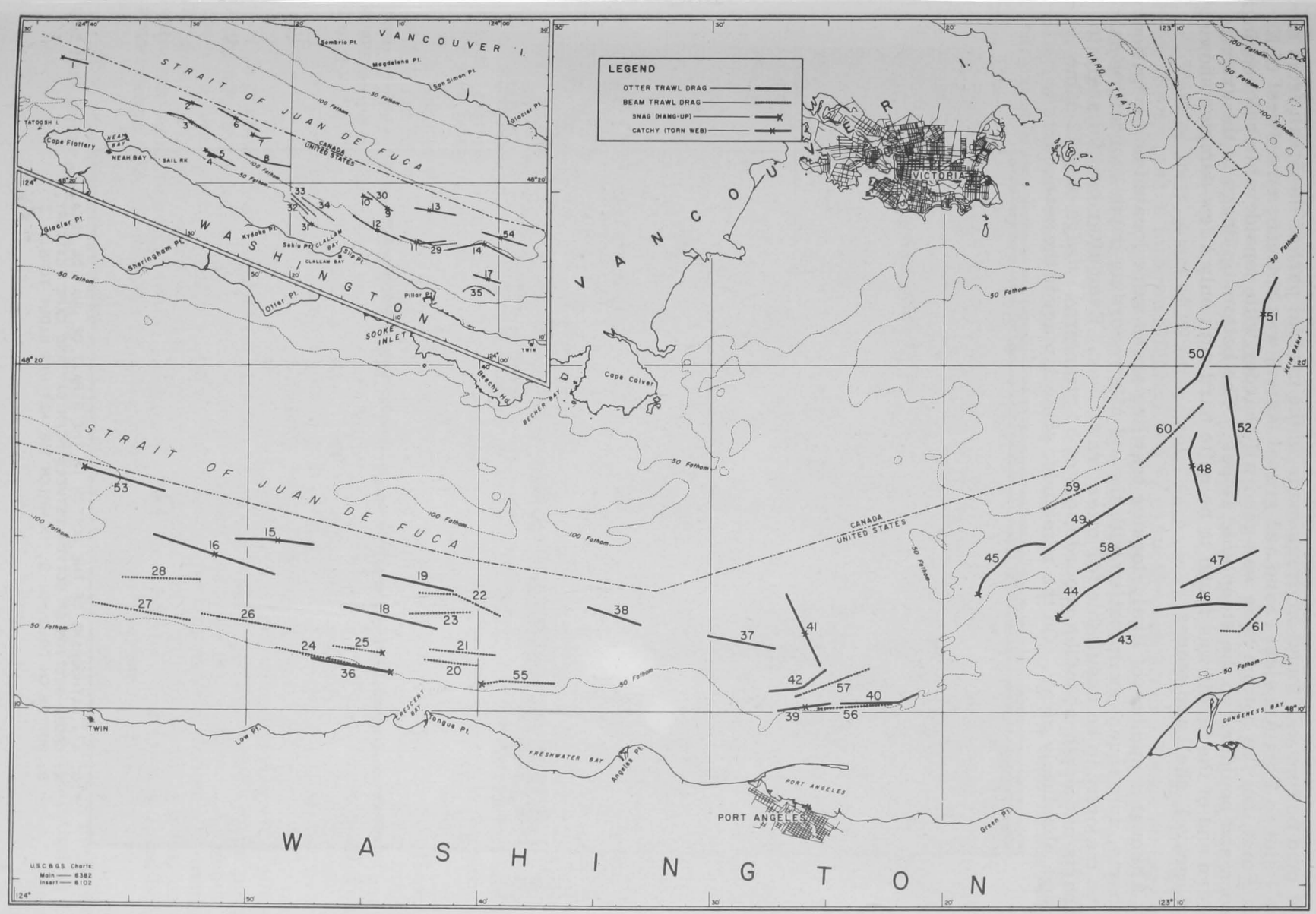

FIG. 3 - LOCATION OF OTTER-TRAWL DRAGS AND BEAM-TRAWL DRAGS IN THE STRAIT OF JUAN DE FUCA.

Most mud bottom was found on drags made in the central part of the Strait from Kydaka Point to Port Angeles. Sand and gravel bottom was not uncommon west of Kydaka Point, but the bottom here was generally harder with considerable outcroppings of rock and boulders on the steep side slopes. The bottom on drags in the extreme eastern end of the Strait was found to be quite hard with only a few samples showing sand, gravel, shell and stones.

Although a number of likely-looking trawling areas were located on navigational charts, subsequent examination with the aid of a recording depth sounder revealed the majority to be unsuitable for otter-trawl gear. Even after careful analysis of charts and depth-sounding records, out of 38 otter-trawl drags only 12 came through absolutely clear. On the remainder some damage to the net occurred.

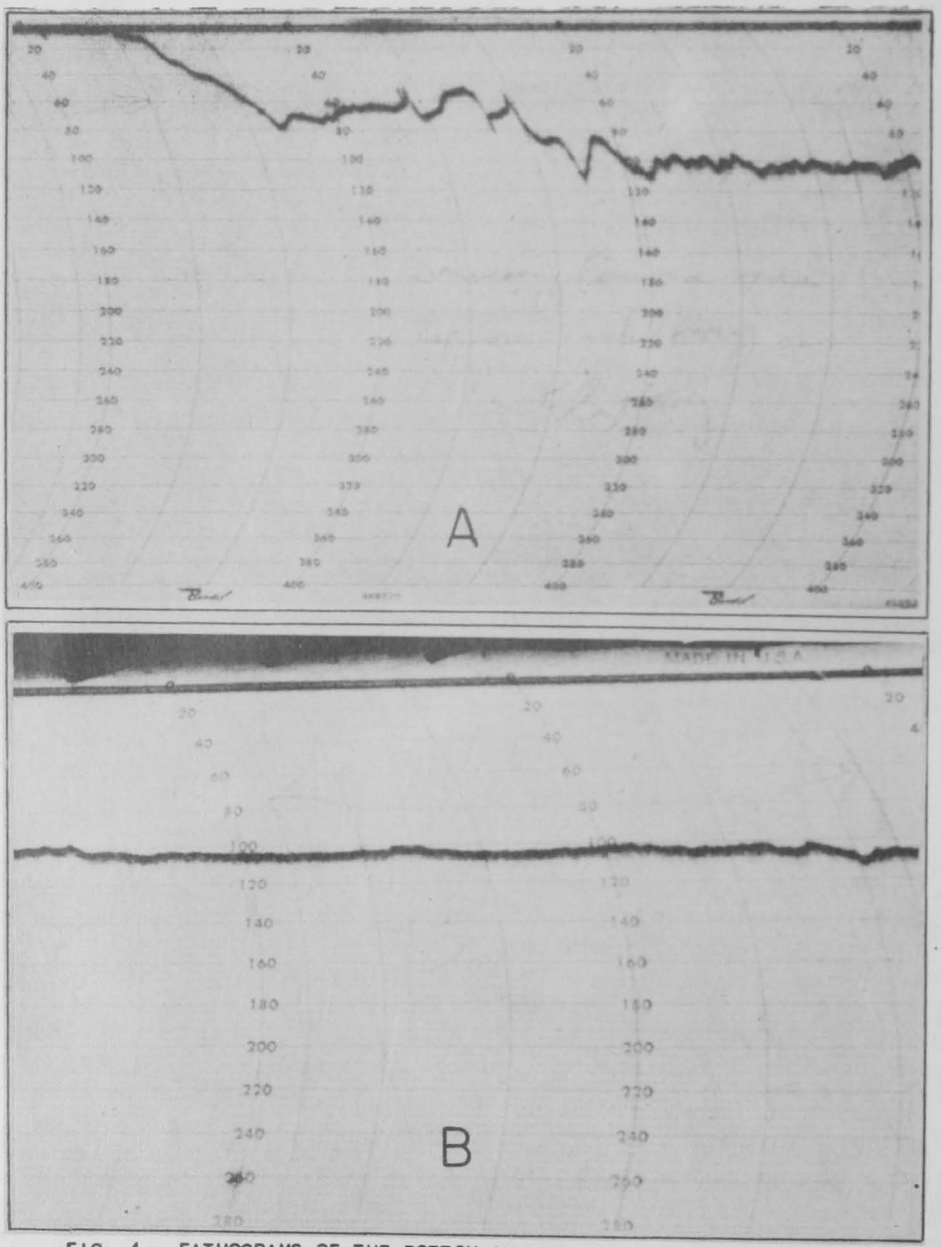

FIG. 4 - FATHOGRAMS OF THE BOTTOM IN THE STRAIT OF JUAN DE FUCA.
A. CROSS-SECTION OF BOTTOM BETWEEN NEAH BAY AND CAPE FLATTERY.
B. BOTTOM ON DRAG NO. 3, IN WHICH THE NET WAS BADLY TORN.

Drag number 8 made in 112 to 118 fathoms north of Kydaka Point was the only otter-trawl drag out of 16 made west of Twin to come through completely clear. However, five of the drags made from Slip Point to Pillar Point in 54 to 96 fathoms came through with relatively minor damage to the net (see fig. 3 and table 1).

East of Twin, 4 out of 22 otter-trawl drags resulted in severe damage to the net. Seven others tore-up slightly, and 11 came through clear. While no particular section in this area can be declared absolutely free from snags and obstructions, the safest part appears to be from Twin to Port Angeles, where six drags made in 72 to 91 fathoms and four drags made in 44 to 74 fathoms suffered little or no gear damage. The "pocket" lying between Green Point, Dungeness Spit, and Hein Bank is relatively free from serious obstacles except near the end of the submarine ridge that extends north from Green Point where two drags hung up.

FIG. 5 - EMPTYING THE COD END ON DECK OF THE JOHN N. COBB. MOSTLY BOTTOM DEBRIS AND NONCOMMERCIAL FISH WERE TAKEN IN THIS DRAG.

A total of 23 beam-trawl drags made at depths from 49 to 118 fathoms from Kydaka Point to Hein Bank indicate that much of the bottom is satisfactory for this type of gear. The only two drags that resulted in considerable damage to the beam trawl were made within the 57- to 68-fathom depth range a short distance off Tongue Point.

FISHING RESULTS

In general, from a commercial fisheries viewpoint, fishing results were poor. Although several species of fish having commercial value were taken throughout the area, noncommercial fish (including ratfish, dogfish, skates, and arrow-toothed flounder or turbot) dominated the otter-trawl catches. Shrimp were present, but were not found in commercial quantities. Detailed results of otter-trawl and beam-trawl drags are tabulated in tables 1 and 2.

The fact that some clear trawling bottom was found in various parts of the Strait and that several kinds of marketable trawl fish were present could mean that at

other times of the year profitable fishing might be found there. This is true of other trawling grounds where the abundance of the fish varies seasonally.

NONCOMMERCIAL FISH: Noncommercial fish were taken in amounts from 150 to to 4,390 pounds per one-hour drag 1/ and the majority of drags took over 950 pounds each. The largest catch included 2,300 pounds of ratfish and 2,000 pounds of dogfish taken in drag number 18 off Crescent Bay in 76 to 81 fathoms. The largest

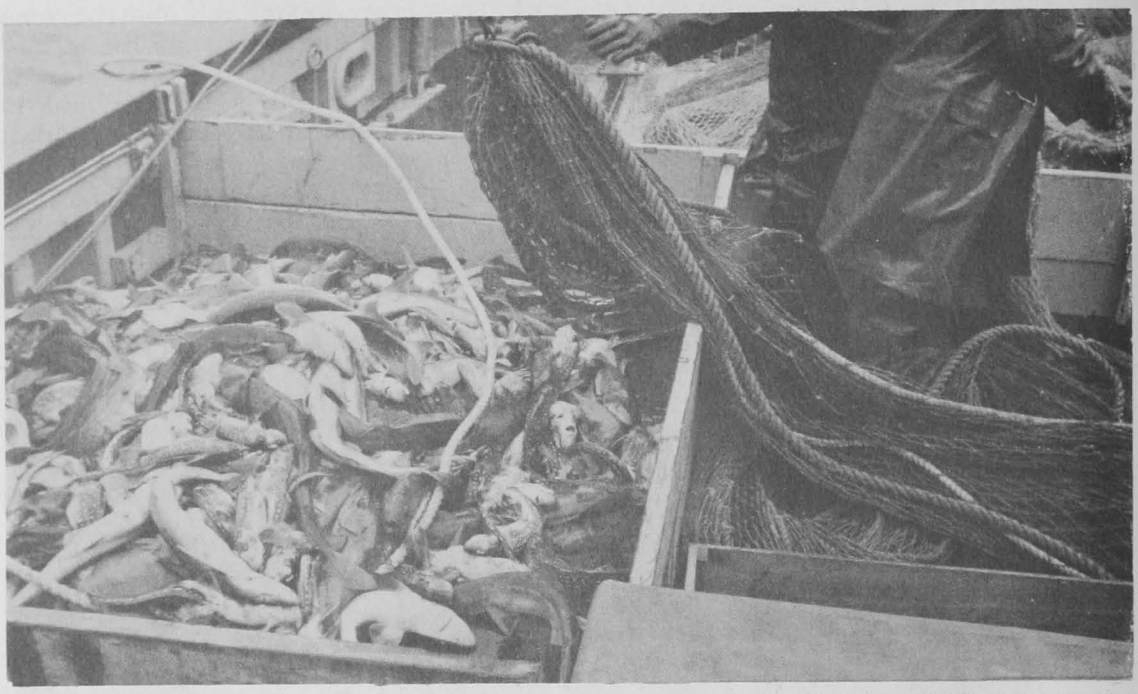

FIG. 6 - NONCOMMERCIAL FISH DOMINATED MOST OF THE CATCHES. THIS CATCH WAS PREDOMINANTLY DOGFISH, RATFISH, AND SKATES.

catch of turbot or arrow-toothed flounder (500 pounds) was taken in drag number 37 off Port Angeles in 72 to 76 fathoms, and the best catch of skate (600 pounds) was in drag number 40 in 44 to 51 fathoms also off Port Angeles.

FOOD FISH: Lingcod and true cod were caught in many of the drags and were the dominant food fish taken throughout the entire area. Except for these and rockfish, no other species of food fish was taken in amounts greater than 35 pounds per drag.

Lingcod: The best catch of lingcod, 335 pounds, was taken in drag number 8 off Kydaka Point in 112 to 118 fathoms. The next largest catch, 248 pounds, was in drag number 50 off Hein Bank in 56 to 66 fathoms. Two other drags caught 75 pounds of lingcod off Sail Rock in 101 to 109 fathoms and off Hein Bank in 70 to 79 fathoms. Lingcod were taken in 17 other drags in amounts of 45 pounds or less.

True cod: The best catch of true cod, 400 pounds, was made in drag number 37 off Port Angeles in 72 to 76 fathoms; 60 to 70 pounds of marketable size true cod were taken in four other drags off Sail Rock, off Slip Point and off Port Angeles.

Flatfish: Several species of flatfish were found distributed throughout the Strait, but they were caught only in small numbers. No single species, except halibut, was taken in amounts greater than 7 pounds per drag. Miscellaneous flatfish caught included Dover sole, English sole, petrale sole, flathead sole, rex sole, rock sole, and sand sole.

1/ DRAGS SUSTAINING SERIOUS GEAR DAMAGE NOT INCLUDED.

Rockfish: A total of 150 pounds of black rockfish were taken in drag number 3 off Sail Rock in 101 to 109 fathoms. The second best catch, 100 pounds, was in drag number 15 off Low Point in 81 to 85 fathoms. Pacific ocean perch were present in 10 drags in amounts of 15 pounds or less, and in two drags in amounts of 25 pounds and 70 pounds. Other species of red rockfish were taken in small numbers.

Shrimp: Four species of commercial shrimp were caught in small quantities with the beam trawl. Up to 30 pounds of 132-count 2/ pink shrimp, 7 pounds of 40-count side-stripe shrimp, $2\frac{1}{2}$ pounds of 46-count spot shrimp, and trace amounts of coon-stripe shrimp were taken per one-hour beam-trawl drag. All four species were found in all areas covered between Kydaka Point and Hein Bank. The best catch of pink and side-stripe shrimp were made between Twin and Freshwater Bay at depths from 57 to 76 fathoms where the bottom consists generally of mud, sand, and gravel.

FIG. 7 - A BEAM-TRAWL CATCH OF SIDE-STRIPE SHRIMP IS WEIGHED AND COUNTED. ALTHOUGH SHRIMP WERE WIDESPREAD, THEY WERE TAKEN ONLY IN SMALL QUANTITIES.

WEATHER CONDITIONS

This survey was carried out during the winter, and the weather conditions were about normal for the season. Air temperatures recorded at the start of each drag ranged from 28° F. to 47° F. and averaged 39° F. Wind velocities as high as 40 knots and precipitation in the form of rain, snow, and sleet were experienced during actual dragging operations. With the exception of the last day of fishing, however, the seas were calm to moderate. The wind, even though strong at times, changed direction frequently which did not give the seas time to build up. Fishing activities were halted on only one day when gusts of wind up to 55 knots swept the strait.

LIST OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHRIMP CAUGHT DURING BOTTOM TRAWLING EXPLORATION IN THE STRAIT OF JUAN DE FUCA--1956

FLAT FISH:	
SOLE:	
DOVER	MICROSTOMUS PACIFICUS
ENGLISH	PAROPHRYS VETULUS
FLATHEAD	HIPPOGLOSSOIDES ELASSODON
PETRALE	EOPSETTA JORDANI
REX	GLYPTOCEPHALUS ZACHIRUS
ROCK	LEPIDOPSETTA BILINEATA
SAND	PSETTICHTHYS MELANOSTICTUS
HALIBUT	HIPPOGLOSSUS STENOLEPIS
ARROW-TOOTHED FLOUNDER (TURBOT)	ATHERESTHES STOMIAS
ROUND FISH:	
HAKE	MERLUCCIUS PRODUCTUS
LINGCOD	OPHIODON ELONGATUS
POLLOCK	THERAGRA CHALCOGRAMMA
SABLEFISH (BLACK COD)	ANOPLOPOMA FIMBRIA
TRUE COD (GREY COD)	GADUS MACROCEPHALUS

ROCKFISH:	
BLACK: ORANGE-SPOTTED	SEBASTODES MALIGER
YELLOW-TAILED	SEBASTODES FLAVIDUS
PACIFIC OCEAN PERCH	SEBASTODES ALUTUS
RED: BLACK-MOUTHED	SEBASTODES CRAMERI
GREEN-STRIPED	SEBASTODES ELONGATUS
ORANGE	SEBASTODES PINNIGER
OTHER:	
DOGFISH	SQUALUS SUCKLEYI
RATFISH	HYDROLAGUS COLLIEI
SKATE: BIG	RAJA BINOCULATA
LONG-NOSED	RAJA RHINA
PRICKLY	RAJA STELLULATA
SHRIMP:	
COON-STRIPE	PANDALUS HYPSINOTUS
PINK	PANDALUS JORDANI
SIDE-STRIPE	PANDALOPSIS DISPAR
SPORT	PANDALUS PLATYCEROS

2/ NUMBER OF HEADS-ON SHRIMP PER POUND.

TABLE 1 - OTTER TRAWL FISHING LOG--M/V JOHN N. COBB--CRUISE 25--STRAIT OF JUAN DE FUCA (FEBRUARY-MARCH 1956)

Area	Tatoush Island to Kydaka Point								Kydaka Point to Twin							
Drag Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	17	54
Date	2/16/56	2/16/56	2/17/56	2/17/56	2/17/56	2/18/56	2/18/56	2/18/56	2/19/56	2/19/56	2/19/56	2/19/56	2/20/56	2/20/56	2/21/56	3/6/56
Latitude N. Longitude W.	48°27.8' 124°39.8'	48°25.5' 124°30.8'	48°23.0' 124°27.3'	48°21.7' 124°27.2'	48°21.1' 124°25.3'	48°23.3' 124°23.0'	48°22.9' 124°21.9'	48°21.1' 124°20.0'	48°18.2' 124°10.2'	48°18.9' 124°12.2'	48°16.3' 124°05.1'	48°16.3' 124°09.6'	48°17.9' 124°04.2'	48°15.1' 123°58.6'	48°13.5' 123°59.7'	48°16.0' 123°57.3'
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	262° 144-148 G. & Hrd. Snag 32	088° 124-131 --- Snag 30	274° 101-109 &, & rky. Catchy 60	270° 58-59 rky. Snag 8	275° 62-68 --- Snag 35	276° 119-127 Blds. Catchy 60	256° 124-129 --- Snag 17	264° 112-118 gy. M. Clear 60	270° 109-110 gn.M.S.& St. Snag 5	270° 114-115 St. Snag 8	252° 100-104 St. & M. Catchy 60	271° 97-101 --- Catchy 60	266° 102-105 --- Catchy 60	256° 96-99 M.S.& G. Catchy 60	270° 57-62 --- Catchy 30	264° 98-102 gn.S. & Sh. Catchy 60
Remarks	Bad tear	Slight tear	Bad tear	Broke D.G. 2/	Broke D.G.	Bad tear	Bad tear	---	Mod. tear	Bad tear	Slight tear	Slight tear	Bad tear	Slight tear	Slight tear	Slight tear
Estimated total catch in pounds	300	75	1500	30	1000	1350	120	2200	60	70	1250	1100	1050	990	700	1500
Catch in pounds (% marketable): Flat Fish																
Dover	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace
English	Trace 3/	---	---	---	---	---	---	---	---	---	Trace	---	---	---	---	---
Flathead	---	---	Trace	---	---	---	---	---	---	---	Trace	---	---	Trace	---	---
Halibut	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Petrale	---	---	---	---	Trace	---	---	---	---	---	---	---	---	---	Trace	---
Rex	---	---	---	---	---	---	---	---	---	---	Trace	Trace	Trace	Trace	---	Trace
Rock	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Sand	---	---	---	---	---	---	---	---	---	---	Trace	---	---	---	---	---
Turbot	30	Trace	20	Trace	Trace	50	Trace	50	Trace	Trace	80	130	70	55	30	250
Round Fish																
Hake	---	---	---	---	---	---	---	Trace	---	---	---	Trace	---	---	---	---
Lingcod	Trace	Trace	75(100%)	---	20(100%)	20(80%)	---	335(98%)	---	---	---	20(100%)	20(80%)	Trace	---	---
Pollock	Trace	Trace	---	Trace	Trace	Trace	---	20	Trace	---	Trace	30	Trace	Trace	---	60
Sablefish	---	---	---	---	---	Trace	---	---	---	---	---	---	Trace	---	---	Trace
True cod	Trace	---	100(70%)	Trace	30(50%)	Trace	---	40(50%)	---	---	50(50%)	125(70%)	Trace	70(50%)	Trace	75(75%)
Rock Fish																
Black	---	---	150(100%)	---	---	Trace	---	---	---	---	80(100%)	60(100%)	---	---	Trace	---
Pacific ocean perch	Trace	---	---	---	---	25(100%)	---	Trace	---	Trace	Trace	Trace	70(100%)	Trace	---	Trace
Red	Trace	Trace	Trace	Trace	25(80%)	Trace	---	25(100%)	---	---	20(100%)	Trace	20(100%)	---	Trace	Trace
Other																
Dogfish	20	---	500	Trace	325	400	60	300	Trace	Trace	450	600	165	350	30	485
Ratfish	220	35	600	Trace	570	800	50	1070	40	50	400	100	650	450	600	525
Skate	---	Trace	30	---	20	Trace	---	350	Trace	Trace	20	---	30	35	Trace	40

Area	Twin to Freshwater Bay						Freshwater Bay to Green Point						Green Point-Dungeness Spit to Hein Bank									
Drag Number	15	16	18	19	36	53	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Date	2/21/56	2/21/56	2/22/56	2/22/56	2/28/56	3/6/56	2/28/56	2/29/56	2/29/56	2/29/56	3/1/56	3/1/56	3/1/56	3/2/56	3/2/56	3/3/56	3/3/56	3/3/56	3/3/56	3/3/56	3/5/56	3/5/56
Latitude N. Longitude W.	48°15.3' 123°47.1'	48°13.9' 123°48.8'	48°12.4' 123°41.8'	48°13.9' 123°41.1'	48°11.5' 123°47.2'	48°16.3' 123°53.6'	48°11.9' 123°27.2'	48°13.0' 123°35.3'	48°10.1' 123°27.1'	48°10.5' 123°21.1'	48°13.4' 123°26.7'	48°11.3' 123°25.1'	48°12.6' 123°11.6'	48°11.2' 123°12.2'	48°11.8' 123°15.7'	48°13.1' 123°06.9'	48°13.6' 123°09.8'	48°16.1' 123°08.9'	48°16.2' 123°11.8'	48°19.2' 123°09.9'	48°20.3' 123°06.5'	48°19.7' 123°07.8'
Course, magnetic 1/ Depth range in fathoms Type of bottom Trawling bottom Time on bottom in minutes	251° 81-85 --- Catchy 60	265° 88-90 M. Catchy 60	260° 76-81 M.S.& G. Clear 60	079° 84-91 S. Clear 60	077° 46-50 Hrd.& St. Snag 60	263° 92-101 gn.S.& St. Snag 60	257° 72-76 gy.M.& St. Clear 60	085° 74-80 --- Clear 60	058° 46-52 gy.M.G.& Sh Catchy 60	239° 44-51 S.G.& Sh. Clear 60	131° 68-74 St.Sh.& Hrd Catchy 60	226° 59-62 gn.S.& Sh. Clear 60	225° 74-78 Hrd. Clear 60	203° 76-90 Hrd.& G. Snag 87 3/	208° 62-73 Hrd.& G. Snag 45	212° 68-79 Hrd. Clear 60	042° 82-88 Hrd.& G. Clear 60	332° 60-64 Hrd. Catchy 60	213° 71-74 Hrd.St.& Sh Catchy 60	007° 56-66 Hrd. Clear 60	350° 70-79 gn.S.St.& Sh Catchy 60	152° 54-60 Hrd. Clear 60
Remarks	Slight tear	Slight tear	---	---	Bad tear	Bad tear	---	---	Slight tear	---	Slight tear	---	---	Bad tear	Bad tear	---	---	Slight tear	Slight tear	---	Slight tear	---
Estimated total catch in pounds	890	900	4500	1140	600	300	2000	250	350	1800	400	600	450	300	550	2500	800	250	1300	1300	2700	750
Catch in pounds (% marketable): Flat Fish																						
Dover	Trace	---	Trace	Trace	Trace	---	---	---	---	---	Trace	---	---	---	---	Trace	---	---	---	Trace	---	---
English	---	---	---	---	---	---	---	---	---	Trace	---	---	---	---	---	Trace	---	---	---	---	---	---
Flathead	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Halibut	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	35(100%)	---	---	---	---	---
Petrale	Trace	Trace	Trace	---	---	---	---	---	---	---	Trace	---	---	---	---	---	---	---	---	Trace	---	---
Rex	---	---	Trace	---	---	---	---	---	---	---	---	---	---	Trace	---	Trace	Trace	Trace	---	Trace	Trace	Trace
Rock	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace	---	Trace
Sand	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	Trace	---	---
Turbot	Trace	25	70	25	Trace	135	500	---	70	200	85	25	90	30	Trace	Trace	60	20	70	125	150	75
Round Fish																						
Hake	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Lingcod	45(95%)	35(100%)	Trace	---	---	---	40(100%)	Trace	---	20(100%)	Trace	25(100%)	---	Trace	---	---	---	---	Trace	258(93%)	75(100%)	---
Pollock	---	---	---	---	---	Trace	20	---	Trace	---	30	---	---	---	---	Trace	---	---	40	20	180	25
Sablefish	---	---	Trace	---	---	---	Trace	20(50%)	---	---	Trace	---	Trace	Trace	---	---	---	---	Trace	---	---	---
True cod	50(20%)	25(40%)	70(40%)	40(50%)	30(50%)	Trace	400(85%)	35(70%)	40(66%)	100(60%)	30(0%)	80(75%)	75(20%)	---	40(75%)	40(60%)	55(25%)	---	35(50%)	35(100%)	265(20%)	35(20%)
Rock Fish																						
Black	100(100%)	21(100%)	40(100%)	Trace	Trace	---	---	---	20(100%)	35(100%)	---	---	---	---	---	Trace	---	---	---	---	---	---
Pacific ocean perch	Trace	Trace	Trace	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Red	---	---	---	---	---	---	---	---	Trace	Trace	---	Trace	---	---	---	---	---	---	---	---	---	---
Other																						
Dogfish	60	320	2000	950	120	100	900	100	90	300	80	25	150	125	400	1100	330	65	230	80	240	135
Ratfish	600	450	2300	100	400	25	---	Trace	---	400	80	100	100	80	60	1300	320	80	760	730	1700	410
Skate	Trace	Trace	20	20	25	---	20	40	125	600	125	300	---	30	25	---	Trace	70	140	25	50	60

1/ Course given is between starting point and end point.
2/ "Trace"-less than 20 pounds of fish.
3/ "D.G." - dandyline gear.
4/ Winch broke down when snag was hit.

G. = gravel Blds. = boulders St. = stones
Hrd. = hard gy.M. = gray mud Sh. = shell
rky. = rocky gn. S. = green sand

TABLE 2 - BEAM TRAWL FISHING LOG--M/V JOHN N. COBB--CRUISE 25--STRAIT OF JUAN DE FUCA (FEBRUARY-MARCH 1956).

Area	Kydaka Point to Twin							Twin to Freshwater Bay				
Drag Number	29	30	31	32	33	34	35	20	21	22	23	24
Date	2/25/56	2/25/56	2/25/56	2/25/56	2/25/56	2/26/56	2/26/56	2/23/56	2/23/56	2/23/56	2/23/56	2/23/56
Latitude N.	48°16.2'	48°18.4'	48°17.2'	48°17.9'	48°17.8'	48°17.6'	48°12.8'	48°11.3'	48°11.8'	48°12.8'	48°12.8'	48°11.1'
Longitude W.	124°04.0'	124°10.8'	124°17.5'	124°18.3'	124°17.5'	124°15.8'	124°00.5'	123°40.1'	123°42.1'	123°40.9'	123°43.0'	123°43.8'
Course, magnetic 1/	251°	287°	285°	288°	290°	282°	254°	253°	072°	262°	065°	259°
Depth range in fathoms	100-102	112-118	49-52	59-66	73-77	84-88	71-83	63-71	68-75	83-90	80-86	48-53
Type of bottom	G.	gn. S.	S.G.& Sh.	S.G.& Sh.	S. & G.	M. & S.	S. & G.	M.S.& G.	S. & G.	M.S.& G.	M. & S.	M. & S.
Trawling bottom	Clear	Clear	Catchy	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	60	60	60	60	60	60	60	60	60	60	60	60
Shrimp catch in pounds (whole shrimp per pound):												
Pink	Trace	Trace	Trace	Trace	Trace	1½(110)	Trace	9½(125)	12(107)	Trace	Trace	1½(103)
Side-stripe	Trace	Trace	3(38)	3½(38)	1(45)	Trace	1½(37)	1 3/4 (44)	6(47)	3¾(43)	1(52)	1(52)
Coon-stripe	-	Trace	Trace	Trace	Trace	Trace	-	Trace	Trace	Trace	Trace	-
Spot	-	Trace	Trace	Trace	2½(46)	Trace	-	-	-	-	-	-
Total Shrimp catch in pounds	1	Trace	3½	3½	4	2½	1½	11¼	18	4	2	2½
Remarks	-	-	Slight tear	-	-	-	-	-	-	-	-	-

Area	Twin to Freshwater Bay (contd.)					Freshwater Bay to Green Point		Green Point-Dungeness Spit to Hein Bank			
Drag Number	25	26	27	28	55	56	57	58	59	60	61
Date	2/24/56	2/24/56	2/24/56	2/24/56	3/7/56	3/8/56	3/8/56	3/8/56	3/8/56	3/8/56	3/8/56
Latitude N.	48°11.9'	48°12.8'	48°13.1'	48°13.7'	48°10.8'	48°10.3'	48°11.2'	48°15.1'	48°16.8'	48°13.9'	48°13.2'
Longitude W.	123°46.3'	123°51.9'	123°56.7'	123°52.0'	123°36.7'	123°22.2'	123°23.2'	123°11.1'	123°12.7'	123°08.8'	123°06.0'
Course, magnetic 1/	075°	076°	076°	248°	246°	243°	226°	218°	221°	202°	217°
Depth range in fathoms	57-65	66-76	58-65	87-89	62-68	48-52	57-61	77-84	56-68	61-63	57-76
Type of bottom	M.S.& G.	M.S.& G.	M.S.& Sh.	S. & G.	gn.M.& St.	gn.S.G.& Sh.	gn.S.& Sh.	gn.S.&St.	gn.S.St.& Sh.	gn.S.St.& Sh.	gn.S. & Hrd.
Trawling bottom	Snag	Clear	Clear	Clear	Snag	Clear	Clear	Clear	Clear	Clear	Clear
Time on bottom in minutes	56	60	60	60	60	60	60	60	60	60	45 2/
Shrimp catch in pounds (whole shrimp per pound):											
Pink	10½(125)	21½(150)	30(132)	Trace	Trace	Trace	Trace	Trace	5(171)	1½(166)	Trace
Side-stripe	7(40)	2 3/4(50)	1¾(31)	1 3/4(49)	1½(54)	Trace	Trace	Trace	1½(31)	1¼(48)	Trace
Coon-stripe	Trace	Trace	Trace	Trace	-	-	Trace	Trace	-	Trace	-
Spot	Trace	Trace	Trace	Trace	Trace	Trace	-	Trace	Trace	Trace	Trace
Total Shrimp catch in pounds	18½	21½	32	2	2½	Trace	Trace	Trace	7	3	1
Remarks	Hung up	-	-	-	Broke beam	-	-	-	-	-	-

1/ Course given is between starting point and end point.
2/ "Trace" - less than 1 pound of shrimp.
3/ Hauled trawl in before hour was up because unexpected steep slope appeared on depth sounder.

G. = gravel
gn.S. = green sand
Sh. = shell
M. = mud
St. = stones
Hrd. = hard

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HADDOCK FILLETS ARE NUTRITIOUS

Easy to handle and quick to cook, haddock fillets are a good choice for the protein part of any meal, according to the U. S. Fish and Wildlife Service. They are versatile enough for company dinners or the simplest family fare.

Cooked without the addition of fat, haddock fillets are an excellent choice for weight-conscious persons as they are a low-calorie high-protein food. When prepared with fat or served with a rich sauce, haddock fillets are equally as good in a weight-increasing diet. Haddock fillets are also a reliable source of the important B-complex vitamins--thiamine, niacin, and riboflavin as well as the important minerals--calcium, iron and iodine.

To retain the nutrients as well as insure maximum juiciness, tenderness, and general eating qualities, avoid overcooking haddock fillets. A good rule to follow is to cook only until the fish flakes easily when tested with a fork.

For a nutritious family dinner, the home economists of the U. S. Fish and Wildlife Service recommend "Haddock Fillets with Bread Stuffing."

HADDOCK FILLETS WITH BREAD STUFFING

- 2 pounds haddock fillets
- 1½ cups chopped celery
- ⅓ cup chopped onion
- ¼ cup butter or other fat, melted
- ½ teaspoon salt
- ½ teaspoon poultry seasoning
- 1¼ quarts soft bread cubes
- 2 tablespoons milk
- 1 egg, beaten
- 2 tablespoons butter or other fat, melted
- ½ teaspoon paprika
- ½ teaspoon salt

Thaw frozen fillets. Cut into serving-size portions. Cook celery and onion in butter until tender. Sprinkle salt and poultry seasoning throughout the bread cubes. Add to celery-onion mixture. Combine milk and eggs. Pour over bread cubes and mix well. Spread stuffing in a shallow, well-greased baking pan. Place fish in a single layer on stuffing. Mix butter, paprika, and salt. Cover fish with the sauce. Bake in a moderate oven, 350° F., for 30 minutes or until fish flakes easily when tested with a fork. Serve 6.