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TRAWL SURVEY OF DEMERSAL FISH AND SHELLFISH RESOURCES IN PRINCE WILLIAM SOUND ALASKA: SPRING 1978

March 1979

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TRAWL SURVEY OF DEMERSAL FISH AND SHELLFISH RESOURCES IN PRINCE WILLIAM SOUND ALASKA: SPRING 1978

by

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March 1979

U.S. DEPARTMENT OF COMMERCE
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TABLE OF CONTENTS

	Page
INTRODUCTION	1
BACKGROUND	2
METHODS	3
VESSEL AND FISHING GEAR	3
SAMPLING PROCEDURES	3
DATA ANALYSIS	5
RESULTS	6
TOTAL SURVEY AREA	6
NORTHEAST QUADRANT	14
Walleye pollock	14
Eulachon	14
Other roundfish and rockfish species	14
Tanner (snow) crab	18
Red king crab	18
Dungeness crab	18
Flathead sole	20
Turbot	20
Pacific halibut	20
Other flatfish	20
Spiny dogfish	21
Skates	21
Sculpins	21
Shrimp	21
Mollusks	22
Miscellaneous	23

Page

SOUTHEAST QUADRANT 22

Walleye pollock 22

Eulachon 26

Other roundfish and rockfish. 26

Tanner (snow) crab 26

Red king crab 28

Dungeness crab 28

Pacific halibut 28

Yellowfin sole 28

Turbot 29

Flathead sole 29

Other flatfish 29

Skates 30

Spiny dogfish 30

Sculpins 30

Shrimp 30

Mollusks 31

Miscellaneous 31

NORTHWEST QUADRANT 31

Walleye pollock 31

Other roundfish and rockfish species 34

Tanner (snow) crab 34

Other crab 34

Turbot 36

Flathead sole 36

Other flatfishes 36

Page

Spiny dogfish 36

Skates 37

Sculpins 37

Shrimp 37

Miscellaneous 37

SOUTHWEST QUADRANT 37

Walleye pollock 38

Eulachon 38

Other roundfish and rockfish species 38

Tanner (snow) crab 41

Golden king crab 41

Red king crab 41

Other crab 41

Flathead sole 43

Turbot 43

Pacific halibut 43

Other flatfishes 43

Skates 44

Sculpins 44

Shrimp 44

Mollusks 44

Miscellaneous 44

CONCLUSIONS 45

REFERENCES 46

APPENDIX 48

INTRODUCTION

Since 1972, the National Marine Fisheries Service (NMFS) in Seattle, Washington, has conducted a series of research cruises in waters of the Gulf of Alaska and southeastern Alaska to determine the distribution, abundance, and biological condition of groundfish resources in these areas. Results of the surveys have been reported by Hughes and Alton (1974); Hughes and Parks (1975); Ronholt et al. (1976); Hughes and Hirschhorn (In press); and Parks and Zenger (1978).

This report is based upon data collected during a trawl survey carried out in April and May 1978 in Prince William Sound, Alaska. The principal objectives were: (1) to assess the distribution, abundance, and biological condition of demersal fish and shellfish resources within Prince William Sound, and (2) to evaluate the feasibility and impact of a trawl fishery in the Sound. The survey was conducted in cooperation with the Prince William Sound Fishery Development Steering Committee and the Alaska Department of Fish and Game.

BACKGROUND

In recent years, the major fisheries in Prince William Sound in order of dollar value have included salmon (all species), Tanner crab (also called snow crab), and herring (roe and bait as well as herring spawn on kelp). Landings and dollar value for these fisheries in 1977 were approximately 6,266,600 fish at $17,000,000; 4,806,700 lb (1977-78 season) at $1,946,700; and 4,983,200 lb at $1,044,300, respectively. Pink and sockeye salmon were of the highest total value followed by chum, chinook, and coho salmon. In addition, 1977 landings of the Dungeness crab and king crab fisheries were approximately 735,600 lb, worth $221,000, and 86,600 lb, worth $117,000, respectively. Smaller fisheries were conducted for bottomfish (used primarily for crab bait), shrimp, and razor clams. Landings and values for these fisheries in 1977 were approximately 83,700 lb at $25,100; 174,500 lb at $20,100; and 2,160 lb at $1,600 respectively. Recently a small fishery developed for large marine whelks, or snails (Neptunea pribiloffensis and N. lyrata). Snails are taken incidentally in Tanner crab pots and landings during the 1977-78 season were approximately 8,200 lb valued at $650.[1/]

During the years 1954, 1959, 1962, and 1970, various NMFS and chartered vessels conducted trawl work in certain parts of Prince William Sound using western otter trawls, beam trawls, and shrimp trawls. However, the results of this past work cannot be used to evaluate the resources of

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1/ The sources of these catch data were (a) the local processors of Cordova, (b) reports to the Alaska Board of Fisheries, (c) Prince William Sound Annual Management Reports, and (d) Historical Catch, Escapement and Related Commercial Fishery Statistics of Fish and Shellfish, Prince William Sound Area, Alaska by Ralph B. Pirtle. The data were provided by Al Kimker, Shellfish Biologist, Alaska Department of Fish and Game, Cordova, Alaska.

the entire Sound because they were not done in a systematic manner and catches generally were low. Recently the processors in Prince William Sound sought to determine if sufficient groundfish were available in the inside waters to keep processing plants busy during slack periods such as between the end of the Tanner crab season and the beginning of the salmon season (approximately April - June). This survey was scheduled during that period and was aimed at providing information to the fishing industry and management agencies, as well as establishing baseline data for future ecological studies.

Common names of species are used in the text wherever possible. Lists of both common and scientific names of the species found in the five depth intervals of each of four survey quadrants are shown in the Appendix.

METHODS

VESSEL AND FISHING GEAR

The 100 ft long NOAA research vessel Oregon was used for the survey. All trawling was conducted on the seabed with 400-mesh Eastern bottom trawls rigged with 1¼-in mesh codend liners to retain small specimens. Trawl doors were 5 x 7 ft steel V-type, with bridles 20-fathom (fm) long and ½-in diameter. According to diver observations, 400 mesh trawls generally have a horizontal spread of about 38 ft and a vertical opening of 6 to 8 ft.

SAMPLING PROCEDURES

Prince William Sound was divided into four quadrants (Figure 1). The area within each quadrant was divided into depth intervals (10-50,

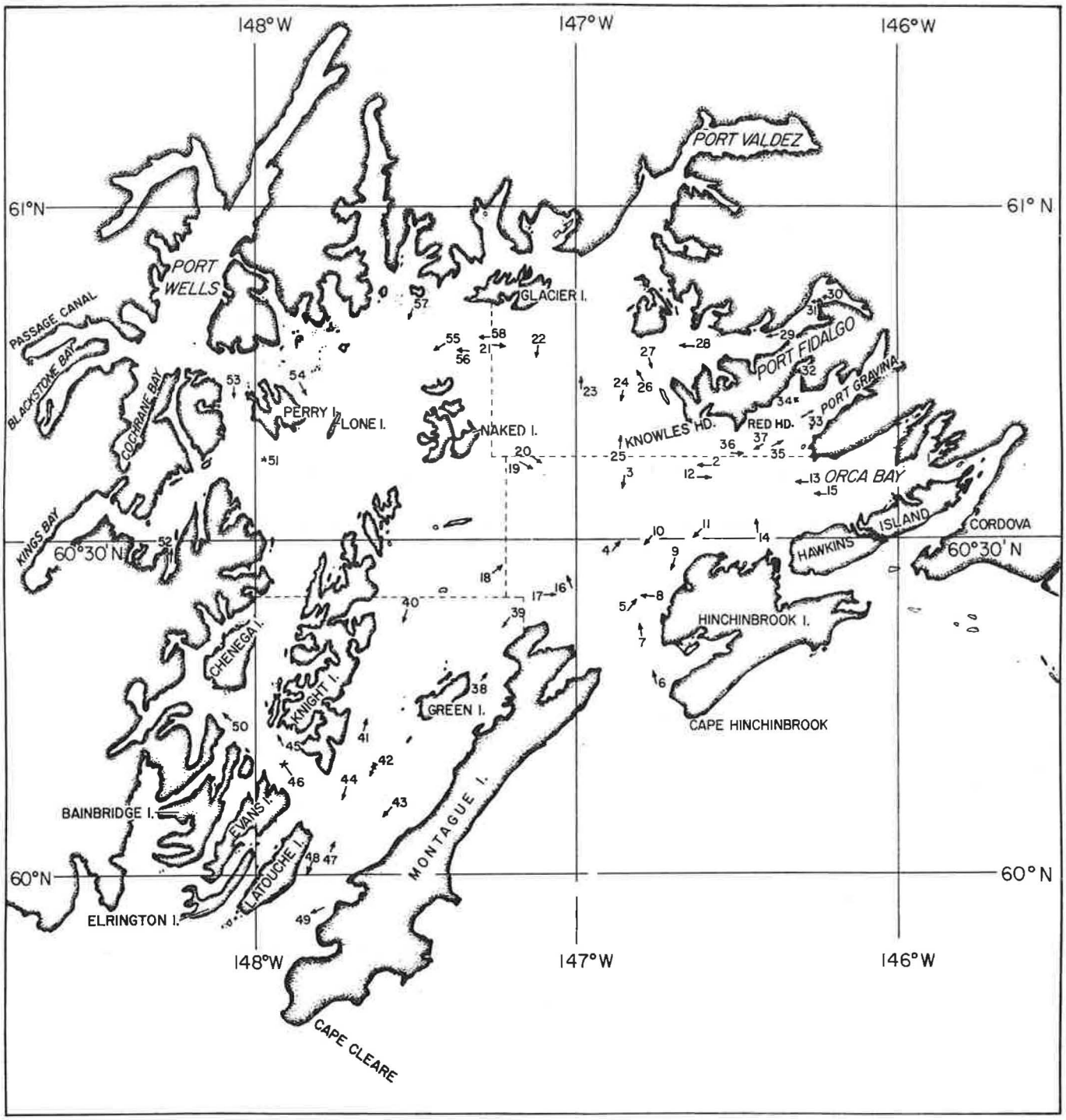


Figure 1.--Prince William Sound showing all drags made during the groundfish survey by NOAA research vessel Oregon during April 1978, and the quadrant division of the Sound (dotted lines).

51-100, 101-150, 151-200, and 201-260 fm) called strata. Each depth stratum was then divided into 25 square mile areas to facilitate sampling and data analysis.

The trawl survey was conducted during daylight hours over a bottom depth range of 10-260 fm. Trawling duration at each station was usually 30 minutes. Only valid hauls, those in which the net did not become torn or hung-up, were counted in the survey results. An XBT (expendable bathythermograph) cast was made during most survey tows to determine water temperature at different depths.

For all hauls, the catches were sorted by species as described by Hughes (1976) and weighed to determine the species composition and catch rates. In all hauls, fish with potential commercial value were separated by sex and measured. Marketable sizes were considered to be 11½ inches for flatfish and 12 inches for roundfish.

DATA ANALYSIS

Catch rates and species composition are presented by quadrants and for the entire Prince William Sound area. Average catch rates may not represent those which could be expected from given areas of high abundance which would be exploited during commercial trawling.

Calculations of exploitable biomass for the principal species in each quadrant were computed using the area-swept technique (Alverson and Pereyra, 1969). Biomass estimates are regarded as conservative because it was assumed that the trawls were 100% efficient, allowing no escapement or selectivity.

Results of the trawl survey indicate the distribution and relative abundance of most groundfish and crab resources in Prince

William Sound. Although the Appendix also lists the various bivalves and gastropods taken, including commercially valuable whelks[2/], this merely shows that they were present in an area but has little quantitative value due to the extreme selectivity of the trawl gear in capturing only a tiny portion of these animals.

RESULTS

TOTAL SURVEY AREA

Fifty-eight trawl hauls were completed during the survey. Of these, 53 were valid hauls free of snags and hang-ups. Following the formal survey 12 extra hauls were completed, primarily in nearby outside waters in conjunction with Tanner crab tagging experiments of the Alaska Department of Fish and Game, and as gear demonstrations for local fishermen. These hauls are not included in the survey results or in Figure 1.

The Appendix lists the average catch rates in order of abundance of all species taken. Walleye pollock and Tanner crab dominated catches with CPUE's (catch per unit of effort) of 358 and 317 lb/h, respectively, followed by big skates (90 lb/h), turbot (89 lb/h), flathead sole (72 lb/h) and Pacific halibut (65 lb/h). Eulachon smelt in near spawning condition were next in abundance with an average catch rate of 56 lb/h; their relatively large numbers in our catches are probably a seasonal occurrence related to their spawning migration to rivers that drain into Prince William Sound. Spiny dogfish, yellowfin sole, and red king crab were next

2/ Identification of all mollusks, including bivalves, gastropods, and cephalopods, was made by Rae Baxter, Fishery Biologist with Alaska Department of Fish and Game, Bethel, Alaska.

in abundance with CPUE's of 34, 28, and 25 lb/h respectively.

Table 1 shows the exploitable biomass and catch per unit of effort of predominant species in Prince William Sound and in more detail by sampling quadrant. In this table skates were combined (including big skate, longnose skate and black skate) and sculpins includes the two largest and most common species (great sculpin and big mouth sculpin). It should be noted that the CPUE and biomass figures for sidestripe and pink shrimp are unrealistically low because a fish trawl rather than a shrimp trawl was used in the survey.

Length frequencies of walleye pollock, Tanner crab, turbot (arrow-tooth flounder), and flathead sole are given by quadrant in Figures 2, 3, 4, and 5. Length frequencies for species not abundant enough to be shown by quadrant are given for the entire Prince William Sound in Figure 6. These include eulachon, yellowfin sole, rex sole, rock sole, sablefish, and Pacific halibut. The length frequencies are separated by sex for all species except sablefish and Pacific halibut. Mean lengths of each species are also shown.

The dotted lines in Figure 1 indicate how the Sound was divided into four quadrants (Northeast, Southeast, Northwest, and Southwest.) Best trawling bottom occurred in the eastern quadrants. The Southwest quadrant had only limited trawlable bottom, while the generally deeper Northwest quadrant was characterized by predominantly rough and silty glacial mud bottom throughout, which greatly limited bottom trawling in this area.

Table 1.--Mean catch per unit of effort (lb /h) and estimates of exploitable biomass (metric tons (mt) X 1000), by quadrant and in total for predominant species in Prince William Sound during Oregon cruise, April 1978.

	Northeast Quadrant (460 sq. mi.)		Southeast Quadrant (436 sq. mi.)		Northwest Quadrant (401 sq. mi.)		Southwest Quadrant (307 sq. mi.)		Total Area (1604 sq. mi.)	
	lb /h	mt (x 1000)	lb /h	mt (x 1000)	lb /h	mt (x 1000)	lb /h	mt (x 1000)	lb /h	mt (x 1000)
Walleye pollock	550	7.2	370	4.6	57	0.7	312	3.1	357	15.6
Tanner (snow) crab	320	4.6	396	5.4	389	4.9	139	1.3	317	16.2
Skates[1/]	75	1.1	230	3.2	57	0.7	84	0.8	130	5.8
Turbot	99	1.4	141	1.9	45	0.4	30	0.3	89	4.0
Flathead sole	68	1.0	80	1.1	11	0.1	105	1.0	72	3.2
Pacific halibut	68	1.0	99	1.3	14	0.3	32	0.3	65	2.9
Eulachon	16	1.0	52	0.7	< 1	0.0[2/]	87	0.8	56	2.5
Spiny dogfish	91	1.4	1	0.0	60	0.7	--[3/]	---	34	2.1
Sculpins[4/]	37	0.5	34	0.5	29	0.4	17	0.2	31	1.6
Yellowfin sole	1	0.0	77	1.1	---	---	< 1	0.0	29	1.1
Red king crab	76	1.1	4	0.1	4	0.0	10	0.1	25	1.3
Starry flounder	3	0.0	39	0.6	---	---	1	0.0	15	0.6
Rex sole	13	0.2	17	0.2	7	0.1	9	0.1	13	0.6
Sablefish	24	0.4	11	0.2	7	0.1	2	0.0	12	0.7
Sidestripe shrimp	11	0.0	10	0.1	22	0.1	9	0.1	12	0.3
Pacific cod	4	0.0	21	0.3	1	0.0	9	0.1	11	0.4

1/ Includes big skate, longnose skate, and black skate.
2/ 0.0 = biomass less than 100 metric tons (mt)
3/ -- = no catch
4/ Includes great sculpin and bigmouth sculpin.

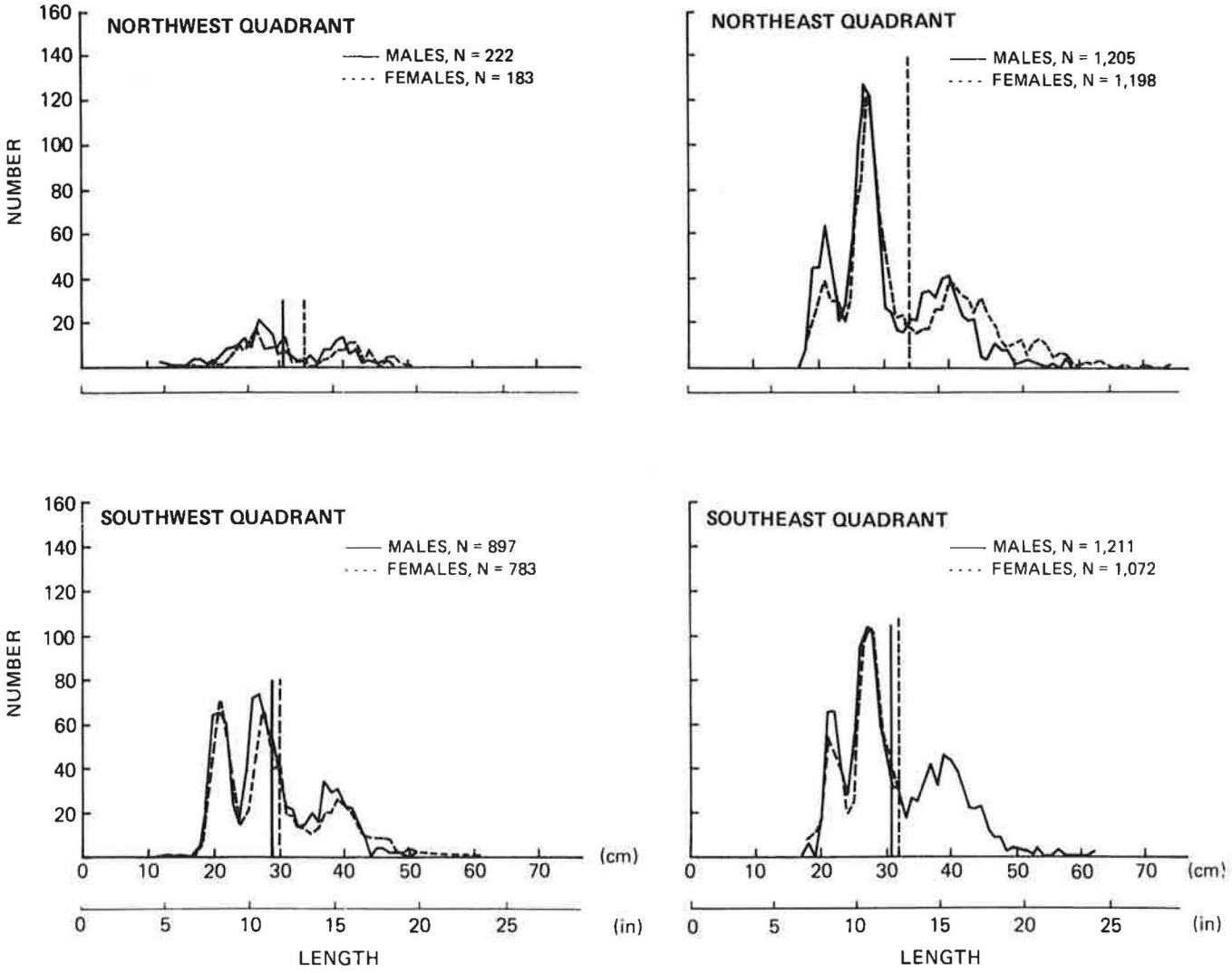


Figure 2.--Length frequencies of walleye pollock by quadrant in Prince William Sound during Oregon cruise, April 1978.

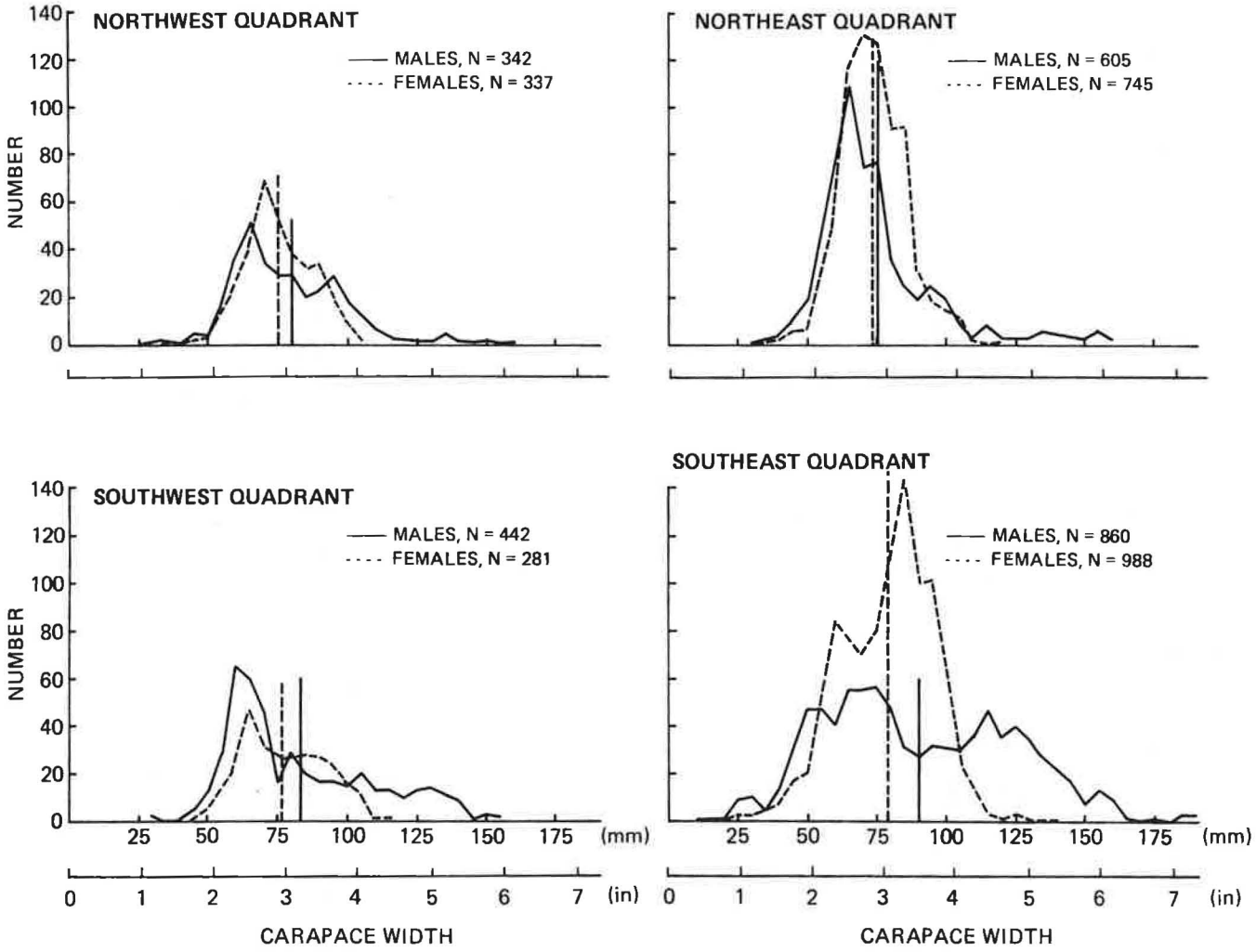


Figure 3.--Carapace widths of Tanner (snow) crab by quadrant in Prince William Sound during Oregon cruise, April 1978.

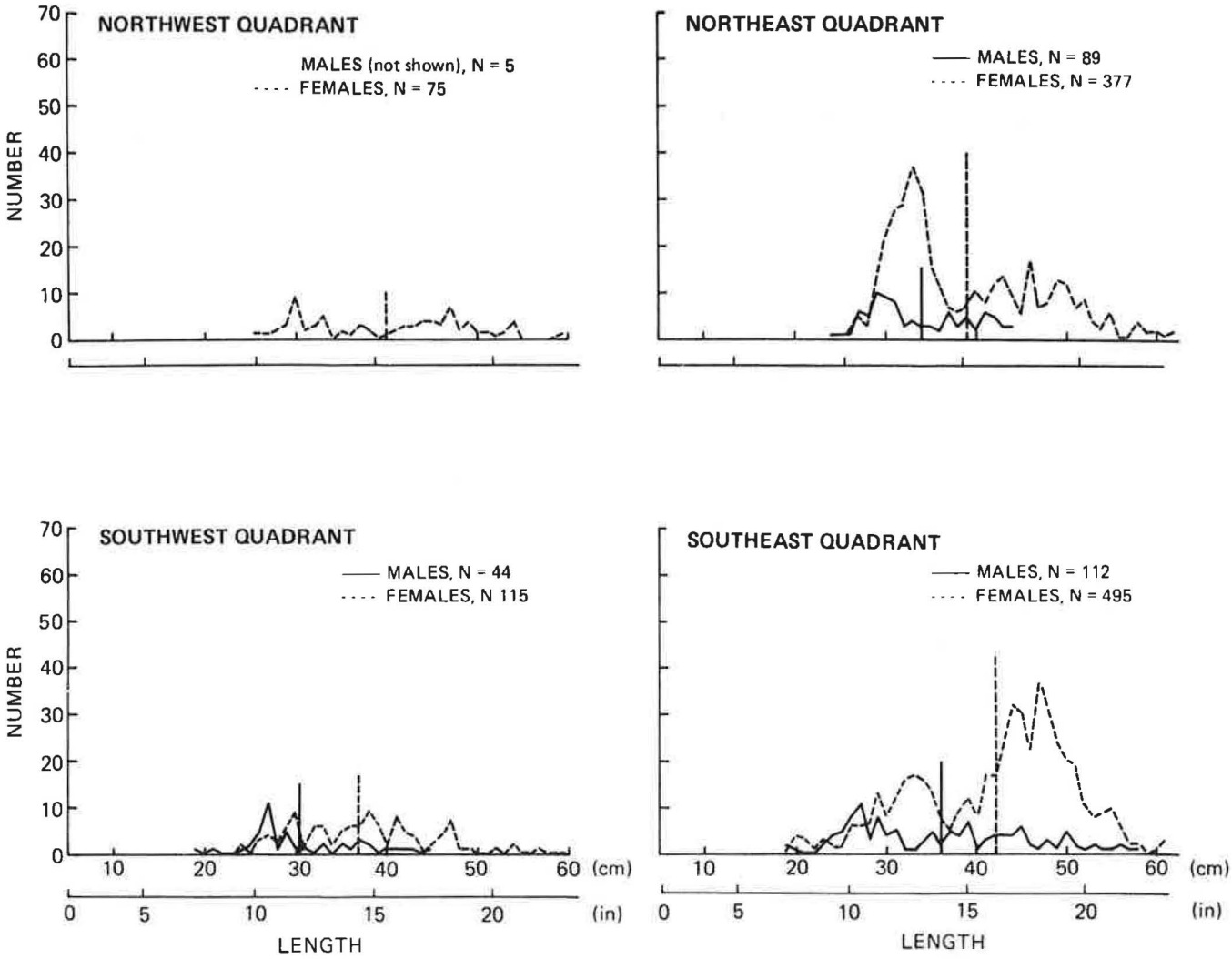


Figure 4.--Length frequencies of turbot (arrowtooth flounder) by quadrant in Prince William Sound during Oregon cruise, April 1978.

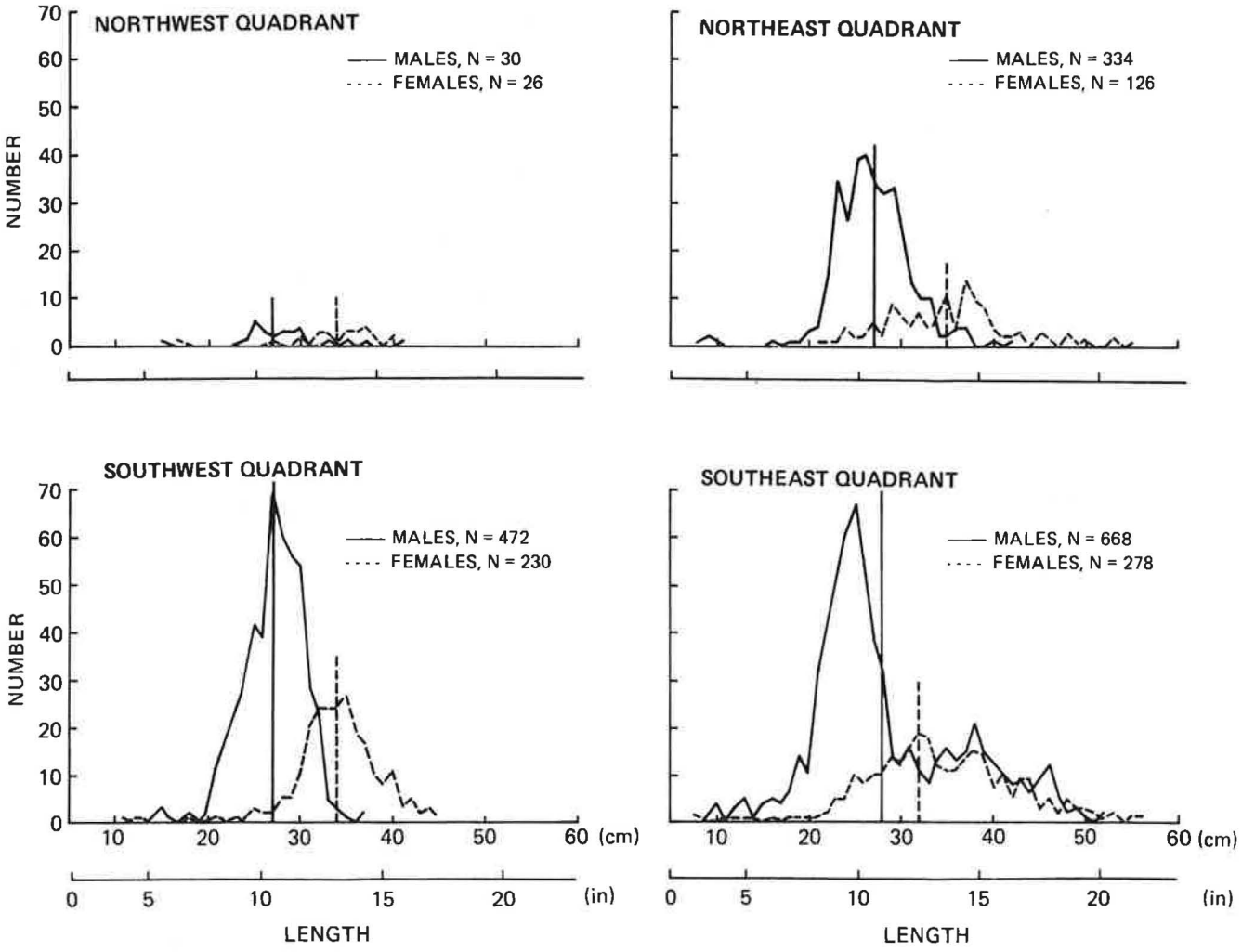


Figure 5.--Length frequencies of flathead sole by quadrant in Prince William Sound during Oregon cruise, April 1978.

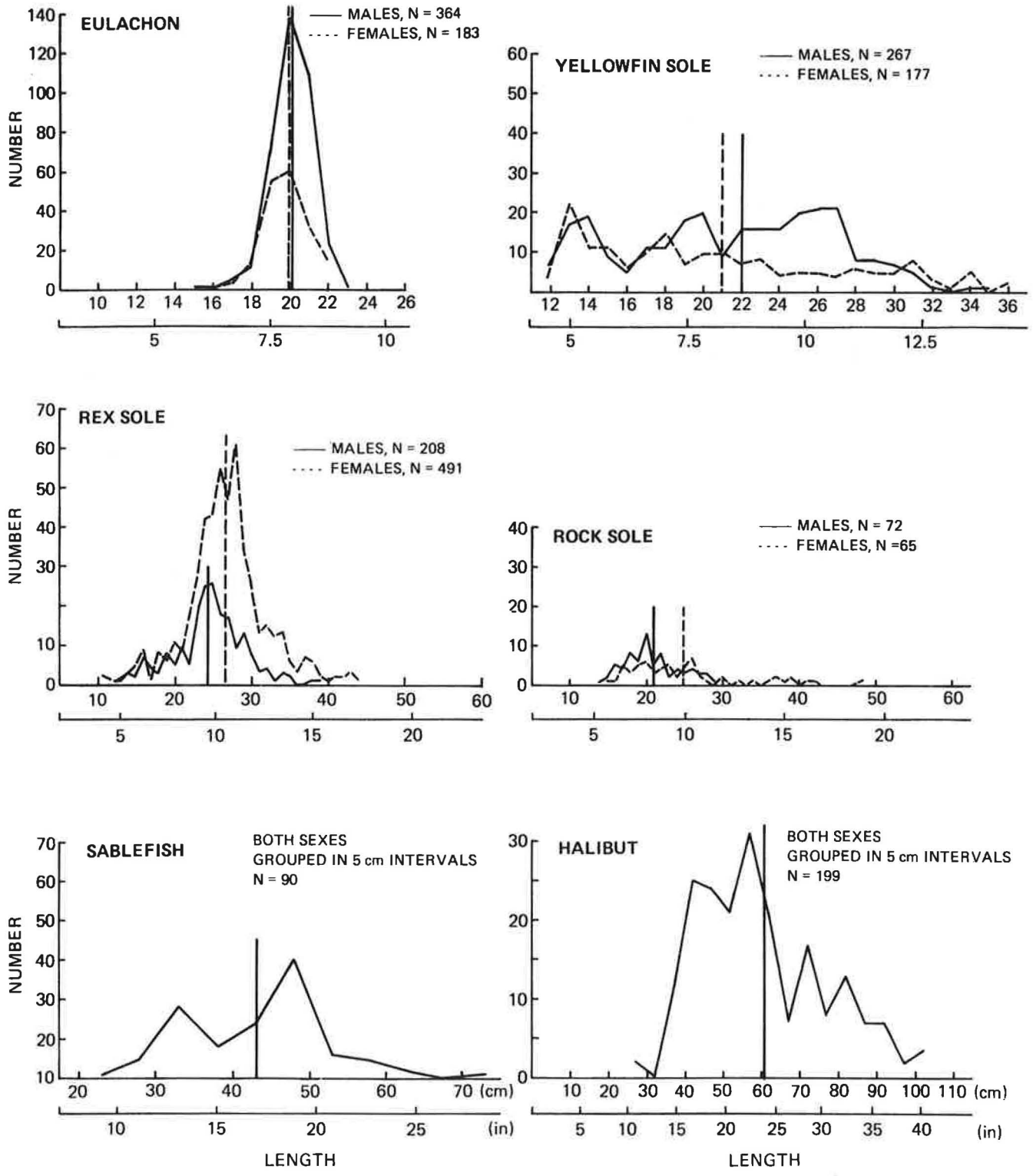


Figure 6.--Length frequencies of eulachon, yellowfin sole, rex sole, rock sole, sablefish, and halibut in Prince William Sound during Oregon cruise, April 1978.

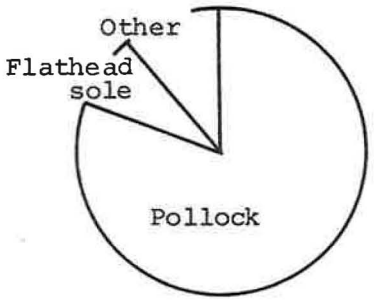
NORTHEAST QUADRANT

A total of 14 valid hauls were made in this quadrant. Figures 7-9 summarize catch information of the dominant species captured at the different depth intervals, the Appendix indicates the average catch rates of all species taken in each depth interval, and Table 1 shows the exploitable biomass estimates of the predominant species.

Walleye pollock--Pollock represented nearly 81% of the total catch in the 10-50 fm interval in this area with an average catch rate of 2,425 lb/h. However, most pollock were juveniles averaging 9 in with only 5% being of marketable size (Figure 7). Pollock also dominated catches in the 51-100 fm interval with a catch rate of 380 lb/h. These fish were primarily adults (average length 15 in) and 75% were of marketable size. Pollock also made up a significant proportion of the catches in the three deeper intervals (Figures 8 and 9, and Appendix). The length frequency of all pollock sampled in this quadrant by sex for all depths combined is shown in Figure 2. The mean length for males and females was 11.9 in and 13.3 in respectively.

Eulachon--Eulachon were taken in all depth intervals in this quadrant (Appendix). The highest catch rates (230 lb/h) occurred in the 201-260 fm interval (Figure 9).

Other roundfish and rockfish species--Very small catches of rougheye rockfish, Pacific herring, Pacific cod, sablefish, lingcod, short spine thornyhead, and Pacific tomcod occurred in the various depth intervals in the Northeast quadrant (Appendix). Sablefish were the most abundant of these other roundfish and occurred primarily in the 201-260 fm depth



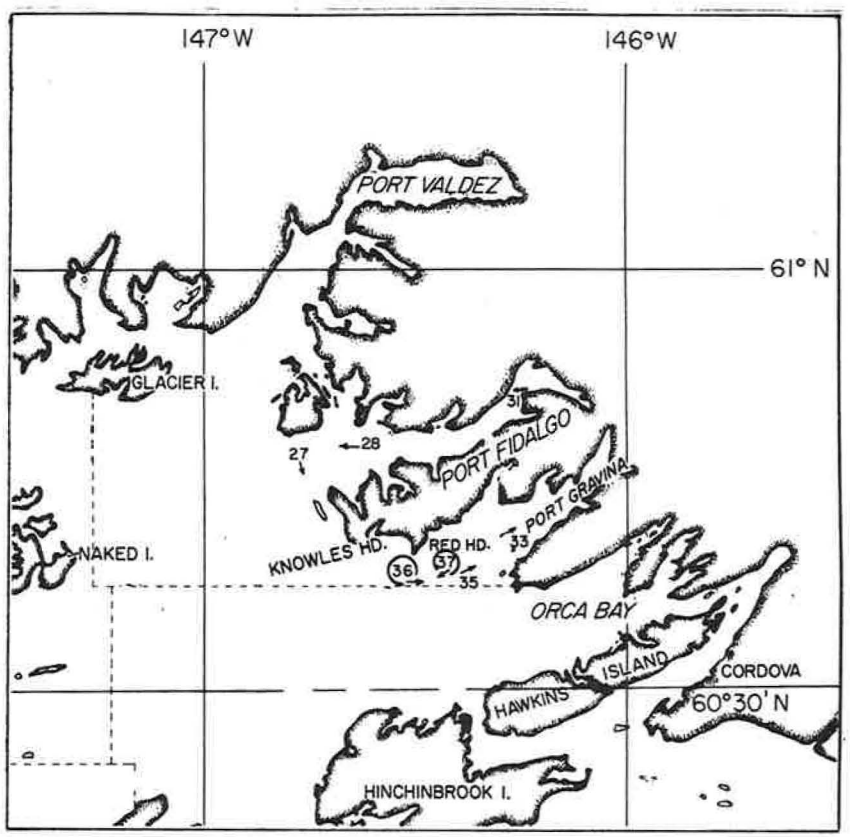
POLLOCK
2,425 lb/h
9 inches
5 % marketable

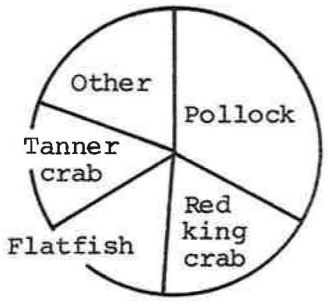
FLATHEAD SOLE
227 lb/h
10 inches
13 % marketable

OTHER SPECIES
348 lb/h
as listed in
Appendix B.

10-50 fm
93 square miles
Haul no. (36), (37)

51-100 fm
83 square miles
Haul no. 27, 28, 31, 33, 35





POLLOCK
380 lb/h
15 inches
75 % marketable

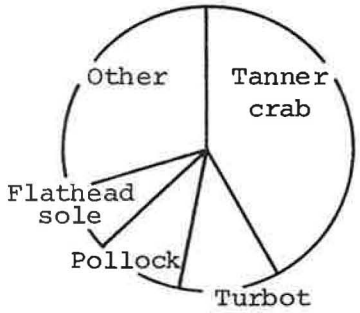
RED KING CRAB
214 lb/h
5.9 inches length
(males)

FLATFISH
173 lb/h

TANNER(SNOW) CRAB
172 lb/h
3.1 inches width
(males)

OTHER SPECIES
237 lb/h
as listed in
Appendix C

Figure 7.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Northeast quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



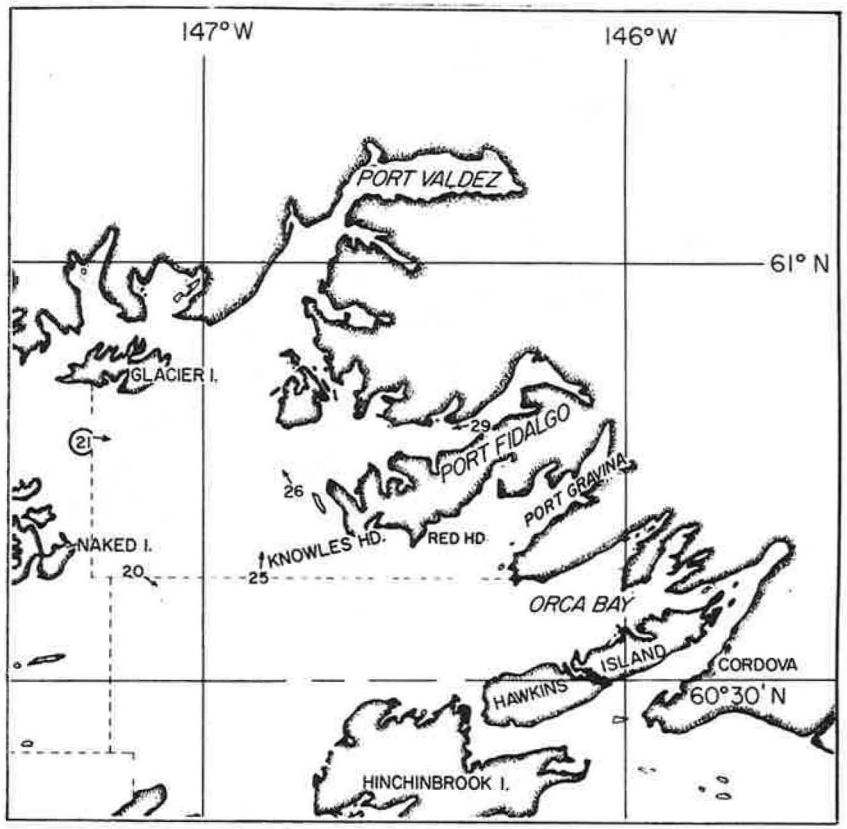
101-150 fm
81 square miles
Haul no. 26, 29

TANNER(SNOW) CRAB
292 lb/h
2.8 inches width
(males)

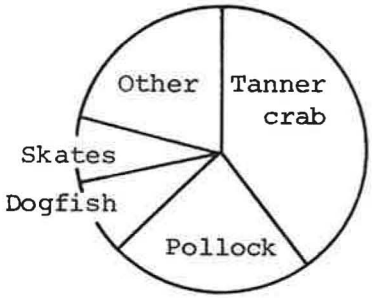
TURBOT
83 lb/h
14 inches
94 % marketable

POLLOCK
69 lb/h
13 inches
38 % marketable

OTHER SPECIES
706 lb/h
as listed in
Appendix D



151-200 fm
94 square miles
Haul no. (21)



TANNER (SNOW) CRAB
350 lb/h
4.0 inches width
(males)

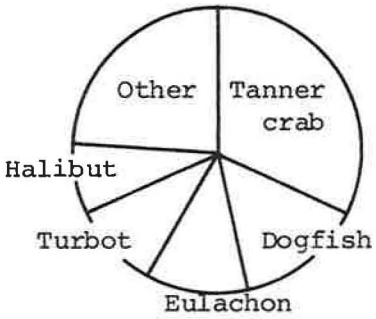
POLLOCK
208 lb/h
13 inches
62 % marketable

DOGFISH
76 lb/h

SKATES
64 lb/h

OTHER SPECIES
192 lb/h
as listed in
Appendix E

Figure 8.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Northeast quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



201-260 fm
109 square miles
Haul no. 22, 23, 24, 25

TANNER (SNOW) CRAB
618 lb/h
2.9 inches width
(males)

DOGFISH
290 lb/h

EULACHON
230 lb/h

TURBOT
190 lb/h
18 inches
100 % marketable

HALIBUT
154 lb/h
28 inches

OTHER SPECIES
468 lb/h
as listed in
Appendix F

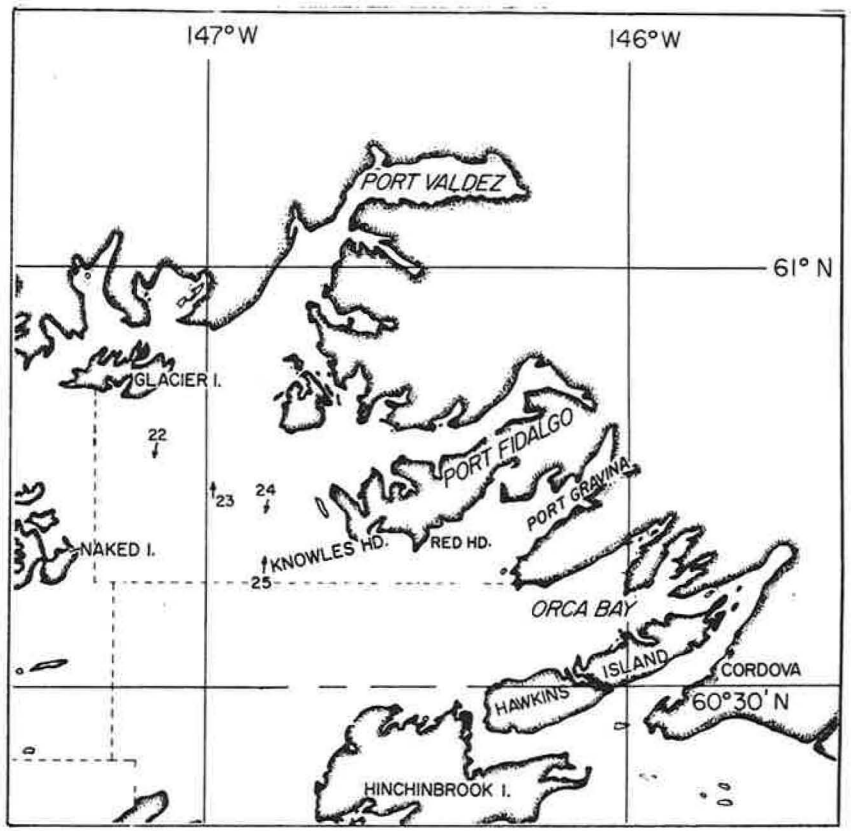


Figure 9.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Northeast quadrant of Prince William Sound. The average measurement of fish and crab in inches and the percentage of marketable-sized fish by number are shown.

interval (Appendix).

Tanner crab--In the 101-150 fm, 151-200 fm and 201-260 fm depth intervals, Tanner crab was the predominant species taken with catch rates of 292, 350, and 618 lb/h, respectively. They also occurred in the 10-50 fm and 51-100 fm depths with catch rates of 107 and 172 lb/h, respectively (Appendix and Figure 7).

The largest male Tanner crabs, with a mean carapace width of 4.0 in, were taken in the 151-200 fm depth interval. Other than the largest crabs being found in this interval, there did not seem to be any consistent size changes with depth (Figure 10). The mean carapace width of male Tanner crabs in other depth intervals ranged from 2.8 in to 3.1 in. Tanner crab carapace width frequencies for the entire quadrant combined are shown in Figure 3.

Red king crab--A catch of 487 lb of red king crab was taken in haul 28 near the mouth of Port Fidalgo. The mean carapace length of the males was 5.9 in and this catch made them the second most abundant species in the 51-100 fm depth interval (Figure 2). Smaller catches of 46 and 1.5 lb occurred in hauls 31 and 33, respectively. Red king crab were not taken in any other depth intervals in this quadrant.

Dungeness crab--The 10-50 fm interval was the only depth range where Dungeness crab were taken. Hauls 36 and 37 had catches of 1.6 and 11.7 lb, respectively, for an average catch rate of 13 lb/h (Appendix). These crabs were small and averaged only about 1 lb each.

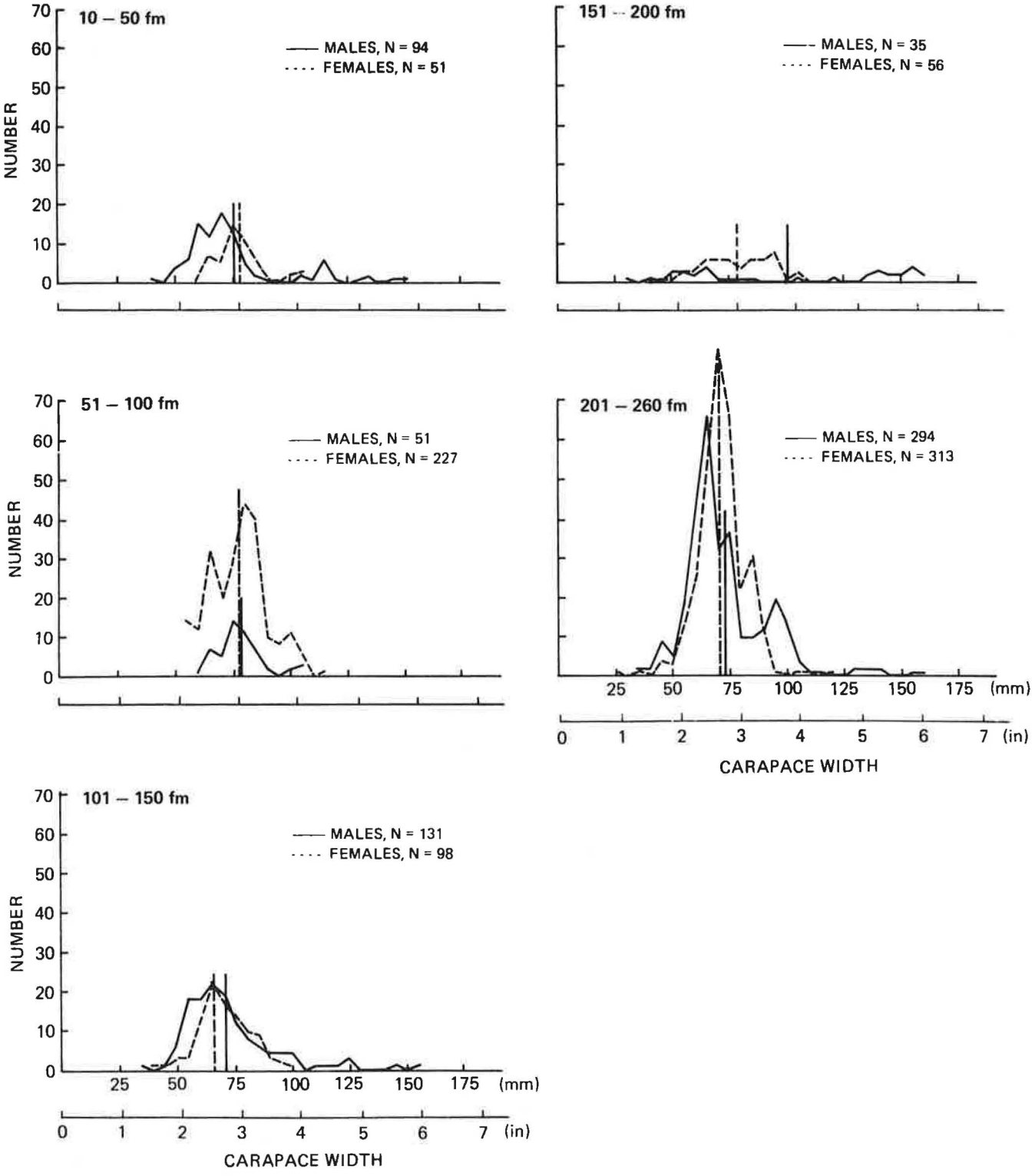


Figure 10.--Carapace width of Tanner (snow) crab in the Northeast quadrant of Prince William Sound by depth interval during Oregon cruise, April 1978.

Flathead sole--In the two shallowest depth intervals flathead sole were the most abundant flatfish with catch rates of 227 and 71 lb/h, respectively (Figure 7 and Appendix). Flathead sole were taken at all depth intervals, but catches generally decreased rapidly with increasing depth. Average catch rates were 50, 2, and 11 lb/h at 101-150, 151-200, and 201-260 fm, respectively (Appendix). Length frequencies and mean lengths of male and female flathead sole in this quadrant are shown in Figure 5.

Turbot--Turbot was among the five most abundant species taken at all depth intervals (Appendix). The size of turbot increased with depth, with the highest average catch rate (190 lb/h), and 100% of marketable size, in the 201-260 fm depth interval (Figure 9). The length frequency of turbot from the Northeast quadrant is shown in Figure 4.

Pacific halibut--Pacific halibut were taken in all depth intervals with the highest average catch rates occurring in the 51-100 and 201-260 fm depths (51 and 154 lb/h, respectively) (Appendix). The largest halibut, averaging 28 in, were taken in the deepest interval (Figure 9). Those in other depth intervals had average lengths ranging from 18 to 25 in, generally increasing with depth.

Other flatfish--Various species of flatfish, including rex sole, English sole, starry flounder, rock sole, dover sole, yellowfin sole, Alaska plaice, butter sole, and a slender sole, as well as flathead sole and turbot, were pooled to make up the flatfish group with an average catch rate of 173 lb/h in 51-100 fm (Figure 7). Most of these other species, with the exception of rex sole and dover sole, occurred only in the three

shallowest depth intervals. The major portion of some of these species, especially rex sole and yellowfin sole, were well below commercial size.

Spiny dogfish--This species was most abundant in the deepest interval (201-260 fm) where they were the second most predominant fish taken with an average catch rate of 290 lb/h (Figure 9). Catches of spiny dogfish decreased in shallower depths with average catch rates of 76 and 23 lb/h in 151-200 and 101-150 fm, respectively. Spiny dogfish were not taken in the two shallowest depth intervals.

Skates--Three species of skates were taken in the Northeast quadrant. These included in order of abundance the longnose skate, black skate and big skate. They were most abundant in the 201-260 fm depth interval where their average catch rates by species were 65, 50, and 34 lb/h, respectively.

Sculpins--One of two large species of sculpins was present in significant numbers at all depth intervals in the Northeast quadrant. Great sculpin were taken in 10-50, 51-100, and 101-150 fm with catch rates of 68, 32, and 30 lb/h, respectively. Bigmouth sculpins, although taken in two shallower depth intervals, were most abundant in deeper water with average catch rates of 30 and 27 lb/h in 151-200, and 201-260 fm, respectively. In addition, spinyhead sculpin, yellow Irish lord, and blackfin sculpin, as well as Triglops sp. and Gymnocanthus sp., were taken in small quantities (Appendix).

Shrimp--Sidestripe shrimp were taken in the 51-100, 151-200, and 201-260 fm depth intervals with average catch rates of 4, 36, and 8 lb/h, respectively. Pink shrimp were taken only in 51-100 fm with an average

CPUE OF 7 lb/h.

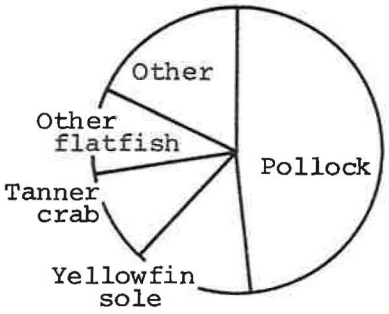
Mollusks--Various species of whelks were taken in the different depth intervals. Neptunea lyrata was taken in all depth intervals, while N. pribiloffensis, Fusitriton oregonensis, and Beringius kennicotti were taken at one or more depth intervals. Very small catches of squid occurred in all but the shallowest depth interval. The various other species of mollusks taken in trace quantities are shown in the Appendix.

Miscellaneous--Average catch rates for starfish were relatively stable throughout all depth intervals at 21, 15, 24, 8, and 22 lb/h by increasing depth. Very small catches of eelpouts, pricklebacks, giant wrymouth, poachers, smooth lumpsucker, and sea cucumbers were taken in the various depth intervals (Appendix).

SOUTHEAST QUADRANT

A total of 19 valid hauls were made in this quadrant. Figures 11-13 summarize catch information of the predominant species captured at the various depth intervals, and the Appendix indicates the average catch rates of all species taken at each depth interval. Table 1 shows the exploitable biomass estimates of the predominant species. This quadrant probably contains more trawlable bottom than any other in Prince William Sound.

Walleye pollock--In the 10-50 fm depth interval pollock made up nearly 48% of the total catch with an average catch rate of 1,691 lb/h. Pollock were among the five most abundant species in the other depth intervals. At 51-100, 101-500, 151-200, and 201-260 fm, the average catch rates of pollock were 119, 73, 137, and 216 lb/h, respectively. The length



POLLOCK
1,691 lb/h
12 inches
38 % marketable

YELLOWFIN SOLE
489 lb/h
10 inches
18 % marketable

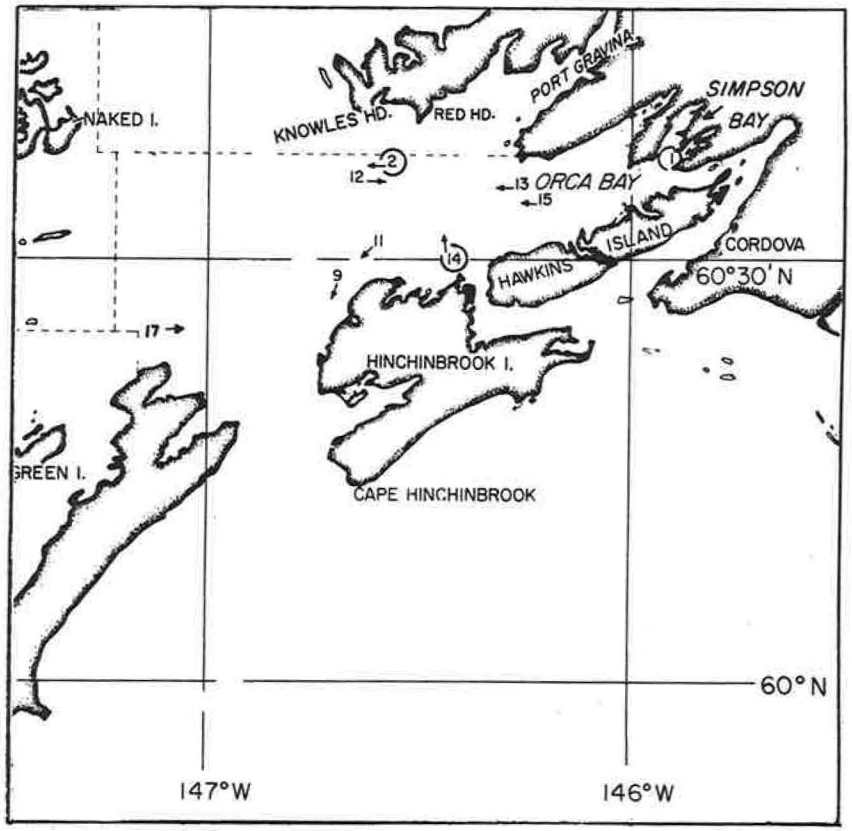
TANNER (SNOW) CRAB
371 lb/h
3 inches width
(males)

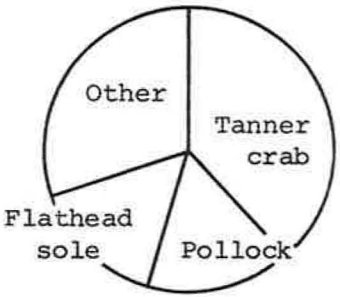
OTHER FLATFISH
320 lb/h

OTHER SPECIES
668 lb/h
as listed in
Appendix G

10-50 fm
81 square miles
Haul no. (1), (2), (14)

51-100 fm
139 square miles
Haul no. 9, 11, 12,
13, 15, 17





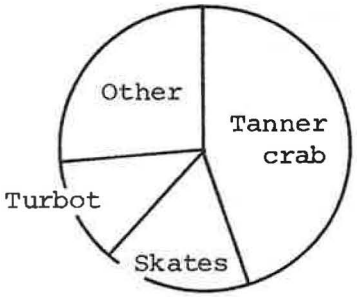
TANNER (SNOW) CRAB
284 lb/h
3.8 inches width
(males)

POLLOCK
119 lb/h
13 inches
55 % marketable

FLATHEAD SOLE
117 lb/h
12 inches
53 % marketable

OTHER SPECIES
226 lb/h
as listed in
Appendix H

Figure 11.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Southeast quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



TANNER (SNOW) CRAB
611 lb/h
4 inches width
(males)

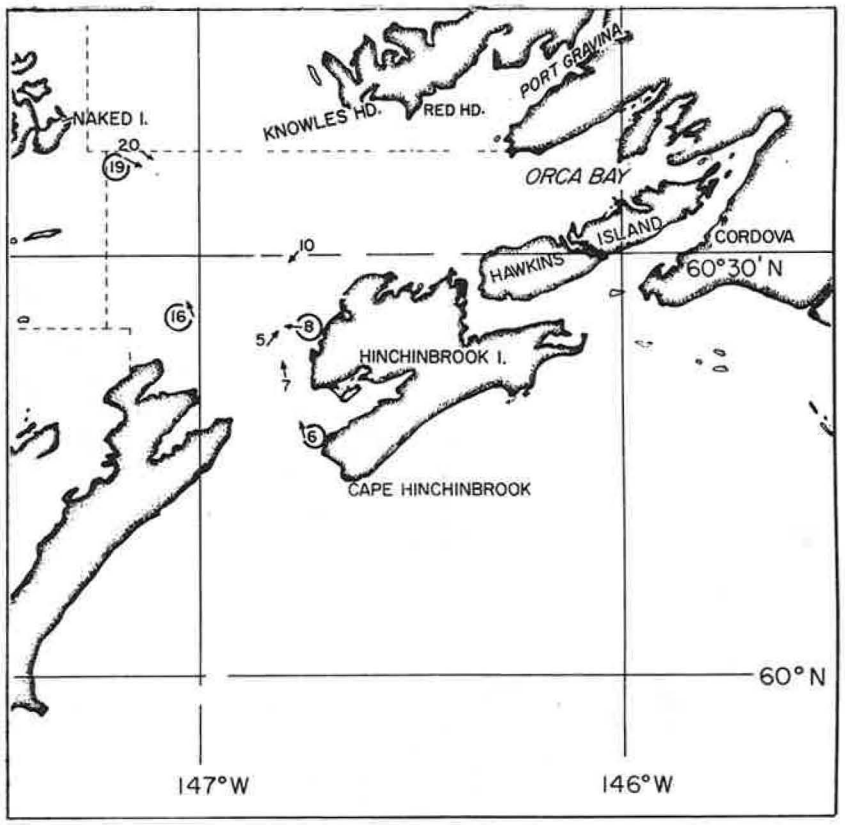
SKATES
230 lb/h

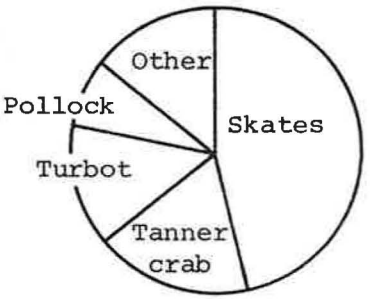
TURBOT
164 lb/h
17 inches
88 % marketable

OTHER SPECIES
360 lb/h
as listed in
Appendix I

101-150 fm
81 square miles
Haul no. (6), (8), (16), (19)

151-200 fm
79 square miles
Haul no. 5, 7, 10, 20





SKATES
851 lb/h

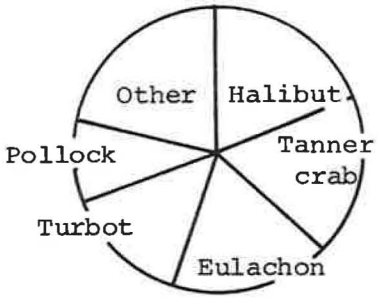
TANNER (SNOW) CRAB
338 lb/h
3.8 inches width
(males)

TURBOT
263 lb/h
18 inches
99 % marketable

POLLOCK
137 lb/h
13 inches
59 % marketable

OTHER SPECIES
261 lb/h
as listed in
Appendix J

Figure 12.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Southeast quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



201-260 fm
56 square miles
Haul no. 3, 4

HALIBUT
458 lb/h
29 inches

TANNER(SNOW) CRAB
452 lb/h
1.8 inches width (males)

EULACHON
451 lb/h
8 inches

TURBOT
342 lb/h
15 inches
87 % marketable

POLLOCK
216 lb/h
12 inches
43 % marketable

OTHER SPECIES
530 lb/h
as listed in Appendix K

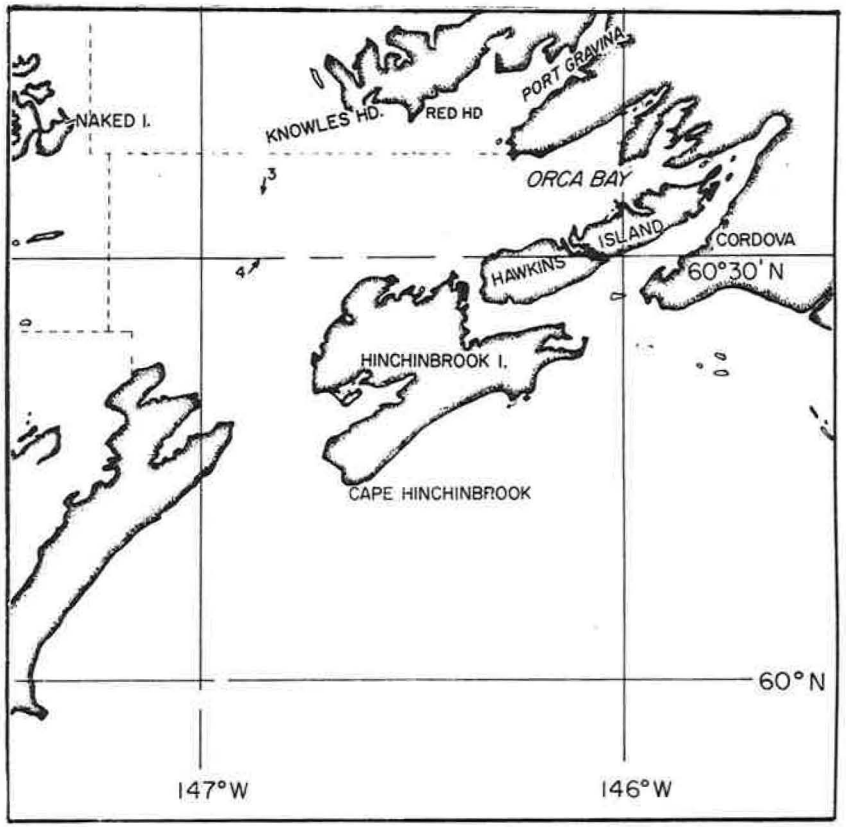


Figure 13.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Southeast quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.

frequencies of pollock by sex in this quadrant are shown in Figure 2. The mean length of males was 12.4 in and of females 12.6 in. Percentage of marketable-sized pollock in the various depth intervals ranged from 38 to 59%.

Eulachon--Average catch rates of eulachon varied from 2 to 9 lb/h in the four shallowest depth intervals, but increased to 451 lb/h in the 201-260 fm depth interval where eulachon were the third most abundant species (Figure 13). The length frequencies of eulachon from all areas of Prince William Sound are shown in Figure 6.

Other roundfish and rockfish species--Small catches of Pacific cod were made in all but the shallowest depth interval. Their average catch rates were highest in the 101-150 and 151-200 fm intervals at 49 and 29 lb/h, respectively. Significant catches of sablefish occurred only in the 201-260 fm depth interval where the average catch rate was 101 lb/h. Most sablefish were of smaller size. Small catches of Pacific tomcod and greenling occurred primarily in the 10-50 fm depth interval, where their average catch rates were 45 and 4 lb/h, respectively. Small catches of rougheye rockfish were taken in all except the 51-100 fm depth interval. Pacific herring, shortspine thornyhead, and lingcod were taken in very small amounts (Appendix).

Tanner crab--In all depth intervals, Tanner crabs were among the three most abundant species. They were the most abundant species in the 51-100 and 101-150 fm depth intervals with average catch rates of 284 and 611 lb/h, respectively. The width frequencies of Tanner crab by sex and by depth interval are shown in Figure 14. The largest males occurred in the

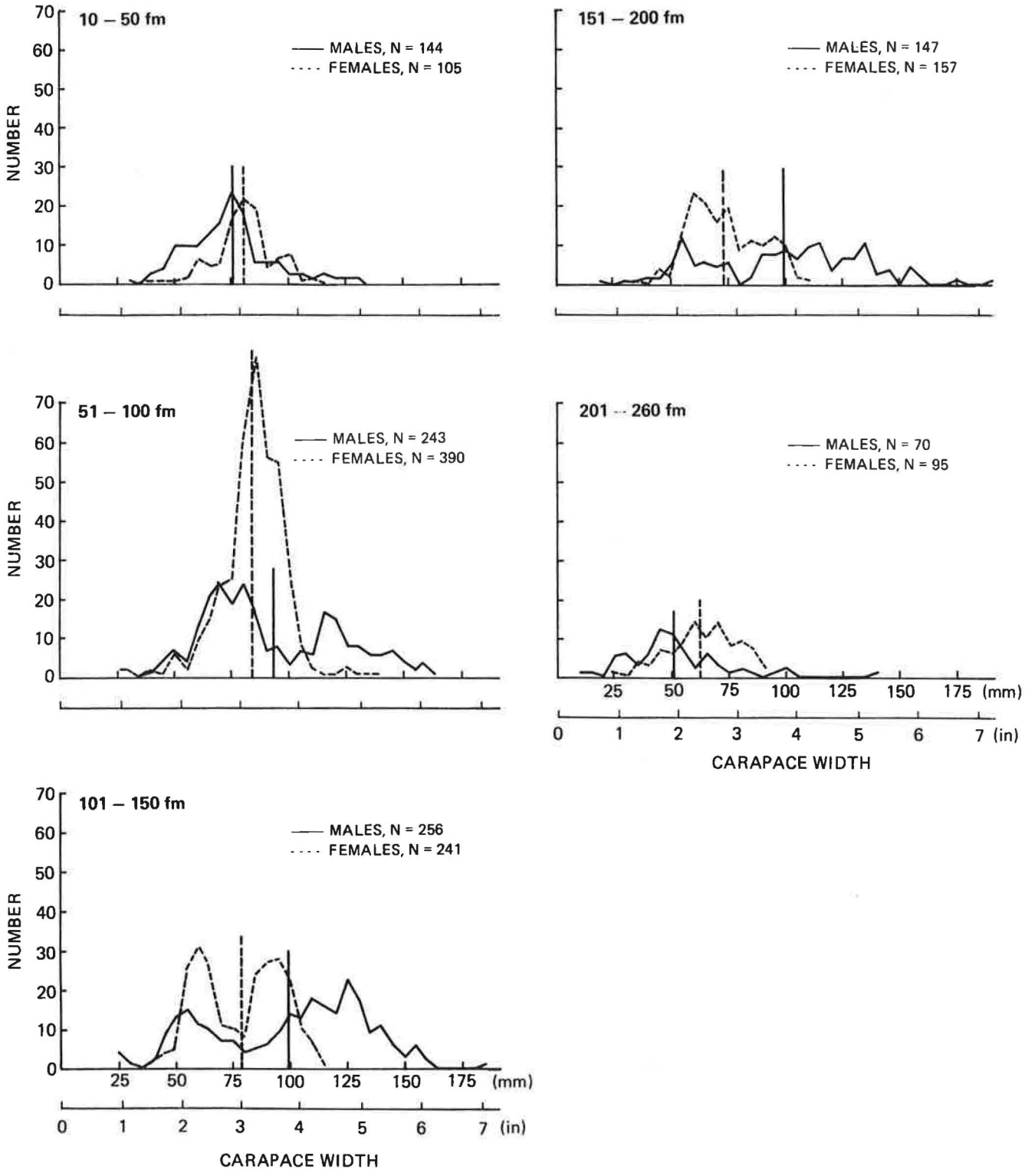


Figure 14.--Carapace width of Tanner (snow) crab in the Southeast quadrant of Prince William Sound by depth interval during Oregon cruise, April 1978.

101-150 and 151-200 fm depth intervals with mean carapace widths of 3.90 and 3.89 in, respectively. In this quadrant the smallest crabs occurred in the deepest interval (201-260 fm). Tanner crab carapace widths for the entire quadrant combined are shown in Figure 3.

Red king crab--In the two shallowest depth intervals, 10-50 and 51-100 fm, small catches of red king crab were taken averaging 20 and 4 lb/h.

Dungeness crab--This species was most abundant in the 10-50 fm depth interval where average catch rates were 75 lb/h. Best catches came from haul #14 just north of Hinchinbrook Island (Figure 11). Mean carapace width for male Dungeness crab was 4.7 in and for females 4.6 in. Small catches of Dungeness crab were also made in the 51-100 and 151-200 fm depth intervals (Appendix).

Pacific halibut--Catch rates of Pacific halibut were higher in the Southeast quadrant than in any other quadrant. Abundance of Pacific halibut increased with depth and in the 201-260 fm depth interval, it was the most abundant species taken (Figure 13). Average catch rates increased with depth and in the 10-50, 51-100, 101-150, 151-200, and 201-260 fm depth intervals were 32, 33, 68, 101, and 458 lb/h, respectively. The mean lengths of Pacific halibut in the Southeast quadrant also increased with depth. In those respective depth intervals, mean lengths of halibut were 16.5, 20.1, 25.2, 26.4, and 28.3 in.

Yellowfin sole--In the 10-50 fm depth interval, yellowfin sole was the second most predominant species with an average catch rate of 489 lb/h. One large catch of 663 lb came from haul #1 in Simpson Bay (Figure 11). These

fish were quite small with a mean length of 9.8 in with only 18% of marketable size. The only other occurrence of yellowfin sole in this quadrant was less than 1 lb/h taken in the 101-150 fm depth interval (Appendix).

Turbot--In all depth intervals except 10-50 fm, turbot were among the four most abundant species. Average catch rates increased with depth. In the 10-50, 51-100, 101-150, 151-200, and 201-260 fm intervals average catch rates were 19, 37, 164, 263, and 342 lb/h. The percentage of marketable-size turbot in the three deepest intervals ranged from 87 to 99. The length frequencies of turbot by sex in this quadrant are shown in Figure 4. Their mean lengths were 14.6 in for males and 16.5 in for females, which is larger than turbot from any other quadrant.

Flathead sole--Average catch rates of flathead sole generally decreased with depth. In the 10-50, 51-100, 101-150, 151-200, 201-260 fm intervals average catch rates were 169, 117, 48, 14, and 37 lb/h, respectively. Length frequencies of flathead sole by sex in the Southeast quadrant are shown in Figure 5. The mean length of females was 12.6 in, the smallest of any quadrant, while the mean length of males was 11.0 in, slightly larger than the approximately 10.6 in mean length of male flathead sole in each of the other quadrants.

Other flatfish--Starry flounder were relatively abundant in the 10-50 fm depth interval with an average catch rate of 249 lb/h. The "other flatfish" group in Figure 11 (catch rate of 320 lb/h) includes flathead sole, Alaska plaice, rock sole, turbot and rex sole. Very small catches of English sole, butter sole, and dover sole were also made. Small catches

of rex sole and dover sole were taken in all depth intervals.

Skates--In the 151-200 fm depth interval the big skate was the predominant species with an average catch rate of 780 lb/h (Appendix). The average weight of big skates in this interval was 34 lb. When they were combined with the black skate and longnose skate, the average CPUE for skates was then 851 lb/h (Figure 12). Skates combined were the second most abundant species in the 101-150 fm depth interval with an average catch rate of 230 lb/h (Figure 12). No skates were taken in 10-50 fm and catches were very small in the 51-100 and 201-260 fm depth intervals.

Spiny dogfish--In this quadrant spiny dogfish were not an abundant species. They were taken only in the deepest interval (201-260 fm) where their average catch rate was 14 lb/h (Appendix).

Sculpins--Great sculpins were the sixth most abundant species taken in the 10-50 fm depth interval with an average catch rate of 126 lb/h (Appendix). They also occurred in the 51-100 and 151-200 fm intervals with average CPUE's of 10 and 8 lb/h, respectively. Bigmouth sculpins were the ninth most abundant species in the 101-150 and 151-200 fm depth intervals with average catch rates of 25 and 21 lb/h, respectively (Appendix). Very small catches of spinyhead, blackfin, yellow Irish lord, staghorn, and ribbed sculpin (in order of decreasing abundance) were taken.

Shrimp--Sidestripe shrimp were taken in all except the shallowest depth interval and were the most abundant shrimp species in this quadrant. In the 50-100, 101-150, 151-200, and 201-260 fm depth intervals the average catch rates of sidestripe shrimp were 12, 9, 9, and 28 lb/h, respectively.

Pink shrimp were most abundant in the 10-50 fm interval where their average CPUE was 35 lb/h.

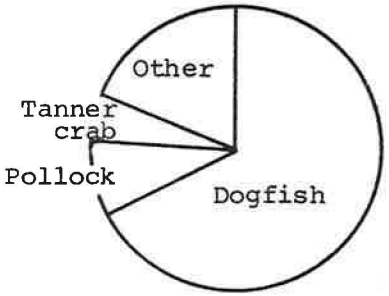
Mollusks--Neptunea pribiloffensis was the most common whelk taken followed by N. lyrata and Fusitriton oregonensis. Squid catch rates increased with depth with their highest average CPUE of 9 lb/h in 201-260 fm.

Miscellaneous--Heart urchins were taken in the 201-260 fm depth interval with an average CPUE of 208 lb/h. Starfish were taken in all depth intervals as were very small catches of eelpouts and pricklebacks. A single chinook salmon weighing 4 lb was taken in haul #5 (Figure 12).

NORTHWEST QUADRANT

A total of only eight valid hauls was made in this quadrant. No trawlable bottom could be found in the 10-50 or 151-200 fm interval and, in general, this area is characterized by hard bottom or very silty glacial mud bottom. Time was not available to sound Port Wells, Passage Canal, or Blackstone, Cochrane and King's Bay. These areas, however, are believed to be largely untrawlable. Figures 15 and 16 summarize catch information of the predominant species captured at the various depth intervals, and the Appendix indicates the average catch rates of all species taken in each depth interval. The exploitable biomass estimates of predominant species taken in this quadrant are shown in Table 1.

Walleye pollock--In this quadrant, pollock ranged from the second to fifth most abundant species, although average catch rates were never greater than 61 lb/h. The length frequencies of pollock by sex are shown in Figure 2.



DOGFISH
314 lb/h

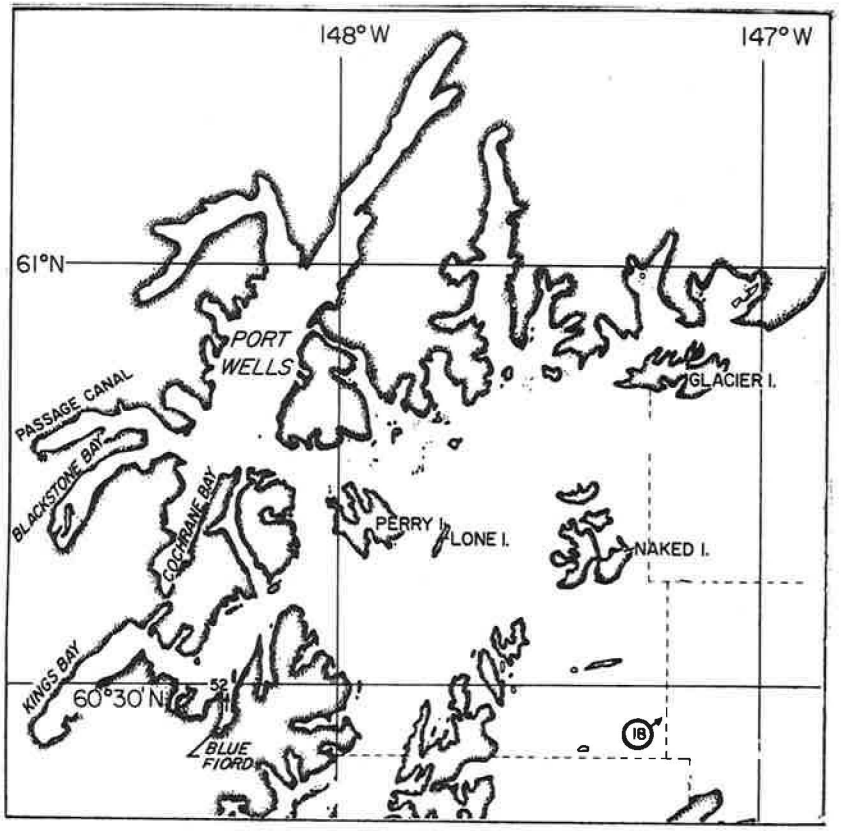
POLLOCK
40 lb/h
10 inches
9 % marketable

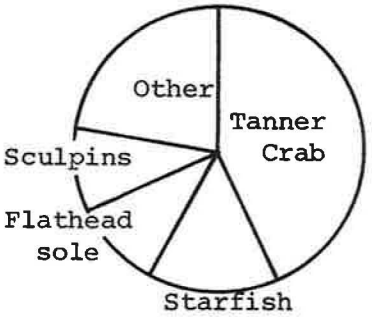
TANNER (SNOW) CRAB
22 lb/h
3.7 inches width
(males)

OTHER SPECIES
87 lb/h
as listed in
Appendix L

51-100 fm
128 square miles
Haul no. 52

101-150 fm
97 square miles
Haul no. 18





TANNER (SNOW) CRAB
177 lb/h
2.8 inches width
(males)

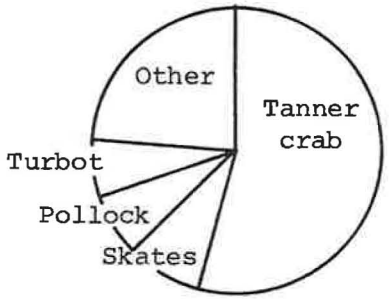
STARFISH
62 lb/h

FLATHEAD SOLE
40 lb/h
13 inches
100 % marketable

SCULPINS
38 lb/h

OTHER SPECIES
94 lb/h
as listed in
Appendix M

Figure15.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Northwest quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



201-260 fm
176 square miles
Haul no. 53, 54, 55, 56, 57, 58

TANNER (SNOW) CRAB
485 lb/h
3.2 inches width (males)

SKATES
75 lb/h

POLLOCK
61 lb/h
14 inches
66 % marketable

TURBOT
44 lb/h
16 inches
95 % marketable

OTHER SPECIES
216 lb/h
as listed in Appendix N

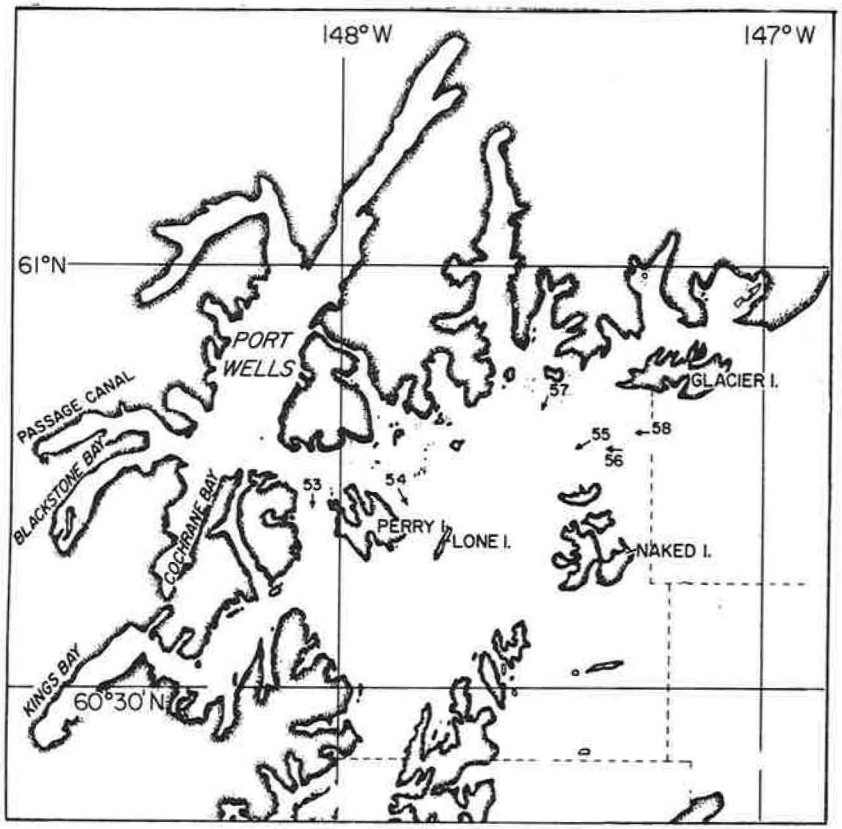


Figure 16.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Northwest quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.

Pollock in the 51-100 fm depth interval averaged 10.0 in with only 9% of marketable size whereas those in 201-260 fm averaged 14.2 in with 66% of marketable size. For the quadrant as a whole the mean lengths of pollock were males 12.0 in and females 13.0 in, very close to the mean lengths of pollock in all other quadrants (Figure 2).

Other roundfish and rockfish species--Eulachon were taken only in the 51-100 and 201-260 fm depth intervals, with an average CPUE < 1 lb/h. They were not an abundant species, as in the Northeast and Southeast quadrants. In the 101-150 fm depth interval, Pacific cod, rougheye rockfish, and capelin were the only other roundfish species taken. Their average catch rates were all very low at 8, 7, and 1 lb/h, respectively. In the 201-260 fm interval, sablefish, shortspine thornyhead, and rougheye rockfish were taken with average CPUE's of 10, 1, and less than 1 lb/h, respectively.

Tanner crab--This species was ranked within the top three in abundance through all depth intervals sampled. In the 51-100, 101-150, and 201-260 fm intervals the average catch rates of Tanner crab increased greatly with depth and were 22, 177, and 485 lb/h, respectively. The mean carapace widths of males at these depth intervals were 3.7 in, 2.8 in, and 3.2 in, (Figure 17). In the 201-260 fm interval, Tanner crab comprised 54% of the total catches.

Other crab--Red king crab were taken only in haul 53 west of Perry Island (Figure 16). This catch consisted of three crabs weighing 17 lb for an average catch rate of 6 lb/h. Very small catches of golden king crab were

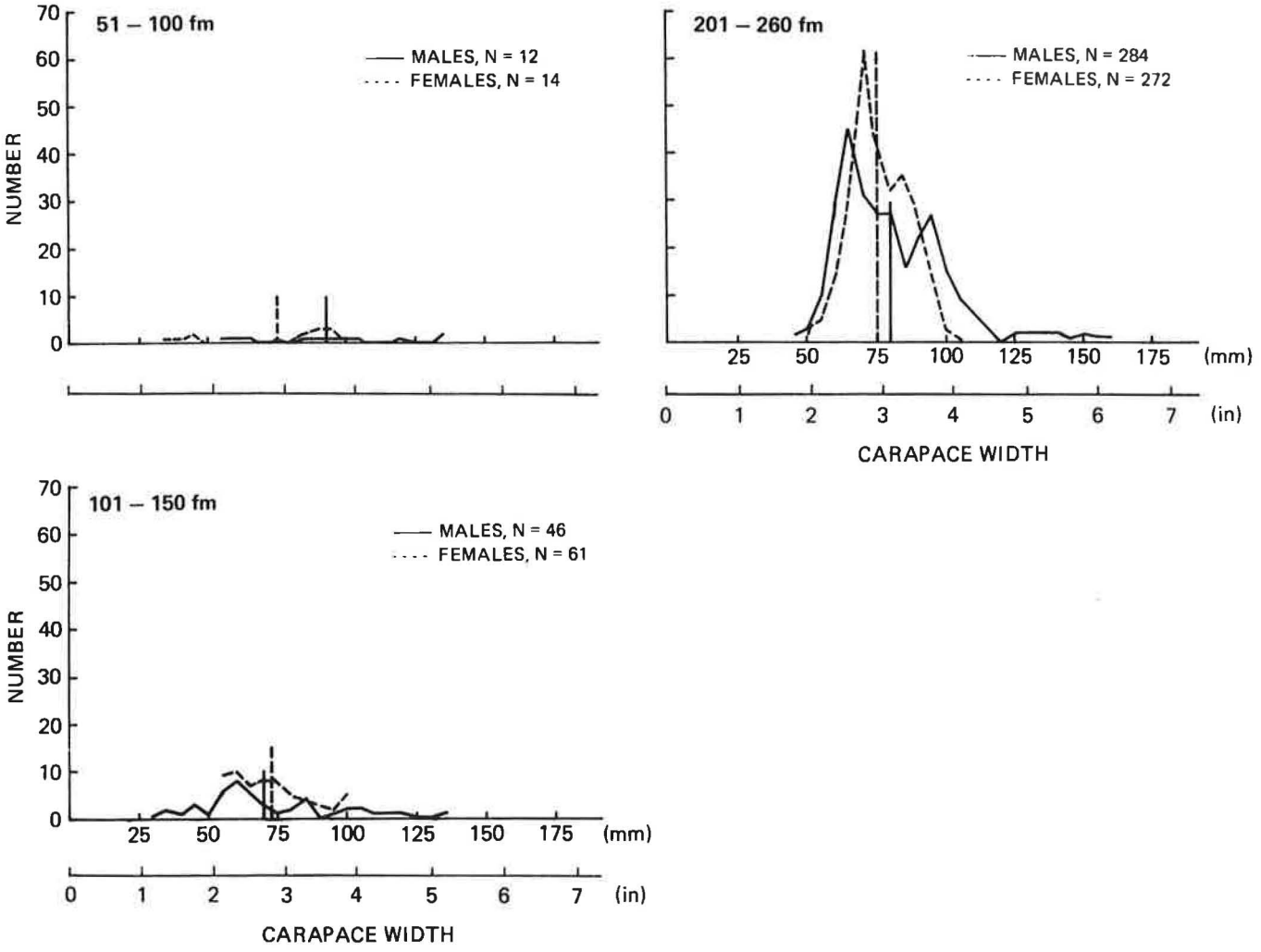


Figure 17.--Carapace width of Tanner (snow) crab in the Northwest quadrant of Prince William Sound by depth interval during Oregon cruise, April 1978.

also made in this haul and in haul 54, east of Perry Island.

Turbot--Average catch rates of this species increased with depth with 44 lb/h in 201-260 fm being the highest. Turbot averaged 16.0 in and 95% were of marketable size. Length frequencies of turbot by sex and quadrant are shown in Figure 4.

Flathead sole--In the 51-100, 101-150, and 201-260 fm depth intervals, average CPUE's for flathead sole were 18, 40, and 4 lb/h, respectively. Length frequencies of flathead sole by sex and quadrant are shown in Figure 5.

Other flatfishes--Rex sole was the third most abundant flatfish taken, and average catch rates were similar in all depth intervals. In the 51-100, 101-150, and 201-260 fm intervals, average CPUE's were 8, 8, and 7 lb/h, respectively. Pacific halibut were taken only in the 201-260 fm interval, where they were the fifth most abundant species and the average catch rate was 35 lb/h. Their mean length was 30.7 in. Other flatfishes taken in very small quantities included Alaska plaice, English sole, slender sole and Greenland turbot (Appendix). Greenland turbot were not taken in any other quadrant and only one other slender sole was taken (Northeast quadrant). Prince William Sound is not within the normal range of either of these two species.

Spiny dogfish--In the 51-100 fm depth interval (haul 52) in Blue Fiord the spiny dogfish was the most abundant species taken with an average catch rate of 314 lb/h (Figure 15). They were not taken in the 101-150 fm interval but had an average CPUE of 28 lb/h in the 201-260 fm depth interval.

Skates--In the 201-260 fm interval, black skates were the second most abundant species with an average catch rate of 68 lb/h (Appendix). Big skates in this interval, with an average CPUE of 7 lb/h, were combined with the black skates for a 75 lb/h average catch rate (Figure 16). Only very small catches of skates were taken in the shallower depth intervals (Appendix).

Sculpins--The great sculpin was the fourth most abundant species in the 101-150 fm interval (35 lb/h), but was not taken in the other depth intervals. Bigmouth sculpin was the most abundant sculpin species and in the 51-100 and 201-260 fm depth intervals had average catch rates of 6 and 32 lb/h, respectively. The spinyhead sculpin had average CPUE's in the three depth intervals sampled of 2, 3, and 6 lb/h, respectively. Very small catches of blackfin sculpin, yellow Irish lord, and thorny sculpin were also taken (Appendix).

Shrimp--Sidestripe shrimp were caught in all depth intervals sampled in the Northwest quadrant. In the 51-100, 101-150, and 201-260 fm depth intervals average CPUE's were 14, 14, and 24 lb/h, respectively. Pink shrimp were less abundant with average catch rates in the 51-100 and 201-260 fm intervals of 14 and 16 lb/h, respectively.

Miscellaneous--Other species taken in smaller quantities included starfish, heart urchins, squid, eelpouts, pricklebacks, whelks, octopus, snailfish, capelin, and smoothtongue in order of decreasing abundance (Appendix).

SOUTHWEST QUADRANT

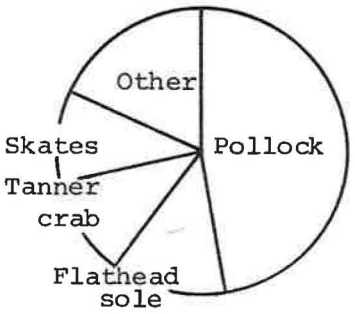
A total of 12 valid hauls was made in this quadrant. A considerable portion of the seabed was found to be unsuitable for trawling, particularly in

the 10-50 fm depth interval and in Montague Strait which lies along the northwest side of Montague Island. Figures 18 and 19 summarize catch information of the predominant species captured at the various depth intervals, the Appendix indicates the average catch rates of all species taken in each depth interval, and biomass estimates of predominant species taken in this quadrant are shown in Table 1.

Walleye pollock--In overall abundance in the Southwest quadrant, pollock was the most abundant species. In the 51-100, 101-150, 151-200, and 201-260 fm depth intervals, average catch rates of pollock were 516, 80, 39, and 186 lb/h, respectively. Pollock in the two shallowest intervals (51-100 and 101-150 fm) averaged 11.0 in, and were 45 and 26% marketable, respectively. In the two deepest intervals (151-200 and 201-260 fm) they averaged 11.8 in and were 32 and 37% of marketable size, respectively. The length frequencies of pollock by sex and quadrant are shown in Figure 2.

Eulachon--Eulachon was the dominate species caught at depths of 201-260 fm (504 lb/h) (Figure 19); however, only trace amounts were caught in the shallower depths in this quadrant. Eulachon averaged 7.9 in in length.

Other roundfish and rockfish species--Catches of all other roundfish and rockfish species were very low in the Southwest quadrant. Pacific cod had the highest average catch rates. In the 51-100, 101-150, 151-200, and 201-260 fm depth intervals, their average CPUE's were 17, 1, 0, and 3 lb/h, respectively. Sablefish were taken only in the deepest interval (201-260 fm) where their average CPUE was 14 lb/h. Rougheye rockfish were



POLLOCK
516 lb/h
11 inches
45 % marketable

FLATHEAD SOLE
143 lb/h
11 inches
41 % marketable

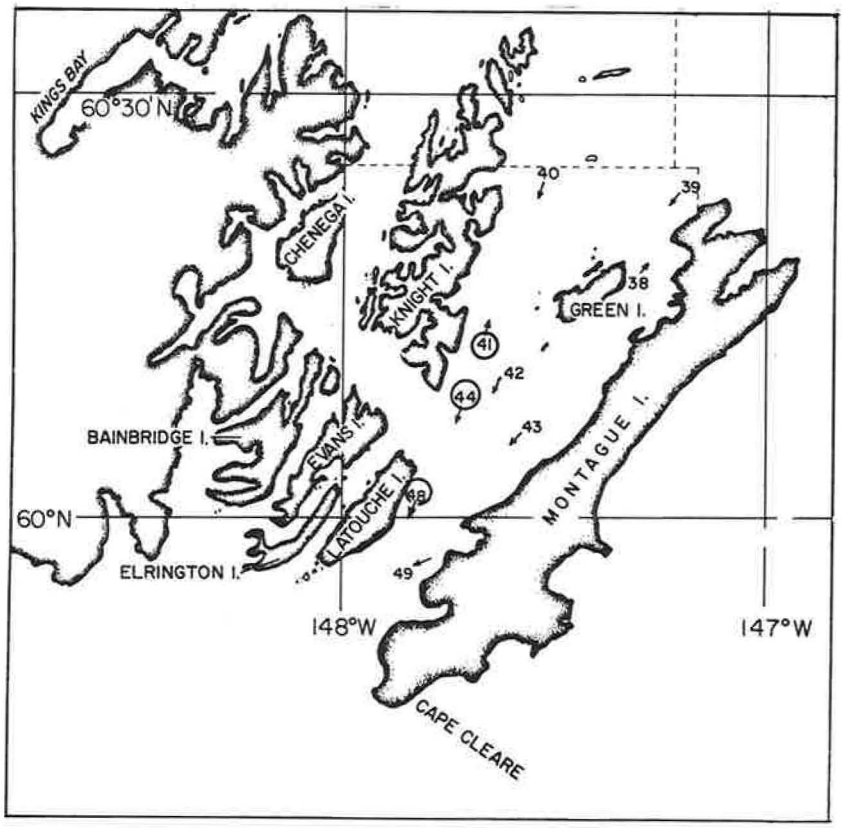
TANNER (SNOW) CRAB
120 lb/h
3.4 inches width (males)

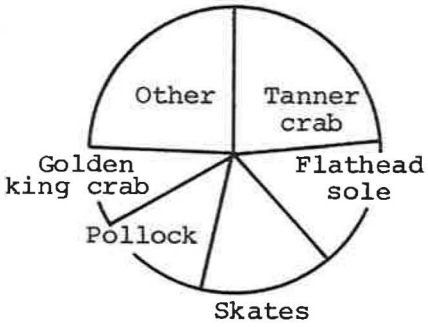
SKATES
111 lb/h

OTHER SPECIES
203 lb/h
as listed in Appendix O

51-100 fm
163 square miles
Haul no. 38, 39, 40, 42, 43, 49

101-150 fm
83 square miles
Haul no. (41), (44), (48)





TANNER (SNOW) CRAB
136 lb/h
2.4 inches width (males)

FLATHEAD SOLE
91 lb/h
12 inches
86 % marketable

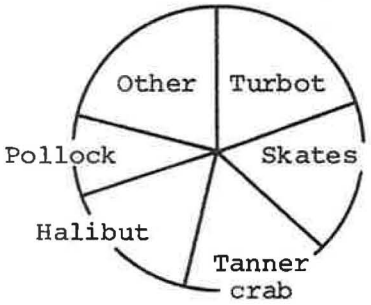
SKATES
91 lb/h

POLLOCK
80 lb/h
11 inches
26 % marketable

GOLDEN KING CRAB
53 lb/h
5.3 inches length (males)

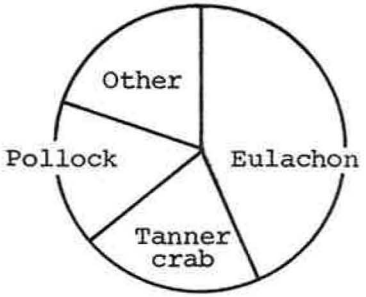
OTHER SPECIES
141 lb/h (as listed in Appendix P)

Figure 18.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Southwest quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.



151-200 fm
36 square miles
Haul no. (47)

201-260 fm
25 square miles
Haul no. 45, 50



TURBOT
80 lb/h
16 inches
100 % marketable

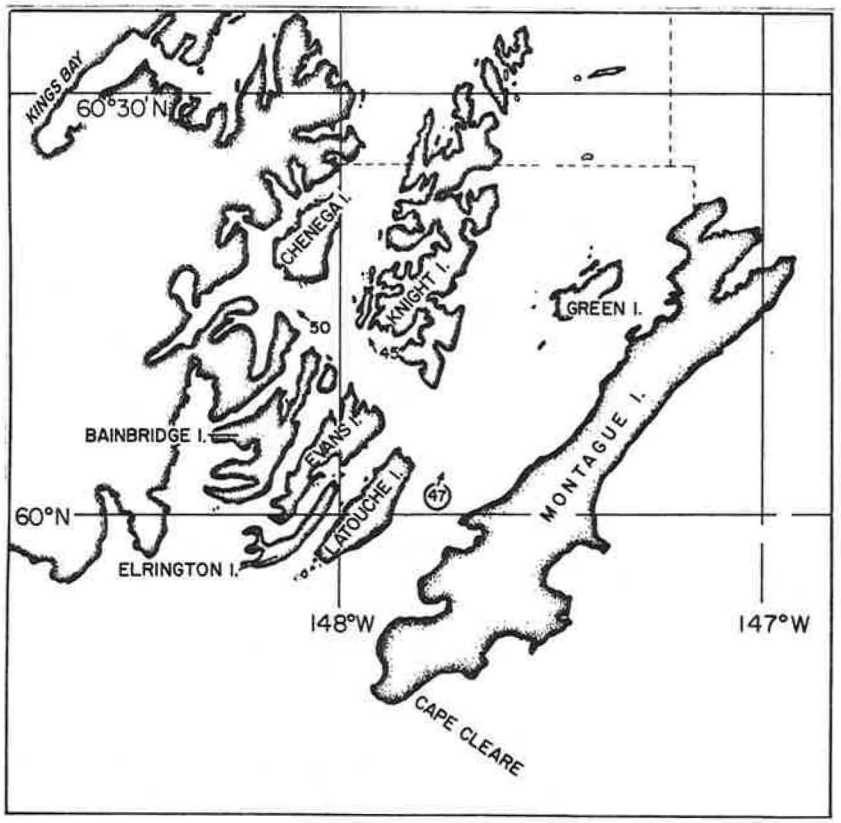
SKATES
72 lb/h

TANNER (SNOW) CRAB
70 lb/h
4.1 inches width
(males)

HALIBUT
67 lb/h
29 inches

POLLOCK
39 lb/h
12 inches
32 % marketable

OTHER SPECIES
87 lb/h
as listed in
Appendix Q



EULACHON
504 lb/h
8 inches

TANNER (SNOW) CRAB
234 lb/h
3.2 inches width
(males)

POLLOCK
186 lb/h
12 inches
37 % marketable

OTHER SPECIES
184 lb/h
as listed in
Appendix R

Figure 19.--Groundfish species composition and pounds of fish and crab caught per hour trawled during April 1978, by depth interval in the Southwest quadrant of Prince William Sound. The average measurement of the fish and crab in inches and the percentage of marketable-sized fish by number are shown.

taken in the 51-100, 101-150, and 151-200 fm intervals with average catch rates of 2, 3, and 8 lb/h, respectively. Pacific herring and Pacific ocean perch were taken in very small amounts (Appendix).

Tanner crab--In the Southwest quadrant Tanner crab ranged from first to third most abundant species. In the 51-100, 101-150, 151-200, and 201-260 fm intervals, the average catch rates for Tanner crab were 120, 136, 70, and 234 lb/h, respectively. Carapace widths of males at the above intervals was 3.4 in, 2.9 in, 4.1 in, and 3.2 in, respectively (Figure 20). Carapace widths of Tanner crabs by sex and by quadrant are shown in Figure 3.

Golden king crab--One 80 lb catch of 26 golden king crab was taken in haul 48 just east of Latouche Island in the 101-150 fm depth interval (Figure 18). Male golden king crab in this haul had mean carapace lengths of 5.3 in, while females averaged 4.9 in. Two golden king crab were taken in haul 49 in the 51-100 fm depth interval.

Red king crab--Small catches of red king crab were made in hauls 38 and 39 near the northwest tip of Montague Island (Figure 18) in the 51-100 fm depth interval.

Other crab--Small catches of Dungeness crab, box crab, and lyre crab were taken in various depth intervals (Appendix). An interesting catch was two male Dungeness crab taken in 256 fm in haul 50 south of Chenega Island (Figure 19). This is very deep water for this species.

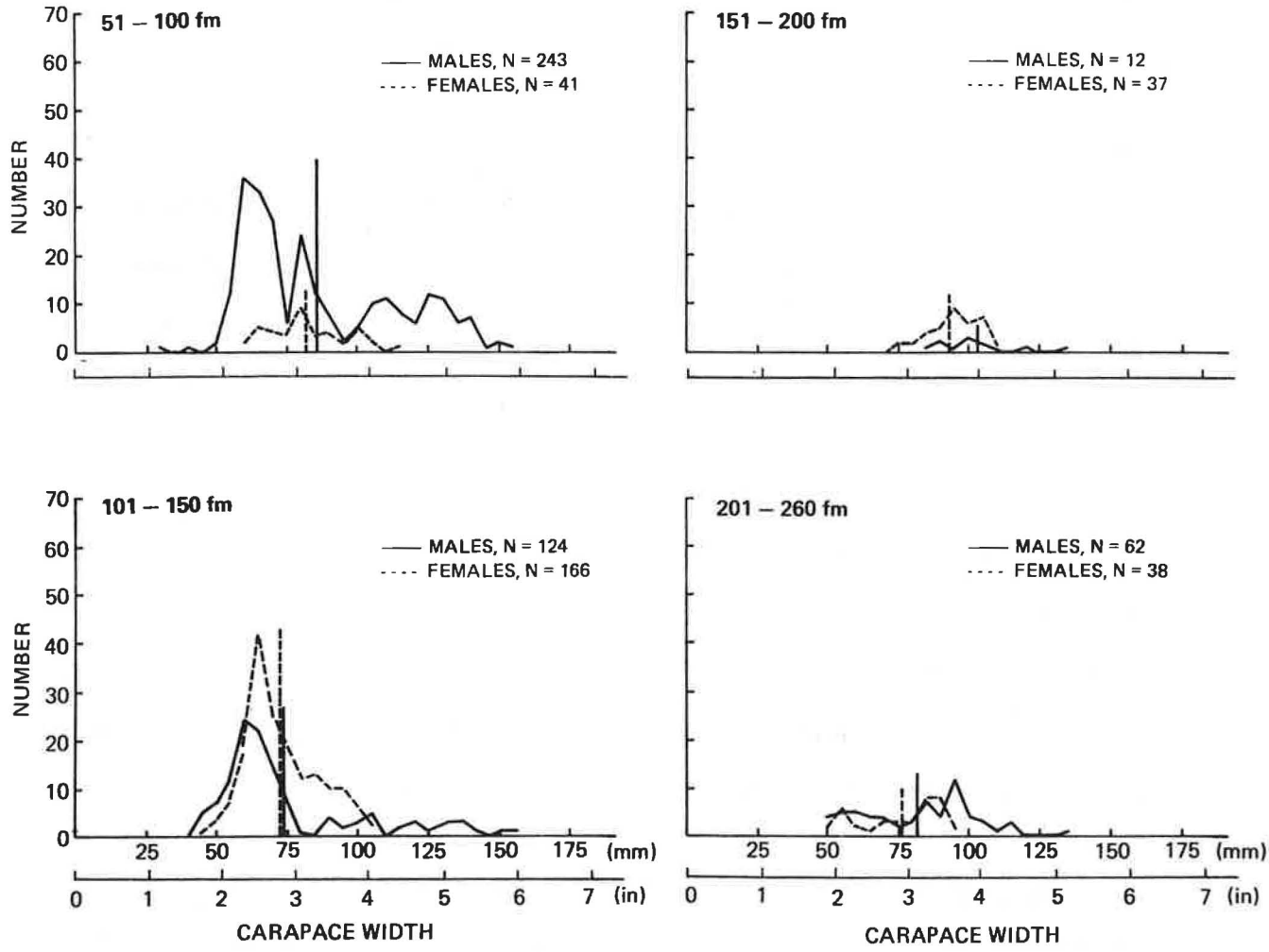


Figure 20.--Carapace width of Tanner (snow) crab in the Southwest quadrant of Prince William Sound by depth interval during Oregon cruise, April 1978.

Flathead sole--This species was the predominant flatfish taken in the Southwest quadrant and catch rates generally decreased with depth. In the 51-100, 101-150, 151-200, and 201-260 fm depth intervals, average catch rates were 143, 91, 17, and 58 lb/h, respectively. Flathead sole was the second most abundant species in both the 51-100 and 101-150 fm intervals, and was ranked sixth and fourth most abundant in 151-200, and 201-260 fm depth intervals, respectively. Length frequencies of flathead sole by sex and by quadrant are shown in Figure 5.

Turbot--This species was the second most abundant flatfish in this quadrant and was the predominant species taken in the 151-200 fm depth interval. Average catch rates by increasing depth interval were 14, 47, 80, and 30 lb/h, respectively. Length frequencies of turbot by sex and quadrant are shown in Figure 4.

Pacific halibut--Pacific halibut was the third most abundant flatfish taken in the Southwest quadrant. Average catch rates were 42, 9, 67, and 16 lb/h in the 51-100, 101-150, 151-200, and 201-260 fm depth intervals, respectively. Mean lengths of Pacific halibut increased with depth at 20.1 in, 21.6 in, 29.5 in, and 33.1 in, respectively.

Other flatfishes--Rex sole was the fourth most abundant flatfish caught in this area and catch rates decreased with depth. Small catches of Alaska plaice, rock sole, starry flounder, English sole, and yellowfin sole were taken in the 51-100 fm depth interval only. Other flatfish taken included very small catches of dover sole and butter sole (Appendix).

Skates--The big skate was the most abundant skate species in the 51-100 and 101-150 fm depth intervals with average catch rates of 98 and 67 lb/h, respectively. In the 151-200 fm interval, the longnose skate was most abundant with an average CPUE of 72 lb/h. No skates were taken in the 201-260 fm depth interval (Appendix). No spiny dogfish were taken in the Southwest quadrant.

Sculpins--The bigmouth sculpin was the most abundant species in this group and catch rates increased with depth. In the 51-100, 101-150, 151-200, and 201-260 fm intervals, the average catch rates of bigmouth sculpin were 1, 2, 8, and 47 lb/h, respectively. Great sculpin was next most abundant with average CPUE's of 12 lb/h in the 51-100 fm interval, and 8 lb/h in the 201-260 fm interval. Very small catches of spinyhead, yellow Irish lord, and blackfin sculpin were also taken (Appendix).

Shrimp--Both pink shrimp and sidestripe shrimp were caught in all depth intervals. Sidestripe shrimp were slightly more abundant with average catch rates in the 51-100, 101-150, 151-200, and 201-260 fm intervals being 5, 14, 15, and 12 lb/h, respectively. Pink shrimp catches in these same depth intervals were 13, 6, 2, and 5 lb/h, respectively (Appendix).

Mollusks--Mollusks included the whelks, Neptunea lyrata, N. pribiloffensis, Fusitriton oregonensis, and Volutopsius harpa, as well as squid and octopus (Appendix).

Miscellaneous--Other fish species taken in very small quantities included giant wrymouth, eelpouts, pricklebacks, poachers, and snailfish. Except for crab, starfish were the most abundant invertebrate taken in all depth intervals and their catch rates decreased with increasing depth. Barnacles, basketstars, and sea urchins also were taken in very small amounts.

CONCLUSIONS

This survey has provided baseline information on the demersal fish and shellfish community in Prince William Sound during the spring of 1978.

Results indicate groundfish abundance during the spring in these waters to be very low relative to coastal waters in the western Gulf of Alaska. Groundfish resources encountered were dominated by low value species, such as walleye pollock, eulachon, skates, turbot, flathead sole, and sculpins. This, coupled with the noted high percentage of juvenile or small fish, indicates poor potential for development of profitable trawl fisheries within Prince William Sound. Substantial bottom trawling in this region may also have an unfavorable impact on Tanner crab, which was the second most abundant species captured.

Detailed information, by area and depth, on species composition has been provided to assist in establishing an ecological data base of the demersal community. This and other environmental data are being gathered in Prince William Sound and other areas which are subject to oil explorations or tanker traffic.

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Appendix.-- List of all species taken and average catch rates (lb/h) in Prince William Sound (P.W.S.), and by quadrant and depth interval, during Oregon cruise, April 1978.

Scientific name	Common name	Total P.W.S. Survey Area	Northeast Quadrant					Southeast Quadrant					Northwest Quadrant			Southwest Quadrant			
			10-50 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm	10-50 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm	51-100 fm	101-150 fm	201-260 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm
Theragra chalcogramma	Walleye pollock	358	2,425	380	69	208	152	1,691	119	73	137	216	40	33	61	516	80	39	186
Chionoecetes bairdi	Tanner crab	317	107	172	292	350	618	371	284	611	338	452	22	177	485	120	136	70	234
Raja binoculata	Big skate	90	0	22	0	0	34	0	<1	137	780	0	0	0	7	98	67	0	0
Atheresthes stomias	Turbot	89	62	59	83	46	190	19	37	164	263	342	3	3	44	14	47	80	30
Hippoglossoides elassodon	Flathead sole	72	227	71	50	2	11	169	117	48	14	37	18	40	4	143	91	17	58
Hippoglossus stenolepis	Pacific halibut	65	6	51	26	17	154	32	33	68	101	458	0	0	35	42	9	67	16
Thaleichthys pacificus	Eulachon	56	5	3	2	14	230	2	5	2	9	451	<1	0	<1	1	7	7	504
Squalus acanthias	Spiny dogfish	34	0	0	23	76	290	0	0	0	0	14	314	0	28	0	0	0	0
Limanda aspera	Yellowfin sole	28	3	1	0	0	0	489	0	<1	0	0	0	0	0	<1	0	0	0
Paralithodes camtschatica	Red king crab	25	0	214	0	0	0	20	4	0	0	0	0	0	6	21	0	0	0
Raja rhina	Longnose skate	21	<1	37	30	0	65	0	5	75	33	0	0	5	0	12	7	72	0
Raja kincaidi	Black skate	19	0	3	11	64	50	0	1	18	38	5	1	0	68	1	17	0	0
Myoxocephalus polyacanthocephalus	Great sculpin	18	68	32	30	0	0	126	10	0	8	0	0	35	0	12	0	0	8
Asteroidea	Starfish	17	0	15	24	8	22	3	29	19	19	35	0	62	9	17	14	5	<1
Platichthys stellatus	Starry flounder	15	0	9	0	0	0	249	0	0	0	0	0	0	0	2	0	0	0
Glyptocephalus zachirus	Rex sole	13	22	18	7	1	9	17	29	11	8	12	8	8	7	12	9	5	4
Ulca bolini	Bigmouth sculpin	13	2	4	0	30	27	0	1	25	21	0	6	3	32	1	2	8	47
Anoplopoma fimbria	Sablefish	12	17	9	3	14	60	2	<1	0	3	101	0	0	10	1	0	0	14
Pandalopsis dispar	Sidestripe shrimp	12	0	4	31	36	8	0	12	9	9	28	14	14	24	5	14	15	12
Gadus morhua macrocephalus	Pacific cod	11	0	10	0	0	0	0	8	49	29	15	0	8	0	17	1	0	3
Echinoidea	Heart urchin	11	0	0	0	0	0	0	0	0	0	208	0	0	24	0	0	0	0
Pleuronectes quadrituberculatus	Alaska plaice	6	0	<1	0	0	0	88	<1	0	0	0	4	5	0	8	0	0	0
Pandalus borealis	Pink shrimp	6	0	7	0	0	0	35	3	0	<1	<1	14	0	6	13	6	2	5
Cancer magister	Dungeness crab	6	13	0	0	0	0	75	7	0	1	0	0	0	0	1	0	0	2
Neptunea pribiloffensis	Whelk	5	0	1	2	2	3	0	3	25	17	17	0	0	<1	1	3	8	<1
Gonatus magister	Squid	4	0	<1	1	2	7	0	0	2	7	9	8	Trace	17	0	1	1	8
Sebastes aleutianus	Rougheye rockfish	4	3	8	12	0	0	2	8	8	2	0	0	7	<1	2	3	8	0
Lithodes aequispina	Golden king crab	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	53	0	0
Microstomus pacificus	Dover sole	3	4	1	0	9	4	1	2	1	5	35	0	0	3	1	0	2	2
Dasycottus setiger	Spinyhead sculpin	3	1	7	1	1	2	8	3	<1	0	1	2	3	6	2	<1	<1	2
Microgadus proximus	Pacific tomcod	3	0	1	0	0	0	45	<1	0	0	0	0	0	0	0	0	0	0
Pycnopodia helianthoides	Starfish	2	21	0	0	0	0	0	6	11	0	6	0	0	0	0	0	0	0
Zoarcidae	Eelpout	2	5	8	1	2	<1	1	4	1	1	0	2	3	2	3	<1	2	<1
Lepidopsetta bilineata	Rock sole	2	0	2	0	0	0	27	0	1	0	0	0	0	0	2	1	0	0
Parophrys vetulus	English sole	2	5	11	0	0	0	6	1	2	0	0	1	0	0	1	0	0	0
Neptunea lyrata	Whelk	2	1	2	<1	2	2	12	1	4	3	1	0	1	<1	2	1	1	0
Lumpenella longirostris	Longsnout prickleback	2	<1	7	2	<1	2	0	2	<1	2	0	2	1	1	<1	<1	2	6
Octopus sp.	Octopus	1	0	0	0	0	1	<1	9	Trace	1	Trace	0	<1	<1	1	0	<1	1
Strongylocentrotus sp.	Sea urchin	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	17	0	0
Malacocottus sp.	Blackfin sculpin	1	0	0	<1	4	4	0	<1	<1	<1	2	<1	<1	3	<1	<1	0	1
Clupea harengus pallasi	Pacific herring	1	2	<1	0	0	0	12	<1	0	0	0	0	0	0	<1	0	0	0
Balanus sp.	Barnacle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
Delolepis gigantea	Giant wrymouth	1	0	1	0	0	0	0	1	0	0	0	0	0	0	5	0	0	0
Ophiuroidea	Basketstarfish	<1	0	0	0	0	0	0	1	0	0	0	0	0	0	3	1	0	0
Isopsetta isolepis	Butter sole	<1	0	<1	0	0	0	1	0	0	0	0	0	0	0	3	<1	0	<1
Fusitriton oregonensis	Whelk	<1	0	<1	0	0	<1	6	<1	Trace	0	<1	0	0	<1	<1	<1	3	0
Raja sp.	Skate egg case (unidentified)	<1	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Hemilepidotus jordani	Yellow Irish lord	<1	0	2	0	<1	0	1	0	0	0	0	1	0	0	1	1	0	0
Lycodes brevipes	Shortfin eelpout	<1	0	0	0	0	0	5	0	0	0	1	0	0	0	0	0	0	0
Podothecus acipenserinus	Sturgeon poacher	<1	1	1	0	0	0	3	<1	0	0	0	0	0	0	0	0	0	0
Pyrulofusus harpa	Whelk	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anthozoa	Sea anemone	<1	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Sebastolobus alascanus	Shortspine thornyhead	<1	0	0	0	0	<1	0	0	0	0	1	0	0	1	0	0	0	0
Lycodes palearis	Wattled eelpout	<1	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Hexagrammos sp.	Greenling	<1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Reinhardtius hippoglossoides	Greenland turbot	<1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Holothuroidea	Sea cucumber	<1	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stichaeidae	Prickleback	<1	0	<1	0	0	0	0	<1	0	<1	2	0	0	0	0	0	0	0
Oncorhynchus tshawytscha	Chinook salmon	<1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Pecten caurinus	Weathervane scallop	<1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Ophiodon elongatus	Lingcod	<1	0	<1	0	2	0	0	0	0	<1	0	0	0	0	0	0	0	0
Gastropoda	Whelk (unidentified)	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallotus villosus	Capelin	<1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Cyclopteridae	Snailfish	<1	0	0	0	0	0	0	1	<1	0	0	<1	0	<1	0	0	0	<1
Beringius kennicotti	Whelk	<1	0	0	0	2	0	0	Trace	Trace	0	0	0	0	1	<1	<1	0	0
Leptocottus armatus	Staghorn sculpin	<1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pandalus hypsinotus	Coonstripe shrimp	<1	0	0	0	0	0	1	0	0	0	0	<1	0	0	0	0	0	0

(continued)

Appendix.--(continued).

Scientific name	Common name	Total P.W.S. Survey Area	Northeast Quadrant					Southeast Quadrant					Northwest Quadrant			Southwest Quadrant			
			10-50 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm	10-50 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm	51-100 fm	101-150 fm	201-260 fm	51-100 fm	101-150 fm	151-200 fm	201-260 fm
Hyas sp.	Lyre crab	<1	0	0	0	0	0	1	0	0	0	0	0	0	0	<1	0	0	<1
Lopholithodes foraminatus	Box crab	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Aptocyclus ventricosus	Smooth lumpsucker	<1	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	0	0
Sebastes alutus	Pacific ocean perch	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Bothrocara molle	Soft eelpout	<1	0	0	0	0	0	0	0	0	0	0	0	0	<1	0	0	0	1
Triglops pingeli	Ribbed sculpin	<1	0	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	0
Bathymaster signatus	Searcher	<1	0	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	0
Lumpenus sagitta	Snake prickleback	<1	0	0	<1	0	0	<1	<1	0	0	0	0	0	0	0	0	0	0
Arctomelon stearnsii	Gastropod	<1	0	0	0	Trace	Trace	0	0	0	0	0	0	0	<1	<1	0	0	0
Buccinum sp.	Gastropod	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lyopsetta exilis	Slender sole	<1	0	0	<1	0	0	0	0	0	0	0	<1	0	0	0	0	0	0
Triglops sp.	Sculpin	<1	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agonidae	Poacher	<1	0	<1	0	0	0	0	0	0	0	0	0	0	0	<1	0	0	0
Cottidae	Sculpin (unidentified)	<1	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serripes groenlandicus	Greenland cockle	<1	0	0	Trace	0	0	0	Trace	<1	0	0	0	Trace	0	0	0	0	0
Sebastes sp.	Rockfish (unidentified)	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	<1	0	0	0
Bathylagus stilbius	Smoothtongue	<1	0	0	0	0	0	0	0	0	0	0	<1	0	<1	0	0	0	0
Myctophidae	Lanternfish (unidentified)	<1	0	0	0	0	0	0	0	0	0	0	0	0	<1	0	0	0	0
Buccinum strigillatum	Gastropod	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gymnocanthus sp.	Sculpin	<1	0	<1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Icelus spiniger	Thorny sculpin	<1	0	0	0	0	0	0	0	0	0	0	<1	0	0	0	0	0	0
Bathyagonus nigripinnis	Blackfin poacher	<1	0	0	0	0	0	0	0	0	0	0	0	0	<1	0	0	0	0
Macoma brota	Bivalve	<1	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0	Trace
Volutopsius harpa	Gastropod	Trace	0	0	0	Trace	0	0	<1	<1	<1	0	0	0	1	<1	3	0	0
Natica aleutica	Gastropod	Trace	Trace	0	0	0	Trace	0	0	0	0	0	0	0	Trace	0	Trace	Trace	0
Buccinum plectrum	Gastropod	Trace	0	Trace	Trace	0	<1	Trace	0	Trace	Trace	0	0	0	<1	0	<1	0	Trace
Colus halli	Gastropod	Trace	0	Trace	0	0	Trace	Trace	Trace	Trace	Trace	Trace	0	0	Trace	Trace	Trace	Trace	0
Rossia pacifica	Squid	Trace	0	0	0	0	0	<1	0	0	0	0	0	0	0	0	0	0	0
Bathybemix cidaris	Gastropod	Trace	0	0	0	0	0	Trace	0	0	0	0	0	0	0	0	0	0	0
Odostomia columbiana	Gastropod	Trace	0	0	0	0	0	Trace	0	0	0	0	0	0	0	0	0	0	0
Chlamys rubida	Bivalve	Trace	0	0	0	0	0	Trace	0	0	0	0	0	0	0	0	0	0	0
Cephalopoda	Squid	Trace	0	0	0	0	0	0	<1	0	0	0	0	0	0	<1	0	0	0
Polinices pallida	Gastropod	Trace	0	0	0	0	0	0	Trace	Trace	Trace	Trace	0	0	0	0	0	0	0
Nuculana fossa	Bivalve	Trace	0	0	0	0	0	0	0	0	Trace	0	0	0	0	0	0	0	0
Mitrella gouldi	Gastropod	Trace	0	0	0	0	0	0	0	0	0	Trace	0	0	0	0	0	0	0
Puncturella cooperi	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0	0
Cryptobranchia concentrica	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0	0
Lepeta alba	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	Trace	0	Trace	0
Cocculina agassizii	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0	0
Yoldia montereyensis	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	Trace	Trace
Delectopecten randolphi	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	Trace	0
Hiatella arctica	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	Trace	0	0	Trace
Bankia setacea	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0	0
Trophonopsis subsuratus	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0
Mopalia swanii	Polyplacophora	Trace	0	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0	0
Aforia circinata	Gastropod	Trace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Trace	0	0
Malletia pacifica	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Trace
Montacuta sp.	Bivalve	Trace	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Trace
	TOTAL CPUE	1,360	3,000	1,176	706	890	1,950	3,532	746	1,365	1,850	2,449	463	411	897	1,093	592	415	1,145