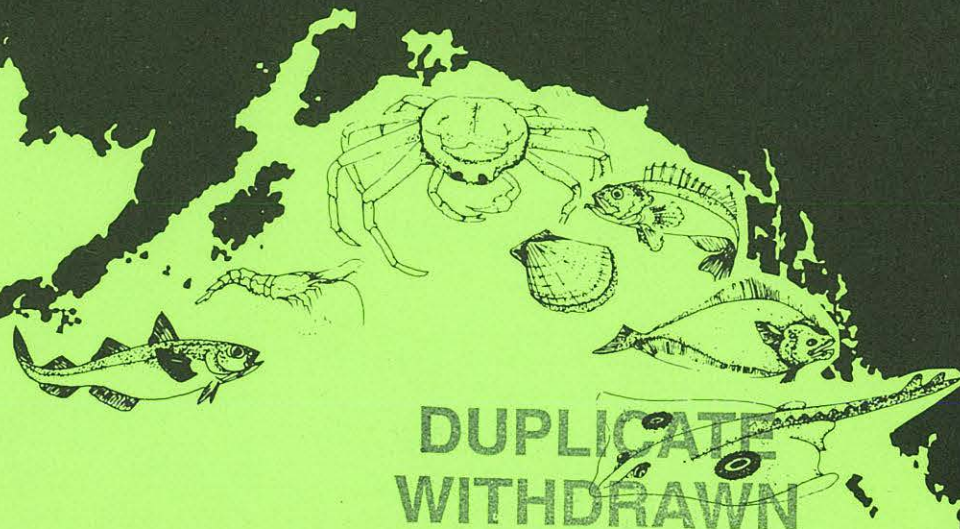


Northwest and Alaska Fisheries Center
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**DEMERSAL FISH AND SHELLFISH
RESOURCES OF THE GULF OF ALASKA
FROM
CAPE SPENCER TO UNIMAK PASS
1948 — 1976
(A Historical Review)**

by
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VOLUME 1

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This is a provisional report for information only.

TABLE OF CONTENTS

SECTION	Page
I. ACKNOWLEDGEMENTS.....	xxiii
II. SUMMARY OF SIGNIFICANT ACCOMPLISHMENTS.....	xxiv
III. INTRODUCTION.....	1
BACKGROUND.....	1
SPECIFIC OBJECTIVES.....	1
TERMINOLOGY.....	2
IV. DESCRIPTION OF STUDY AREA.....	3
V. DESCRIPTION OF FAUNA.....	5
FISH FAUNA.....	5
INVERTEBRATE FAUNA.....	5
VI. DATA SOURCES.....	14
VII. HISTORY OF COMMERCIAL EXPLOITATION OF DEMERSAL FISH AND SHELLFISH SPECIES IN THE GULF OF ALASKA.....	15
INTRODUCTION.....	15
DOMESTIC FISHERIES.....	15
King crab.....	15
Tanner crab.....	15
Dungeness crab.....	15
Pandalid shrimp.....	19
Scallop.....	19
Halibut.....	19
Sablefish.....	23
FOREIGN FISHERIES.....	23
Japanese fisheries.....	23
Bottom gillnet fishery.....	26
Trawl fishery.....	26
Longline fishery.....	26
Combined Japanese fisheries.....	28
Soviet Fisheries.....	28
Republic of Korea fisheries.....	31
Polish fisheries.....	31

	Page
VIII. REGIONAL CATCH STATISTICS.....	32
INTRODUCTION.....	32
DOMESTIC FISHERIES.....	32
King crab.....	33
Tanner crab.....	33
Dungeness crab.....	35
Pandalid shrimp	35
Scallop.....	38
Halibut.....	38
FOREIGN FISHERIES.....	42
Japanese trawl fisheries.....	42
Turbot.....	44
Other flatfishes.....	44
Sablefish.....	47
Pacific cod.....	47
Walleye pollock.....	47
Pacific ocean perch.....	47
Other rockfishes.....	52
Miscellaneous fishes.....	52
Total trawl catch.....	52
Japanese longline fisheries.....	56
Sablefish.....	56
Other species.....	56
The combined Japanese trawl and longline fisheries	56
IX. SPECIFIC FISHING AREAS OF HIGH PRODUCTION.....	66
INTRODUCTION.....	66
DOMESTIC FISHERIES.....	66
King crab.....	66
Tanner crab.....	68
Dungeness crab.....	71
Pandalid shrimp	71
Scallop.....	74
Halibut.....	78
JAPANESE FISHERIES.....	78
Turbot.....	81
Flatfishes other than turbot.....	81
Sablefish.....	81
Pacific cod.....	81
Walleye pollock.....	81
Pacific ocean perch.....	85
Total trawl catch.....	85
Catch of all bottomfish species by trawl and longline; 1964-1974.....	85

	Page
X. EXPLORATORY FISHING CRUISES IN THE GULF OF ALASKA.....	88
INTRODUCTION.....	88
METHODS.....	88
Cruise Approach and Rationale.....	88
Vessels and Fishing Gear.....	88
Procedure for Sampling Catches.....	91
Biological Sampling.....	91
Analytical Procedure.....	91
RESULTS.....	96
Otter trawl cruises.....	96
R/V <u>Washington</u> (October 1948).....	96
Cruise 015, R/V <u>John N. Cobb</u> (March - April 1953).....	98
Cruise 018 and 020, R/V <u>John N. Cobb</u> (February - April and July - September 1954).....	98
Cruise 002, Chartered Fishing Vessel <u>Tordenskjold</u> (July - September 1957).....	114
Cruise 601, Chartered Fishing Vessel <u>New Hope</u> (September 1960).....	114
Cruise 612, Chartered Fishing Vessel <u>Tordenskjold</u> (September 1961).....	114
Cruise 621, Chartered Fishing Vessel <u>Yaquina</u> (July - August 1962).....	124
Cruise 636, R/V <u>G. B. Reed</u> (July - August 1963).....	143
Cruise 637, R/V <u>G. B. Reed</u> (August - September 1963).....	143
Cruise 648, R/V <u>G. B. Reed</u> (July - August 1964).....	143
Cruise 652, R/V <u>G. B. Reed</u> (February 1965).....	143
Cruise 673, R/V <u>John R. Manning</u> (July - August 1967).....	152
Cruise 701, R/V <u>G. B. Reed</u> (May 1970).....	152
Shrimp Trawl Cruises.....	152
Cruise 015, R/V <u>John N. Cobb</u> (March - April 1953).....	152
Cruise 018, R/V <u>John N. Cobb</u> (February - April 1954).....	161
Cruise 020, R/V <u>John N. Cobb</u> (July - September 1954).....	168
Cruise 003, Chartered Fishing Vessel <u>Tordenskjold</u> (July - September 1957).....	168
Cruise 039, R/V <u>John N. Cobb</u> (July - August 1958).....	168
Cruise 044, R/V <u>John N. Cobb</u> (October - November 1959).....	181
Cruise 622, Chartered Fishing Vessel <u>Yaquina</u> (August - October 1962).....	205
Cruise 632, Chartered Fishing Vessel <u>Yaquina</u> (July - September 1963).....	205

	Page
Cruise 642, Chartered Fishing Vessel <u>Paragon</u> (June - August 1964).....	226
Cruise 682, R/V <u>John R. Manning</u> (July - September 1968).....	234
Cruise 703, Chartered Fishing Vessel <u>Pacific Lady</u> (August - October 1970).....	263
Scallop Dredge Cruises.....	263
Cruise 631, R/V <u>John R. Manning</u> (May - June 1963).....	263
Cruise 632, Chartered Fishing Vessel <u>Yaquina</u> (July - September 1963).....	273
Cruise 642, Chartered Fishing Vessel <u>Paragon</u> (June - August 1964).....	274

Table IV-1.--Continental shelf and upper slope area by geographic subdivisions and depth zones, 1961-1962 surveys.	4
Table V-1.--Families of fishes and approximate number of genera and species reported from the Gulf of Alaska.	6
Table V-2.--Proportion contributed by the ten dominant families to total species composition of the Gulf of Alaska fish fauna.	7
Table V-3.--List of fish families and species encountered in Gulf of Alaska exploratory cruises and resource assessment surveys.	8
Table V-4.--List of commercially important invertebrate families and species encountered in Gulf of Alaska exploratory cruises and resource assessment surveys.	13
Table VII-1.--United States catch of king crab in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1941-1973. Source: U.S. Fishery Statistics.	16
Table VII-2.--United States catch of Tanner (snow) crab in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1951-1973. Source: U.S. Fishery Statistics.	17
Table VII-3.--United States catch of Dungeness crab in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1941-1973. Source: U.S. Fishery Statistics.	18
Table VII-4.--United States catch of pandalid shrimp in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1942-1973. Source: U.S. Fishery Statistics.	20
Table VII-5.--United States catch of scallop in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1967-1973. Source: U.S. Fishery Statistics.	21
Table VII-6.--Combined United States and Canadian catches of halibut from Cape Spencer (136°30' W. long.) to Trinity Islands (155° W. long.), 1921-1960. Source: Bell 1968.	22
Table VII-7.--United States catch of sablefish (blackcod) in the area from Cape Suckling (144° W. long.) to Scotch Cap (165° W. long.), 1945-1973. Source: U.S. Fishery Statistics.	24
Table VII-8.--Summary of foreign fish and shellfish catches from within the Study Area, 1969-1975 (metric tons).	25
Table VII-9.--Japanese fisheries from Cape Spencer (137° W. long.) to Unimak Pass (169° W. long.) by area, year, and gear type, 1963-1973 (Catches in metric tons).	27
Table VII-10.--Bottomfish catches by the U.S.S.R. from the Gulf of Alaska, 1963-1973 (in metric tons).	29

	Page
Table VII-11.--Soviet fish and shellfish catches from within the Study Area, by subarea and species group, 1973-1975 (in metric tons).	30
Table VIII-1.--United States catches of king crab , 1969-1975, by region of the Study Area (metric tons).	34
Table VIII-2.--United States catches of Tanner (snow) crab , 1969-1975, by region of the Study Area (metric tons).	36
Table VIII-3.--United States catches of Dungeness crab , 1969-1975, by region of the Study Area (metric tons).	37
Table VIII-4.--United States catches of pandalid shrimp , 1969-1975, by region of the Study Area (metric tons).	39
Table VIII-5.--United States catches of scallop , 1969-1975, by region of the Study Area (metric tons).	40
Table VIII-6.--United States and Canadian catches of halibut, 1969-1975, by region of the Study Area (metric tons).	41
Table VIII-7.--United States and Canadian catches of halibut, 1960-1968, by region of the Study Area (metric tons).	43
Table VIII-8.--Annual Japanese trawl catches of turbot (arrowtooth flounders), 1969-1974, by region of the Study Area (metric tons).	45
Table VIII-9.--Annual Japanese trawl catches of flatfishes other than turbot, 1969-1974, by region of the Study Area (metric tons).	46
Table VIII-10.--Annual Japanese trawl catches of sablefish (blackcod), 1969-1974, by region of the Study Area (metric tons).	48
Table VIII-11.--Annual Japanese trawl catches of Pacific cod, 1969-1974, by region of the Study Area (metric tons).	49
Table VIII-12.--Annual Japanese trawl catches of walleye pollock, 1969-1974, by region of the Study Area (metric tons).	50
Table VIII-13.--Annual Japanese trawl catches of Pacific ocean perch, 1969-1974, by region of the Study Area (metric tons).	51
Table VIII-14.--Annual Japanese trawl catches of rockfishes other than Pacific ocean perch, 1969-1974, by region of the Study Area (metric tons).	53
Table VIII-15.--Annual Japanese trawl catches of miscellaneous fishes, 1969-1974, by region of the Study Area (metric tons).	54
Table VIII-16.--Annual Japanese trawl catches of finfishes 1969-1974, by region of the Study Area (metric tons).	55
Table VIII-17.--Annual Japanese trawl catches by species or species groups and region of the Study Area (metric tons).	57

	Page
Table VIII-18.--Total Japanese longline catch of sablefish and other species and comparison between total trawl and total longline catches for the period 1969-1974, by region of the Study Area (metric tons).	58
Table VIII-19.--Annual Japanese longline catches of fin fishes, 1969-1974, by region of the Study Area (metric tons).	59
Table VIII-20.--Annual Japanese longline catches of sablefish (blackcod), 1969-1974, by region of the Study Area (metric tons).	60
Table VIII-21.--Annual Japanese longline catches of fishes other than sablefish, 1969-1974, by region of the Study Area (metric tons).	61
Table VIII-22.--Annual Japanese catches of fin fishes, trawl and longline combined, 1969-1974, by region of the Study Area (metric tons).	63
Table VIII-23.--Annual Japanese catches of sablefish (blackcod), trawl and longline combined, 1969-1974, by region of the Study Area (metric tons).	64
Table VIII-24.--Total Japanese trawl and longline catch by species or species groups and region of the Study Area, 1969-1974 (metric tons).	65
Table IX-1.--Areas important to the production of king crab , 1969-1975.	67
Table IX-2.--Areas important to the production of Tanner (snow) crab , 1969-1975.	70
Table IX-3.--Areas important to the production of Dungeness crab , 1969-1975.	72
Table IX-4.--Areas important to the production of pandalid shrimps, 1969-1975.	75
Table IX-5.--Areas important to the production of scallop , 1969-1975.	77
Table IX-6.--Halibut catches by United States and Canadian fishermen by International Pacific Halibut Commission statistical areas, 1960-1968 and 1969-1975.	80
Table X-1.--BCF exploratory fishing cruises and FRB Canada Pacific ocean perch cruises conducted with otter trawls in the Gulf of Alaska.	89
Table X-2.--Specifications of the 600-mesh "Atlantic" type otter trawl.	90
Table X-3.--BCF exploratory fishing cruises conducted with shrimp trawls in the Gulf of Alaska.	92
Table X-4.--BCF exploratory fishing cruises conducted in the Gulf of Alaska with scallop dredges.	93

	Page
Table X-5.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 015, R/V <u>John N. Cobb</u> .	100
Table X-6.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 018, R/V <u>John N. Cobb</u> .	102
Table X-7.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 020, R/V <u>John N. Cobb</u> .	105
Table X-8.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	106
Table X-9.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 022, charter vessel <u>Tordenskjold</u> .	116
Table X-10.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	117
Table X-11.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 601, charter vessel <u>New Hope</u> .	125
Table X-12.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 612, charter vessel <u>Tordenskjold</u> .	127
Table X-13.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 612, charter vessel <u>Tordenskjold</u> .	129
Table X-14.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 621, charter vessel <u>Yaquina</u> .	135
Table X-15.--A list of the stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	136
Table X-16.--A list of the stations where the species standardized catch rates exceeded 50 kg/hr, cruise 636, R/V <u>G. B. Reed</u> .	146
Table X-17.--A list of the stations where the species standardized catch rates exceeded 50 kg/hr, cruise 637, R/V <u>G. B. Reed</u> .	146
Table X-18.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr, cruise 648, R/V <u>G. B. Reed</u> .	149
Table X-19.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr, cruise 652, R/V <u>G. B. Reed</u> .	149

	Page
Table X-20.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 673, R/V <u>John R. Manning</u> .	154
Table X-21.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 673, R/V <u>John R. Manning</u> .	155
Table X-22.--Mean CPUE's for individual shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1953-1960.	163
Table X-23.--Mean CPUE's for species other than pandalid shrimp which averaged over 10 kg/hr during exploratory shrimp cruises in the Gulf of Alaska from 1953-1960.	165
Table X-24.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 015, R/V <u>John N. Cobb</u> .	166
Table X-25.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	171
Table X-26.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 003, charter vessel <u>Tordenskjold</u> .	171
Table X-27.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 039, R/V <u>John N. Cobb</u> .	183
Table X-28.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 044, R/V <u>John N. Cobb</u> .	199
Table X-29.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 622, charter vessel <u>Yaquina</u> .	207
Table X-30.--Mean CPUE's for individual pandalid shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.	208
Table X-31.--Mean CPUE's for species other than pandalid shrimp which averaged over 10 kg/hr during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.	211

	Page
Table X-32.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 632, charter vessel <u>Yaquina</u> .	218
Table X-33.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 642, charter vessel <u>Paragon</u> .	231
Table X-34.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 682, R/V <u>John R. Manning</u> .	258
Table X-35.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 703, charter vessel <u>Pacific Lady</u> .	265
Table X-36.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 631, R/V <u>John R. Manning</u> .	271
Table X-37.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 632, charter vessel <u>Yaquina</u> .	271
Table X-38.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 642, charter vessel <u>Paragon</u> .	276

LIST OF FIGURES

	Page
Figure VIII-1.--Regions of the northern Gulf of Alaska Study Area.	32
Figure IX-1.--Areas of high production of king crab by United States fishermen, 1969-1975.	68
Figure IX-2.--Areas of high production of Tanner (snow) crab by United States fishermen, 1969-1975 (eastern Study Area).	69
Figure IX-3.--Areas of high production of Tanner (snow) crab by United States fishermen, 1969-1975 (western Study Area).	69
Figure IX-4.--Areas of high production of Dungeness crab by United States fishermen, 1969-1975 (eastern Study Area).	73
Figure IX-5.--Areas of high production of Dungeness crab by United States fishermen, 1969-1975 (western Study Area).	73
Figure IX-6.--Areas of high production of pandalid shrimp by United States fishermen, 1969-1975.	74
Figure IX-7.--Areas of high production of scallop by United States fishermen, 1969-1975 (eastern Study Area).	76
Figure IX-8.--Areas of high production of scallop by United States fishermen, 1969-1975 (western Study Area).	76
Figure IX-9.--Statistical reporting areas for halibut production from Cape Spencer to Unimak Pass by United States and Canadian fishermen.	79
Figure IX-10.--Mean annual catch (mt) of turbot (arrowtooth flounder) by the Japanese trawl fishery, 1964-1974.	82
Figure IX-11.--Mean annual catch (mt) of flatfishes other than turbot by the Japanese trawl fishery, 1964-1974.	82
Figure IX-12.--Mean annual catch (mt) of sablefish (blackcod) by the Japanese trawl and longline fisheries, 1964-1974.	83
Figure IX-13.--Mean annual catch (mt) of Pacific cod by the Japanese trawl fishery, 1964-1974.	83
Figure IX-14.--Mean annual catch (mt) of walleye pollock by the Japanese trawl fishery, 1964-1974.	84
Figure IX-15.--Mean annual catch (mt) of Pacific ocean perch by the Japanese trawl fishery, 1964-1974.	86

	Page
Figure IX-16.--Mean annual trawl fishery catch (mt) by Japan, 1964-1974.	86
Figure IX-17.--Mean annual bottomfish catch (mt) by Japanese trawl and longline fisheries, 1964-1974.	87
Figure X-1.--Schematic drawing and specifications of the NMFS modified "eastern" trawl.	94
Figure X-2.--Schematic drawing and specifications of the 66' shrimp trawl.	95
Figure X-3.--Stations successfully trawled (otter trawl) during October 1948, R/V <u>Washington</u> .	97
Figure X-4.--Stations successfully trawled (otter trawl) during cruises 015 and 601, R/V <u>John N. Cobb</u> and charter vessel <u>New Hope</u> .	99
Figure X-5.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 015, R/V <u>John N. Cobb</u> .	99
Figure X-6.--Stations successfully trawled (otter trawl) during cruise 018, R/V <u>John N. Cobb</u> .	101
Figure X-7.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 018, R/V <u>John N. Cobb</u> .	101
Figure X-8-9.--Distribution of Pacific halibut and walleye pollock standardized catch rates, in kg/hr, cruise 018, R/V <u>John N. Cobb</u> .	103
Figure X-10.--Stations successfully trawled (otter trawl), during cruise 020, R/V <u>John N. Cobb</u> .	104
Figure X-11.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 020, R/V <u>John N. Cobb</u> .	104
Figure X-12-13.--Distribution of Pacific ocean perch and turbot standardized catch rates, in kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	107
Figure X-14-15.--Distribution of starry flounder and skates standardized catch rates, in kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	108
Figure X-16-17.--Distribution of dogfish shark and sablefish standardized catch rates, in kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	109

Figure X-18-19.--Distribution of walleye pollock and Pacific cod standardized catch rates, in kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	110
Figure X-20-21.--Distribution of Pacific halibut and flathead sole standardized catch rates, kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	111
Figure X-22-23.--Distribution of king crab and Tanner crab standardized catch rates, kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	112
Figure X-24-25.--Distribution of thornyheads and Dungeness crab standardized catch rates, kg/hr, cruise 020, R/V <u>John N. Cobb</u> .	113
Figure X-26.--Stations successfully trawled, (otter trawl), during cruise 002, charter vessel <u>Tordenskjold</u> .	115
Figure X-27.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 002, charter vessel <u>Tordenskjold</u> .	115
Figure X-28-29.--Distribution of turbot and Pacific cod standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	118
Figure X-30-31.--Distribution of sea anemones and cottids standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	119
Figure X-32-33.--Distribution of Tanner crab and rock sole standardized catch rates, in kg/hr, cruise 002 charter vessel <u>Tordenskjold</u> .	120
Figure X-34-35.--Distribution of pink shrimp and Pacific halibut standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	121
Figure X-36-37.--Distribution of flathead sole and Stichaeidae standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	122
Figure X-38-39.--Distribution of Zoarcidae and sidestripe shrimp standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	123
Figure X-40.--Distribution of king crab standardized catch rates, in kg/hr, cruise 002, charter vessel <u>Tordenskjold</u> .	124

	Page
Figure X-41.--Stations successfully trawled, otter trawl, during cruise 612, charter vessel <u>Tordenskjold</u> .	126
Figure X-42.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 612, charter vessel <u>Tordenskjold</u> .	126
Figures X-43-44.--Distribution of Tanner and king crab standardized catch rates, in kg/hr, cruise 612, charter vessel <u>Tordenskjold</u> .	128
Figures X-45-46.--Distribution of sea urchins and butter sole standardized catch rates, in kg/hr, cruise 612, charter vessel <u>Tordenskjold</u> .	130
Figures X-47-48.--Distribution of pink shrimp and turbot standardized catch rates, in kg/hr cruise 612, charter vessel <u>Tordenskjold</u> .	131
Figures X-49-50.--Distribution of yellowfin sole and flathead sole standardized catch rates, in kg/hr, cruise 612, charter vessel <u>Tordenskjold</u> .	132
Figures X-51-52.--Distribution of walleye pollock and Pacific halibut standardized catch rates, in kg/hr, cruise 612, charter vessel <u>Tordenskjold</u> .	133
Figure X-53.--Stations successfully trawled, otter trawl, during cruise 621, charter vessel <u>Yaquina</u> .	134
Figure X-54.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	134
Figures X-55-56.--Distribution of Pacific ocean perch and rock sole standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	137
Figures X-57-58.--Distribution of king crab and turbot standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	138
Figures X-59-60.--Distribution of flathead and rex sole standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	139
Figures X-61-62.--Distribution of sea urchins and walleye pollock standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	140
Figures X-63-64.--Distribution of Pacific halibut and Tanner crab standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	141

	Page
Figures X-65-66.--Distribution of cottids and Bathymasteridae standardized catch rates, in kg/hr, cruise 621, charter vessel <u>Yaquina</u> .	142
Figure X-67.--Stations successfully trawled, otter trawl, during cruise 636, R/V <u>G. B. Reed</u> .	144
Figure X-68.--Distribution of Pacific Ocean perch standardized catch rates, in kg/hr, during cruise 636, R/V <u>G. B. Reed</u> .	145
Figure X-69.--Stations successfully trawled, otter trawl, during cruise 637, R/V <u>G. B. Reed</u> .	147
Figure X-70.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 637, R/V <u>G. B. Reed</u> .	147
Figure X-71.--Stations successfully trawled, otter trawl, during cruise 648, R/V <u>G. B. Reed</u> .	148
Figure X-72.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 648, R/V <u>G. B. Reed</u> .	148
Figure X-73.--Stations successfully trawled, otter trawl, during cruise 652, R/V <u>G. B. Reed</u> .	150
Figure X-74.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 652, R/V <u>G. B. Reed</u> .	151
Figure X-75.--Stations successfully trawled, (otter trawl), during cruise 673, R/V <u>John R. Manning</u> .	153
Figure X-76.--Distribution of standardized catch rates, all species combined, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	153
Figures X-77-78.--Distribution of Pacific cod and turbot standardized catch rates, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	156
Figures X-79-80.--Distribution of walleye pollock and Pacific ocean perch standardized catch rates, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	157
Figures X-81-82.--Distribution of flathead sole and starfish standardized catch rates, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	158
Figures X-83-84.--Distribution of Pacific halibut and sablefish standardized catch rates, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	159

	Page
Figures X-85-86.--Distribution of Tanner crab and Dover sole standardized catch rates, in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	160
Figure X-87.--Distribution of heart urchin standardized catch rates in kg/hr, cruise 673, R/V <u>John R. Manning</u> .	161
Figure X-88.--Stations successfully trawled (beam trawl) cruise 015, R/V <u>John N. Cobb</u> .	162
Figure X-89.--Distribution of standardized catch rates, all species combined, in kg/hr, cruise 015, R/V <u>John N. Cobb</u> .	162
Figures X-90-91.--Distribution of pandalid shrimp and brittlestars standardized catch rates, in kg/hr, cruise 015, R/V <u>John N. Cobb</u> .	164
Figures X-92-93.--Distribution of Tanner crab and butter sole standardized catch rates, in kg/hr, cruise 015, R/V <u>John N. Cobb</u> .	164
Figure X-94.--Stations successfully trawled (beam trawl) during cruise 018, R/V <u>John N. Cobb</u> .	166
Figure X-95.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 018, R/V <u>John N. Cobb</u> .	167
Figure X-96.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 018, R/V <u>John N. Cobb</u> .	167
Figure X-97.--Stations successfully trawled (beam trawl) during cruise 020, R/V <u>John N. Cobb</u> .	169
Figure X-98.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 020, R/V <u>John N. Cobb</u> .	169
Figures X-99-100.--Distribution of pandalid shrimp and Tanner crab standardized catch rates in kg/hr, during cruise 020, R/V <u>John N. Cobb</u> .	170
Figures X-101-102.--Distribution of flathead sole and rockfish standardized catch rates, in kg/hr, during cruise 020, R/V <u>John N. Cobb</u> .	172
Figures X-103-104.--Distribution of walleye pollock and jellyfish standardized catch rates, in kg/hr, during cruise 020, R/V <u>John N. Cobb</u> .	173
Figure X-105.--Stations successfully trawled (shrimp trawl) during cruise 003, charter vessel <u>Tordenskjold</u> .	174

Figure X-106.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u> .	174
Figures X-107-108.--Distribution of pandalid shrimp and king crab standardized catch rates, in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u> .	175
Figures X-109-110.--Distribution of cottids and turbot standardized catch rates, in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u> .	176
Figures X-111-112.--Distribution of Tanner crab and Alaska plaice standardized catch rates, in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u> .	177
Figures X-113-114.--Distribution of rock sole and walleye pollock standardized catch rates, in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u> .	178
Figure X-115.--Distribution of Pacific cod standardized catch during in kg/hr, during cruise 003, charter vessel <u>Tordenskjold</u>	179
Figure X-116.--Stations successfully trawled (shrimp trawl) during cruise 039, R/V <u>John N. Cobb</u> .	180
Figure X-117.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	182
Figure X-118.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	184
Figure X-119.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	185
Figure X-120.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	186
Figure X-121.--Distribution of sablefish standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	187
Figure X-122.--Distribution of Tanner crab standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	188
Figure X-123.--Distribution of king crab standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	189
Figure X-124.--Distribution of cottids standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	190

Figure X-125.--Distribution of yellowfin sole standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	191
Figure X-126.--Distribution of Pacific halibut standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	192
Figure X-127.--Distribution of flathead sole standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	193
Figure X-128.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	194
Figure X-129.--Distribution of starfish standardized catch rates, in kg/hr, during cruise 039, R/V <u>John N. Cobb</u> .	195
Figure X-130.--Stations successfully trawled (shrimp trawl) during cruise 044, R/V <u>John N. Cobb</u> .	196
Figure X-131.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	197
Figure X-132.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	198
Figure X-133.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	200
Figure X-134.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	201
Figure X-135.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	202
Figure X-136.--Distribution of Pacific herring standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	203
Figure X-137.--Distribution of Tanner crab standardized catch rates, in kg/hr, during cruise 044, R/V <u>John N. Cobb</u> .	204
Figure X-138.--Stations successfully trawled (shrimp trawl) during cruise 622, charter vessel <u>Yaquina</u> .	206
Figure X-139.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 622, charter vessel <u>Yaquina</u> .	206
Figures X-140-141.--Distribution of pandalid shrimp and walleye pollock standardized catch rates, in kg/hr, during cruise 622, charter vessel <u>Yaquina</u> .	209

Figures X-142-143.--Distribution of brittlestars and soft coral standardized catch rates, in kg/hr, during cruise 622, charter vessel, <u>Yaquina</u> .	210
Figures X-144-145.--Distribution of starfish and Tanner crab standardized catch rates, in kg/hr, during cruise 622, charter vessel <u>Yaquina</u> .	212
Figures X-146-147.--Distribution of flathead and rock sole standardized catch rates, in kg/hr, during cruise 622, charter vessel <u>Yaquina</u> .	213
Figure X-148.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 622, charter vessel <u>Yaquina</u> .	214
Figure X-149.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel <u>Yaquina</u> .	215
Figure X-150.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel <u>Yaquina</u> .	216
Figure X-151.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	216
Figure X-152.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	217
Figure X-153.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	219
Figure X-154.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	220
Figure X-155.--Distribution of king crab standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	220
Figure X-156.--Distribution of king crab standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	221
Figure X-157.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	222
Figure X-158.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	223
Figure X-159.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	223

	Page
Figure X-160.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	224
Figure X-161.--Distribution of brittlestars standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	225
Figure X-162.--Distribution of brittlestars standardized catch rates, in kg/hr, during cruise 632, charter vessel <u>Yaquina</u> .	226
Figure X-163.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel <u>Paragon</u> .	227
Figure X-164.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel <u>Paragon</u> .	228
Figure X-165.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	229
Figure X-166.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	230
Figure X-167.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	232
Figure X-168.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	233
Figure X-169.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	235
Figure X-170.--Distribution of turbot standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	236
Figure X-171.--Distribution of king crab standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	237
Figure X-172.--Distribution of king crab standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	238
Figure X-173.-- Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	239
Figure X-174.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	240
Figure X-175.--Distribution of flathead sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	241

Figure X-176.--Distribution of flathead sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	242
Figure X-177.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	243
Figure X-178.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	244
Figure X-179.--Distribution of rock sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	245
Figure X-180.--Distribution of rock sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	246
Figure X-181.--Distribution of yellowfin sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	247
Figure X-182.--Distribution of yellowfin sole standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	248
Figure X-183.--Distribution of cottids standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	249
Figure X-184.--Distribution of cottids standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	250
Figure X-185.--Distribution of Tanner crab standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	251
Figure X-186.--Distribution of Tanner crab standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	252
Figure X-187.--Distribution of starfish standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	253
Figure X-188.--Distribution of starfish standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	254
Figure X-189.--Distribution of sponge standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	255
Figure X-190.--Distribution of sponge standardized catch rates, in kg/hr, during cruise 642, charter vessel <u>Paragon</u> .	256
Figure X-191.--Stations successfully trawled (shrimp trawl) during cruise 682, R/V <u>John R. Manning</u> .	257

	Page
Figure X-192.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 682, R/V <u>John R. Manning</u> .	257
Figures X-193-194.--Distribution of pandalid shrimp and walleye pollock standardized catch rates, in kg/hr, during cruise 682, R/V <u>John R. Manning</u> .	259
Figures X-195-196.--Distribution of turbot and flathead sole standardized catch rates, in kg/hr, during cruise 682, R/V <u>John R. Manning</u> .	260
Figures X-197-198.--Distribution of Pacific cod and Pacific herring standardized catch rates, in kg/hr, during cruise 682, R/V <u>John R. Manning</u> .	261
Figure X-199-200.--Distribution of yellowfin sole and Tanner crab standardized catch rates, in kg/hr, during cruise 682, R/V <u>John R. Manning</u> .	262
Figure X-201.--Stations successfully trawled (shrimp trawl) during cruise 703, charter vessel <u>Pacific Lady</u> .	264
Figure X-202.--Distribution of standardized catch rates, all species combined, in kg/hr, during cruise 703, charter vessel <u>Pacific Lady</u> .	266
Figure X-203.--Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 703, charter vessel <u>Pacific Lady</u> .	267
Figure X-204.--Distribution of walleye pollock standardized catch rates, in kg/hr, during cruise 703, charter vessel <u>Pacific Lady</u> .	268
Figure X-205.--Distribution of Pacific herring standardized catch rates, in kg/hr, during cruise 703, charter vessel <u>Pacific Lady</u> .	269
Figure X-206.--Stations successfully sampled (scallop dredge) during cruise 631, R/V <u>John R. Manning</u> .	270
Figure X-207.--Distribution of scallops standardized catch rates, during cruise 631, R/V <u>John R. Manning</u> .	272
Figure X-208.--Stations successfully sampled (scallop dredge) during cruise 632, charter vessel <u>Yaquina</u> .	274
Figure X-209.--Distribution of scallop standardized catch rates, during cruise 632 <u>Yaquina</u> .	274
Figure X-210.--Stations successfully sampled (scallop dredge) during cruise 642, charter vessel <u>Paragon</u> .	275
Figures X-211.--Distribution of scallop standardized catch rates, during cruise 642, charter vessel <u>Paragon</u> .	277

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SUMMARY OF SIGNIFICANT ACCOMPLISHMENTS

This report contains (1) a description of the Study area, that part of the Gulf of Alaska from Cape Spencer to Unimak Pass, including its physical features and fauna; (2) a listing of the data sources utilized in the report; (3) a general review of the history of exploitation of demersal finfishes and shellfishes within the entire Study Area by domestic and foreign producers; (4) a review by regions within the Study Area of fish catches by the United States and Japan from 1969 through 1974/1975, and a review of the joint United States-Canada halibut catch from 1960-1968 and from 1969-1975; (5) a listing and plotting of specific locations of high productivity for U.S. fisheries within the Study Area from 1969-1975, for the joint United States-Canadian halibut fishery from 1960-1975, and for Japanese bottomfish catches from 1964-1974; (6) a description of and results obtained from exploratory fishing cruises for demersal fishes and shellfishes within the Study Area from 1948 through 1970; (7) descriptions of and results of demersal resource assessment surveys for pandalid shrimp during the period of 1971-1976; (8) description of and results of demersal resource assessment surveys in 1961-1962 and 1973-1976; and (9) comparison of the demersal resource assessment survey results obtained in 1961-1962 with those obtained in 1973-1976.

The Study Area includes the continental shelf (0-200 m depth) and upper slope (200-400 m depth) in the northern Gulf of Alaska from Cape Spencer to Unimak Pass, an arc 2200 kilometers in length and encompassing an area of 219,000 square kilometers. The continental shelf in this area varies from 19-176 kilometers in width and is cut by numerous canyons. The substrate is quite variable. Water temperature offshore ranges from -1°C to 15°C , and salinities vary from 28-34 o/oo. The Gulf of Alaska supports about 300 species of marine fishes belonging to 55 families; of this total, 138 species and 26 families have been reported by exploratory fishing and resource assessment surveys. Additionally, 7 species of pandalid shrimp and 4 commercially important crab species were reported.

Agencies contributing data which is included or analyzed in this report include the Bureau of Commercial Fisheries, the International Pacific Halibut Commission, the Fishery Research Board of Canada, the National Marine Fisheries Service, the Alaska Department of Fish and Game, and fisheries agencies or scientific delegations of Japan, the Soviet Union, the Republic of Korea, and Poland.

Commercial exploitation of demersal resources in the northern Gulf of Alaska has been carried out by fishermen from the United States, Canada, Japan, the USSR, South Korea, Poland and Taiwan. Important American fisheries have been those for king crab (1953-present), Tanner (snow) crab (1968-present), Dungeness crab (from at least 1941-present), pandalid shrimp (from 1959-present), and scallop (1968-present). A joint (1959-present) fishery for halibut by U.S. and Canadian fishermen extends from the 1920's to the present. Japanese and Soviet fisheries for finfishes

other than halibut have developed since their beginning in 1963 and continue to the present. Additionally, the Soviets have fished for shrimp intermittently. Fishermen from the Republic of Korea (South Korea) have fished within the Study Area beginning in 1966, and although poorly documented, their catches appear to be relatively small. The Polish and Taiwanese fishing efforts within the Study Area are those of only a few vessels and are not significant at the present time.

The Study Area was divided into 9 regions and the annual catches within each was tabulated for the years from 1969-1975. This treatment enables the importance of individual regions to the production of various species to be evaluated. Species fished by Americans are king crab, Tanner crab, Dungeness crab, shrimp, scallop, and halibut. Species fished by Japan are the turbot (arrowtooth flounder), other flatfishes, sablefish (blackcod), walleye pollock, Pacific ocean perch, other rockfishes, and miscellaneous fishes. Soviet and Korean catch reports were not sufficiently precise to classify by region.

The demersal catch statistics supplied by the State of Alaska, IPHC, and Japan were sufficiently precise to identify specific geographic areas that contributed especially large quantities of fish and shellfish. The most important areas for king crab, Tanner crab, Dungeness crab, turbot, flatfishes other than turbot, sablefish, Pacific cod, walleye pollock, Pacific ocean perch, the total trawl catch by Japan, and the bottomfish catch by Japan are identified on charts.

Exploratory fishing cruises were conducted in the Study Area from 1948 until 1970. The object of these cruises was to define commercially important concentrations of demersal fish and shellfish, and to determine trawlable areas. Described are results of 13 otter trawl cruises, 11 shrimp trawl cruises, and 4 scallop dredge cruises, by United States and Canadian research vessels.

Twelve pandalid shrimp surveys, conducted from 1971-1976 to assess distribution and relative abundance, and to provide means for the estimation of the standing stock (biomass), are described. In the case of shrimp surveys, incidental catches of fishes and other shellfishes, mainly crab, were also taken. The distribution and relative abundance of these incidental catches are described.

Resource assessment surveys in the Gulf of Alaska were initiated in 1961 when the International Pacific Halibut Commission (IPHC), with the cooperation of the (then) Bureau of Commercial Fisheries (BCF), surveyed the entire area from Unimak Pass to Cape Spencer. The project continued through 1962. Ten years later the National Marine Fisheries Service (NMFS), successor to the BCF, conducted resource assessment surveys of demersal fish and shellfish resources throughout the same area during the period from 1973-1976. These surveys were conducted by otter trawl and were designed to define the distribution and relative abundance of demersal fish and shellfish resources, provide estimates of standing stocks and size compositions of commercially important species, define the nature of species associations by area and depth, and to provide biological data such as the age composition and growth rate of selected species.

Between the two periods 1961-1962 and 1973-1976, when the aforementioned demersal resource assessment surveys were conducted, a large expansion occurred in foreign fishing activities in the northern Gulf of Alaska. It is possible that environmental changes and natural fluctuations have also occurred during the decade which separates the two survey periods, although these factors are not documented. In any event, comparison of relative abundance indices between the two surveys suggests where changes have taken place.

INTRODUCTION

BACKGROUND

Since 1953, the National Marine Fisheries Service (NMFS), formerly the Bureau of Commercial Fisheries (BCF), has conducted resource assessment surveys and exploratory fishing cruises on the continental shelf and upper continental slope from Unimak Pass to Cape Spencer. During 1961-1963, the first major resource survey was conducted by the International Pacific Halibut Commission with assistance and participation by BCF. The 1971-76 resource assessment surveys were part of NMFS Marine Monitoring Assessment and Prediction (MARMAP) program, with the exception of the 1975 NEGOA resource assessment survey which was conducted from Yakutat to Cape Cleare under contract to the Bureau of Land Management (BLM).

The Gulf of Alaska, which is rich in demersal fish and shellfish resources, is also thought to contain bountiful oil and natural gas resources. During 1976, numerous offshore oil and gas leases were sold in the eastern Gulf of Alaska, Yakutat Bay to Cape Cleare; however, additional gas and oil leases which were originally scheduled for 1977 have been delayed until 1980 in the western Gulf of Alaska.

BLM has the responsibility for conducting the offshore leasing. By law, BLM must provide an environmental impact statement (EIS), assessing the environmental risks involved in developing potential offshore oil reserves. In Alaskan waters, the National Oceanographic and Atmospheric Administrations' (NOAA) Environmental Research Laboratory (ERL) is managing the environmental studies through its Outer Continental Shelf Environmental Assessment Program Office (OCSEAP) and has arranged with elements within NOAA, such as NMFS and other federal agencies, the State of Alaska, private industry, and universities, to conduct studies to provide the necessary information on life forms and processes and the physical environmental data and analyses for the EIS.

During 1976-77, NMFS contracted with the OCSEAP office to provide an historical review of the available data on the demersal fish and shellfish resources in the Gulf of Alaska from Unimak Pass to Cape Spencer.

SPECIFIC OBJECTIVES

The objectives of this report are:

1. to describe the composition, distribution, and relative apparent abundance of demersal fish, shellfish, and principle epibenthic invertebrate resources of the continental shelf and upper slope of the Gulf of Alaska during the 1961-62 IPHC surveys and the 1973-76 NMFS surveys;

2. to describe species concentrations and high abundance areas as provided by historical exploratory fish cruises;
3. to establish, for commercially important demersal fish and shellfish species, population characteristics that could change because of environmental stresses (e.g., stock size, size and age composition, growth rates, and length-weight relationship, when data are available.
4. to describe recent trends in commercial fish and shellfish landings both foreign and domestic, and areas of high fish and/or shellfish production
5. to compare distribution patterns and apparent abundances between the 1961-62 IPHC-BCF surveys and the 1973-76 NMFS surveys.

TERMINOLOGY

The nomenclature used for fishes is that of the American Fisheries Society (1970) and Quast and Hall (1972) with the exception of one species of Pleuronectid, (Atheresthes stomias) for which the common name of turbot is used in this report. The common names given for crab are those that have developed in their commercial fisheries, with one exception. The fishing industry prefers the name "snow crab" for Chionoecetes bairdi, but "Tanner crab" is the standard name used in scientific reports and is retained here. Common names for shrimp follow Schmitz (1921) or Butler (1950).

Terms frequently used in this report for which definitions may be difficult to find except in fishery and statistical texts are defined here.

Age structures.--For fish, these are otoliths (ear bones) and/or scales on which annual rings are laid down.

Catch-per-unit effort (CPUE).--The catch of a species per unit of sampling effort is an index of density. Catch per hour has been used in this report.

Standing stock.--The total population of a species vulnerable to the trawl in the defined area. Standing stock may be described in terms of weight (biomass) or numbers of individuals (population).

DESCRIPTION OF THE STUDY AREA

The region of investigation includes the continental shelf (0-200 m) and upper slope (201-400 m) of the Gulf of Alaska from Unimak Pass to Cape Spencer^{1/} which contains a total area of approximately 218,900 km² (Table IV-1). Of this total area the outer shelf (101-200 m) contains 48%, the inner shelf (1-100 m) 36% and the upper slope (201-400 m) 16%. The western portion of the Gulf of Alaska, 151°00'W longitude to Unimak Pass, contained 1.6 times as much continental shelf and upper slope area as the eastern Gulf of Alaska.

Within this region the shelf varies from 19 to 176 km in width and is bisected by numerous troughs or canyons. Substrate composition consists of rock, gravel, sand, or mud and changes rapidly within short distances.

Surface currents in the shelf region generally flow northwesterly in the Fairweather-Yakutat regions, turn westerly past Middleton Island and Prince William and then swing southwesterly in the Kenai region and continue southwesterly through the Kodiak, Chirikof, Shumagin, and Sanak regions. Offshore water temperatures range from -1 to 15°C and salinities from 28 to 34 ‰ but can reach 16°C and 20 ‰, respectively, in the nearshore areas which are affected by heavy fresh water runoff.

^{1/} Locations of geographic name places are presented in Appendix A.

Table IV-1.--Continental shelf and upper slope area by geographic subdivisions and depth zones, 1961-1962 surveys.

Geographic subdivisions	Depth zones (meters)			
	<u>0-100</u> km ²	<u>101-200</u> km ²	<u>201-400</u> km ²	<u>0-400</u> km ²
Fairweather	2,566	11,617	2,144	16,327
Yakutat	4,418	10,430	4,894	19,742
Prince William	7,885	8,990	2,600	19,475
Kenai	322	19,183	7,926	27,431
Kodiak	16,350	11,785	1,701	29,836
Shelikof	3,759	5,574	6,287	15,620
Chirikof	17,321	12,210	7,463	36,994
Shumagin	13,569	12,972	1,670	28,211
Sanak	12,773	11,607	888	25,268
Total	78,963	104,368	35,573	218,904
Eastern Gulf	15,191	50,220	17,564	82,975
Western Gulf	63,772	54,148	18,009	135,929

DESCRIPTION OF THE FAUNA

FISH FAUNA

The Gulf of Alaska supports approximately 287 species of primarily marine fishes belonging to about 55 families (Table V-1). Sculpins (Cottidae) and snailfishes (Cyclopteridae), the largest family groups, contribute 19 and 13 percent, respectively, to the total species occurring in the Gulf of Alaska, and the ten largest families include 68% of the total species reported by Quast and Hall (1972) (Table V-2).

The Gulf of Alaska exploratory cruises and resource assessment surveys using bottom sampling gears have captured 138 species representing 26 families. Of these species only 39% were included in the ten largest families. The rockfishes (Scorpaenidae) were the largest group, accounting for 10 percent and included eight additional species not reported by Quast and Hall (1972). Other well represented family groups included the sculpins (8%) and flounders (Pleuronectidae) (6%), with the seven remaining families contributing from 2-3 percent.

Several families with relatively large numbers of species inhabiting the Gulf of Alaska assumed a lesser importance with respect to susceptibility to capture by bottom sampling gears. This reduction in number of species encountered can be caused by gear selectivity, the inability to sample all substrates with trawls, incomplete sampling of the water column, and limitations of the gear to sample those species occurring at substantial depth (>450 m). A complete list of the fish species encountered in these surveys is presented in Table V-3).

INVERTEBRATE FAUNA

Although the Gulf of Alaska supports a large number of invertebrate species, our knowledge of this fauna is restricted mainly to a variety of familiar and conspicuous forms of macrobenthos such as crab, clams, snails, starfish, and shrimp. The smaller sized elements of the fauna are poorly known and are inadequately sampled during resource surveys using fish trawls.

Commercially important invertebrates encountered in the Gulf of Alaska consisted of approximately 13 species representing five families (Table V-4). The shrimp family, Pandalidae, was represented by 8 species, 7 from the genus Pandalus and one from the genus Pandalopsis. Three families account for the four commercially important crab species taken in the Gulf although only two species, the Tanner crab (Chionoecetes bairdi) and the red king crab (Paralithodes camtschatica) are regularly taken in commercial quantities. The weathervane scallop (Pecten caurinus) represents the remaining important invertebrate family, Pectinidae.

Table V-1.--Families of fishes and approximate number of genera and species reported from the Gulf of Alaska.

Family	<u>1/</u>		<u>2/</u>	
	No. Genera	No. Species	No. Genera	No. Species
Petromyzontidae	2	3	--	--
Hexanchidae	1	1	--	--
Lamnidae	2	2	1	1
Carcharhinidae	1	1	--	--
Squalidae	2	2	1	1
Rajidae	1	7	1	4
Acipenseridae	1	2	--	--
Clupeidae	2	2	1	1
Salmonidae	6	12	1	3
Osmeridae	5	6	5	6
Bathylagidae	1	4	--	--
Opisthoproctidae	1	1	--	--
Gonostomatidae	2	4	--	--
Melanostomiidae	1	1	--	--
Chauliodontidae	1	1	1	1
Alepocephalidae	1	1	--	--
Anotopteridae	1	1	--	--
Scopelarchidae	1	1	--	--
Myctophidae	7	10	1	1
Oneirodidae	1	3	--	--
Moridae	1	1	--	--
Gadidae	5	5	5	5
Ophidiidae	2	2	--	--
Zoarcidae	6	11	4	7
Macrouridae	1	3	1	1
Scomberesocidae	1	1	1	1
Melamphaeidae	3	3	--	--
Zeidae	1	1	--	--
Lampridae	1	1	--	--
Trachipteridae	1	1	--	--
Gasterosteidae	2	2	--	--
Scorpaenidae	2	22	2	30
Hexagrammidae	3	6	3	5
Anoplopomatidae	2	2	1	1
Cottidae	30	54	15	24
Psychrolutidae	1	1	--	--
Agonidae	8	12	8	9
Cyclopteridae	12	38	5	7
Bramidae	1	1	--	--
Pentacerotidae	1	1	--	--
Sphyracidae	1	1	--	--
Trichodontidae	2	2	1	1
Bathymasteridae	2	4	2	2
Anarhichadidae	1	1	1	1
Stichaeidae	10	15	4	6
Ptilichthyidae	1	1	--	--
Pholididae	2	4	--	--
Scytalinidae	1	1	--	--
Zaproridae	1	1	1	1
Ammodytidae	1	1	1	1
Scombridae	2	2	--	--
Centrolophidae	1	1	--	--
Bothidae	1	1	--	--
Pleuronectidae	15	17	15	16
Cryptacanthodidae ^{3/}	2	2	2	2
TOTALS	<u>167</u>	<u>287</u>	<u>84</u>	<u>138</u>

^{1/} After Quast and Hall, (1972)

^{2/} Gulf of Alaska exploratory, BCF, IPHC & NMFS trawl survey data

^{3/} Quast and Hall (1972) include these genera and species in the family Stichaeidae while Hart (1973) recognizes a separate family.

Table V-2.--Proportion contributed by the ten dominant families to total species composition of Gulf of Alaska fish fauna.

Family ^{1/}	Percentage of total fish species	Family ^{2/}	Percentage of total fish species
Cottidae	19	Scorpaenidae	10
Cyclopteridae	13	Cottidae	8
Scorpaenidae	8	Pleuronectidae	6
Pleuronectidae	6	Agonidae	3
Stichaeidae	5	Zoarcidae	2
Salmonidae	4	Cyclopteridae	2
Agonidae	4	Stichaeidae	2
Zoarcidae	4	Osmeridae	2
Myctophidae	3	Gadidae	2
Rajidae	2	Hexagrammidae	2
Total	68		39

1/ From Quast and Hall, 1972.

2/ From Gulf of Alaska exploratory cruises and resource assessment surveys.

Table V-3.--List of fish families and species encountered in Gulf of Alaska exploratory cruises and resource assessment surveys.

SCIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Lamnidae - Mackerel sharks							
<u>Lamna ditropis</u>	Salmon shark						X
Squalidae - Dogfish shark							
<u>Squalus acanthias</u>	Spiny dogfish	X	X	X	X	X	X
Rajidae - Skates							
<u>Raja Sp.</u>	Unidentified skate	X	X	X	X	X	X
<u>Raja binoculata</u>	Big skate	X	X				X
<u>Raja kincaidi</u>	Black skate		X				X
<u>Raja rhina</u>	Longnose skate	X	X				X
<u>Raja stellulata</u>	Starry skate	X					
Clupeidae - Herrings							
<u>Clupea harengus pallasii</u>	Pacific herring	X	X	X	X	X	X
Salmonidae - Salmon							
<u>Oncorhynchus sp.</u>	Unidentified salmon	X	X	X	X	X	X
<u>Oncorhynchus kisutch</u>	Coho salmon						X
<u>Oncorhynchus nerka</u>	Pink salmon	X					
<u>Oncorhynchus tshawytscha</u>	Chinook salmon	X					X
Osmeridae - Smelts							
	Unidentified smelt	X	X	X	X	X	X
<u>Hypomesus pretiosus</u>	Surf smelt	X					
<u>Mallotus villosus</u>	Capelin ^{7/}						X
<u>Osmerus mordax dentex</u>	Rainbow smelt	X					
<u>Spirinchus starksi</u>	Night smelt	X					
<u>Spirinchus thaleichthys</u>	Longfin smelt	X					
<u>Thaleichthys pacificus</u>	Eulachon	X	X		X	X	X
Chauliodontidae - Viperfishes							
<u>Chauliodus macouni</u>	Pacific viperfish						X
Myctophidae - Lanternfishes							
<u>Stenobrachius leucopsarus</u>	Northern lampfish	X					
Gadidae - Codfishes							
<u>Eleginus gracilis</u>	Saffron cod	X					
<u>Gadus macrocephalus</u>	Pacific cod	X	X	X	X	X	X
<u>Merluccius productus</u>	Pacific hake	X	X				
<u>Microgadus proximus</u>	Pacific tomcod	X	X	X	X	X	X
<u>Theragra chalcogramma</u>	Walleye pollock	X	X	X	X	X	X

Table V-3. (cont'd.)

SCIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Zoarcidae - Eelpouts							
	Unidentified eelpout	X	X	X	X	X	X
<u>Bothrocara remigerum</u>	Longsnout eelpout						X
<u>Bothrocara molle</u>	Soft eelpout						X
<u>Lycodapus fierasfer</u>	Blackmouth eelpout						X
<u>Lycodes brevipes</u>	Shortfin eelpout						X
<u>Lycodes diapterus</u>	Black eelpout						X
<u>Lycodes palearis</u>	Wattled eelpout						X
<u>Lycodopsis pacifica</u>	Blackbelly eelpout						X
Macrouridae - Grenadiers							
	Unidentified rattail	X	X	X	X		
<u>Coryphaenoides acrolepis</u>	Roughscale rattail	X	X				X
Scomberesocidae - sauries							
<u>Cololabis saira</u>	Pacific saury		X				
Trichodontidae - Sandfishes							
<u>Trichodon trichodon</u>	Pacific sandfish	X	X	X	X	X	X
Bathymasteridae - Ronquils							
	Unidentified ronquils	X	X	X	X	X	X
<u>Bathymaster signatus</u>	Searcher	X	X				X
<u>Ronquilus jordani</u>	Northern ronquil						X
Stichaeidae - Pricklebacks							
	Unidentified prickleback	X	X	X	X	X	X
<u>Chirolophis decoratus</u>	Decorated warbonnet	X					
<u>Chirolophis nugator</u>	Mosshead warbonnet ^{7/}	X					
<u>Lumpenella longirostris</u>	Longsnout prickleback	X					X
<u>Lumpenus maculatus</u>	Daubed shanny						X
<u>Lumpenus sagitta</u>	Snake prickleback	X					X
<u>Poroclinus rothroeki</u>	Whitebarred prickleback						X
Anarhichadidae - Wolffishes							
<u>Anarhichthys ocellatus</u>	Wolf-eel	X	X				X
Cryptacanthodidae - Wrymouth							
<u>Delolepis gigantea</u>	Giant wrymouth	X					X
<u>Lyconectes aleutensis</u>	Dwarf wrymouth	X					X
Zaproridae - Prowfish							
<u>Zaprora silenus</u>	Prowfish	X	X				X

Table V-3. (cont'd.)

SCIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Ammodytidae - Sand lances							
<u>Ammodytes hexapterus</u>	Pacific sand lance	X					
Scorpaenidae - Scorpionfishes							
<u>Sebastes sp.</u>	Unidentified rockfish	X	X	X	X	X	
<u>Sebastes aleutianus</u>	Rougheye rockfish	X	X	X	X	X	
<u>Sebastes alutus</u>	Pacific ocean perch ^{7/}	X	X	X	X	X	
<u>Sebastes auriculatus</u>	Brown rockfish ^{7/}	X					
<u>Sebastes babcocki</u>	Redbanded rockfish	X	X				X
<u>Sebastes brevispinis</u>	Silvergrey rockfish	X	X				X
<u>Sebastes ciliatus</u>	Dusky rockfish	X	X				X
<u>Sebastes crameri</u>	Darkblotched rockfish	X	X				X
<u>Sebastes diploproa</u>	Splitnose rockfish	X					X
<u>Sebastes elongatus</u>	Greenstriped rockfish	X	X				X
<u>Sebastes entomelas</u>	Widow rockfish	X					X
<u>Sebastes flavidus</u>	Yellowtail rockfish	X					X
<u>Sebastes helvomaculatus</u>	Rosethorn rockfish ^{7/}	X	X				X
<u>Sebastes jordani</u>	Shortbelly rockfish ^{7/}	X					
<u>Sebastes maliger</u>	Quillback rockfish	X					X
<u>Sebastes melanops</u>	Black rockfish	X	X				X
<u>Sebastes melanostomus</u>	Blackgill rockfish	X					
<u>Sebastes mystinus</u>	Blue rockfish	X	X	X	X	X	X
<u>Sebastes nebulosus</u>	China rockfish	X	X				
<u>Sebastes paucispinis</u>	Bocaccio rockfish	X	X				X
<u>Sebastes phillipsi</u>							X
<u>Sebastes pinniger</u>	Canary rockfish	X	X				
<u>Sebastes polyspinis</u>	Northern rockfish	X					
<u>Sebastes proriger</u>	Redstripe rockfish	X					
<u>Sebastes rubberimus</u>	Yelloweye rockfish ^{7/}	X	X				X
<u>Sebastes saxicola</u>	Stripetail rockfish ^{7/}	X					
<u>Sebastes variegatus</u>	Harlequin rockfish						X
<u>Sebastes wilsoni</u>	Pygmy rockfish	X					
<u>Sebastes zacentrus</u>	Sharpchin rockfish	X					
<u>Sebastolobus sp.</u>	Unidentified thornyhead	X	X	X	X	X	
<u>Sebastolobus alascanus</u>	Shortspine thornyhead	X	X			X	X
<u>Sebastolobus altivelis</u>	Longspine thornyhead		X	X	X	X	
Anoplopomatidae - Sablefishes							
<u>Anoplopoma fimbria</u>	Sablefish	X	X	X	X	X	X
Hexagrammidae - Greenlings							
	Unidentified greenling	X	X	X	X	X	
<u>Hexagrammos decagrammus</u>	Kelp greenling	X	X				
<u>Hexagrammos lagocephalus</u>	Rock greenling	X	X				
<u>Hexagrammos stelleri</u>	Whitespotted greenling	X					
<u>Ophiodon elongatus</u>	Lingcod	X	X		X	X	X
<u>Pleurogrammus monoptyerygius</u>	Atka mackerel	X	X	X	X	X	X

Table V-3. (cont'd.)

SCIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Cottidae - Sculpins							
	Unidentified sculpin	X	X	X	X	X	X
<u>Blepsias bilobus</u>	Crested sculpin						X
<u>Blepsias cirrhosus</u>	Silverspotted sculpin	X					
<u>Dasycottus setiger</u>	Spinyhead sculpin	X					X
<u>Enophrys bison</u>	Buffalo sculpin ^{7/}						X
<u>Gymnocanthus galeatus</u>	Armorhead sculpin ^{7/}	X					
<u>Hemilepidotus hemilepidotus</u>	Red Irish lord	X	X				X
<u>Hemilepidotus spinosus</u>	Brown Irish lord						X
<u>Hemilepidotus jordani</u>	Yellow Irish lord						X
<u>Hemitripterus bolini</u>	Bigmouth sculpin						X
<u>Icelinus borealis</u>	Northern sculpin ^{7/}						X
<u>Icelinus filamentosus</u>	Threadfin sculpin ^{7/}	X					
<u>Icelinus oculatus</u>	Frogmouth sculpin ^{7/}						X
<u>Icelus spiniger</u>	Thorny sculpin						X
<u>Icelus euryops</u>							X
<u>Leptocottus armatus</u>	Pacific staghorn sculpin						X
<u>Malacocottus kincaidi</u>	Blackfin sculpin						X
<u>Myoxocephalus mednius</u>							
<u>Myoxocephalus polyacanthocephalus</u>	Great sculpin	X					X
<u>Psychrolutes paradoxus</u>	Tadpole sculpin						X
<u>Radulinus asprellus</u>	Slim sculpin	X					
<u>Rhamphocottus richardsoni</u>	Grunt sculpin						X
<u>Triglops macellus</u>	Roughspine sculpin						X
<u>Triglops pingeli</u>	Ribbed sculpin ^{7/}						X
<u>Triglops forficata</u>	Scissortail sculpin ^{7/}						X
Agonidae - Poachers							
	Unidentified poacher	X	X	X	X	X	X
<u>Agonopsis emmelane</u>	Northern spearnose poacher						X
<u>Agonus acipenserinus</u>	Sturgeon poacher						X
<u>Anoplagonus inermis</u>	Smooth alligatorfish	X					
<u>Asterotheca alascana</u>	Gray starsnout	X					
<u>Asterotheca infraspinata</u>	Spinycheek starsnout	X					
<u>Bathyagonus nigripinnis</u>	Blackfin poacher						X
<u>Hypsagonus quadricornis</u>	Fourhorn poacher						X
<u>Ocella verrucosa</u>	Warty poacher	X					
<u>Sarritor frenatus</u>	Sawback poacher	X					
Cyclopteridae - Lumpfishes and snailfishes							
	Unidentified snailfish	X	X	X	X	X	X
<u>Aptocyclus ventricosus</u>	Smalldisk snailfish						X
<u>Careproctus gilberti</u>	Smooth lumpsucker ^{7/}						X
<u>Careproctus melanurus</u>	Blacktail snailfish ^{7/}	X	X				X
<u>Eumicrotremus derjugini</u>	Leatherfin lumpsucker ^{7/}	X					
<u>Eumicrotremus orbis</u>	Pacific spiny lumpsucker						X
<u>Liparis dennyi</u>	Marbled snailfish						X
<u>Paraliparis deani</u>	Prickly snailfish						X

Table V-3. (cont'd.)

SCIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Pleuronectidae - Righteye flounders							
<u>Atheresthes stomias</u> . . . . .	.Arrowtooth flounder	X	X	X	X	X	X
<u>Eopsetta jordani</u>. . . . .	.Petrale sole	X	X		X	X	X
<u>Glyptocephalus zachirus</u> . . . . .	.Rex sole	X	X	X	X	X	X
<u>Hippoglossoides elassodon</u> . . . . .	.Flathead sole	X	X	X	X	X	X
<u>Hippoglossus stenolepis</u> . . . . .	.Pacific halibut	X	X	X	X	X	X
<u>Isopsetta isolepis</u>. . . . .	.Butter sole	X	X	X	X	X	X
<u>Lepidopsetta bilineata</u>. . . . .	.Rock sole	X	X	X	X	X	X
<u>Limanda aspera</u>. . . . .	.Yellowfin sole	X	X	X	X	X	X
<u>Limanda proboscidea</u> . . . . .	.Longhead dab ^{7/}	X					
<u>Lyopsetta exilis</u>. . . . .	.Slender sole	X					X
<u>Microstomus pacificus</u> . . . . .	.Dover sole	X	X	X	X	X	X
<u>Parophrys vetulus</u> . . . . .	.English sole	X	X	X	X	X	X
<u>Platichthys stellatus</u> . . . . .	.Starry flounder	X	X	X	X	X	X
<u>Pleuronectes quadrituberculatus</u> . . . . .	.Alaska plaice	X	X	X	X	X	X
<u>Psettichthys melanostictus</u>. . . . .	.Sand sole	X	X	X	X	X	X
<u>Reinhardtius hippoglossoides</u>. . . . .	.Greenland halibut						X
	Unidentified flatfishes	X			X	X	
Bothidae - Lefteye flounders							
<u>Citharichthys sp.</u>	Unidentified sanddab	X	X				

1/ Data source includes all exploratory fishing cruises
 2/ Data source includes cruise 611, 052 and 618 (136°00'W to 165°00'W longitude)
 3/ Data source: cruise 619 (151°00'W to 165°00'W longitude)
 4/ Data source: cruise 628 (136°00'W to 151°00'W longitude)
 5/ Data source: cruise 629 (136°00'W to 151°00'W longitude)
 6/ Data source includes cruise 733, 734, 753, 751 and 762 (136°00'W to 165°00'W longitude)
 7/ Identification may be uncertain. Quast and Hall (1974), Hart (1973), Wilimovsky (1958), and Clemens and Wilby (1961) do not describe a Gulf of Alaska distribution for this species.

Table V-4.--List of commercially important invertebrate families and species encountered in Gulf of Alaska exploratory cruises and resource assessment surveys.

SCIENTIFIC NAME	COMMON NAME	<u>1/</u>	<u>2/</u>	<u>3/</u>	<u>4/</u>	<u>5/</u>	<u>6/</u>
Canceridae							
<u>Cancer magister</u>	Dungeness crab	X	X	X	X	X	X
Inachidae							
<u>Chionoecetes bairdi</u>	Tanner crab	X	X	X	X	X	X
Lithodidae							
<u>Lithodes aequispina</u>	Golden king crab						X
<u>Paralithodes camtschatica</u>	Red king crab	X	X	X	X	X	X
Pandalidae							
<u>Pandalus borealis</u>	Pink shrimp	X	X	X	X	X	X
<u>Pandalus danae</u>	Dock shrimp	X					X
<u>Pandalus goniurus</u>	Humpy shrimp	X					X
<u>Pandalus hypsinotus</u>	Coonstripe shrimp	X	X				X
<u>Pandalus jordani</u>	Ocean pink shrimp	X					X
<u>Pandalus platyceros</u>	Spot shrimp	X	X				X
<u>Pandalus montagui tridens</u>		X					X
<u>Pandalopsis dispar</u>	Sidestripe shrimp	X	X				X
Pectinidae							
<u>Pecten caurinus</u>	Weatherwane scallop	X	X	X	X	X	X

1/ Data source includes all exploratory fishing cruises

2/ Data source includes cruise 611, 052 and 618 (136°00'W to 165°00'W longitude)

3/ Data source: cruise 619 (151°00'W to 165°00'W longitude)

4/ Data source: cruise 628 (136°00'W to 151°00'W longitude)

5/ Data source: cruise 629 (136°00'W to 151°00'W longitude)

6/ Data source includes cruise 733, 734, 753, 751 and 762 (136°00'W to 165°00'W longitude)

DATA SOURCES

A. Exploratory fishing data.--Bureau of Commercial Fisheries, Seattle, Washington, 1948-1959.

B. Exploratory fishing data.--Bureau of Commercial Fisheries, Juneau, Alaska, 1960-1970.

C. Demersal fish and crab resource survey data.--International Pacific Halibut Commission, 1961-1963.

D. Results from surveys of Pacific ocean perch.--Fisheries Research Board of Canada, 1963-1970.

E. Pandalid shrimp resource assessment survey data.--National Marine Fisheries Service, NWAFC, Kodiak, Alaska.

F. Demersal fish resource assessment survey data.--National Marine Fisheries Service, NWAFC, Seattle, Washington.

G. Domestic catch statistics.--International Pacific Halibut Commission and Alaska Department of Fish and Game (ADF&G).

H. Foreign catch statistics.--Japanese Fisheries Agency and meetings with scientific delegations of the Soviet Union, Republic of Korea, and Poland.

These data bases have been divided into three categories for analysis:

- (1) Catch statistics, domestic and foreign.
- (2) Exploratory fishing cruises.
- (3) Resource assessment surveys.

Data sources not included in this report are those from research projects of ADF&G, Pacific ocean perch investigations conducted at the NMFS Auke Bay Laboratory, the Bureau of Commercial Fisheries 1969 scallop explorations in the western Gulf of Alaska and the 1968 ADF&G-BCF cooperative scallop exploration in the eastern Gulf of Alaska. These data were not available for automatic data processing.

HISTORY OF COMMERCIAL EXPLOITATION OF DEMERSAL FISH
AND SHELLFISH SPECIES IN THE GULF OF ALASKA

INTRODUCTION

Commercial harvesting of demersal resources within the northern Gulf of Alaska Study Area has been carried out by both North American fishermen (American and Canadian) and foreign fishermen (Japanese, Soviets, South Koreans, and Poles). The fisheries developed by these various foreign nationals have remained relatively non-competitive of domestic fisheries with a few significant exceptions. United States fishermen have concentrated on shellfishes such as shrimp, crab, and scallop and virtually ignored the finfishes except for the halibut which is the object of a common fishery by Americans and Canadians. Foreign fishermen generally seek finfishes other than the halibut and to a lesser extent they have taken shrimp. Conflicts between domestic and foreign fishing endeavors have arisen because of incidental catches of halibut taken by the large scale foreign effort on other species, over competition for fishing grounds, and over lost or damaged fishing gear, especially crab traps, for which Americans have blamed foreign fishing activities.

DOMESTIC FISHERIES

1. King crab

Commercial king crab fishing in the northern Gulf of Alaska began in the early 1950's after a decade of small experimental catches (Table VII-1). The magnitude of the catch increased rapidly to peak at 53 thousand mt in 1966 which was followed by a rapid decline during the late 1960's. During the early part of the 1970's the king crab catch has increased slightly and appears to have stabilized at 10-12 thousand mt.

2. Tanner crab

The commercial harvesting of Tanner (snow) crab in the northern Gulf of Alaska began in the late 1960's (Table VIII-2), and coincided with the aforementioned decline in the production of king crab. The commercial utilization of the Tanner crab resource was hampered by unusual difficulty in the separation of meat from shell, and once this technological problem was overcome production increased rapidly.

3. Dungeness crab

The fishery for Dungeness crab is one of the older ones in Alaska, but records for the catch from central Alaska (Cape Suckling to Scotch Cap) were not separated from the remainder of Alaska until 1941 (Table VII-3). The catch from the (approximate) Study Area has varied at a relatively low level during the 30 years for which records are available. It is likely that the catch of Dungeness crab in Alaska is influenced by the supply of other crab species and by the availability of Dungeness crab off the Pacific Northwest.

Table VII-1,--United States catch of king crab in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W long.), 1941-1973. SOURCE: U.S. Fishery Statistics.

Year	Catch (mt)
1941	15
1942	32
1943	14
1944	0.7
1945	--
1946	4
1947	0.2
1948	--
1949	--
1950	29
1951	92
1952	354
1953	1,186
1954	2,883
1955	2,699
1956	3,129
1957	5,664
1958	5,085
1959	8,544
1960	12,643
1961	17,621
1962	20,251
1963	23,032
1964	23,419
1965	42,860
1966	53,200
1967	37,647
1968	17,034
1969	9,195
1970	8,883
1971	9,170
1972	11,212
1973	12,068

Table VII-2.—United States catch of Tanner (snow) crab in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W. long.), 1951-1973.
 SOURCE: U.S. Fishery Statistics.

Year	Catch (mt)
1951	5
1952	6
1953	23
1954	--
1955	0.3
1956	--
1957	--
1958	--
1959	--
1960	--
1961	--
1962	2
1963	--
1964	--
1965	--
1966	0.1
1967	52
1968	1,407
1969	4,482
1970	5,635
1971	5,652
1972	13,258
1973	26,892

Table VII-3.--United States catch of Dungeness crab in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W long.), 1941-1973.
SOURCE: U.S. Fishery Statistics.

Year	Catch (mt)
1941	243
1942	273
1943	254
1944	377
1945	574
1946	812
1947	438
1948	459
1949	452
1950	1,259
1951	1,363
1952	545
1953	629
1954	675
1955	907
1956	397
1957	99
1958	540
1959	1,169
1960	1,243
1961	1,314
1962	2,298
1963	3,358
1964	3,662
1965	2,536
1966	1,160
1967	3,416
1968	4,195
1969	3,779
1970	3,036
1971	936
1972	1,295
1973	1,511

4. Pandalid shrimp

Alaska's shrimp fishery is one of that state's older fishing enterprises and extends at least from 1918 (Wiese, 1971). Most of the activity during these early years was in Southeastern Alaska, however, and the U.S. shrimp fishery within the northern Gulf of Alaska did not bloom until late in the 1950's (Table VII-4). The above shrimp catch from central Alaska, which includes Cook Inlet and Prince William Sound as well as the Study Area, continued to expand during the 1960's and into the 1970's, climbing to more than 53 thousand mt in 1973.

5. Scallop

The historical records for the scallop fishery in central Alaska, including the Study Area, include the period from 1967 to recent years (Table V-II-5). The fishery for scallop has been restricted in its development by the regulatory closure of some waters to fishing scallop gears, dredges and trawls, to protect other commercially valuable species, especially crab, which might be injured by these gears. In the Study Area itself the scallop fishery is relatively small in comparison to those for crab, shrimp, and halibut.

6. Halibut

Throughout its range in the eastern Pacific Ocean, from California to the Bering Sea, halibut are the objectives of a fishery conducted jointly by fishermen from both the United States and Canada. The halibut fishery in the eastern Pacific began in the late 19th century and was restrained in its development only by market demands, a condition that led to depletion of stock by the early years of the 20th century. The United States and Canada joined together to rebuild and manage the halibut stocks and from 1920 until about 1960 the condition of the halibut stocks appeared to improve. Since 1960, however, the relative condition of halibut stocks as measured by catch per unit of effort, has declined sharply in spite of reduced catches and increased minimum size limitations imposed by the International Pacific Halibut Commission (IPHC). North American fishermen are inclined to blame the incidental halibut catch by large scale operations of foreign fishermen, principally Japanese and Soviet, as an important factor in the decline of halibut stocks.

The catch of halibut by American and Canadian fishermen from within the area between Cape Spencer (136°30'W long) to the Trinity Islands (155°W long) and for the period from 1921-1960 is shown in Table VII-6. During this 40-year period the catch has ranged from less than 9 thousand mt in 1921 and 1922 to nearly 18 thousand mt in 1954 with a mean annual catch of 12,542 mt. There was a long term trend towards increasing the catch through the years.

The catch of halibut by United States and Canadian fishermen from within the Study Area for the years 1960-1975 is shown in Tables VIII-6 and VIII-7. The catch remained at about 20 thousand mt annually from 1960 through 1970, but then it declined sharply to a level of 6-8 thousand mt in 1974-1975. The outlook for the halibut fishery remains in doubt at this time.

Table VII-4.--United States catch of pandalid shrimp in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W long.), 1942-1973. SOURCE: U.S. Fishery Statistics.

Year	Catch (mt)
1942	0
1943	1
1944	0
1945	5
1946	0
1947	9
1948	0
1949	0
1950	0.6
1951	0.6
1952	4
1953	5
1954	6
1955	23
1956	5
1957	13
1958	116
1959	3,417
1960	1,856
1961	5,337
1962	5,922
1963	5,450
1964	2,237
1965	6,292
1966	11,069
1967	17,691
1968	18,129
1969	20,939
1970	33,242
1971	42,599
1972	37,556
1973	53,876

Table VII-5.--United States catch of scallop in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W long.), 1967-1973.
 SOURCE: U.S. Fishery Statistics.^{1/}

Year	Catch (mt)
1967	4
1968	3,563
1969	4,767
1970	6,429
1971	3,838
1972	4,711
1973	4,244

^{1/} The meat weights given in U.S. Fishery Statistics have been multiplied by 10 to approximate catch weight in the round.

Table VII-6.--Combined United States and Canadian catches of halibut from Cape Spencer (136°30'W long.) to Trinity Islands (155°W long.), 1921-1960.

SOURCE: Bell, 1968

Year	Catch (mt)		Total
	Cape Spencer to Cape St. Elias	Cape St. Elias to Trinity Islands	
1921	5,635	3,257	8,892
1922	4,272	2,742	7,014
1923	7,293	5,730	13,023
1924	5,103	9,864	14,967
1925	4,409	8,953	13,362
1926	3,236	9,435	12,671
1927	4,934	8,707	13,641
1928	4,855	8,734	13,589
1929	4,135	9,295	13,430
1930	3,410	7,559	10,969
1931	3,072	5,736	8,808
1932	3,496	6,580	10,076
1933	4,302	7,492	11,794
1934	3,841	7,443	11,284
1935	4,638	6,953	11,591
1936	4,243	6,736	10,979
1937	3,268	7,797	11,065
1938	3,987	7,846	11,833
1939	3,362	8,142	11,504
1940	3,028	9,806	12,834
1941	2,594	9,270	11,864
1942	2,653	9,766	12,419
1943	3,157	9,073	12,230
1944	2,316	9,782	12,098
1945	1,940	9,895	11,835
1946	3,303	9,858	13,163
1947	4,289	7,679	11,968
1948	2,879	8,952	11,831
1949	3,586	9,046	12,632
1950	3,972	10,400	14,372
1951	3,841	8,738	12,579
1952	5,575	10,868	16,443
1953	4,974	8,797	13,771
1954	5,455	12,306	17,761
1955	4,310	9,567	13,877
1956	3,572	9,761	13,333
1957	3,168	10,610	13,778
1958	3,946	10,480	14,426
1959	5,018	10,276	15,294
1960	3,259	9,431	12,690

By authority of the IPHC, North American fishermen have been limited annually to 11 thousand mt (dressed weight) of halibut to be taken by hook and line gear only in the Northeast Pacific Region in 1974 and 1975. Dressed weight of halibut is approximately 75% of round weight.

7. Sablefish

Sablefish is one of the older fisheries pursued by American fishermen in the Pacific Northwest, but in spite of the fact that Japanese fishermen have harvested a big catch from the northern Gulf of Alaska, Americans have not developed any significant sablefish industry there (Table VII-7).

FOREIGN FISHERIES

In addition to the domestic fisheries conducted by Americans and Canadians in the northern Gulf of Alaska, there are also major fisheries by Japan and the Soviet Union and lesser fisheries by the Republic of Korea, Poland, and the Republic of China (Taiwan). A summary of these foreign fisheries from 1969-1975 is given in Table VII-8. Japan has taken 55% of the catch during the period, and the Soviet Union 43%; South Korea and the Poles have only a few years of record in the area while the Chinese effort was that of a single trawler in 1976.

Regulations which affect the fishing activities of foreign nations in the waters off Alaska have been imposed by the United States. In the period before March 1, 1977, these regulations, in the form of catch limitations, gear prohibitions, and time-area closures, were included in bilateral agreements. As of March 1, 1977, however, provisions of the Fishery Conservation and Management Act of 1976 have permitted the United States to extend its jurisdiction over the fisheries, to establish programs for their management, and to allocate the harvest between domestic and foreign fishermen.

1. Japanese fisheries

Japanese fisheries in the northern Gulf of Alaska Study Area can be classified according to the gear and methods employed: bottom gill net, trawl (including Danish seine, side trawl, stern trawl, and shrimp trawl); and longline. Both the bottom gill net and trawl fisheries began in the early 1960's, but the gill net venture endured only a single season while the trawl fishery continues to the present. The longline fishery in the Study Area began in 1968 and continues until the present.

Table VII-7.--United States catch of sablefish (blackcod) in the area from Cape Suckling (144°W long.) to Scotch Cap (165°W long.), 1945-1973.
 SOURCE: U.S. Fishery Statistics.

Year	Catch (mt)
1945	0.8
1946	0
1947	0
1948	9
1949	12
1950	0
1951	211
1952	6
1953	0
1954	9
1955	0
1956	0
1957	0
1958	0
1959	0
1960	17
1961	1
1962	1
1963	1
1964	0
1965	0
1966	60
1967	43
1968	0.2
1969	0
1970	5
1971	10
1972	3
1973	17

Table VII-8.--Summary of foreign fish and shellfish catches from within the Study Area, 1969-1975 (metric tons).

Nation Fishery	Y E A R							Total	%
	1969	1970	1971	1972	1973	1974	1975		
<u>Japan</u>									
Trawl	49,410	41,509	44,550	51,655	66,864	62,068	55,138	371,194	43
Longline	10,527	15,918	14,734	19,184	15,823	11,515	14,664	102,365	12
Other	--	1,643	--	--	--	--	--	1,643	--
TOTAL	59,937	59,070	59,284	70,839	82,687	73,583	69,802	475,202	55
<u>U.S.S.R.</u>									
Fish	20,000	9,000	31,000	68,875	53,171	79,468	95,465	356,979	41
Shrimp	5,307	4,218	4,717	2,313	2,000	1,106	?	19,661	2
TOTAL	25,307	13,218	35,717	71,188	55,171	80,574	95,465	376,640	43
<u>South Korea</u>	--	--	--	4,000	4,000	6,000	?	14,000	2
<u>Poland</u>	--	--	--	--	100	183	2,132	2,415	0
Grand Total	85,244	72,288	95,001	146,027	141,958	160,340	167,399	868,257	100

a. Bottom gill net fishery

During the single year (1963) it was conducted, the bottom gill net fishery took 1,556 mt of bottom fish (Table VII-9). Of this total a single species, sablefish, contributed 1,498 mt (96.3%), arrowtooth flounder (turbot) 22 mt (1.4%), and miscellaneous rockfishes, including Pacific Ocean perch, 35 mt (2.3%).

The bulk of the catch of the bottom gill net fishery was taken in the vicinity of Kodiak Island (81%) with the lesser amounts from the Yakutat (11%), the Chirikof (6%), and the Shumagin (2%) Divisions (Tanonaka and Nishimoto, 1965).

The Japanese company fishing the gill nets apparently encountered a number of drawbacks with this operation and elected to change over to longline fishing. In comparison to gill nets, longline gear is relatively cheaper, more easy to repair or replace, more quickly set and retrieved, and the fish caught are of superior quality.

b. Trawl fishery

As noted above, the Japanese trawl fishery includes a variety of gears that have in common the fact that in operation they sweep the ocean bottom. In the course of its development over the years, however, stern trawling has replaced the other methods classified here under trawl fishing.

After its start within the northern Gulf of Alaska about 1963, Japan's trawl fishery catch increased rapidly, and by 1966 it took more than 83 thousand mt. Catches then declined moderately and have since fluctuated between 45 and 70 thousand mt annually in the 1970's (Table VII-9).

Within the INPFC Area Divisions (Table VII-9), the largest part of the trawl catch came from the Kodiak area (36%), followed by Yakutat (29%), Shumagin (18%), and Chirikof (17%). The species composition of the Japanese trawl catch will be considered in Section VIII where regional catch statistics are discussed.

c. Longline fishery

The Japanese longline fishery within the Study Area started in 1968 and was directed at sablefish. Catch records ^{1/} indicate that 98% of the weight caught by this fishery, 1969-1974, has been sablefish. The annual catch has fluctuated between 13 and 18 thousand mt since 1970 (Table VII-9).

Within the various INPFC Area Divisions (Table VII-9), nearly half (47%) of the longline catch has come from the Yakutat Region followed by Kodiak (28%), Shumagin (14%), and Chirikof (11%).

^{1/} No official record of Japan's longline catch for the period 1963-1967 is available.

Table VII-9.--Japanese fisheries from Cape Spencer (137°W long.) to Unimak Pass (169°W long.) by area, year, and gear type, 1963-1973. (Catches in metric tons.)

Year	Gear type	I.N.P.F.C. area divisions ^{1/}				Total
		Shumagin	Chirikof	Kodiak	Yakutat	
1963	Trawl	?	?	?	?	9,373
	Bottom gillnet	37	88	1,266	165	1,556
	Total	37+	88+	1,266+	165+	10,929
1964	Trawl	1,904	1,472	16,362	25	19,763
1965	Trawl	12,456	14,285	26,445	61	53,247
1966	Trawl	27,020	26,697	34,056	586	83,359
1967	Trawl	11,694	9,371	22,900	16,942	60,907
1968	Trawl	2,540	3,266	12,520	40,252	58,578
	Longline	68	164	982	3,352	4,566
	Total	2,608	3,430	13,502	43,604	63,144
1969	Trawl	14,252	8,135	16,401	24,155	62,943
	Longline	486	597	2,069	5,183	8,335
	Total	14,738	8,732	18,470	29,338	71,278
1970	Trawl	7,175	7,953	15,343	13,744	44,215
	Longline	1,184	1,161	4,501	7,051	13,897
	Total	8,359	9,114	19,844	20,795	58,112
1971	Trawl	8,066	6,484	18,825	17,116	50,491
	Longline	1,794	1,209	4,074	6,371	13,448
	Total	9,860	7,693	22,899	23,487	63,939
1972	Trawl	12,412	4,952	21,291	22,824	61,479
	Longline	3,379	2,398	5,049	7,065	17,891
	Total	15,791	7,350	26,340	29,889	79,370
1973	Trawl	6,541	12,819	20,414	29,454	69,228
	Longline	3,656	2,355	4,301	5,668	15,980
	Total	10,197	15,174	24,715	35,122	85,208
1963-1973						
	Trawl	99,060	95,434	204,557	165,159	564,210
	Longline	10,567	7,884	20,976	34,690	74,117
	Bottom gillnet	37	88	1,266	165	1,566
	Total	109,664	103,406	226,799	200,014	639,883

^{1/} Note that these INPFC (International North Pacific Fisheries Commission) area divisions are different from the regions bearing similar names which appear elsewhere in this report. Under INPFC system the boundaries are as follows:

Shumagin: 159°-169°W long.
 Chirikof: 154°-159°W long.
 Kodiak: 147°-154°W long.
 Yakutat: 137°-147°W long.

d. Combined Japanese fisheries

The combined Japanese fisheries for groundfishes in the 11-year period, 1963-1973, within the Study Area took 640 thousand mt of which 564 thousand mt (88%) was taken by trawl, 74 thousand mt (12%) was taken by longline, and 2 thousand mt (0.2%) was taken by the short-lived sunken gill net fishery in 1963 (Table VII-9).

Of the combined fish catch by all gears, the Kodiak (INPFC) area provided 35%, the Yakutat area 31%, the Shumagin area 17%, and the Chirikof area 16%. The annual combined catch by Japan from within the study area from 1955 to 1973 ranged from 53 to 85 thousand mt with a mean of 70 thousand mt. Catches during the last 2 years generally have been well above the mean.

There was a limited Japanese fishery for shrimp, operating in the vicinity of Kodiak, from 1964-1968, with a catch ranging from 231 to 2 thousand mt annually. Pink shrimp (*P. borealis*) appear to be the principal species taken although records are neither precise nor comprehensive on this fishery. By comparison with the late blooming United States shrimp fishery (Table VII-4), the shrimp catch by Japan was relatively minor.

Soviet Fisheries

Soviet fishing in the Gulf of Alaska began with an exploratory effort in 1960, and by 1963 Soviet fishing fleets were engaged in year-round operations throughout much of the Study Area, their primary target being Pacific ocean perch (Chitwood, 1969). Records of Soviet fishing, especially during the first half of the 1960's are lacking in precision with respect to geographic and species origin of the catch, but have generally improved in recent years (Table VII-10).

The level of Soviet fishing activity in the northern Gulf of Alaska appears to have increased from 1962-1965, diminished from 1966-1970, and then increased again in 1971-1973. The decline in the Soviet bottomfish catch from 1966-1970 corresponds to their development in 1964 and later years of a fishery for hake off the Pacific Northwest.

Beginning with 1973, the precision of Soviet catch reporting improved, and their catches for 1973-1975 by species or species group and INPFC subarea are presented in Table VII-11. In this "modern" era, the pollock and Atka mackerel have exceeded the Pacific Ocean perch as target species of the Soviet trawl fishery. The level of Soviet catches has risen sharply each year since 1973, and the bulk of the catch has come from the Kodiak area.

A Soviet shrimp fishery began during the fall of 1964 in the vicinity of Kodiak Island with the appearance of 2 trawlers. In subsequent years the number of Soviet vessels increased as did the area encompassed by operations with an estimated 8 thousand mt of shrimp being taken in 1965 and 12 thousand mt in 1966 (Chitwood, 1969). The catch of the Soviet shrimp fishery within the Study Area has lessened during the 1970's (Table VII-8).

Table VII-10.--Bottomfish catches^{1/} by the U.S.S.R. from the Gulf of Alaska, 1963-1973. (In metric tons.)

Area and species	Year										
	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Western Gulf of Alaska											
(165°W-147°W)	?	?	?	?	53,260	29,680	19,311	9,336	22,479	68,865	58,312
Pacific halibut	?	?	?	?	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	302	162
Other flatfishes	?	?	?	?	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	1,363	1,038
Sablefish	?	?	?	?	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	535	109
Pacific cod	?	?	?	?	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	176	2,696	3,300
Pollock	?	?	?	?	-- ^{3/}	-- ^{3/}	-- ^{3/}	-- ^{3/}	440	20,385	33,124
Rockfishes	?	?	?	?	44,473	20,680	18,159	-- ^{3/}	21,600	24,011	5,488
Atka mackerel	?	?	?	?	--	--	--	7,282	--	6,282	10,998
Other fishes	?	?	?	?	8,787	9,000	1,152	2,054	263	13,290	4,093
Eastern Gulf of Alaska											
(147°W-54°40'N)	?	?	?	?	23,677	29,742	704	0	8,540	0	3,844
Rockfishes	?	?	?	?	22,012	24,506	665	0	8,100	0	158
Others	?	?	?	?	1,665	5,236	39	0	140	0	3,686
Total	108,000 ^{2/}	230,000 ^{2/}	340,000 ^{2/}	83,000 ^{2/}	76,937	59,422	20,015	9,336	31,019	68,865	62,156

^{1/} Round weight.

^{2/} Includes waters off southeast Alaska.

^{3/} Catch, if any, is included in "other fishes."

SOURCE: 1963-1966: Mutual Information Exchanges by Scientific Delegations.

1967-1973: INPFC Proceedings of the 22nd Annual Meeting 1975, Table 12, p. 273.

Table VII-11.--Soviet fish and shellfish catches from within the Study Area, by subarea and species group, 1973-1975 (in metric tons).

Species or species group	I.N.P.F.C. Statistical Area ^{1/}												Study Area total		
	Shumagin			Chirikof			Kodiak			Yakutat			1973	1974	1975
	1973	1974	1975	1973	1974	1975	1973	1974	1975	1973	1974	1975			
Flatfishes	257	490	545	539	31	25	304	1,861	2,234	35	12	12	1,135	2,394	2,816
Halibut	36	5	17	74	27	9	52	16	24	12	12	--	174	60	50
Turbot ^{2/}	153	393	451	424	4	16	189	1,015	1,237	--	--	10	766	1,412	1,714
Others	68	92	77	41	--	--	63	830	973	23	--	2	195	922	1,052
Roundfishes	12,714	13,452	12,225	13,071	3,994	2,210	14,985	31,978	53,155	3,173	1,191	2,719	43,943	50,615	70,309
Atka mackerel	3,319	4,742	2,132	5,003	2,748	743	321	10,041	23,688	856	--	1,213	9,499	17,531	27,776
Pacific cod	739	40	309	829	--	--	1,256	2,096	2,226	95	--	16	2,919	2,136	2,551
Rattails	--	--	--	--	--	--	5	--	--	--	--	--	5	--	--
Sablefish	2	--	8	35	--	5	72	27	18	--	11	2	109	38	33
Sculpins	17	--	--	24	--	--	32	--	--	1,208	--	--	1,281	--	--
Pollock	8,637	8,670	9,776	7,180	1,246	1,462	13,299	19,814	27,223	1,014	1,180	1,488	30,130	30,910	39,949
30 Rockfishes	757	4,180	2,921	1,384	3,034	1,437	2,042	7,892	10,330	158	2,088	383	4,341	17,194	15,071
Pacific ocean perch	707	3,987	2,624	1,248	2,716	1,238	1,879	2,612	9,150	136	1,647	302	3,970	10,962	13,314
Others	50	193	297	136	318	199	163	5,280	1,180	22	441	81	371	6,232	1,757
Other fishes	254	1,880	938	1,124	930	416	1,896	4,569	5,716	478	180	199	3,752	7,559	7,269
Groundfish total	13,982	20,002	16,629	16,118	7,989	4,088	19,227	46,300	71,435	3,844	3,471	3,313	53,171	77,762	95,465
Shrimp	--	600	--	--	--	--	--	1,106	--	--	--	--	--	1,706	--
Grand total	13,983	20,602	16,629	16,118	7,989	4,088	19,227	47,406	71,435	3,844	3,471	3,313	53,171	79,468	95,465

^{1/} Note that these areas are different from the regions bearing similar names used elsewhere in this report. The limits of these I.N.P.F.C. areas are as follows: Shumagin 159°-170°W long.; Chirikof 154°-159°W long.; Kodiak 147°-154°W long.; and Yakutat 137°-147°W long.

^{2/} Turbot here is Atheresthes stomias, the arrowtooth flounder.

Republic of Korea Fisheries

Fish production by South Korean vessels within the Study Area is poorly documented and has been estimated as shown in Table VII-8. The composition of the catch by Korean fleets appears to consist of a mixture of flatfishes and sablefish.

Vessels of the ROK are not permitted by U.S. regulations to fish halibut in the Northwest Pacific Region.

Polish Fisheries

In the initial year of operation in the northern Gulf of Alaska, 1973, Poland reported a catch of 100 mt of pollock, and in 1974 she reported another 100 mt of pollock plus 83 mt of Atka mackerel. In 1975 the fishery increased and she reported a total catch of 2,132 mt made up of 784 mt of Pacific cod, 631 mt of pollock, 619 mt of Atka mackerel, 67 mt of arrowtooth flounder, and 31 mt of halibut. All the 1975 catch came from the Kodiak (INPFC) Area except the halibut which was attributed to the Chirikof Area (Table VII-8).

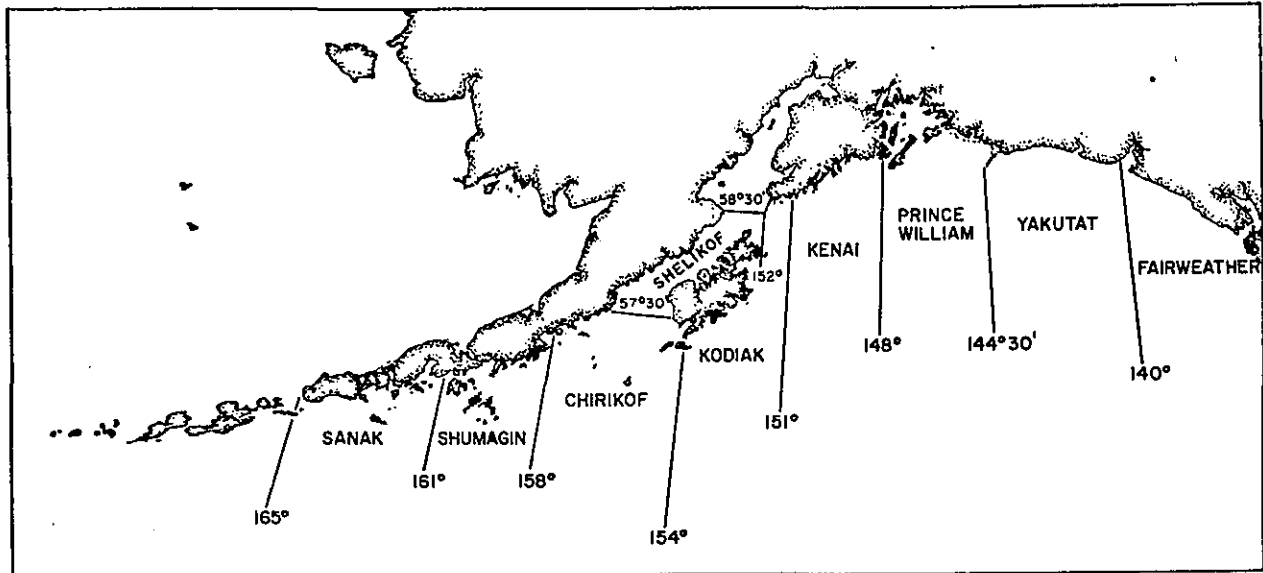


Figure VIII-1.--Regions of the northern Gulf of Alaska Study Area.

VIII

REGIONAL CATCH STATISTICS

INTRCDUCTION

The Study Area was divided into nine regions as shown in Figure VIII-1, and the annual catches for both domestic and foreign fisheries were determined for each of the regions.

DOMESTIC FISHERIES

The domestic fisheries include those by U.S. fishermen on shellfishes (crab, shrimp, and scallop) and that by U.S. and Canadian fishermen on halibut. Among the domestic fisheries in the Study Area, the shrimp fishery with an annual mean catch of 37 thousand mt (for the 7 years from 1969 to 1975) is the largest, followed by the halibut fishery (10 thousand mt), the king crab fishery (9 thousand mt), the Dungeness crab fishery (2 thousand mt), and the scallop fishery (458 mt). If the separate crab fisheries are considered as a whole, this fishery with a mean annual catch of 21 thousand mt would be second only to shrimp among the domestic fisheries in the Gulf of Alaska.

1. King crab

Four distinct species are included under the designation of king crab by the Alaska State Fishing Regulations. The four species are:

<u>Common name</u>	<u>Scientific name</u>
Red king crab	<u>Paralithodes camtschatica</u>
Blue king crab	<u>Paralithodes platypus</u>
none	<u>Paralithodes brevipes</u>
Brown or golden king crab	<u>Lithodes aequispina</u>

Within the Study Area, Paralithodes camtschatica is by far the most common king crab; Lithodes aequispina occurs sporadically, and the other two species are rare.

Commercial king crab fishing in Alaskan waters was begun during the 1930's by Japan in the eastern Bering Sea, but a king crab fishery did not develop within the Study Area until the early 1950's, when an American fishery began in the vicinity of Kodiak Island. Fishing for king crab by Americans is done with large square baited pots that are set and retrieved by fishing boats. The larger male crabs are retained and delivered alive to either shore plants or factory ships for processing.

For the period from 1969-1975, the annual catch of king crab by American fishermen from each of the regions within the Study Area is shown in Table VIII-1; a mean annual catch based on the number of years for which data is reported from each region is also presented. In order of importance to king crab production during 1969-75, the regions rank as follows: Kodiak (35%), Chirikof (29%), Sanak (16%), Shelikof (14%), Shumagin (4%), and Kenai (2%). Fairweather, Yakutat, and Prince William produced no significant amounts of king crab. The annual king crab production from within the Study Area as a whole, ranged from 7 to 12 thousand mt with a mean of 9 thousand mt and a trend toward increased production in more recent years.

The fishery for king crab within the Study Area is regulated by the Alaska Board of Fish and Game. King crab vessels and gears must be registered prior to fishing in one of several statistical areas of the fishery, and be used only in that area. Pots, ring nets, and diving gear are the only legal means of fishing. Minimum size limits are set for male crabs, and the retention of undersized males and all females is illegal. Fishing seasons for king crabs usually start during August and continue until a set harvest level has been obtained.

2. Tanner crab

Two species of Tanner crab are found in Alaskan waters, Chionoecetes bairdi and Chionoecetes opilio; Chionoecetes bairdi is by far the most common.

Table VIII-1.--United States catches^{1/} of king crab, 1969 - 1975, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.6	1	0.6
Yakutat	0.0	0.0	0.0	2.0	0.0	0.0	3.0	5.0	2	2.5
Prince William	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0
Kenai	83.7	186.9	8.0	96.4	225.9	435.9	364.8	1,401.6	7	200.2
Kodiak	2,507.1	2,570.1	2,090.3	2,328.4	3,429.8	4,674.3	4,865.3	22,465.3	7	3,209.3
Shelikof	1,583.2	1,235.8	518.6	935.6	933.3	1,808.9	2,111.5	9,126.9	7	1,303.8
Chirikof	1,499.6	1,411.5	2,764.4	3,617.9	1,956.9	3,547.6	3,462.7	18,260.6	7	2,608.7
Shumagin	391.2	226.9	311.8	697.7	444.0	337.7	147.4	2,556.7	7	365.2
Sanak	1,628.5	1,296.1	1,461.4	1,733.3	1,616.7	1,487.7	859.3	10,083.0	7	1,440.4
TOTAL	7,693.3	6,927.3	7,154.5	9,411.9	8,606.6	12,292.1	11,814.0	63,899.7	7	9,128.5

^{1/} Round weight

The fishery for Tanner crab increased markedly during the mid-1970's, because of improved technology for processing. Difficulties in filling the demand for king crab has led fishermen and processors to turn increasingly to Tanner crab to meet their needs.

Fishing is done with truncated conical-shaped or square pots, each with its own buoy line, set and retrieved by the fishing vessel. As of 1975, no minimum size had been specified for tanner crab, but only the males were to be retained for processing. The season for Tanner crab is variable according to district, but it begins during the fall of the year and lasts until either a specified date the following spring, or until a specified harvest has been obtained.

For the period from 1969-75, the annual catch of Tanner crab by American fishermen from each of the regions within the Study Area is shown in Table VIII-2; a mean annual catch based upon the number of years with reported data is also presented. In order of importance to Tanner crab production, the regions rank as follows: Kodiak (29%), Shelikof (22%), Chirikof (19%), Sanak (11%), Shumagin (11%), Yakutat (3%), Kenai (3%), Fairweather (2%), and Prince William (1%). The annual production within the Study Area as a whole, ranged from 4 to 19 thousand mt, with a mean of 10 thousand mt, and a trend toward increasing production in the more recent years.

3. Dungeness crab

The success of year-classes is highly variable in the Dungeness crab population, and the fishery in Alaska is to a degree dependent upon conditions in the fishery for this species off the Pacific Northwest, where a short supply of crabs encourages fishing in Alaska. Commercial fishing is done from fishing vessels which set and retrieve cylindrical-shaped baited pots. The state of Alaska defines a legal 6½" minimum size limitation on male crabs, and requires that smaller males and all females be returned to the sea. Except for a variable closed period in spring, the fishing season remains open much of the year.

The annual catch of Dungeness crab from within each of the regions of the Study Area is shown in Table VIII-3 together with a mean annual catch derived from the number of years in which data were reported. In order of importance to the production of Dungeness crab, the regions rank as follows: Chirikof (23%), Yakutat (23%), Kodiak (21%), Shelikof (18%), Fairweather (12%), and Sanak (3%). The Shumagin and Prince William Regions contribute little or nothing to the Dungeness crab catch. Within the Study Area as a whole, the annual catch of Dungeness crab has ranged from .6 to 35 thousand mt during the 7-year period from 1969 to 1975, with a mean annual catch of 2 thousand mt. A general trend of declining although variable production from 1969 to 1975 is evident.

4. Pandalid shrimp

Three pandalid shrimp species make up the bulk of the commercial catch from the Study Area. The most important, contributing 80-90% of the catch, is Pandalus borealis, the pink shrimp. Other important species are Pandalus goniurus, the humpy shrimp, which is most often taken in shallow waters and Pandalopsis dispar, the sidestripe shrimp, a deeper water

Table VIII-2.--United States catches^{1/} of Tanner (snow) crab, 1969 - 1975, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	--	--	--	12.9	132.8	280.9	525.9	952.5	4	238.1
Yakutat	--	--	--	7.0	92.6	568.0	377.3	1,044.9	4	261.2
Prince William	135.6	--	--	--	--	--	--	135.6	1	135.6
Kenai	16.0	76.0	31.5	318.8	450.7	864.3	36.2	1,793.5	7	256.2
Kodiak	1,961.5	1,701.8	869.6	1,595.0	5,604.7	4,850.7	3,970.7	20,553.4	7	2,936.2
Shelikof	974.0	1,412.6	995.5	2,695.6	4,429.2	3,203.3	2,035.3	15,745.5	7	2,249.4
Chirikof	129.5	301.0	1,485.5	1,119.6	4,454.3	3,883.6	2,213.4	13,586.9	7	1,941.0
Shumagin	153.7	697.9	672.4	395.4	1,329.1	2,095.6	2,303.4	7,647.5	7	1,092.5
Sanak	140.3	250.1	307.5	1,271.3	1,299.9	2,920.1	1,540.2	7,729.4	7	1,104.2
TOTAL	3,510.6	4,439.4	4,362.0	7,415.6	17,793.3	18,665.9	13,002.4	69,189.2	7	9,884.2

^{1/} Round weight

Table VIII-3.--United States catches^{1/} of Dungeness crab, 1969 - 1975, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	--	201.3	201.0	459.9	515.3	108.5	97.8	1,619.8	6	270.0
Yakutat	547.6	515.8	365.9	505.0	633.4	385.1	187.4	3,140.2	7	448.6
Prince William	--	--	--	--	--	--	--	0	0	0
Kenai	--	--	--	--	0.4	--	--	0.4	1	0.4
Kodiak	675.9	892.7	213.6	350.7	456.9	165.7	117.9	2,873.4	7	410.5
Shelikof	380.9	530.6	211.8	555.9	377.7	159.5	192.7	2,409.1	7	344.2
Chirikof	1,494.3	1,094.6	225.1	265.0	79.6	17.1	3.4	3,179.1	7	454.2
Shumagin	40.6	--	6.0	--	7.1	--	--	53.7	3	17.9
Sanak	361.1	2.4	--	--	81.1	--	--	444.6	3	148.2
TOTAL	3,500.4	3,237.4	1,223.4	2,172.5	2,151.5	835.9	599.2	13,720.3	7	1,960.0

^{1/} Round weight

species. A number of other pandalid shrimp species also contribute small amounts to the commercial catch.

During the period from 1965 to 1975, the regions rank as follows in order of their importance to shrimp production (Table VIII-4): Kodiak (61%), Shumagin (24%), Chirikof (6%), and Sanak (3%). Little or no shrimp came from the Fairweather, Yakutat, Prince William, and Kenai Regions. The annual production of shrimp from the Study Area as a whole, ranged from 19 to 51 thousand mt, with a mean of 37 thousand mt. Production peaked in 1973, after a rise from 1969.

The Alaska shrimp fishery is regulated by the Department of Fish and Game. The legal gears for the commercial harvest of shrimp are pots and trawls. There are no set closed seasons for the Alaska shrimp fishery, but area-time closures and harvest range guidelines are established for various districts of the fishery. Regulations also enable the commissioner to close an area by emergency order when he finds that continued fishing would jeopardize the shrimp within the area.

5. Scallop

The predominant scallop species taken within the Study Area is the weathervane scallop, Pecten caurinus.

During the period 1969-75, the various regions ranked as follows in the order of their importance to the production of scallops (Table VIII-5): Kodiak (51%), Kenai (23%), Fairweather (12%), and Yakutat (11%). The Prince William, Chirikof, Shumagin, and Sanak regions contributed little to scallop production. The annual production for scallops within the Study Area has ranged from 141 to 786 mt, with a mean of 467 mt. There has been a marked decline in production from 1969 until 1975.

Legal gears for scallops are dredges and trawls. In the Yakutat Region, there is no closed season (1975); in the Kodiak and westward regions, scallop fishing is permitted much of the year except for closures in spring. Substantial areas have been closed to scallop fishing, however, mostly to avoid damage to crab resources.

6. Halibut

The fishery for halibut, Hippoglossus stenolepis, is conducted jointly by American and Canadian fishermen. Set-line halibut fishing gear (baited hooks spaced at 3 to 8 m apart on a main line which is laid along the ocean bottom) is fished by vessels licensed by the IPHC and accounts for all but 10% of the total halibut catch. The remainder of the catch is taken by small, unlicensed vessels.

For the period from 1969-1975 the annual catch of halibut from each region within the Study Area is shown in Table VIII-6; a mean annual catch for each region is also presented. In order of their importance to halibut production the regions rank as follows: Kenai (27%), Chirikof (19%), Kodiak (14%), Shumagin (13%), Yakutat (10%), Prince William (8%), Fairweather (6%), and Sanak (4%).

Table VIII-4.--United States catches^{1/} of pandalid shrimp, 1969 - 1975, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS.	ANNUAL MEAN
Fairweather	--	--	--	--	--	--	--	0	0	0
Yakutat	--	1.2	--	--	--	0.1	--	1.3	2	0.6
Prince William	--	--	--	--	--	--	--	0	0	0
Kenai	-	1.1	5.9	159.9	63.0	266.5	316.9	813.3	6	135.6
Kodiak	15,110.2	25,046.9	34,274.7	23,348.5	24,756.4	17,654.5	18,060.4	158,251.6	7	22,607.4
Shelikof	2,846.9	1,140.0	1,301.7	1,407.1	3,920.5	2,385.3	1,613.7	14,615.2	7	2,087.9
Chirikof	35.0	443.3	1,010.2	1,856.4	5,774.7	3,032.9	2,919.3	15,072.8	7	2,153.3
Shumagin	595.6	1,569.2	2,740.4	6,914.1	14,995.4	17,080.6	17,852.6	61,747.9	7	8,821.1
Sanak	826.1	790.5	125.8	1,527.1	1,545.8	3,218.4	546.0	8,579.7	7	1,225.7
TOTAL	19,414.8	28,992.2	39,458.7	35,213.1	51,005.8	43,638.3	41,308.9	259,081.8	7	37,011.7

^{1/} Round weight

Table VIII-5.--United States catches^{1/} of scallop, 1969 - 1975, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	172.6	--	20.3	21.3	61.3	120.0	6.1	401.6	6	66.9
Yakutat	207.0	10.3	18.3	58.2	17.4	41.8	--	353.0	6	58.8
Prince William	--	--	--	--	--	--	--	0	0	0
Kenai	167.7	276.4	83.7	109.3	78.5	--	34.6	750.2	6	125.0
Kodiak	217.2	364.8	281.1	333.6	325.4	66.9	78.9	1,667.9	7	238.3
Shelikof	21.1	1.7	3.9	25.8	9.0	8.8	19.9	90.2	7	12.9
Chirikof	--	--	--	--	--	--	--	0	0	0
Shumagin	--	--	--	--	--	--	1.1	1.1	1	1.1
Sanak	--	--	2.3	--	--	--	--	2.3	1	2.3
TOTAL	785.6	653.2	409.6	548.2	491.6	237.5	140.6	3,266.3	7	466.6

^{1/} Round weight

Table VIII-6.--United States and Canadian catches^{1/} of halibut, 1969 - 1975, by region of the Study Area (metric tons).

REGION ^{2/}	1969	1970	1971	1972	1973	1974	1975	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	1,257	1,028	713	755	682	638	871	5,944	7	849
Yakutat	2,078	1,530	1,495	1,313	1,105	825	1,118	9,464	7	1,352
Prince William	1,972	1,845	1,380	908	771	464	970	8,310	7	1,187
Kenai	4,753	4,777	5,045	4,313	3,204	2,011	2,391	26,444	7	3,785
Kodiak	2,054	2,829	2,083	2,543	2,382	1,001	1,046	13,938	7	1,991
Shelikof	--	--	--	--	--	--	--	--	--	--
Chirikof	4,250	4,357	2,915	3,646	1,790	629	888	18,475	7	2,639
Shumagin	3,049	2,988	3,275	1,533	898	332	509	12,584	7	1,798
Sanak	1,210	897	534	452	249	47	149	3,538	7	505
TOTAL	20,623	20,251	17,440	15,463	11,081	5,947	7,942	98,747	7	14,107

^{1/} Round weight

^{2/} The geographic divisions of the IPHC statistical system makes the amounts assigned to each region only approximate, and does not permit catches from the Shelikof Region to be separated from those of adjacent regions.

Seasons and catch limits for various areas of the halibut fishery are established each year by the IPHC, a body composed of 3 United States and 3 Canadian commissioners, who in turn appoint a Director to supervise the scientific staff. The open season within the Study Area is usually from May until September.

The condition of halibut stocks within the Study Area as evidenced by the catch per unit of effort (CPUE), has been in a long term decline until 1973, when it reached about 40% of its 1960 level; since 1973, the CPUE appears to have stabilized (IPHC Annual Report, 1975). To accomplish this stabilization the IPHC has had to impose continually lower catch limits on U.S. and Canadian halibut fishermen. Time and area closures for foreign trawl operations may also have contributed to the stabilization of the decline in halibut stocks. The present level of apparent abundance, however, is much below that which could lend encouragement toward the definite recovery of halibut stocks.

Records for the halibut fishery are available for many years prior to 1969-75 period considered above, and catches for the period from 1960 to 1968 may be compared with those of the more recent period, to determine if a significant change in catch distribution has occurred. The annual catch of halibut from each of the regions of the Study Area during 1960-68 is presented in Table VIII-7, together with an annual mean. The mean annual catch for the Study Area during 1960-68 was 21,456 mt. which is greater than the 14,197 mt annual mean catch for the Study Area in the period of 1969-75. In spite of the substantial decline in the general productivity of the Study Area, the rank order of the annual mean catches by regions is similar during both periods, with a rank correlation coefficient of 0.93. This high correlation suggests that despite the decline in abundance, the catch distribution of halibut has been relatively stable over the past 15 years.

FOREIGN FISHERIES

Foreign fisheries within the northern Gulf of Alaska Study Area include those by Japan, the Soviet Union, the Republic of Korea, and Poland. Only the information provided by Japan in terms of 1° (long.) by ½° (lat.) blocks is sufficiently precise to be allocated to the various regions of the Study Area.

1. Japanese trawl fisheries

Japanese trawl fisheries include a variety of gears: stern trawl, side trawl, pair trawl, and Danish seine but their catches are here considered collectively under the term trawl catches. The species of fishes or groups taken by the Japanese trawl fisheries include the following:

Table VIII-7.--United States and Canadian catches^{1/} of halibut, 1960 - 1968, by region of the Study Area (metric tons).

REGION ^{2/}	1960	1961	1962	1963	1964	1965	1966	1967	1968	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	819	749	810	567	850	1,206	1,238	630	610	7,479	9	831
Yakutat	1,660	1,873	1,449	1,785	1,597	1,639	2,163	1,835	1,248	15,249	9	1,694
Prince Wm.	2,139	1,947	2,529	1,964	2,026	2,609	2,656	1,135	975	17,980	9	1,998
Kenai	5,222	6,411	6,345	6,391	6,311	5,786	7,432	5,595	3,952	53,445	9	5,938
Kodiak	2,857	2,938	3,372	2,752	2,825	2,623	2,054	2,665	2,128	24,214	9	2,690
Shelikof	--	--	--	--	--	--	--	--	--	--	-	--
Chirikof	4,474	4,937	4,599	4,500	4,561	4,479	3,562	5,199	5,225	41,536	9	4,615
Shumagin	2,516	2,493	2,759	3,005	3,113	3,015	2,543	2,441	3,697	25,582	9	2,842
Sanak	817	587	945	1,056	1,403	1,003	727	414	667	7,619	9	849
TOTAL	20,504	21,935	22,808	22,020	22,686	22,360	22,375	19,914	18,502	193,104	9	21,456

^{1/} Round weight

^{2/} The geographic division of the IPHC statistical system makes the amounts assigned to each region only approximate, and does not permit catches from the Shelikof Region to be separated from those of adjacent regions.

Turbot (Arrowtooth flounder)	<u>Atheresthes stomias</u>
Other flatfishes	- -
Sablefish (black cod)	<u>Anoplopoma fimbria</u>
Pacific cod	<u>Gadus macrocephalus</u>
Walleye pollock	<u>Theragra chalcogramma</u>
Pacific Ocean perch	<u>Sebastes alutus</u>
Other rockfishes	- -
Miscellaneous fishes	- -

Total trawl catch of fishes and shellfishes.

A. Turbot

The Japanese trawl catch of arrowtooth flounder from each of the regions within the Study Area, for the period 1969-74, is shown in Table VIII-8, and a mean annual catch is calculated based upon the number of years in which data were reported. The 14 thousand mt of arrowtooth flounder taken during the 1969-74 period was 4.3% of the 328 thousand mt total trawl catch by Japan from the Study Area. The mean annual catch of arrowtooth flounder from the Study Area has ranged from 1 thousand mt to 5 thousand mt, with an average of 2 thousand mt, and a trend toward increased catches during the more recent years.

Within the Study Area, the regions of importance to the production of arrowtooth flounder are as follows: Chirikof (23%); Sanak (22%); Yakutat (20%), Kodiak (12%), Fairweather (10%), Prince William (7%), Shumagin (5%), and Sanak (2%).

B. Other flatfishes

The Japanese trawl catch of flatfishes other than arrowtooth flounder by year and region within the Study Area is presented in Table VIII-9.

The 13 thousand mt of mixed flatfishes taken during the period from 1969-74 was 3.9% of the total trawl catch by Japan from the Study Area. The annual catch of mixed flatfishes within the Study Area, during the years 1969-74, ranged from 222 to 6 thousand mt with a mean of 2 thousand mt. There was a ten-fold increase in the catch during the 1972-74 3-year period.

With respect to region of capture the eastern part of the study Area was the most important in the Japanese production of flatfishes other than turbot. The order of rank of the regions for 1969-74 is as follows: Yakutat (28%), Fairweather (22%), Kenai (15%), Chirikof (14%), Kodiak (8%), Prince William (6%), Sanak (4%), and Shumagin (4%).

Table VIII-8.--Annual Japanese trawl catches^{1/} of turbot (arrowtooth flounder), 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	359	504	88	166	216	50	1,383	6	230
Yakutat	474	301	125	202	1,406	356	2,864	6	477
Prince William	25	81	41	246	347	218	958	6	160
Kenai	229	287	676	746	618	652	3,208	6	535
Kodiak	131	160	218	127	489	654	1,779	6	297
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	129	235	115	125	1,620	938	3,162	6	527
Shumagin	71	20	30	0	363	161	645	5	129
Sanak	49	0	0	0	51	128	228	3	76
TOTAL	1,467	1,588	1,293	1,612	5,110	3,157	14,227	6	2,371

^{1/} Round weight

Table VIII-9.-- Annual Japanese trawl catches^{1/} of flatfishes other than turbot, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	124	162	69	562	1,687	249	2,853	6	475
Yakutat	160	31	127	903	1,662	852	3,735	6	622
Prince William	4	5	15	81	346	231	682	6	114
Kenai	37	0	50	119	893	855	1,954	5	391
4* Kodiak	14	0	45	248	474	227	1,008	5	202
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	1	0	107	145	833	682	1,768	5	354
Shumagin	1	0	0	7	263	184	455	4	114
Sanak	20	24	89	34	72	244	483	6	80
TOTAL	361	222	502	2,099	6,230	3,524	12,938	6	2,156

^{1/} Round weight

C. Sablefish (blackcod)

The catch of sablefish or blackcod by the Japanese trawl fishery by year and region within the Study Area is shown in Table VIII-10. The 24 thousand mt of sablefish caught during the 1969-74 period was 7.3% of the total trawl catch by Japan from the Study Area. The annual catch of sablefish during the years from 1969 through 1974 ranged from 2 to 7 thousand mt with a mean of 4 thousand mt.

With respect to region of capture, the eastern part of the Study Area was the most important area of production for sablefish. The order of rank for the regions is as follows: Yakutat (27%), Kenai (19%), Fairweather (13%), Prince William (12%), Chirikof (12%), Kodiak (11%), Sanak (3%), Shumagin (3%), and Shelikof (0%).

D. Pacific cod

The Japanese trawl catch of Pacific cod by year and region within the Study Area is shown in Table VIII-11. The 9 thousand mt of Pacific cod within the Study Area taken by Japanese fishermen from 1969 through 1974 was 2.6% of their total trawl catch. The annual catch of cod has ranged from 426 mt to 3 thousand mt with a mean of 2 thousand mt. More than half the six-year catch was made in the last two years, 1973-74.

In terms of production, the order of rank for the 1969-74 period of the regions is as follows: Kodiak (23%), Chirikof (21%), Kenai (16%), Prince William (15%), Sanak (8%), Yakutat (8%), Shumagin (6%), Fairweather (2%), and Shelikof (0%).

E. Walleye pollock

The trawl catch by Japanese vessels of pollock from within the Study Area is shown in Table VIII-12. The 62 thousand mt taken during the 1969-74 period was 19.0% of the total trawl catch made during that 6-year period by Japan. The annual catch of pollock ranged from 5 to 29 thousand mt with a mean of 10 thousand mt; the largest catch of 29 thousand mt came in 1974 and was 3 to 4 times greater than any previous annual catch, so that the above mean annual catch is actually larger than any annual catch from 1960 to 1973.

With respect to region of capture, the central part of the Study Area was the most important in the production of pollock during the 1969-1974 period. In order of contribution to production, the regions rank as follows: Kodiak (34%), Chirikof (20%), Kenai (16%), Sanak (12%), Yakutat (7%), Prince William (4%), Shumagin (4%), Fairweather (3%), and Shelikof (0%).

F. Pacific ocean perch

The Japanese trawl catch of Pacific ocean perch from within the Study Area by region and year is shown in Table VIII-13. The 189 thousand mt of Pacific ocean perch taken by Japanese trawlers were more than half (57.4%) of their entire trawl catch of all species during the 1960-74 period. The annual trawl catch of Pacific ocean perch by Japan has ranged from 25 to 36 thousand mt with a mean of 31 thousand mt, during the 6-year period from 1969 to 1974.

Table VIII-10.--Annual Japanese trawl catches^{1/} of sablefish (blackcod), 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	477	578	486	736	482	433	3,192	6	532
Yakutat	1,130	692	704	1,930	1,207	847	6,510	6	1,085
Prince William	342	251	226	1,120	650	358	2,947	6	491
Kenai	585	356	852	1,251	1,079	509	4,632	6	772
Kodiak	366	258	370	772	488	282	2,536	6	423
Shelikof	0	0	0	12	0	0	12	1	12
Chirikof	292	238	432	573	948	352	2,835	6	472
Shumagin	75	21	18	40	356	186	696	6	116
Sanak	58	86	94	87	182	133	640	6	107
TOTAL	3,325	2,480	3,182	6,521	5,392	3,100	24,000	6	4,000

^{1/} Round weight

Table VIII-11.--Annual Japanese trawl catches^{1/} of Pacific cod, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	22	13	7	12	6	96	156	6	26
Yakutat	48	41	16	42	293	300	740	6	123
Prince William	190	643	25	55	208	155	1,276	6	213
Kenai	176	259	103	153	307	399	1,347	6	233
Kodiak	285	230	134	261	460	673	2,043	6	340
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	138	260	51	89	801	504	1,843	6	307
Shumagin	2	0	6	14	292	207	521	5	104
Sanak	44	-135	84	33	125	314	735	6	122
TOTAL	905	1,581	426	659	2,492	2,648	8,711	6	1,452

^{1/} Round weight

Table VIII-12.-- Annual Japanese trawl catches^{1/} of walleye pollock, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	516	116	148	83	96	614	1,573	6	262
Yakutat	1,427	175	265	927	589	1,266	4,649	6	775
Prince William	222	118	372	188	191	1,501	2,592	6	432
Kenai	1,211	275	2,084	910	740	4,766	9,986	6	1,664
Kodiak	969	1,045	862	3,182	2,777	12,402	21,237	6	3,540
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	1,028	1,493	652	936	1,899	6,713	12,721	6	2,120
Shumagin	723	13	1	686	38	965	2,426	6	404
Sanak	2,519	1,619	1,292	892	23	889	7,234	6	1,206
TOTAL	8,615	4,854	5,676	7,804	6,353	29,116	62,418	6	10,403

^{1/} Round weight

Table VIII-13.--Annual Japanese trawl catches^{1/} of Pacific ocean perch, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	6,925	4,415	4,623	5,650	5,710	4,526	31,649	6	5,275
Yakutat	10,749	5,803	8,922	9,293	10,390	6,075	51,232	6	8,539
Prince William	3,425	2,357	1,799	2,581	2,747	1,302	14,211	6	2,368
Kenai	5,345	5,221	7,307	6,522	5,353	4,088	33,836	6	5,639
Kodiak	3,623	4,179	3,596	2,888	2,444	2,975	19,705	6	3,284
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	5,374	7,786	4,645	2,698	4,883	3,173	28,559	6	4,760
Shumagin	496	169	384	349	1,956	774	4,128	6	688
Sanak	318	90	303	507	1,863	1,970	5,051	6	842
TOTAL	36,255	30,020	31,579	30,488	35,346	24,683	188,371	6	31,395

^{1/} Round weight

The production of Pacific ocean perch by region of the Study Area from perch 1969-74 ranks as follows: Yakutat (27%), Kenai (18%), Fairweather (17%), Chirikof (15%), Kodiak (10%), Prince William (8%), Sanak (3%), Shumagin (2%), and Shelikof (0%).

G. Other rockfishes

The Japanese trawl catch of rockfishes other than Pacific ocean perch is shown in Table VIII-14. The 10 thousand mt of these miscellaneous rockfishes captured within the Study Area from 1969 through 1974 by Japan represented 2.9% of the total trawl catch. The annual catch of this group has ranged from .4 to 4 thousand mt, with a mean of 2 thousand mt for the six-year period. A sharp increase in the catch of these rockfishes appears to have taken place in 1973 and 1974.

With respect to production, the various regions of the Study Area rank as follows: Yakutat (33%), Fairweather (33%), Kenai (12%), Prince William (8%), Kodiak (6%), Chirikof (4%), Sanak (2%), Shumagin (1%), and Shelikof (0%).

H. Miscellaneous fishes

The Japanese trawl catch of fishes other than those considered above by years and region within the Study Area is presented in Table VIII-15. The 8 thousand mt of these fishes is 2.5% of the total Japanese catch by trawl during the period from 1969-1974. The annual catch of this group of fishes has ranged from .4 to 2.6 thousand mt, with a mean of 1.4 thousand mt; a dramatic increase in catch occurred in 1973 and 1974 to more than double the annual catch of previous years.

With respect to production, the various regions of the Study Area rank as follows: Yakutat (28%), Fairweather (16%), Kenai (16%), Chirikof (11%), Kodiak (11%), Prince William (8%), Shumagin (5%), Sanak (5%), and Shelikof (0%).

I. Total trawl catch

The entire Japanese trawl fishery catch from the Study Area for the 1969-74 period by year and regions is shown in Table VIII-16. The 328 thousand mt taken by the trawl fishery is 78.4% of the 419 thousand mt total catch by all Japanese fisheries in the Study Area during that period. The annual trawl catch by Japan from the Study Area has ranged from 42 to 71 thousand mt, with a mean of 55 thousand mt. The mean annual trawl catch during the 1973-74 period increased sharply from that of previous 4 years.

With respect to the role of the various regions which make up the Study Area, their rank order in production of the trawl catch by Japan during the 1969-74 period is as follows: Yakutat (21%), Fairweather (18%), Kenai (17%), Chirikof (14%), Kodiak (14%), Prince William (8%), Sanak (5%), Shumagin (3%), and Shelikof (0%).

Table VIII-14.--Annual Japanese trawl catches^{1/} of rockfishes other than Pacific ocean perch, 1969 - 1974, in regions of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	211	169	151	283	1,844	540	3,198	6	533
Yakutat	308	189	390	570	944	804	3,205	6	534
Prince William	87	10	54	165	184	281	781	6	130
Kenai	43	8	331	170	358	287	1,197	6	200
Kodiak	79	5	172	128	124	114	622	6	104
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	48	19	71	44	142	35	359	6	60
Shumagin	1	0	1	31	65	31	129	5	26
Sanak	0	0	20	7	59	66	152	4	38
TOTAL	777	400	1,190	1,398	3,720	2,158	9,643	6	1,607

^{1/} Round weight

Table VIII-15.--Annual Japanese trawl catches^{1/} of miscellaneous fishes, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	279	94	102	126	400	274	1,275	6	212
Yakutat	300	95	242	333	585	698	2,253	6	376
Prince William	80	24	23	130	189	234	680	6	113
Kenai	111	38	151	171	361	435	1,267	6	211
Kodiak	134	47	82	192	207	244	906	6	151
Shelikof	0	0	0	2	0	0	2	1	2
Chirikof	119	61	50	92	258	337	917	6	153
Shumagin	65	1	4	6	147	188	411	6	69
Sanak	6	4	48	22	74	233	387	6	65
TOTAL	1,094	364	702	1,074	2,221	2,643	8,098	6	1,350

^{1/} Round weight

Table VIII-16.-- Annual Japanese trawl catches^{1/} of finfishes, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	8,913	6,051	5,674	7,618	10,441	6,582	45,279	6	7,546
Yakutat	14,596	7,327	10,791	14,200	17,076	11,198	75,188	6	12,531
Prince William	4,375	3,489	2,555	4,566	4,862	4,280	24,127	6	4,021
Kenai	7,737	6,444	11,554	10,042	9,709	11,991	57,477	6	9,580
Kodiak	5,601	5,924	5,479	7,798	7,463	17,571	49,836	6	8,306
55 Shelikof	0	0	0	14	0	0	14	1	14
Chirikof	7,129	10,092	6,123	4,702	11,384	12,734	52,164	6	8,694
Shumagin	1,434	224	444	1,133	3,480	2,696	9,411	6	1,569
Sanak	3,014	1,958	1,930	1,582	2,449	3,977	14,910	6	2,485
TOTAL	52,799	41,509	44,550	51,655	66,864	71,029	328,406	6	54,734

^{1/} Round weight

The contributions of the different species or species groups by regions to the Japanese trawl catch in 1969-74 is shown in Table VIII-17. Two species, Pacific ocean perch (57%) and walleye pollock (19%), together contributed more than three-quarters of the catch with sablefish (7%), turbot (4%), and other flatfishes (4%), providing lesser amounts. Pacific ocean perch was the largest element of the catch in six of the nine regions, the exceptions being walleye pollock in the Kodiak and Sanak Regions and sablefish in the Shelikof Region.

2. Japanese longline fisheries

The principal species taken by Japanese longline fisheries in the Gulf of Alaska Study Area is the sablefish (also known as blackcod) which accounts for 89 thousand mt (98%) of the 91 thousand mt total Japanese longline catch for the period 1969-74 (Table VIII-18). The longline catch was 21.6% of the total Japanese catch by all gears from the Study Area from 1969 to 1974. The various regions of the Study Area contributed to the longline catch as follows: Fairweather (31%), Yakutat (15%), Kenai (14%), Kodiak (9%), Chirikof (9%), Prince William (8%), Sanak (7%), Shumagin (5%), and Shelikof (0%).

The Japanese longline catch from 1969 to 1974 from the Study Area is shown in Table VIII-19. The annual catch has ranged from 11 to 19 thousand mt with a mean of 15 thousand mt. Catches increased from 1969 to a peak in 1972 and have since declined.

A. Sablefish

The Japanese longline catch of sablefish from within the Study Area by region and year is shown in Table VIII-20. The annual catch of sablefish during the 1969 to 1974 period ranged from 10 to 19 thousand mt, with a mean of 15 thousand mt. Since the longline catch is almost entirely sablefish, there is little difference in contribution by region between the longline sablefish catch and the entire longline catch. During the 6-year period under scrutiny, the longline catch of sablefish by Japan increased from 10 thousand mt in 1969 to a peak of 19 thousand in 1972, and then declined in 1973 and 1974.

B. Other species

The Japanese longline catch of fishes other than sablefish is relatively small, 2 thousand mt, and amounts to only 2% of the longline total catch during the 1969-74 period (Table VIII-18). The various regions of the Study Area contributed to the production of these fishes as follows: Fairweather (44%), Kenai (13%), Yakutat (10%), Kodiak (8%), Chirikof (7%), Prince William (7%), Sanak (7%), Shumagin (4%), and Shelikof (0%).

The annual catch of these fishes by regions of the Study Area is shown in Table VIII-21. During the 1969-74 period, the catch ranged from 60 - 614 mt with a mean of 291 mt.

Table VIII-17.--Annual Japanese trawl catches^{1/} by species or species group and region of the Study Area, 1969-1974 (metric tons).

Region	SPECIES OR SPECIES GROUP								Total	Percent
	Turbot	Other Flatfishes	Sablefish	Pacific cod	Pollock	Pac. ocean perch	Other Rockfishes	Misc. Fishes		
Fairweather	1,383	2,853	3,192	156	1,573	31,649	3,198	1,275	45,279	14
Yakutat	2,864	3,735	6,510	740	4,649	51,232	3,205	2,253	75,188	23
Prince William	958	958	2,947	1,276	2,592	14,211	781	680	24,127	7
Kenai	3,208	1,954	4,632	1,347	9,986	33,836	1,197	1,267	57,477	18
57 Kodiak	1,779	1,008	2,536	2,043	21,237	19,705	622	906	49,836	15
Shelikof	0	0	12	0	0	0	0	2	14	0
Chirikof	3,162	1,768	2,835	1,843	12,721	28,559	359	917	52,164	16
Shumagin	645	455	696	521	2,426	4,128	129	411	9,411	3
Sanak	228	483	640	735	7,234	5,051	152	387	14,910	5
Total	14,227	12,938	24,000	8,711	62,418	188,371	9,643	8,098	328,406	101
Percent	4	4	7	3	19	57	3	3	100	

^{1/} Round weight

Table VIII-18.--Total Japanese longline catch (metric tons) of sablefish and other species and comparison between total trawl and total longline catches for the period 1969-1974, by region of the Study Area.

REGION	LONGLINE FISHERY CATCH ^{1/}				TRAWL - LONGLINE FISHERY COMPARISON							
	Metric tons				All Species ^{1/} - - - - metric tons				Sablefish only ^{1/} - - - - metric tons			
	Sable- fish	%	Other fishes%	Total %	Trawl %	Longline %	Total %	%	Trawl %	Long- line %	Total %	%
Fairweather	27,993 (97)		778 (3)	28,771(31)	45,279(61)	28,771 (39)	74,050 (18)		3,192 (10)	27,993 (90)	31,185 (28)	
Yakutat	13,712 (99)		182 (1)	13,894(15)	75,188(84)	13,894 (16)	89,082 (21)		6,510 (32)	13,712 (68)	20,222 (18)	
Prince Wm.	7,295 (98)		119 (2)	7,414(8)	24,127(76)	7,414 (24)	31,541 (8)		2,947 (29)	7,295 (71)	10,242 (9)	
Kenai	12,507 (98)		224 (2)	12,731(14)	57,477(82)	12,731 (18)	70,208 (17)		4,632 (27)	12,507 (73)	17,139 (15)	
Kodiak	8,346 (98)		136 (2)	8,482 (9)	59,836(85)	8,482 (15)	58,318 (14)		2,536 (23)	8,346 (77)	10,882 (10)	
Shelikof	0 (0)		0 (0)	0 (0)	14(100)	0 (0)	14 (0)		12 (100)	0 (0)	12 (0)	
Chirikof	7,871 (98)		121 (2)	7,992 (9)	52,164(87)	7,992 (13)	60,156 (14)		2,835 (26)	7,871 (74)	10,706 (9)	
Shumagin	4,761 (98)		74 (2)	4,835 (5)	9,411(66)	4,835 (34)	14,246 (3)		696 (13)	4,761 (87)	5,457 (5)	
Sanak	6,360 (98)		114 (2)	6,474 (7)	14,910(70)	6,474 (30)	21,384 (5)		640 (9)	6,360 (91)	7,000 (6)	
TOTAL	88,845 (98)		1,748 (2)	90,593(100)	328,406(78)	90,593 (22)	418,999(100)		24,000 (21)	88,845 (79)	112,845 (100)	

^{1/} Round weight

Table VIII-19.--Annual Japanese longline catches^{1/} of finfishes, 1969-1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	4,886	5,652	5,515	5,809	3,222	3,687	28,771	6	4,795
Yakutat	1,958	2,627	1,981	2,446	2,749	2,133	13,894	6	2,316
Prince William	912	1,773	1,180	1,432	1,292	825	7,414	6	1,236
Kenai	1,254	2,454	1,872	2,487	2,332	2,332	12,731	6	2,122
Kodiak	438	1,327	1,682	2,250	1,679	1,106	8,482	6	1,414
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	436	887	943	1,905	2,001	1,820	7,992	6	1,332
Shumagin	326	642	684	1,249	938	996	4,835	6	806
Sanak	317	556	877	1,606	1,610	1,508	6,474	6	1,079
TOTAL	10,527	15,918	14,734	19,184	15,823	14,407	90,593	6	15,099

^{1/} Round weight

Table VIII-20.--Annual Japanese longline catches^{1/} of sablefish (blackcod), 1969-1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	4,550	5,581	5,430	5,743	3,040	3,649	27,993	6	4,666
Yakutat	1,944	2,588	1,961	2,425	2,663	2,131	13,712	6	2,285
Prince William	908	1,755	1,148	1,420	1,243	821	7,295	6	1,216
Kenai	1,245	2,430	1,827	2,444	2,232	2,329	12,507	6	2,084
Kodiak	438	1,309	1,653	2,220	1,621	1,105	8,346	6	1,391
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	436	882	913	1,879	1,943	1,818	7,871	6	1,312
Shumagin	324	638	659	1,231	916	993	4,761	6	794
Sanak	317	552	858	1,581	1,551	1,501	6,360	6	1,060
TOTAL	10,162	15,735	14,449	18,943	15,209	14,347	88,845	6	14,808

^{1/} Round weight

Table VIII-21.-- Annual Japanese longline catches^{1/} of fishes other than sablefish, 1969-1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	336	71	85	66	182	38	778	6	130
Yakutat	14	39	20	21	86	2	182	6	30
Prince William	4	18	32	12	49	4	119	6	20
Kenai	9	24	45	43	100	3	224	6	37
Kodiak	0	18	29	30	58	1	136	5	2
Shelikof	0	0	0	0	0	0	0	0	0
Chirikof	0	5	30	26	58	2	121	5	24
Shumagin	2	4	25	18	22	3	74	6	12
Sanak	0	4	19	25	59	7	114	5	23
TOTAL	365	183	285	241	614	60	1,748	6	291

^{1/} Round weight

3. The combined Japanese trawl and longline fisheries

The fisheries by Japan in the Study Area, trawl and longline, took 419 thousand mt during the 1969-74 period of which 328 thousand mt (78%) was by trawl, and 91 thousand mt (22%) was by longline (Table VIII-18). Within the various regions of the Study Area the percentage of the total catch taken by trawl ranged from 61% to 87% and the percentage taken by longline ranged from 13% to 39%.

The annual combined trawl and longline catch by region (Table VIII-22) has ranged from 57 to 85 thousand mt for the years from 1969 to 1974 with a mean of 70 thousand mt. During the last part of the period, 1972-74, the catch increased sharply over that of 1969-71. The contributions of the different regions of the Study Area to production of groundfishes during the 1967 to 74 period is as follows: Yakutat (21%), Fairweather (18%), Kenai (17%), Chirikof (14%), Kodiak (14%), Prince William (8%), Shumagin (3%), and Shelikof (0%).

Only a single groundfish species, the sablefish, is taken prominently by both the trawl and longline fisheries. During the 1969-74 period, 21% of the sablefish catch by Japan was captured by trawl, and 79% was taken by longline fisheries is shown in Table VIII-23. During the 6-year period from 1969 to 1974, the sablefish catch has ranged from 13 to 25 thousand mt per year, with a mean of 19 thousand mt. The ranking of the various regions of the Study Area with respect to sablefish production during that period is as follows: Fairweather (28%), Yakutat (18%), Kenai (15%), Kodiak (10%), Chirikof (9%), Prince William (9%), Sanak (6%), Shumagin (5%), and Shelikof (0%)

For the 6-year period from 1969 to 1974, the Japanese combined trawl and longline catches by region and species are shown in Table VIII-24. In order of their contribution to the catch, the species rank as follows: Pacific ocean perch (45%), sablefish (27%), pollock (15%), turbot (3%), other flatfishes (3%), other fishes (2%), other rockfishes (2%), and Pacific cod (2%). The regions in order of their contribution to the total catch, during the 1969-74 period, ranks as follows: Yakutat (21%), Fairweather (18%), Kenai (17%), Chirikof (14%), Kodiak (14%), Prince William (8%), Sanak (5%), Shumagin (3%), and Shelikof (0%). Regions of particular importance in the production of Pacific ocean perch were Yakutat (27%), Kenai (18%), Fairweather (17%), and Chirikof (15%). Regions important in the production of sablefish were Fairweather (28%), Yakutat (18%), and Kenai (15%). The more important regions in the production of pollock were Kodiak (34%), Chirikof (20%), Kenai (16%), and Sanak (12%).

Table VIII-22.-- Annual Japanese catches of finfishes, trawl and longline combined, 1969-1974, by regions of the Study Area (metric tons).^{1/}

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	13,799	11,703	11,189	13,427	13,663	10,269	74,050	6	12,342
Yakutat	16,554	9,954	12,772	16,646	19,825	13,331	89,082	6	14,847
Prince William	5,287	5,262	3,735	5,998	6,154	5,105	31,541	6	5,257
Kenai	8,991	8,898	13,426	12,529	12,041	14,323	70,208	6	11,701
☪ Kodiak	6,039	7,251	7,161	10,048	9,142	18,677	58,318	6	9,720
Shelikof	0	0	0	14	0	0	14	1	14
Chirikof	7,565	10,979	7,066	6,607	13,385	14,554	60,156	6	10,026
Shumagin	1,760	866	1,128	2,382	4,418	3,692	14,246	6	2,374
Sanak	3,331	2,514	2,807	3,188	4,059	5,485	21,384	6	3,564
TOTAL	63,326	57,427	59,284	70,839	82,687	85,436	418,999	6	69,833

^{1/} Round weight

Table VIII-23.--Annual Japanese catches of sablefish (blackcod), trawl and longline combined, 1969-1974, by region of the Study Area (metric tons)^{1/}.

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fairweather	5,027	6,159	5,916	6,479	3,522	4,082	31,185	6	5,198
Yakutat	3,074	3,280	2,665	4,355	3,870	2,978	20,222	6	3,370
Prince William	1,250	2,006	1,374	2,540	1,893	1,179	10,242	6	1,707
Kenai	1,830	2,786	2,679	3,695	3,311	2,838	17,139	6	2,856
Kodiak	804	1,567	2,023	2,992	2,109	1,387	10,882	6	1,814
Shelikof	0	0	0	12	0	0	12	1	12
Chirikof	728	1,120	1,345	2,452	2,891	2,170	10,706	6	1,784
Shumagin	399	659	677	1,271	1,272	1,179	5,457	6	910
Sanak	375	638	952	1,668	1,733	1,634	7,000	6	1,167
TOTAL	13,487	18,215	17,631	25,464	20,601	17,447	112,845	6	18,808

^{1/} Round weight

Table VIII-24.--Total Japanese trawl and longline catch^{1/} by species or species group and region in the Study Area, 1969 - 1974, (metric tons).

Region	SPECIES OR SPECIES GROUP								Total	Percent
	Turbot	Other Flatfishes	Sablefish	Pacific cod	OR Pollock	Pac. ocean perch	Other Rockfishes	Misc. Fishes		
Fairweather	1,383	2,853	31,185	156	1,573	31,649	3,198	2,053	74,050	18
Yakutat	2,864	3,735	20,222	740	4,649	51,232	3,205	2,435	89,082	21
Prince William	958	682	10,242	1,276	2,592	14,211	781	799	31,541	8
Kenai	3,208	1,954	17,139	1,397	9,986	33,836	1,197	1,491	70,208	17
Kodiak	1,779	1,008	10,882	2,043	21,237	19,705	622	1,042	58,318	14
Shelikof	0	0	12	0	0	0	0	2	14	0
Chirikof	3,162	1,768	10,706	1,843	12,721	28,559	359	1,038	60,156	14
Shumagin	645	455	5,457	521	2,426	4,128	129	485	14,246	3
Sanak	228	483	7,000	735	7,234	5,051	152	501	21,384	5
TOTAL	14,227	12,938	112,845	8,711	62,418	188,371	9,643	9,846	418,999	100
Percent	3	3	27	2	15	45	2	2	100	

^{1/} Round weight

SPECIFIC FISHING AREAS OF HIGH PRODUCTION

INTRODUCTION

The catch statistics supplied by the State of Alaska (ADF&G), the International Pacific Halibut Commission (IPHC), and Japan are sufficiently precise to identify specific geographic areas that contribute unusually large quantities of fish and shellfish.

DOMESTIC FISHERIES

Domestic fisheries considered are those for Dungeness crab, Tanner (snow) crab, king crab, pandalid shrimp, and scallop and the joint U.S.-Canada fishery for halibut. The data source for all except the halibut fishery is the State of Alaska Department of Fish and Game, which provided records for 1969-1975. The halibut data are from the International Pacific Halibut Commission and two periods have been considered, 1960-1968 and 1969-1975. Each of the above agencies associates commercial catches with a particular statistical area defined by the agency so that it is possible to determine which of the statistical areas are the more important contributors to production of a species or group of species. The 313 statistical areas defined by the State of Alaska within the study area are smaller and hence more precise than the 18 defined by the IPHC. On the other hand, the records of the IPHC extend over a long period and permit a comparison of the decade of the "1960's" with that of the "1970's".

1. King crab

A statistical sub-area which produced in any single year from 1969-1975 at least 500 thousand pounds of king crab is considered to be an area of high production. By this rule, a total of 30 statistical sub-areas have been identified from the 313 within the Study Area. These 30 sub-areas provided 73% of the total king crab production from the Study Area from 1969-1975.

The locations of these 30 "king crab" sub-areas are shown in Figure IX-1. They appear to fall into four groups within the western half of the Study Area, the first lying off Afognak Island and the northern end of Kodiak Island; the second group are found off the Trinity Islands; the third group are in the gully between Chirikof Island and the Semidi Islands; and the fourth are scattered along the south shore of the Alaska Peninsula from the Shumagin Islands to Unimak Pass.

In Table IX-1 the mean annual king crab production (in pounds) of each important sub-area is listed together with the range of annual production and the rank order of the mean annual production within the 30 important king crab sub-areas; also listed is the percent of the 1969-1975 Study Area production contributed by each sub-area and the rank order of this percentage. The leading sub-area of king crab production was 258-81 (lying to the east of the Trinity Islands) which provided 11 percent of the total king crab catch from the Study Area from 1969-1975.

Table IX-1.--Areas important to the production of king crab, 1969 - 1975.

Statistical sub-area number	Annual Production (Pounds)			Contribution to 1969- 1975 Production	
	Annual Mean	1969 - 1975 Range	Rank Order (mean)	Percent	Rank Order
252 - 30	376,472	16,698 - 1,116,209	14	1.9	14
252 - 51	305,616	24,426 - 655,806	19	1.3	20
252 - 52	191,617	23,953 - 693,933	29	1.0	26
252 - 53	138,090	3,205 - 579,525	31	0.7	31
252 - 56	211,171	55,574 - 599,839	26	0.9	27
252 - 59	432,460	7,043 - 1,694,223	13	2.1	11
252 - 63	305,796	41,057 - 568,332	18	1.1	23
253 - 31	510,270	37,103 - 1,054,135	10	2.5	8
257 - 10	371,022	53,104 - 953,000	15	1.6	16
257 - 81	969,664	67,837 - 2,188,434	6	4.8	5
257 - 82	564,095	179,981 - 946,019	7	2.4	9
257 - 91	1,080,582	517,169 - 1,682,194	3	5.4	3
258 - 60	229,607	11,930 - 562,083	24	1.1	22
258 - 80	293,074	77,165 - 960,886	20	1.5	18
258 - 81	2,185,625	677,030 - 3,439,400	1	10.9	1
258 - 95	458,351	34,109 - 1,433,873	11	2.3	10
258 - 96	561,336	118,250 - 992,030	8	2.7	6
259 - 21	211,851	760 - 756,541	25	1.1	24
282 - 22	236,105	10,073 - 942,540	23	0.8	29
283 - 51	253,200	56,936 - 758,496	22	1.3	21
283 - 61	543,020	420,946 - 818,268	9	2.7	7
284 - 30	197,555	10,843 - 509,808	28	1.0	25
284 - 71	308,407	59,055 - 962,210	17	1.5	17
284 - 72	292,105	36,201 - 538,646	21	1.4	19
286 - 41	203,574	32,526 - 589,671	27	0.9	28
291 - 12	342,660	58,884 - 1,193,014	16	1.7	15
291 - 52	451,791	45,935 - 1,154,458	12	1.9	13
291 - 53	1,053,715	718,109 - 2,178,960	4	5.2	4
291 - 63	989,483	207,594 - 1,940,171	5	2.1	12
291 - 73	1,119,645	582,357 - 2,648,453	2	5.6	2
291 - 82	180,789	34,313 - 577,297	30	0.8	30

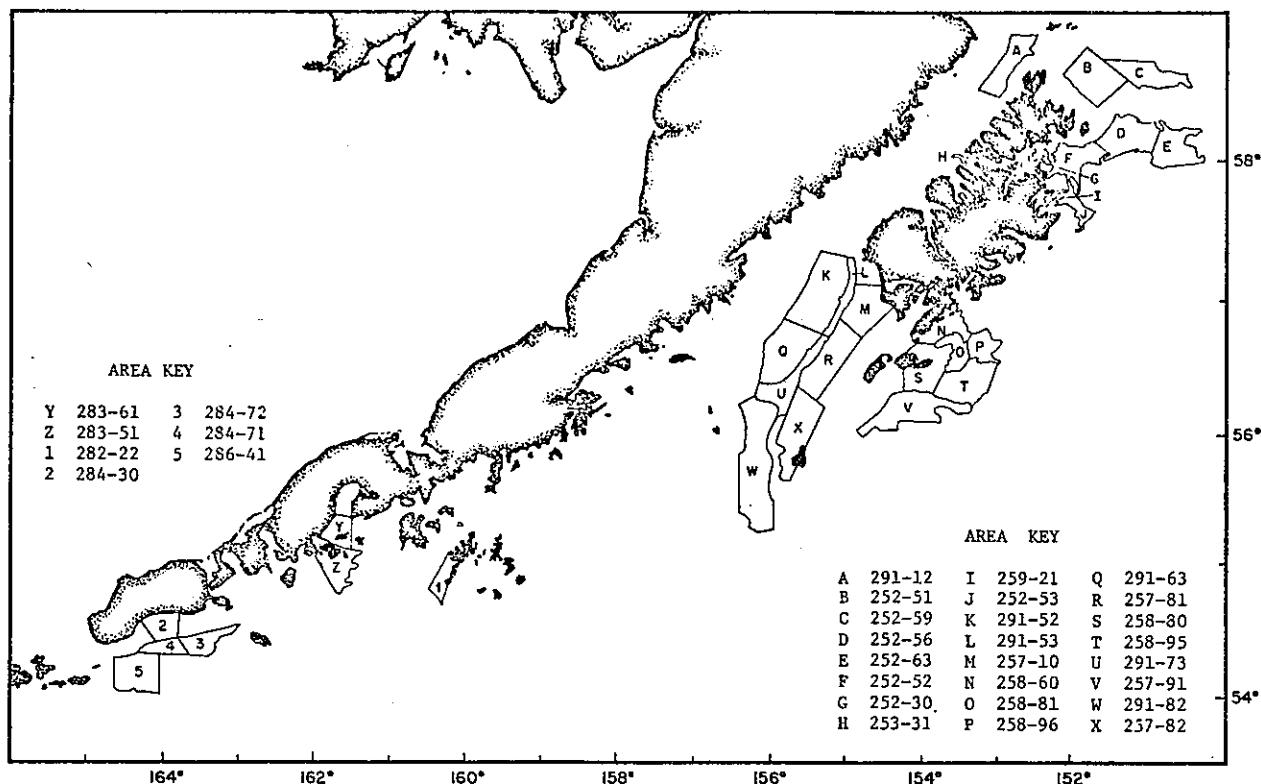


Figure IX-1.--Areas of high production of king crab by United States fishermen, 1969 - 1975.

2. Tanner crab

Any statistical sub-area which produced at least 500 thousand pounds of Tanner crab in a single year, 1969-1975, was designated as an area of high production. Application of this rule led to the identification of 40 such subareas from the total of 313 within the limits of the Study Area. These 40 sub-areas provided 77 percent of the total snow crab production from the Study Area from 1969 through 1975.

The locations of these "snow crab" sub-areas is shown in Figures IX-2-3. The areas of high snow crab production are found mostly in the western part of the Study Area from Kodiak Island westward to Unimak Pass with a lengthy gap in the distribution of important snow crab sub-areas between the Kenai Peninsula and Yakutat Bay.

In Table IX-2, the mean annual snow crab production (in pounds) of each important snow crab sub-area is listed together with the range of annual production and the rank order of the mean annual production within the 40 important snow crab sub-areas; also listed is the percent of the 1969-1975 Study Area production contributed by each important snow crab sub-area and the rank order of this percentage. The leading area of snow crab production in the 1969-1975 period was 257-81 (lying west of the Trinity Islands) which provided 10 percent of the total Study Area production.

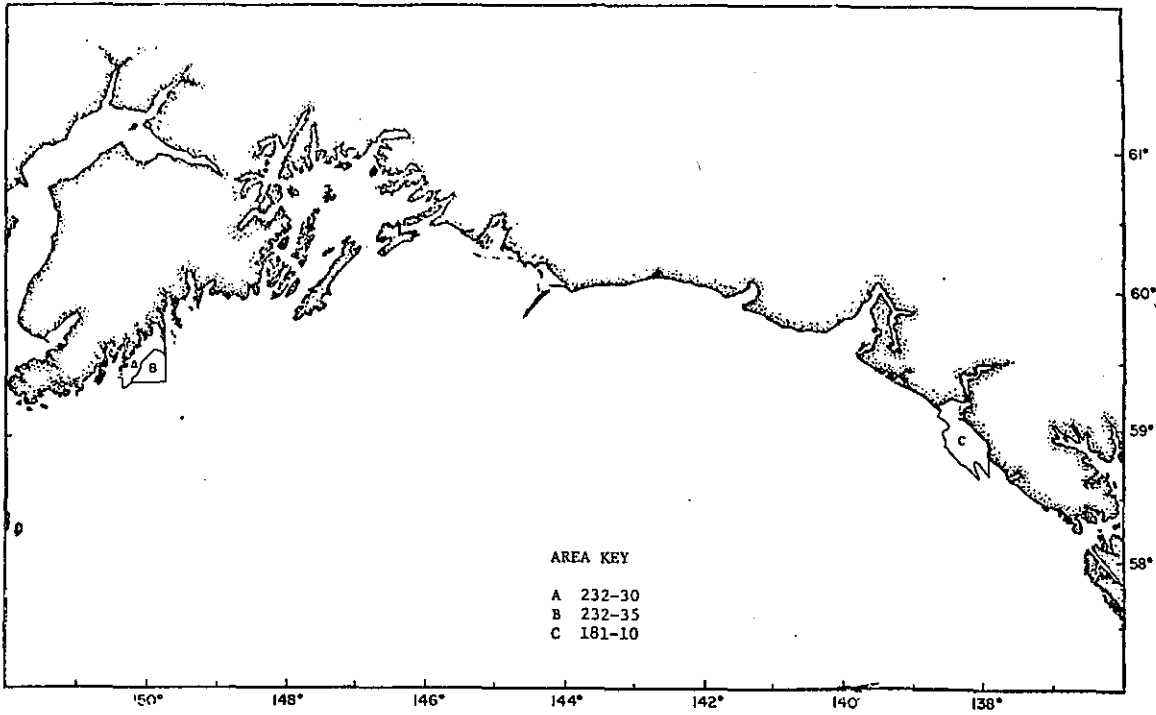


Figure IX-2.--Areas of high production of Tanner (snow) crab by United States fishermen, 1969 - 1975 (eastern Study Area).

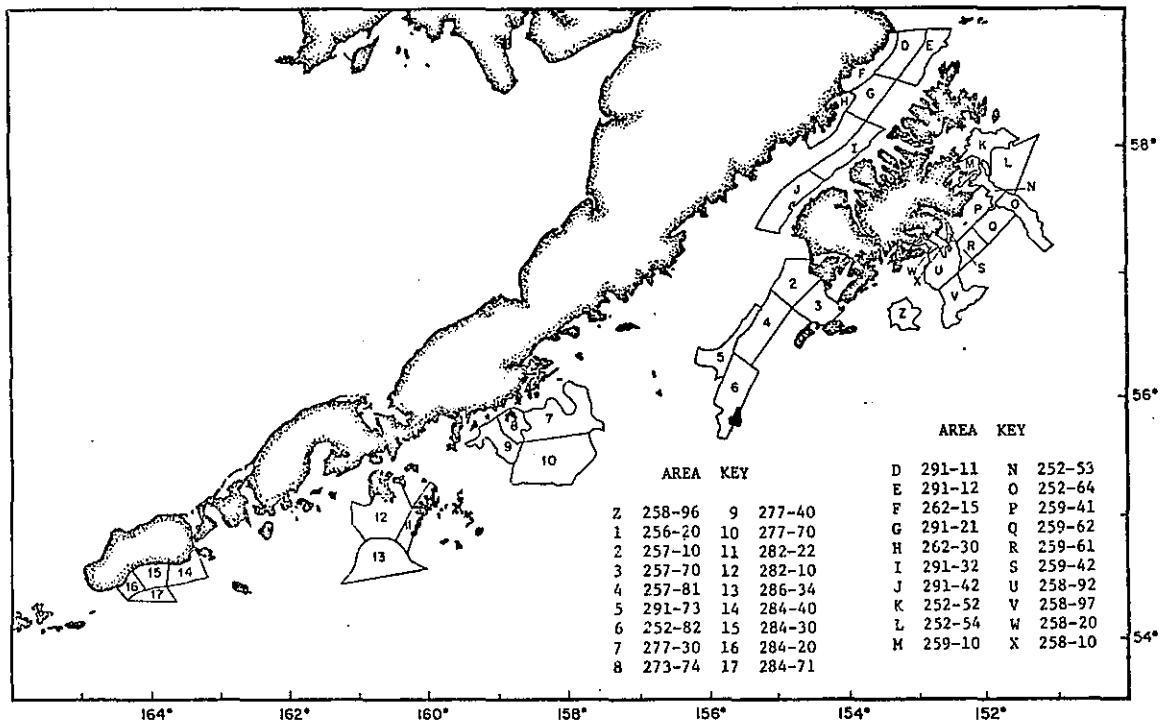


Figure IX-3.--Areas of high production of Tanner (snow) crab by United States fishermen, 1969 - 1975 (western Study Area).

Table IX-2.--Areas important to the production of Tanner (snow) crab, 1969 - 1975.

Statistical sub-area number	Annual Production (Pounds)			Rank Order (mean)	Contribution to 1969- 1975 Production	
	Annual Mean	1969-1975 Range			Percent	Rank Order
181 - 10	537,584	62,559 - 1,012,609		11	0.7	36
232 - 30	132,359	1,498 - 580,456		39	0.4	40
232 - 35	401,038	115,139 - 578,314		17	0.8	33
252 - 52	390,305	234,734 - 554,452		18	1.8	13
252 - 53	106,604	114,849 - 1,377,014		40	1.8	12
252 - 54	287,550	26,256 - 523,806		30	1.1	24
252 - 64	889,969	29,984 - 2,160,054		6	4.1	5
257 - 10	378,424	43,164 - 1,333,581		10	1.2	22
257 - 70	342,367	6,954 - 976,360		23	1.6	17
257 - 81	2,530,339	356,171 - 4,317,232		1	10.0	1
257 - 82	1,187,127	110,737 - 3,125,827		3	3.1	6
258 - 10	299,458	29,440 - 817,968		27	1.0	28
258 - 20	337,896	124,627 - 751,684		25	0.9	29
258 - 92	1,256,784	469,868 - 2,390,761		2	5.8	2
258 - 96	193,449	13,144 - 288,187		36	0.8	34
258 - 97	264,586	540 - 880,110		32	0.9	31
259 - 10	225,099	6,046 - 752,617		34	0.9	30
259 - 41	346,557	680 - 992,984		22	1.4	19
259 - 42	340,808	22,276 - 480,910		24	1.6	18
259 - 61	289,256	4,845 - 695,514		28	1.3	20
259 - 62	156,512	22,378 - 520,348		38	0.7	35
262 - 15	991,331	13,364 - 2,051,697		5	4.5	4
262 - 30	668,204	25,786 - 1,597,846		8	2.2	9
273 - 74	323,429	138,201 - 668,079		26	0.6	38
277 - 30	435,114	116,894 - 953,449		13	0.9	32
277 - 40	540,615	1,491 - 813,395		10	1.1	26
277 - 70	242,908	535 - 690,759		33	0.5	39
282 - 10	288,550	19,274 - 718,610		29	1.3	21
282 - 22	406,820	28,878 - 1,433,213		16	1.6	16
284 - 20	347,722	10,377 - 1,062,805		21	1.1	23
284 - 30	650,885	576 - 1,874,564		9	3.0	8
284 - 40	285,634	9,908 - 827,822		31	1.1	25
284 - 71	448,922	6,068 - 1,164,929		12	1.8	14
286 - 34	419,790	3,510 - 1,240,513		15	1.9	11
291 - 11	1,034,278	39,184 - 2,581,366		4	4.7	3
291 - 12	382,419	11,664 - 1,230,337		19	1.8	15
291 - 21	675,186	117,801 - 1,618,798		7	3.1	7
291 - 32	429,982	14,698 - 809,752		14	2.0	10
291 - 42	167,297	14,641 - 531,940		37	0.7	37
291 - 73	219,012	81,699 - 532,584		35	1.0	27

3. Dungeness crab

Any of the Alaska Department of Fish and Game statistical sub-areas which produced 1 million pounds or more of Dungeness crab in a single year, 1969-1975, was considered to be an area of high production. By this criterion, 24 statistical sub-areas have been identified from the 313 within the Study Area. These 24 sub-areas provided 89% of the total Dungeness crab production from the Study Area from 1969-1975.

The locations of these 24 "Dungeness crab" sub-areas is shown in Figures IX-4-5. They fall into 3 widely separate localities, one group lying from Lituya Bay to Kayak Island, the second group is in the vicinity of Kodiak Island and the adjacent mainland of the Alaska Peninsula, and the third group to the south of Unimak Island.

In Table IX-3 the mean annual Dungeness crab production (in pounds) of each important sub-area is listed together with the range of annual production and the rank order of the mean annual production within the 24 important Dungeness crab sub-areas; also listed is the percent of the 1969-1975 Study Area production of Dungeness crab contributed by each important sub-area and the rank order of this percentage. The leading sub-area of Dungeness crab production from 1969-1975 was 257-90 (lying southwest of the Trinity Islands) which provided nearly 21 percent of the total catch from the Study Area.

4. Pandalid Shrimp

A statistical sub-area for which a production of 2 million pounds or more of shrimp was reported in any single year from 1969-1975 was designated as an area of high production. By this procedure, 24 such sub-areas were identified from the total of 313 within the Study Area. These 24 sub-areas accounted for 81% of the total shrimp production from the Study Area in the period from 1969-1975.

The locations of these "shrimp" sub-areas is shown in Figure IX-6. The areas occur in the western part of the Study Area, mainly in and around Kodiak Island and along the south side of the Alaska Peninsula.

In Table IX-4, the mean annual shrimp catch (in pounds) of each important sub-area is listed together with the range of annual production and the rank order of the mean annual production within the 24 important shrimp sub-areas; also listed is the percent of the 1969-1975 Study Area production contributed by each important sub-area and the rank order of this percentage. The leading single area of shrimp production is 258-55, (lying west of Sitkalidak Island) in the southwest corner of Kodiak Island; this area provided nearly 15 percent of the 1969-1975 shrimp production from the Study Area.

Table IX-3.--Areas important to the production of Dungeness crab, 1969 - 1975

Statistical sub-area number	Annual Production (Pounds)			Contribution to 1969- 1975 Production		
	Annual Mean	1969-1975 Range		Rank Order (mean)	Percent	Rank Order
116 - 14	62,472	29,020 -	143,650	20	1.2	17
181 - 10	113,214	15,160 -	230,705	15	2.2	11
181 - 60	377,971	127,676 -	720,086	3	7.5	4
183 - 10	120,620	6,031 -	481,287	13	2.8	10
184 - 10	168,730	10,421 -	276,077	11	3.9	8
186 - 10	474,047	283,187 -	727,756	2	11.0	2
191 - 10	212,705	19,910 -	711,207	9	4.9	6
252 - 35	29,914	2,015 -	116,425	23	0.6	21
254 - 40	86,908	13,742 -	189,363	19	2.0	13
256 - 20	99,100	33,285 -	156,632	18	1.3	16
257 - 70	196,823	34,642 -	498,096	10	2.0	14
257 - 90	896,422	7,540 -	2,757,628	1	20.7	1
258 - 55	103,767	103,767 -	103,767	17	0.3	24
258 - 80	241,080	4,555 -	671,134	7	4.0	7
258 - 92	28,413	956 -	114,651	24	0.5	22
259 - 30	37,078	328 -	94,633	22	0.9	20
259 - 41	329,668	104,228 -	742,264	4	7.6	3
259 - 42	167,009	2,000 -	825,642	12	3.3	9
262 - 15	314,520	141,604 -	487,435	5	2.1	12
262 - 30	56,142	14,313 -	190,919	21	1.1	18
262 - 65	249,655	22,887 -	489,328	6	5.8	5
284 - 20	117,295	117,295 -	117,295	14	0.4	23
284 - 30	235,886	2,454 -	469,317	8	1.6	15
284 - 40	107,225	2,304 -	178,640	16	1.1	19

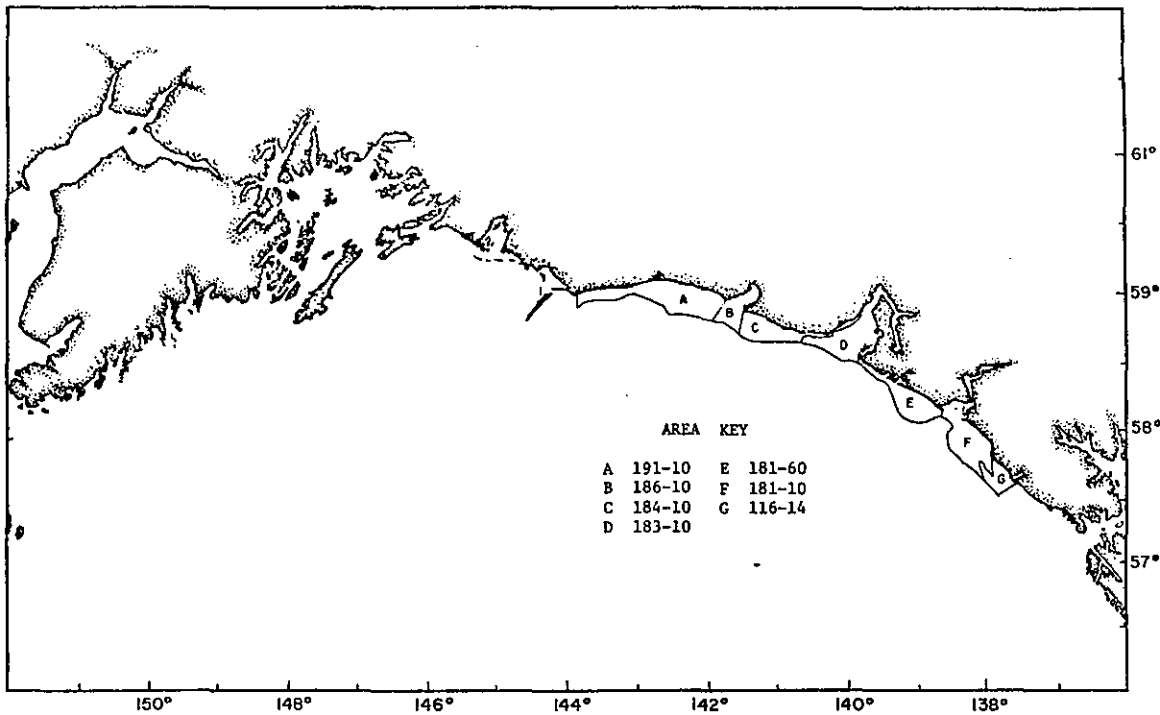


Figure IX-4.--Areas of high production of Dungeness crab by United States fishermen, 1969 - 1975 (eastern Study Area).

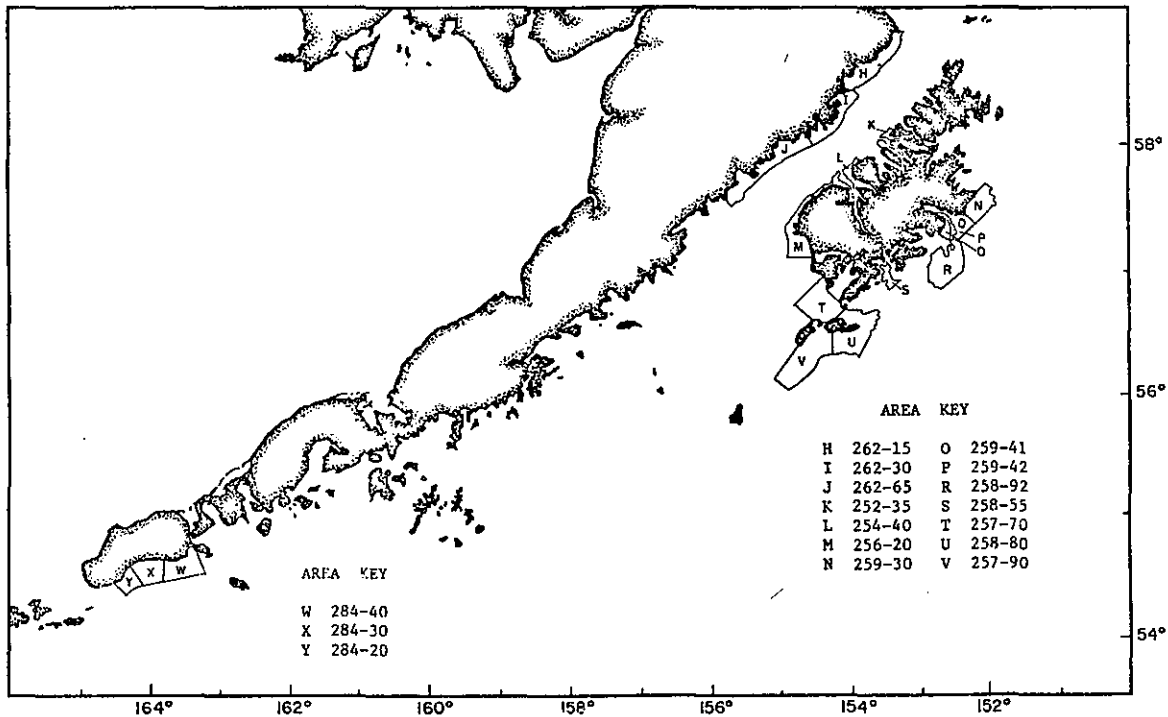


Figure IX-5.--Areas of high production of Dungeness crab by United States fishermen, 1969 - 1975 (western Study Area).

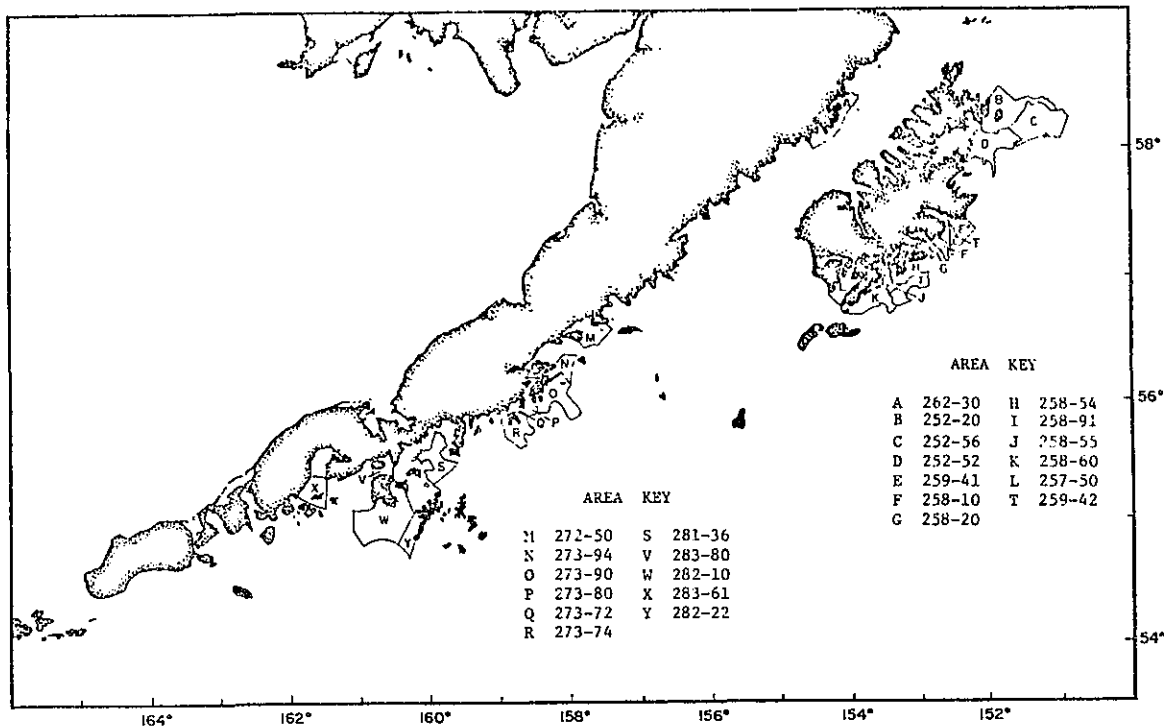


Figure IX-6.--Areas of high production of pandalid shrimps by United States fishermen, 1969 - 1975.

5. Scallop

Any Alaska Department of Fish and Game statistical sub-area that produced at least 50 thousand pounds of scallop meats (approximately 1/10 of the round weight) during any year from 1969-1975 was designated an area of high production. This rule led to the identification of 17 statistical sub-areas important to scallop production from the total of 313 within the Study Area. These 17 statistical sub-areas accounted for 84% of the total scallop production from within the Study Area from 1969-1975.

The locations of these 17 "scallop" sub-areas is shown in Figures IX-6-7 four of them are located in the eastern part of the Study Area and the remainder lie on Portlock and Albatross Banks east and north of Kodiak Island. Relatively little of the scallop production came from waters west of Kodiak Island.

In Table IX-5, the mean annual scallop production (in pounds of meats) of each important sub-area is listed together with the range of annual production and the rank order of the mean within the 17 important scallop sub-areas; also listed is the percent of the 1969-1975 Study Area production contributed by each important sub-area and the rank order of this percentage. The most important sub-areas for scallop production are 252-68 (to the east of Afognak Island), and 259-62 (to the east of Kodiak Island) which combined provided more than 20 percent of the total scallop catch from the Study Area from 1969-1975.

Table IX-4.--Areas important to the production of pandalid shrimp, 1969 - 1975.

Statistical sub-area number	Annual Production (Pounds)		Rank Order (mean)	Contribution to 1969- 1975 production	
	Annual Mean	1969 - 1975 Range		Percent	Rank Order
252 - 20	2,956,964	14,567 - 7,010,680	9	3.6	6
252 - 52	6,723,937	32,787 - 16,542,492	2	8.2	2
252 - 56	4,710,874	1,485,192 - 9,681,993	4	4.1	5
257 - 50	3,020,121	47,362 - 7,736,024	8	3.2	9
258 - 10	4,007,552	2,750,082 - 5,221,805	5	4.9	3
258 - 20	2,401,760	1,626,460 - 4,199,968	13	2.9	11
258 - 54	1,936,326	104,700 - 7,278,851	20	2.0	17
258 - 55	11,888,872	8,041,946 - 15,981,116	1	14.6	1
258 - 60	2,822,956	161,884 - 7,138,818	11	3.5	8
258 - 91	2,007,415	25,815 - 7,895,306	18	2.5	14
259 - 41	2,763,976	126,334 - 8,460,042	12	2.9	12
259 - 42	3,483,885	40,855 - 7,434,263	7	3.0	10
262 - 30	1,026,135	102,167 - 2,770,968	24	1.3	20
272 - 50	1,654,296	746,675 - 2,447,436	21	0.9	23
273 - 72	3,619,400	11,571 - 8,740,166	6	1.9	18
273 - 74	2,881,996	419,830 - 8,918,114	10	3.5	7
273 - 80	2,011,079	178,214 - 4,580,839	17	1.1	21
273 - 90	1,433,390	189,986 - 4,066,272	23	1.0	22
273 - 94	2,288,456	39,605 - 3,983,730	15	1.6	19
281 - 36	2,317,160	48,479 - 6,817,833	14	2.4	15
282 - 10	4,953,405	1,209,770 - 7,681,292	3	4.3	4
282 - 22	1,590,971	438,080 - 4,143,100	22	0.8	24
283 - 61	1,941,632	277,421 - 6,389,397	19	2.4	16
283 - 80	2,210,667	703,201 - 3,564,629	16	2.7	13

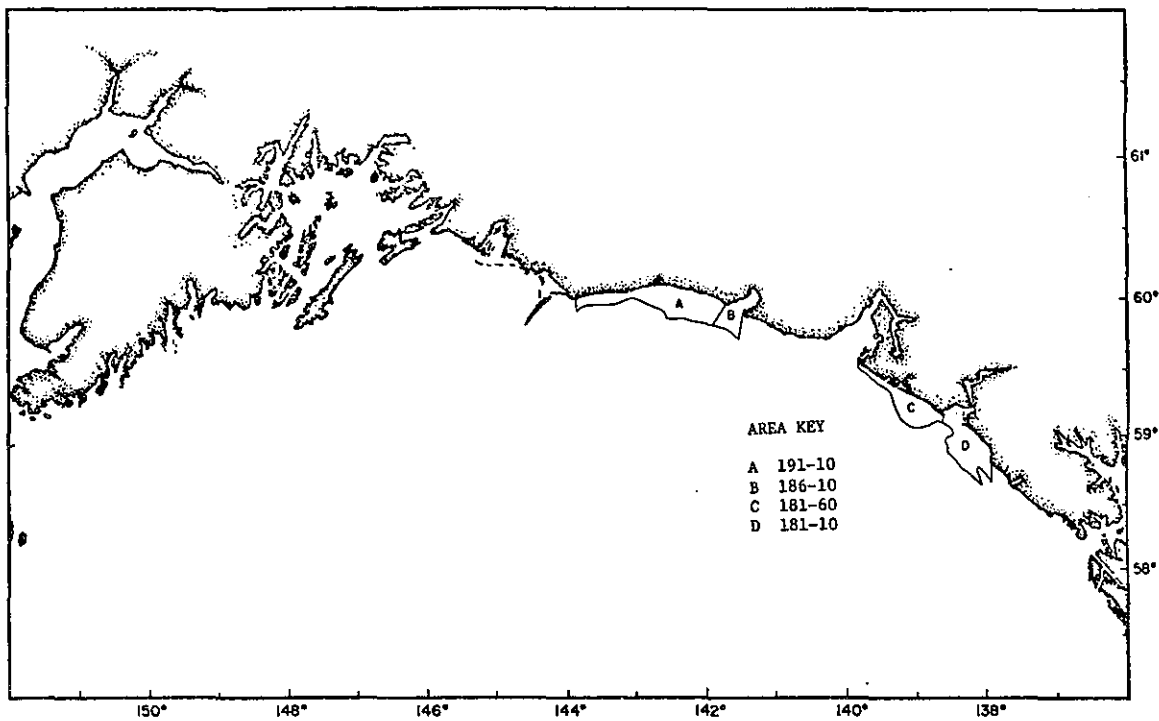


Figure IX-7.--Areas of high production of scallop by United States fishermen, 1969 - 1975 (eastern Study Area).

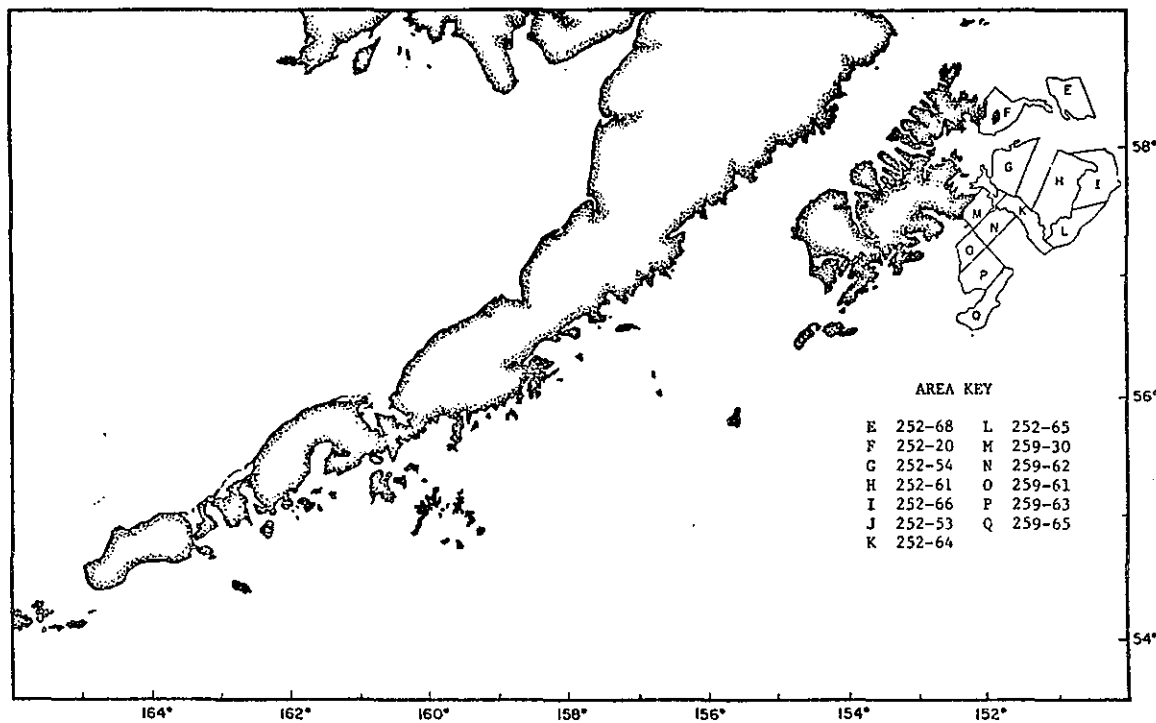


Figure IX-8.--Areas of high production of scallop by United States fishermen, 1969 - 1975 (western Study Area).

Table IX-5.--Areas important to the production of scallop, 1969 - 1975.

Statistical Sub-area number	Annual Production (Pounds)			Contribution to 1969- 1975 production	
	Annual Mean	1969 - 1975 Range	Rank Order (mean)	Percent	Rank Order
181 - 10	101,267	24,155 - 201,136	4	4.2	8
181 - 60	96,886	13,413 - 185,796	5	8.1	3
186 - 10	91,197	16,744 - 262,296	7	5.1	7
191 - 10	67,049	38,439 - 128,234	11	3.7	11
252 - 20	20,544	488 - 55,128	17	1.4	17
252 - 53	55,625	176 - 91,959	13	3.9	10
252 - 54	148,813	28,593 - 269,033	1	4.1	9
252 - 61	52,737	19,494 - 113,575	14	3.7	13
252 - 64	59,196	11,860 - 141,832	12	2.5	15
252 - 65	30,341	11,180 - 60,349	16	2.1	16
252 - 66	83,553	18,131 - 184,219	9	5.8	5
252 - 68	131,506	29,078 - 317,892	2	11.0	1
259 - 30	69,558	8,762 - 187,586	10	6.0	4
259 - 61	44,376	22,323 - 128,008	15	3.7	12
259 - 62	112,080	7,855 - 217,015	3	9.3	2
259 - 63	87,100	78,984 - 93,759	8	3.6	14
259 - 65	92,510	1,760 - 184,918	6	5.1	6

6. Halibut

The Study Area, from Cape Spencer to Unimak Pass, has been divided by the IPHC into 18 statistical reporting areas (Figure IX-9). The mean annual catch for each of two periods, 1960-1968 and 1969-1975, together with the range and rank order of the mean is shown in Table IX-6. Although the mean annual catches during the most recent period are generally about 2/3rds of the catches during the earlier period, the order of ranks of the 18 statistical areas is quite similar during both and yields a rank correlation coefficient of 0.98.

The most important areas contributing to the halibut catch from 1960 through 1975 are 25 and 26 off the Kenai Peninsula and 29, 30, and 31 lying along the south side of the Alaska Peninsula between the Shumagin Islands and Kodiak Island. Of the total halibut catch, approximately 27-28% came from the two Kenai Peninsula areas and a similar proportion from the three Alaska Peninsula areas. A lesser portion of the halibut catch, 13-14 percent, came from areas 27 and 28 which lie off Kodiak Island. Thus, the 7 areas from 25 through 31 (Kenai Peninsula to the Shumagin Islands) provided about 70 percent of the halibut catch from the Study Area.

JAPANESE FISHERIES

The species or groups of species identifiable in Japanese bottom fish statistics are as follows: turbot (arrowtooth flounder), flatfishes other than turbot, sablefish (black cod), Pacific cod, walleye pollock, and Pacific ocean perch. Also identifiable are the total trawl catch and the catch of all species by both trawl and longline gear.

The Japan Fishery Agency assigns commercial fish catches to statistical blocks that are 1° longitude wide by ½° latitude long., which makes each block approximately 30 nautical miles on each side.

During the period including 1964 to 1974, catches came from 115 separate blocks within the Study Area. In the designation of a specific block, a 5-digit number is used. The initial 2-digits are the longitude less 100° of the eastern edge of the block, and the next 2-digits are the latitude in degrees of the southern edge of the block; the final digit, either 0 or 3, indicates whether the latitude is a whole degree (0) or plus 30' (3); for example, the block containing Chirikof Island (to the southwest of Kodiak Island) is designated 5553 since its eastern edge is 155° W. long. and its southern edge is 55°30'N. Lat.

The value shown in each 1° x ½° block is a mean calculated by dividing the total catch over the 11 years by the number of years in which catches were recorded. Thus, years in which no catch was recorded in a block did not enter into the calculation of the mean.

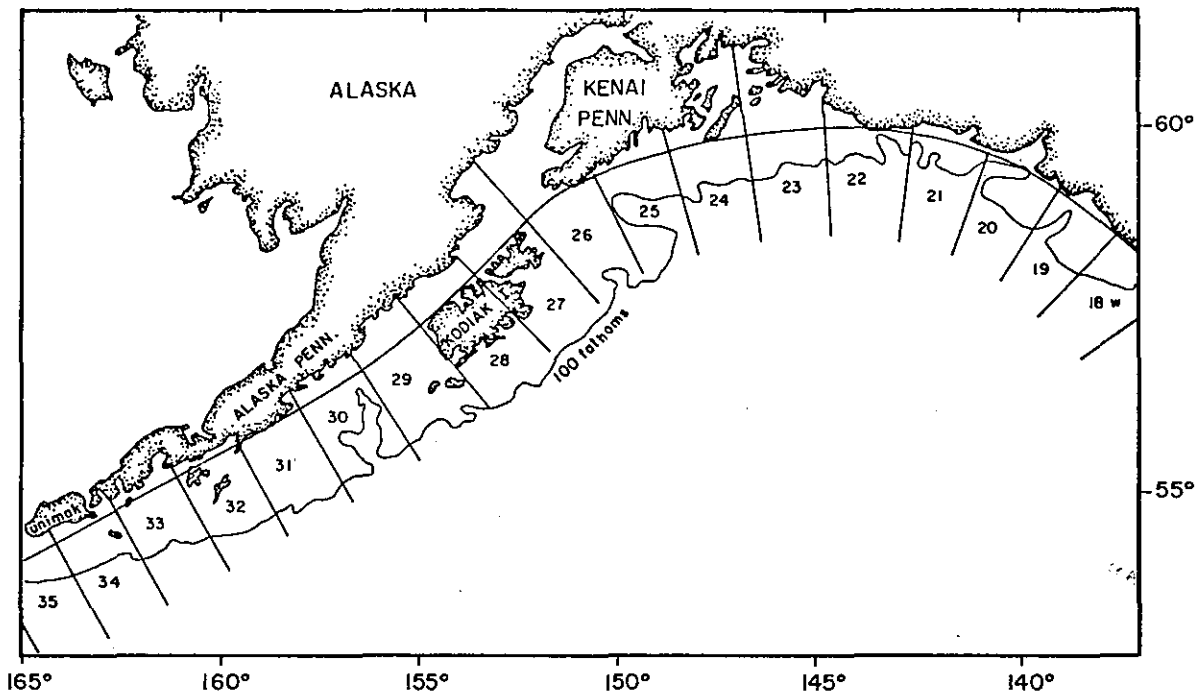


Figure IX-9.--Statistical reporting areas for halibut production from Cape Spencer to Unimak Pass by United States and Canadian fishermen.

Table IX-6.--Mean halibut catches by United States and Canadian fishermen by International Halibut Commission statistical areas, 1960-1968 and 1969-1975, (metric tons).

Statistical Reporting Area	1960 - 1968			1969 - 1975		
	Annual Mean	% of Total	Rank Order	Annual Mean	% of Total	Rank Order
18W	254	1.2	16	269	2.0	15
19	577	2.7	13	581	4.1	11
20	692	3.2	11	654	4.6	10
21	404	1.9	15	259	1.8	16
22	598	2.8	12	439	3.1	13
23	801	3.7	10	516	3.7	12
24	1197	5.6	7	671	4.8	8
25	3277	15.3	1	2219	15.7	1
26	2661	12.4	2	1566	11.1	2
27	1044	4.9	9	947	6.7	7
28	1646	7.7	6	1044	7.4	6
29	2302	10.7	4	1412	10.0	3
30	2313	10.8	3	1227	8.7	4
31	1730	8.1	5	1138	8.1	5
32	1112	5.2	8	660	4.7	9
33	558	2.6	14	347	2.5	14
34	222	1.0	17	96	0.7	17
35	67	0.3	18	62	0.4	18
TOTAL	21,455	100.1	--	14,107	100.1	--

1. Turbot

The catches of turbot (Atheresthes stomias) were distributed throughout the Study Area in moderate quantities (Figure IX-10). Blocks with an unusually high mean catch were 43593 off Cape Suckling, 48583 south of the Kenai Peninsula, 55550 and 56550 south of Chirikof Island, and 64533 south of Unimak Pass.

2. Flatfishes other than turbot

The distribution of the mean annual catches of flatfishes other than turbot during the 11 years from 1964 to 1974 is shown in Figure IX-11. Two blocks, 41590 off Yakutat Bay and 47590 south of Montague Island, had relatively high yields of this species group. The identity of the species involved is not known, but biological surveys have found the starry flounder (Platichthys stellatus) and the butter sole (Isopsetta isolepis) to be unusually prevalent in the vicinity of Icy Bay and Yakutat Bay.

3. Sablefish

The sablefish constitutes the dominant element, 98% by weight, of the longline fishery; it is also an important element of the trawl catch. The mean annual catch from within each block for both fisheries combined during the 1964-1974 period is shown in Figure IX-12.

The blocks with the larger apparent abundances of sablefish lie in the eastern part of the Study Area; 39580, 40583, and 41590 off Yakutat; 42590 off Icy Bay; and 48580 and 48583 south of the Kenai Peninsula.

4. Pacific cod

Statistical blocks with unusually large catches of Pacific cod were 47590 (south of Montague Island), several blocks between 53563 and 56550 (lying in an arc from east of the Trinity Islands to south of Chirikof Island), and 64533 (south of Unimak Pass) (Figure IX-13).

5. Walleye pollock

The catch of pollock by Japan throughout the 1964-1974 period appears to come from most parts of the Study Area, but the larger mean annual catches come from the area south of Kodiak Island (Figure IX-14). Blocks producing the larger mean catches extend from 48583 (south of Montague Island) to 56550 (south of the Semidi Islands). Another series of blocks with moderately large production of pollock lie in the western part of the Study Area to the south and west of the Shumagin Islands. Isolated blocks of unusually large pollock catches are 41583 (off Icy Bay), 43593 (off Cape Suckling), and two blocks, 64530 and 64533, (south of Unimak Pass).

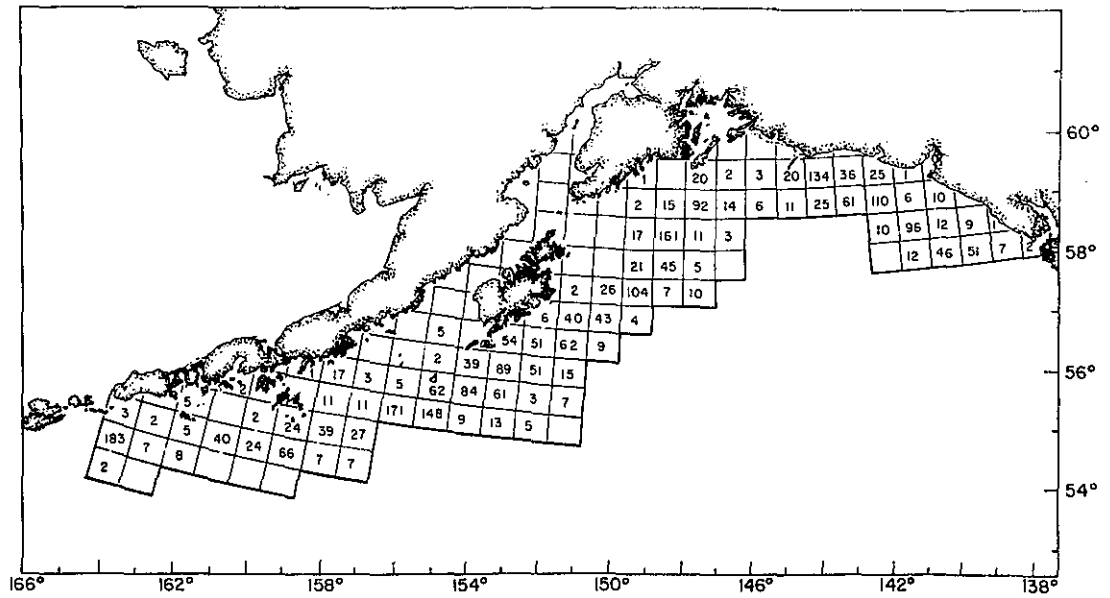


Figure IX-10.--Mean annual catch (mt) of turbot (arrowtooth flounder) by the Japanese trawl fishery, 1964 - 1974.

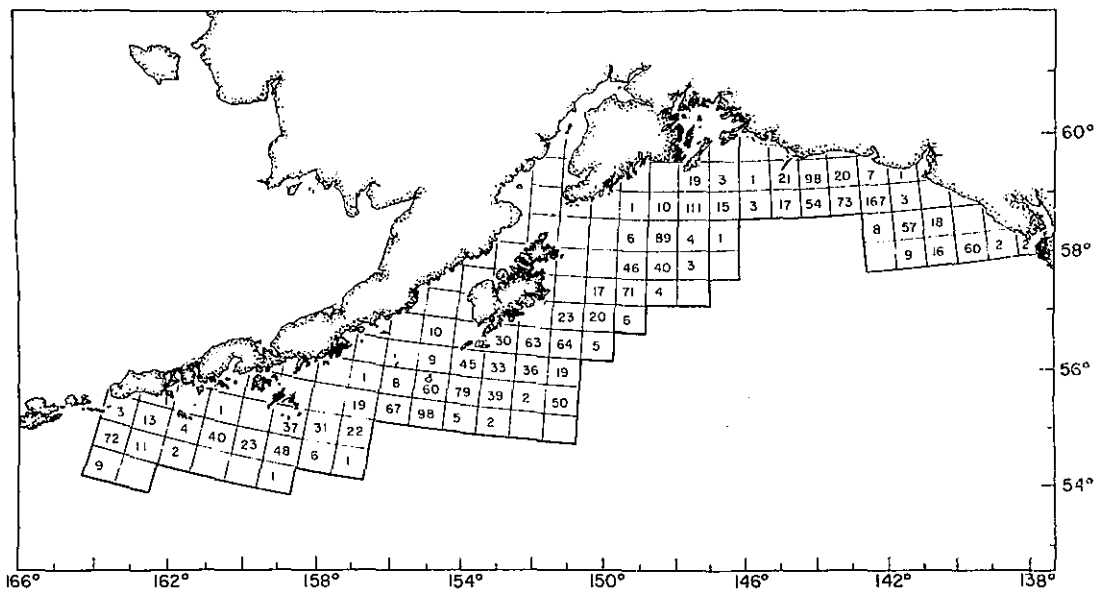


Figure IX-11.--Mean annual catch (mt) of flatfishes other than turbot by the Japanese trawl fishery, 1964 - 1974.

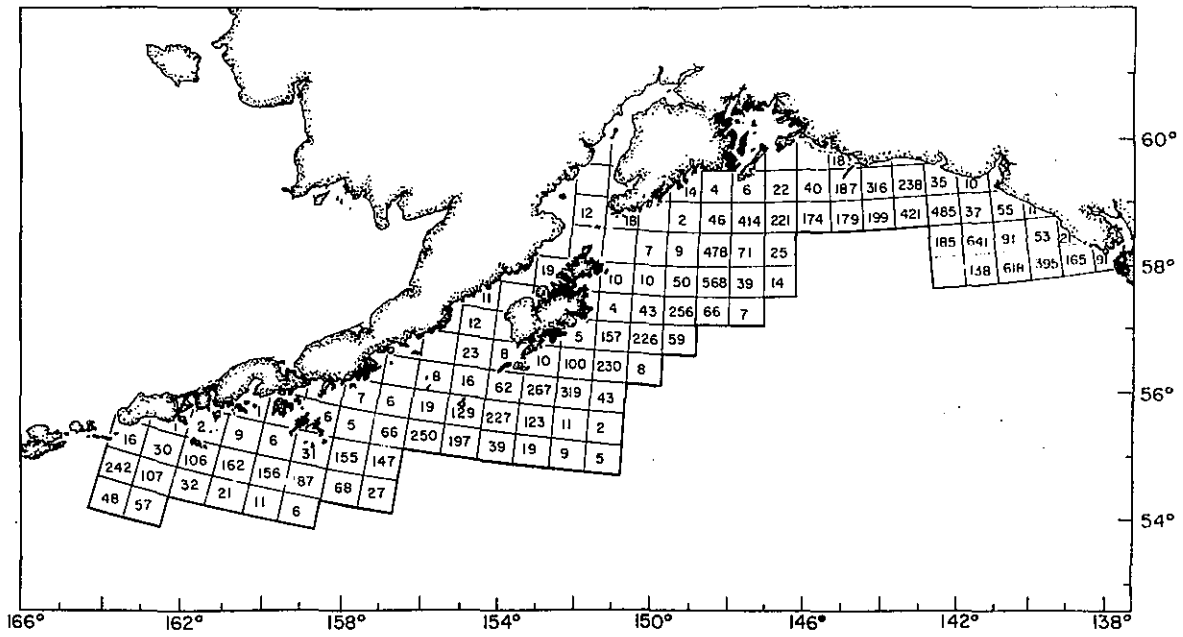


Figure IX-12.--Mean annual catch (mt) of sablefish (blackcod) by the Japanese trawl and longline fisheries, 1964 - 1974.

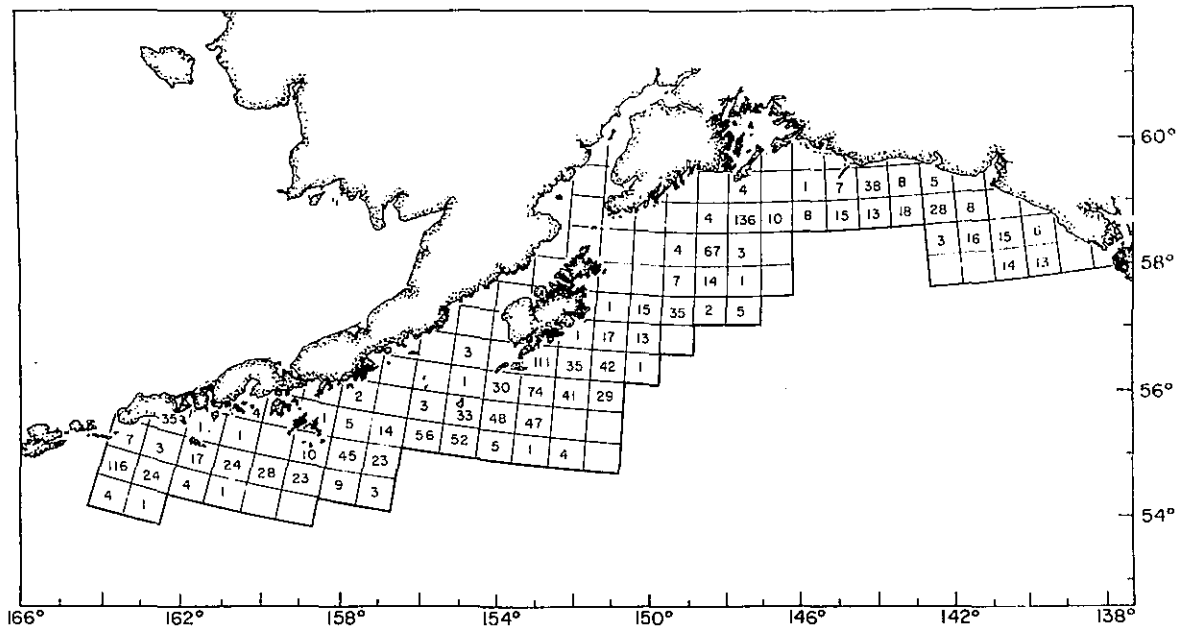


Figure IX-13.--Mean annual catch (mt) of Pacific cod by the Japanese trawl fishery, 1964 - 1974.

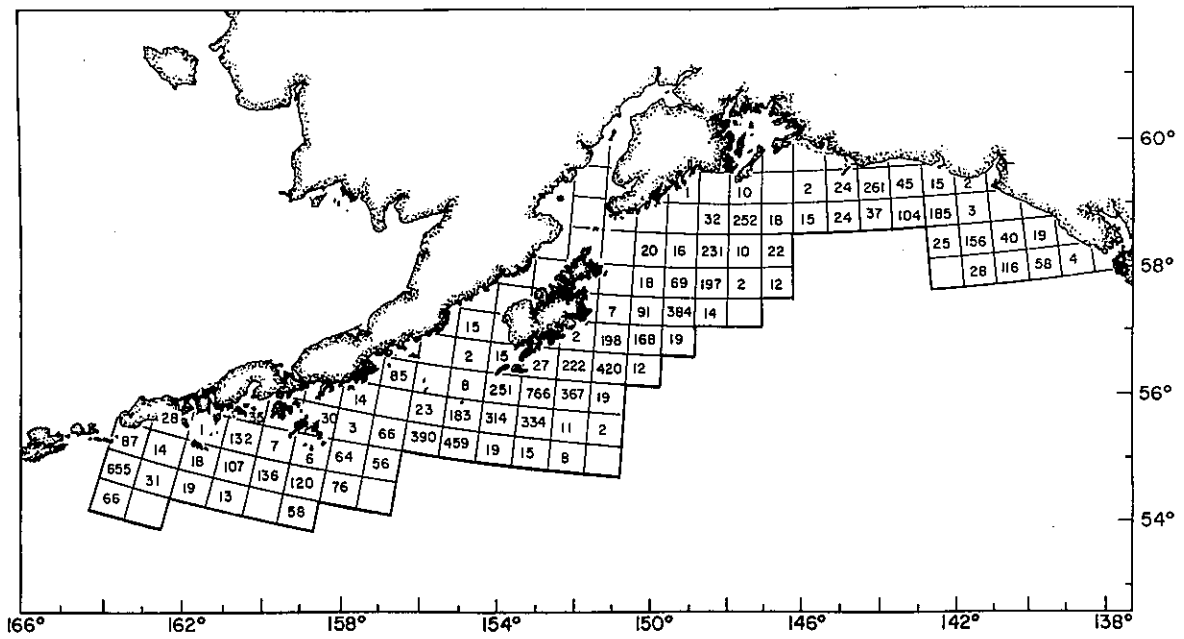


Figure IX-14.--Mean annual catch (mt) of walleye pollock by the Japanese trawl fishery, 1964 - 1974.

6. Pacific ocean perch

Pacific ocean perch, making up 59% of the trawl catches and 46% of the total bottomfish catch, has been the dominant element in the Japanese groundfish catch from the Study Area. The blocks contributing the largest catches are 40583 and 41590 located off Icy Bay and Yakutat Bay in the eastern part of the Study Area. Large quantities also come from the area between the Kenai Peninsula and Chirikof Island (Figure IX-15).

7. Total trawl catch

The distribution of $1^{\circ} \times \frac{1}{2}^{\circ}$ blocks of the mean annual catches of all trawl caught species has been determined for the period from 1964-1974 (Figure IX-16). The blocks of greater productivity (in excess of 1000 mt) are distributed mainly from Chirikof Island eastward to Cape Spencer; the area from Chirikof Island westward toward Unimak Pass is of generally low productivity except in the immediate area of Unimak Pass.

8. Catch of all bottomfish species by trawl and longline; 1964-1974.

The mean annual catch of bottomfish by Japan, 1964-1974, is shown in Figure IX-17. Since the bottomfish catch is largely (78%) made up of trawl-caught species, the distribution of the whole catch is similar to that of the trawl catch shown in Figure IX-16. The statistical blocks of larger bottomfish production are located between the Semidi Islands (157° W. long.) and Cape Spencer (138° W. long.); in the western part of the Study Area only a single block near Unimak Pass had a notably large production.

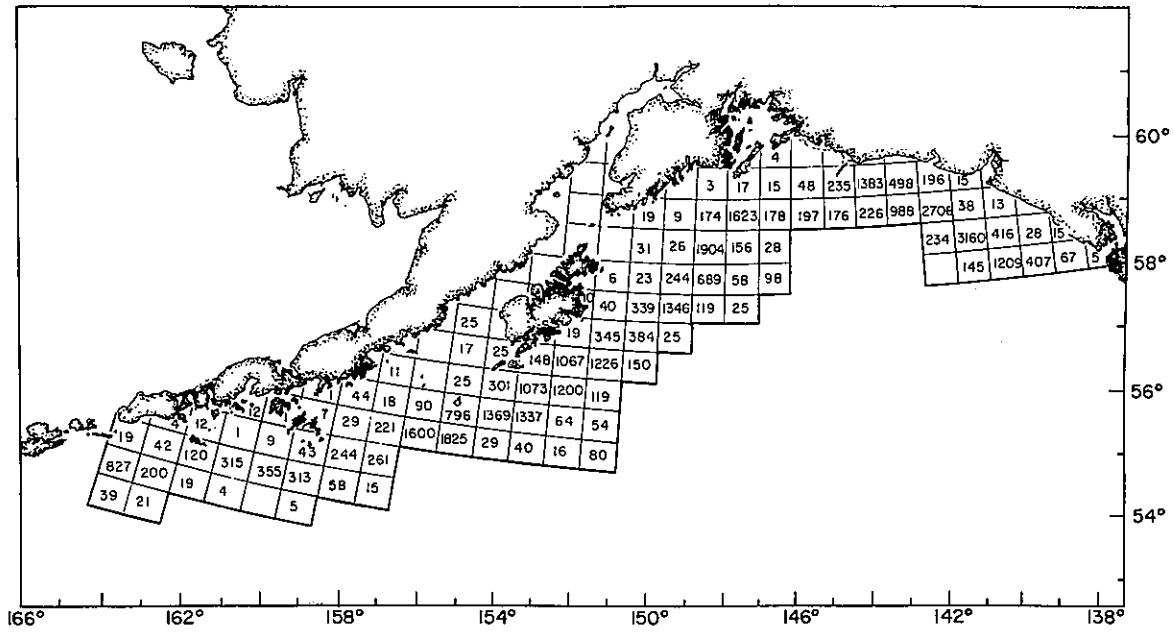


Figure IX-15.--Mean annual catch (mt) of Pacific ocean perch by the Japanese trawl fishery, 1964 - 1974.

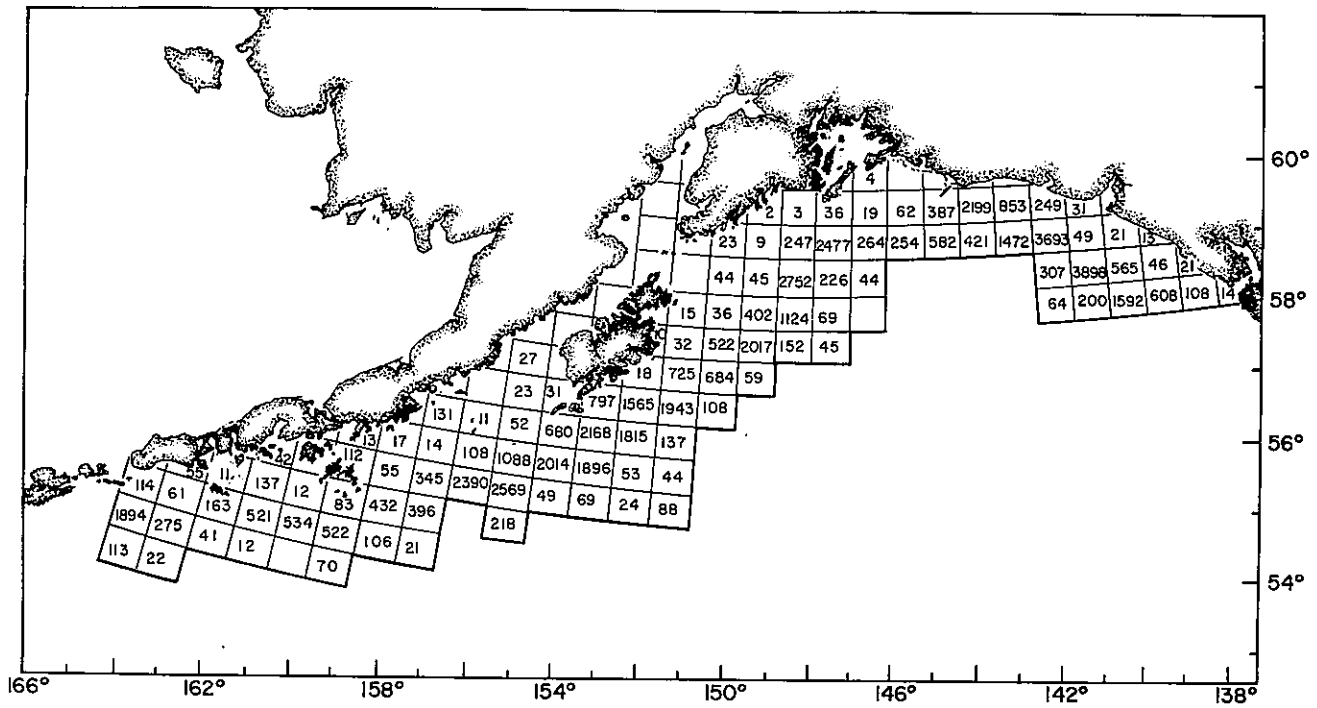


Figure IX-16.--Mean annual trawl fishery catch (mt) by Japan, 1964-1974.

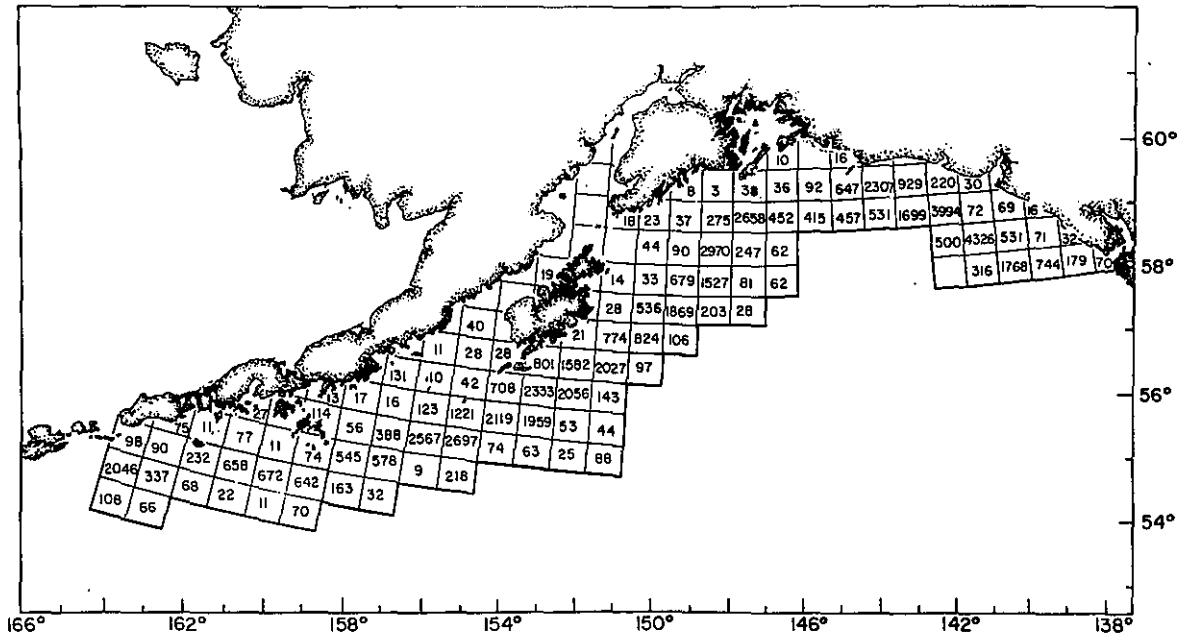


Figure IX-17.--Mean annual bottomfish catch (mt) by Japanese trawl and long line fisheries, 1964 - 1974.

EXPLORATORY FISHING CRUISES IN THE GULF OF ALASKA

INTRODUCTION

Exploratory fishing cruises were conducted in the Gulf of Alaska from 1948 to 1970 (Table X-1). The first cruise was conducted by the U.S. fish and Wildlife Service using the R/V Washington. From 1950 to 1959 the Seattle Exploratory Fishing and Gear Research Base conducted numerous cruises in Alaskan waters. In 1960, an Alaskan Exploratory Fishing and Gear Research Base was established at Juneau, Alaska, and exploratory cruises were conducted from 1960 to 1970.

The objectives of these exploratory fishing cruises were to define commercially important concentrations of demersal fish and shellfish, define areas of trawlable substrate and define species composition and distribution.

The Fisheries Research Board of Canada, Nanaimo Laboratory, conducted research investigations in the eastern Pacific Ocean. Although FRB did not call these investigations exploratory fishing cruises, their general approach was similar to that used in exploratory surveys, so these FRB cruise data are included in this section. FRB conducted five exploratory-type cruises in the Gulf of Alaska from 1963 to 1970.

Objective of their research was to investigate the abundance and size composition of Pacific ocean perch in the eastern Pacific Ocean.

METHODS

1. Cruise Approach and Rationale

Exploratory fishing cruises did not utilize predetermined systematic or random stratified sampling patterns. Instead, a geographical region was selected to be explored for the availability of a particular species or species assemblage. Sampling sites were selected on-the-spot based on previous successful sampling results, water depths, and interpretation of hydrographic charts and/or echo sounder recordings. During the Pacific ocean perch investigations all likely depths were randomly sounded to locate trawlable bottom. Trawling, however, was usually conducted only where schools of fish were located with the sounder.

2. Vessels and Fishing Gear

Exploratory fishing cruises were conducted primarily using the government research vessels John N. Cobb and John R. Manning and, at times, chartered commercial fishing vessels. These vessels ranged from 35 to 47 m in overall length. For Pacific ocean perch investigations the Canadian Government used the 84 m research vessel G. B. Reed.

Table X-1.--BCF exploratory fishing cruises and FRB Canada Pacific ocean perch cruises conducted with otter trawls in the Gulf of Alaska.

Cruise No.	Vessel		1/ Gear	Stations Attempted	Regions	Year	Months
	Name	Length (m)					
--	<u>Washington</u>	47	AT	21	Kodiak-Shumagin	1948	Sept.-Oct.
15	<u>John N. Cobb</u>	44	OTW (2)	7	Yakutat	1953	March-April
18	<u>John N. Cobb</u>	44	OTW (4)	102	Prince William	1954	Feb.-April
20	<u>John N. Cobb</u>	44	OTW (4)	88	Prince William	1954	July-Sept.
2	<u>Tordenskjold</u>	35	OTE	61	Shumagin-Sanak	1957	July-Sept.
601	<u>New Hope</u>	40	OTE	4	Fairweather	1960	September
612	<u>Tordenskjold</u>	35	OTE	25	Cook Inlet	1961	September
621	<u>Yaquina</u>	35	OTE	63	Kodiak	1962	July-August
673	<u>John R. Manning</u>	41	OTE-OTER	79	Kenai	1967	July-August
636	<u>G.B. Reed</u>	84	ESB	38	Yakutat to Kenai	1963	July-August
637	<u>G.B. Reed</u>	84	ESB	25	Kenai to Chirikof	1963	August-Sept.
648	<u>G.B. Reed</u>	84	ESB	30	Chirikof to Sanak	1964	July-August
652	<u>G.B. Reed</u>	84	ESB	15	Yakutat to Kodiak	1965	February

-69-

- 1/ OTW (2) Western otter trawl (200-mesh) (Schaefers, Edward A. and Keith A. Smith, 1954).
- OTE Eastern otter trawl (400-mesh) (Greenwood, 1958).
- OTER Eastern otter trawl with roller gear.
- OTM Modified Eastern otter trawl. (Figure X-1.)
- OTW (4) Western otter trawl (400-mesh) (Alverson, Dayton L., 1951).
- ESB Eastern-type semi-balloon otter trawl (Harling, W. R. and S. J. Westrheim, 1966)
- AT Atlantic type otter trawl (600-mesh).

Table X-2.--Specifications of the 600-mesh "Atlantic" type otter trawl.

Lines:

Length of head line.....	111	feet
Length of foot line.....	138	"
Length of breast line.....	14	"
Rope serving on head line.....	6	thread
Rope serving on foot line.....	27	"
Rope serving on breastline.....	6	"

Head line - 6/19 3/8' diameter plow steel,
galvanized
Foot line - 6/24 1/2" diameter plow steel,
galvanized
Breast line - 6/19 3/8" diameter plow steel,
galvanized

Mesh Size and Weight

Top wings.....	4½"	mesh	36	thread
Bottom wings.....	"	"	48	"
Square.....	"	"	36	"
Top belly.....	"	"	36	"
Bottom belly.....	"	"	48	"
First intermediate bag.....	3½"	"	60	"
Second intermediate bag.....	"	"	84	"
Fish bag.....	"	"	96	"

Because of the multispecies nature of the exploratory fishing programs, many different types of sampling gear, both mobile and stationary, were used. However, since stationary gears such as crab and shrimp pots are highly species-selective and were infrequently used, data derived from these gears have not been examined for inclusion in this report.

Only data from mobile gears have been examined. Mobile gears have varied considerably over the years, but can be divided into three categories: otter trawls, shrimp trawls, and scallop dredges. BCF used five kinds of otter trawls, four different shrimp trawls, and two sizes of scallop dredges (Table X-2-4, and Figures X-1-2). Additionally, otter boards size and construction, length of dandy-lines, bridles and methods of rigging the trawls have changed over the years and with types of gear. During the Canadian Pacific ocean perch surveys, an eastern-type semi-balloon otter trawl was used.

3. Procedure for Sampling Catches

During the early exploratory fishing cruises only the total weights of the dominant species caught were recorded with priority going to commercially important species. By the late 1950's, sampling procedures had improved and there began a more detailed description of the contents of catches. Catches of less than approximately 2,000 lbs. or less were separated into individual species and either measured by weight or volume. For larger catches a randomly selected portion of the catch was removed and separated by species, and each species catch weighed.

In the Canadian Pacific ocean perch investigations, individual species were separated into 20-inch galvanized tubs and weighed to the nearest pound.

4. Biological Sampling

During the early 1960's exploratory fishing cruises, randomly selected length frequency samples of dominant species were occasionally taken. During the Pacific ocean perch investigation, all specimens of this species were measured.

5. Analytical procedure

Because of the possible data bias in CPUE's due to differences in sampling procedures and gears used, no attempt has been made to compare relative abundance of species between regions, seasons, or years, or to make biomass estimates. Data analysis has been limited to determining standardized catch rates (CPUE) by stations in kg/hour trawled:

$$CPUE_{ik} = \frac{C_{ik}}{F_{ik}} (.453592)(60)$$

Table X-3.--BCF exploratory fishing cruises conducted with shrimp trawls in the Gulf of Alaska.

Cruise No.	Name	Length (m)	<u>1/</u> Gear	Stations Attempted	Regions	Year	Months
15	<u>John N. Cobb</u>	44	BT	67	Yakutat	1953	March-April
18	<u>John N. Cobb</u>	44	BT	18	Prince William	1954	Feb.-April
20	<u>John N. Cobb</u>	44	BT	90	Prince William	1954	July-August
3	<u>Tordenskjold</u>	35	ST 40	29	Shumagin-Sanak	1957	July-Sept.
39	<u>John N. Cobb</u>	44	ST 40	109	Cook Inlet-Kodiak Shelikof	1958	July-August
44	<u>John N. Cobb</u>	44	ST 40	101	Kenai	1959	Oct.-Nov.
622	<u>Yaquina</u>	35	ST 70	92	Prince William-Kenai	1962	August-Oct.
632	<u>Yaquina</u>	35	ST 40	221	Kodiak to Prince William	1963	July-Sept.
642	<u>Paragon</u>	43	ST 40-70	243	Kodiak to Sanak	1964	June-August
682	<u>John R. Manning</u>	41	ST 65	79	Kodiak	1968	July-Sept.
703	<u>Pacific Lady</u>	37	ST 65	113	Kodiak to Prince William	1970	August-Oct.

1/ BT 20' Beam trawl (Ellson and Livingston, 1952).
 ST 40 40' Gulf of Mexico-type flat trawl (Schaefer and Johnson, 1957).
 ST 70 70' Gulf of Mexico-type semi-balloon trawl (Greenwood, 1959).
 ST 66 66' Kodiak shrimp trawl (Figure X-2),

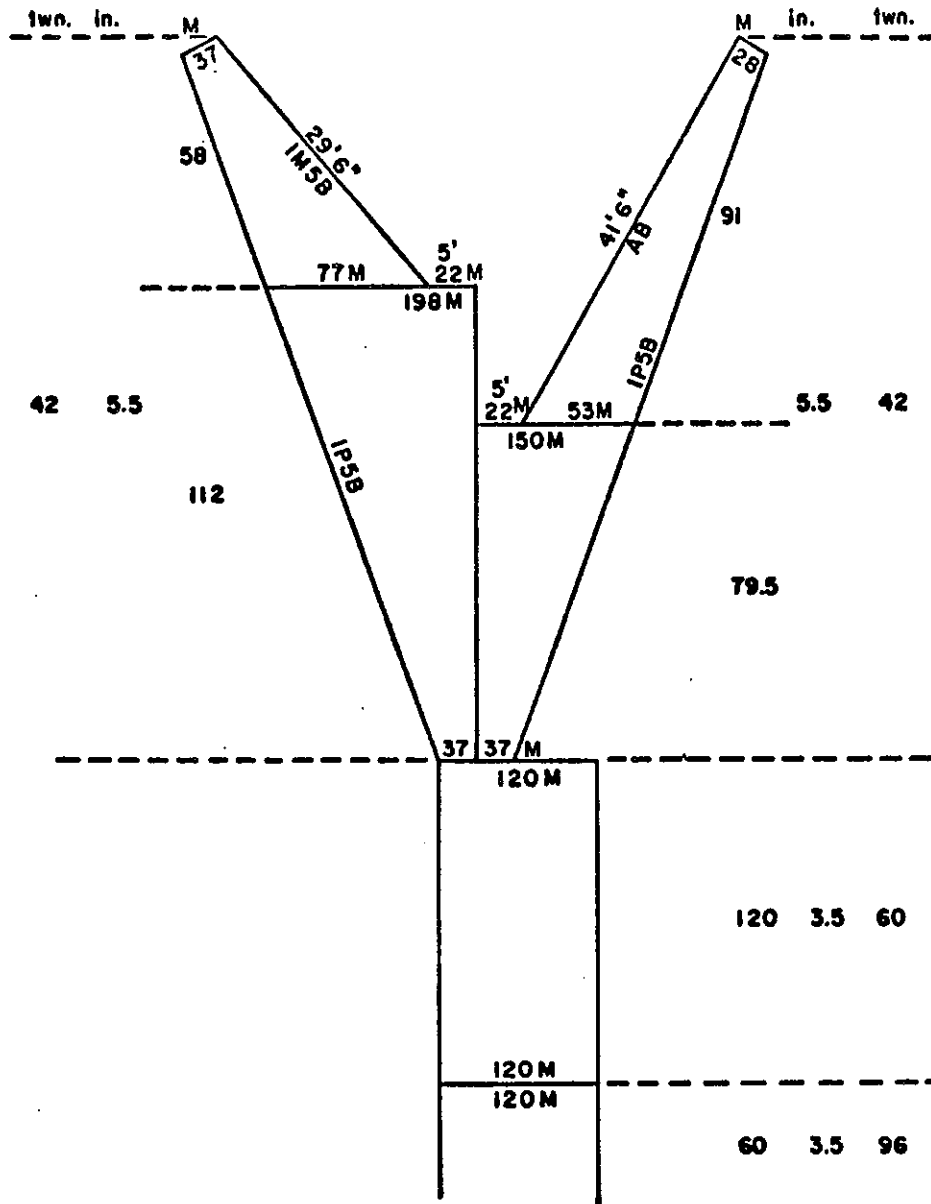
Table X-4.--BCF exploratory fishing cruises conducted in the Gulf of Alaska with scallop dredges.

Cruise No.	Vessel Name	Vessel Length (m)	Gear ^{1/}	Stations Attempted	Regions	Year	Months
631	<u>John R. Manning</u>	41	SD 8	82	Fairweather-Yakutat	1963	May-June
632	<u>Yaquina</u>	35	SD 8	8	Kenai-Kodiak	1963	July-September
642	<u>Paragon</u>	43	SD 8	67	Sanak-Shumagin-Kodiak	1964	June-August

^{1/} SD 8 8' New Bedford-type scallop dredge (Royce, 1946).

SD 13 13' New Bedford-type scallop dredge.

NMFS MODIFIED EASTERN TRAWL



Netting:

Preshrunk nylon

Headrope:

69½ ft., ½ inc. dia. 6 x 19 galv. wire rope, wrapped with 3/8-in. dia. polypropylene rope

Footrope:

93½ ft., 5/8 in. dia., 6 x 19 galv. wire rope

Hanging line:

¼ in. galv. proof coil chain

Breastlines:

5/8 in. dia. braided nylon

Riblines:

127 ft. 9 in., 3/4 in. dia. braided nylon

Flotation:

21 pieces, 8 in. dia. floats (5.5 lbs. buoyancy each).

M = meshes

Figure X-1--Schematic drawing and specifications of the NMFS modified Eastern trawl.

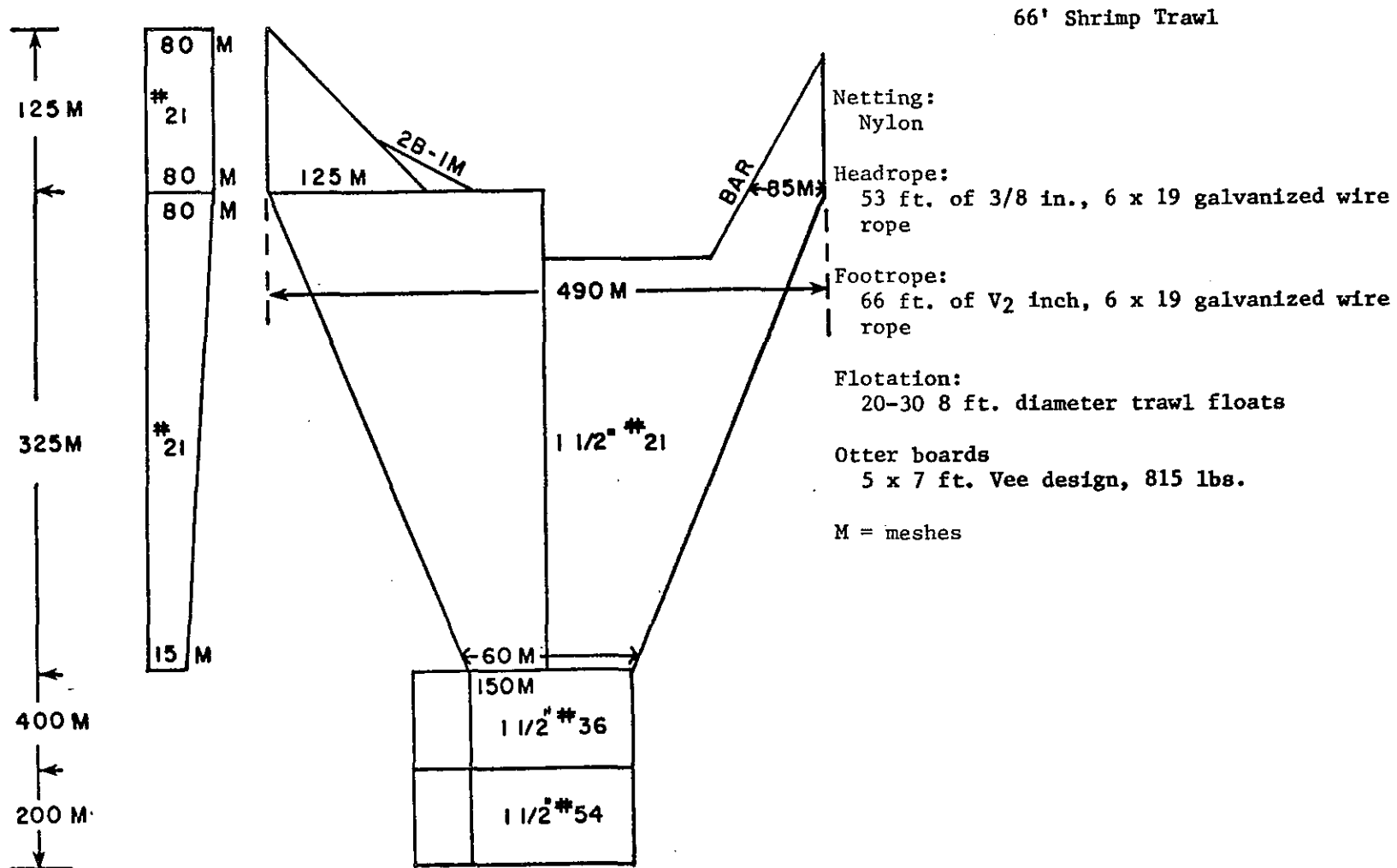


Figure X-2--Schematic drawing and specifications of the 66' shrimp trawl

where C = the catch of species k at station i in pounds, f = the fishing effort in minutes, (.453492) = conversion factor from pounds to kilograms, and (60) = 1 hour fishing effort. Mean CPUE for selected depth intervals or areas were calculated:

$$\overline{\text{CPUE}}_k = \sum_{i=1}^n \frac{\text{CPUE}_{ik}}{N_i}$$

where N equal the number of sampling units.

6. Data presentation

Exploratory fishing-type data are presented in three ways:

(a) Computer-generated plots of successfully sampled stations by cruise with the station number printed beside the station position.

(b) Computer-generated species distribution and relative abundance charts by cruise. Station positions are plotted at the geographic coordinates with one of the following symbols to represent the CPUE:

- x station occupied but no catch
- 0.1 to 0.5 kg/hr
- 5.1 to 25.0 kg/hr
- + 25.1 to 50.0 kg/hr
- + (No.) CPUE rounded to nearest centner (100 kg)

Species catch plots are included for only those species whose catch rates averaged over 10 kg/hr in at least one depth zone. In some plots, stations appear to be located on land masses because of some impreciseness in computer-generated drawings of the land mass.

(c) Listing of the dominant species or species groups of fish and invertebrates based on CPUE.

The results of the analysis of exploratory fishing-type data are presented chronologically by gear type, i.e., otter trawl, shrimp trawl, and scallop dredge.

RESULTS

1. Otter trawl cruises

a. R/V Washington (October 1948)

The R/V Washington conducted trawling operations at 21 locations in the western Gulf of Alaska using a 600-mesh Atlantic-type otter trawl (Figure X-3). Three stations were occupied in Pavlof and Canoe Bays, and 18 along the eastern side of Kodiak Island and Marmot Bay. Since the catch data for this cruise were incomplete in regards to species weights, standardized CPUE's could not be calculated for every station. Some significant species catches were 499 and 454 kg/hr of Pacific cod at tows 24 and 25 in Marmot Bay and 667, 200 and 100 individual Tanner crabs at stations 28, 26, and 27 in Marmot Bay.

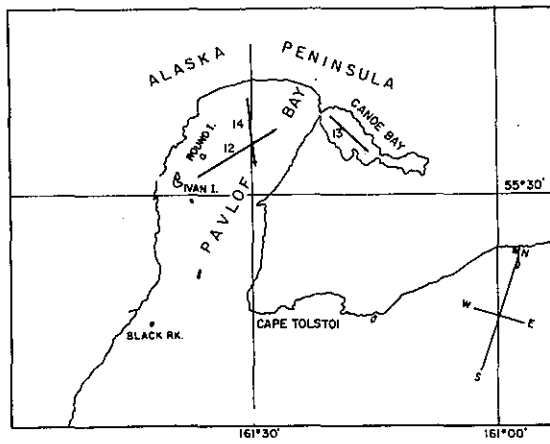
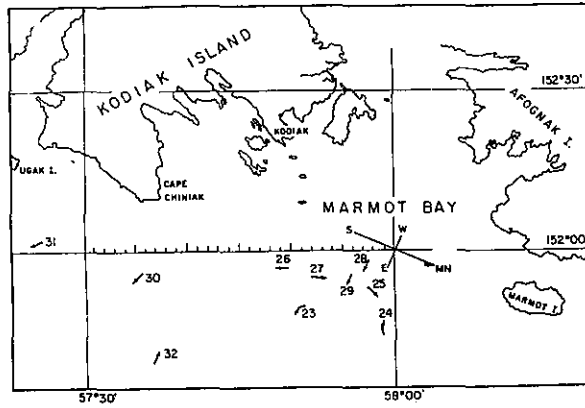
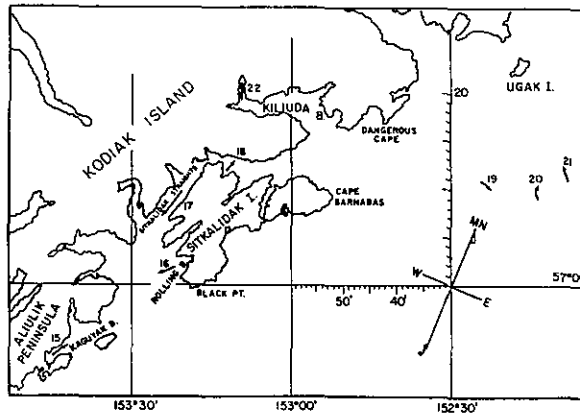


Figure X-3.--Stations successfully trawled (otter trawl) during October 1948, R/V Washington.

b. Cruise 015, R/V John N. Cobb (March-April 1953)

The BCF conducted the first multi-species, multi-gear exploratory cruise in Alaska using the R/V John N. Cobb. Explorations were conducted primarily inside Yakutat Bay with a few sampling stations located in offshore waters.

Five otter trawl stations, of which three were successful, were attempted immediately offshore from Ocean Cape in less than 100 meters of water using a 200-mesh western-type otter trawl (Figure X-4). Total catches of all species were low, averaging only 111 kg/hr (Figure X-5). Species catch rates were extremely low, averaging less than 10 kg/hr for all species except brittlestars (Ophiuroids) which averaged 76 kg/hr (Table X-5).

c. Cruise 018 and 020, R/V John N. Cobb (February-April and July-September 1954)

Prince William Sound and the offshore continental shelf and upper slope were explored by the BCF during two multi-species, multi-gear cruises in 1954. During the former cruise, 102 sampling stations were attempted using 400-mesh western-type otter trawls (Figure X-6). The average CPUE for all species remained low throughout the survey period ranging from 51 to 58 kg/hr in the three depth zones (Table X-6, Figure X-7). Species catch rates were generally low in all areas, with only Pacific halibut and walleye pollock averaging 10 kg/hr or more. Highest catch rates for Pacific Halibut occurred offshore of Hinchinbrook Island, in Orca Bay and in Montague Strait and walleye pollock in northern Prince William Sound (Figures X-8-9). During July-September, 60 stations were attempted using the 400-mesh western-style otter trawl (Figure X-10). Catch rates during the summer cruise were several magnitudes greater than during the earlier February-April cruise. Total catches for all species ranged up to 2900 kg/hr, and averaged near 500 kg/hr in the inner shelf and outer shelf and 922 kg/hr in the upper slope. Highest standardized catch rates for all species were found just offshore of Montague Straits (Figure X-11). Pacific ocean perch, turbot, skates and starry flounder, sablefish, walleye pollock, dogfish shark, Tanner crab, and Pacific cod averaged over 50 kg/hr. (Table X-7). Pacific ocean perch, which had the highest average catch rate, were particularly available in the outer Montague Straits gully where catch rates reached 1500 kg/hr. (Table X-8). Other catches (300 kg/hr or more) were also made along the outer shelf and upper slope east and west of Middleton Island and in Hinchinbrook Gully (Figure X-12). Turbot catches of 300 kg/hr or more were made in Montague Straits, Orca Bay, and the deeper offshore waters (Figure X-13). In the shallow water east from Cape Hinchinbrook, towards Cape St. Elias, the largest concentrations of starry flounder, skates, and dogfish shark were found (Figures X-14-16). Largest catches of sablefish were restricted to outer Montague Strait gully and west of Middleton Island (Figure X-17), while walleye pollock was the only species which produced standardized CPUE's greater than 200 kg/hr in Prince William Sound (Figure X-18). The distribution of the standardized CPUE's for other species which averaged over 10 kg/hr in at least one depth zone are presented in Figures X-19-25).

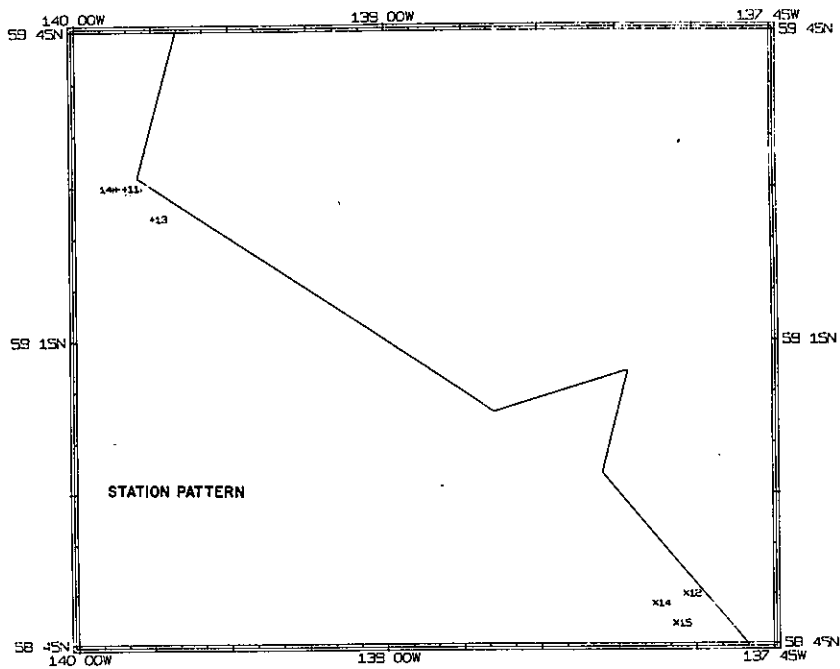


Figure X-4.--Stations successfully trawled (otter trawl) during cruises 015 (+) and 601 (x), R/V John N. Cobb and charter vessel New Hope.

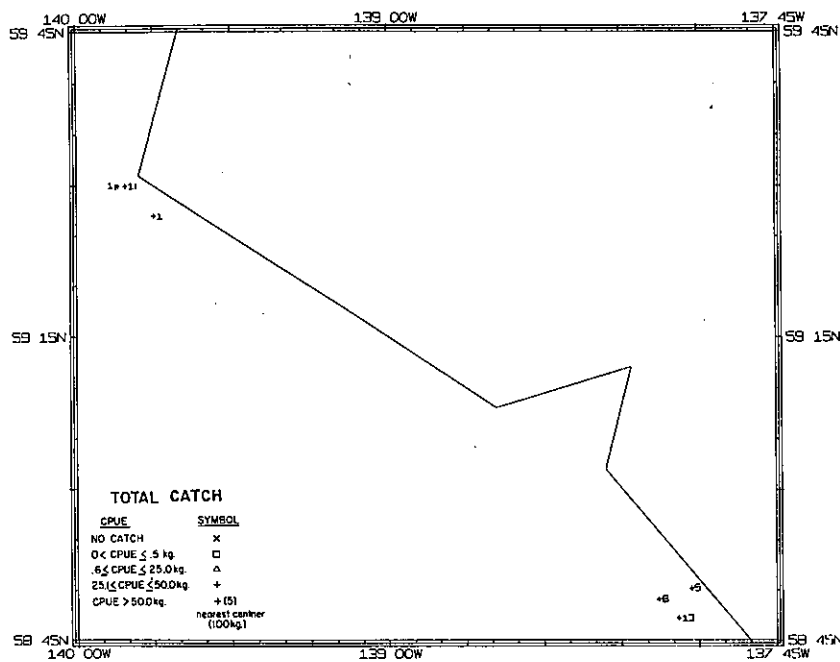


Figure X-5.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 015, R/V John N. Cobb.

Table X-5.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 015,R/V John N. Cobb.

Depth Zone (m) 0 - 100	Avg. kg/hr	Station Number		
		11 kg/hr	13 kg/hr	14 kg/hr
Brittlestar	75.5	45.3	90.7	90.7
Tomcod	9.8	13.6	5.4	10.4
Turbot	6.8	0	17.2	3.2
Skates	6.8	4.5	3.2	12.7
Butter sole	5.0	1.8	11.3	1.8
Eulachon	1.3	1.1	1.8	1.1
Tanner crab	1.2	0	0.9	2.7
Pacific cod	1.2	0	0.9	2.7
Scallop	1.1	0	0.9	2.5
English sole	0.9	0	0.5	2.3

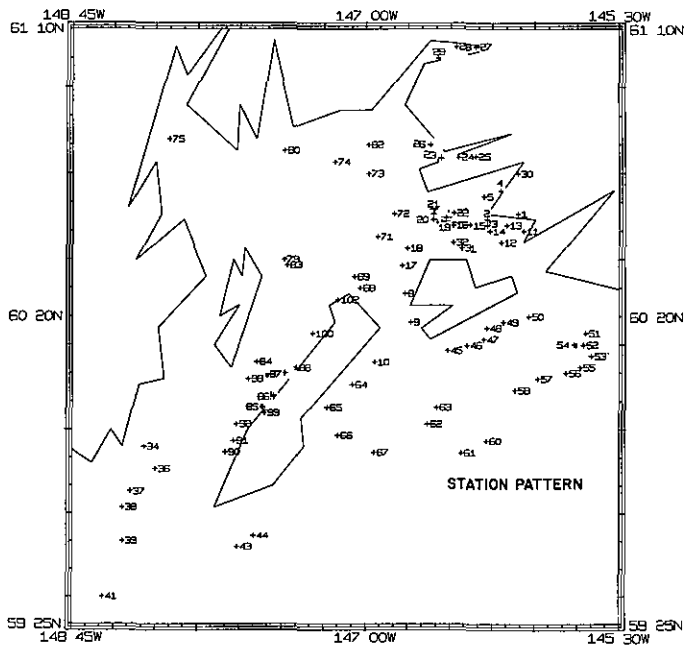


Figure X-6.--Stations successfully trawled (otter trawl) during cruise 018, R/V John N. Cobb.

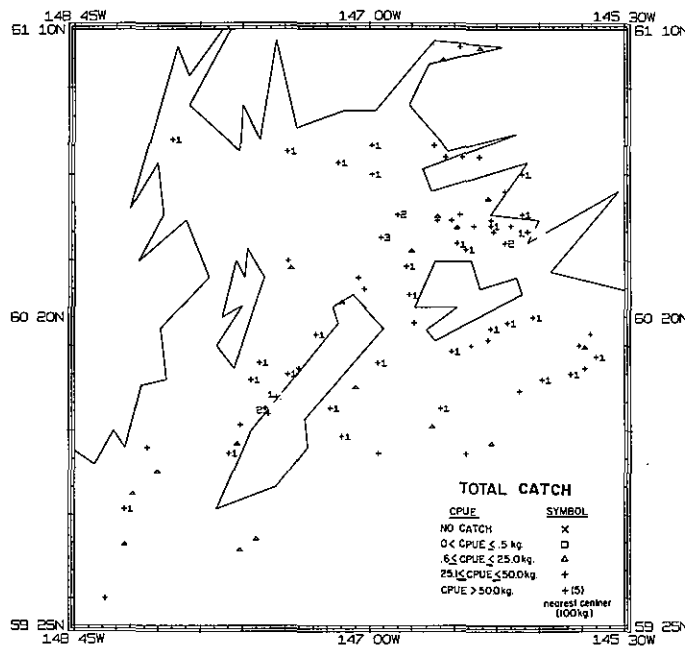
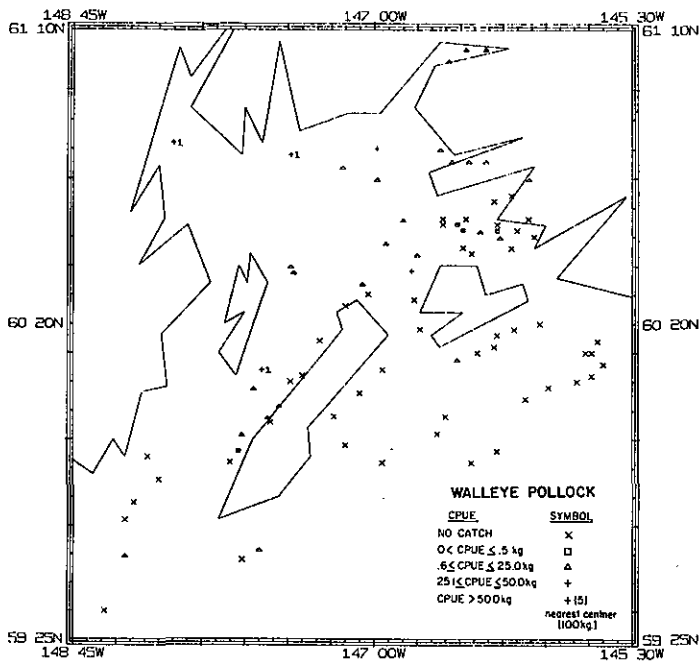
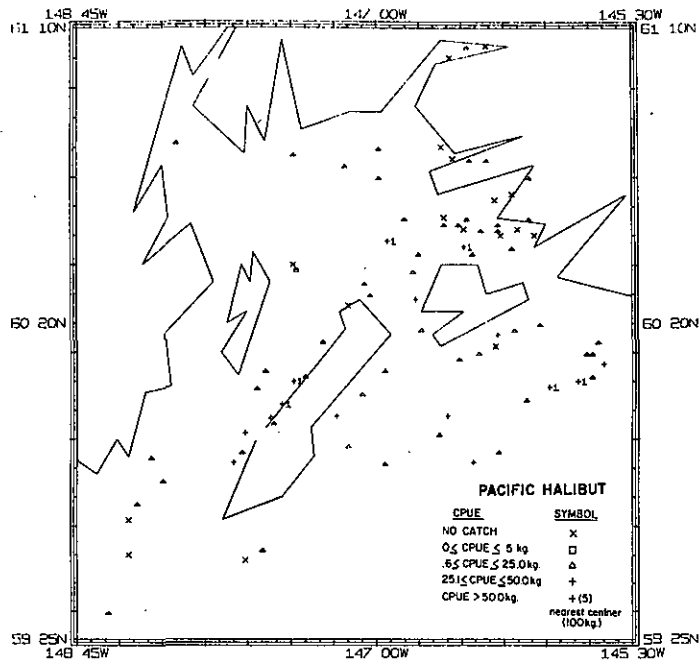


Figure X-7.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 018, R/V John N. Cobb.

Table X-6.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 018, R/V John N. Cobb.

Species	Depth Zones (m)		Species	201 - 400	
	1 - 100	101 - 200		Species	kg/hr
Pacific halibut	19.5	Pacific halibut	15.6	Walleye pollock	11.4
Tanner crab	9.1	Tanner crab	7.1	Pacific halibut	10.6
Dungeness crab	6.8	King crab	6.0	Skates	9.5
Dogfish shark	3.0	Flathead sole	3.6	Tanner crab	6.7
Starry flounder	6.4	Pacific cod	3.1	Dogfish shark	6.3
Flathead sole	2.6	Dogfish shark	2.8	Pacific cod	5.1
King crab	2.4	Skates	2.6	Turbot	4.7
Alaska plaice	1.5	Rockfish	2.4	Flathead sole	0.7
Skates	1.1	Turbot	1.8	English sole	0.6
Pacific cod	0.9	Walleye pollock	1.8	Rockfish	0.5
Total	53.3		46.8		56.1
Total all species	57.3		51.1		57.9



Figures X-8-9.--Distribution of Pacific halibut and walleye pollock standardized catch rates, in kg/hr, cruise 018, R/V John N. Cobb.

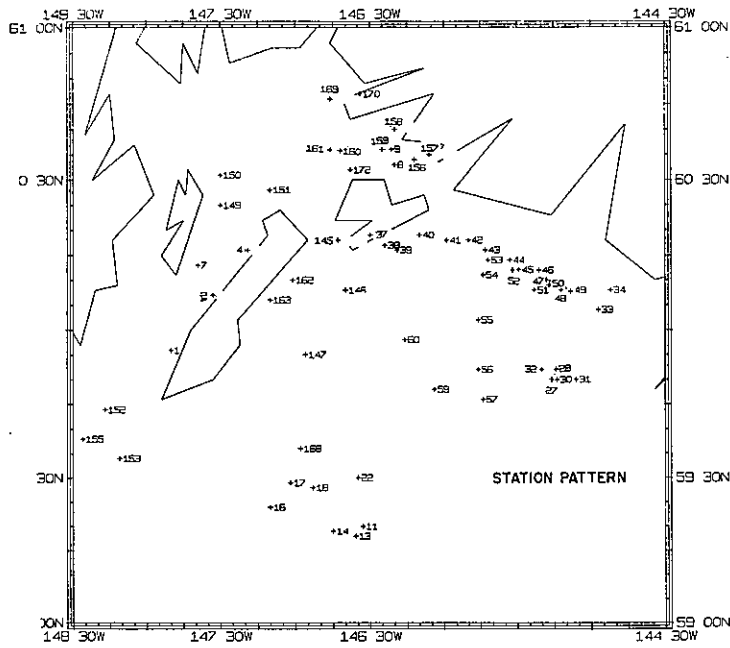


Figure X-10.--Stations successfully trawled (otter trawl) during cruise 020, R/V John N. Cobb.

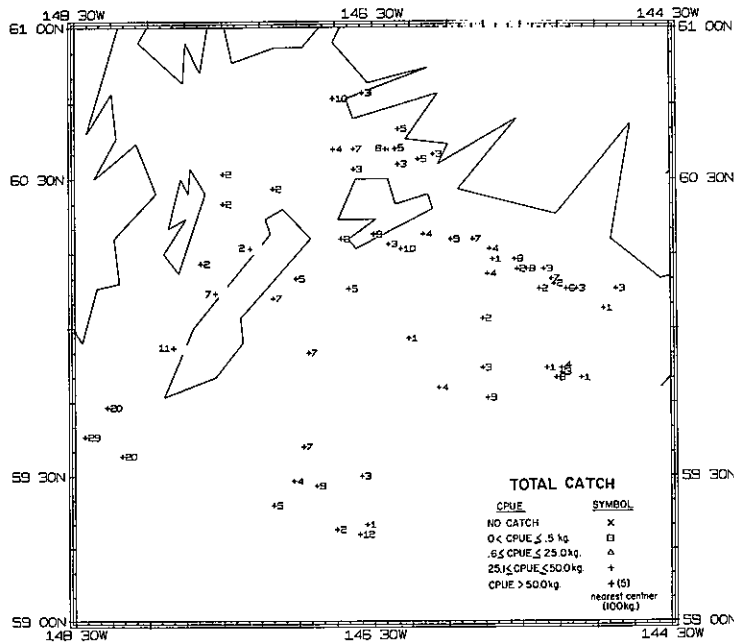


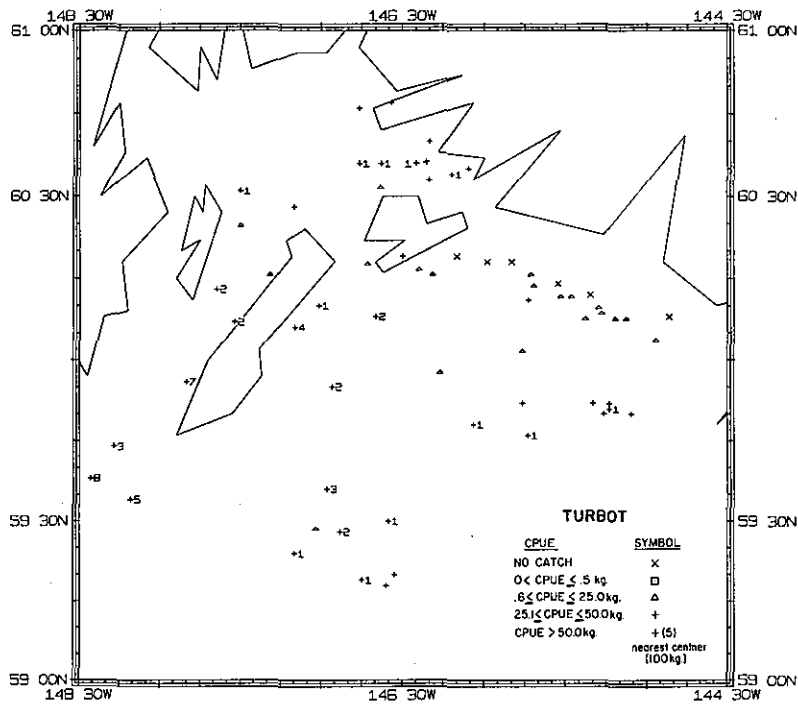
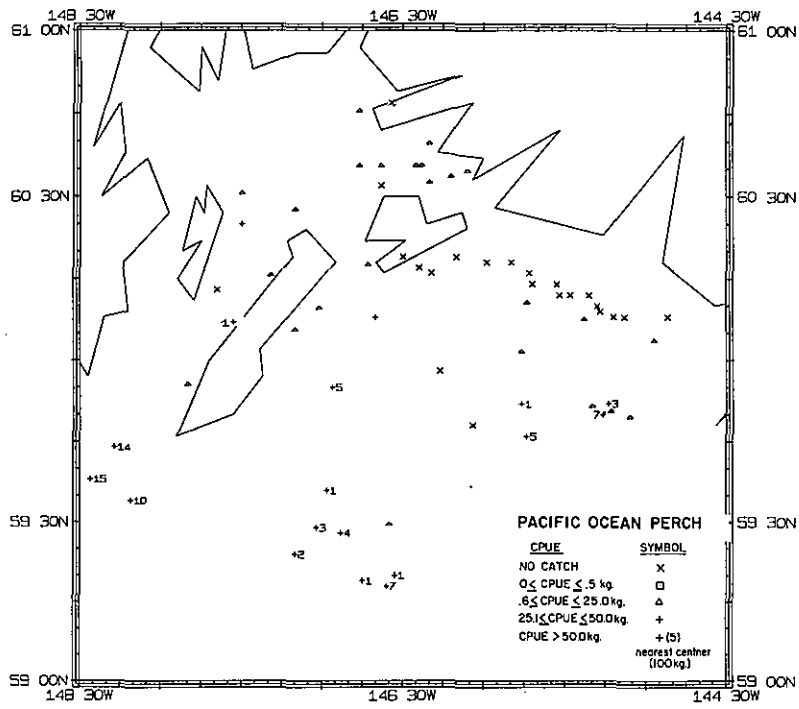
Figure X-11.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 020, R/V John N. Cobb.

Table X-7.--Mean CPUE's for the dominant species or species groups captured with otter trawls,
cruise 020, R/V John N. Cobb.

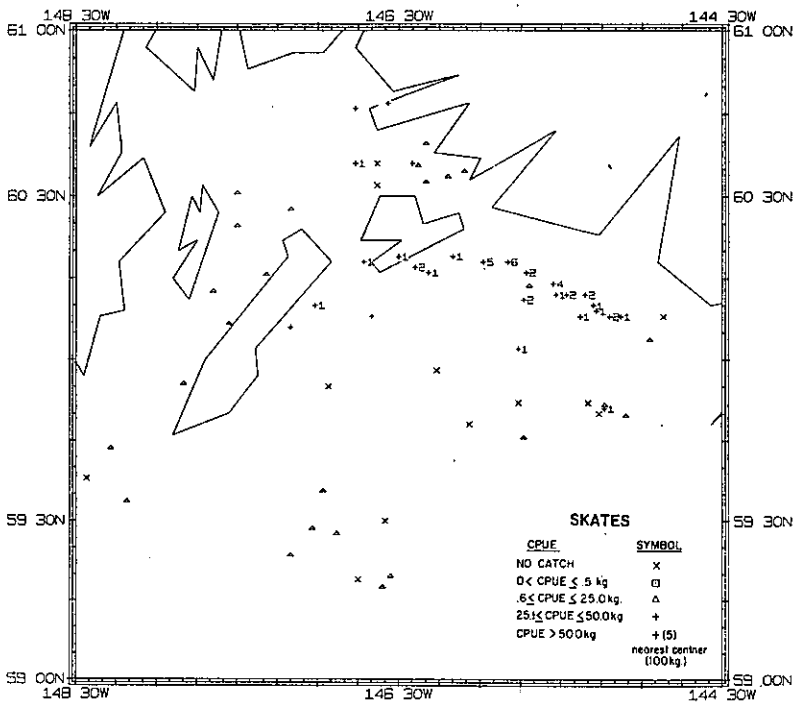
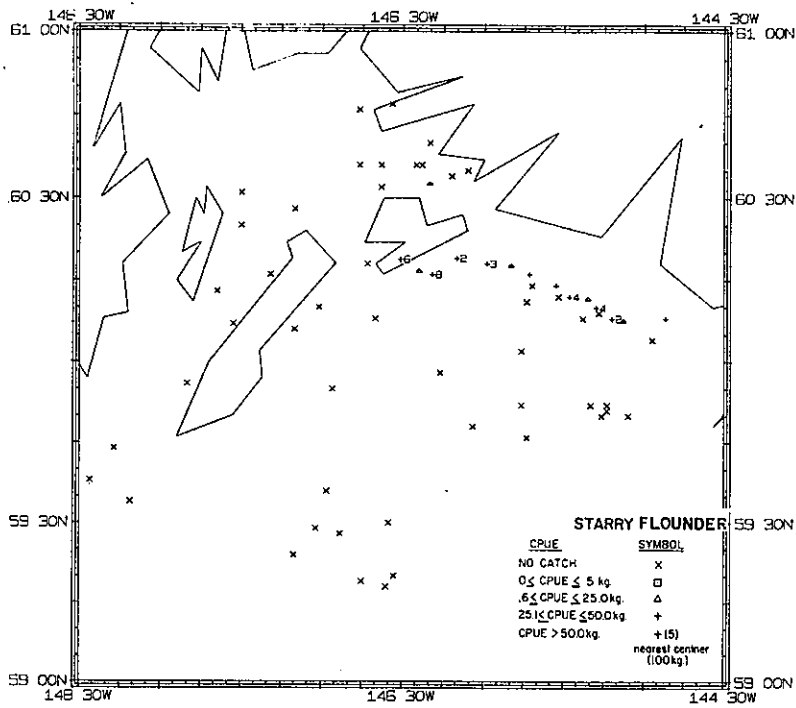
1 - 100		Depth Zones (m) 101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	Species	kg/hr
Skates	144.8	Pacific ocean perch	155.8	Pacific ocean perch	314.1
Starry flounder	139.4	Turbot	81.8	Turbot	311.4
Dogfish shark	38.6	Walleye pollock	80.2	Sablefish	91.4
Dungeness crab	63.2	Pacific cod	38.5	Tanner crab	55.6
Pacific halibut	31.2	Tanner crab	33.9	Pacific cod	53.1
Turbot	15.7	Flathead sole	31.6	Skates	25.7
Pacific cod	11.4	Skates	21.8	Flathead sole	23.4
Walleye pollock	7.8	Pacific halibut	14.6	Walleye pollock	21.1
Flathead sole	6.9	Sablefish	13.2	Shortspine thornyhead	10.8
Pacific ocean perch	6.6	King crab	10.6	King crab	2.7
Total	465.6		482.0		909.3
Total all species	492.8		505.1		921.8

Table X-8.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 020, R/V John N. Cobb.

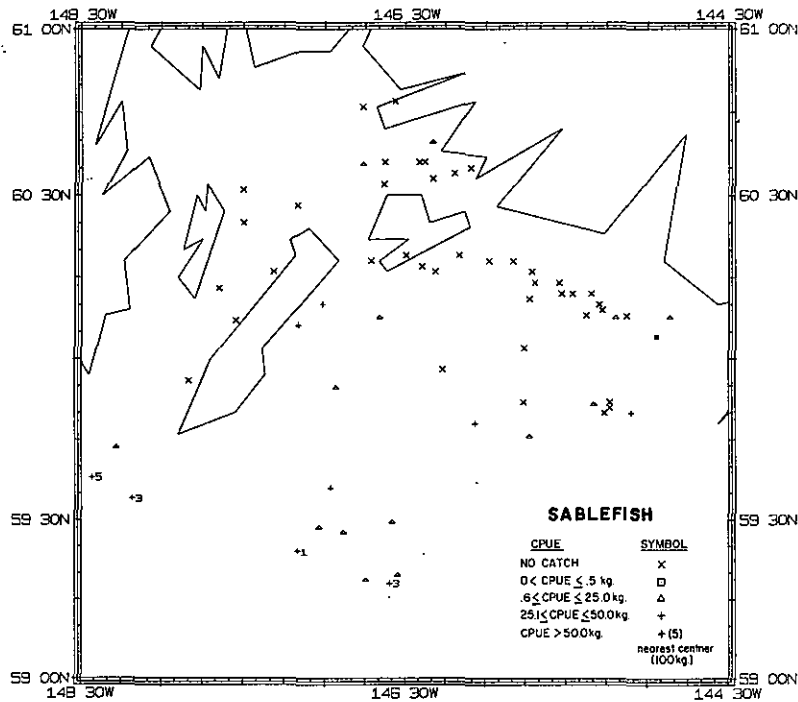
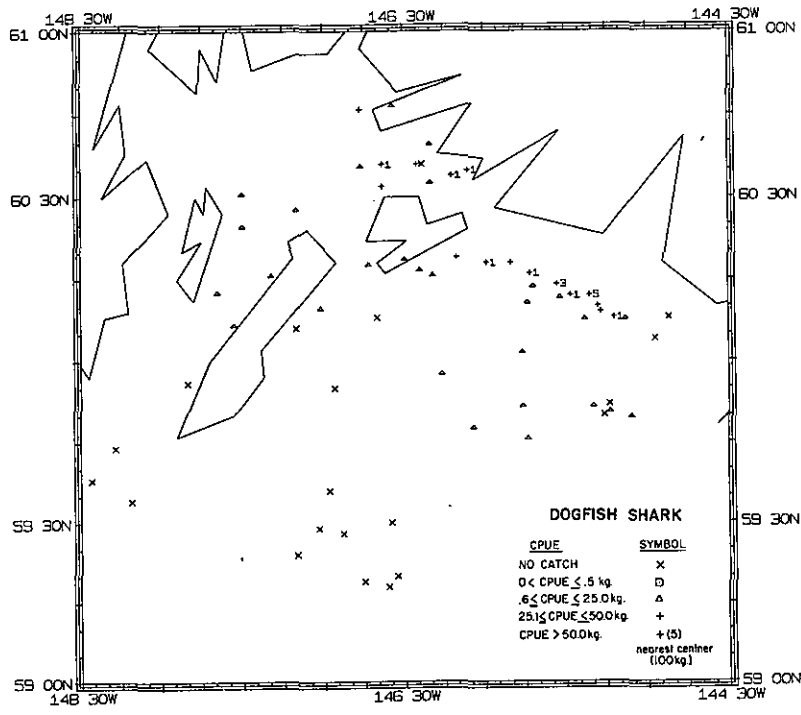
Species or Species group	Station Numbers
Total catch	1, 13, 39, 152, 153, 155 and 169.
Pacific ocean perch	1, 13, 14, 16, 17, 18, 27, 28, 56, 57, 147, 152, 153, 155 and 168.
Turbot	1, 2, 7, 14, 16, 18, 22, 30, 57, 59, 146, 147, 150, 152, 153, 155, 156, 159, 160, 161, 162, 163 and 168.
Skates	30, 37-52, 54, 55, 145, 161 and 162.
Starry flounder	37, 39, 40, 41, 45, 47 and 48.
Sablefish	13, 16, 153 and 155.
Walleye pollock	9, 27, 54, 57, 152, 155-160, 169, 170 and 172.
Dogfish shark	41, 43-46, 48, 156, 157 and 160.
Dungeness crab	34, 40, 41, 43, 44 and 46-49.
Tanner crab	1, 16, 18, 22, 153, 158, 159, 161, 168 and 170.
Pacific cod	1, 2, 4, 8, 9, 51, 155, 159, 162, 163 and 169.
Flathead sole	1, 2, 18, 146, 159 and 160.
Halibut	9, 13, 33, 34, 37, 48, 49 and 59.
Thornyheads	168.
King crab	159 and 169.



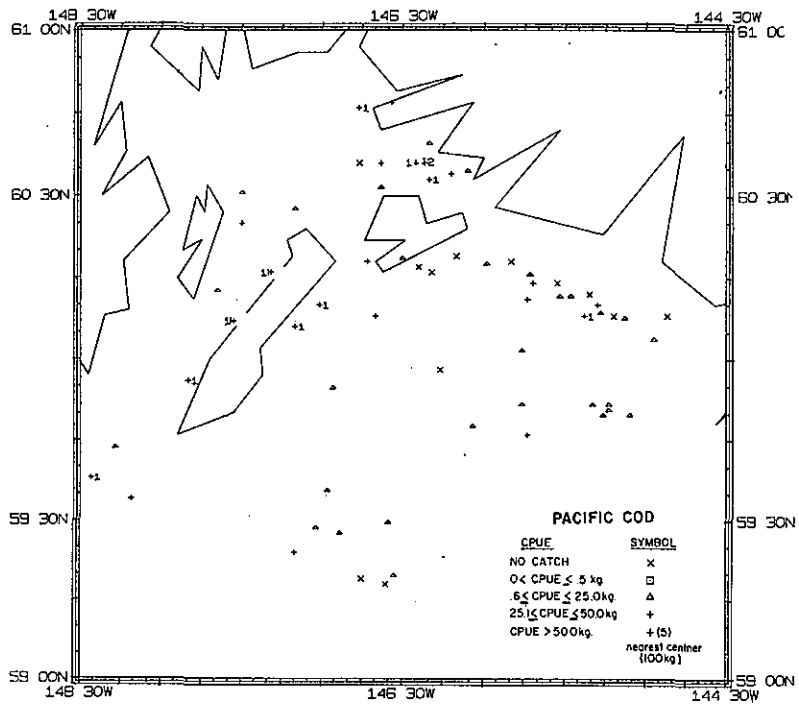
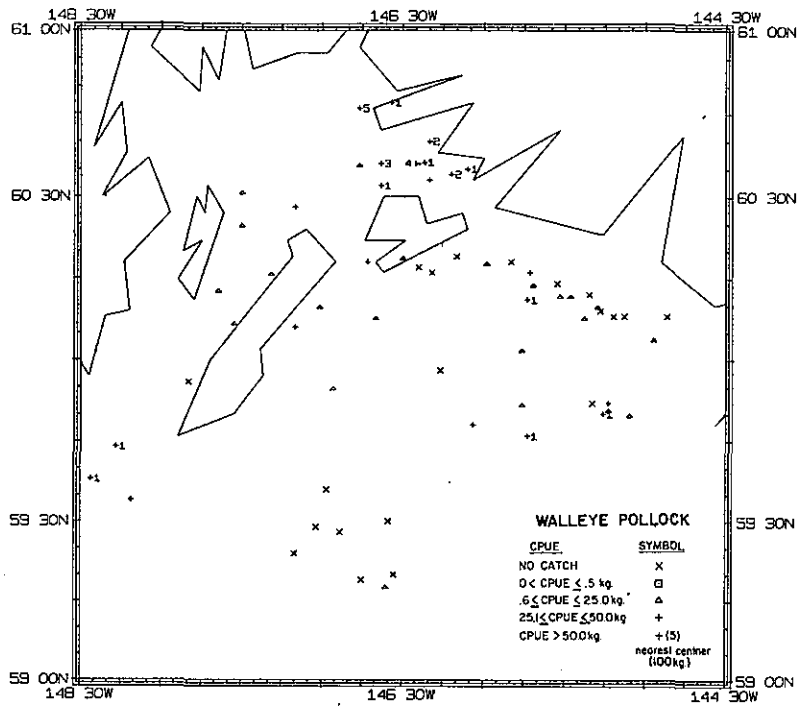
Figures X-12-13.--Distribution of Pacific ocean perch and turbot standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



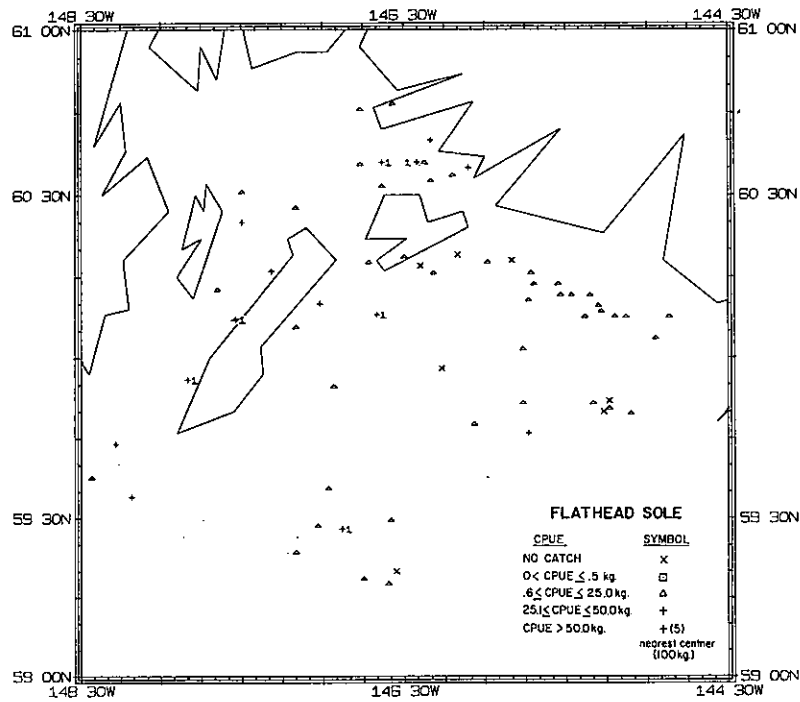
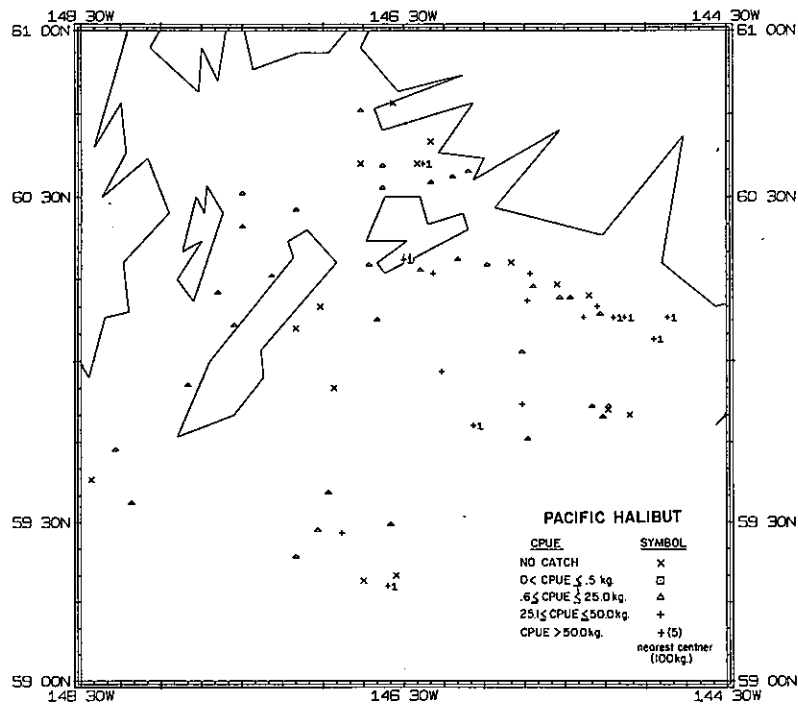
Figures X-14-15. Distribution of starry flounder and skates standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



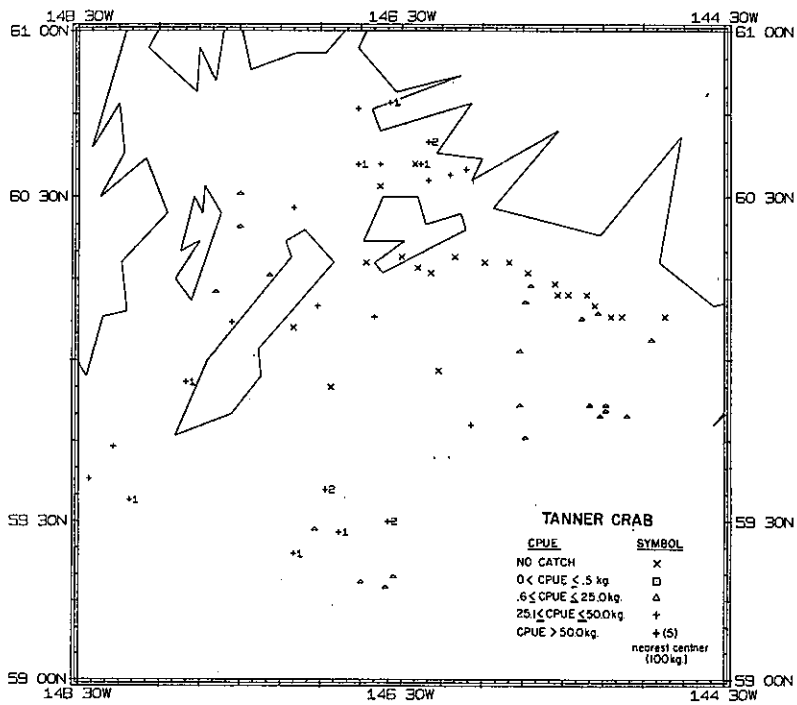
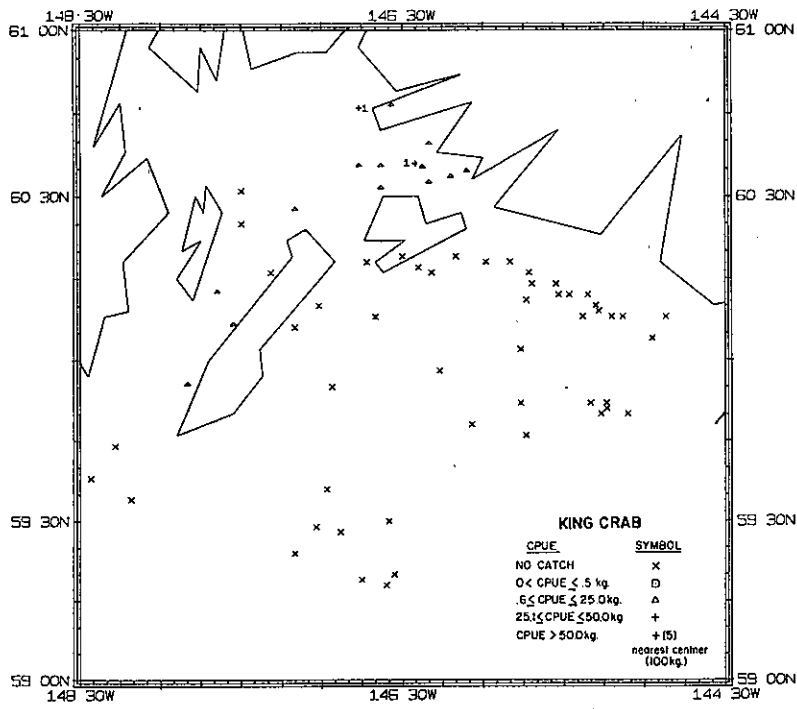
Figures X-16-17.--Distribution of dogfish shark and sablefish standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



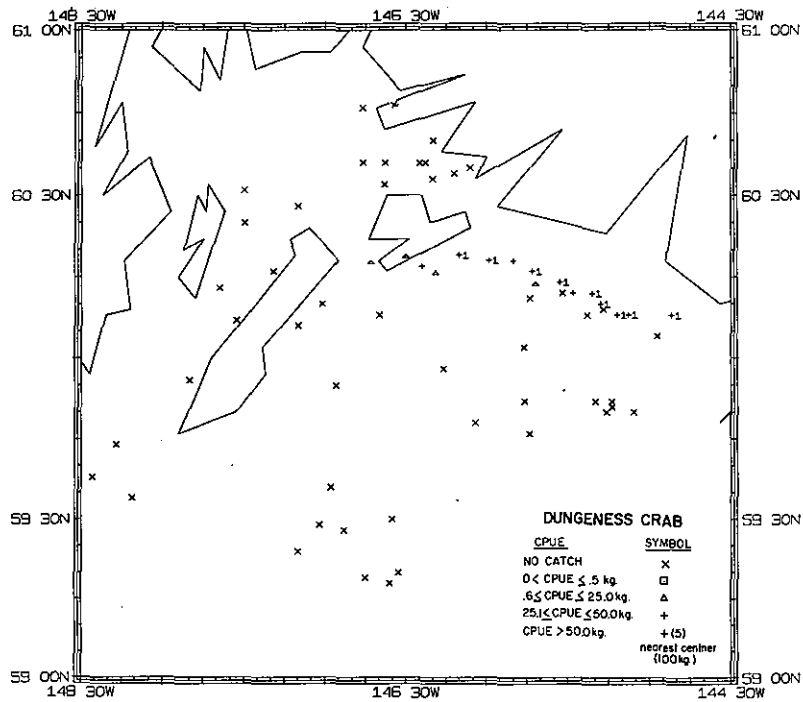
Figures X-18-19.--Distribution of walleye pollock and Pacific cod standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



Figures X-20-21.--Distribution of Pacific halibut and flathead sole standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



Figures X-22-23. --Distribution of king crab and Tanner crab standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



Figures X-24-25.--Distribution of thornyheads and Dungeness crab standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.

d. Cruise 002, Chartered Fishing Vessel Tordenskjold (July-September 1957)

The Tordenskjold was used for a multi-species, multi-gear exploratory cruise in the Shumagin-Sanak regions. Sampling was attempted at 61 stations using a 400-mesh eastern otter trawl (Figure X-26). The total catch for all species ranged up to 2400 kg/hr and averaged from 287 kg/hr in the upper slope to 417 kg/hr in the outer shelf (Table X-9). Highest catch rates for all species were made off Otter Cove and in Ikatan Bay (Figure X-27). Mean catch rates greater than 50 kg/hr were obtained for turbot, Pacific cod, sea anemones, cottids, Tanner crab, rock sole, and pink shrimp. Largest catches of these species or species groups occurred in the following areas: Pacific cod off Otter Cove, turbot on the edge of the continental shelf south of Unga Island, pink shrimp south of Unga Island and in Unga Strait, Tanner crab and cottids in Ikatan Bay, and sea anemones in Morzhovoi Bay (Table X-10, Figures X-28-34). The distribution of the standardized CPUE's for other species which did not occur in large catches but averaged over 10 kg/hr in a depth zone are presented in Figures X-35-40.

e. Cruise 601, Chartered Fishing Vessel New Hope (September 1960)

The New Hope was used by the BCF in an otter trawl survey principally off southeastern Alaska, however, four stations were attempted in the Fairweather region, of which three were successful. The mean CPUE's at these successful stations, are 906 kg/hr (Figure X-4). Three species, English sole and butter sole and turbot produced average catches exceeding 50 kg/hr. The individual station catch rates and the average for the dominant species are shown in Table X-11.

f. Cruise 612, Chartered Fishing Vessel Tordenskjold (September 1961)

BCF conducted otter trawl sampling in Cook Inlet where 25 stations were sampled using a 400-mesh eastern-type otter trawl (Figure X-41). For all species the total catch rates ranged up to 8200 kg/hr and averaged 1354 kg/hr in the inner shelf and 1581 kg/hr in the outer shelf (Table X-12). Large total species catches, over 1000 kg/hr, occurred at 83% of the stations sampled. (Figure X-42). Tanner crab, butter sole, king crab, sea urchins, yellowfin sole, and pink shrimp, all produced CPUE's greater than 50 kg/hr. Large catches of Tanner crab, over 300 kg/hr, occurred at 15 of the 18 successfully sampled stations and king crab at 4 stations (Figures X-43-44, Table X-13). Other species occurring in large catches were sea urchins, butter sole, and pink shrimp (Figures X-45-47). The distribution of the standardized CPUE's for other species averaging over 10 kg/hr in a depth zone are presented in Figures X-48-52.

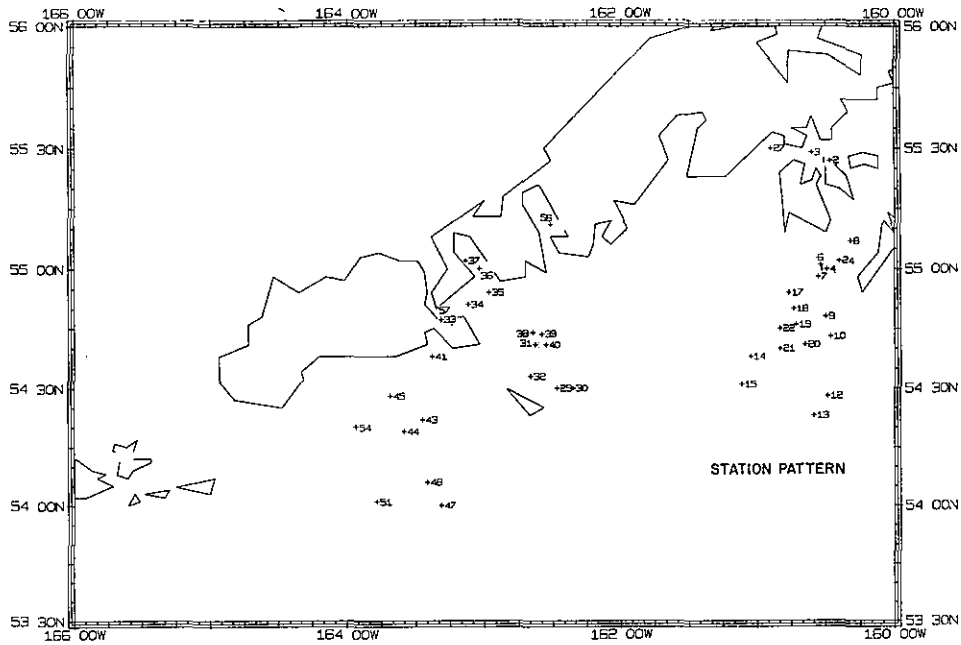


Figure X-26.--Stations successfully trawled (otter trawl) during cruise 002, charter vessel Tordenskjold.

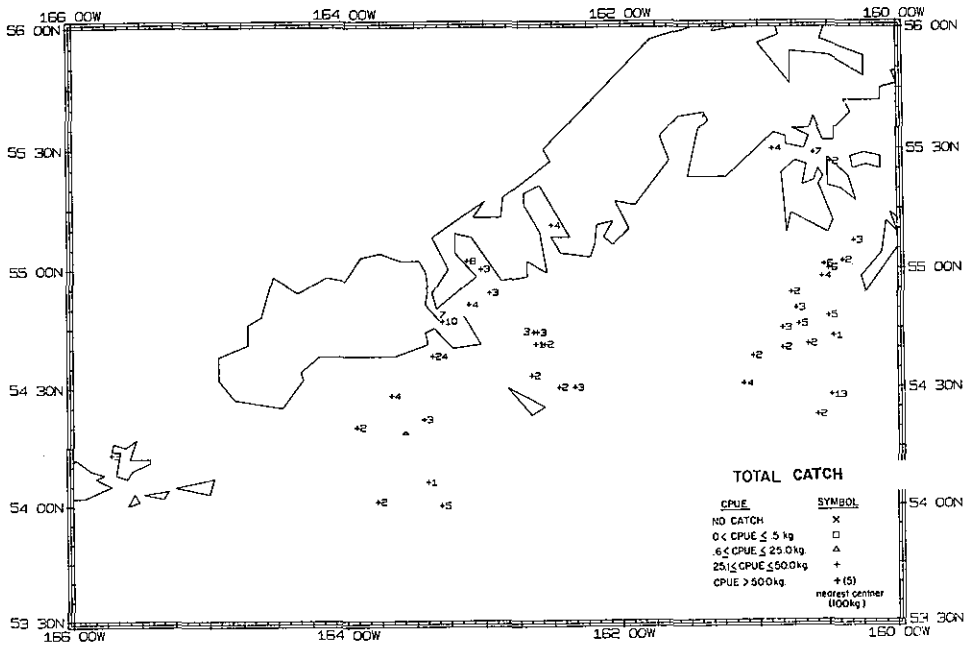


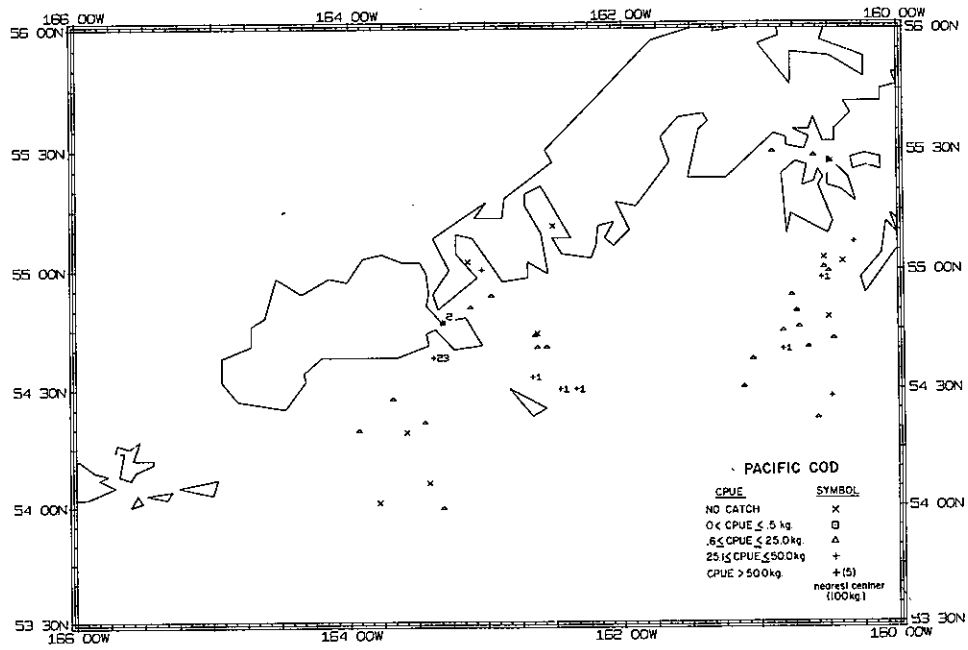
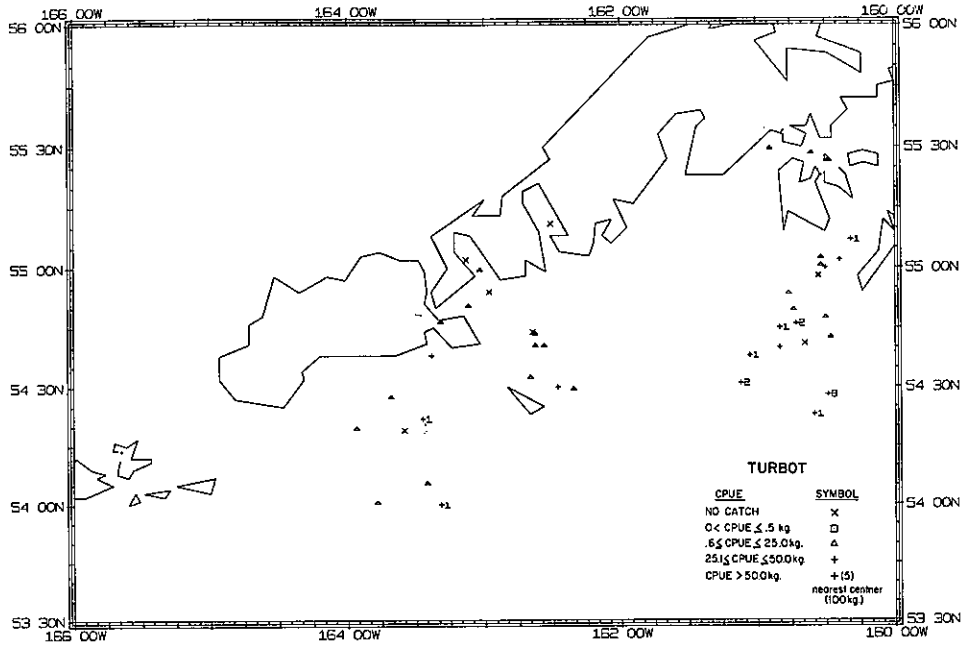
Figure X-27.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 002, charter vessel Tordenskjold.

Table X-9.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 002, charter vessel Tordenskjold.

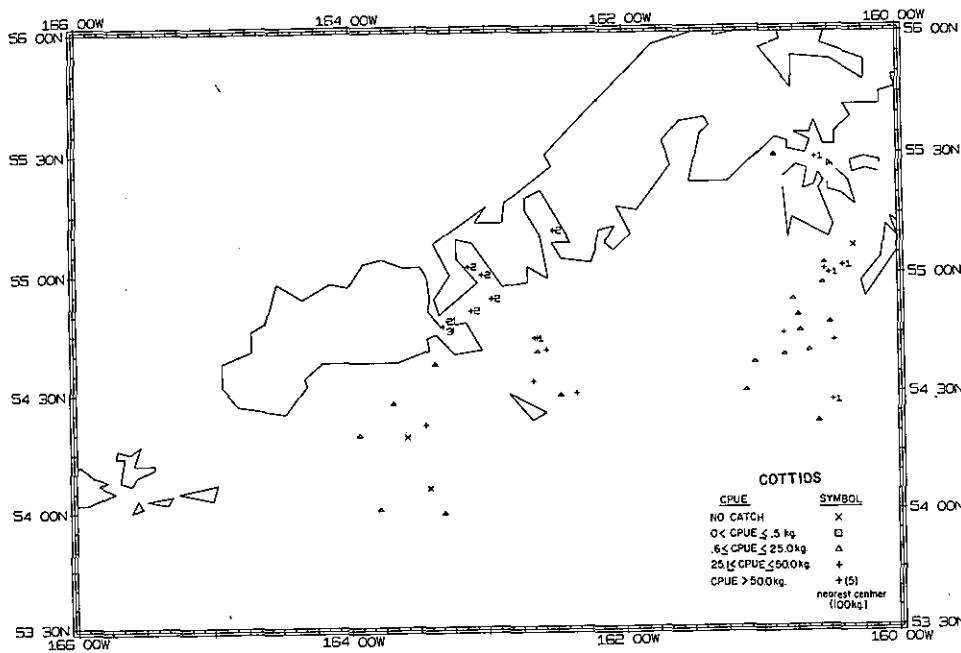
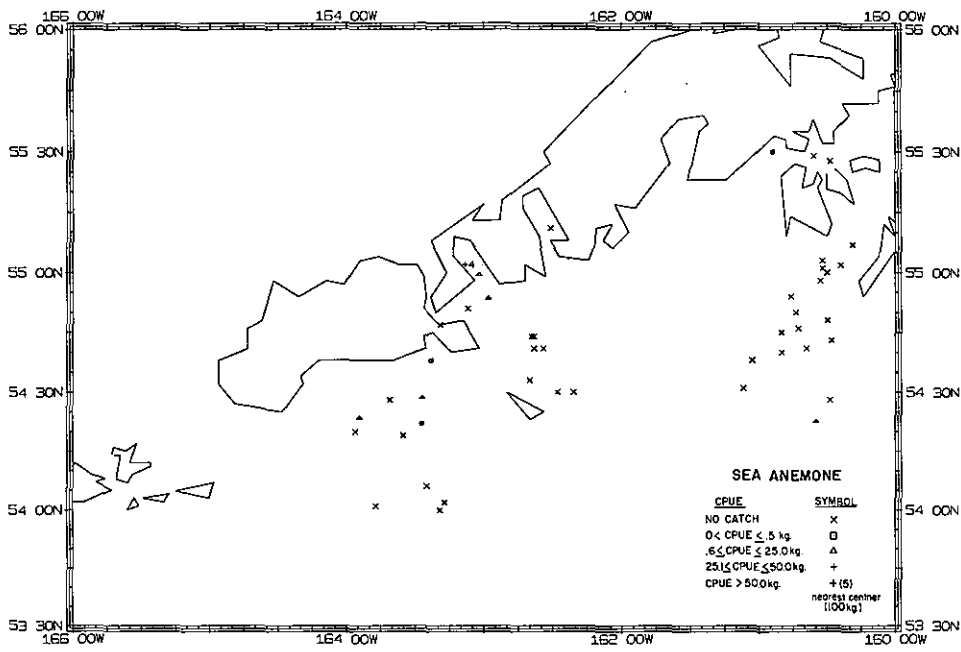
Species	0 - 100 kg/hr	Depth Zones (m)		Species	kg/hr	Species	kg/hr
		101 - 200	201 - 400				
Sea anemone	82.6	Pacific cod	84.2	Turbot	99.8		
Cottids (Sculpins)	79.4	Turbot	63.8	Pacific cod	34.0		
Tanner crab	67.4	Cottids	53.4	Pink shrimp	23.8		
Rock sole	55.8	Pink shrimp	50.9	Flathead sole	15.9		
Pacific halibut	26.5	Tanner crab	46.3	Pricklebacks	14.7		
Turbot	9.4	King crab	22.1	Tanner crab	14.1		
Sponge	8.2	Rock sole	19.8	King crab	13.6		
Pacific cod	7.8	Walleye pollock	13.9	Walleye pollock	13.6		
King crab	6.9	Pacific halibut	11.5	Sidestripe shrimp	13.6		
Pink shrimp	5.9	Flathead sole	8.8	Eelpouts	13.6		
Total	349.9		374.7		256.7		
Total all species	375.9		416.9		287.1		

Table X-10.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 002, charter vessel Tordenskjold.

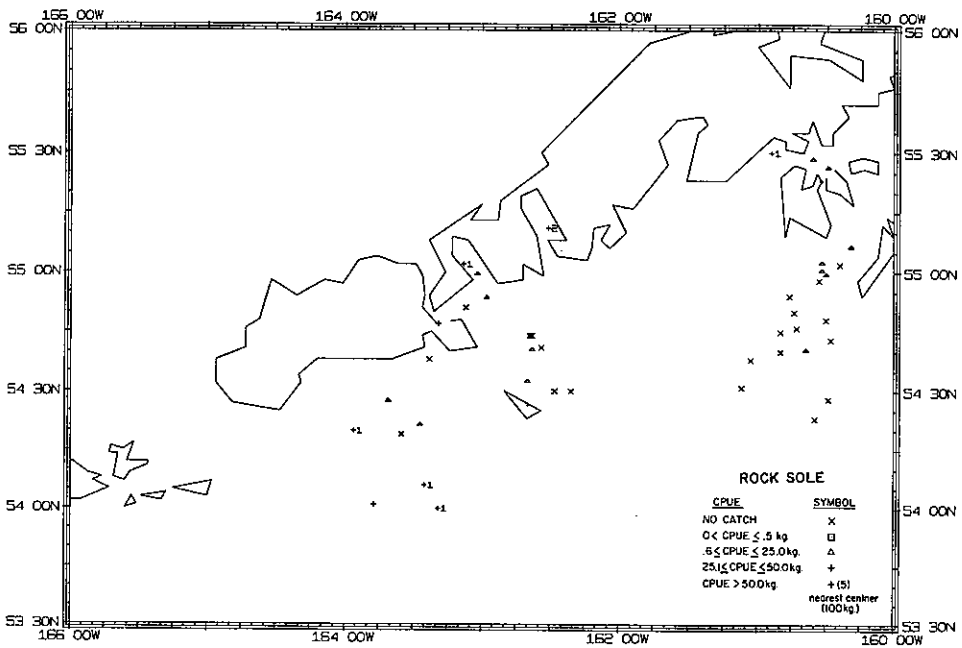
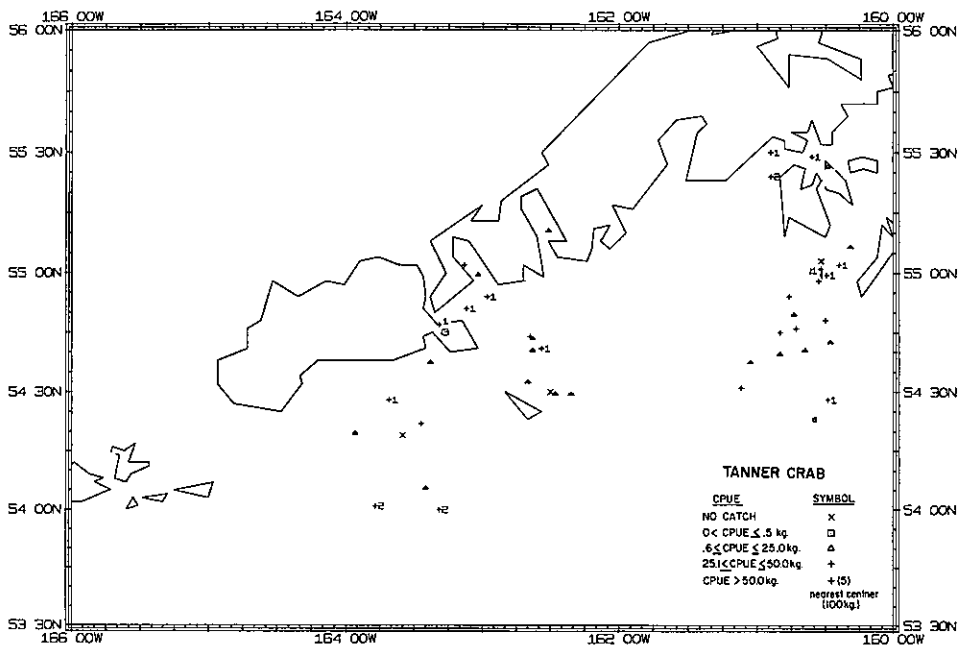
Species or Species group	Station numbers
Total catch	33 and 41.
Turbot	8, 12-15, 19, 22, 43 and 47.
Pacific cod	7, 21, 29, 30, 32, 41 and 57.
Sea anemone	37.
Cottids	3, 4, 7, 12, 33-38, 56 and 57.
Tanner crab	3, 4, 12, 24, 27, 33-35, 40, 45, 47, 51 and 57.
Rock sole	27, 37, 47, 48, 54 and 56.
Pink shrimp	2-4, 7, 9, 14, 18, 19 and 22.
Pacific halibut	7, 27, and 57.
King crab	38-40.



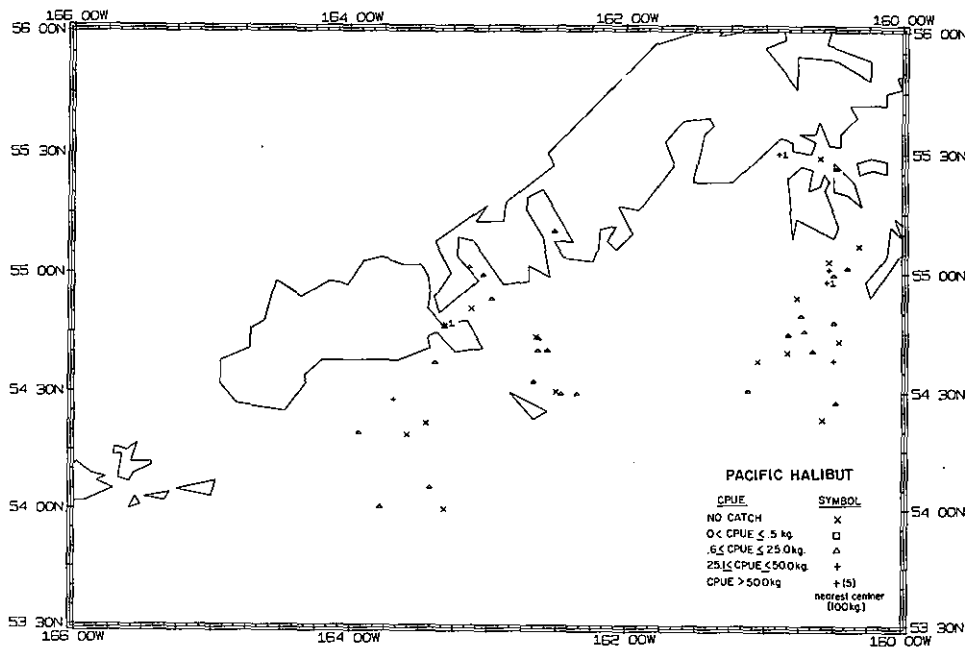
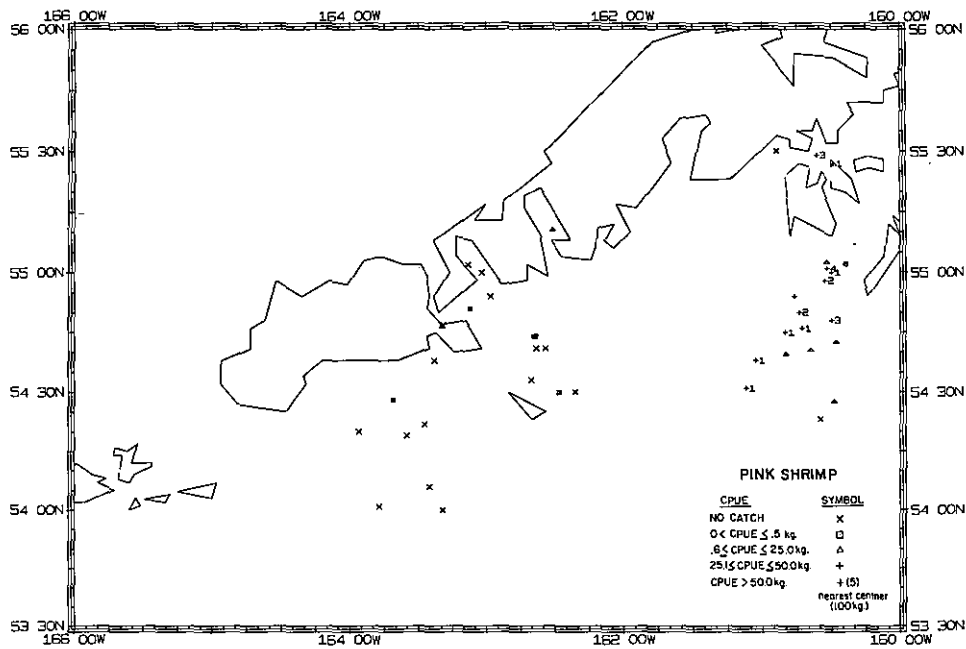
Figures X-28-29.--Distribution of turbot and Pacific cod standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



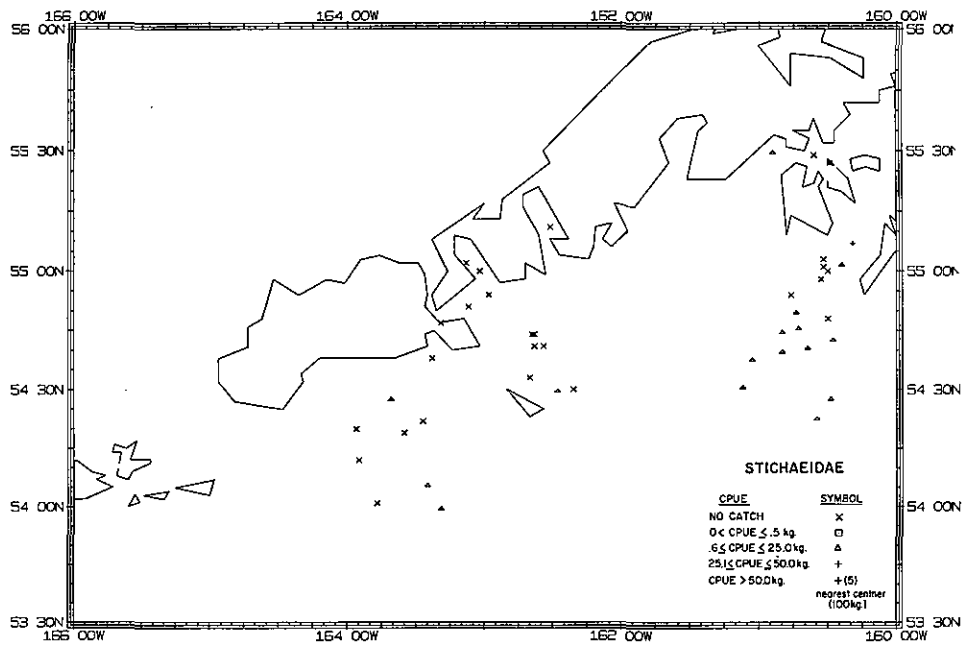
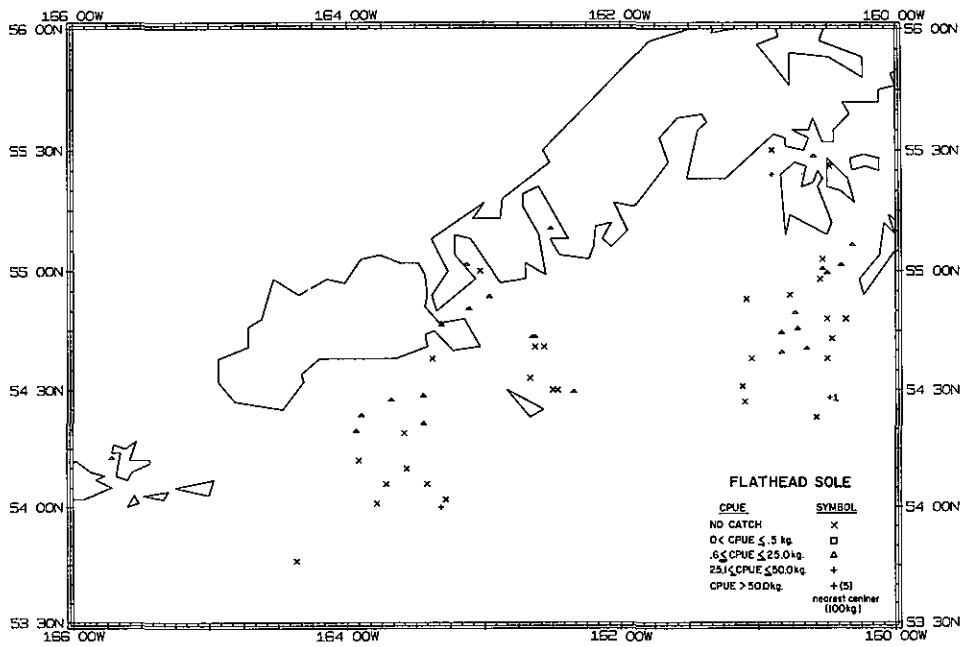
Figures X-30-31.--Distribution of sea anemones and cottids standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



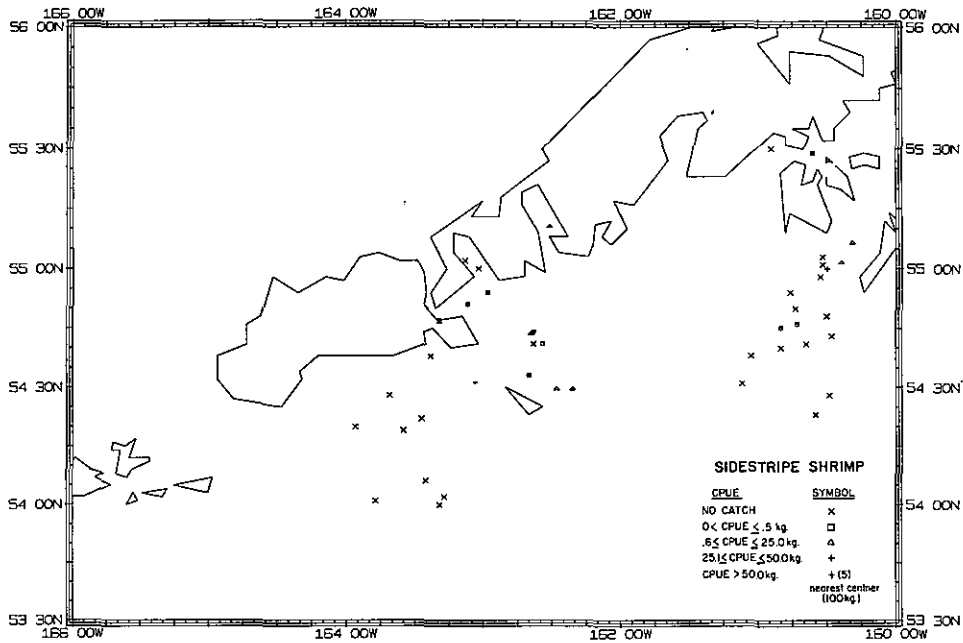
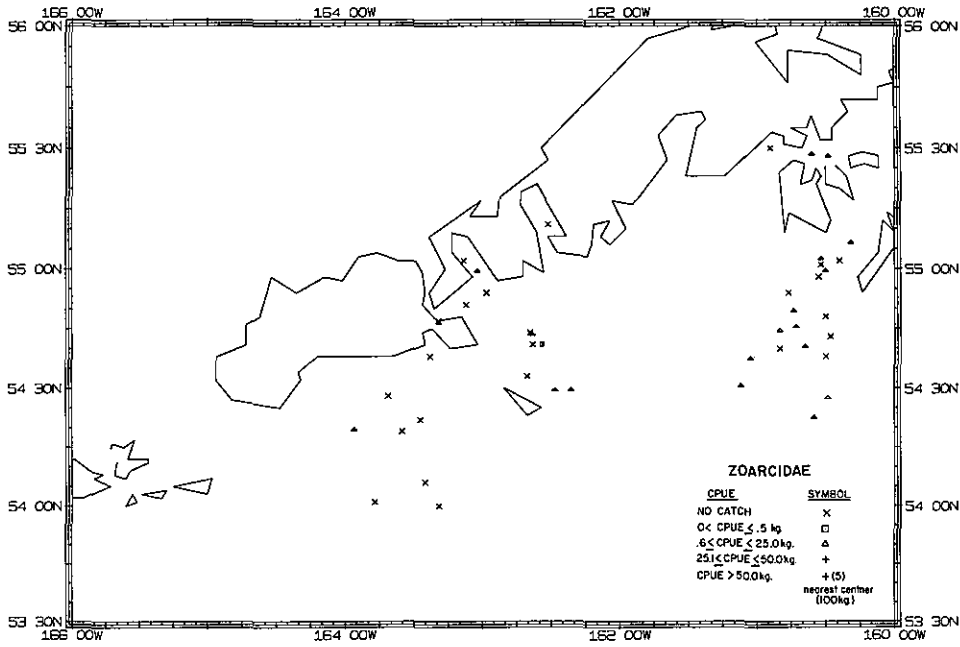
Figures X-32-33.--Distribution of Tanner crab and rock sole standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



Figures XI-34-35.--Distribution of pink shrimp and Pacific halibut standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



Figures XI-36-37.--Distribution of flathead sole and Stichaeidae standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjoeld.



Figures XI-38-39.--Distribution of Zoarcidae and sidestripe shrimp standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.

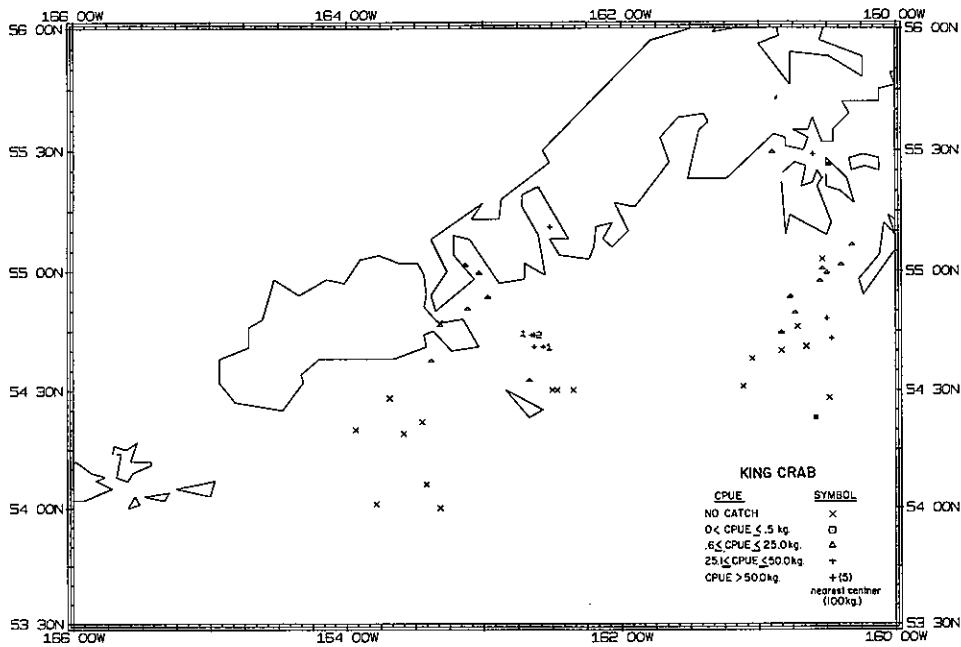


Figure XI-40.--Distribution of king crab standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.

g. Cruise 621, Chartered Fishing Vessel Yaquina (July-August 1962)

The BCF conducted an exploratory cruise in the Kenai-Kodiak regions of the Gulf of Alaska. Sixty-three stations were attempted with 400-mesh eastern otter trawl, (Figure X-53). The mean CPUE for all species ranged up to 2900 kg/hr and decreased with increasing water depth from 691 kg in the inner shelf to 269 kg/hr in the upper slope (Table X-14, Figure X-54). Pacific ocean perch, rock sole, and Pacific halibut were the only species with mean catch rates exceeding 50 kg/hr. For Pacific ocean perch largest catches, greater than 200 kg/hr, occurred in outer Marmot Gully where catch rates ranged as high as 2300 kg/hr, outer Chiniak Gully, east of Portlock Bank, and east of north Albatross Bank (Table X-15, Figure X-55). Rock sole occurred in largest catches on middle Albatross Bank and king crab in Marmot Gully (Figures X-56-57). The standardized catch rates of the three pleuronectids, turbot, flathead and rex sole, occurred at levels exceeding 200 kg/hr east of Portlock Bank. (Figures X-58-60). Turbot were also taken in large catches in Marmot Bay. Largest catches of two other species, sea urchins, and walleye pollock were obtained in Marmot Gully (Figures X-61-62). The distribution of the standardized CPUE's for other species averaging over 10 kg/hr in a depth zone are presented in Figures X-63-66.

Table X-11.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 601, charter vessel New Hope.

Depth Zone (m) 1 - 100	Avg kg/hr	Station Number		
		12	14	15
English sole	504.4	61.9	544.3	907.2
Butter sole	126.5	288.7	90.7	0
Turbot	59.8	20.6	0	158.8
Dungeness crab	25.4	41.2	5.4	29.4
Pacific halibut	23.6	7.4	18.1	45.4
Scallop	18.9	0	29.5	27.2
Skates	15.7	41.2	1.4	4.5
Starry flounder	13.7	41.2	0	0
Sand sole	11.0	10.3	22.3	0
Pacific cod	10.0	12.3	10.9	6.8
Total	809.0	524.8	772.6	1,179.3
Total all species	906.0	536.5	917.3	1,264.2

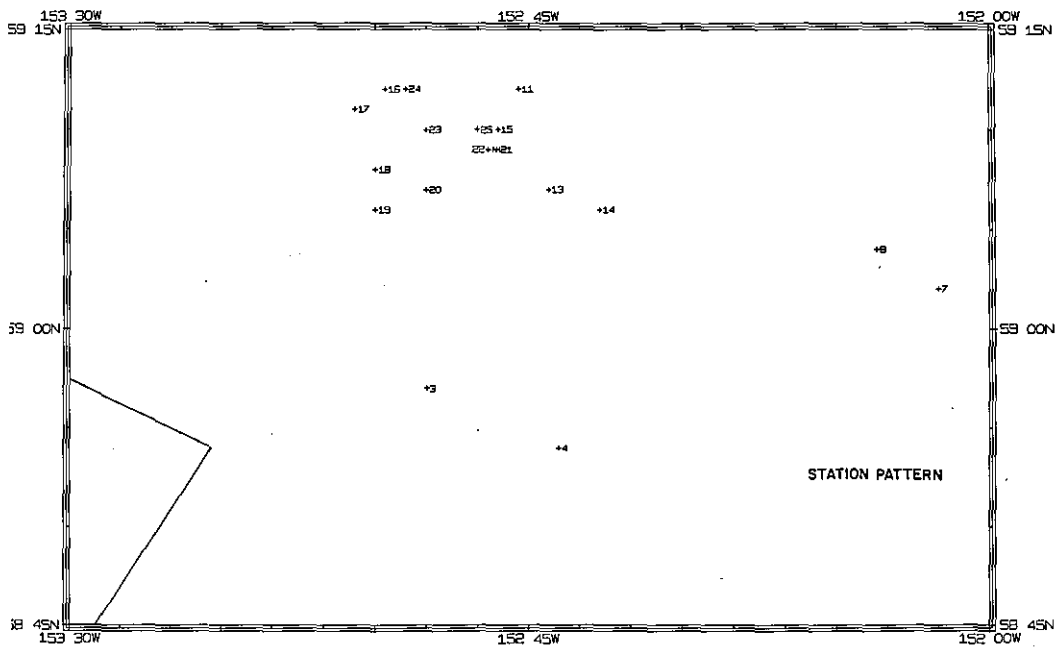


Figure X-41.--Stations successfully trawled (otter trawl) during cruise 612, charter vessel Tordenskjold.

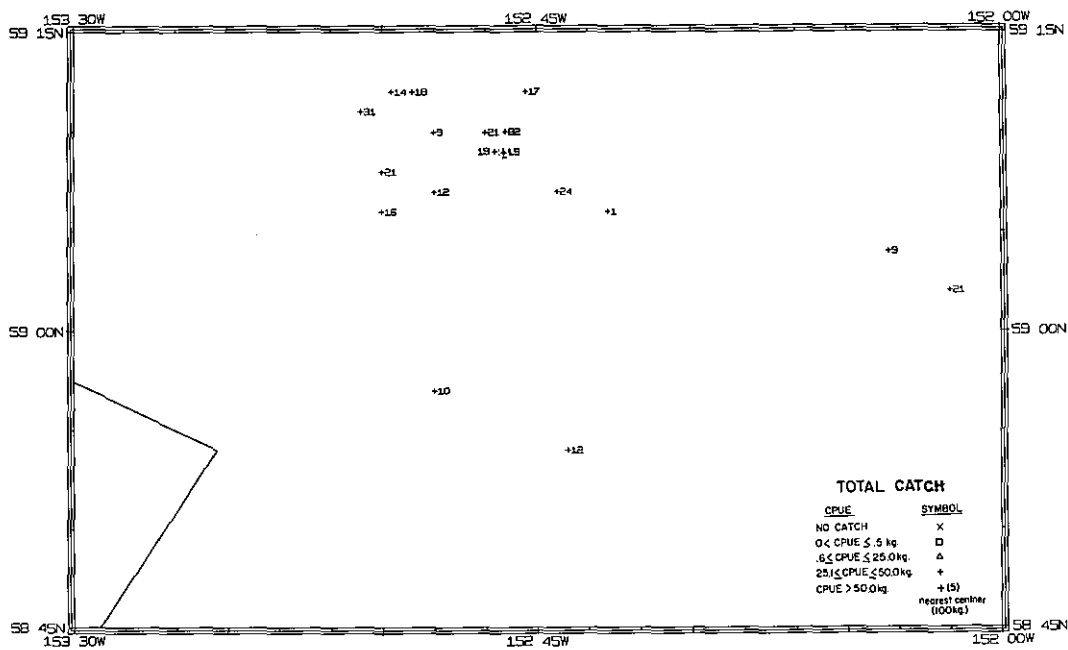
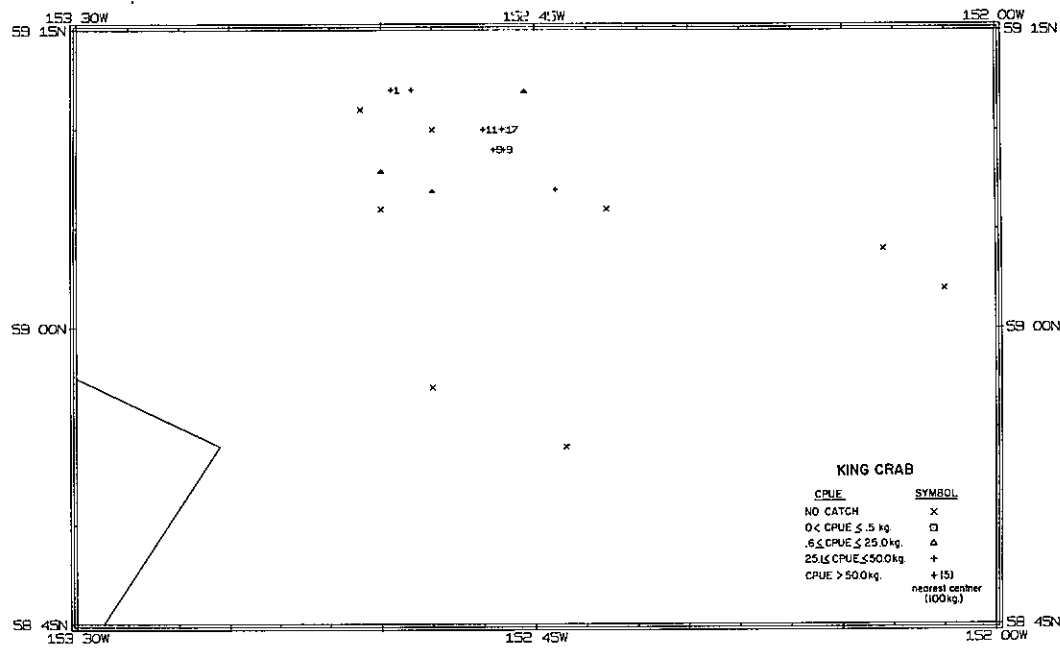
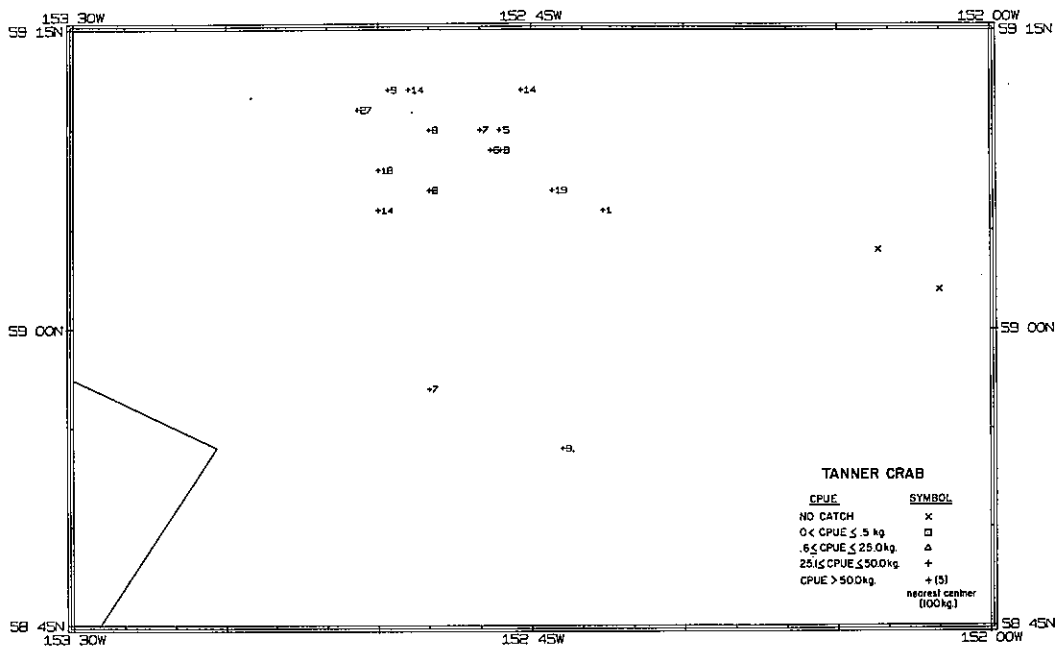


Figure X-42.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 612, charter vessel Tordenskjold.

Table X-12.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 612, charter vessel Tordenskjold.

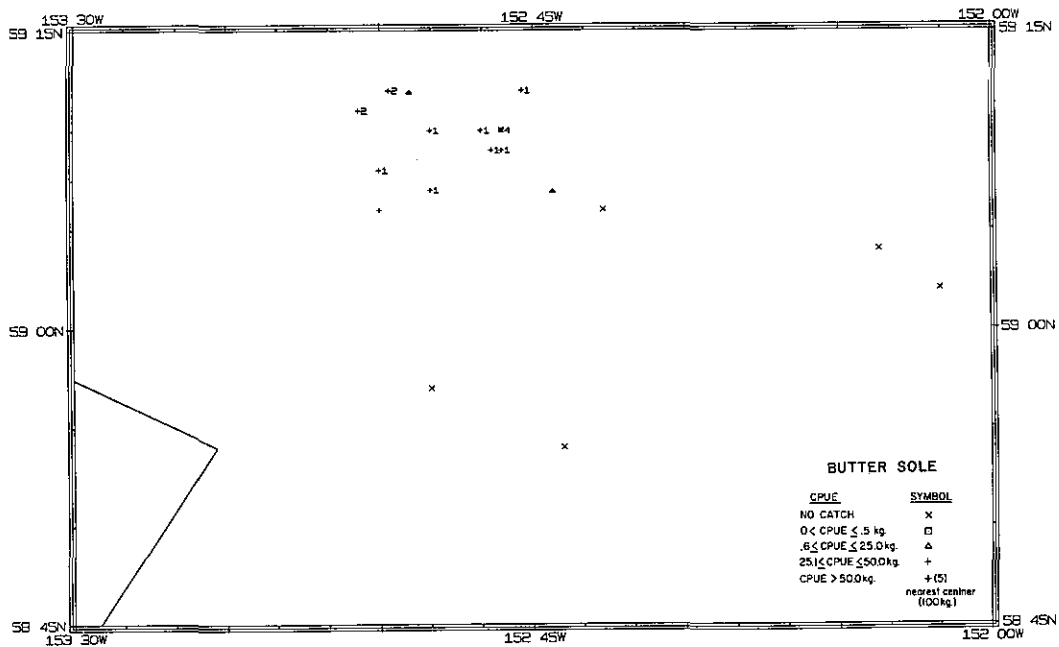
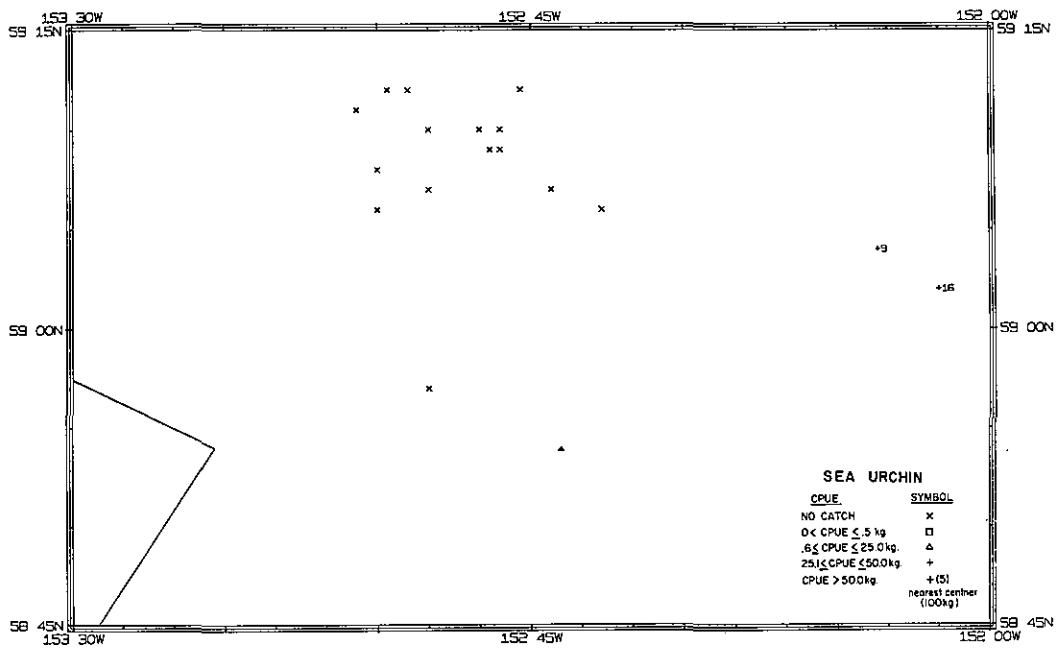
1 - 100		Depth Zones (m)		201 - 400	
Species	kg/hr	Species	kg/hr	Species	kg/hr
		101 - 200			
Tanner crab	907.2	Tanner crab	931.1	No sampling	
Butter sole	181.4	King crab	179.8		
Yellowfin sole	136.1	Sea urchin	146.8		
King crab	92.5	Butter sole	76.9		
Pacific halibut	18.1	Pink shrimp	54.3		
Cottids	6.8	Turbot	36.8		
Starry flounder	4.5	Yellowfin sole	29.8		
Sea poachers	4.4	Walleye pollock	23.8		
Walleye pollock	2.7	Flathead sole	14.1		
Scallop	0.5	Pacific halibut	13.8		
Total	1354.2		1507.2		
Total all species	1354.2		1580.6		



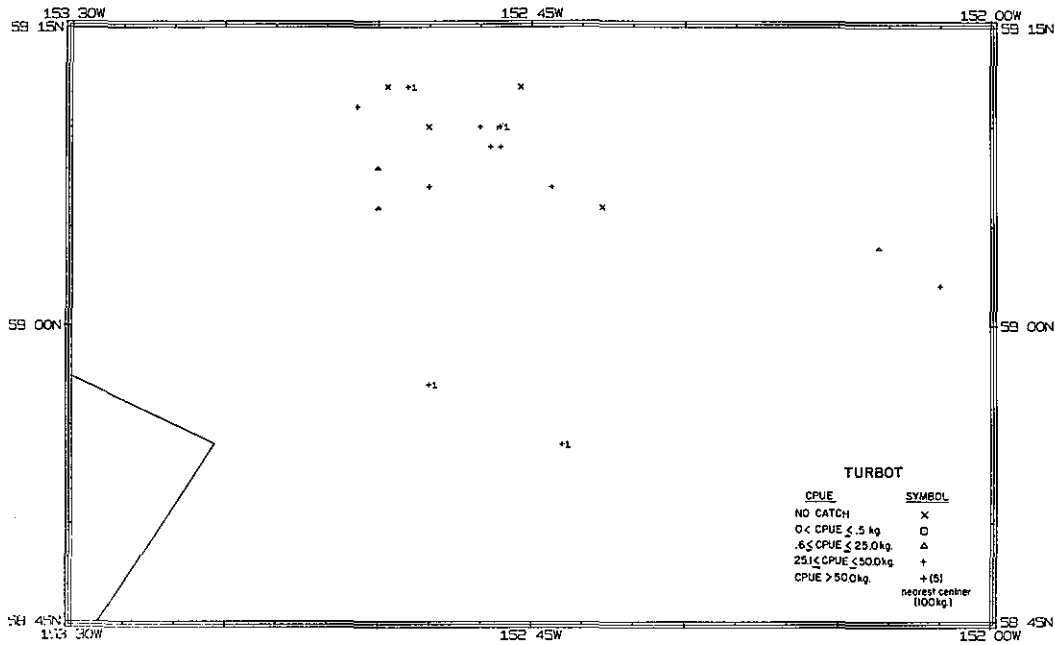
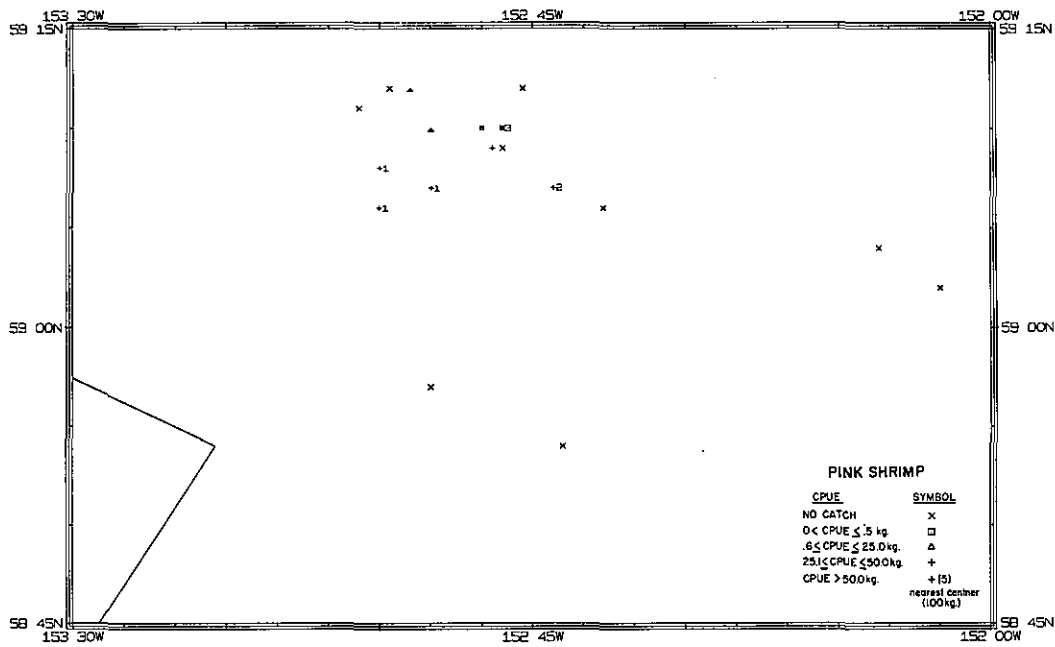
Figures X-43-44.--Distribution of Tanner and king crab standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.

Table X-13.--A list of stations where species or species group standardized catch rates exceeded 50 kg/hr and total species catch rates exceeded 950 kg/hr, cruise 612, charter vessel Tordenskjold.

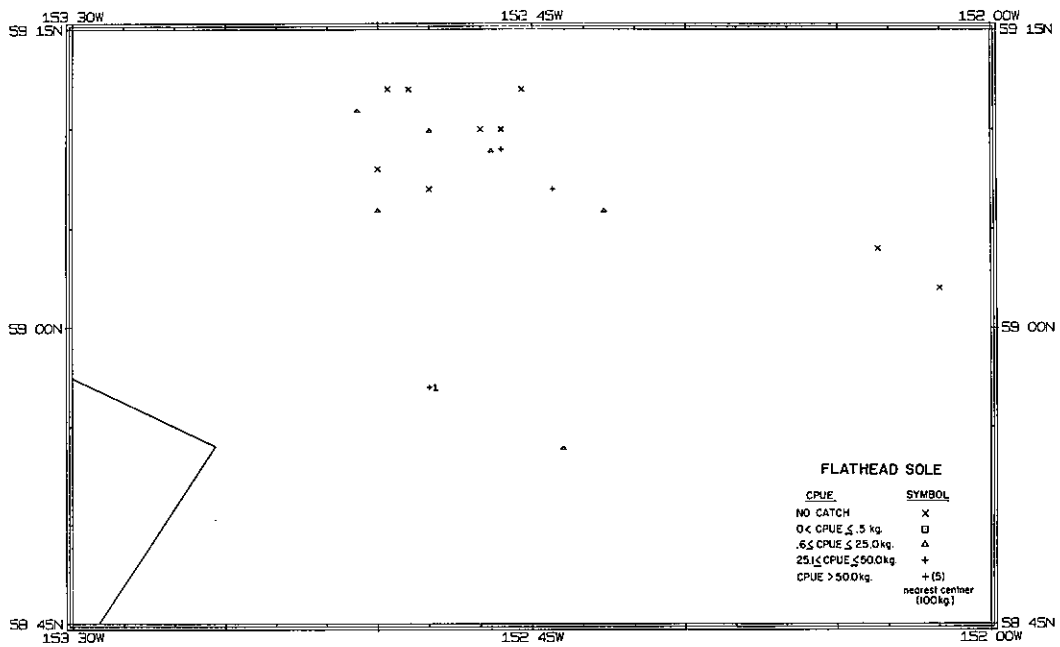
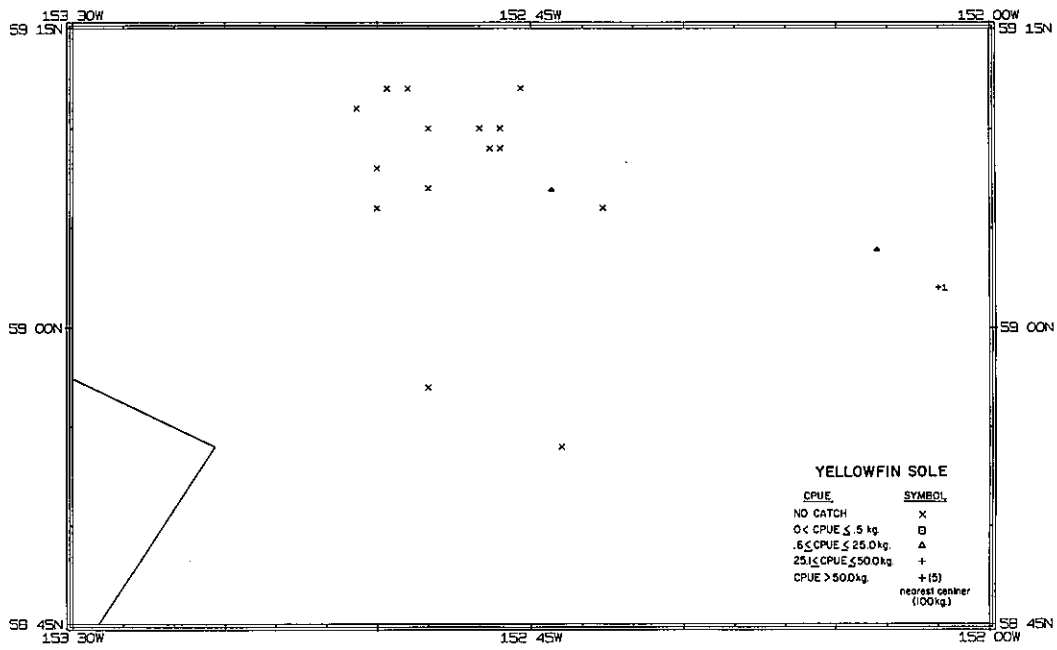
Species or Species groups	Station numbers
Total catch	3, 4, 7, 11, 13, 15-22, 24 and 25.
Tanner crab	3, 4, 11 and 13-25.
Butter sole	11, 15-18, 20-23 and 25.
King crab	15, 16, 21, 22 and 25.
Sea urchin	7 and 8.
Yellowfin sole	7.
Pink shrimp	13, 15 and 18-20.
Turbot	3, 4, 15 and 24.
Walleye pollock	4, 7 and 20.
Flathead sole	3.



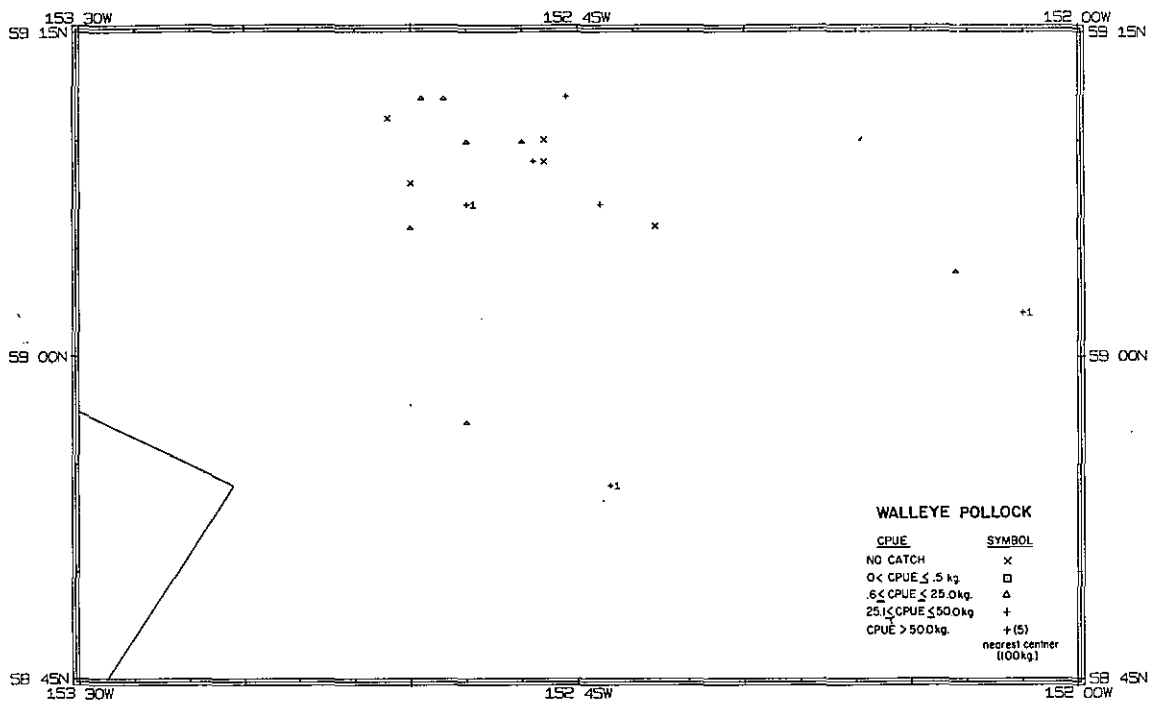
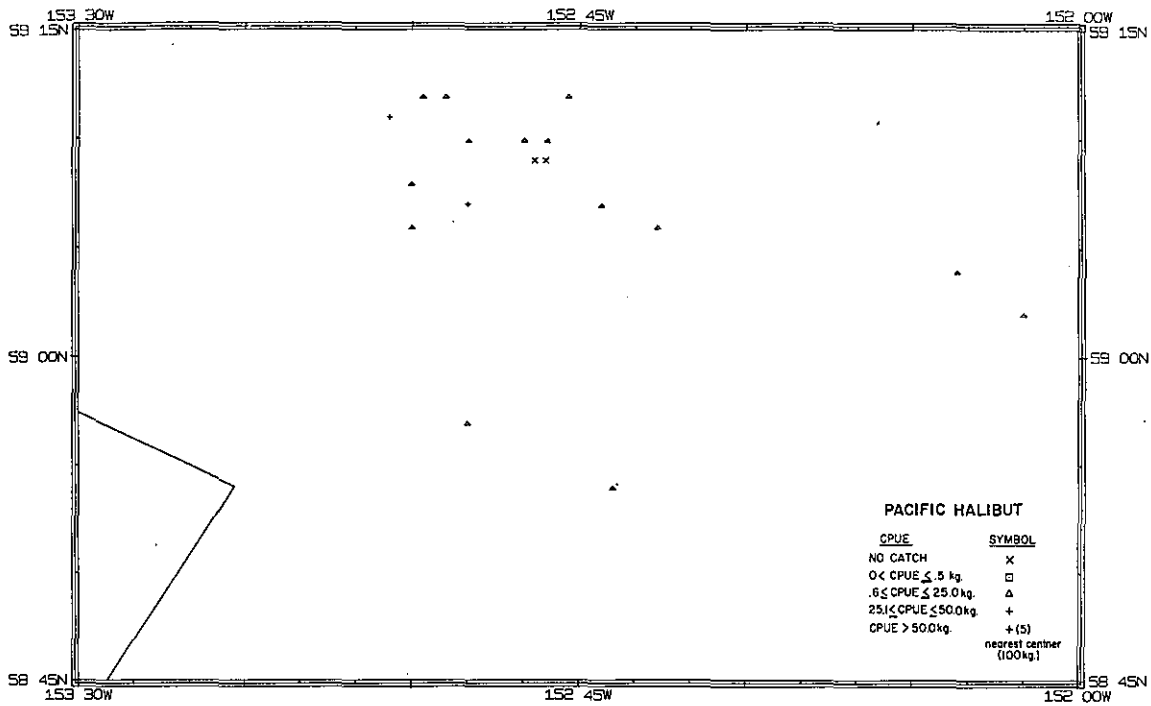
Figures X-45-46.--Distribution of sea urchins and butter sole standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.



Figures X-47-48.--Distribution of pink shrimp and turbot standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.



Figures X-49-50.--Distribution of yellowfin sole and flathead sole standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjoeld.



Figures X-51-52.--Distribution of walleye pollock and Pacific halibut standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.

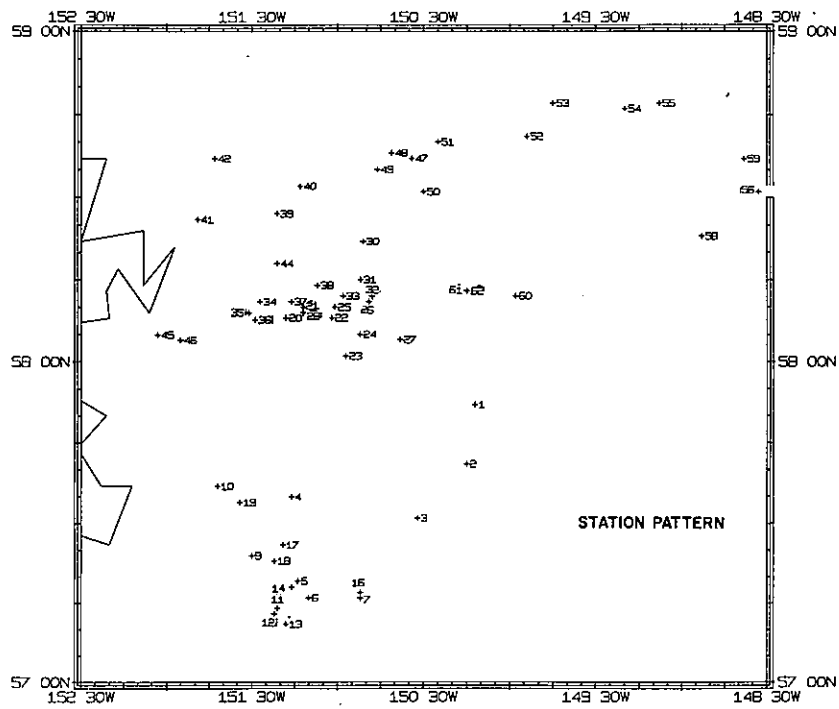


Figure X-53.--Stations successfully trawled (otter trawl) during cruise 621, charter vessel Yaquina.

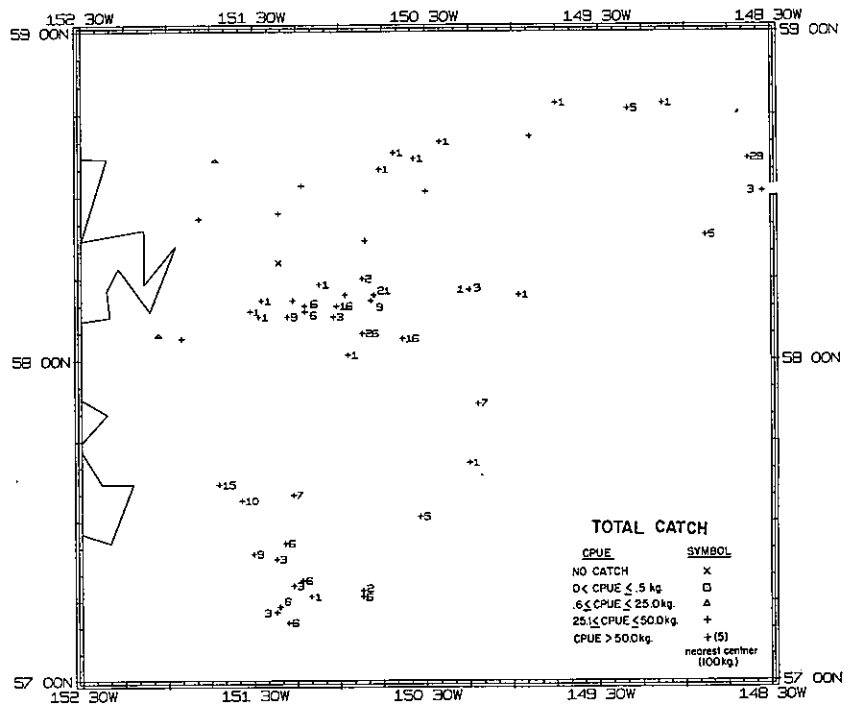


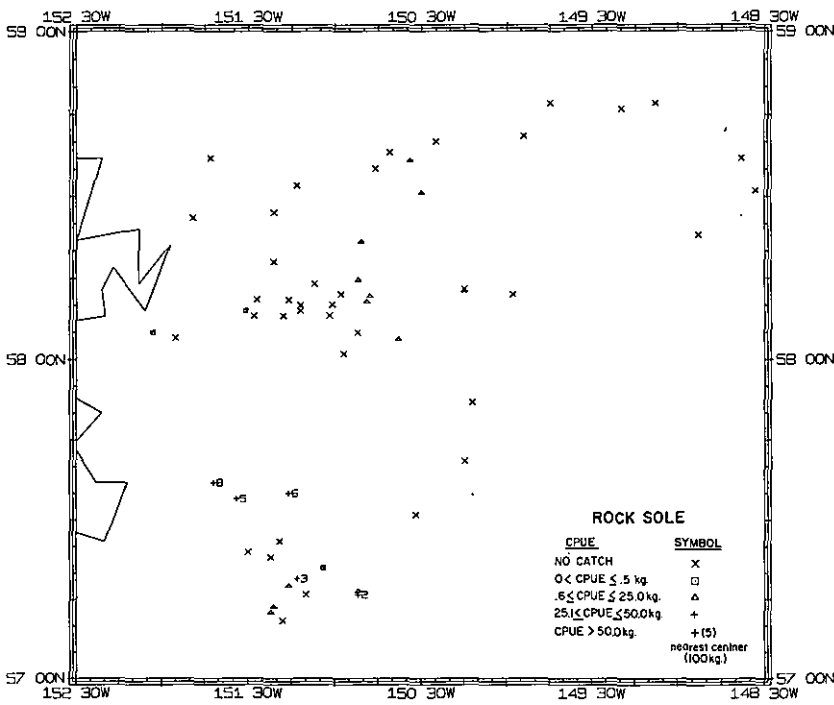
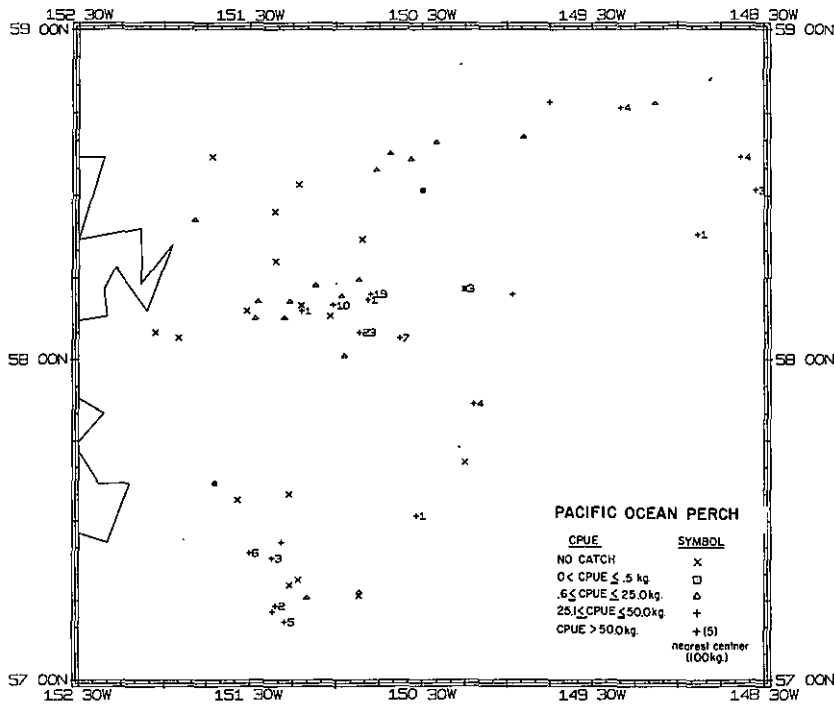
Figure X-54.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 621, charter vessel Yaquina.

Table X-14.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 62-1, charter vessel Yaquina.

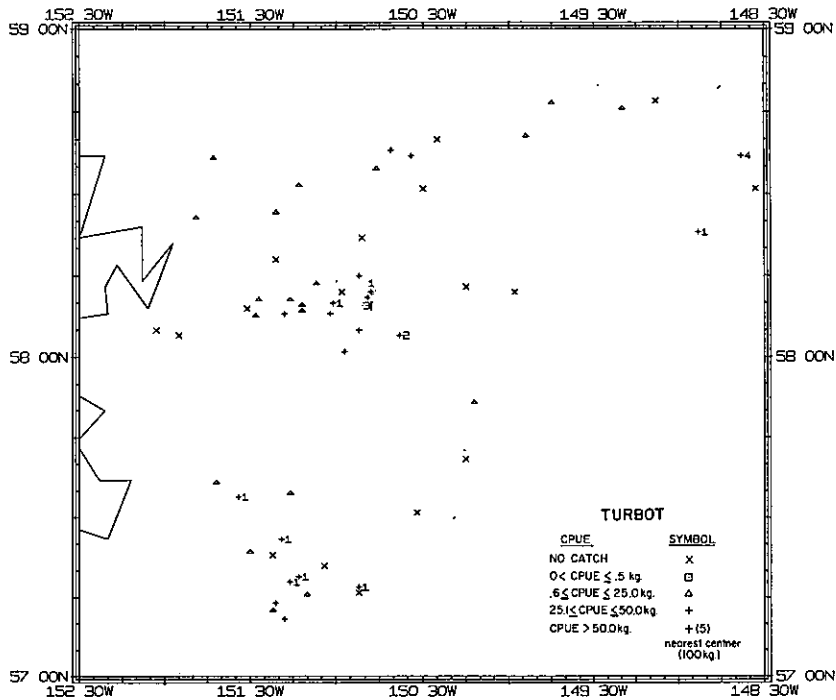
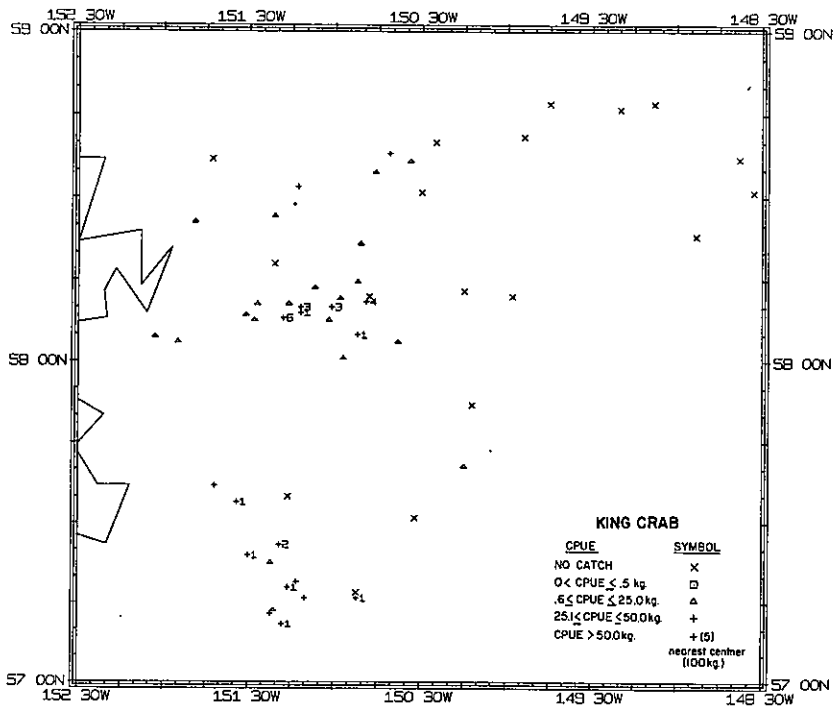
Species	1 - 100 kg/hr	Depth Zones (m)		Species	201 - 400 kg/hr
		Species	101 - 200 kg/hr		
Rock sole	421.9	Pacific ocean perch	193.3	Pacific ocean perch	160.2
Pacific halibut	97.9	King crab	58.4	Turbot	18.7
Cottids	44.5	Turbot	41.6	Tanner crab	18.4
Tanner crab	42.5	Flathead sole	21.4	Pacific halibut	10.0
King crab	29.9	Pacific halibut	19.5	Dover sole	9.1
Bathymasteridae	25.9	Walleye pollock	18.6	Pacific cod	7.4
Sea anemone	7.1	Rock sole	17.3	King crab	7.3
Pacific cod	7.0	Sea urchin	17.0	Rex sole	6.6
Sand sole	4.5	Tanner crab	16.9	Sablefish	6.2
Flathead sole	2.8	Rex sole	12.0	Skates	4.3
Total	684.0		416.0		248.2
Total all species	691.1		488.1		269.0

Table X-15.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr or the total species standardized catch rates exceeded 950 kg/hr, cruise 621, charter vessel Yaquina.

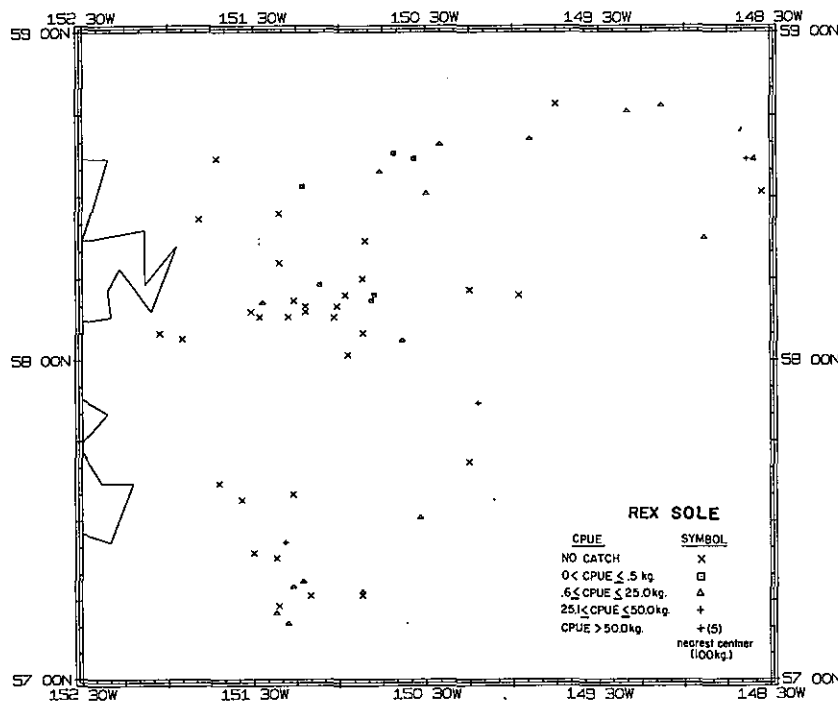
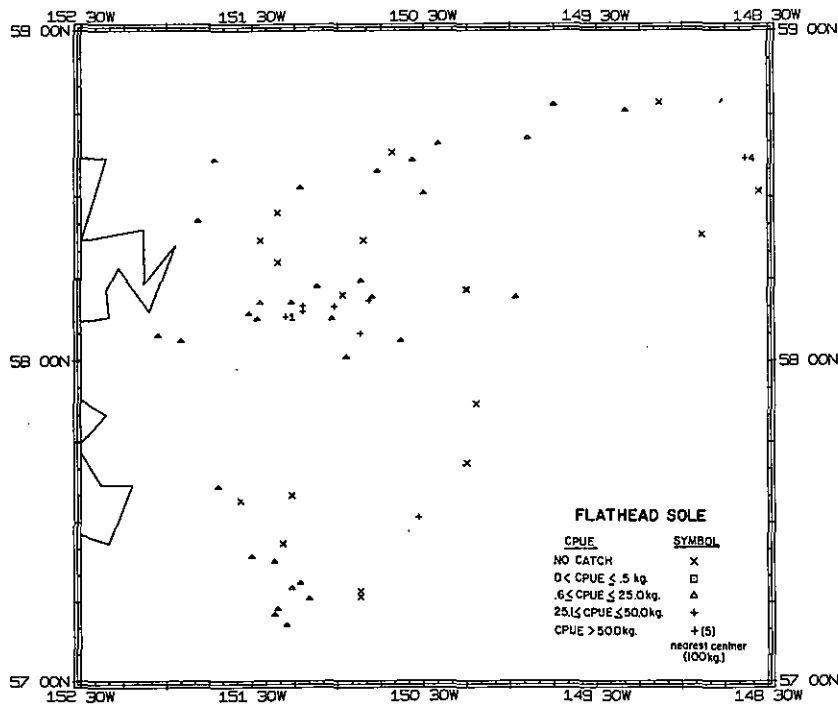
Species or Species groups	Station numbers
Total catch	10, 19, 24, 25, 27, 32 and 59.
Rock sole	4, 5, 7, 10 and 19.
Pacific ocean perch	1, 3, 9, 11, 13, 18, 24-28, 32, 54, 56, 58, 59 and 61.
Pacific halibut	5, 7, 10, 11, 17, 19, 31 and 58.
King crab	7, 9, 13, 14, 17, 19-21, 24-26 and 28.
Cottids	9, 10 and 17.
Tanner crab	1, 3, 10, 17, 20 and 24.
Turbot	5, 14, 16, 17, 19, 25-27, 32, 58 and 59.
Bathymasteridae	7, 11 and 12.
Flathead sole	20 and 59.
Walleye pollock	21, 22 and 28.
Sea urchin	11, 27 and 31.
Rex sole	59.



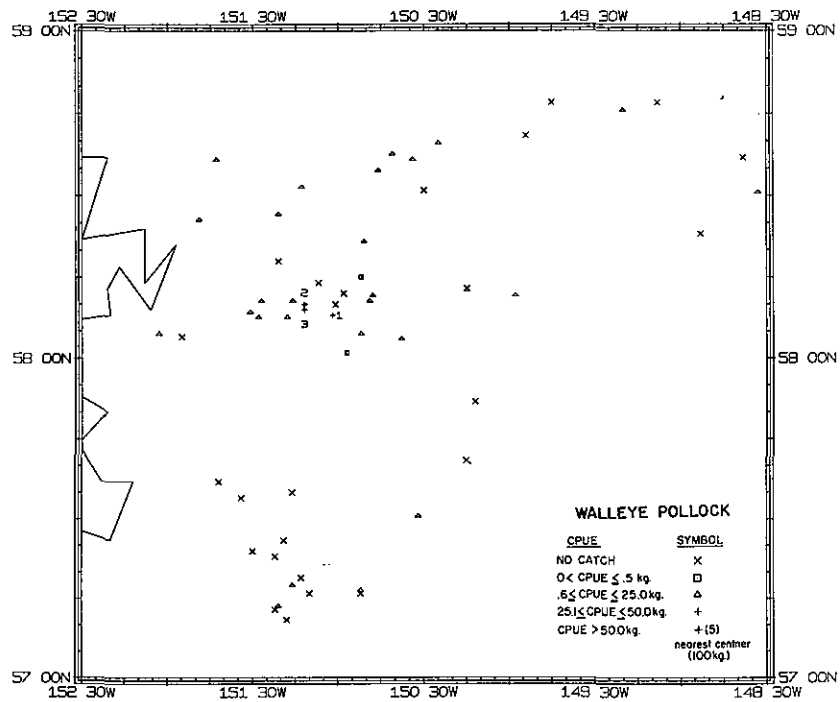
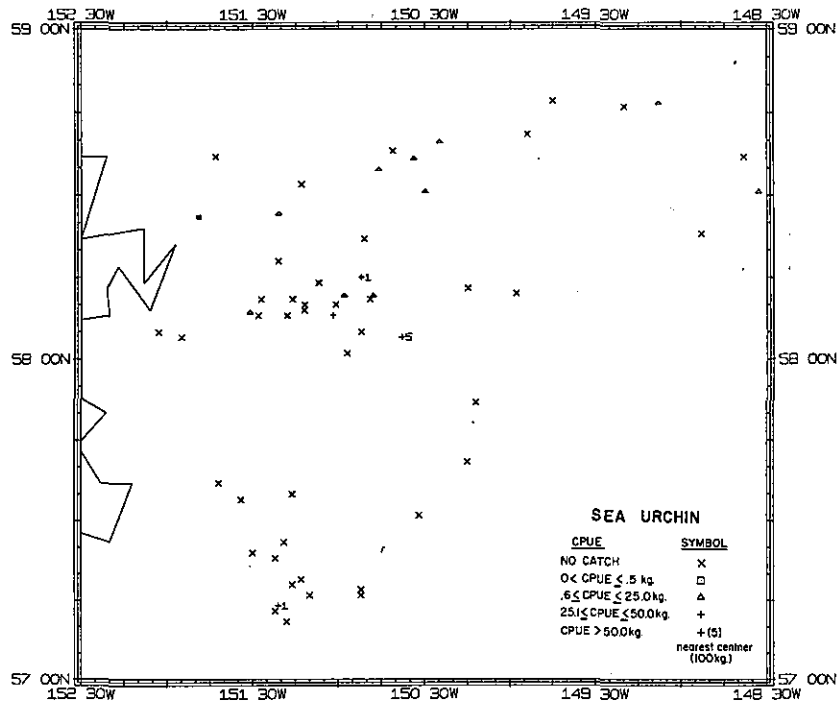
Figures X-55-56.--Distribution of Pacific ocean perch and rock sole standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



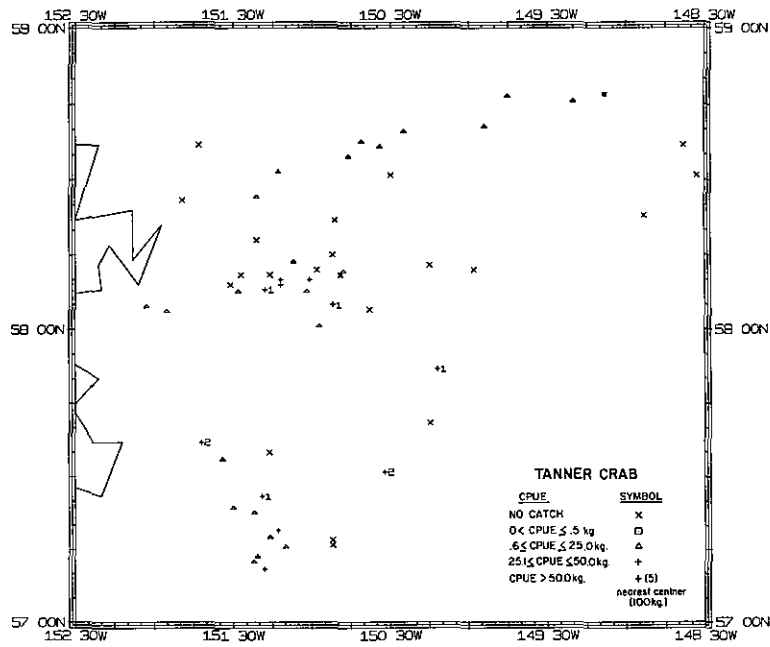
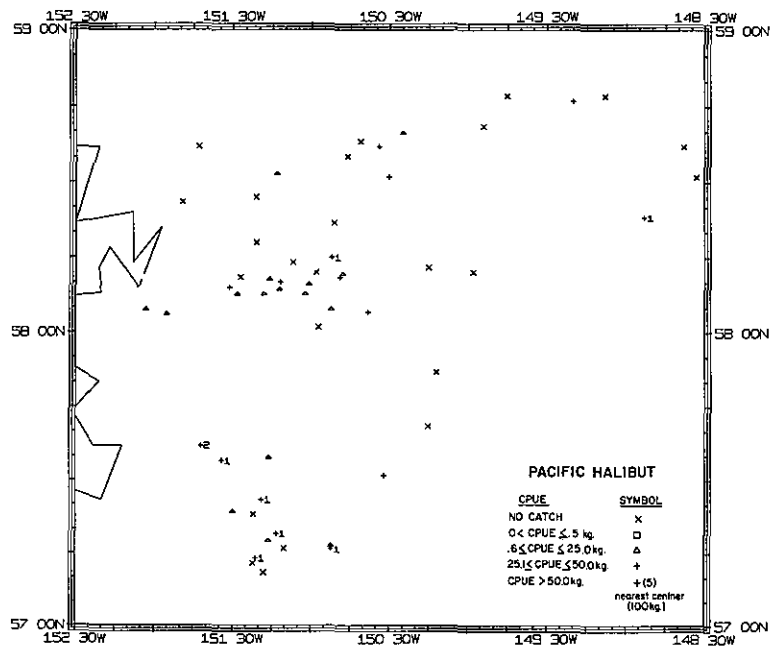
Figures X-57-58.--Distribution of king crab and turbot standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



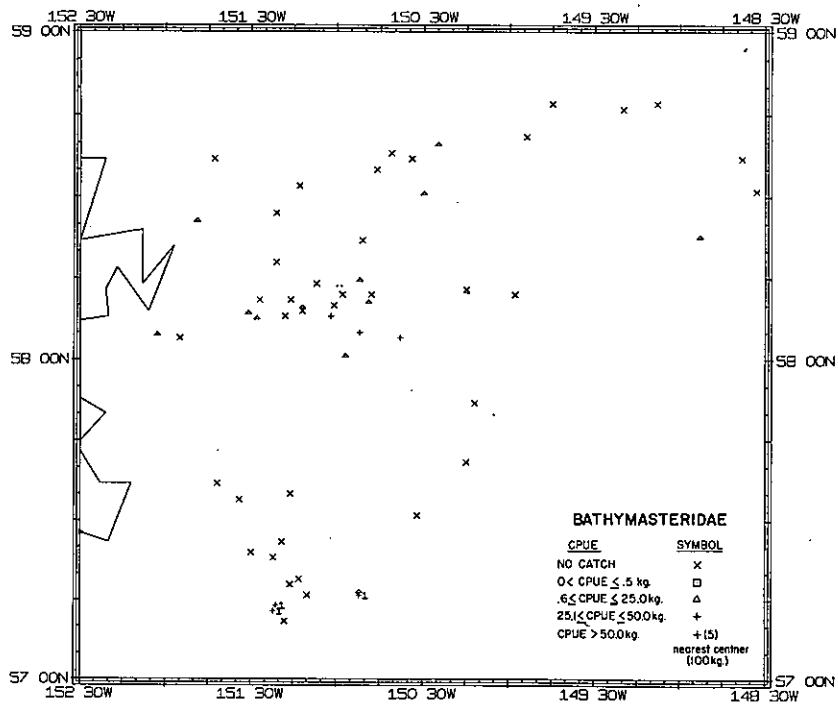
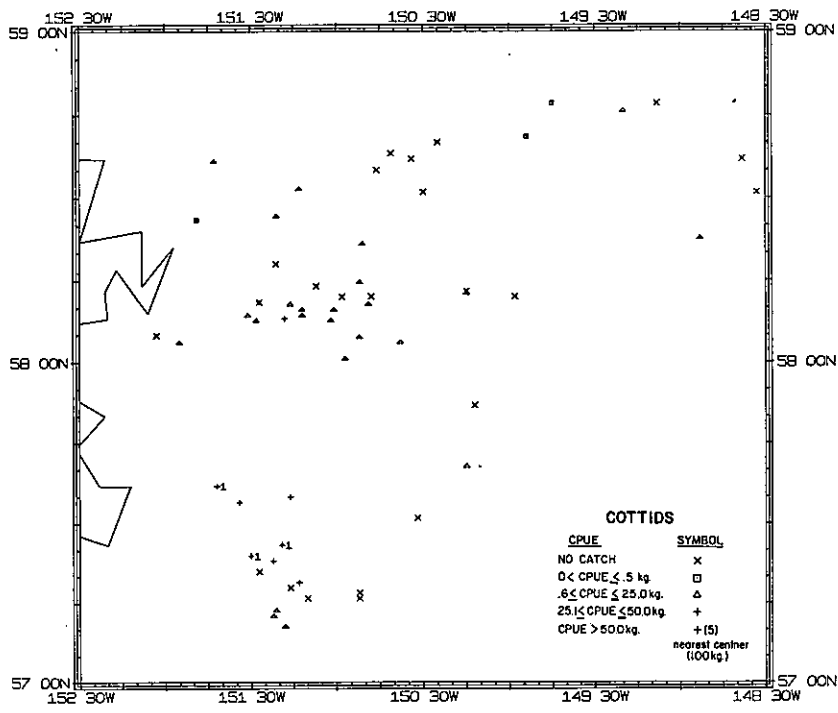
Figures X-59-60.---Distribution of flathead and rex sole standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



Figures X-61-62.--Distribution of sea urchins and walleye pollock standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



Figures X-63-64.--Distribution of Pacific halibut and Tanner crab standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



Figures X-65-66.--Distribution of cottids and Bathymasteridae standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.

h. Cruise 636, R/V G. B. Reed (July-August 1963)

During the Fisheries Research Board of Canada's first of five Pacific ocean perch cruises in the Gulf of Alaska, 36 stations were sampled between Cape Spencer and Blying Bank using an eastern type semi-balloon otter trawl (Figure X-67). Catch rates for Pacific ocean perch during this cruise ranged from 0 to 7143 kg/hr and averaged 740 kg/hr. Large catches (100 kg/hr or more) occurred in the gullies off Yakutat Bay, Icy Bay, Cape Suckling, Cape Hinchinbrook, and Montague Island (Figure X-68, Table X-16). Large catches of other species were 6399 kg/hr of sharpchin rockfish at station 48; 5190 and 4248 kg/hr of walleye pollock at stations 64 and 51; and 1577 and 1176 kg/hr of turbot at stations 62 and 35.

i. Cruise 637, R/V G. B. Reed (August-September 1963)

FRB's Gulf of Alaska rockfish investigations expanded to the western Gulf of Alaska where 32 stations were attempted from Seward Gully to the Trinity Islands, (Figure X-69). Pacific ocean perch catches ranged from 87 to 8560 kg/hr and averaged 2909 kg/hr. Largest catches were made along the outer continental shelf and upper slope throughout the survey area (Figure X-70, Table X-17). Other species for which large catches were reported included 6259 kg/hr of sharpchin rockfish at station 1; 5837, 5400, and 5046 kg/hr respectively of walleye pollock at stations 5, 4, and 71; 4431 and 2237 kg/hr of turbot at stations 67 and 5; and 3739 and 2618 kg/hr of Pacific cod at stations 2 and 1.

j. Cruise 648, R/V G. B. Reed (July-August 1964)

The third cruise of the FRB Canada was conducted from the Trinity Islands to Unimak Pass where thirty otter trawl stations were attempted (Figure X-71). Pacific ocean perch catches ranged from 0-9995 kg/hr and averaged 2438 kg/hr. Largest catches were made along the outer continental shelf and upper slope from the Trinity Islands to Unimak Pass (Table X-18, Figure X-72). Large catches reported for other species included 6292 and 6516 kg/hr of walleye pollock at stations 35 and 31 and 6201 kg/hr of grenadiers (rattails) at station 32.

k. Cruise 652, R/V G. B. Reed (February 1965)

FRB occupied 21 stations off Kodiak Island and in Icy and Yakutat Gullies (Figures X-73). Catches of Pacific ocean perch ranged from 0-1477 kg/hr and averaged 270 kg/hr with the larger catches occurring off Kodiak Island and in Yakutat Gully (Table X-19, Figure X-74). Other species which occurred in large quantities, all off Kodiak Island, are sculpins (6966, 3534, and 1793 kg/hr at stations 25, 15, and 14,) and turbot (2552 kg/hr at station 15).

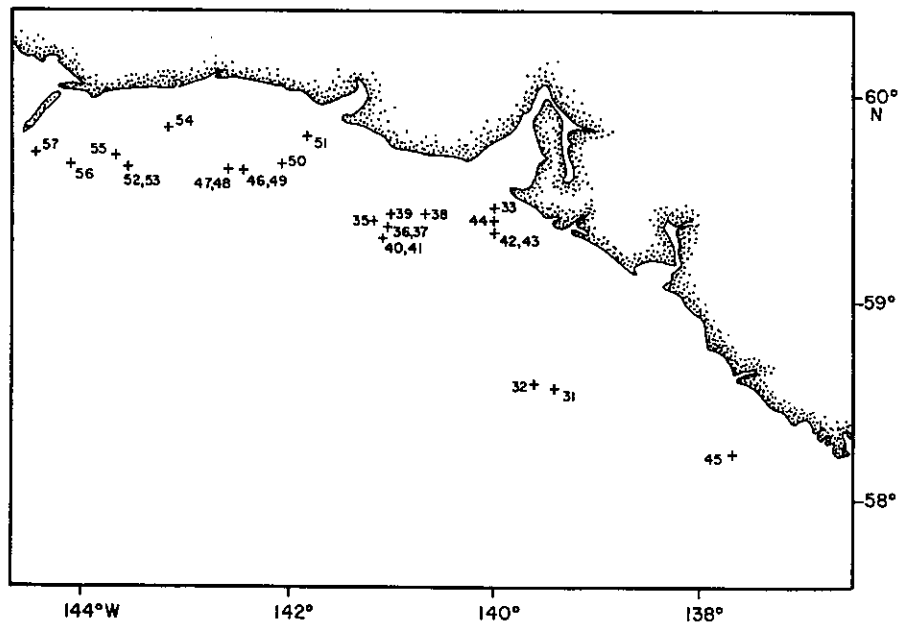
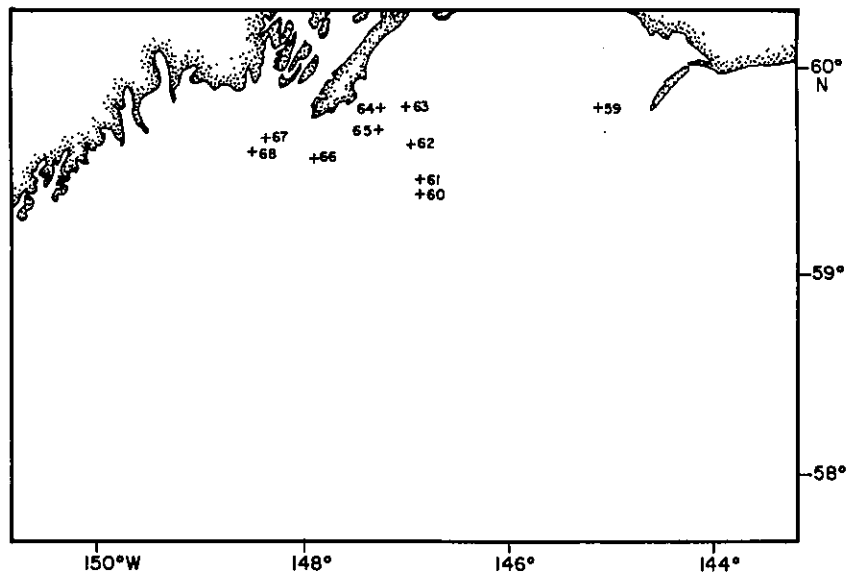


Figure X-67.--Stations successfully trawled (otter trawl) during cruise 636, R/V G. B. Reed.

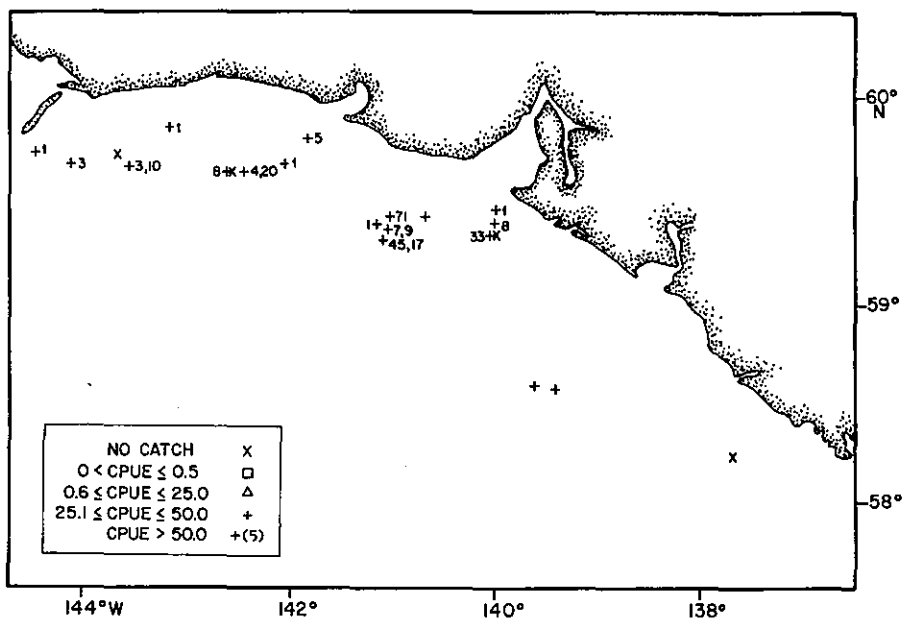
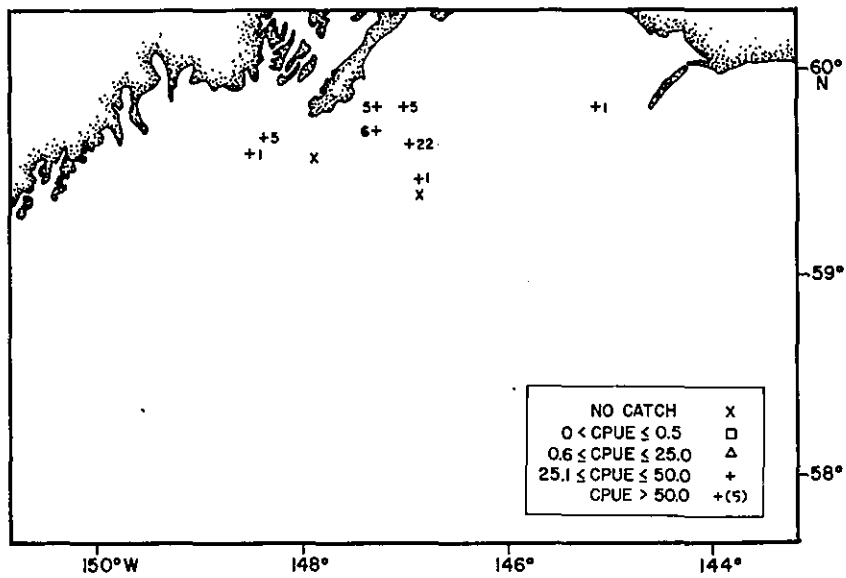


Figure X-68.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 636, R/V G. B. Reed.

Table X-16.--A list of the stations where the species standardized catch rates exceeded 50 kg/hr, cruise 636, R/V G. B. Reed.

Species or Species group	Station numbers
Pacific ocean perch	33, 35-37, 39-42, 44, 46, 48-54, 56, 57, 59, 61-65, 67 and 68.
Sharpchin rockfish	48.
Turbot	51 and 62.
Pollock	64.

Table X-17.--A list of stations where the species standardized catch rates exceeded 50 kg/hr, cruise 637, R/V G. B. Reed.

Species	Station numbers
Pacific ocean perch	1-7, 54, 55 and 57-71.
Pacific cod	1 and 2.
Walleye pollock	4, 5 and 71.
Turbot	5 and 67.
Sharpchin rockfish	1.

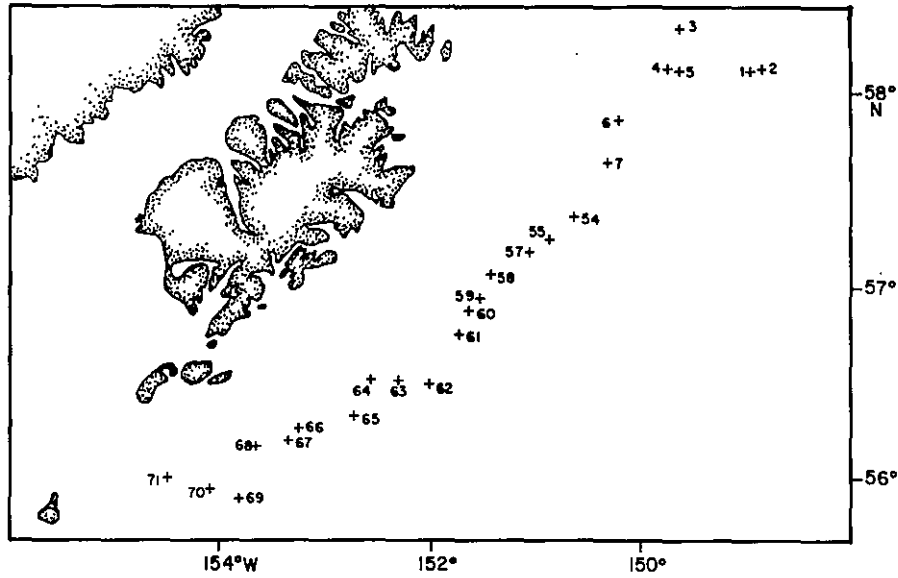


Figure X-69.--Stations successfully trawled (otter trawl) during cruise 637, R/V G. B. Reed.

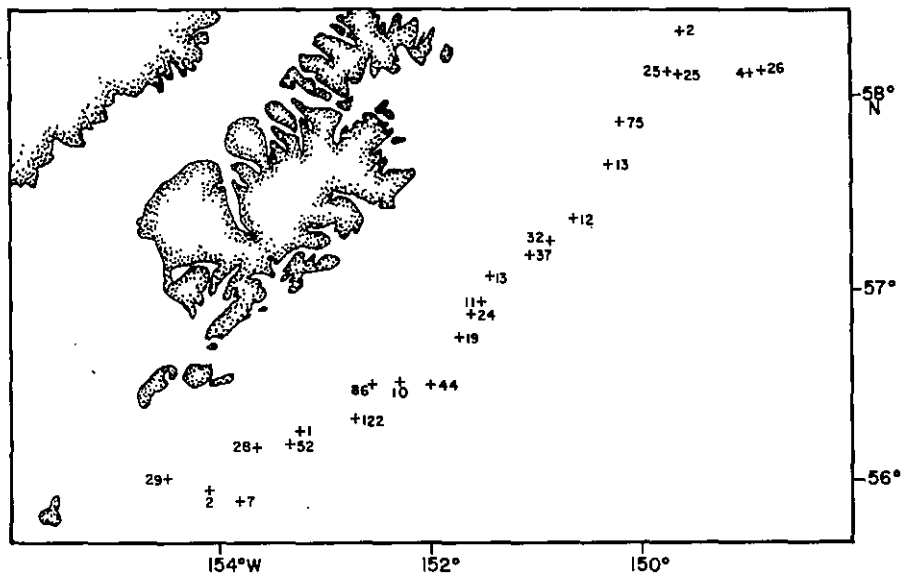


Figure X-70.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 637, R/V. G. B. Reed.

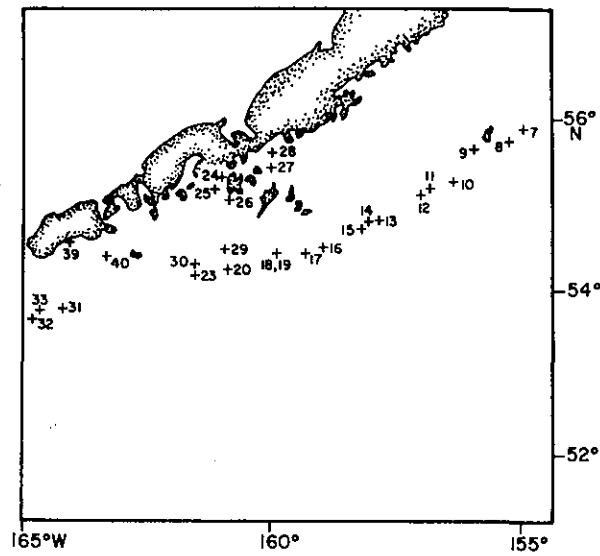


Figure X-71.--Stations successfully trawled (otter trawl) during cruise 648, R/V. G. B. Reed.

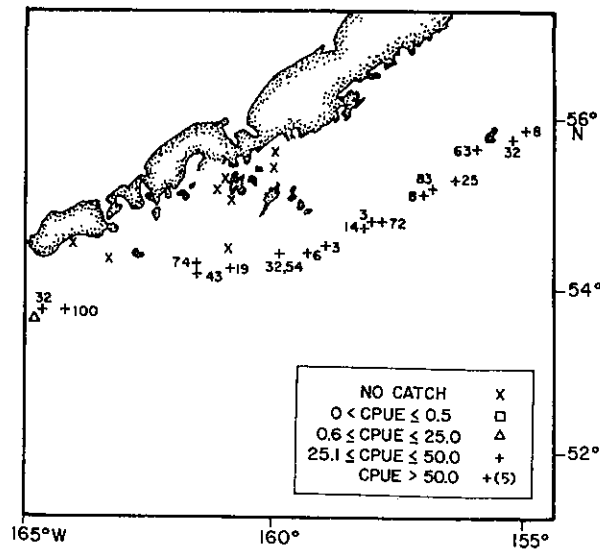


Figure X-72.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 648, R/V G. B. Reed.

Table X-18.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr, cruise 648, R/V G. B. Reed.

Species or Species group	Station numbers
Pacific ocean perch	7-20, 23, 30, 31, 33 and 35
Walleye pollock	31 and 35.
Grenadier	33.

Table X-19.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr, cruise 652, R/V G. B. Reed.

Species or Species groups	Station numbers
Pacific ocean perch	15-17, 21 and 31.
Pacific cod	14 and 21.
Greenling	15.
Turbot	15.
Sculpin	14.
Dover sole	28.

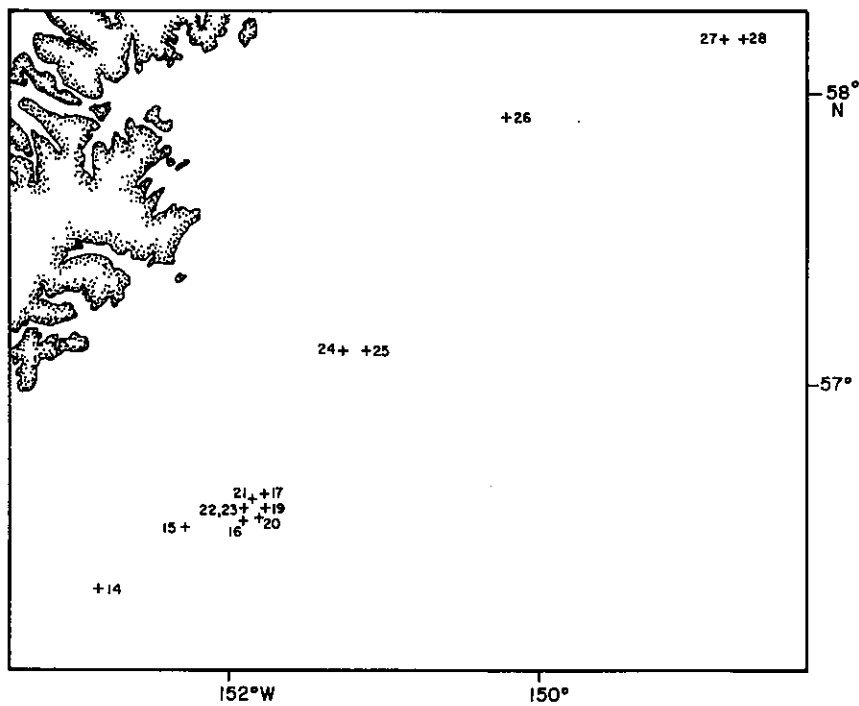
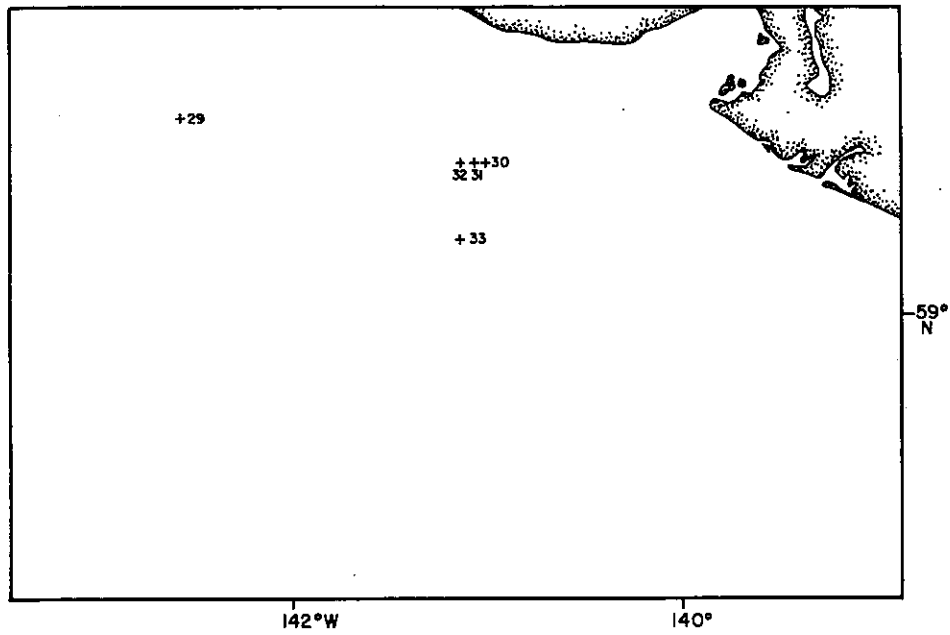


Figure X-73.--Stations successfully trawled (otter trawl) during cruise 652, R/V G. B. Reed.

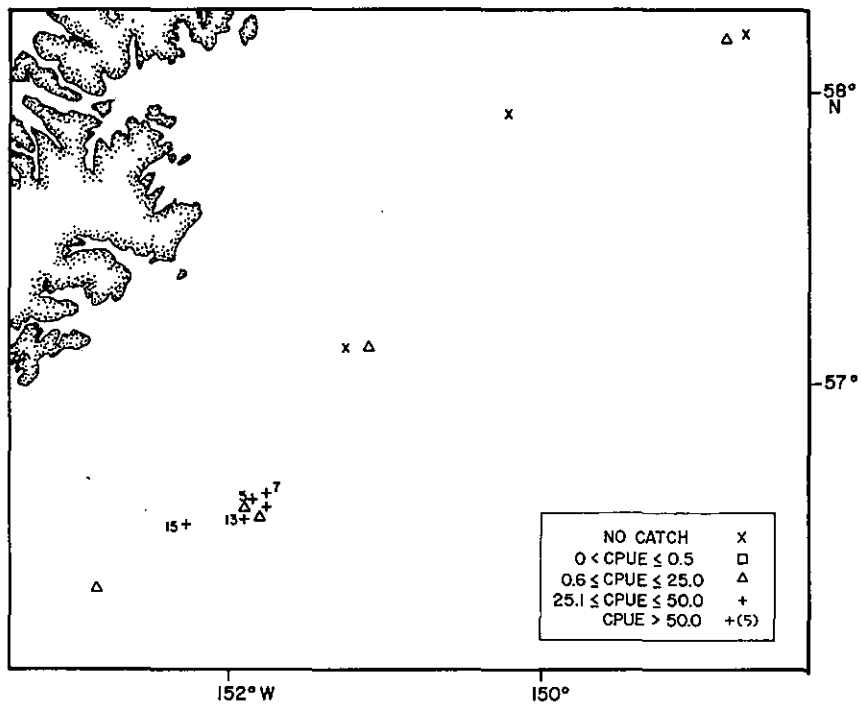
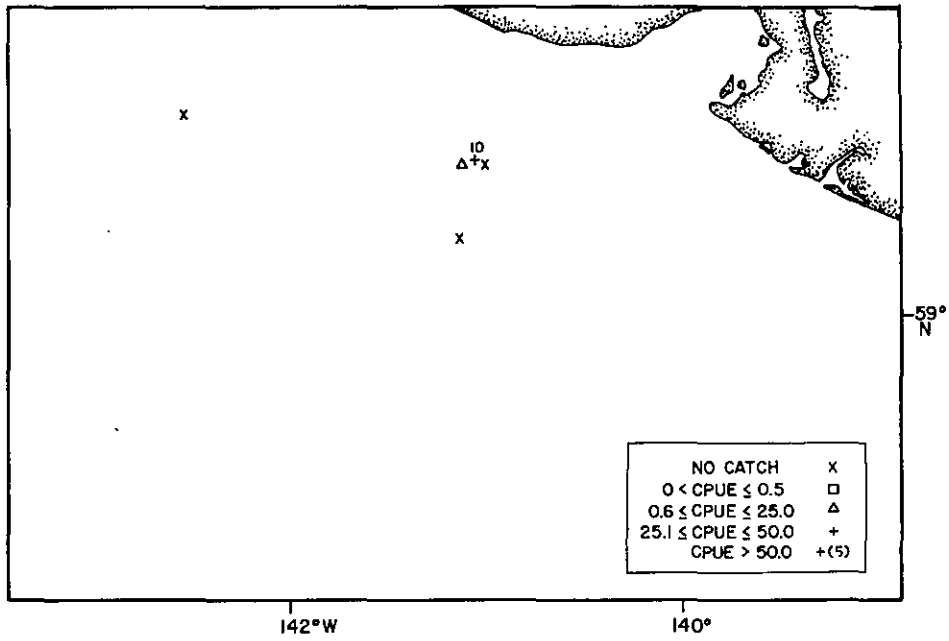


Figure X-74.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 652, R/V G. B. Reed.

1. Cruise 673, R/V John R. Manning (July-August 1967)

In 1967 the last U.S. exploratory cruise in the Gulf of Alaska with otter trawls was conducted using the R/V John R. Manning. Seventy-nine stations were attempted in the Kenai region of the Gulf of Alaska (Figure X-75). The standardized catch rates for all species ranged up to 4800 kg/hr and averaged 642 kg/hr in the outer shelf, 400 kg in the upper slope, and 112 kg/hr in the inner shelf (Table X-20, Figure X-76). Species producing CPUE's greater than 50 kg/hr included Pacific cod, turbot, walleye pollock, Pacific ocean perch, and flathead sole (Table X-21). Largest catches of Pacific cod occurred east of the Pye Islands, turbot around Blying Bank, and in Seward Gully, and pollock east of the Pye Islands around Blying Bank, and off Port Bainbridge (Figure X-77-79). The largest catches of Pacific ocean perch, flathead sole, and starfish, respectively, were taken around Blying Bank (Figures X-80-82). The distribution of the standardized CPUE's of other species averaging 10 kg/hr or more in a depth zone are presented in Figures X-83-87.

m. Cruise 701, R/V G. B. Reed (May 1970)

The FRB Canada conducted trawling operations off Alaska where three tows were made near Icy Gully. Pacific ocean perch averaged 256 and Pacific halibut 81 kg/hr. No exact positions for the trawling were provided, except that they were in INPFC statistical block 042593.

Shrimp Trawl Cruises

a. Cruise 015, R/V John N. Cobb (March-April 1953)

During the 1953 multi-gear, multi-species survey conducted aboard the R/V John N. Cobb, BCF conducted the first exploratory shrimp sampling in the Gulf of Alaska west of Cape Spencer. Sixty-seven stations were sampled primarily within Yakutat Bay with a 20 foot beam trawl (Figure X-88). The standardized catch rates for all species (fish and invertebrates) ranged up to 600 kg/hr in the survey area and averaged 187 kg in the inner shelf and 159 kg/hr in the outer shelf (Figure X-89).

Pink shrimp was the dominant pandalid species captured in Yakutat Bay averaging 100 and 28 kg/hr respectively, in the inner and outer shelf zones (Table X-22). In the inner shelf pink shrimp made up 96% of the total shrimp catch and 54% of the total species catch and in the outer shelf, 57% of the total shrimp catch, and 18% of the total species catch. Sideshripe was the only other species of shrimp to average over 10 kg/hr. The larger catches of pandalid shrimp occurred at the 24 stations in the inner bay (Figure X-90). Species or species groups producing mean CPUE's greater than 10 kg/hr were brittlestars, which were more abundant near the mouth of Yakutat Bay, and Tanner crab and butter sole, which had the highest standardized catch rates more towards the head of the bay (Table X-23-24, Figures X-91-93). The pandalid shrimp and these dominant species constituted 89% of the total catch in the inner shelf and 79% in the outer shelf.

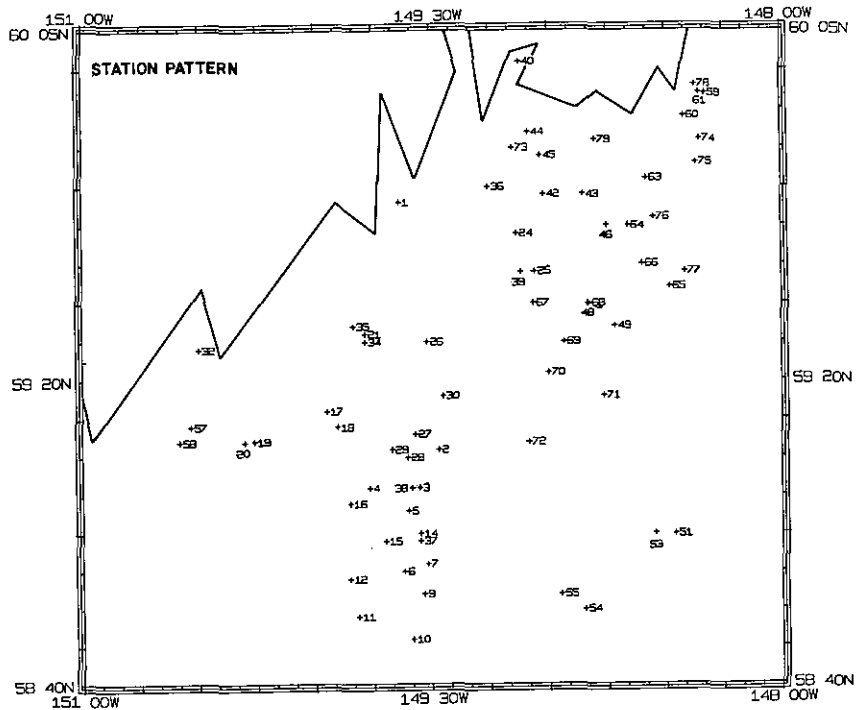


Figure X-75.--Stations successfully trawled (otter trawl) during cruise 673, R/V John R. Manning.

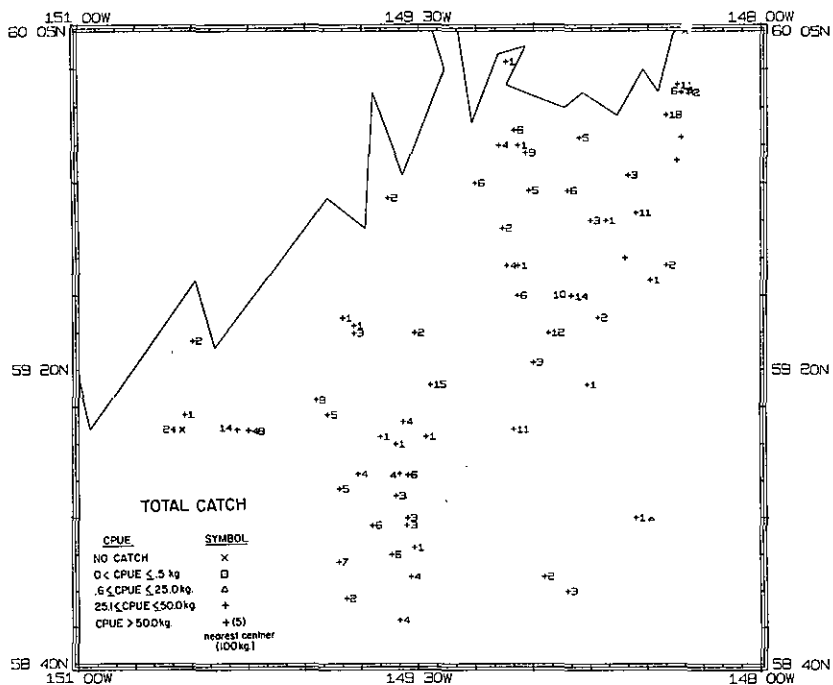


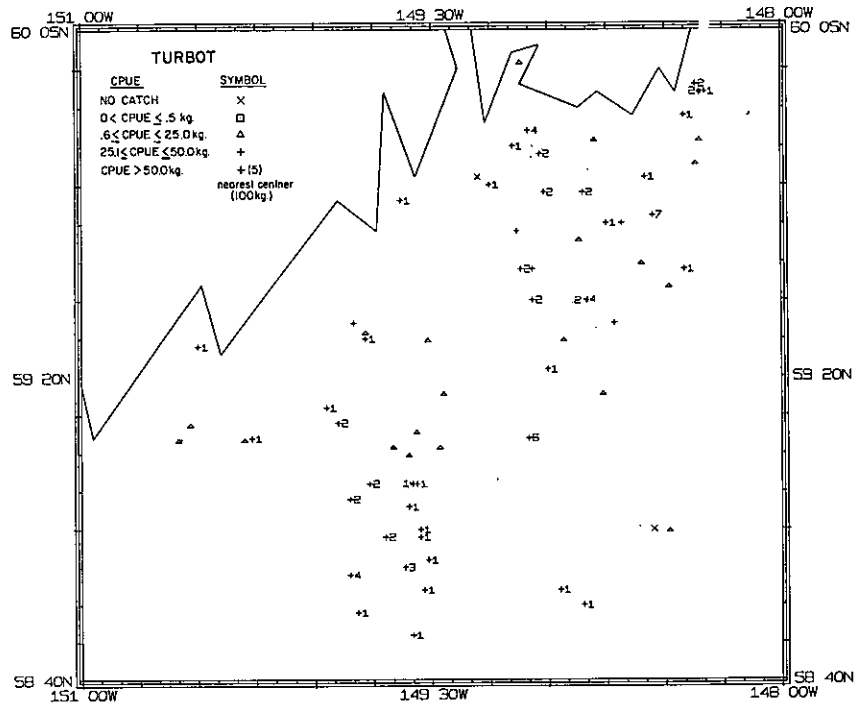
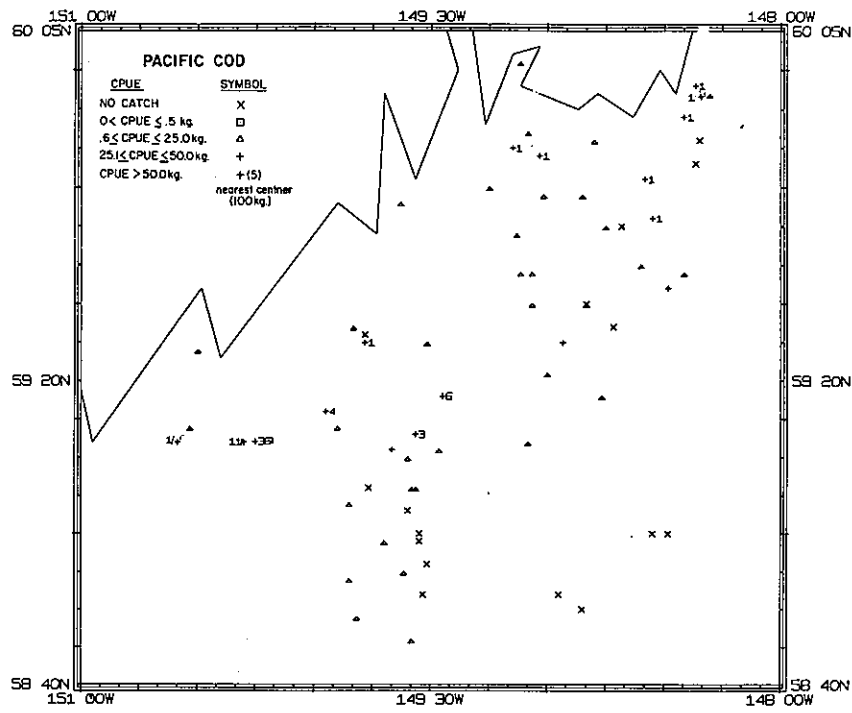
Figure X-76.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 673, R/V John R. Manning.

Table X-20.--Mean CPUE's for the dominant species or species groups captured with otter trawls,
cruise 67-3, R/V John R. Manning.

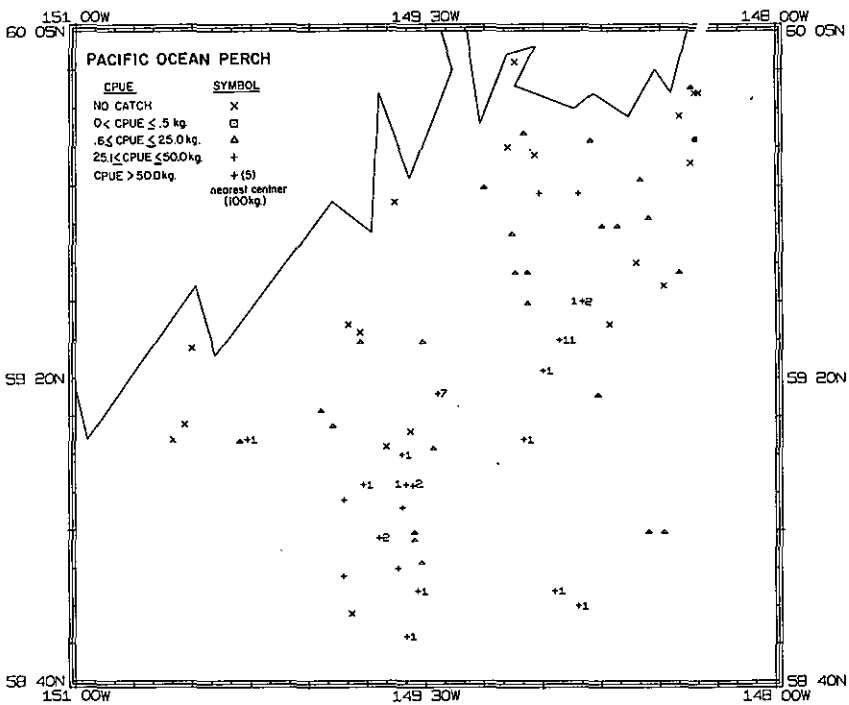
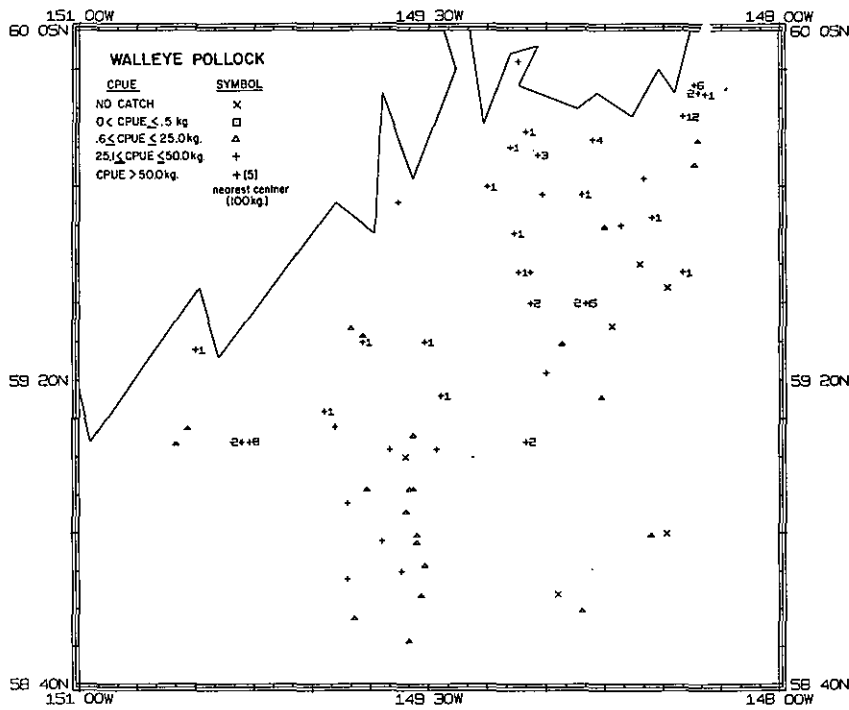
Species	1 - 100 kg/hr	Depth Zones (m)		Species	201 - 400 kg/hr
		Species	101 - 200 kg/hr		
Pacific halibut	37.2	Pacific cod	186.8	Turbot	152.7
Flathead sole	22.5	Walleye pollock	150.1	Walleye pollock	46.2
Pacific cod	11.0	Turbot	105.8	Pacific ocean perch	41.1
Heart urchin	10.8	Pacific ocean perch	69.5	Flathead sole	36.5
Turbot	10.2	Flathead sole	53.3	Sablefish	31.2
Rock sole	6.3	Tanner crab	22.3	Tanner crab	19.8
Bathymasteridae	5.5	Pacific halibut	20.0	Dover sole	18.6
Basketstar	2.4	Sablefish	12.5	Pacific cod	15.9
Box crab	2.2	Sponge	3.9	Starfish	13.0
Sea urchin	1.1	Dover sole	1.8	Rex sole	7.0
Total	109.2		626.0		382.0
Total all species	112.2		642.4		400.1

Table X-21.--A list of stations where species or species group standardized catch rates exceeded 50 kg/hr or total species catch rates exceeded 950 kg/hr, cruise 673, R/V John R. Manning.

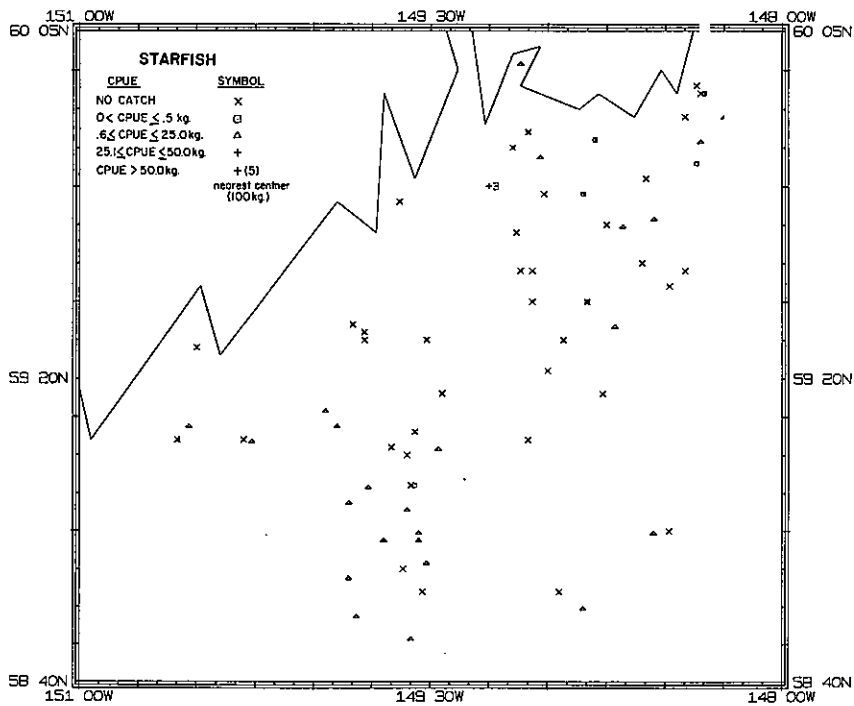
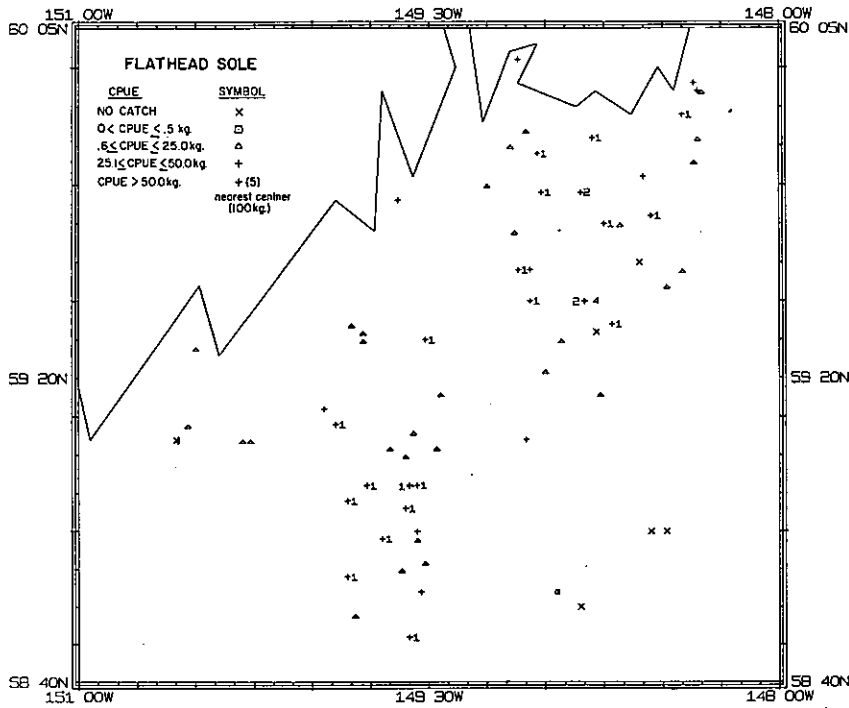
Species or Species groups	Station Numbers
Total catch	19, 20, 30, 48, 61, 68, 69, 72, 76 and 78.
Pacific cod	17, 19, 20, 27, 30, 34, 45, 58, 60, 61, 63, 73, 76 and 78.
Turbot	1, 3, 4-7, 9-12, 14-19, 32, 34, 36-39, 42-46, 48, 54, 55, 59-61, 63, 67, 70, 72, 73 and 76-78.
Pollock	17, 19, 20, 24, 26, 30, 32, 34, 36, 39, 43-45, 48, 59-61, 67, 68, 73, 76, 78 and 79.
Pacific ocean perch	3, 4, 9, 10, 15, 19, 28, 30, 38, 48, 54, 55, 68-70 and 72.
Flathead sole	3-5, 10, 12, 15, 16, 18, 26, 38, 39, 42, 43, 45, 46, 48, 49, 60, 67, 68, 76 and 79.
Sablefish	3, 6, 12, 15, 16, 19, 37, 44, 68 and 72.
Tanner crab	18, 36, 60, 61, 72 and 73.
Pacific halibut	30, 57, 58, 60, 61 and 78.
Dover sole	9 and 10.
Starfish	36.



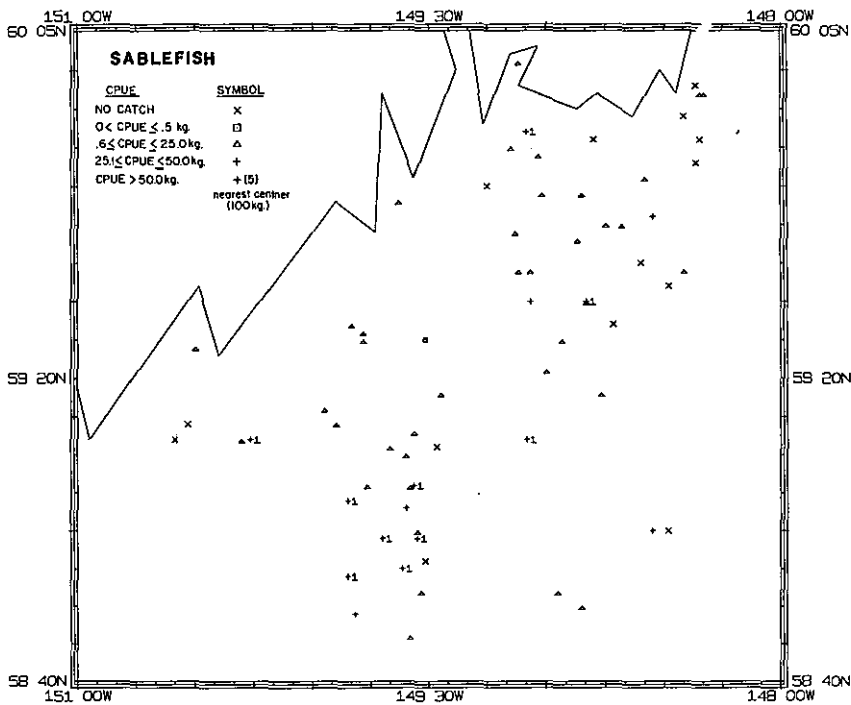
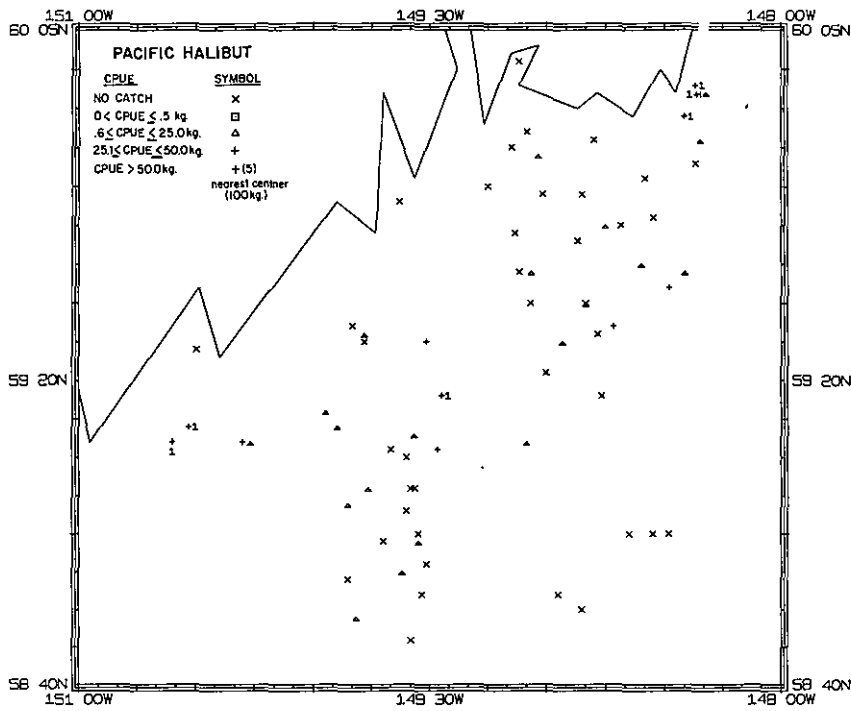
Figures X-77-78.--Distribution of Pacific cod and turbot standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



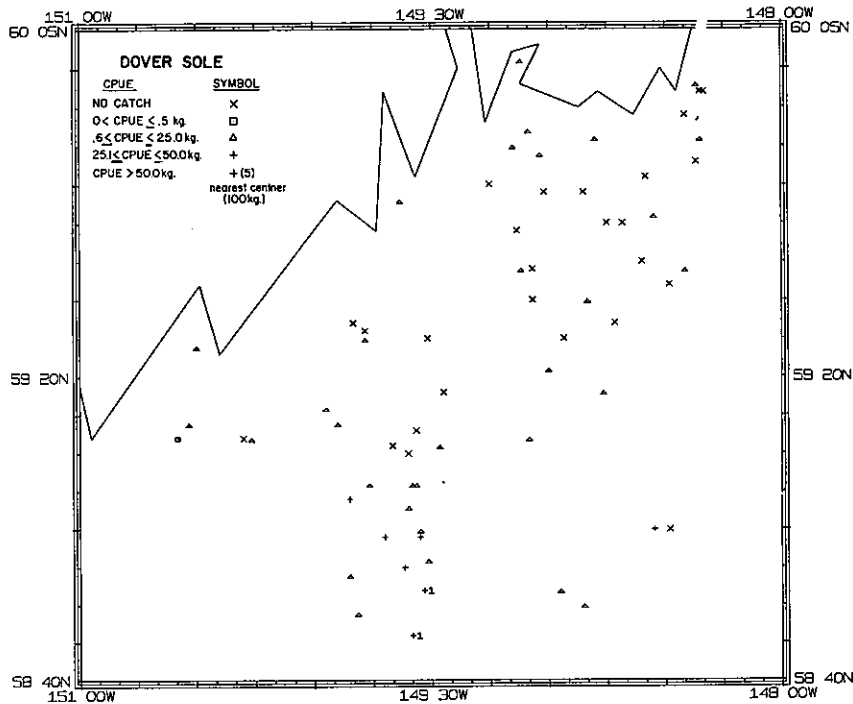
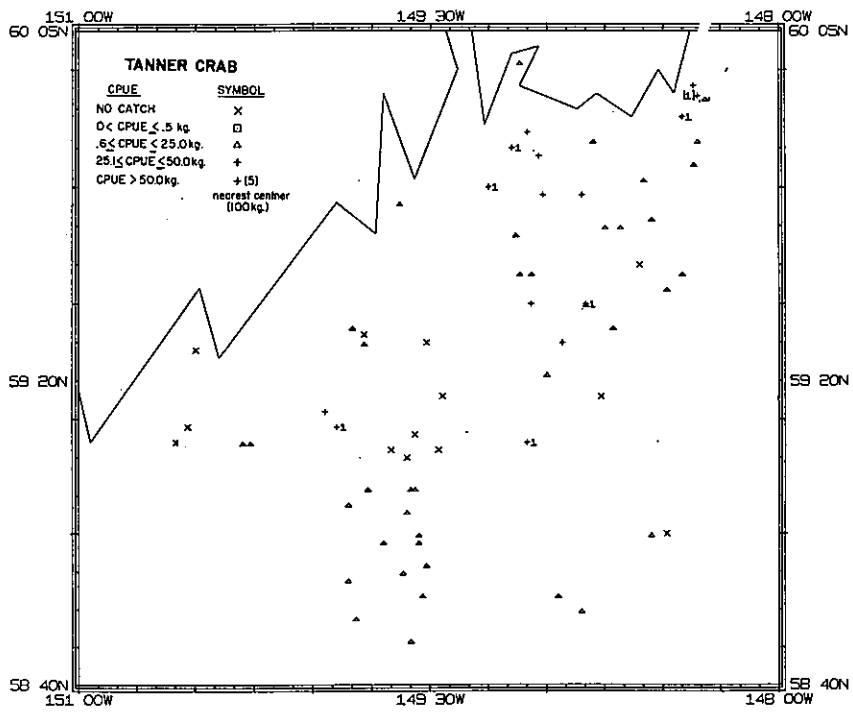
Figures X-79-80.--Distribution of walleye pollock and Pacific ocean perch standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



Figures X-81-82.--Distribution of flathead sole and starfish standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



Figures X-83-84.--Distribution of Pacific halibut and sablefish standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



Figures X-85-86.--Distribution of Tanner crab and Dover sole standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.

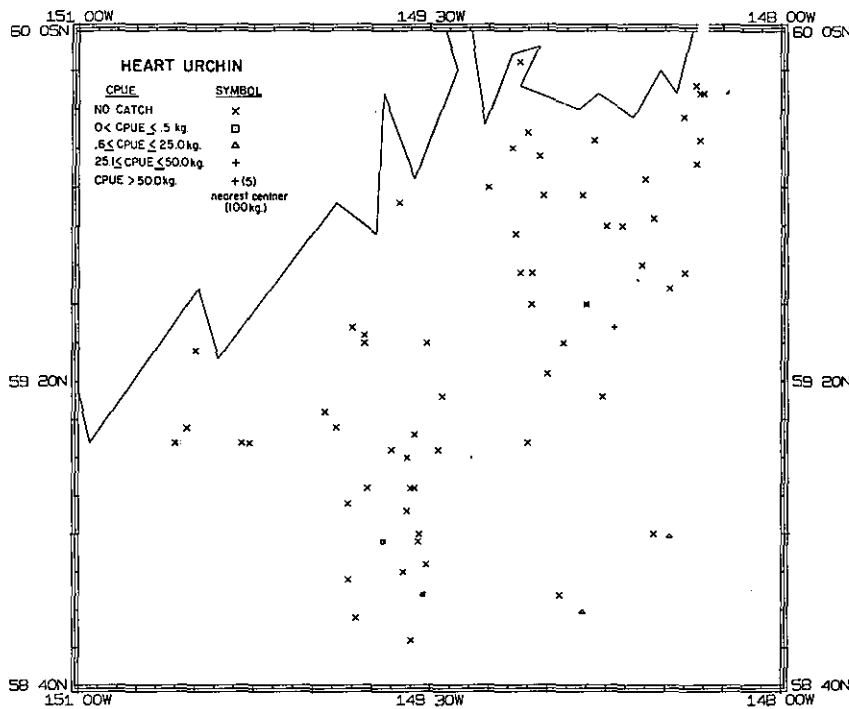


Figure X-87.--Distribution of heart urchin standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.

b. Cruise 018, R/V John N. Cobb (February-April 1954)

Shrimp "beam" trawls were used by BCF in the 1954 Prince William Sound explorations. Eighteen sampling stations were attempted in Orca Bay and its tributaries and Port Fidalgo (Figure X-94).

The total standardized catch rates for all species were extremely low, less than 39 kg/hr (Figure X-95). Pink shrimp, the dominant pandalid species, averaged 35 and 15 kg/hr in the inner and outer shelf zones (Table X-22, Figure X-96). In the shallower water pink shrimp constituted 100% of the pandalid catch and 88.4% of the total species catch and 73% of the pandalid shrimp and 45% of the total species catch in the outer shelf depth zone. No other species occurred at abundances which produced CPUE's greater than 10 kg/hr (Table X-23).

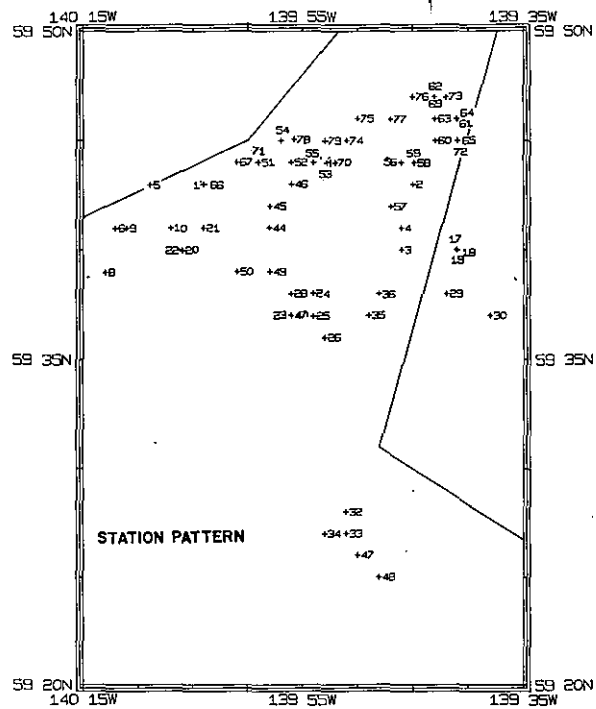


Figure X-88.--Stations successfully trawled (beam trawl) during Cruise 015, R/V John N. Cobb.

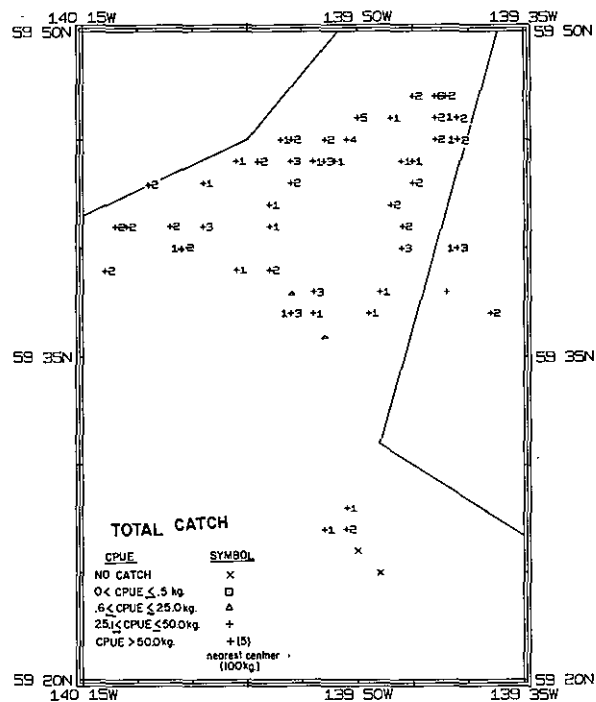


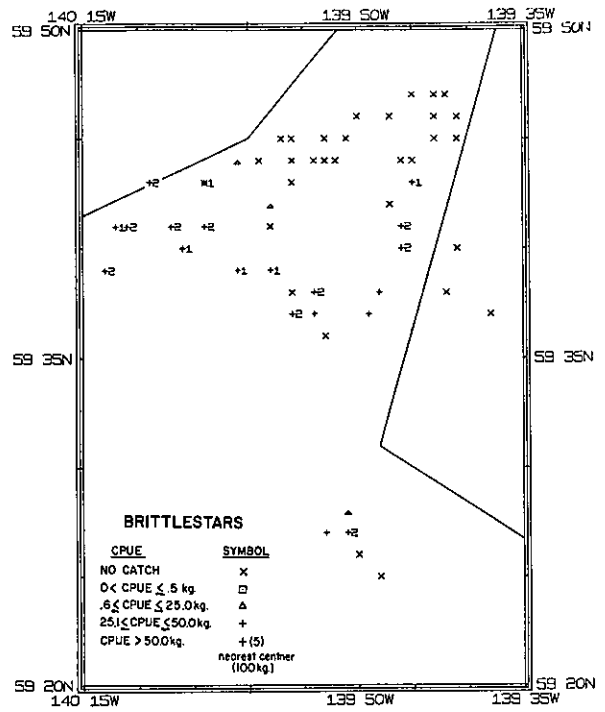
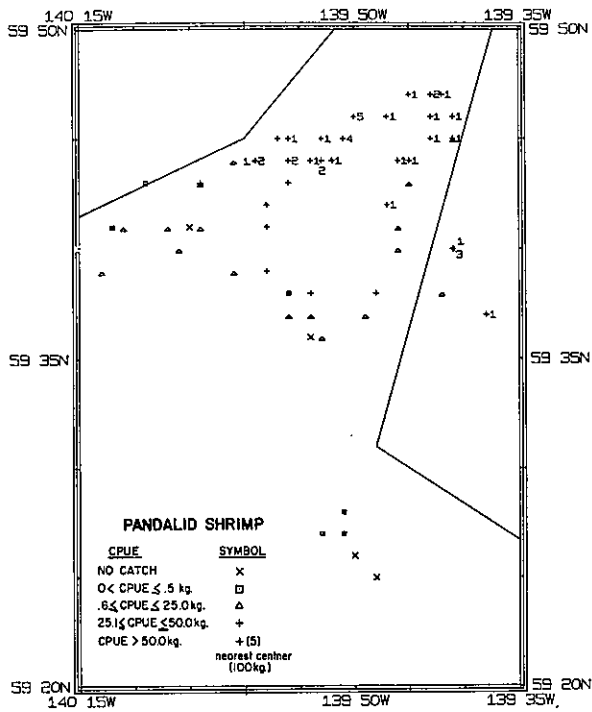
Figure X-89.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 015, R/V John N. Cobb.

Table X-22.--Mean CPUE's for individual pandalid shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1953-1960.

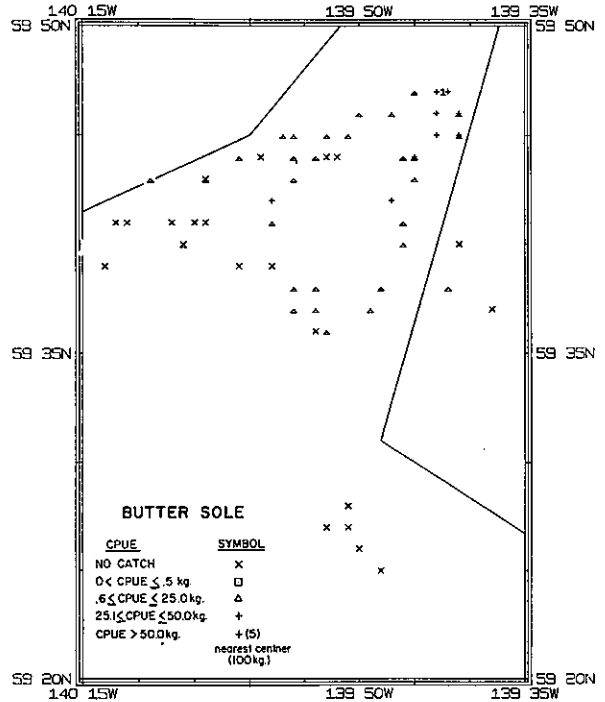
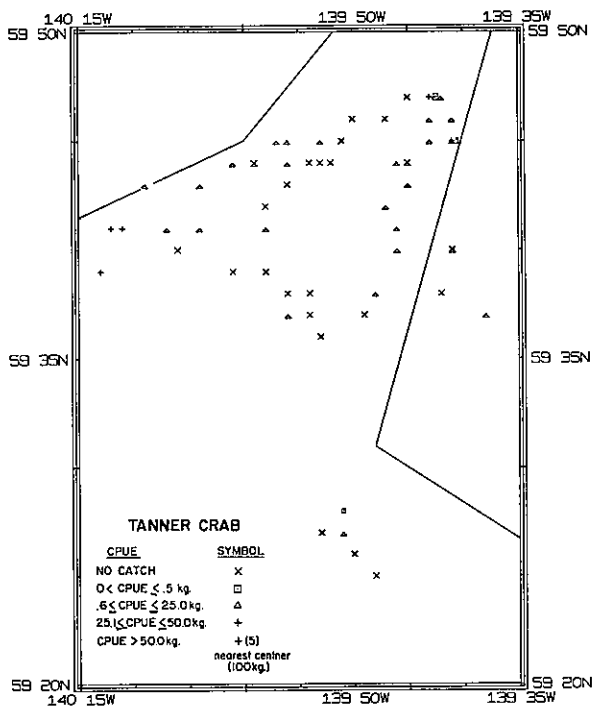
Cruise file	Species	Depth intervals (m)								
		0-100			100-200			200-400		
		CPUE kg/hr	% of shrimp	% Total biomass	CPUE kg/hr	% of shrimp	% Total biomass	CPUE kg/hr	% of shrimp	% Total biomass
015	Pink	100.2	96.4	53.6	28.3	56.6	17.8	--	--	--
	Sidestripe	3.7	3.6	2.0	21.7	43.4	13.6	--	--	--
	Coonstripe	-- 1/	-- 2/	-- 2/	-- 1/	-- 2/	-- 2/	--	--	--
		<u>103.9</u>	<u>100.0</u>	<u>55.6</u>	<u>50.0</u>	<u>100.0</u>	<u>31.4</u>			
018	Pink	34.5	100.0	88.4	14.8	72.9	44.7	--	--	--
	Sidestripe	0	0	0	5.2	25.6	15.7	--	--	--
	Coonstripe	0	0	0	0.3	1.5	1.0	--	--	--
	Spot	0	0	0	-- 1/	-- 2/	-- 2/	--	--	--
		<u>34.5</u>	<u>100.0</u>	<u>88.4</u>	<u>20.3</u>	<u>100.0</u>	<u>61.4</u>			
020	Pink	11.0	96.5	10.9	40.1	89.3	24.3	14.2	62.6	15.4
	Sidestripe	-- 1/	-- 2/	-- 2/	4.6	10.2	2.8	8.3	36.6	9.1
	Coonstripe	0.4	3.5	0.3	0.2	0.4	0.1	0.2	0.9	0.2
	Dock	-- 1/	-- 2/	-- 2/	0	0	0	0	0	0
	Spot	0	0	0	-- 1/	-- 2/	-- 2/	-- 1/	-- 2/	-- 2/
		<u>11.4</u>	<u>100.0</u>	<u>11.2</u>	<u>44.9</u>	<u>99.9</u>	<u>27.2</u>	<u>22.7</u>	<u>100.1</u>	<u>24.7</u>
039	Pink	286.7	80.9	54.8	209.3	64.1	39.1	75.6	53.2	20.8
	Sidestripe	21.2	5.9	4.0	106.2	32.6	19.8	63.7	44.9	17.5
	Coonstripe	45.8	12.9	8.8	10.6	3.3	2.0	2.3	1.6	0.6
	Humpy	0.6	0.2	1.0	0.1	-- 2/	-- 2/	0	0	0
	Spot	0	0	0	0.1	-- 2/	-- 2/	0.4	0.3	0.1
		<u>354.3</u>	<u>99.9</u>	<u>68.6</u>	<u>326.3</u>	<u>100.0</u>	<u>60.9</u>	<u>142.0</u>	<u>100.0</u>	<u>39.0</u>
003	Pink	769.2	99.2	76.7	1376.7	94.0	80.6	--	--	--
	Sidestripe	3.9	0.5	0.4	72.5	5.0	4.2	--	--	--
	Coonstripe	2.4	0.3	0.2	14.7	1.0	0.9	--	--	--
		<u>775.5</u>	<u>100.0</u>	<u>77.3</u>	<u>1463.9</u>	<u>100.0</u>	<u>85.7</u>			
044	Pink	33.5	78.3	26.8	40.4	73.2	25.9	33.5	64.2	17.6
	Sidestripe	5.7	13.3	4.6	14.2	25.7	9.1	18.7	35.8	9.8
	Coonstripe	3.6	8.4	2.9	0.5	0.9	0.3	0	0	0
	Humpy	0	0	0	0.1	0.2	0.1	0	0	0
	Spot	0	0	0	-- 1/	-- 2/	-- 2/	0	0	0
		<u>42.8</u>	<u>100.0</u>	<u>34.3</u>	<u>55.2</u>	<u>100.0</u>	<u>35.4</u>	<u>52.2</u>	<u>100.0</u>	<u>27.4</u>

1/ less than 0.1 kg/hr

2/ less than 0.1%



Figures X-90-91.--Distribution of pandalid shrimp and brittlestars standardized catch rates, in kg/hr, cruise 015, R/V John N. Cobb.



Figures X-92-93.--Distribution of Tanner crab and butter sole standardized catch rates, in kg/hr, cruise 015, R/V John N. Cobb.

Table X-23.-- Mean CPUE's for species other than pandalid shrimps which averaged over 10 kg/hr during exploratory shrimp cruises in the Gulf of Alaska from 1953-1960.

		DEPTH ZONES (m)					
Cruise	Species	1 - 100		101 - 200		201 - 400	
		CPUE kg/hr	% of total catch	CPUE kg/hr	% of total catch	CPUE kg/hr	% of total catch
015	Brittlestars	45.4	24.3	50.1	31.5	--	--
	Tanner crab	8.9	4.7	13.2	8.3	--	--
	Butter sole	7.3	3.9	12.1	7.6	--	--
		<u>61.6</u>	<u>32.9</u>	<u>75.4</u>	<u>47.4</u>	--	--
018	No species						
020	Flathead sole	26.0	25.8	26.0	15.7	2.2	2.4
	Sebastes sp.	12.2	11.2	6.1	7.5	3.0	3.3
	Tanner crab	11.0	10.9	26.4	16.0	27.4	29.8
	Walleye pollock	4.8	4.8	11.0	6.6	2.3	2.5
	Jellyfish	0	0	0	0	10.6	11.5
		<u>54.0</u>	<u>52.7</u>	<u>69.5</u>	<u>35.8</u>	<u>45.5</u>	<u>49.5</u>
003	King crab	83.1	8.3	92.2	5.4	--	--
	Alaska plaice	34.7	3.5	9.0	0.5	--	--
	Cottids	21.6	2.2	20.9	1.2	--	--
	Rock sole	14.9	1.5	2.9	0.2	--	--
	Turbot	13.6	1.4	10.4	0.6	--	--
	Tanner crab	11.3	1.1	38.5	2.3	--	--
	Walleye pollock	3.5	0.3	16.0	0.9	--	--
	Pacific cod	1.3	0.1	12.3	0.7	--	--
		<u>184.0</u>	<u>18.4</u>	<u>202.2</u>	<u>11.8</u>	--	--
039	Tanner crab	39.4	7.5	19.2	3.6	16.1	4.4
	King crab	13.6	2.6	6.7	1.2	2.7	0.7
	Cottids	13.0	2.5	5.7	1.1	1.9	0.5
	Yellowfin sole	12.7	2.4	0.4	0.1	0.1	2/
	Pacific halibut	11.3	2.2	2.9	0.5	2.2	0.6
	Flathead sole	10.0	1.9	28.3	5.3	19.2	5.3
	Turbot	5.1	1.0	67.4	12.6	82.3	22.6
	Walleye pollock	9.1	1.7	22.6	4.2	33.6	9.3
	Sablefish	0.2	2/	10.2	1.9	1.0	0.3
	Pac. ocean perch	0	0	8.9	1.7	20.0	5.5
	Starfish	0.7	0.1	4.4	0.8	12.7	3.5
		<u>115.1</u>	<u>21.9</u>	<u>176.7</u>	<u>33.0</u>	<u>191.8</u>	<u>52.7</u>
044	Pacific herring	23.6	18.9	0.5	0.3	0.1	0.1
	Walleye pollock	14.7	11.8	23.4	15.0	32.5	17.1
	Turbot	8.2	6.5	11.9	7.6	48.3	25.3
	Pac. ocean perch	0	0	10.9	7.0	16.1	8.4
	Tanner crab	0	0	10.2	6.5	4.2	2.2
		<u>46.5</u>	<u>37.2</u>	<u>56.9</u>	<u>36.4</u>	<u>101.2</u>	<u>53.1</u>

2/ less than 0.1 percent.

Table X-24.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr or the total species standardized catch rates exceeded 950 kg/hr cruise 015, R/V John N. Cobb.

Species or Species group	Station Numbers
Total catch	None
Pandalid shrimp	18, 19, 51-53, 55-64 and 69-79.
Brittlestars	1-6, 8-10, 20-24, 33, 47, 49 and 50.
Tanner crab	62 and 72.
Butter sole	69.

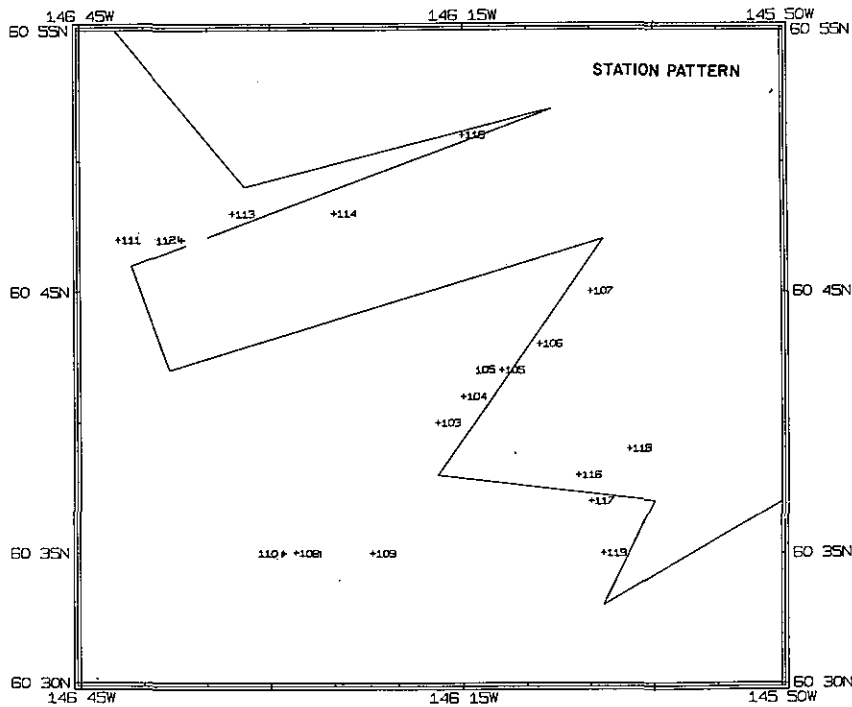


Figure X-94.--Stations successfully trawled (beam trawl) during Cruise 018, R/V John N. Cobb.

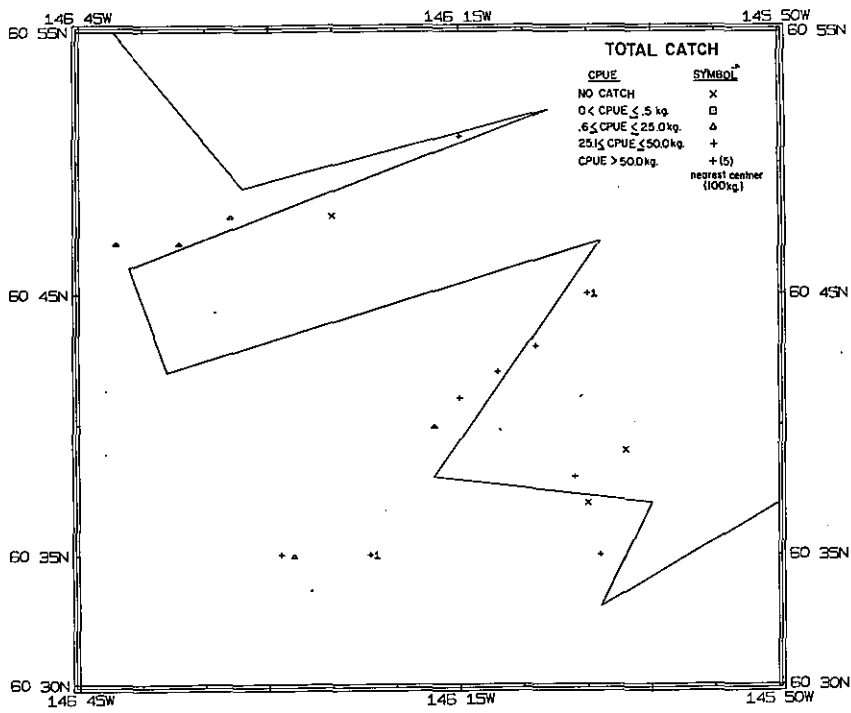


Figure X-95.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 018, R/V John N. Cobb.

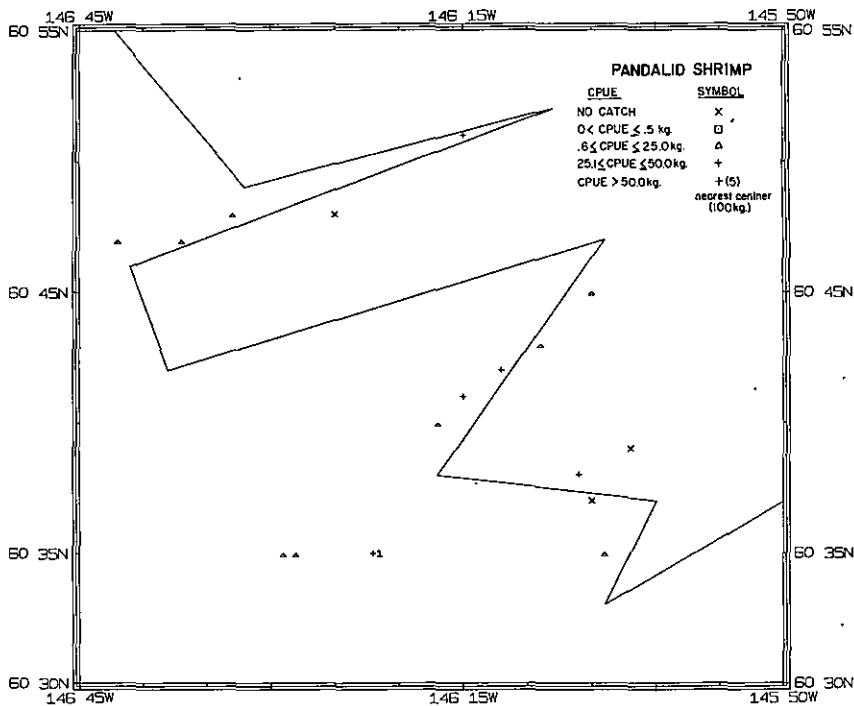


Figure X-96.-- Distribution of pandalid shrimp standardized catch rates, in kg/hr, during cruise 018, R/V John N. Cobb.

c. Cruise 020, R/V John N. Cobb (July-September 1954)

The BCF occupied 90 stations primarily in Orca Bay and its tributaries, Port Fidalgo, Montague Straits, and Port Valdez (Figure X-97). The standardized catch rates of all species were considerably larger than during the earlier cruise in Feb.-April, 1954, ranging up to 500 kg/hr and averaging 165 kg/hr in the outer shelf, 101 kg/hr in the inner shelf, and 92 kg/hr in the upper slope (Figure X-98). Largest catch rates of all species occurred in Port Fidalgo, and Port Gavina. Pandalid shrimp catches remained small, less than 44.9 kg/hr, (Table X-22). Pink shrimp made up 97, 89, and 63% of the shrimp catches, in the inner shelf to upper slope depth zones respectively, but only 11, 27, and 25% of the total species catches. Standardized shrimp catches over 100 kg/hr were made in Montague Strait and Orca Bay (Figure X-99, Table X-25). Species producing mean CPUE's greater than 10 kg/hr were Tanner crab in all three depth zones, flathead sole in the inner shelf and outer shelf, rockfish in the inner shelf, walleye pollock in the outer shelf, and jellyfish in the upper slope. Jellyfish were probably captured in the near-surface waters while setting and retrieving the trawl. Of these 5 species, only Tanner crab were taken at a catch level exceeding 200 kg/hr, (Figures X-100-104).

d. Cruise 003, Chartered Fishing Vessel, Tordenskjold (July-September 1957)

BCF sampled 29 stations in the Sanak and Shumagin regions using a Gulf of Mexico-type flat trawl, (Figure X-105). The average CPUE's of all species were 1,003 kg/hr in the inner shelf and 1,707 kg/hr in the outer shelf, with individual station standardized catch rates ranging up to 4,000 kg/hr. Largest catches occurred at outer Pavlof Bay, Beaver Bay, Unga Straits, Stepovak Bay, and outer west Nagai Straits (Table X-26, Figure X-106). Catches of pandalid shrimp averaged 776 kg/hr in the inner shelf and 1,464 kg/hr in the outer shelf and consisted of over 94% pinks (Table X-22). Sidestripe and coonstripe shrimp both averaged over 10 kg/hr in the outer shelf depth zone. Very large catches of pandalid shrimp, over 1,000 kg/hr, occurred in Stepovak Bay, Beaver Bay, Unga Straits, lower west Nagai Straits, and off Pavlof Bay (Figure X-107).

Species averaging over 10 kg/hr were king crab, cottids, turbot, and Tanner crab in both the inner and outer shelf depth zones, Alaska plaice and rock sole in the inner shelf and walleye pollock and Pacific cod in the outer shelf (Table X-23). King crab was the only species to occur at a catch rate greater than 200 kg/hr and this was at only 1 station, No. 13, in Unga Straits (Figure X-108). The distribution of the standardized catches for the other species are shown in Figures X-109-115. The dominant species and pandalid shrimp accounted for over 96% of the total species catches in the inner shelf and outer shelf depth zone.

e. Cruise 039, R/V John N. Cobb (July-August 1958)

During July-August 1958, shrimp explorations were conducted in Cook Inlet and the Kodiak-Shelikof regions using the R/V John N. Cobb. Sampling was attempted at 109 stations with a 40' Gulf of Mexico-type flat trawl (Figure X-116).

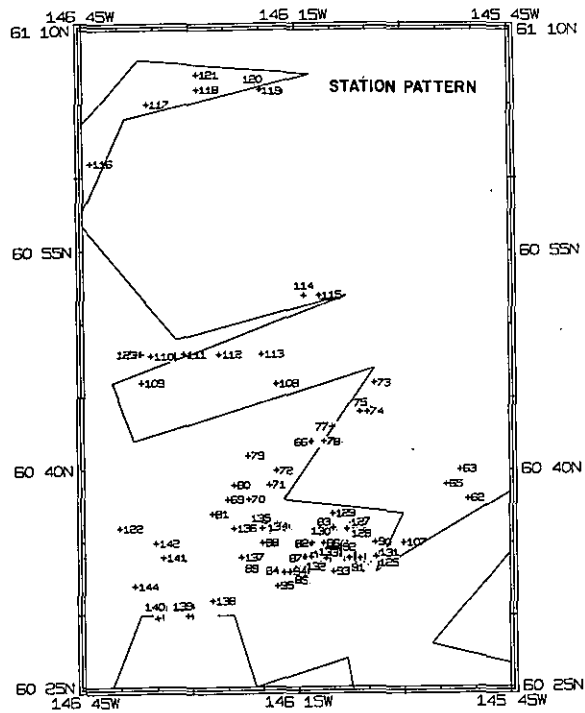
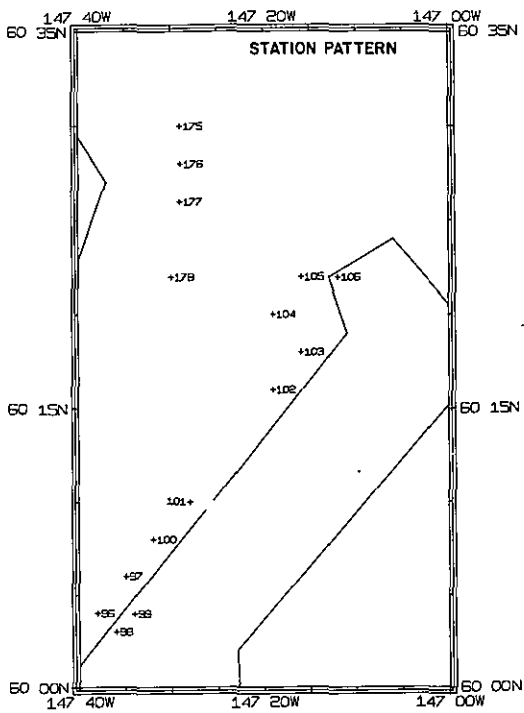


Figure X-97.--Stations successfully trawled (beam trawl) during cruise 020, R/V John N. Cobb.

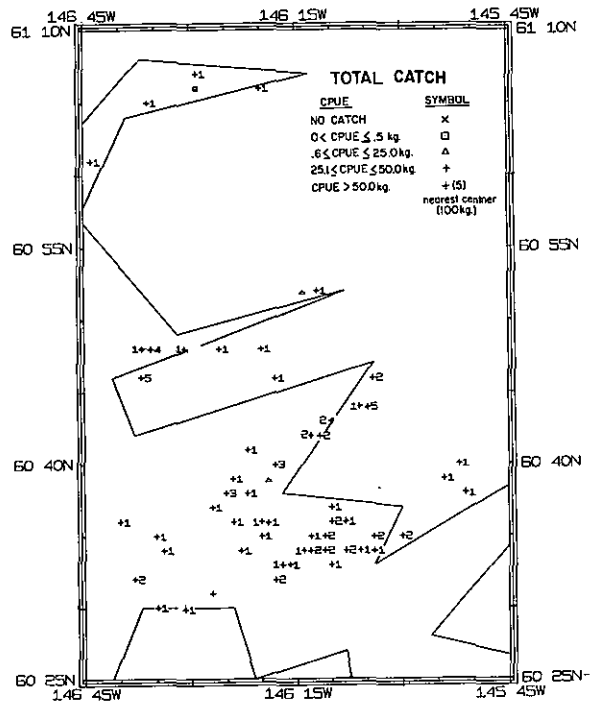
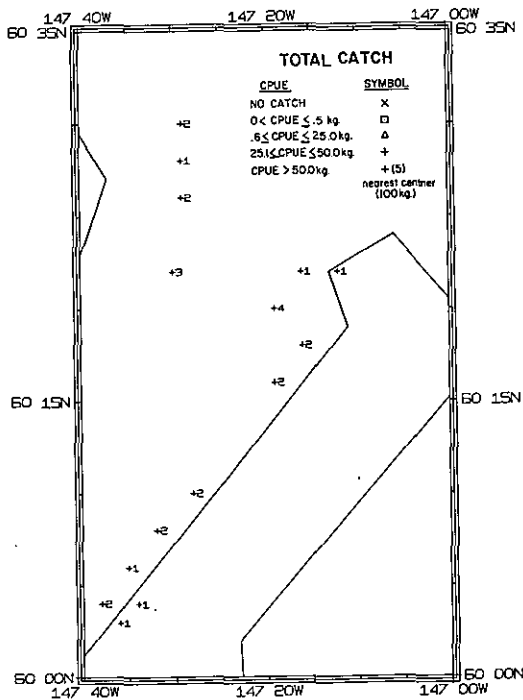
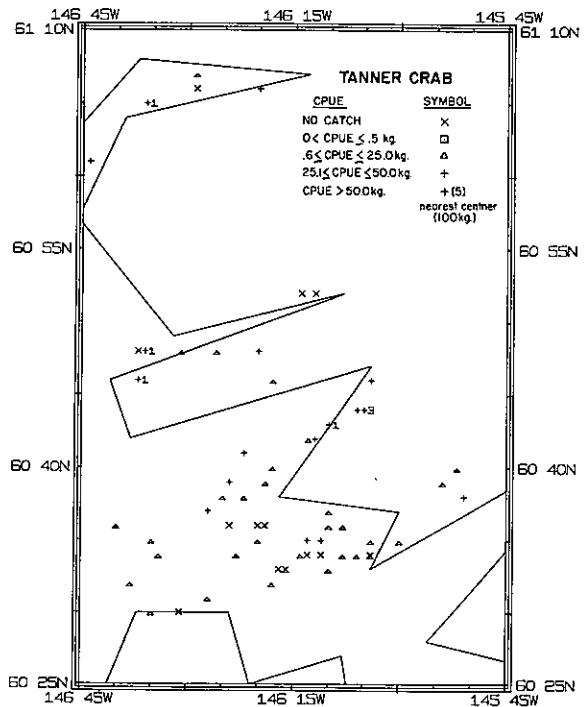
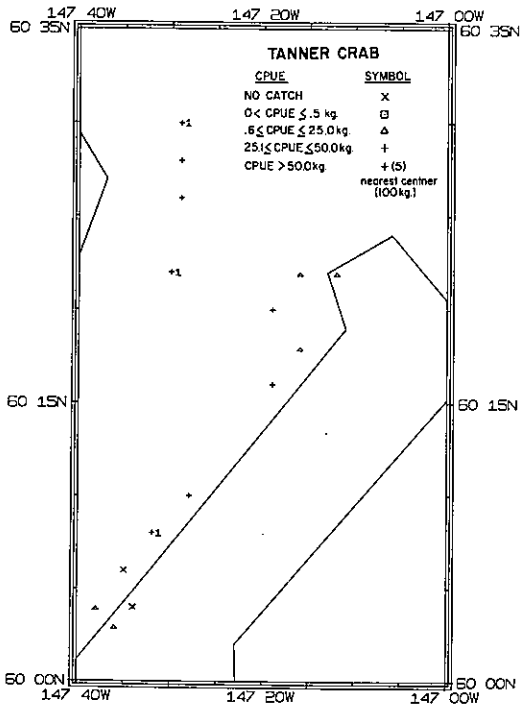
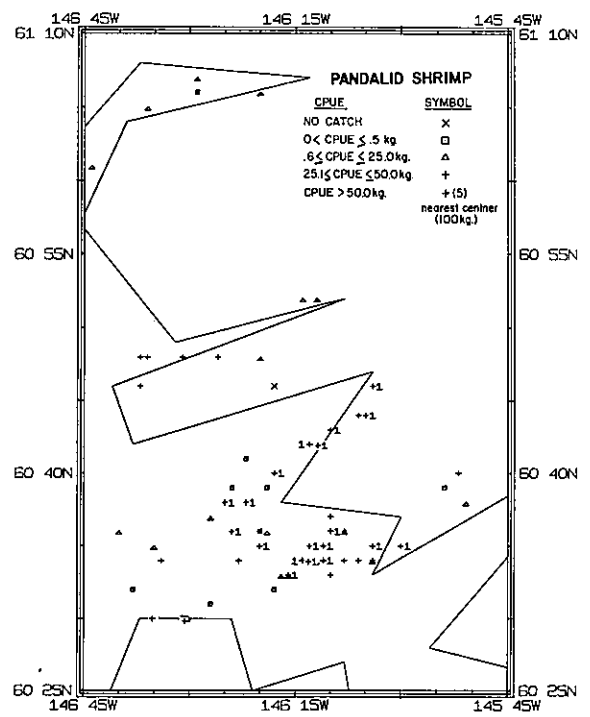
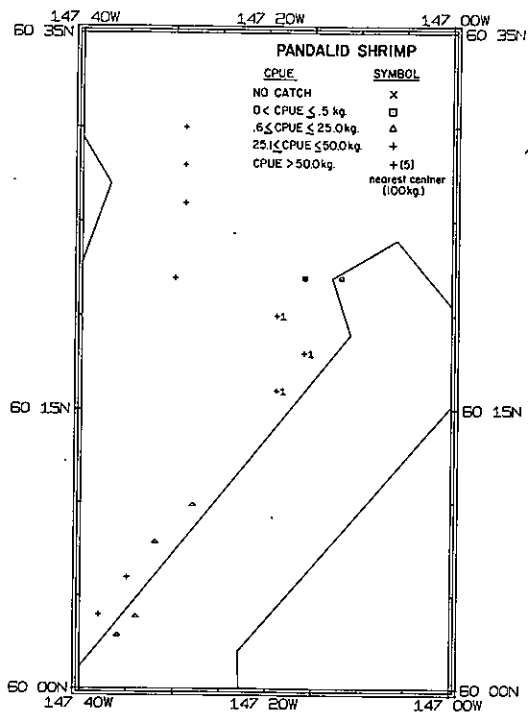


Figure X-98.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 020, R/V John N. Cobb.



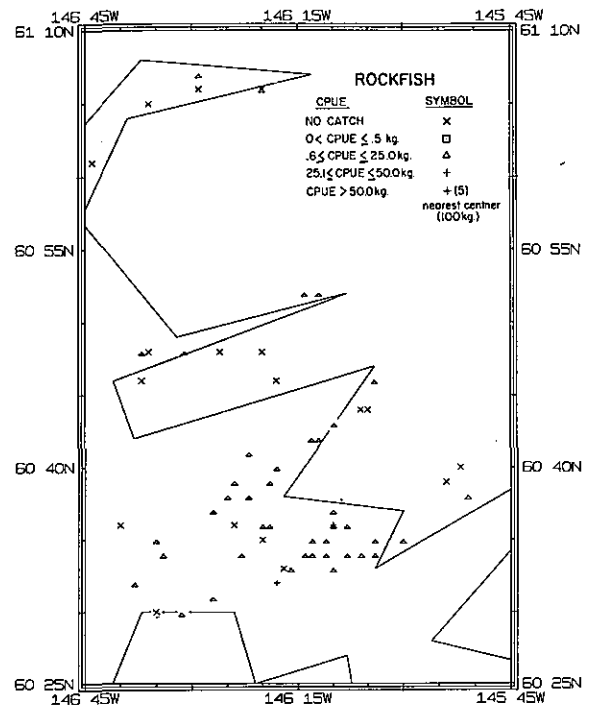
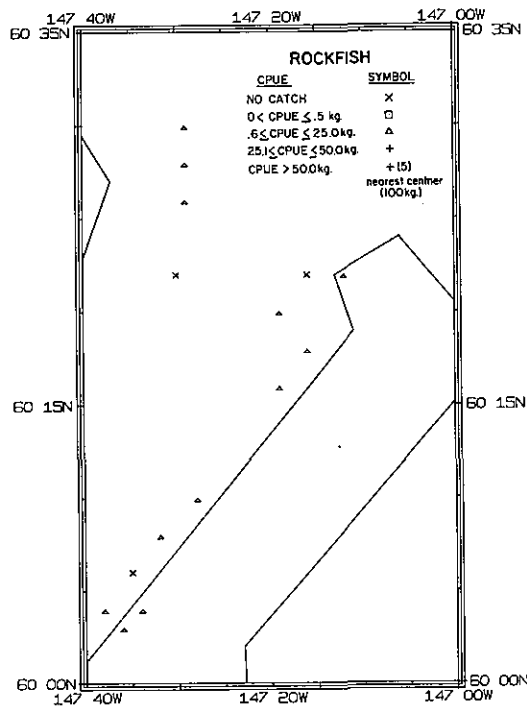
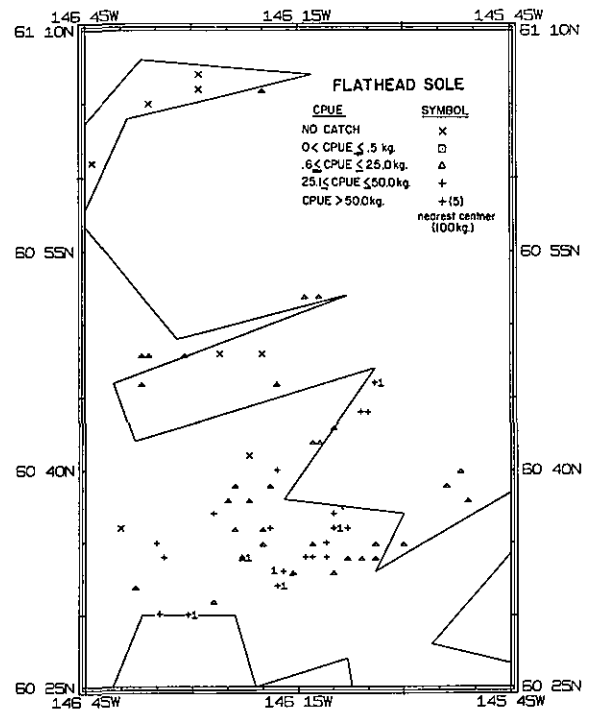
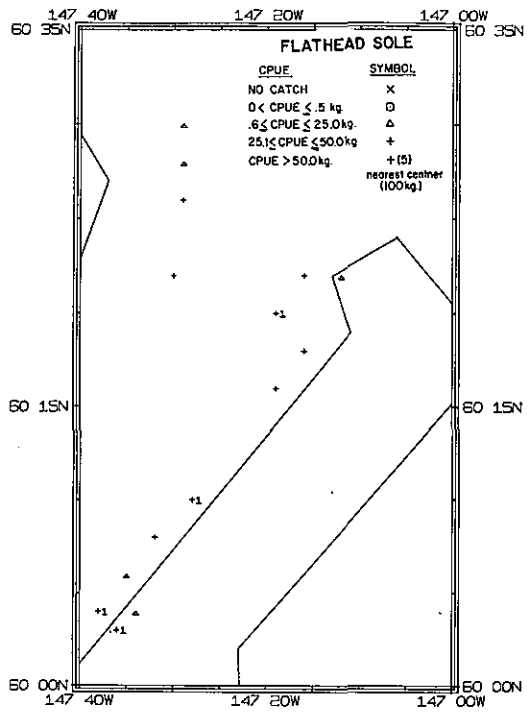
Figures X-99-100.--Distribution of pandalid shrimp and Tanner crab standardized catch rates, in kg/hr, during cruise 020, R/V John N. Cobb.

Table X-25.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 020, R/V John N. Cobb.

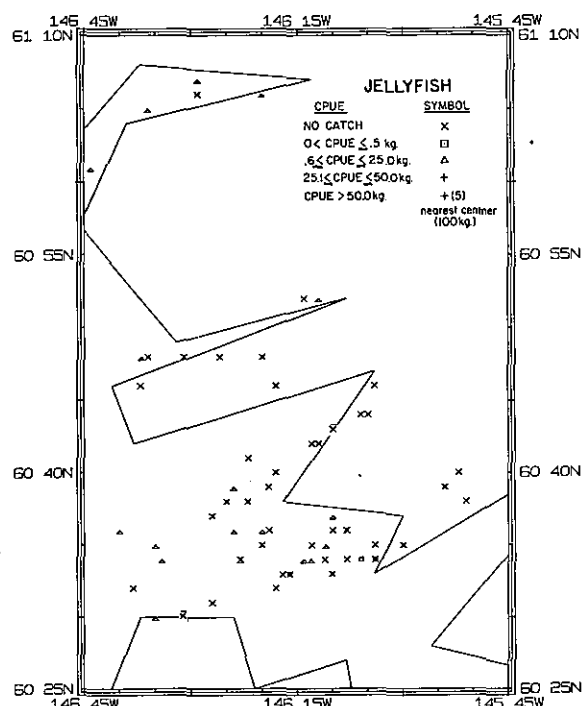
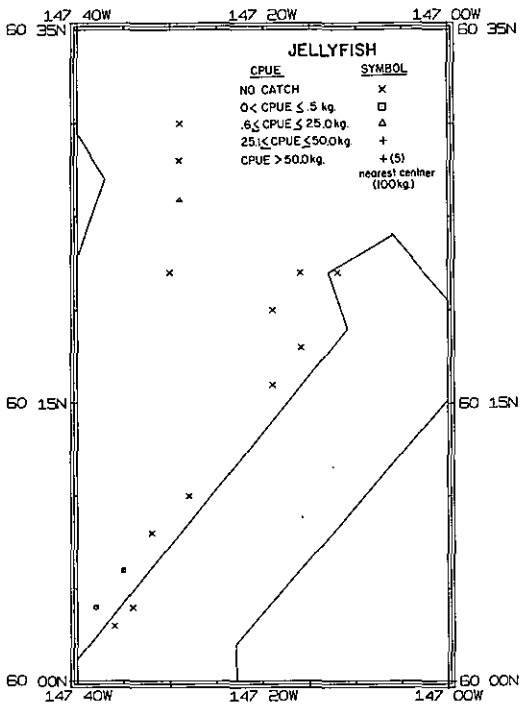
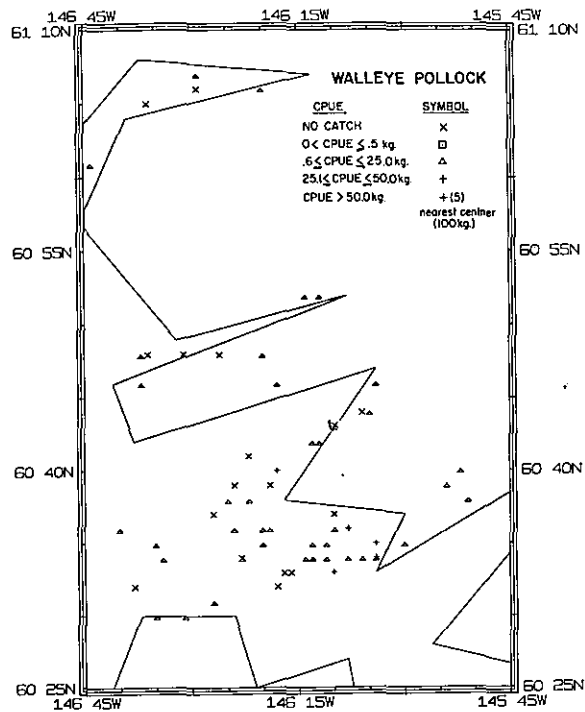
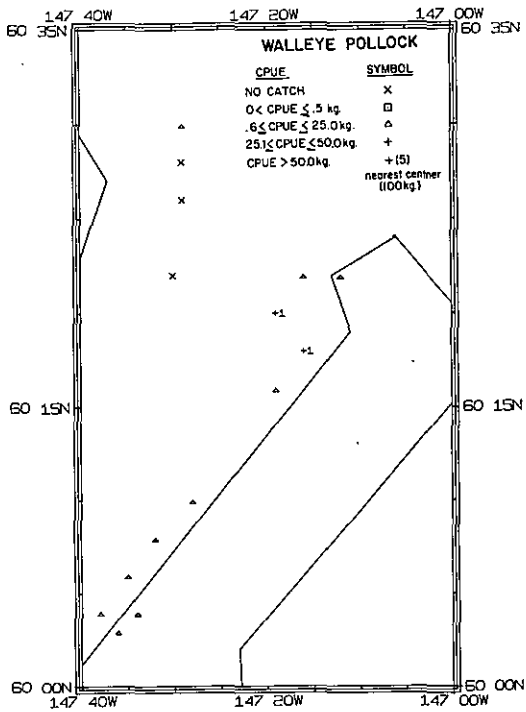
Species or Species group	Station numbers
Total catch	None
Pandalid shrimp	66, 69, 70, 72-24, 77, 78, 82, 83, 85-88, 90, 102-104, 107, 130, 132, 133 and 136.
Tanner crab	74, 77, 100, 109, 110, 117, 175 and 180.
Flathead sole	73, 83, 84, 89, 95, 96, 98, 101, 104, 130 and 139.
Rockfish	None
Walleye pollock	103 and 104.

Table X-26.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 003, charter vessel Tordenskjold.

Species or Species groups	Station numbers
Total catch	1-6, 8, 9, 11-14, 18, 19 and 21-29.
Pandalid shrimp	1-6, 8, 9, 11-13, 18, 19 and 21-29.
King crab	3, 5, 8-13, 15, 21 and 23-29.
Tanner crab	3-5 and 29.
Alaska plaice	10.
Cottids	8 and 10.
Walleye pollock	3, 8 and 14.
Rock sole	10.
Turbot	None



Figures X-101-102.--Distribution of flathead sole and rockfish standardized catch rates, in kg/hr, during cruise 020, R/V John N. Cobb.



Figures X-103-104.--Distribution of walleye pollock and jellyfish standardized catch rates, in kg/hr, during cruise 020, R/V John N. Cobb.

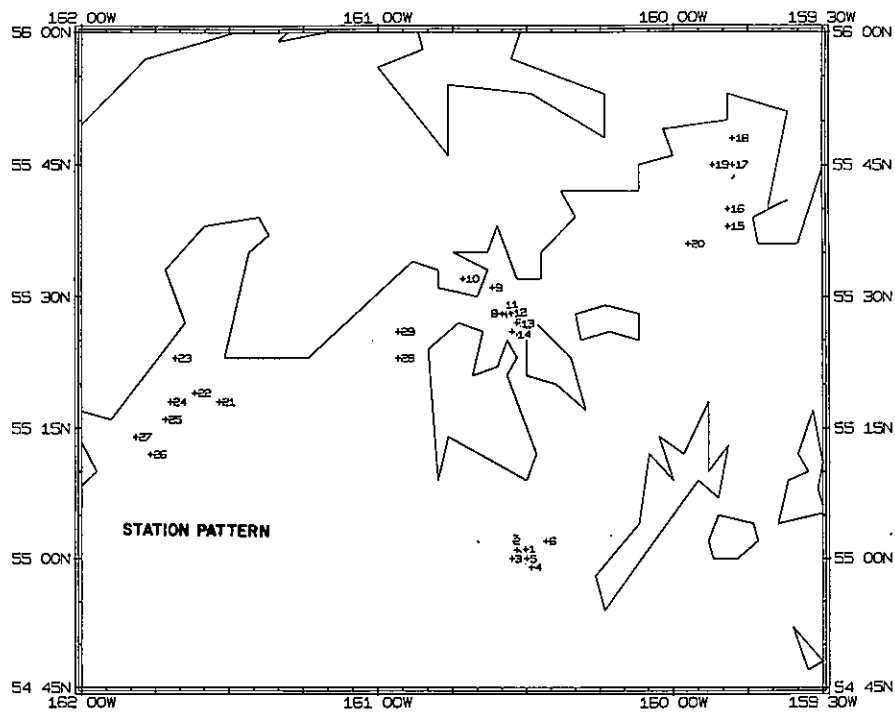


Figure X-105.--Stations successfully trawled (shrimp trawl) during cruise 003, charter vessel Tordenskjold.

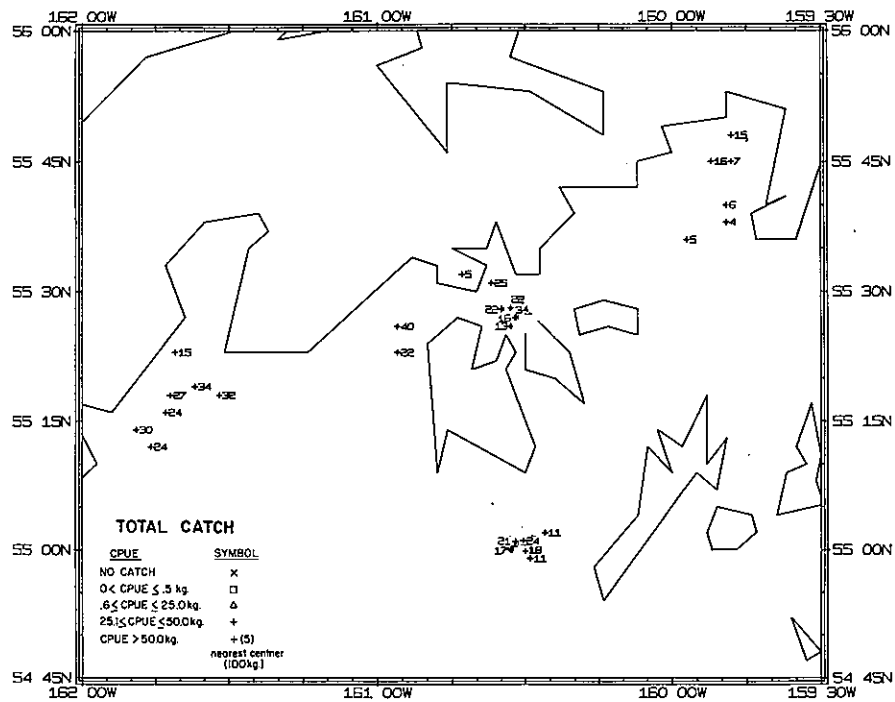
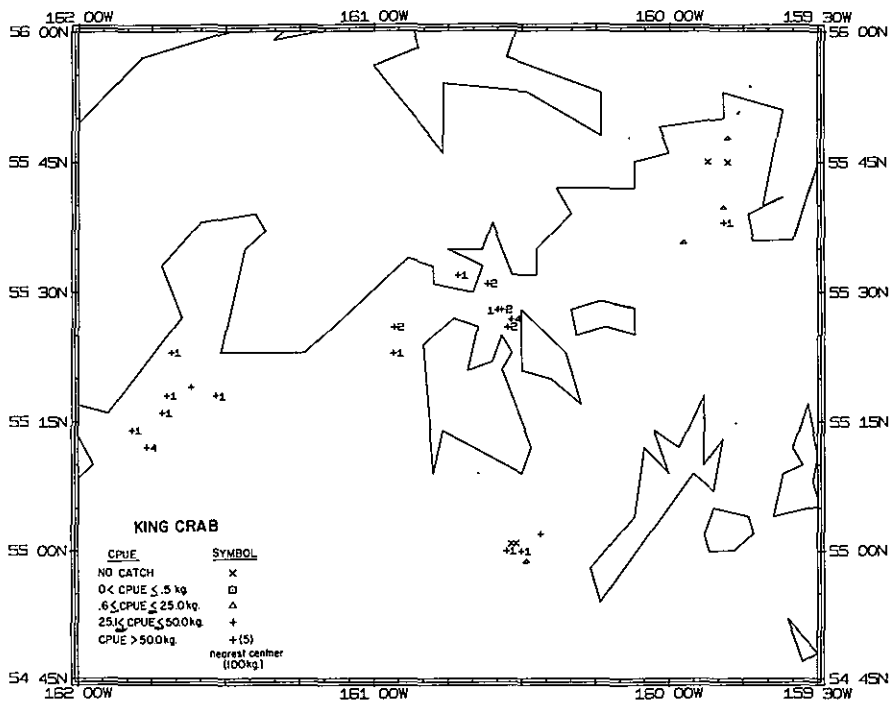
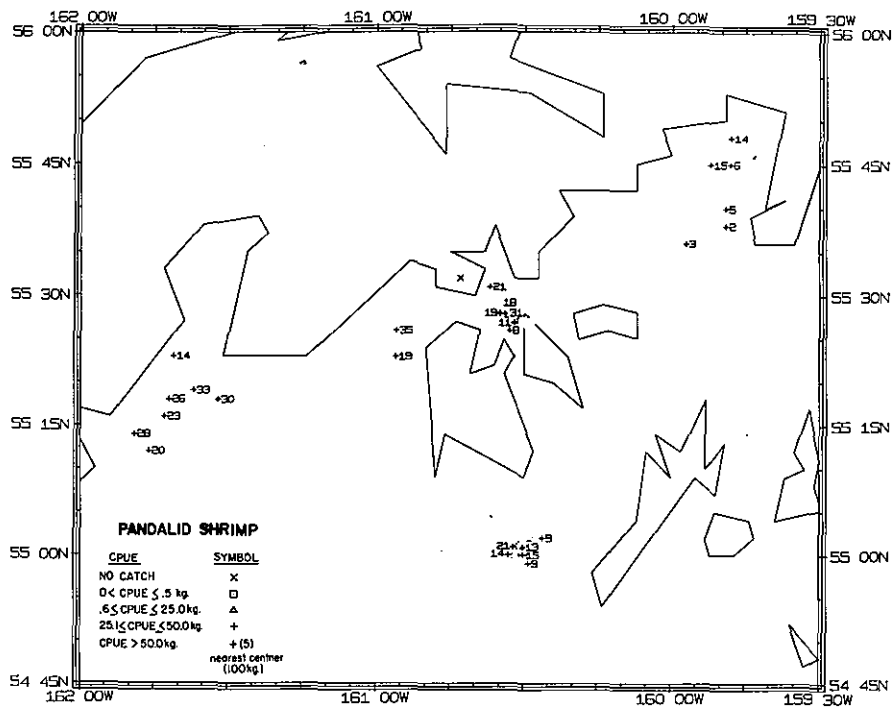
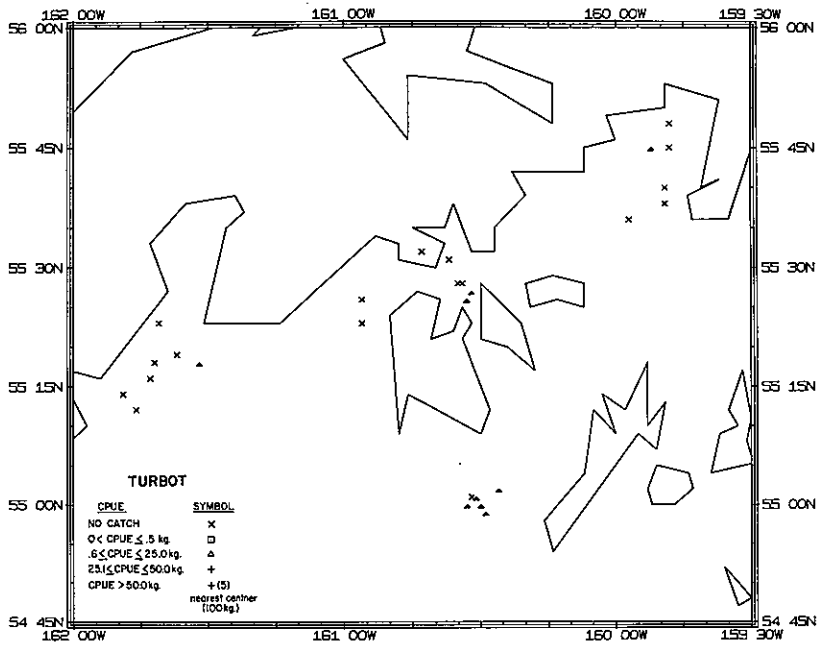
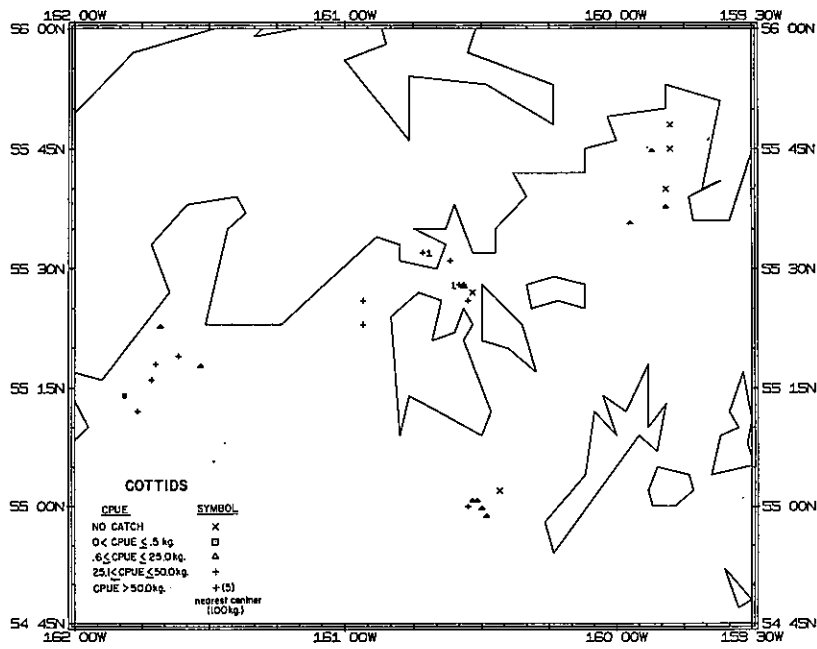


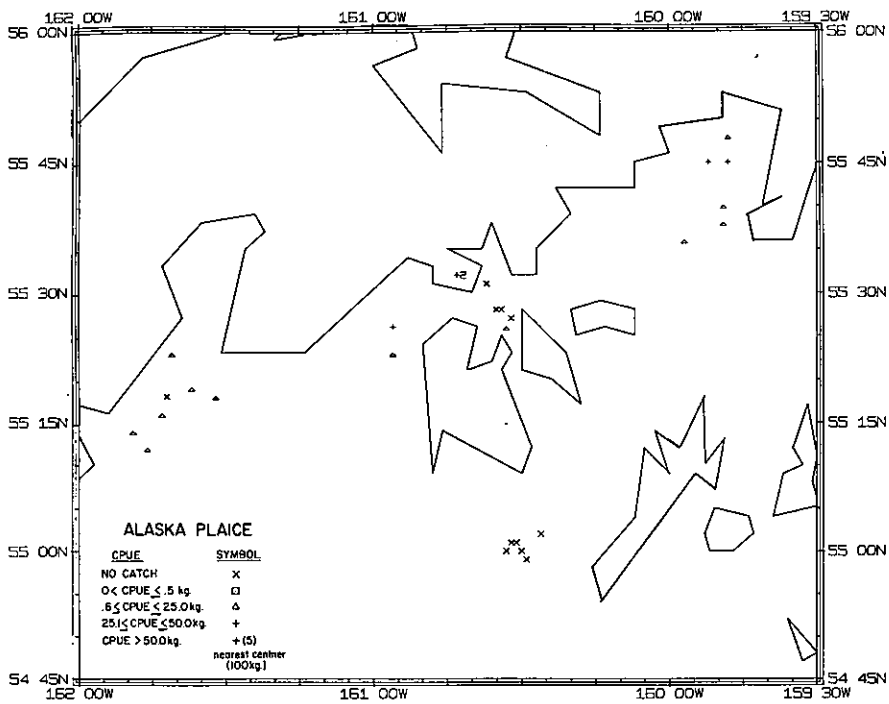
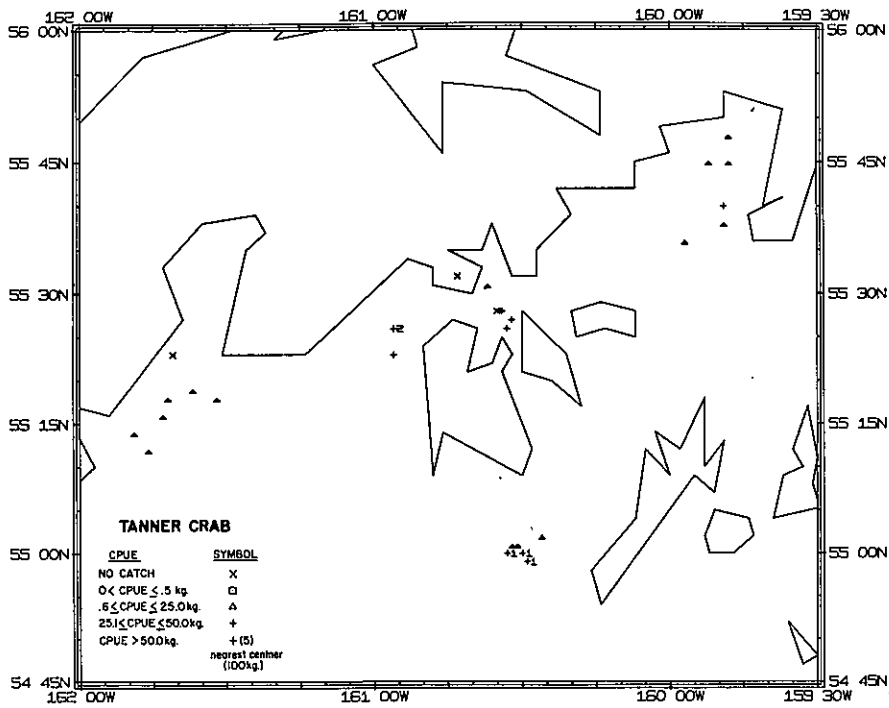
Figure X-106.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 003, charter vessel Tordenskjold.



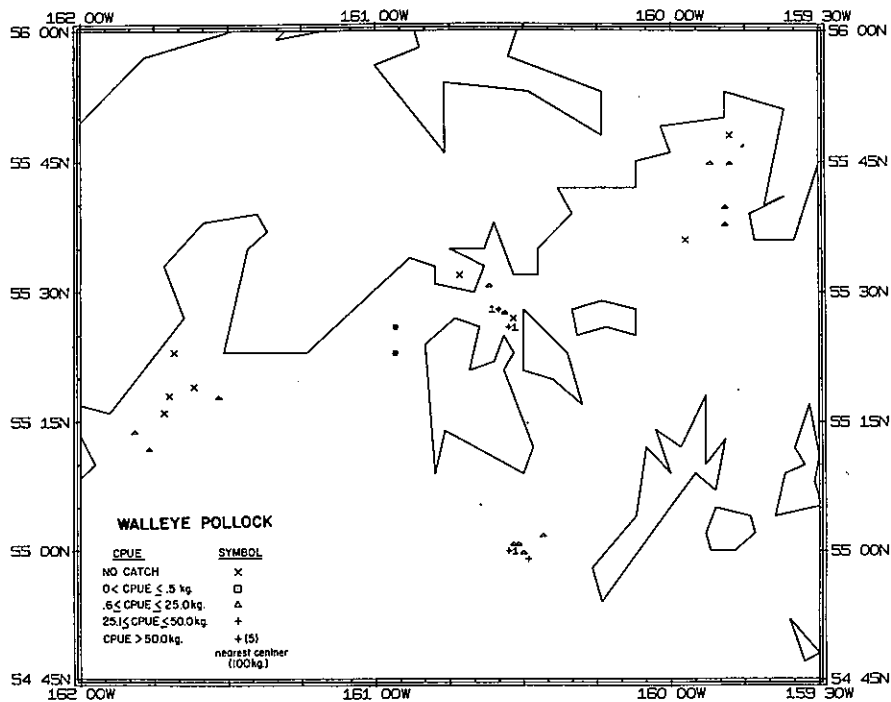
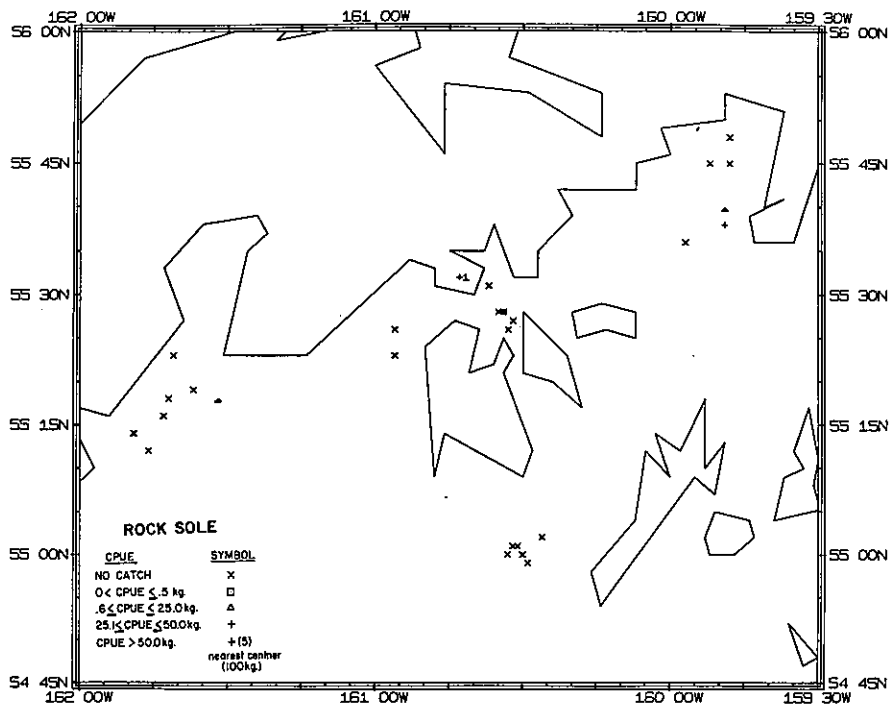
Figures X-107-108.--Distribution of pandalid shrimp and king crab standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



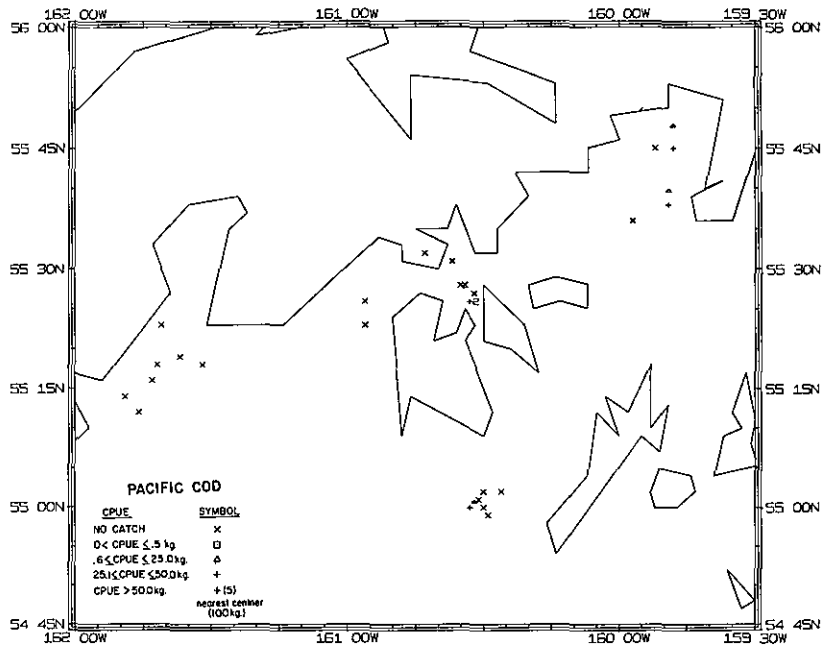
Figures X-109-110.--Distribution of cottids and turbot standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



Figures X-111-112.--Distribution of Tanner crab and Alaska plaice standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



Figures X-113-114.--Distribution of rock sole and walleye pollock standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



Figures X-115.--Distribution of Pacific cod standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.

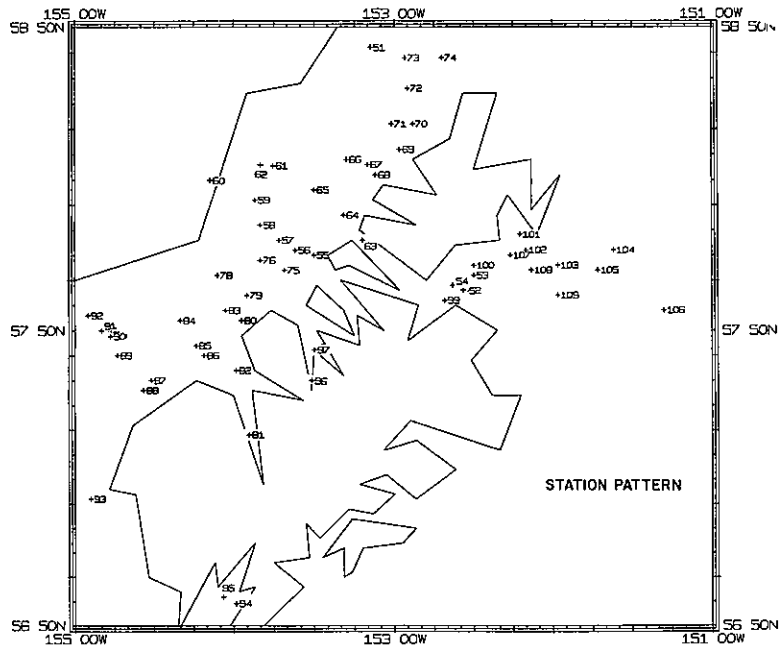
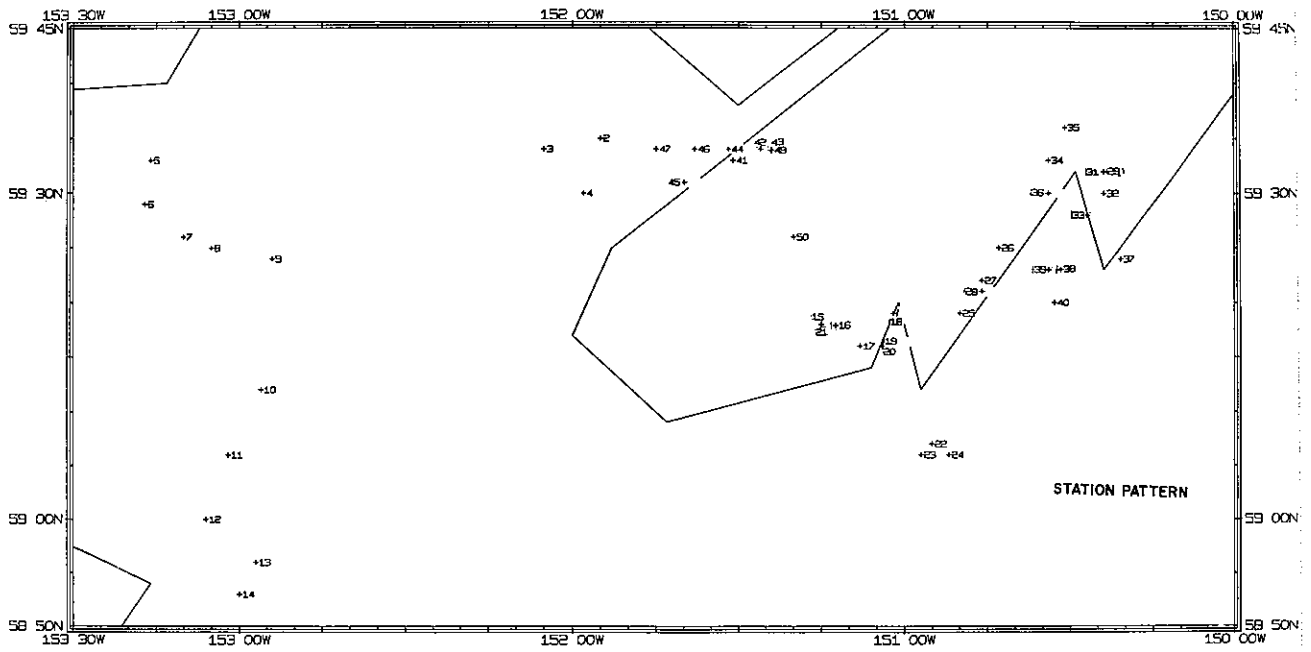


Figure X-116.--Stations successfully trawled (shrimp trawl) during cruise 039, R/V John N. Cobb.

The CPUE for all species averaged near 500 kg/hr in the inner shelf and outer shelf and 360 kg/hr in upper slope with individual standardized catch rates ranging up to 1800 kg/hr (Figure X-117). Largest catches, over 1,000 kg/hr, were made in Kachemak Bay, Uganik Bay, Marmot Bay, Ugak Bay, Alitak Bay and Kulak Bay (Table X-27).

Pandalid shrimp averaged over 300 kg/hr in the inner shelf and outer shelf and decreased to 142 kg/hr in the upper slope. Pink shrimp was the dominant pandalid shrimp species in all three depth zones. Sidestripe shrimp was the only species besides pink shrimp which averaged over 10 kg/hr. Extremely large catches of pandalid shrimp, over 1,000 kg/hr, occurred in Kachemak Bay, and Marmot Bay (Figures X-118).

Species other than pandalid shrimp having a mean CPUE greater than 10 kg/hr were Tanner crab and flathead sole in all three depth zones, turbot and walleye pollock in the outer shelf and upper slope depth zones, king crab, cottids and yellowfin sole and Pacific halibut in the inner shelf along with sablefish in the outer shelf and Pacific ocean perch and starfish in the upper slope. Highest abundances of turbot, over 200 kg/hr were found in Shelikof Straits and Ugak Bay, walleye pollock in Uyak Bay, sablefish in Raspberry Straits and Tanner crab in Kachemak Bay (Table X-23, Figures X-119-122). The distribution of the standardized catches for the remaining species averaging 10 kg/hr or more are presented in Figures X-123-129. The total catch for pandalid shrimp plus these 11 dominant species made up over 91% of the total catch.

f. Cruise 044, R/V John N. Cobb (October-November 1959)

Shrimp explorations were conducted by BCF in the Kenai-Prince William regions where 101 stations were attempted using the 40' Gulf of Mexico-type flat trawl, cruise 044 (Figure X-130).

The average catch for all species was highest in the upper slope depth zone and decreased with decreasing water depth. Individual station catch rates ranged up to 800 kg/hr with the largest catches for all species occurring in Orca Bay, Montague Strait and offshore from Port Bainbridge and the Pye Island. (Figure X-131).

Pandalid shrimp catches were low, averaging from 43 to 55 kg/hr with the highest average catch occurring in the outer shelf depth zones (Table X-22). Pink shrimp remained the dominant species, constituting over 10 kg/hr in the outer shelf, and upper slope, and made up over 26% of the total shrimp catch. The standardized catch rates of pandalid shrimp never exceeded 300 kg/hr (Figure X-132).

Pollock was the only species which averaged 10 kg/hr or more in all three depth zones. Turbot and Pacific ocean perch mean CPUE's exceeded 10 kg/hr or more in the outer shelf and upper slope, Pacific herring in the inner shelf, and Tanner crab in the outer shelf. Pacific ocean perch was the only species occurring at catch rates exceeding 200 kg/hr (Table X-28, Figure X-133). The distribution of the standardized catches of the remaining species are presented in Figures X-134-137. The combined catches of these more abundant forms and the pandalid shrimp made up 72% of the total catch in the inner and outer shelves and 81% in the upper slope.

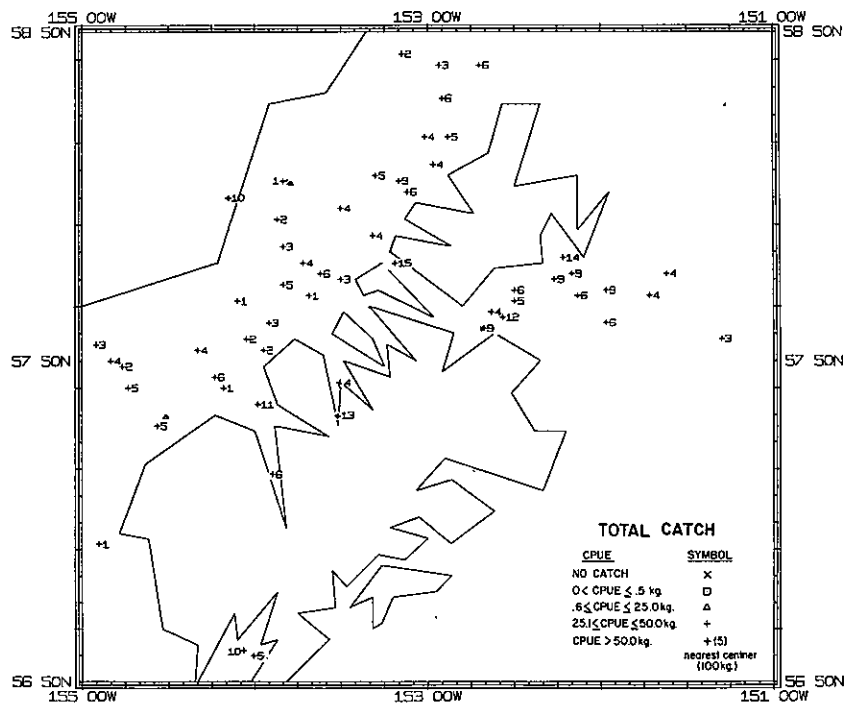
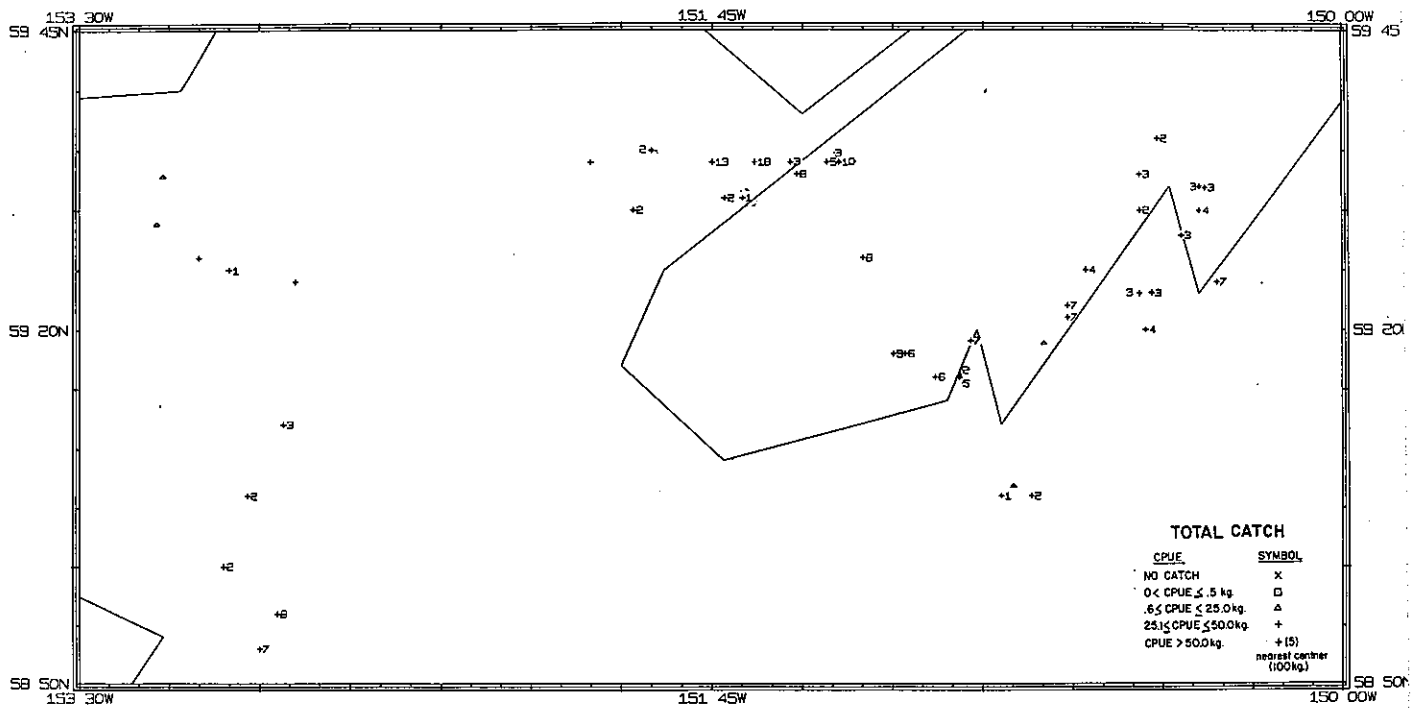


Figure X-117.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 039, R/V John N. Cobb.

Table X-27.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 039, R/V John N. Cobb.

Species or Species groups	Station numbers
Total catch	46, 47, 49, 52, 60, 63, 82, 95, 96 and 101.
Pandalid shrimp	13-21, 26-29, 31-47, 49-59, 63, 65-67, 72-74, 76, 79, 81, 82, 84, 85, 89, 94-97 and 99-109.
Turbot	13, 14, 37, 40, 52, 53, 55-58, 63-76, 79, 81, 82, 84-86, 88, 89, 91, 99-105, 108 and 109.
Tanner crab	10, 31, 47, 71, 72 and 92.
Walleye pollock	12, 13, 15, 21, 55, 70, 74, 76, 82-85, 88, 89, 91, 92, 96, 97 and 104.
Flathead sole	63, 65-68, 71, 76, 81, 82, 97 and 109.
Pacific ocean perch	64, 67, 69, 70, 85, 88 and 89.
King crab	4 and 95.
Cottids	18.
Yellowfin sole	96.
Pacific halibut	47.
Starfish	68 and 90.
Sablefish	63.

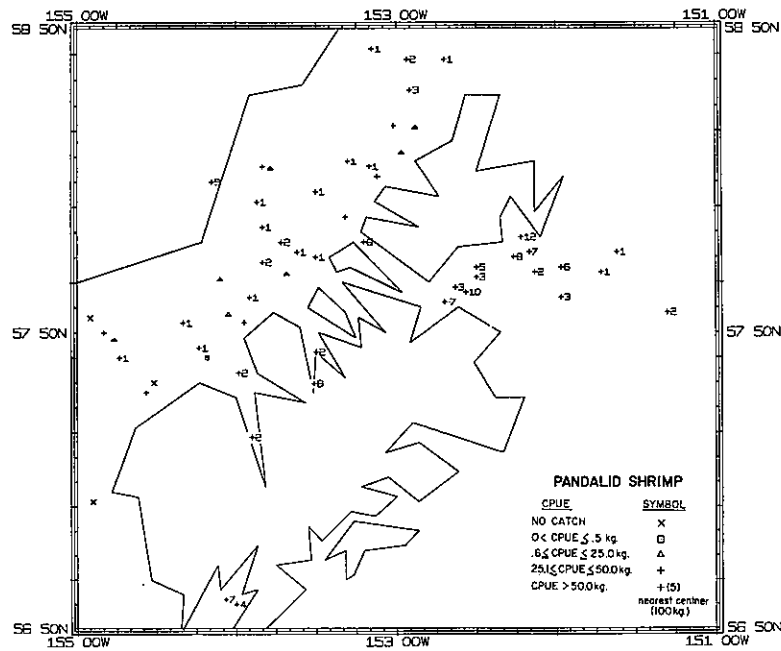
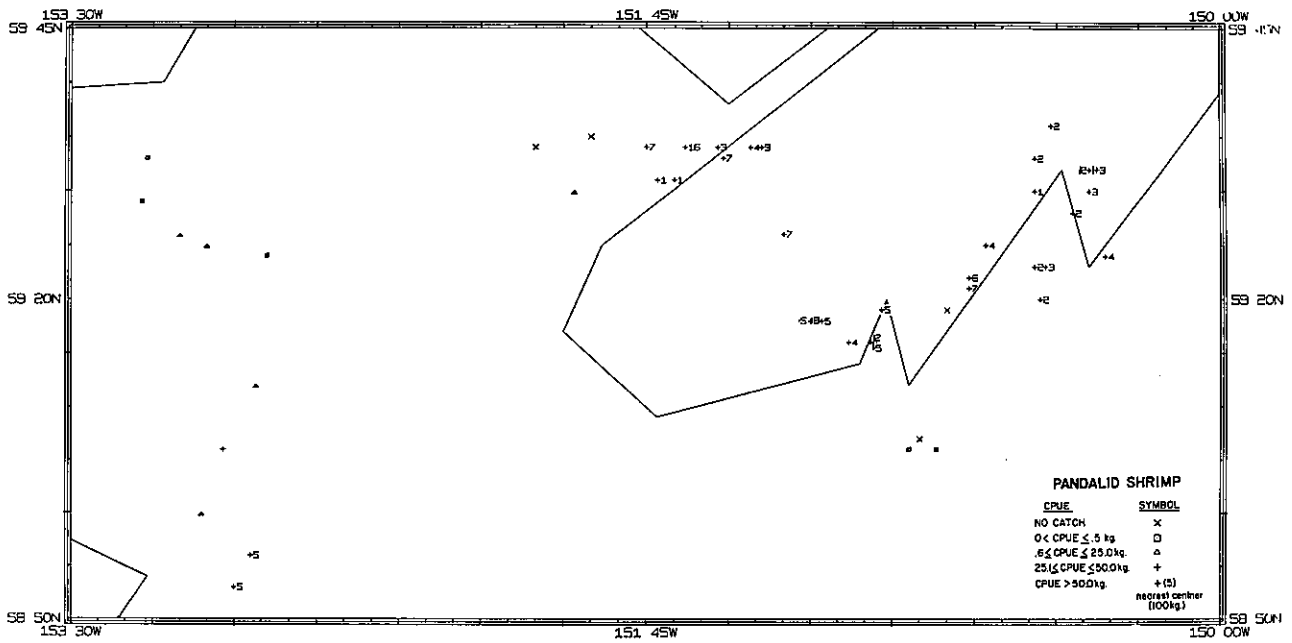


Figure X-118.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

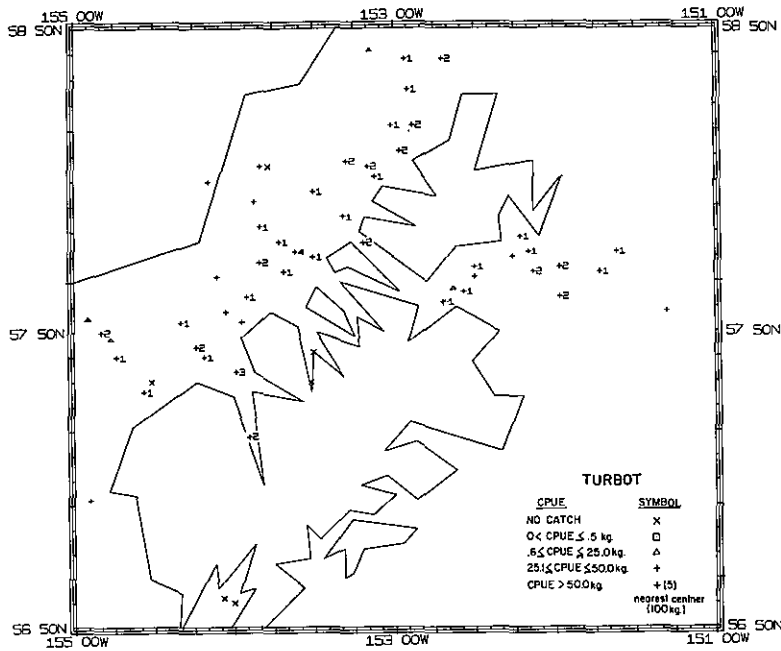
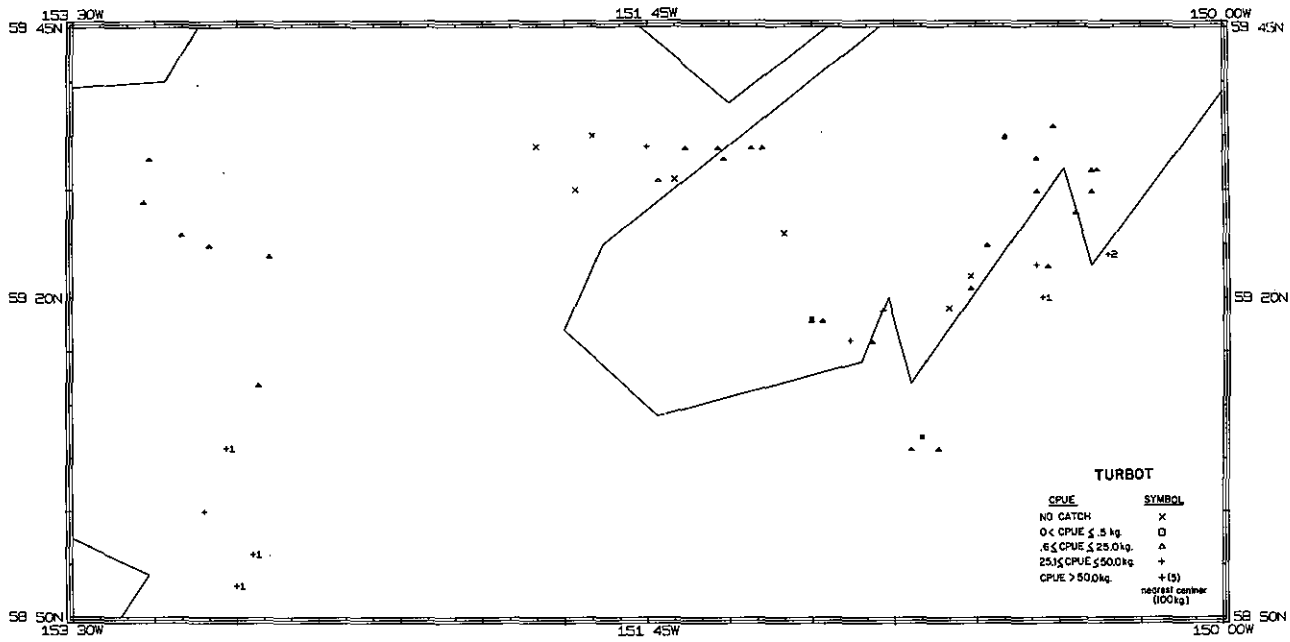


Figure X-119.--Distribution of turbot standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

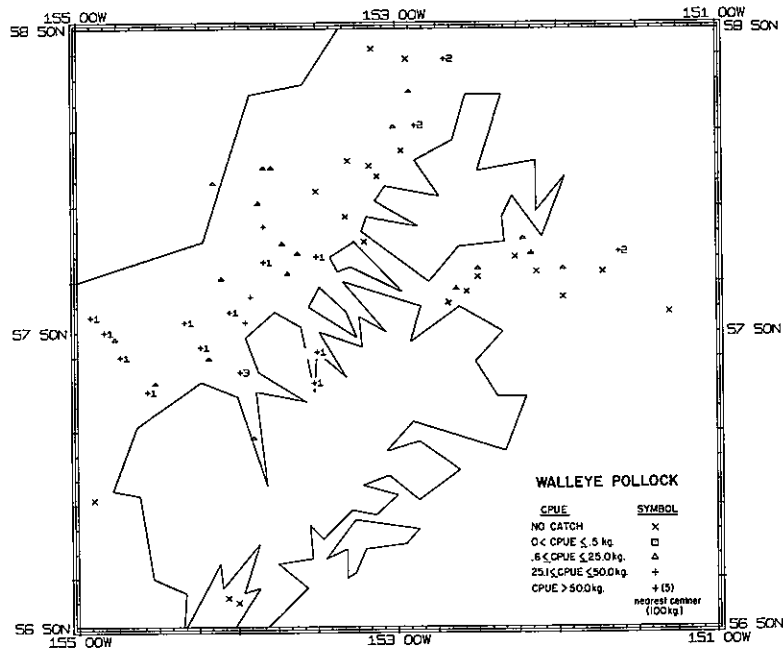
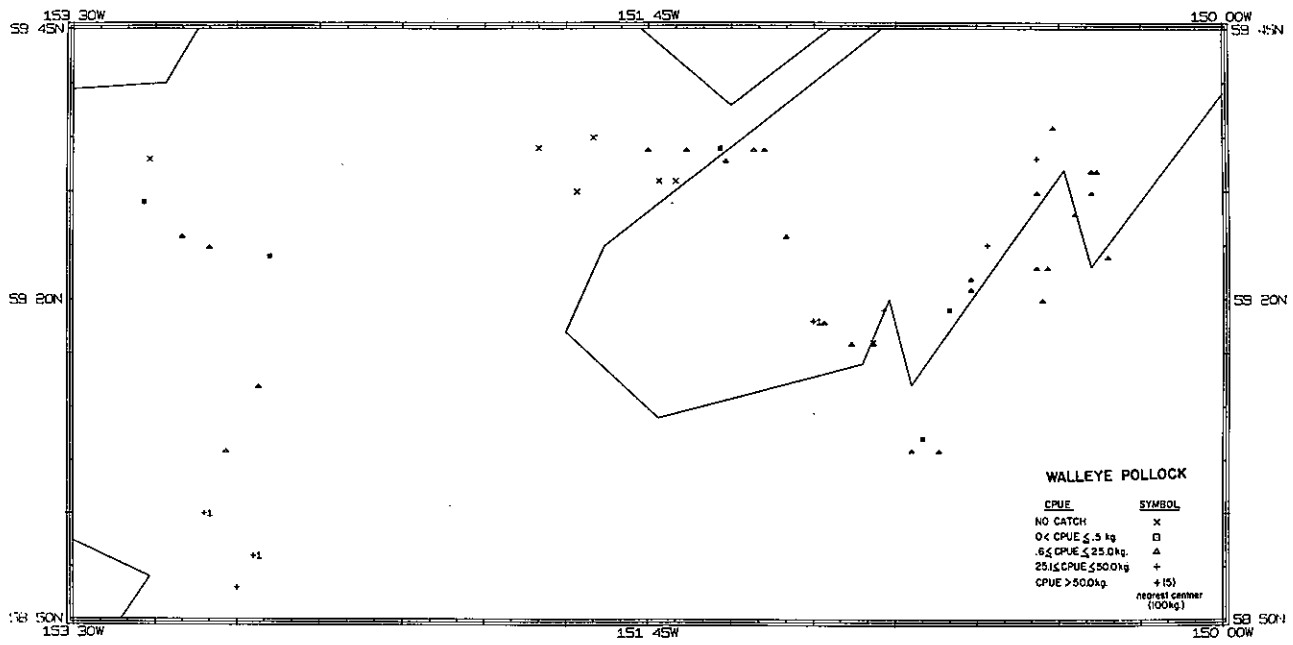


Figure X-120.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

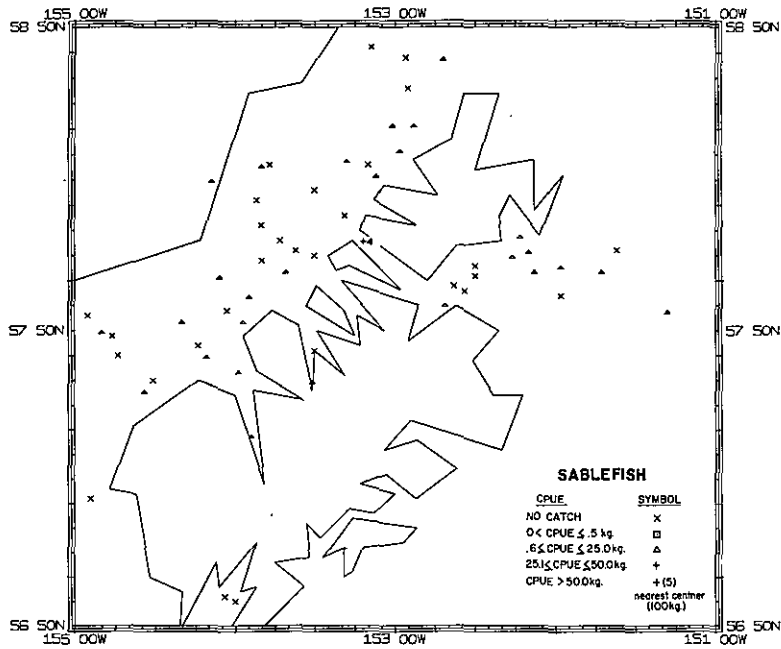
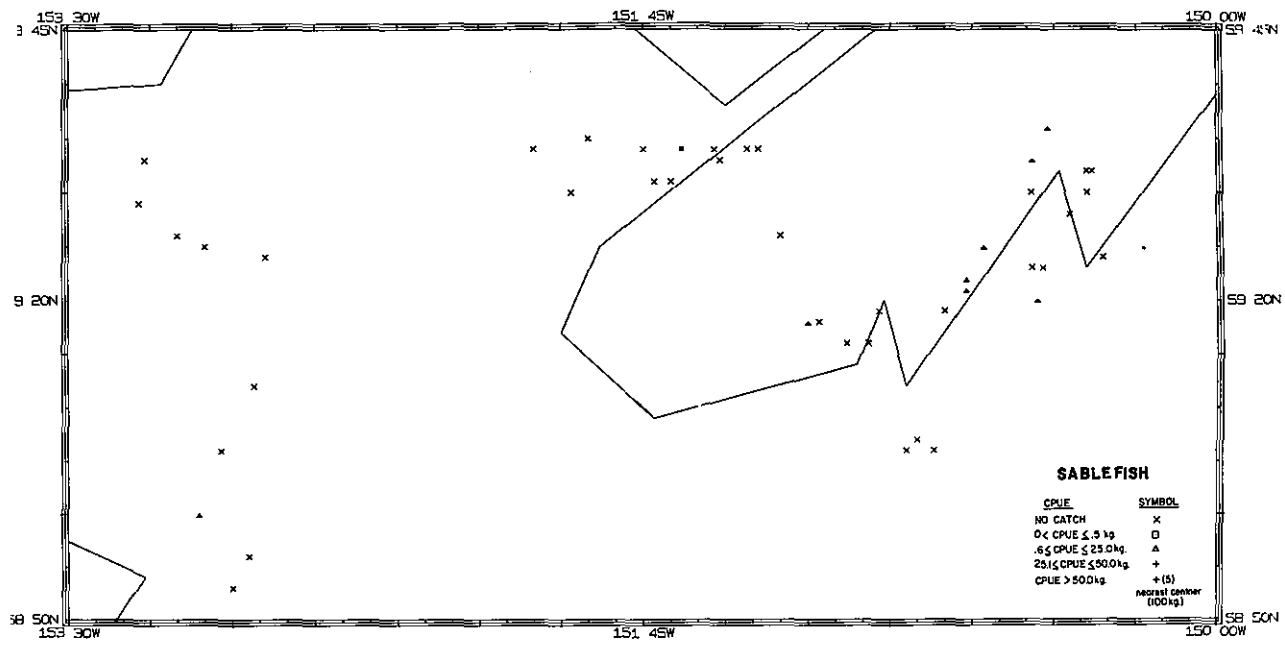


Figure X-121.--Distribution of sablefish standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

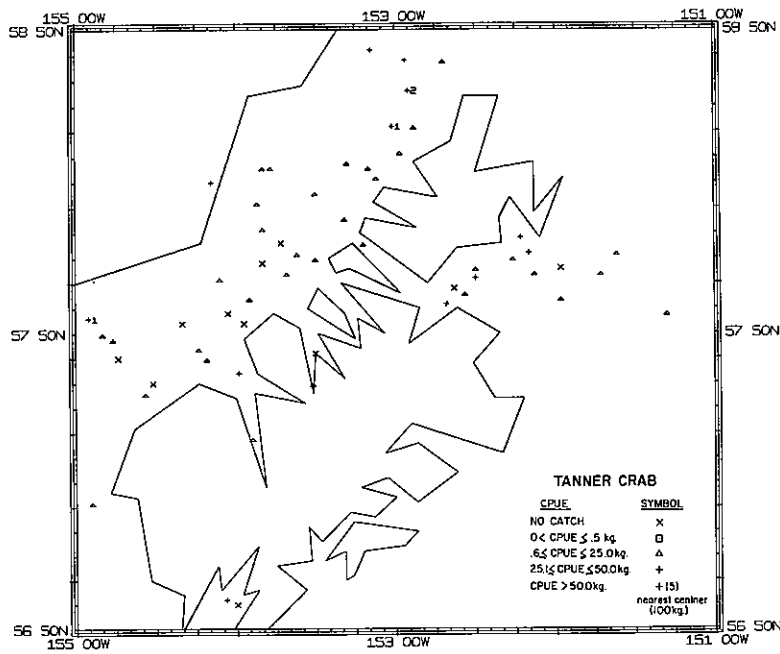
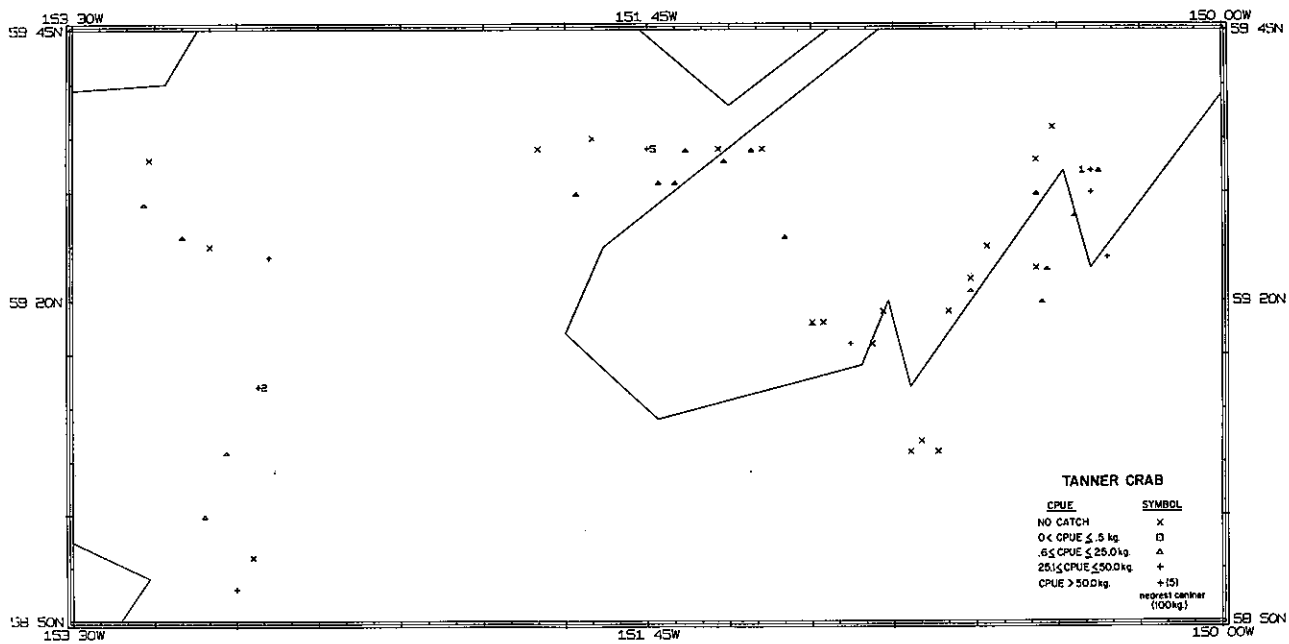


Figure X-122.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

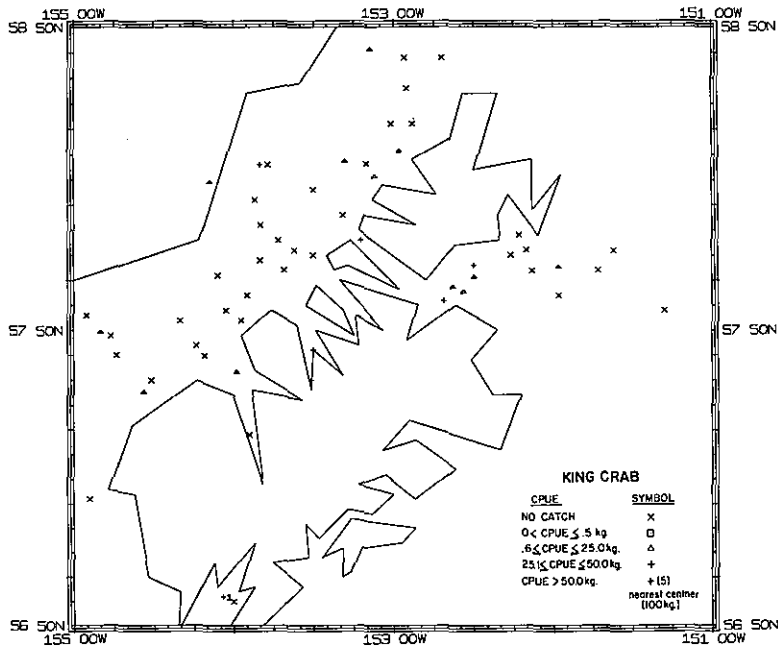
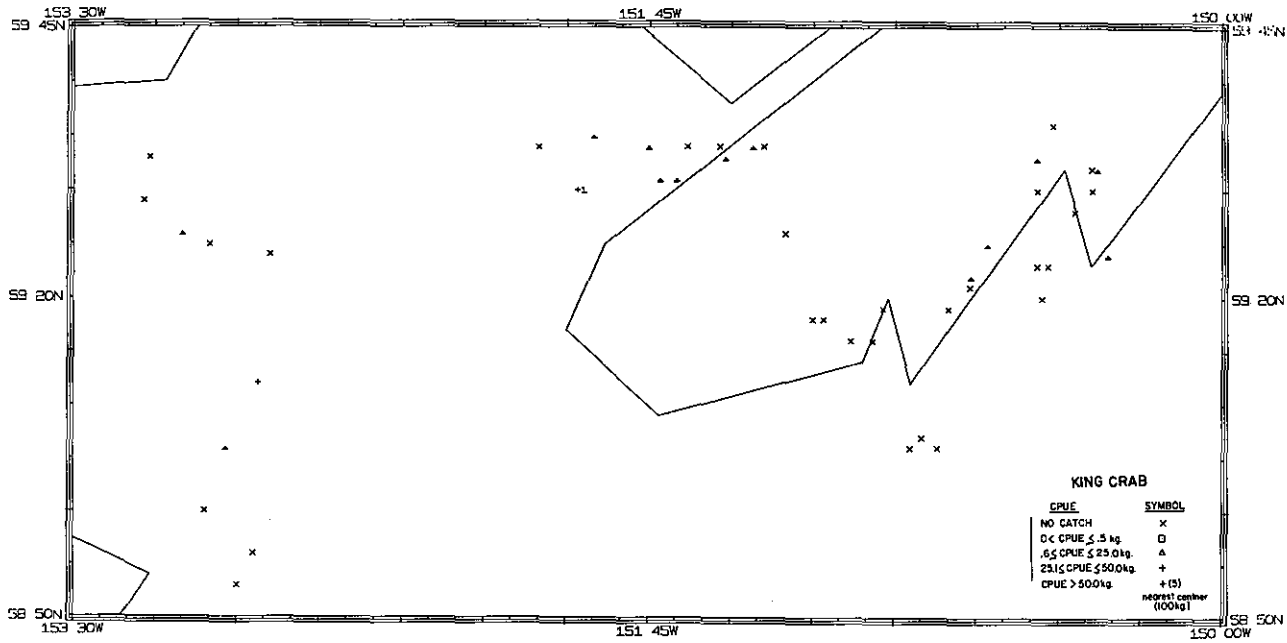


Figure X-123.--Distribution of king crab standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

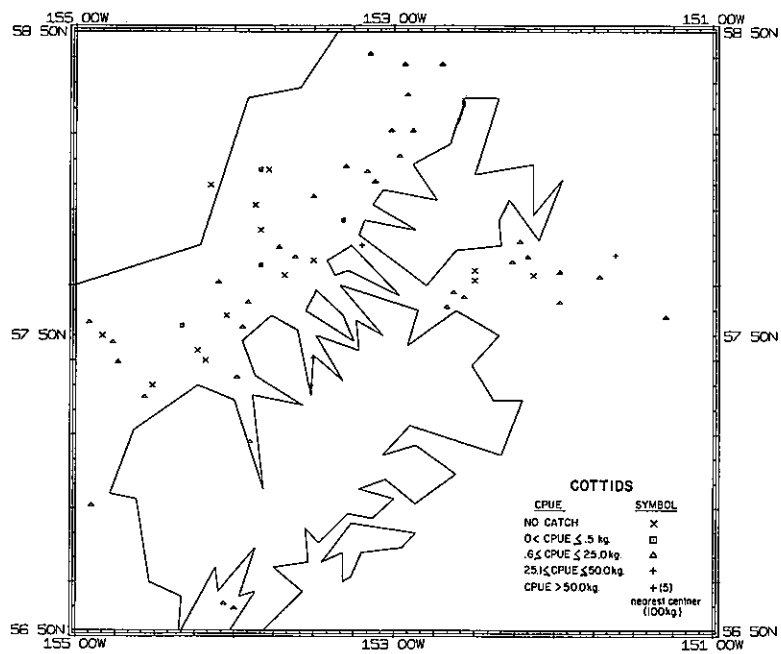
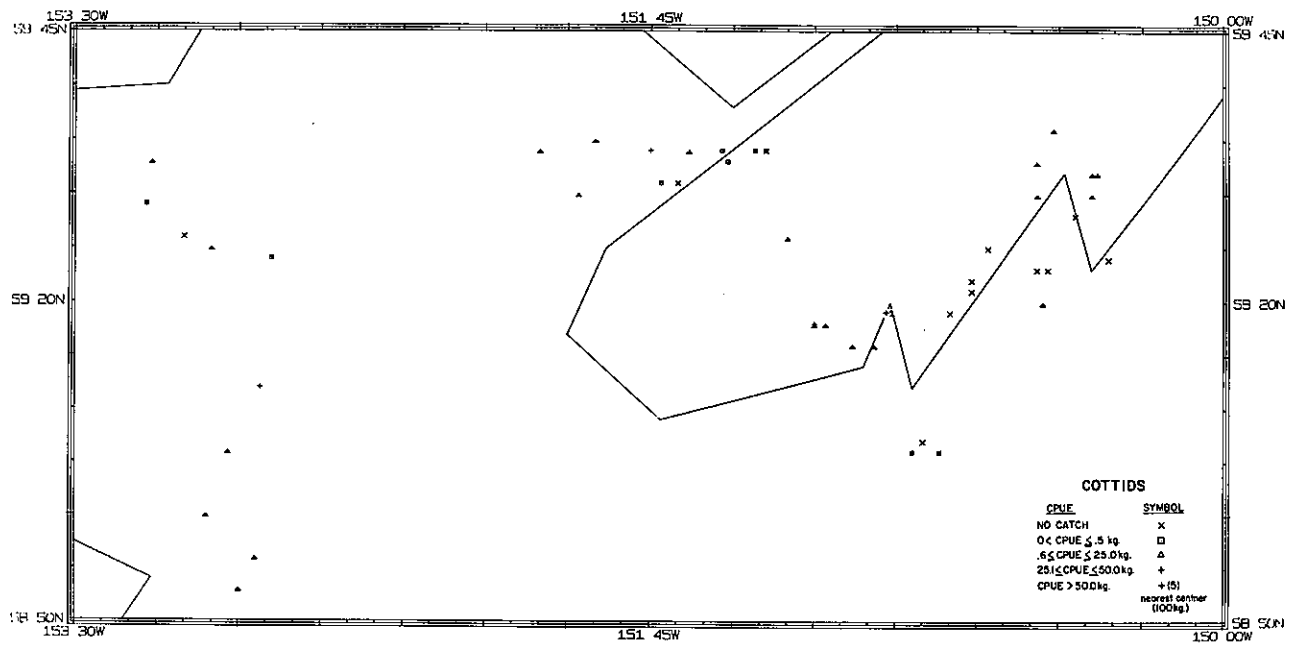


Figure X-124.—Distribution of cottids standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

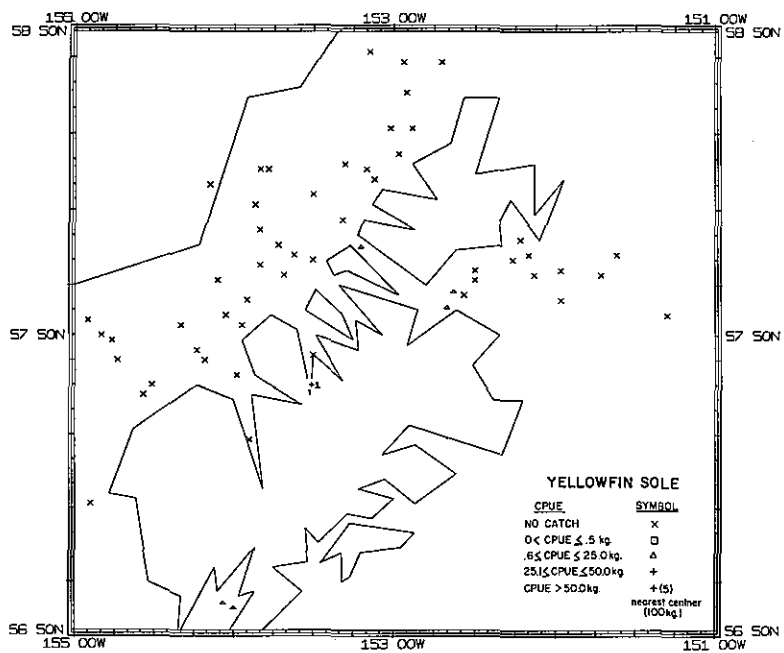
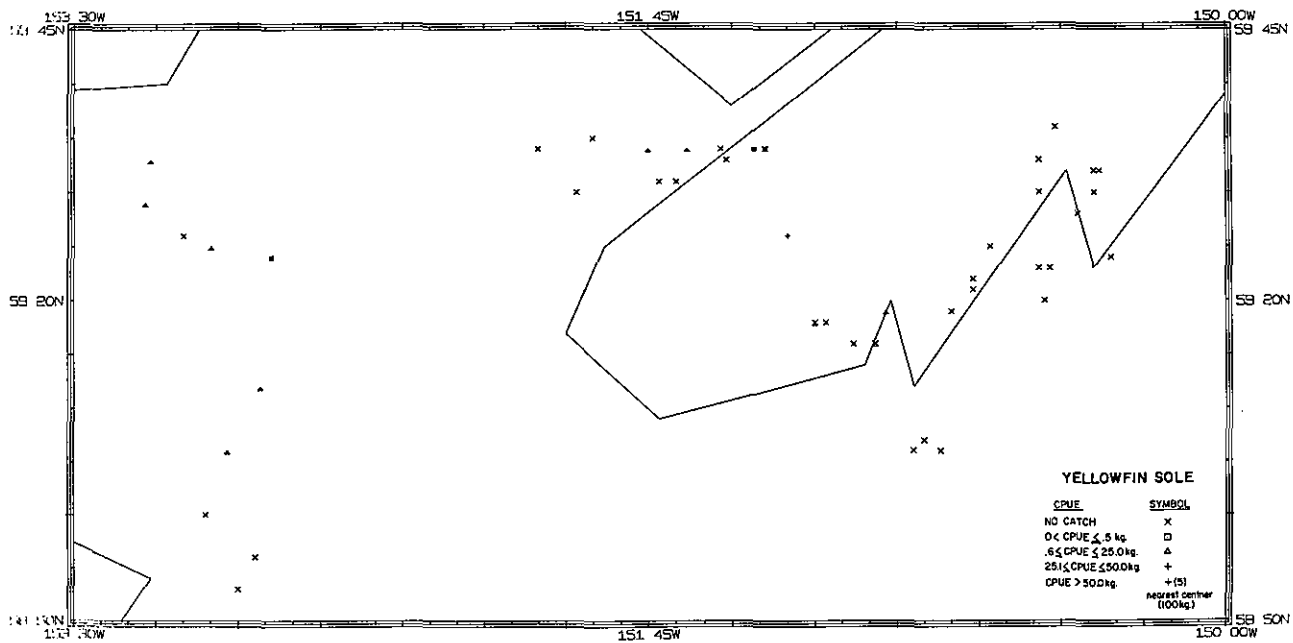


Figure X-125.--Distribution of yellowfin sole standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

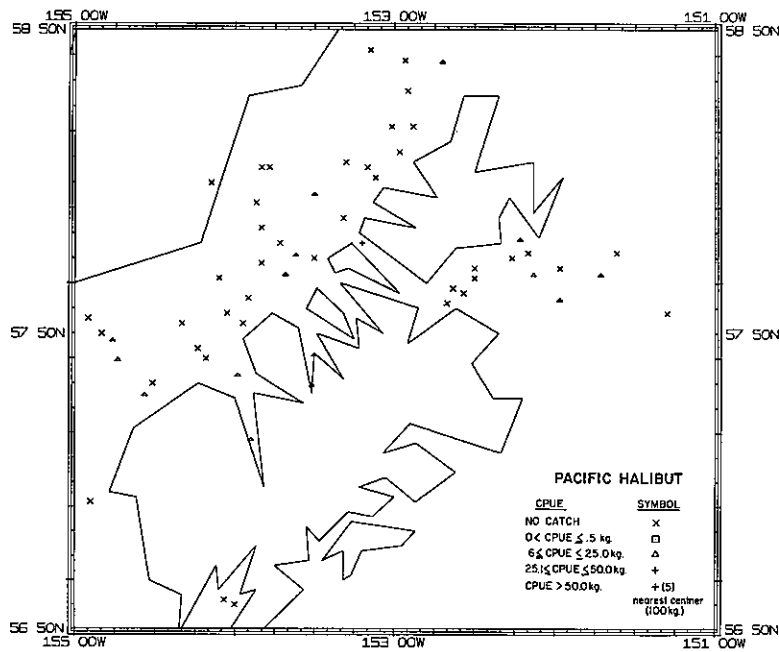
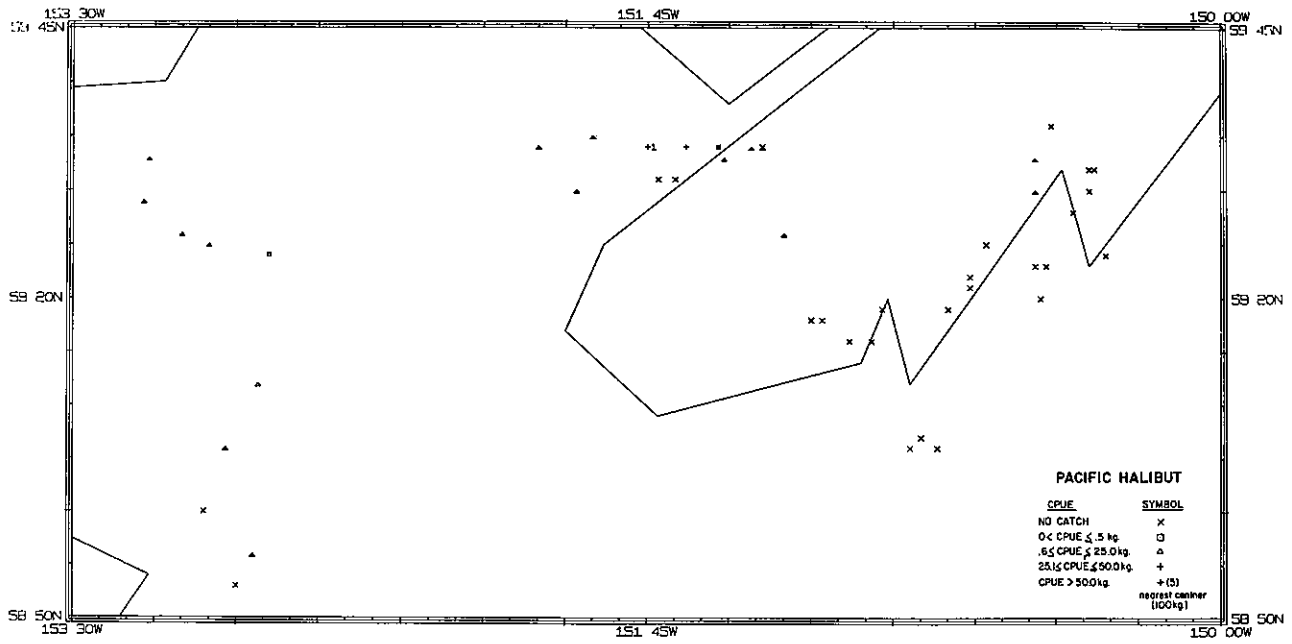


Figure X-126.--Distribution of Pacific halibut standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

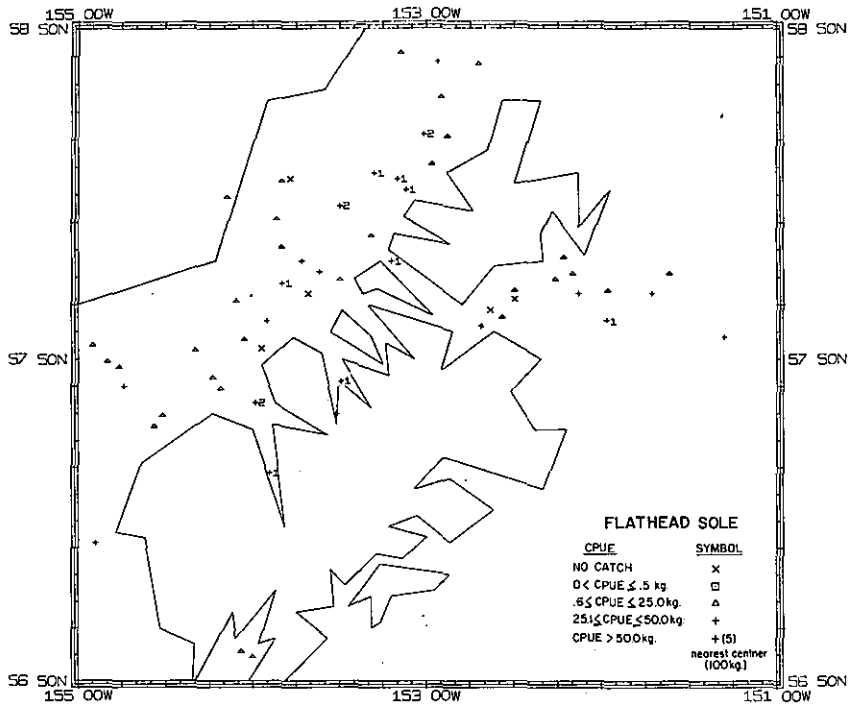
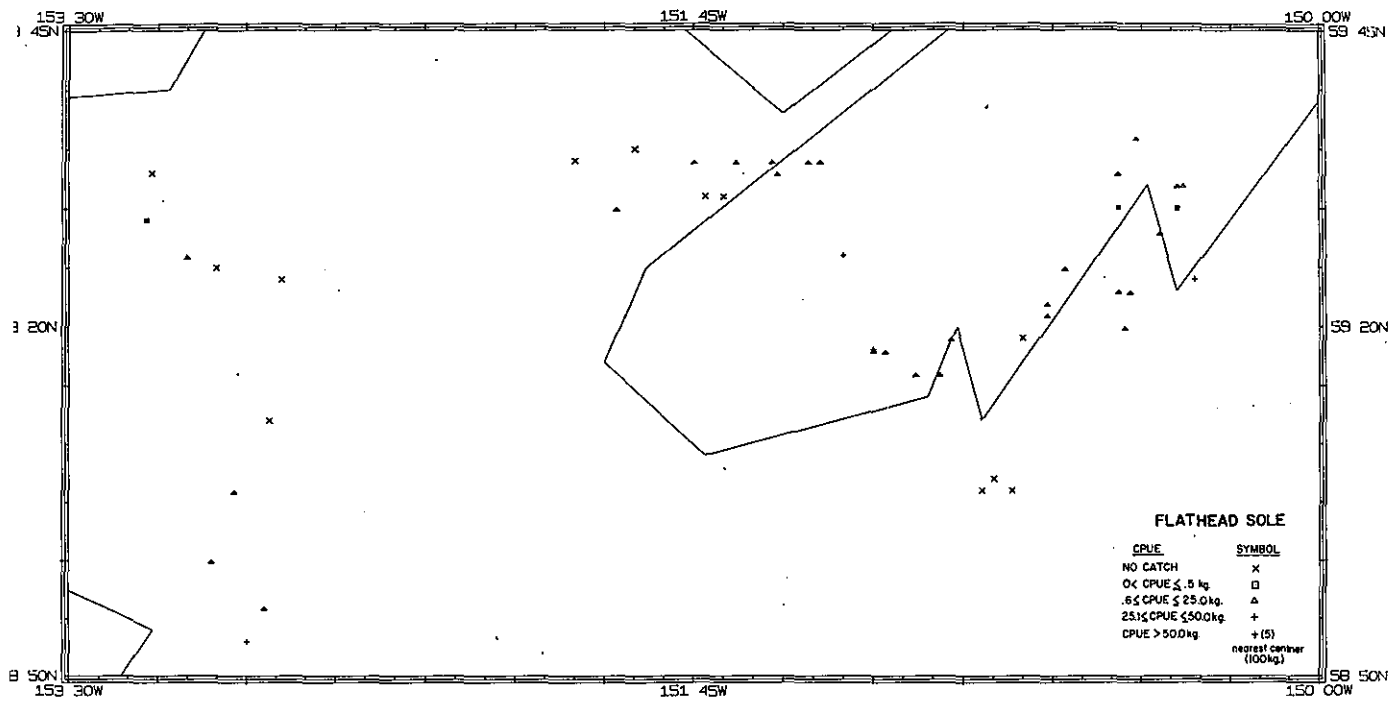


Figure X-127.--Distribution of flathead sole standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

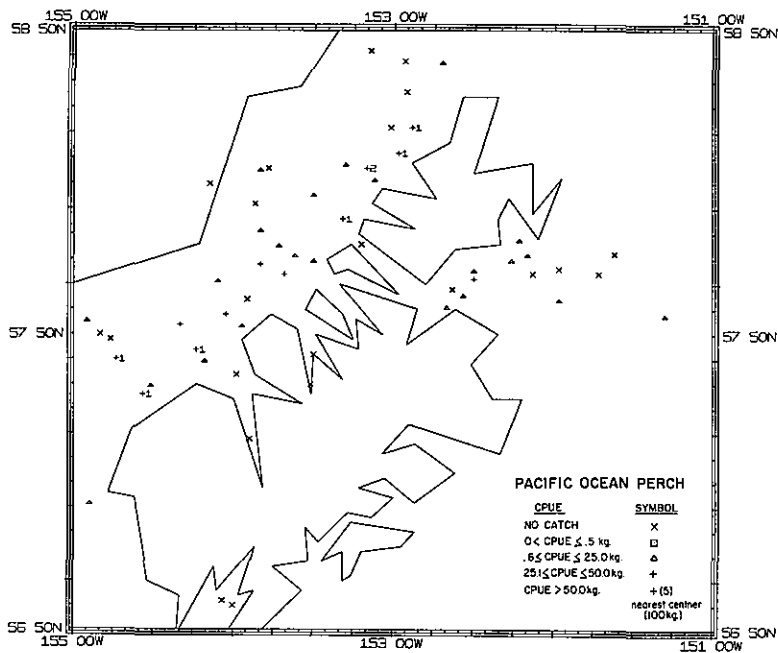
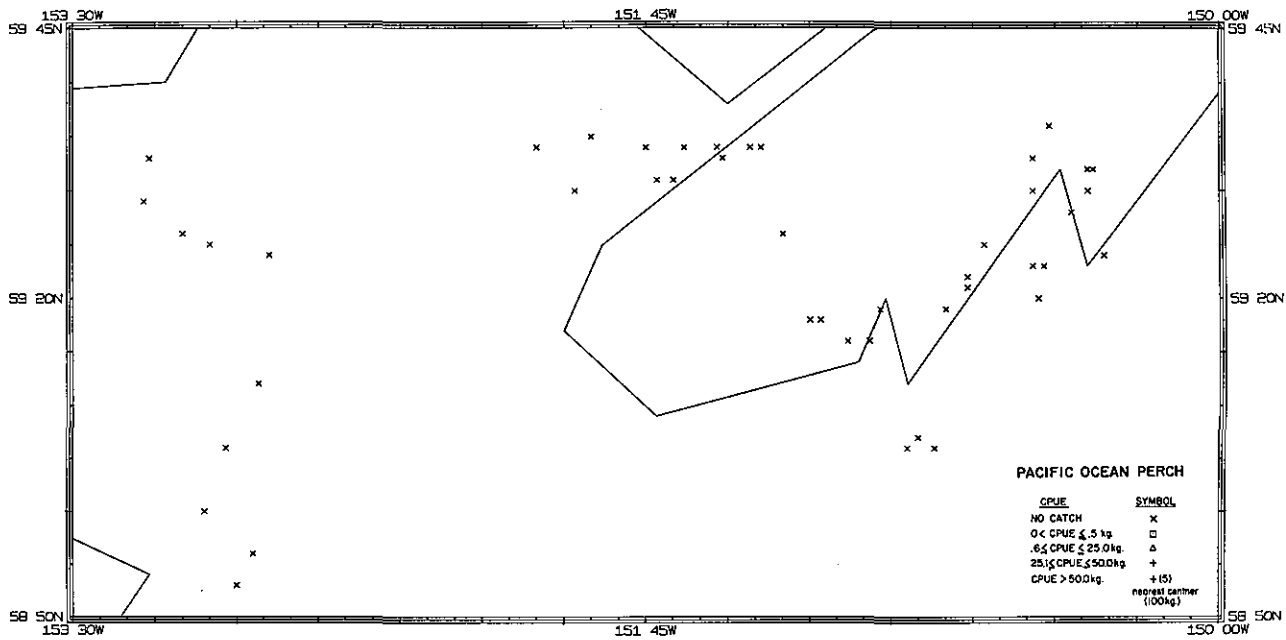


Figure X-128.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

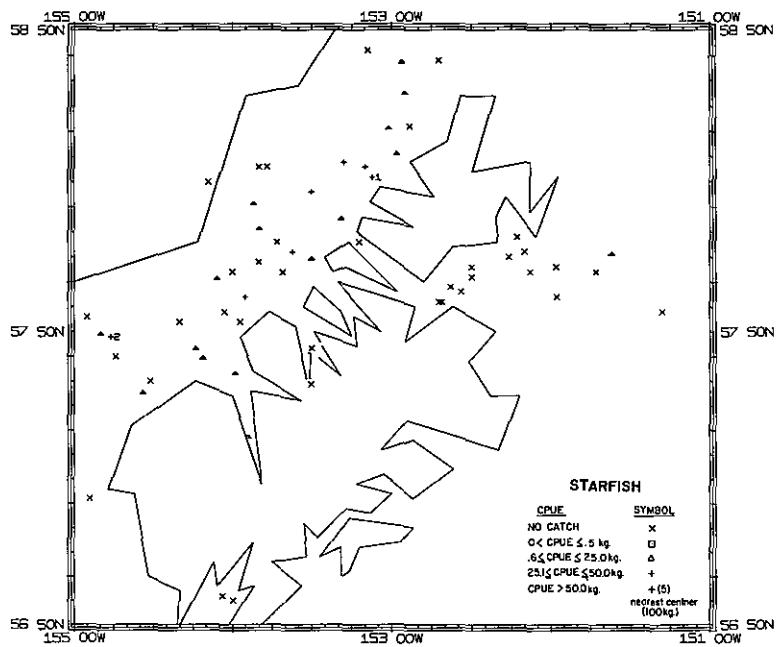
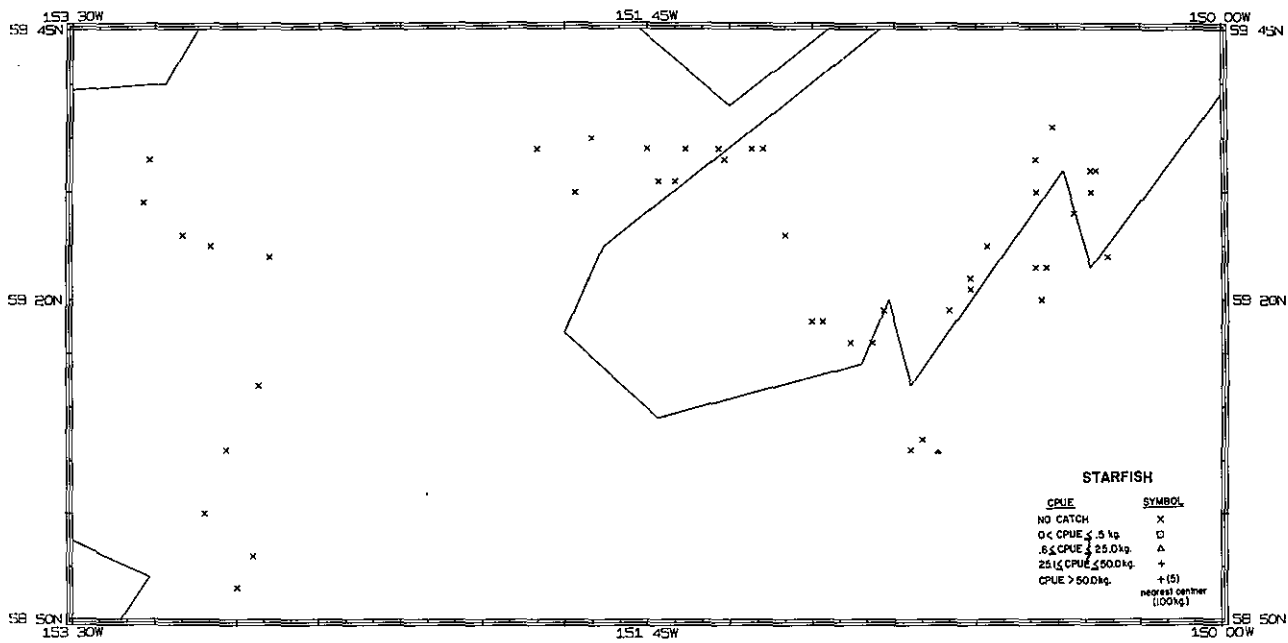


Figure X-129.--Distribution of starfish standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.

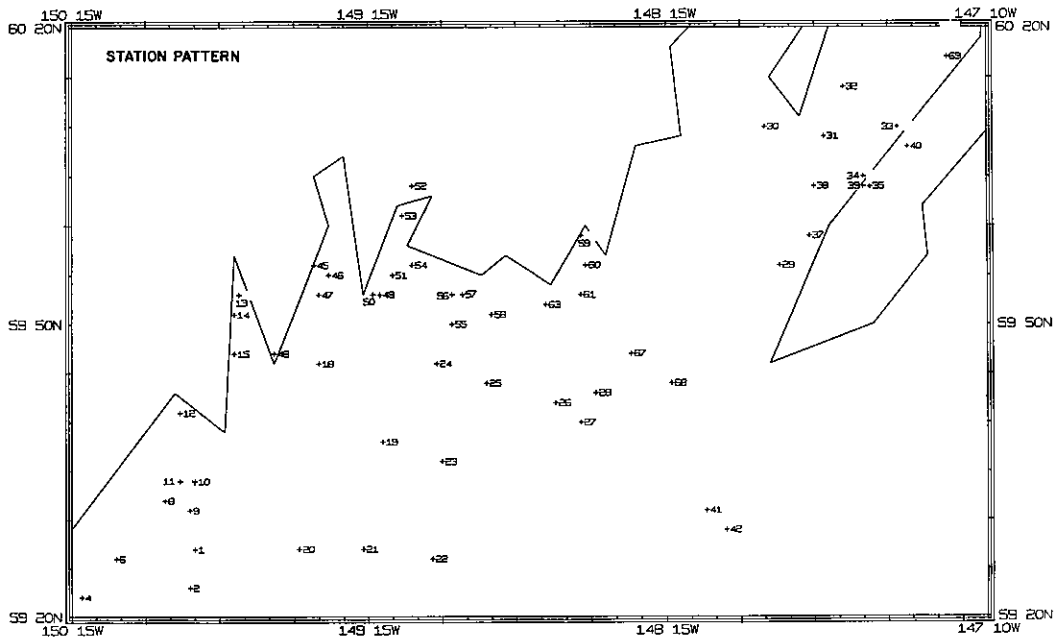
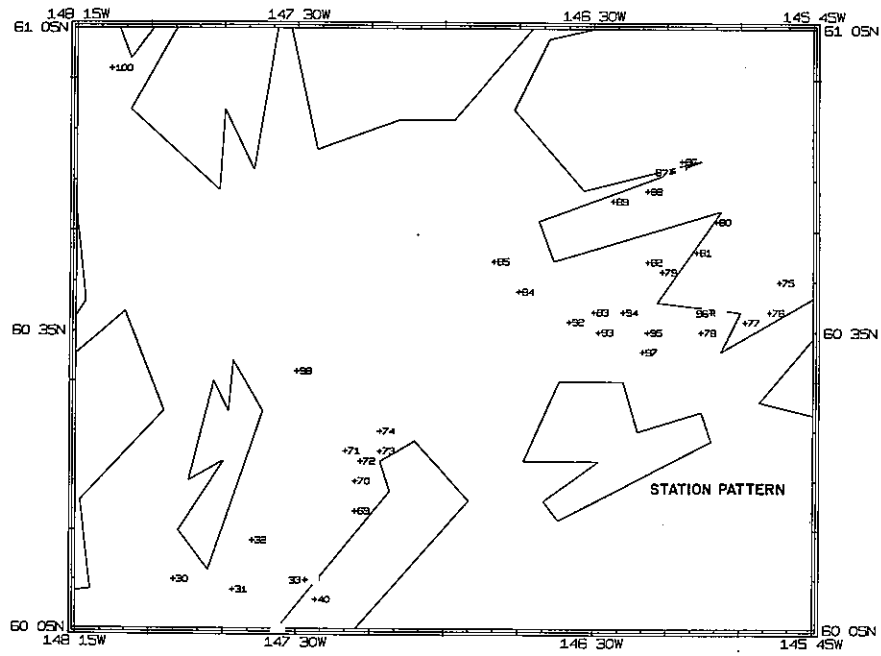


Figure X-130.--Stations successfully trawled (shrimp trawl) during cruise 044, R/V John N. Cobb.

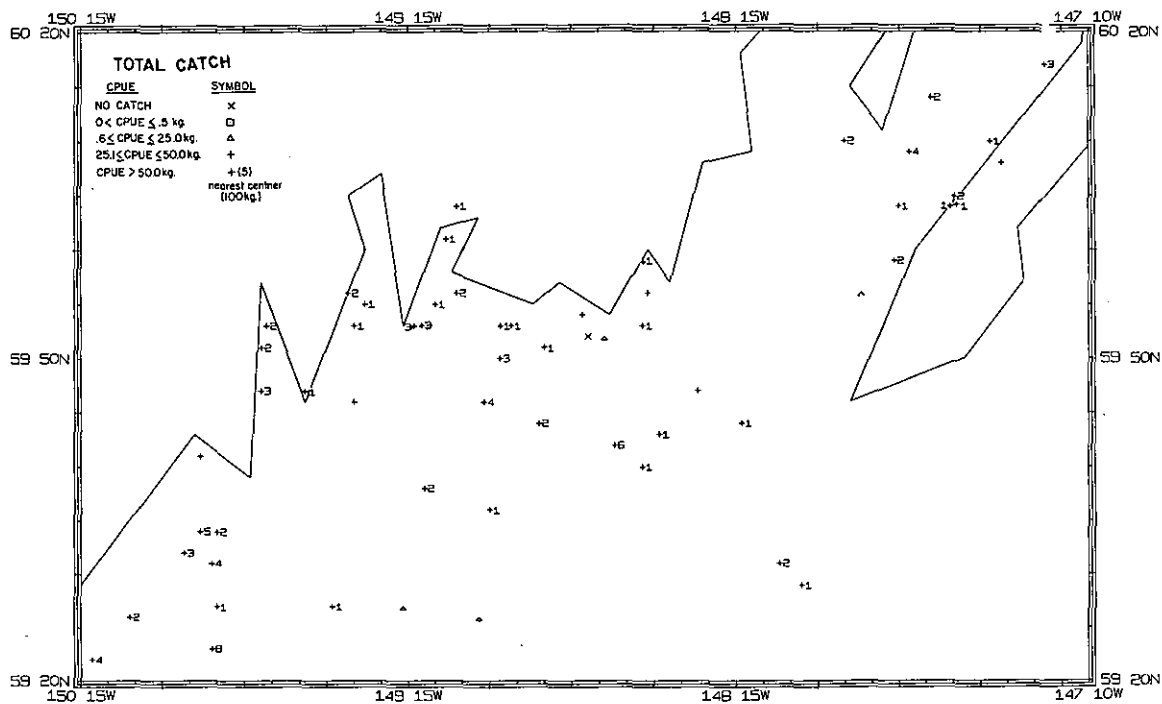
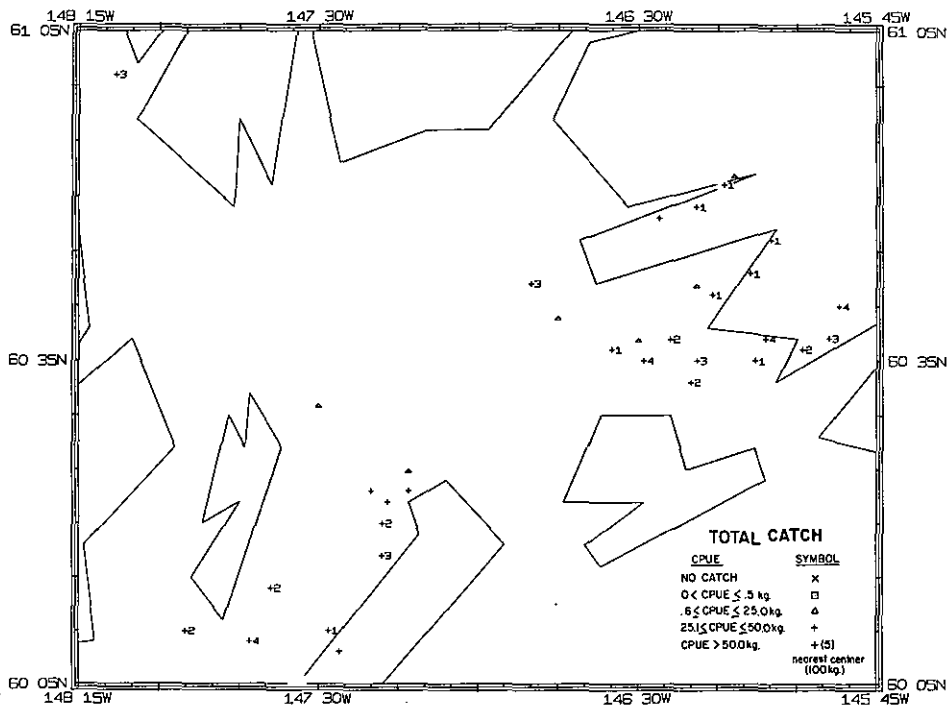


Figure X-131.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 044, R/V John N. Cobb.

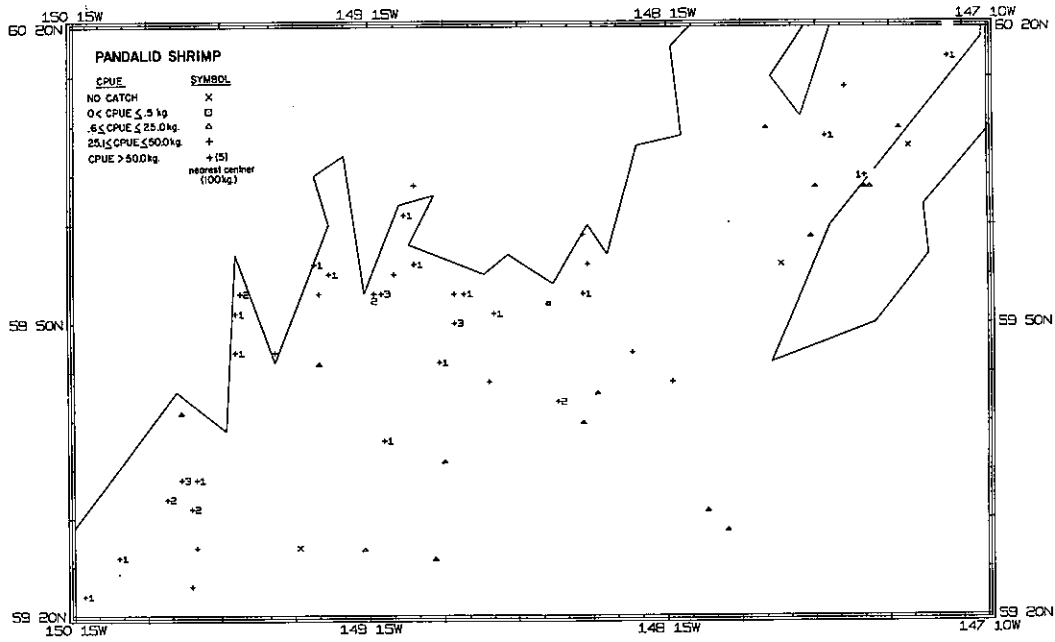
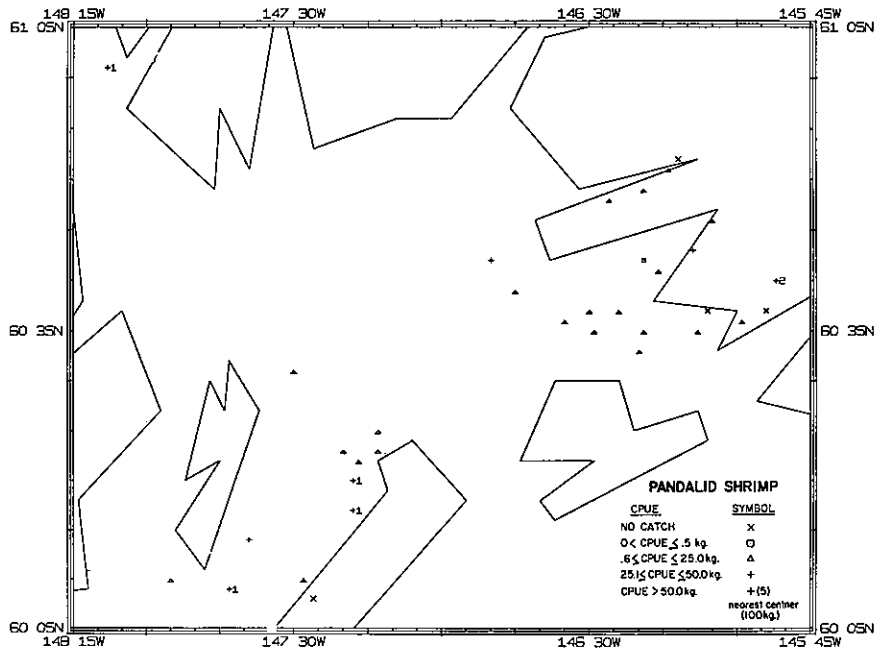


Figure X-132.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

Table X-28.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 044, R/V John N. Cobb.

Species or Species groups	Station numbers
Total catch	None
Pandalid shrimp	4, 6, 8-11, 13-15, 19, 24, 26, 31, 34, 45, 46, 49, 50, 53-55, 57, 58, 61, 69, 70, 75 and 100.
Turbot	11, 23-26, 28, 31, 32, 35, 37, 38, 41 and 85.
Walleye pollock	1, 14, 15, 31, 32, 45-47, 70, 85, 87, 92-95 and 97.
Pacific herring	75.
Pacific ocean perch	2, 24 and 26.
Tanner crab	25, 93, 95, 96 and 100.

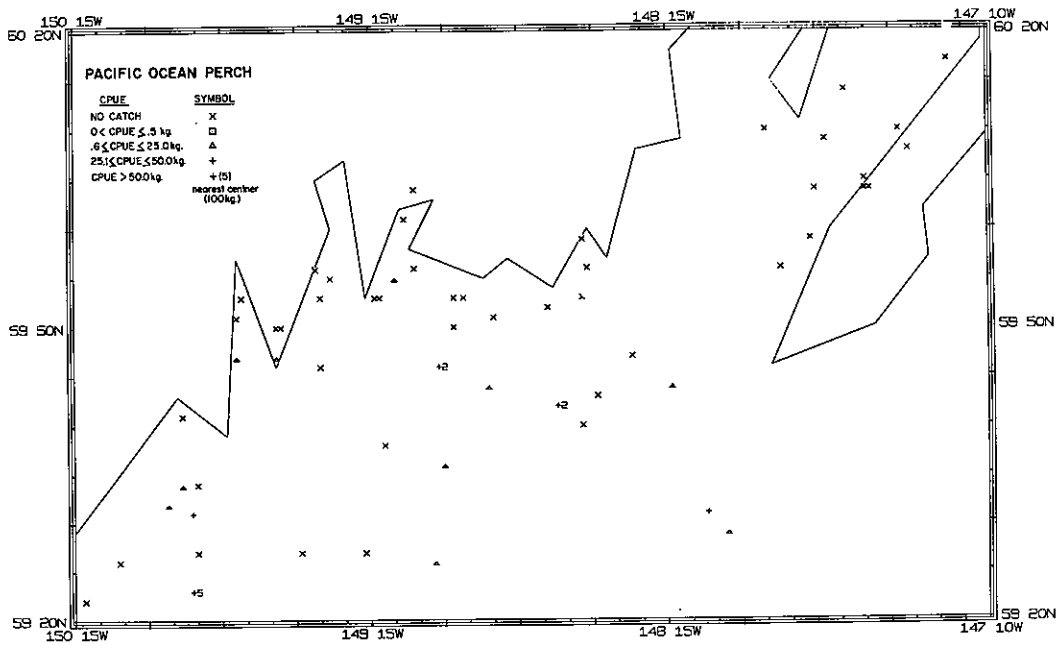
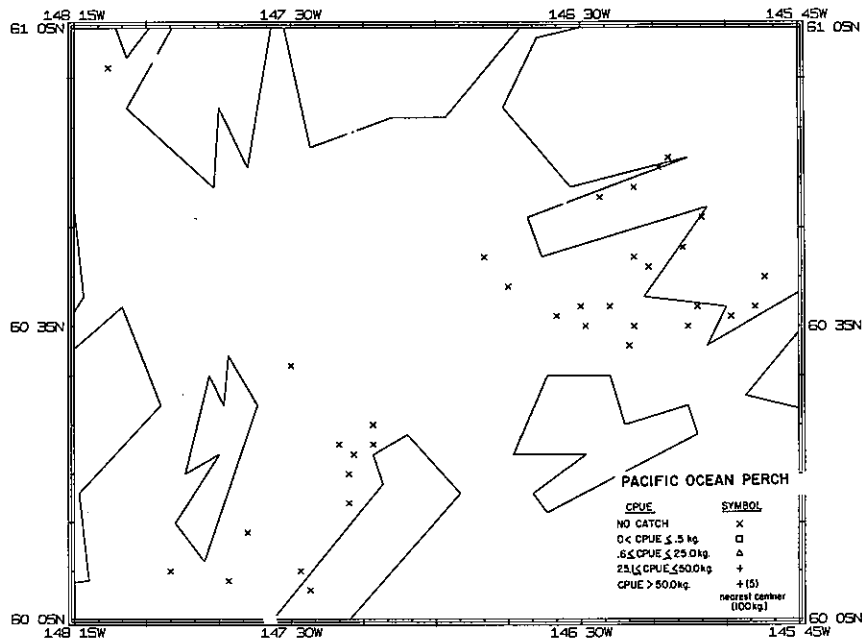


Figure X-133.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

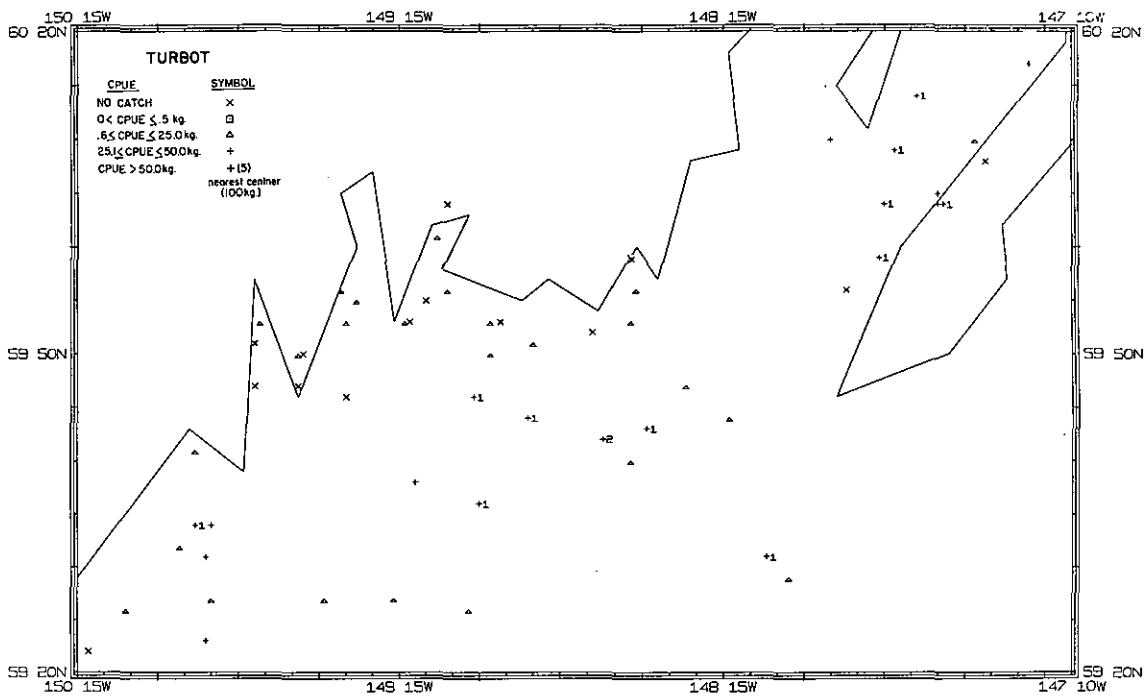
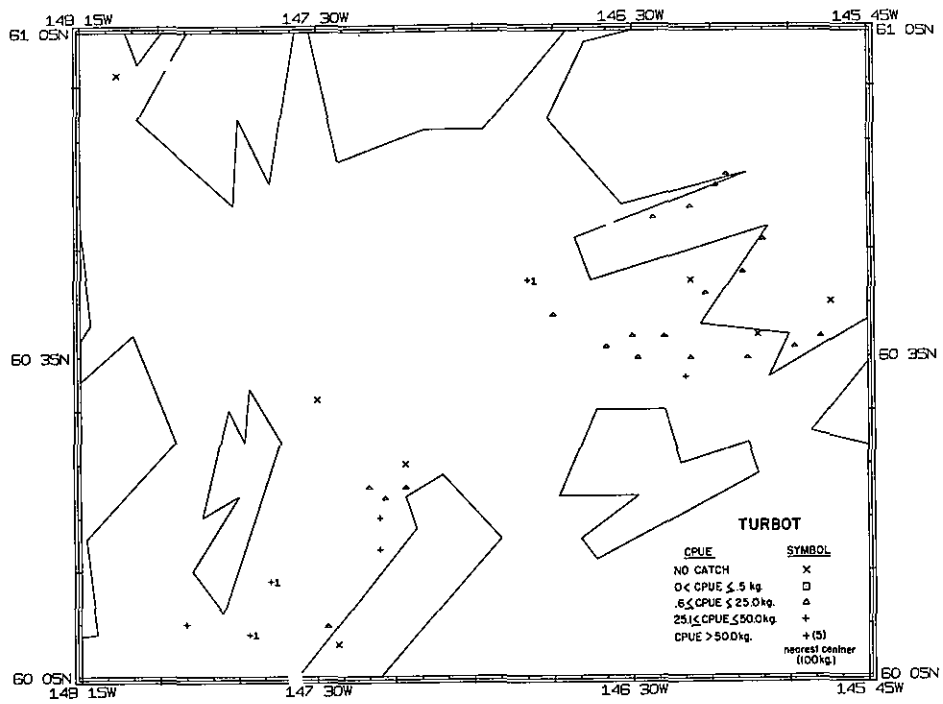


Figure X-134.--Distribution of turbot standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

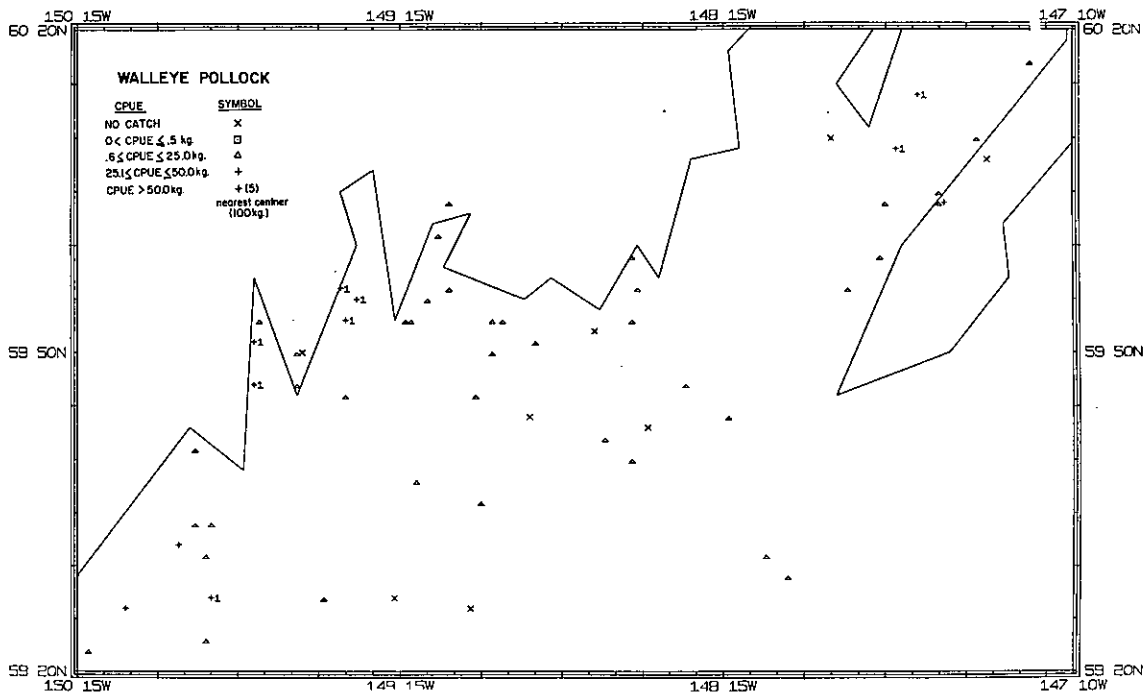
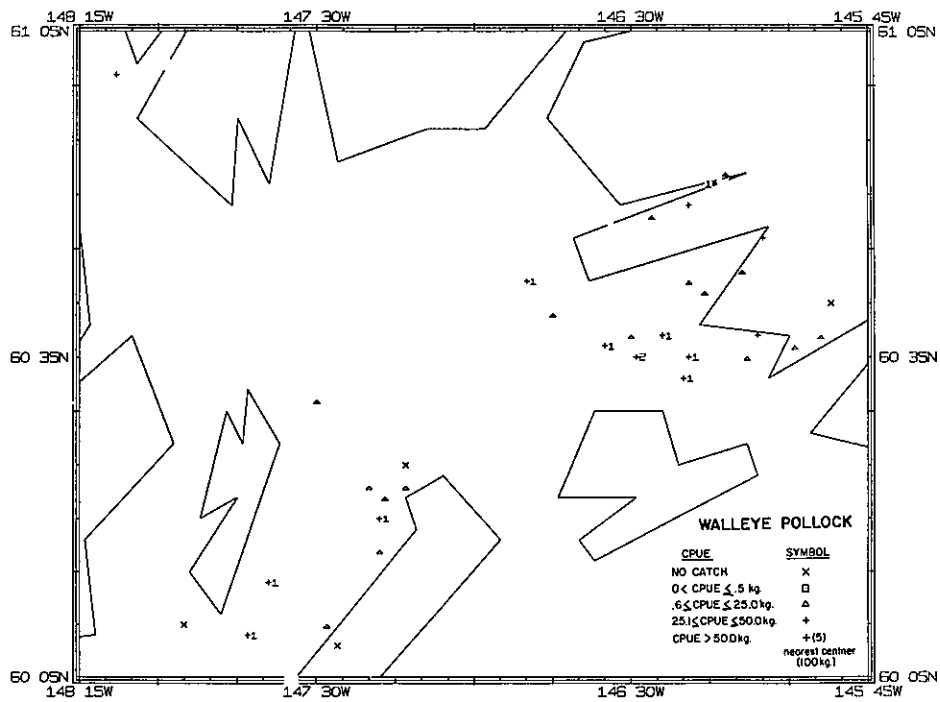


Figure X-135.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

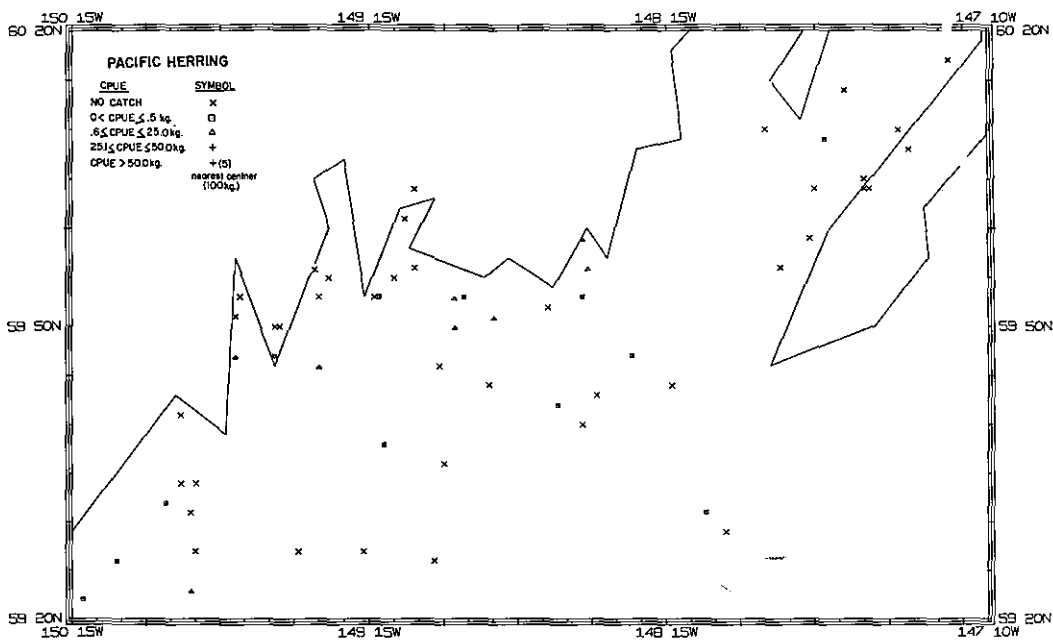
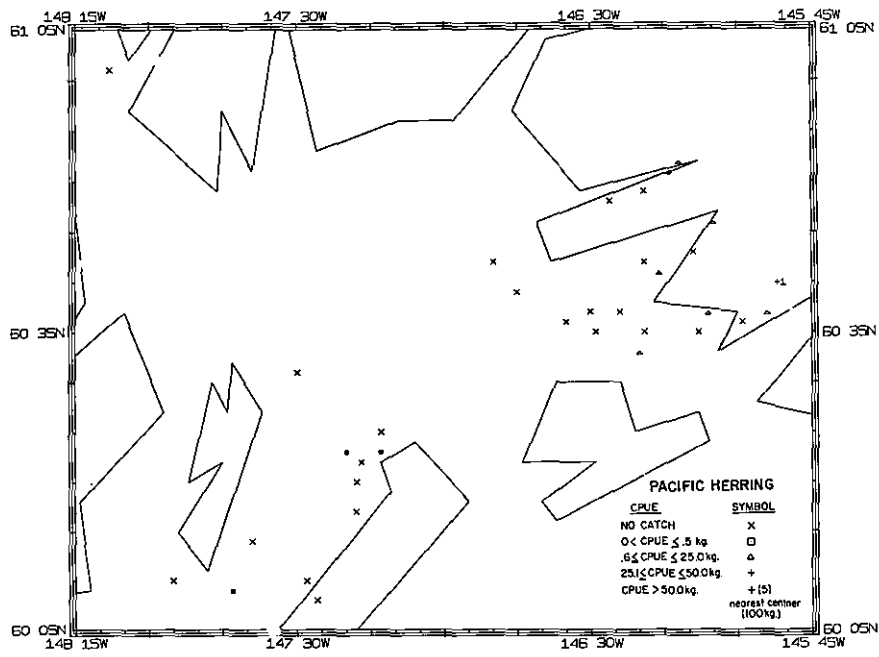


Figure X-136.--Distribution of Pacific herring standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

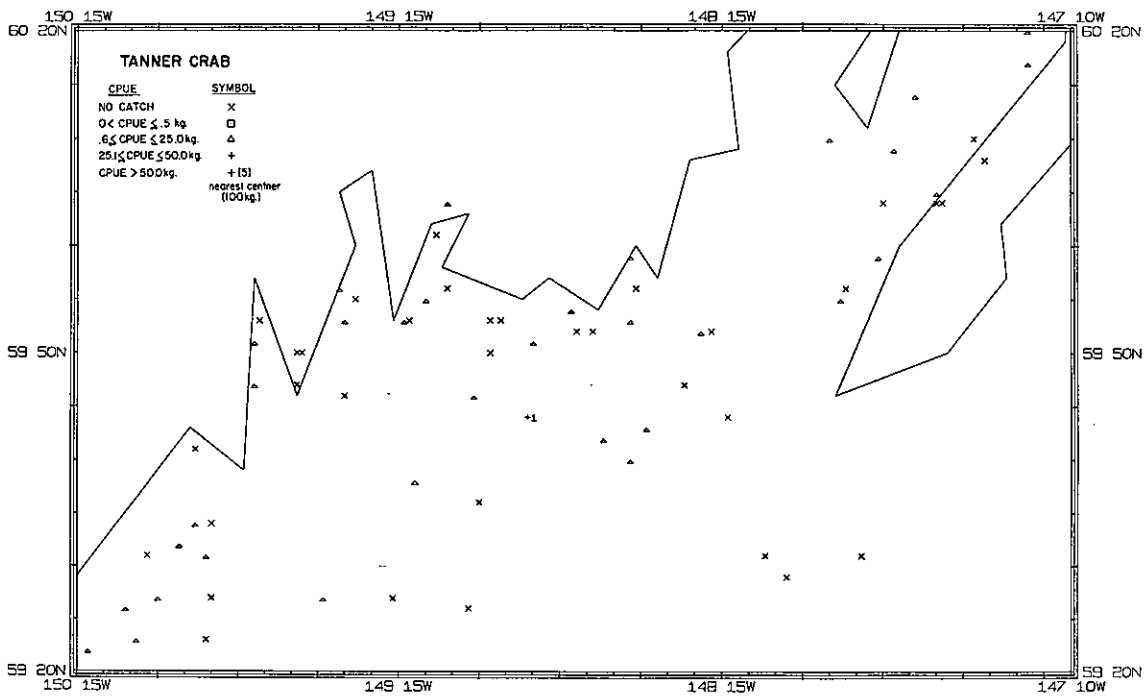
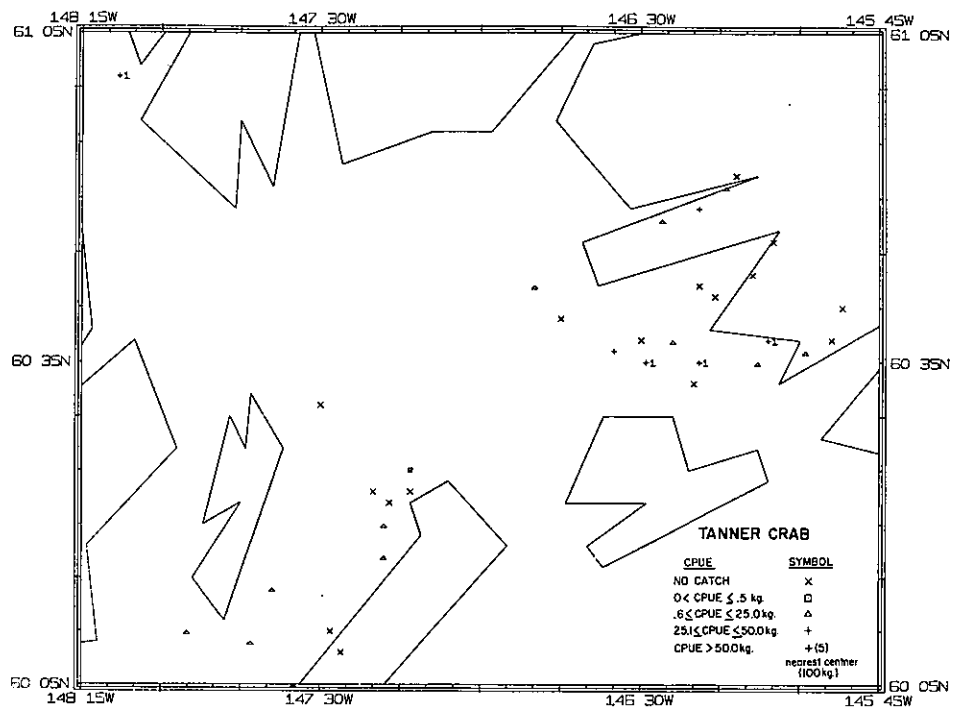


Figure X-137.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

g. Cruise 622, Chartered Fishing Vessel, Yaquina (August-October 1962)

Pandalid shrimp explorations were conducted in the Prince William and Kenai regions, where ninety-two stations were attempted with a 70 ft. semi-balloon-type shrimp trawl (Figure X-138).

The total catch for all species averaged 30, 478, and 252 kg/hr in the inner and outer shelves and upper slope depth zones, respectively and ranged up to 2,200 kg/hr. Largest total catches, over 1,000 kg/hr, were made in Montague Strait, Hinchinbrook Gully, and off Day Harbor (Table X-29, Figure X-139).

Pandalid shrimp were captured in the outer shelf and upper slope depth zones where the catches averaged 132 and 14 kg/hr (Table X-30). Pink shrimp was the dominant pandalid species in the outer shelf making up 88% of the total shrimp catch. In the upper slope, sidestripe shrimp had the highest mean CPUE and accounted for 69% of the total shrimp catch. The pandalid shrimp catch made up only 27% of the total catch of all species in the inner shelf and 5% in the upper slope. Largest catches of pandalid shrimp were made along the western side of Hinchinbrook Gully (Figure X-140). During this cruise, 8 species or species groups other than pandalid shrimp had mean CPUE's in excess of 10 kg/hr, (Table X-31). These species included walleye pollock and flathead sole in the outer shelf and upper slope depth zones, starfish, turbot, and Tanner crab in the outer shelf, soft coral in the upper slope, and rock sole in the inner shelf. Walleye pollock occurred in catches greater than 200 kg/hr in Montague Strait, Orca Bay, and Port Bainbridge, off Day Harbor, and in Hinchinbrook Entrance, (Figure X-141). One species group, brittlestars, exceeded the 200 kg/hr catch level at two stations, and two species, soft coral, and starfish at 1 station each (Figures X-142-144). The distribution of the standardized catches for the other species or species groups averaging over 10 kg/hr are presented in Figure X-145-148. The total catches for pandalid shrimp and these 8 species and species groups made up from 88 to 91% of the total species catch.

h. Cruise 632, Chartered Fishing Vessel, Yaquina (July-September 1963)

BCF conducted an exploratory pandalid shrimp survey in the Kenai-Shelikof-Chirikof regions. A 40 ft. Gulf of Mexico-type flat trawl was used at 221 attempted sampling stations (Figures X-149-150).

Total catches for all species averaged from 280-345 kg/hr, being highest in the outer shelf depth zone. Individual standardized station catch rates reached 2,900 kg/hr (Figures X-151-152) with the largest catch rates (greater than 1,000 kg/hr) occurring in Nuka Passage, at the eastern entrance to Cook Inlet, upper Shelikof Strait, Tonki Bay, Viokoda Bay, Uganik Bay, Alitak Bay, Ugak Bay, Kiluda Bay, and along the southeastern Kodiak continental shelf (Table X-32).

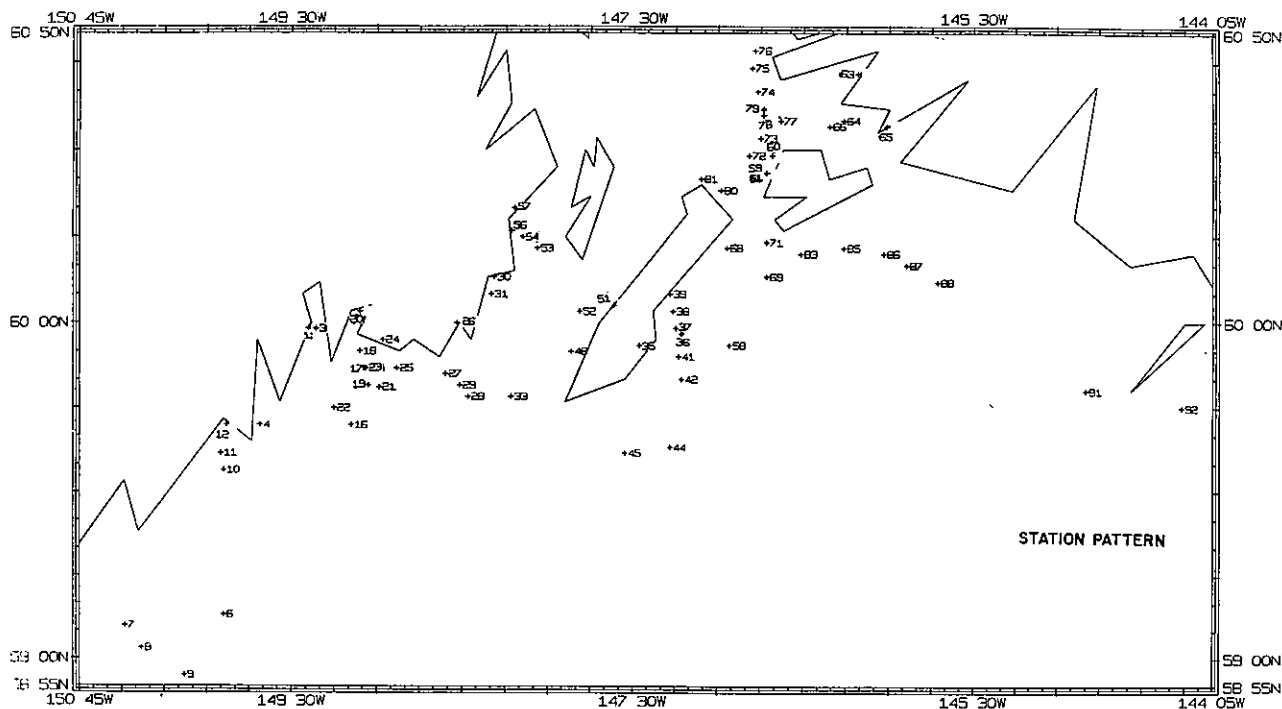


Figure X-138.--Stations successfully trawled (shrimp trawl) during cruise 622, charter vessel Yaquina.

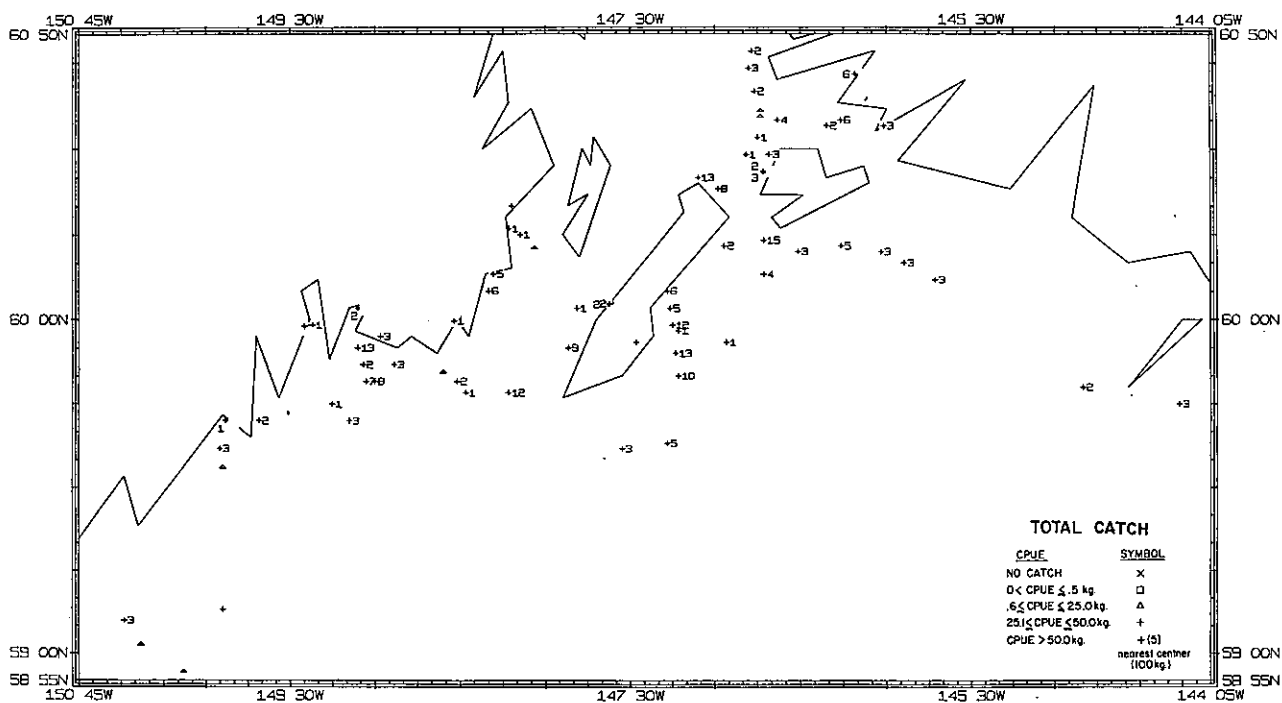


Figure X-139.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 622, charter vessel Yaquina.

Table X-29.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 622, charter vessel Yaquina.

Species or Species groups	Station numbers
Total catch	18, 33, 37, 41, 42-51 and 81.
Pandalid shrimp	15, 16, 24, 25, 36, 38, 39, 41, 42, 45, 69, 78 and 86-88.
Walleye pollock	15, 17, 18, 20, 21, 29, 30, 31, 33, 38, 44, 48, 51, 52, 59, 60, 61, 63-66, 68, 69, 71, 74-77, 80 and 81.
Brittlestars	7, 71 and 91.
Starfish	37, 44, 69, 83, 85, 86 and 92.
Rock sole	None
Turbot	44 and 81.
Soft coral	4 and 11.
Flathead sole	18, 19, 51, 64, 68 and 69.
Tanner crab	38 and 75.

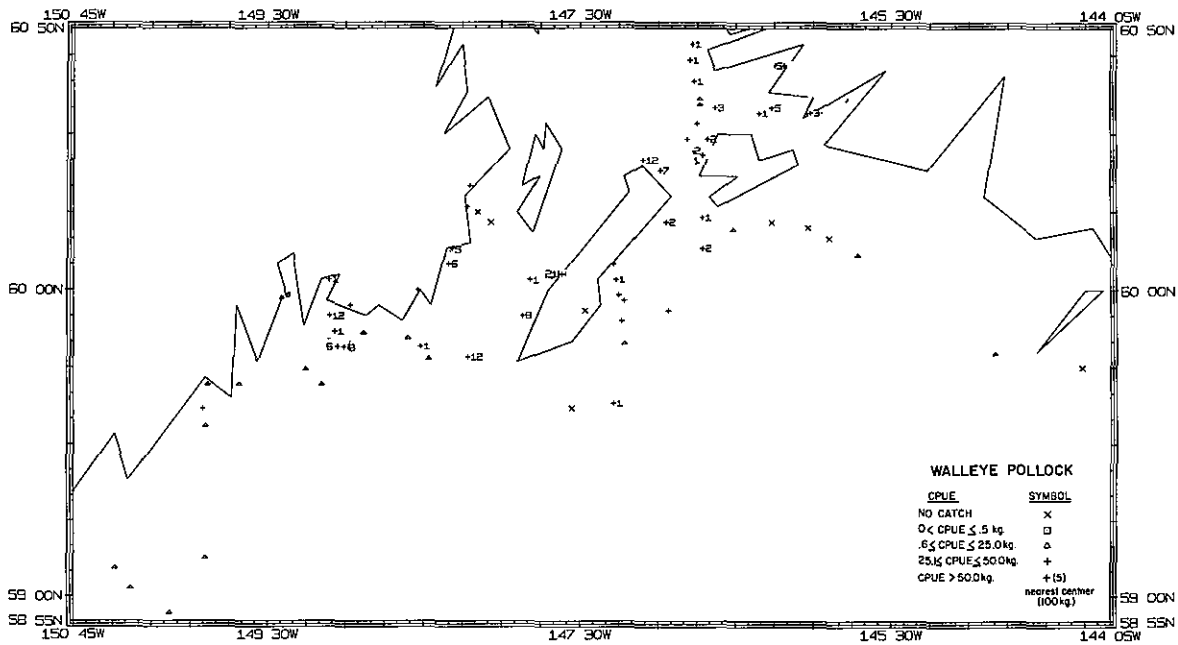
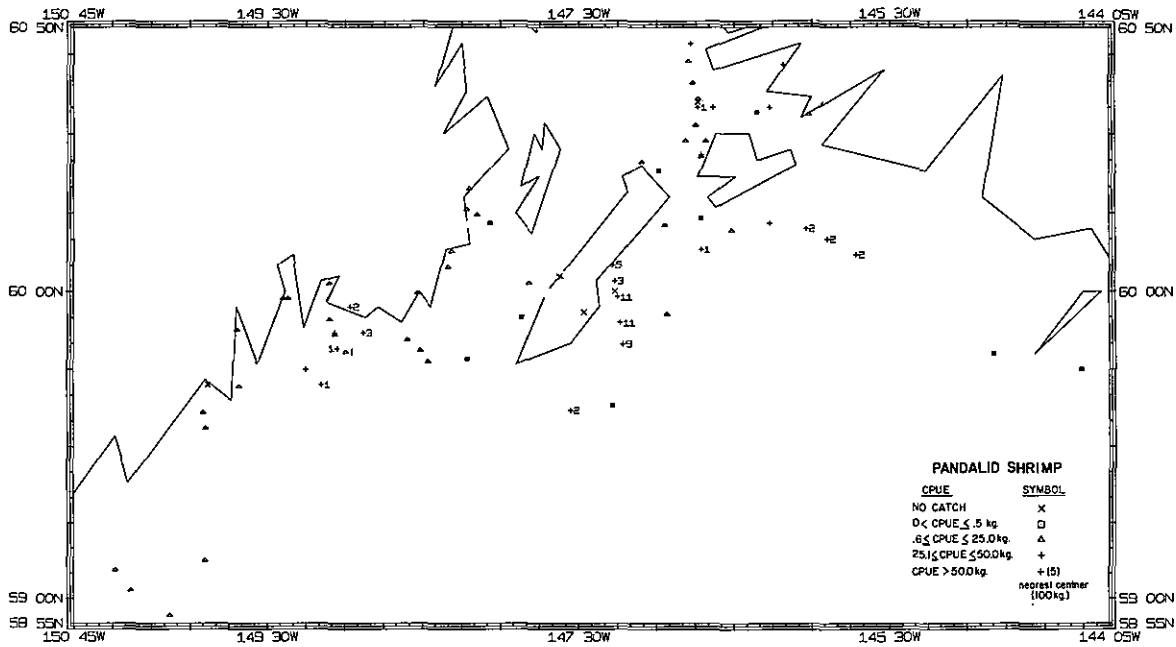
Table X-30.--Mean CPUE's for individual pandalid shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.

Cruise file	Species	0 - 100 M.			101 - 200 M.			201 - 400 M.		
		CPUE kg/hr	% of shrimp	% Total catch	CPUE kg/hr	% of shrimp	% Total catch	CPUE kg/hr	% of shrimp	% Total catch
622	Pink	0	0	0	115.9	88.0	24.2	4.2	30.7	1.7
	Sidestripe	0	0	0	11.6	8.8	2.4	9.4	68.6	3.7
	Ocean pink	0	0	0	3.0	2.3	0.6	0	0	0
	Humpy	0	0	0	1.1	0.8	0.2	<u>1/</u>	<u>2/</u>	<u>2/</u>
	Coonstripe	0	0	0	0.1	0.1	<u>2/</u>	<u>1/</u>	<u>2/</u>	<u>2/</u>
	Spot	0	0	0	<u>1/</u>	<u>2/</u>	<u>2/</u>	<u>1/</u>	0.7	<u>2/</u>
		0	0	0	131.7	100.0	27.4	13.7	100.0	5.4
632	Pink	133.9	69.3	47.8	163.8	75.9	47.7	9.7	67.8	12.4
	Sidestripe	6.0	3.1	2.1	34.3	15.9	9.9	4.6	32.2	5.9
	Humpy	34.2	17.7	12.2	11.0	5.1	3.2	0	0	0
	Coonstripe	19.1	9.9	6.8	5.4	2.5	1.6	<u>1/</u>	<u>2/</u>	<u>2/</u>
	Dock	0.1	0.1	<u>2/</u>	0.2	0.1	0.1	0	0	0
	Spot	<u>1/</u>	<u>2/</u>	<u>2/</u>	0.2	0.1	0.1	<u>1/</u>	<u>2/</u>	<u>2/</u>
	P. montagui	<u>1/</u>	<u>2/</u>	<u>2/</u>	0.1	0.1	<u>2/</u>	0	0	0
	Ocean pink	0	0	0	0.8	0.4	0.2	0	0	0
		193.3	100.1	68.9	215.8	100.1	62.8	14.3	100.0	28.3
642	Pink	320.4	73.9	59.8	313.0	70.6	47.6	47.9	30.7	9.8
	Sidestripe	1.1	0.3	<u>2/</u>	103.6	23.4	15.8	107.6	69.1	22.1
	Humpy	70.0	16.1	13.1	15.5	3.5	2.4	<u>1/</u>	<u>2/</u>	<u>2/</u>
	Coonstripe	42.3	9.8	7.9	7.8	1.8	1.2	0.3	0.2	<u>2/</u>
	P. montagui	<u>1/</u>	<u>2/</u>	<u>2/</u>	3.5	0.8	0.5	0	0	0
	Spot	0	0	0	<u>1/</u>	<u>2/</u>	<u>2/</u>	0	0	<u>2/</u>
		433.8	100.1	80.8	443.4	100.1	67.5	155.8	100.0	31.9
682	Pink	422.4	68.7	56.8	480.1	71.1	30.1	40.4	83.3	13.7
	Sidestripe	0.1	<u>2/</u>	<u>2/</u>	106.6	15.8	6.7	8.1	16.7	2.8
	Humpy	118.1	19.2	15.9	72.3	10.7	4.5	0	0	0
	Coonstripe	74.5	12.1	10.0	6.9	1.0	0.4	0	0	0
	Ocean pink	0	0	0	9.1	1.4	0.6	0	0	0
	Spot	0	0	0	<u>1/</u>	<u>2/</u>	<u>2/</u>	0	0	0
		615.1	100.0	82.7	675.0	100.0	42.3	48.5	100.0	16.5
703	Pink	207.4	86.5	57.6	243.1	89.0	50.4	39.5	85.0	34.1
	Sidestripe	24.6	10.3	6.8	17.1	6.3	3.5	6.8	14.6	5.8
	Humpy	0.1	<u>2/</u>	<u>2/</u>	4.2	1.5	0.9	0	0	0
	Coonstripe	7.3	3.0	2.0	5.0	1.8	1.0	0.2	0.4	0.1
	Spot	0.4	0.2	0.1	3.8	1.4	0.8	0.4	0	0
	P. montagui	0	0	0	0.1	<u>2/</u>	<u>2/</u>	0	0	0
		239.8	100.0	66.5	273.3	100.0	56.6	46.9	100.0	40.0

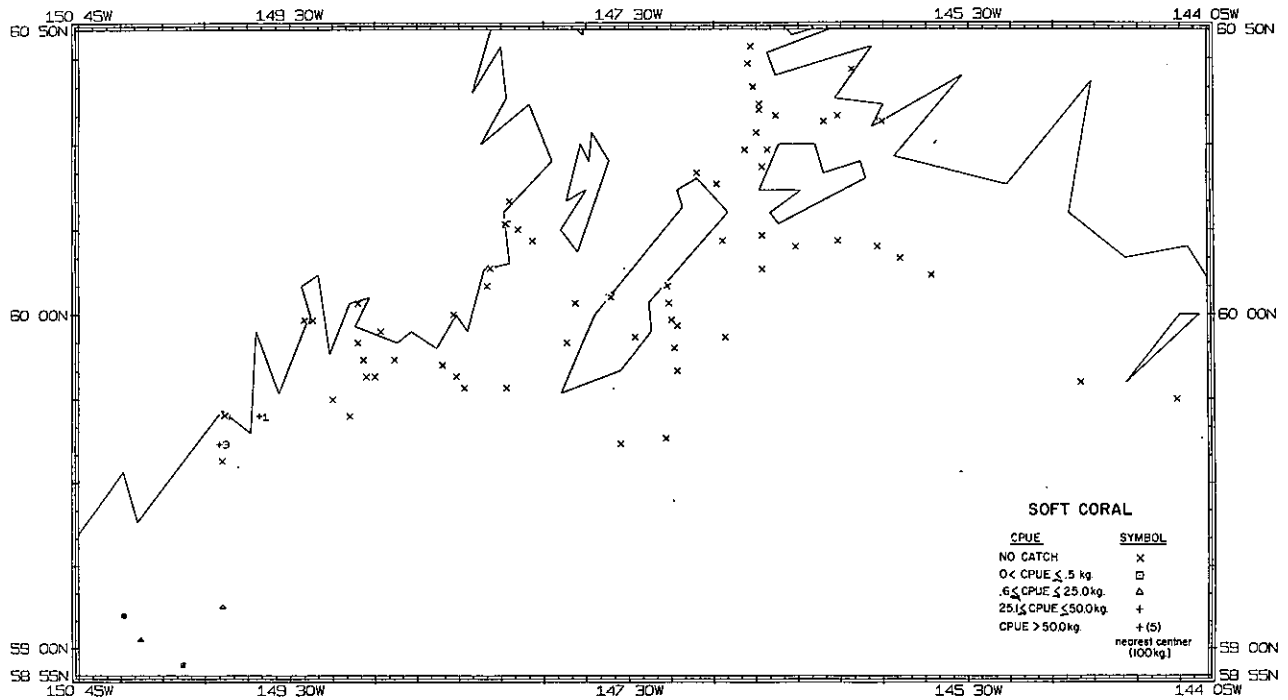
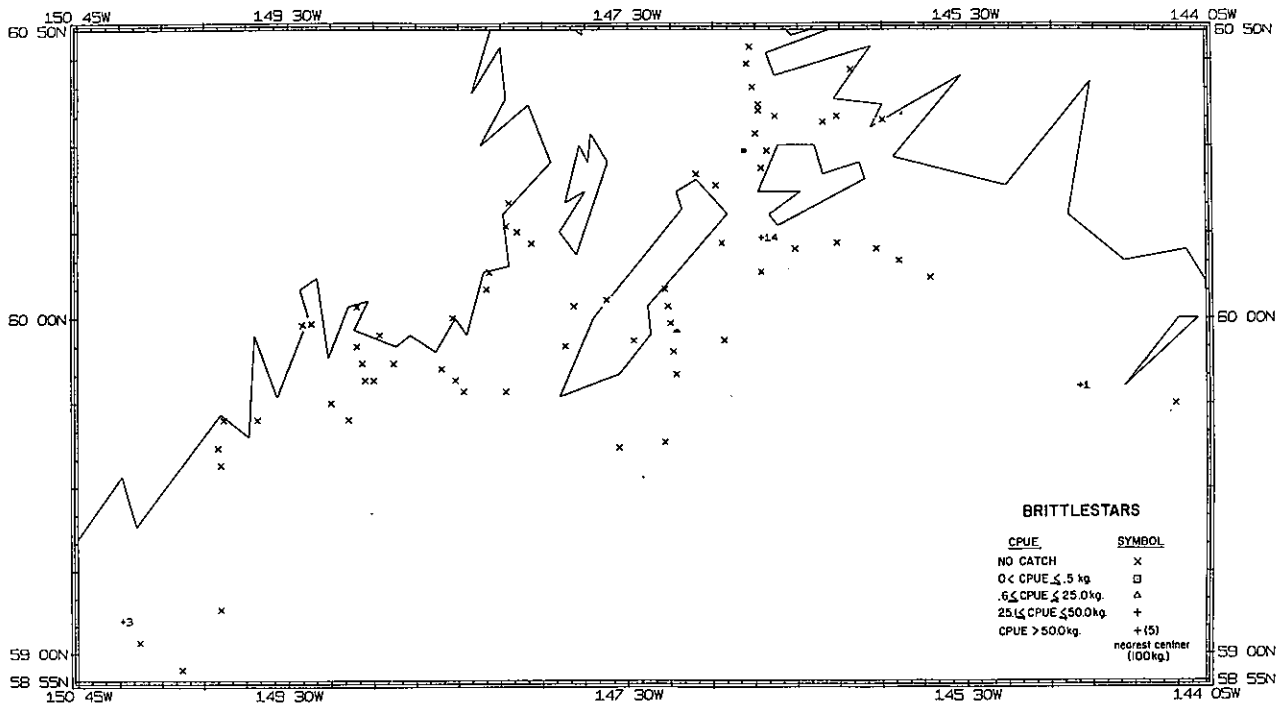
-208-

1/ Less than 0.1 kg/hr.

2/ Less than 0.1 percent.



Figures X-140-141.--Distribution of pandalid shrimp and walleye pollock standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.



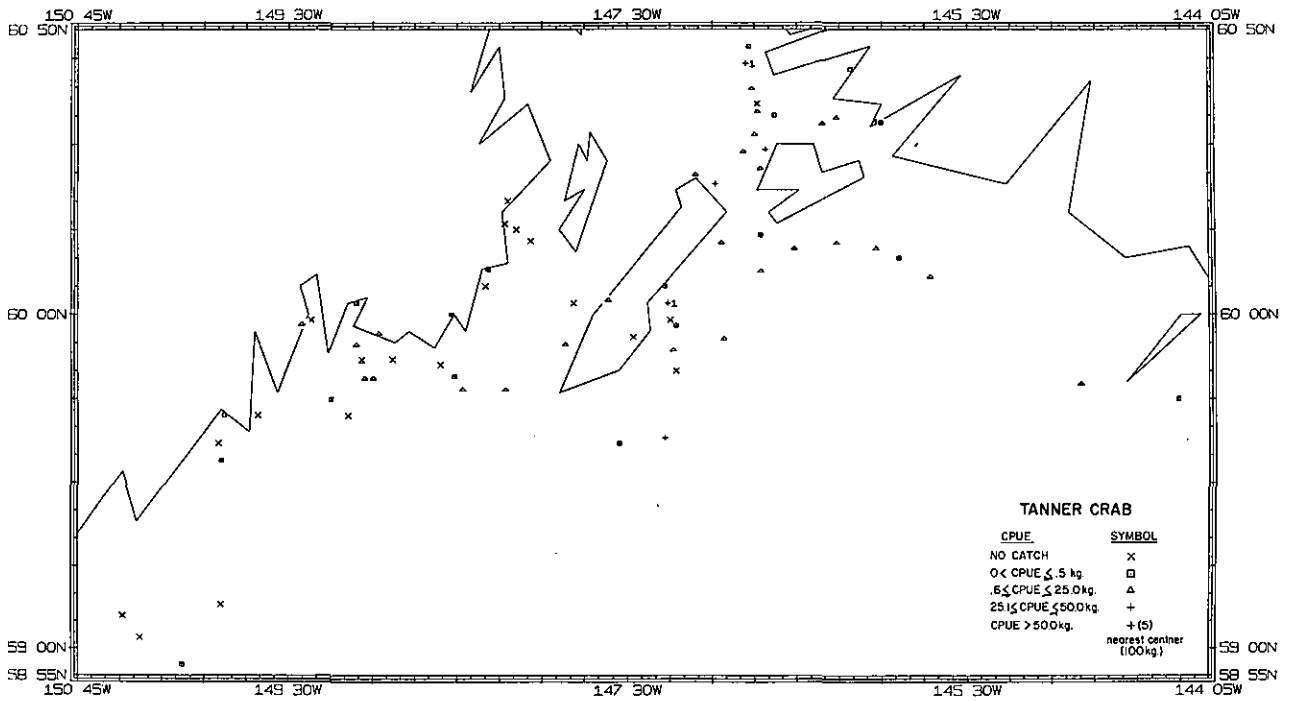
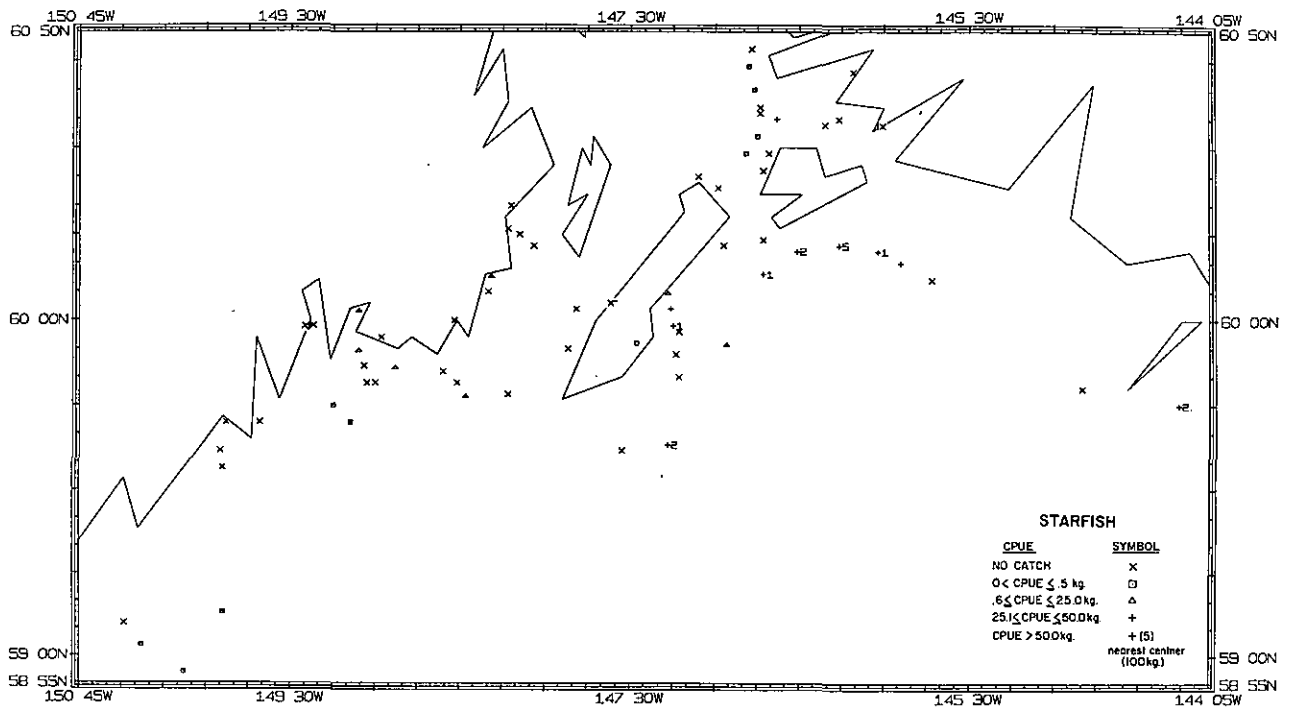
Figures X-142-143.--Distribution of brittlestars and soft coral standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.

Table X-31.--Mean CPUE's for species other than pandalid shrimps which averaged over 10 kg/hr during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.

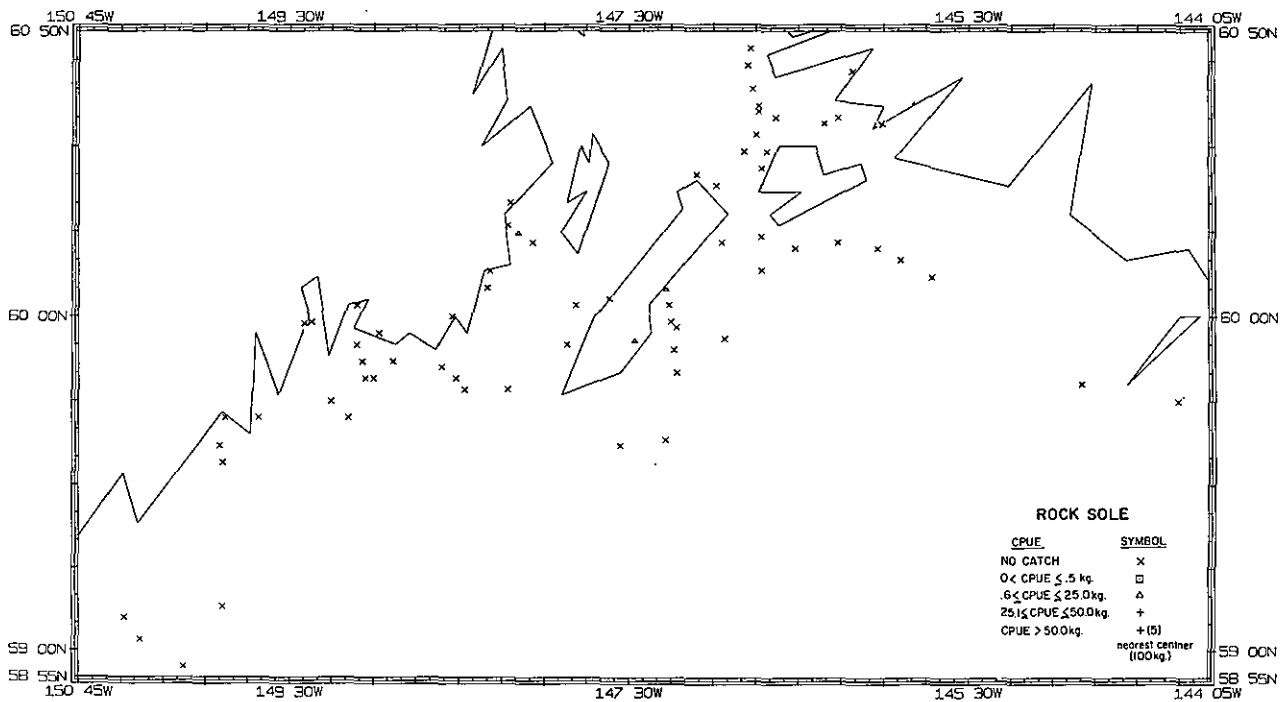
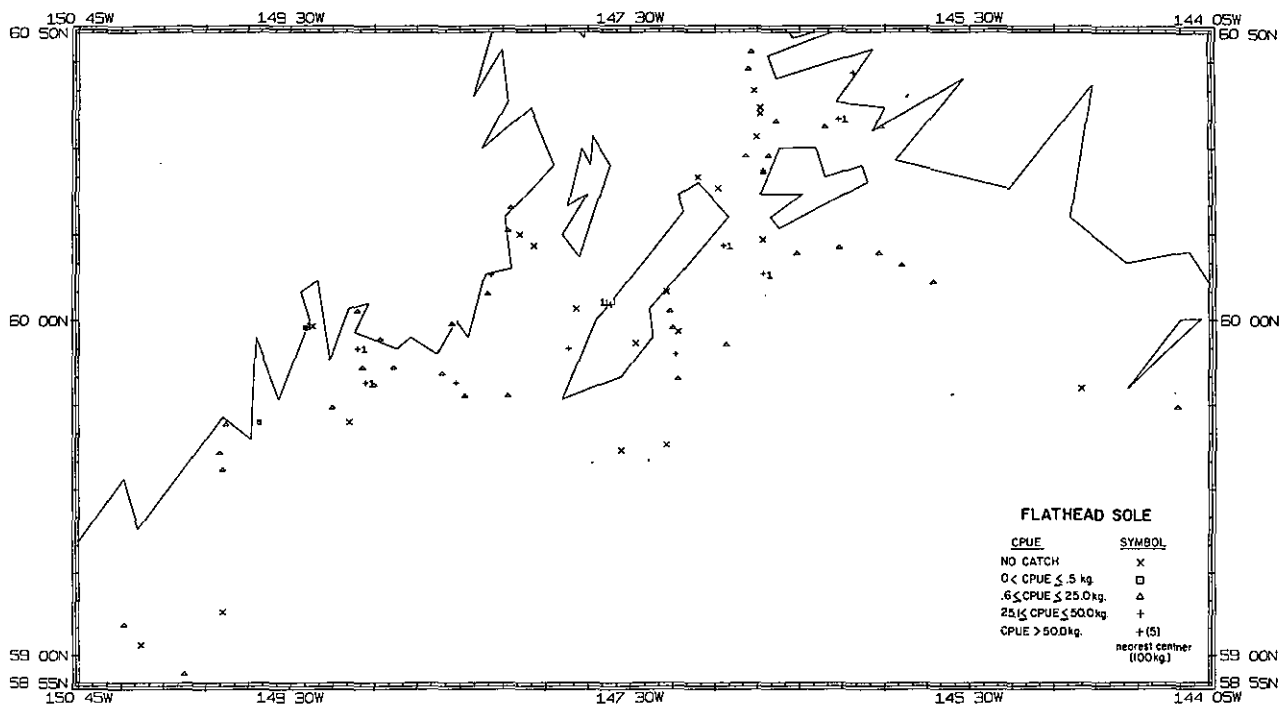
Cruise	Species	DEPTH ZONES					
		1 - 100 M.		101 - 200 M.		201 - 400 M.	
		CPUE kg/hr	% of total catch	CPUE kg/hr	% of total catch	CPUE kg/hr	% of total catch
622	Rock sole	22.7	74.6	0	0	0	0
	Walleye pollock	0	0	235.0	49.1	124.1	49.3
	Starfish	0.2	0.6	31.9	6.7	2.5	1.0
	Turbot	3.8	12.4	15.6	3.3	6.7	2.7
	Flathead sole	0	0	11.1	2.3	10.0	4.0
	Tanner crab	0	0	10.3	2.1	2.5	1.0
	Brittlestars	0	0	9.3	2.0	54.4	21.6
	Soft coral	0	0	0.4	0.1	15.4	6.1
		<u>26.7</u>	<u>87.6</u>	<u>313.6</u>	<u>65.6</u>	<u>215.6</u>	<u>85.7</u>
632	King crab	28.4	10.1	17.9	5.2	2.4	3.1
	Walleye pollock	5.8	2.1	26.0	7.5	6.5	8.3
	Turbot	4.1	1.4	15.4	4.5	10.9	13.9
	Brittlestars	1.4	0.5	11.4	3.3	2.0	2.5
		<u>39.7</u>	<u>14.1</u>	<u>70.7</u>	<u>20.5</u>	<u>21.8</u>	<u>27.8</u>
642	Starfish	0.7	<u>2/</u>	1.9	<u>2/</u>	16.3	3.4
	Cottids	6.0	1.1	14.7	2.2	3.1	0.6
	King crab	26.6	5.0	25.0	3.8	2.7	0.6
	Walleye pollock	10.3	1.9	15.2	2.3	28.5	5.9
	Turbot	8.9	1.7	60.1	9.1	163.9	33.7
	Flathead sole	3.3	0.6	28.3	4.3	33.6	6.9
	Pac. ocean perch	0.3	<u>2/</u>	12.5	1.9	13.6	2.8
	Tanner crab	6.6	1.2	10.4	1.6	30.3	6.2
		<u>62.7</u>	<u>11.5</u>	<u>168.1</u>	<u>25.2</u>	<u>292.0</u>	<u>60.1</u>
682	Pacific herring	43.5	5.8	4.7	0.3	0	0
	Yellowfin sole	18.3	2.5	5.3	0.3	0	0
	Walleye pollock	14.1	1.9	532.2	33.4	79.6	27.0
	Turbot	<u>1/</u>	<u>2/</u>	122.2	7.7	90.5	30.7
	Flathead sole	7.8	1.0	111.9	7.0	13.0	4.4
	Pacific cod	0	0	84.3	5.3	12.3	4.2
	Tanner crab	1.2	0.2	3.8	0.2	16.1	5.5
		<u>84.9</u>	<u>11.4</u>	<u>864.4</u>	<u>54.2</u>	<u>211.5</u>	<u>71.8</u>
703	Walleye pollock	82.3	22.9	151.0	31.3	29.3	25.2
	Pacific herring	15.1	4.2	7.0	1.4	0.1	<u>2/</u>
		<u>97.4</u>	<u>27.1</u>	<u>158.0</u>	<u>32.7</u>	<u>29.4</u>	<u>25.2</u>

1/ Less than 0.1 kg/hr

2/ Less than 0.1 percent



Figures X-144-145.--Distribution of starfish and Tanner crab standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.



Figures X-146-147.--Distribution of flathead and rock sole standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.

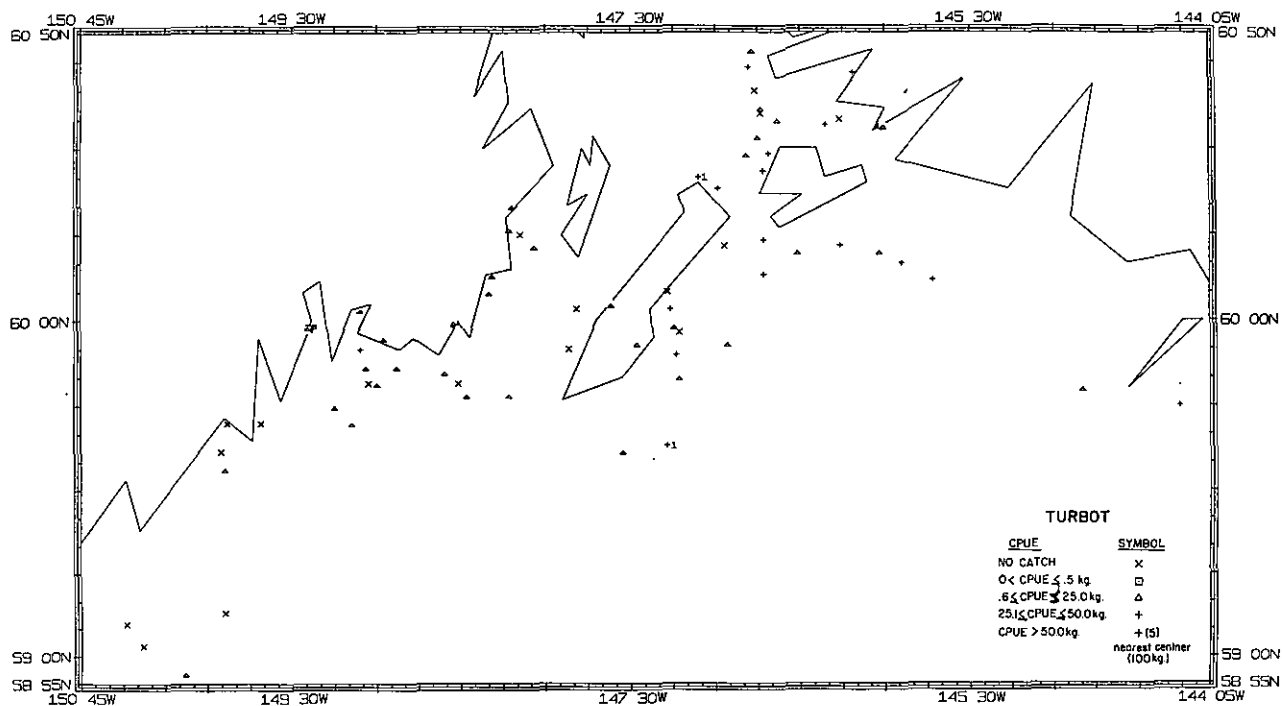


Figure X-148.--Distribution of turbot standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.

The mean CPUE for pandalid shrimp averaged near 200 kg/hr in the inner shelf and outer shelf but only 14 kg/hr in the upper slope (Table X-30). Eight species of pandalid shrimp were captured of which pink shrimp was the dominant species. Pink shrimp made up over 68% of the total shrimp catch in all depth zones, but only 48% of the total species catch on the shelf zones and 12% in the upper slope. The humpy shrimp occurred at abundances which produced mean CPUE's greater than 10 kg/hr in the two shallower depth zones, while coonstripe and sidestripe shrimp exceeded 10 kg/hr in the inner shelf and outer shelf, respectively. Largest concentrations (over 1,000 kg/hr) of pandalid shrimp were located in Tonki Bay, Vikoda Bay, Uganik Bay, Kiluda Bay, Ugak Bay, Alitak Bay and offshore from Sitkalidak Island to Sitkanak Island (Figures X-153-154).

Only four other species occurred at CPUEs greater than 10 kg/hr--king crab and turbot, in the outer shelf and upper slope, and walleye pollock and brittlestars in the outer shelf. Species having individual station catches over 200 kg/hr were king crab in Uganik Bay, and on the continental shelf southeast of Kodiak, turbot in upper Shelikof Strait, walleye pollock in upper Shelikof Strait, on the continental shelf northwest of Kodiak Island and south of Montague Island, and brittlestars in the entrance to Cook Inlet (Figures X-155-162). The catch of these species plus the pandalid shrimp made up over 83% of the total catch in the inner and outer shelves, but only 56% in the upper slope.

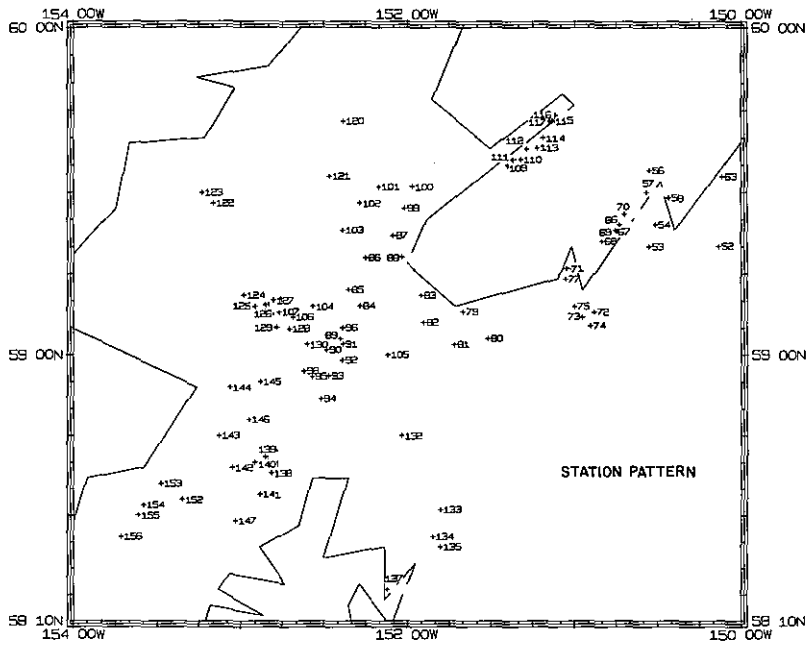
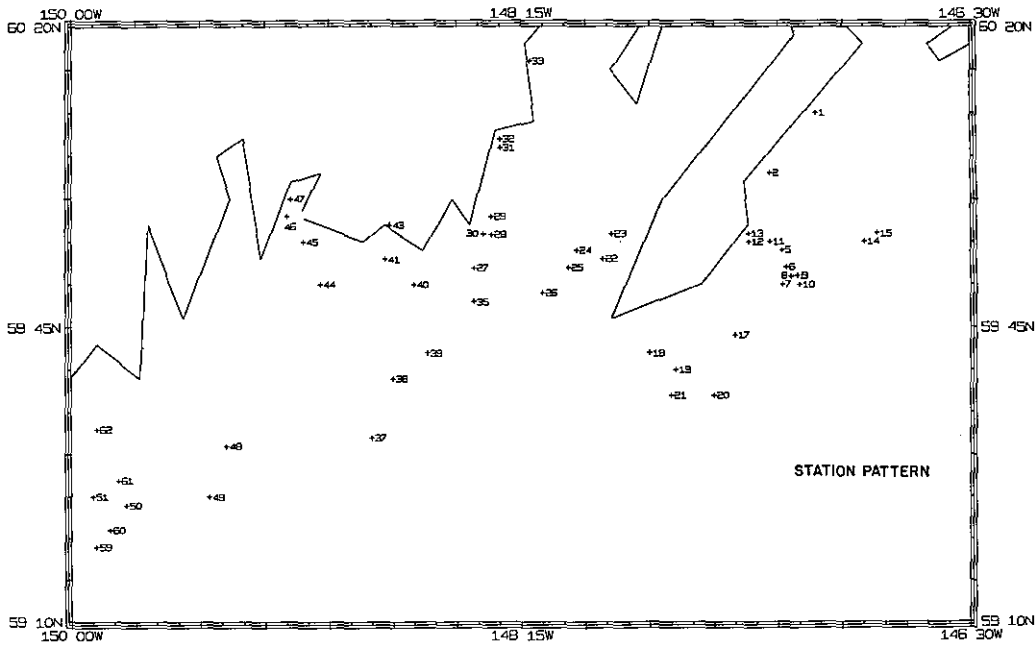


Figure X-149.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel Yaquina.

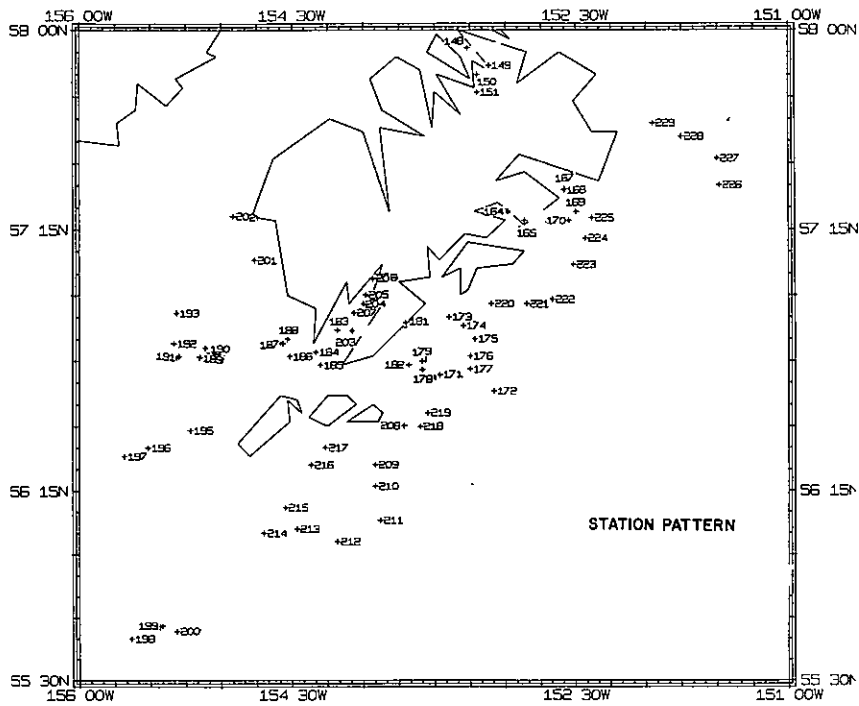


Figure X-150.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel Yaquina.

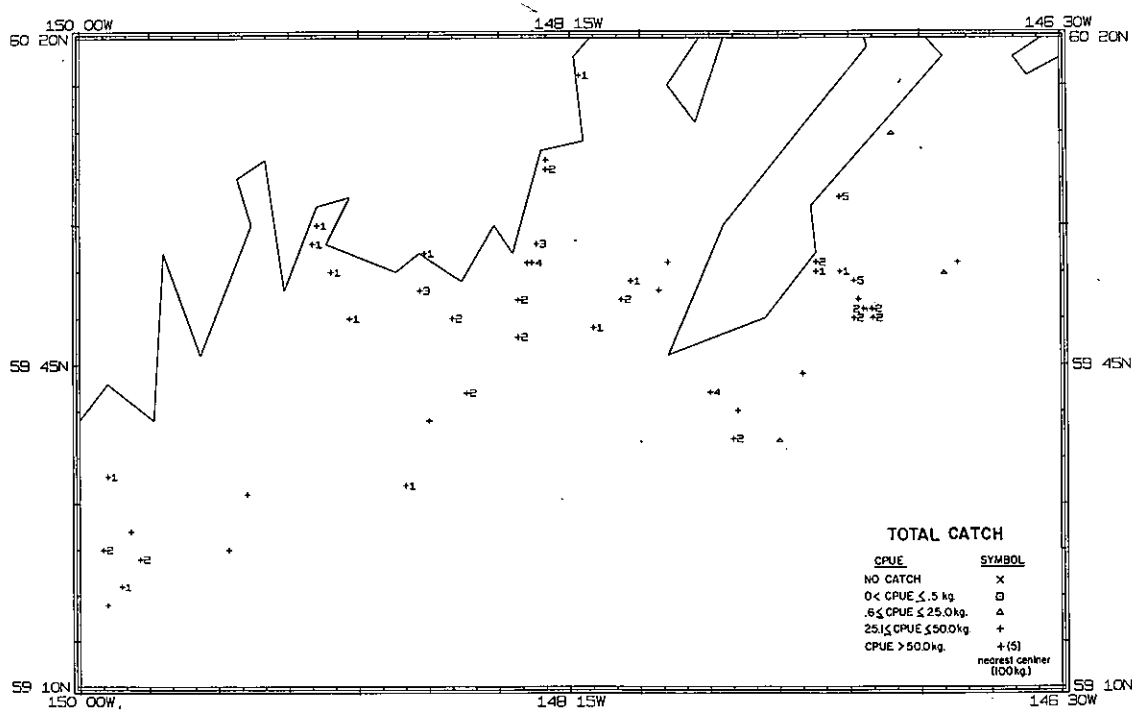


Figure X-151.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 632, charter vessel Yaquina.

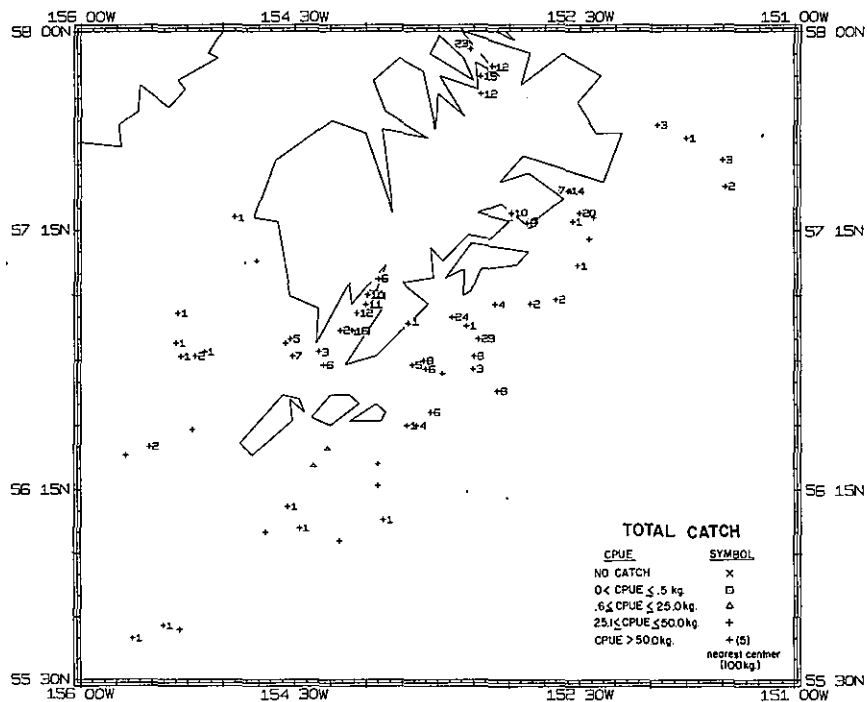
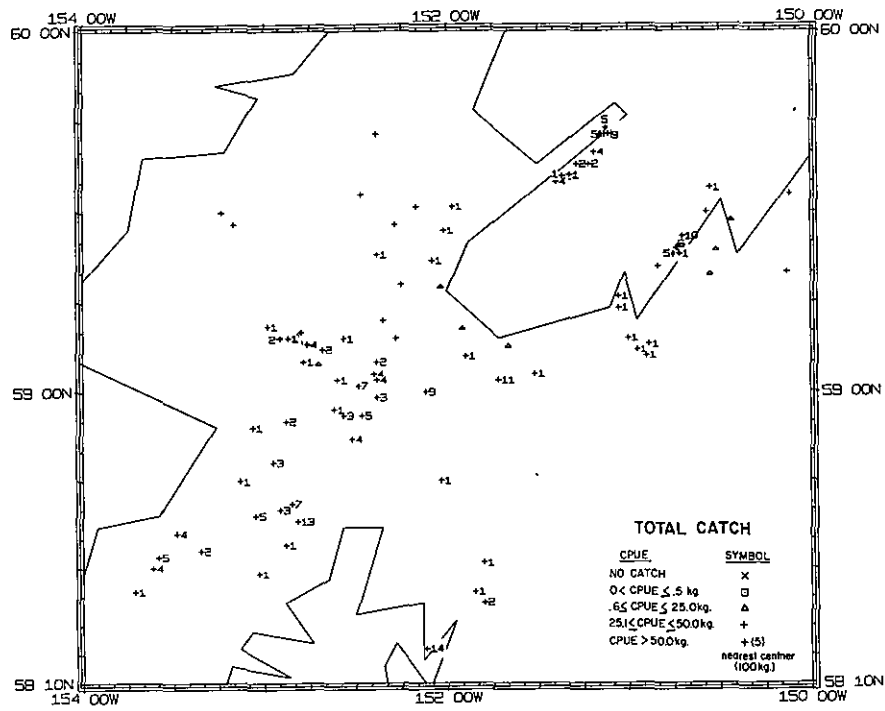


Figure X-152.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 632, charter vessel Yaquina.

Table X-32.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 632, charter vessel Yaquina.

Species or Species groups	Station numbers
Total catch	70, 81, 131, 138, 148-151, 164, 168, 169, 173, 175, 203-205 and 207.
Pandalid shrimp	11, 28, 29, 31, 40, 50, 51, 56, 66, 67, 69, 70, 96, 106, 107, 109, 110, 112-117, 124-126, 129, 134, 135, 137, 138-140, 142, 143, 145, 146, 152-155, 148-151, 164, 165, 167-169, 172, 173, 175-179, 182, 183-186, 188, 203-207 and 218-220.
King crab	99, 137, 149-151, 167, 168, 172, 175, 184, 185, 188, 189, 196, 207, 219-221 and 227.
Walleye pollock	2, 5, 18, 21, 25, 28, 29, 40, 41, 138, 173, 178, 208, 218-220 and 228.
Turbot	2, 5, 8, 9, 18, 27-29, 51, 138, 152, 219, 222 and 226.
Brittlestars	7, 81, 93 and 95.

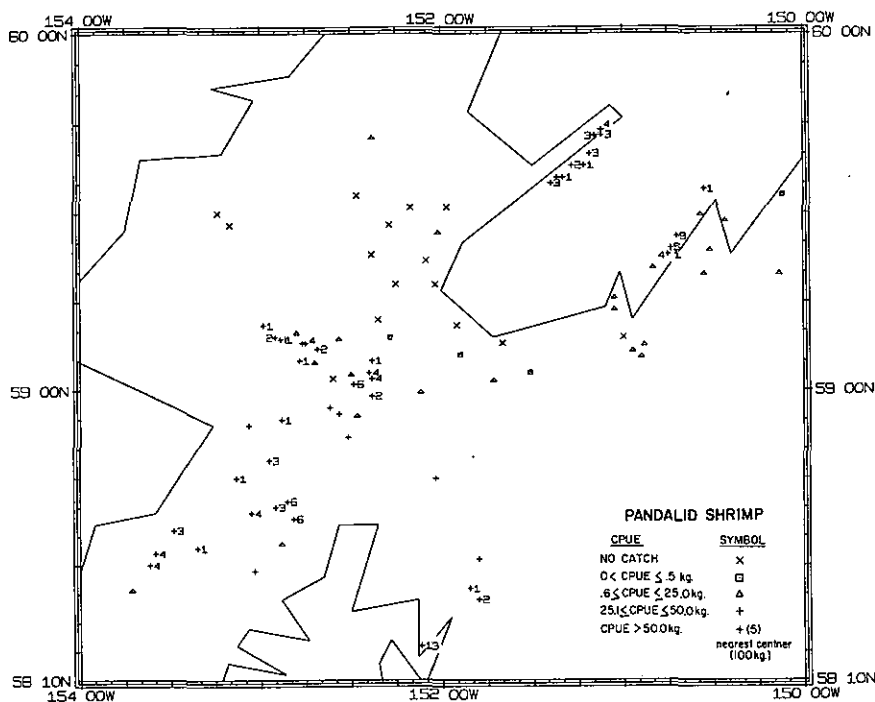
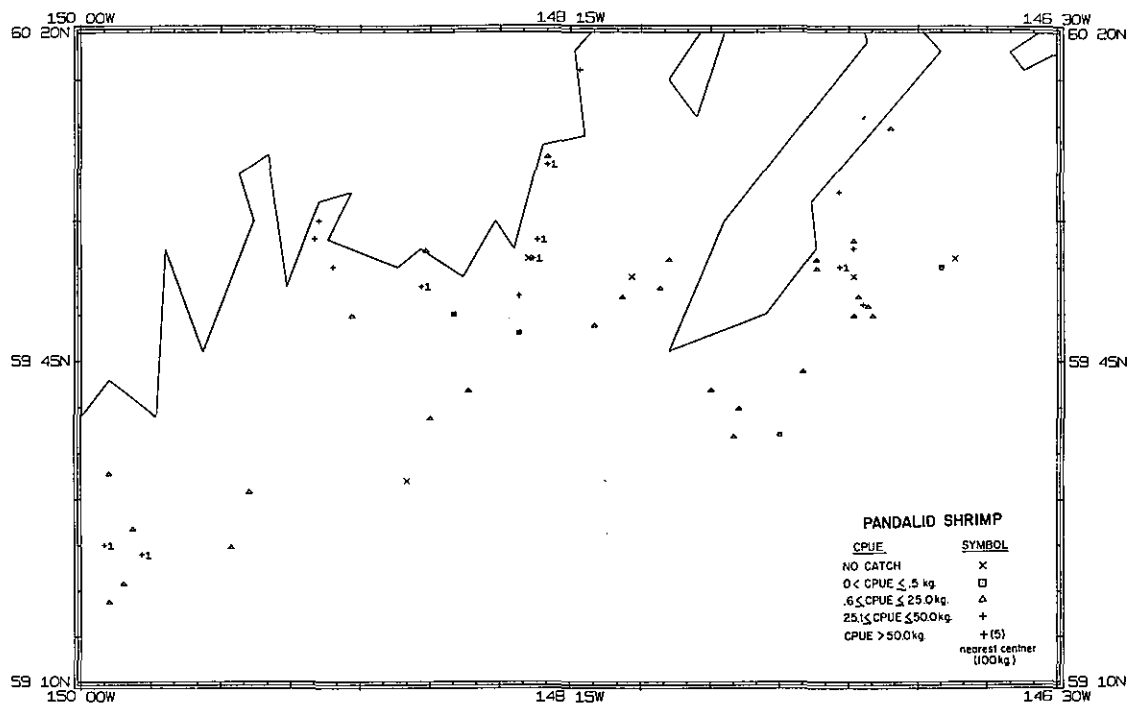


Figure X-153.--Distribution of pandalid shrimp standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

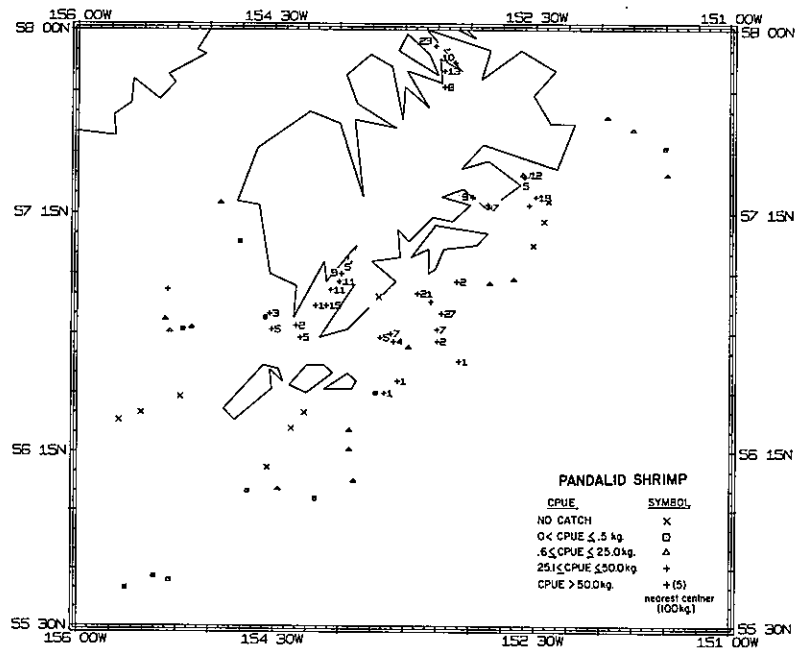


Figure X-154.--Distribution of pandalid shrimp standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

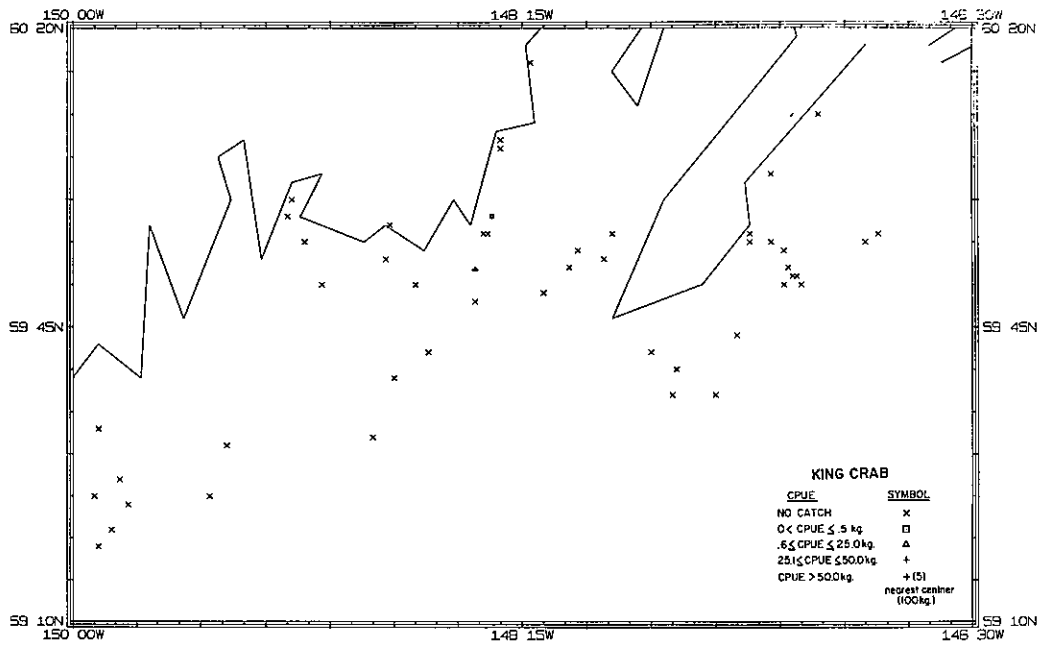


Figure X-155.--Distribution of king crab standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

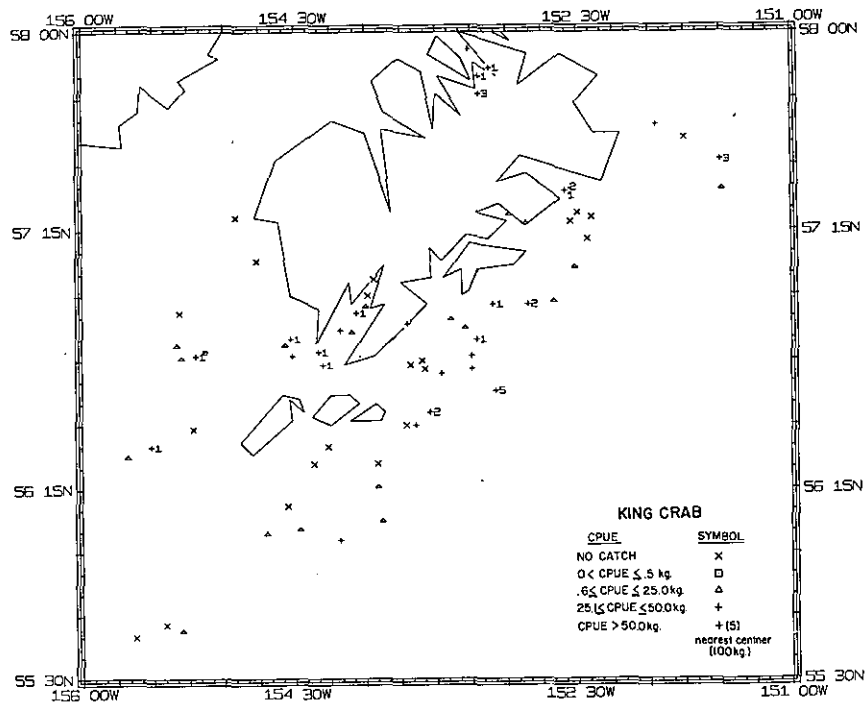
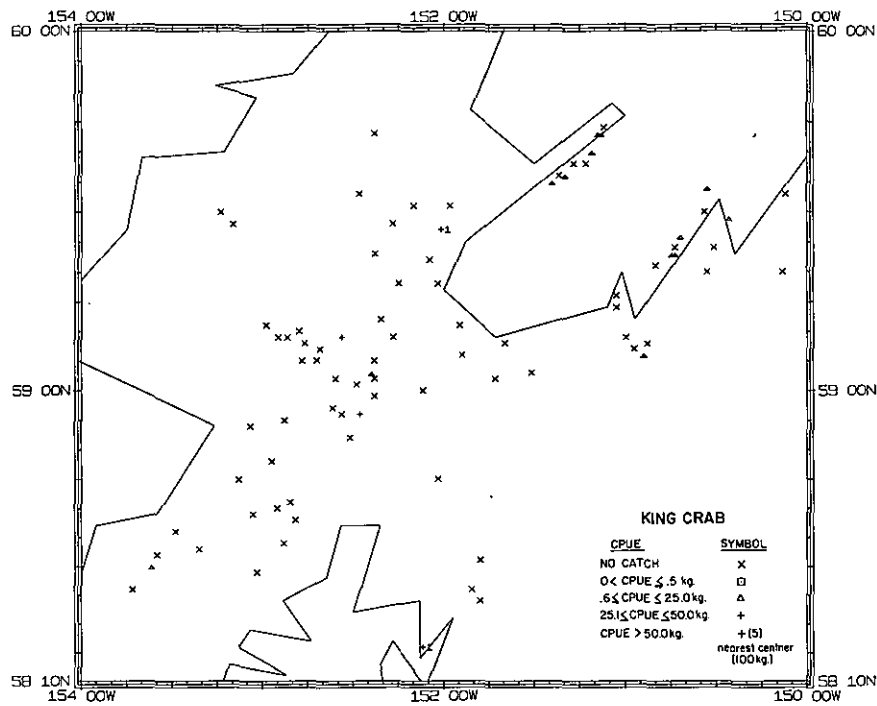


Figure X-156.--Distribution of king crab standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

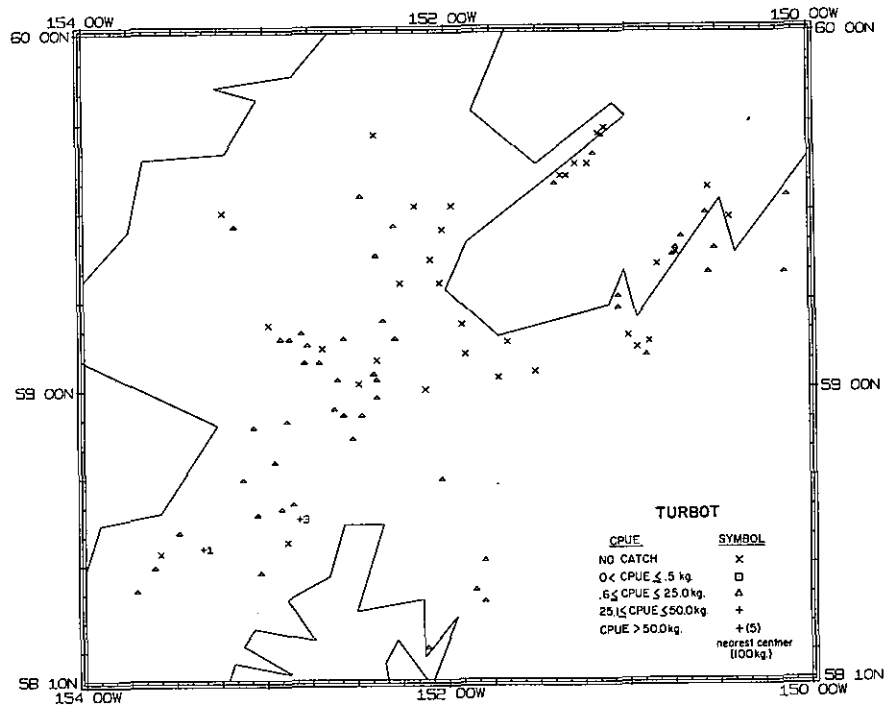
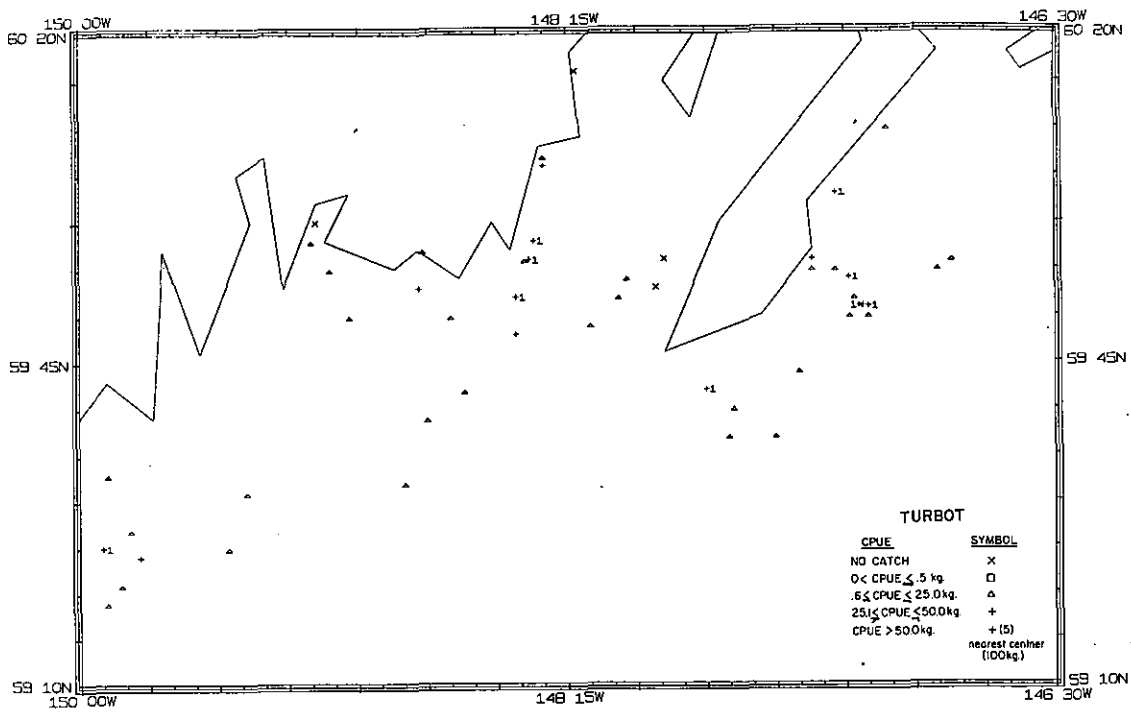


Figure X-157.--Distribution of turbot standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

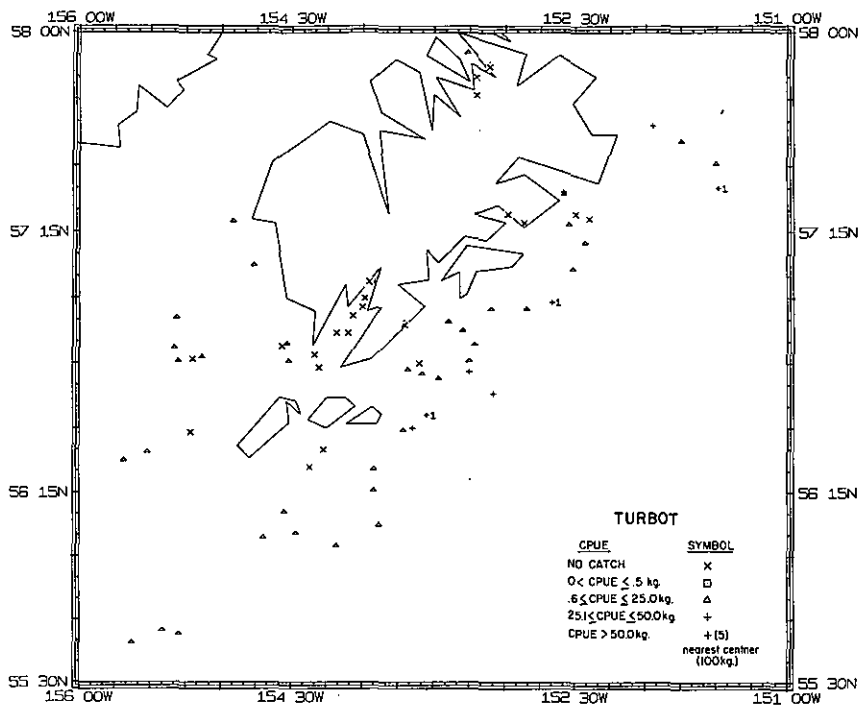


Figure X-158.--Distribution of turbot standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

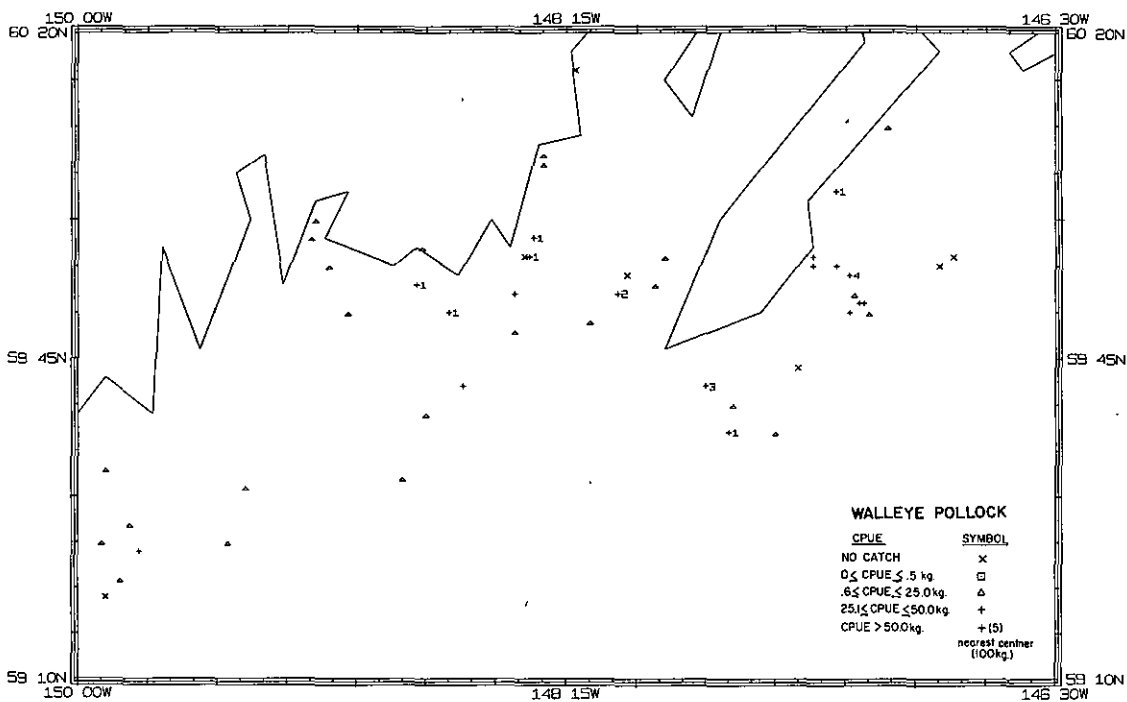


Figure X-159.--Distribution of walleye pollock standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

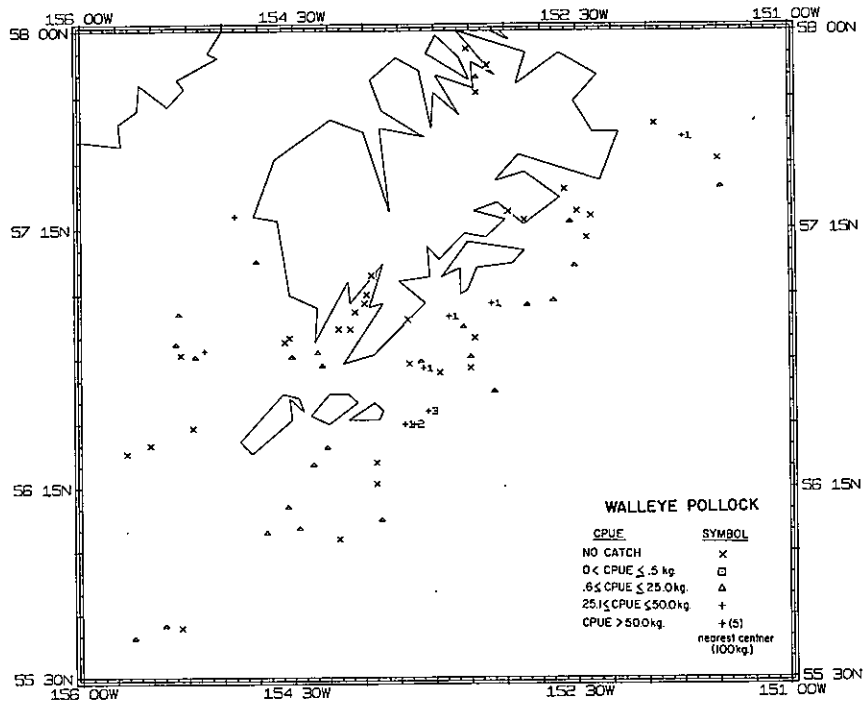
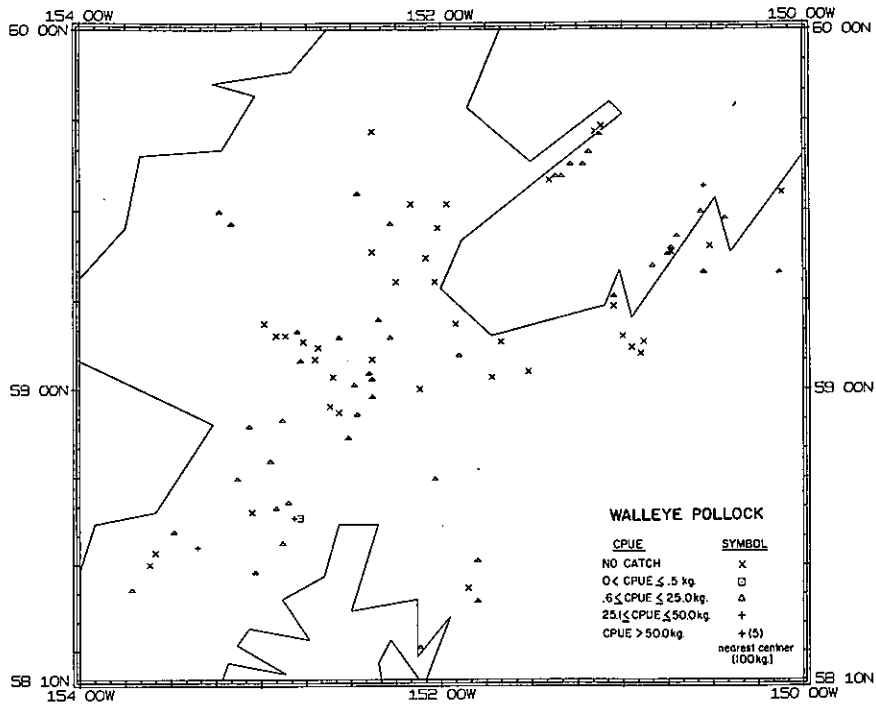


Figure X-160.--Distribution of walleye pollock standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

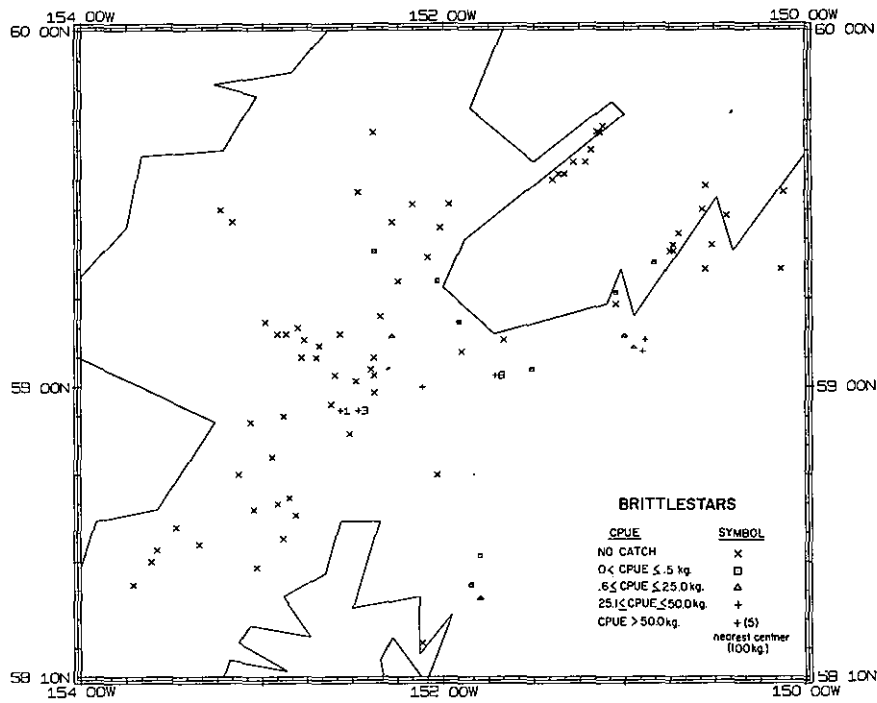
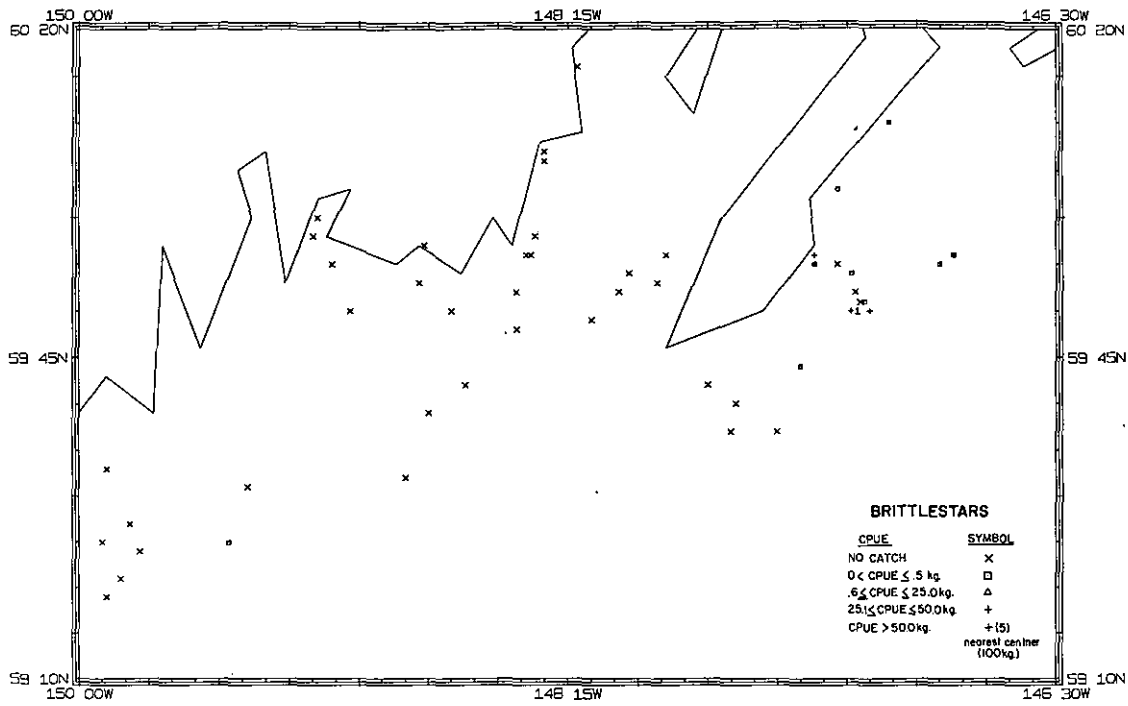


Figure X-161.--Distribution of brittlestars standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

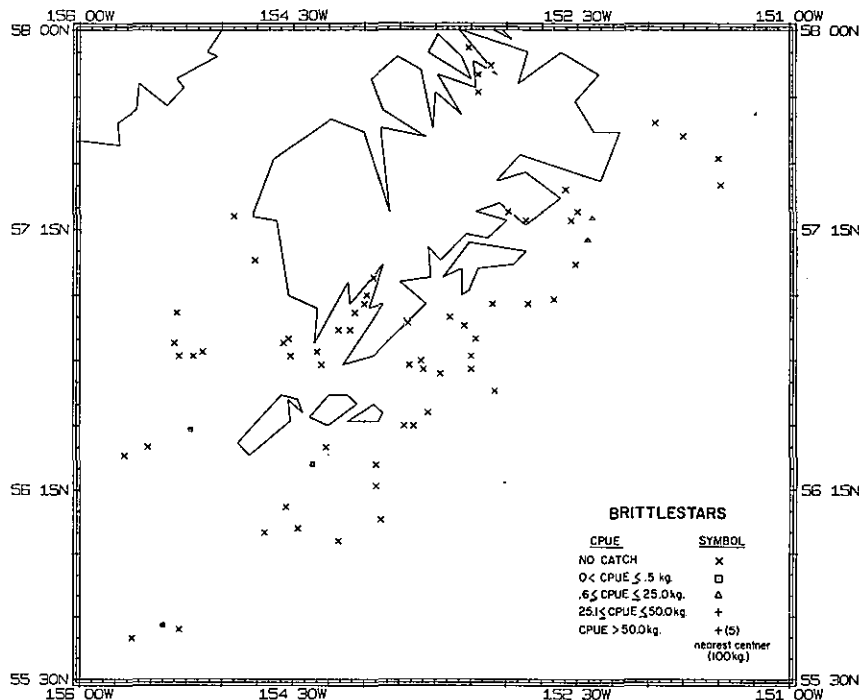


Figure X-162.--Distribution of brittlestars standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

h. Cruise 642, Chartered Fishing Vessel, Paragon (June-August 1964)

An exploratory shrimp cruise was conducted by the BCF in the Kodiak, Shelikof, Chirikof, Shumagin, and Sanak regions. Two hundred and forty three stations were attempted using the 40 ft. Gulf of Mexico-type flat shrimp trawl and 70 ft. semi-balloon type shrimp trawl (figures X-163-164).

Average CPUE's for the total catches of all species exceeded 487 kg/hr in all depth zones with individual standardized station total species catch rates reaching 3,000 kg/hr. High total catch rates, over 1,000 kg/hr, occurred in Marmot Bay and Gully and Shelikof Straits on the continental shelf along the Alaska Peninsula, Castle Bay, Kuiuukta Bay, Stepovak Bay, Unga Strait, Beaver Bay, Pavlof Bay, Belkofski Bay, and Morzhovoi Bay (Figures X-165-166, Table X-33).

The total catches of pandalid shrimp averaged over 400 kg in the outer shelf and the inner shelf, and 156 kg/hr in the upper slope (Table X-30). Pink shrimp made up over 70% of the total catch in the inner and outer shelves and 30% in the upper slope. Humpy shrimp mean CPUE's exceeded 10 kg/hr in the inner and outer shelves, sidestripe shrimp in the outer shelf and upper slope and coonstripe shrimp in the inner shelf. Large catches of pandalid shrimp (over 1,000 kg/hr) occurred in Marmot Bay, Castle Bay, Kuiuukta Bay, Stepovak Bay, West Nagai Straits, Unga Strait, Pavlof Bay, Morzhovoi Bay, Beaver Bay, Belkofski Bay, and along the continental shelf (Figures X-167-168).

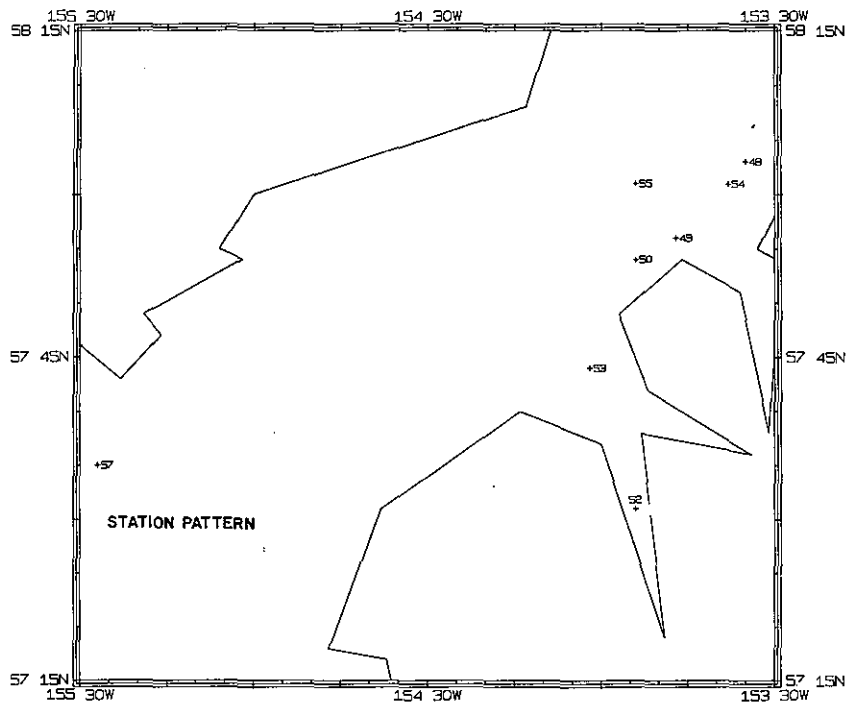
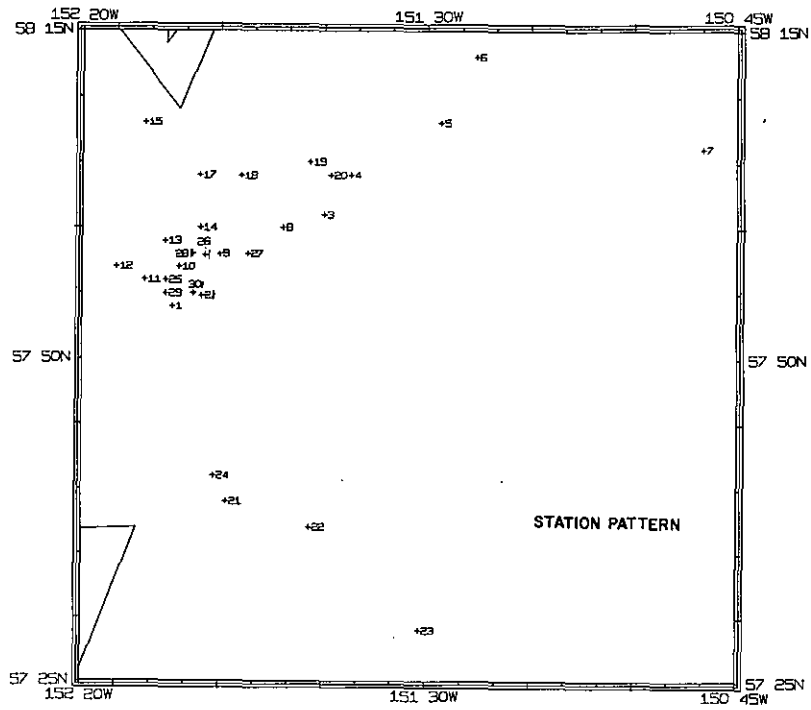


Figure X-163.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel Paragon.

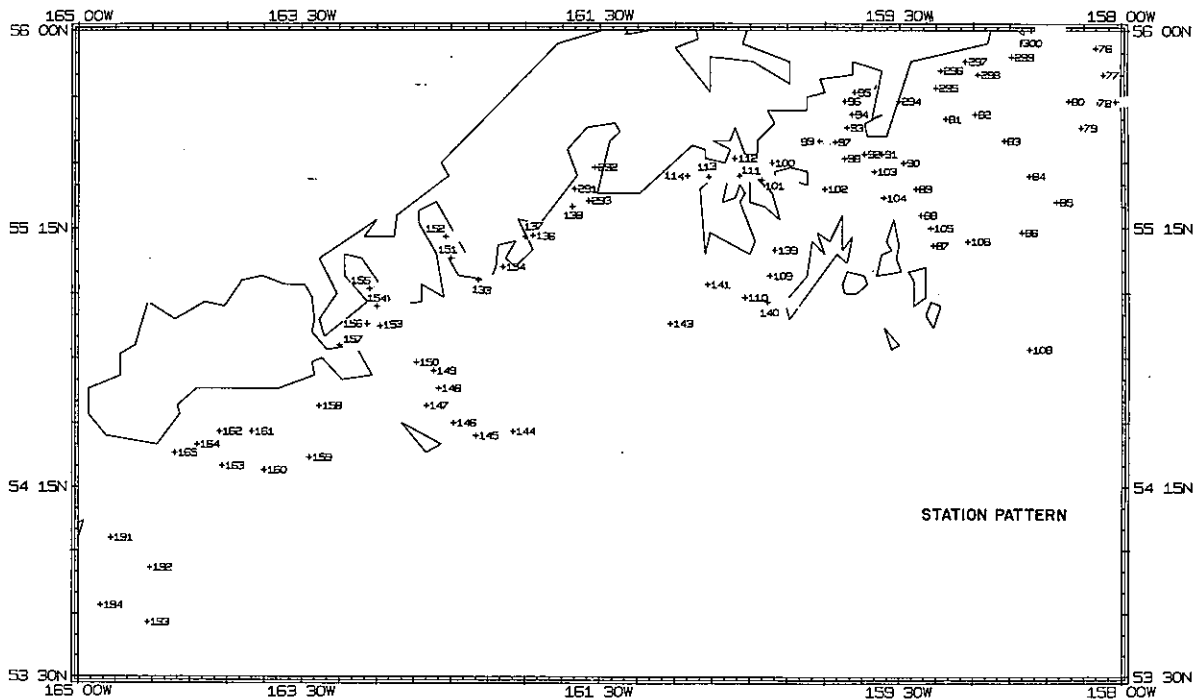
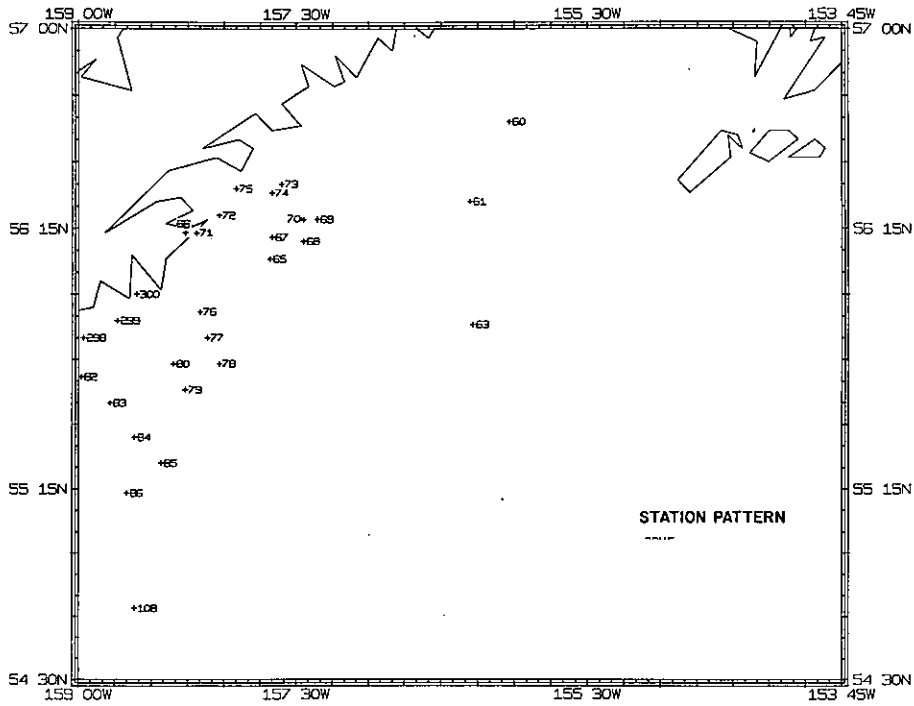


Figure X-164.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel Paragon.

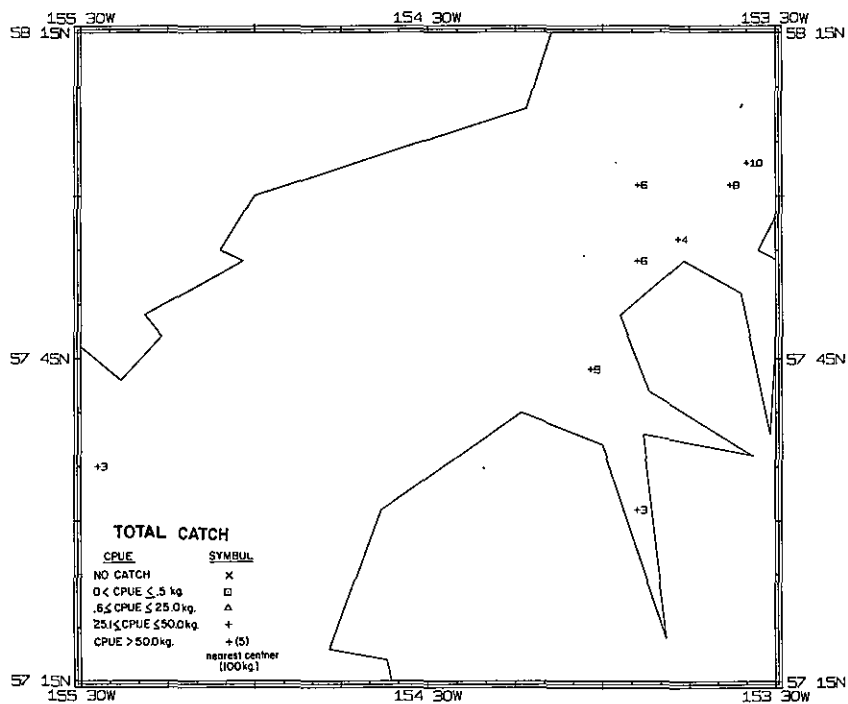
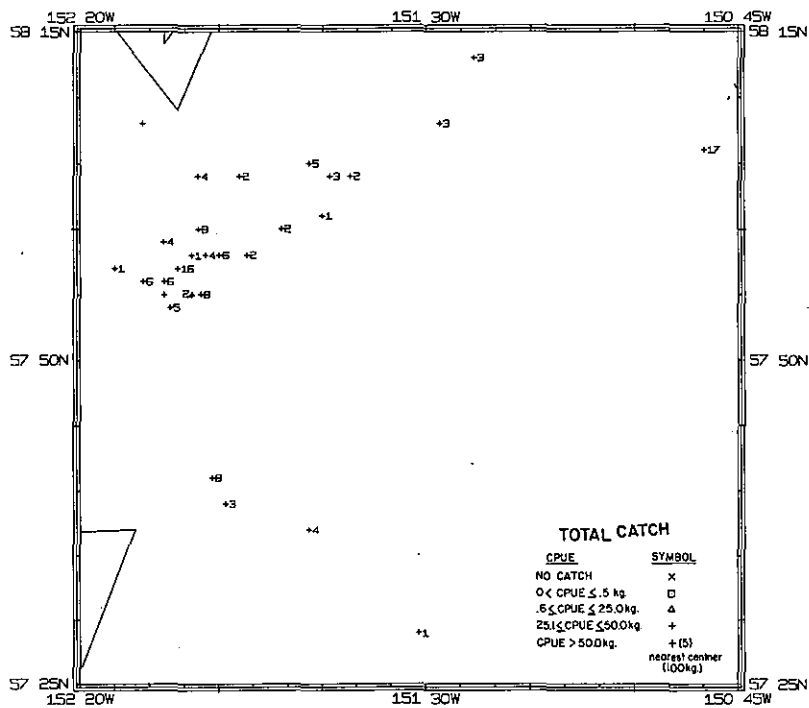


Figure X-165.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 642, charter vessel Paragon.

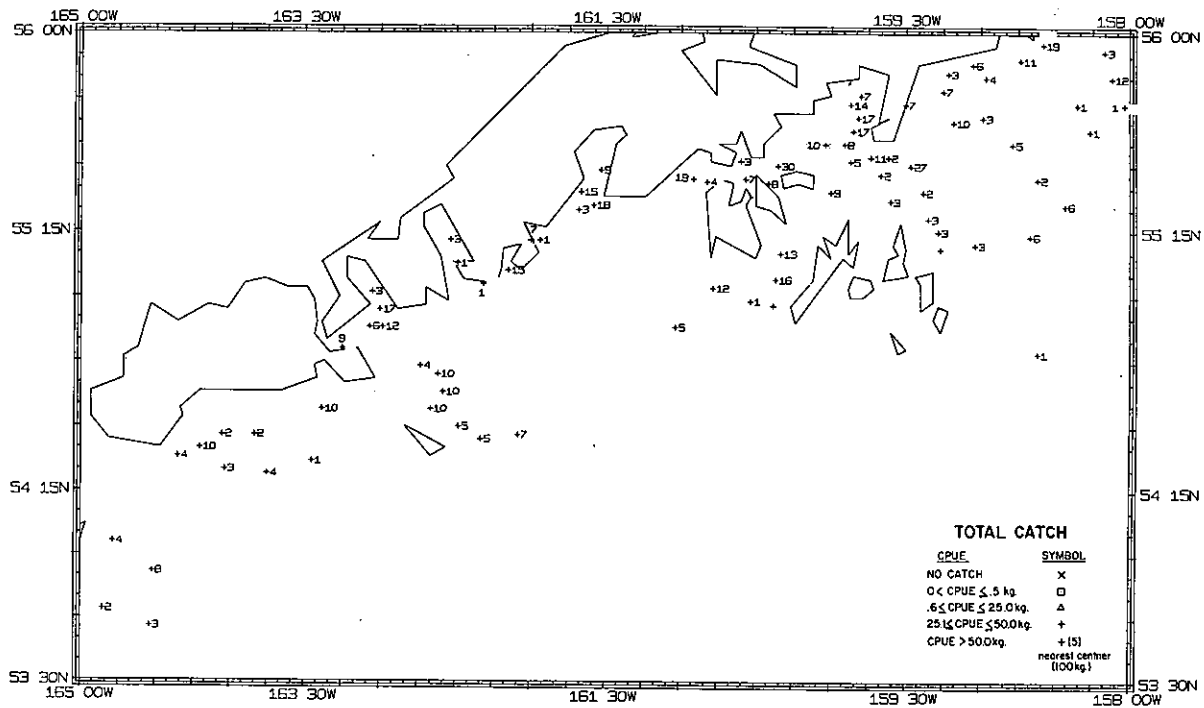
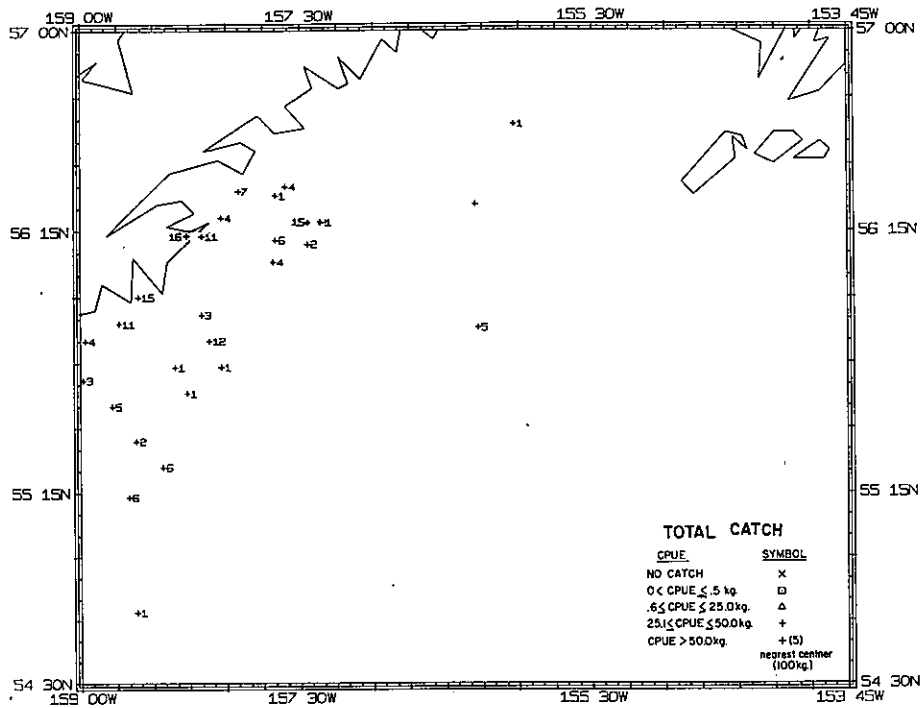


Figure X-166.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 642, charter vessel Paragon.

Table X-33.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 642, charter vessel Paragon.

Species or Species groups	Station numbers
Total catch	7, 10, 48, 66, 70, 71, 77, 81, 90, 92-94, 96, 99, 100, 109, 114, 134, 139, 141, 147-149, 153, 154, 158, 164, 192-194, 291, 293, 299 and 300.
Pandalid shrimp	1, 2, 5, 9-14, 17, 18, 25-28, 30, 52, 53, 55, 60, 63, 65, 66, 68-73, 75-77, 80, 81, 88-97, 99-102, 104, 110-114, 134, 136-139, 141, 143-150, 152-158 and 291-300.
Turbot	1, 4, 6-10, 13, 14, 17-20, 22, 24, 25, 48-50, 53-55, 57, 63, 76, 82-86, 88, 97-99, 103, 144, 145, 159-165 and 192.
Yellowfin sole	None
Starfish	None
King crab	53, 114, 141, 150, 157, 162-164, 192 and 292.
Flathead sole	1, 4, 6, 7, 9, 10, 13, 19, 20, 24, 26, 48, 53, 55, 83, 85, 86, 98, 144, 145, 160 and 164.
Walleye pollock	7, 48, 49, 54, 55, 109, 114, 153 and 154.
Pacific ocean perch	7, 26, 27, 54 and 108.
Cottids	2, 22, 24, 105, 106 and 191.
Sponge	None
Tanner crab	2, 21 and 153.
Rock sole	191.

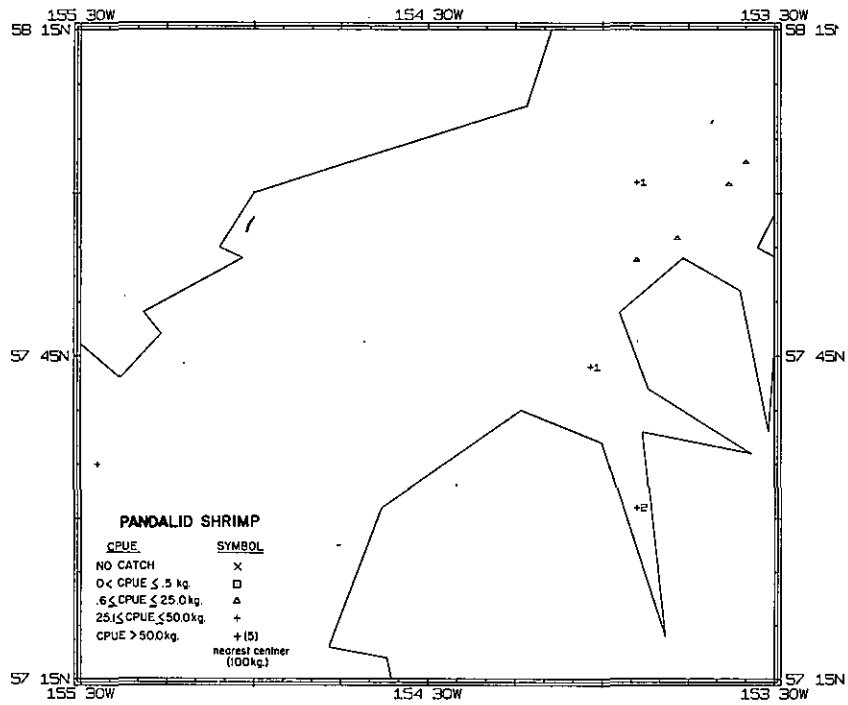
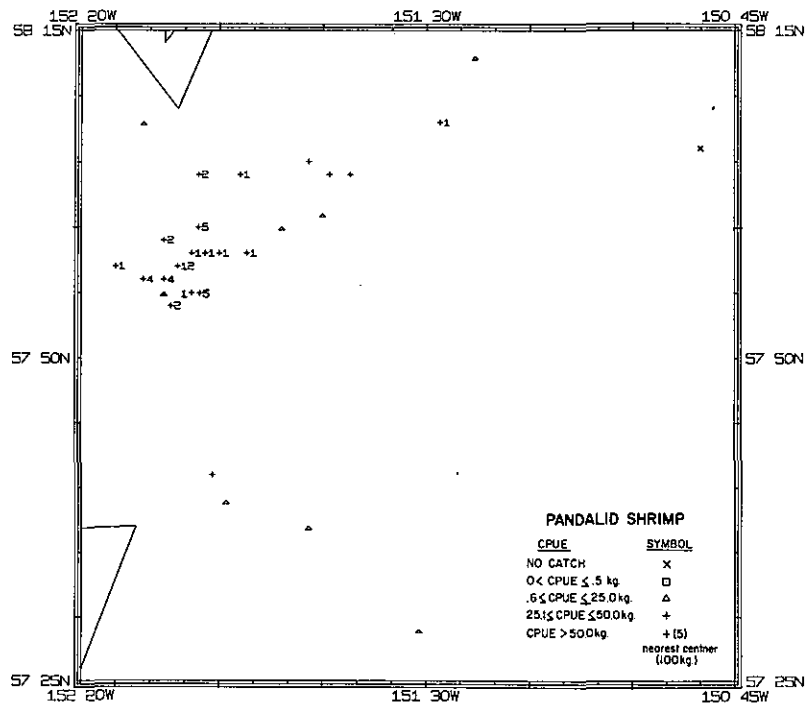


Figure X-167.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

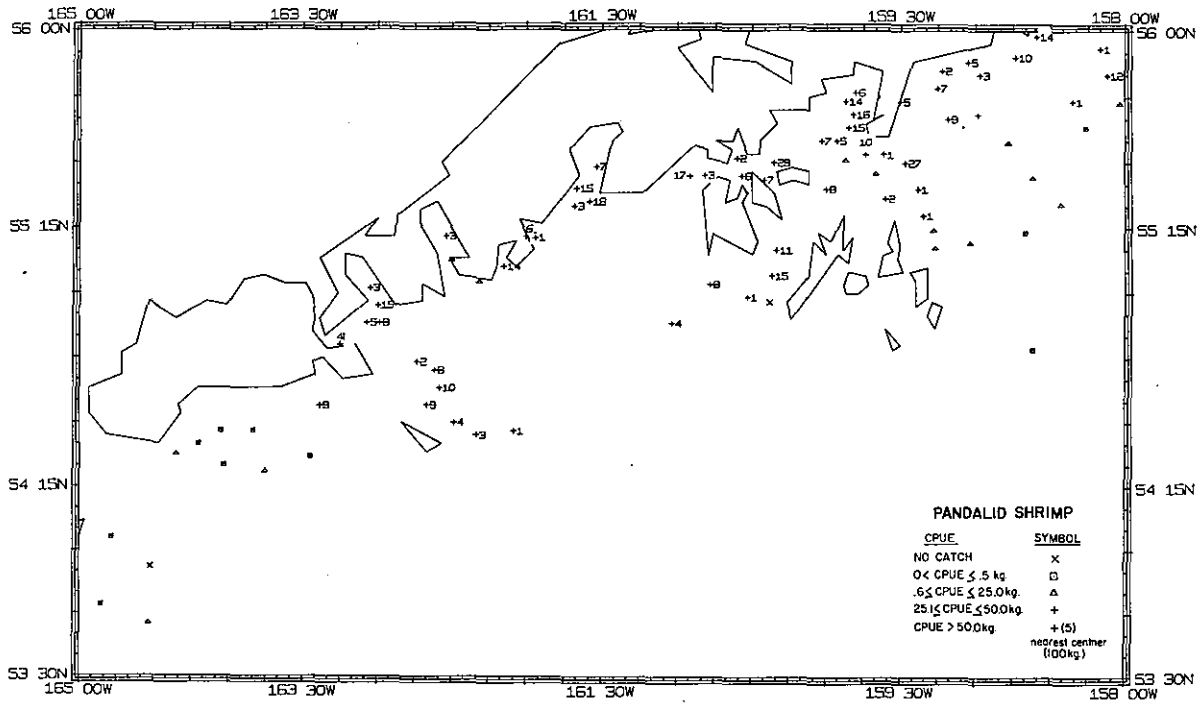
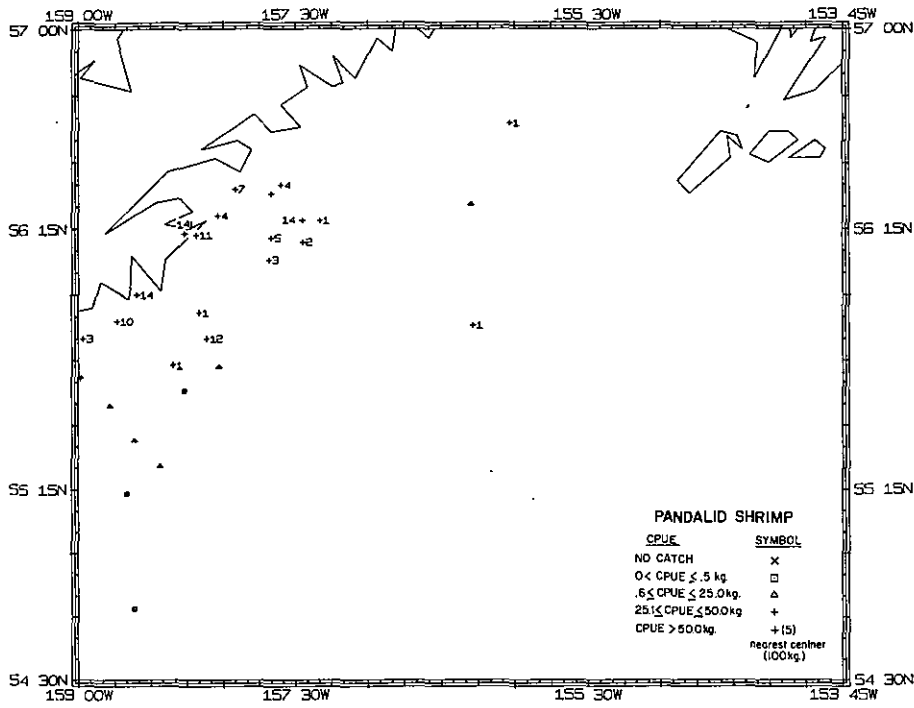


Figure X-168.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

Eight species or species groups occurred at mean CPUE's greater than 10 kg/hr; walleye pollock in all three depth zones, turbot, flathead sole, Pacific ocean perch and Tanner crab in the two deeper depth zones, king crab in the inner and outer shelves, starfish in the inner shelf, and cottids in the outer shelf. Five species of fish and invertebrates produced standardized catch rates of 200 kg/hr or more. These were turbot in Marmot Bay, Shelikof Strait, and along the continental shelf, king crab on the continental shelf west of the Shumagin Islands and in Ikatan Bay, walleye pollock in Shelikof Strait, flathead sole in Shelikof Strait and on the continental shelf, and Pacific ocean perch on the continental shelf. (Figures X-169-178). The distribution of the standardized catch rates for the remaining species with mean catches over 10 kg/hr in a depth zone are presented in Figures X-179-190. These species plus the pandalid shrimp accounted for over 81% of the total catch in all depth zones.

i. Cruise 682, R/V John R. Manning (July-September 1968)

An exploratory shrimp cruise was conducted by BCF in the Kodiak and Shelikof regions. Seventy-nine stations were attempted with a 65 ft. Nordby shrimp trawl (Figure X-191).

The average catch of all species was highest in the outer shelf (1,595 kg/hr) and averaged 744 kg/hr in the inner shelf and 295 kg/hr in the upper slope with standardized catch rates up to 13,100 kg/hr. Numerous large catches (over 1,000 kg/hr) were made in Marmot Bay and Marmot Gully, and the continental shelf along the southeastern side of Kodiak Island, Uganik Bay, Raspberry Strait and the northeastern side of Shelikof Strait (Figure X-192, Table X-34).

Pandalid shrimp catches during this cruise averaged over 600 kg/hr in the inner and outer shelves and only 49 kg/hr in the upper slope (Table X-30). Pink shrimp constituted over 68% of the pandalid shrimp catch in all 3 depth zones. Other shrimp mean CPUE's over 10 kg/hr were humpy shrimp in the shelf zones, coonstripe in the inner shelf, and sidestripe in the outer shelf. Catches of pandalid shrimp of 1,000 kg/hr or more were made in Marmot Bay, Uganik Bay, Raspberry Strait, and along the northeast side of Shelikof Straits (Figure X-193).

Seven species, other than pandalid shrimp, occurred at significant levels. Pollock averaged over 10 kg/hr in all depth zones and was particularly abundant in the outer shelf. Turbot, flathead sole, and Pacific cod averaged 10 kg/hr or more in the inner shelf and the outer shelf, Pacific herring and yellowfin sole in the inner shelf and Tanner crab in the upper slope. During this cruise period, walleye pollock were particularly abundant along the southeast coast of Kodiak Island where several station catch rates exceeded 200 kg/hr or more (Figure X-194). Turbot, flathead sole, and Pacific cod also had station catch rates of 200 kg/hr or more, primarily along the southeastern coast of Kodiak Island (Figures X-195-197). The distribution of the standardized catches for the other species averaging over 10 kg/hr are presented in Figures X-198-200. These species, plus pandalid shrimp, made up over 88% of the total catch in the three depth zones.

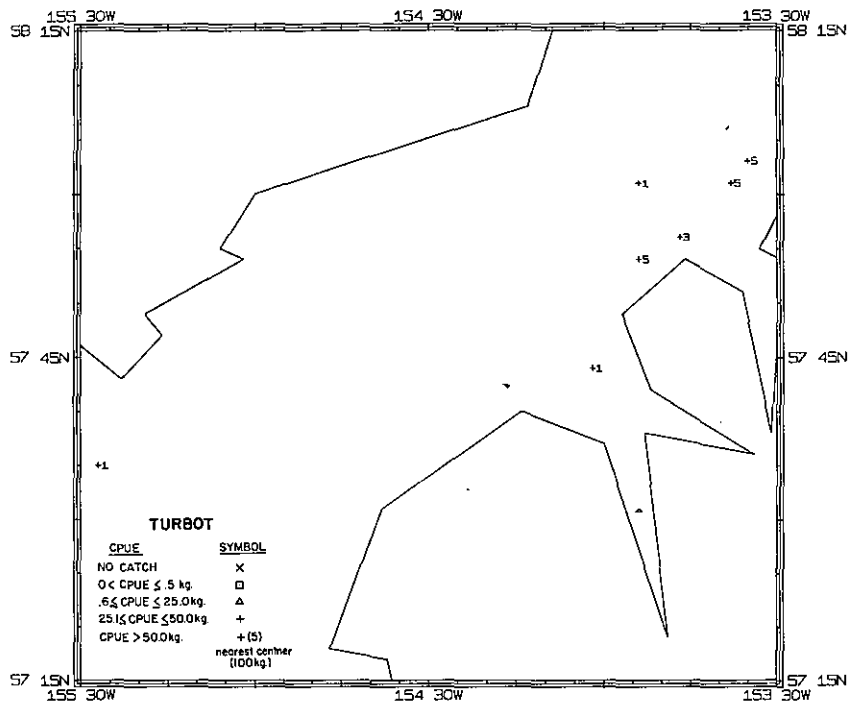
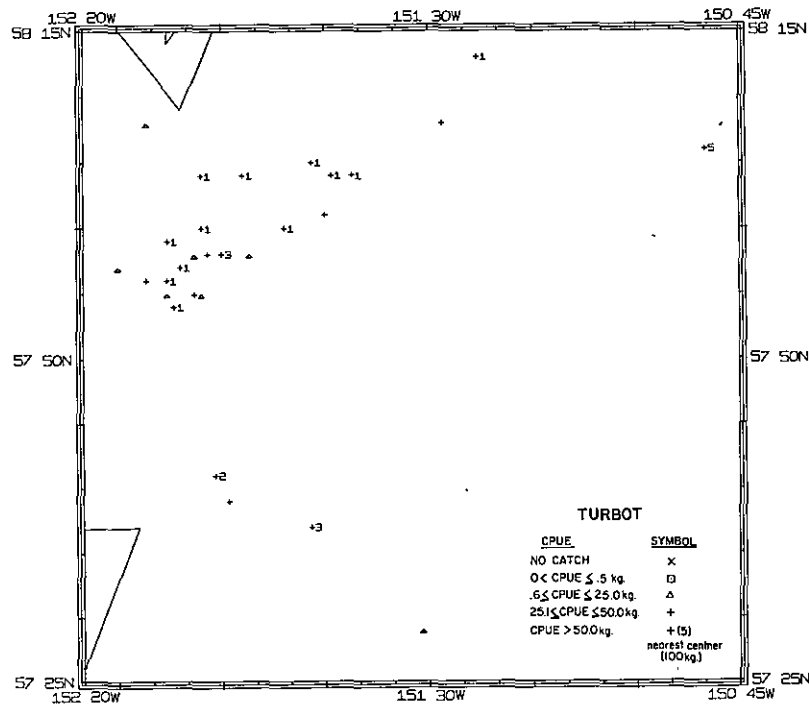


Figure X-169.--Distribution of turbot standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

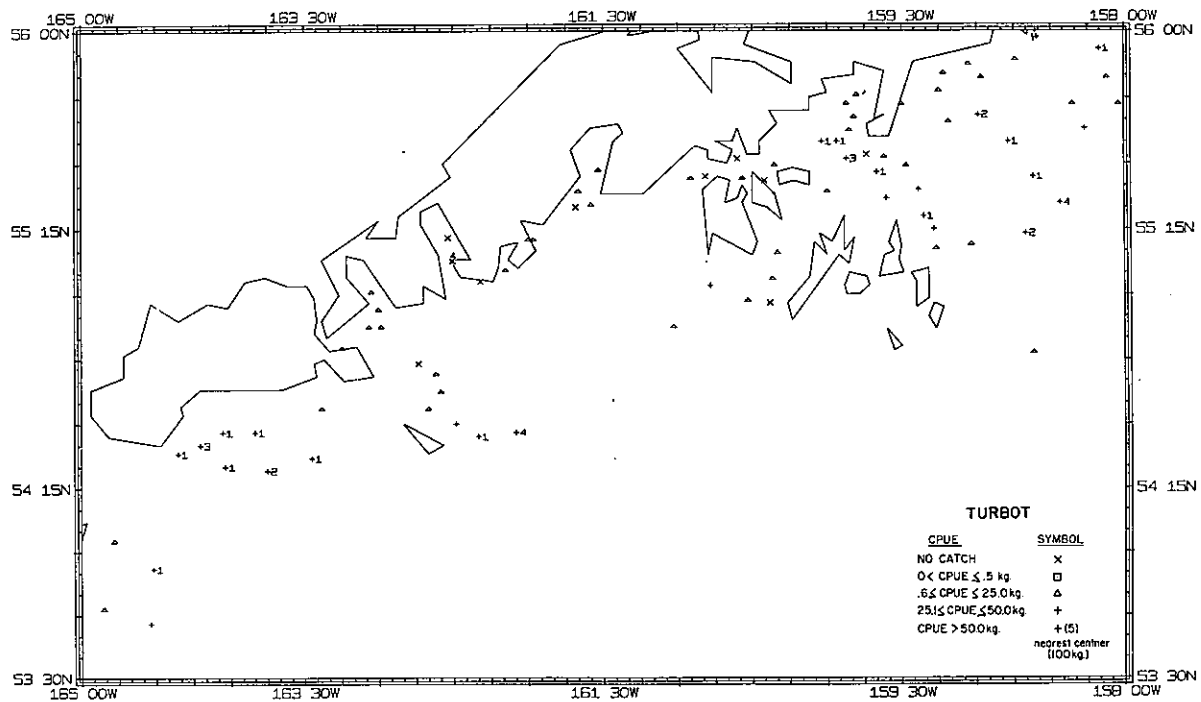
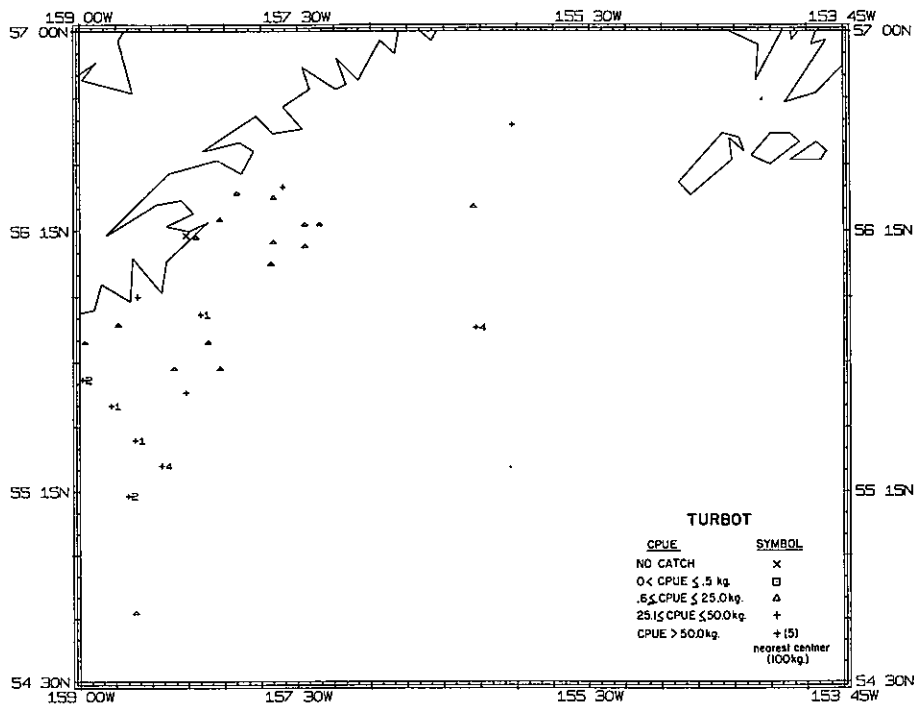


Figure X-170.--Distribution of turbot standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

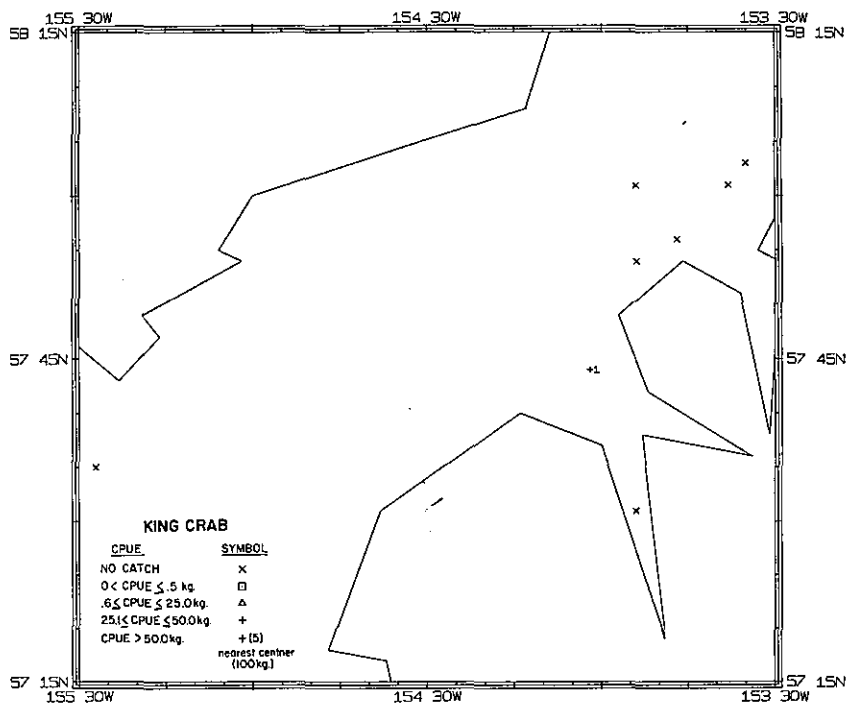
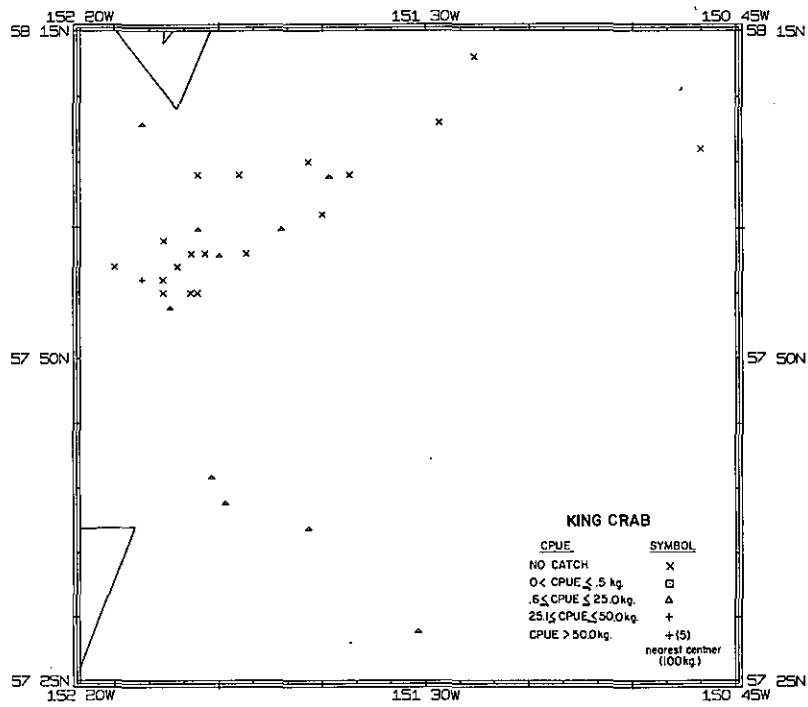


Figure X-171.--Distribution of king crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

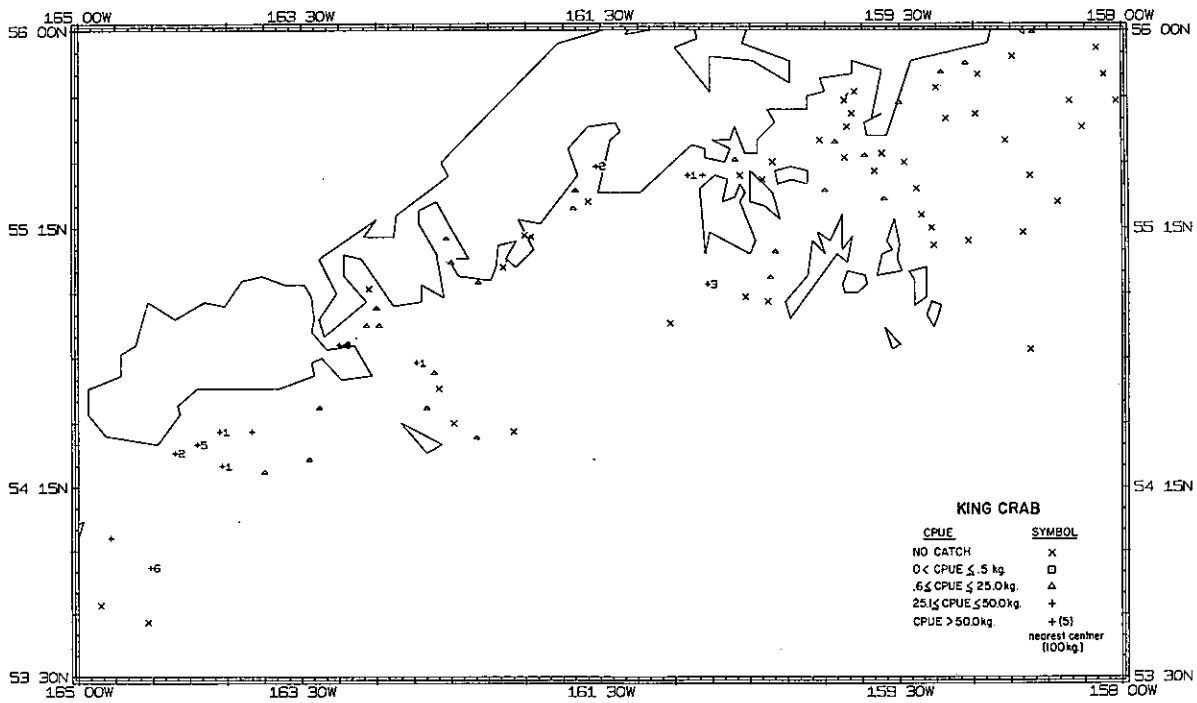
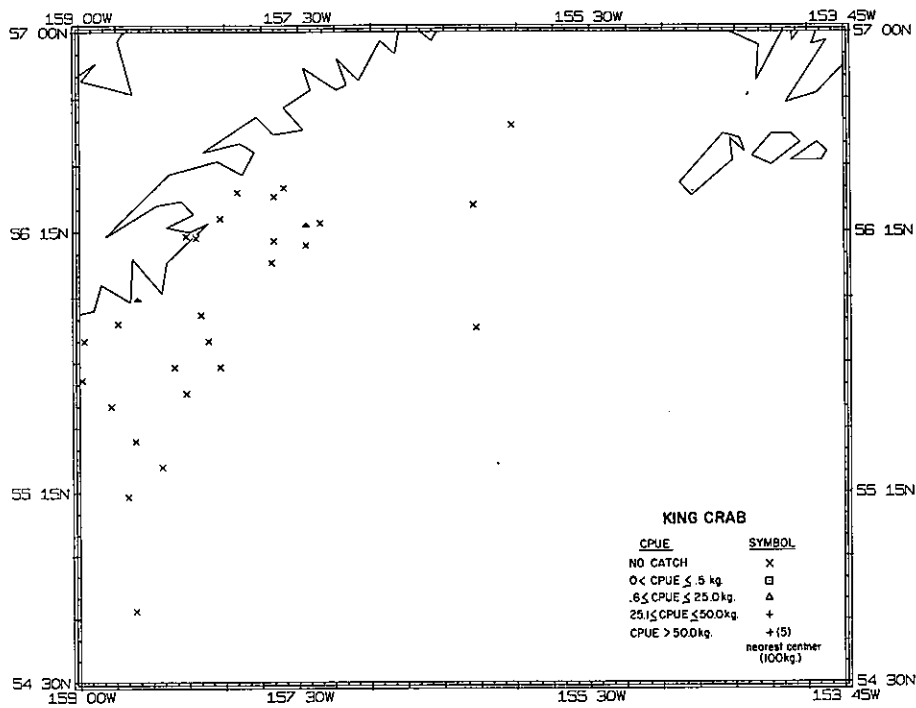


Figure X-172.--Distribution of king crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

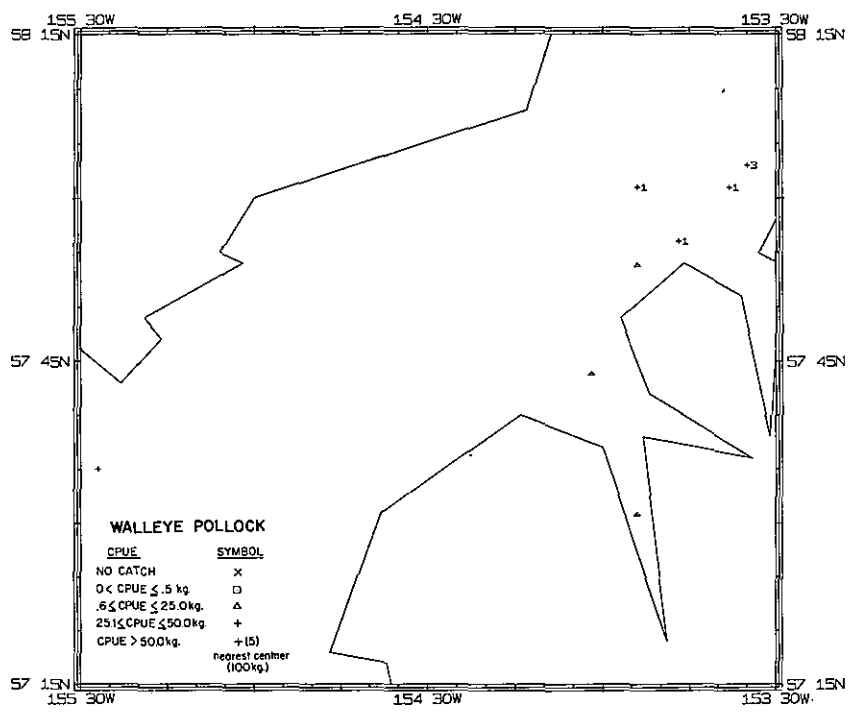
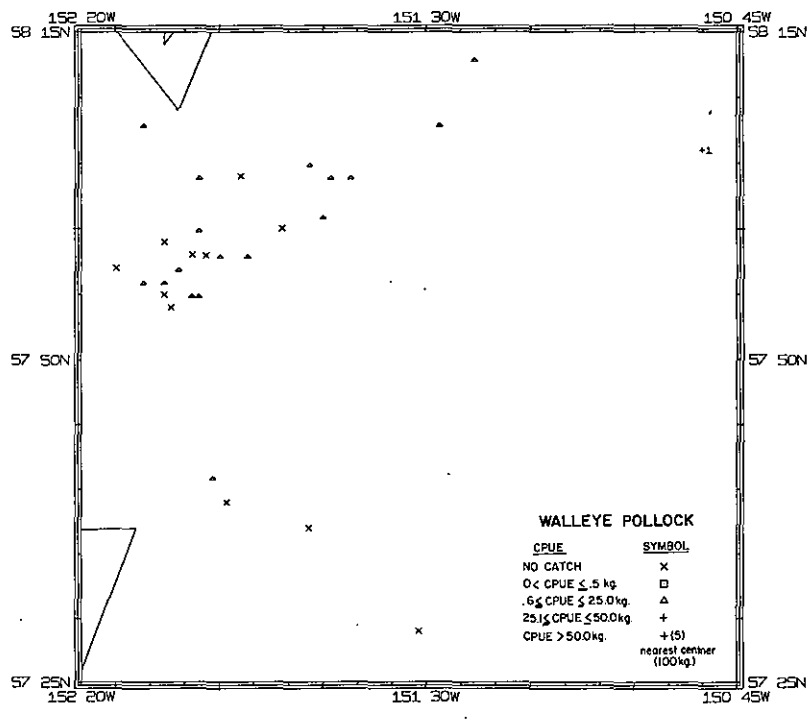


Figure X-173.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

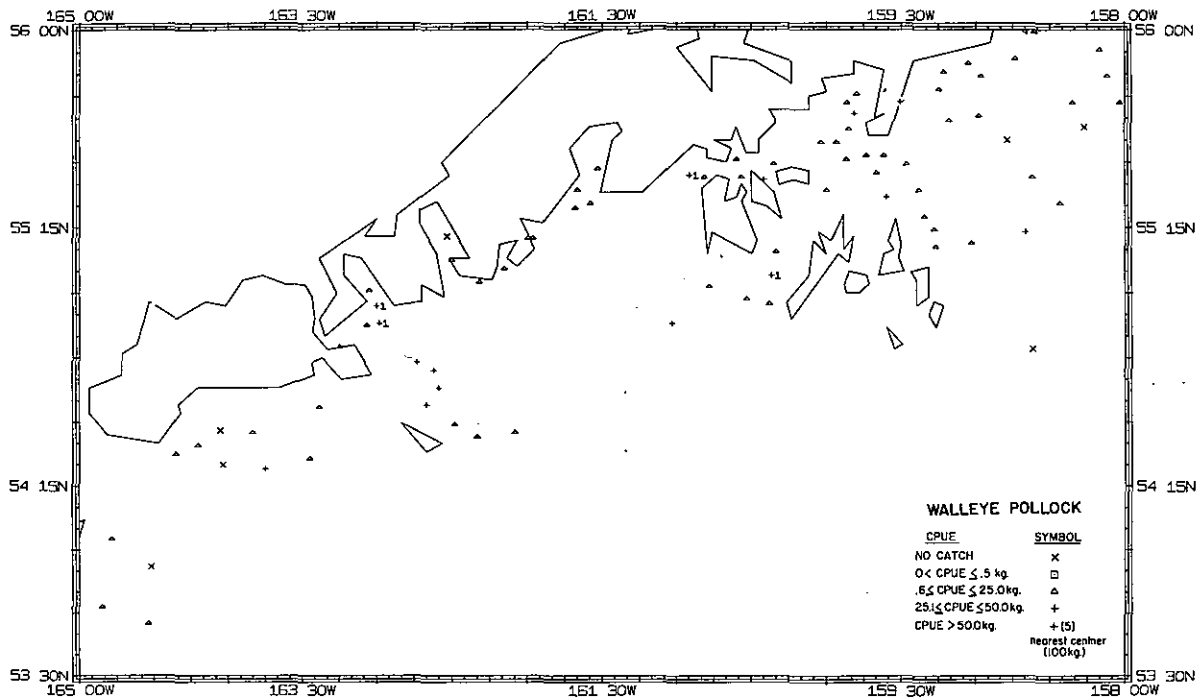
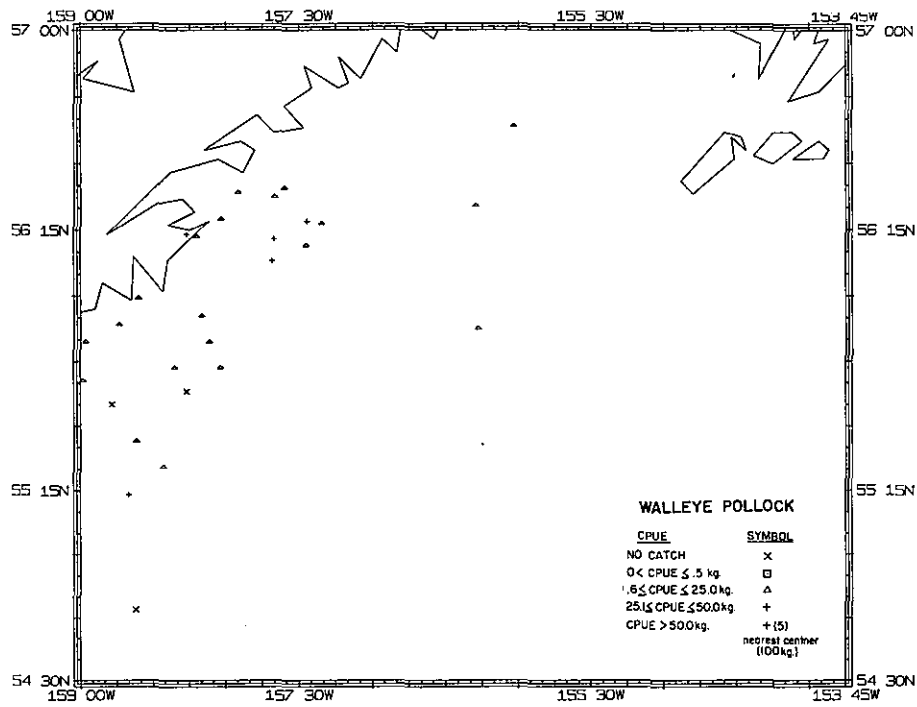


Figure X-174.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

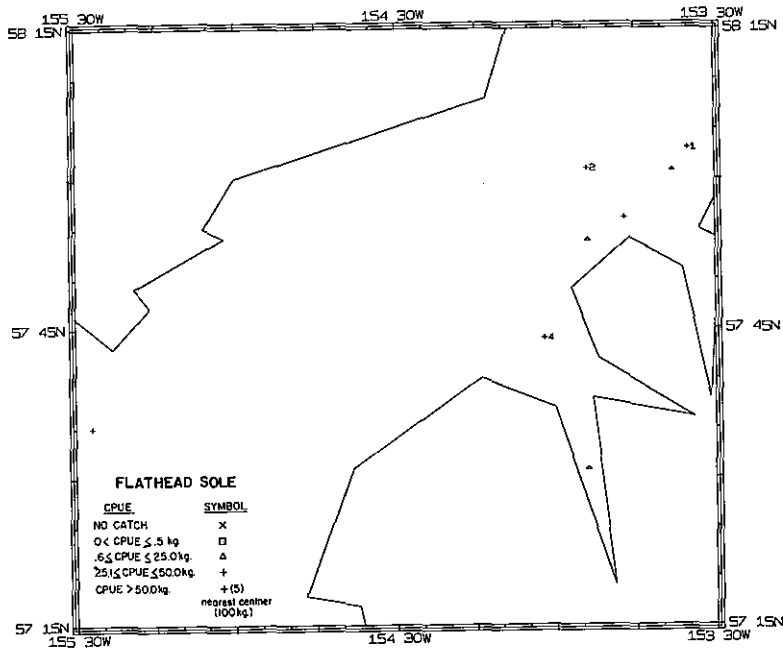
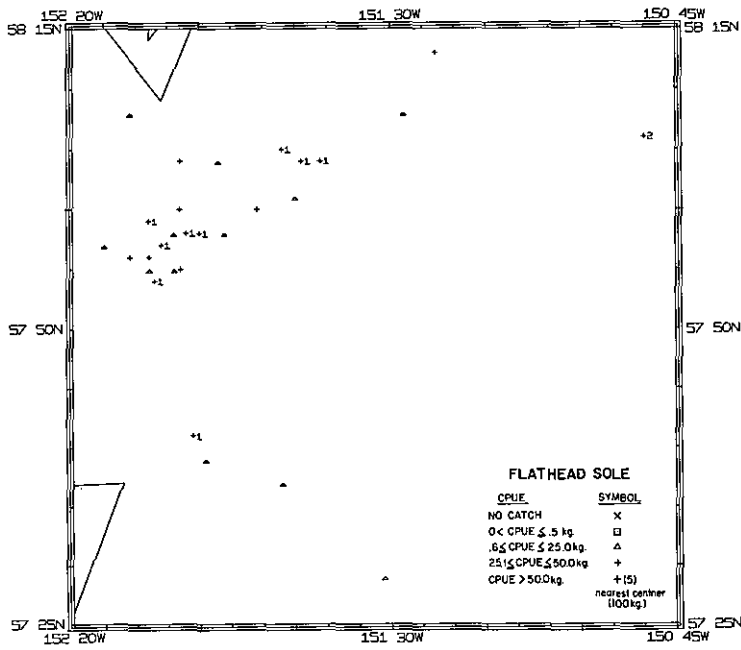


Figure X-175.--Distribution of flathead sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

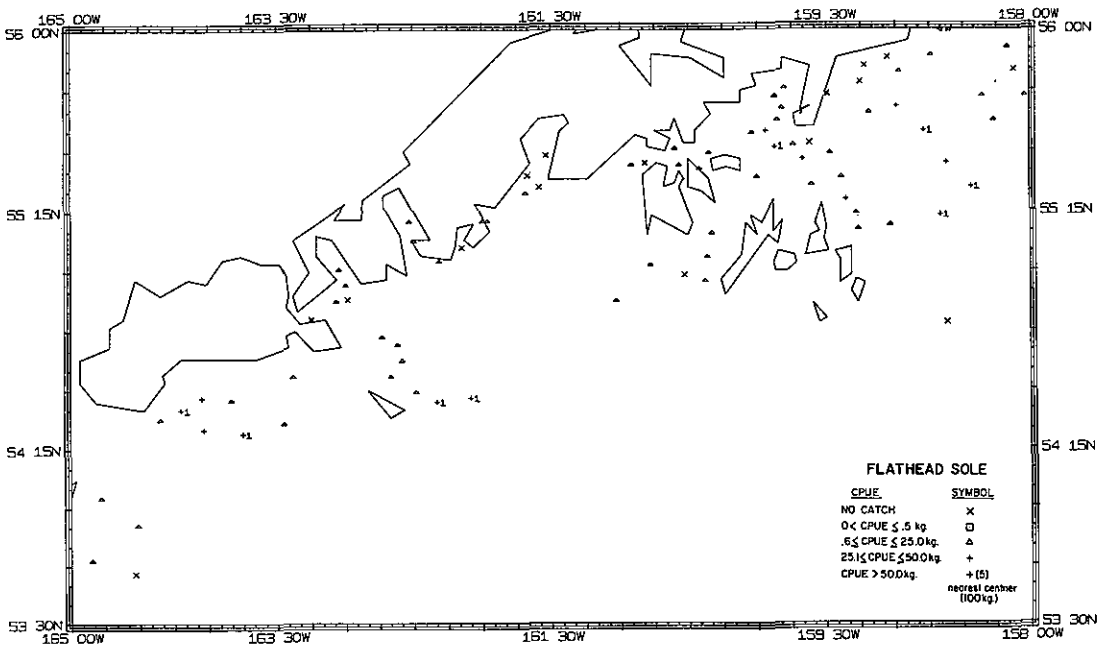
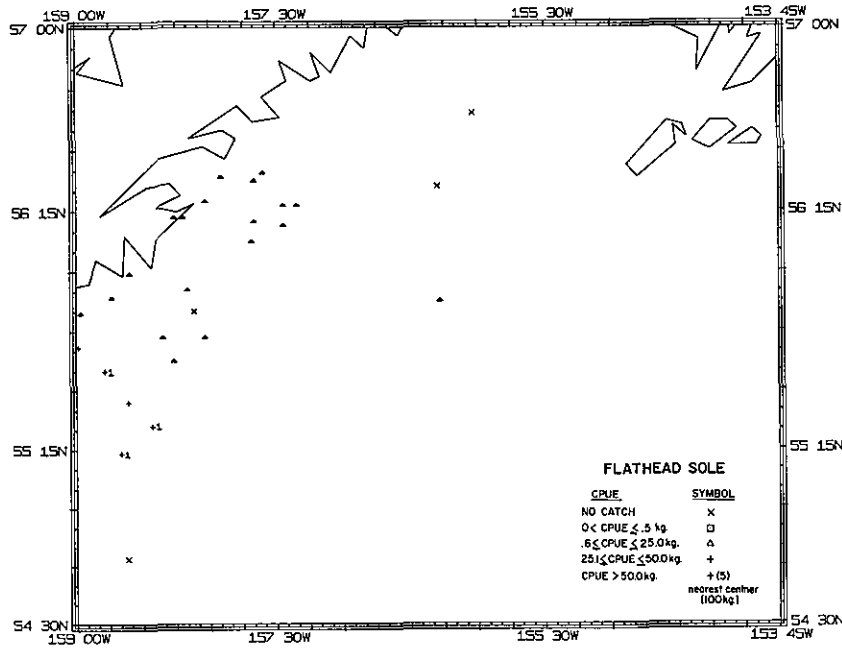


Figure X-176.--Distribution of flathead sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

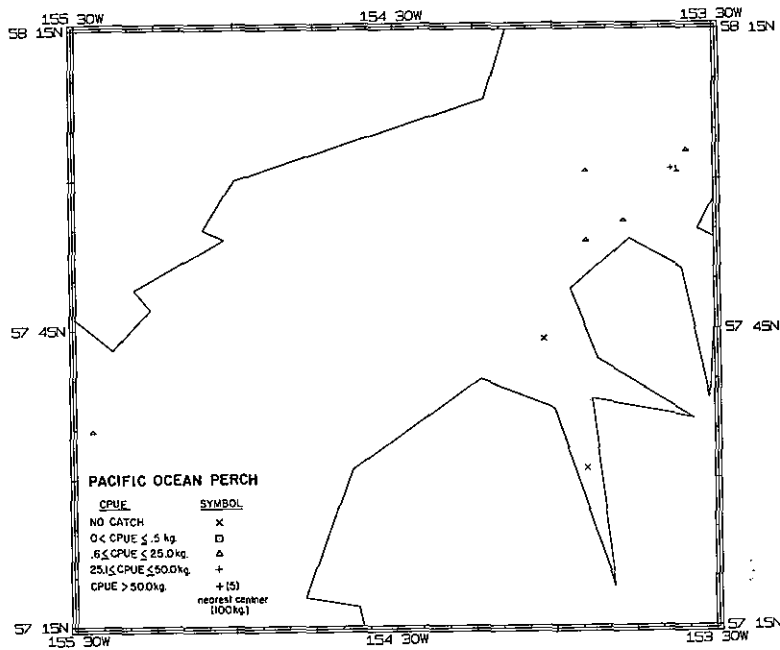
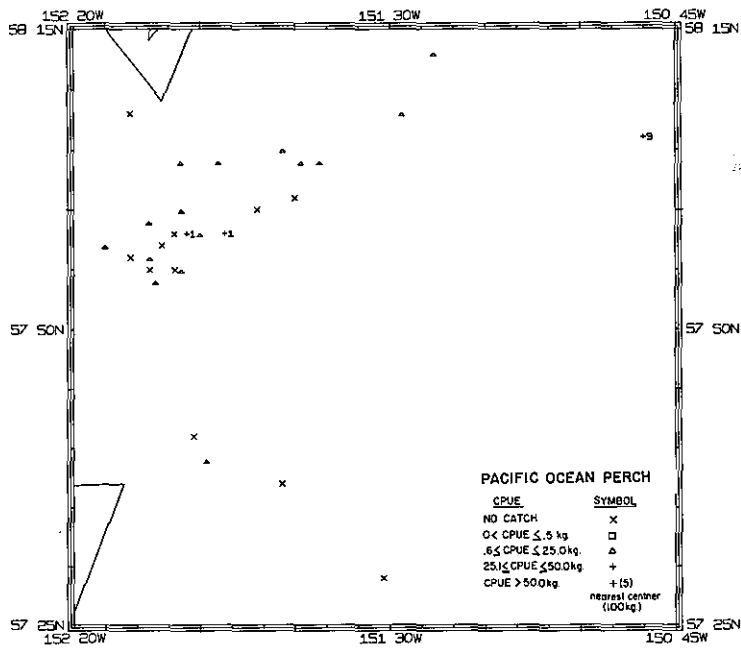


Figure X-177.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

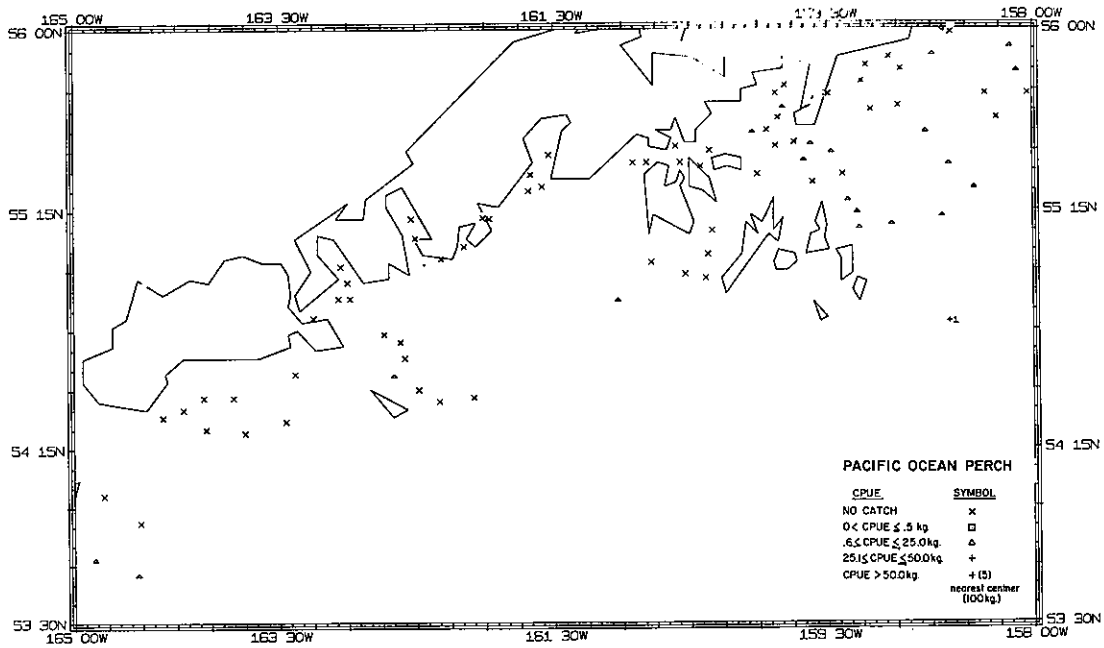
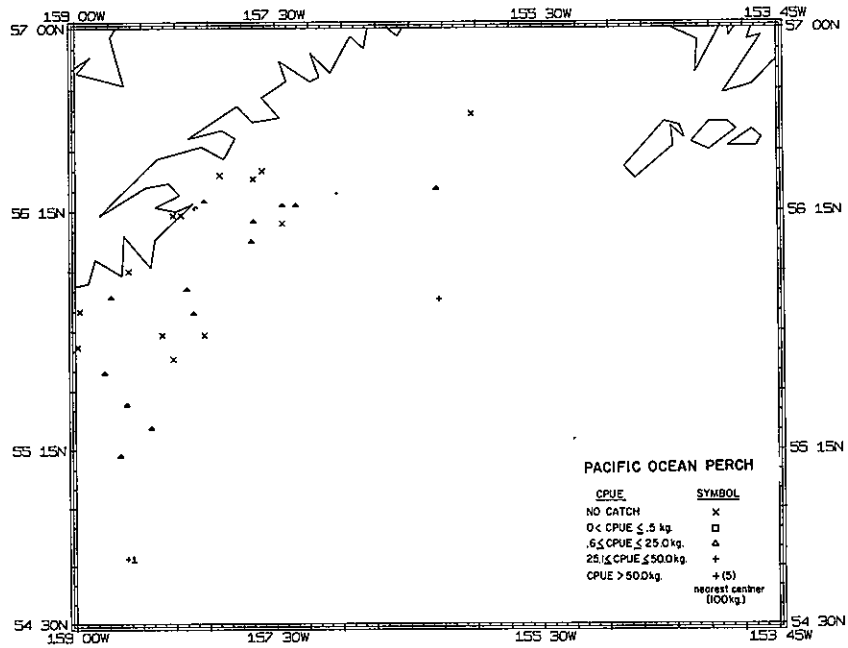


Figure X-178.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

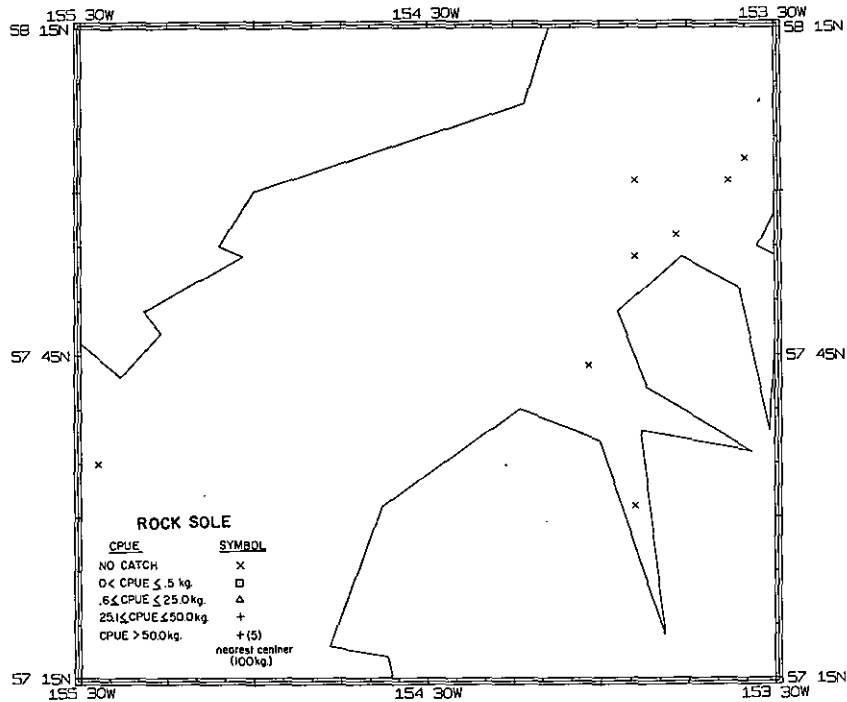
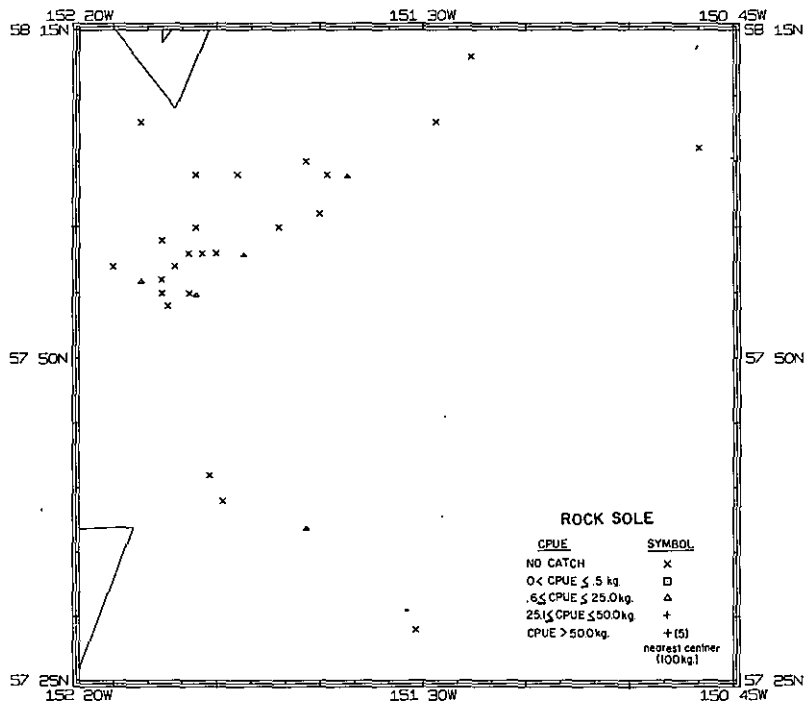


Figure X-179.--Distribution of rock sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

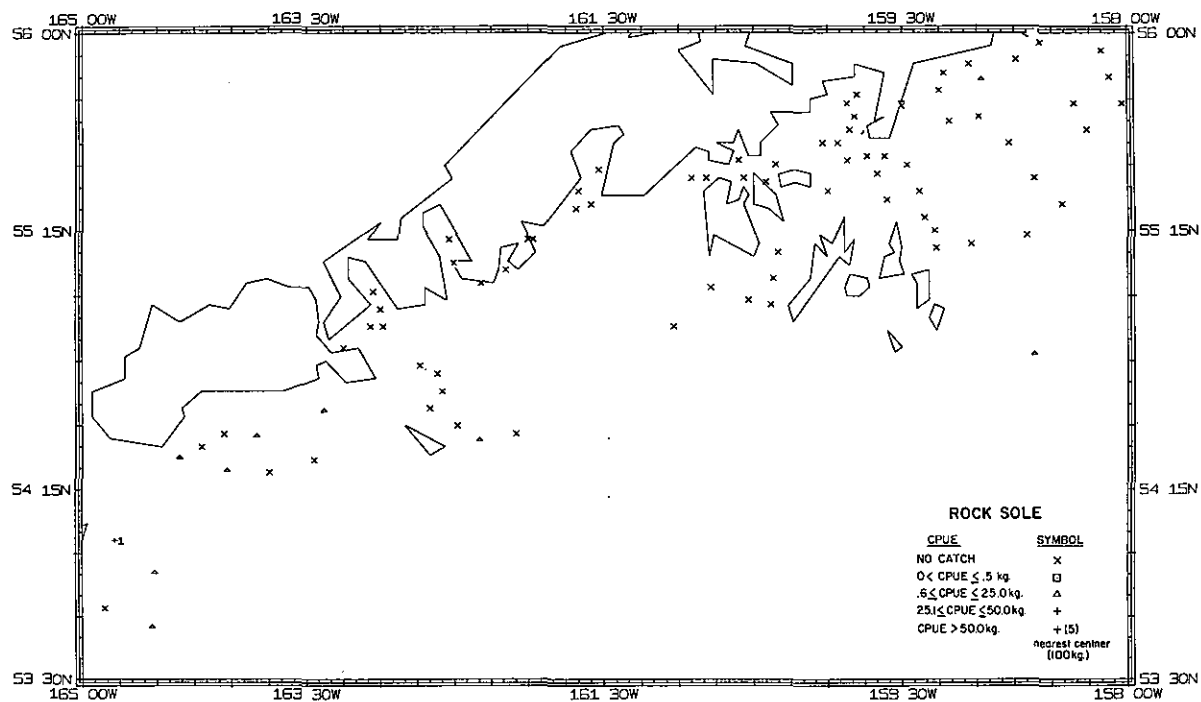
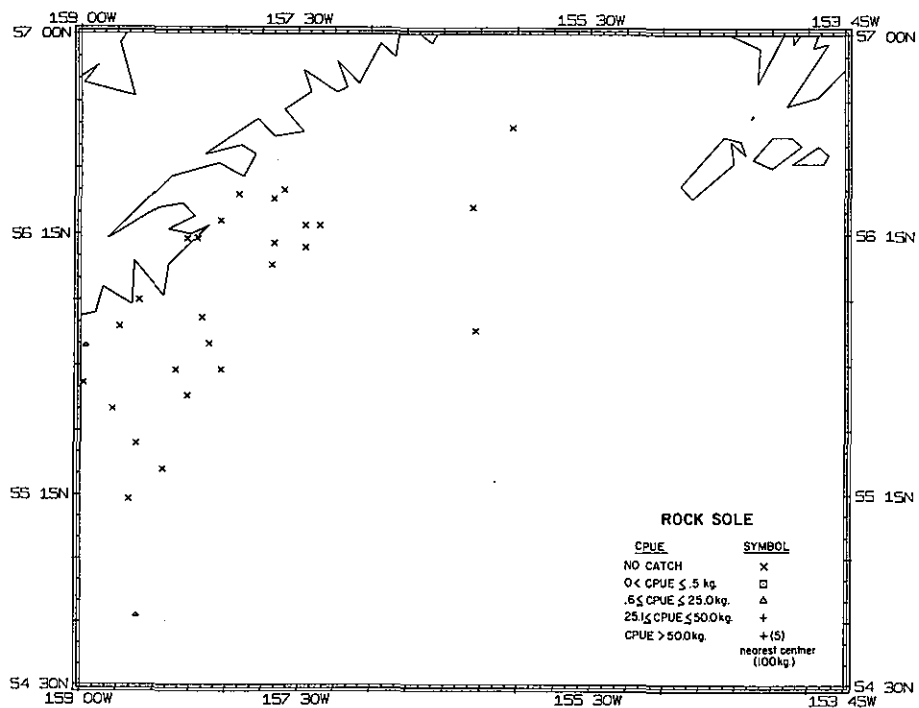


Figure X-180.--Distribution of rock sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

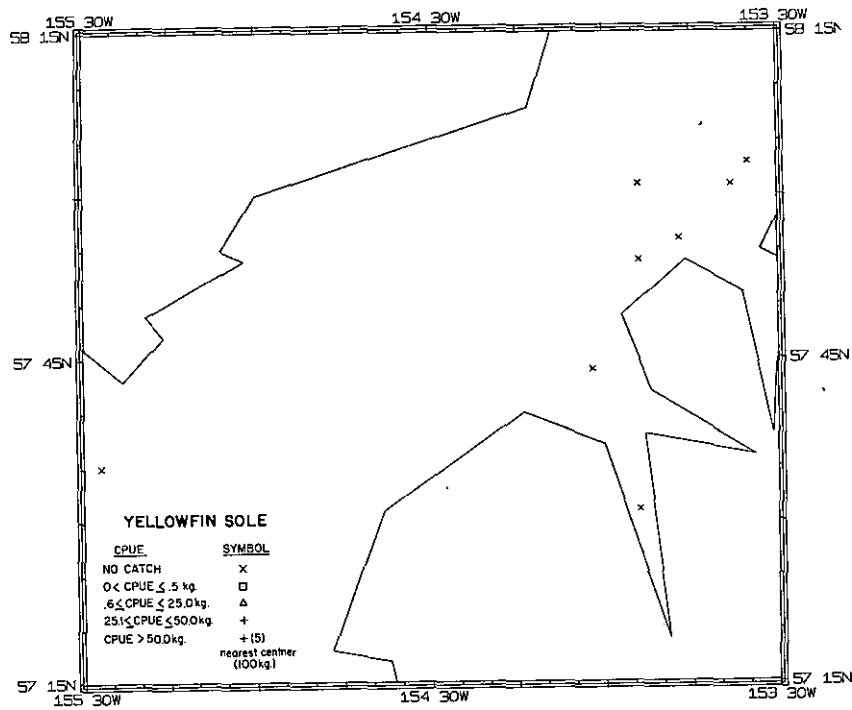
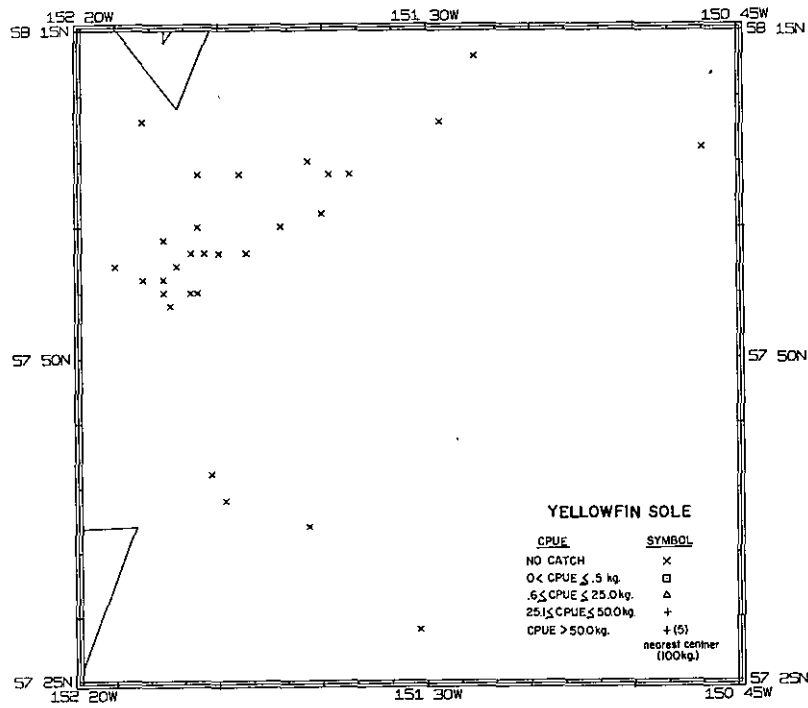


Figure X-181.--Distribution of yellowfin sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

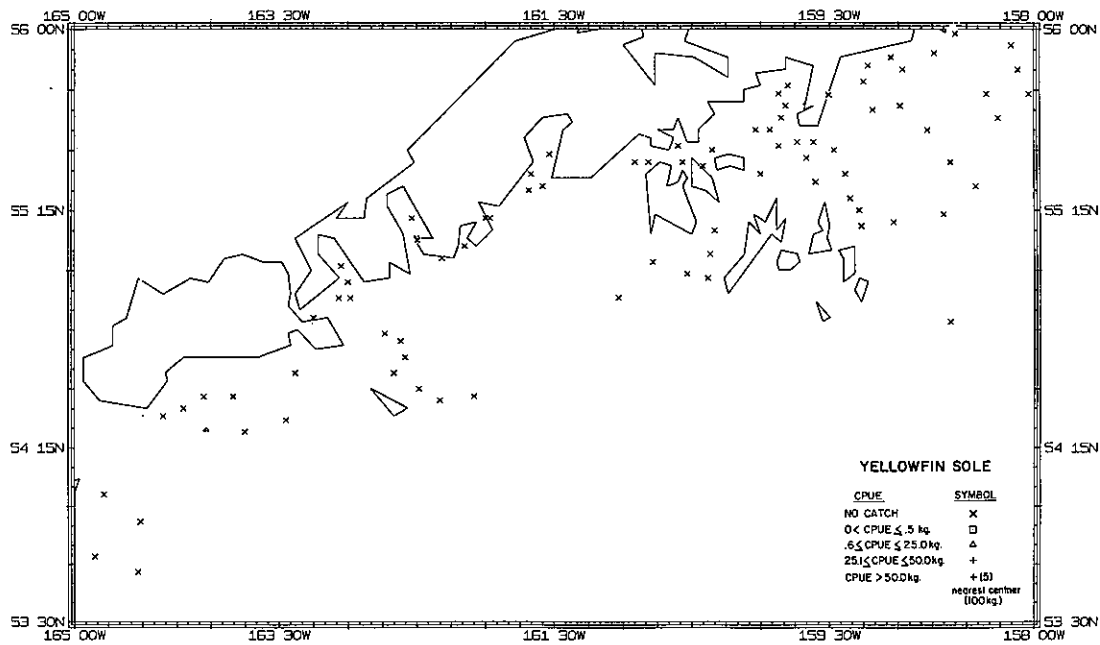
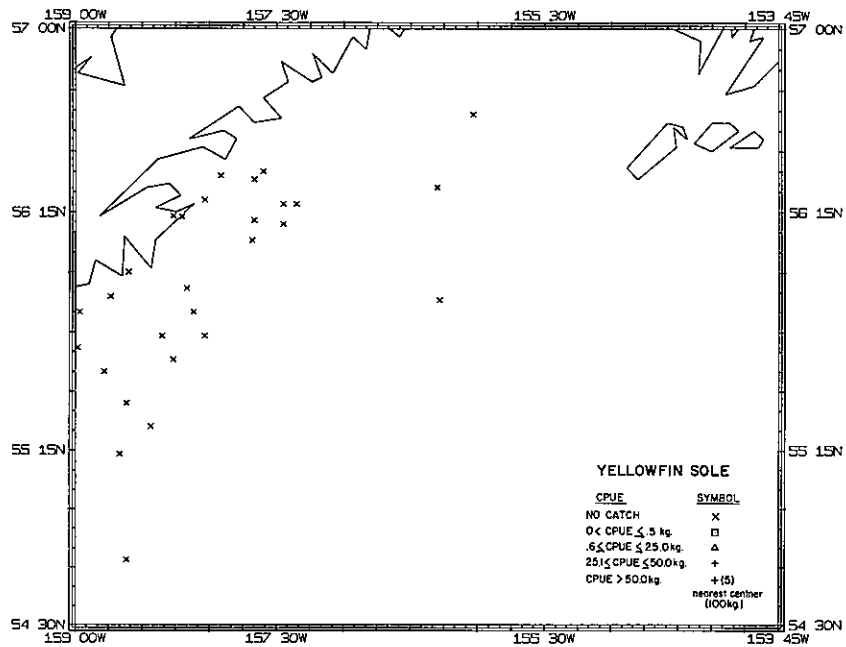


Figure X-182.--Distribution of yellowfin sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

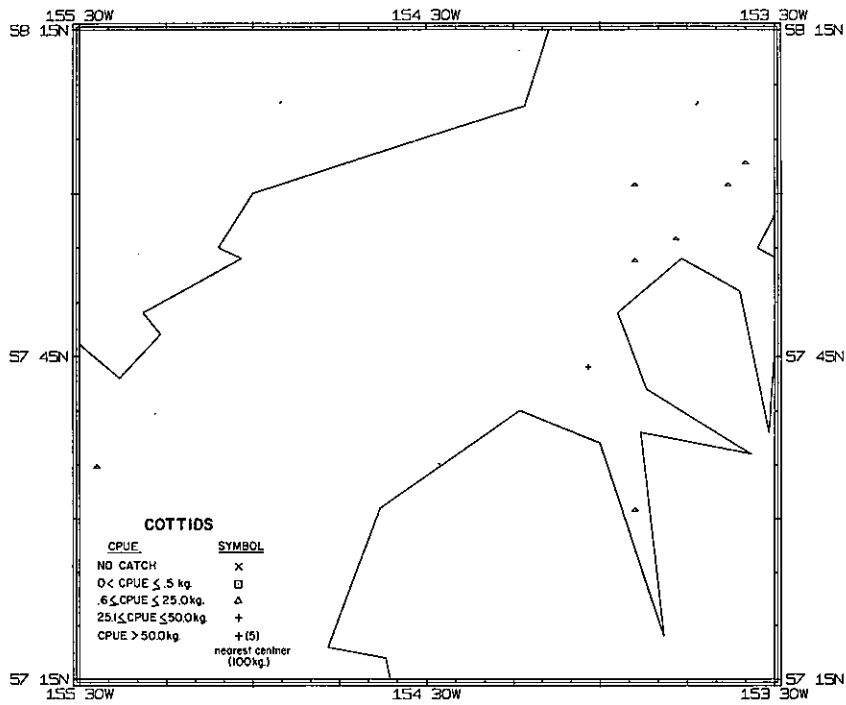
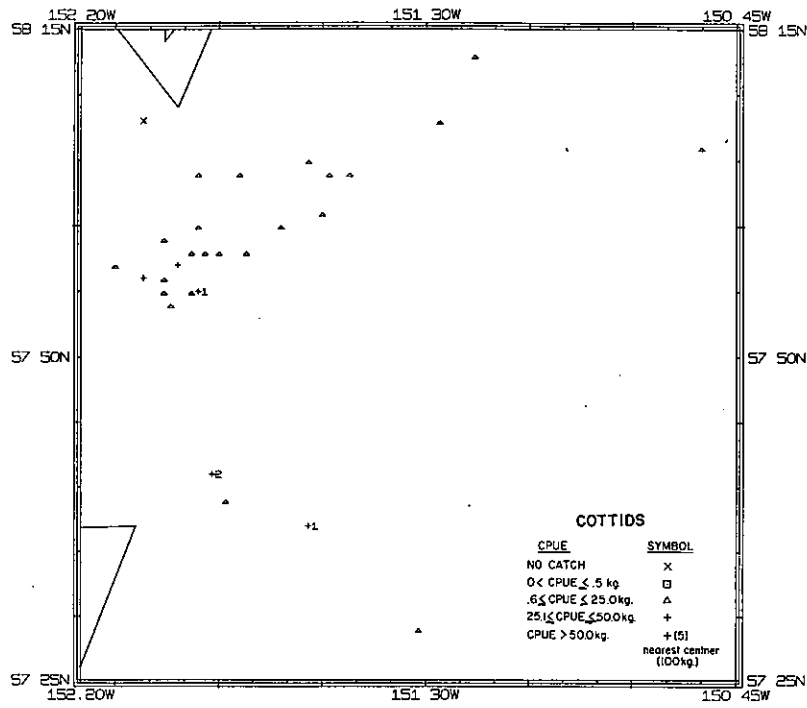


Figure X-183.--Distribution of cottids standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

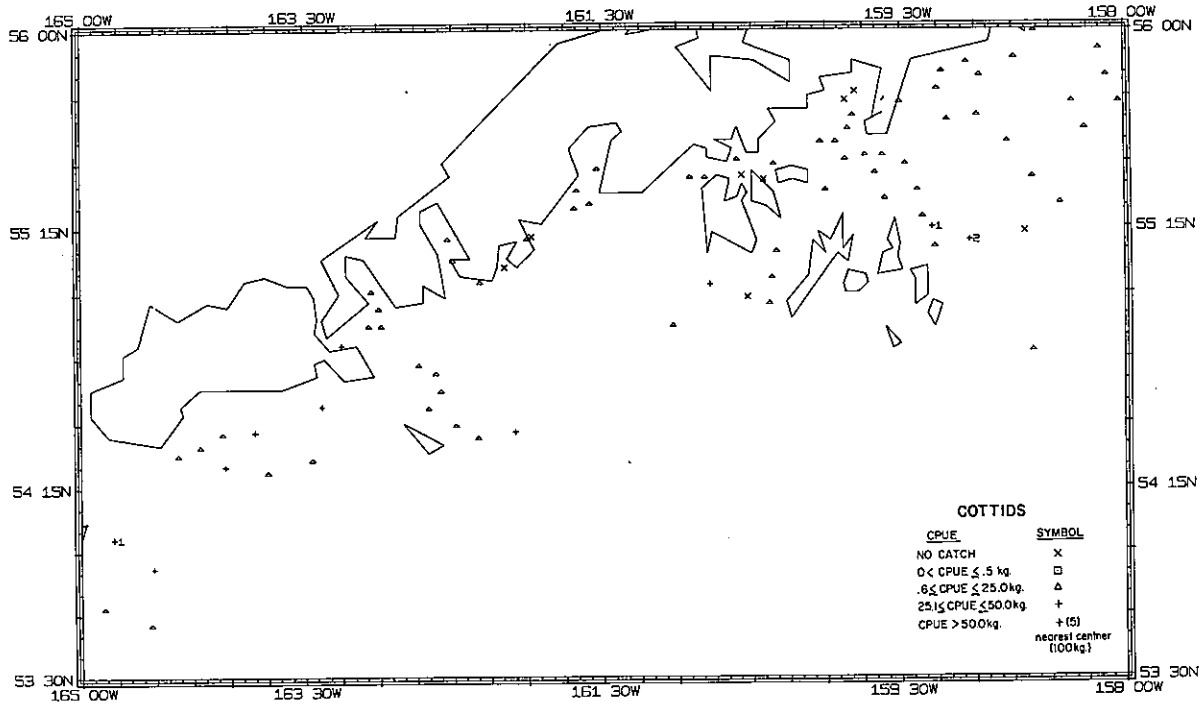
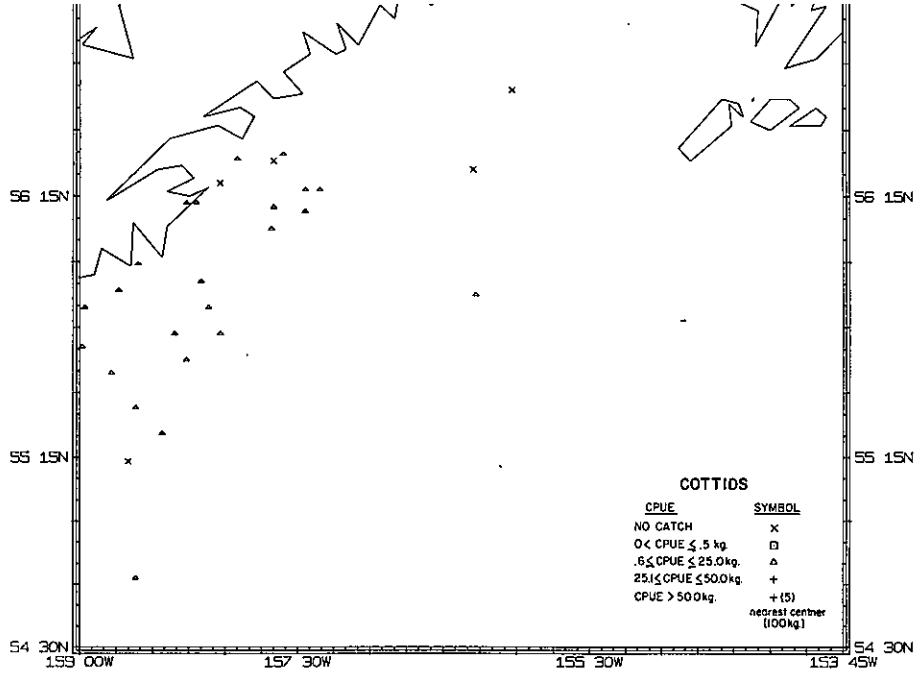


Figure X-184.--Distribution of cottids standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

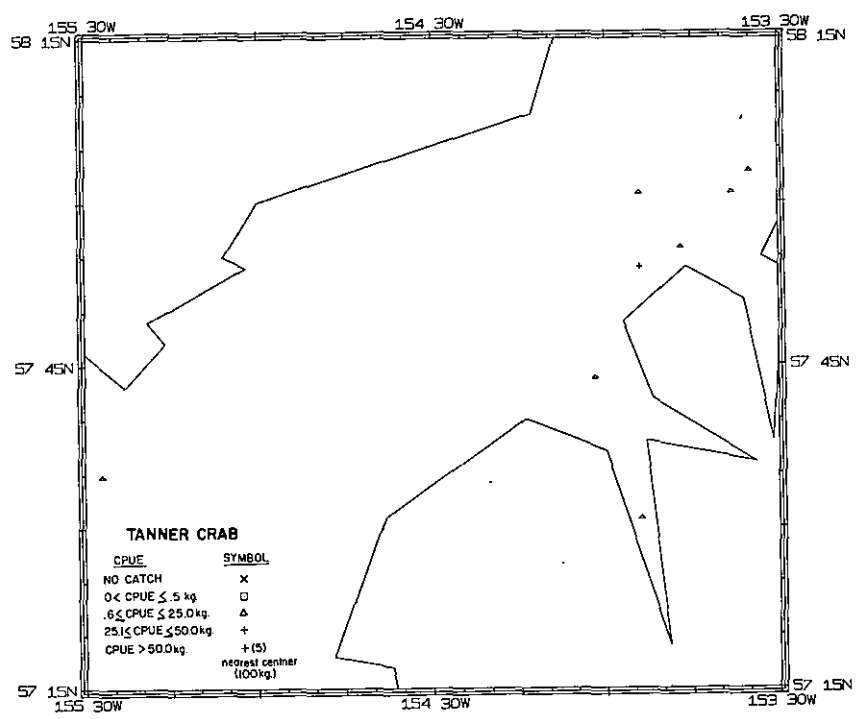
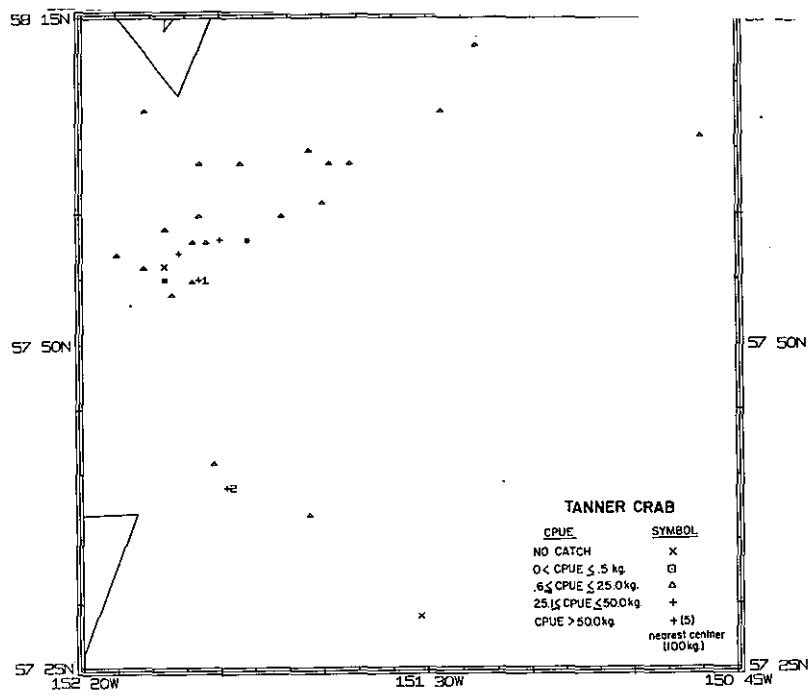


Figure X-185.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

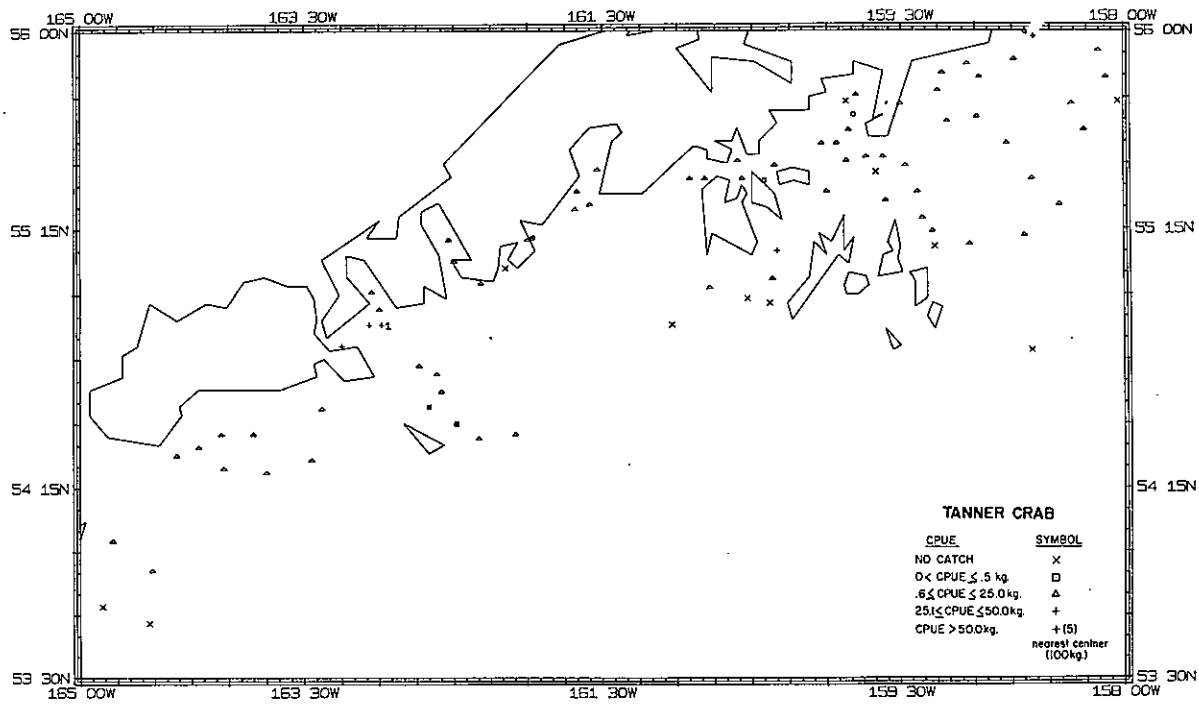
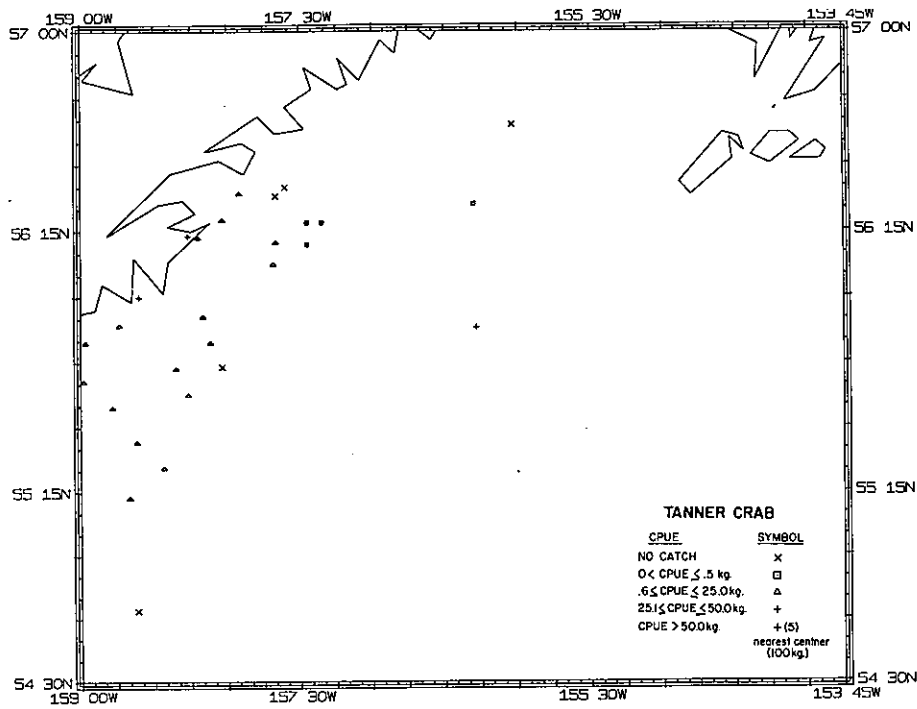


Figure X-186.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

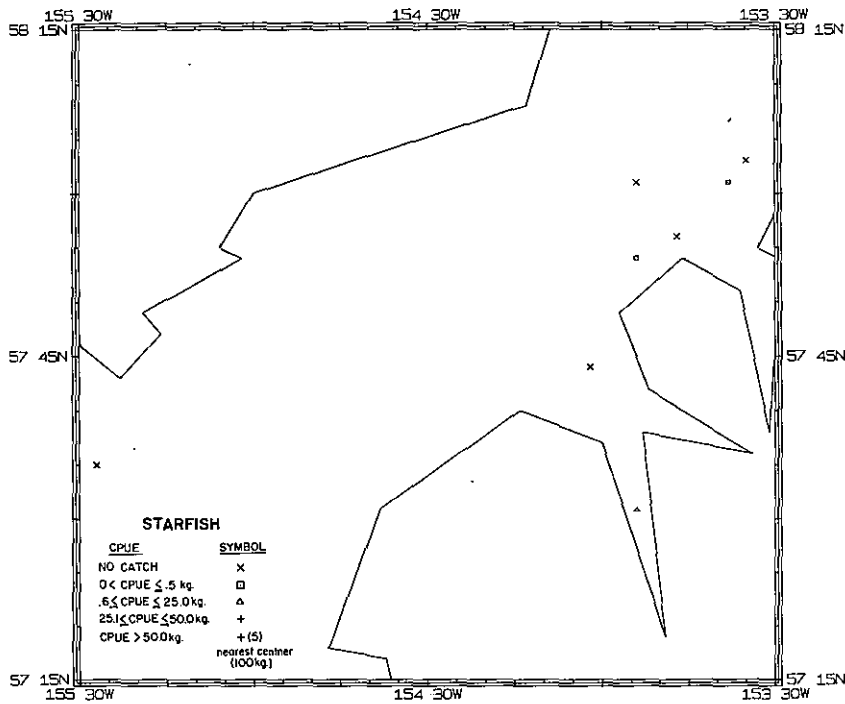
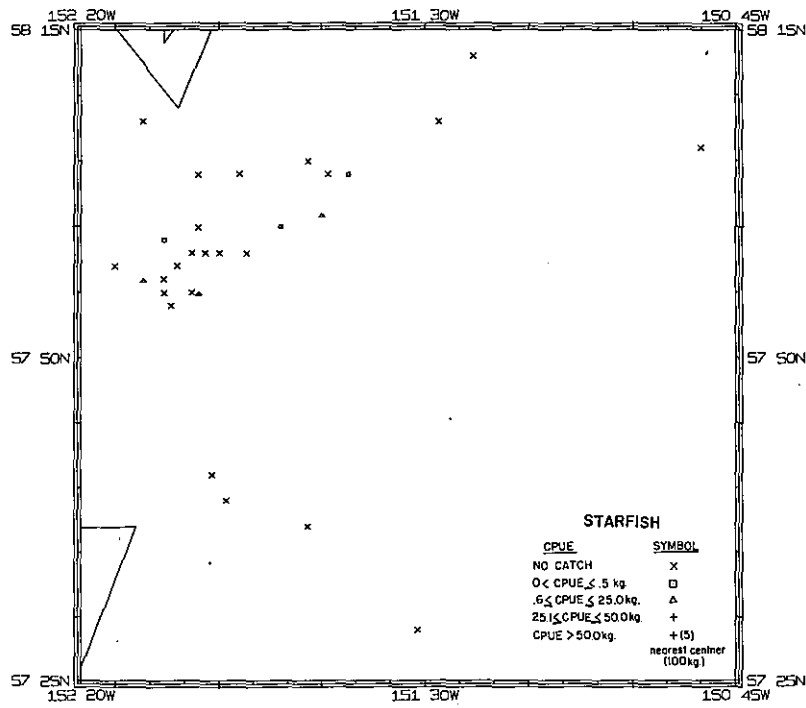


Figure X-187.--Distribution of starfish standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

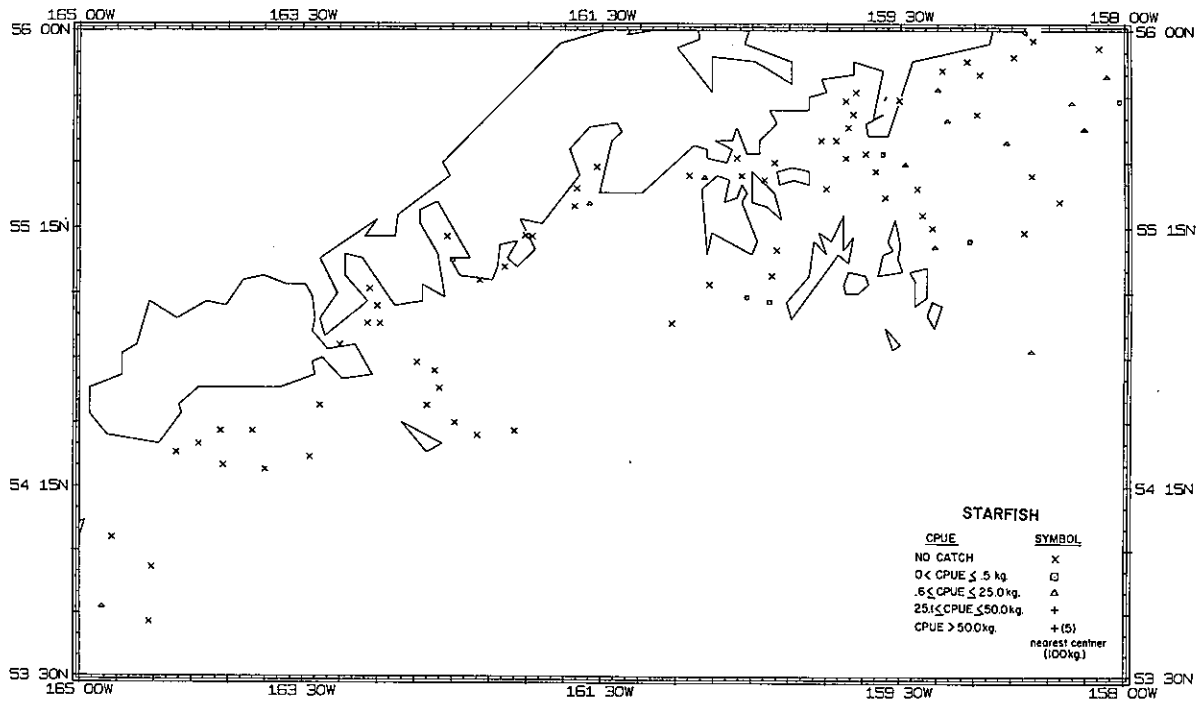
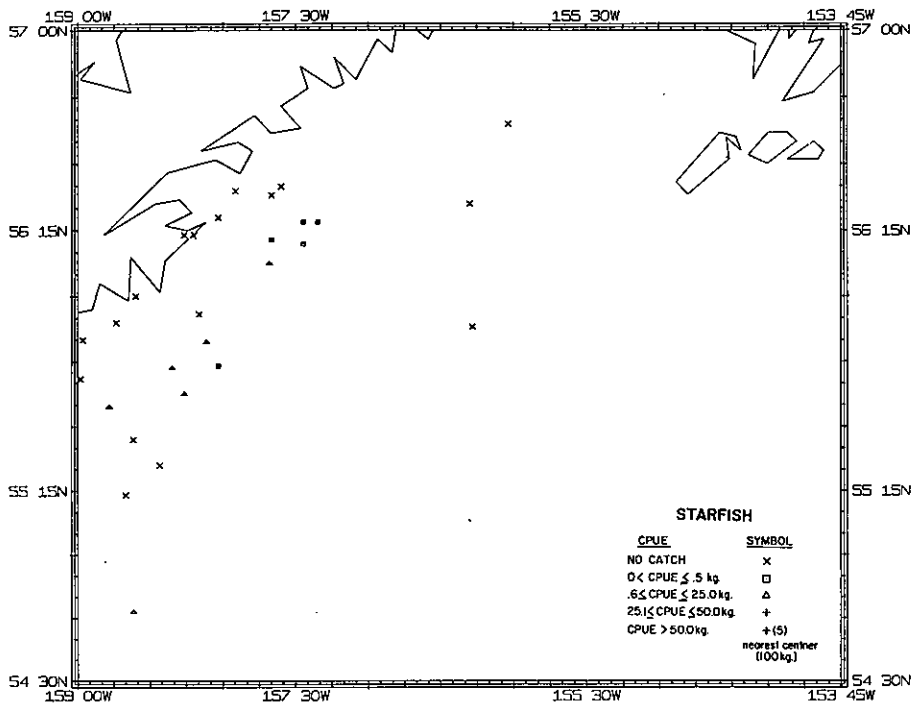


Figure X-188.--Distribution of starfish standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

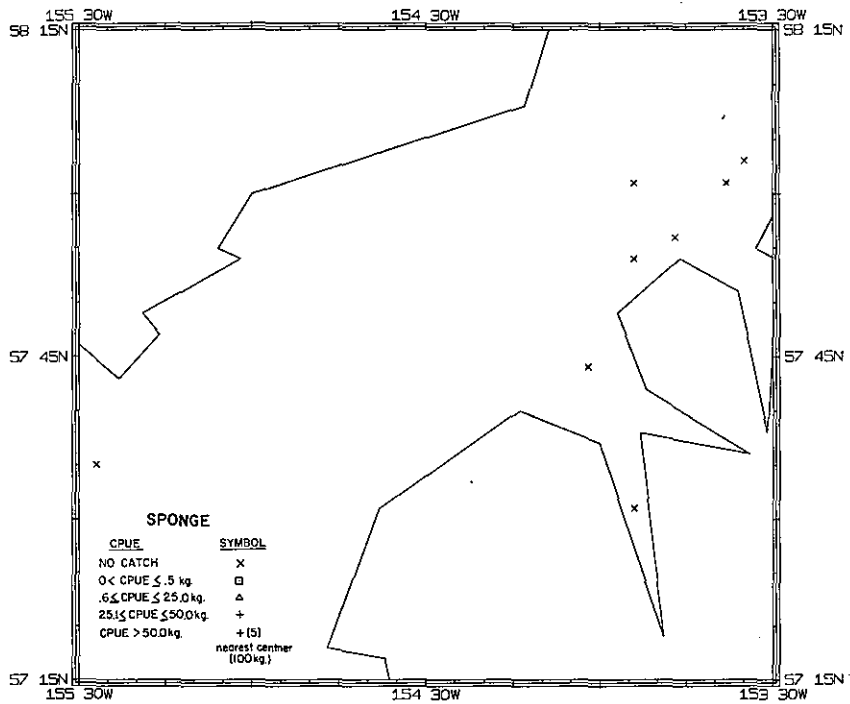
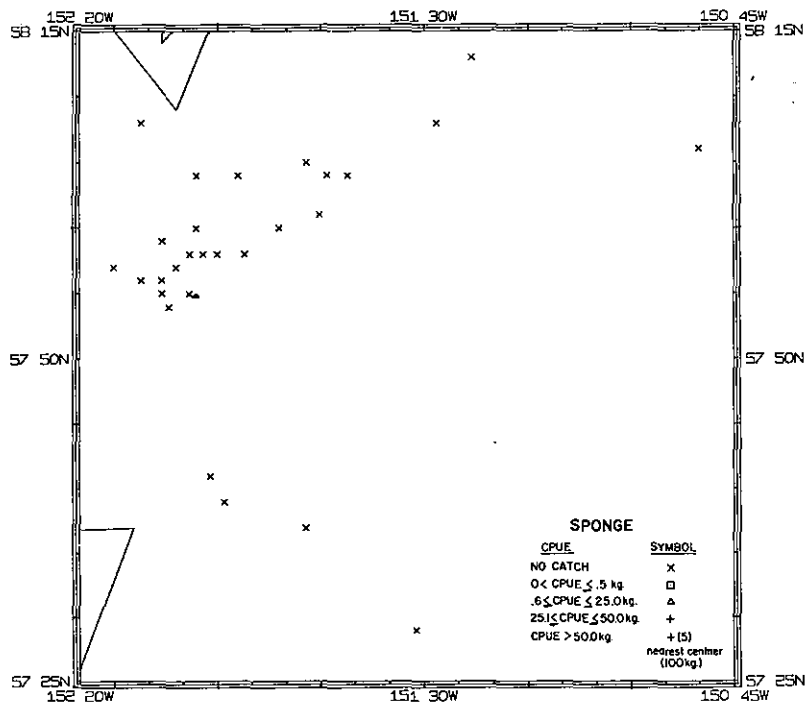


Figure X-189.--Distribution of sponge standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

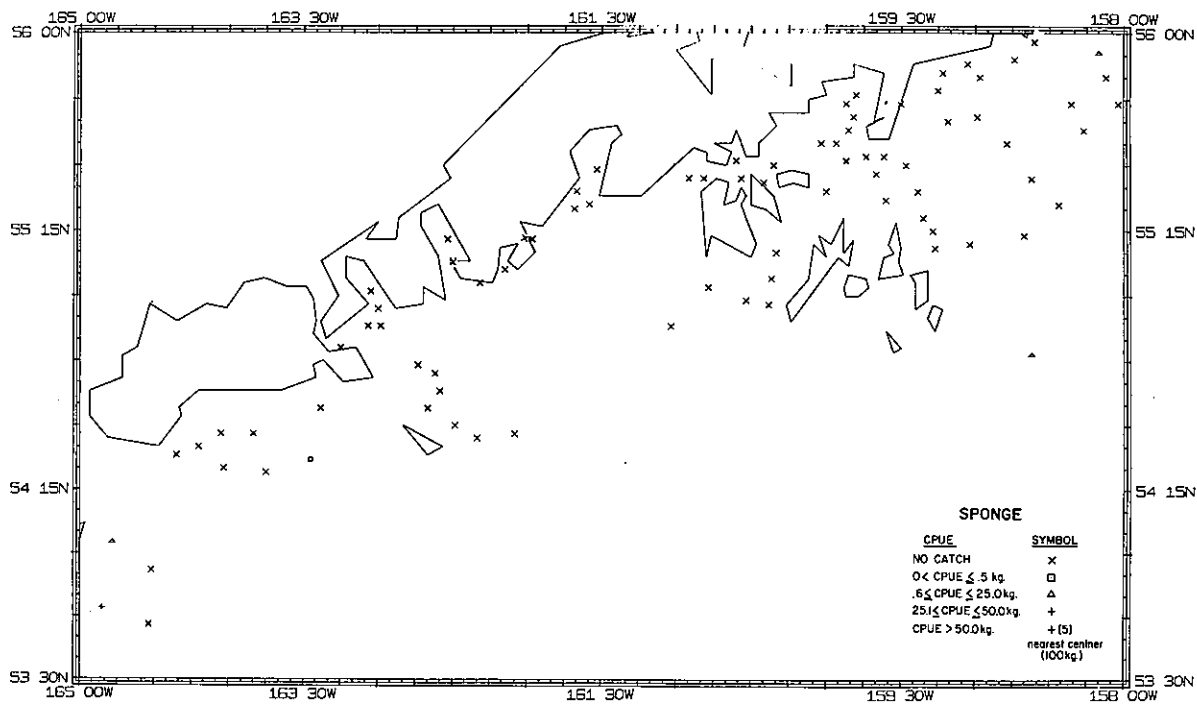
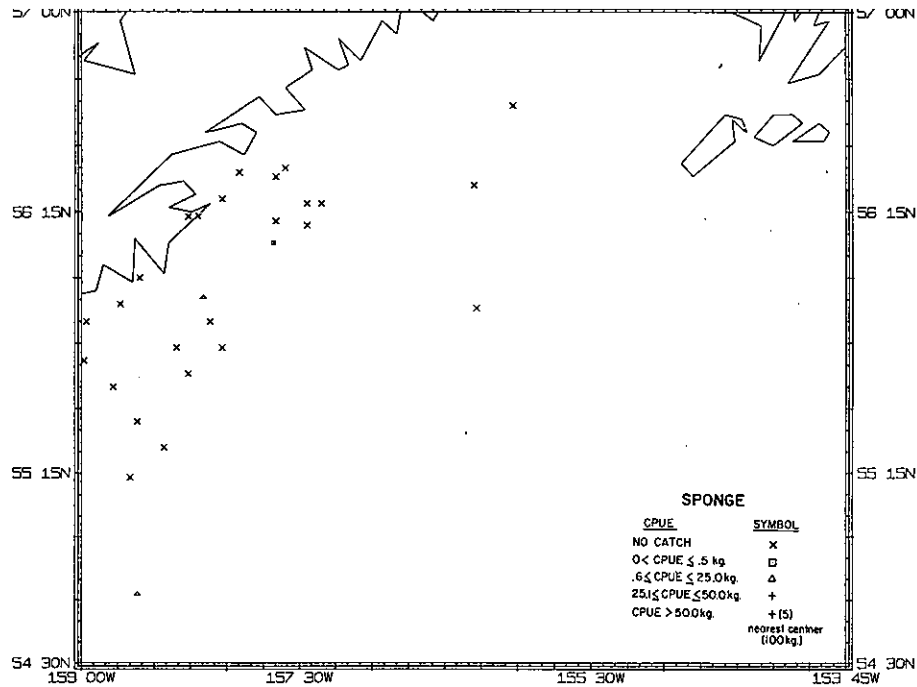


Figure X-190.--Distribution of sponge standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

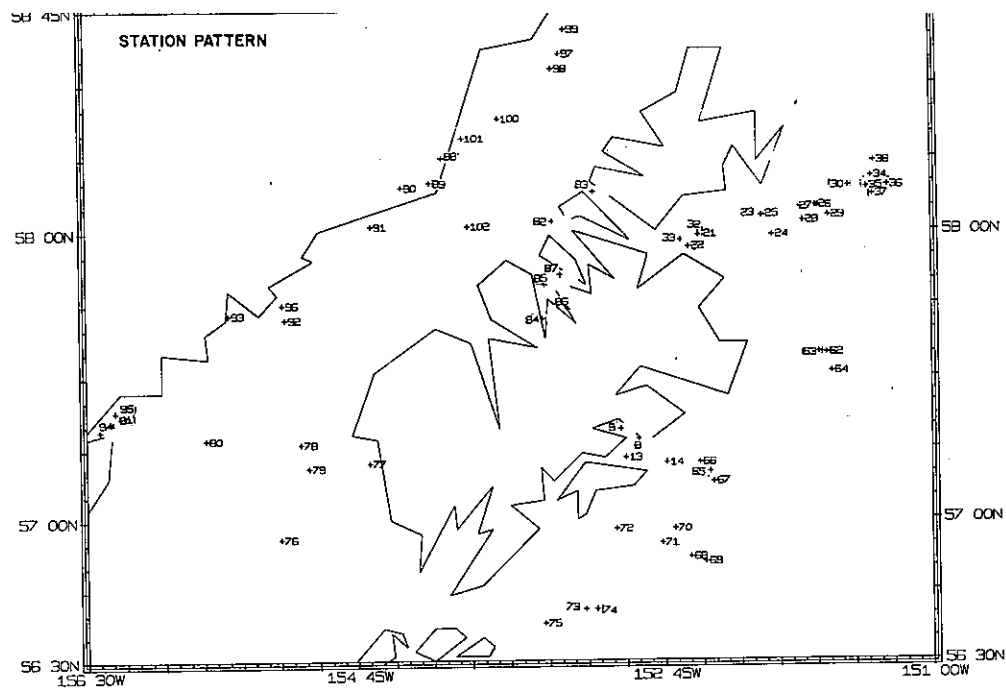


Figure X-191.--Stations successfully trawled (shrimp trawl) during cruise 682, R/V John R. Manning.

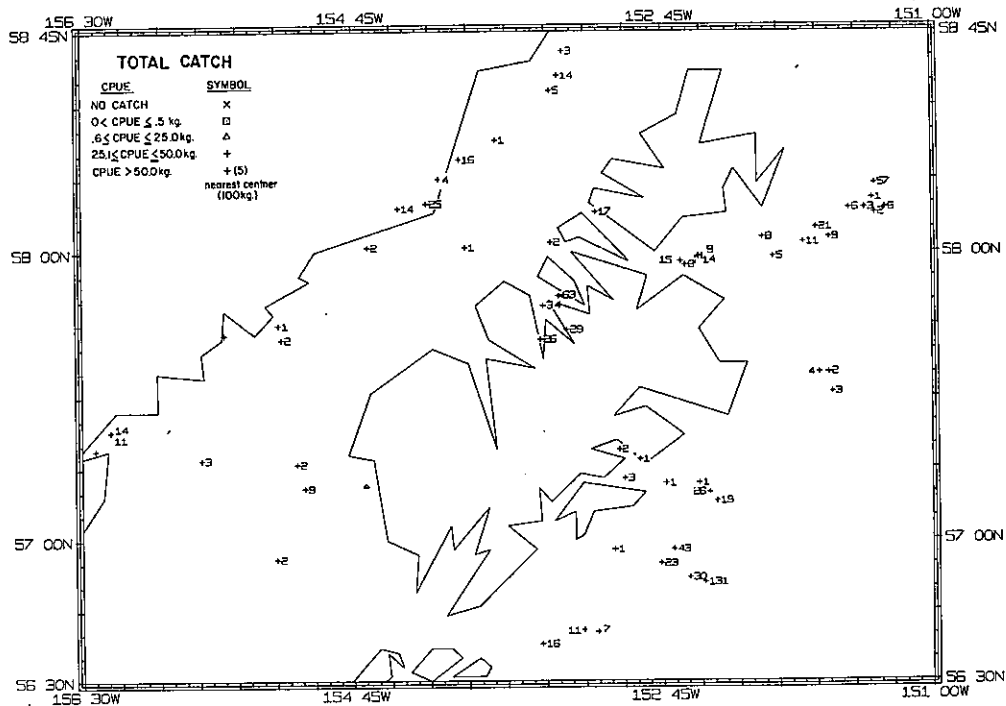
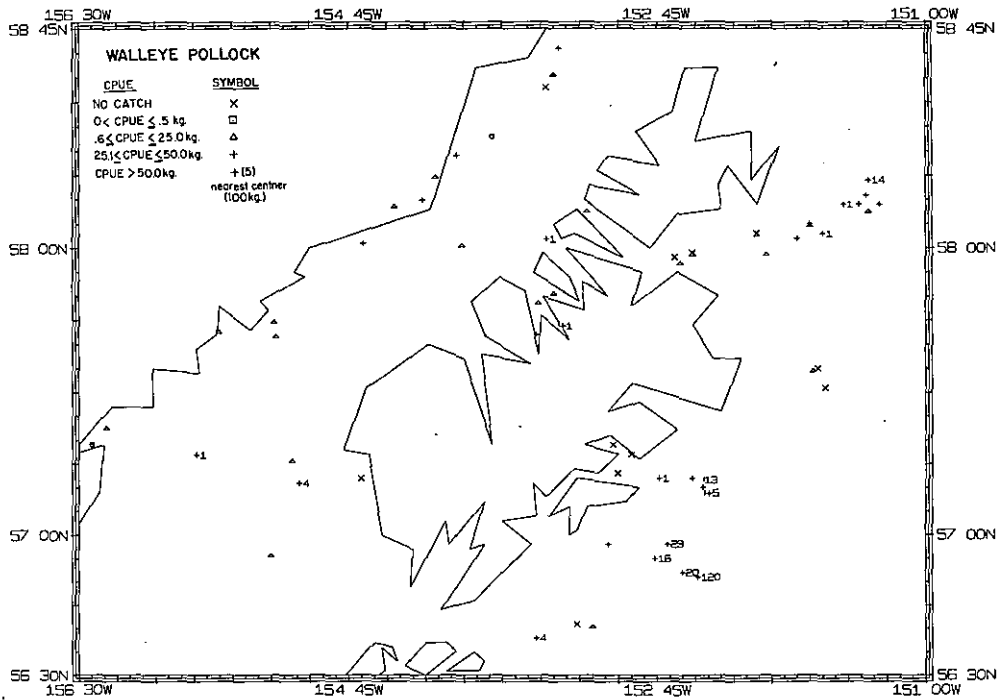
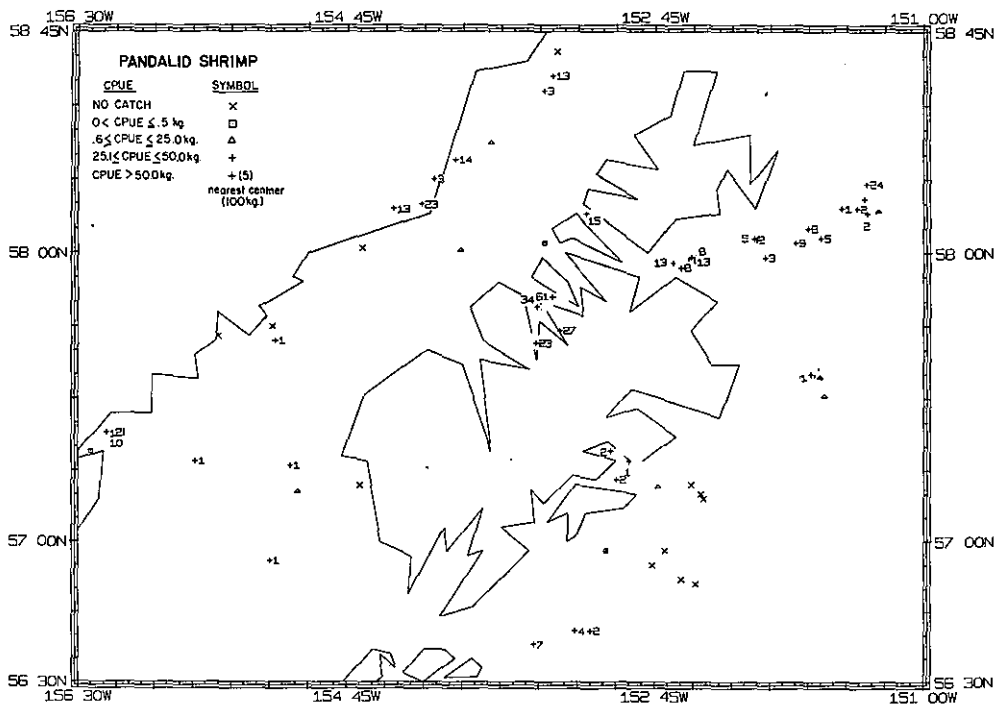


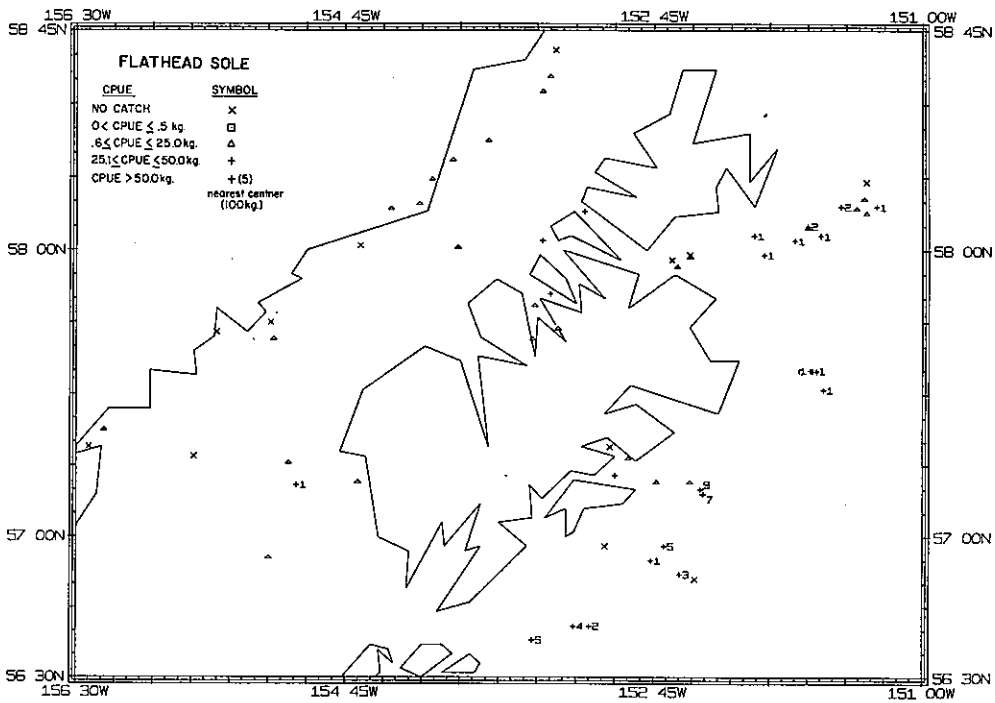
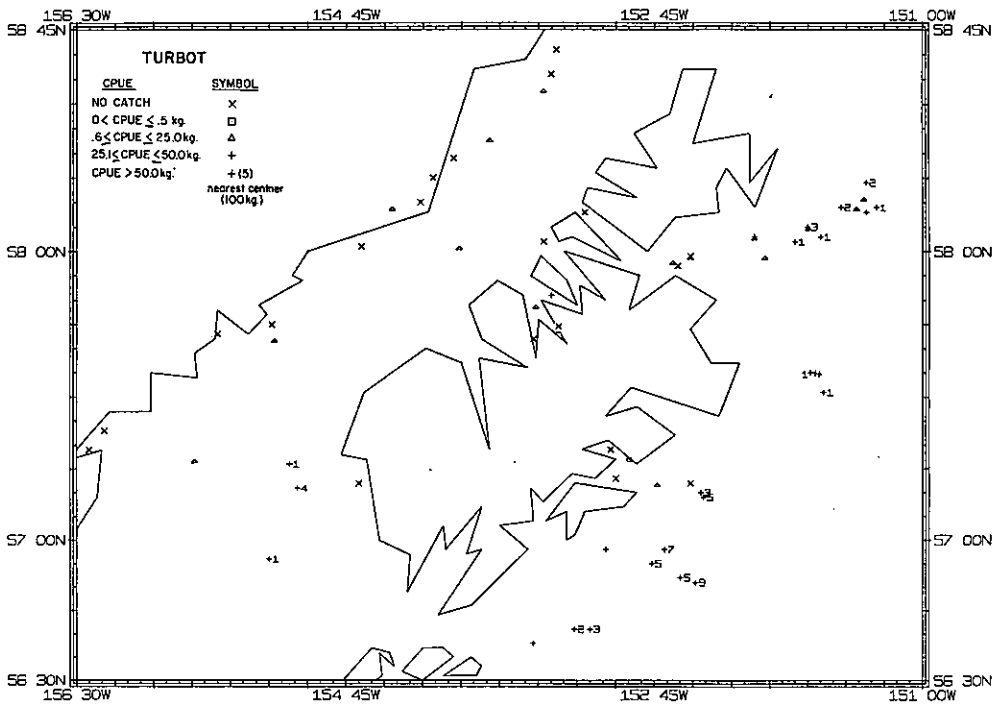
Figure X-192.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 682, R/V John R. Manning.

Table X-34.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 682, R/V John R. Manning.

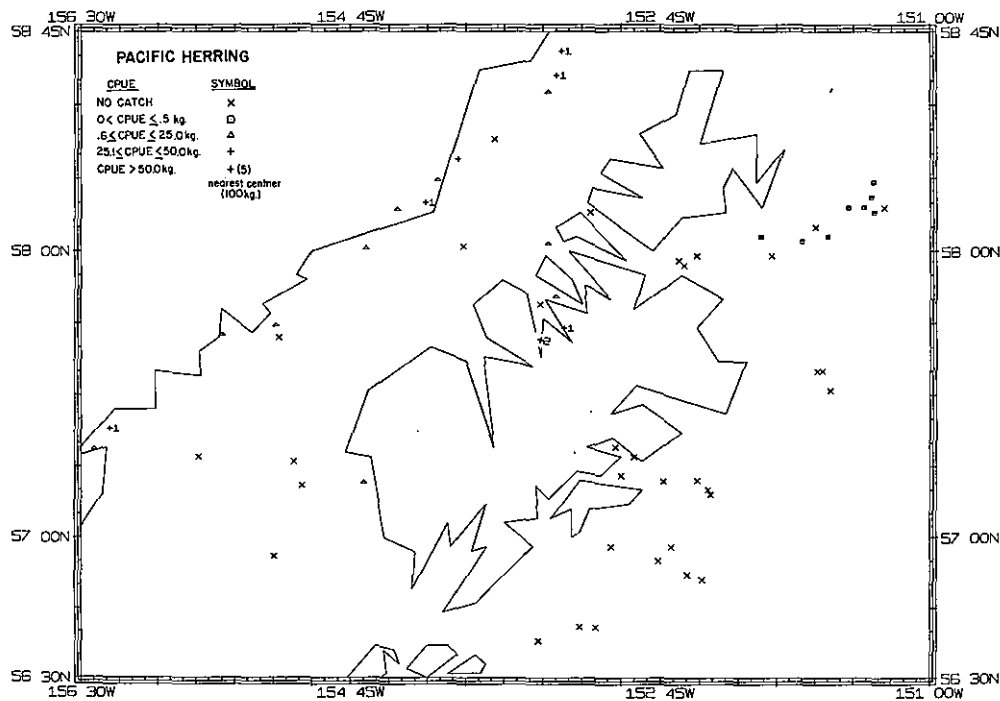
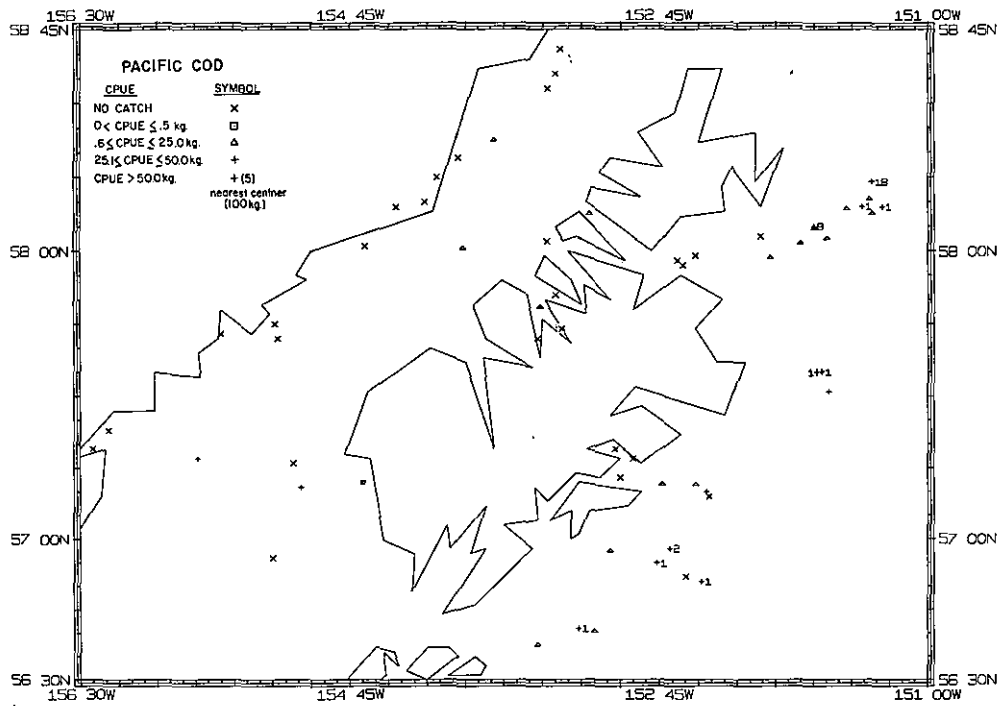
Species or Species groups	Station numbers
Total catch	21, 27, 28, 33, 38, 65, 67-71, 73, 75, 81, 83-87, 89, 90, 95, 97 and 101.
Pandalid shrimp	8, 9, 13, 21-30, 32, 33, 35, 37, 38, 63, 73-76, 78, 80, 81, 83-98 and 101.
Walleye pollock	14, 29, 30, 38, 66-71, 75, 79, 80, 82 and 86.
Turbot	27-30, 36, 38, 63-65, 67-70, 73, 74, 76, 78 and 79.
Flathead sole	24, 25, 27-30, 36, 62-65, 67, 68, 70, 71, 73-75 and 79.
Pacific cod	27, 35, 36, 38, 62, 63, 69, 70, 71 and 73.
Pacific herring	84, 86, 89, 95, 97 and 99.
Yellowfin sole	98, 99 and 101.
Tanner crab	76.



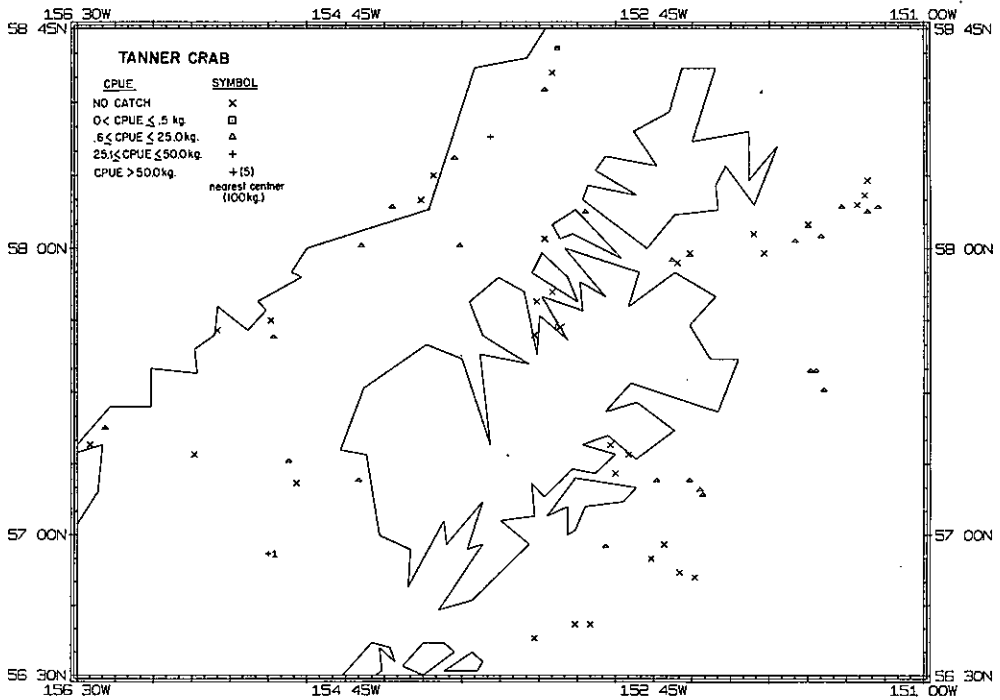
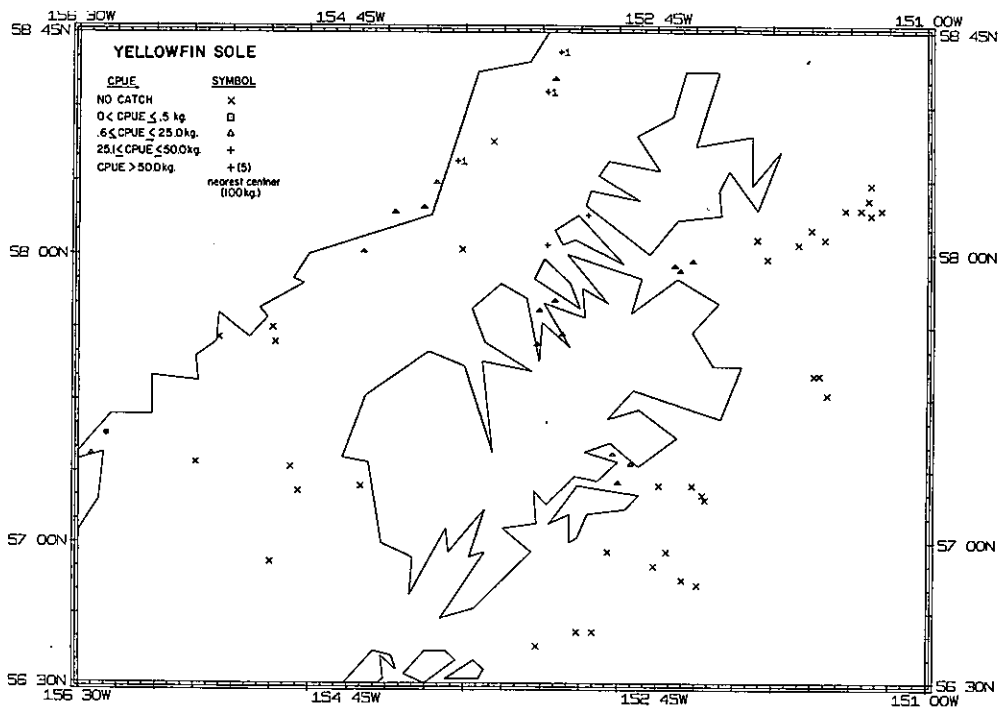
Figures X-193-194.--Distribution of pandalid shrimp and walleye pollock standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.



Figures X-195-196.--Distribution of turbot and flathead sole standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.



Figures X-197-198.--Distribution of Pacific cod and Pacific herring standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.



Figures X-199-200.--Distribution of yellowfin sole and Tanner crab standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.

j. Cruise 703, Chartered Fishing Vessel, Pacific Lady (August-October 1970)

The last exploratory shrimp cruise by NMFS was conducted in the Kodiak, Kenai, and Prince William regions. One hundred thirteen stations were attempted with a 65 ft. Nordby shrimp trawl (Figure X-201).

The outer shelf depth zone (482 kg/hr) again had the highest average catch followed by the inner shelf (360 kg/hr) and upper slope (116 kg/hr). Standardized station catch rates ranged to 6,000 kg/hr. Total mean catch rates greater than 1,000 kg/hr occurred in Port Dick, Nuka Bay, Aialik Bay, and Perenosa Bay (Table X-35, Figure X-202).

Pandalid shrimp occurred primarily in the outer shelf depth zone where the mean CPUE was 132 kg/hr and consisted of 88% pink shrimp (Table X-30). Sidestripe shrimp, outer shelf, was the only other species with a mean CPUE of 10 kg/hr or more. Largest catch rates of pandalid shrimp, over 1,000 kg/hr occurred in Aialik Bay, Nuka Bay and Peronosa Bay on Afognak Island (Figure X-203).

Walleye pollock and herring were the only other species to occur at mean catch rates greater than 10 kg/hr. Walleye pollock in the inner and outer shelf depth zones and Pacific herring in the inner shelf. Largest concentration of walleye pollock was located in Port Dick, Jack Bay in Prince William Sound, and offshore from Nuka Bay (Figure X-204). Pacific herring were not found in concentrations which produced catches over 200 kg/hr (Figure X-205). These species, plus the pandalid shrimp, made up over 89% of the total catch in the shelf depth zones and 65% in the upper slope.

Scallop Dredge Cruises

a. Cruise 631, R/V John R. Manning (May-June 1963)

During May-June 1963 the first scallop dredge sampling was conducted in the Gulf of Alaska. Eighty-two stations were attempted in the Dry Bay to Cape St. Elias area, with an 8 ft. New Bedford type scallop dredge, (Figure X-206).

The total catch for all species averaged about 60 kg/hr in the inner and outer shelf depth zones. (Table X-36). Weathervane scallop averaged near 50 kg/hr respectively in both depth zones and constituted 88 and 77% of the total catch (Figure X-207). Tanner crab and sidestripe shrimp were the only other species captured which produced a mean CPUE of 1 kg/hr or more.

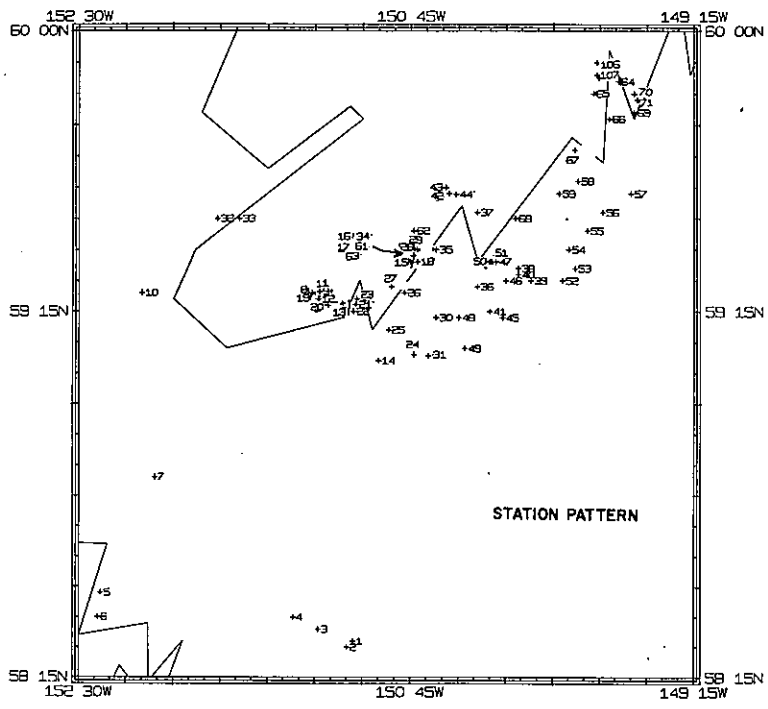
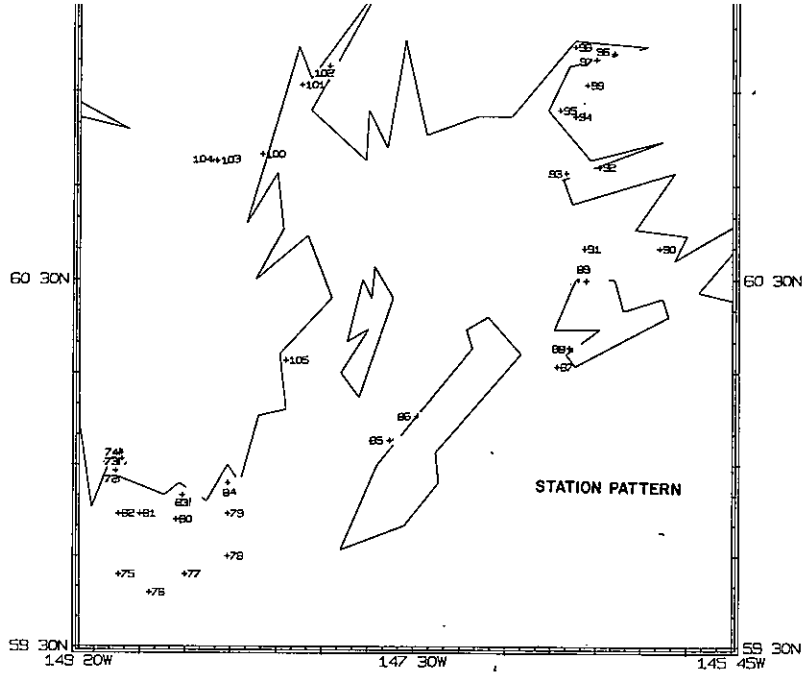


Figure X-201.--Stations successfully trawled (shrimp trawl) during cruise 700, charter vessel Pacific Lady.

Table X-35.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 703, charter vessel Pacific Lady.

Species or Species group	Station numbers
Total catch	4-6, 11, 17, 20, 28, 29, 106 and 107.
Pandalid shrimp	2, 3, 5, 6, 8, 9, 17, 18, 20, 21, 28, 29, 34, 35, 38, 39, 41, 42, 44, 46, 47, 50, 51, 56, 58, 59, 63, 65-67, 69, 71, 72, 74, 76-78, 80, 82-85 and 105-107.
Walleye pollock	1, 2, 4, 5, 8, 9, 11-13, 19, 20, 22, 23, 25, 30, 34, 36, 38, 40-43, 45-47, 50, 51, 56, 63, 71, 77-79, 90, 94, 99, 100 and 107.
Pacific herring	94, 99 and 105.

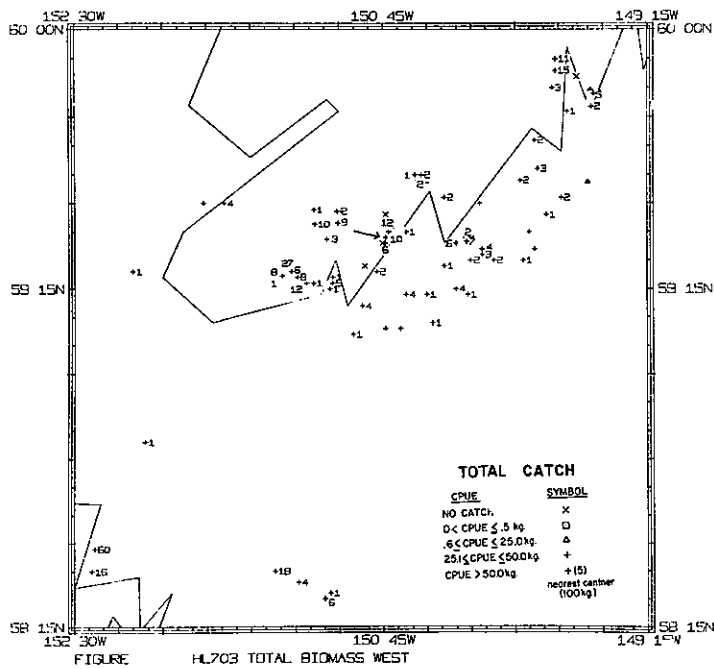
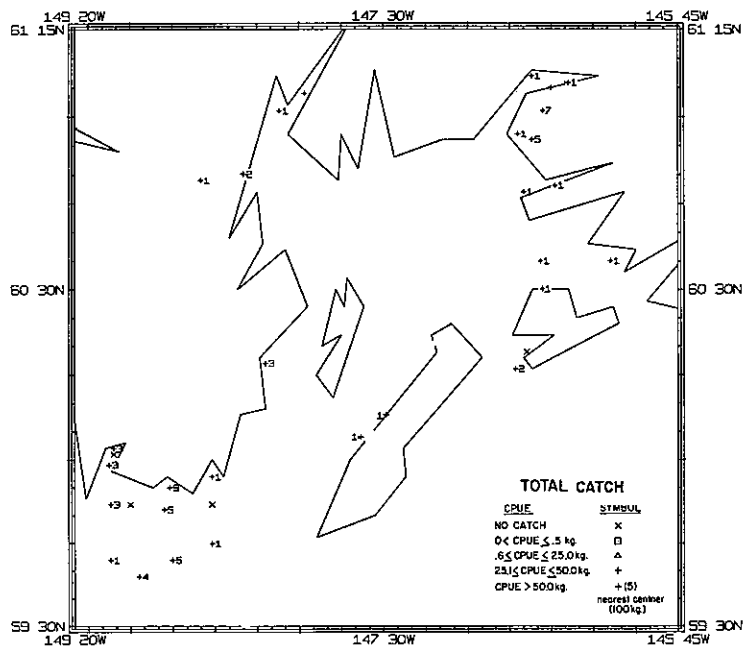


Figure X-202.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 703, charter vessel Pacific Lady.

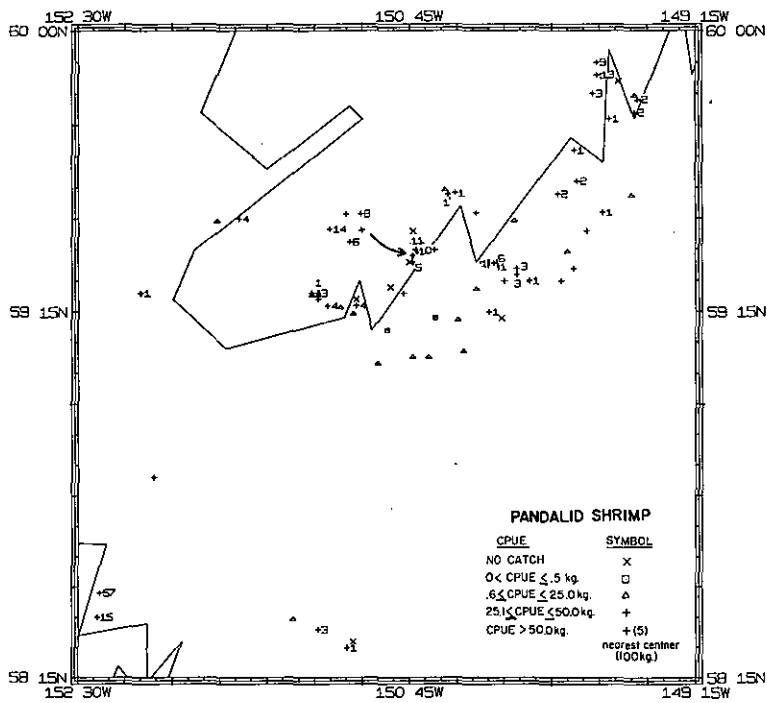
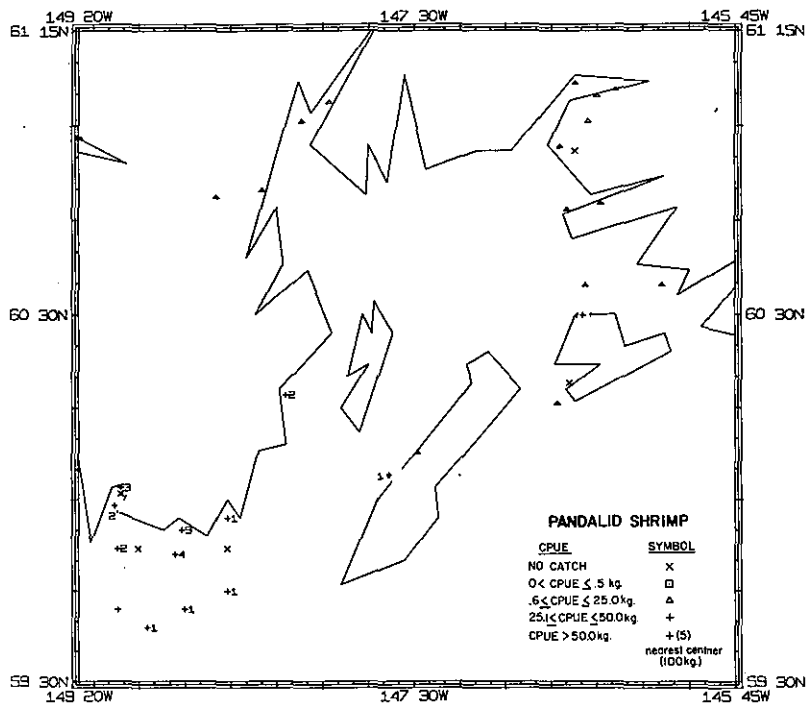


Figure X-203.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 703, charter vessel Pacific Lady.

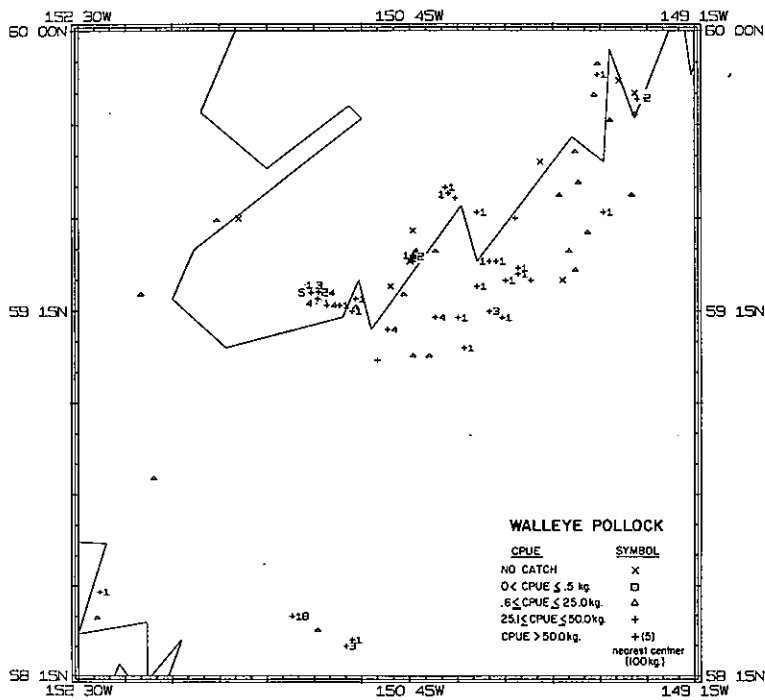
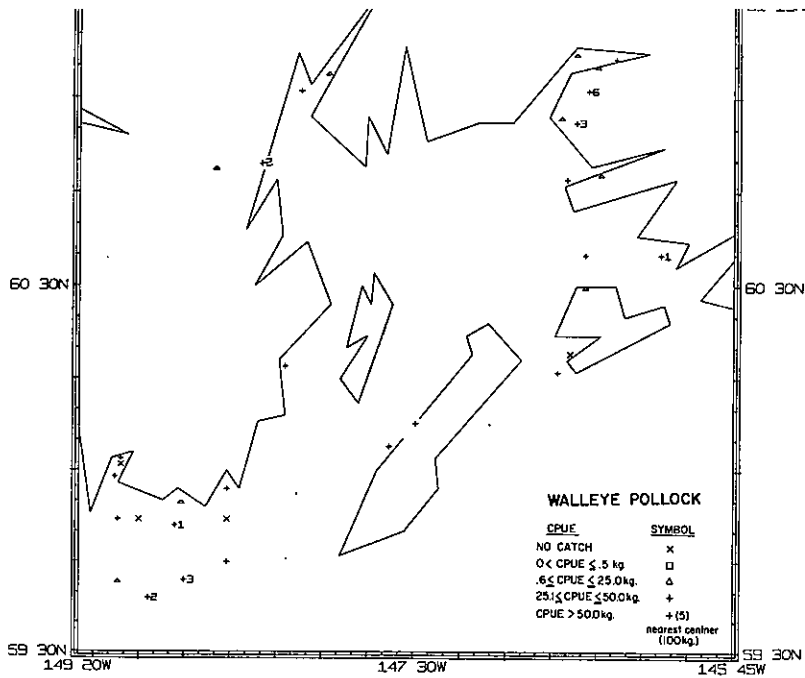


Figure X-204.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 703, charter vessel Pacific Lady.

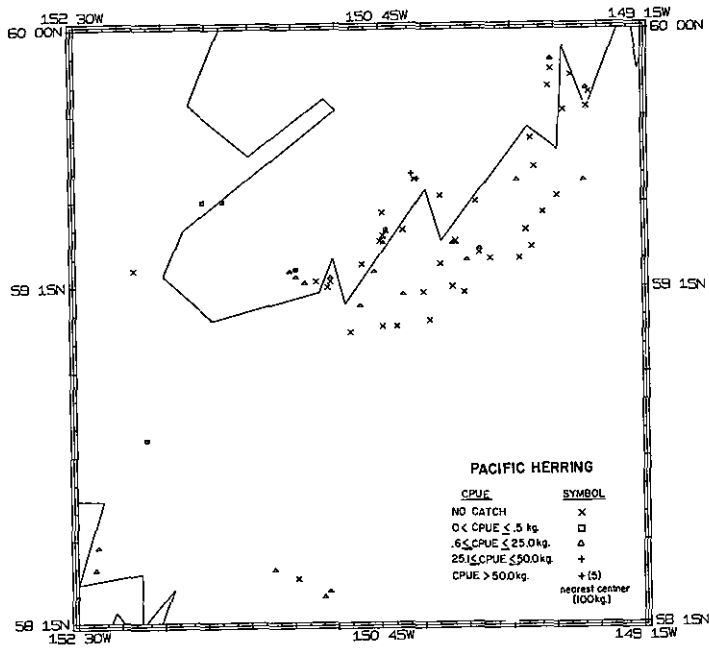
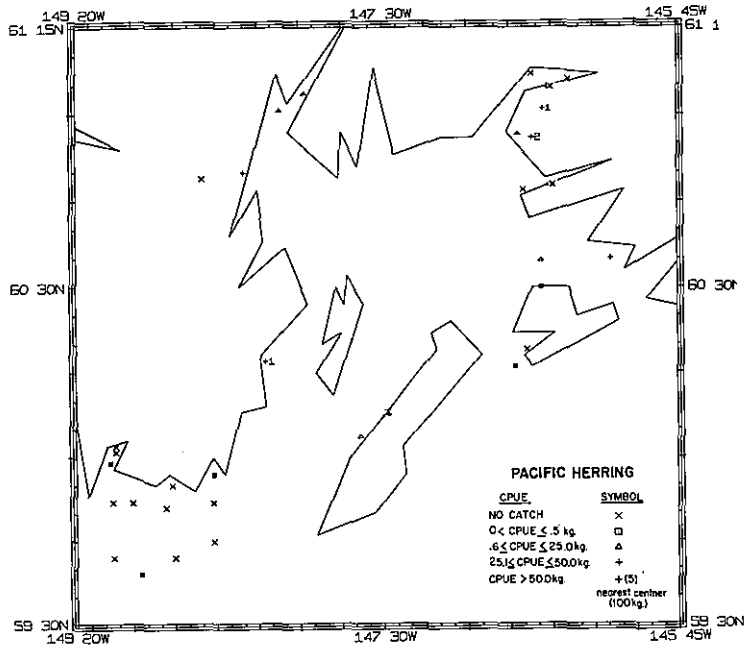
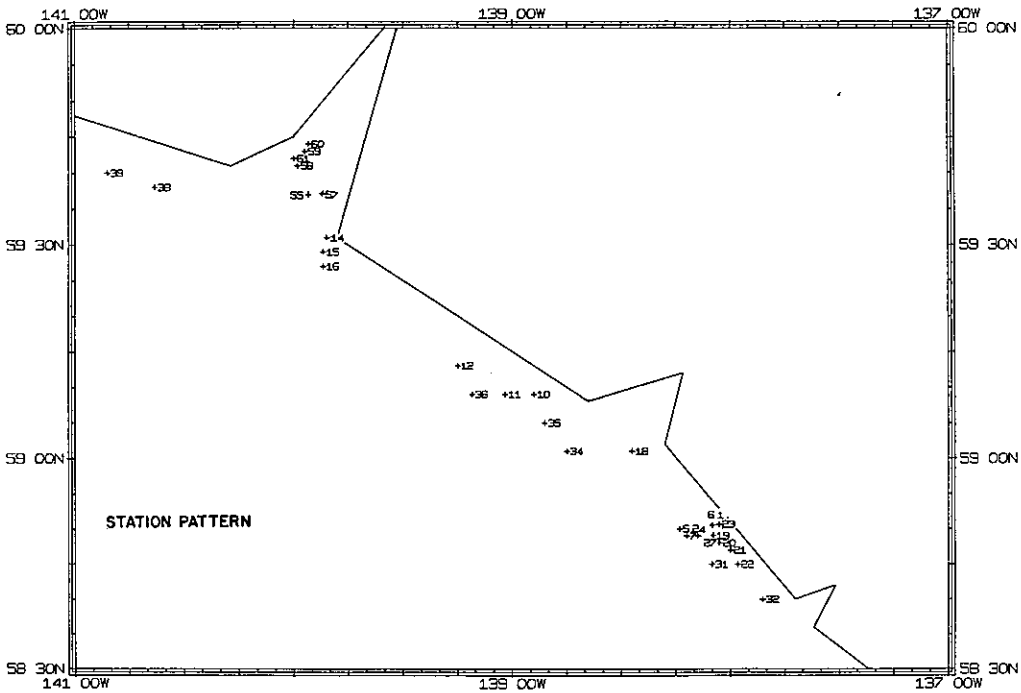
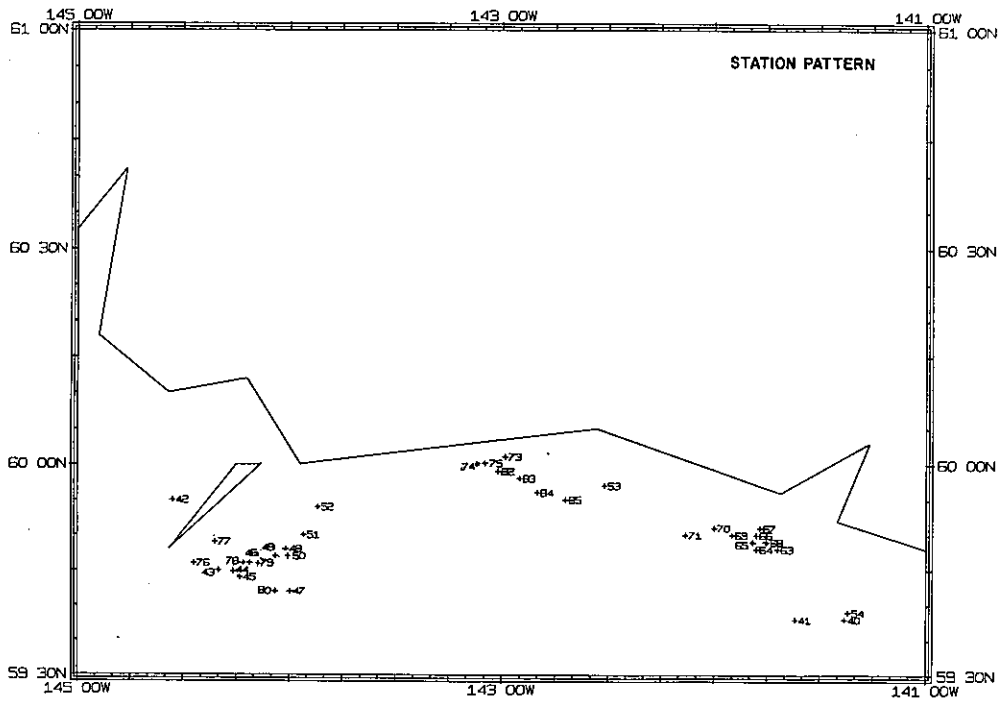


Figure X-205.--Distribution of Pacific herring standardized catch rates in kg/hr, during cruise 703, charter vessel Pacific Lady.



Vessel
34

Figure X-206.--Stations successfully sampled (scallop dredge) during cruise 631, R/V John R. Manning.

Table X-36.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 631, charter vessel Yaquina.

		Depth Zones	
0 - 100 m		101 - 200 m	
Species & groups	kg/hr	Species & groups	kg/hr
Weathervane scallop	51.4	Weathervane scallop	47.6
Tanner crab	1.5	Sidestripe shrimp	8.8
Total	52.9		56.4
Total all species	58.2		61.5

Table X-37.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 632, charter vessel Yaquina.

		Depth Zones	
0 - 100 m		101 - 200 m	
Species & groups	kg/hr	Species & groups	kg/hr
King crab	139.3	Starfish	0.5
Dungeness crab	1.8		
Weathervane scallop	1.8		
Total	142.9		0.5
Total all species	146.9		0.5

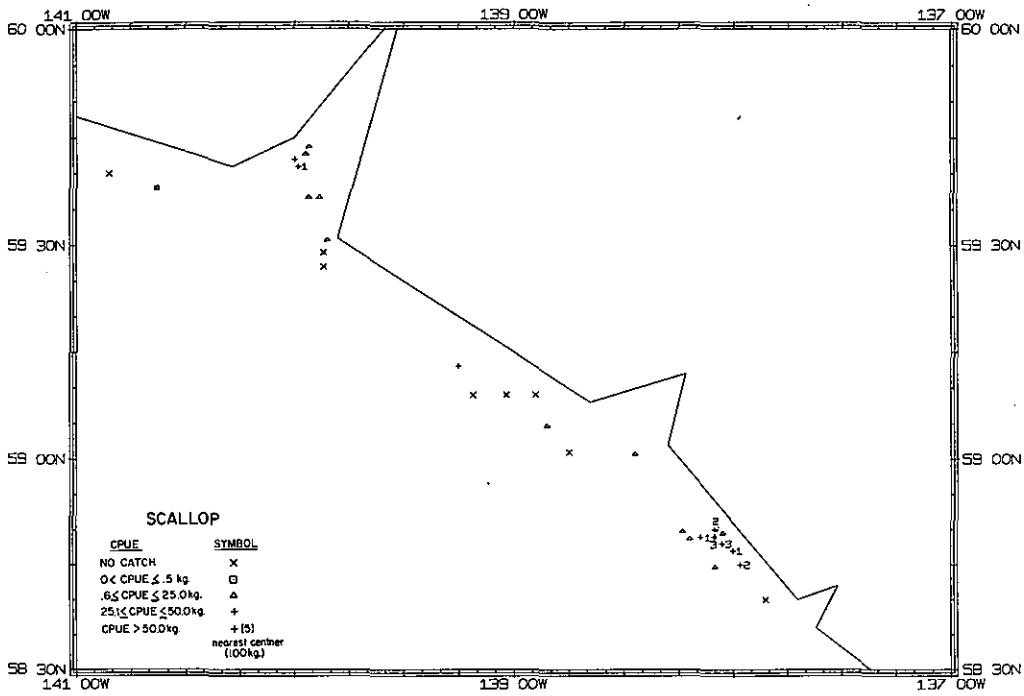
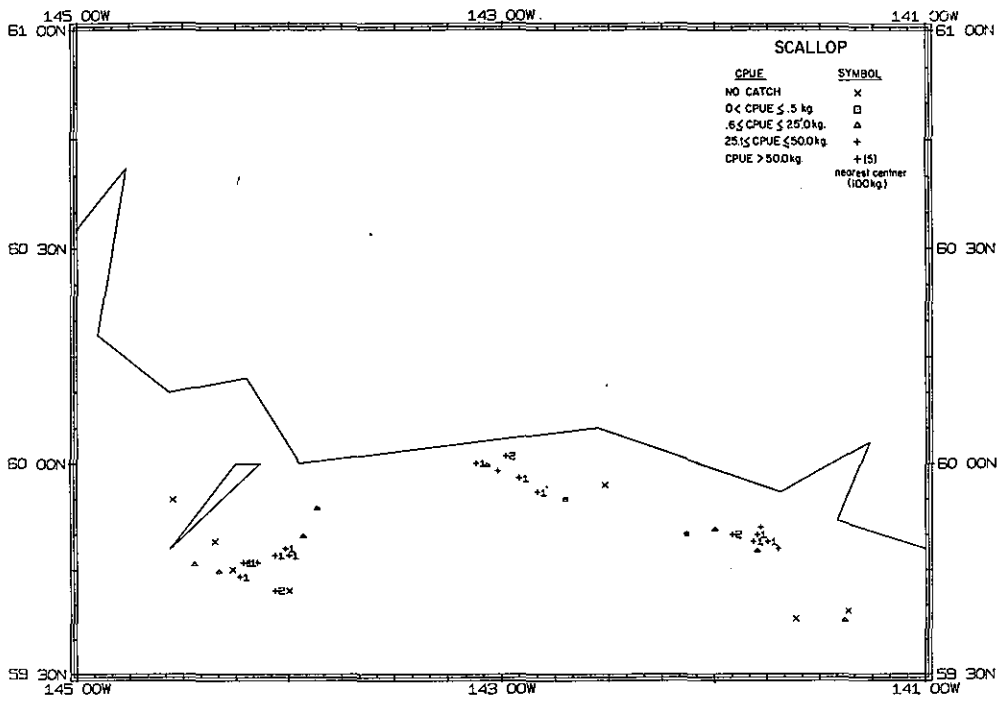


Figure X-207.--Distribution of scallop standardized catch rates in kg/hr, during cruise 631, R/V John R. Manning.

b. Cruise 632, Chartered Fishing Vessel, Yaquina (July-September 1963)

During July-September 1963 a scallop dredge was fished at 8 stations during a exploratory shrimp cruise in the central Gulf of Alaska. (Figure X-208). The total species catches averaged 147 kg/hr in the inner shelf and 0.5 kg/hr for 1 station in the outer shelf. (Table X-37). Weathervane scallop averaged only 2 kg/hr in the inner shelf as did Dungeness crab (Figure X-209). King crab was the principal species averaging 139 kg/hr. These 3 species made up 95% of the total catch.

c. Cruise 642, Chartered Fishing Vessel, Paragon (June-August 1964)

During June-Sept. 1964, 67 stations were sampled with an 8 foot scallop dredge (Figure X-210). The total catch for all species averaged 98 kg/hr in the inner shelf and 44 kg/hr in the outer shelf. Scallops averaged 5 kg/hr in the inner shelf and 20 kg/hr in the outer shelf. (Table X-38). Largest catches occurred in Marmot Bay and Unimak bight. (Figure X-211).

King crab and Dungeness crab occurred at mean CPUE's of 10 kg/hr or more in the inner shelf and were the only species exceeding this level.

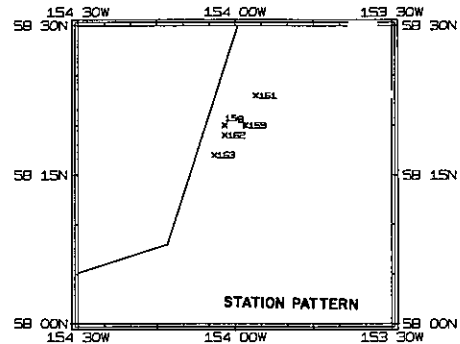
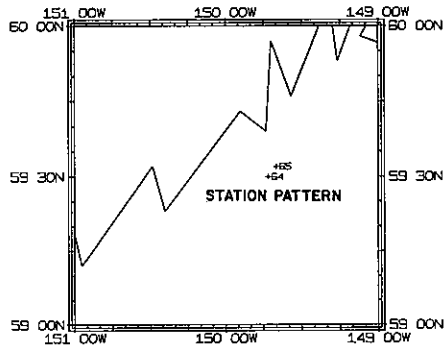


Figure X-208.--Stations successfully sampled (scallop dredge) during cruise 632, charter vessel Yaquina.

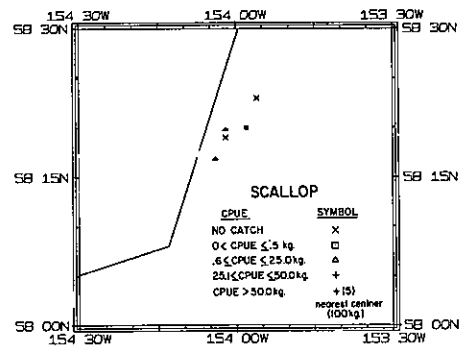
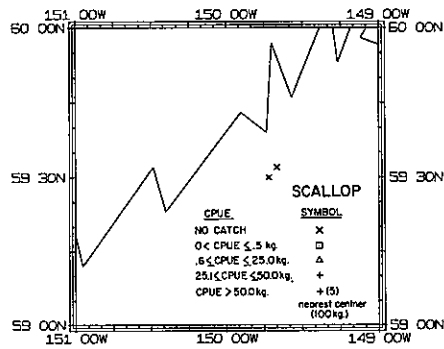


Figure X-209.--Distribution of scallop standardized catch rates in kg/hr, during cruise 632, charter vessel Yaquina.

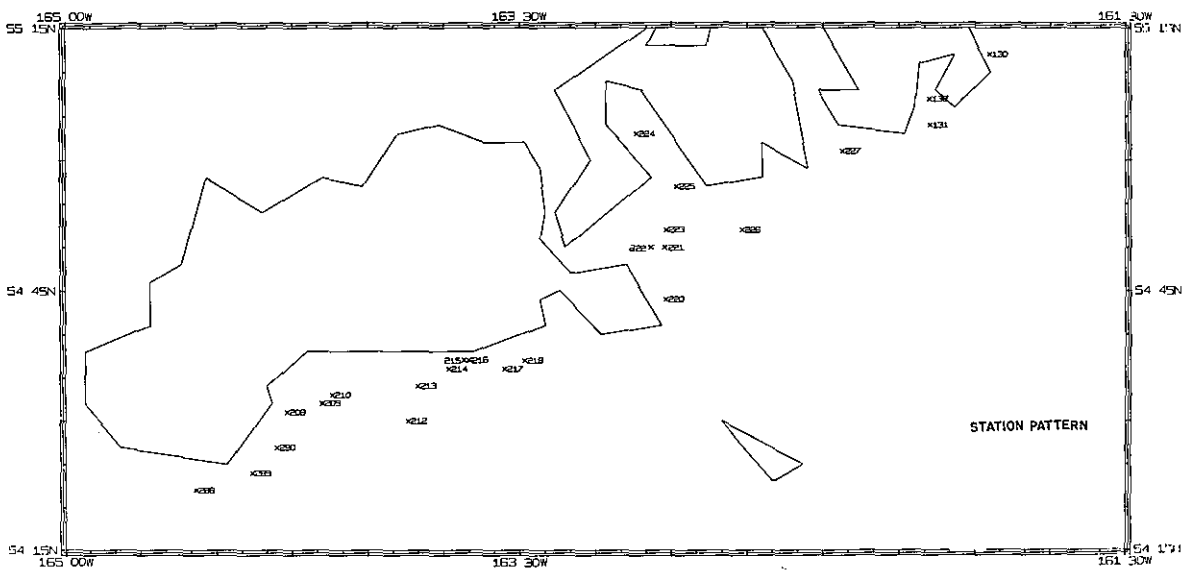
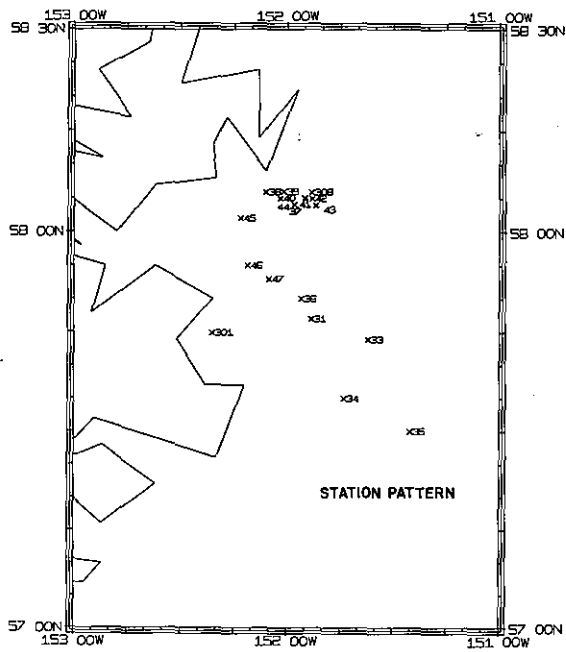


Figure X-210.--Stations successfully sampled (scallop dredge) during cruise 642, charter vessel Paragon.

Table X-38.--Mean CPUE's for the dominant species or species groups captured with scallop dredges, cruise 642, charter vessel Paragon.

Species & groups	Depth Zones		
	0 - 100 m	101 - 200 m	
Species & groups	kg/hr	Species & groups	kg/hr
Starfish	32.2	Weathervane scallop	19.5
King crab	19.4	Tanner crab	8.7
Dungeness crab	16.9	King crab	5.6
Tanner crab	7.3	Starfish	5.4
Sea anemone	5.2	Flathead sole	1.7
Weathervane scallop	4.7	Sea cucumber	1.2
Hermit crab	2.3		
Rock sole	1.5		
Snails	1.5		
Sand dollar	1.3		
Total	92.3		42.1
Total all species	98.4		44.2

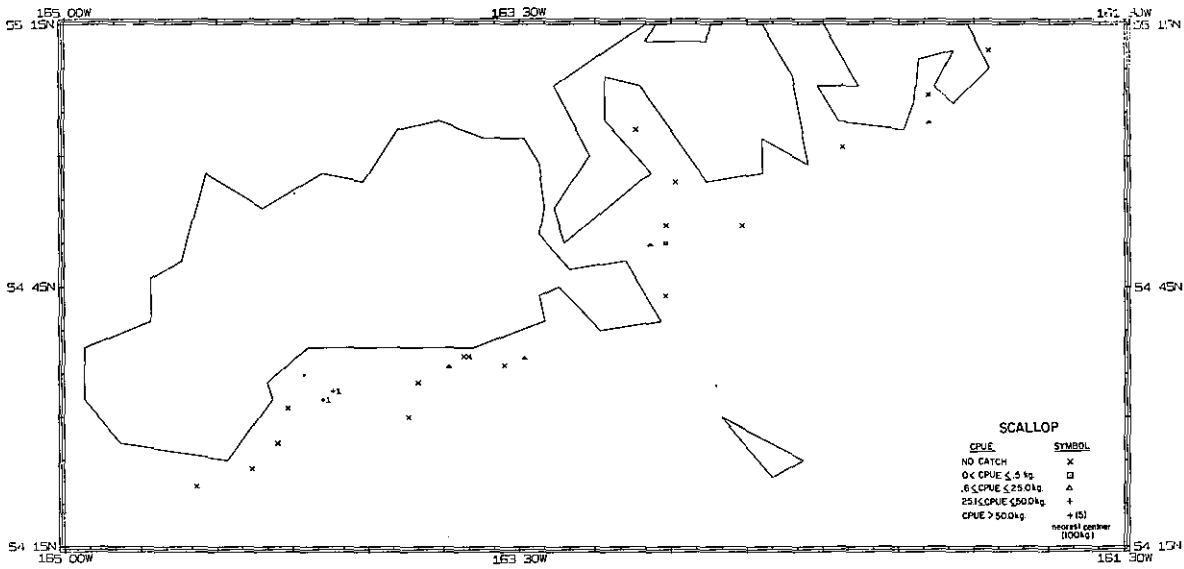
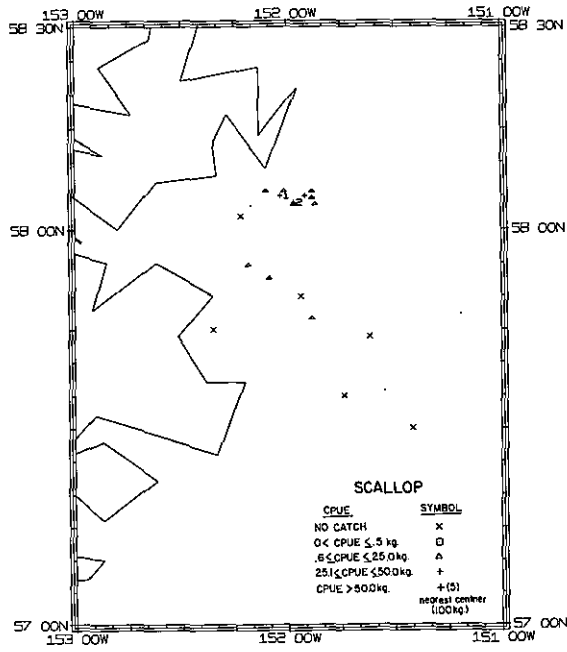


Figure X-211.--Distribution of scallop standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

