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Environmental Research Laboratories
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RESEARCH UNIT 174

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976

A Historical Review

.by

Lael L. Ronholt, Herbert H. Shippen and Eric S. Brown

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Volume 1

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II

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 shrimps 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 these 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 shrimps 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 crabs (1953-present), Tanner (snow) crabs (1968-present), Dungeness crabs (from at least 194 l-present), Pandalid shrimps (from 1959-present), and scallops (1968-present). A joint 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 crabs, Tanner crabs, Dungeness crabs, shrimps, scallops, and halibut. Species fished by Japan are the turbot (arrowtooth flounder) other flatfishes, sablefish (black-cod), 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 crabs, Tanner crabs, Dungeness crabs, 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 crabs, 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.

III

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 crabs 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).

IV

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 Ian" (Table IV-l). Of this total area the outer shelf (101-200 m) contains 48%, the inner shelf (L-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 °/oo, but can reach 16°C and 20 °/oo in the neashore areas which are affected by heavy fresh water runoff.

1/ Locations of geographic name places are presented in Appendix I.

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

Geographic subdivisions	Depth zones (meters) 0-100 km^2	101-200 km^2	201-400 km^2	0-400 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

V

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-l). 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, while the ten most dominant families account for 68% (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 the ten dominant families which accounted for only 39 percent of the total species occurring in the Gulf of Alaska, 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 dominant families with relatively large numbers of species inhabiting the Gulf of Alaska assumed a lesser importance with respect to susceptability of capture by bottom sampling gears. This reduction in 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 (>450m). 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 limited mainly to a variety of familiar and conspicious forms of macrobenthos such as crabs, clams, snails, starfish, and shrimp. The smaller elements of the fauna are poorly known and are inadequately sampled during fishery resource surveys using 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 representing the genus Pandalus and one 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-l.--Families of fishes and approximate number of genera and species reported from the Gulf of Alaska.

Family	1/ No. Genera	1/ No. Species	2/ No. Genera	2/ 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	--	--
Melanostomiatidae	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	--	--
Sphyraenidae	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	167	287	84	138

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 seperate 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
Zoaricidae	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							
Lamna ditropis	Salmon shark						X
Squalidae - Dogfish shark							
Squalus acanthias	Spiny dogfish	X	X	X	X	X	X
Rajidae - Skates							
Raja Sp.	Unidentified skate	X	X	X	X	X	X
Raja binoculata	Big skate	X	X				X
Raja kincaidi	Black skate		X				X
Raja rhina	Longnose skate	X	X				X
Raja stellulata	Starry skate	X					
Clupeidae - Herrings							
Clupea harengus pallasi	Pacific herring	X	X	X	X	X	X
Salmonidae - Salmon							
Oncorhynchus sp.	Unidentified salmon	X	X	X	X	X	X
Oncorhunchus kisutch	Coho salmon						X
Oncorhynchus nerka	Pink salmon	X					
Oncorhynchus tshawytscha	Chinook salmon	X					X
Osmeridae - Smelts							
	Unidentified smelt	X	X	X	X	X	X
Hypomesus pretiosus	Surf smelt	X					
Mallotus villosus	Capelin						X
Osmerus mordax dentex	Rainbow smelt 7/	X					
Spirinchus starksi	Night smelt	X					
Spirinchus thaleichthys	Longfin smelt	X					
Thaleichthys pacificus	Eulachon	X	X		X	X	X
Chauliodontidae - Viperfishes							
Chauliodus macouni	Pacific viperfish						X
Myctophidae - Lanternfishes							
Stenobrachius leucopsarus	Northern lampfish	X					
Gadidae - Codfishes							
Eleginus gracilis	Saffron cod	X					
Gadus macrocephalus	Pacific cod	X	X	X	X	X	X
Merluccius productus	Pacific hake	X	X				
Microgadus proximus	Pacific tomcod	X	X	X	X	X	X
Theragra chalcogramma	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
Bothrocara remigerum	Longsnout eelpout						X
Bothrocara molle	Soft eelpout						X
Lycodapus fierasfer	Blackmouth eelpout						X
Lycodes brevipes	Shortfin eelpout						X
Lycodes diapterus	Black eelpout						X
Lycodes palearis	Wattled eelpout						X
Lycodopsis pacifica	Blackbelly eelpout						X
Macrouridae - Grenadiers							
	Unidentified rattail	X	X	X	X		
Coryphaenoides acrolepis	Roughscale rattail	X	X				X
Scomberesocidae - sauries							
Cololabis saira	Pacific saury		X				
Trichodontidae - Sandfishes							
Trichodon trichodon	Pacific sandfish	X	X	X	X	X	X
Bathymasteridae - Ronquils							
	Unidentified ronquils	X	X	X	X	X	X
Bathymaster signatus	Searcher	X	X				X
Ronquilus jordani	Northern ronquil						X
Stichaeidae - Prickelbacks							
	Unidentified prickleback	X	X	X	X	X	X
Chirolophis decoratus	Decorated warbonnet	X					
Chirolophis nugator	Mosshead warbonnet 7/	X					
Lumpenella longirostris	Longsnout prickleback	X					X
Lumpenus maculatus	Daubed shanny						X
Lumpenus sagitta	Snake prickleback	X					X
Poroclinus rothrocki	Whitebarred prickleback						X
Anarhichadidae - Wolffishes							
Anarhichthys ocellatus	Wolf-eel	X	X				X
Cryptacanthodidae - Wrymouth							
Delolepis gigantea	Giant wrymouth	X					X
Lpconectes aleutensis	Dwarf wrymouth	X					X
Zaproridae - Prowfish							
Zaprora silenus	Prowfish	X	X				X

Table V-3. (cont'd.)

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

ıble V-3. (cont'd.)

CIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Cottidae - Sculpins							
	Unidentified sculpin	X	x	x	x	x	x
lepsias bilobus	Crested sculpin						X
lepsias cirrhosus	Silverspotted sculpin	X					
asycottus setiger	Spinyhead sculpin	X					X
nophrys bison	Buffalo sculpin						X
ymnocanthus galeatus.	Armorhead sculpin 7/	X					
emilepidotus hemilepidotus.	Red Irish lord	X	X				X
emilepidotus spinosus	Brown Irish lord						X
emilepidotus jordani.	Yellow Irish lord						X
emitripterus bolini	Bigmouth sculpin						X
celinus borealis.	Northern sculpin 7/						X
celinus filamentosus.	Threadfin sculpin 7/	X					
celinus oculatus.	Frogmouth sculpin 7/						X
celus spiniger.	Thorny sculpin						X
celus euryops							X
eptocottus armatus.	Pacific staghorn sculpin						X
alacocottus kincaidi.	Blackfin sculpin						X
yoxocephalus mednius		..					
yoxocephalus polyacanthocephalus.	Great sculpfn	X					X
sychrolutes paradoxus	Tadpole sculpin						X
adulinus asprellus.	Slim sculpin	X					
bamphocottus richardsoni.	Grunt sculpin						X
riglops macellus.	Roughspine sculpin						X
riglops pingeli	Ribbed sculpin 7/						X
riglops forficata	Scissortail sculpin 7/						X
Agonidae - Poachers							
	Unidentified poacher	X	x	x	x	x	x
gonopsis emmelane	Northern spearnose poacher						X
gonus acipenserinus	Sturgeon poacher						X
soplagonus inermis.	Smooth alligatorfish	X					
sterotheca alascana	Gray starsnout	X					
sterotheca infraspinata	Spinycheek starsnout	X					
athyagonus nigripinnis.	Blackfin poacher						X
ypsagonus quadricornis.	Fourhorn poacher						X
ccella verrucosa.	Warty poacher	X					
arritor frenatus.	Sawback poacher	X					
Cyclopteridae - Lumpfishes and snailfishes							
	Unidentified snailfish	X	x	x	x	x	x
ptocyclus ventricosus	Smalldisk snailfish						X
areproctus gilberti	Smooth lumpsucker						X
areproctus melanurus.	Blacktail snailfish 7/	X	X				X
umicrotremus derjugini.	Leatherfin lumpsucker 7/	X					
umicrotremus orbis.	Pacific spiny lumpsucker						X
liparis dennyi	Marbled snailfish						X
araliparis deani.	Prickly snailfish						X

Table V-3. (cont'd.)

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

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

CIENTIFIC NAME	COMMON NAME	1/	2/	3/	4/	5/	6/
Cancridae							
ancer magister	Dungeness crab	X	X	X	X	X	X
Inachidae							
hionoecetes bairdi	Tanner crab	X	X	X	X	X	X
Lithodidae							
ithodes aequispina	Golden king crab						X
aralithodes camtschatica	Red king crab	X	X	X	X	X	X
Pandalidae							
andalus borealis	Pink shrimp	X	X	X	X	X	X
andalus danae.	Dock shrimp	X					X
andalus goniurus	Humpy shrimp	X					X
andalus hypsinotus	Coonstripe shrimp	X	X				X
andalus jordani.	Ocean pink shrimp	X					X
andalus platyceros	Spot shrimp	X	X				X
andalus montagui tridens		X					X
andalopsis dispar.	Sidestripe shrimp	X	X				X
Pectinidae							
ectin caurinus	Weathervane 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)

VI

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.

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,

VII

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 (United States 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 shrimps, crabs, and scallops 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 crabs

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-l). The magnitude of the catch increased rapidly 'to peak at 53,200 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 10,000 to 12,000 mt.

2. Tanner crabs

The commercial harvesting of Tanner (snow) crabs 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 crabs. 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 crabs

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 crabs off the Pacific Northwest.

Table VII-l,-United States catch of king crabs in the area from Cape Suckling (144% 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) crabs 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	a.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 shrimps

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 53,000 mt in 1973.

5. Scallops

The historical records for the scallop fishery in central Alaska, including the Study Area, include the period from 1967 to recent years (Table V-11-5). The fishery for scallops 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 crabs, which might be injured by these gears. In the Study Area itself the scallop fishery is relatively small in comparison to those for crabs, 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% 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 9,000 mt in 1921 and 1922 tc nearly 18,000 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-6-7. The catch remained at about 20,000 mt annually from 1960 through 1970, but then it declined sharply to a level of 6,000-8,000 mt in 1974-75. The outlook for the halibut fishery remains in doubt at this time.

Table VII-4.--United States catch of pandalid shrimps 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 scallops 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) Cape Spencer to Cape St. Elias	Cape St. Elias to Trinity Islands	Total
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	6,353	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 11,338 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	Year 1969	1970	1971	1972	1973	1974	1975	Total	%
Japan	59,937	59,070	59,284	70,839	82,687	73,583	69,802	475,202	55
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	
U.S.S.R.	25,307	13,218	35,717	71,188	55,171	80,574	95,465	376,640	43
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
South Korea	--	--	--	4,000	4,000	6,000	?	14,000	2
Poland	--	--	--	--	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 which sablefish contributed 1,498 mt (96.3%), followed by 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 as taken in the vicinity of Kodiak Island (81%) with the lesser amounts from the Yakutat (11%), and Chirikof (6%), and the Shumagin (2%) regions (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 83,000 mt. Catches then declined moderately and have since fluctuated between 45,000 and 70,000 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 on a small scale in 1963 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 13,000 and 18,300 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 division&/ Shumagin	Chirikof	Kodiak	Yakutat	Total
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	22,020	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
	Longlfne	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 I.N.P.F.C. (International North Pacific Fisheries Commission) area divisions are different from the regions bearing similar names which appear elsewhere in this report. Under the I.N.P.F.C. 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 639,883 mt of which 564,210 mt (88%) was taken by trawl, 74,117 mt (12%) was taken by longline, and 1,556 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 53,247 to 85,208 mt with a mean of 68,729 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 2,371 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 8,000 tons of shrimp being taken in 1965 and 12,000 tons 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' 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/	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 Iklegations.
1967-1973:' I.N.P.F.C. 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/ Shumagin 1973	Shumagin 1974	Shumagin 1975	Chirikof 1973	Chirikof 1974	Chirikof 1975	Kodiak 1973	Kodiak 1974	Kodiak 1975	Yakutat 1973	Yakutat 1974	Yakutat 1975	Study Area total 1973	Study Area total 1974	Study Area total 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
Koundfishes	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
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	53,172	77,762	95,465
Shrimp	--	600	--	--	--	--	--	1,106	--	--	--	--	--	1,706	--
Grand total	13,982	20,602	16,629	16,118	7,989	4,088	19,227	47,406	71,435	3,844	3,471	3,313	53,172	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 her 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).

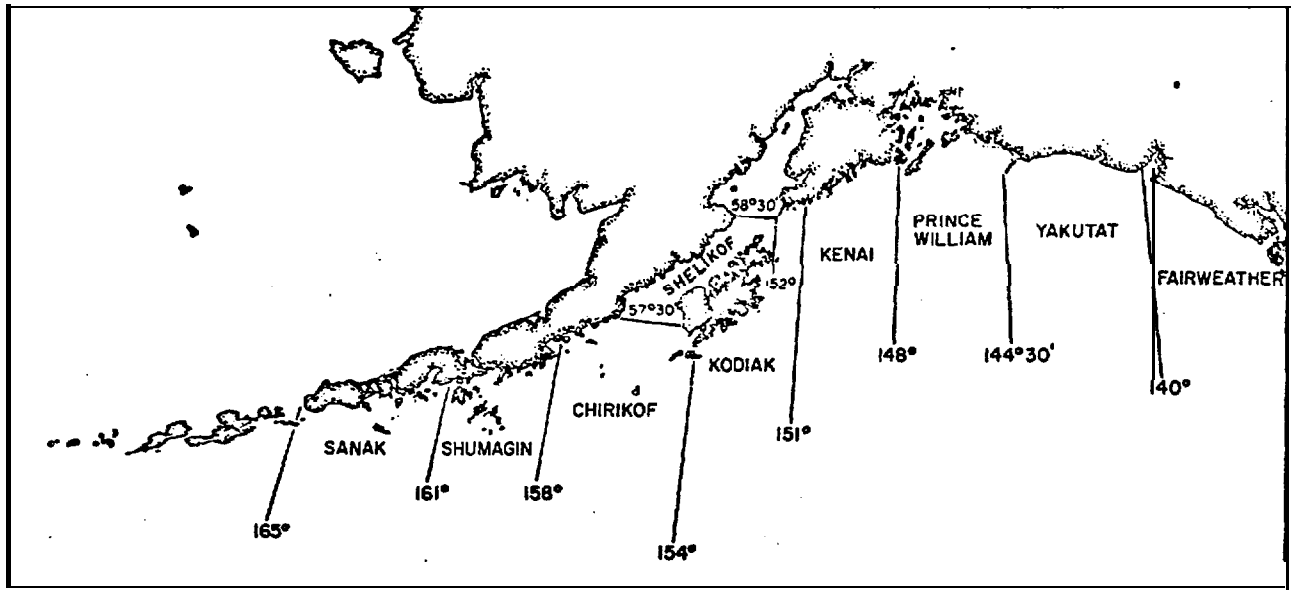


Figure VIII-1.--Regions of the northern Gulf of Alaska Study Area.

VIII

REGIONAL CATCH STATISTICS

INTRODUCTION

The Study Area was divided into nine regions as shown in Figure VIII-l, 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 (crabs, shrimp, and scallops) 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 37,012 mt (for the 7 years from 1969 to 1975) is the largest, followed by the halibut fishery (9884 mt), the king crab fishery (9129 mt), the Dungeness crab fishery (1960 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 20,973 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 crabs by the Alaska State Fishing Regulations. The four species are:

Common name	Scientific name
Red king crab	Paralithodes camtschatica
Blue king crab'	Paralithodes platypus
none	Paralithodes brevipes
Brown or golden king crab	Lithodes aequispina

Within the Study Area, Paralithodes camtschatica is by far the most common king crab; Lithodes aequispina occurs sporatically, 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 crabs 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 crabs by American fishermen from each of the regions within the Study Area is shown in Table VIII-l; 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 6927.3-12,292.1 mt with a mean of 9128.5 mt and a trend toward increased production in more recent years.

The fishery for king crabs 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 crabs are found in the Study Area, 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	ANN ME
Fairweather	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.6	1	
Yakutat	0.0	0.0	0.0	2.0	0.0	0.0	3.0	5.0	2	
Prince William	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	20
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	3,20
Shelikof	1,583.2	1,235.8	518.6	935.6	933.3	1,808.9	2,111.5	9,126.9	7	1,30
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	2.60
Shumagin	391.2	226.9	311.8	'697.7	444.0	337.7	147.4	2,556.7	7	36
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	1,44
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	9,12

1/ Round weight

The fishery for Tanner crabs increased markedly during the mid-1970's, because of improved technology for processing. Difficulties in filling the demand for king crabs 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 crabs 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 crabs by American fishermen from each of the regions within the Study Area is shown in Table VIII-Z; a mean annual catch based upon the number of years with reported data in 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 3,510.6-18,665.0 mt, with a mean of 9,884.2 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 599.2 to 3500.4 mt during the 7-year period from 1969 to 1975, with a mean annual catch of 1960.0 mt. A general trend of declining although variable production from 1969 to 1975 is evident.

4. Pandalid shrimps

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

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
Fair-weather	--	--	--	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

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 19,414.0 to 51,055.8 mt, with a mean of 37,011.7 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 estabished 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. Scallops

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 140.6 to 785.6 mt, with a mean of 466.6 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%), Fair-weather (6%), and Sanak (4%).

Table VIII-4.--United States catches[1/] of pandalid shrimps, 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	2j919.3	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	37,001.7

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	AK M
Fairweather	172.6		20.3	21.3	61.3	12Q.0	6.1	401.6	6	
Yakutat	207.0	10.3	18.3	58.2	17.4	41.8	--	353.0	6	
Prince William	--	--	--	--	--	--	--	0	0	
Kenai	167.7	276.4	83.7	109.3	78.5	--	34.6	750.2	6	I
Kodiak	217.2	364.8	281.1	333.6	325.4	66.9	78.9	1,667.9	7	2
Shelikof	21.1	1.7	3.9	25.8	9.0	8.8	19.9	90.2	7	
Chirikof	--	--	--	--	--	--	--	0	0	
Shumagin	--	--	--		--	--	1.1	1.1	1	
Sanak	--	--	2.3	--	--	--	--	2.3	1	
TOTAL	785.6	653.2	409.6	548.2	491.6	237.5	140.6	3,266.3	7	4

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 YIII-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
Fair-weather	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	--	--	--	--	--	cc	--	--	--	--		--
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)	Atheresthes stomias
Other flatfishes	
Sablefish (black cod)	Anoplopoma fimbria
Pacific cod	Gadus macrocephalus
Walleye pollock	Theragra chalcogramma
Pacific ocean perch	Sebastes alutus
Other rockfishes	-
Miscellaneous fishes	-
Total trawl catch of fishes and shellfishes.	

A. Turbot (Arrowtooth flounder)

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 calculatedbased upon the number of years in which data were reported. The 14,227 mt of arrowtooth flounder taken during the 1969-74 period was 4.32 of the 328,406 mt total trawl catch by Japan from the Study Area. The mean annual catch of arrowtooth flounder from the Study Area has ranged from 1293 mt to 5110 mt, with an average of 2,371 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 12,938 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 6230 mt with a mean of 2,156 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 (29%), 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 Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	A
Fairweather	359	504	88	166	216	50	1,383	6	
Yakutat	474	301	125	202	1,406	356	2,854	6	
Prince William	25	81	41	246	347	218	958	6	
Kenai	229	287	676	746	618	652	3,208	6	
Kodiak	131	160	218	127	489	654	1,779	6	
Shelikof	0	0	0	0	0	0	0	0	
Chirikof	129	235	115	125	1,620	938	3,162	6	
Shumagin	71	20	30	0	363	161	645	5	
Sanak	49	0	0	0	51	128	228	3	
TOTAL	1,467	1,588	1,293	1,612	5,110	3,157	14,227	6	

1/ Round weight

Table VIII-9.--'Annual Japanese trawl catches[1/] of flatfishes other than turbot, 1969 - 1974, by region of the S
Area (metric tons).'

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

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-LO. The 24,000 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 2,480 to 6,521 mt with a mean of 4,000 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 8,711 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 to 2,648 mt with a mean of 1,452 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 Willaim (15%), Sanak (8%), Yakutat (8%), Shumagin (6%), Fairweather (2X), 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 62,418 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 4,854 to 29,116 mt with a mean of 10,403 mt; the largest catch of 29,116 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 188,731 mt of Pacific ocean perch taken by Japanese trawlers were more than half (57.4X) 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 24,683 to 36,255 mt with a mean of 31,395 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
Chjrikof	292	238	432	573	948	352	2,835	6	472
Shumagin	75	22	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 (metr tons).

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

1/ Round weight

Table VIII-12.--Annual Japanese trawl catches[1/] of walleye pollock, 1969 - 1974, by region of the Study Area (m tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	AN M
Fairweather	516	116	148	83	96	614	1.573	6	
Yakutat	1,427	175	265	927	589	1,266	4,649	6	
Prince William	222	118	372	188	191	1,501	2,592	6	
Kenai	1,211	275	2,084	910	740	4,766	9,986	6	
Kodiak	969	1,045	862	3,182	2,777	12,402	21,237	6	
Shelikof	0	0	0	0	0	0	0	0	
Chir iko f	1,028	1,493	652	936	1,899	6,713	12,721	6	2
Shumagin	723	13	1	686	38	965	2,426	6	
Sanak	2,519	1,619	1,292	892	23	889	7,234	6	1
TOTAL	8,615	4,854	5,676	7,804	6,353	29,116	62,418	6	10

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	4,326	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	5,951	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 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 9,643 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 400 to 3720 mt, with a mean of 1607 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 8098 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 364 to 2643 mt, with a mean of 1350 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 328,406 mt taken by the trawl fishery is 78.4% of the 418,999 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 41,509 to 71,029 mt, with a mean of 54.734 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	ANNUA MEAN
Fairweather	211	169	151	283	1,844	540	3,198	6	53
Yakutat	308	189	390	570	944	804	3,205	6	53
Prince William	87	10	54	165	184	281	781	6	13
Kenai	43	8	331	170	358	287	1,197	6	20
Kodiak	79	5	172	128	124	114	622	6	10
Shelikof	0	0	0	0	0	0	0	0	
Chirikof	48	19	71	44	142	35	359	6	6
Shumagin	1	0	1	31	65	31	129	5	2
Sanak	0	0	20	7	59	66	152	4	3
TOTAL	777	400	1,190	1,398	3,720	2,158	9,643	6	1,60

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 fin fishes, 1969 - 1974, by region of the Study Area (metric tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS	ANNUAL MEAN
Fair-weather	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
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	324,406	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 88,845 mt (98%) of the 90,593 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 10,527 to 19,184 mt with a mean of 15,099 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 10,162 to 18,943 mt, with a mean of 14,808 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 10,000 mt in 1969 to a peak of 19,000 in 1972, and then declined in 1973 and 1974.

B. Other species

The Japanese longline catch of fishes other than sablefish is relatively small, 1748 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.

3. The combined trawl and longline fisheries'by Japan

The fisheries by Japan in the Study Area, trawl and longline, took 418,999 mt during the 1969-74 period of which 328,406 mt (78%) was by trawl, and

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
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 of sablefish and other species and comparison between total tr and total longline catches for the period 1969-1974, by regions in the Study Area.

	LONCLINE FISHERY CATCH1/				TRAWL - LONCLINE FISHERY COMPARISON							
	Metric tons				All Specie&.' - - - - - metric tons				Sablefish only.?./ - - - -			
REGION	Sable-fish	%	Other fishes	%	Total	%	Trawl	%	Longline	%	Total	%	Trawl	%	Long-'line	%
Fair-weather	27,993	(97)	778	(3)	28,771	(31)	45,279	(61)	28,771	(39)	74,050	(18)	3,192	(10)	27,993	(90)
Yakutat	13,712	(99)	182	(1)	13,894	(15)	75,188	(84)	13,894	(16)	89,082	(21)	6,510	(32)	13,712	(68)
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)
Kenai	12,507	(98)	224	(2)	12,731	(14)	57,477	(82)	12,731	(18)	70,208	(17)	4,632	(27)	12,507	(73)
Kodiak	8,346	(98)	136	(2)	8,482	(9)	59,836	(85)	8,482	(15)	58,318	(14)	2,536	(23)	8,346	(77)
Shelikof	0	(0)	0	(0)	0	(0)	14	(100)	0	(0)	14	(0)	12	(100)	0	(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)
Shumagin	4,761	(98)	74	(2)	4,835	(5)	9,411	(66)	4,835	(34)	1'4,246	(3)	696	(13)	4,761	(87)
Sanak	6,360	(98)	114	(2)	6,474	(7)	14,910	(70)	6,474	(30)	21,384	(5)	640	(9)'	6,360	(91)
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)

1/ Round weight

Table VIII-19.--Annual Japanese longline catches[1/] of fin fishes. 1969 - 1974, by region of the Study Area (
tons).

REGION	1969	1970	1971	1972	1973	1974	TOTAL	NO. YRS
Fairweather	4,886	5,652	5,515	5,809	3,222	3,687	28,771	6
Yakutat	1,958	2,627	1,981	2,446	2,749	2,133	13,894	6
Prince William	912	1,773	1,180	1,432	1,292	825	7,414	6
Kenai	1,254	2,454	1,872	2,487	2,332	2,332	12,731	6
Kodiak	438	1,327	1,682	2,250	1,679	1,106	8,482	6
Shelikof	0	0	0	0	0	0	0	0
Chirikof	'436	887	943	1,905	2,001	1,820	7.992	6
Shumagin	326	642	684	1,249	938	996	4,835	6
Sanak	317	556	877	1,606	1,610	1,508	6,474	6
TOTAL	10,527	15,918	14,734	19,184	15,823	14,407	90,593	6

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	A
Fairweather	336	71	85	66	182	38	778	6	
Yakutat	14	39	20	21	86	2	182	6	
Prince William	4	18	32	12	49	4	119	6	
Kenai	9	24	45	43	100	3	224	6	
Kodiak	0	18	29	30	58	1	136	5	
Shelikof	0	0	0	0	0	0	0	0	
Chirikof	0	5	30	26	58	2	121	5	
Shumagin	2	4	25	18	22	3	74	6	
Sanak	0	4	19	25	59	7	114	5	
TOTAL	365	183	285	241	614	60	1,748	6	

1/ Round weight

90,593 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 57,427 to 85,436 mt for the years from 1969 to 1974 with a mean of 69,833. During the last part of the period, 1972-74. the catch increased sharply over that of 1969-71. The' contribution& 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 as shown in Table VIII-23. During the 6-year period from 1969 to 1974, the sablefish catch has ranged from 13,487 to 25,464 mt per year, with a mean of 18,808 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 fin fishes, 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	ANN ME
Fairweather	13,799	11,703	11,189	13,427	13,663	10,269	74,050	6	12,
Yakutat	16,554	9,954	12,772	16,646	19,825	13,331'	89,082	6	14,
Prince William	5,287	5,262	3,735	5,998	6,154	5,105	31,541	6	5,
Kenai	8,991	8,898	13,426	12,529	12,041	14,323	70,208	6	11,
Kodiak	6,039	7,251	7,161	10,048	9,142	18,677	58,318	6	9,
Shelikof	0	0	0	14	0	0	14	1	
Chirikof	7,565	10,979	7,066	6,607	13,385	14,554	60,156	6	10,
Shumagin	1,760	866	1,128	2,382	4,418	3,692	14,246	6	2,
Sanak	7,331	2,514	2,807	3,188	4,059	5,485	21,384	6	3,
TOTAL	63,326	57,427	59,284	70,839	82,681	85,436	418,999	6	69,

1/ Round weight

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

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

1/ Round weight

Table VIII-24.--Total Japanese trawl and longline catch!/ by species or species group and region in the Study Arc 1969 - 1974, (metric tons),

Region	SPECIES OR SPECIES GROUP								Total	Perce
	Turbot	Other Flatfishes	Sablcfish	Pacific cod	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	60,158	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) crabs, king crabs, pandalid shrimps, and scallops 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 crabs

A statistical sub-area which produced in any single year from 1969-1975 at least 500,000 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 1X-l. 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	a	2.7	6
259 - 21	211,851	760 - 756,541	2s	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	2%	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

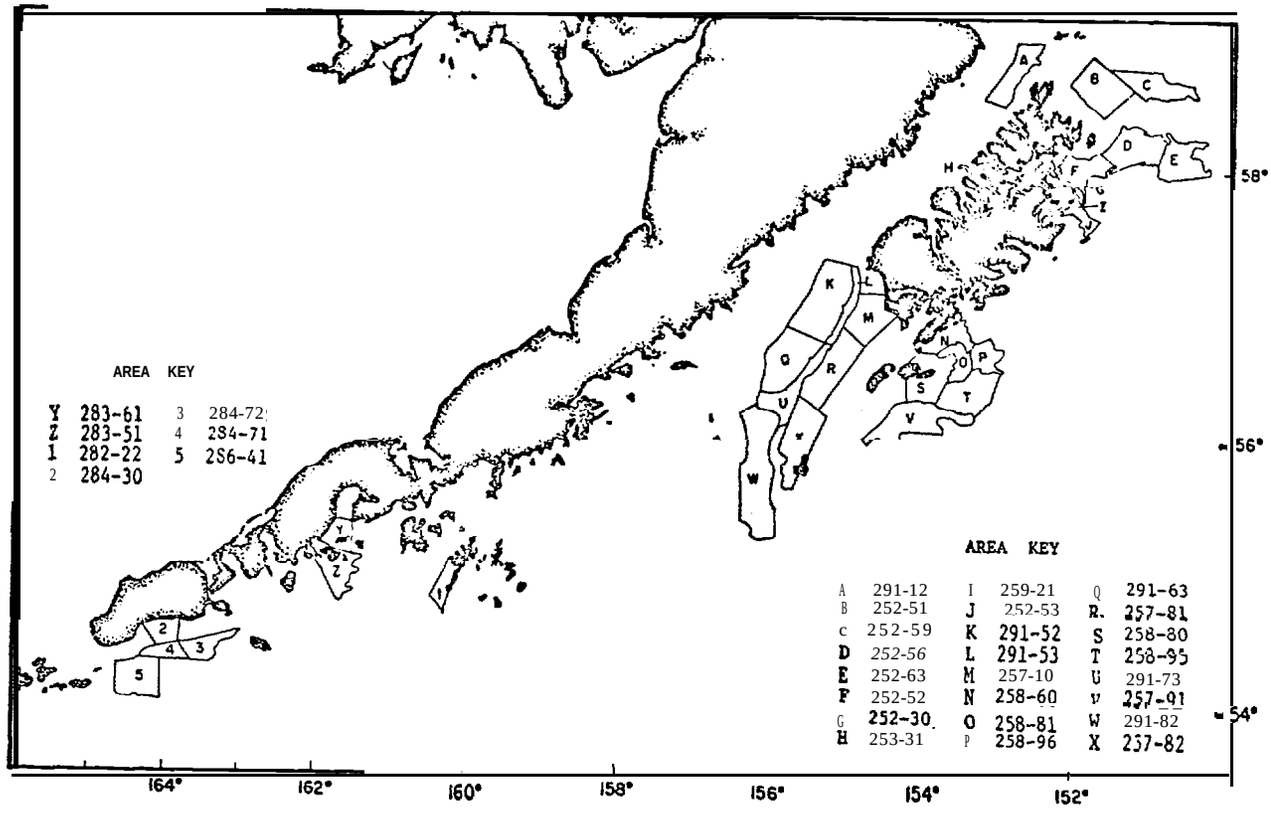


Figure IX-l .--Areas of high production of king crab by United States fishermen, 1969 - 1975.

2. Tanner crab

Any statistical sub-area which produced at least 500,000 pounds of Tanner crabs 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 1X-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 1X-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 crder 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.

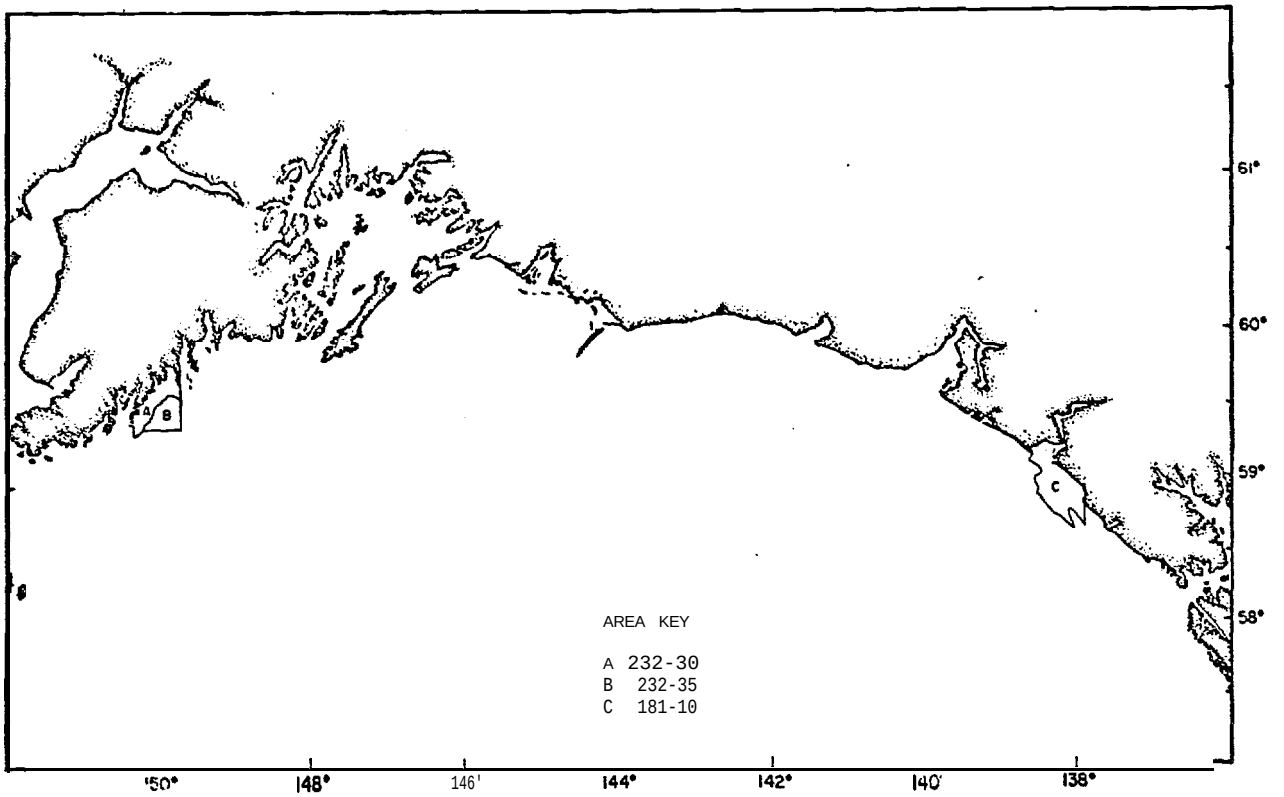


Figure 1X-2. --Areas of high production of Tanner (snow) crab by United States fishermen, 1969 - 1975 (eastern Study Area).

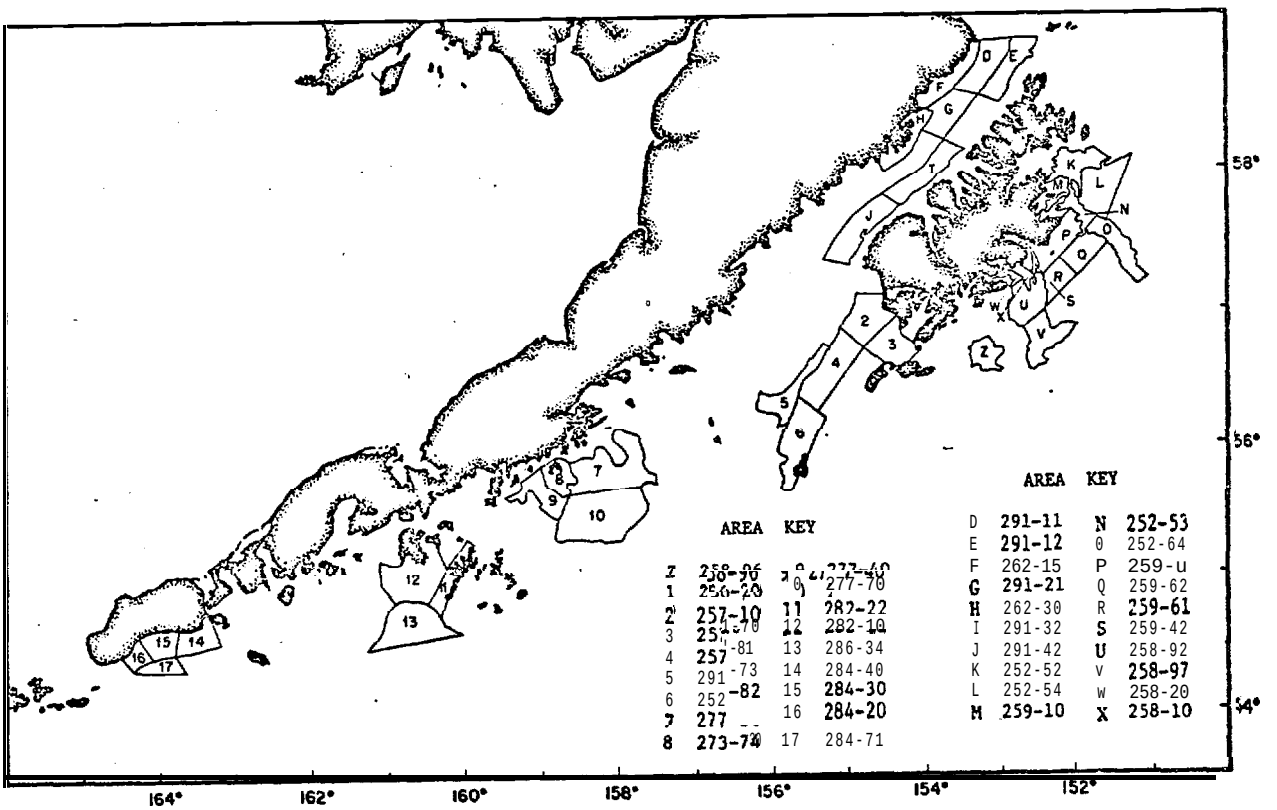


Figure 1X-3. --Areas of high production of Tanner (snow) crab by United States fishermen, 1969 - 1975 (western Study Area).

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 - 813,355	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 crabs

Any of the Alaska Department of Fish and Game statistical sub-areas which produced 1,000,000 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 1X-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 shrimps

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 1X-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 1X-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 1X-3.--Areas important to the production of Dungeness 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
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	235,586	2,454 - 469,317	8	1.6	15
284 - 40	107,225	2,304 - 178,640	16	1.1	19

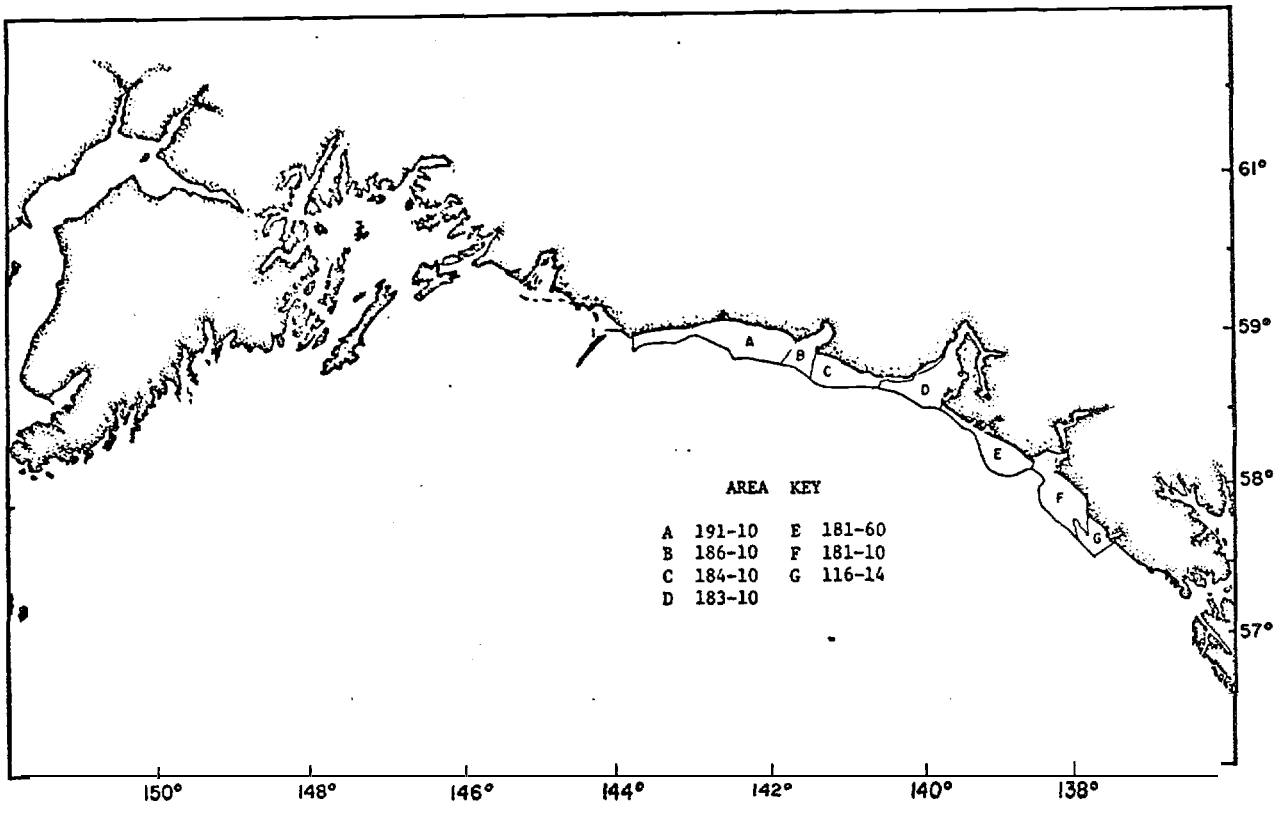


Figure 1X-4, --Areas of high production of Dungeness crab by United States fishermen, 1969 - 1975 (eastern Study Area).

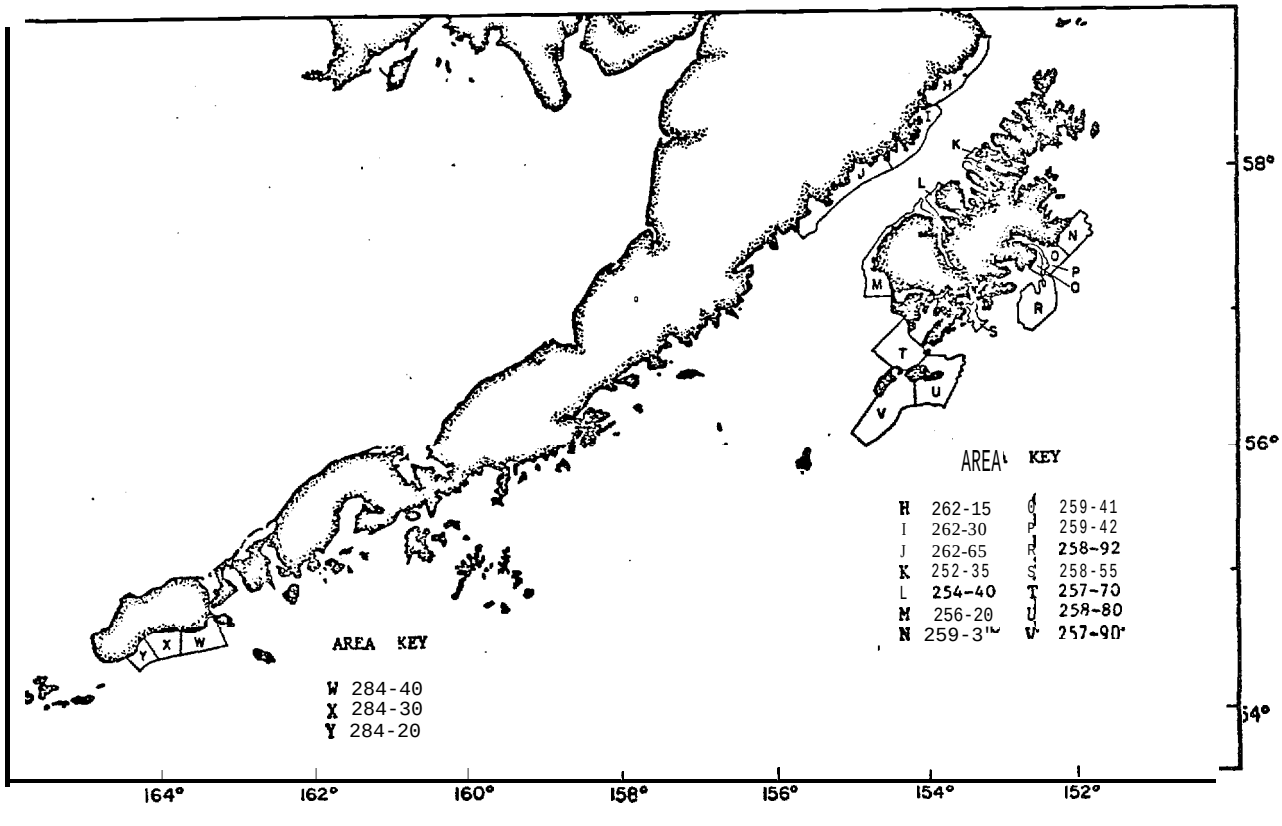


Figure 1X-5. --Areas of high production of Dungeness crab by United States fishermen, 1969 - 1975 (western Study Area).

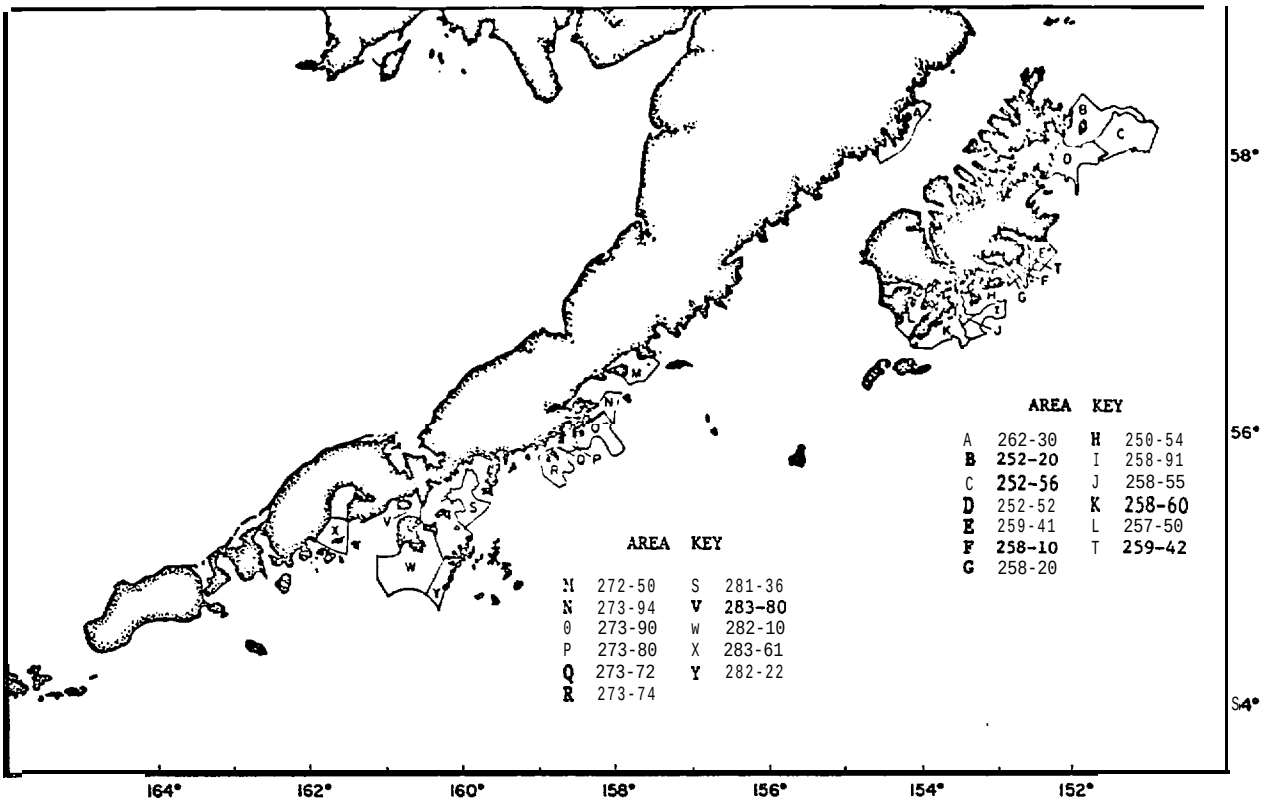


Figure IX-6. --Areas of high production of Pandalid shrimps by United States fishermen, 1969 - 1975.

5. Scallops

Any Alaska Department of Fish and Game statistical sub-area that produced at least 50,000 pounds of scallop meats (approximately 1/10 of the round weight) during any year from 196.9-1975 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 1X-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 Tsiand.

In Table 1X-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 shrimps, 1969 - 1975.

Statistical sub-area number	Contribution to Annual Production (Pounds)				Contribution to 1969-1975 production	
	Annual Mean	1969 - 1975 Range	Rank Order (mean)		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

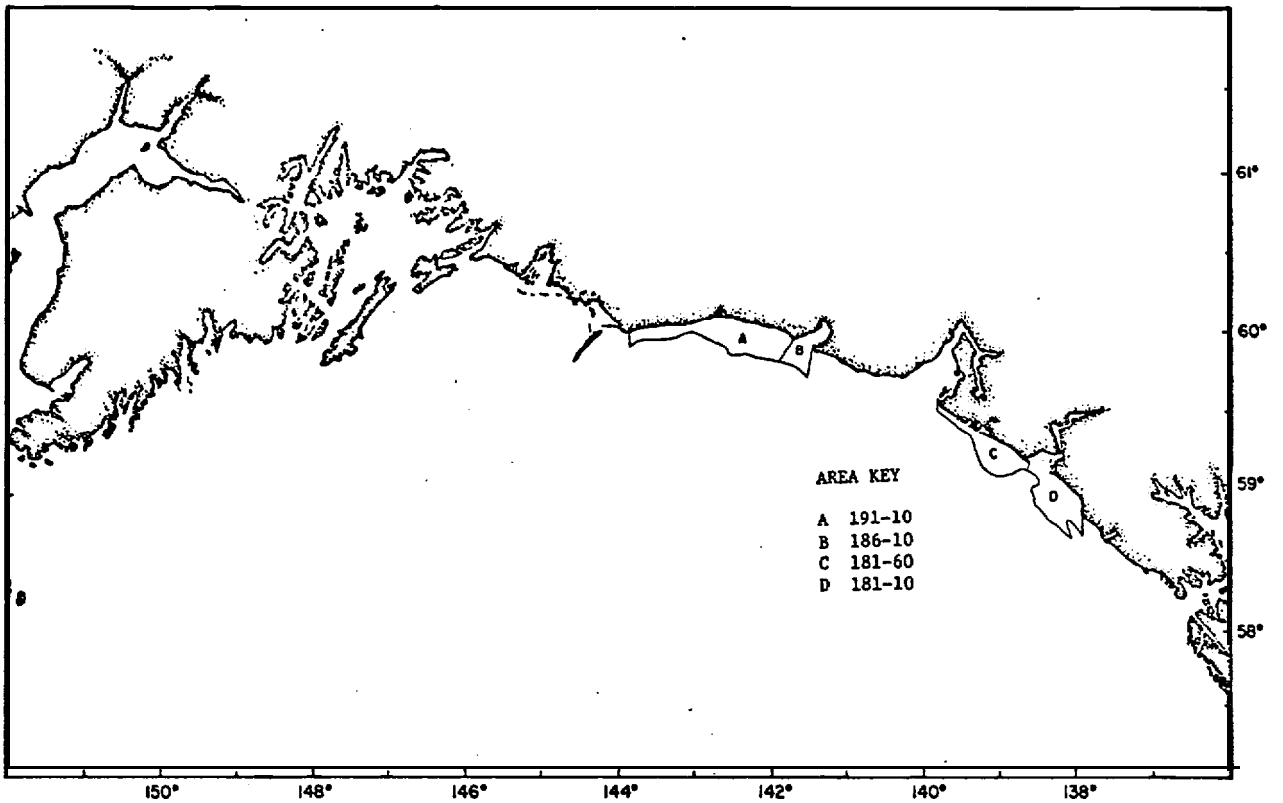


Figure 1X-7. --Areas of high production of scallop by United States fishermen, 1969 - 1975 (eastern Study Area).

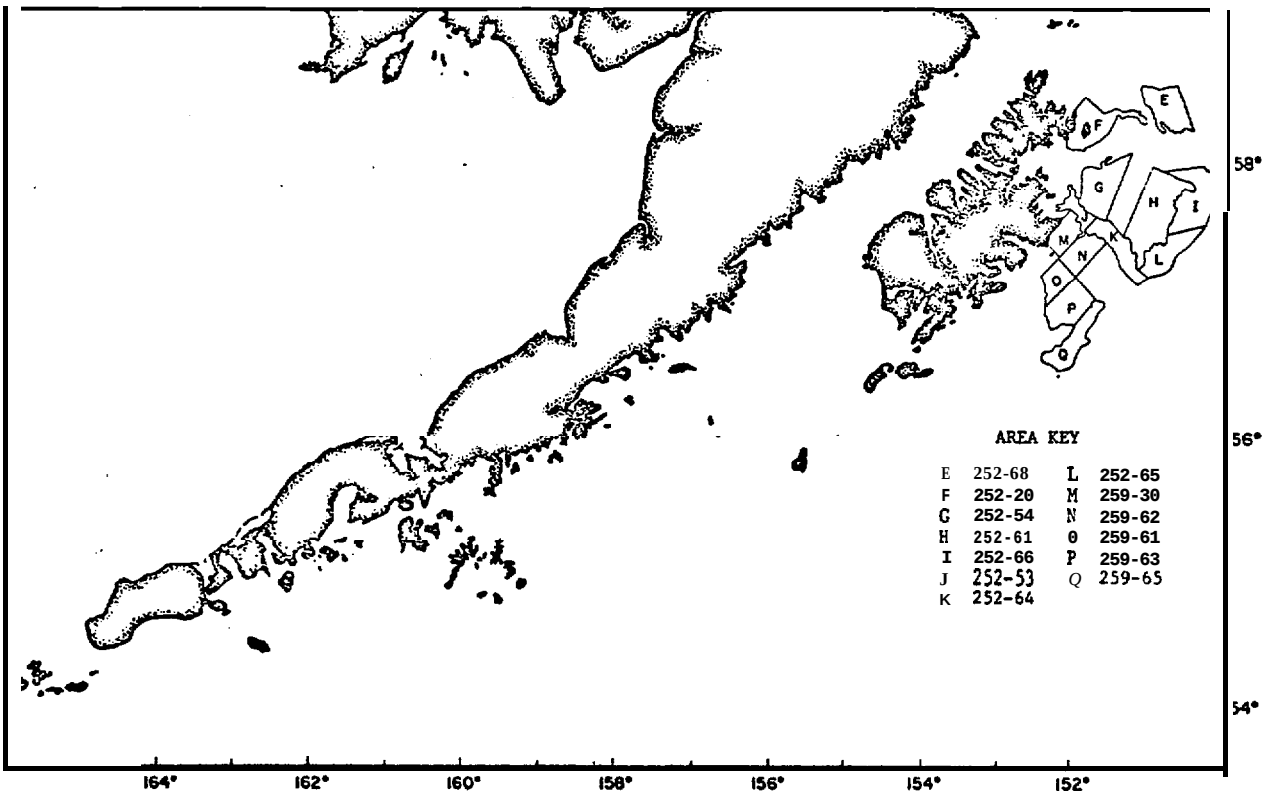


Figure 1X-8. --Areas of high production of scallop by United States fishermen, 1969 - 1975 (western Study Area),

Table 1X-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 1X-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 1X-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 55553 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.

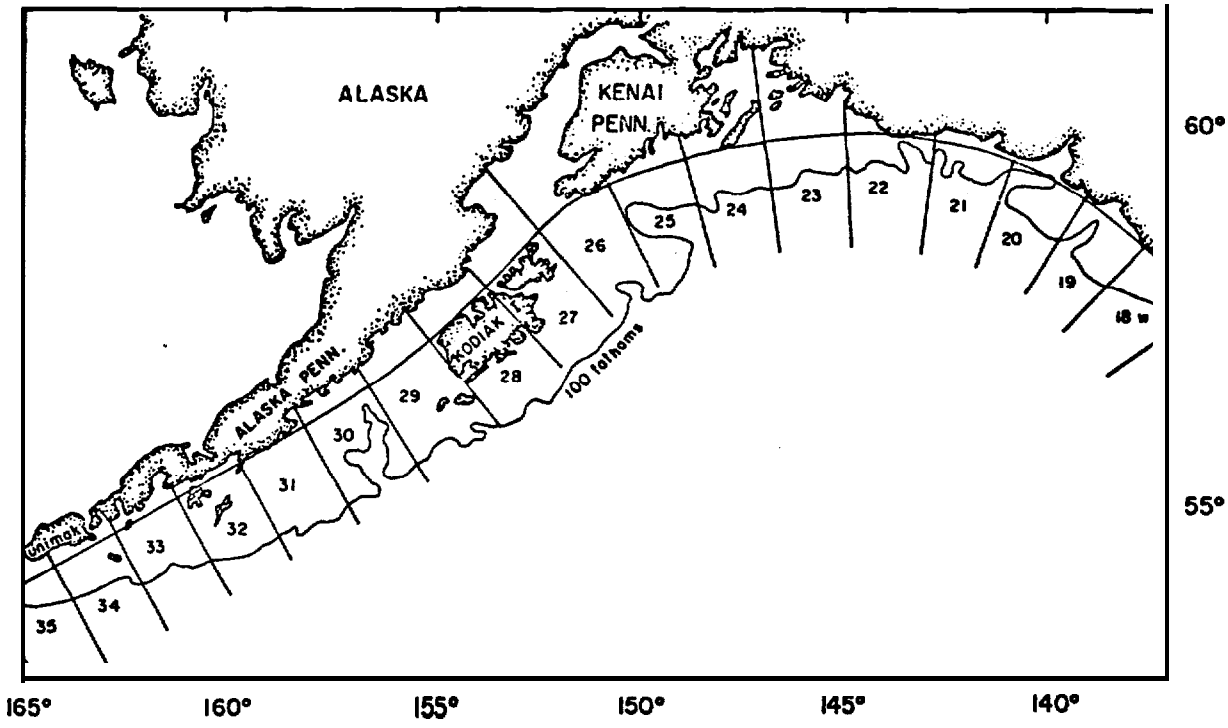


Figure IX-9.--Statistical reporting areas for halibut production from Cape Spencer to Unimak Pass by United States and Canadian fishermen.

Table IX-6.--Halibut catches by United States and Canadian fishermen by International Pacific Halibut Commission statistical areas, 1960 - 1968 and 1969 - 1975.

Statistical Reporting Area	1960 - 1968 Annual Mean (mt)	% of Total	Rank Order	1969 - 1975 Annual Mean (mt)	% 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 (arrowtooth flounder)

The catches of turbot (Atheresthes stomias) were distributed throughout the Study Area in moderate quantities (Figure IX-IO). 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 1X-11. Two blocks, 41590 off Yakutat Bay and 47590 south of Montague Island, had relatively high yield 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 or black cod

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 1X-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 1X-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).

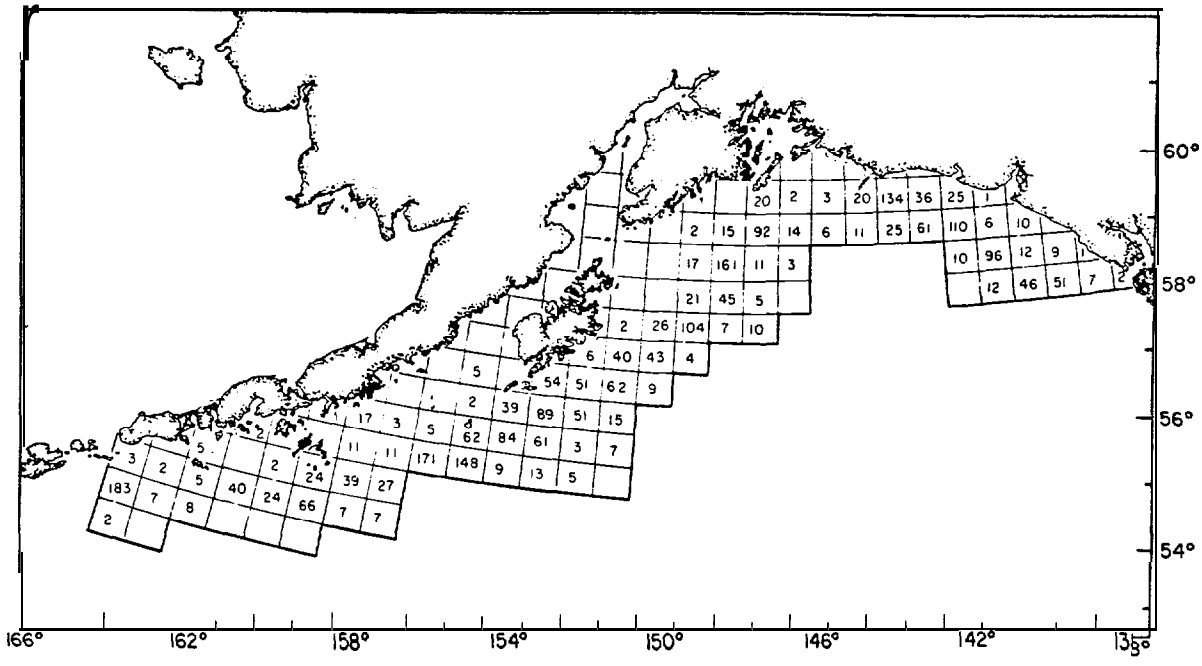


Figure IX-10.--Mean annual catch (mt) of turbot (arrowtooth flounder) by the Japanese trawl fishery, 1964 - 1974.

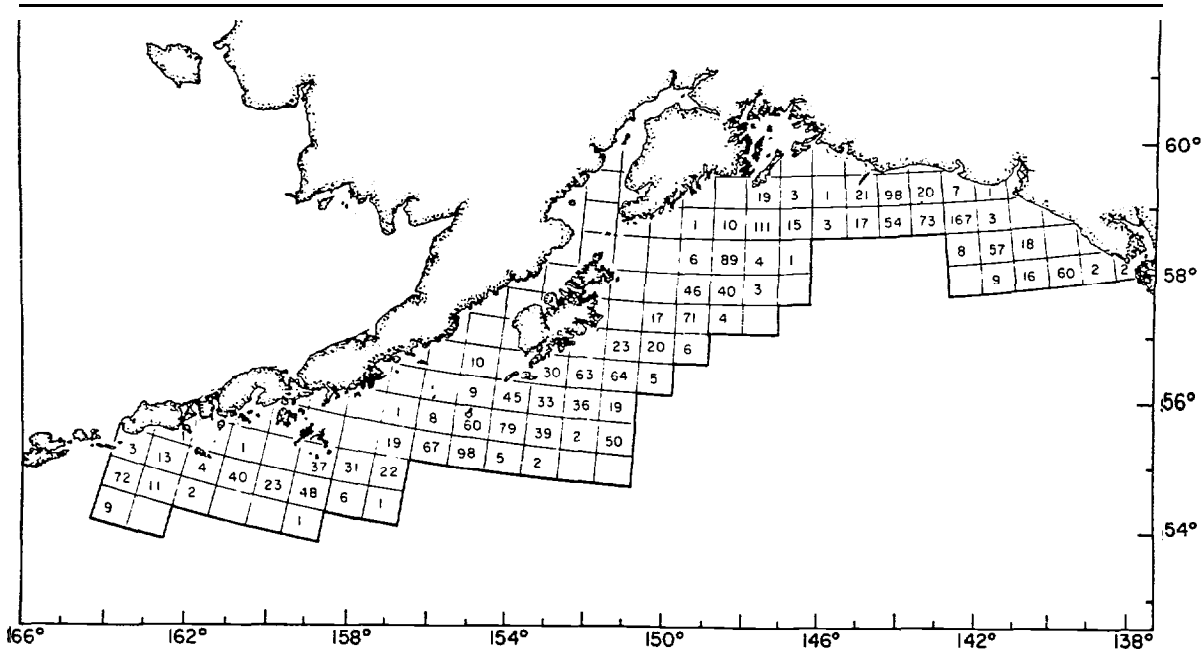


Figure 1X-11.--Mean annual catch (mt) of flatfishes other than turbot by the Japanese trawl fishery, 1964 - 1974.

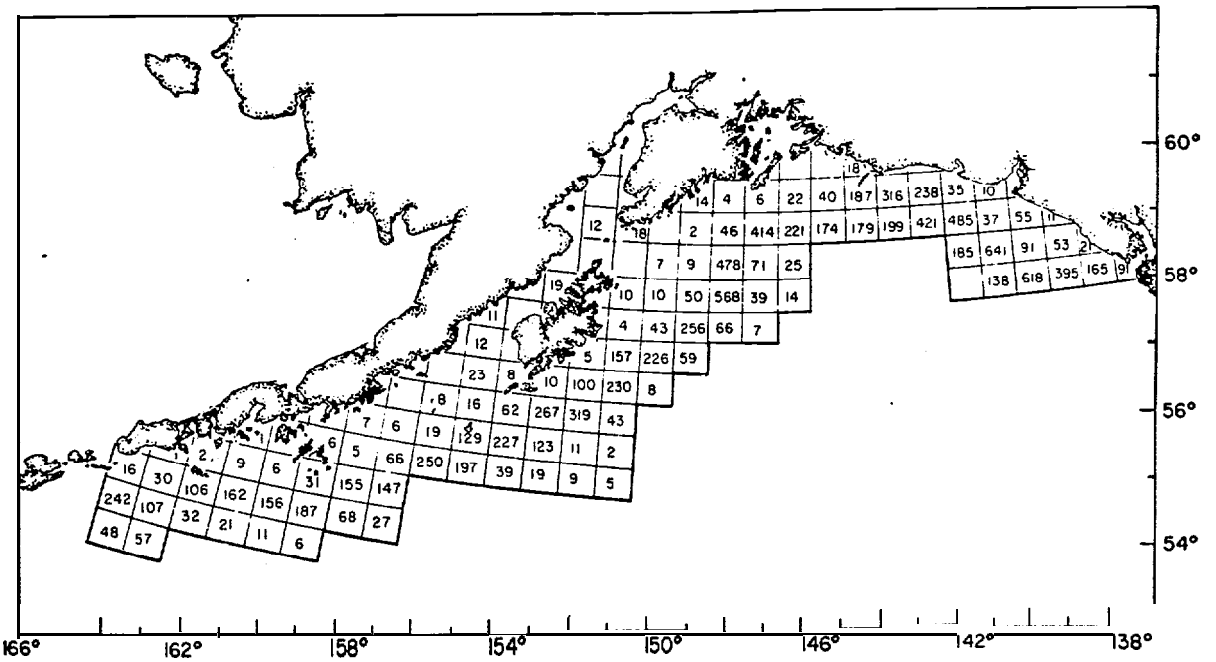


Figure 1X-12.--Mean annual catch (mt) of sablefish (blackcod) by the Japanese trawl and longline fisheries, 1964 - 1974.

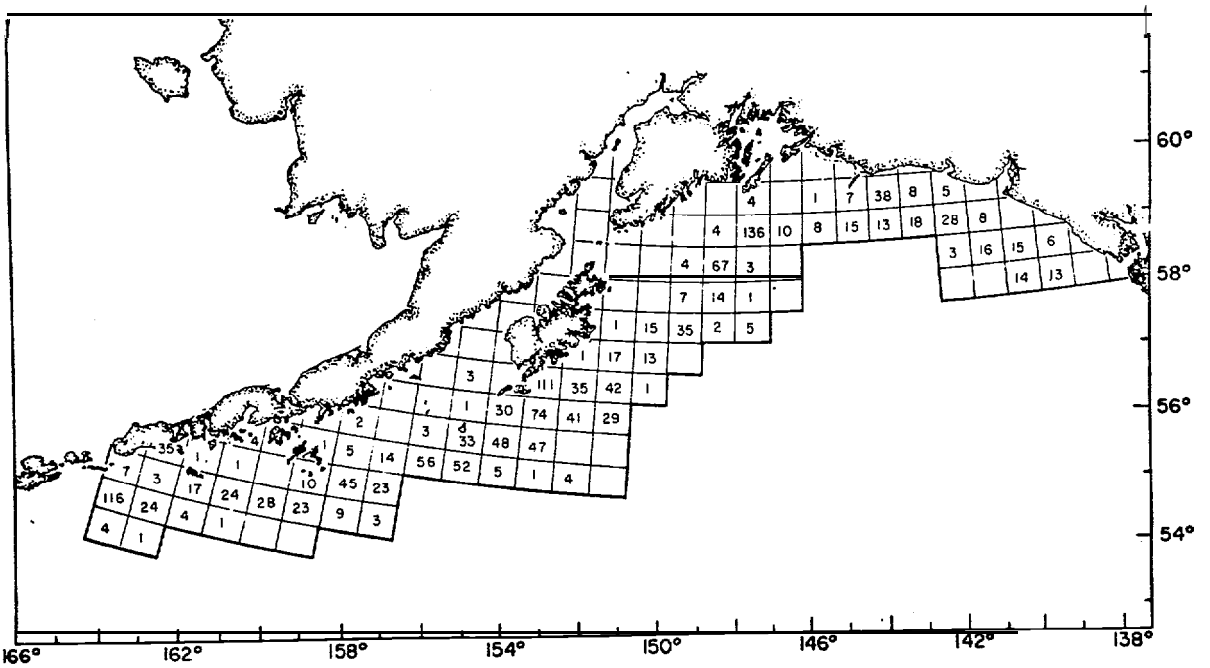


Figure 1X-13.--Mean annual catch (mt) of Pacific cod by the Japanese trawl fishery, 1964 - 1974.

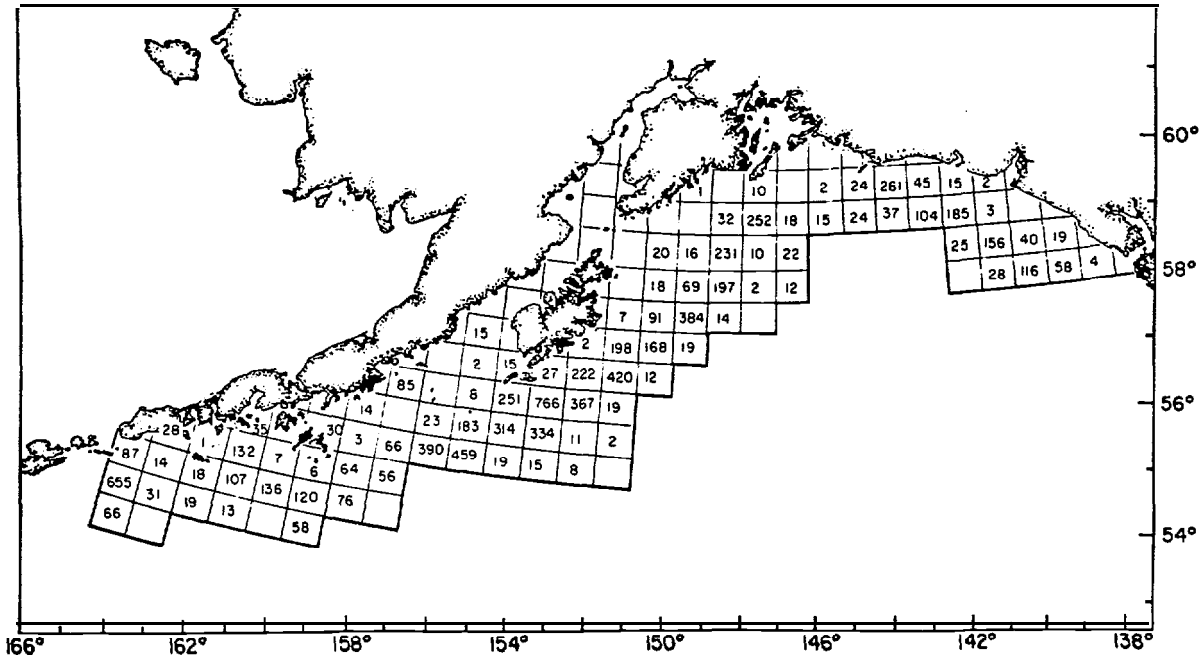


Figure 1X-14.--Mean annual catch (mt) of walleye pollock by the Japanese trawl fishery, 1964 - 1974.

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 1X-15).

7. Total trawl catch

The distribution of 1° x ½° blocks of the mean annual catches of all trawl caught species has been determined for the period from 1964-1974 (Figure 1X-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 genrally 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 1X-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 1X-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,

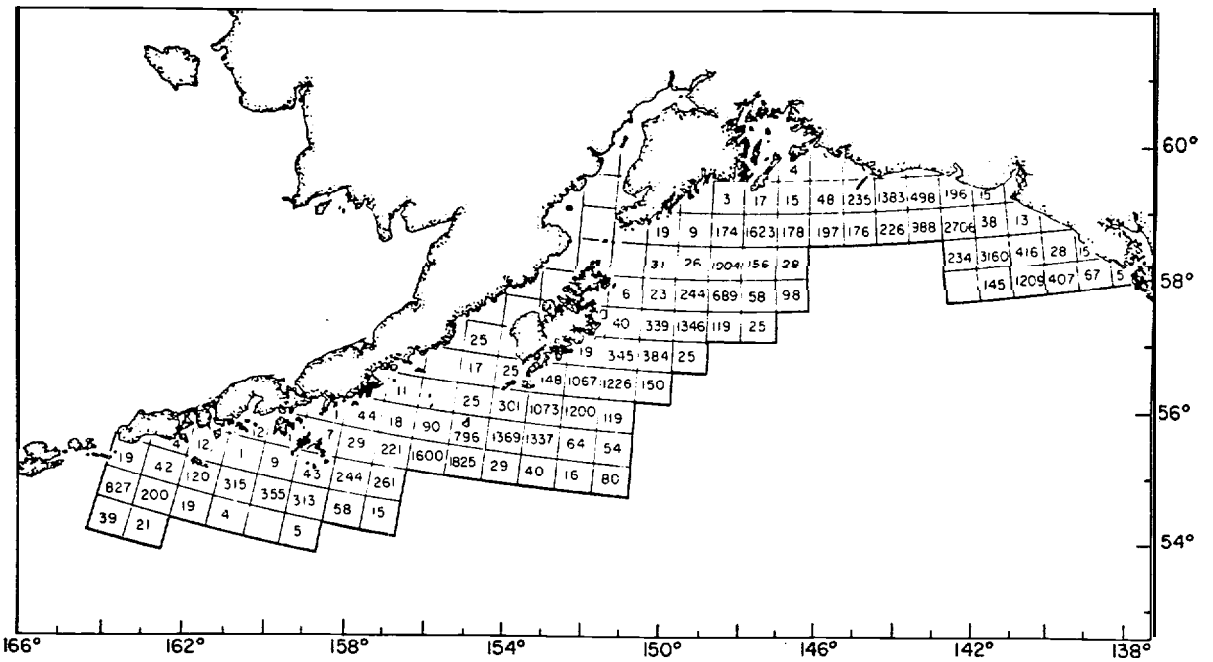


Figure IX-15 ,--Mean annual catch (mt) of Pacific ocean perch by the Japanese trawl fishery, 1964 - 1974.

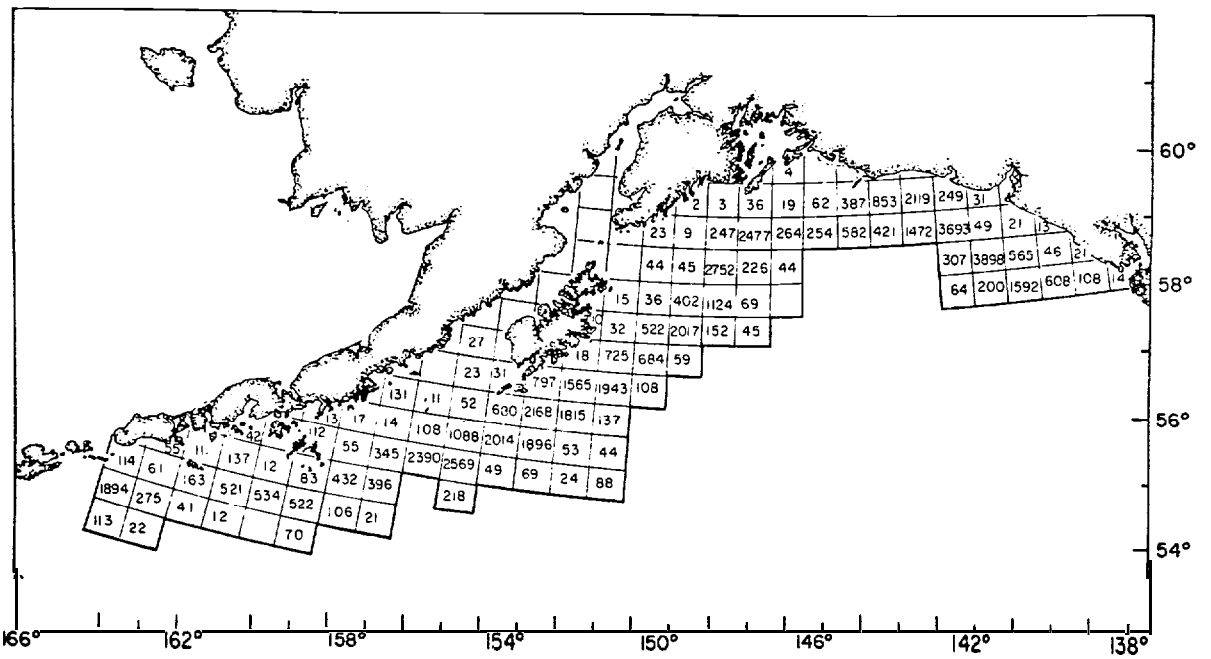


Figure IX-16 .--Mean annual trawl fishery catch (mt) by Japan, 1964-1974.

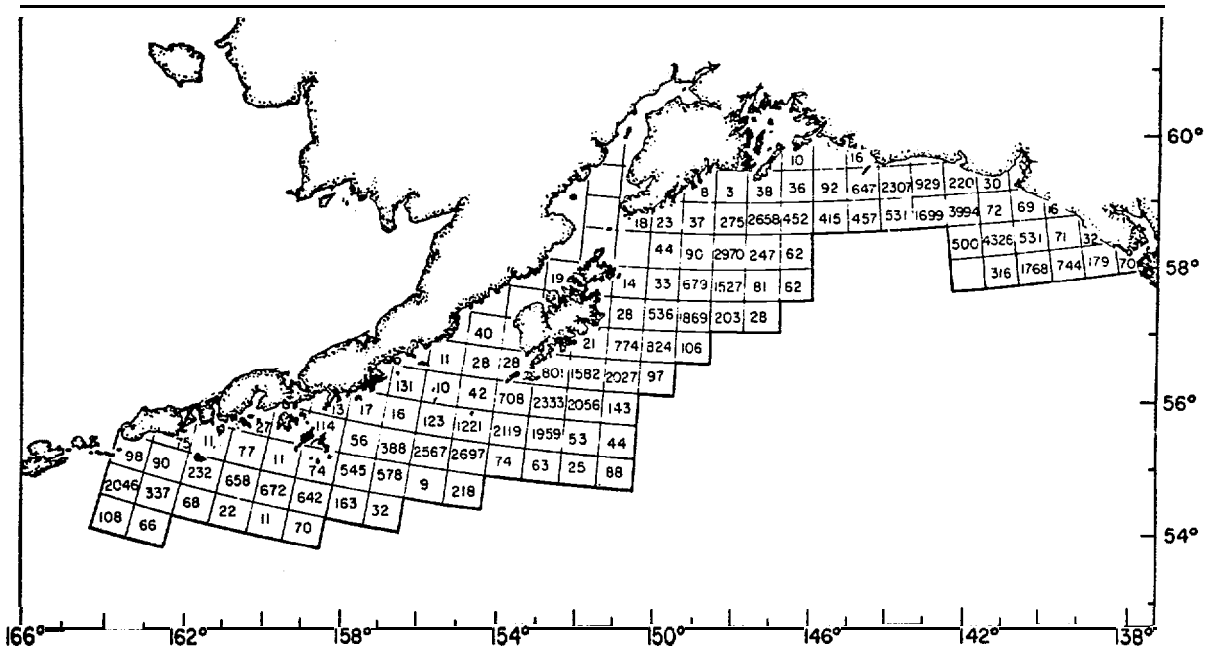


Figure IX-17.--Mean annual bottomfish catch (mt) by Japanese trawl and long line fisheries, 1964 - 1974.

X

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

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

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-l,)

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-Z.--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.....	4¼"	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-l-2). Additionally, otter boards size and construction, length of dandylines, 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 prodedure

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)	Gear 1/	Stations Attempted	Regions	Year	Months
15	John N. Cobb	44	BT	67	Yakutat	1953	March-April
18	John N. Cobb	44	BT	18	Prince William	1954	Feb.-April
20	John N. Cobb	44	BT	90	Prince William	1954	July-August
3	Tordenskjold	35	ST 40	29	Shumagin-Sanak	1957	July-Sept.
39	John N. Cobb	44	ST 40	109	Cook Inlet-Kodiak Shelikof	1958	July-August
44	John N. Cobb	44	ST 40	101	Kenai	1959	Oct.-Nov.
622	Yaquina	35	ST 70	92	Prince William-Kenai	1962	August-Oct.
632	Yaquina	35	ST 40	221	Kodiak to Prince William	1963	July-Sept.
642	Paragon	43	ST 40-70	243	Kodiak to Sanak	1964	June-August
682	John R. Manning	41	ST 65	79	Kodiak	1968	July-Sept.
703	Pacific Lady	37	ST 65	113	Kodiak to Prince William	1970	August-Oct.

1/ BT 20' Beam trawl (Ellson and Livingston, 19521.
ST 40 40' Gulf of Mexico-type flat trawl (Schaefer and Johnson, 1957).

ST 70 70' Gulf of Mexico-type seme-balloon trawl (Greenwood, 1959).

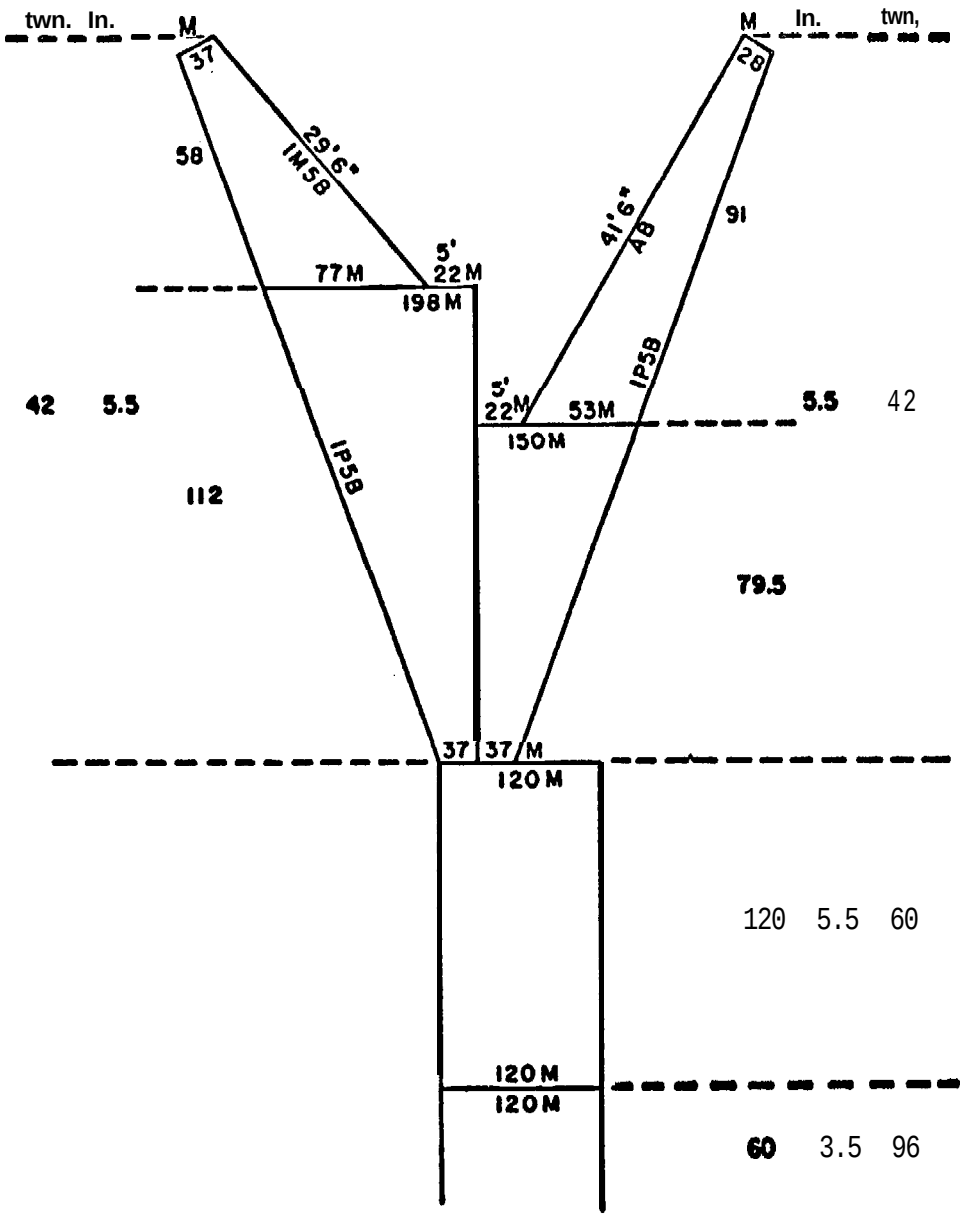
ST 66 66' Kodiak shrimp trawl (Figure X-21,

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	John R. Manning	41	SD 8	82	Fairweather-Yakutat	1963	May-June
632	Yaquina	35	SD 8	8	Kenai-Kodiak	1963	July-September
642	Paragon	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

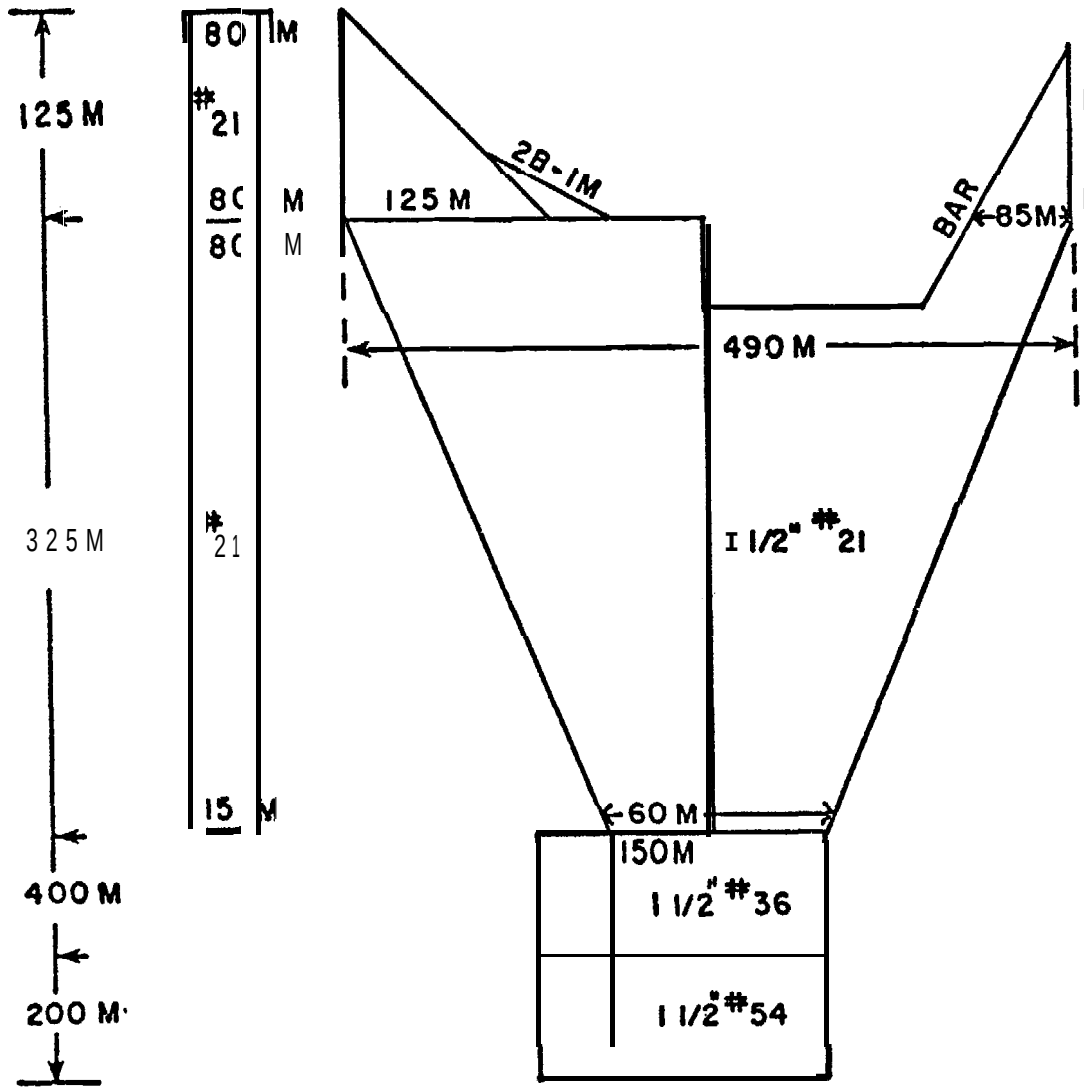
Breastlines:
5/8 in. dia. braided nylon

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-l--Schematic drawing and specifications of the NMFS modified Eastern trawl.



66' Shrimp Trawl

Netting:
Nylon

Headrope:
53 ft. of 3/8 in., 6 x 19 galvanized wire rope

Footrope:
66 ft. of 1/2 inch, 6 x 19 galvanized wire rope

Flotation:
20-30 8 ft. diameter trawl floats

Otter boards
5 x 7 ft'. Vee design, 815 lbs.

M = meshes

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

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

$$\overline{CPUE_k} = \sum_{i=1}^{n} \frac{CPUE_{ik}}{N_i}$$

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 interval. 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.

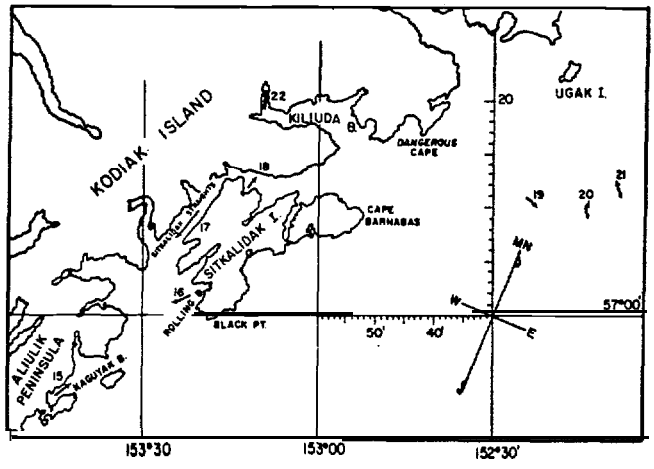
The results of the analysis of exploratory fishing-type data are presented chronologically by gear type, i.e., otter trawl, shrimp trawl, and scallop dredge.

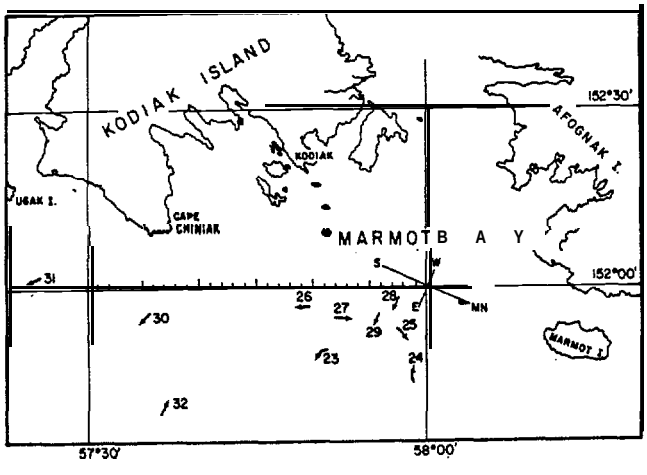
RESULTS

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.





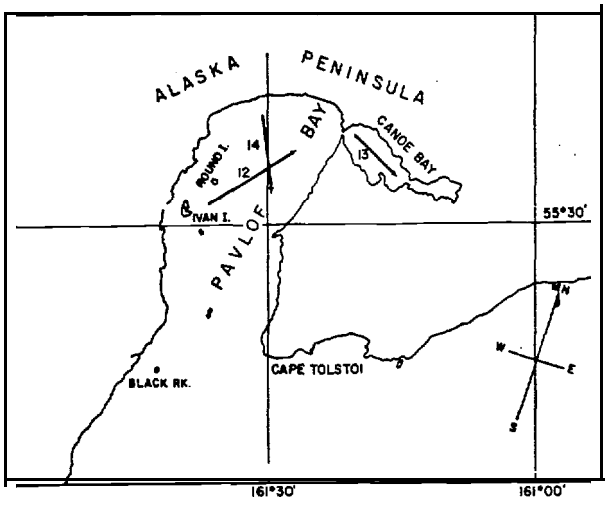


Figure X-3.--Stations successfully trawled (otter trawl) during October 1948, R/V Washington.

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 ZOO-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 LO 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 reach 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).

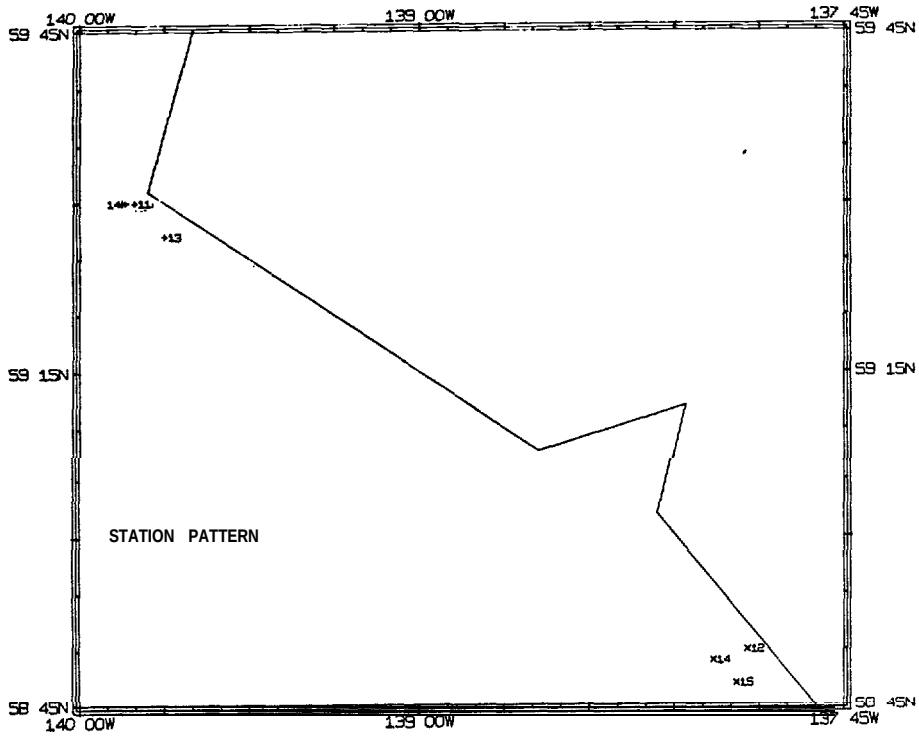


Figure X-4.--Stations successfully trawled (otter trawl) during cruises 015 (+) and 601 (X), R/V John N. Cobb and New Hope.

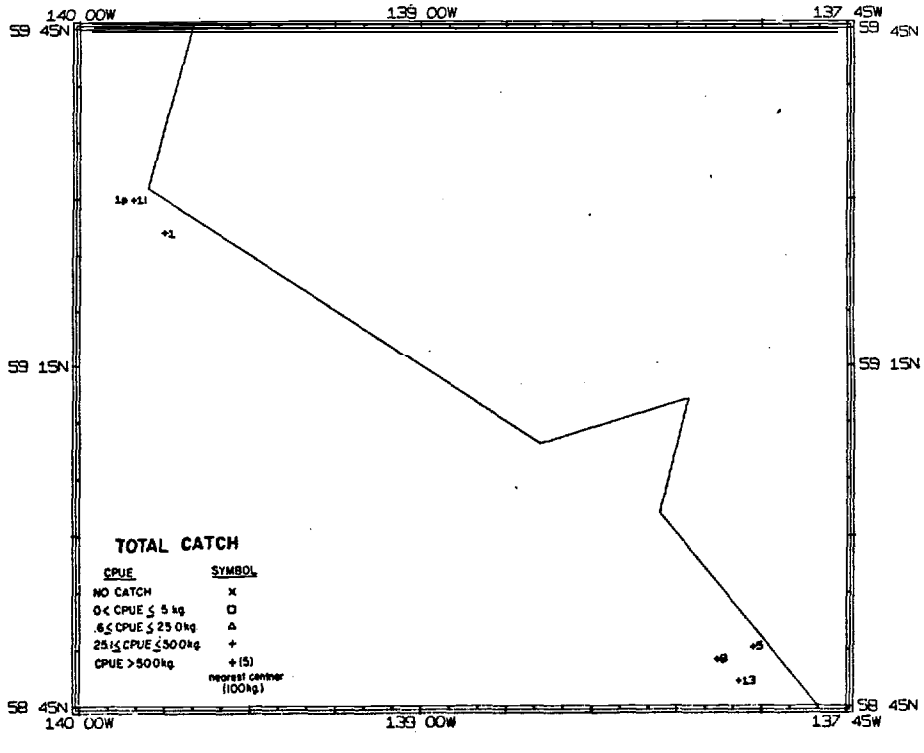


Figure X-5.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 015, R/V John N. Cobb.

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 Interval 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

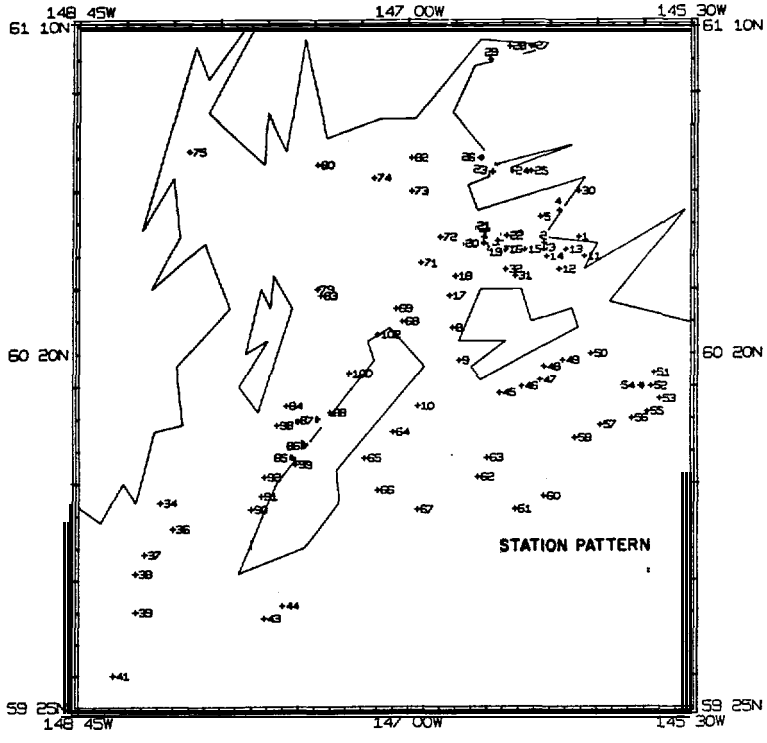


Figure X-6.--Stations successfully trawled (otter trawl) during cruise 018, R/V John N. Cobb.

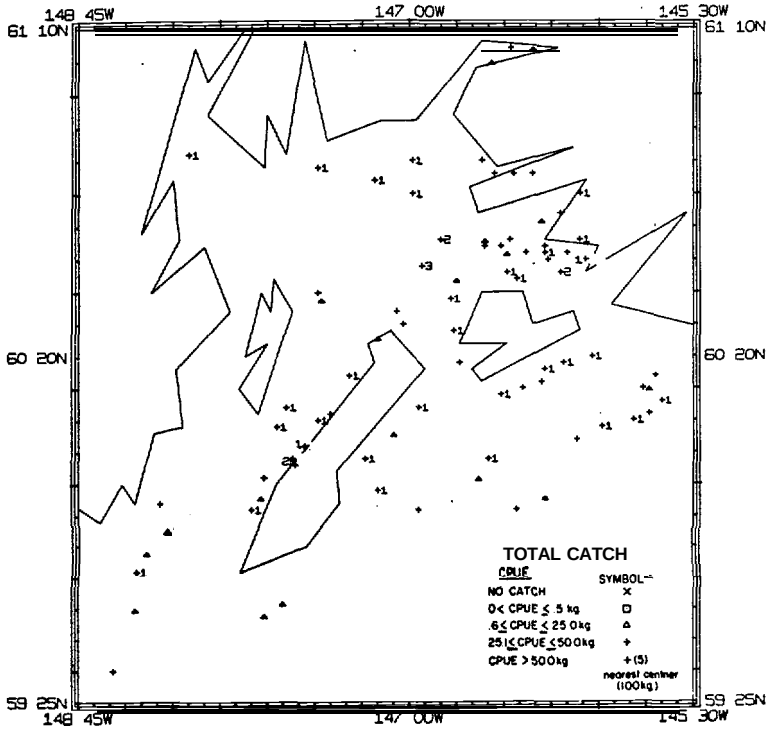
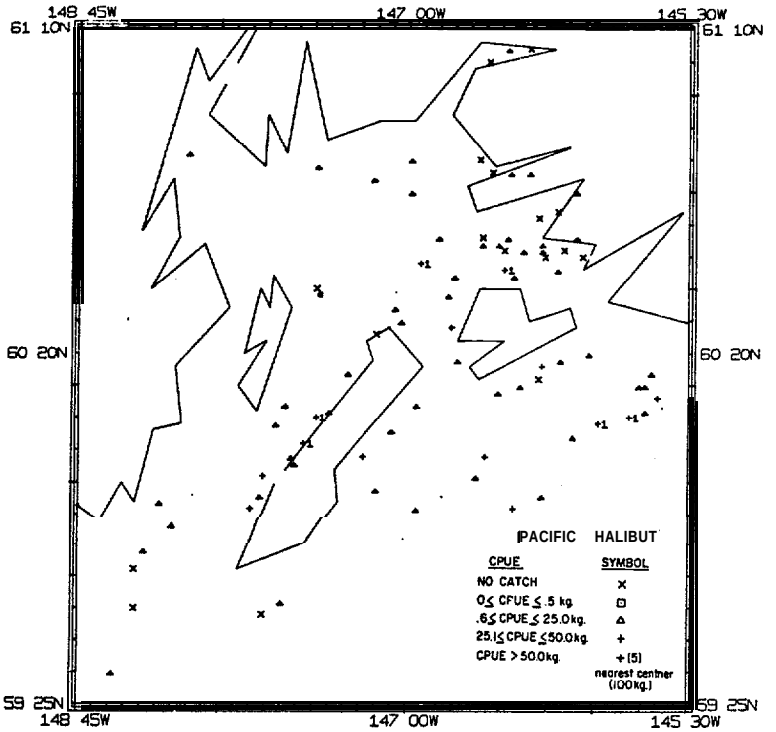
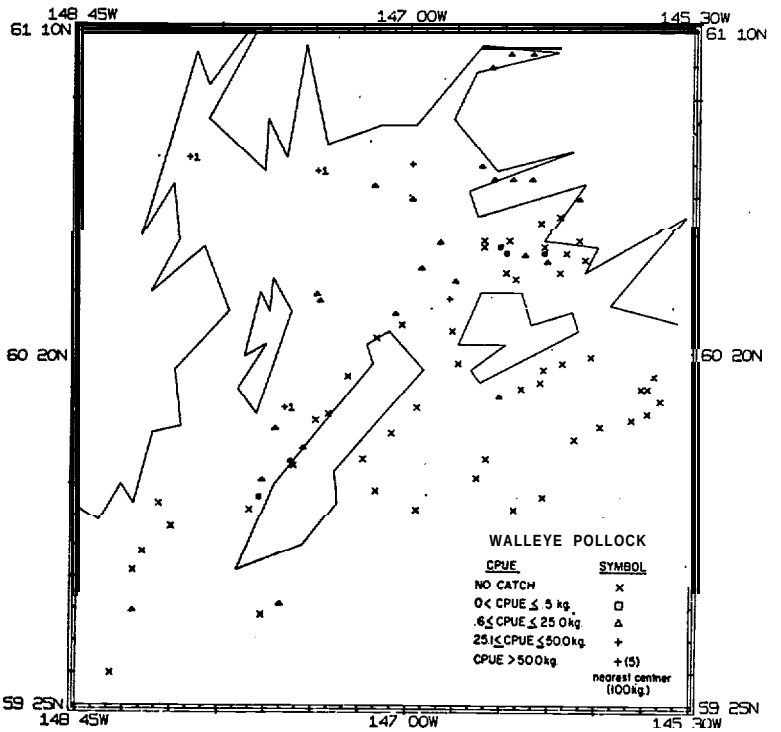


Figure X-7:--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 018, R/V John N. Cobb.

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

Depth Zones (m) 1 - 100		101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	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.

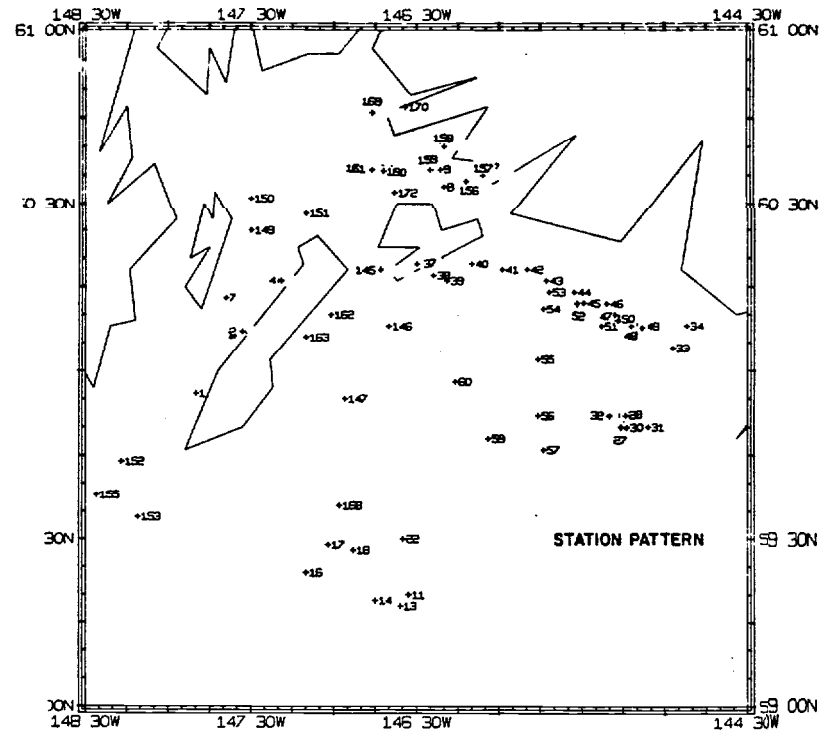


Figure X-10.--Stations successfully trawled (otter trawl) during cruise 020, R/V John N. Cobb.

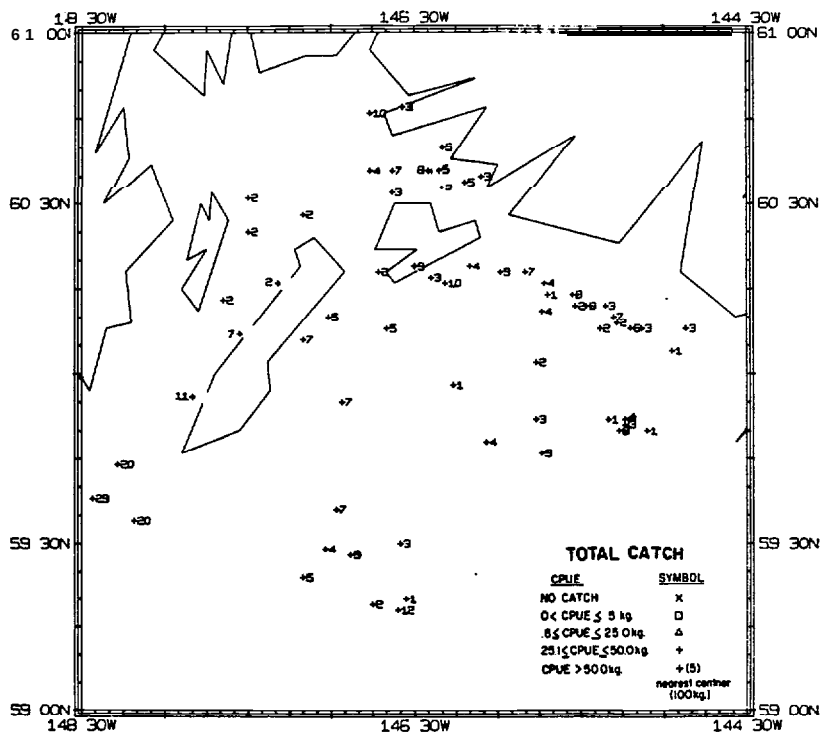


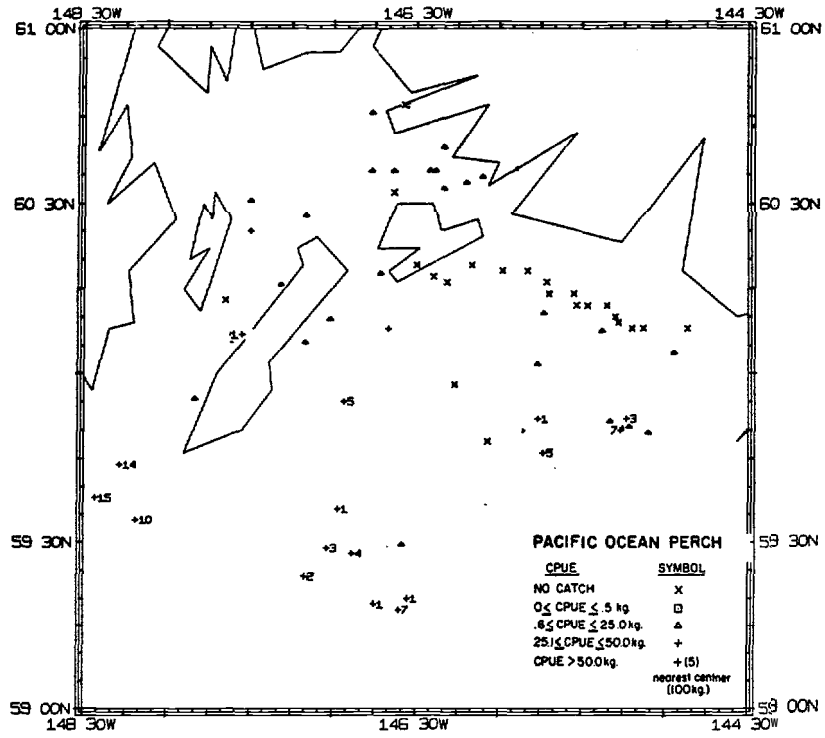
Figure X-11.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 020, R/V John N. Cobb.

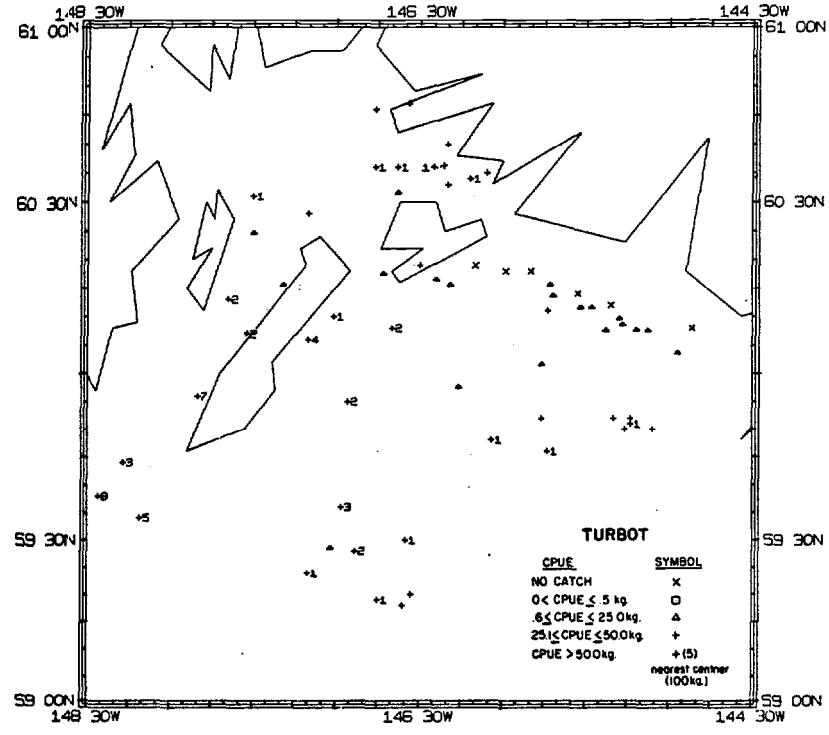
Table X-7.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 020, R/V John N. Cobb.

Depth Zones (m) 1 - 100		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	63.2	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 rockfish	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

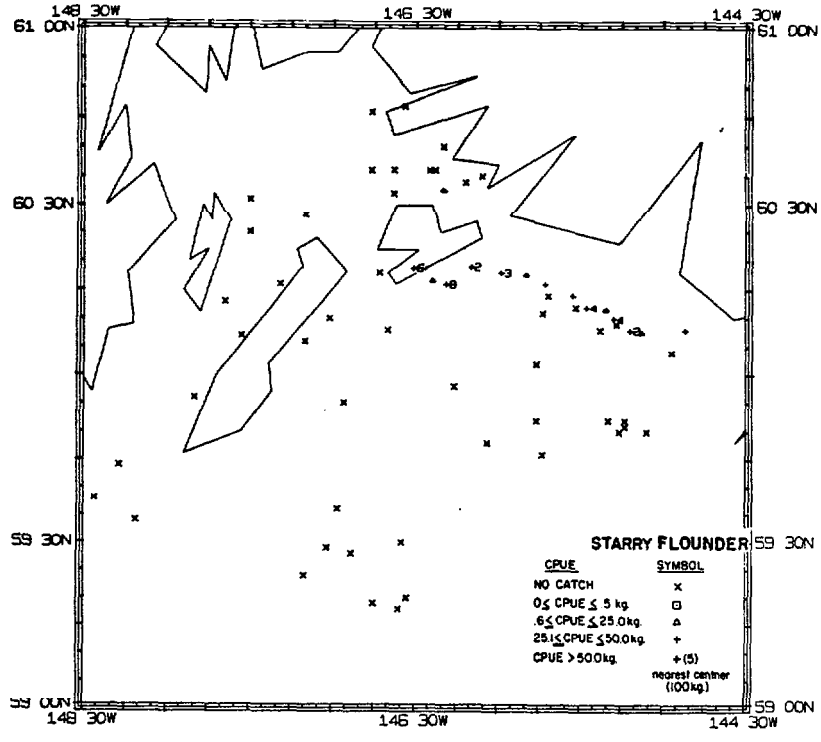
Table X-8.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 020, R/V John N. Cobb.

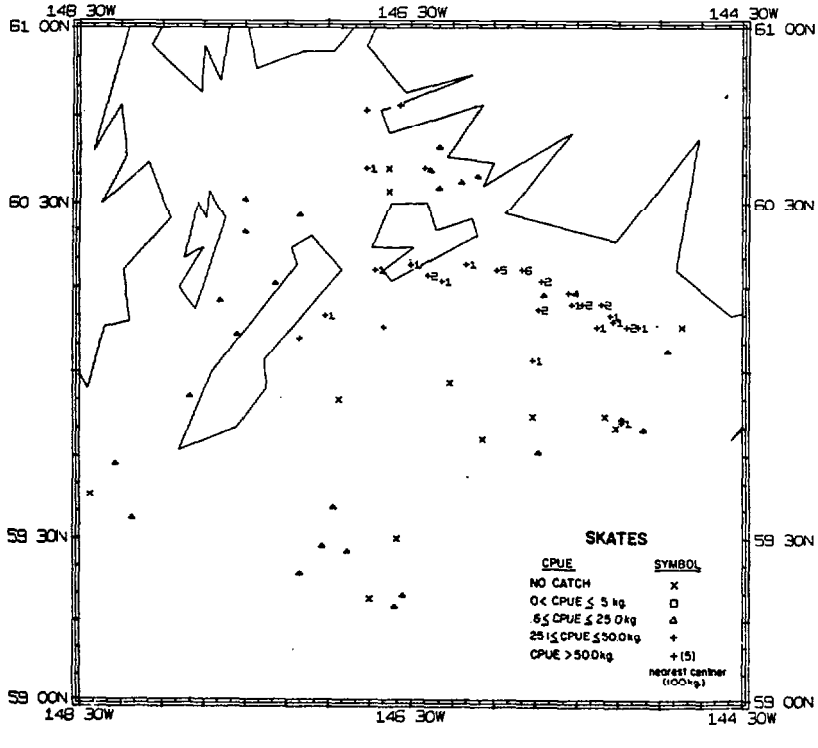
Species or Species group	Station Numbers
Total catch	1, 13, 39, 152, 153, 155 and 169.
Pacific ocean perch	1, 13, 14, 16, 17, 18, 27, 28, 56, 57, 147, 152, 153, 155 and 168.
Turbot	1, 2, 7, 14, 16, 18, 22, 30, 57, 59, 146, 147, 150, 152, 153, 155, 156, 159, 160, 161, 162, 163 and 168.
Skates	30, 37-52, 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.



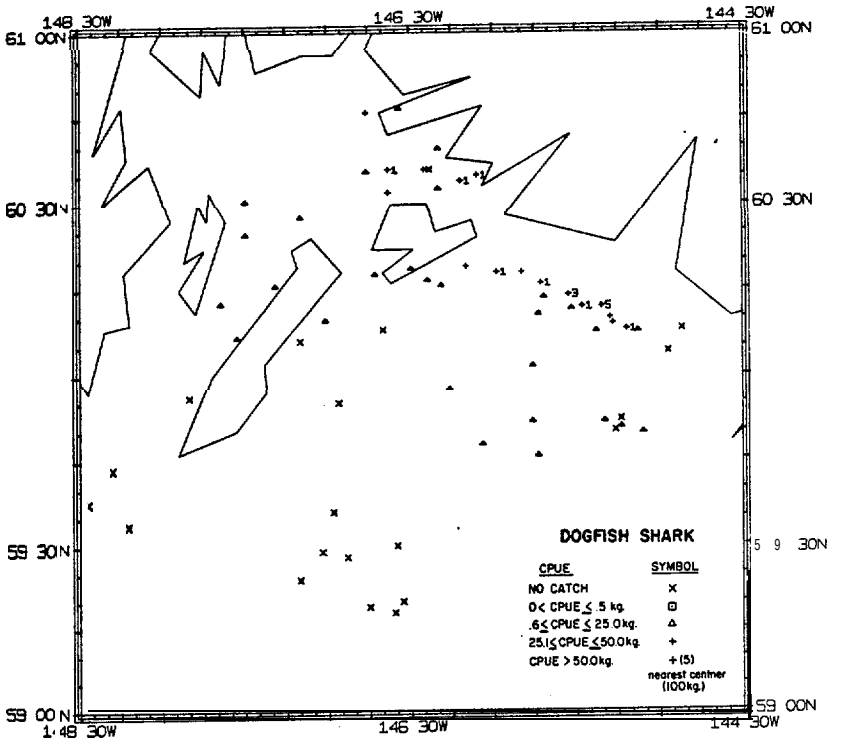


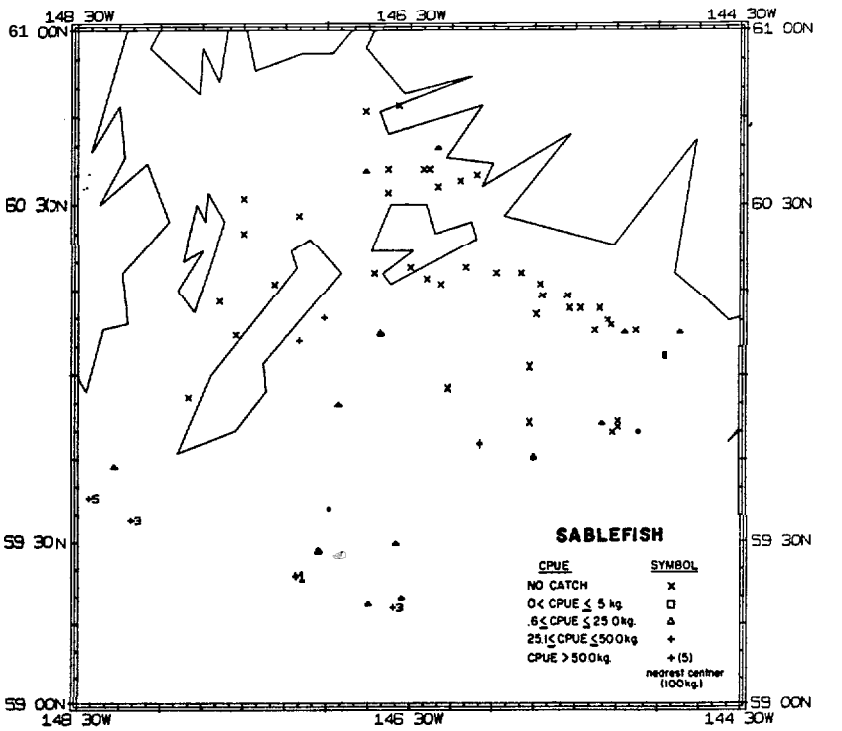
Figures X-12-13.--Distribution of Pacific ocean perch and turbot standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



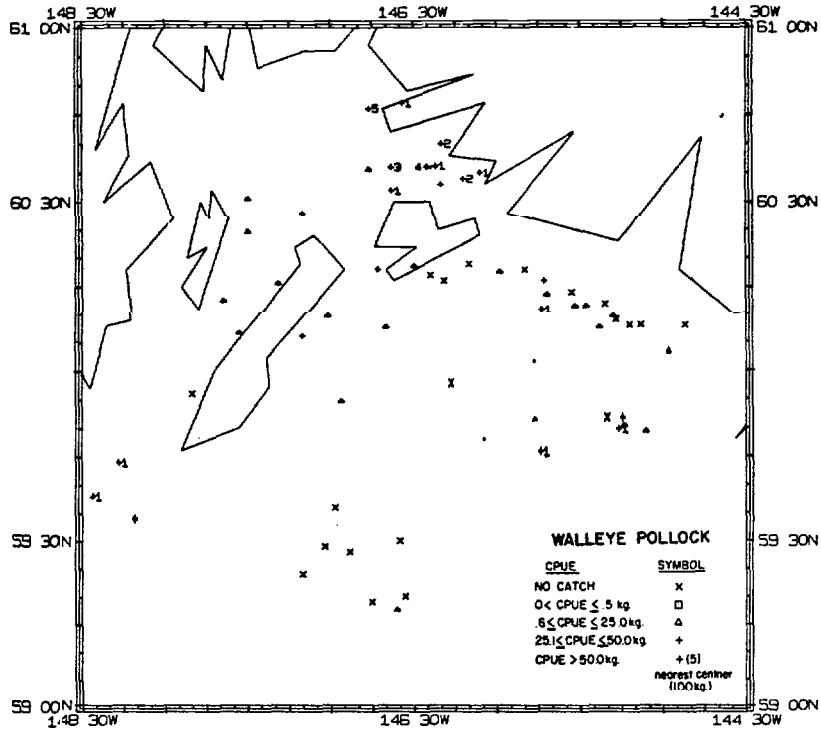


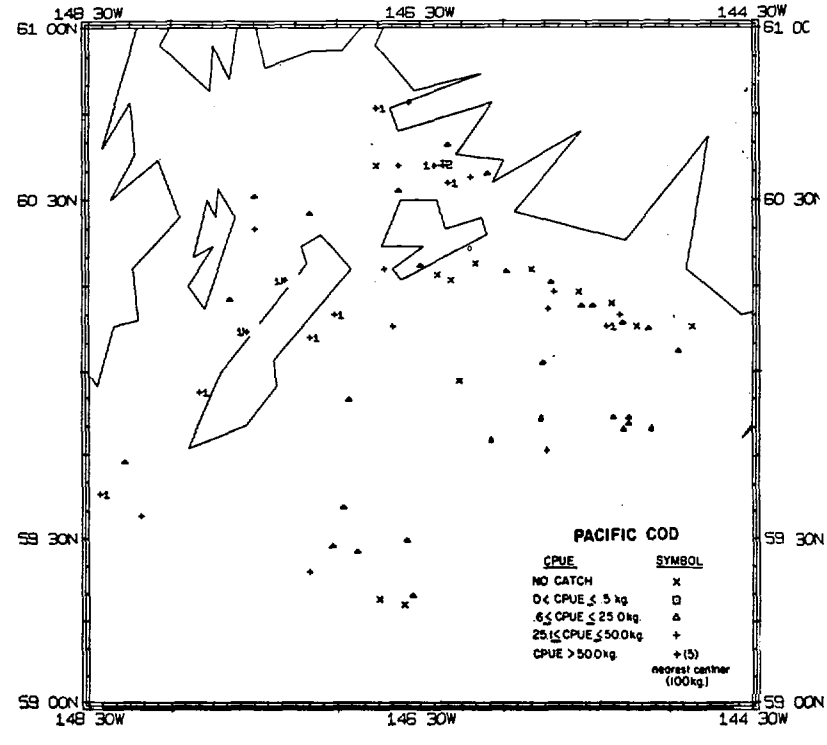
Figures X-14-15.--Distribution of starry flounder and skates standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



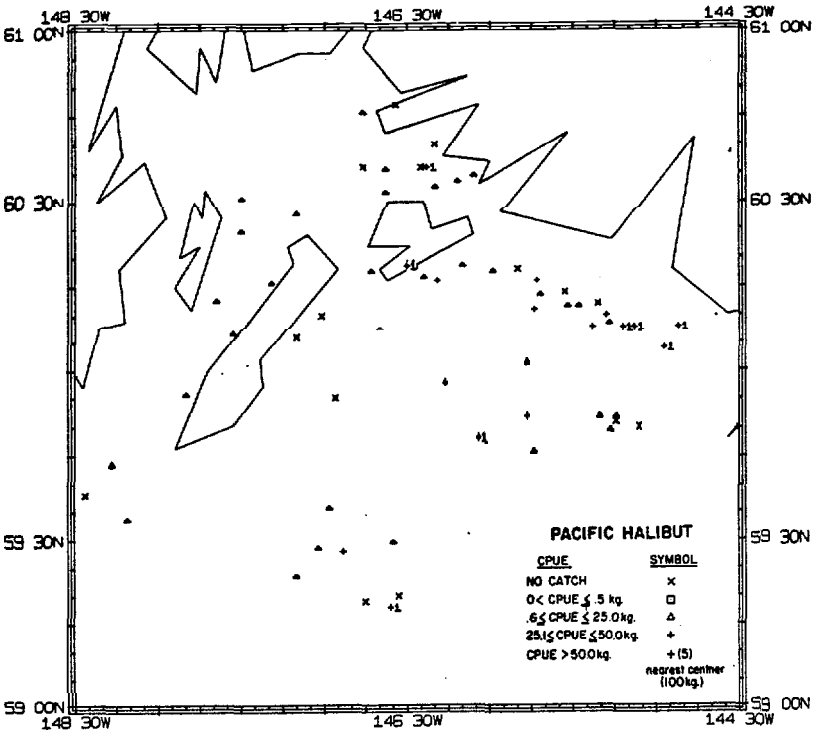


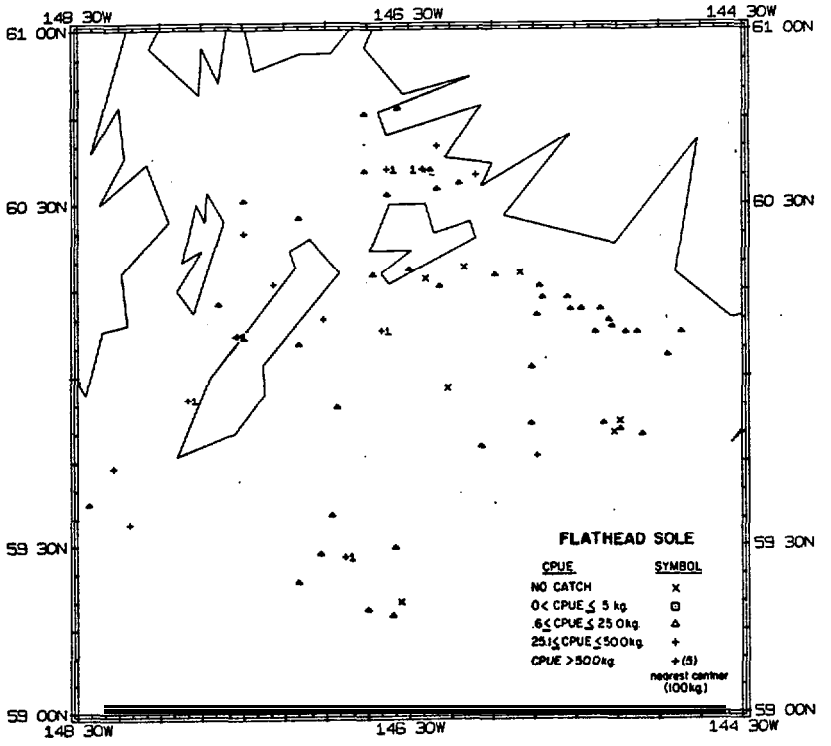
Figures X-16-17.--Distribution of dogfish shark and sablefish standardized catch **rates,** in kg/hr, cruise 020, R/V John N. Cobb.



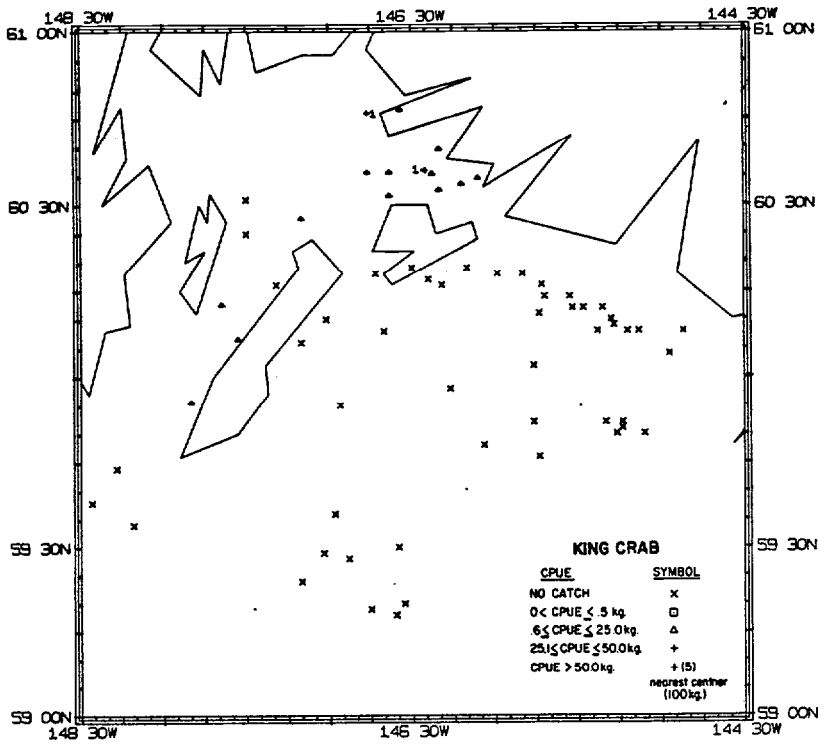


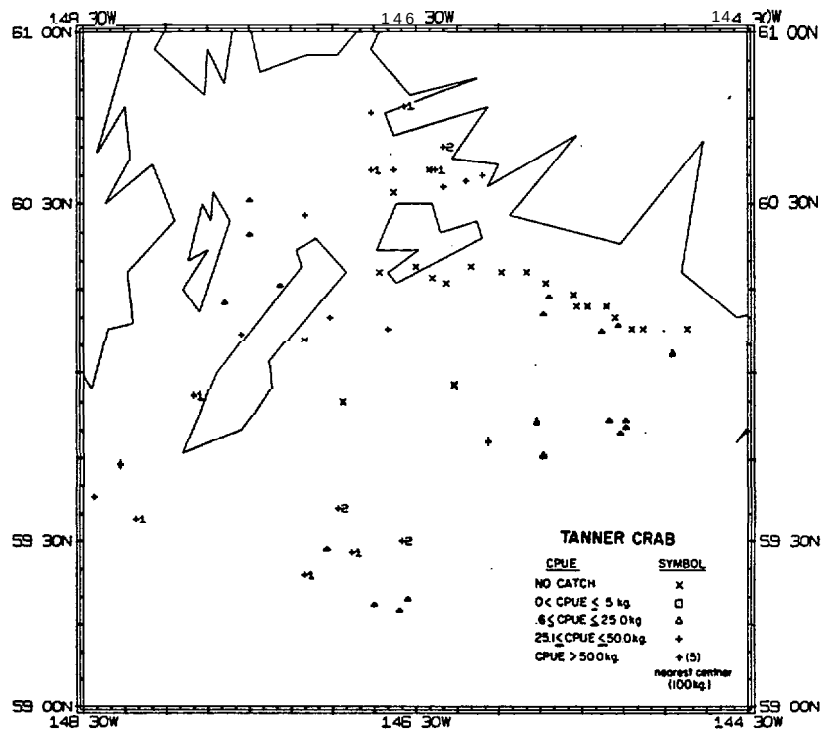
Figures X-18-19.--Distribution of walleye pollock and Pacific cod standardized catch rates, in kg/hr, cruise 020, R/V John N. Cobb.



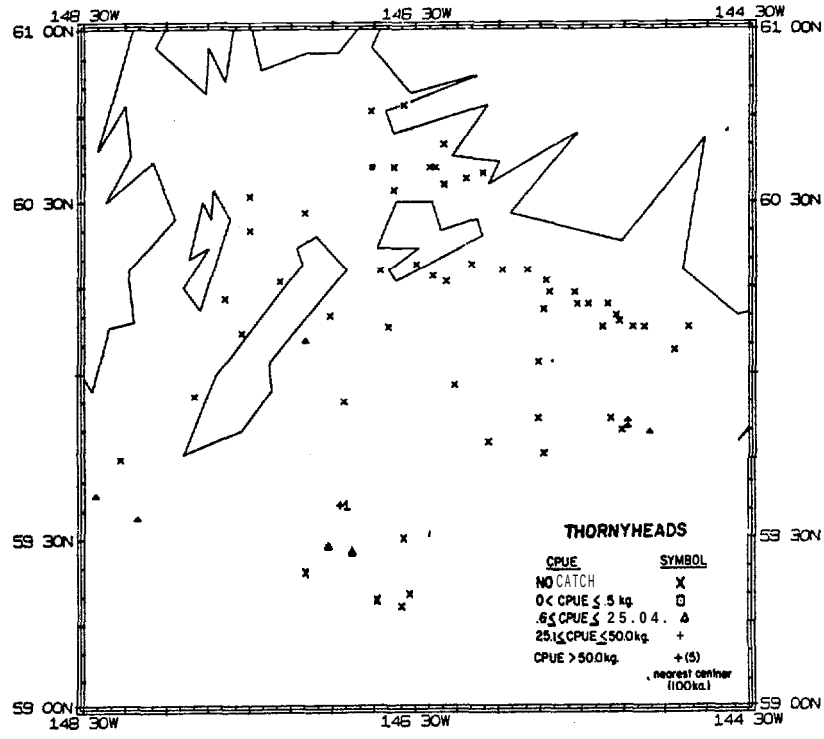


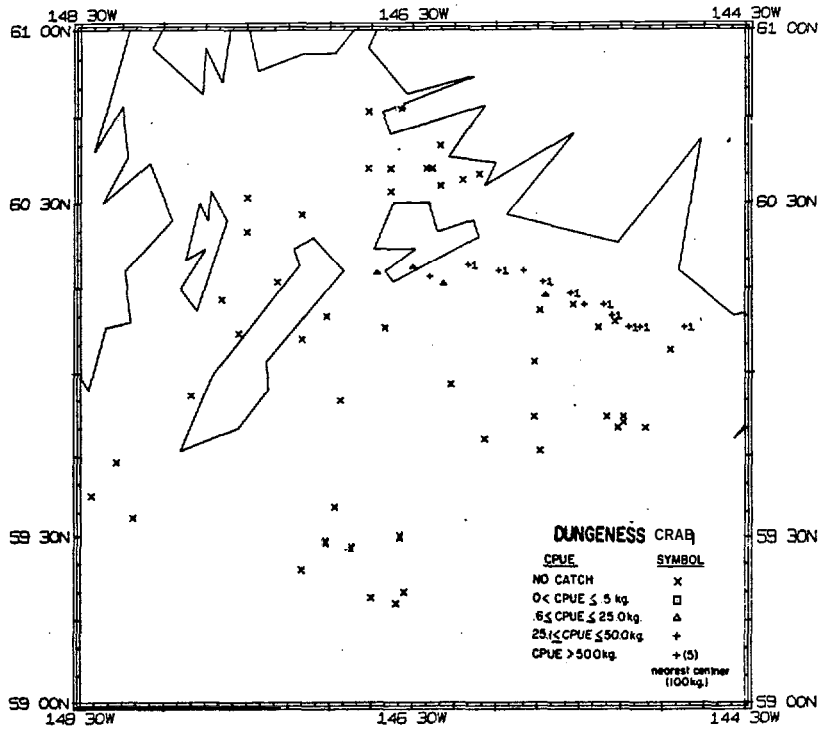
Figures X-20-21.--Distribution of Pacific halibut and flathead sole standardized catch rates, in kg/hr, cruise 020, R/V John N:. Cobb.





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 Tordenskiold (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 LO 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 crabs, 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.

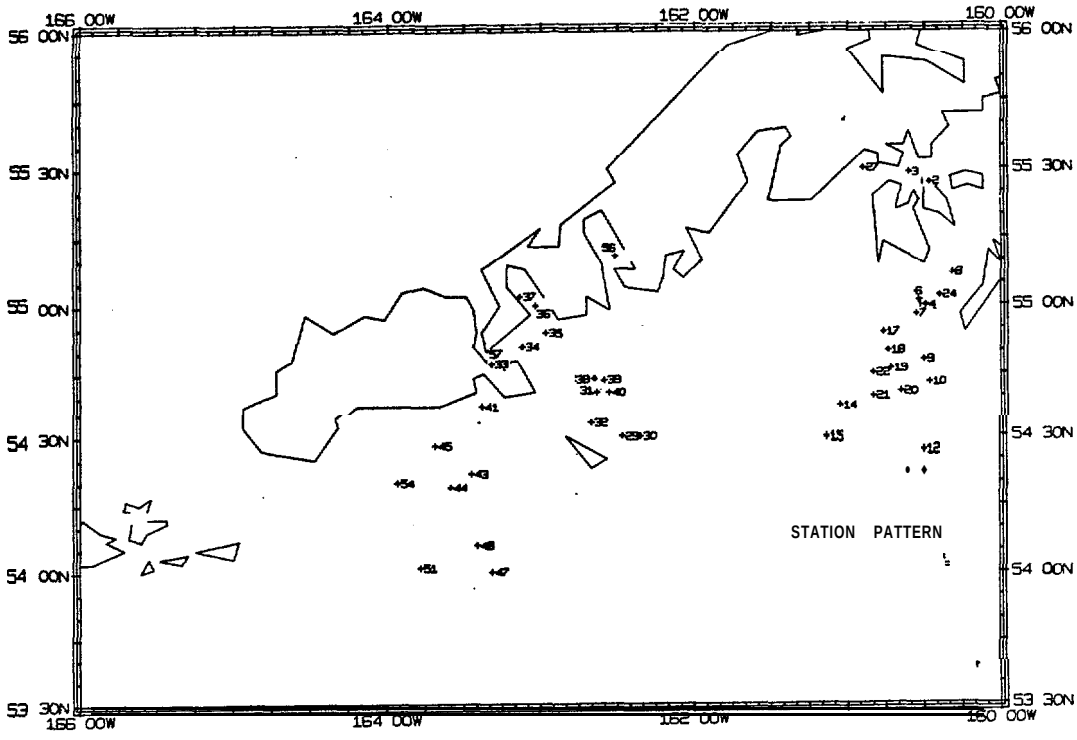


Figure X-26.--Stations successfully trawled (otter trawl) during cruise 002, charter vessel Tordenskjold.

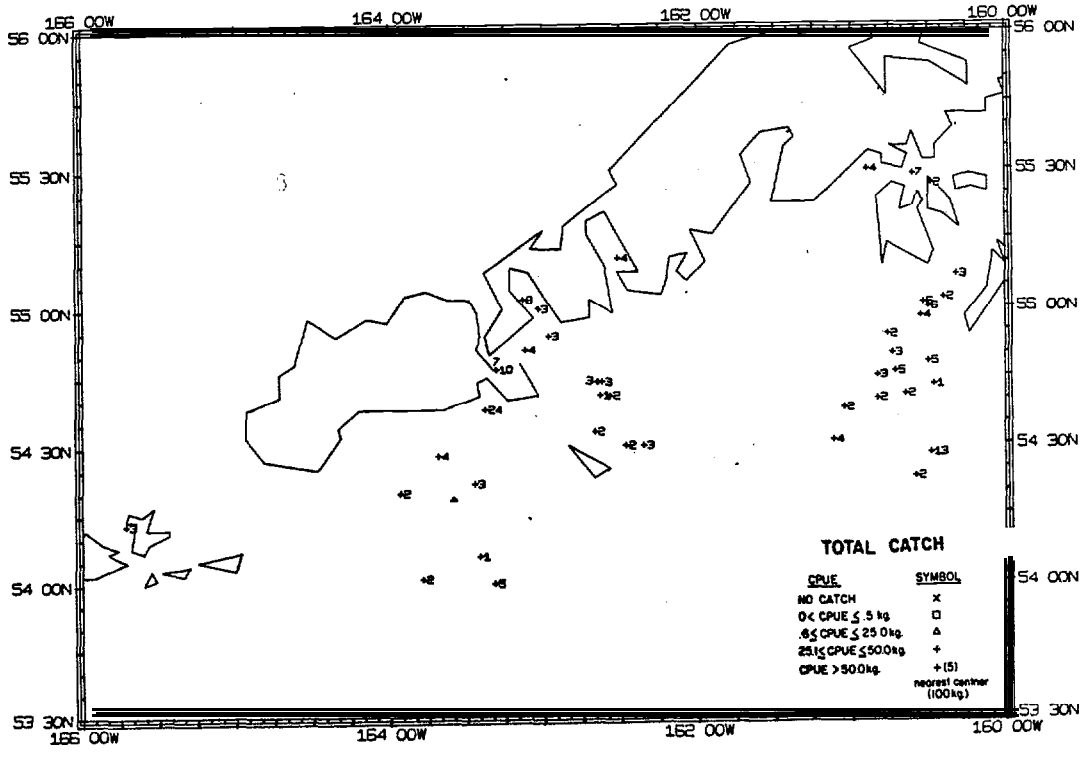


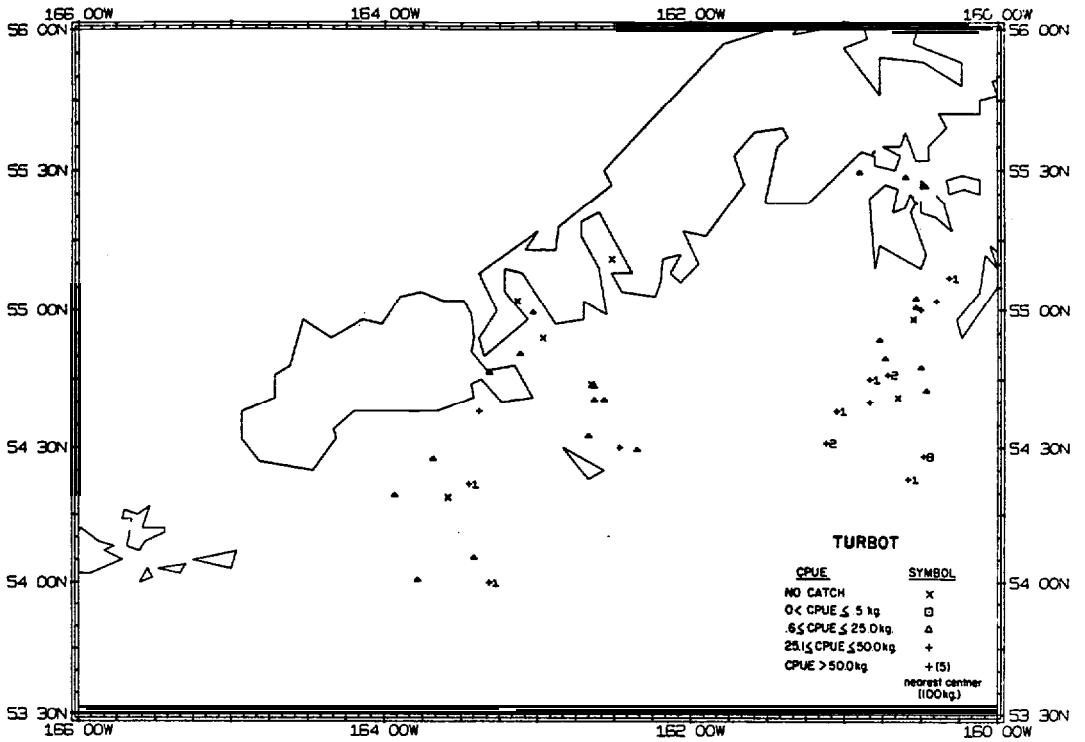
Figure -X-27.--Distribution of standardized catch rates, all species combined in **kg/hr,** for cruise 002, charter vessel Tordenskjold.

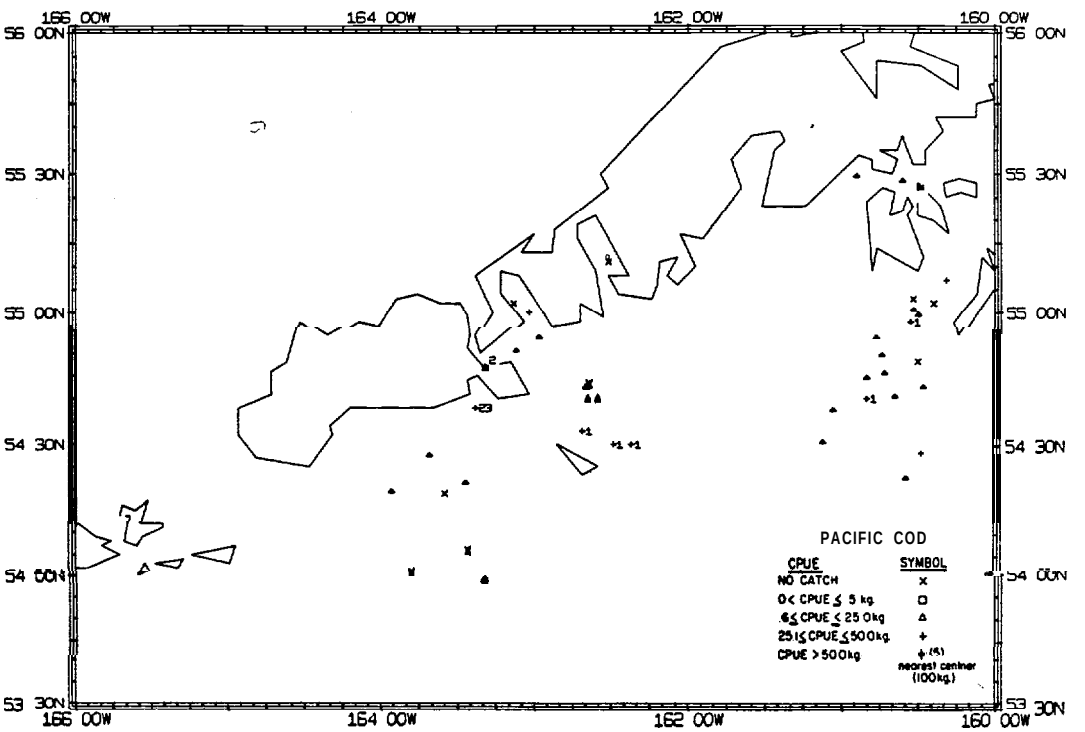
Table X-9.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 002, charter vessel Tordenskjold.

Depth Zones (m). 0 - 100		101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	Species	kg/hr
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		257.8
Total all species	375.9		416.9		287.1

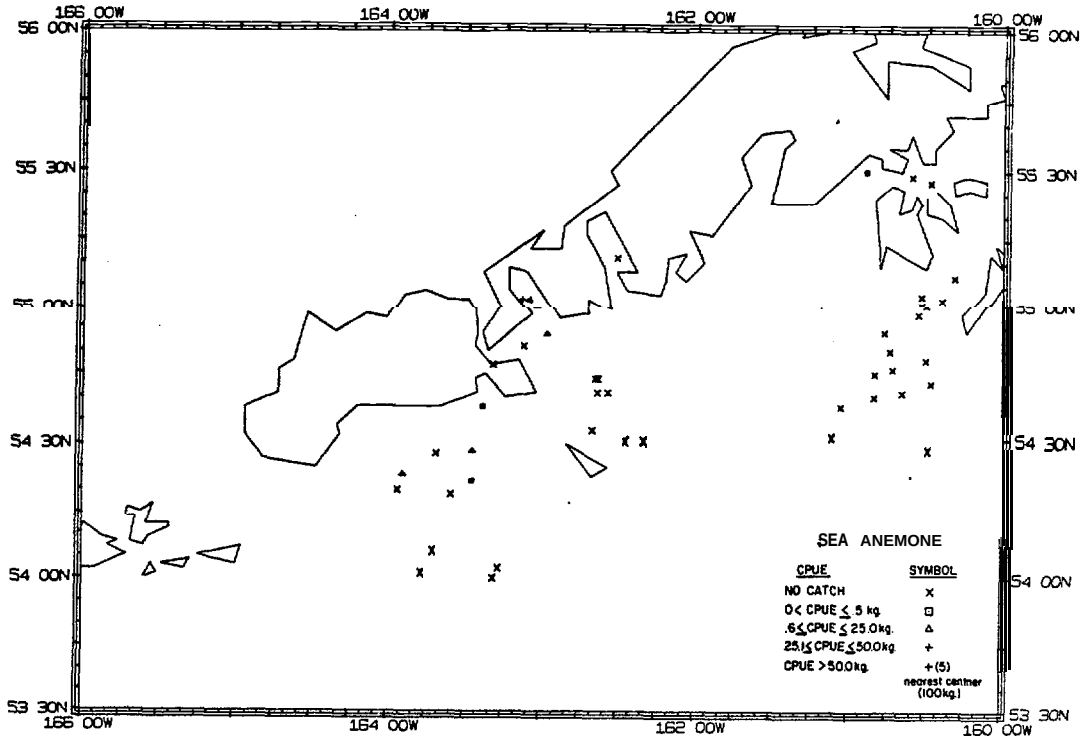
Table X-10, --A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 002, charter vessel Tordenskjold.

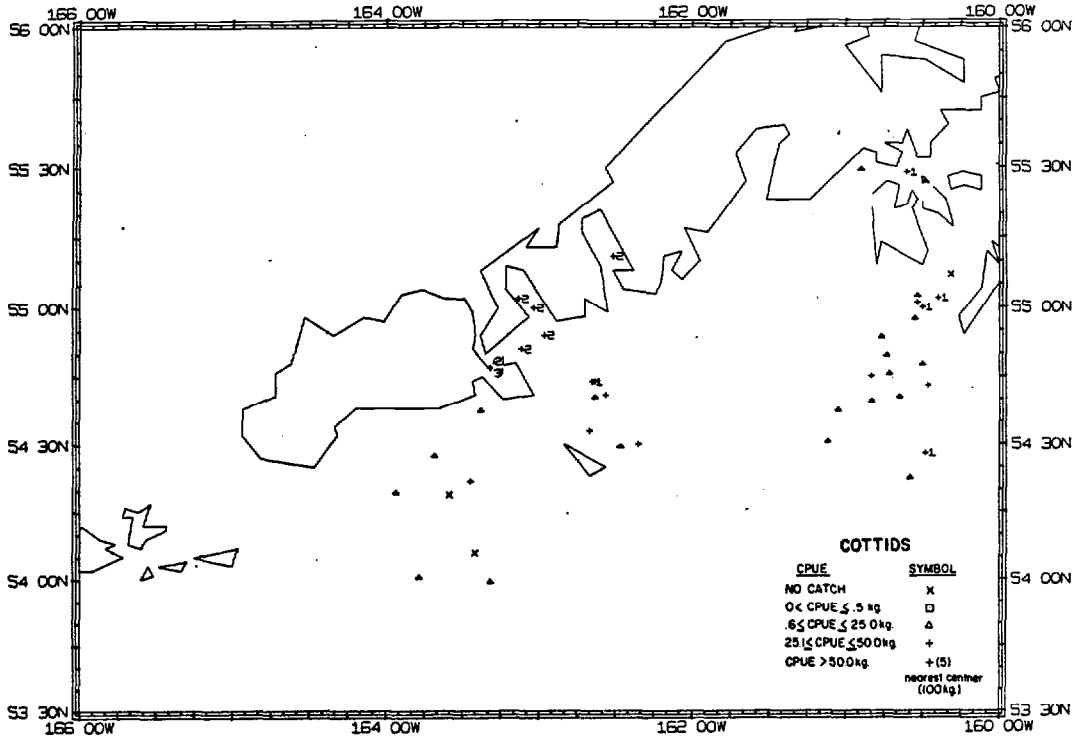
Species or Species group	Station numbers
Total catch	33' and 41.
Turbot	8, 12-15, 19, 22, 43 and 47.
Pacific cod	7, 21, 29, 30, 32, 41 and 57.
Sea anemone	37.
Cottids	3, 4, 7, 12, 33-38, 56 and 57.
Tanner crab	3, 4, 12, 24, 27, 33-35, 40, 45, 47, 51 and 57.
Rock sole	27, 37, 47, 48, 54 and 56.
Pink shrimp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



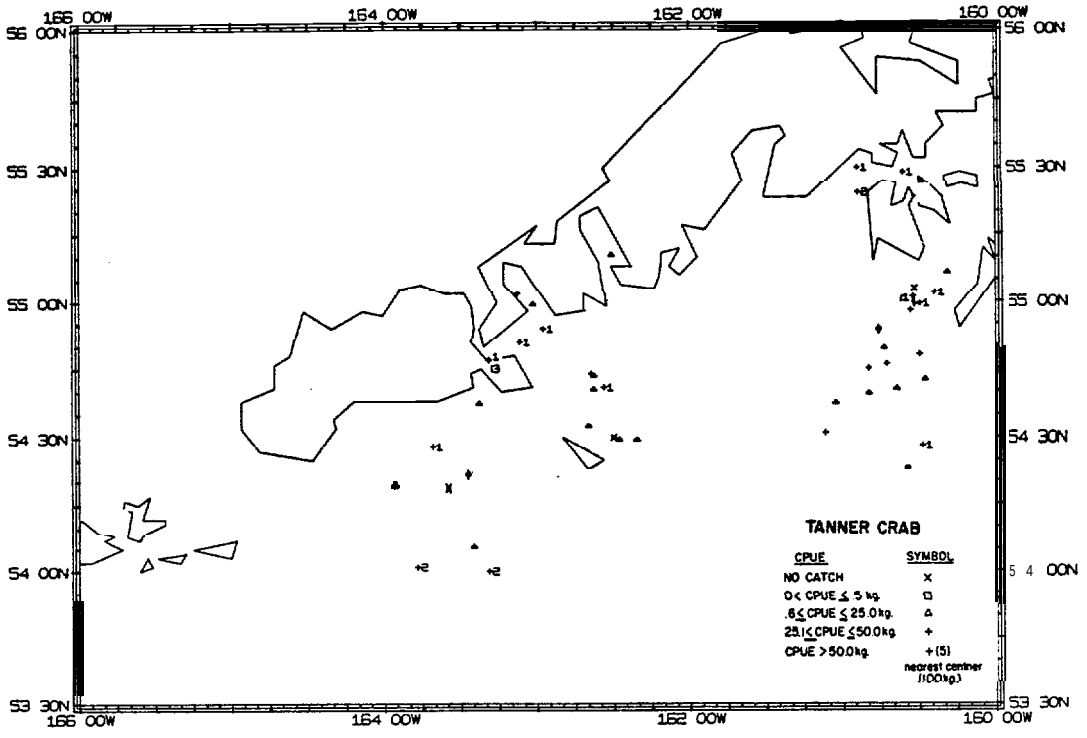


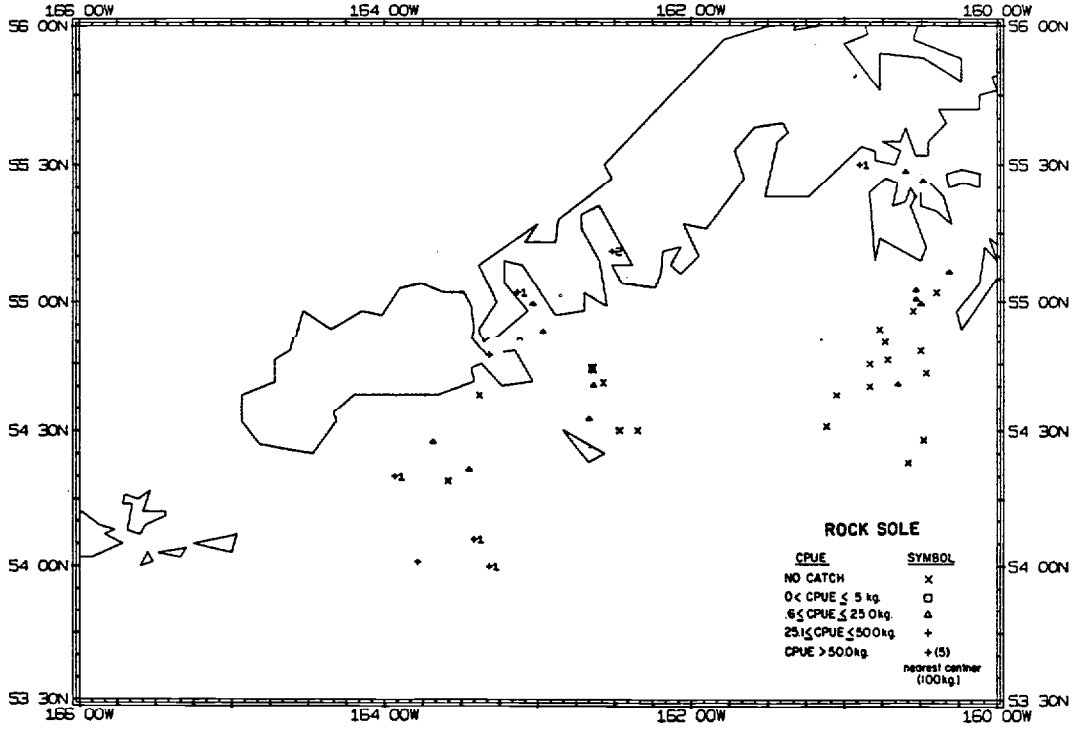
Figures X-28-29 .--Distribution of turbot and Pacific cod standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



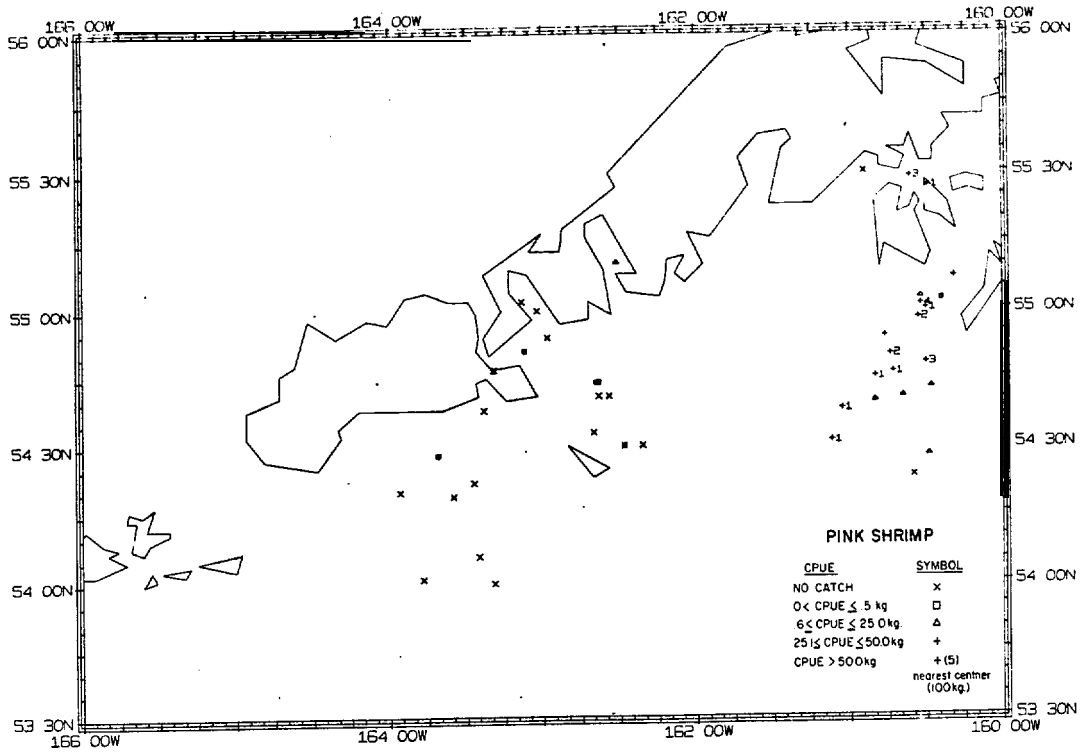


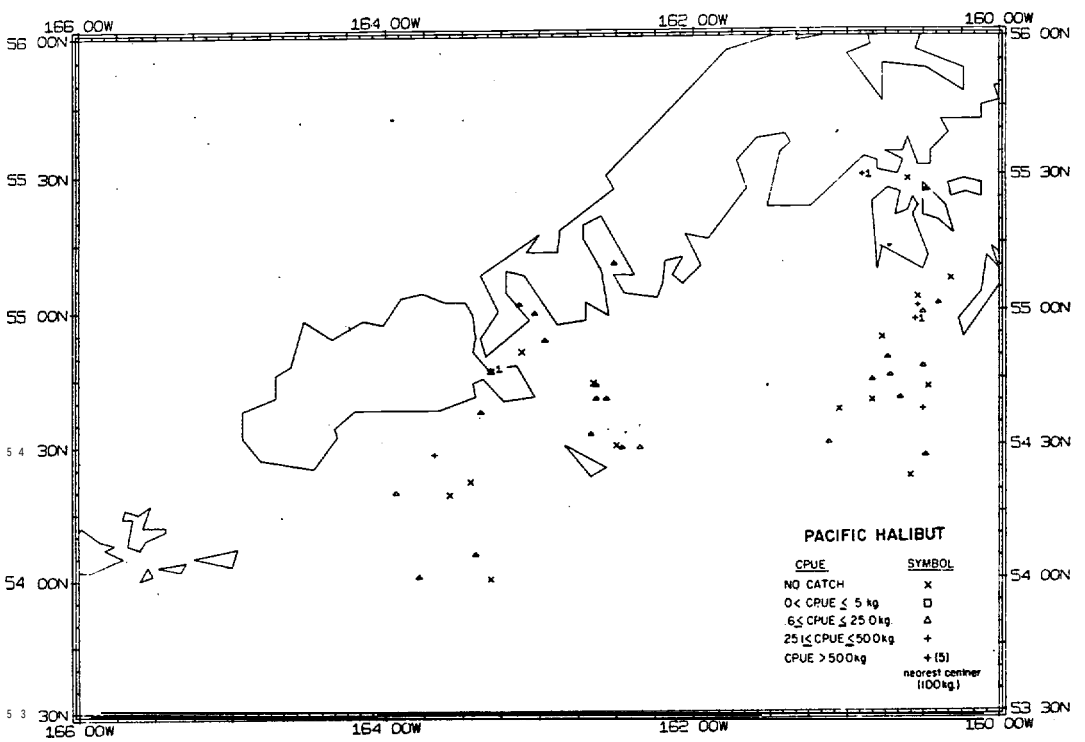
Figures X-30-31.--Distribution of sea anemones and cottids standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



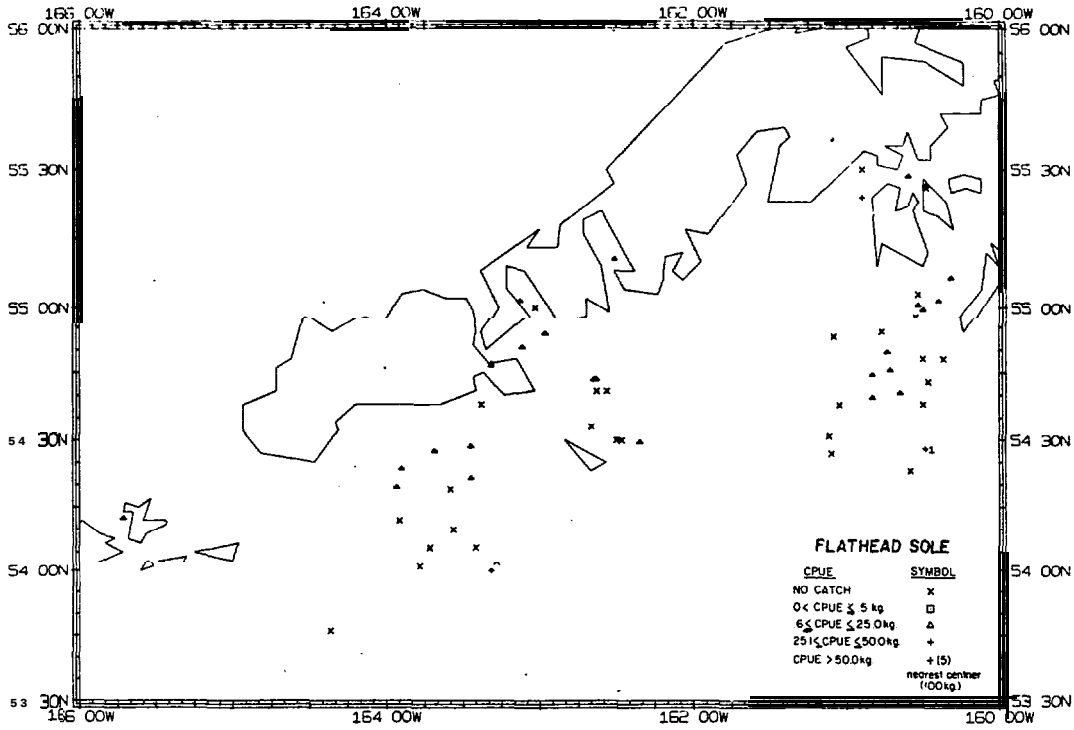


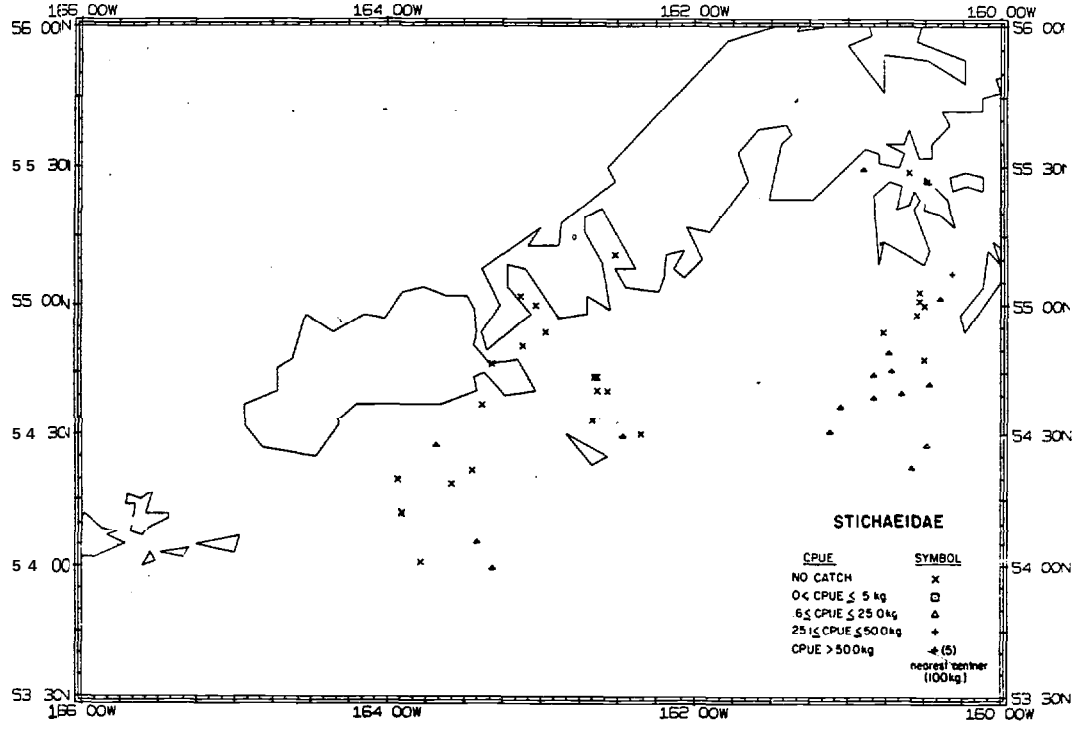
Figures X-32-33.--Distribution of Tanner crab and rock sole standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.



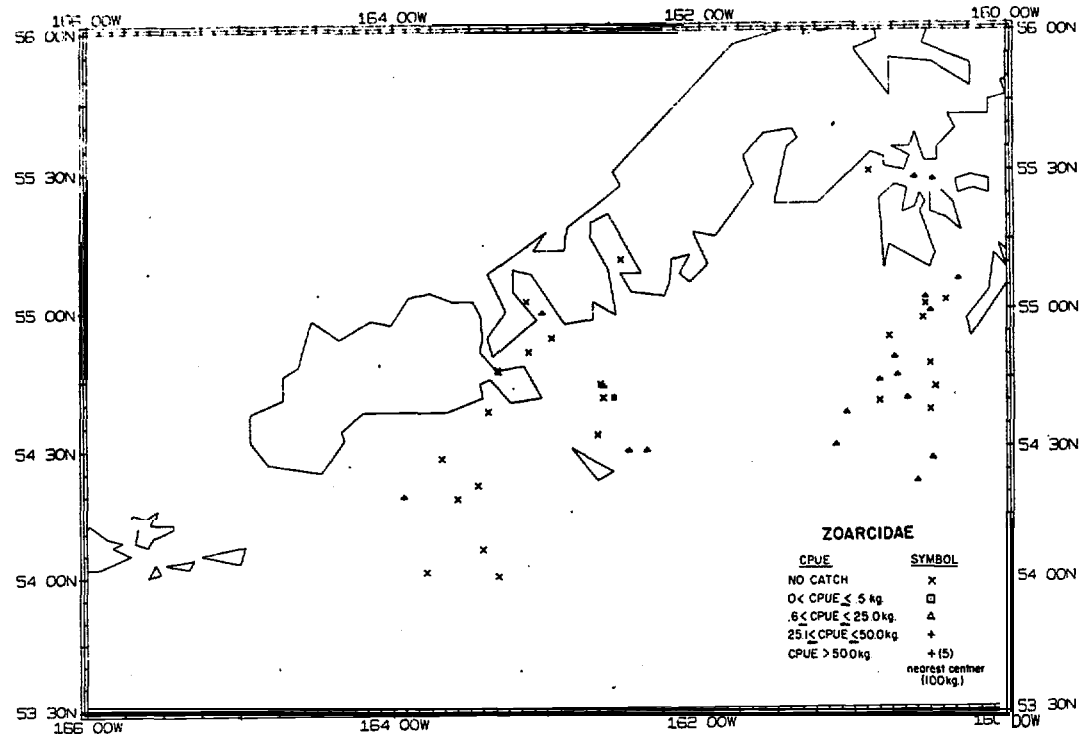


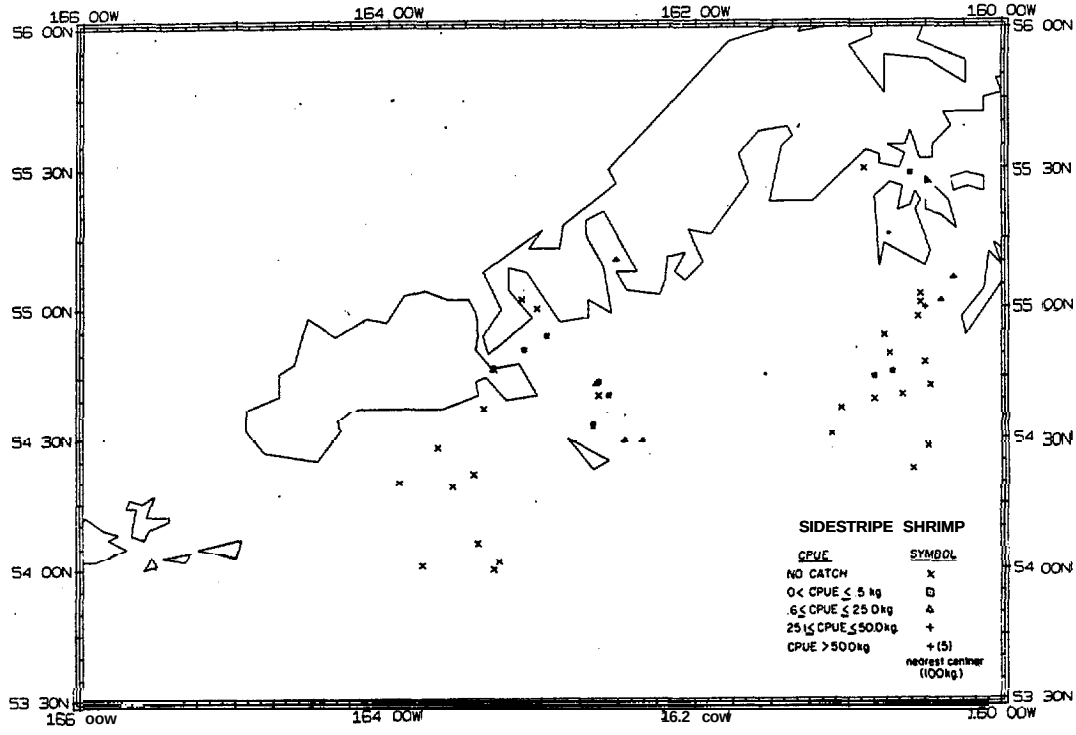
Figures X1-34-35.--Distribution of pink shrimp and Pacific halibut standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.





Figures X1-36-37.--Distribution of **flathead** sole and Stichaeidae standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.





Figures X1-38-39. --Distribution of Zoarcidae and sidestripe shrimp standardized catch rates, in **kg/hr,** cruise 002, charter vessel Tordenskjold.

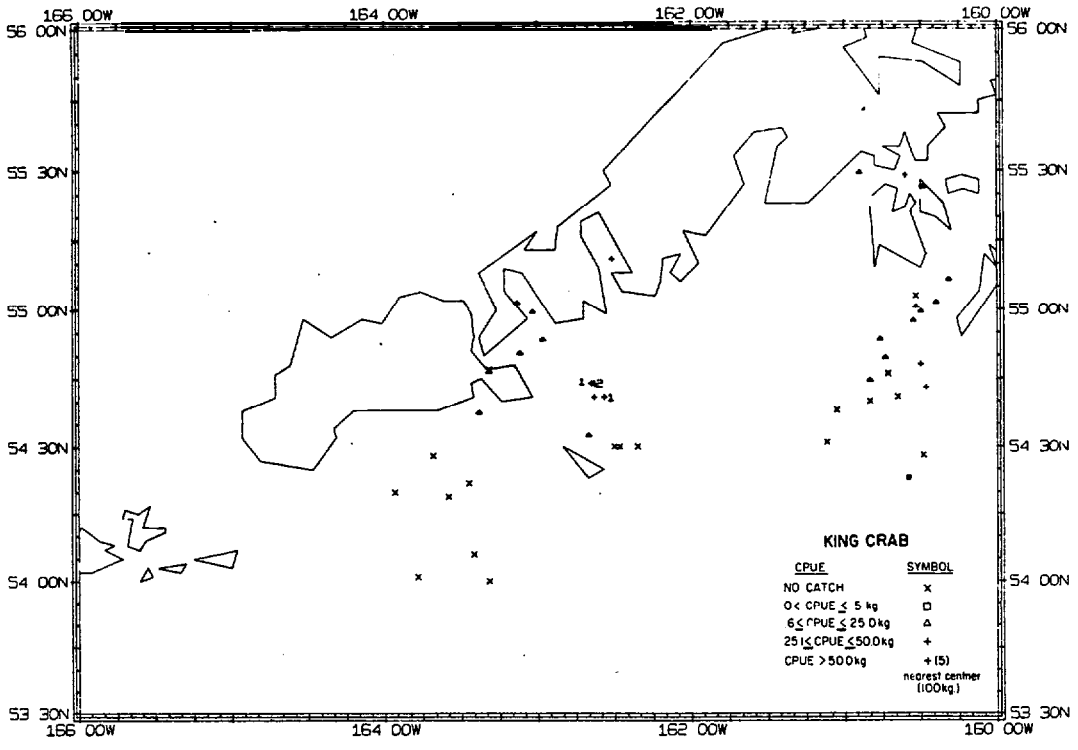


Figure X1-40. --Distribution of king crab standardized catch rates, in kg/hr, cruise 002, charter vessel Tordenskjold.

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 CPLJE 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 Albratross 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 Pe,

Depth Interval 1 - 100 m	Avg kg/hr	Station Number 12 kg/hr	14 kg/hr	15 kg/hr
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			
Total all species	906.0			

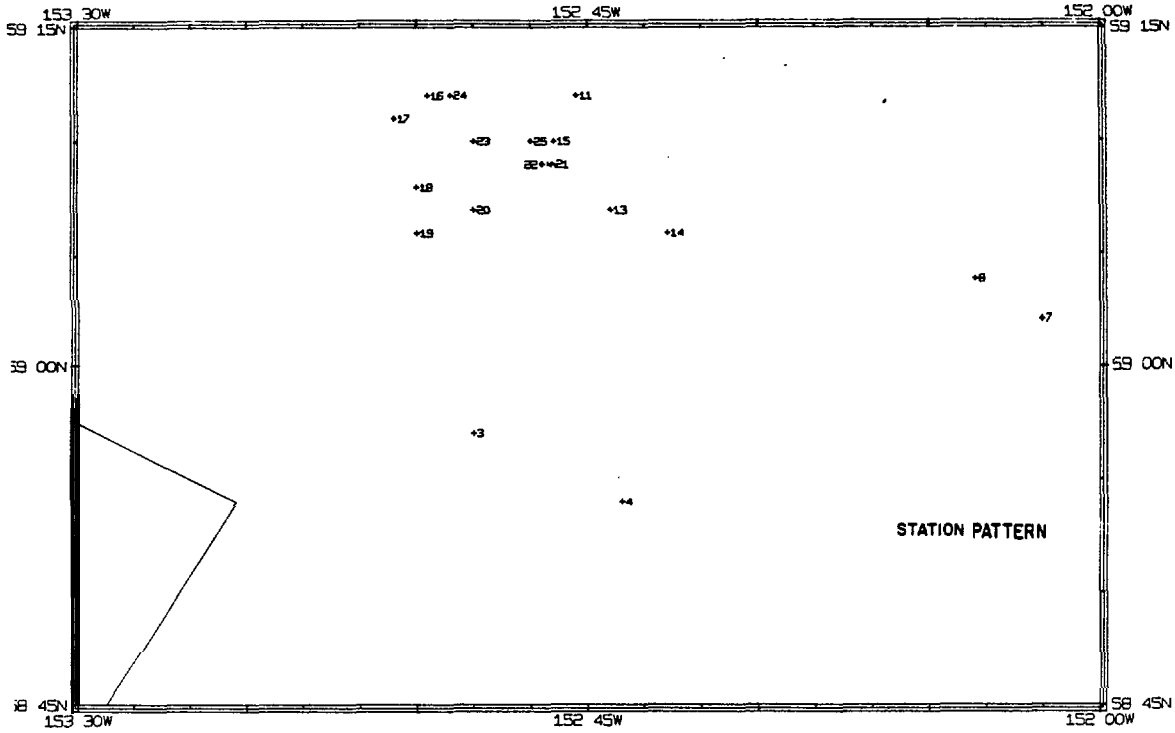


Figure X-41.--Stations successfully trawled (otter trawl) during cruise 612, charter vessel Tordenskjold.

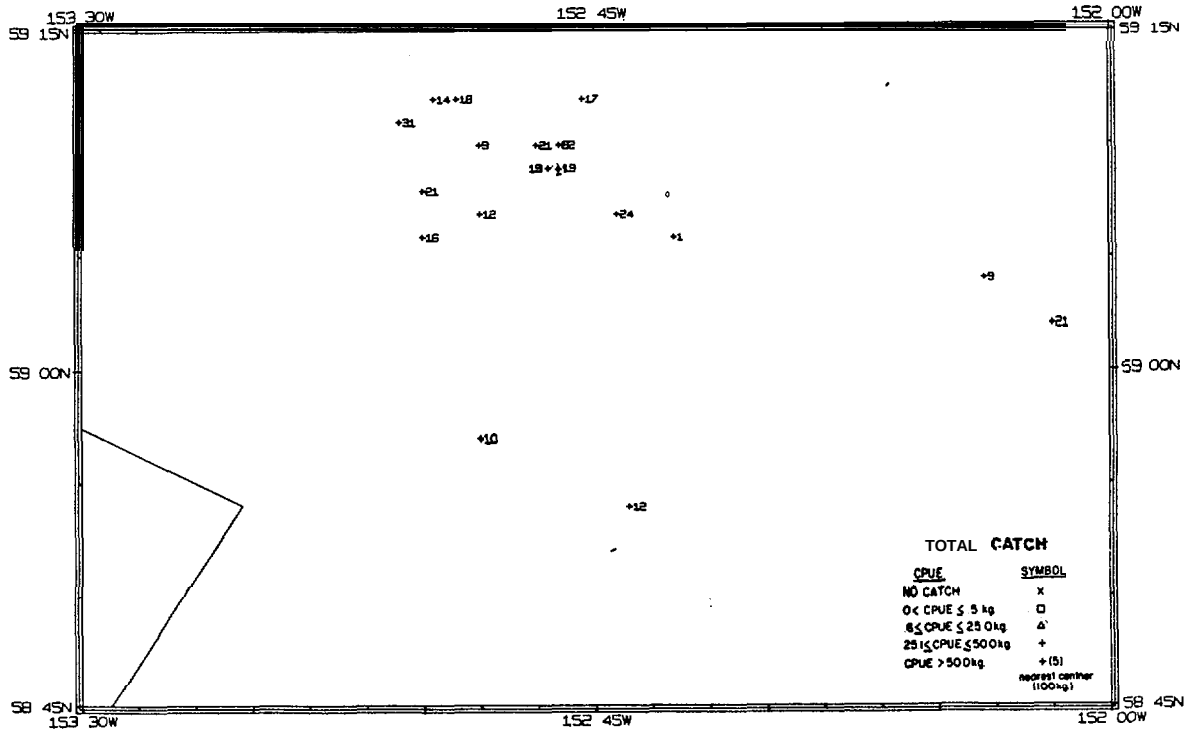
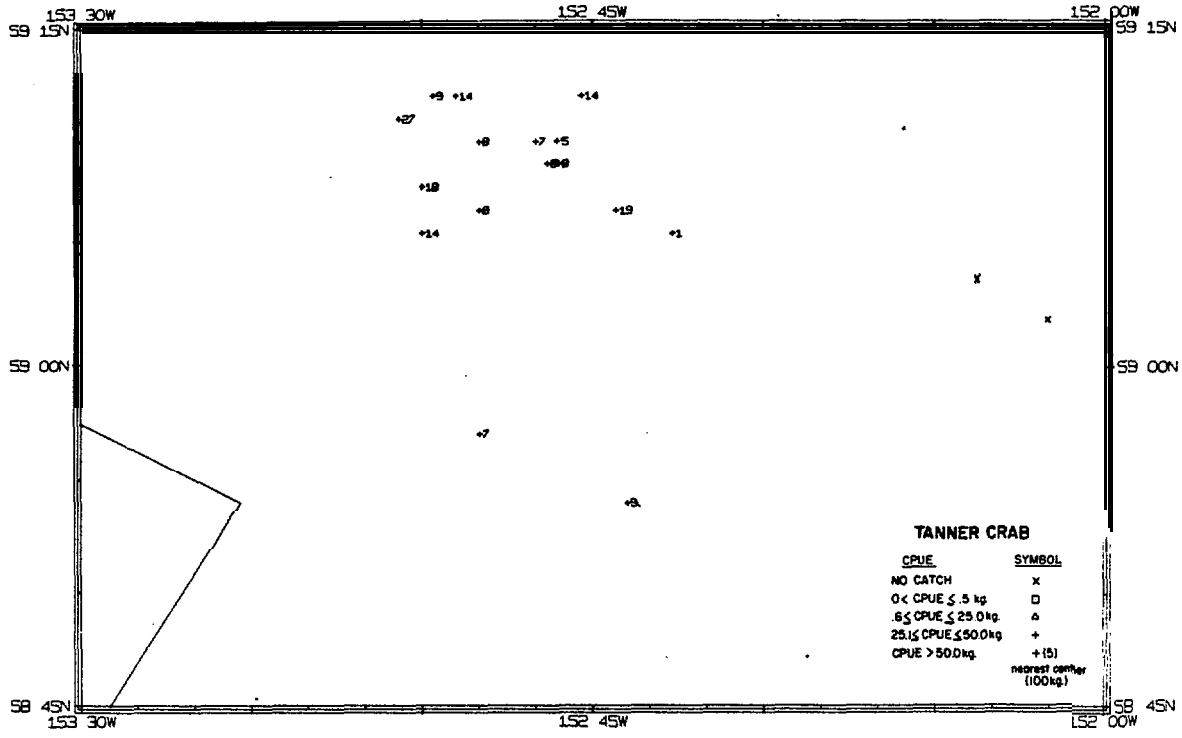
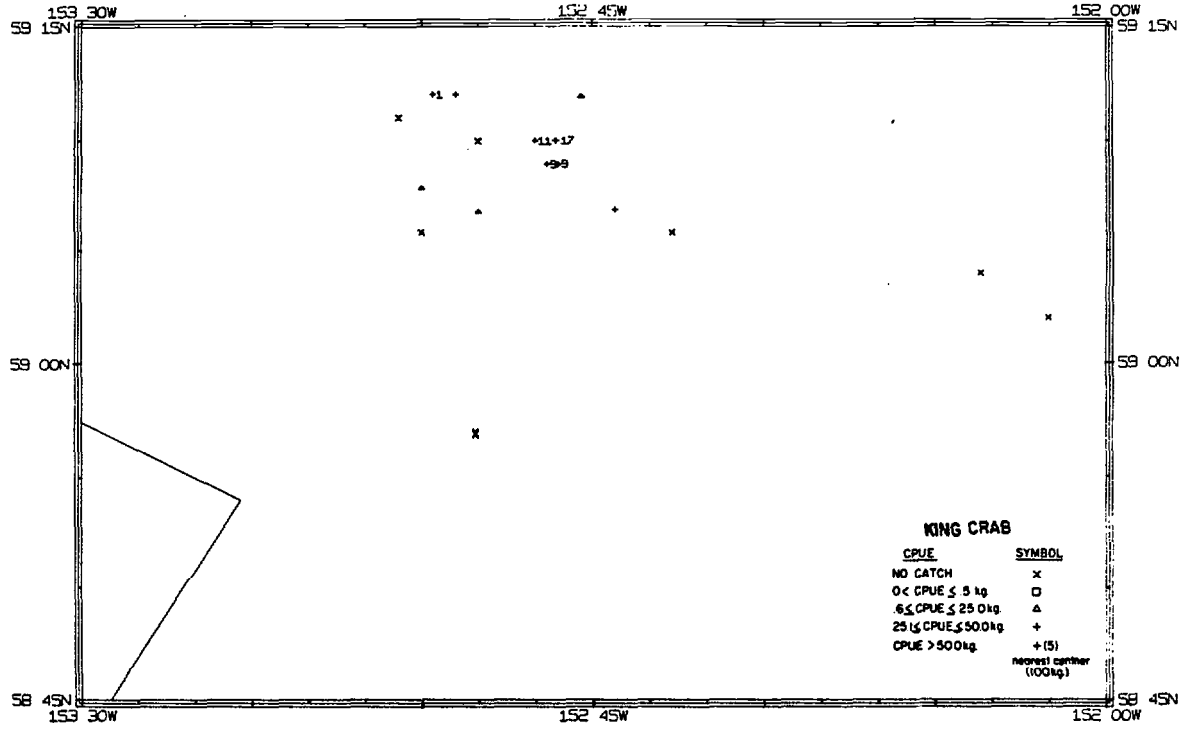


Figure X-42.--Distribution of standardized catch rates, all species combined in kg/hr, for cruise 612, charter vessel Tordenskjold.

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

Depth Intervals (m) 1 - 100		101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	Species	kg/hr
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		

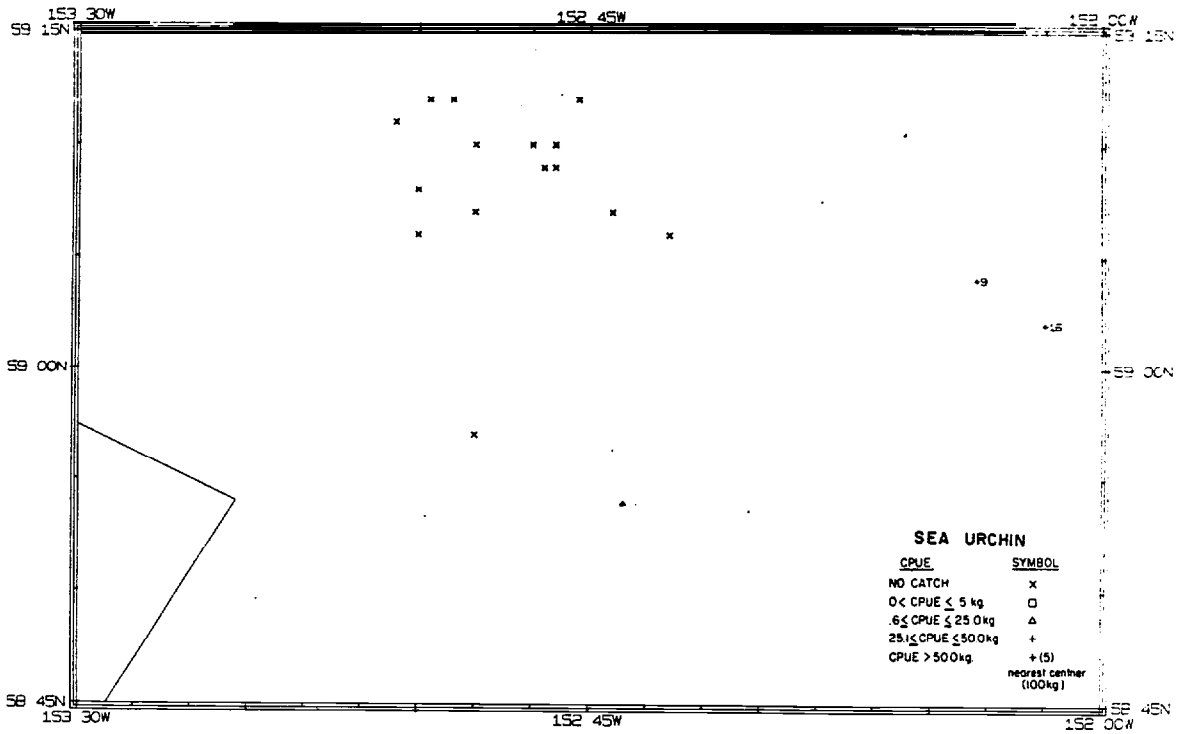


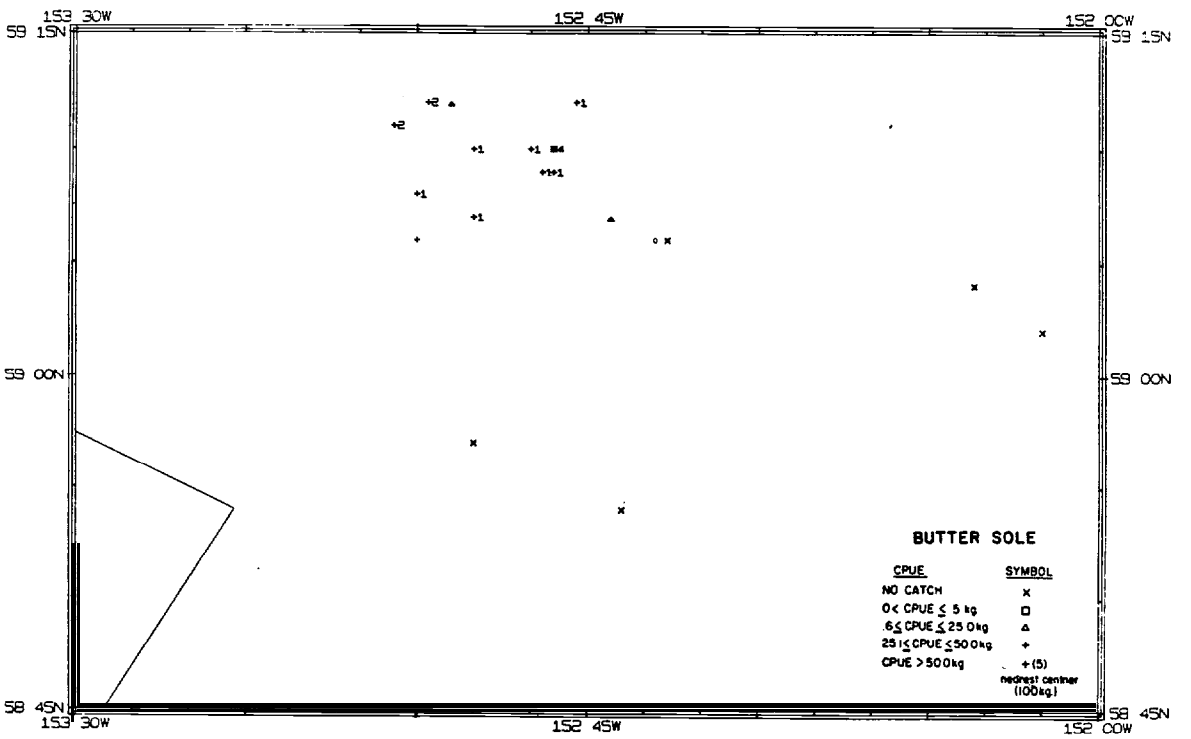


Figures X-43-44 .-Distrfbution of Tanner and king crab standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.

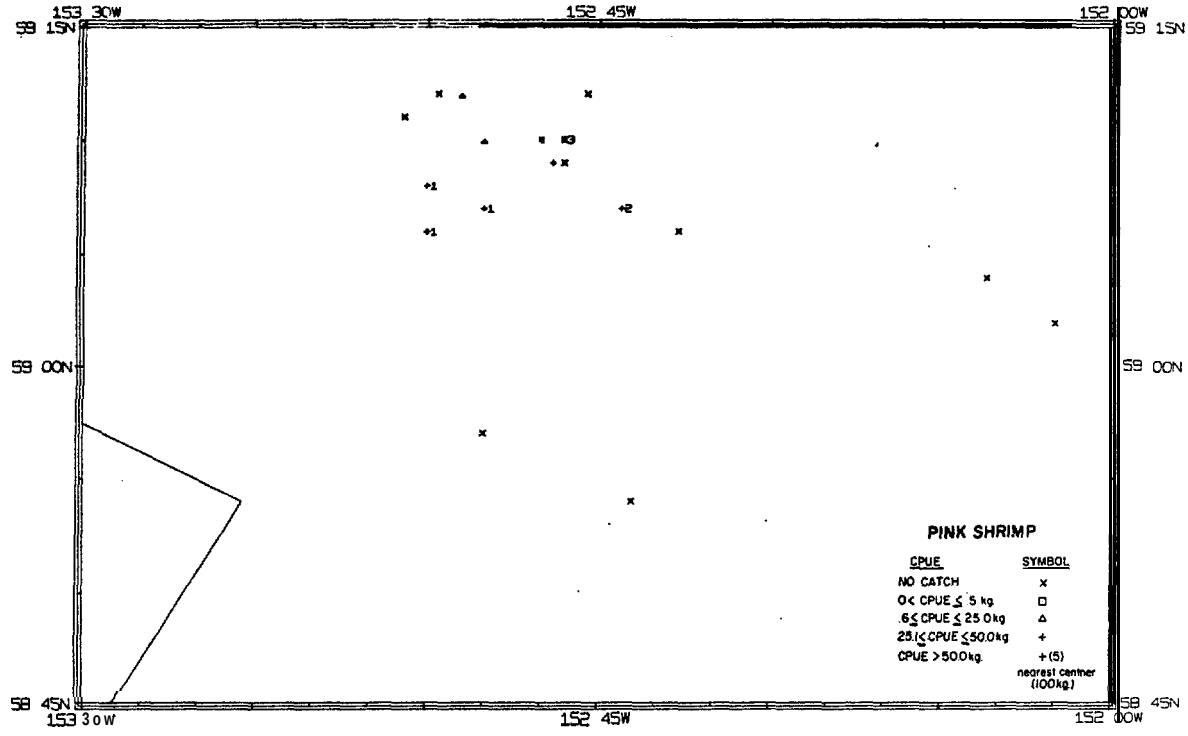
Table X-13.--A list of stations where species or species group standardized catch rates exceeded 50 kg/hr and total species catch rates exceeded 950 kg/hr, cruise 612, charter vessel Tordenskjold.

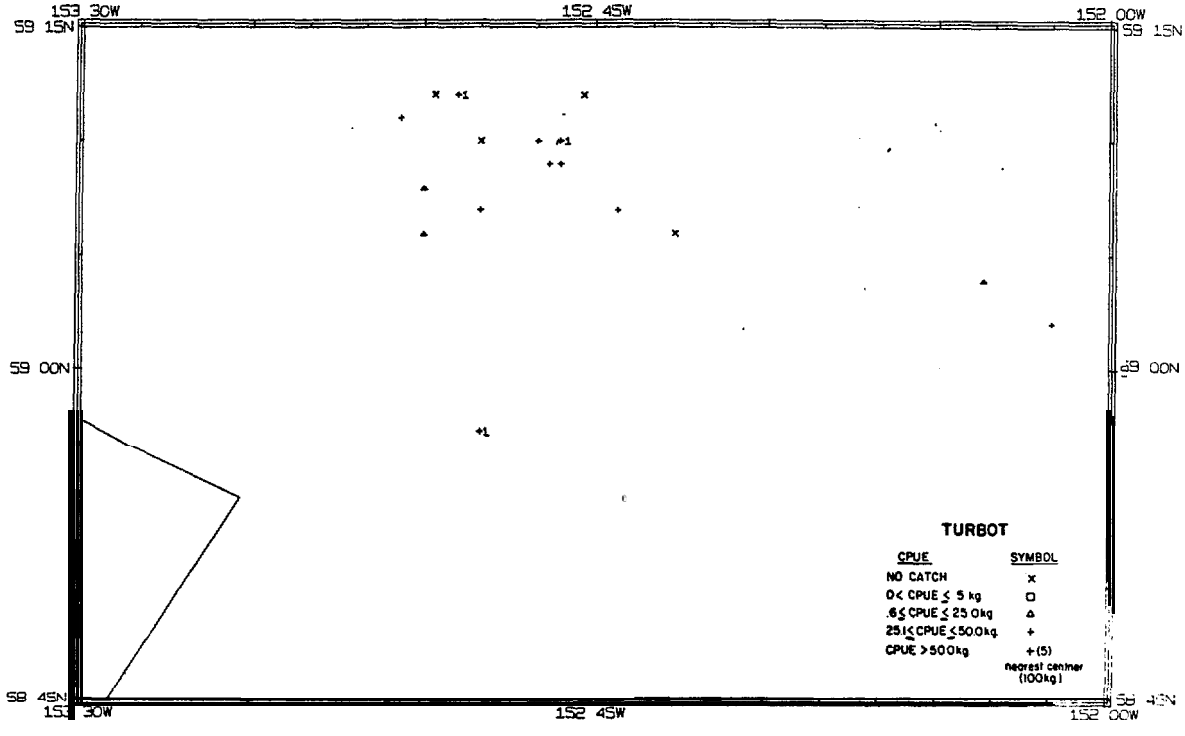
Species or Species groups	Station numbers
Total catch	3, 4, 7, 11, 13, 15-22, 24 and 25.
Tanner crab	3, 4, 11 and 13-25.
Butter sole	11, 15-18, 20-23 and 25.
King crab	15, 16, 21, 22 and 25.
Sea urchin	7 and 8.
Yellowfin sole	7.
Pink shrimp	13, 15 and 18-20.
Turbot	3, 4, 15 and 24.
Walleye pollock	4,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



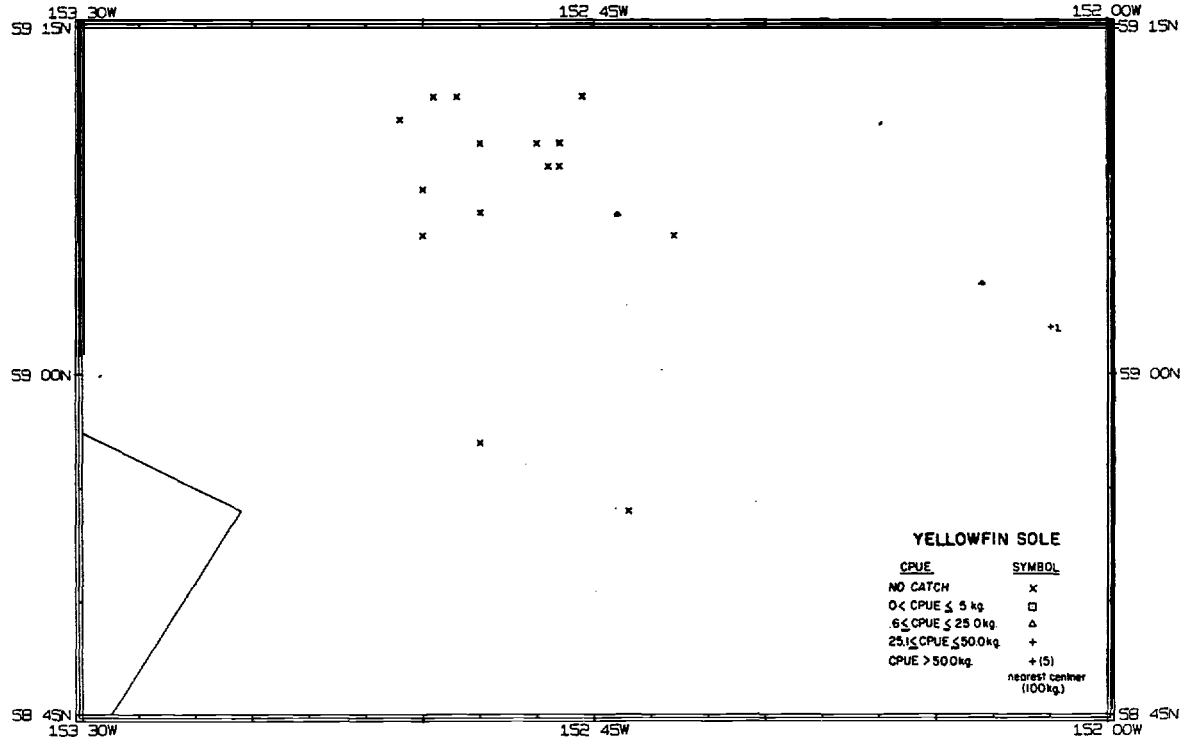


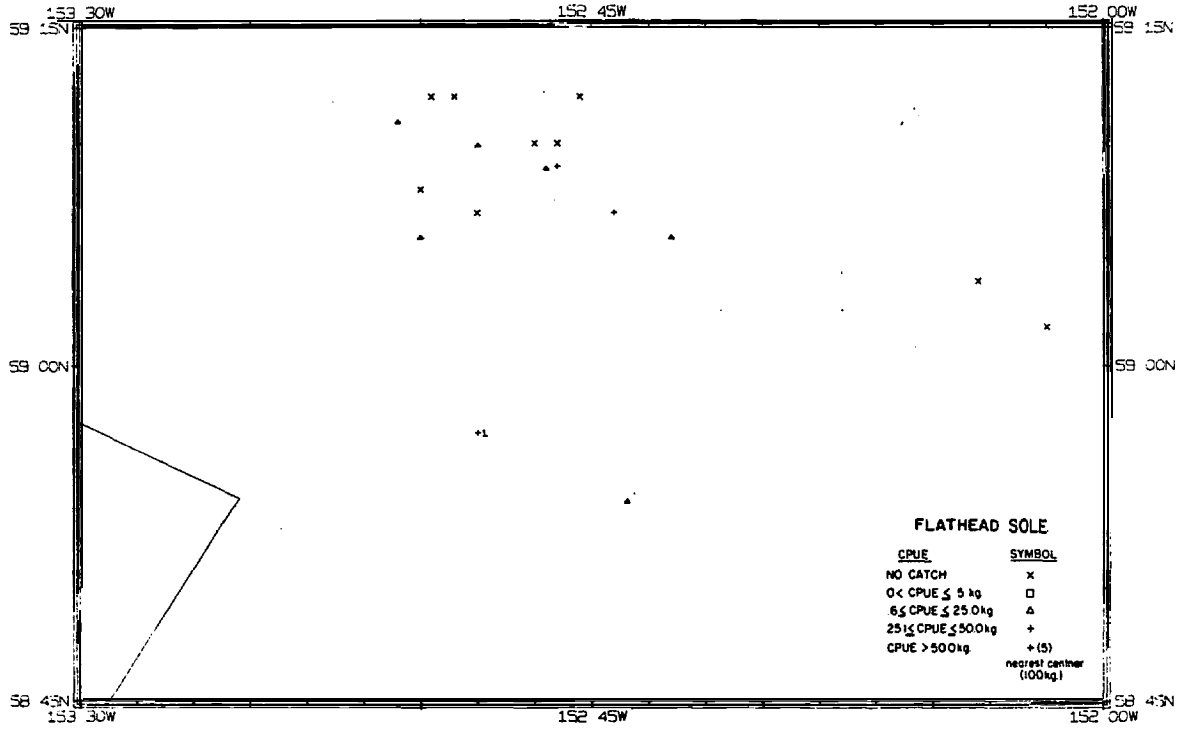
'Figures X-45-46. --Distribution of sea urchins and butter sole standardized catch rates, in **kg/hr,** cruise 612, charter vessel Tordenskjold.



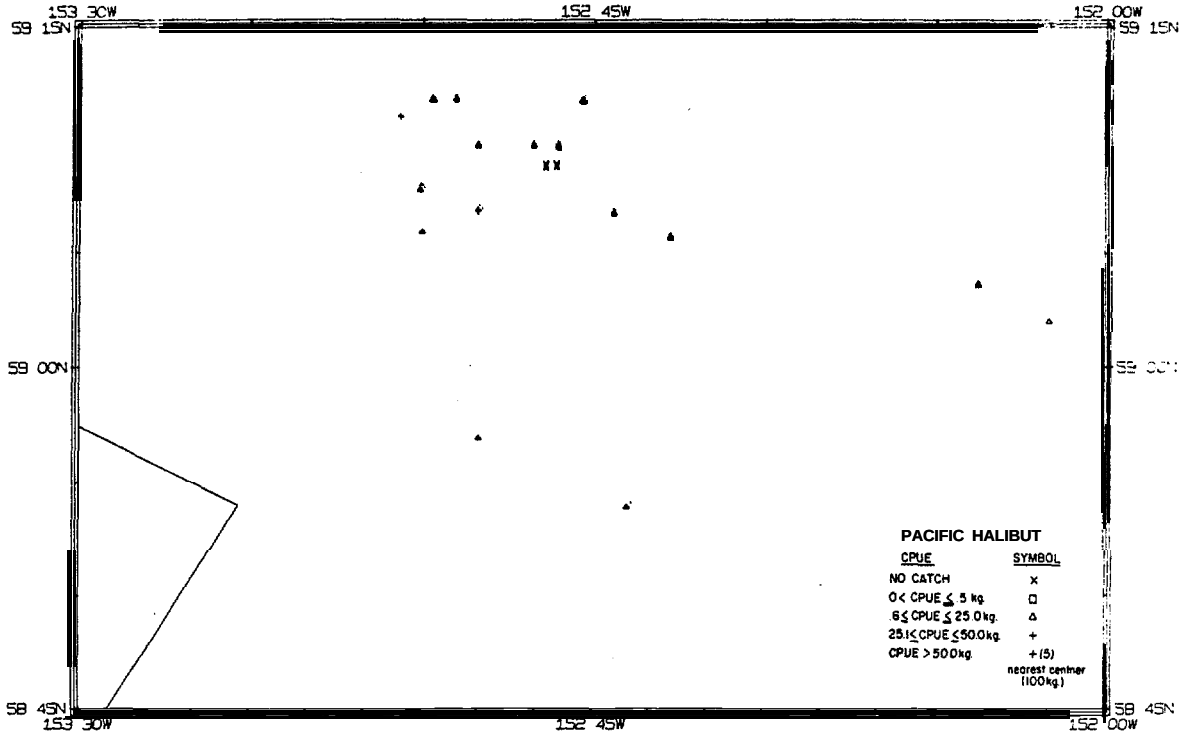


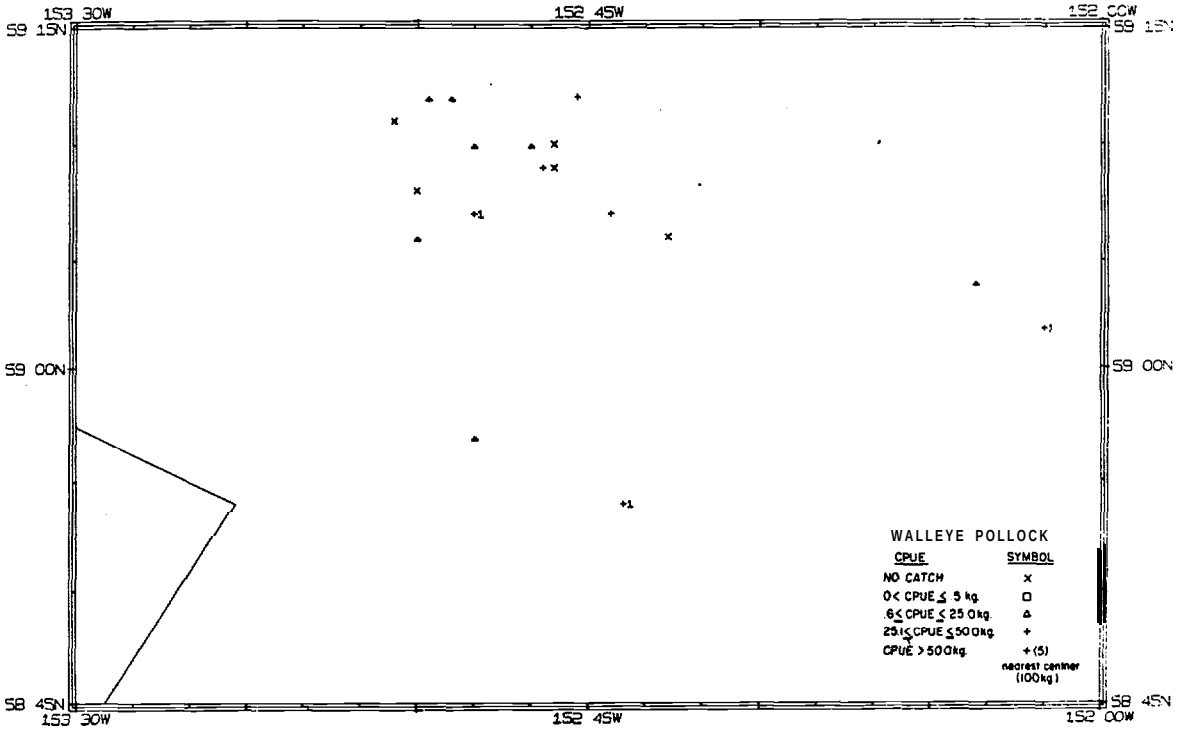
Figures X-47-48.--Distribution of pink shrimp and turbot standardized catch rates, in kg/hr, cruise 612, charter vessel Tordenskjold.





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





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

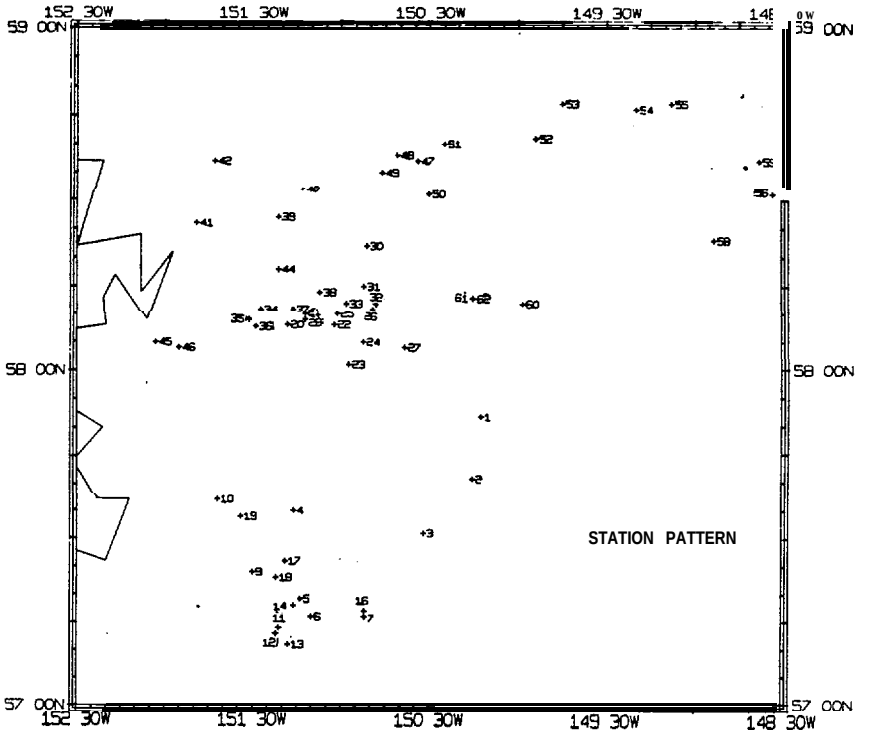


Figure X-53. --Stations successfully trawled (otter trawl) during cruise 621, charter vessel Yaquina.

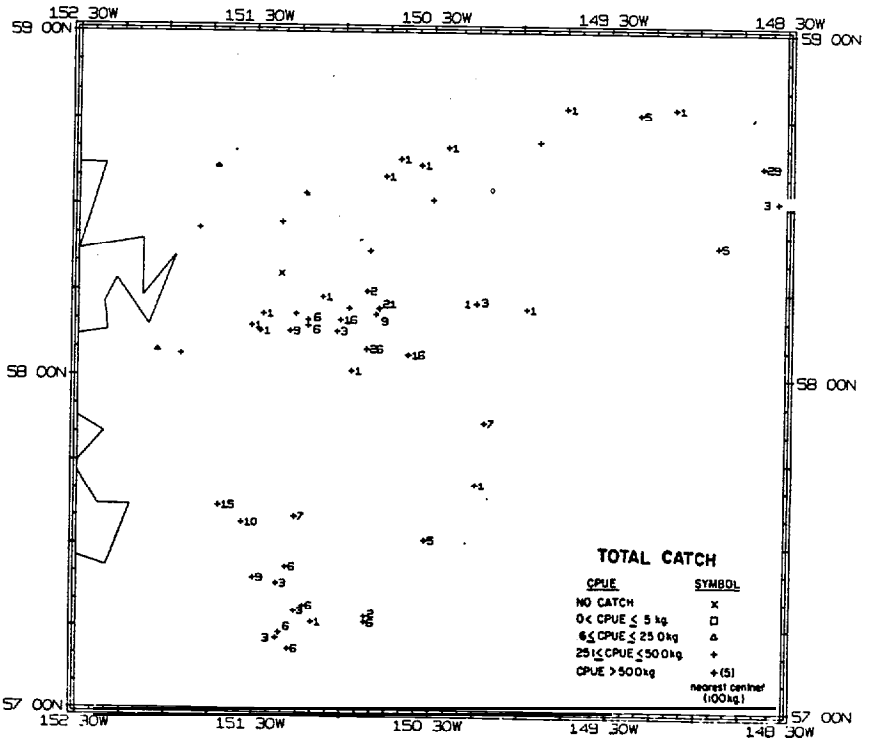


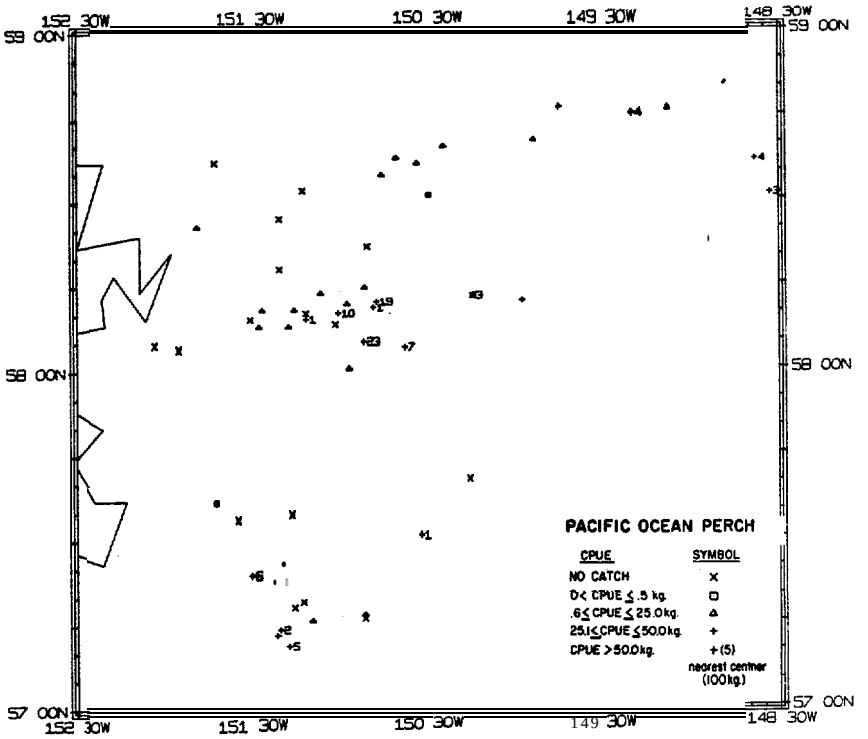
Figure X-54. --Distribution of standardized catch rates, all species combined in kg/hr, cruise 621, charter vessel Yaquina.

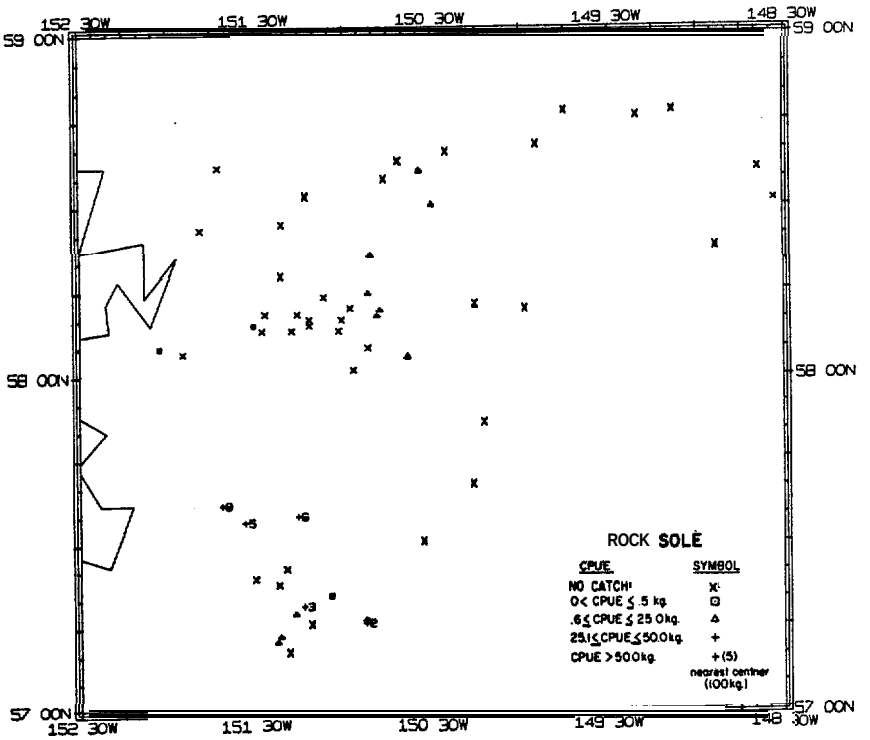
Table X-14.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 62-1, charter vessel Yaquina.

Depth Zones (m) 1 - 100		101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	Species	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

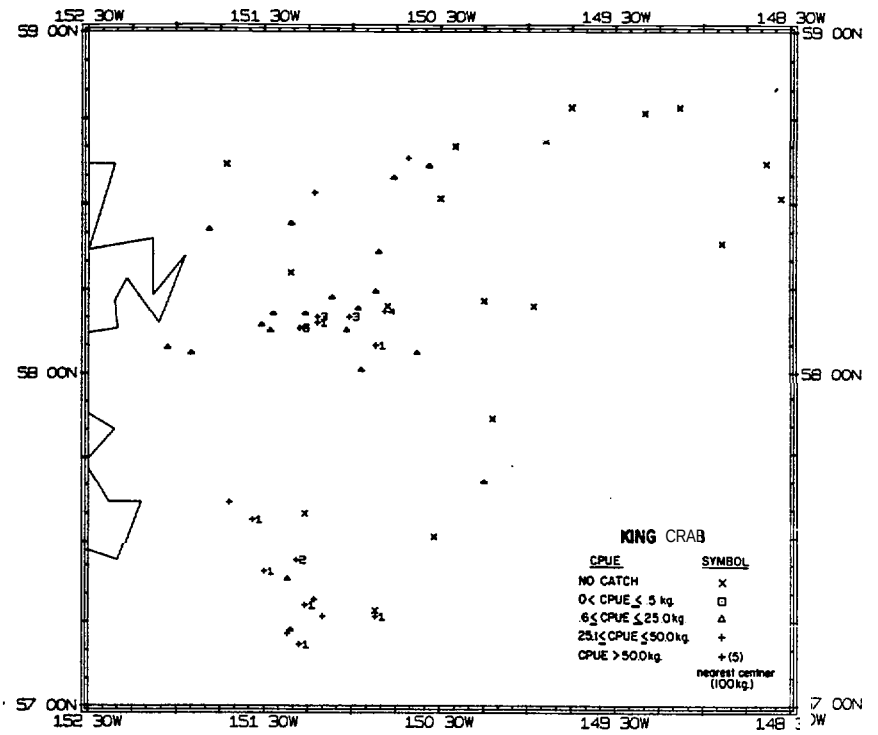
Table X-15.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr or the total species standardized catch rates exceeded 950 kg/hr, cruise 621, charter vessel Yaquina.

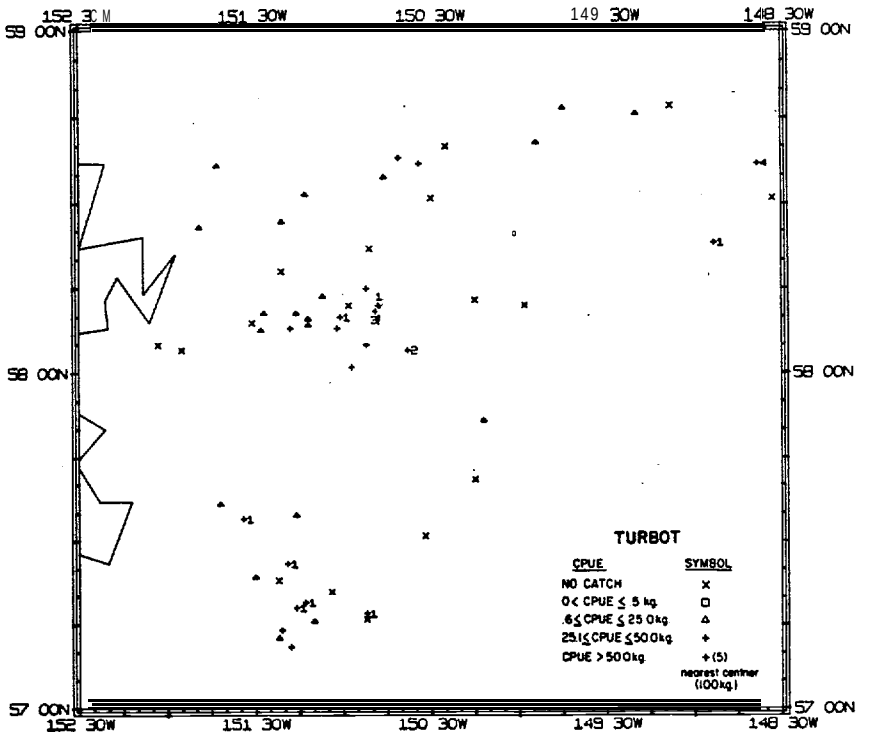
Species or Species groups	Station numbers
Total catch	10, 19, 24, 25, 27, 32 and 59.
Rock sole	4, 5, 7, 10 and 19.
Pacific ocean perch	1, 3, 9, 11, 13, 18, 24-28, 32, 54, 56, 58, 59 and 61.
Pacific halibut	5, 7, 10, 11, 17, 19, 31 and 58.
King crab	7, 9, 13, 14, 17, 19-21, 24-26 and 28.
Cottids	9, 10 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.



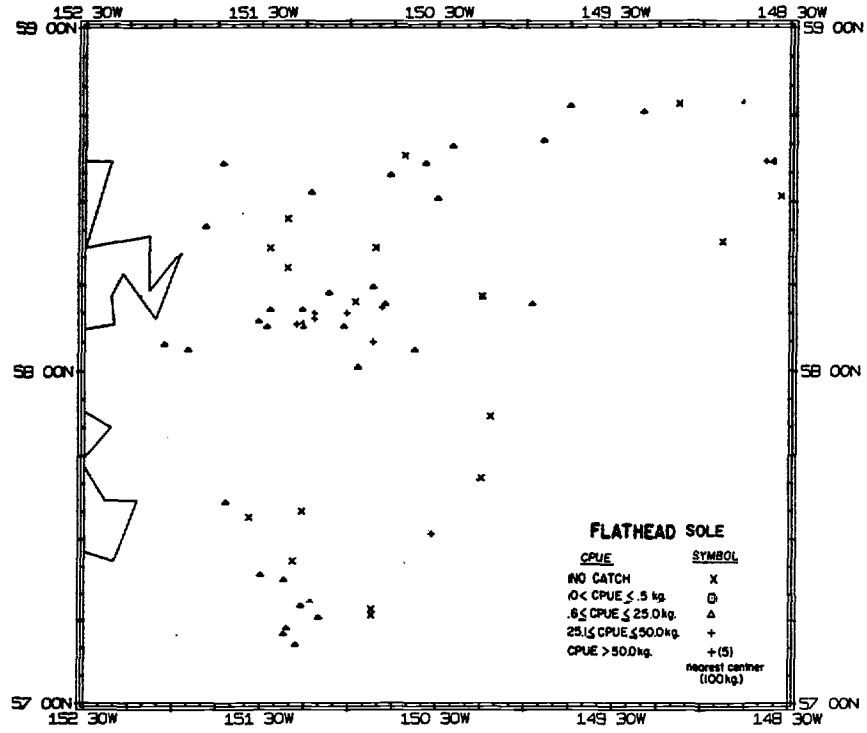


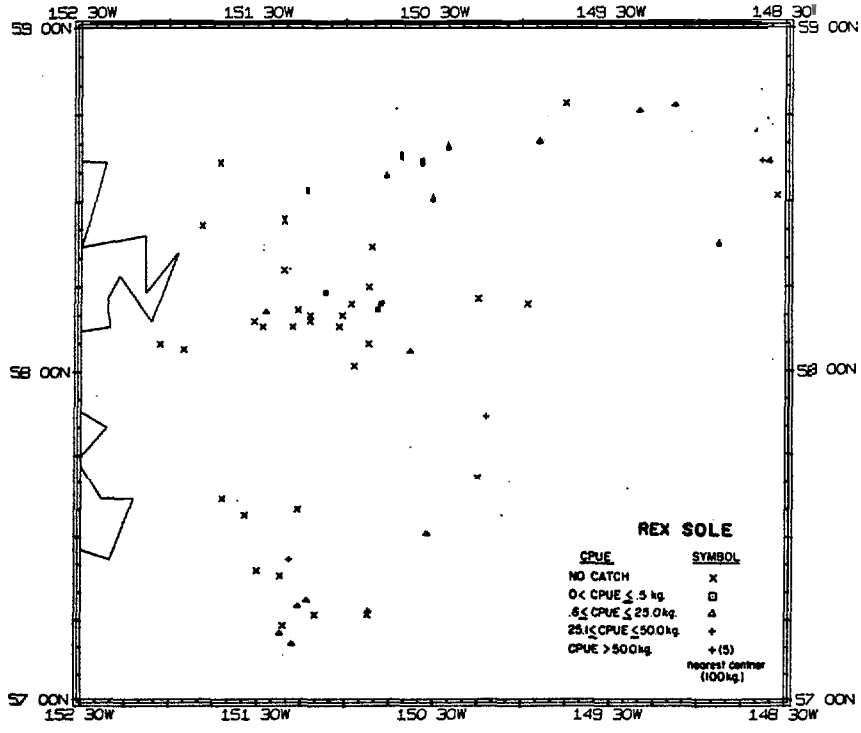
Figures X-55-56.--Distribution of Pacific ocean perch and rock sole standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.



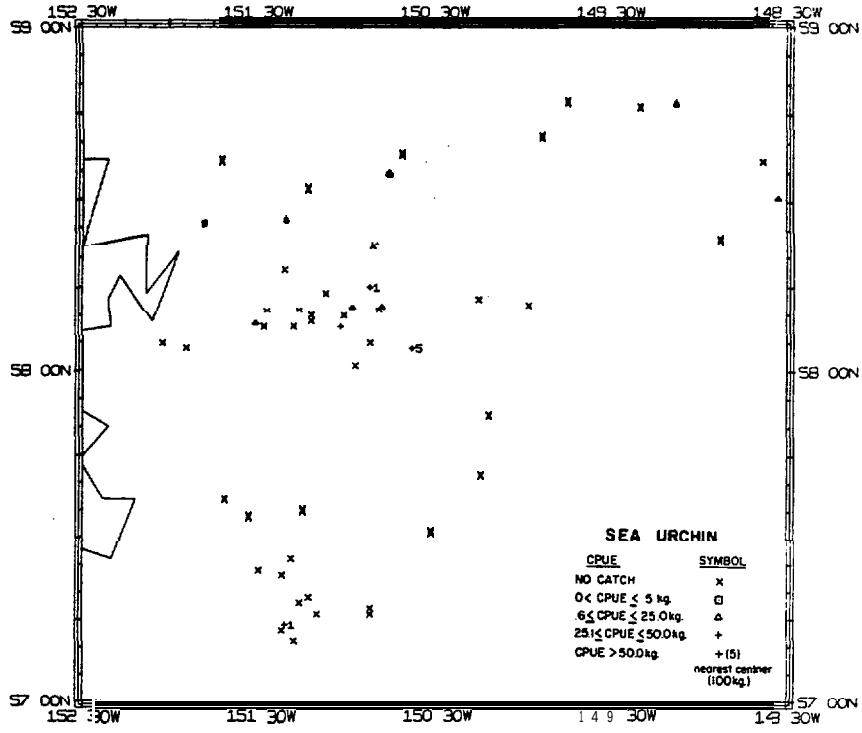


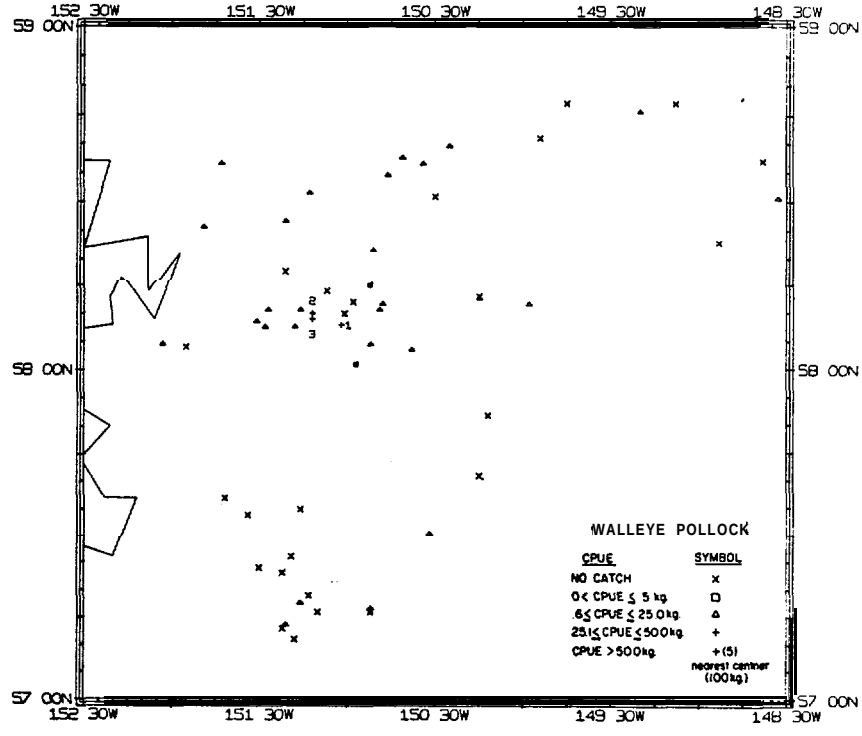
Figures X-57-58.--Distribution of king crab and turbot standardized catch rates, in **kg/hr,** cruise 621, charter vessel Yaquina.



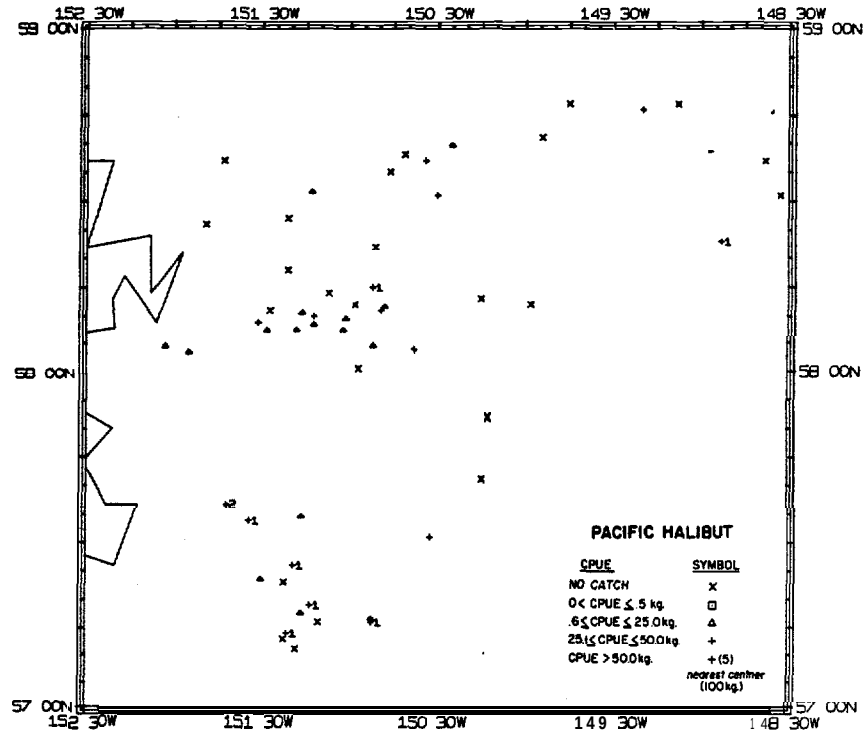


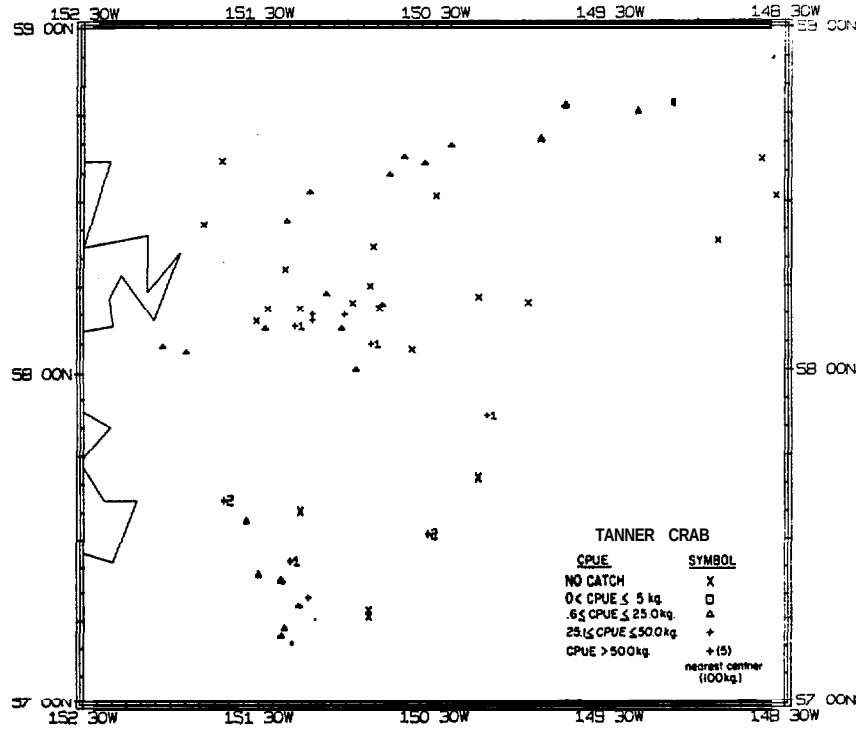
Figures X-59-60.--Distribution of **flathead** and rex sole standardized catch rates, in **kg/hr,** cruise 621, charter vessel Yaquina.



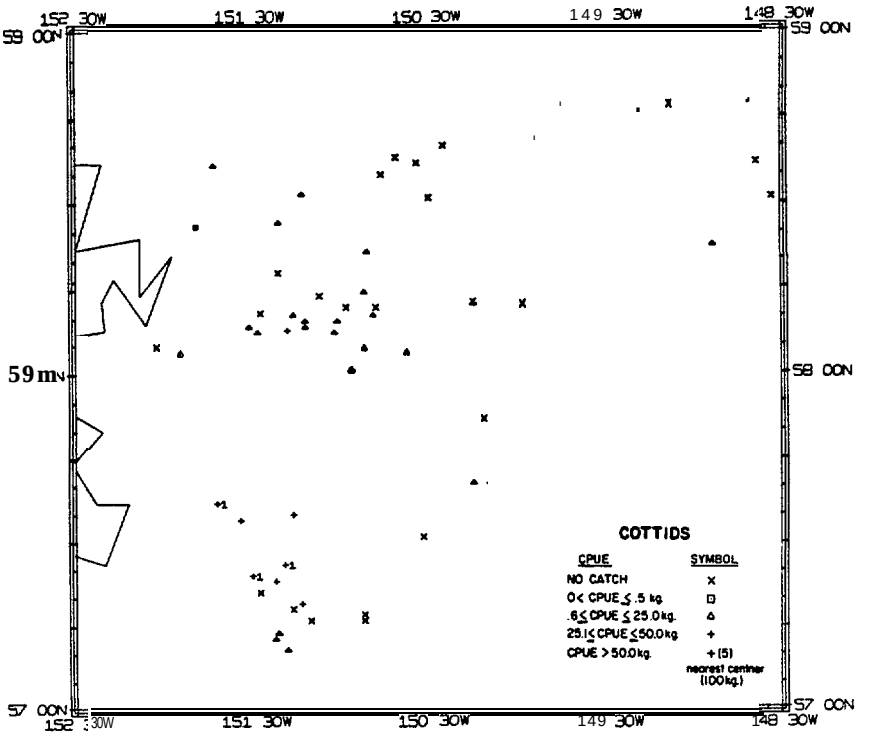


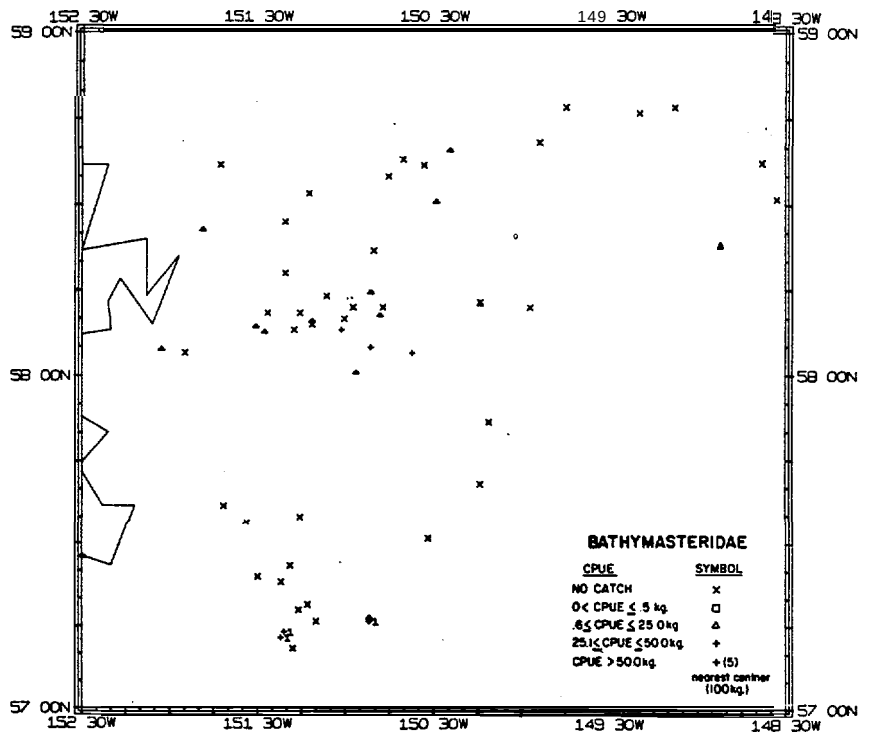
Figures X-61-62.--Distribution of sea urchins and walleye pollock standardized catch rates, in kg/hr, cruise 621, charter vessel Yaquina.





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)

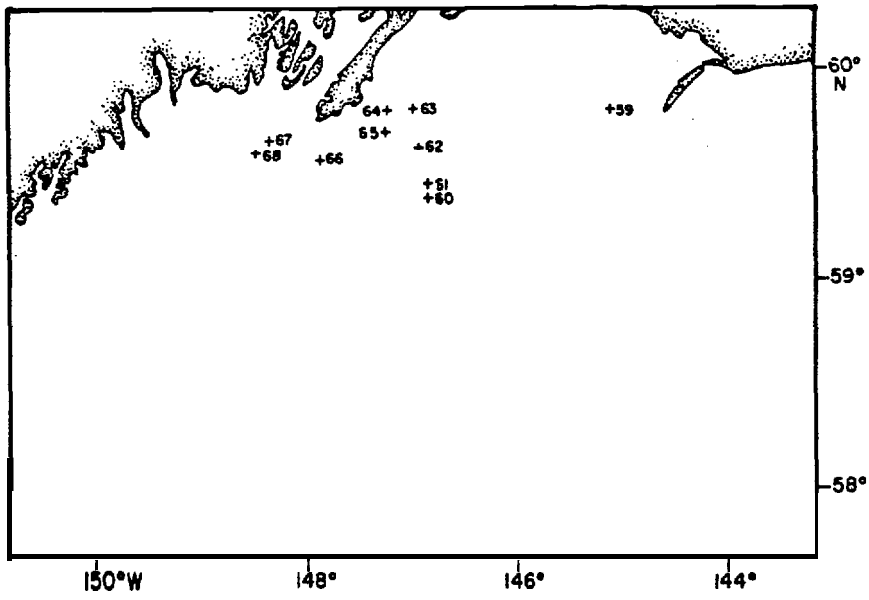
FRB's Gulf of Alaska rockfish investigations expanded to the western Gulf of Alaska where 32 stations were attempted from Seward Gully to the Trinity Islands, (Figure X-69). Pacific ocean perch catches ranged from 87 to 8560 kg/hr and averaged 2909 kg/hr. Largest catches were made along the outer continental 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 PRB 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, 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).



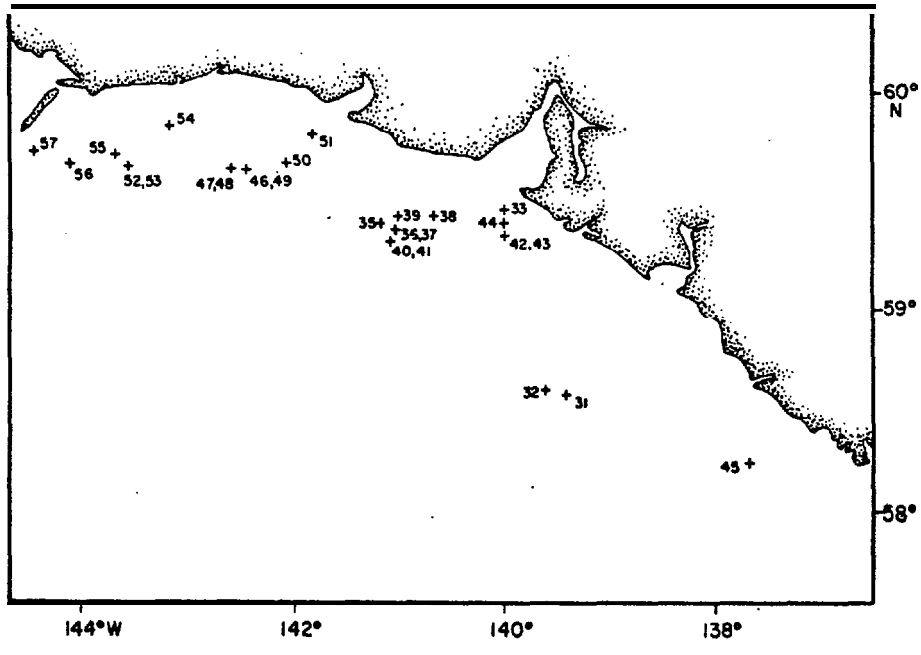
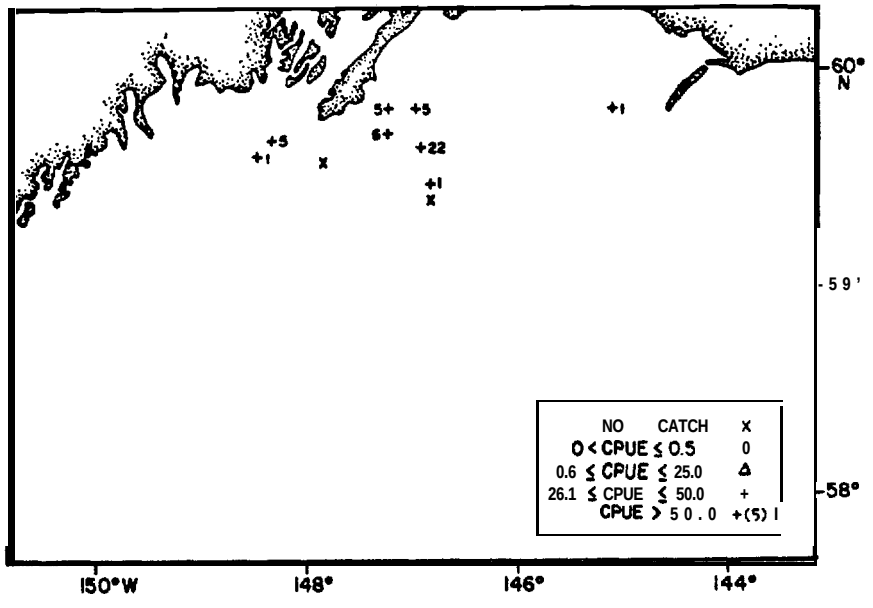


Figure X-67.--Stations successfully trawled (otter trawl) during cruise 636, R/V G. B. Reed.



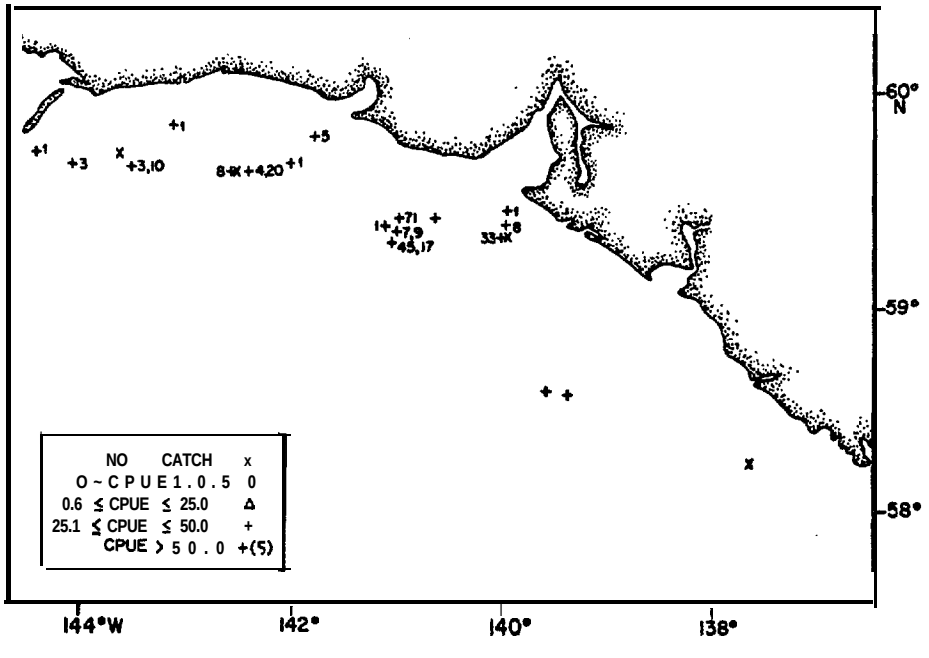


Figure X-68.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 636, R/V G. B. Reed.

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	l-7, 54, 55 and 57-71.
Pacific cod	1 and 2.
Walleye pollock	4, 5 and 71.
Turbot	5 and 67.
Sharpchin rockfish	1.

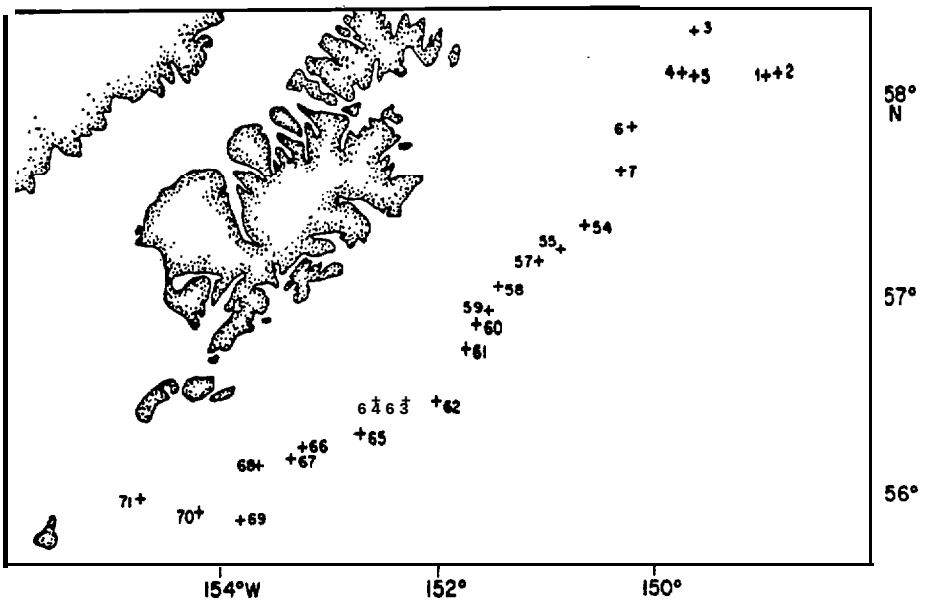


Figure X-69.--Stations successfully trawled (otter trawl) during cruise 637, R/V G. B. Reed.

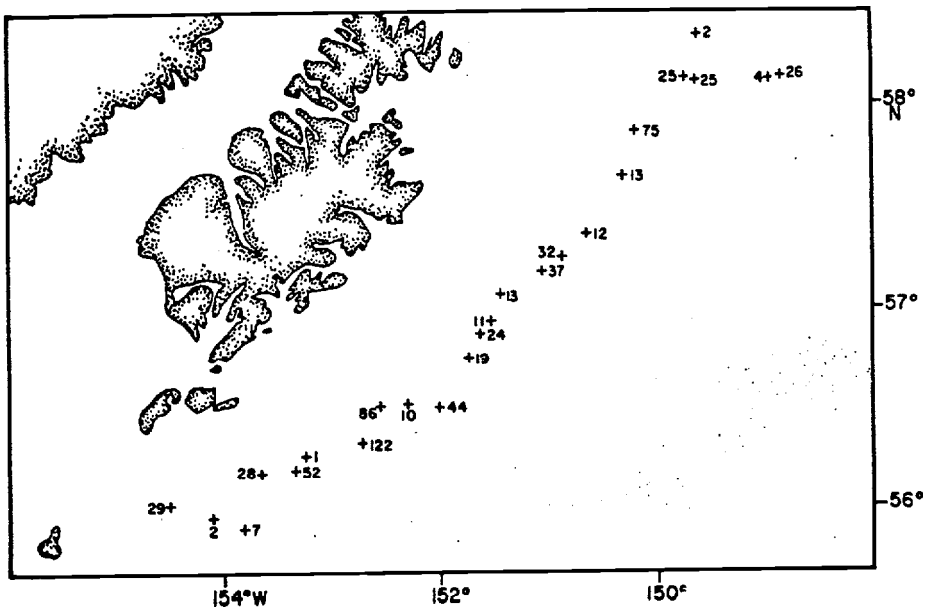


Figure X-70.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 637, R/V. G. B. ~~Reed.~~

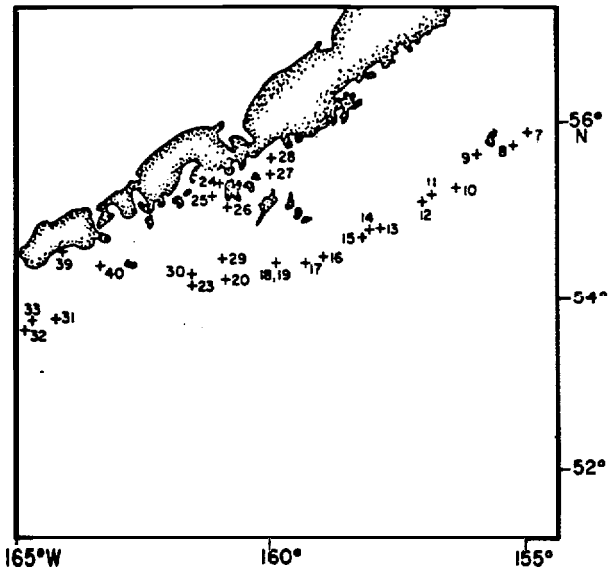


Figure X-71.--Stations successfully trawled (otter trawl) during cruise 648, R/V. G. B. Reed.

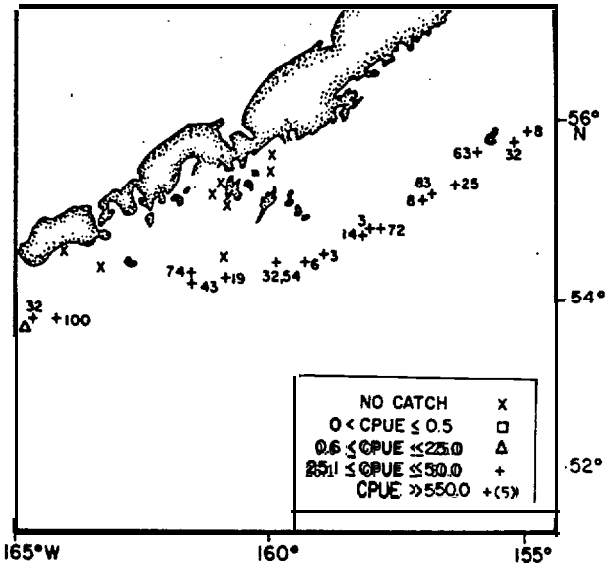


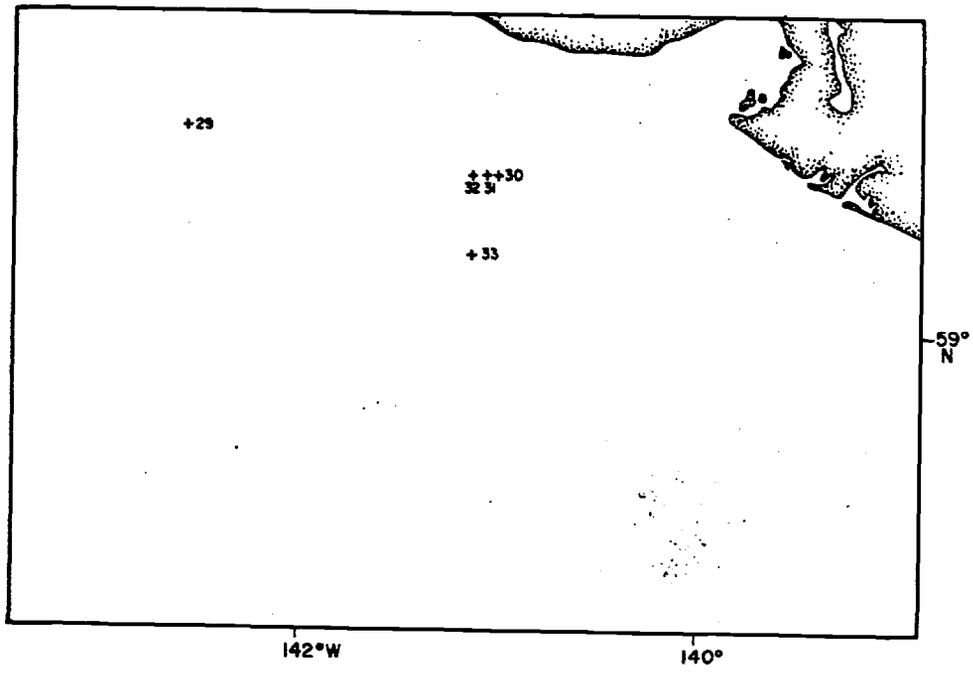
Figure X-72.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 648, R/V G. B. Reed.

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.



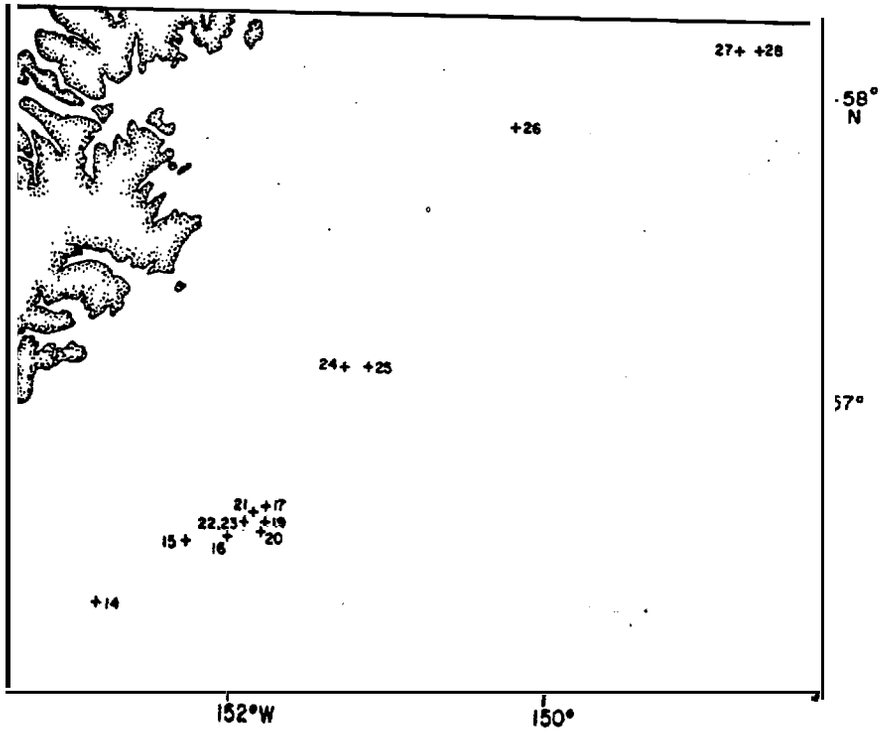
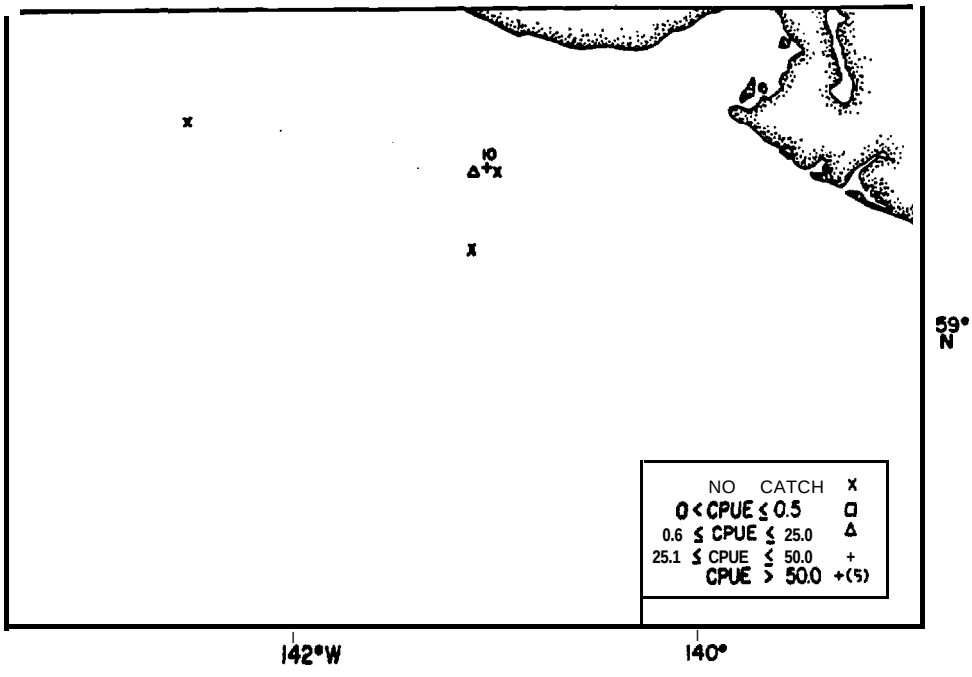


Figure X-73.--Stations successfully trawled (otter trawl) during cruise 652, R/V G. B. Reed.



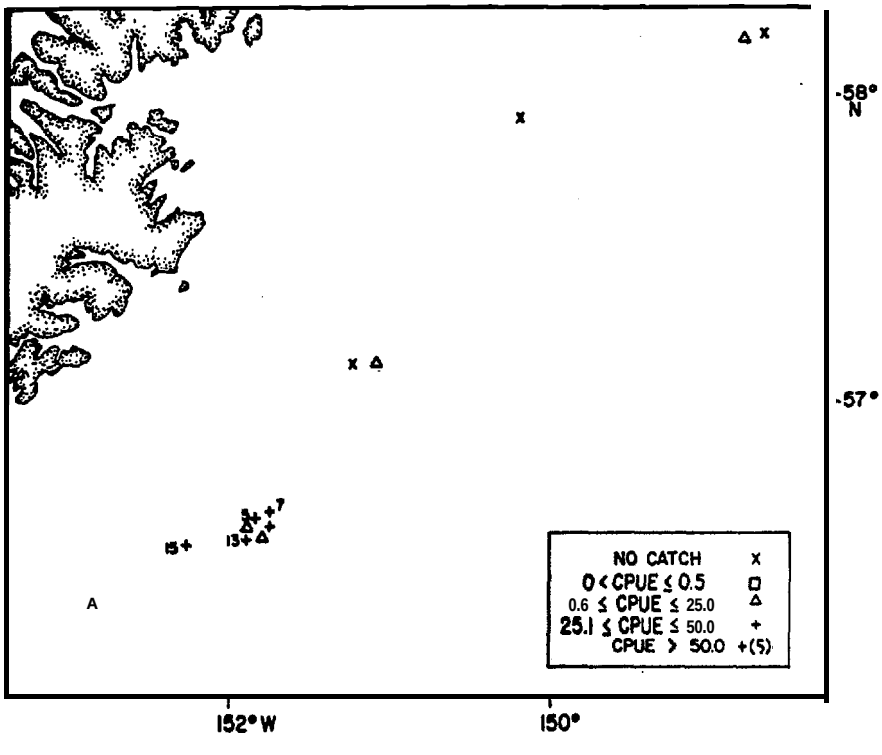


Figure X-74.--Distribution of Pacific ocean perch standardized catch rates, in kg/hr, during cruise 652, R/V G. B. Reed.

l. 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-83).

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 cuter shelf, 57% of the total shrimp catch, and 18% of the total species catch. Sidestripe was the only other species of shrimp to average over 10 kg/hr. The larger catches of pandalid shrimps occurred at the 24 stations in the inner bay (F ig ure 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 shrimps and these dominant species constituted 89% of the total catch in the inner shelf and 79% in the outer shelf.

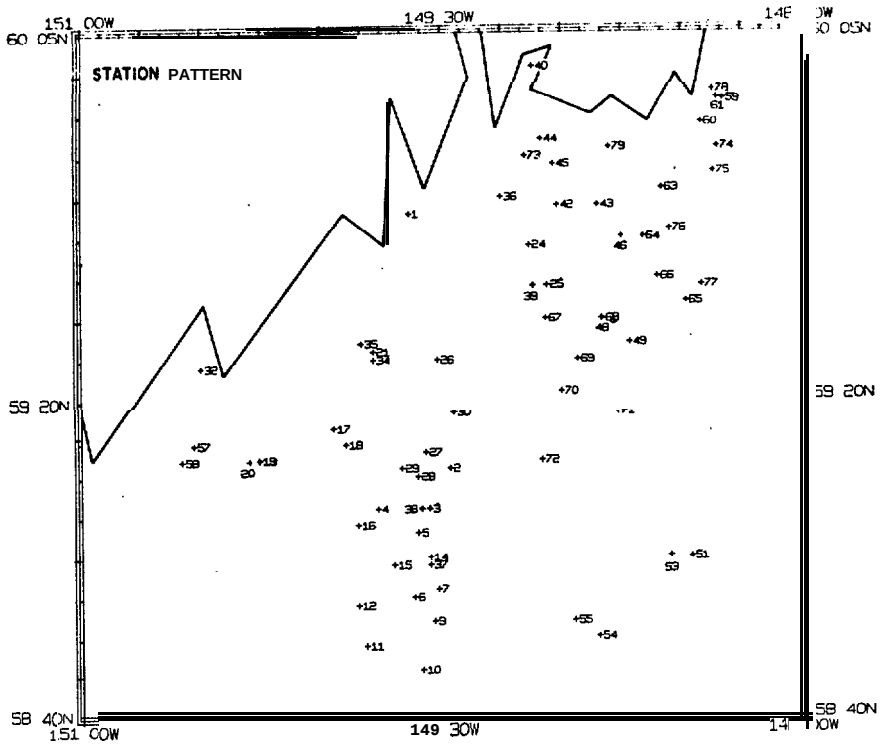


Figure X-75.--Stations successfully trawled (otter trawl) during cruise 673, R/V John R. Manning.

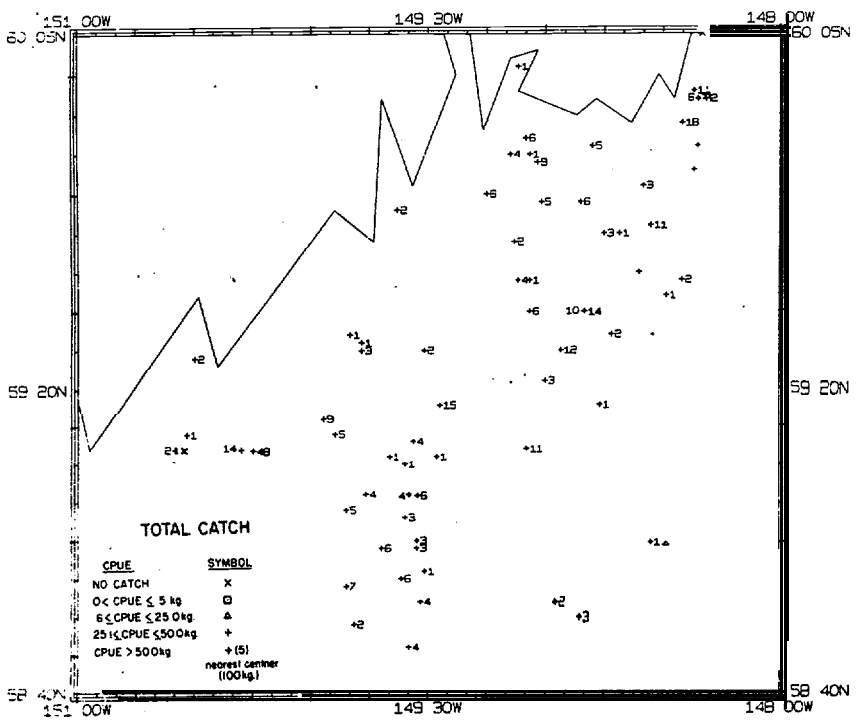


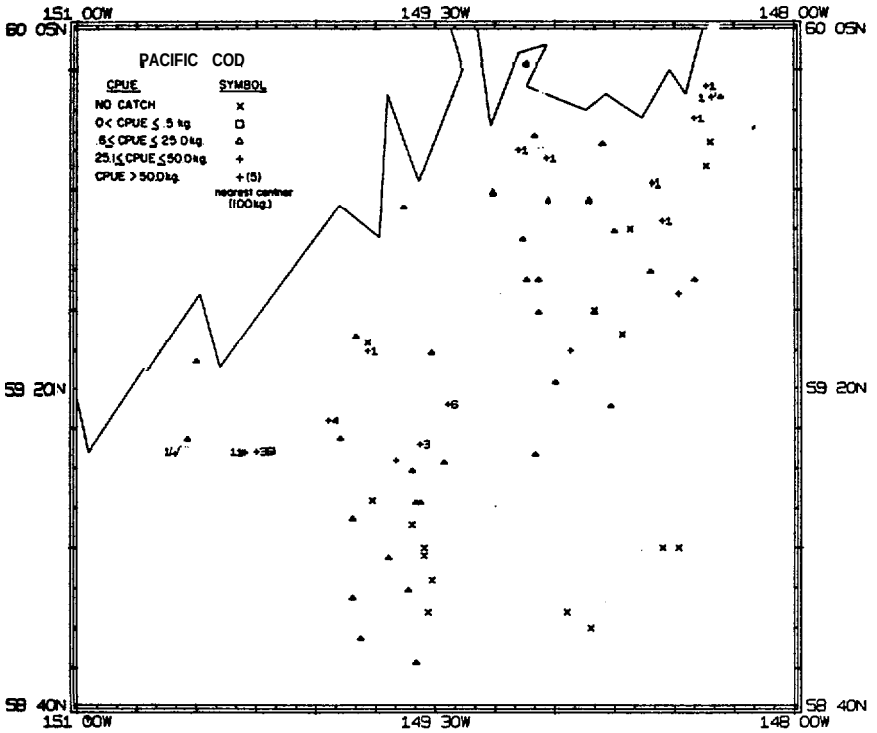
Figure X-76 .--Distribution of standardized catch rates, all species combined in kg/hr, cruise 673, R/V John R. Manning.

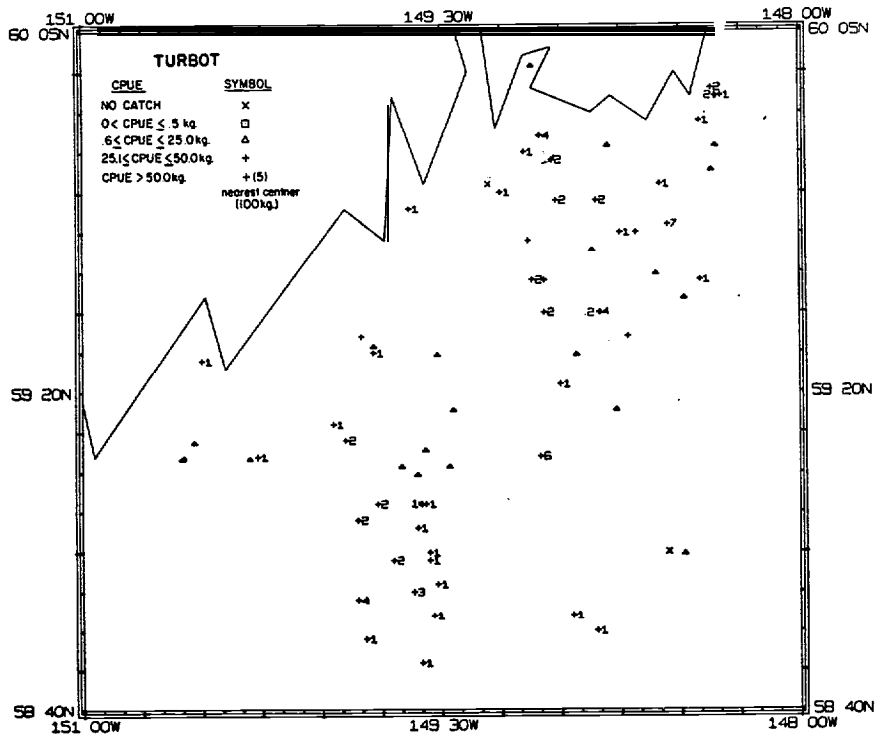
Table X-20.--Mean CPUE's for the dominant species or species groups captured with otter trawls, cruise 67-3, R/V John R. Manning.

Depth Zones (m) 1 - 100		101 - 200		201 - 400	
Species	kg/hr	Species	kg/hr	Species	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

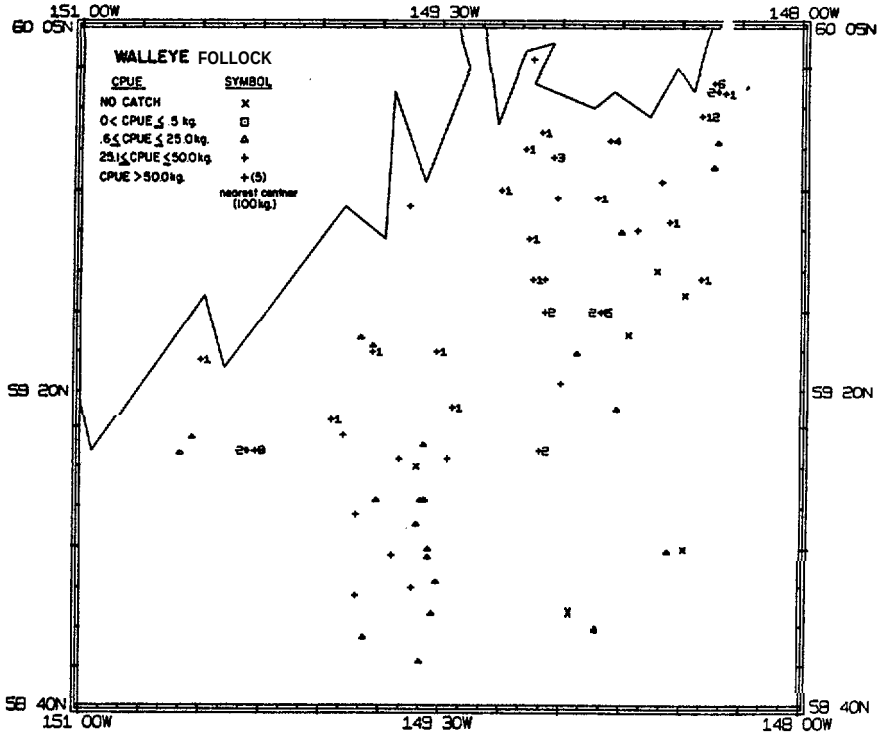
Table X-21.--A list of stations where species or species group standardized catch rates exceeded 50 kg/hr or total species catch rates exceeded 950 kg/hr, cruise 673, R/V John R. Manning.

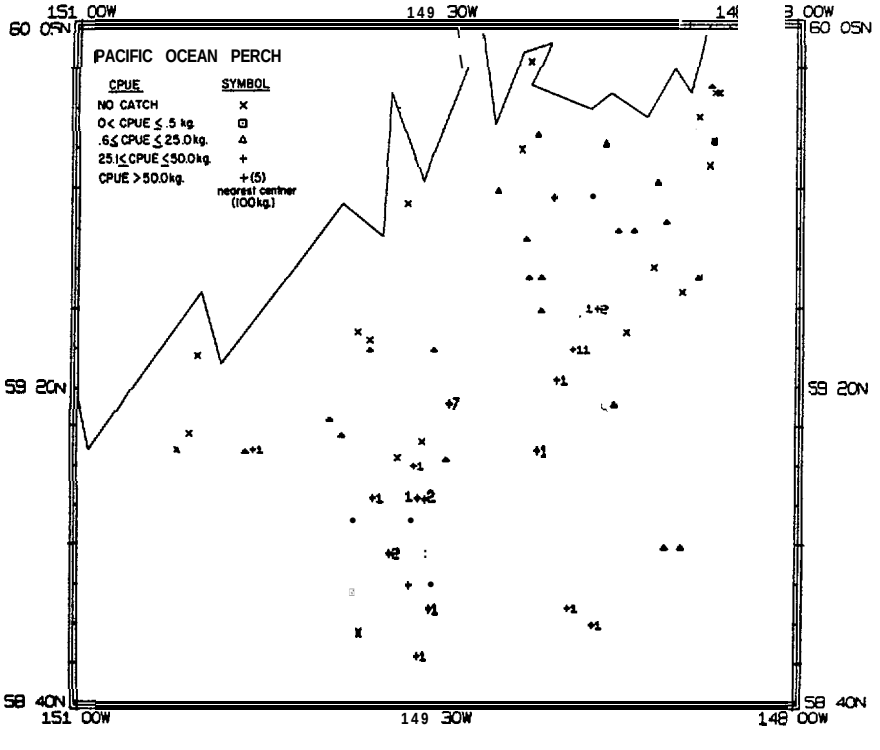
Species or Species groups	Station Numbers
Total catch	19, 20, 30, 48, 61, 68, 69, 72, 76 and 78.
Pacific cod	17, 19, 20, 27, 30, 34, 45, 58, 60, 61, 63, 73, 76 and 78.
Turbot	1, 3, 4-7, 9-12, 14-19, 32, 34, 36-39, 42-46, 48, 54, 55, 59-61, 63, 67, 70, 72, 73 and 76-78.
Pollock	17, 19, 20, 24, 26, 30, 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.



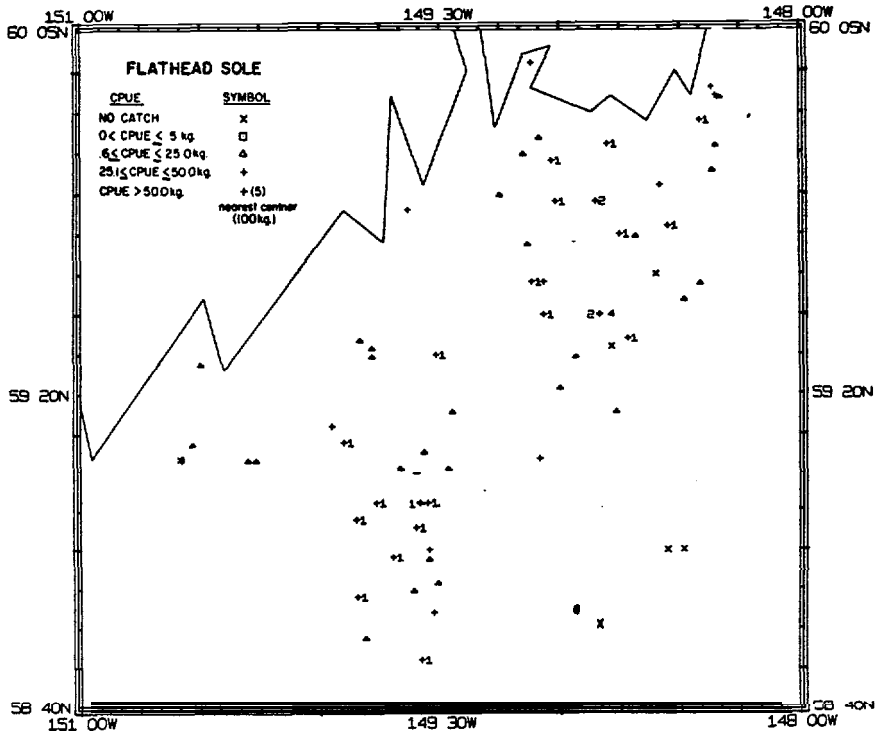


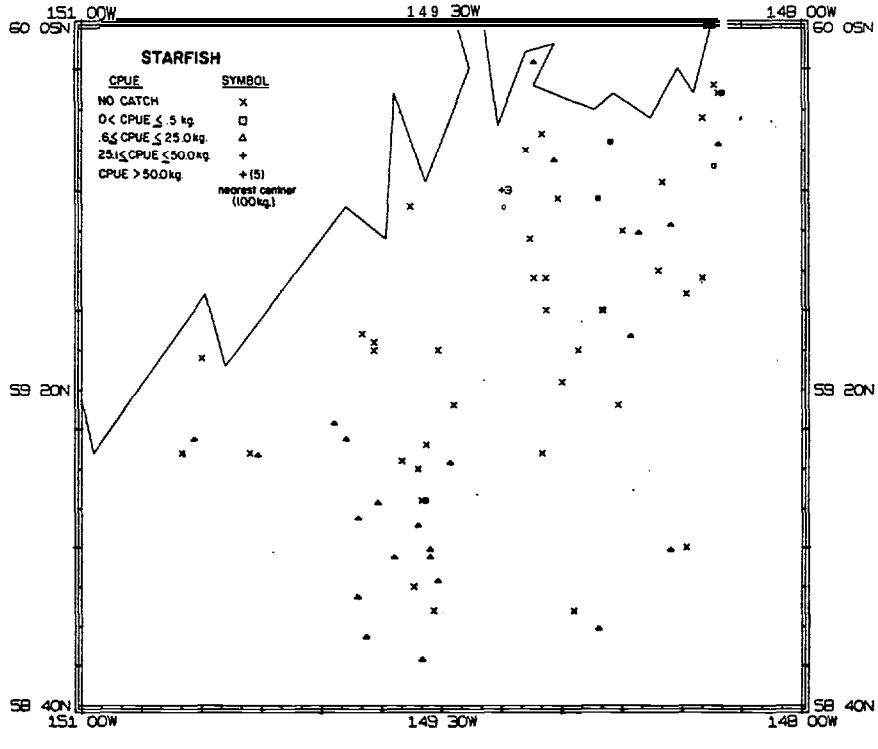
Figures X-77-78.--Distribution of Pacific cod and **turbot** standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



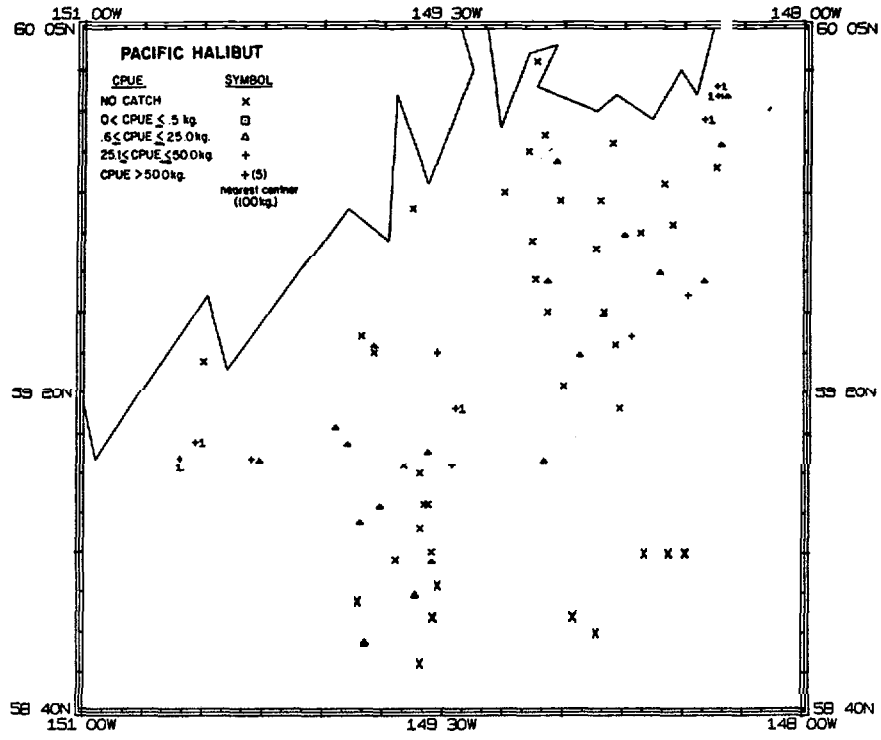


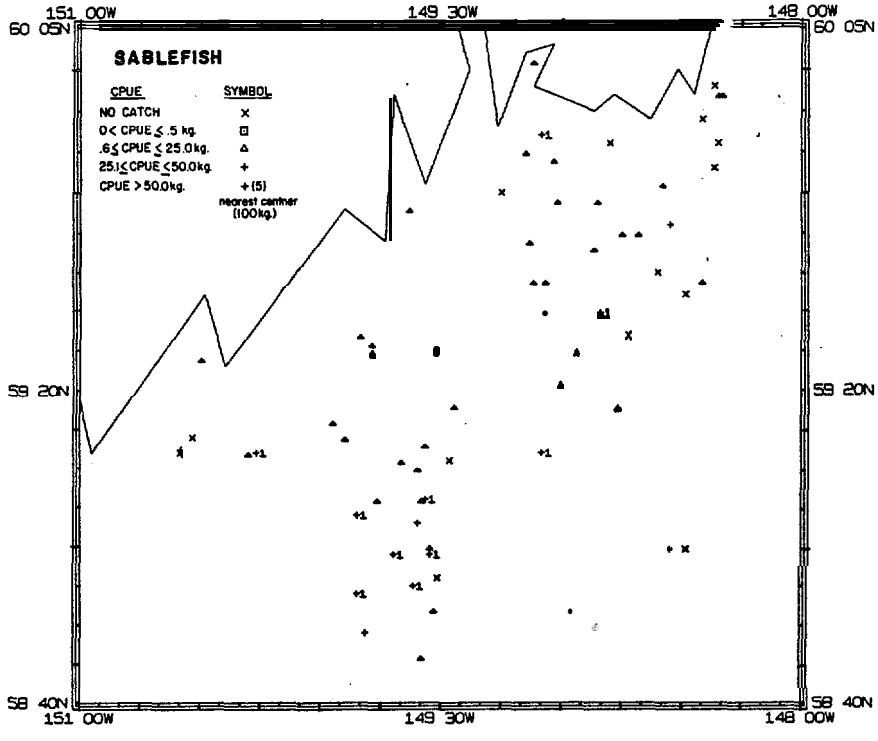
Figures X-79-80.--Distribution of walleye pollock and Pacific ocean perch standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.



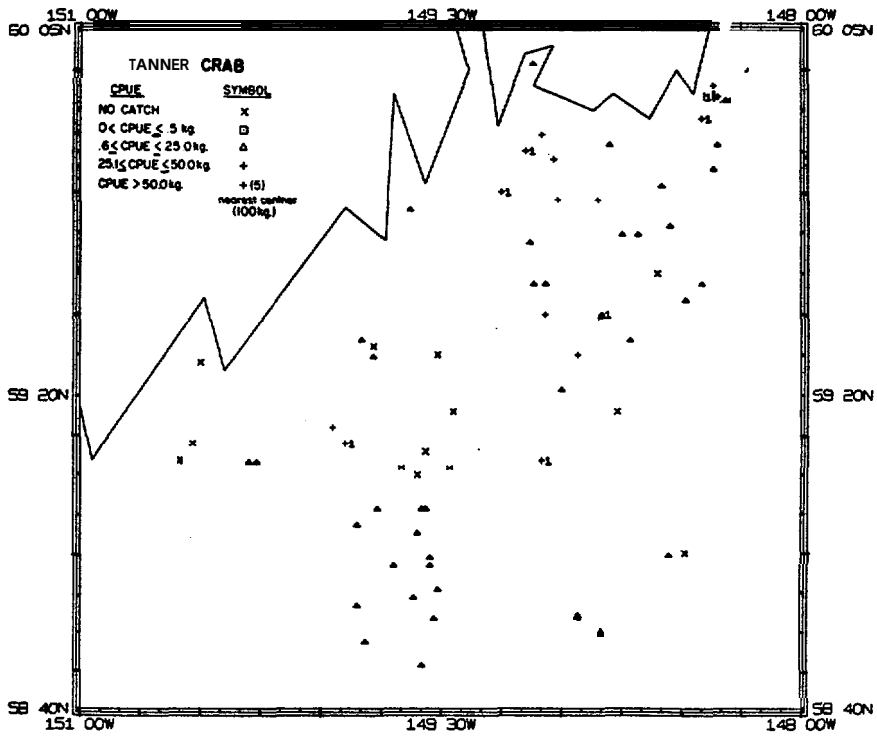


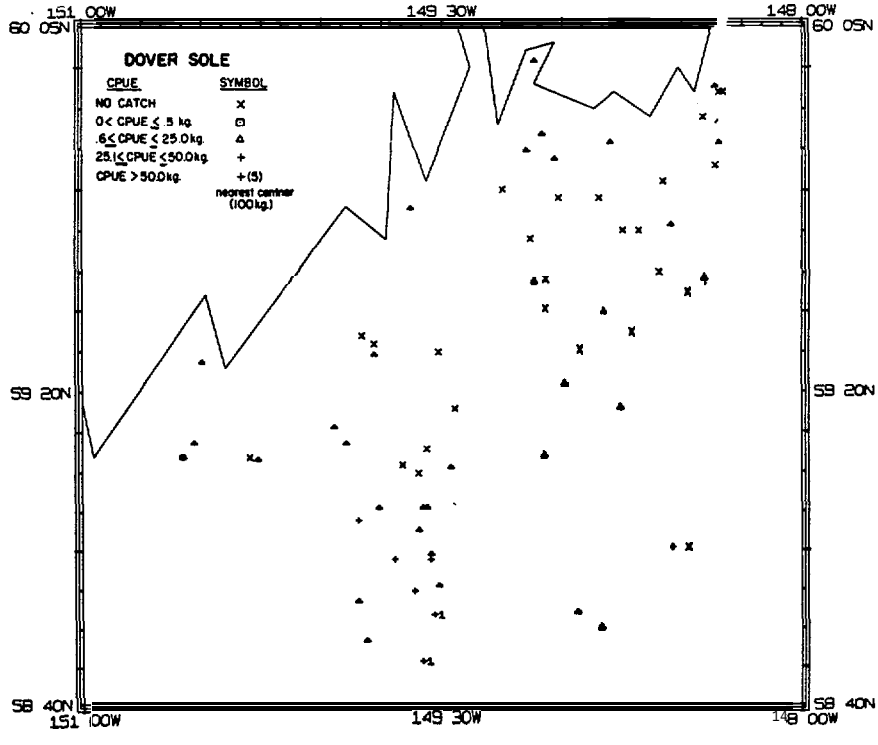
Figures X-81-82.--Distribution of **flathead** sole and starfish standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.





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.

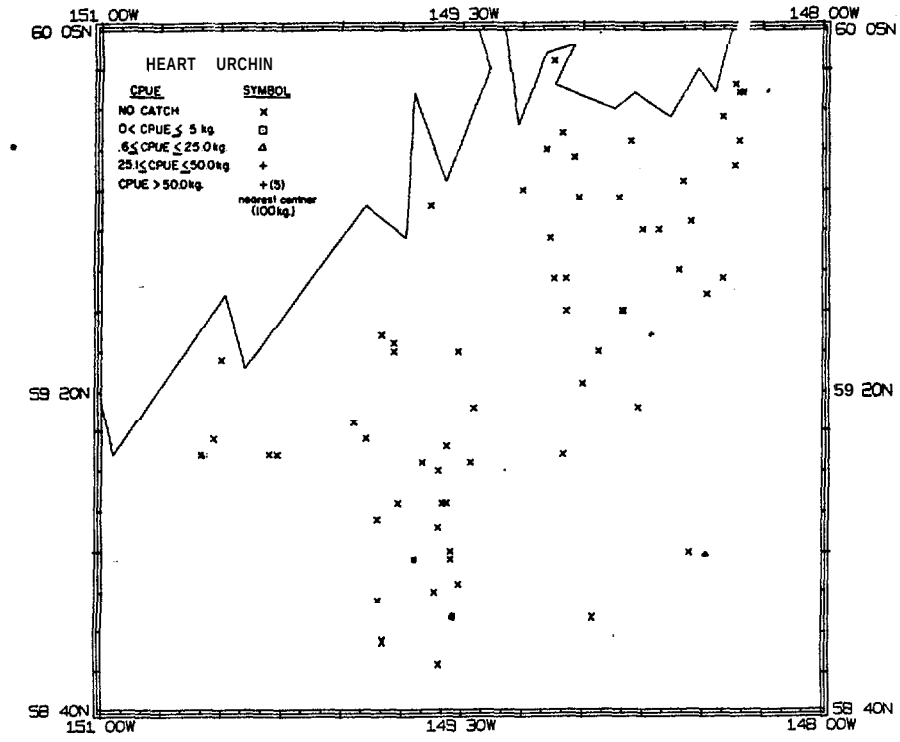


Figure X-87.--Distribution of heart urchin standardized catch rates, in kg/hr, cruise 673, R/V John R. Manning.

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).

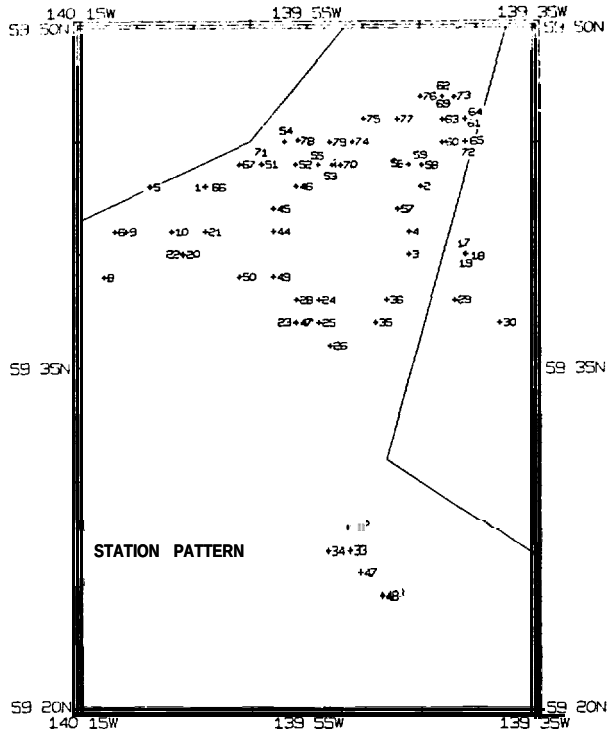


Figure X-88.--Stations successfully trawled (beam trawl) during Cruise 015, R/V John N. Cobb.

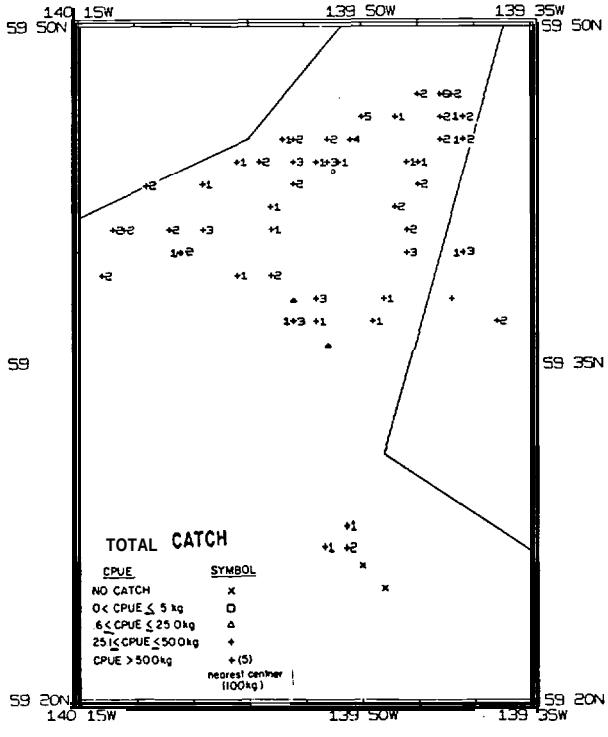
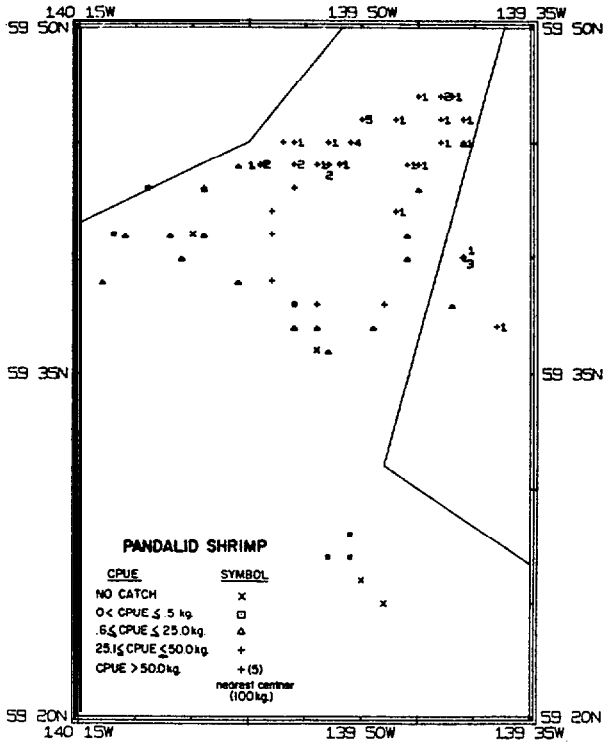
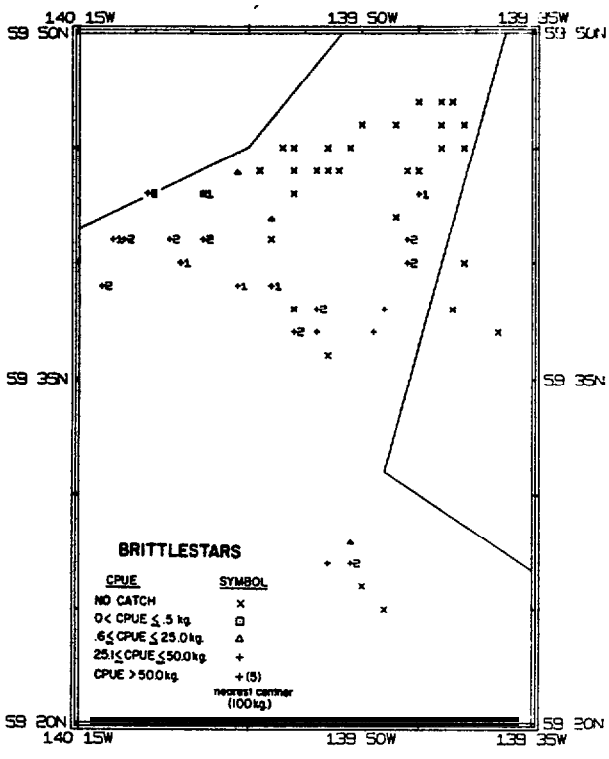


Figure X-89.--Distribution of standardized catch rates, all species combined in kg/hr, cruise 015, R/V John N. Cobb.

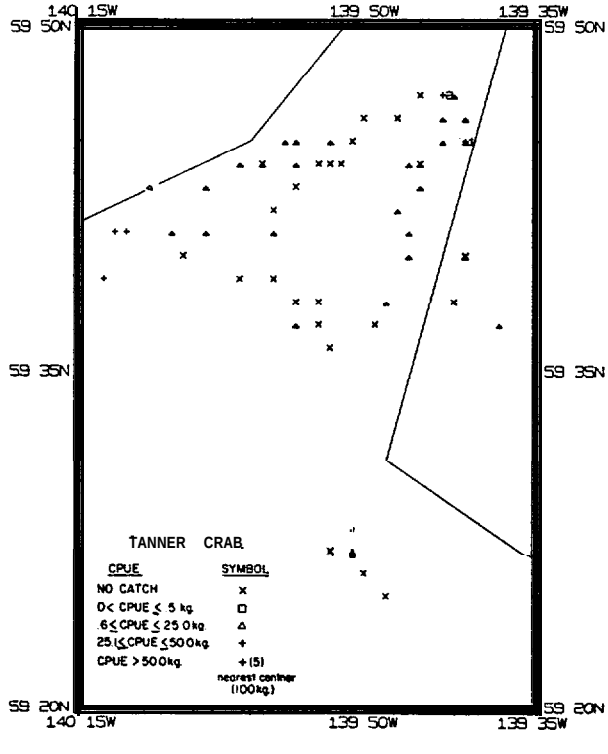
Table X-22.--Mean CPUE's for individual pandalid shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1953-1960.

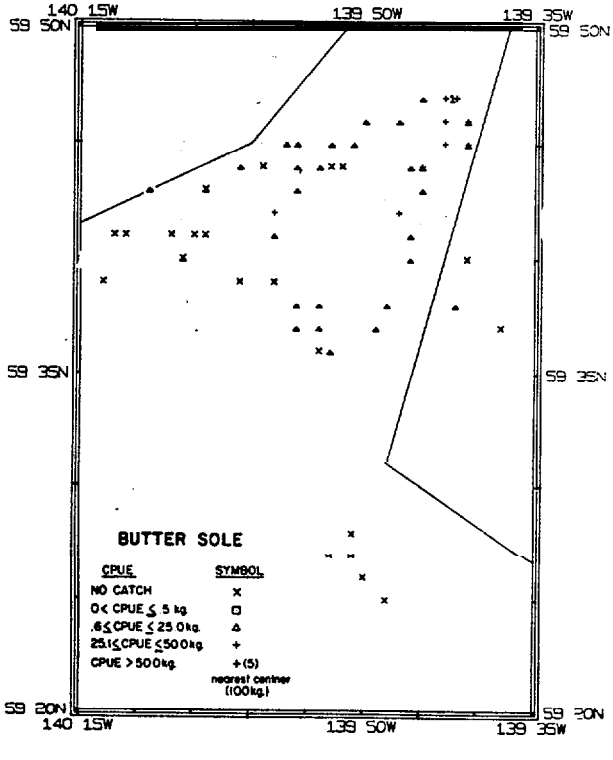
		Depth intervals (m)								
		0-100			100-200			200-400		
Cruise file	Species	CPUE kg/hr	% of shrimp	% Total biomass	CPUE kg/hr	% of shrimp	% Total biomass	CPUE kg/hr	%of shrimp	% T bio
015	Pink	100.2	96.4	53.6	28.3	56.6	17.8	--	--	
	Sidestripe	3.7	3.6	2.0	21.7	43.4	13.6	--	--	
	Coonstripe	-- 1/	-- 2/	-- 2/	-- 1/	-- 2/	-- 2/	--	--	
		103.9	100.0	55.6	5Q.Q	100.Q	31.4			
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	Q	0	0.3	1.5	1.0		--	
	spot	0	Q	0	-- 1/	-- 2/	-- 2/	--	--	
		34.5	100.Q	88.4	20.3	100.0	61.4			
020	Pink	11.0	96.5	1Q.9	40.1	89.3	24.3	14.2	62.6	1
	Sidestripe	-- 1/	-- 2/	-- 2/	4.6	10.2	2.8	8.3	36.6	
	Coonstripe	0.4	3.5	Q.3	Q.2	Q.4	0.1	0.2	0.9	
	Dock	-- 1/	-- 2/	-- 2/	0	Q	0	Q	0	
	spot	0	Q	Q	-- 1/	-- 2/	-- 2/	-- 1/	-- 2/	
		11.4	lQQ.Q	11.2	44.9	99.9	27.2	22.7	100.1	-2
039	Pink	286.7	80.9	54.8	209.3	64.1	39.1	75.6	53.2	2
	Sidestripe	21.2	5.9	4.0	106.2	32.6	19.8	63.7	44.9	1
	Cocnstripe	45.8	12.9	8.8	10.6	3.3	2.0	2.3	1.6	
	Humpy	0.6	0.2	1.0	0.1	-- 2/	-- 2/	0	0	
	spot	0	0	0	0.1	-- 2/	-- 2/	0.4	0.3	
		354.3	99.9	68.6	326.3	100.0	60.9	142.0	100.0	3
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	--		
		775.5	100.0	77.3	1463.9	100.0	85.7			
044	Pink	33.5'	78.3	26.8	40.4	73.2	25.9	33.5	64.2	3
	Sidestripe	5.7	13.3	4.6	14.2	25.7	9.1	18.7	35.8	
	Coonstripe	3.6	8.4	2.9	0.5	0.9	0.3	0	0	
	Humpy	0	0	Q	0.1	0.2	0.1	0	0	
	spot	0	0	0	-- 1/	-- 2/	-- 2/	0	0	
		42.8	100.0	34.3	55.2	100.0	35.4	52.2	100.0	2





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.

Cruise	Species	1 - 100 CPUE kg/hr	1 - 100 % of total catch	101 - 200 CPUE kg/hr	101 - 200 % of total catch	201 - 400 CPUE kg/hr	201 - 400 % 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	--	--
		61.6	32.9	75.4	47.4	--	--
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
		54.0	51.9	69.5	35.8	45.5	49.5
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	--	--
		184.0	18.4	110.0	11.8	--	--
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
		115.1	21.9	176.7	33.0	191.8	52.7
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
		46.5	37.2	56.9	36.4	101.2	53.1

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 shrimps	18, 19, 51-53, 55-64 and 69-79.
Brittlestars	l-6, 8-10, 20-24, 33, 47, 49 and 50.
Tanner crab	62 and 72.
Butter sole	69.

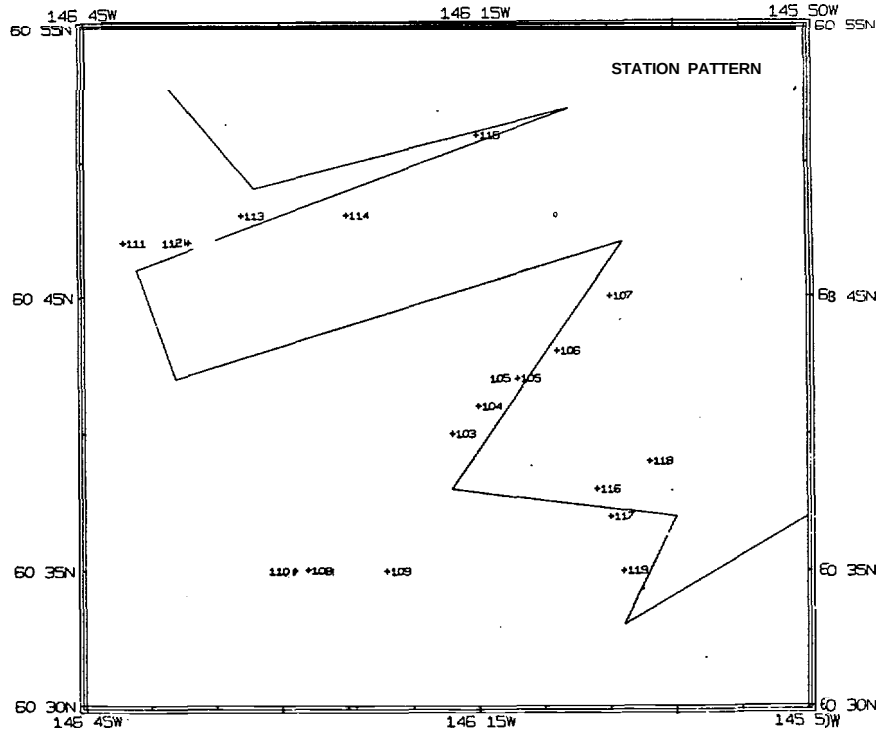


Figure X-94.--Stations successfully trawled (beam trawl) during Cruise 018, R/V John N. Cobb.

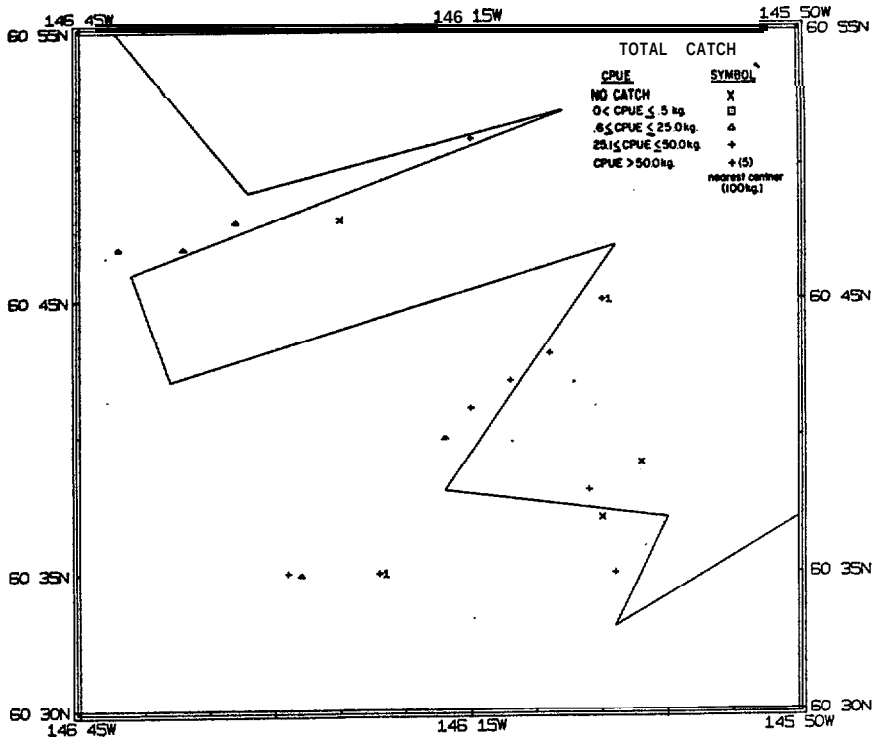


Figure X-95.--Distribution of standardized catch rates, all species combined in **kg/hr,** cruise 018, R/V John N. Cobb.

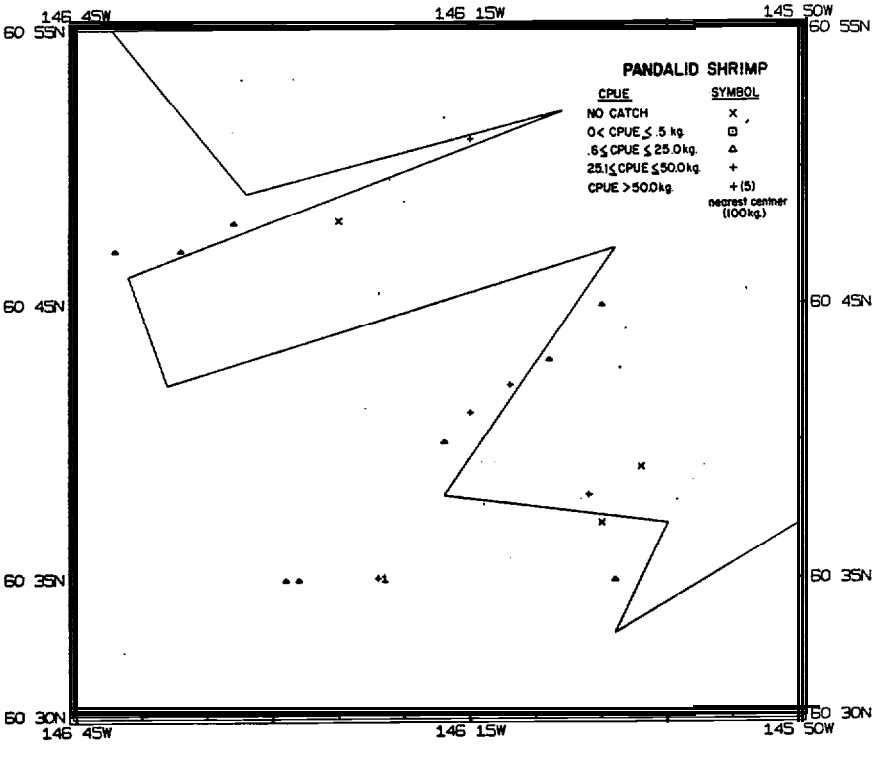


Figure X-96.-- Distribution of **pandalid** shrimp standardized catch rates, in kg/hr, during cruise 018, R/V John N. Cobb.

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-221, Sidestripe and coonstripe shrimp both average over 10 kg/hr in the outer shelf depth zones. 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 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 shrimps 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).

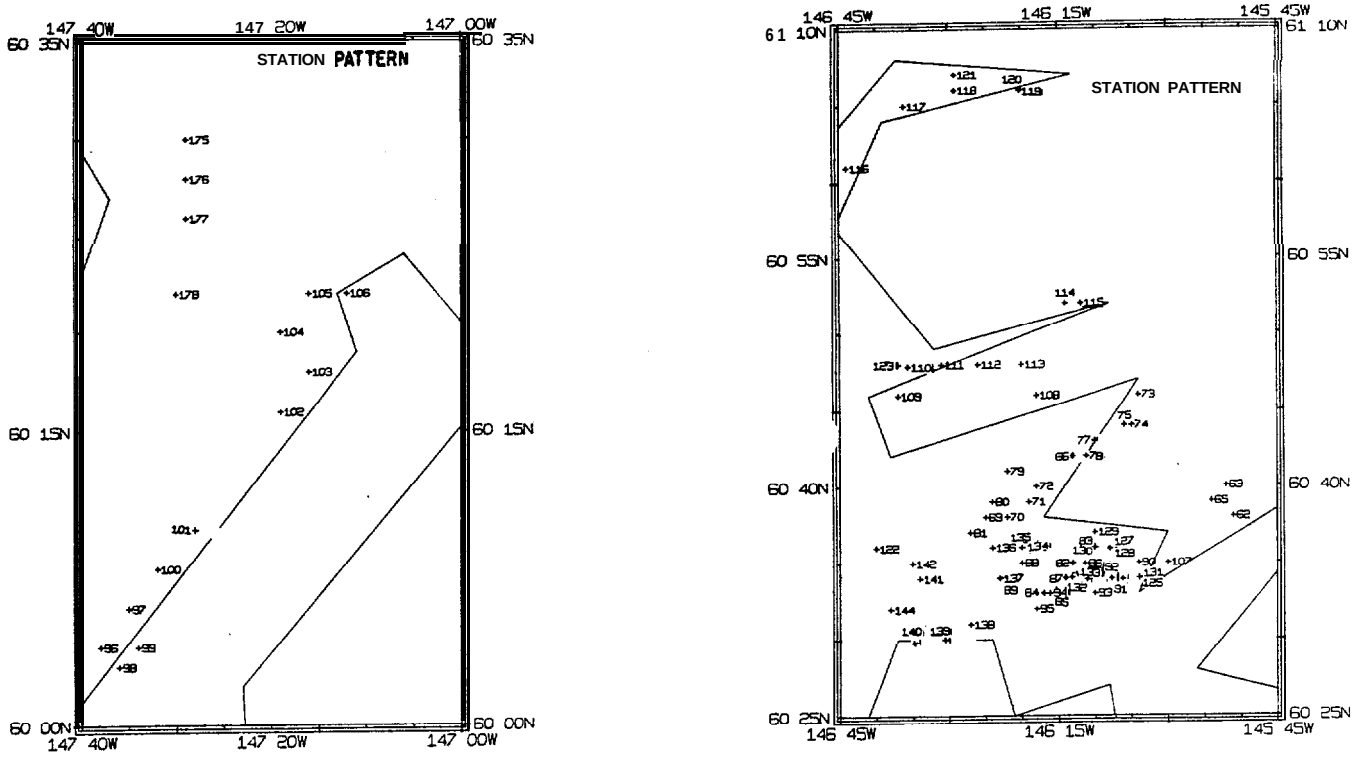


Figure X-97.--Stations successfully trawled (beam trawl) during cruise 020, R/V John N. Cobb.

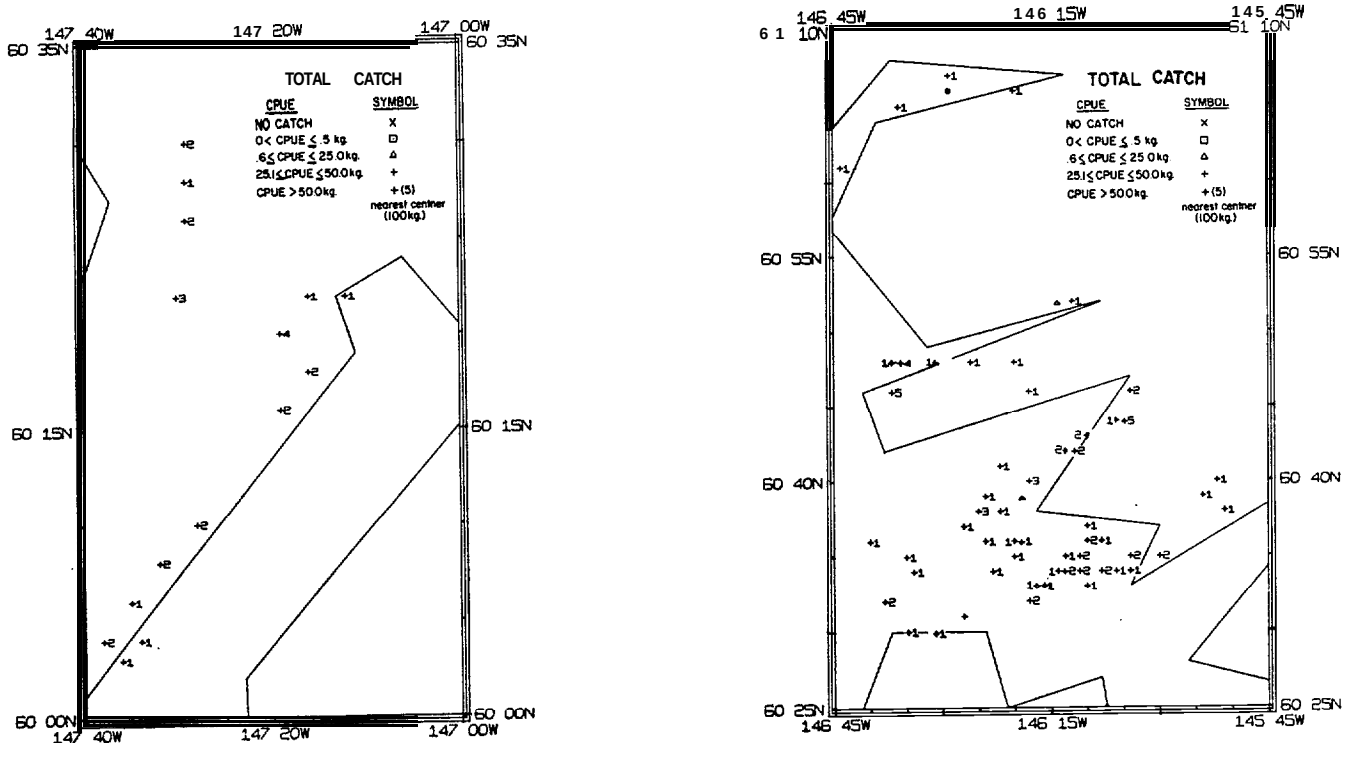
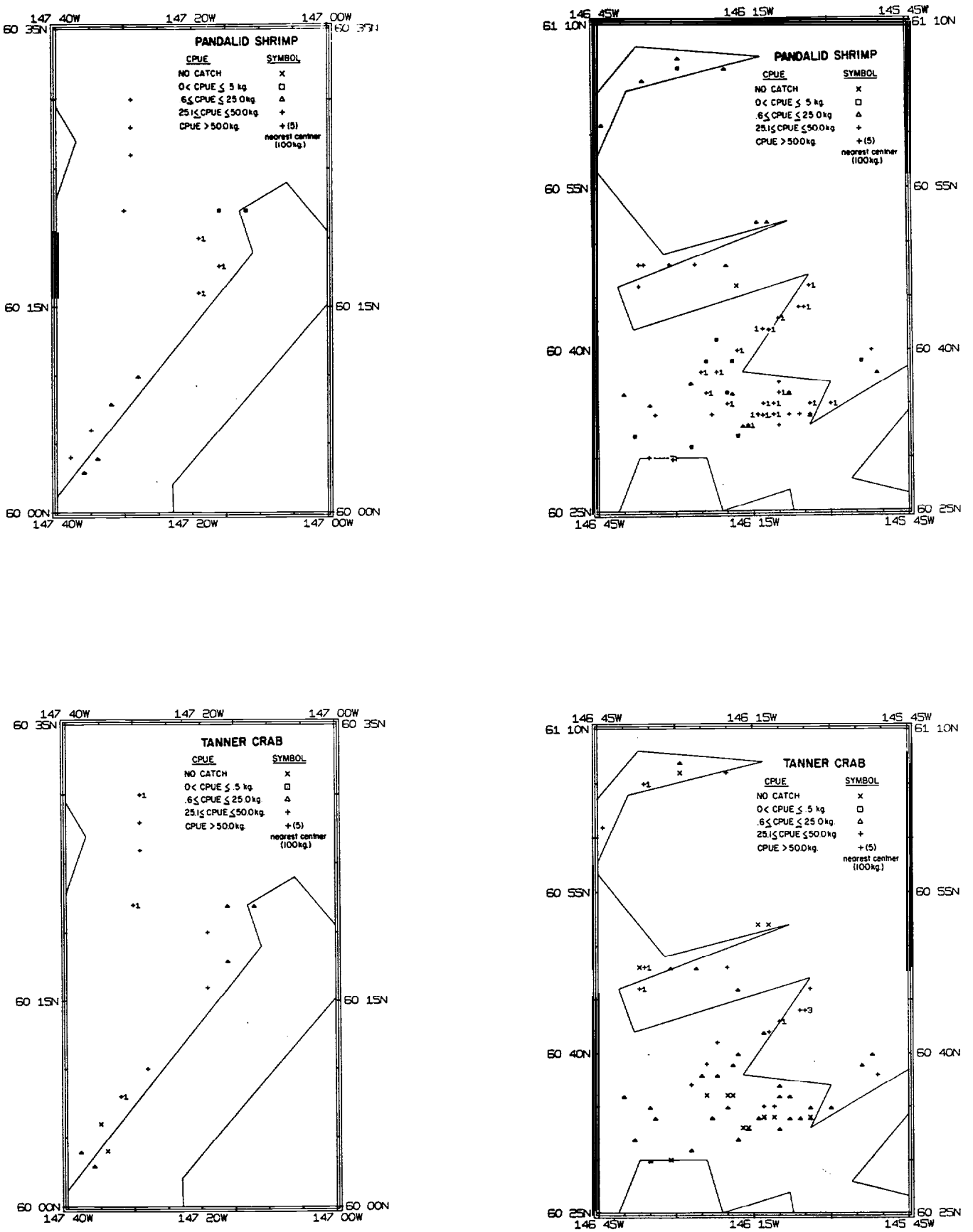


Figure X-98.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 020, R/V John N. Cobb.



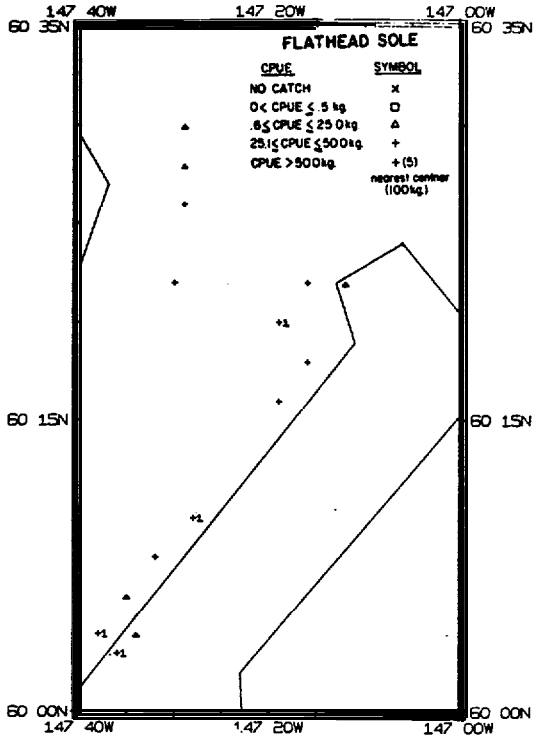
Figures X-99-100.--Distribution of **pandalid** shrimp and Tanner crab standardized catch rates, in **kg/hr,** during cruise 020, R/V John N. Cobb.

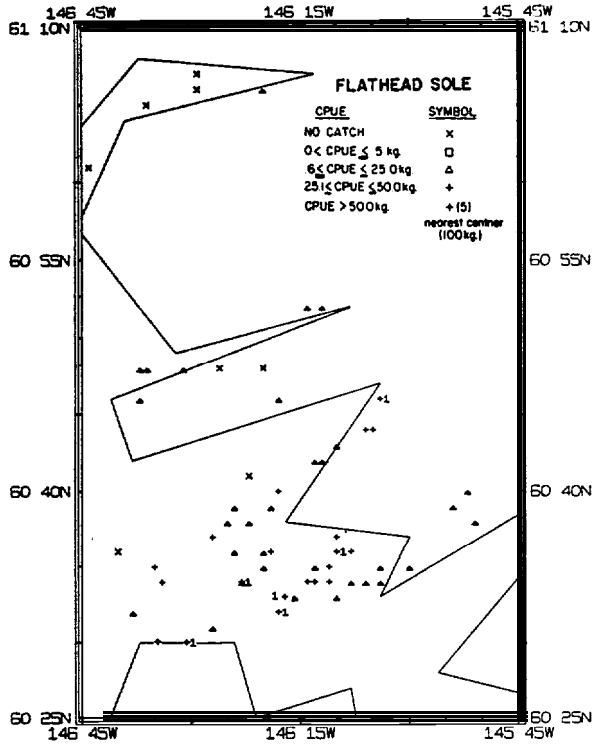
Table X-25.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded. 950 kg/hr, cruise 020, R/V John N. Cobb.

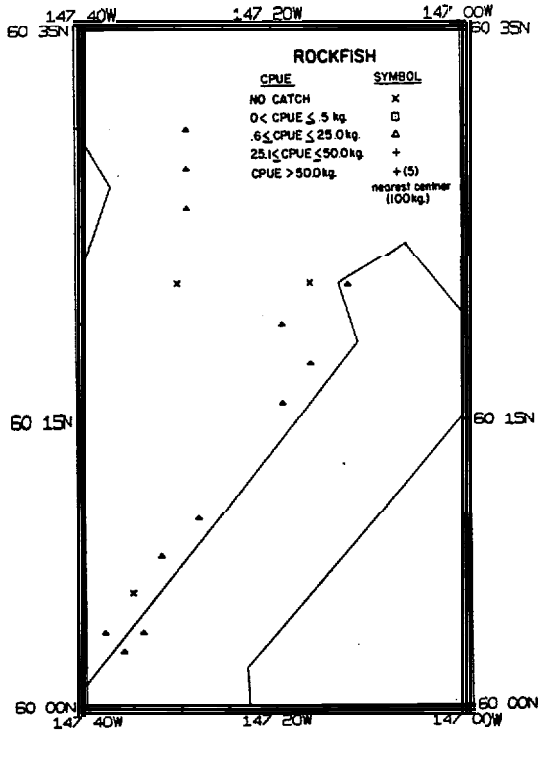
Species or Species group	Station numbers
Total. catch	None
Pandalid shrimp	66, 69, 70, 72-24, 77, 78, 82, 83, 85-88, 90, 102-104, 107, 130, 132, 133 and 136.
Tanner crab	74, 77, 100, 109, 110, 117, 175 and 180.
Flathead sole	73, 83, 84, 89, 95, 96, 98, 101, 104, 130 and 139.
Rockfish	None
Walleye pollock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

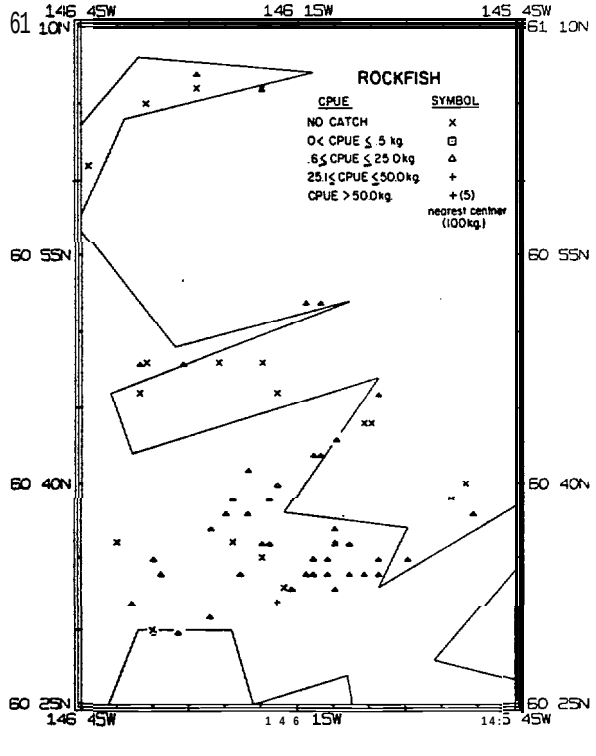
Table X-26.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 003, charter vessel. Tordenskjold.

Species or Species groups	Station numbers
Total catch	l-6, 8, 9, 11-14, 18, 19 and 21-29.
Pandalid shrimp	l-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

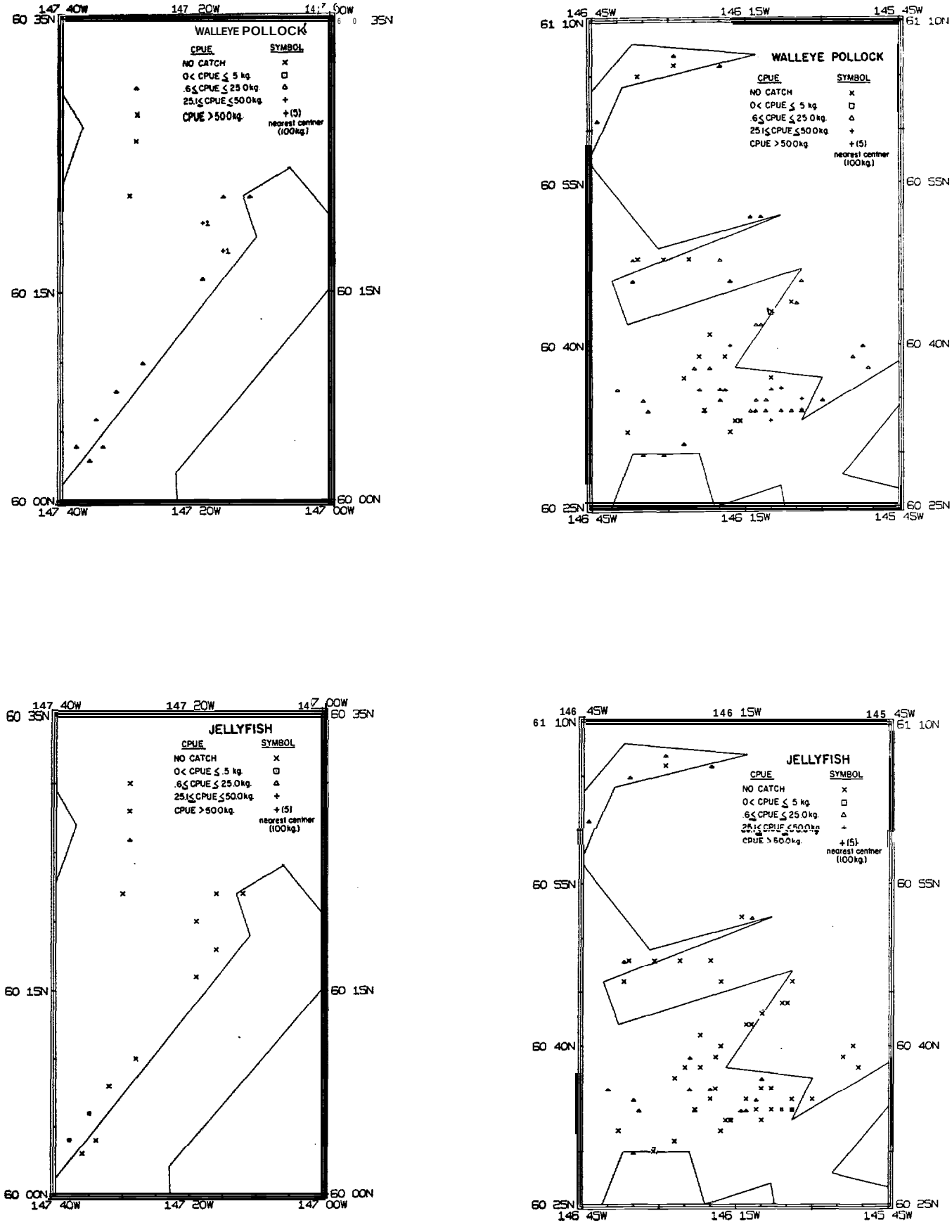








Figures X-101-102.--Distribution of **flathead** sole and **rockfish** standardized catch rates, in kg/hr, during cruise 020, R/V John N. Cobb.



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

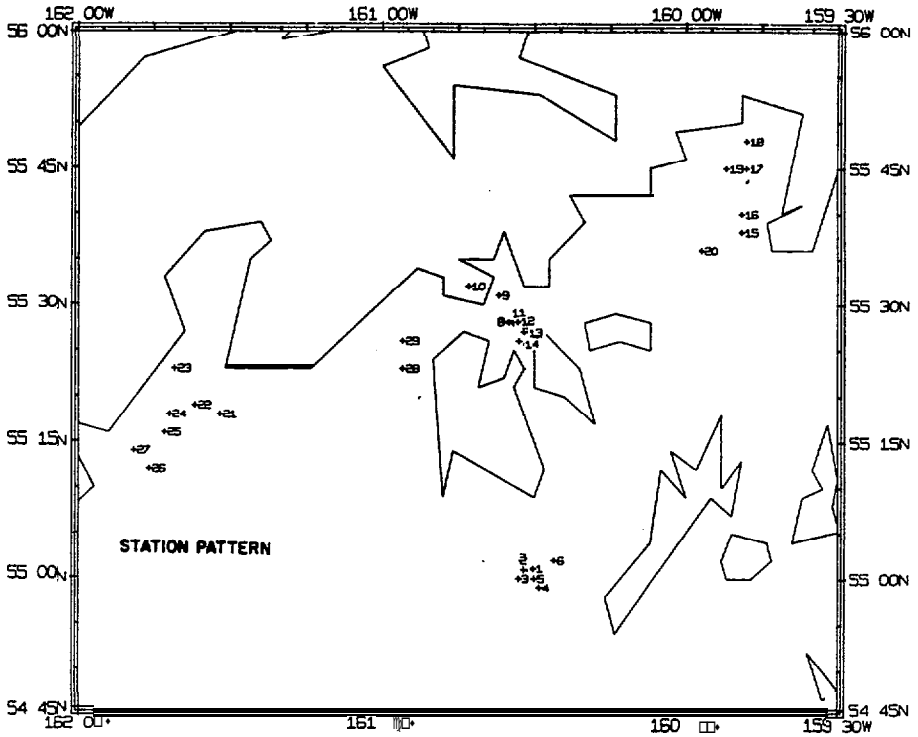


Figure X-105.--Stations successfully trawled (shrimp trawl) during cruise 003, charter vessel Tordenskjold.

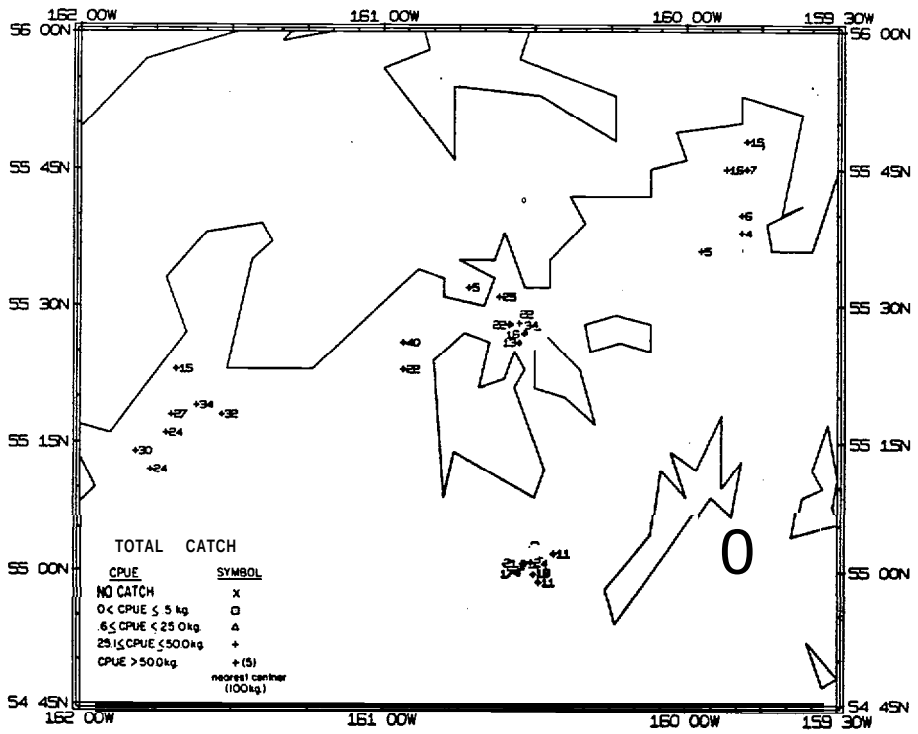
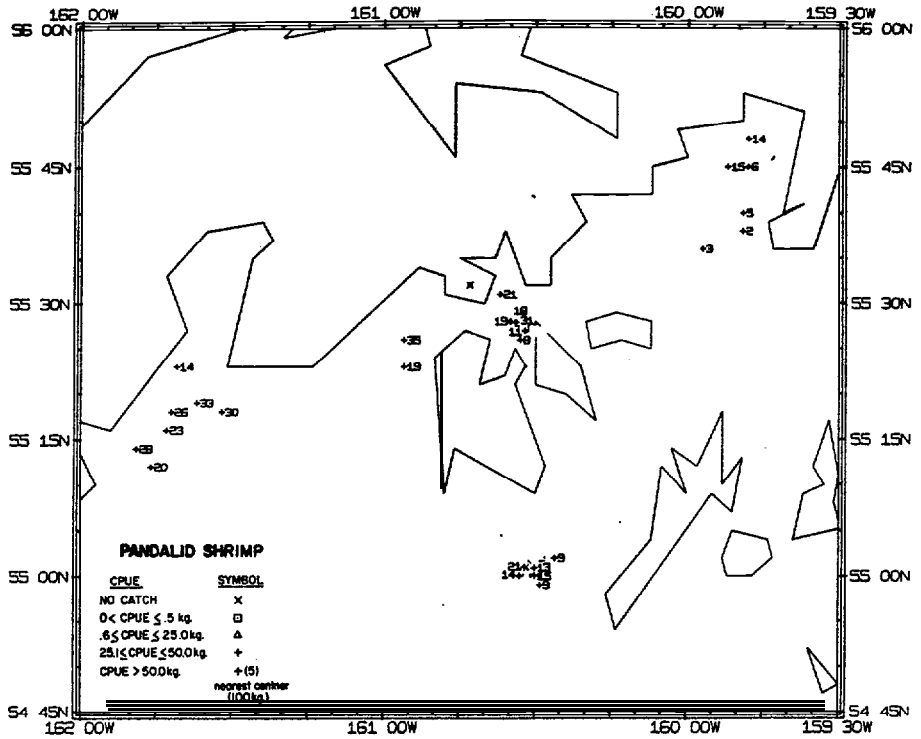
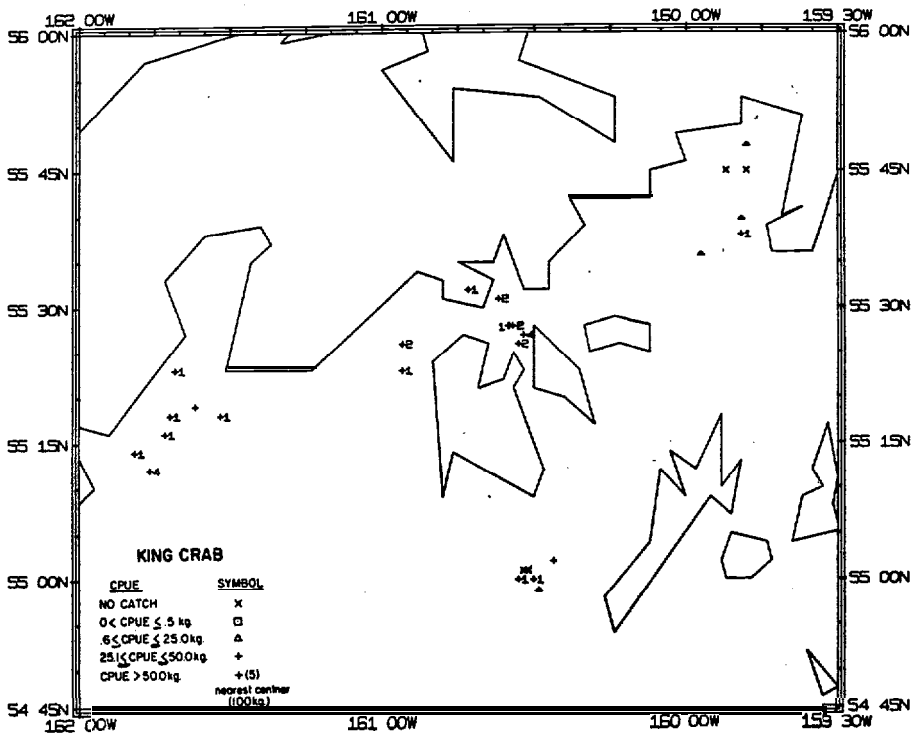
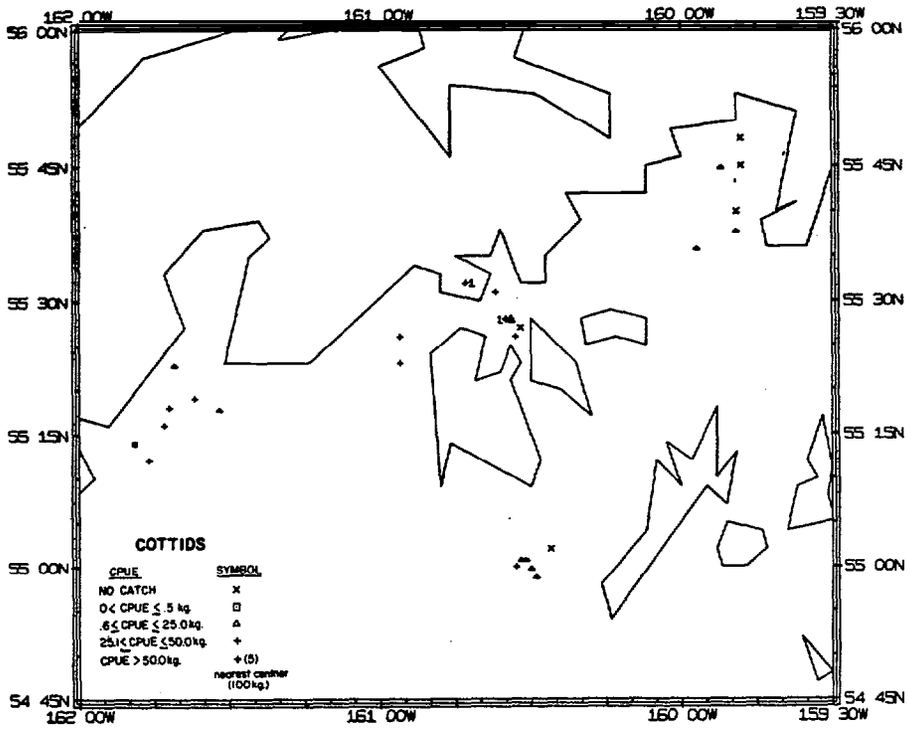


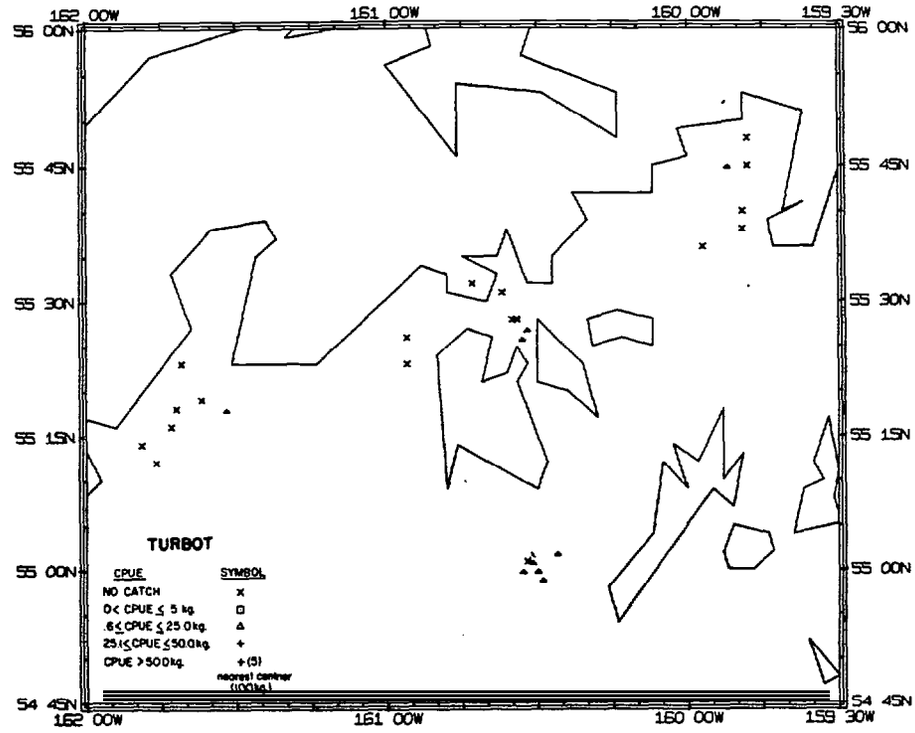
Figure X-106.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 003, charter vessel Tordenskjold.



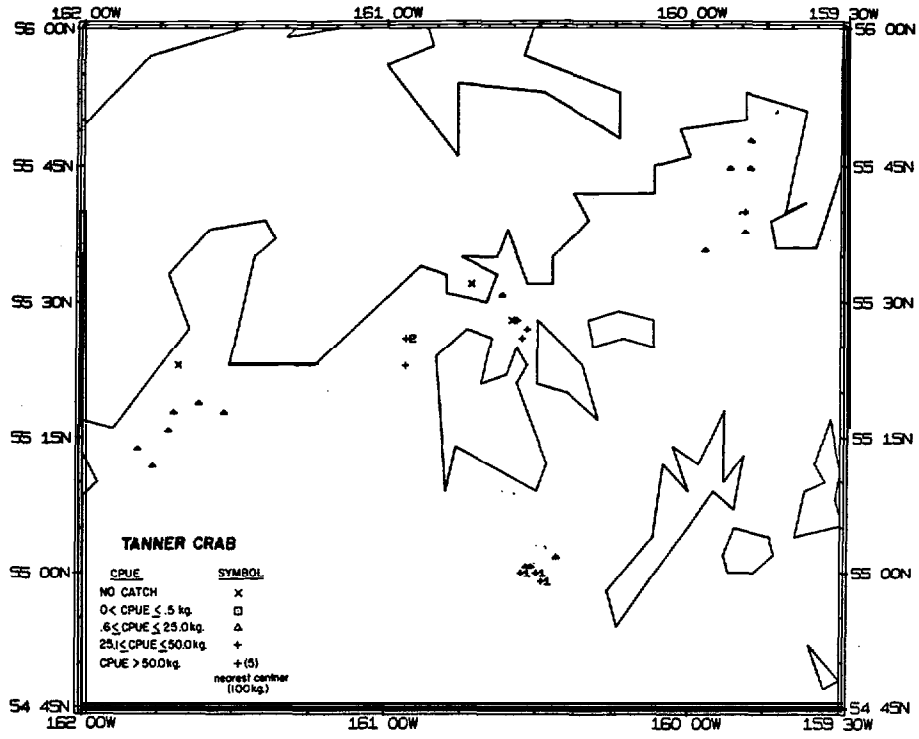


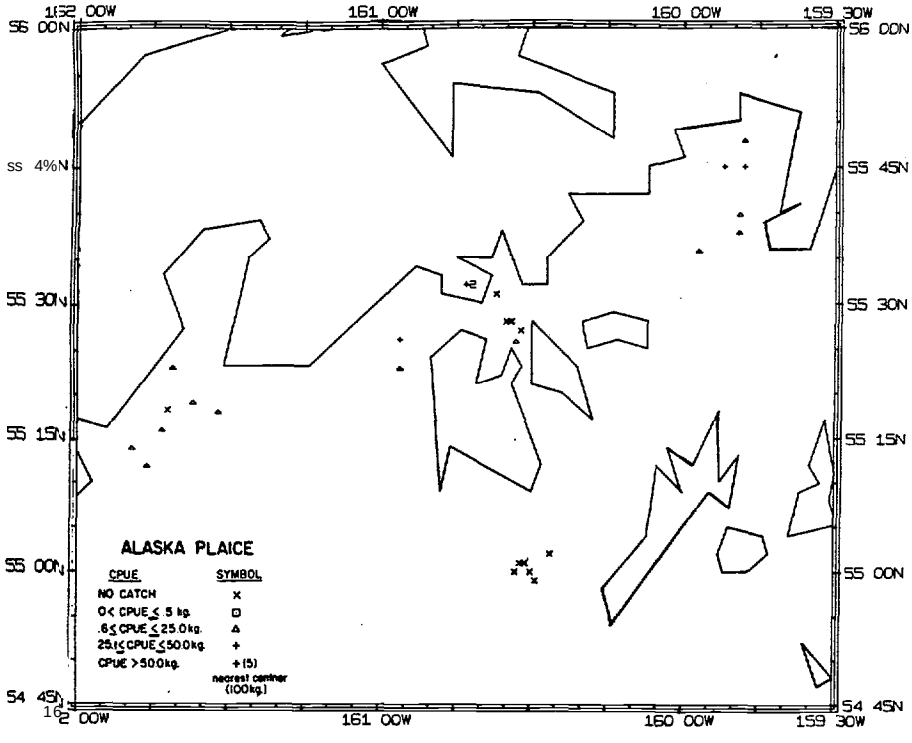
Figures X-107-108.--Distribution of **pandalid** shrimp and king crab standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



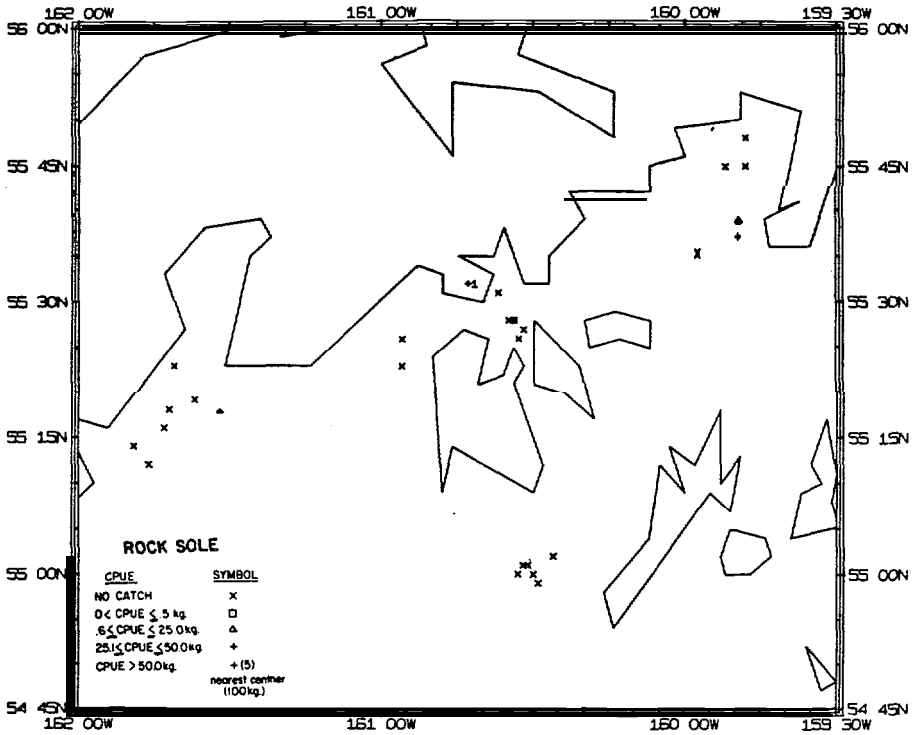


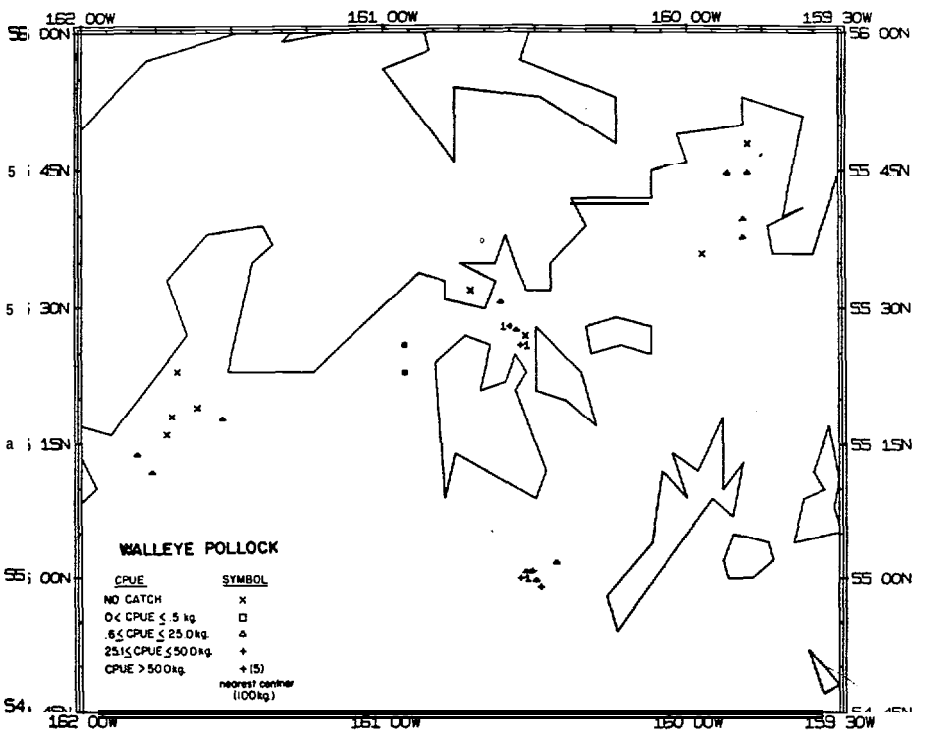
Figures X-109-110.--Distribution of cottids and turbot standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



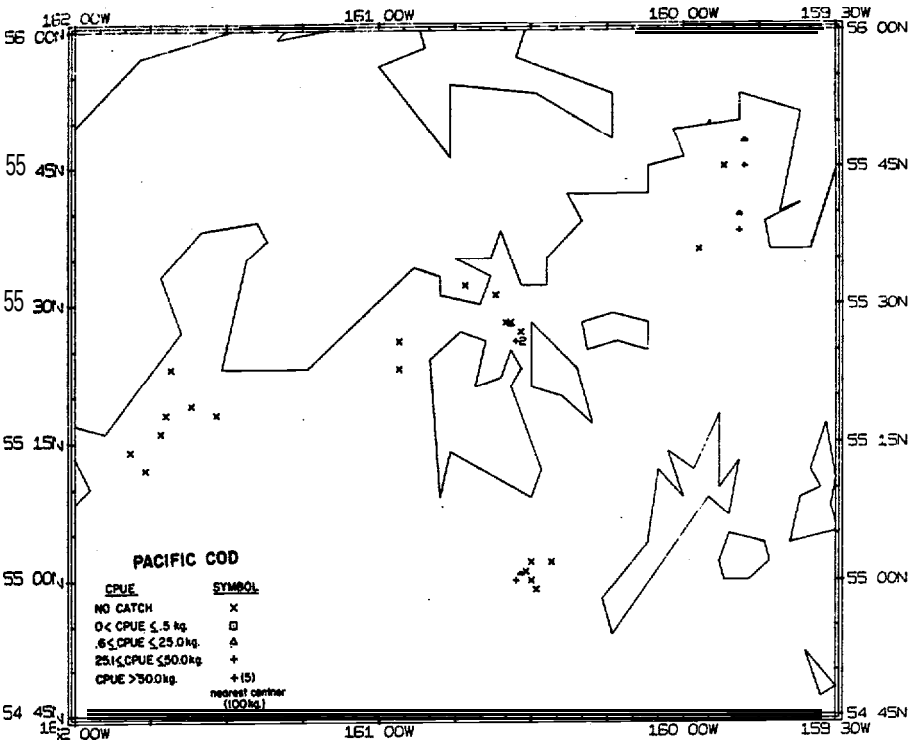


Figures X-111~112.--Distribution of Tanner crab and Alaska plaice standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.

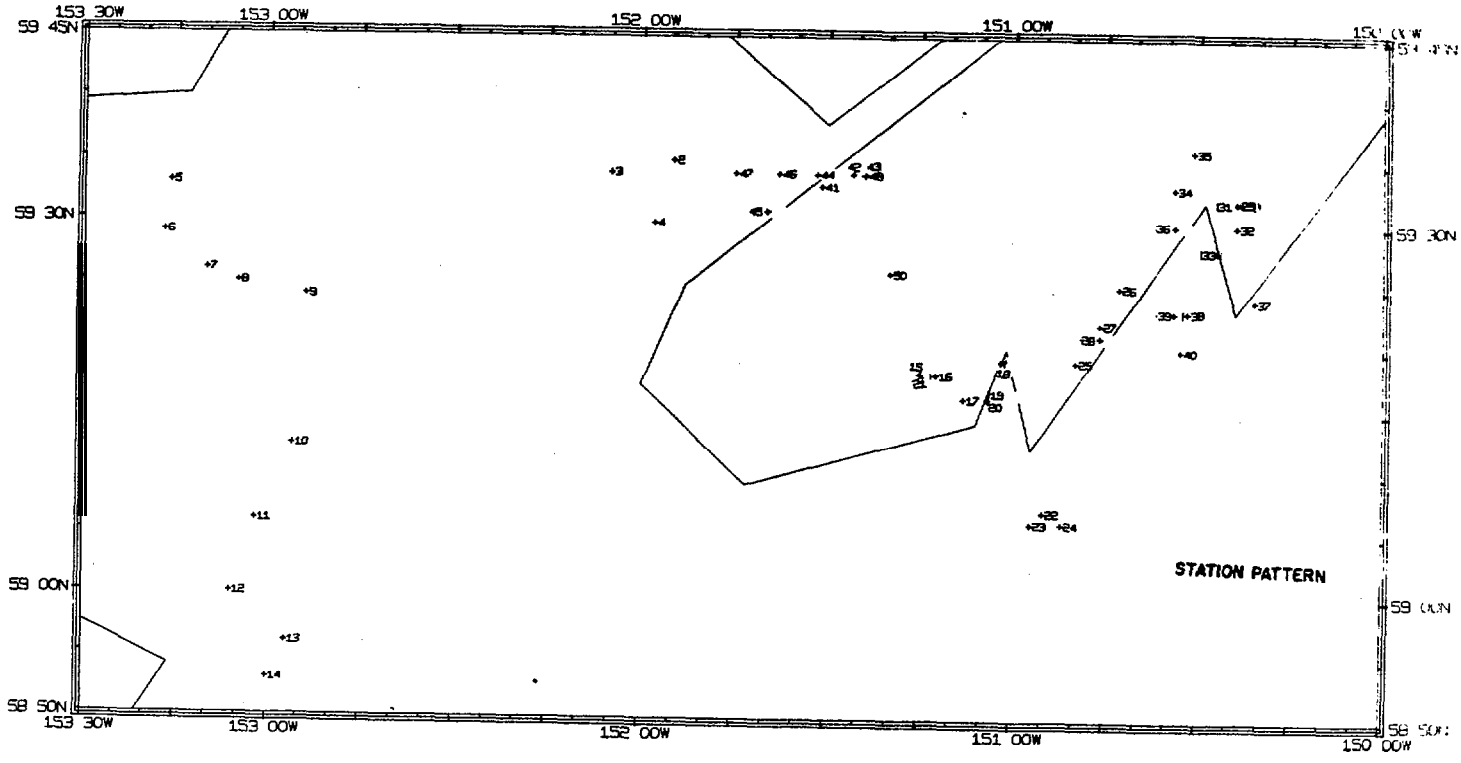




Figures X-113-114.--Distribution of rock sole and walleye pollock standardized catch rates in kg/hr, during cruise 003, charter vessel Tordenskjold.



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



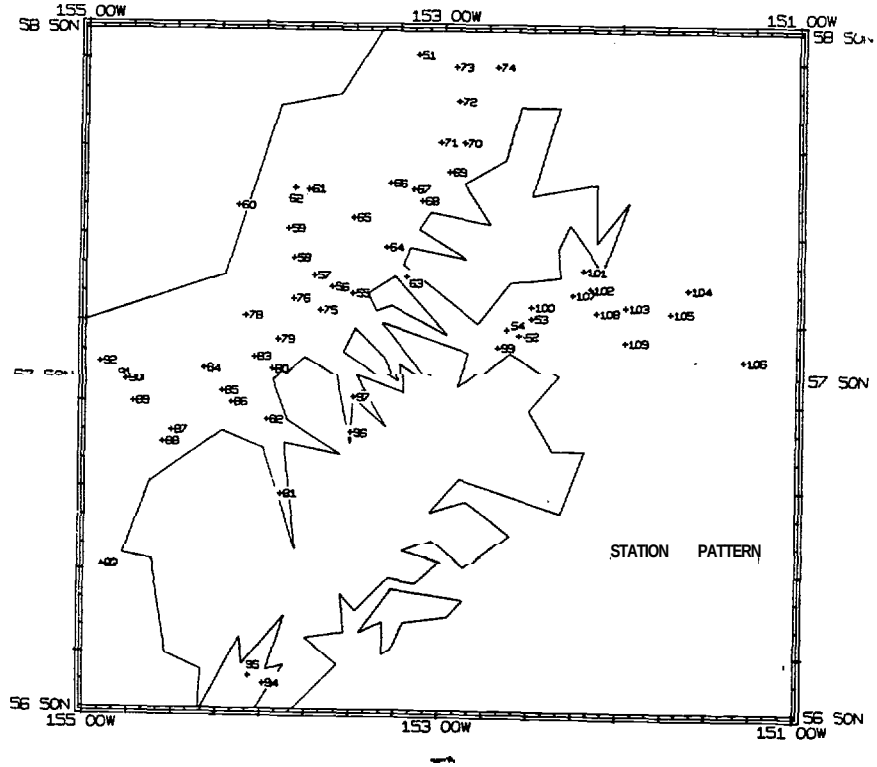


Figure X-116.--Stations, successfully trawled (shrimp trawl) during cruise 039, R/V John N. Cobb.

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 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 crabs in Kachemak Bay (Table X-2% 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.

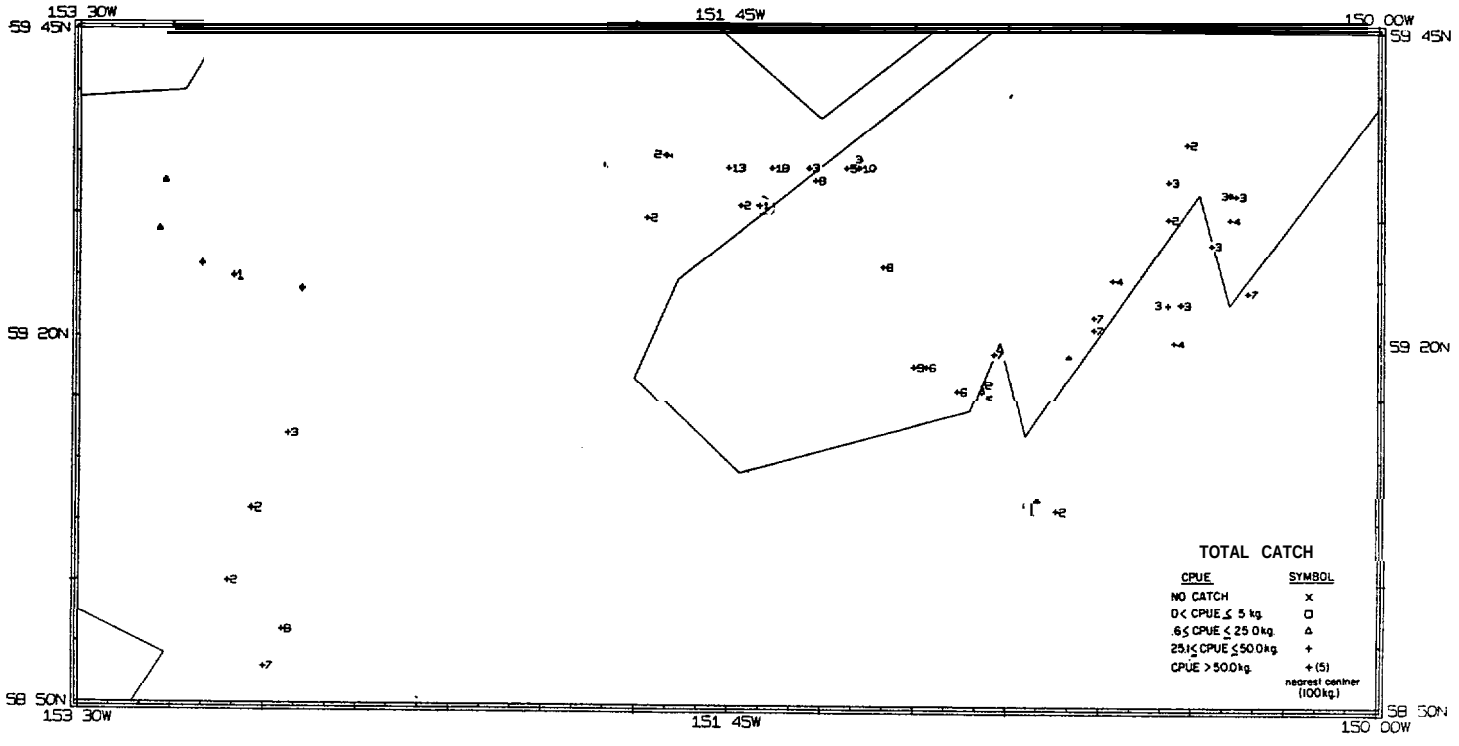
f. Cruise 044, R/V John N. Cobb (October-November 1959)

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 Pacfic 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 occuring 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.



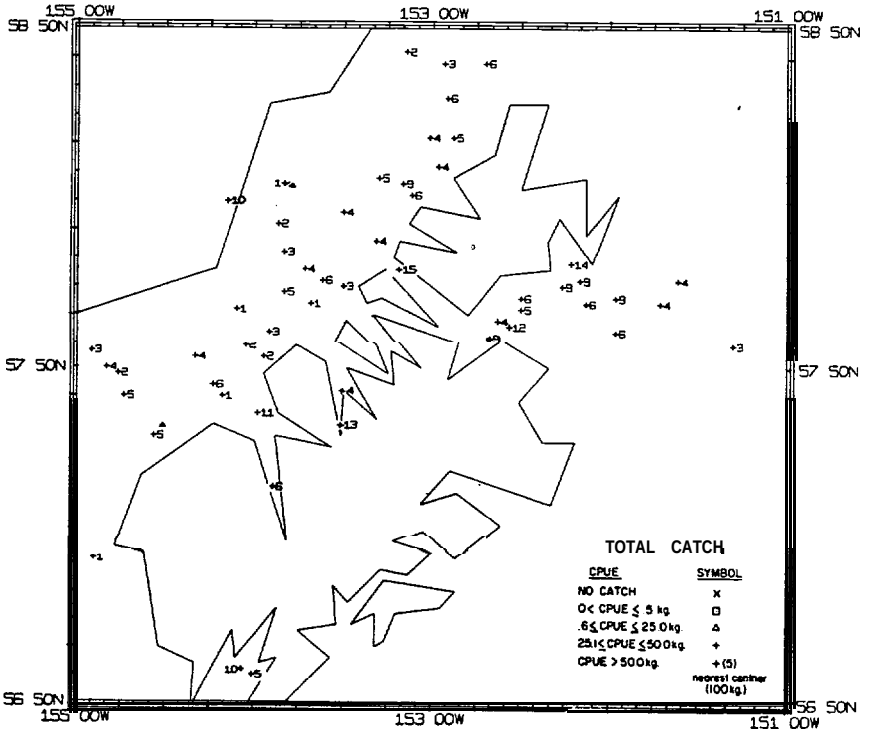
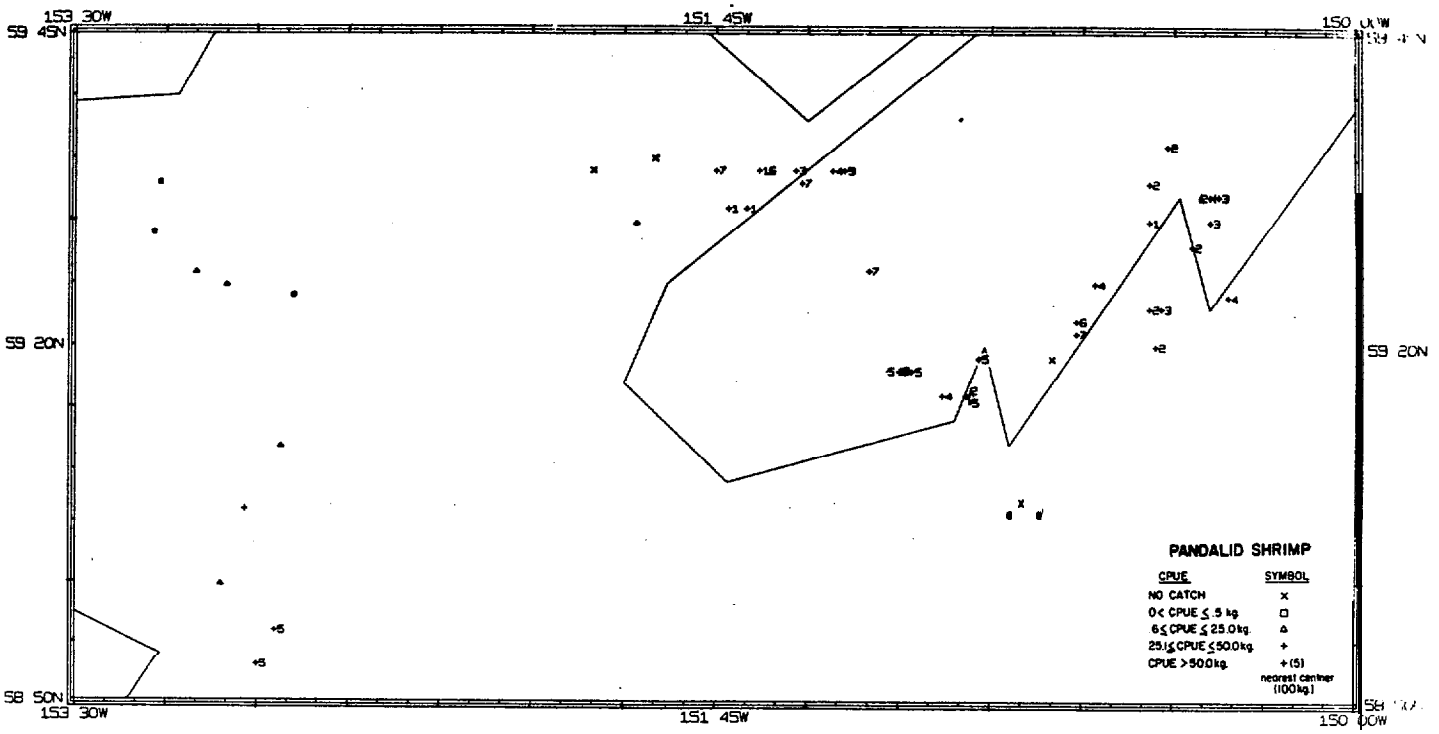


Figure X-117.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 039, R/V John N. Cobb.

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.



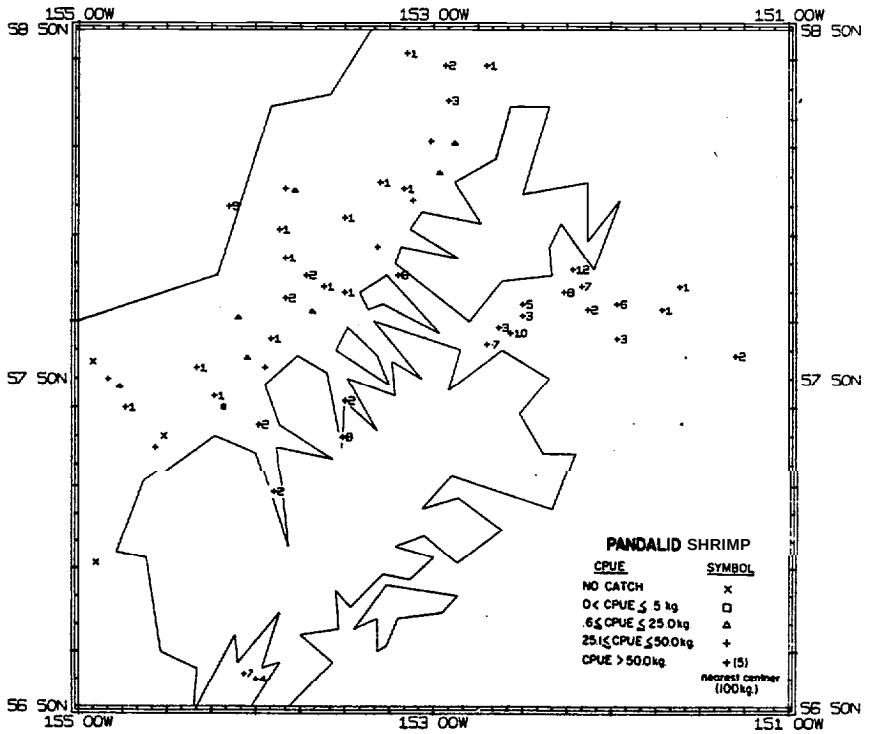
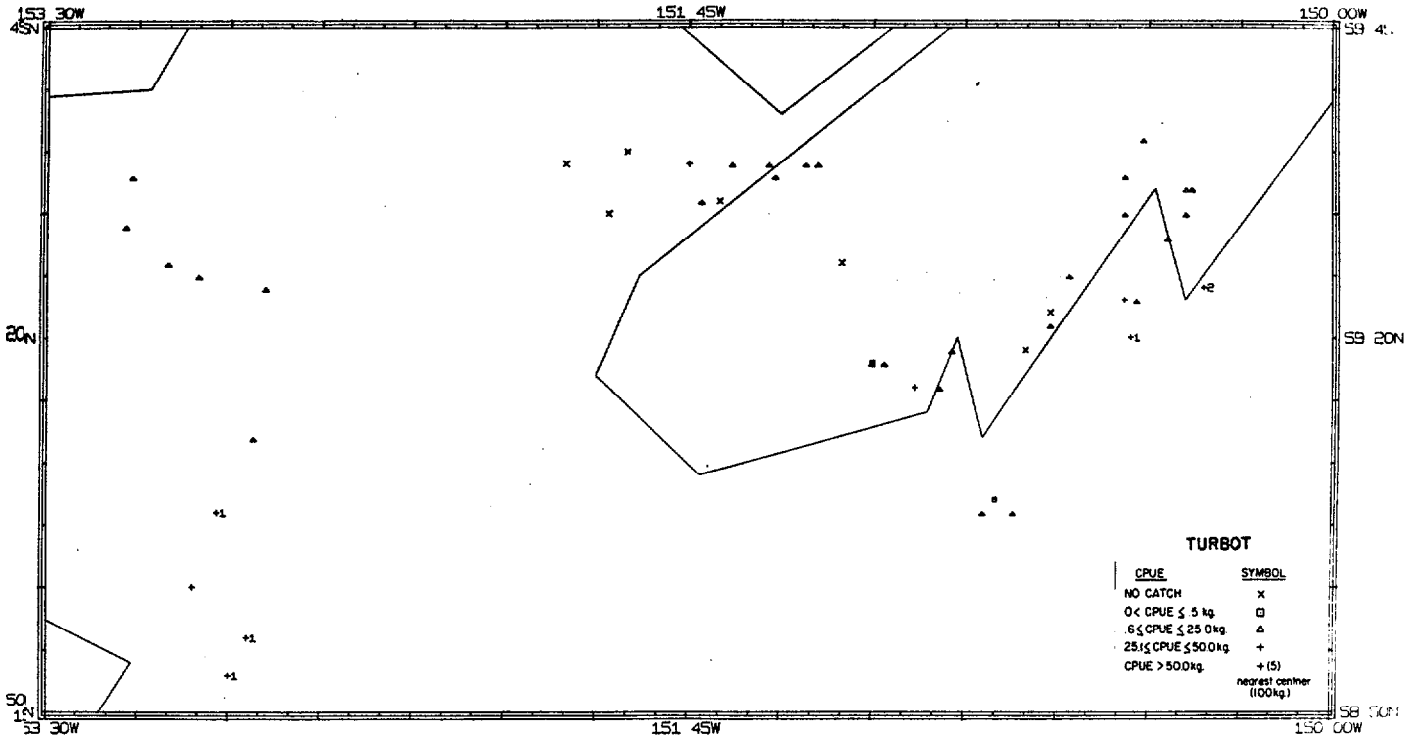


Figure X-118.--Distribution of **pandalid** shrimp standardized catch rates in **kg/hr, during cruise 039, R/V** John N. Cobb.



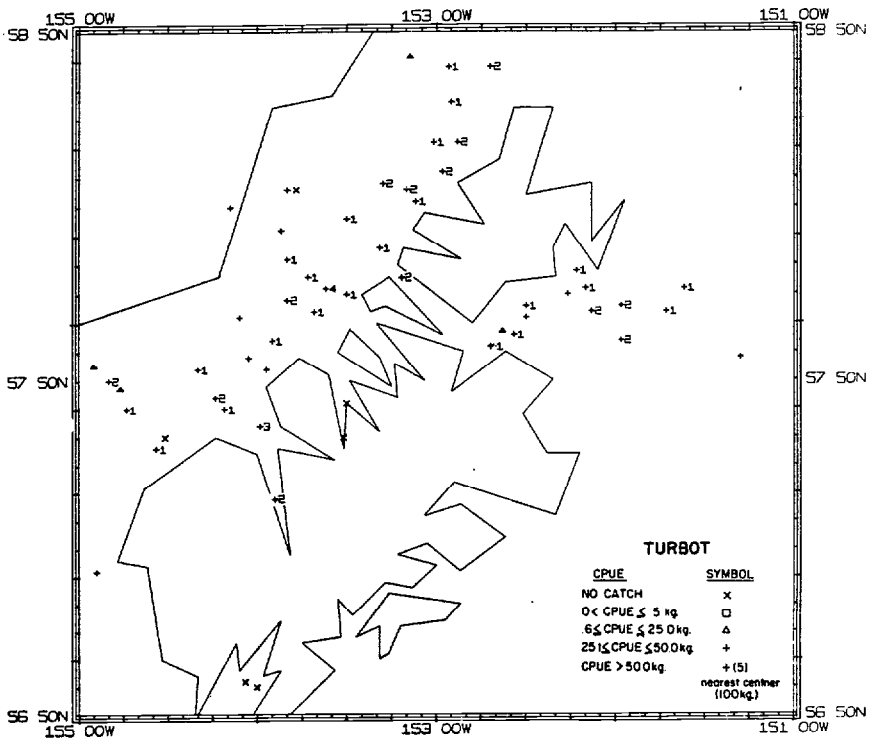
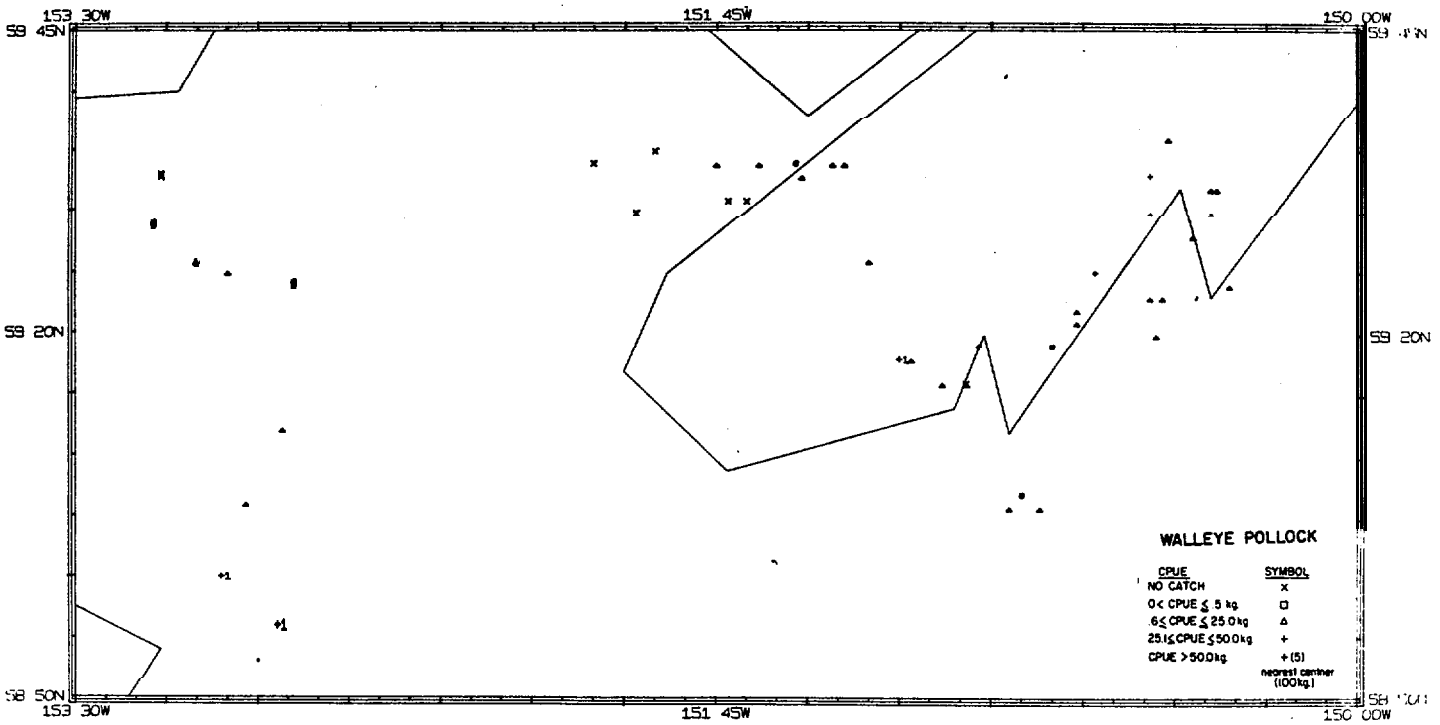


Figure X-119.--Distribution of turbot standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



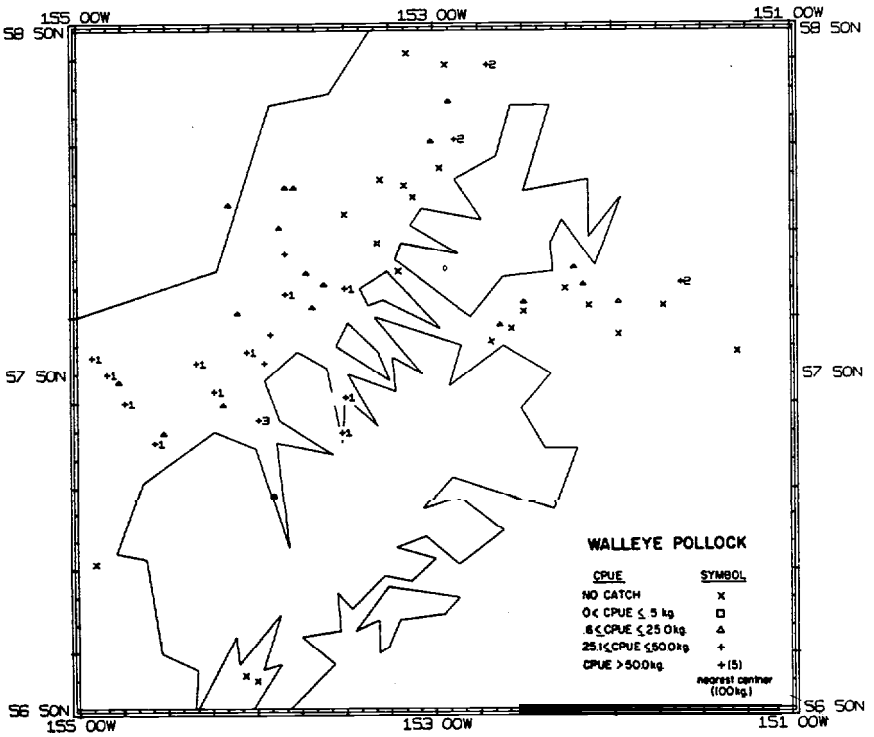
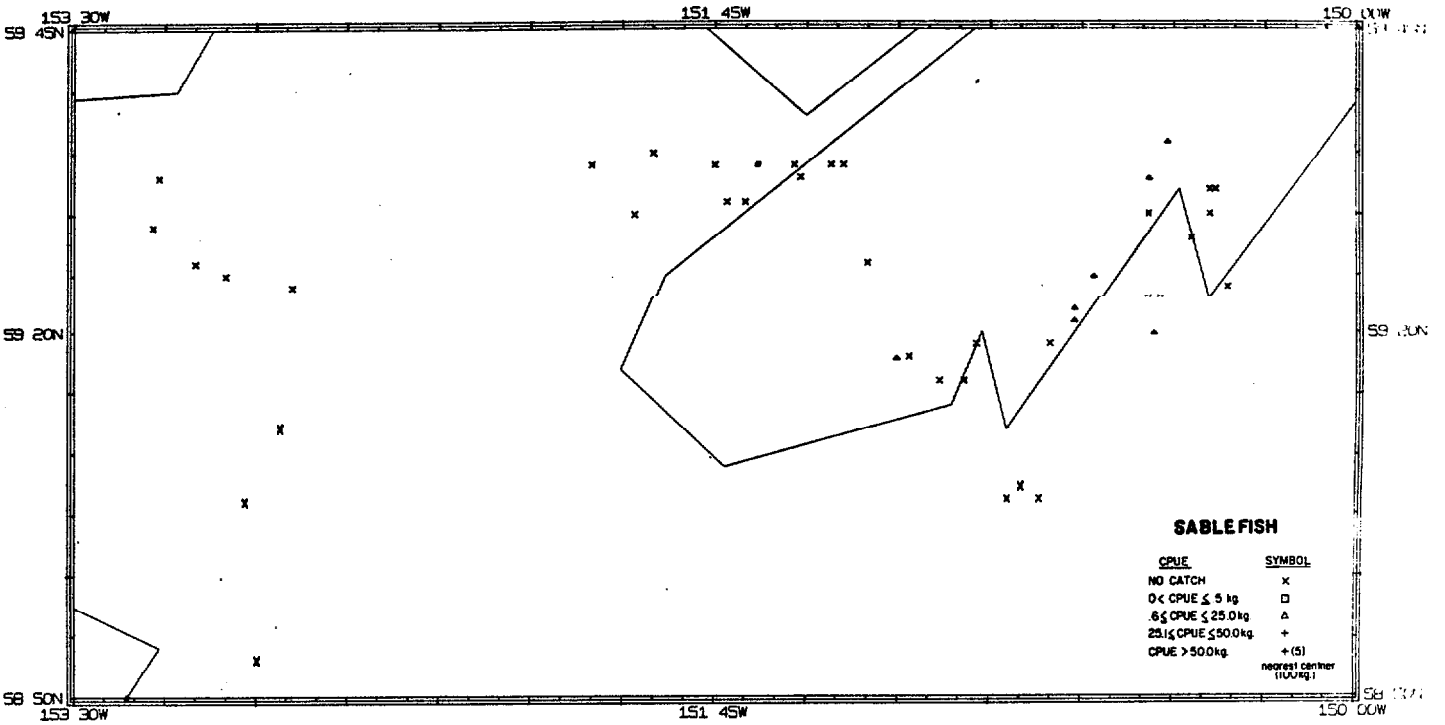


Figure X-120. --**Distribution** of walleye pollock standardized catch rates in **kg/hr,** during cruise 039, R/V John N. Cobb.



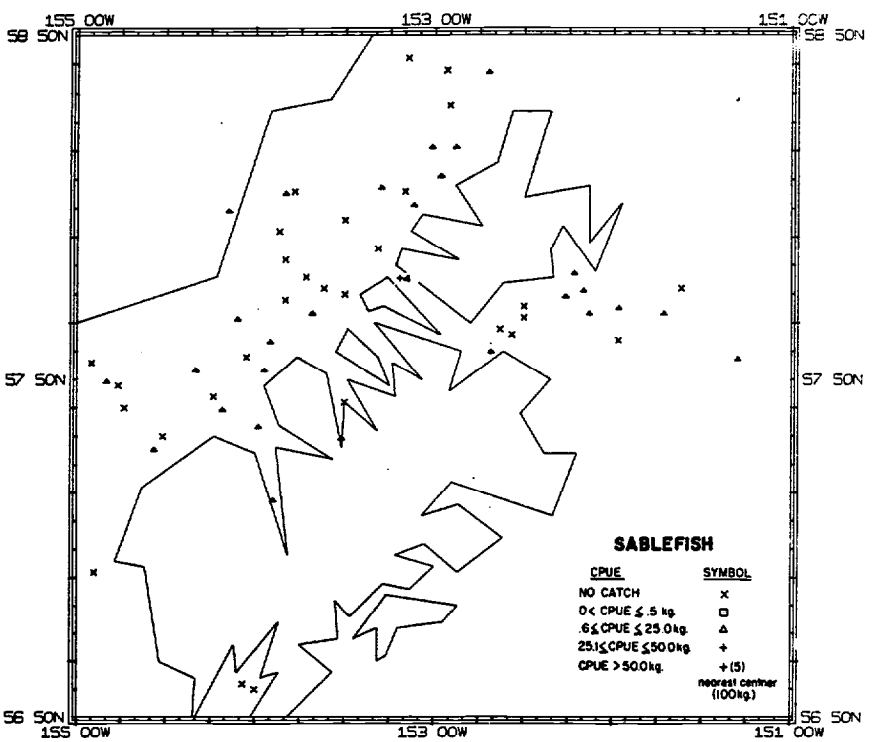
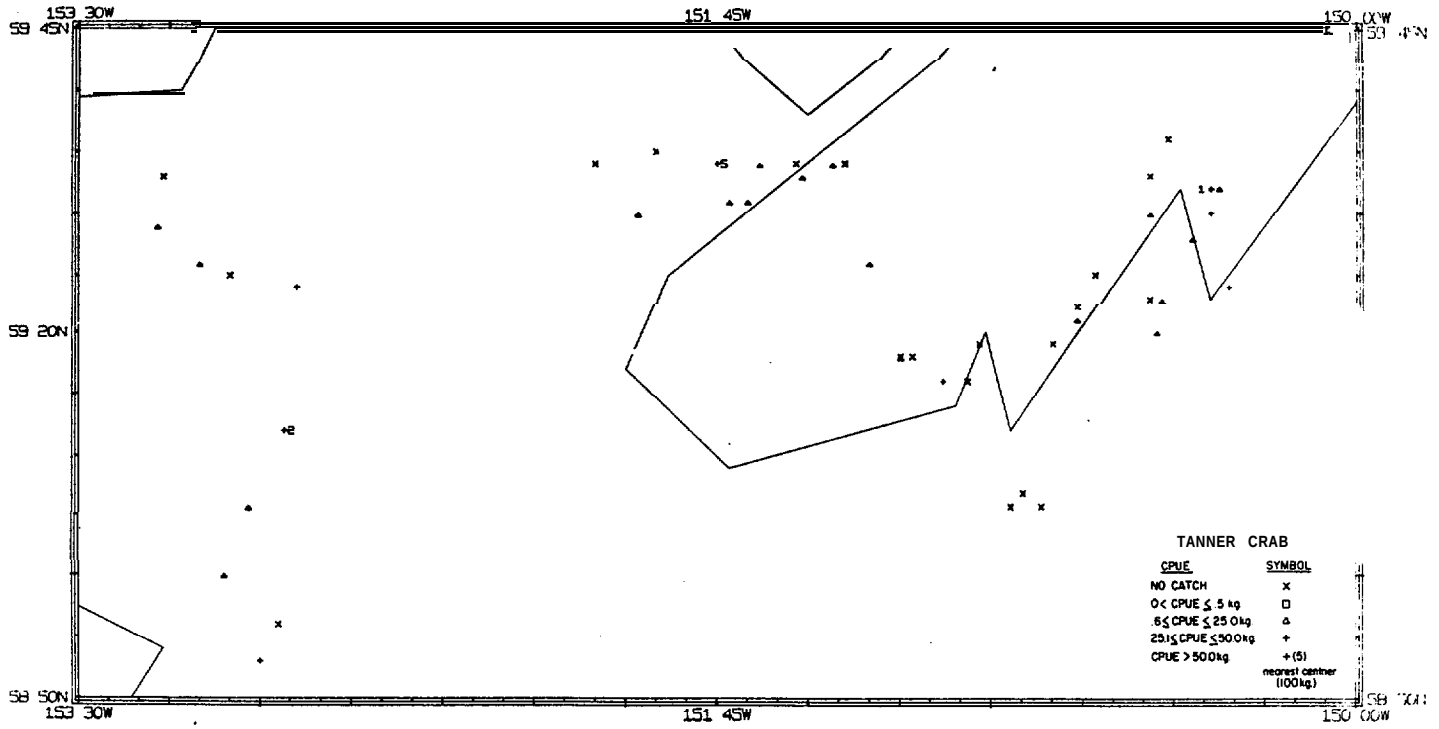


Figure X-121.--Distribution of sablefish standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



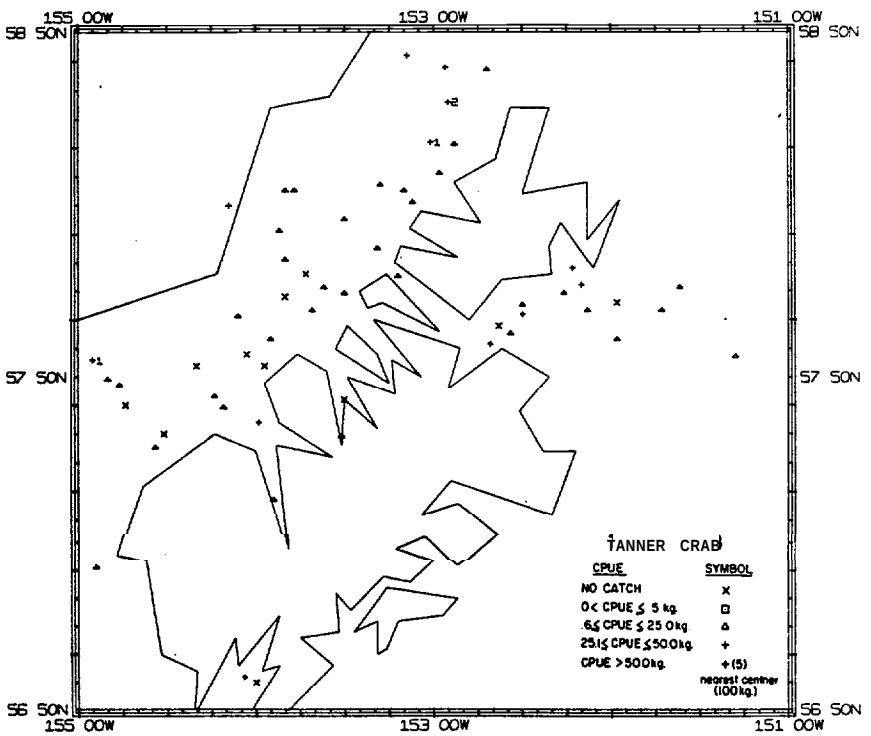
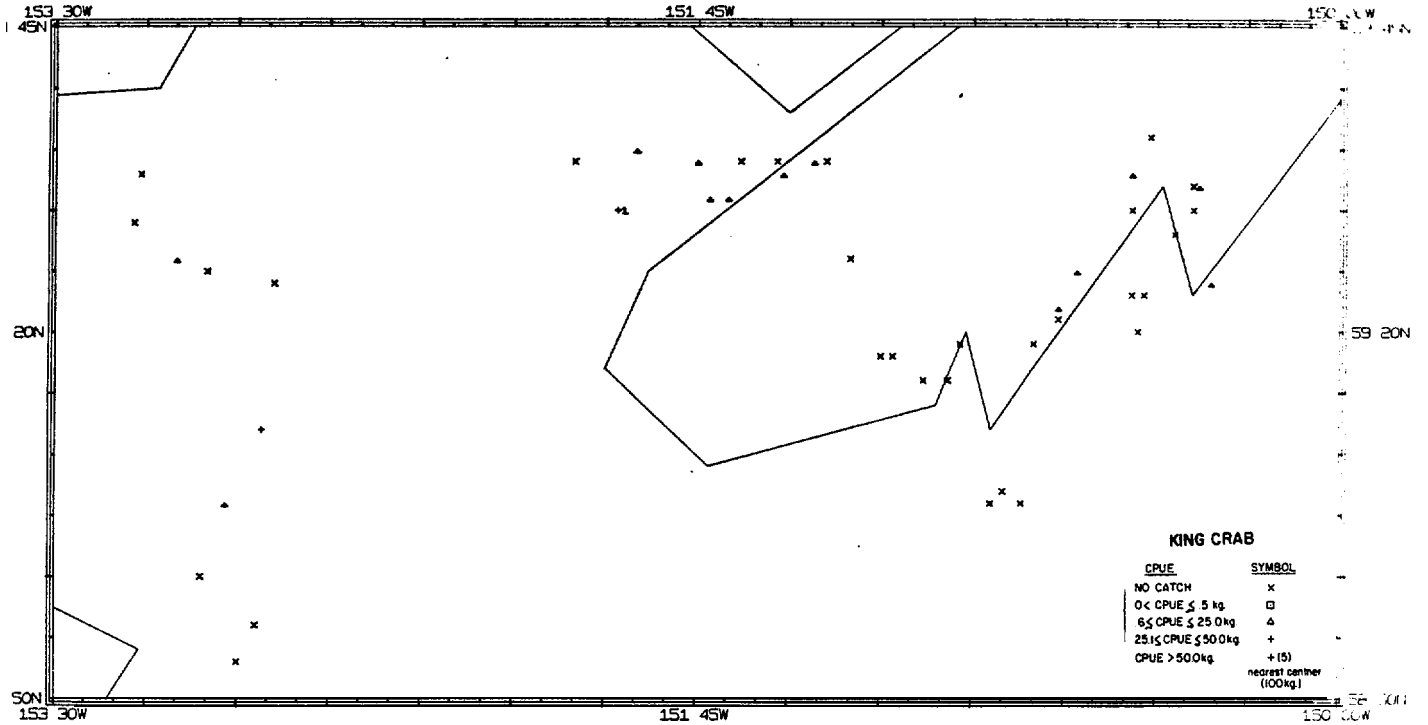


Figure X-122.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



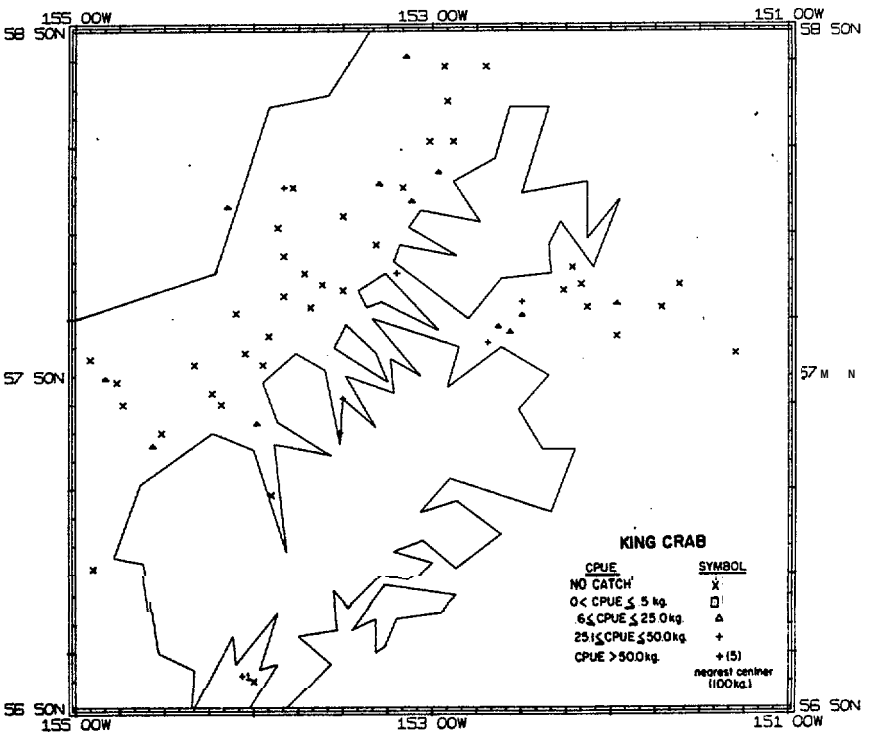
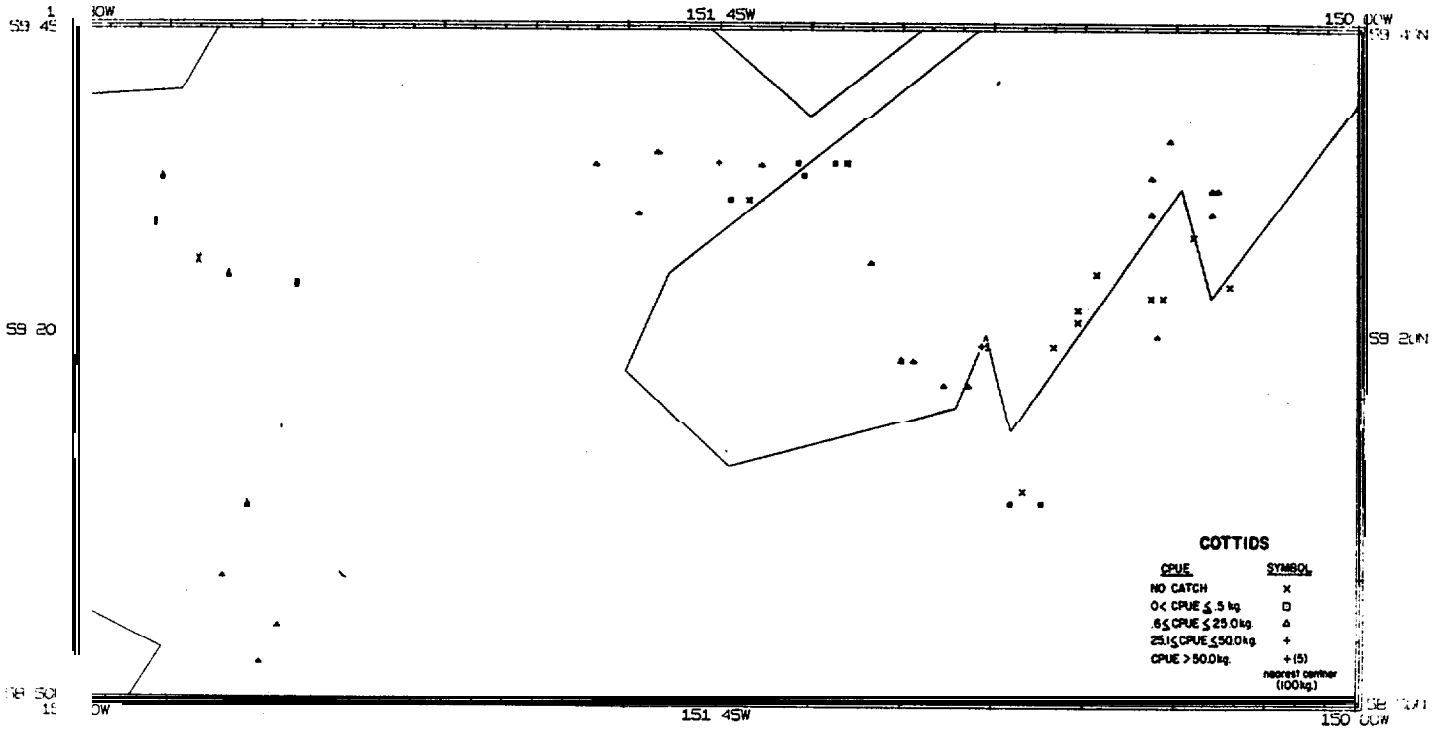
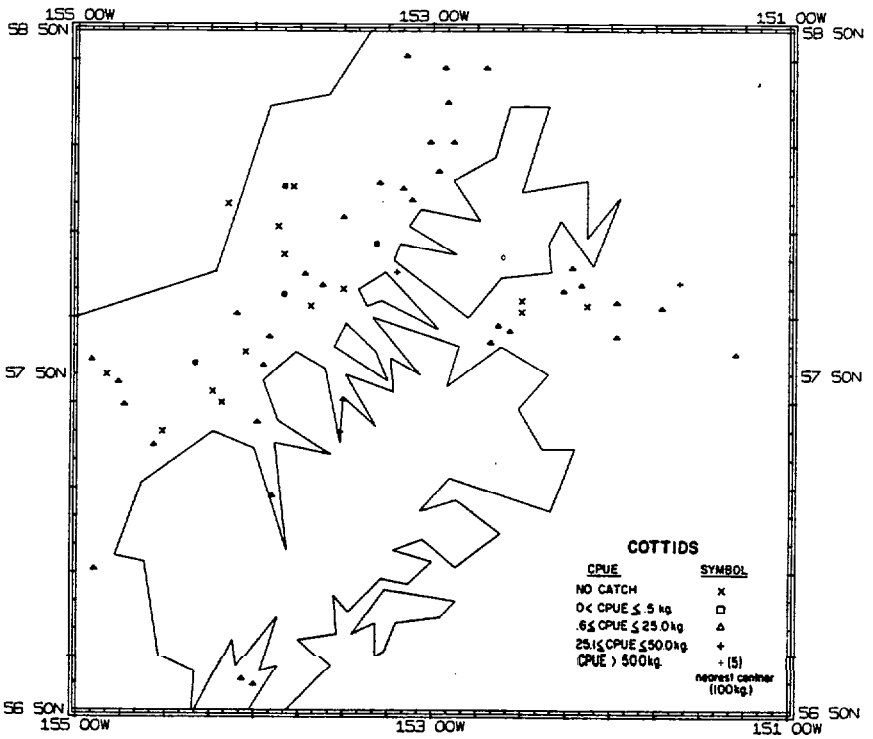
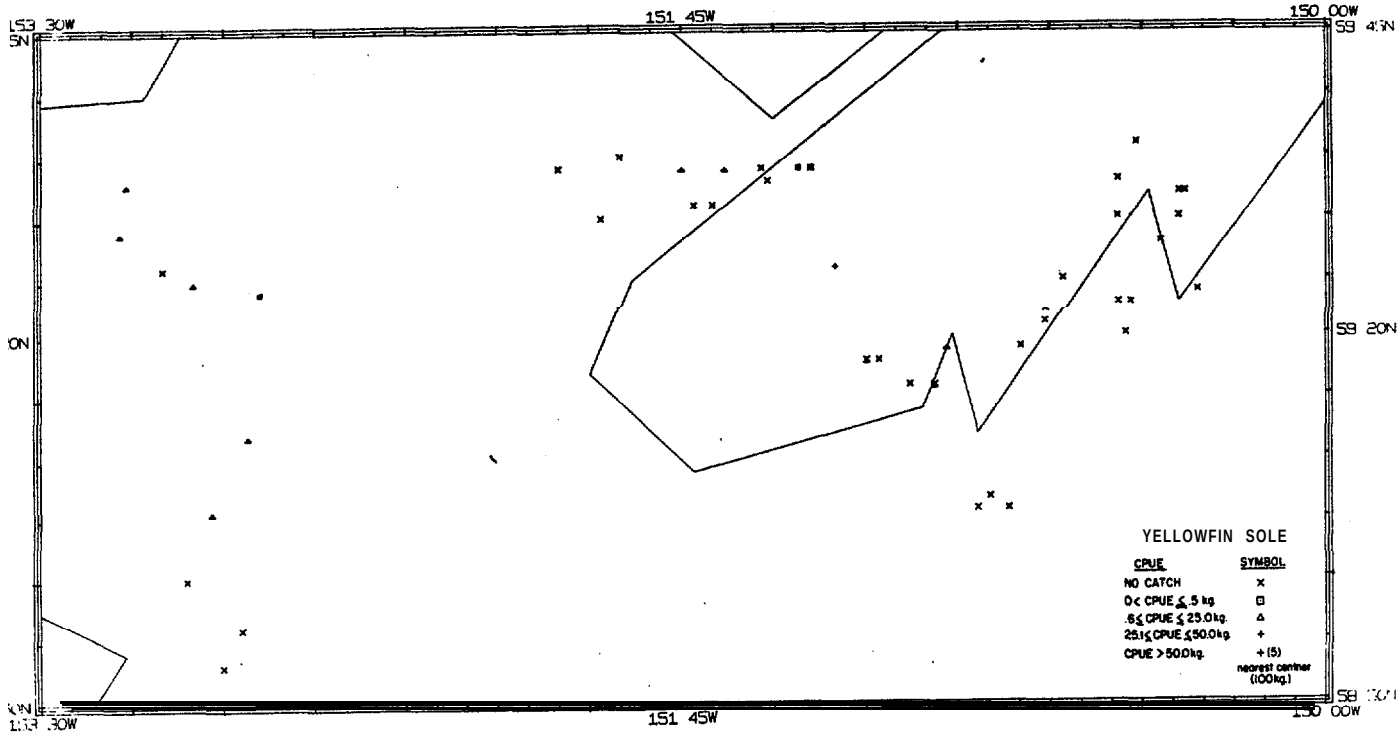


Figure X-123.--Distribution of king crab standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.





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



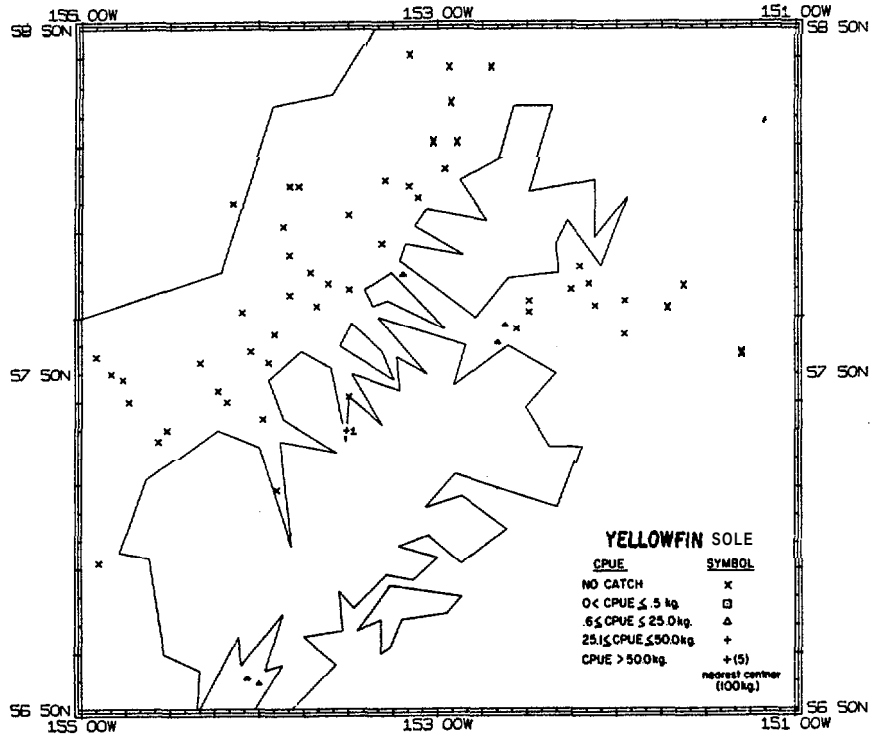
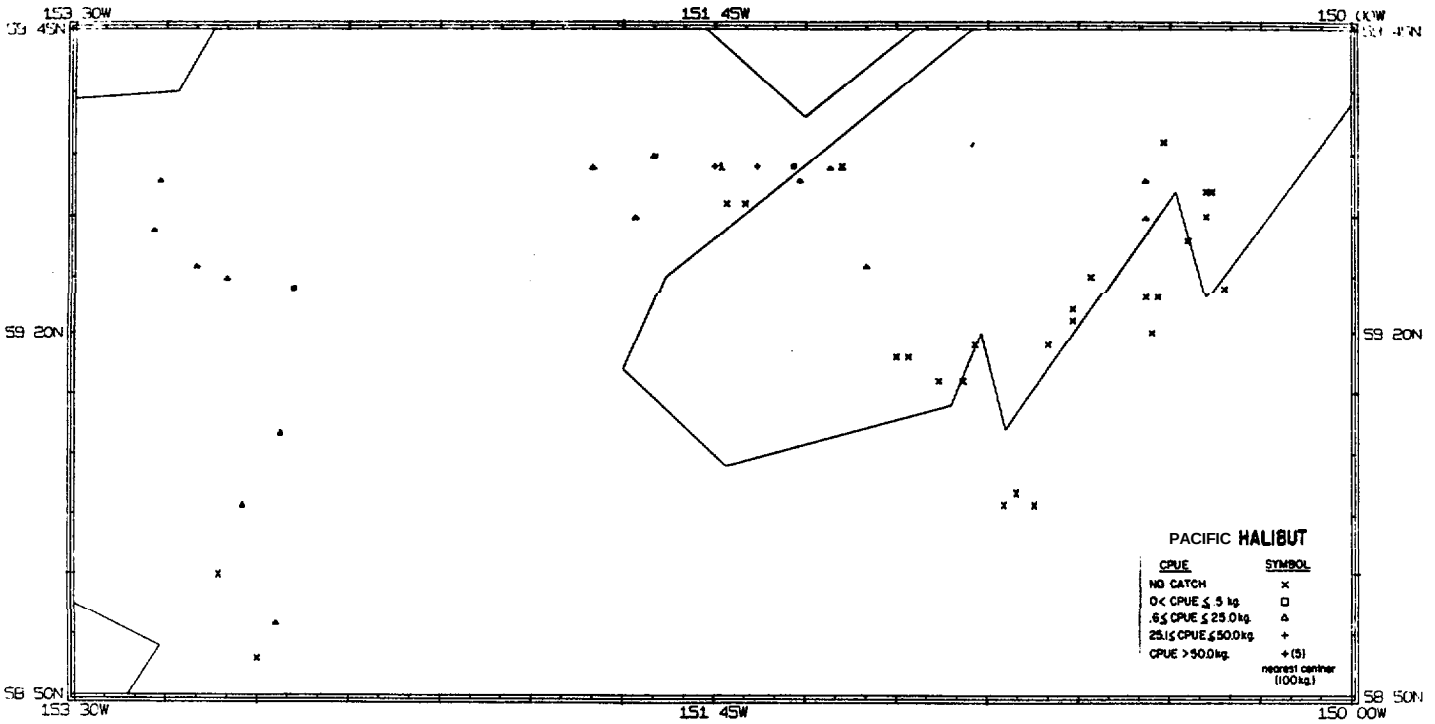


Figure X-125.--Distribution of yellowfin sole standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



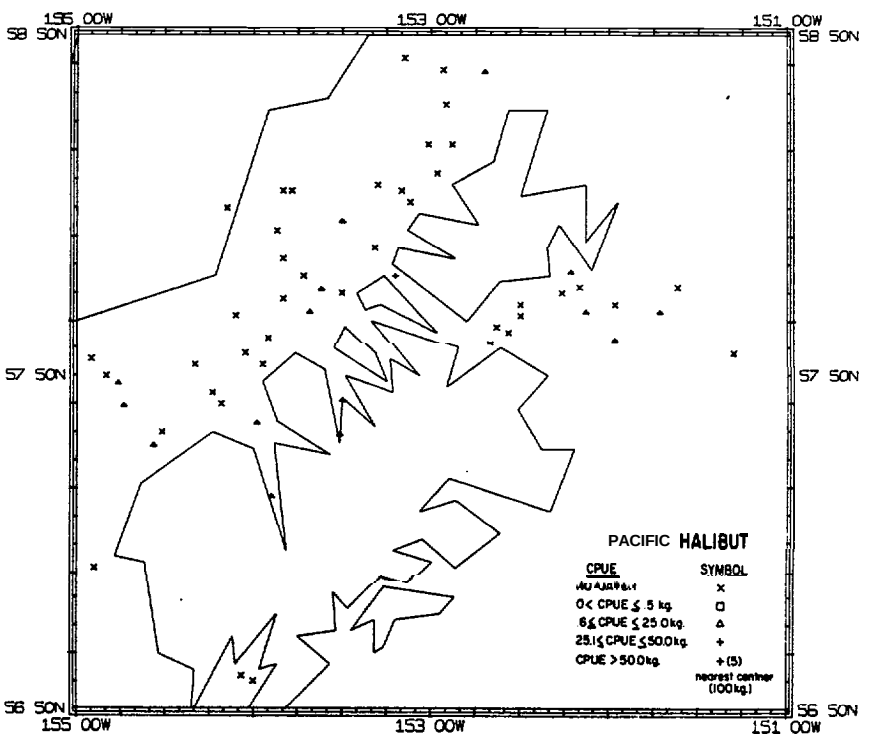
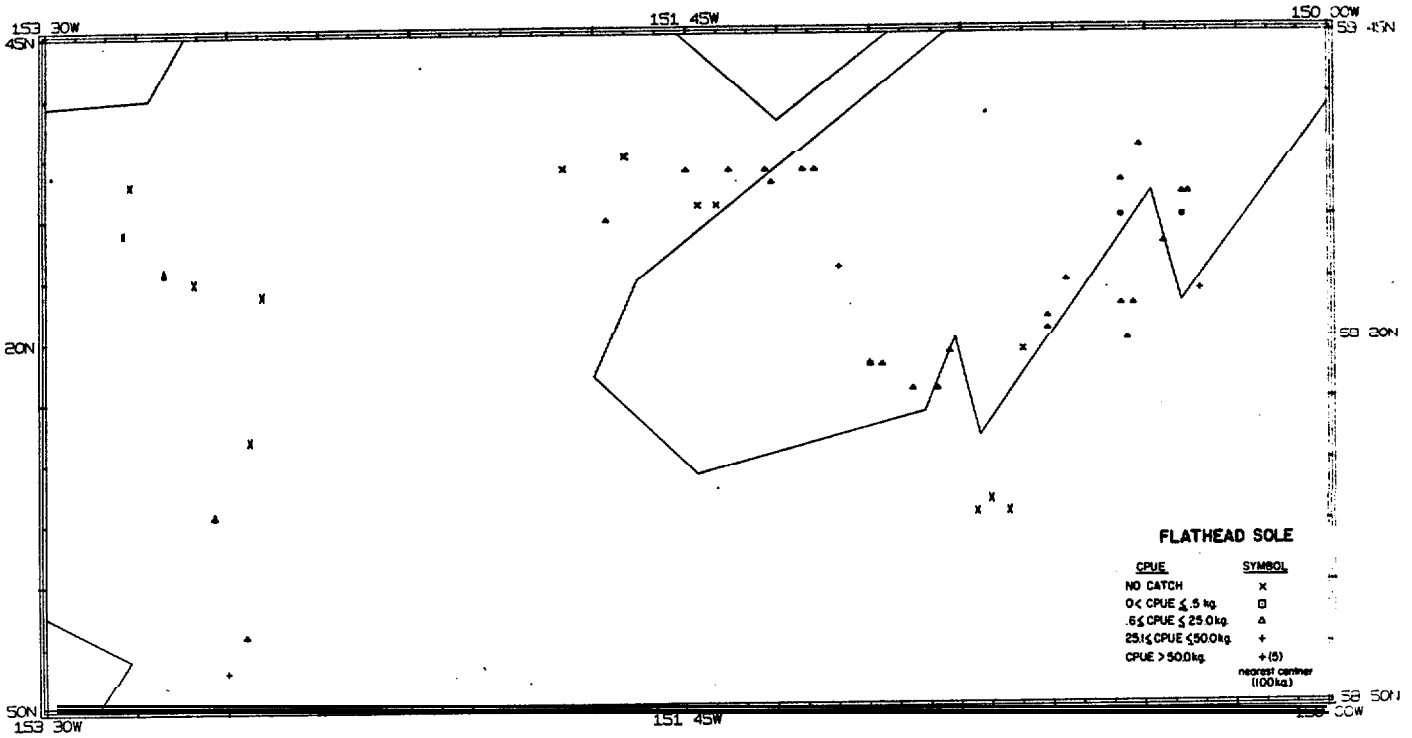


Figure X-126.--Distribution of Pacific halibut standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



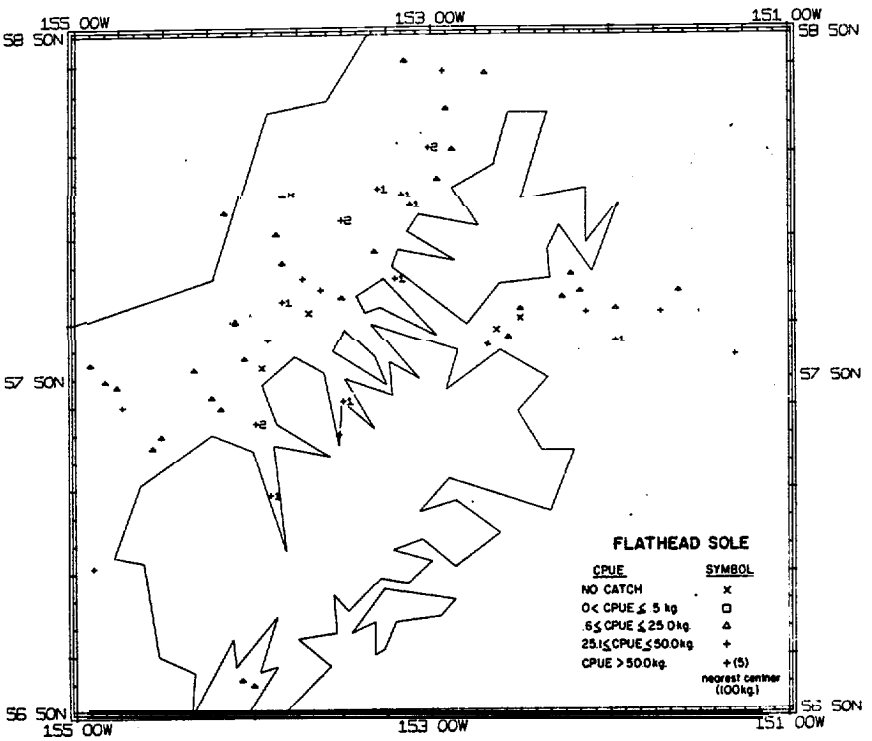
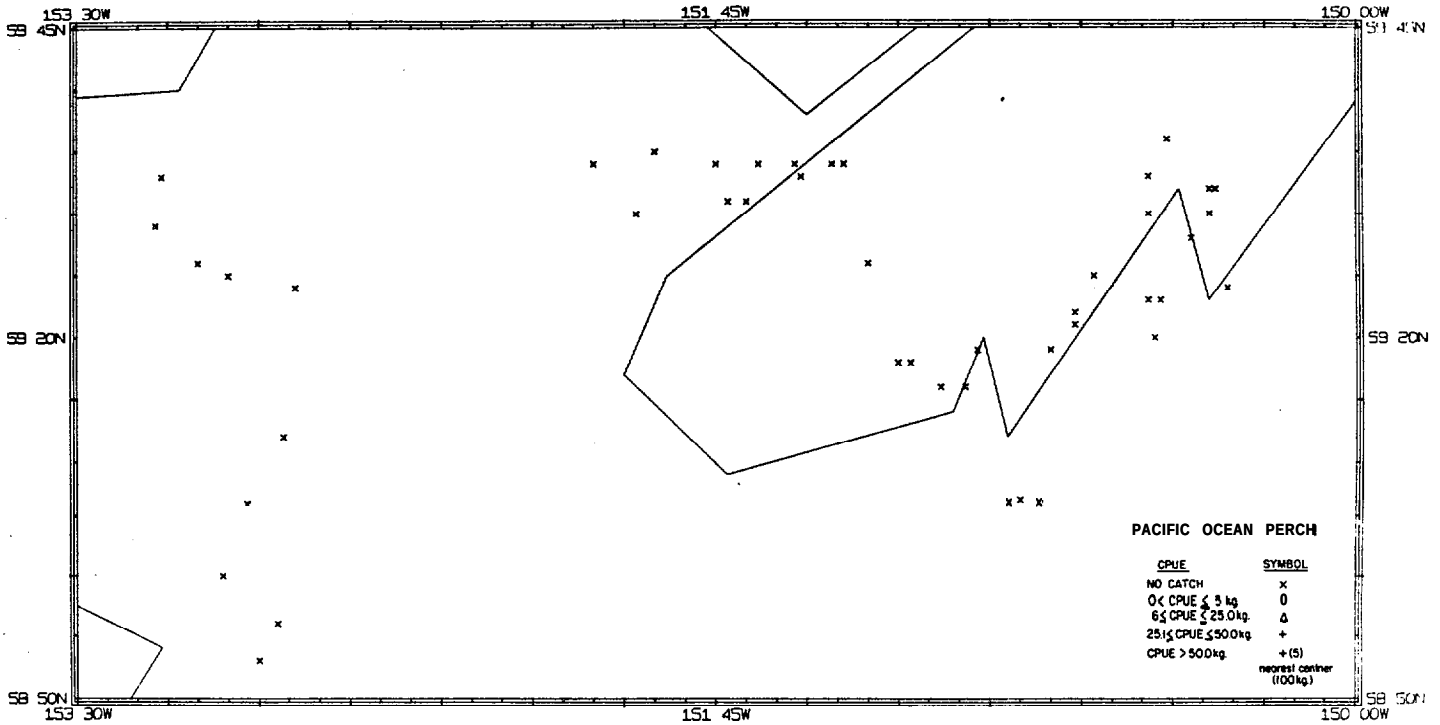


Figure X-127.-Distribution of flathead sole standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



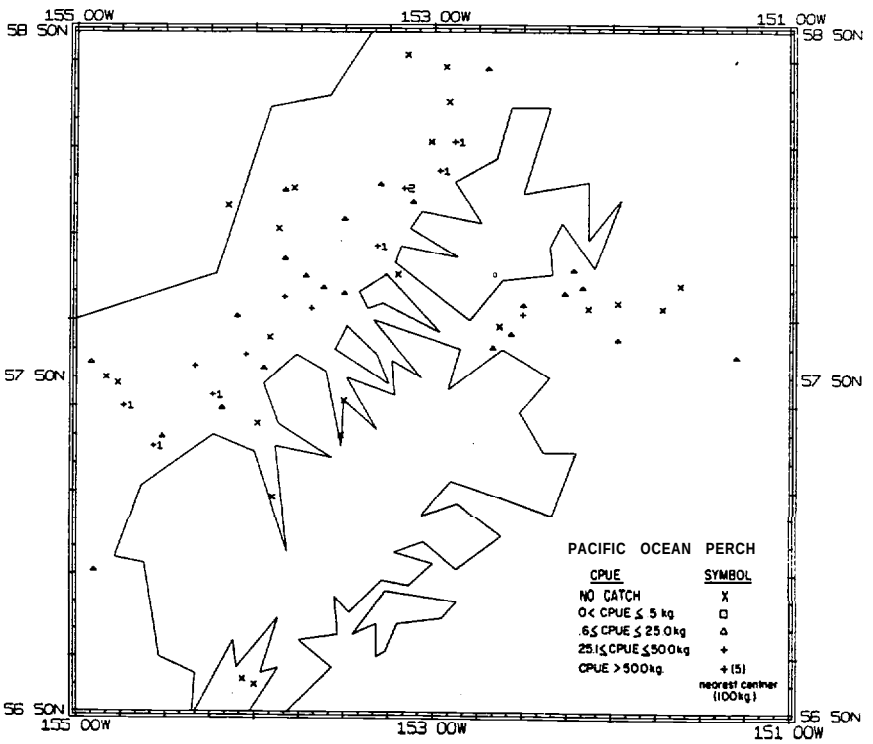
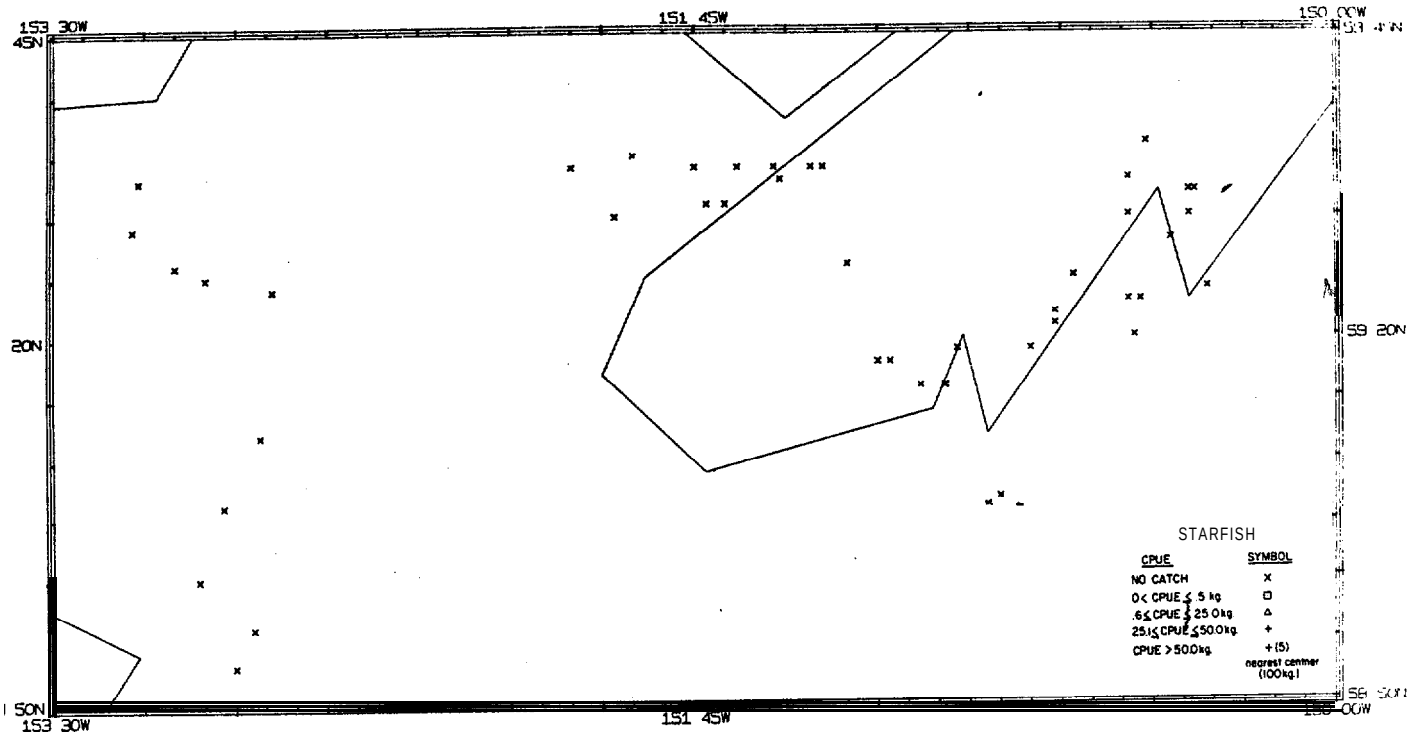


Figure X-128.-Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



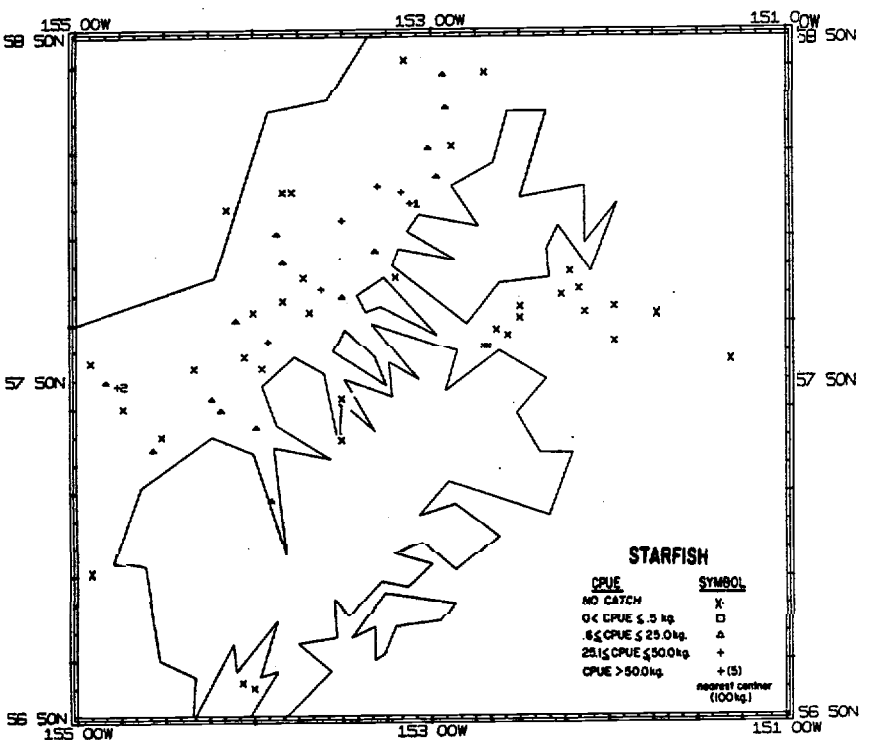
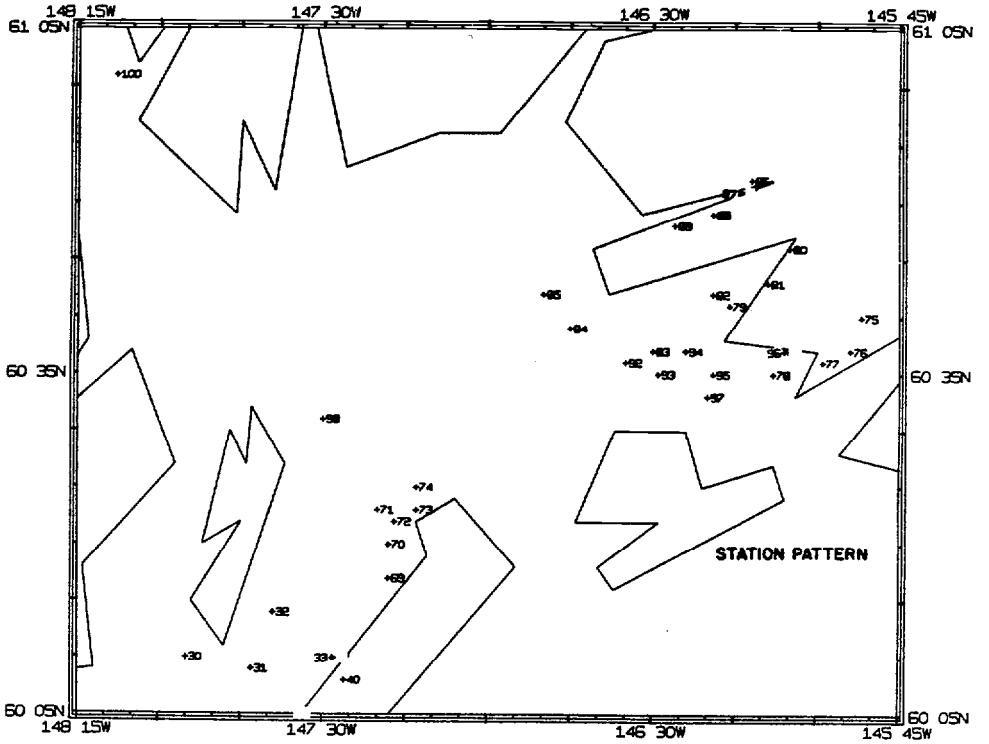


Figure X-129.--Distribution of starfish standardized catch rates in kg/hr, during cruise 039, R/V John N. Cobb.



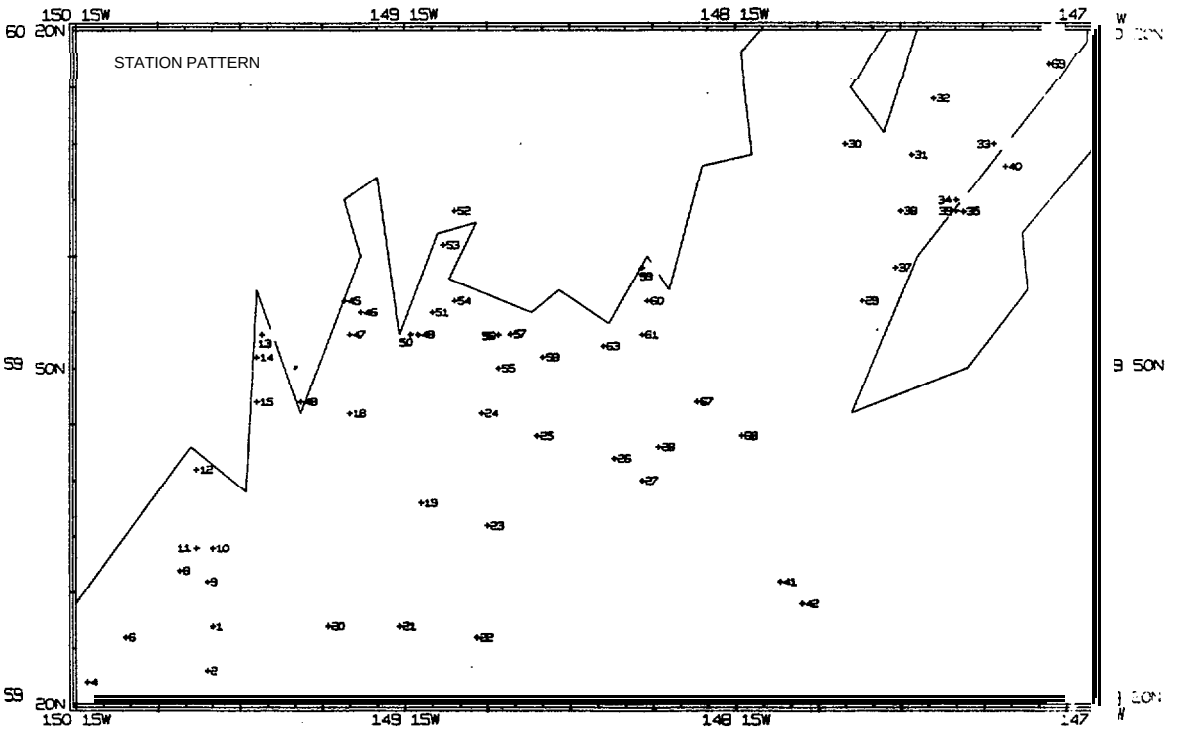
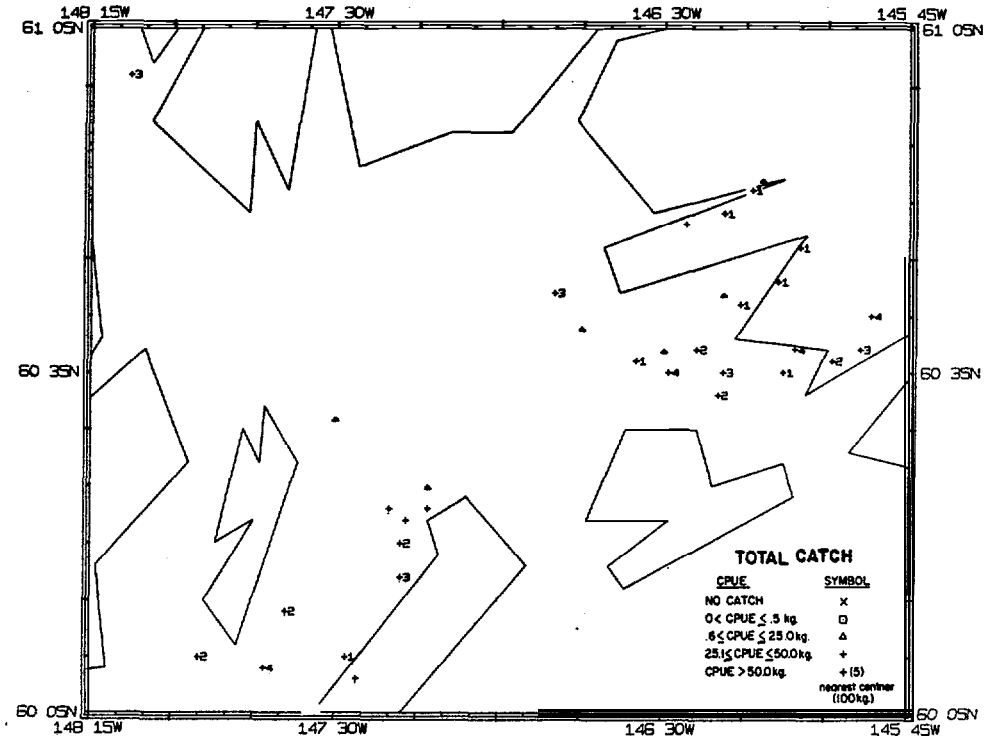


Figure X-130.--Stations successfully trawled (shrimp trawl) during cruise 044, R/V John N. Cobb.



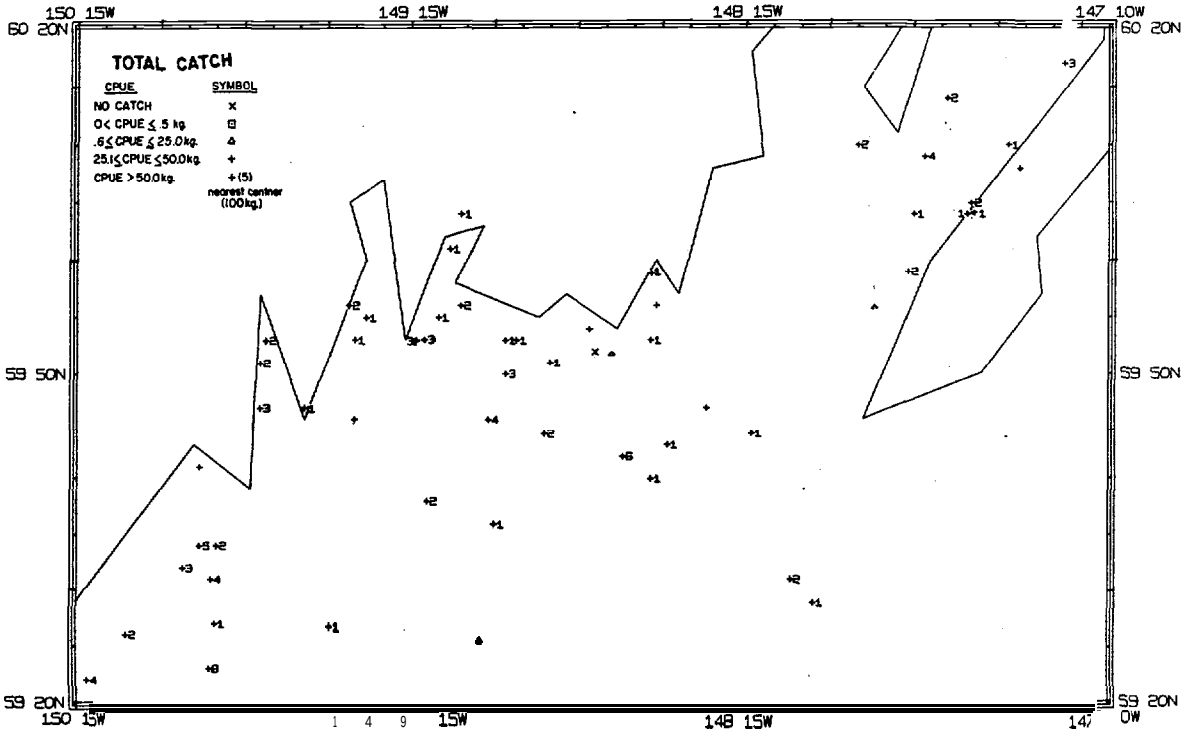
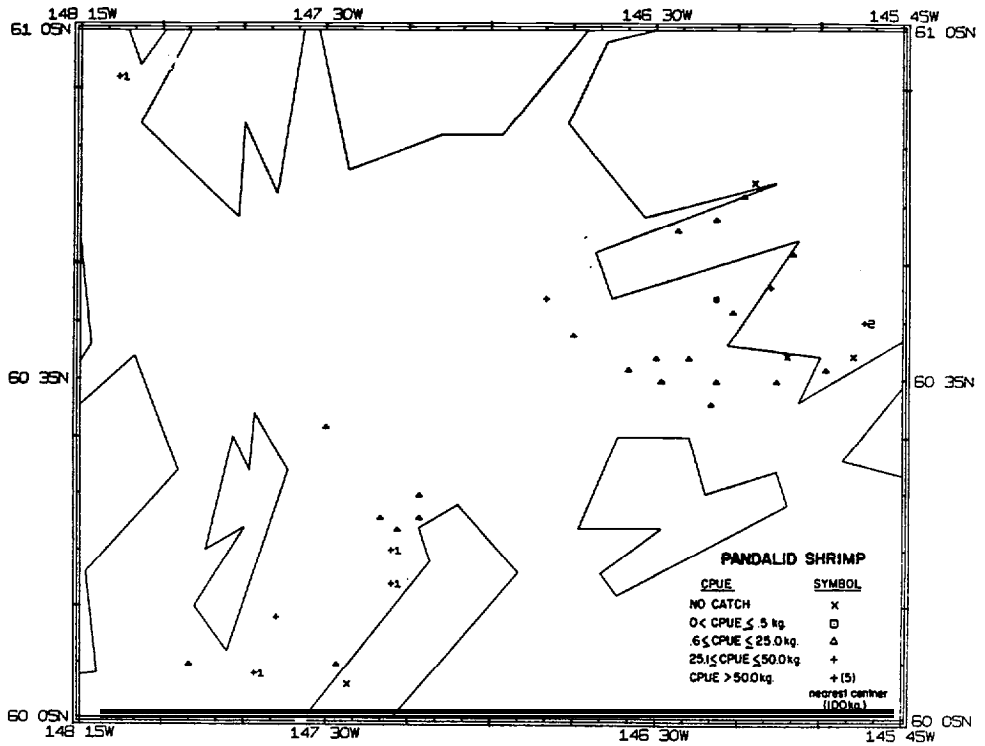


Figure X-131.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 044, R/V John N. Cobb.



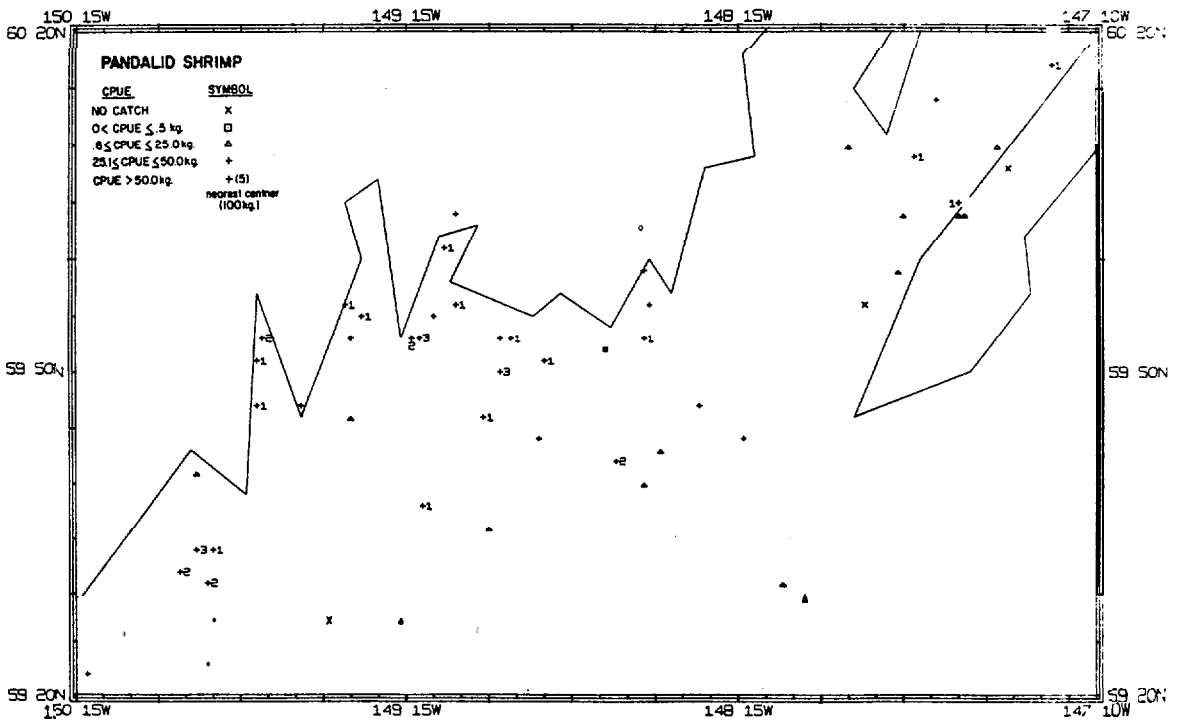
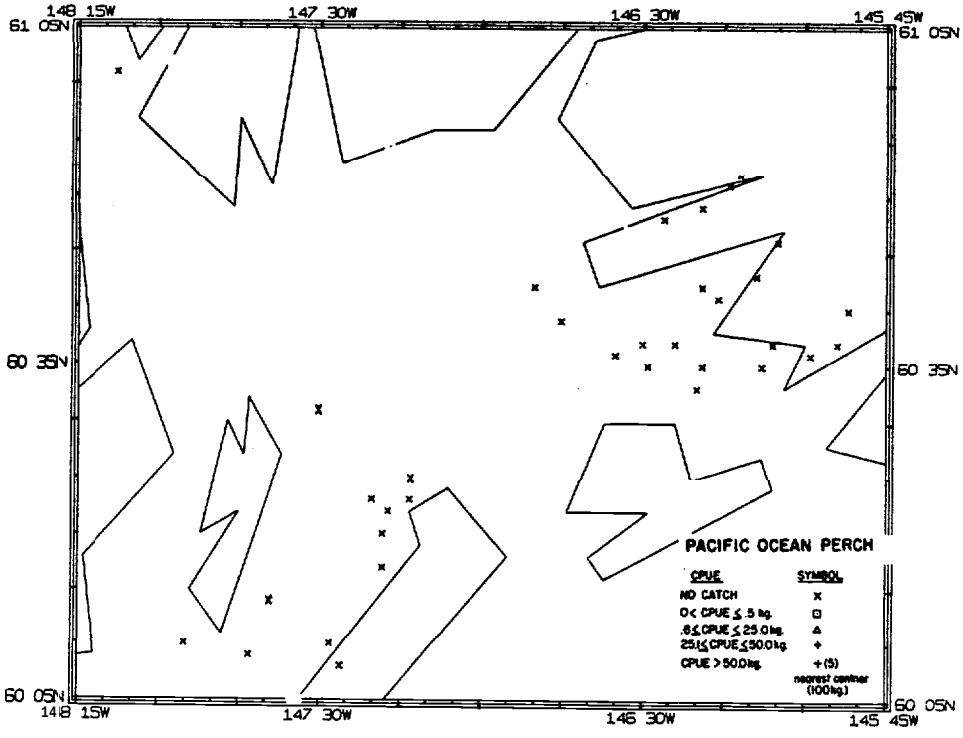


Figure i-132.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb,

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.



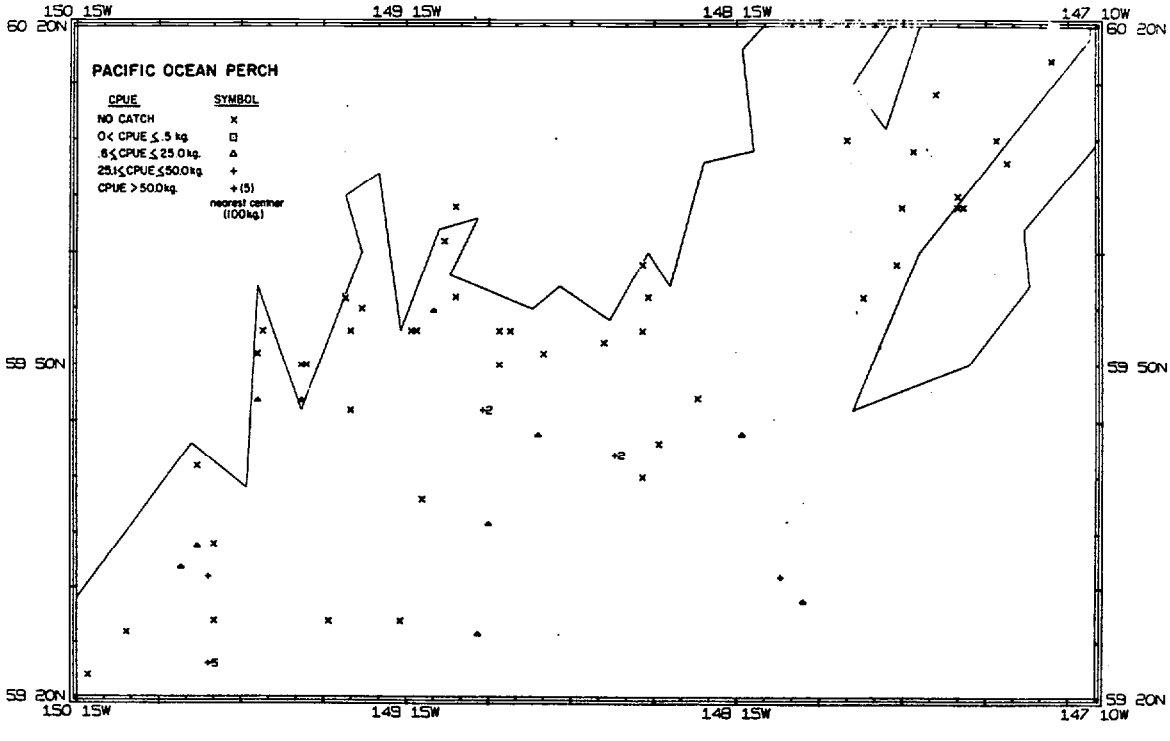
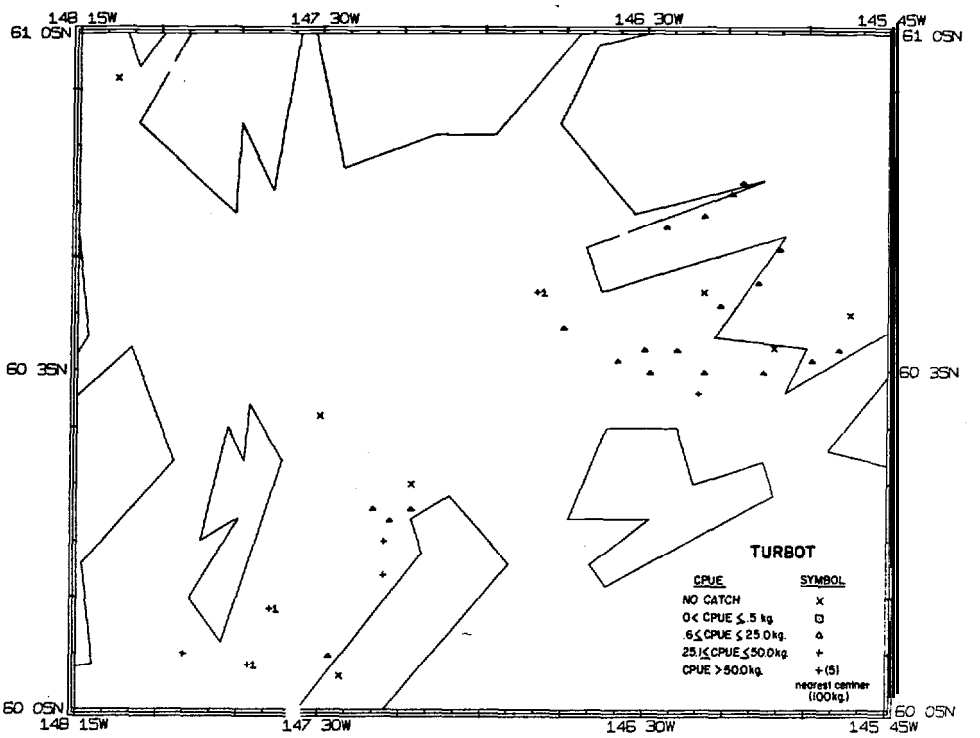


Figure X-133.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.



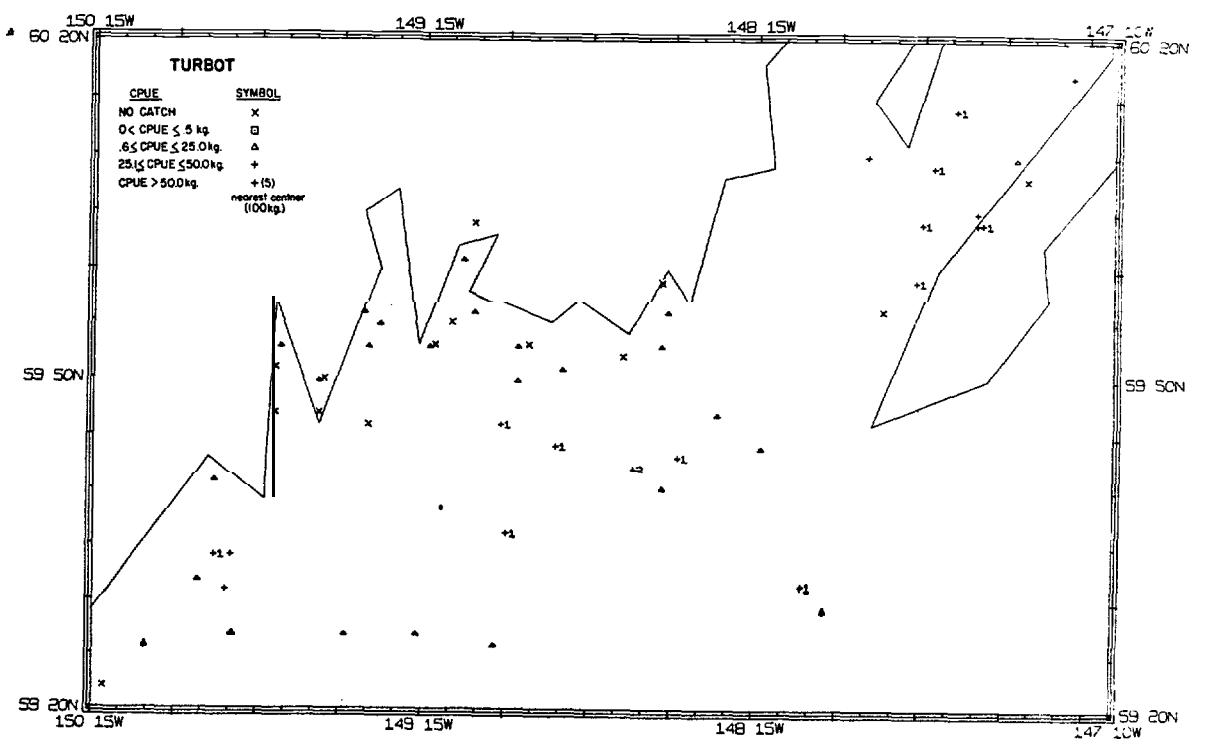
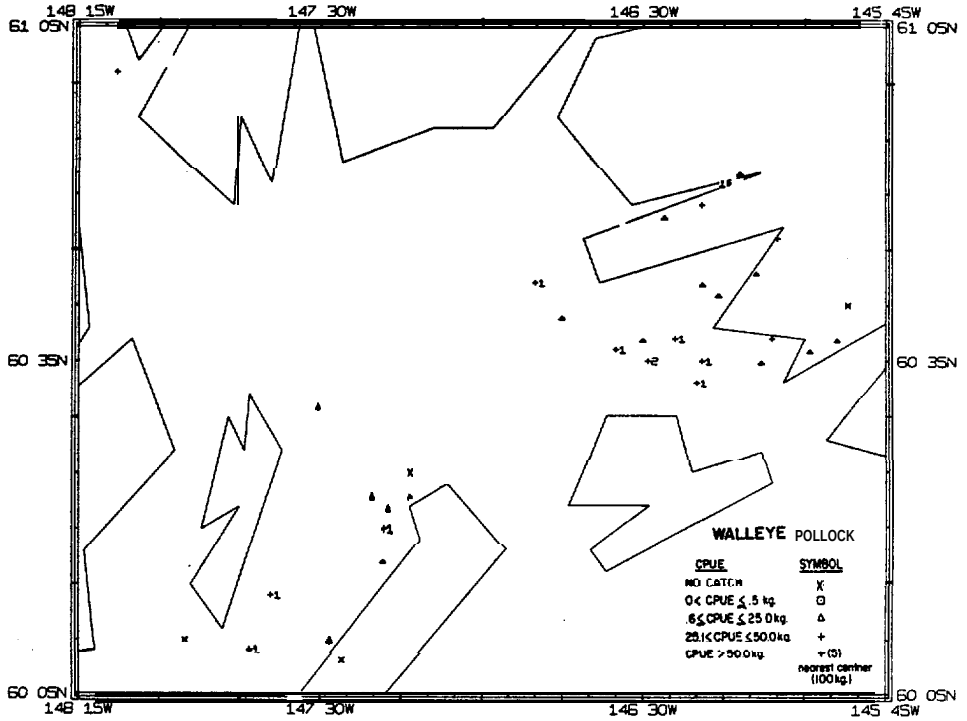


Figure X-134.--Distribution of turbot standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.



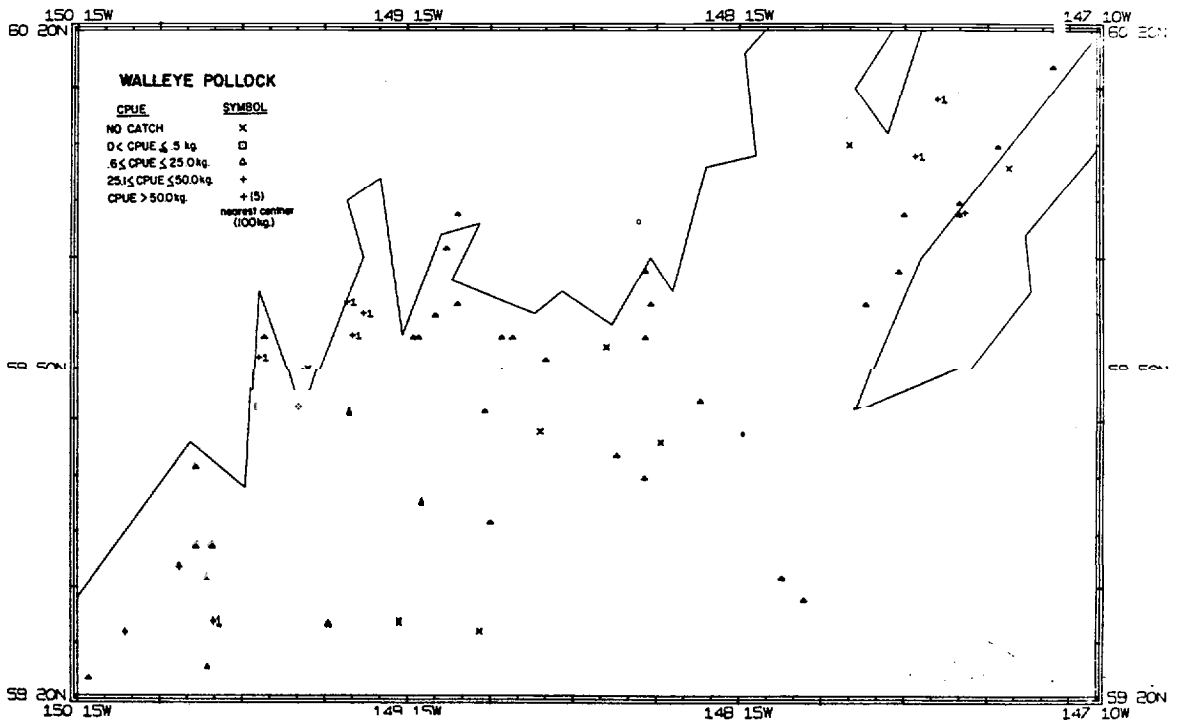
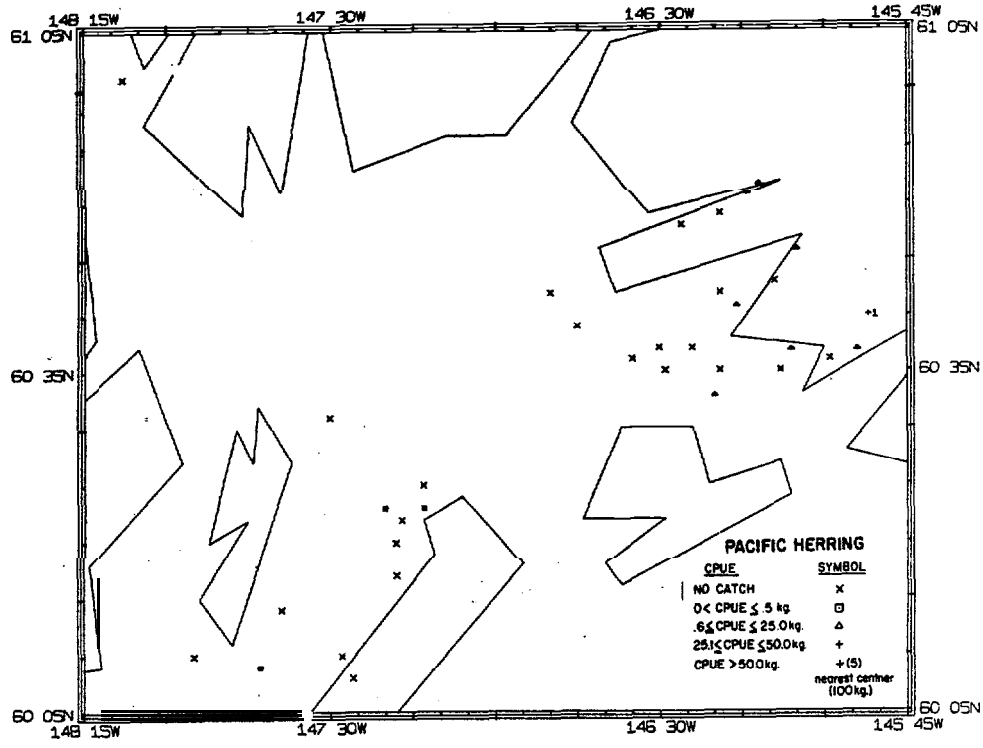


Figure X-135. -Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.



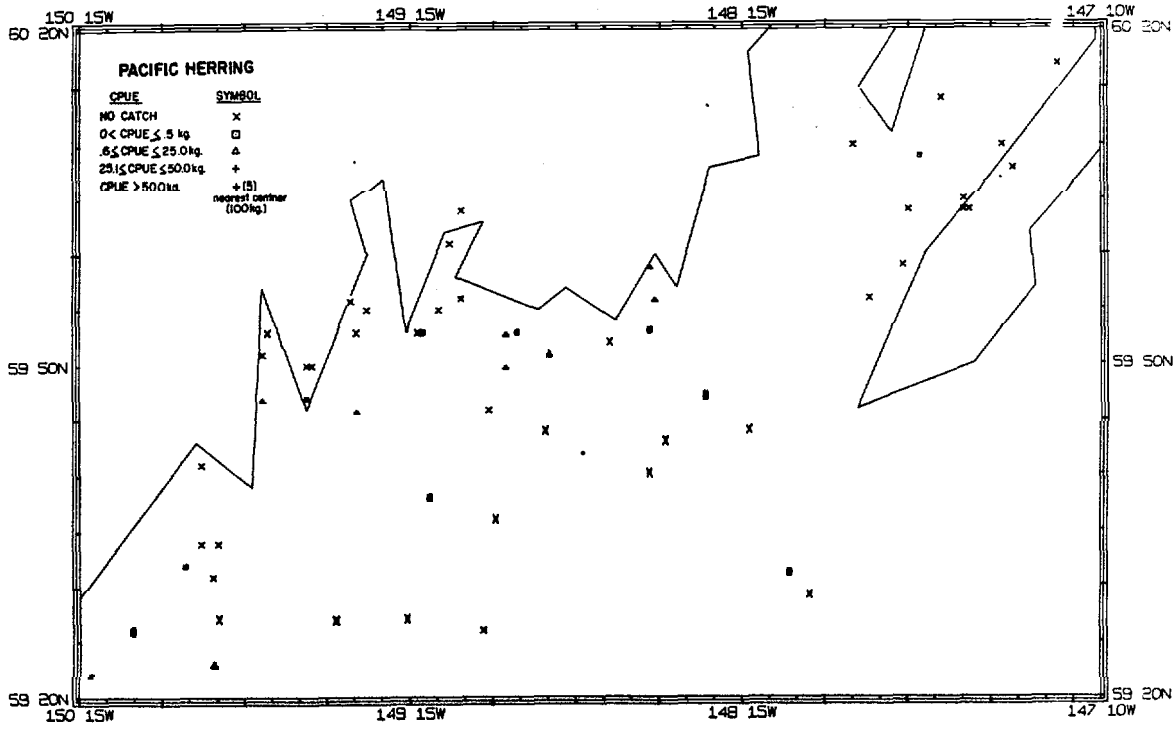
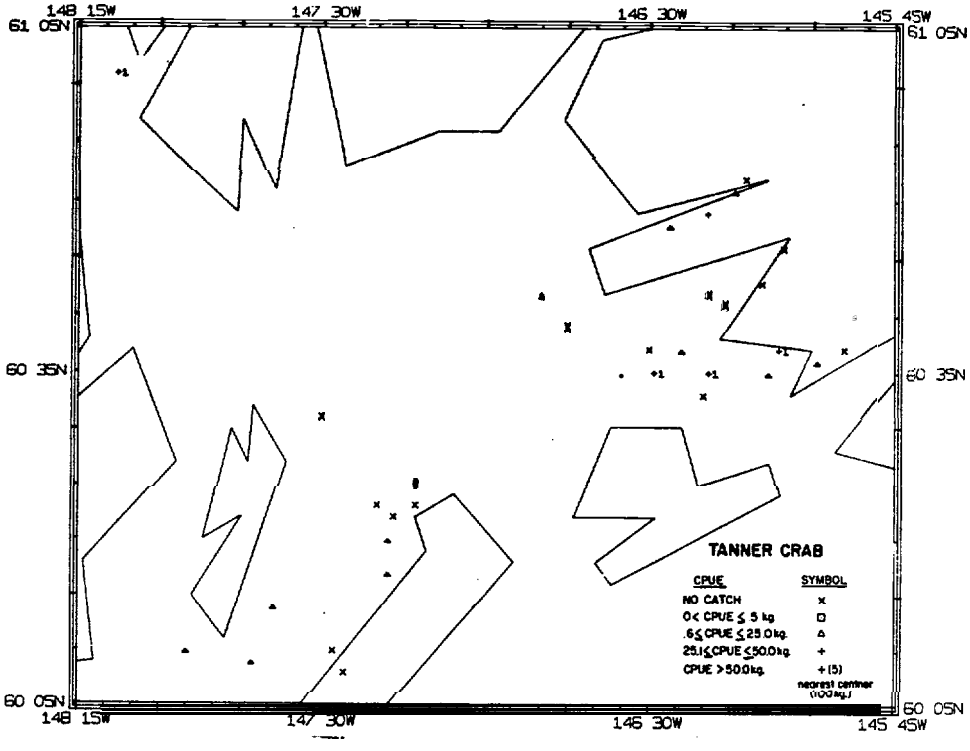


Figure X-136.--Distribution of Pacific herring standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.



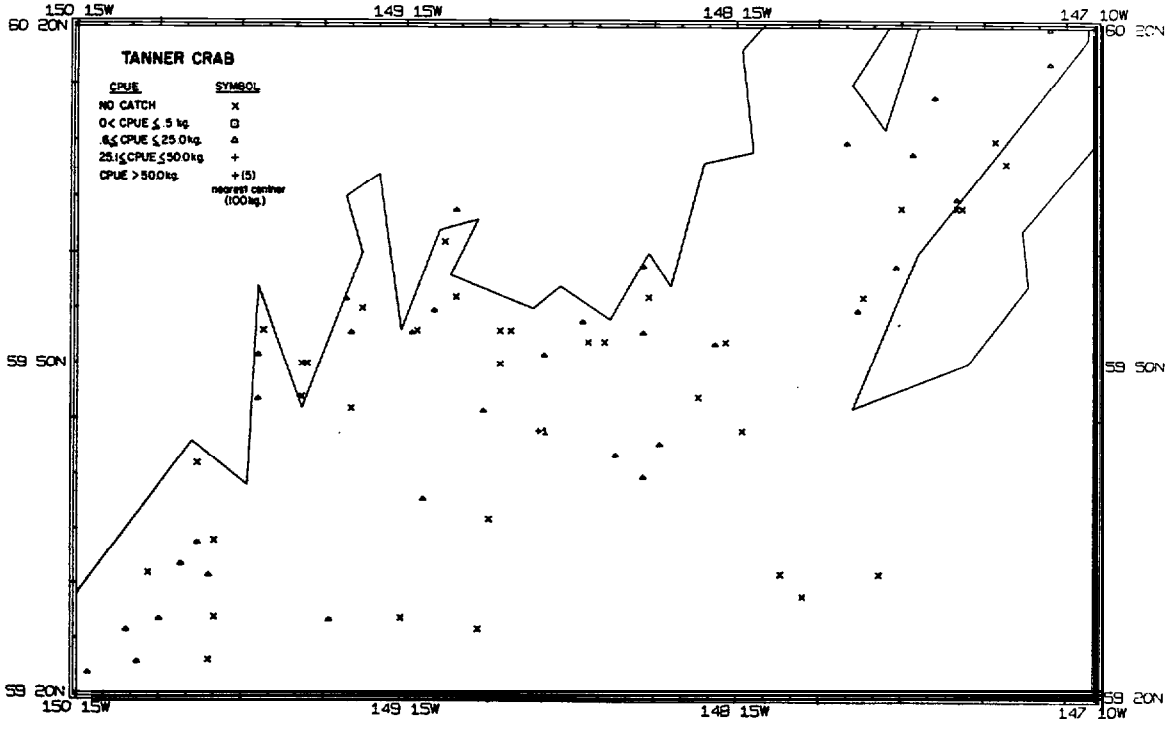


Figure X-137.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 044, R/V John N. Cobb.

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' semi-balloon-type shrimp trawl (Figure X-138).

The total catch for all species averaged 30, 478, and 252 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 10 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 Figures 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' 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, Viekoda Bay, Uganik Bay, Alitak Bay, Ugak Bay, Kiluda Bay, and along the southeastern Kodiak continental shelf (Table X-32).

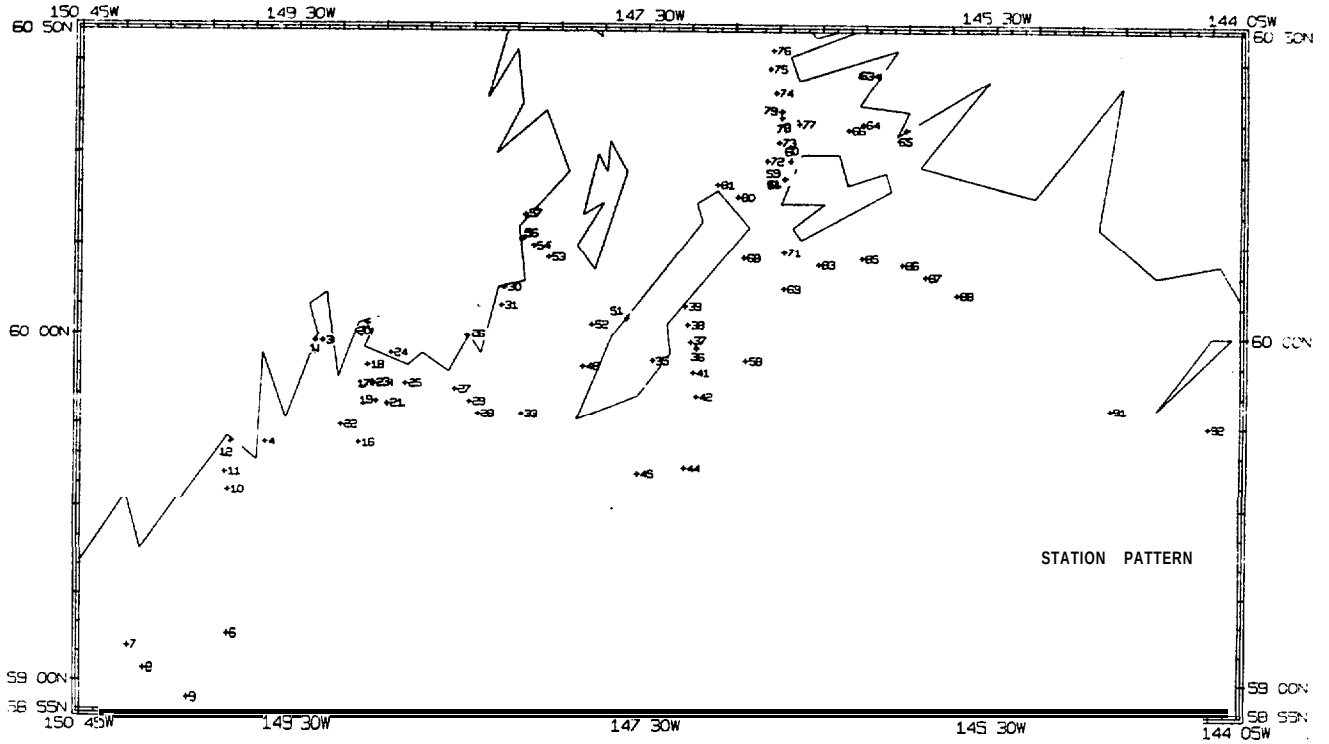


Figure X-138.--Stations successfully trawled (shrimp trawl) during cruise 622, charter vessel Yaquina.

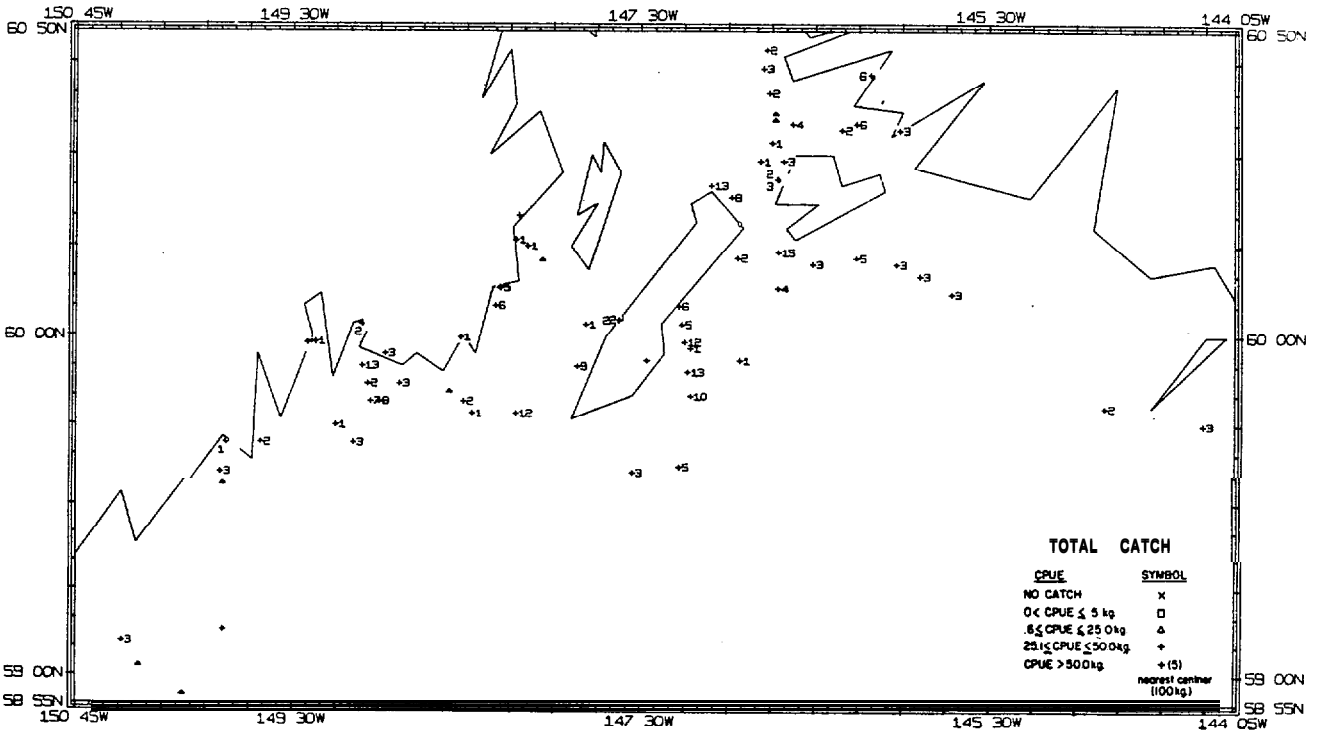


Figure X-139.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 622, charter vessel Yaquina.

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.

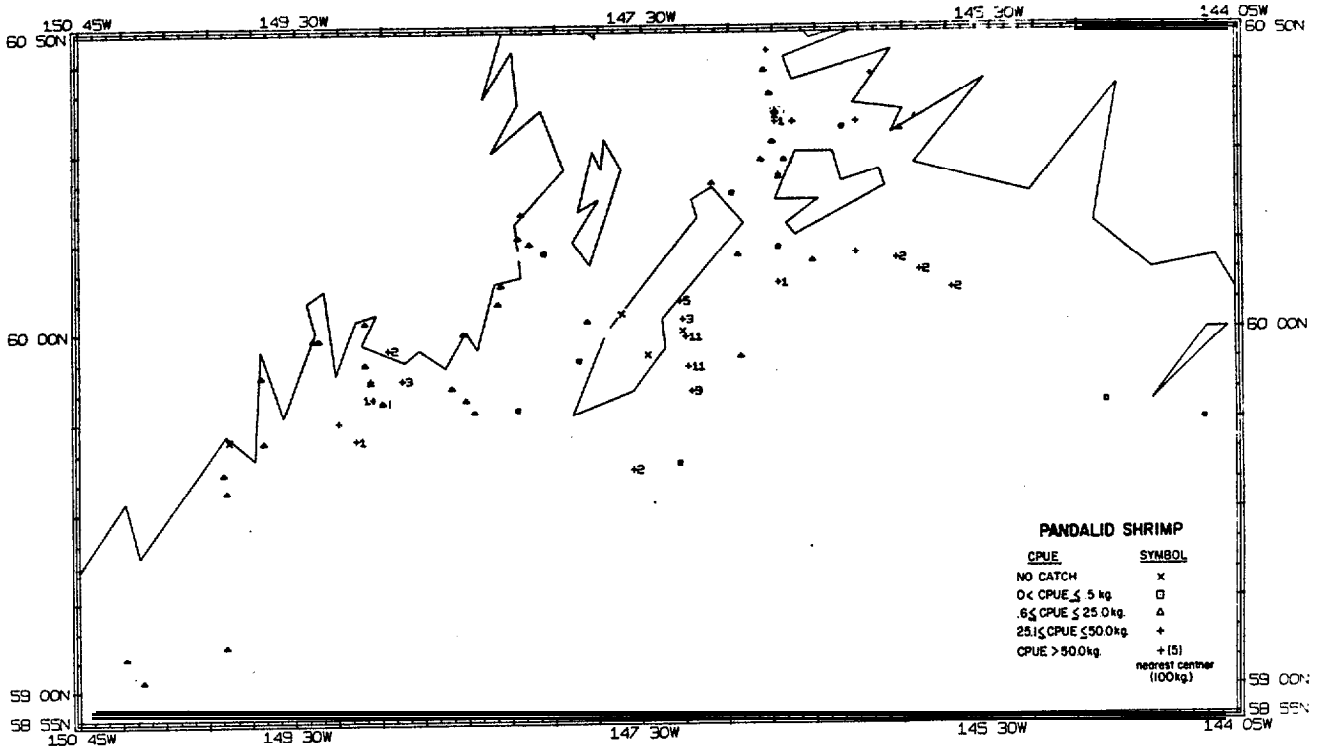
Species or Species groups	Station numbers
Total catch	18, 33, 37, 41, 42-51 and 81.
Pandalid shrimp	15, 16, 24, 25, 36, 38, 39, 41, 42, 45, 69, 78 and 86-88.
Walleye pollock	15, 17, 18, 20, 21, 29, 30, 31, 33, 38, 44, 48, 51, 52, 59, 60, 61, 63-66, 68, 69, 71, 74-77, 80 and 81.
Brittlestars	7, 71 and 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.

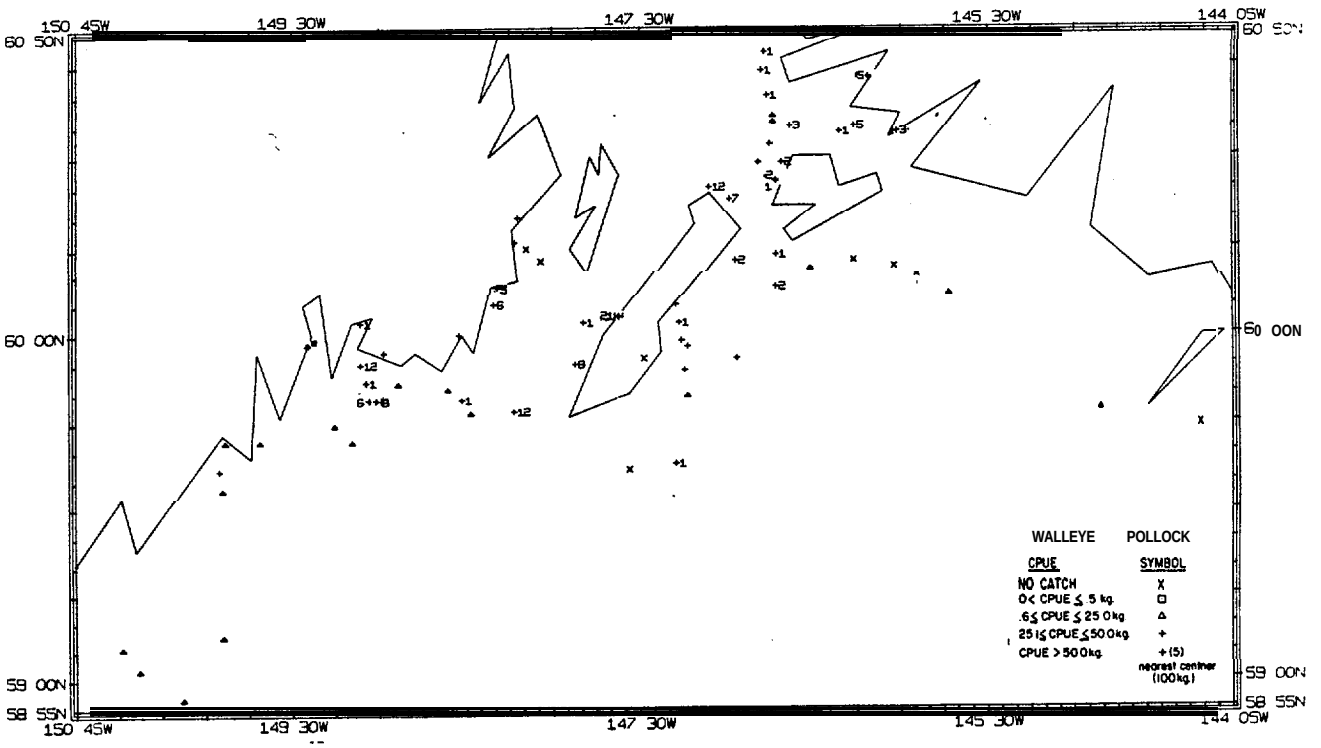
Table X-30.--Mean CPUE's for individual pandalid shrimp species captured during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.

Cruise file	Species	0 - 100 M. CPUE kg/hr	0 - 100 M. % of shrimp	0 - 100 M. % Total catch	101 - 200 M. CPUE kg/hr	101 - 200 M. % of shrimp	101 - 200 M. % Total catch	201 - 400 M. CPUE kg/hr	201 - 400 M. % of shrimp	201 - 400 M. % 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	1/	2/	2/
	Coonstripe	0	0	0	0.1	0.1	2/	1/	2/	2/
	spot	0	0	0	1/	2/	2/	1/	0.7	2/
		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	1/	2/	2/
	Dock	0.1	0.1	2/	0.2	0.1	0.1	0	0	0
	spot	1/	2/	2/	0.2	0.1	0.1	1/	2/	(2/
	P. montagui	1/	2/	2/	0.1	0.1	2/	0	0	0
	Ocean pink	- 0 -	0	0	0.8	0.4	0.2	0	0	0
		1.93.3	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	2/	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	1/	2/	2/
	Coonstripe	42.3	9.8	7.9	7.8	1.8	1.2	0.3	0.2	2/
	P. montagui	1/	2/	2/	3.5	0.8	0.5	0	0	0
	spot	0	0	0	1/	2/	2/	0	0	2/
		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	2/	2/	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	1/	2/	2/	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	2/	2/	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	2/	2/	0	0	0
		239.8	100.0	66.5	273.3	100.0	56.6	46.5	100.0	40.0

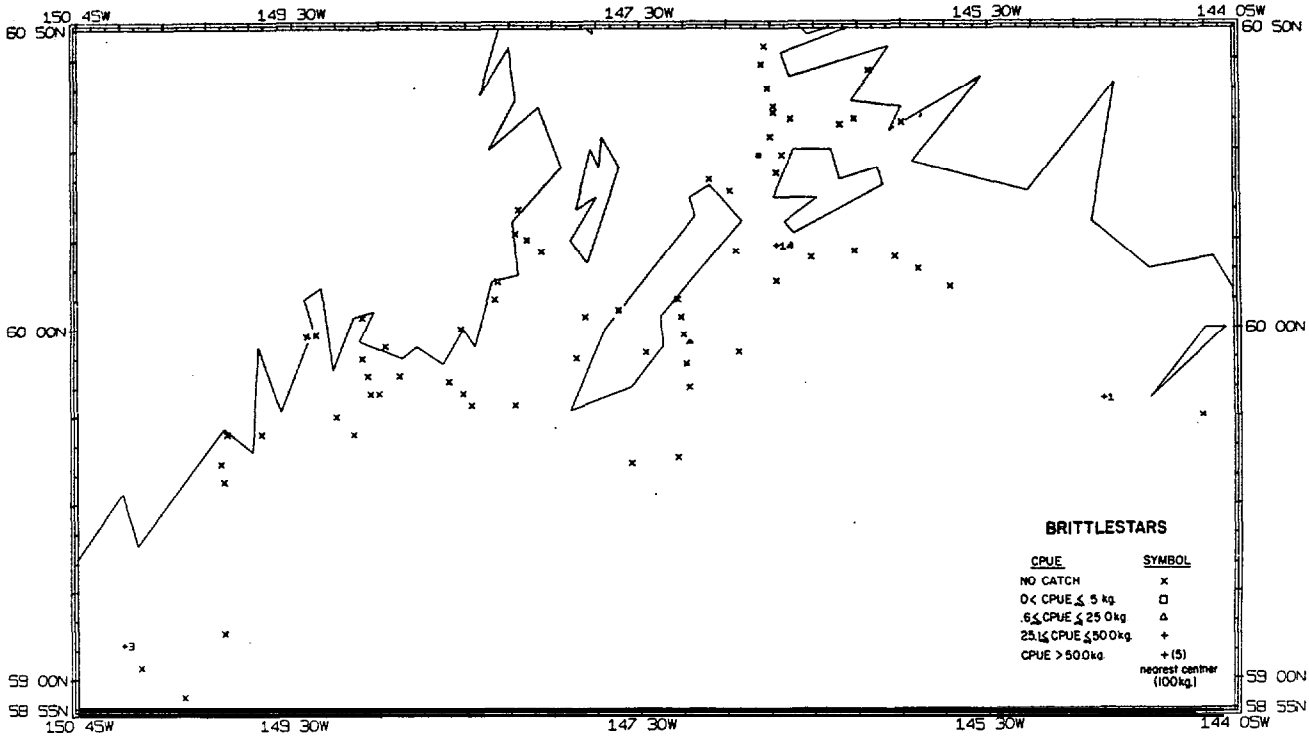
1/ Less than 0.1 kg/hr.

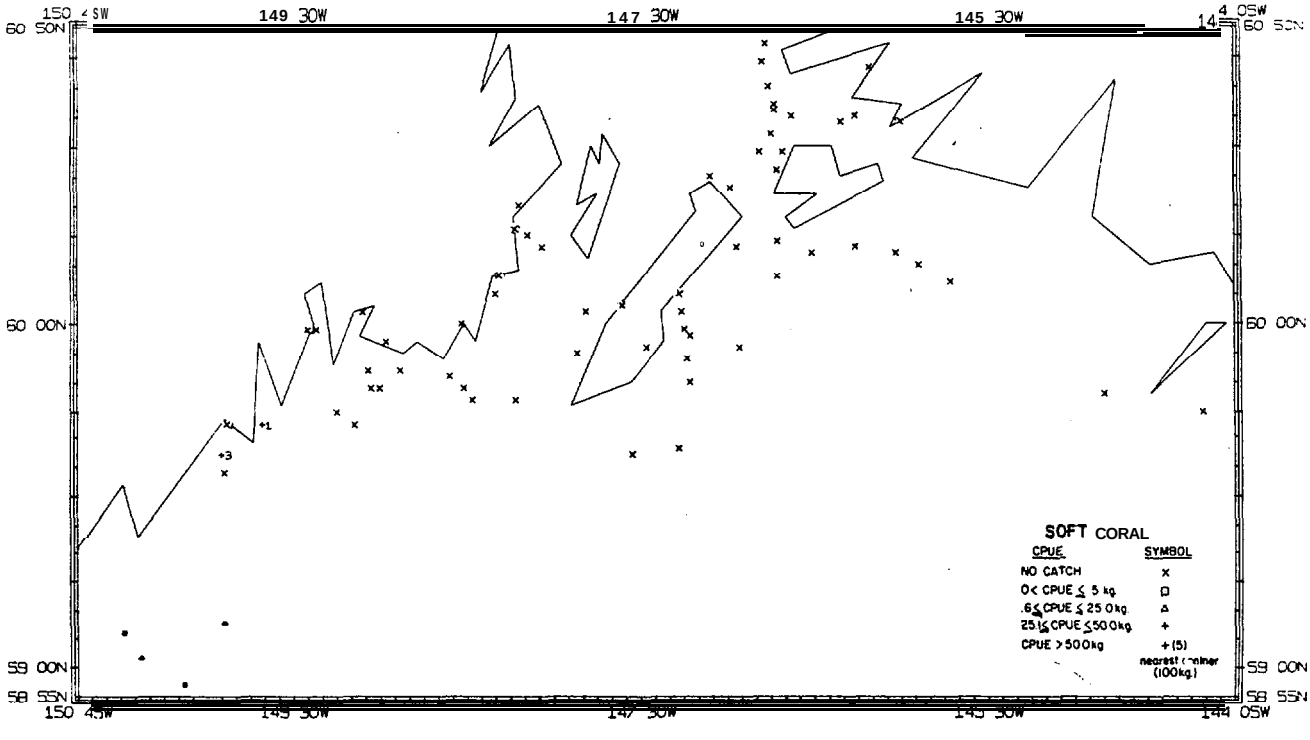
2/ Less than 0.1 percent.





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





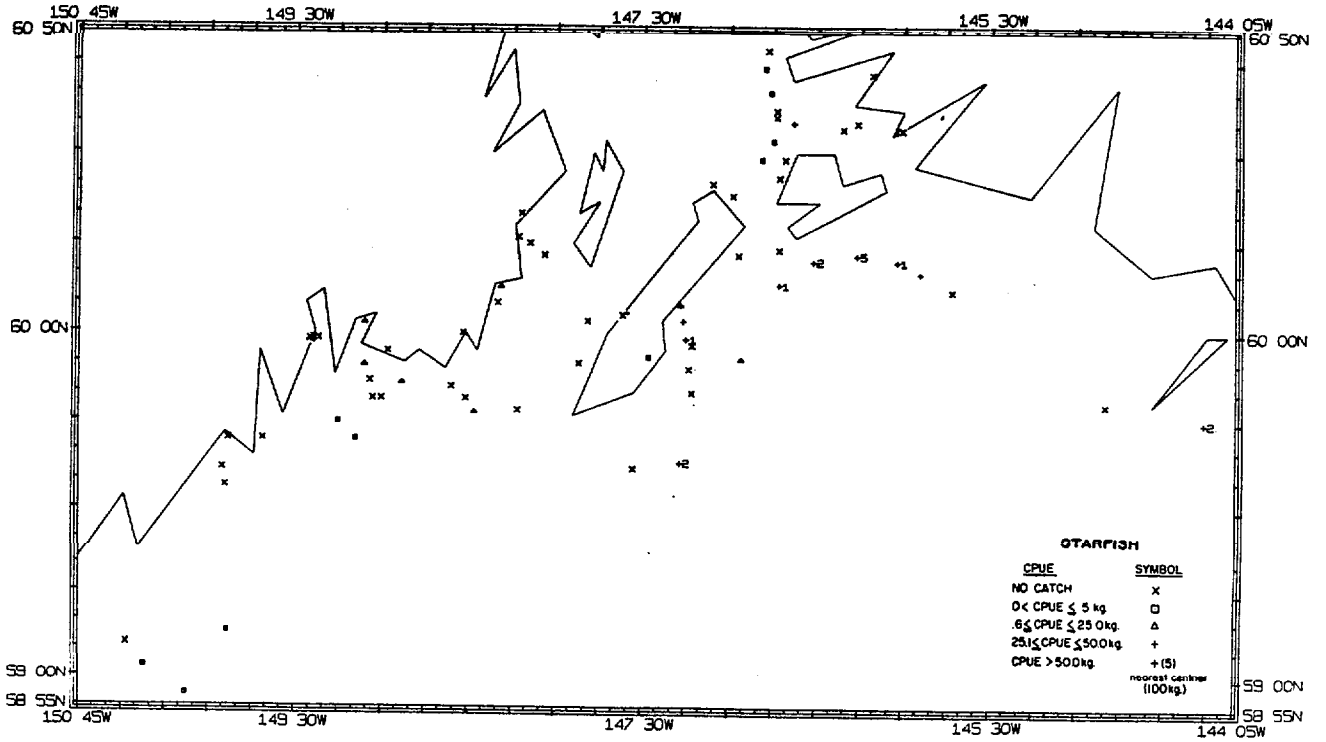
Figures X-142-143.--Distribution of brittlestars and soft coral standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.

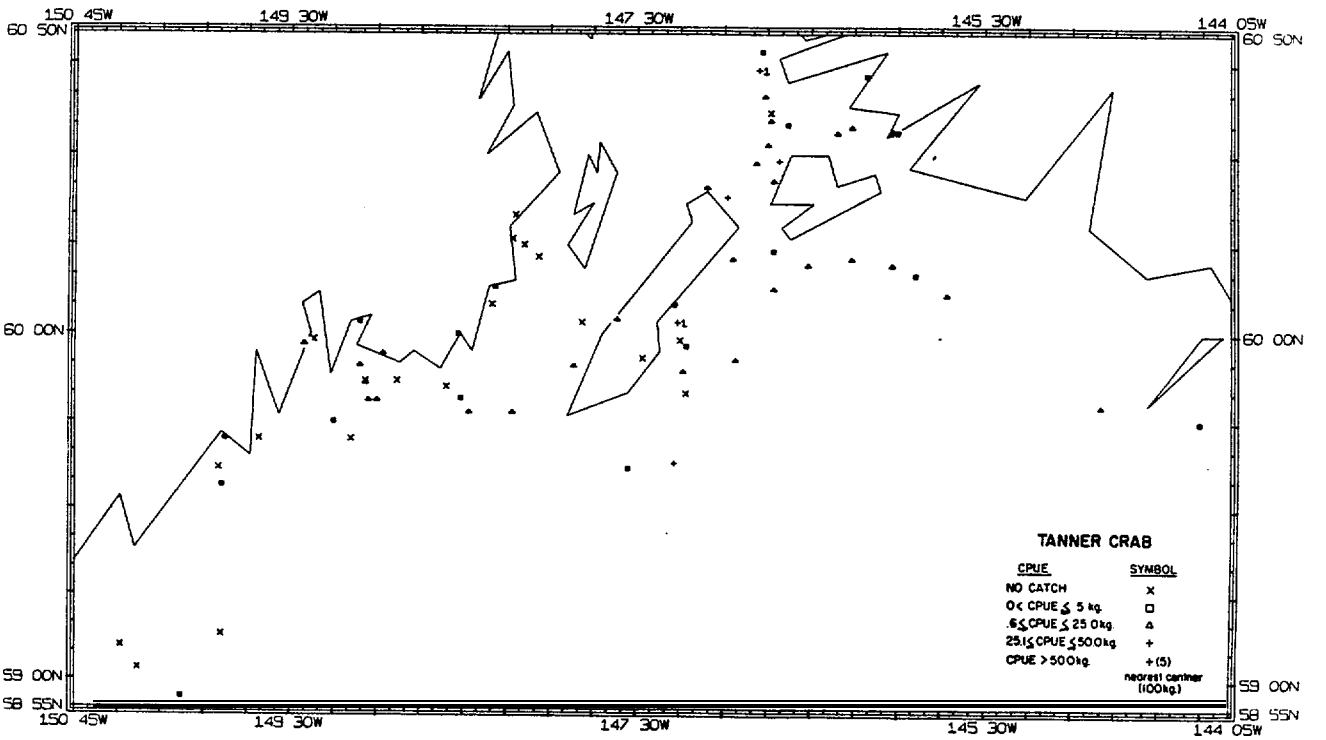
Table X-31.--Mean CPUE's for species other than pandalid shrimps which averaged over 10 kg/hr during exploratory shrimp cruises in the Gulf of Alaska from 1962-1970.

		'1 - LOOM.		101 - 200 M.		201 - 400 M.	
Cruise	Species	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
		26.7	87.6	313.6	65.6	215.6	85.7
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
		39.7	14.1	70.7	20.5	21.8	27.8
642	Starfish	0.7	2/	1.9	2/	16.3	3.4
	Cottids	6.0	i. 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	2/.	12.5	1.9	13.6	2.8
	Tanner crab	6.6	1 . 2	10.4	1.6	30.3	6.2
		62.7	11.5	168.1	25.2	292.0	60.1
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	1/	2/	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
		84.9	11.4	864.4	54.2	211.5	71.8
703	Walieye 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	2/
		97.4	27.1	158.0	32.7	29.4	25.2

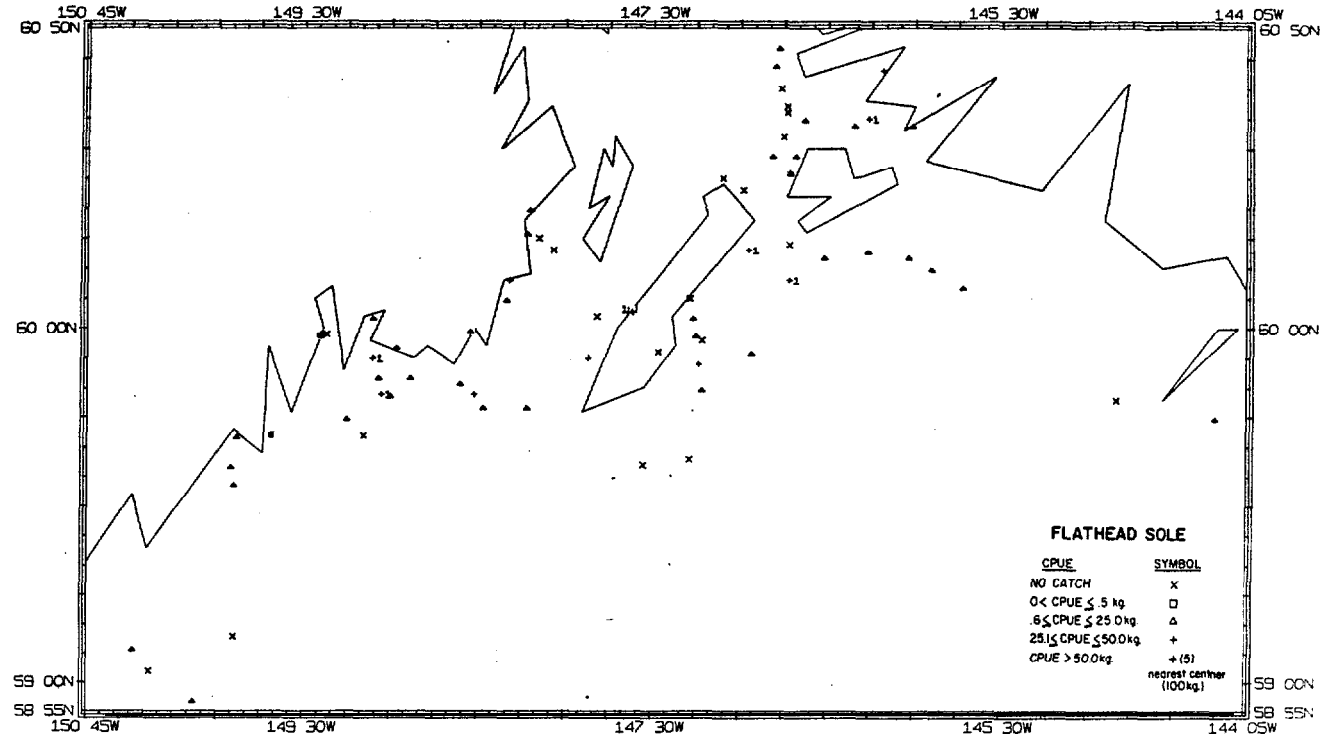
1/ Less than 0.1 kg/hr

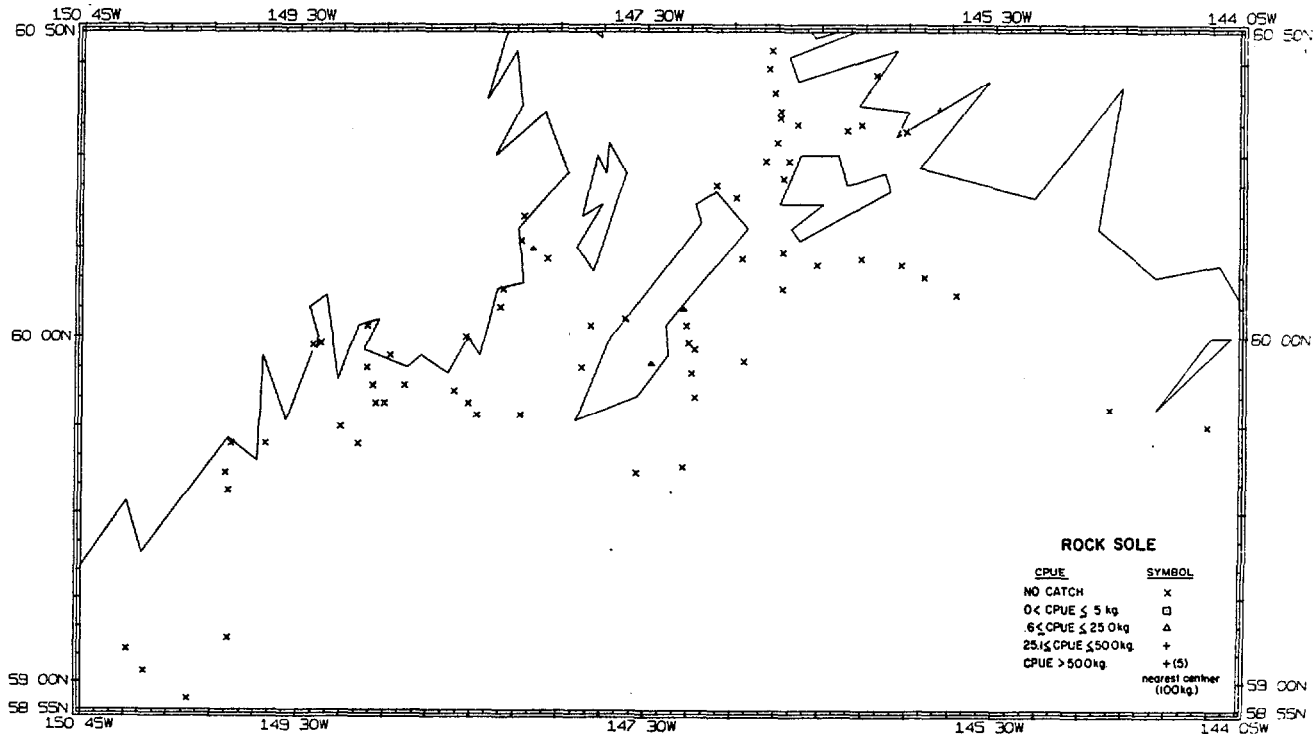
2/ Less than 0.1 percent





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.

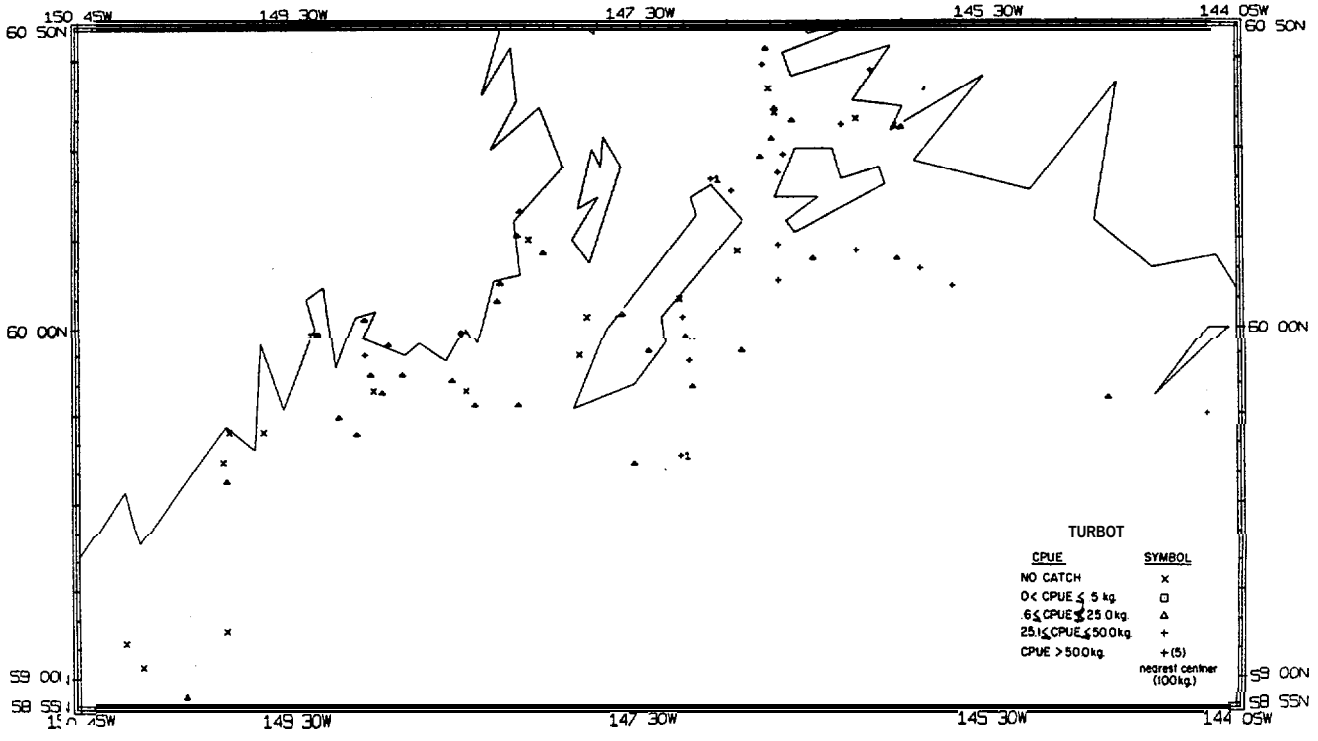
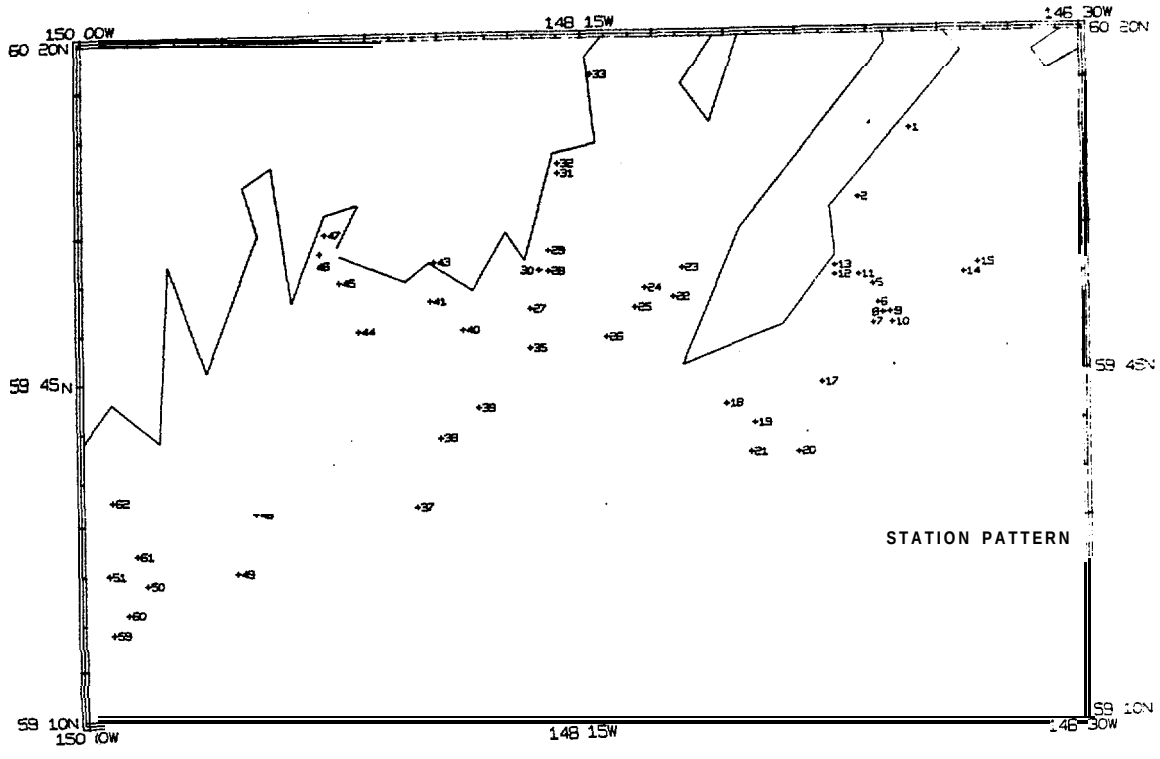


Figure X-148.--Distribution of turbot standardized catch rates in kg/hr, during cruise 622, charter vessel Yaquina.

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.



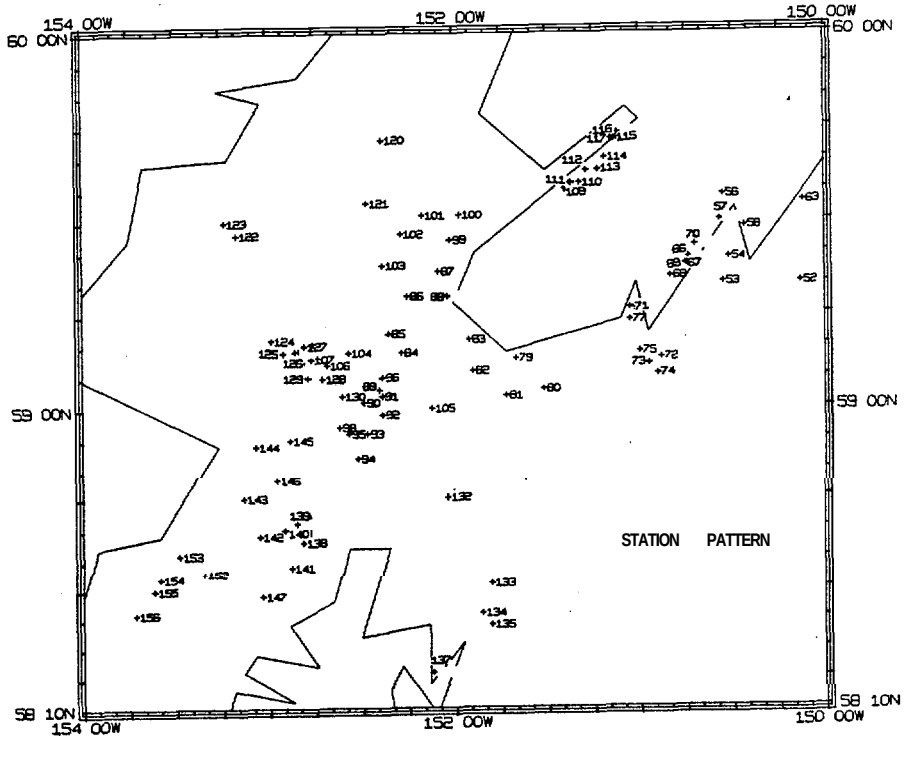


Figure X-149.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel Yaquina.

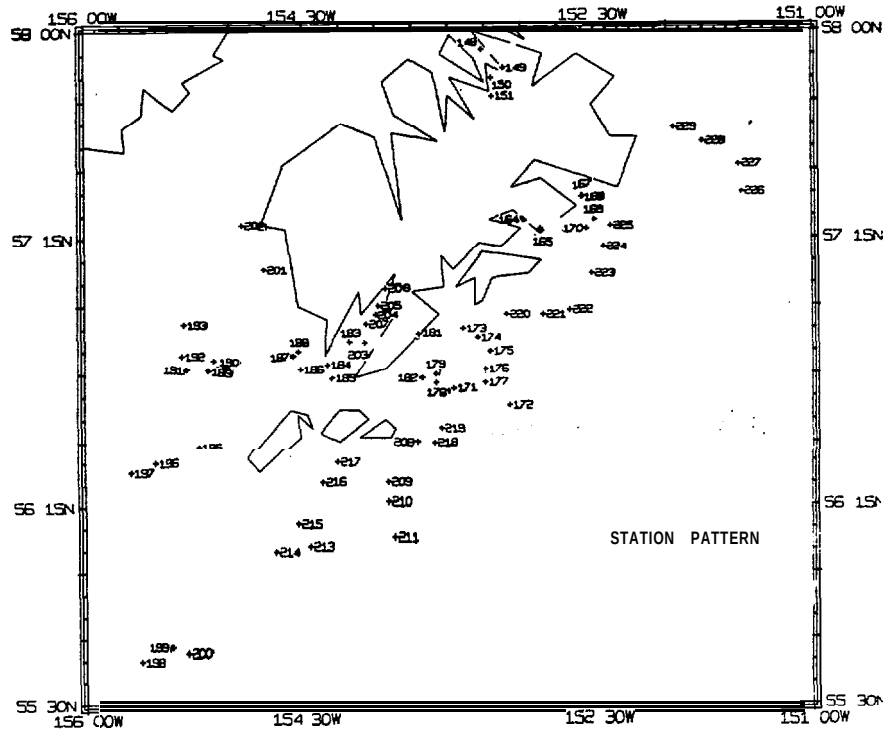


Figure X-150.--Stations successfully trawled (shrimp trawl) during cruise 632, charter vessel Yaquina.

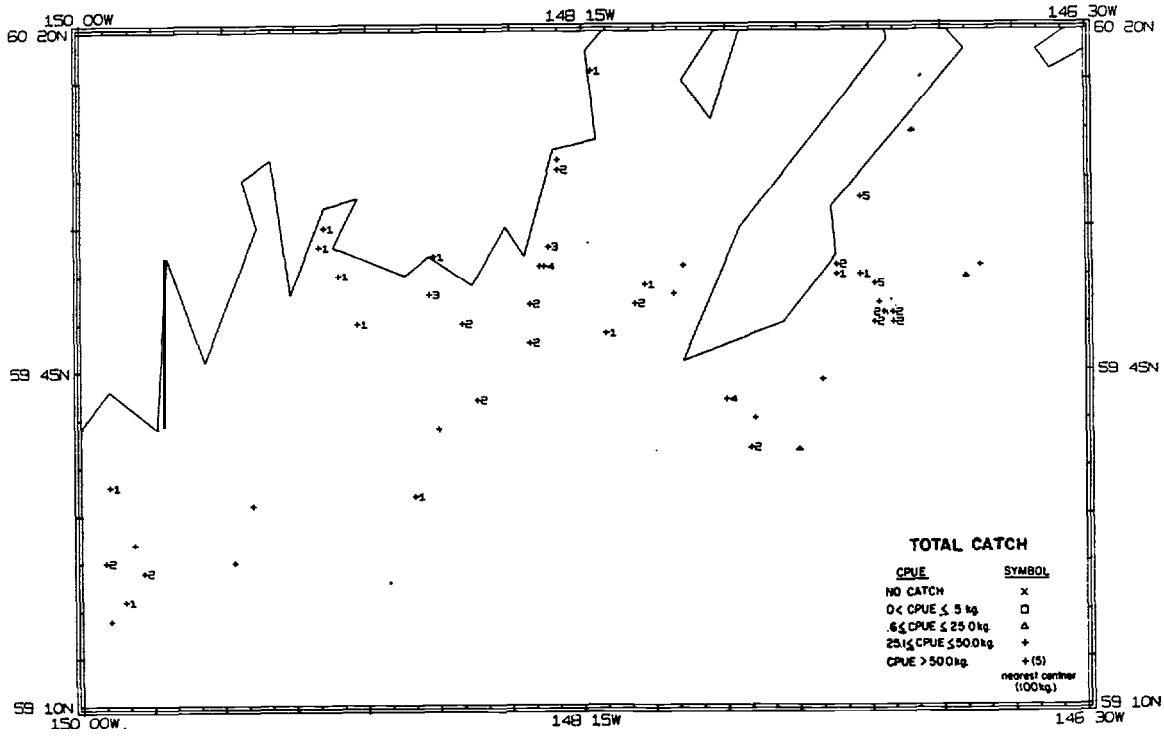
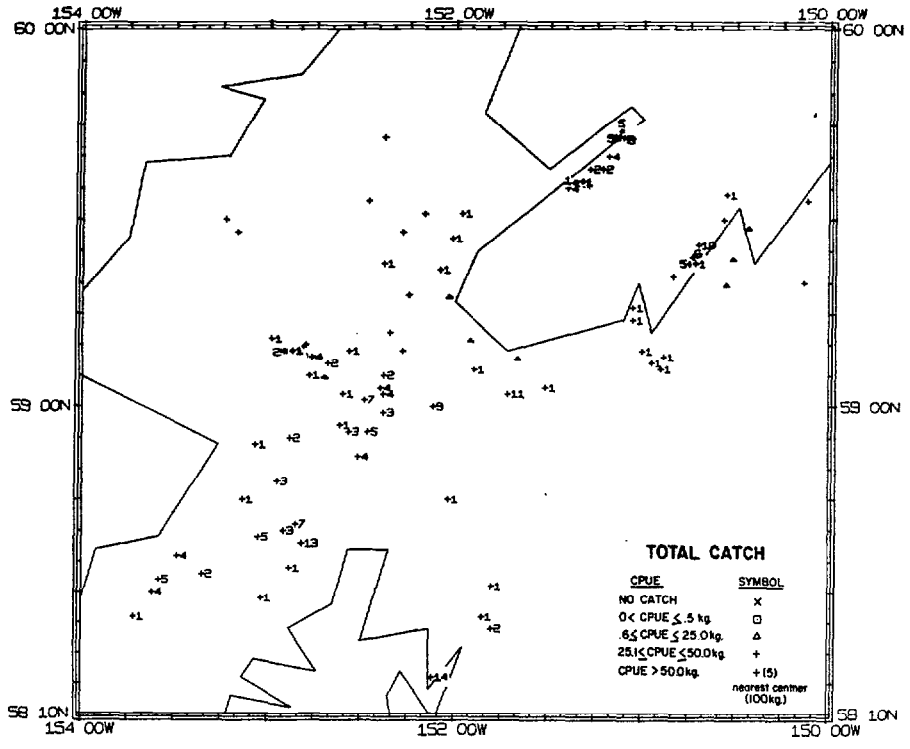


Figure X-151.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 632, charter vessel Yaquina.



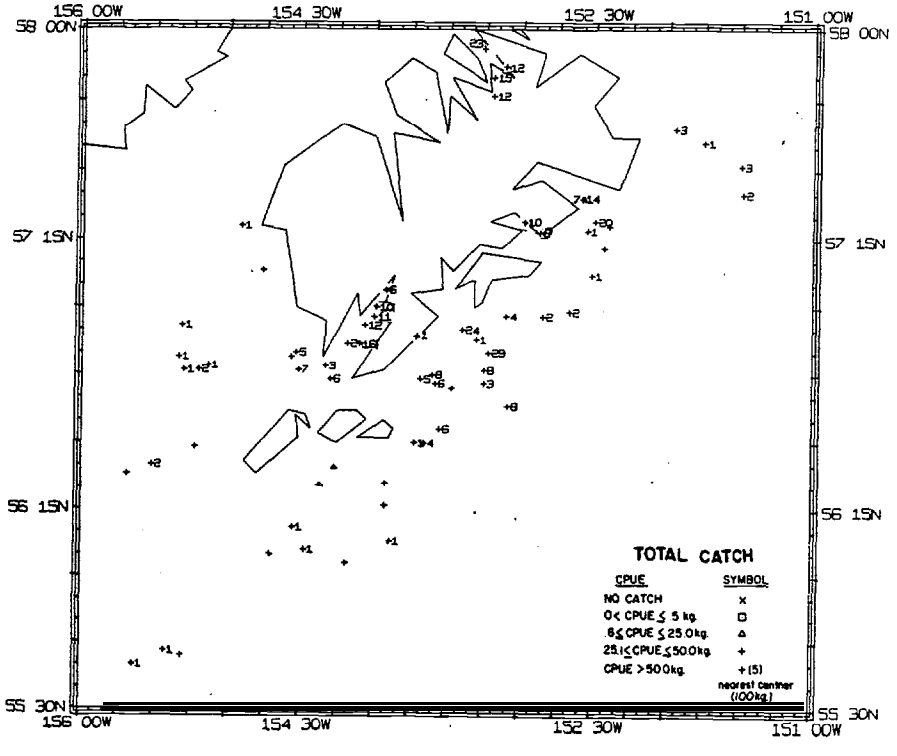
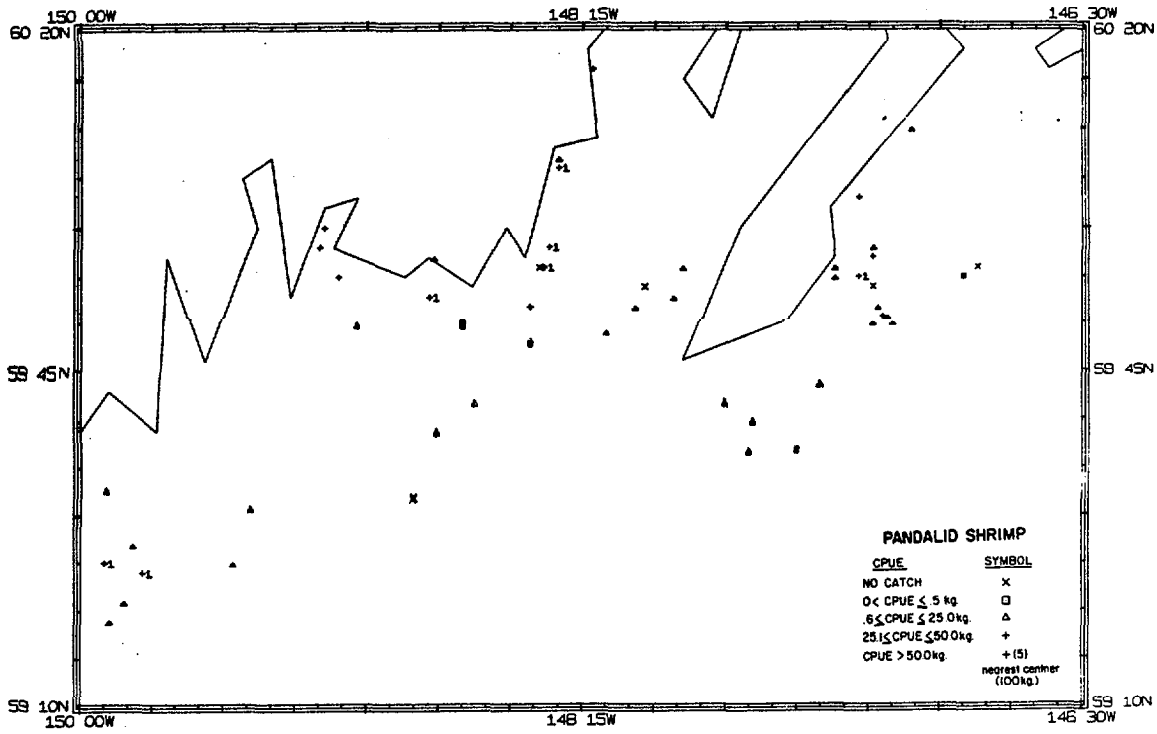
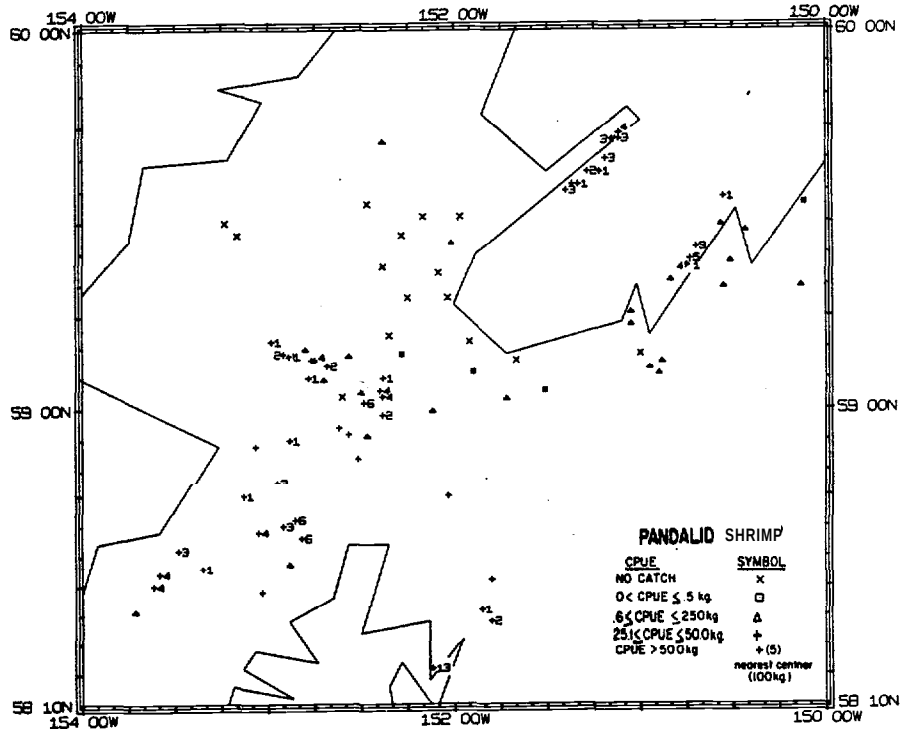


Figure X-152.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 632, charter vessel Yaquina.

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.





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

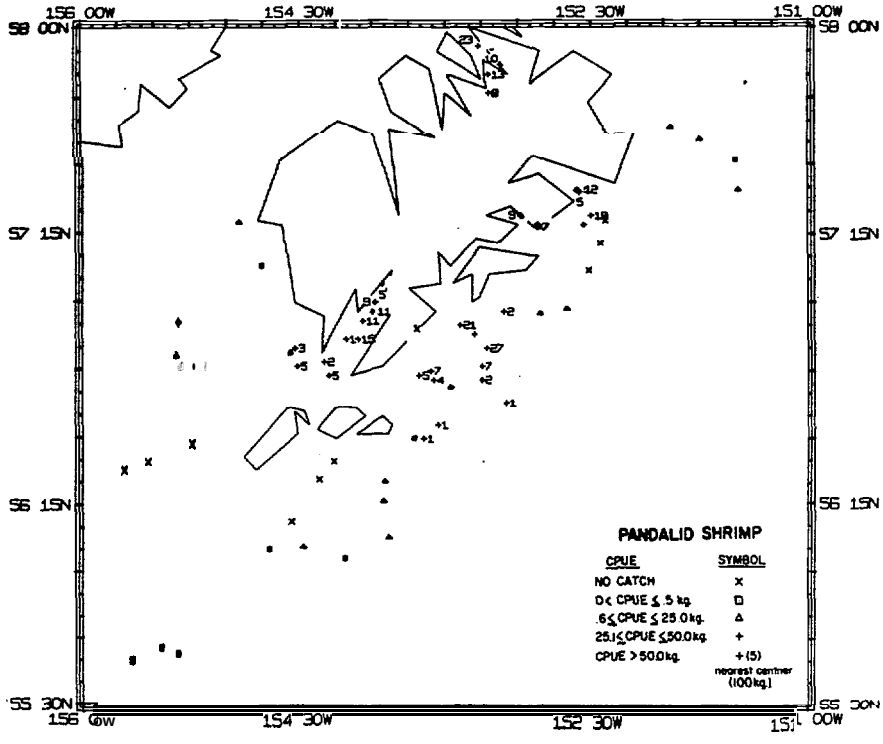


Figure X-154. --Distribution of **pandalid** shrimp standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaauina.

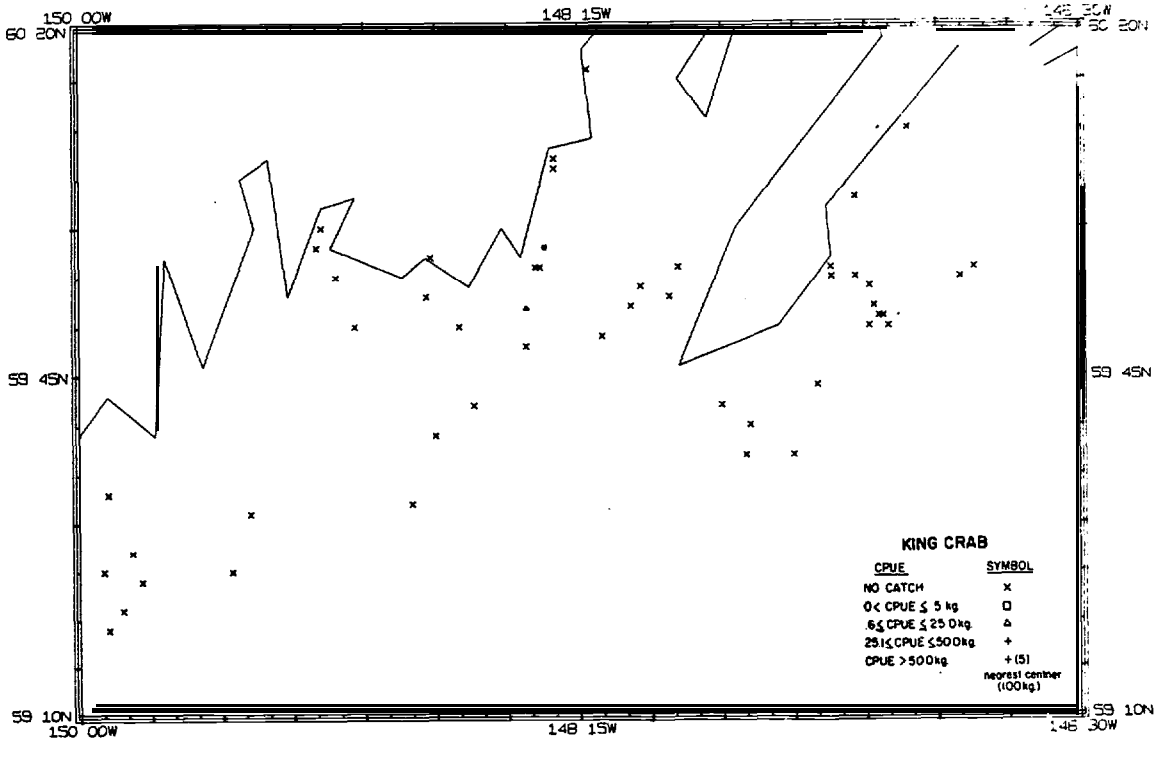
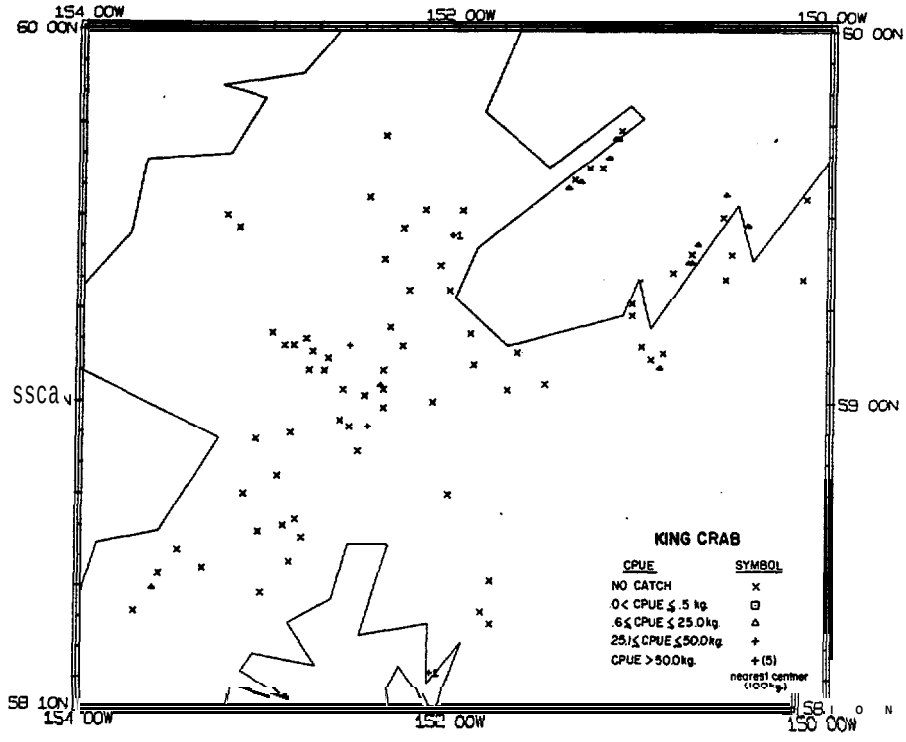


Figure X-155. --Distribution of king crab standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.



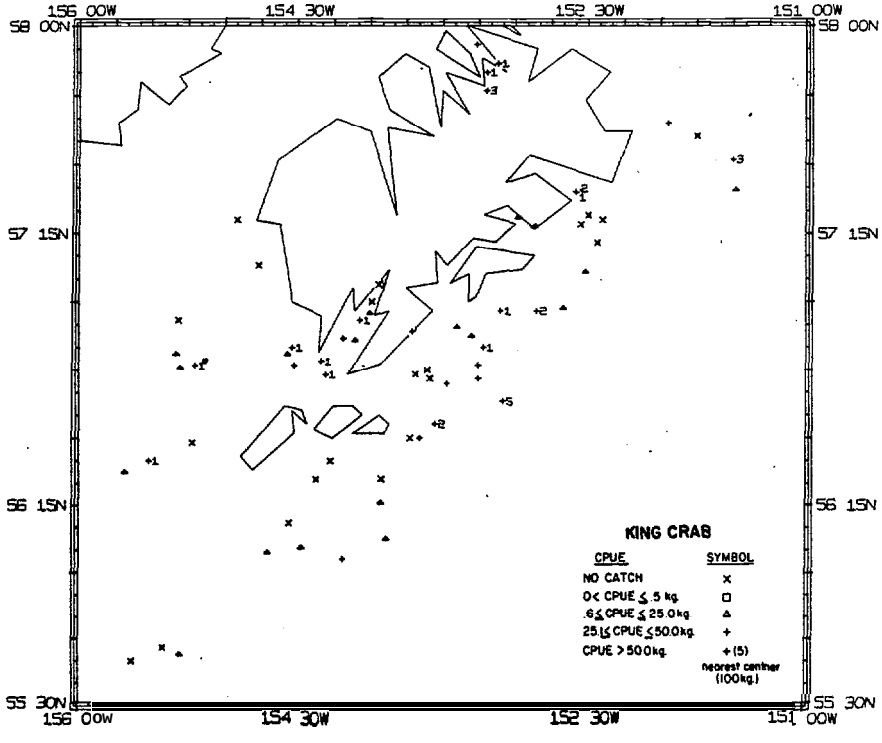
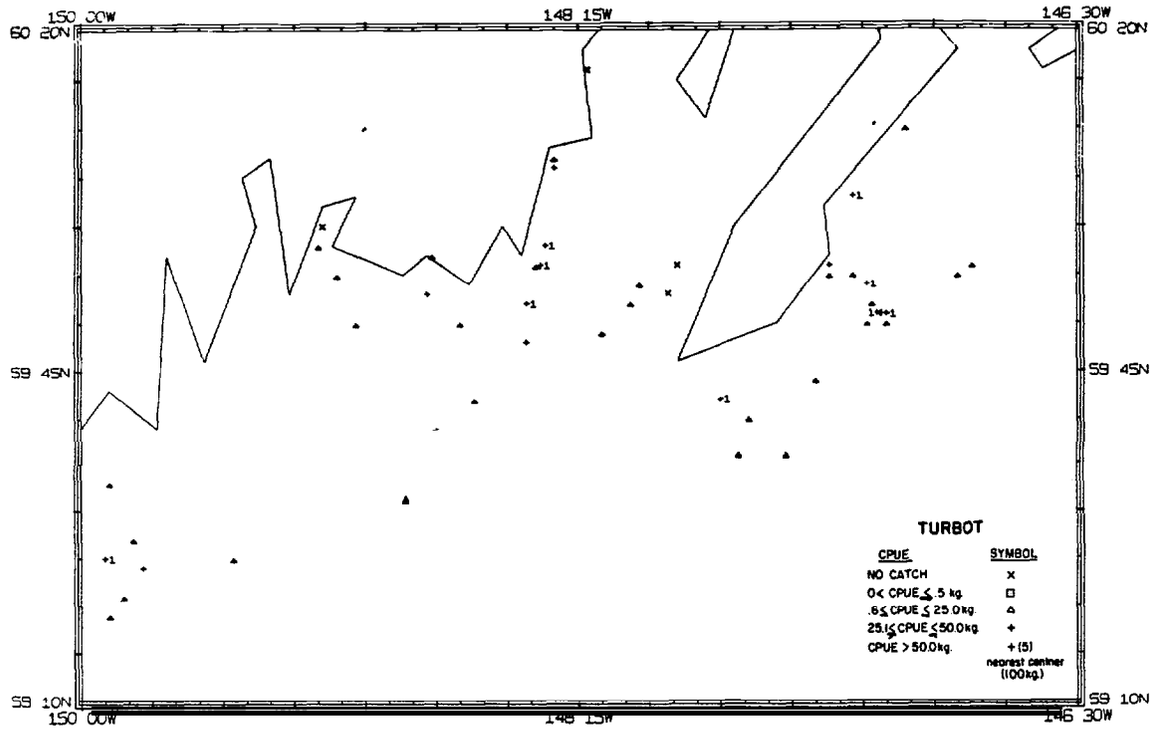


Figure X-156.--Distribution of king crab standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.



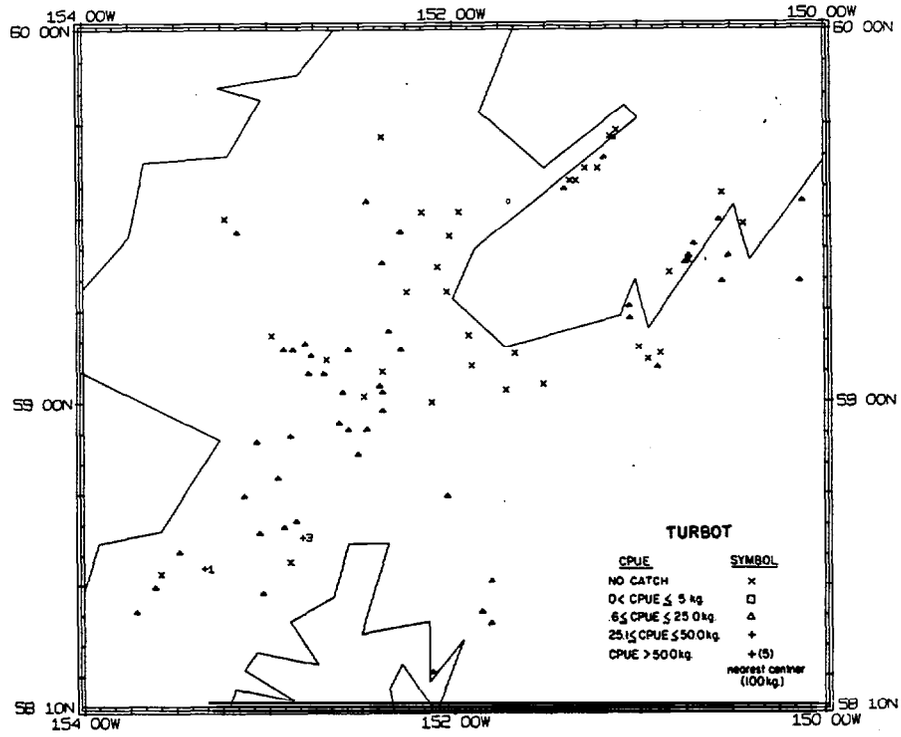


Figure X-157.--Distribution of turbot standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.

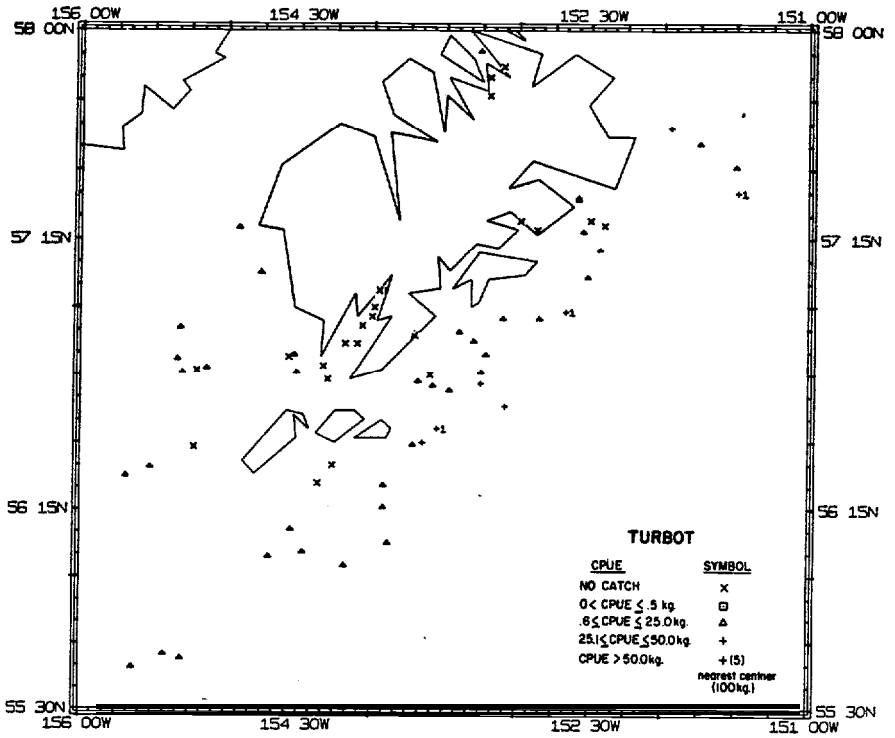


Figure X-158.--Distribution of turbot standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.

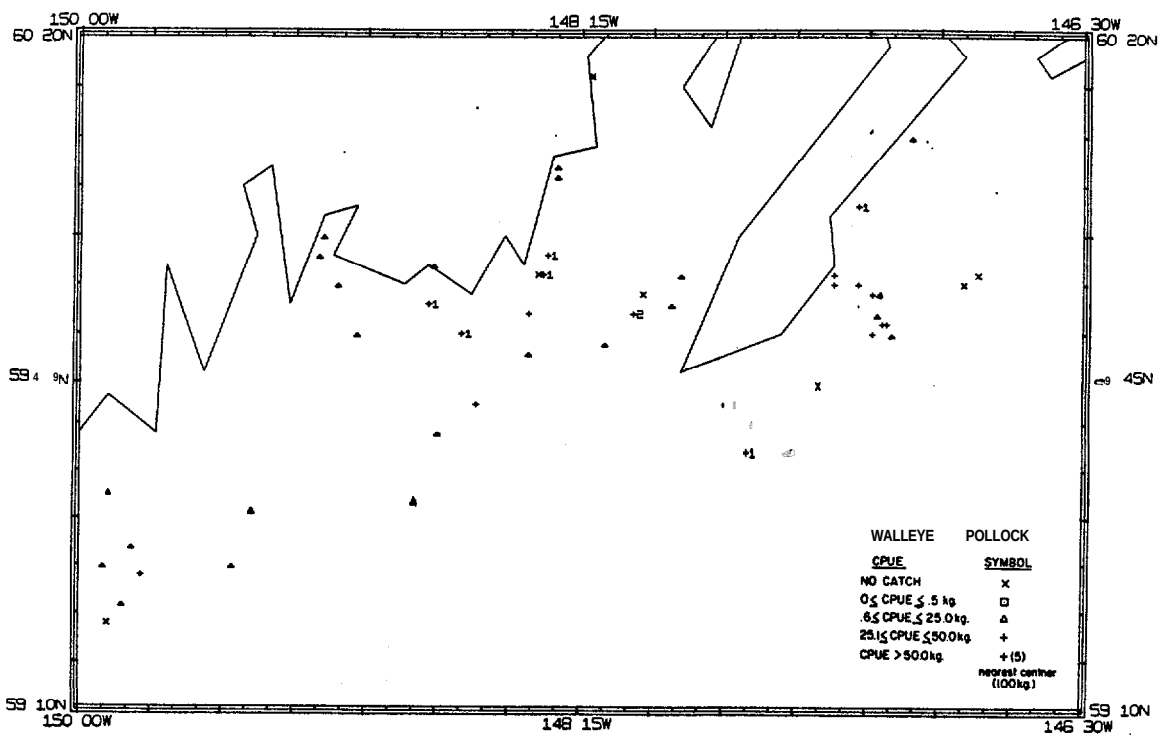
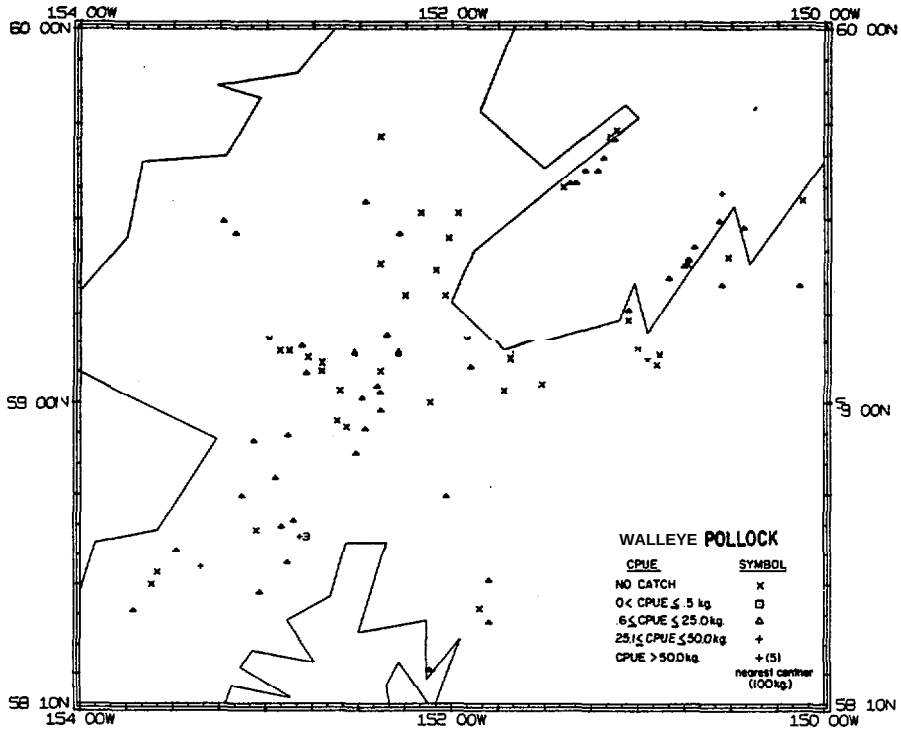


Figure X-159.--Distribution of walleye pollock standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.



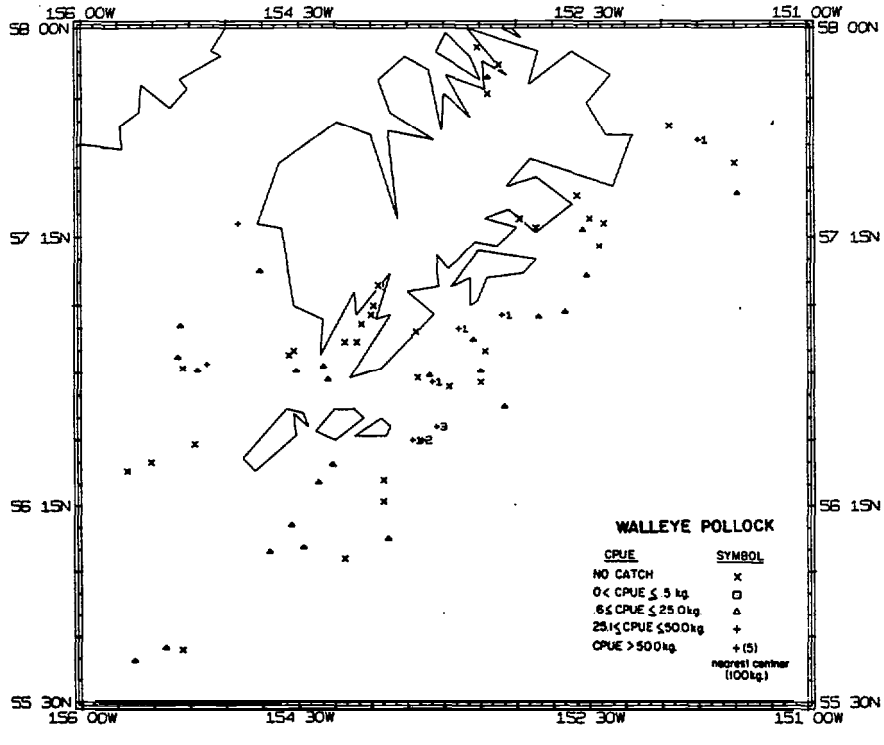
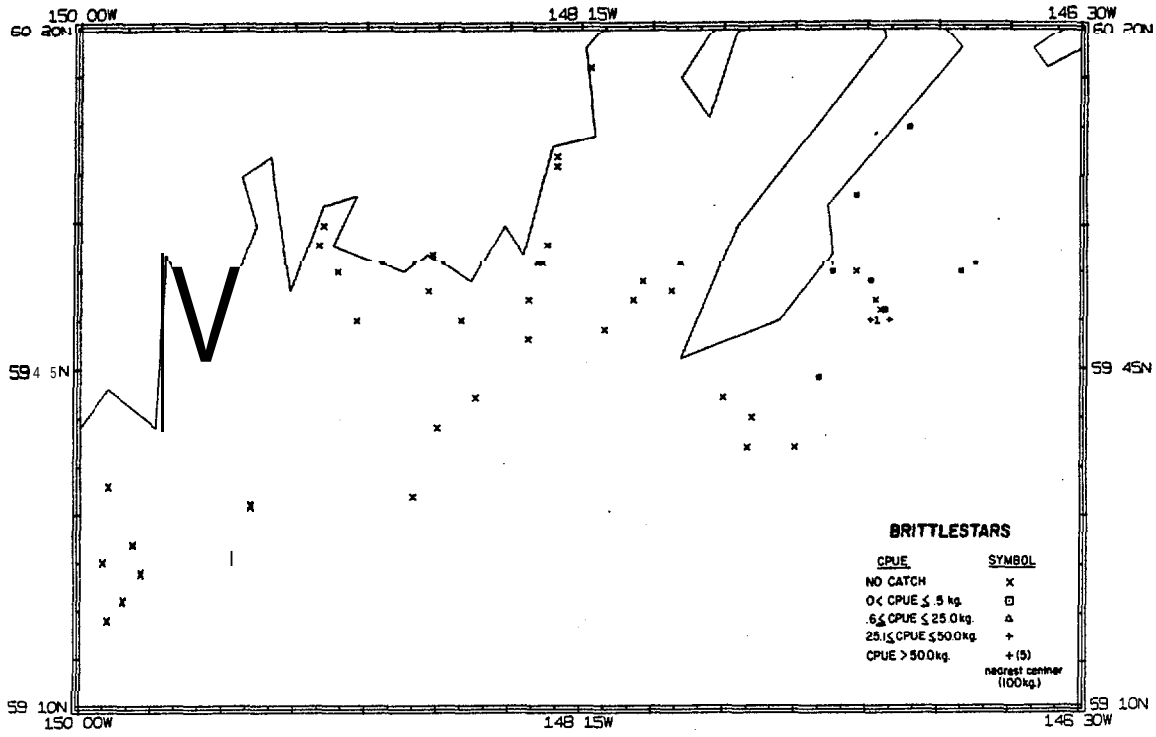


Figure X-160.--Distribution of walleye pollock standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.



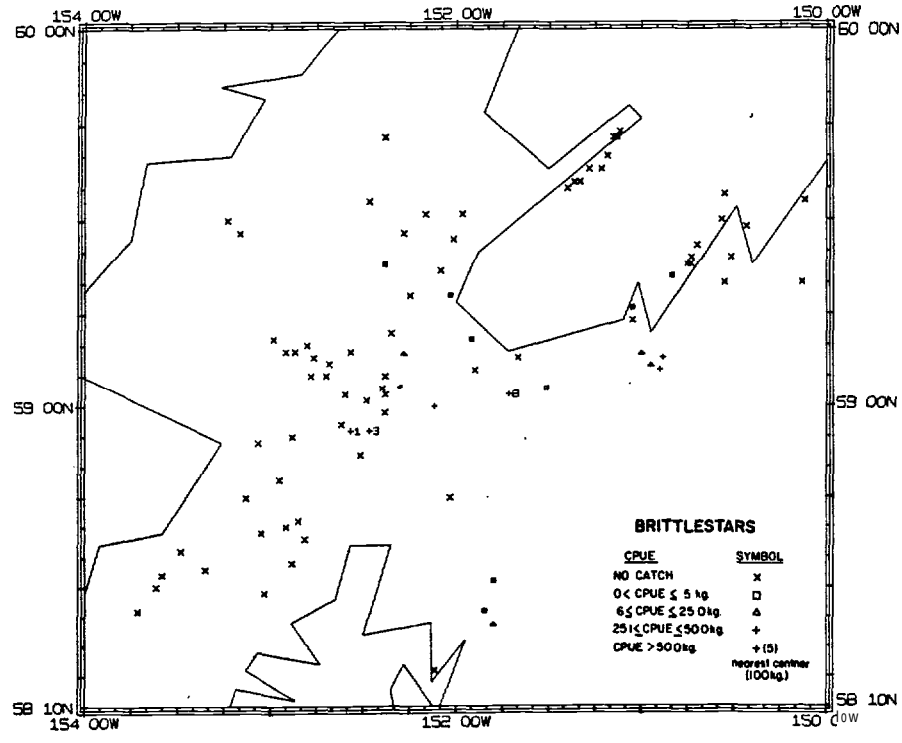


Figure X-161.--Distribution of brittlestars standardized catch rates in **kg/hr** during cruise 632, charter vessel Yaquina.

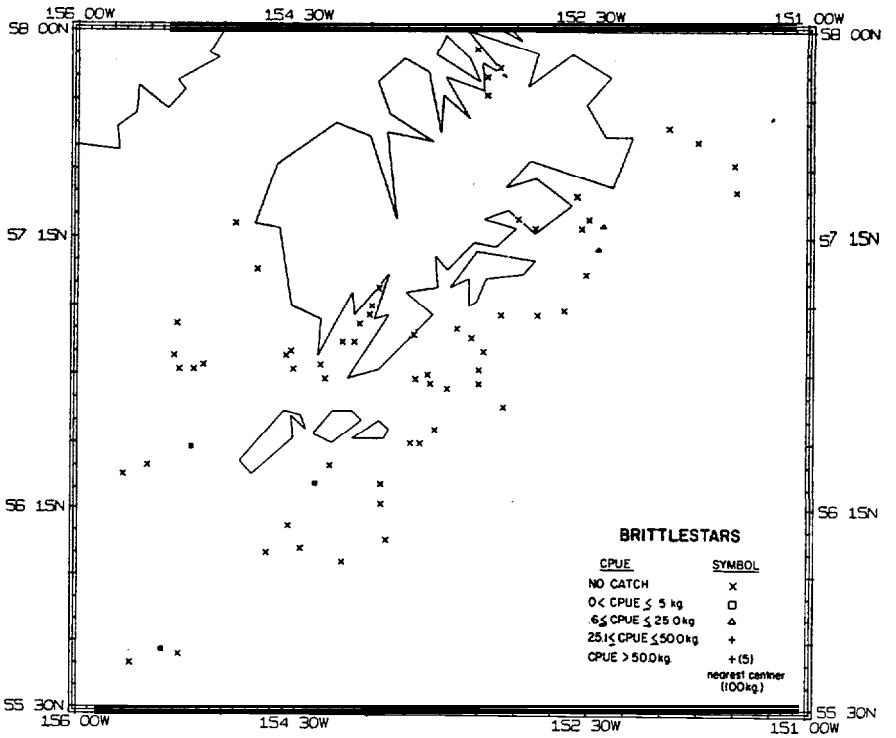


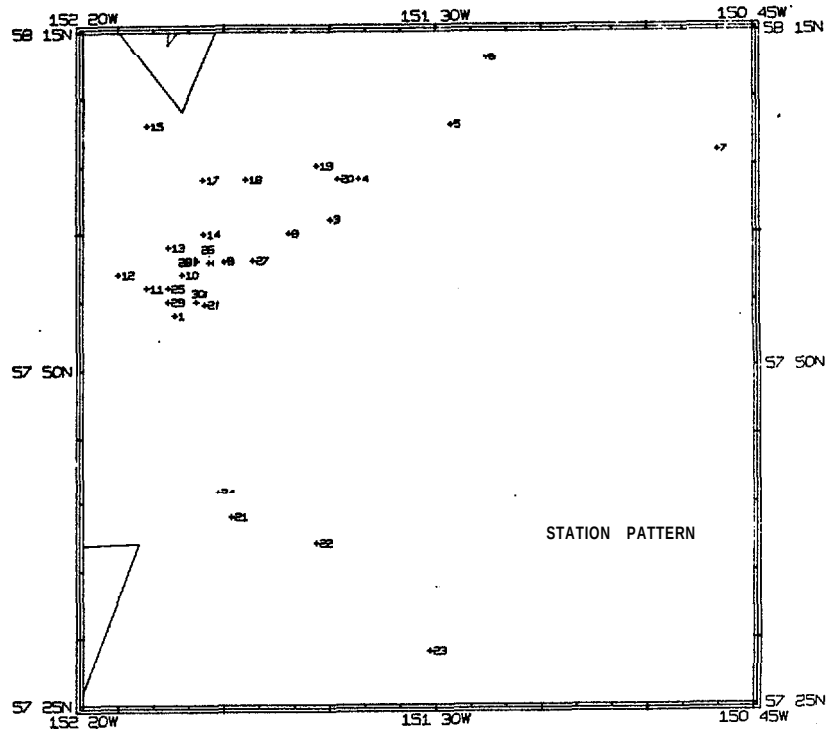
Figure X-162.--Distr .bution of brittlestars standardized catch rates in kg/hr during cruise 632, charter vessel Yaquina.

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' Gulf of Mexico-type flat shrimp trawl and 70' 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, Kuiukta 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 slope. Large 'catches of pandalid shrimp (over 1,000 kg/hr) occurred in Marmot Bay, Castle Bay, Kuiukta 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).



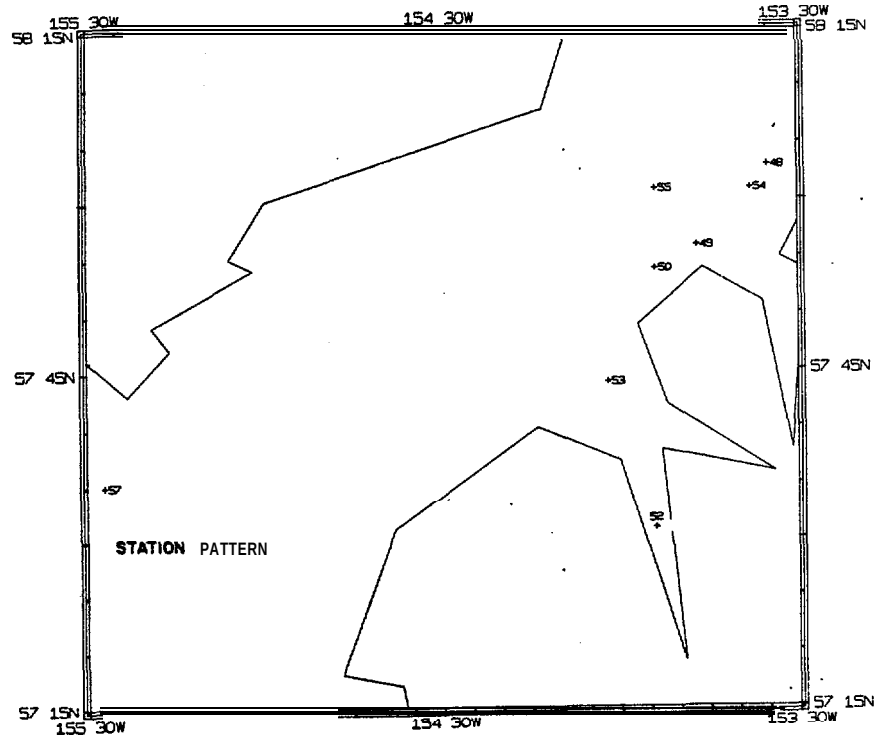
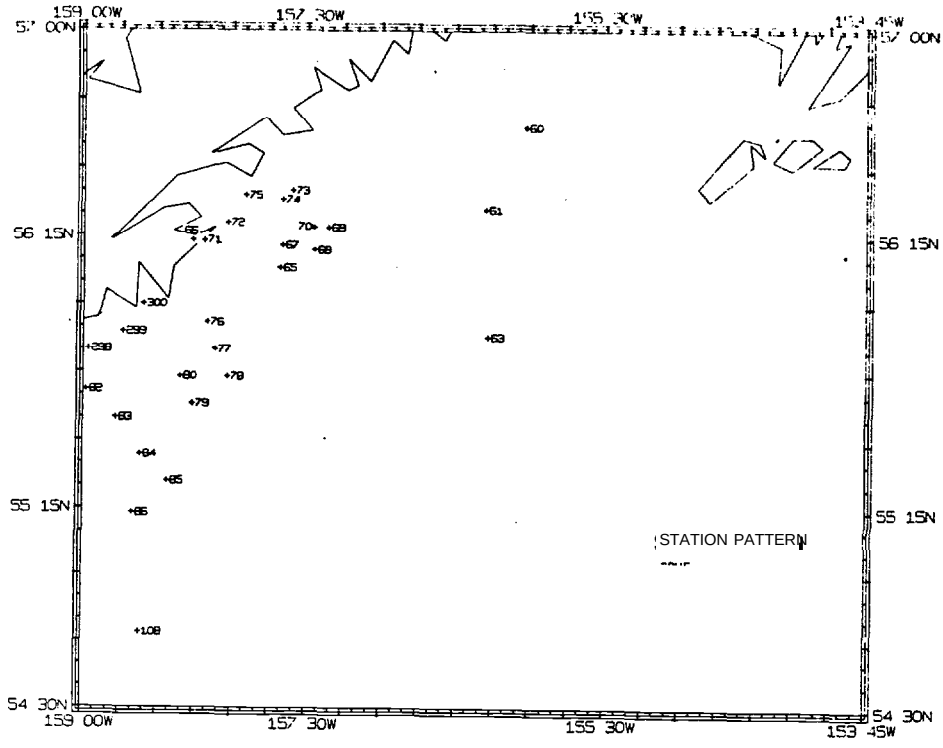


Figure X-163.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel Paragon.



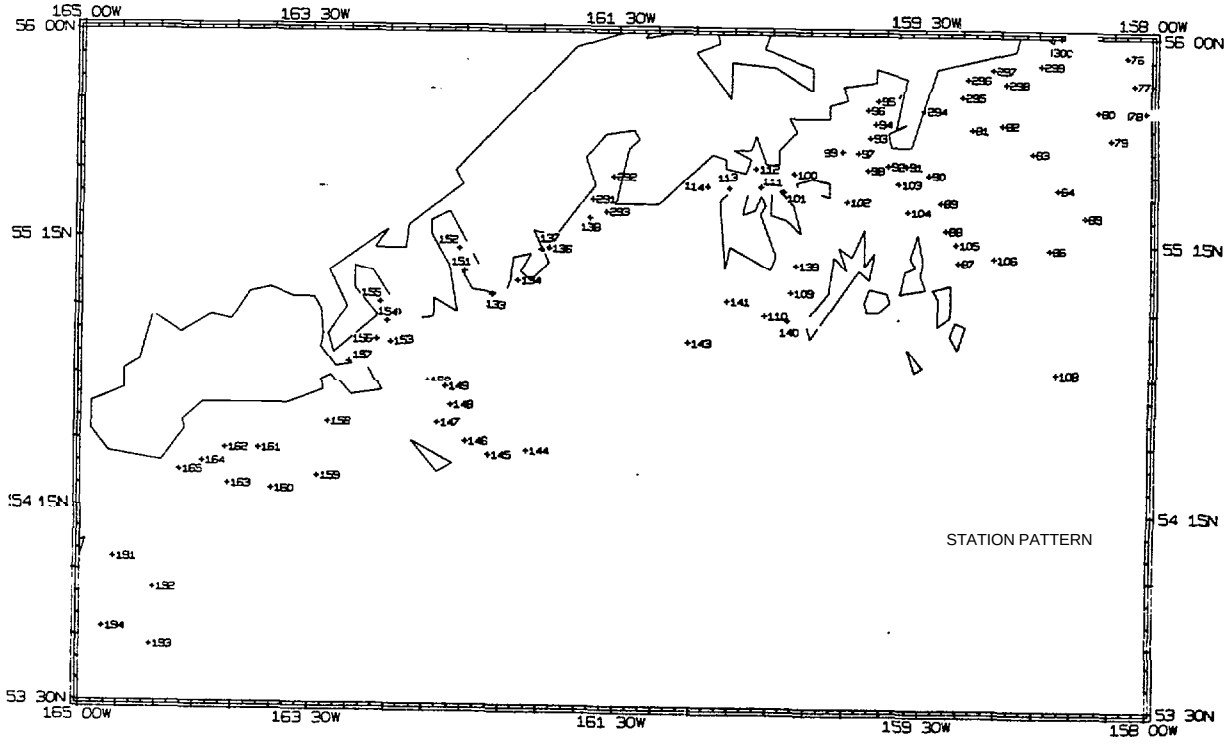
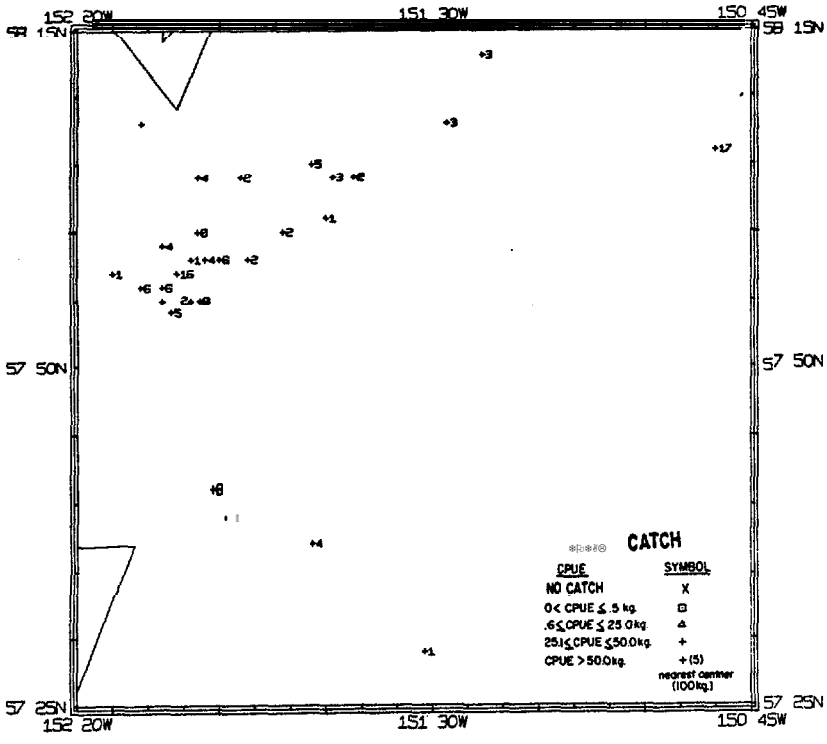


Figure X-164.--Stations successfully trawled (shrimp trawl) during cruise 642, charter vessel Paragon.



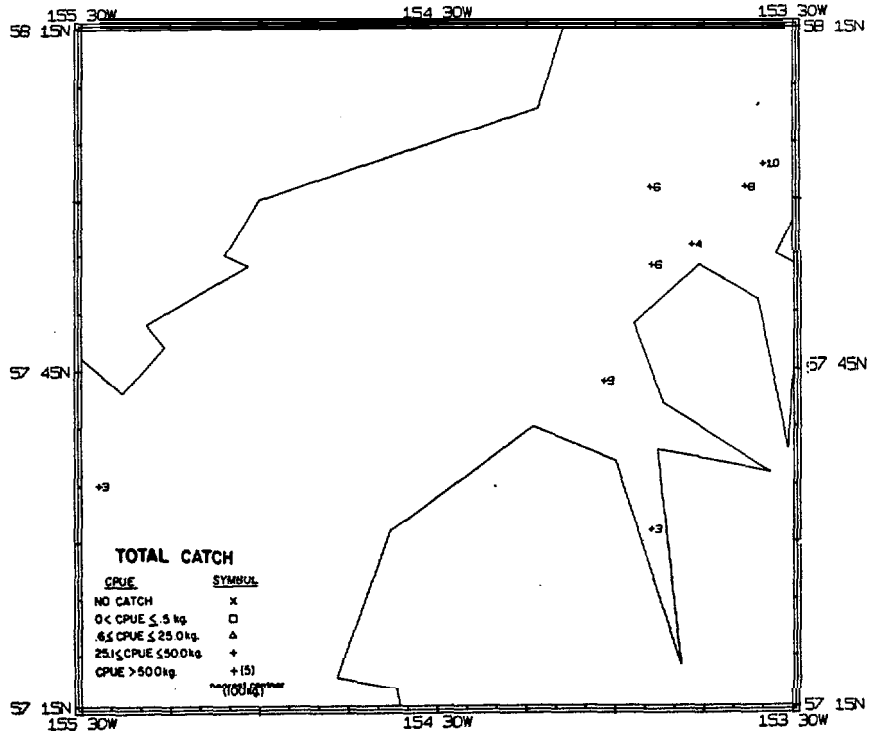
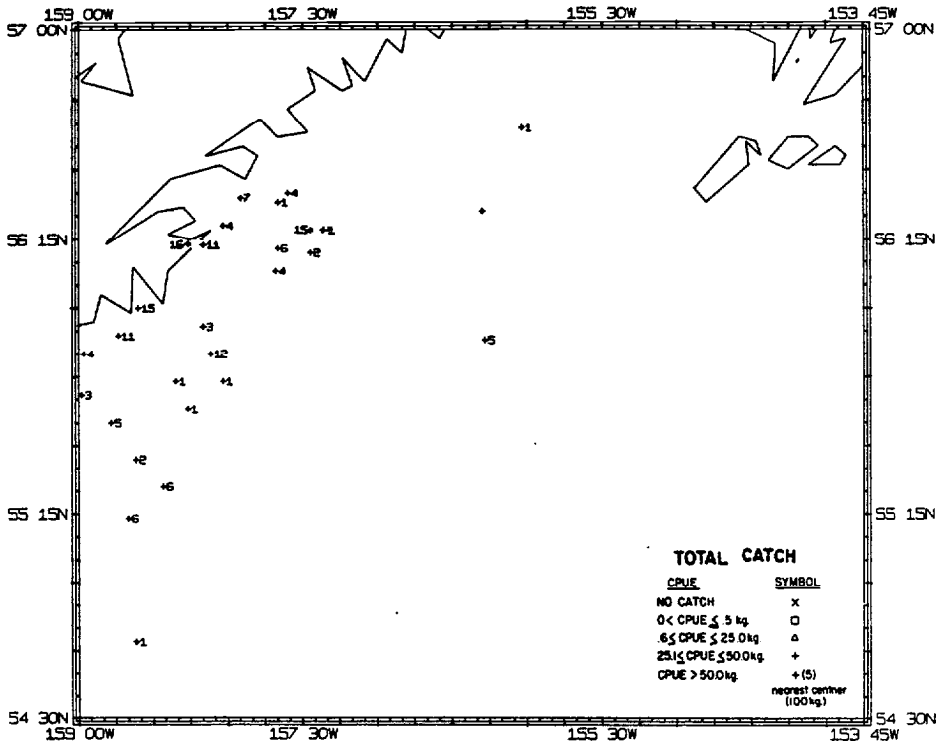


Figure X-165.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise **642,** charter vessel Paragon.



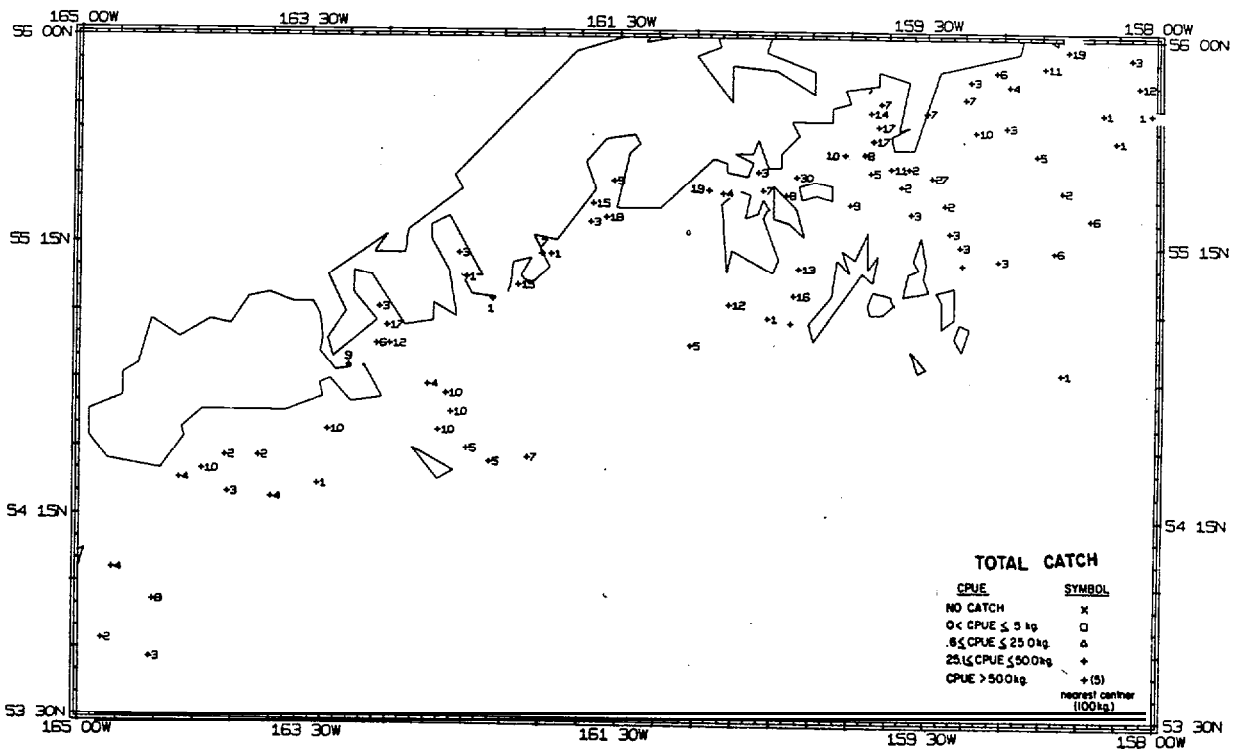
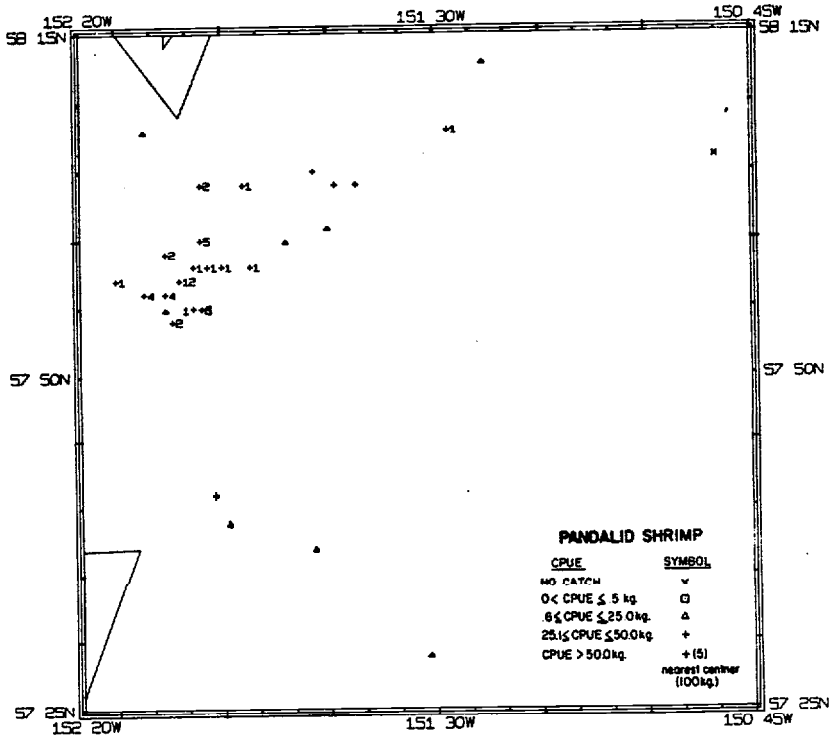


Figure X-166.--Distribution of standardized catch rates, all species combined in **kg/hr,** during cruise 642, charter vessel Paragon.

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.



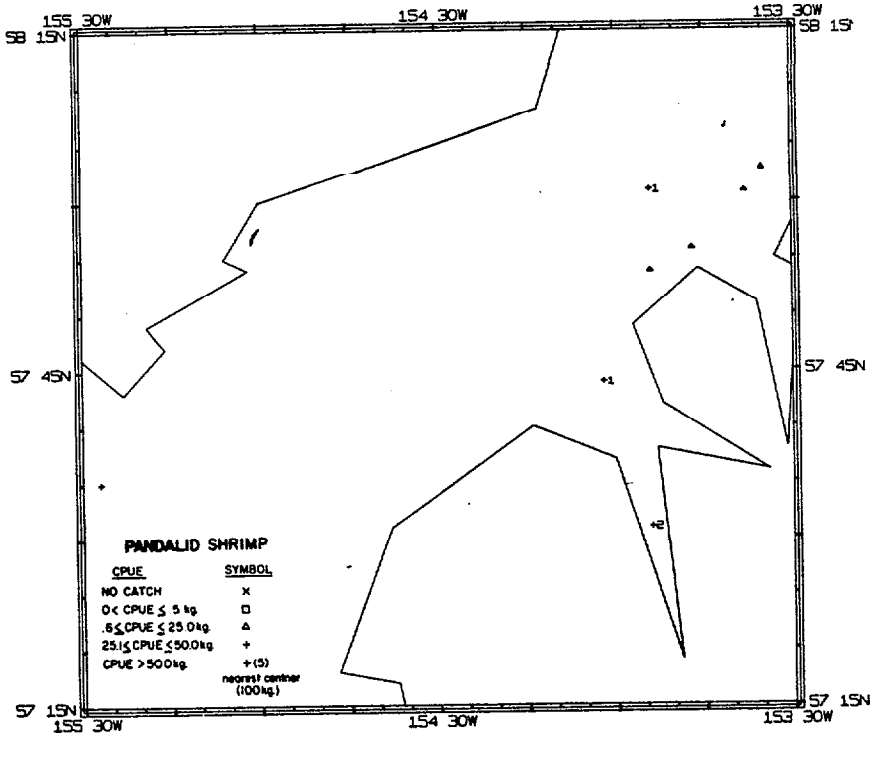
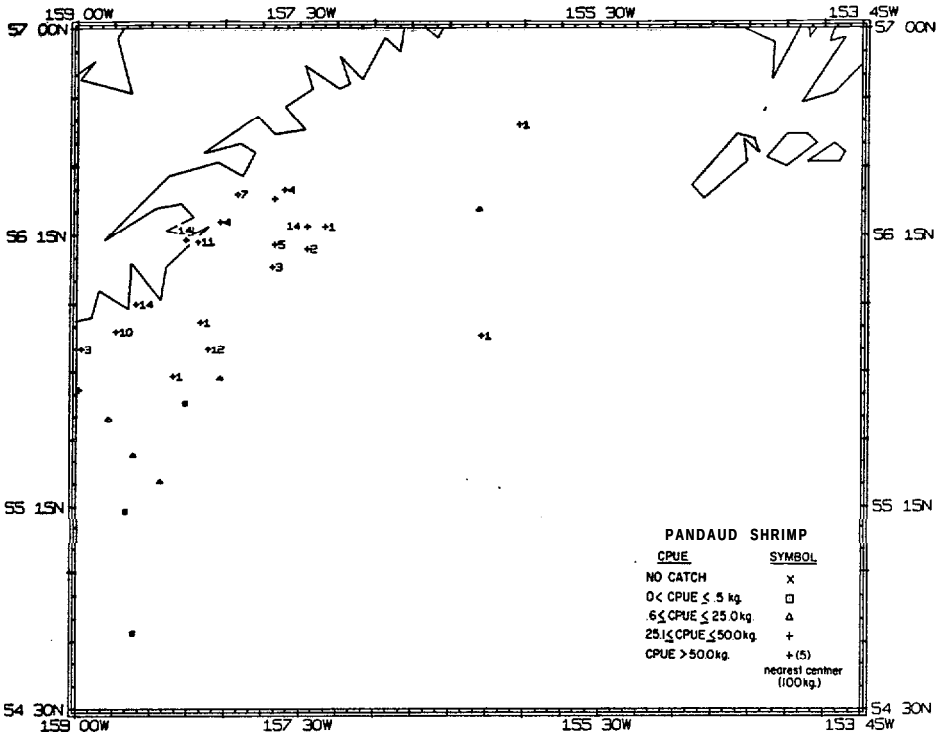


Figure X-167.--Distribution of **pandalid** shrimp standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



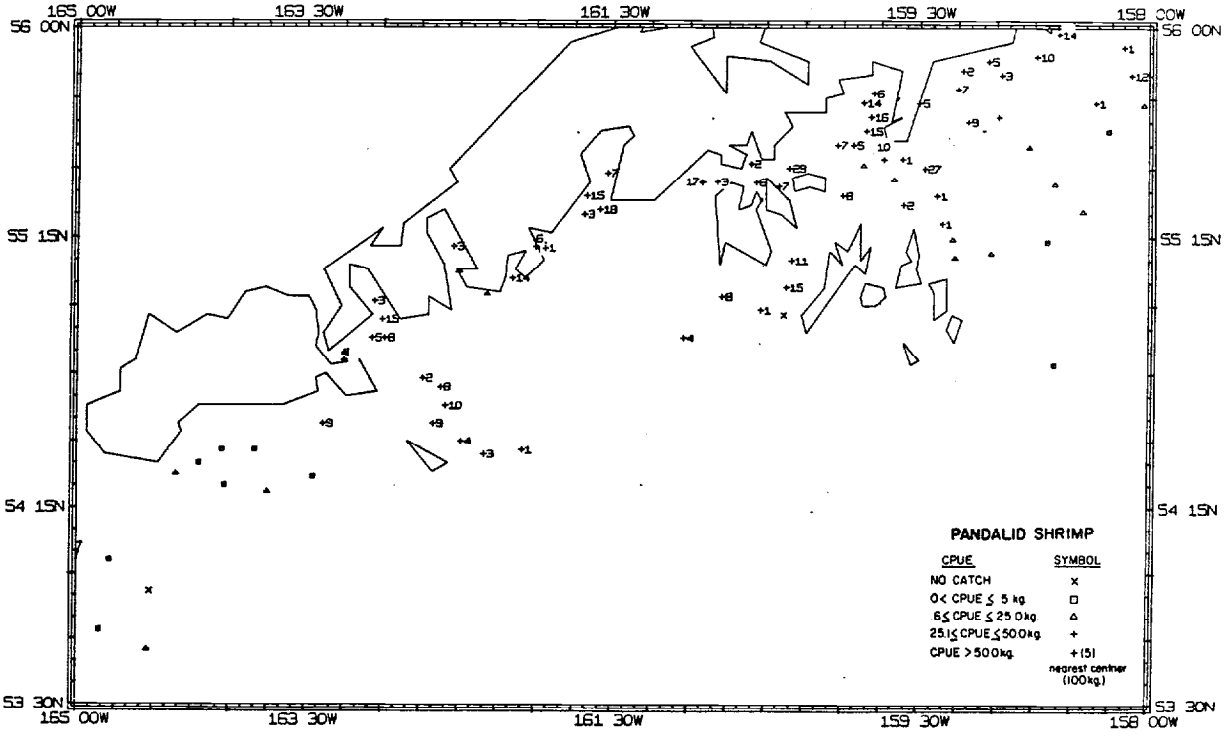


Figure X-168.--Distribution of pandalid shrimp standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

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.

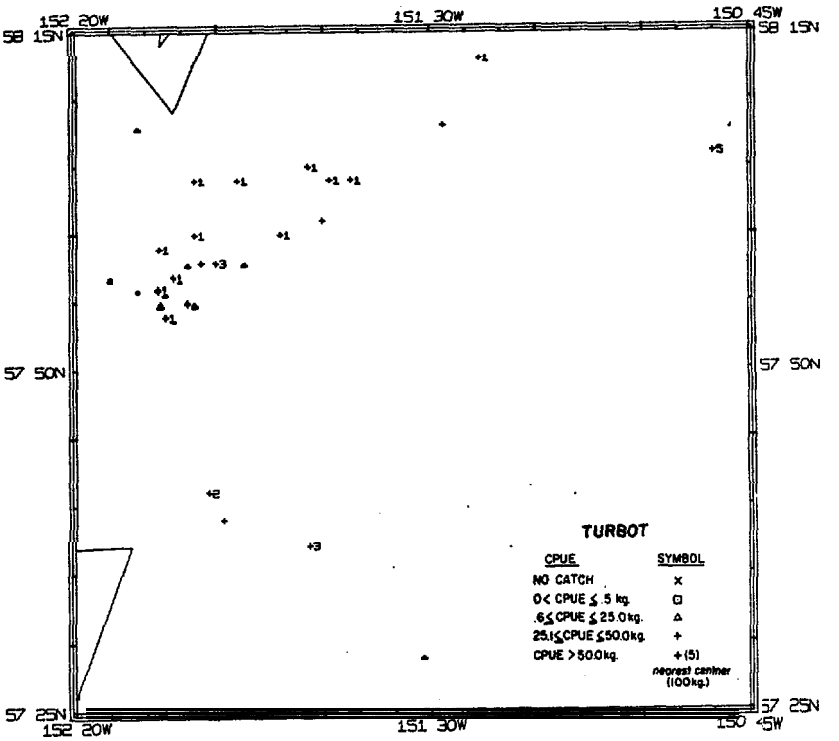
i. Cruise 682, R/V John R. Manning (July-September 1968)

An exploratory shrimp cruise was conducted by BCF in the Kodiak and Shelikof regions. Seventy-nine stations were attempted with a 65' 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 of 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.



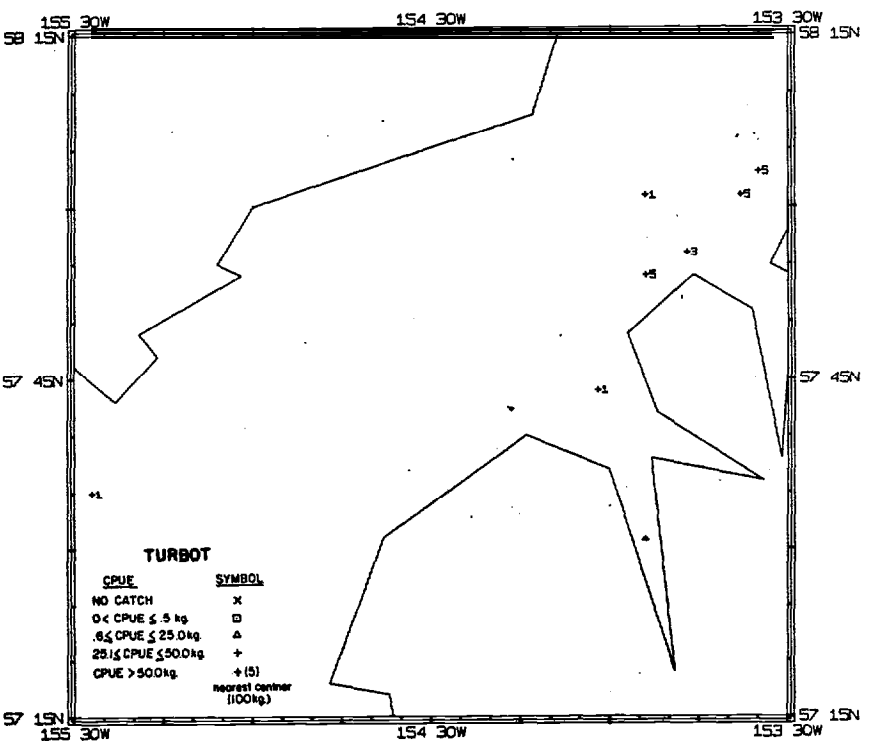
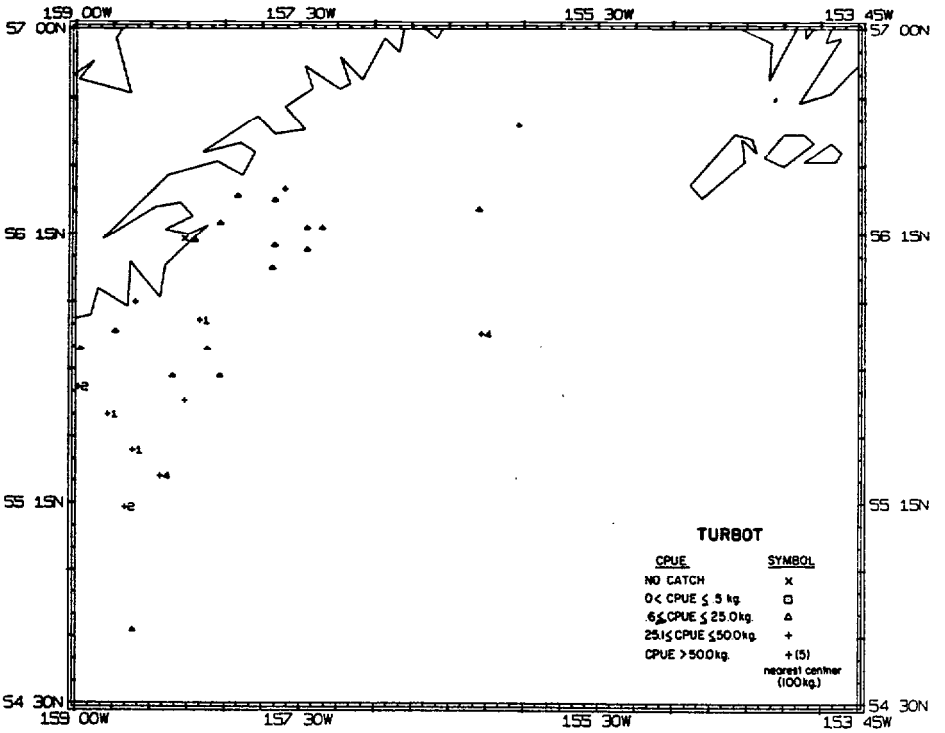


Figure X-169.--Distribution of turbot standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



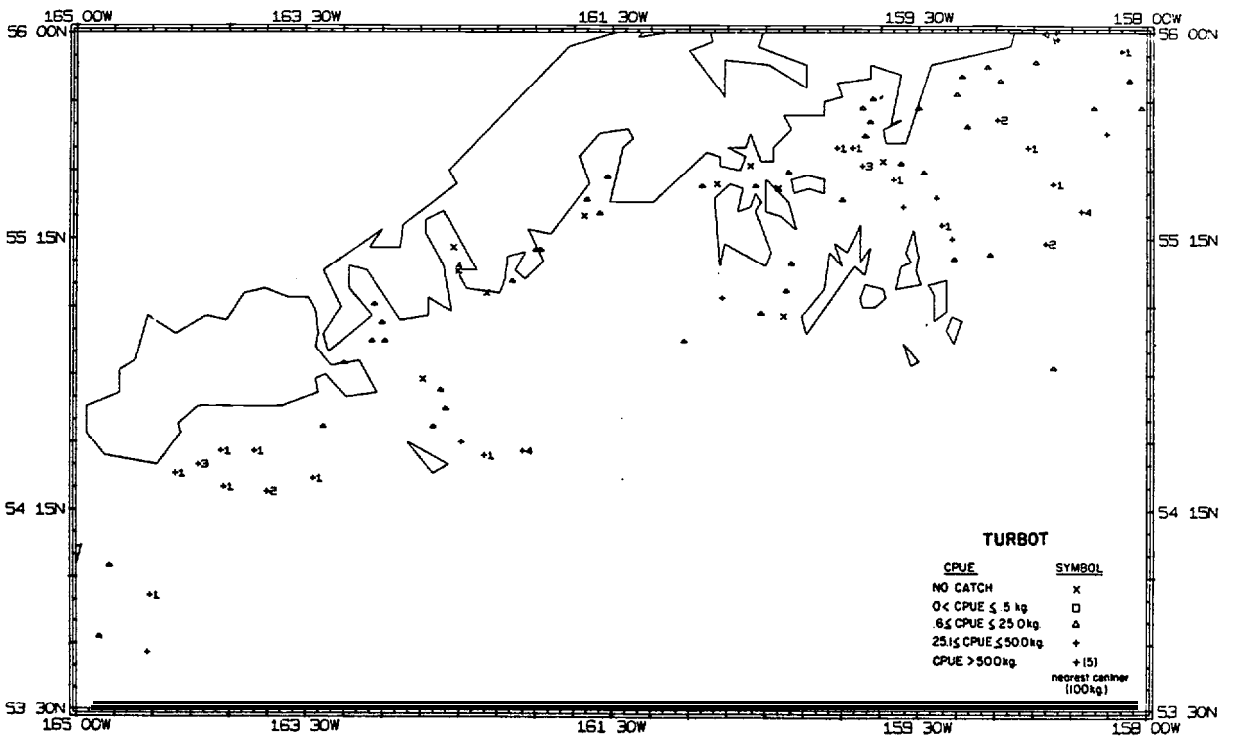
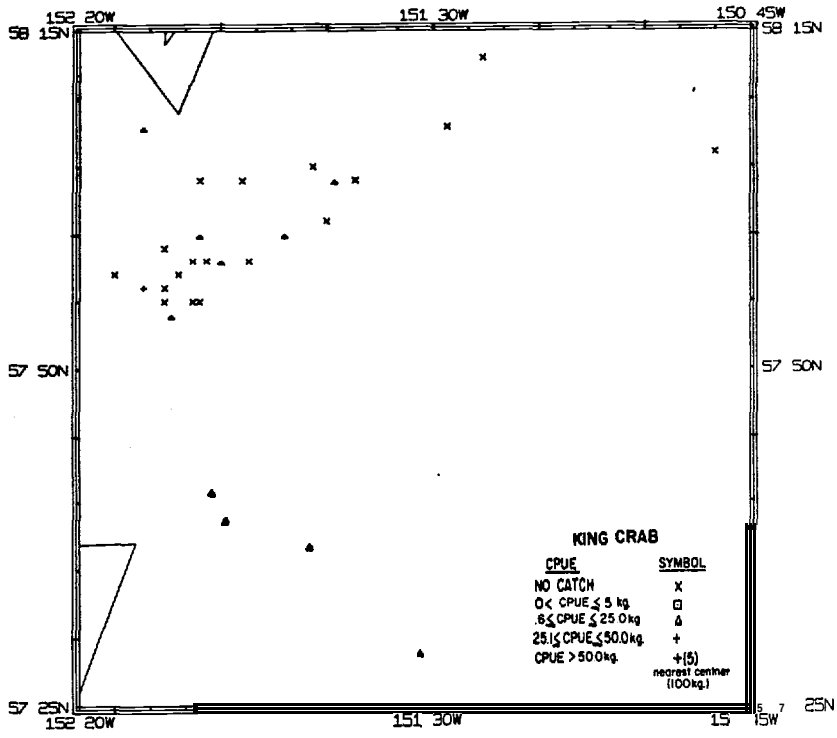


Figure X-170.--Distribution of turbot standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



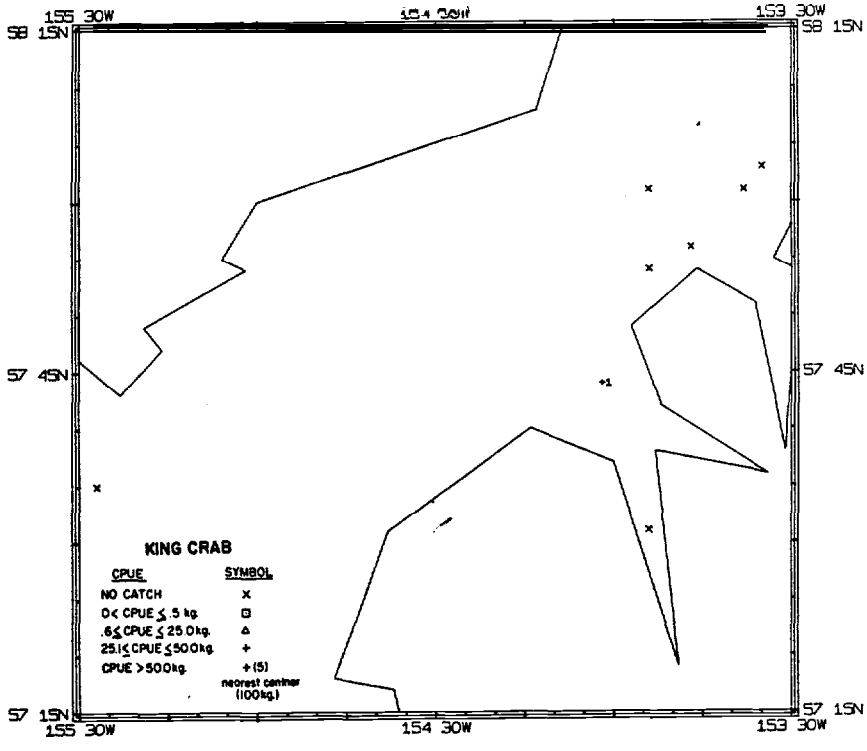
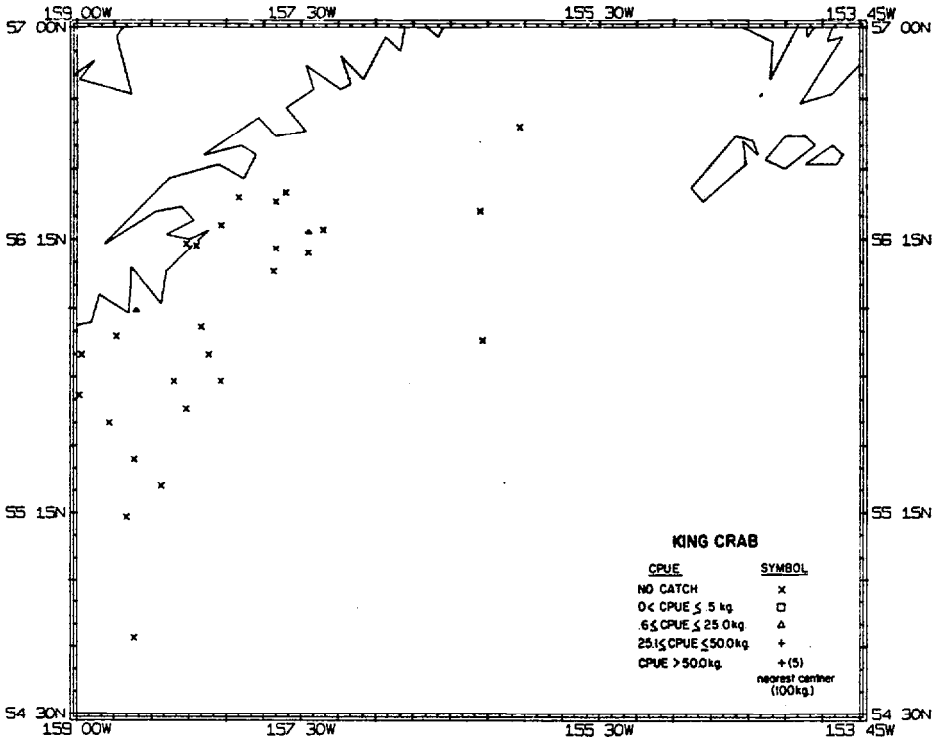


Figure X-171.--Distribution of king crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



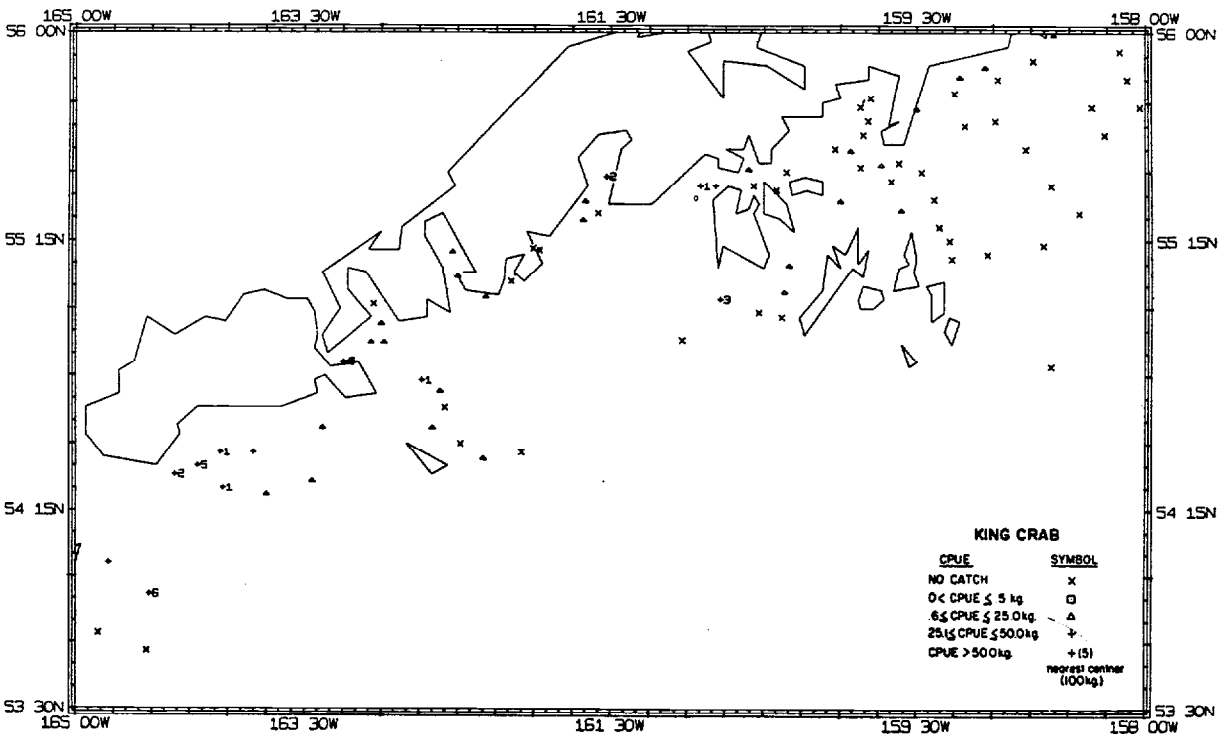
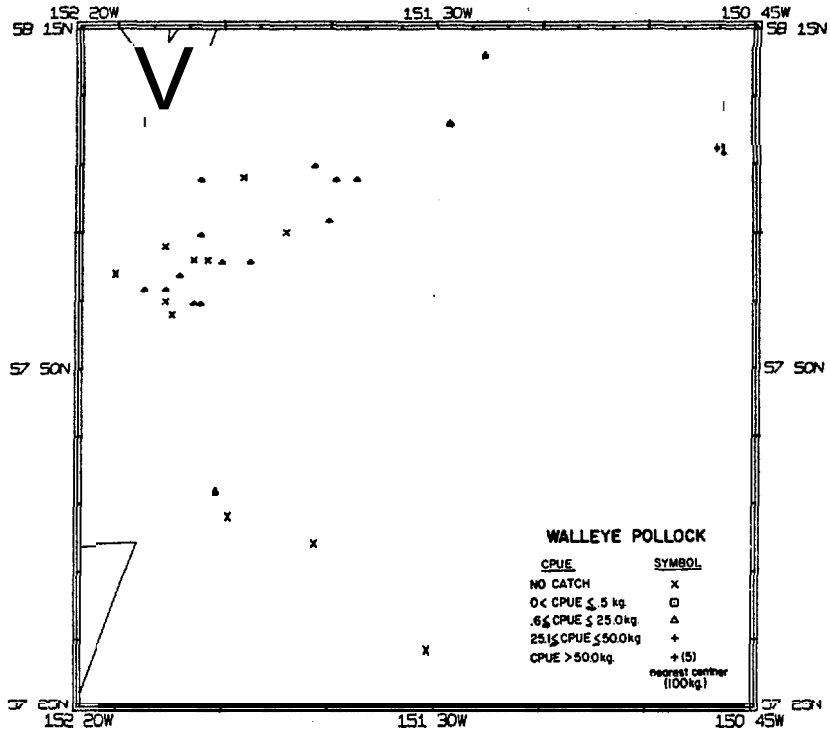


Figure X-172.--Distribution of king crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



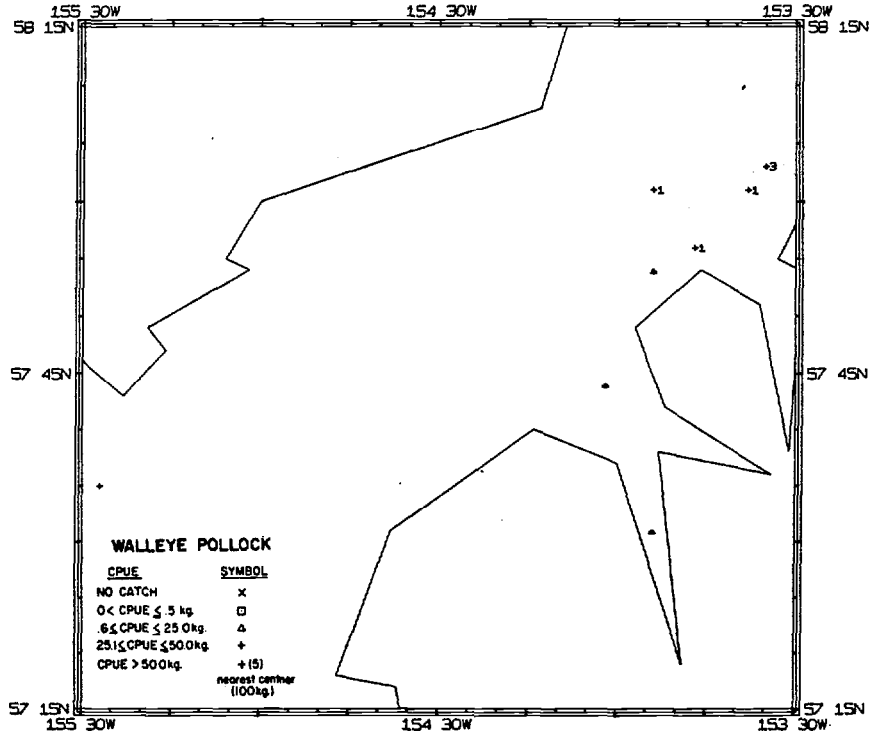
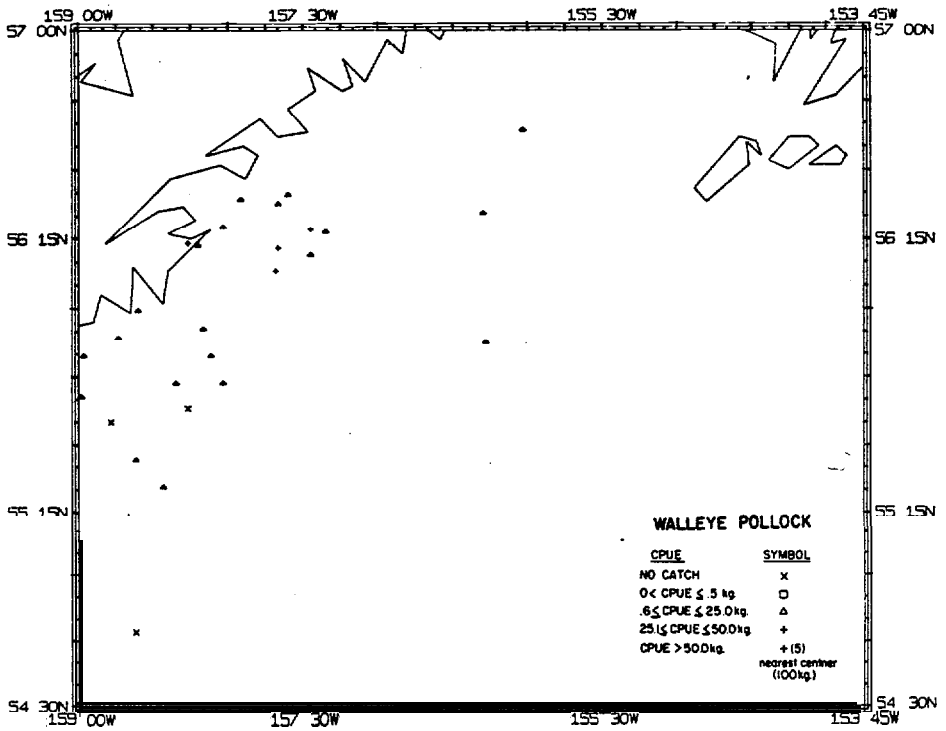


Figure X-173.--Distribution of walleye **pollock** standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



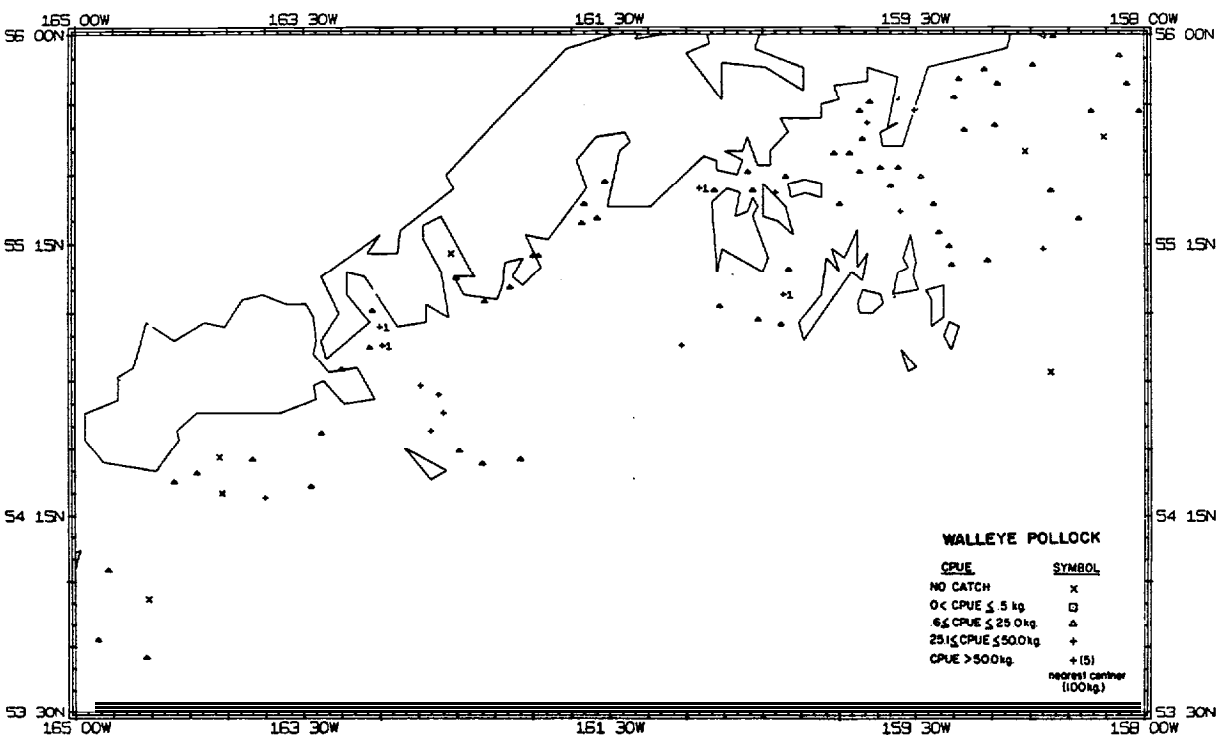
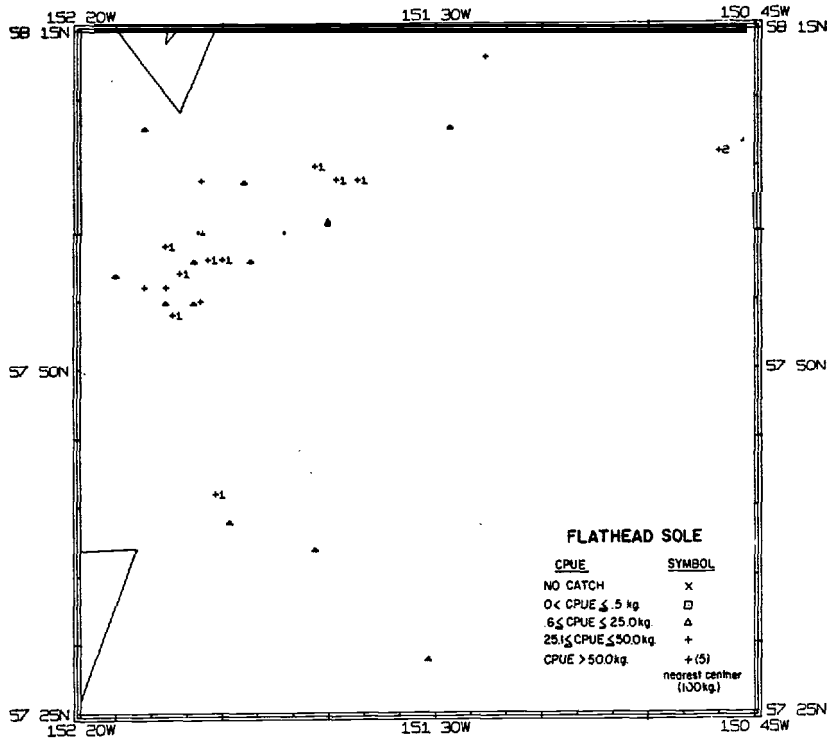


Figure X-174.--Distribution of walleye pollock standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



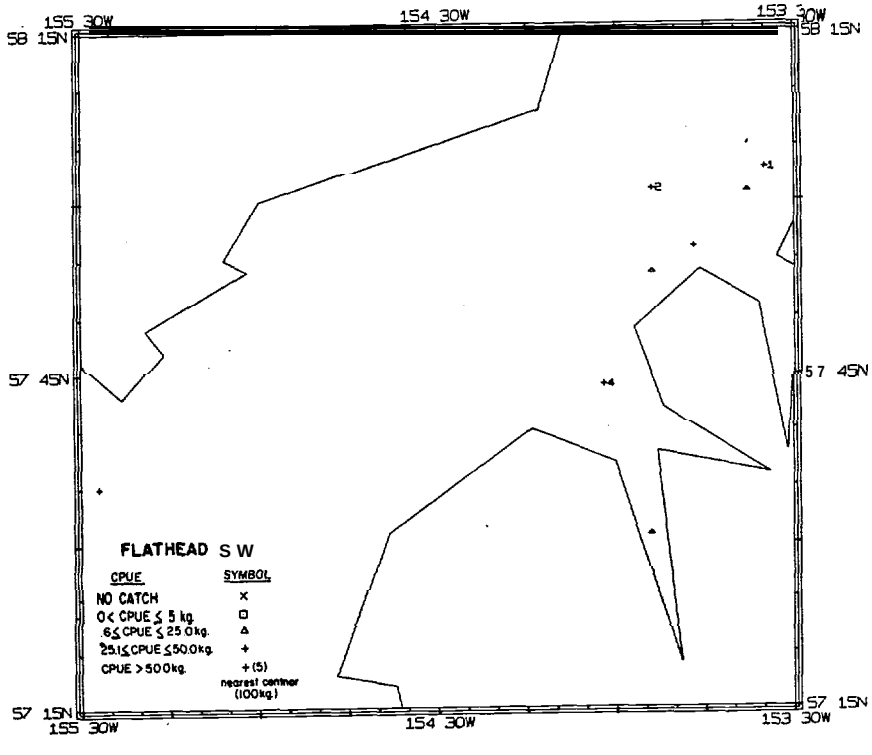
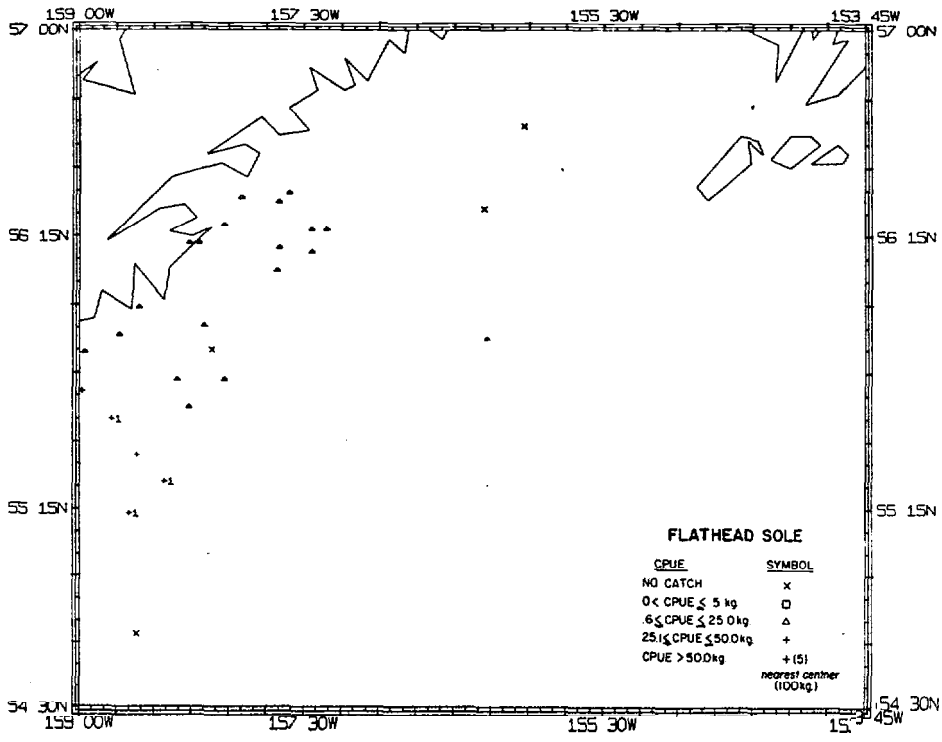


Figure X-175.--Distribution of flathead sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



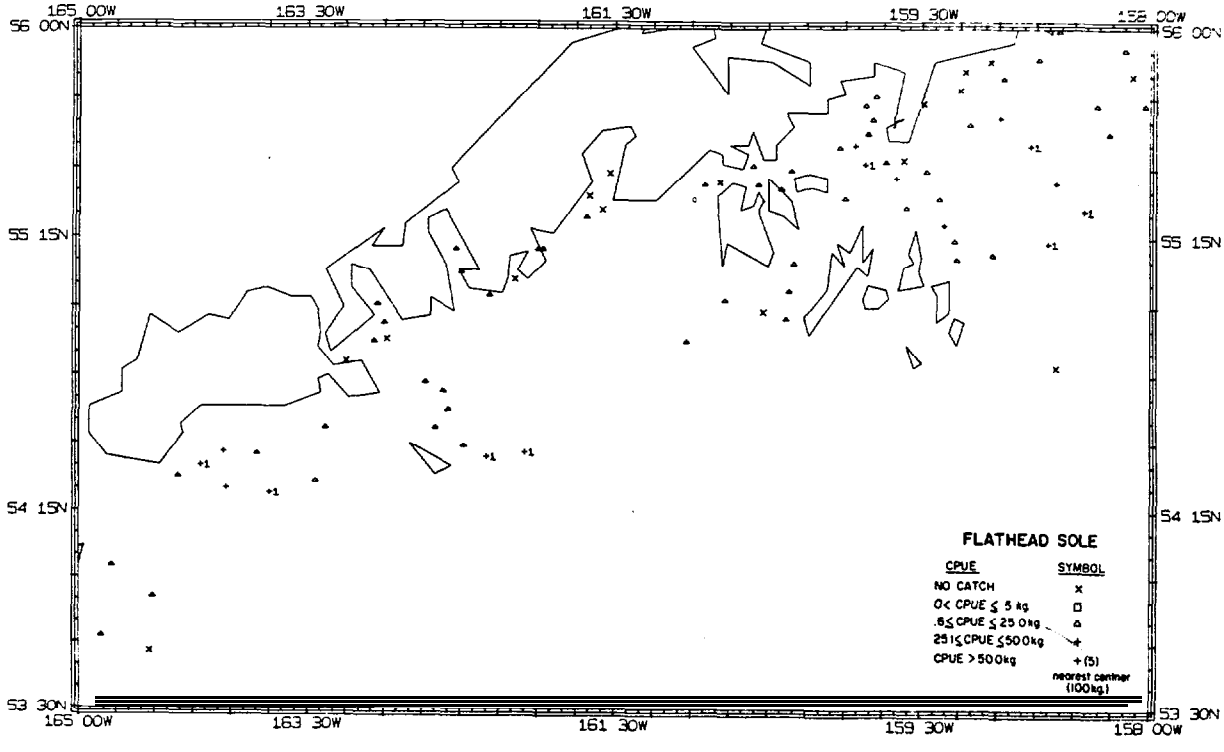
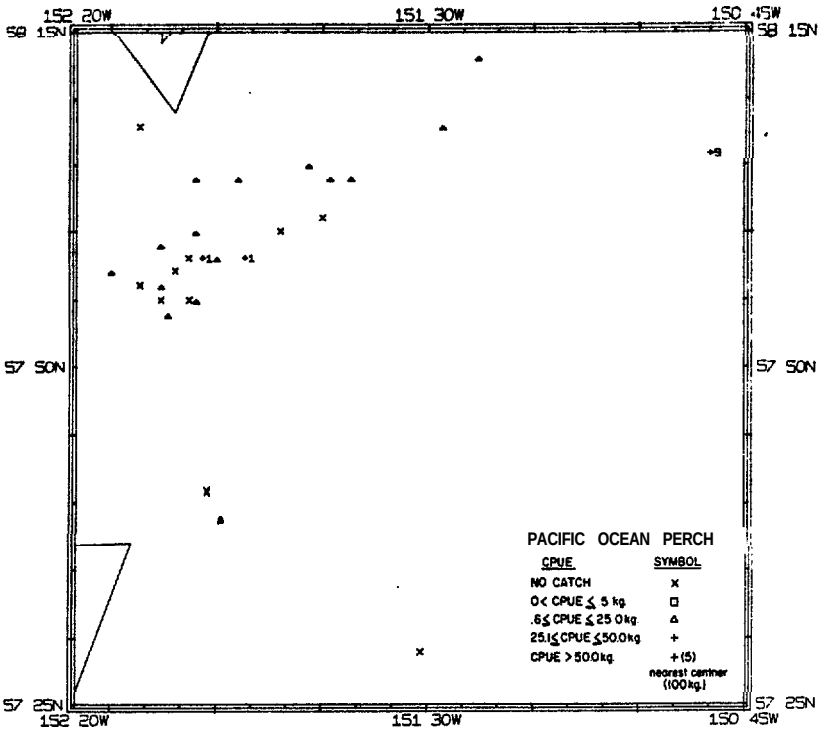


Figure X-176.--Distribution of flathead sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



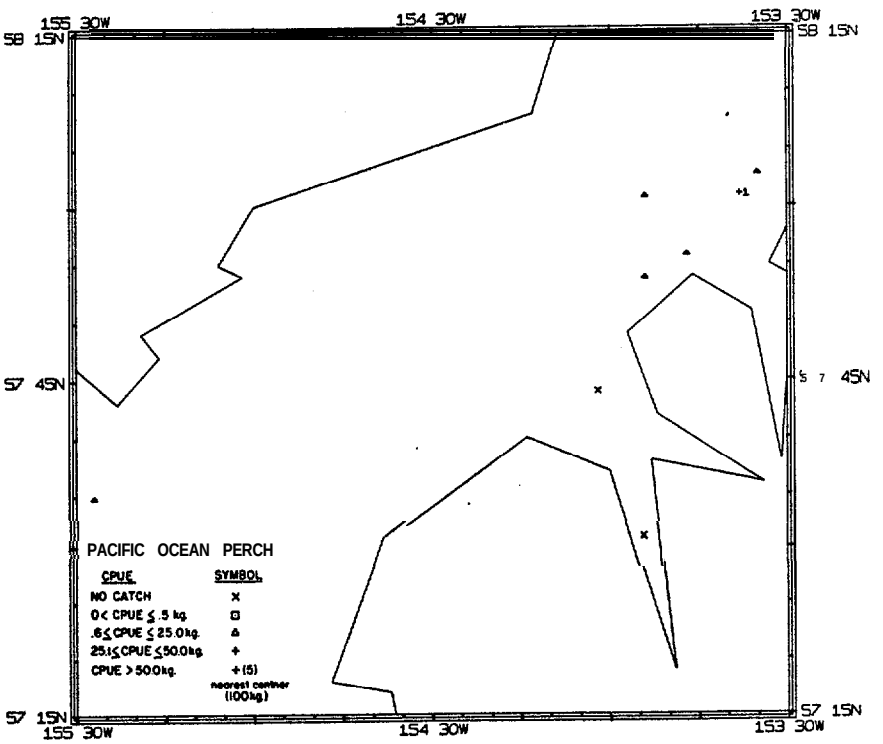
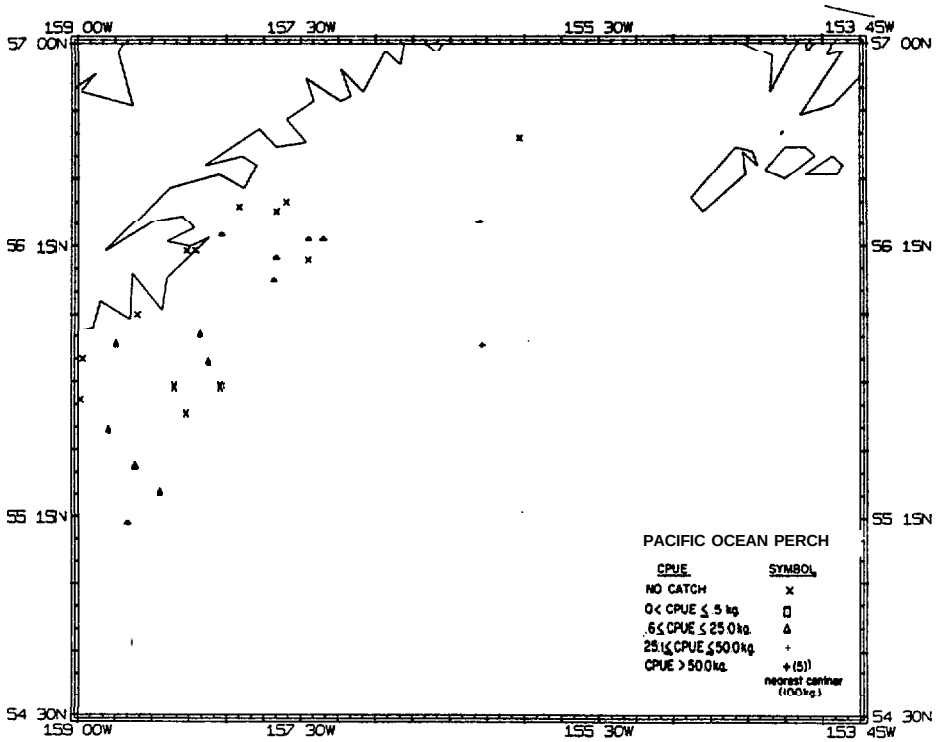


Figure X-177.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



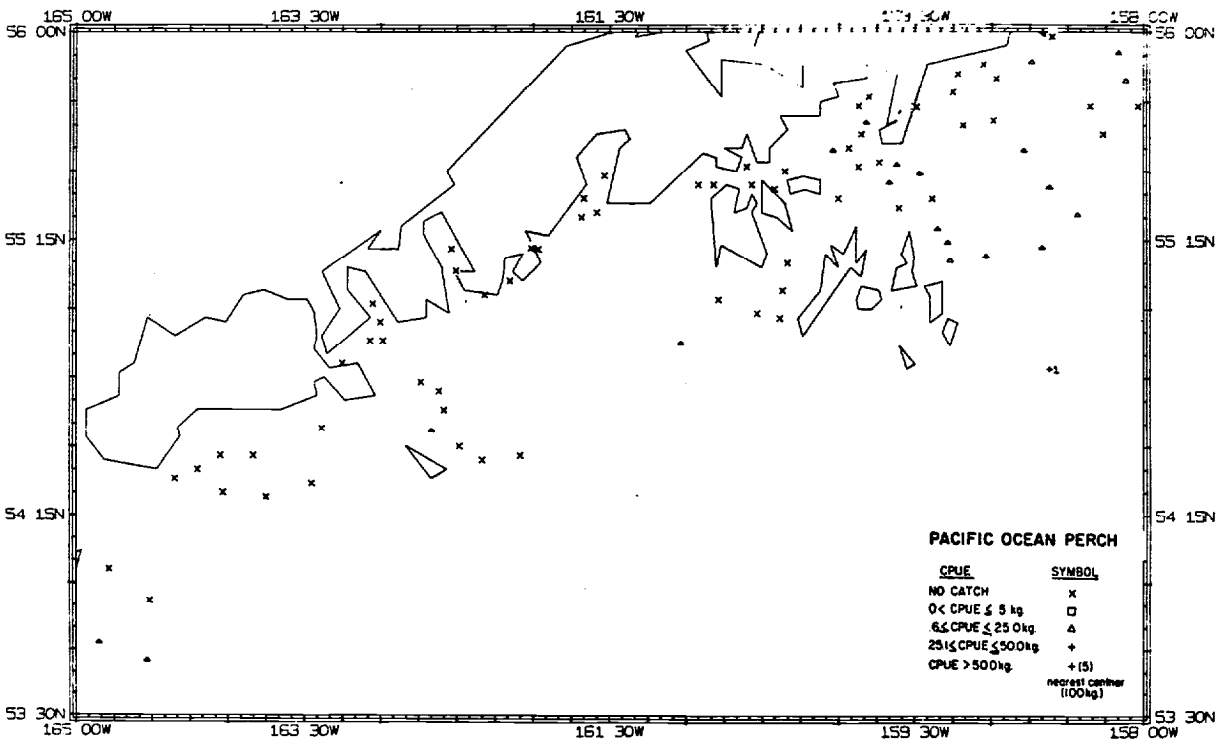
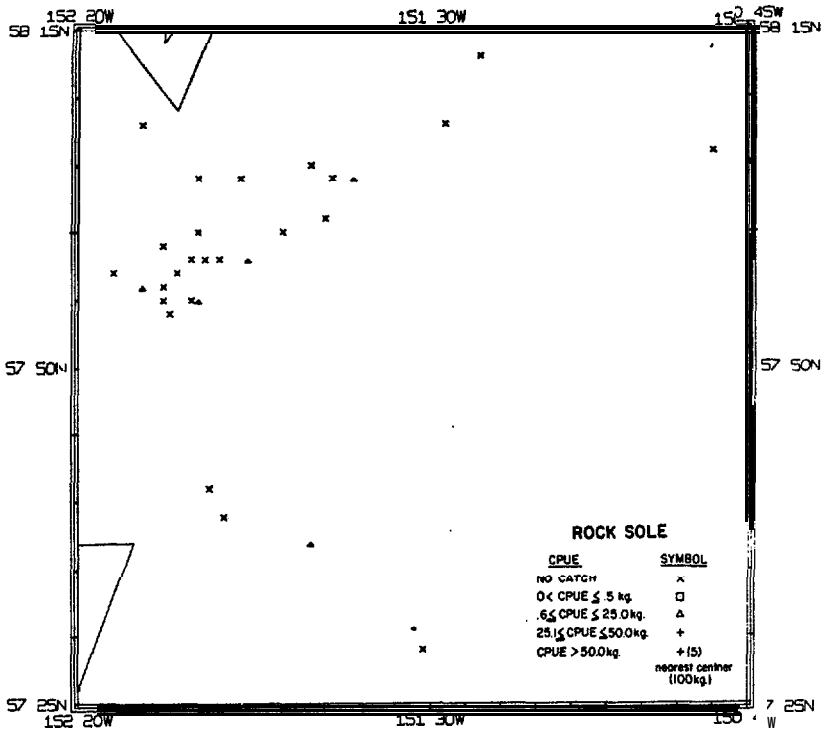


Figure X-178.--Distribution of Pacific ocean perch standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



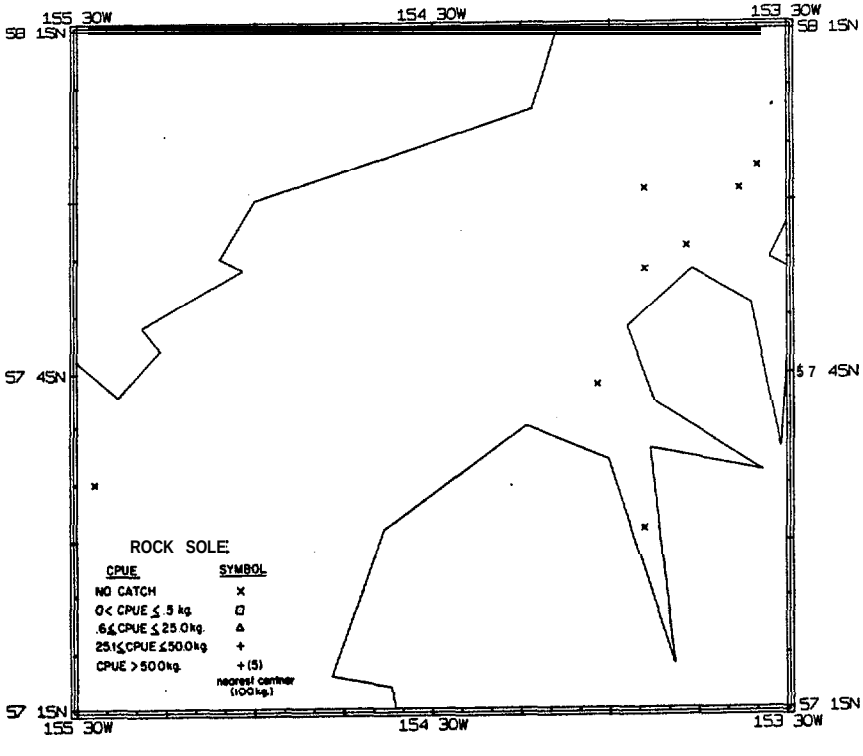
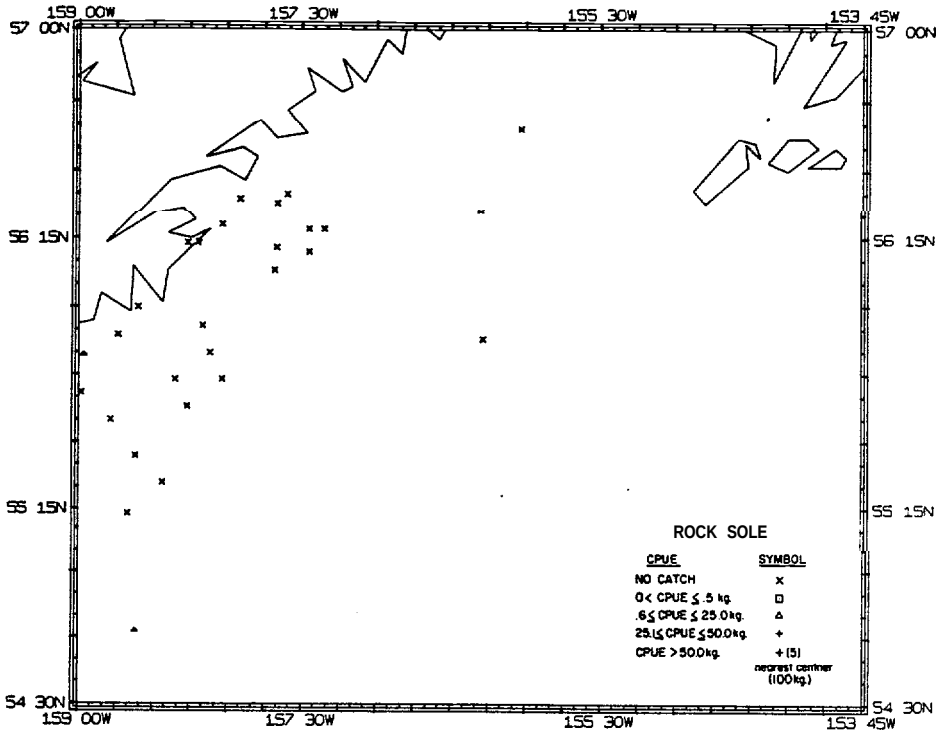


Figure X-179.--Distribution of rock sole standardized catch rates in **kg/hr,** during cruise 642, charter vessel Paragon.



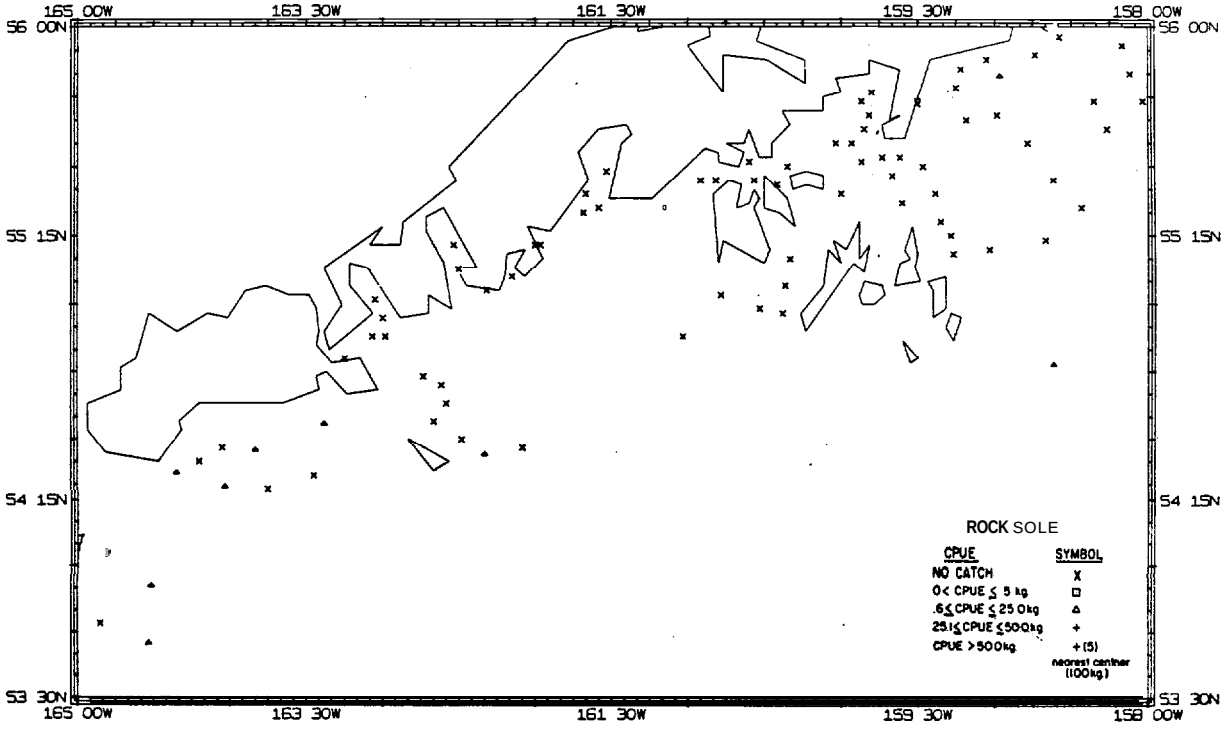
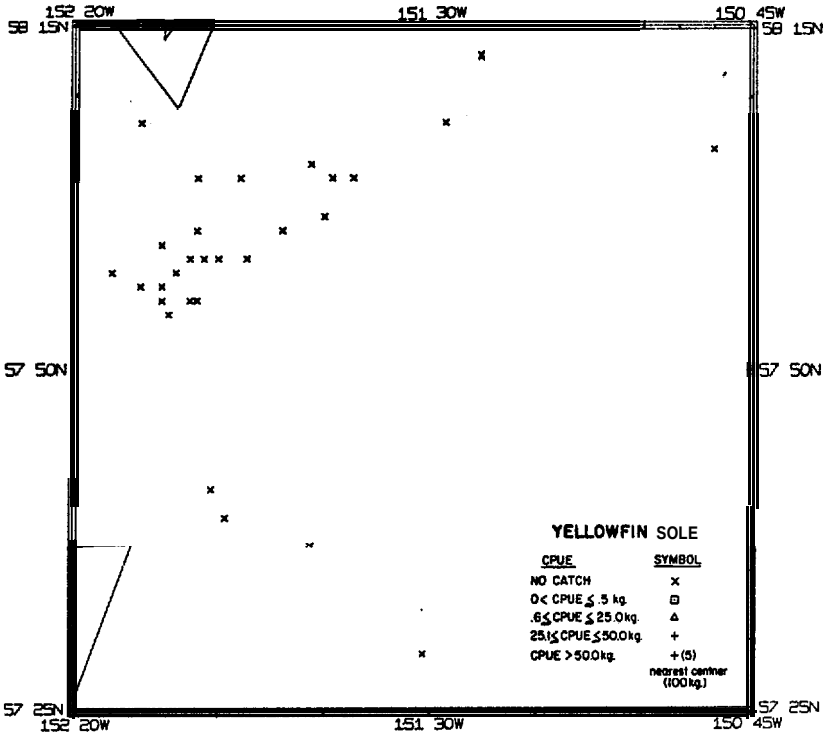


Figure X-180.--Distribution of rock sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



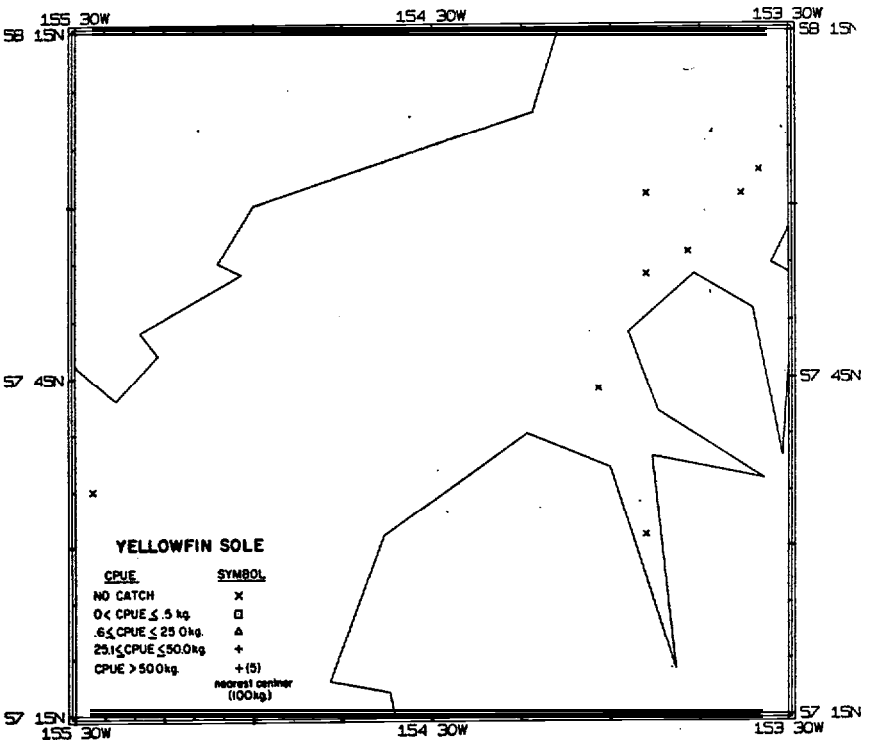
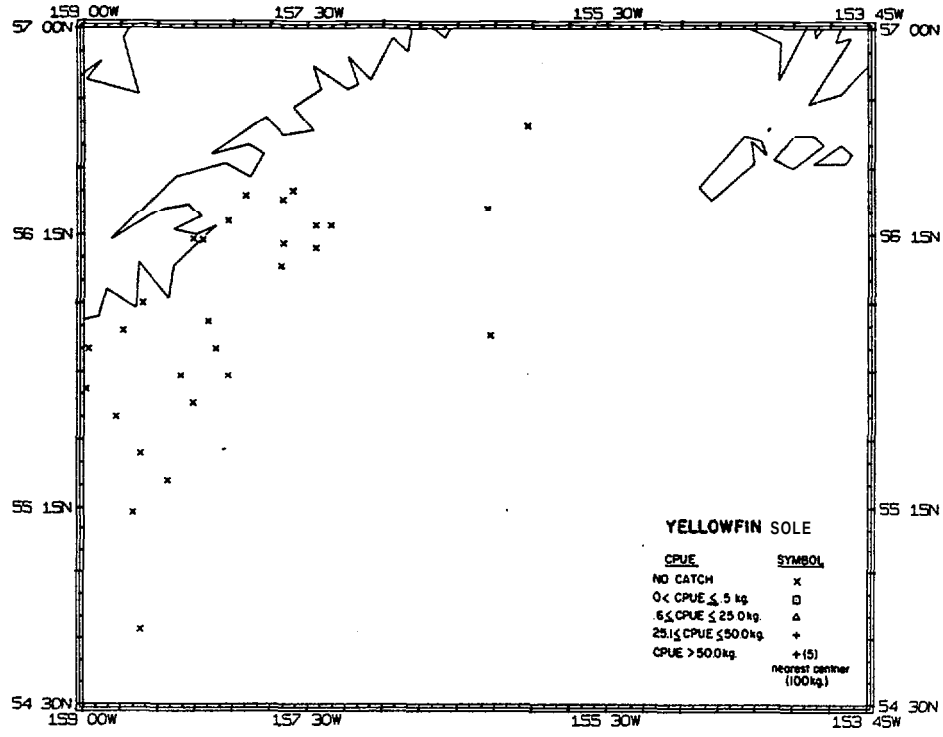


Figure X-181.--Distribution of yellowfin sole standardized catch rates in **kg/hr,** during cruise 642, charter vessel Paragon.



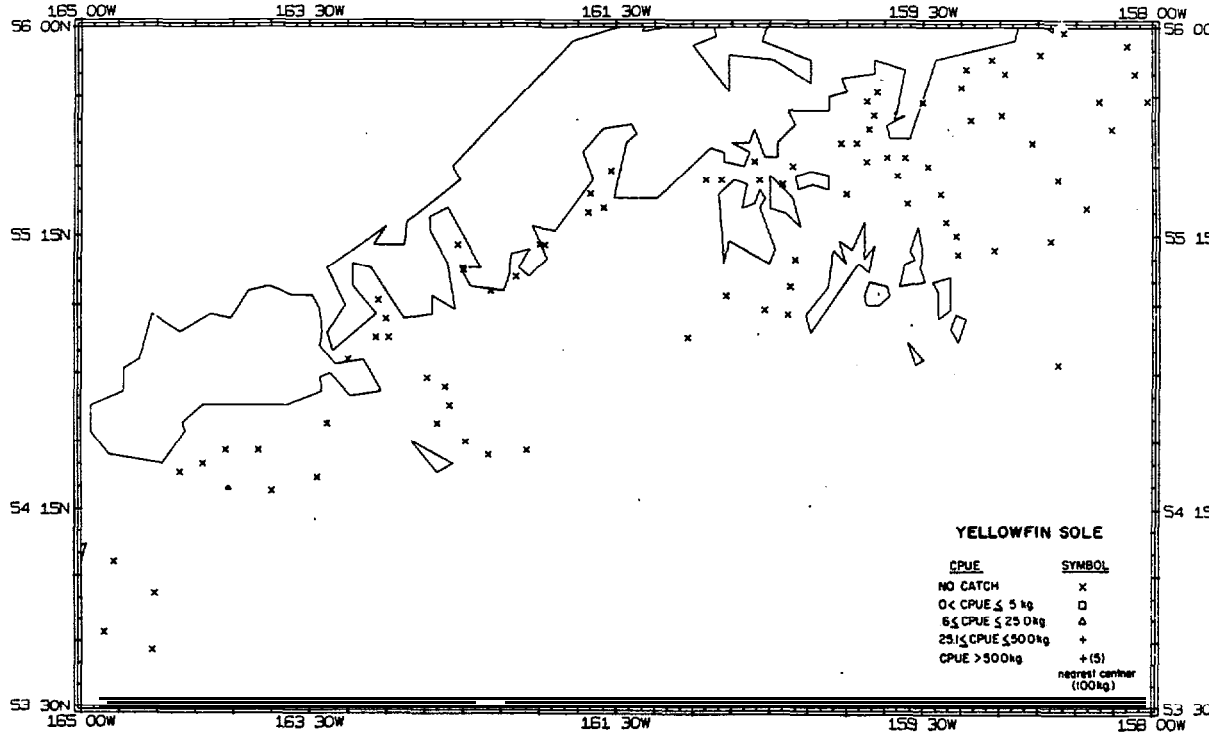
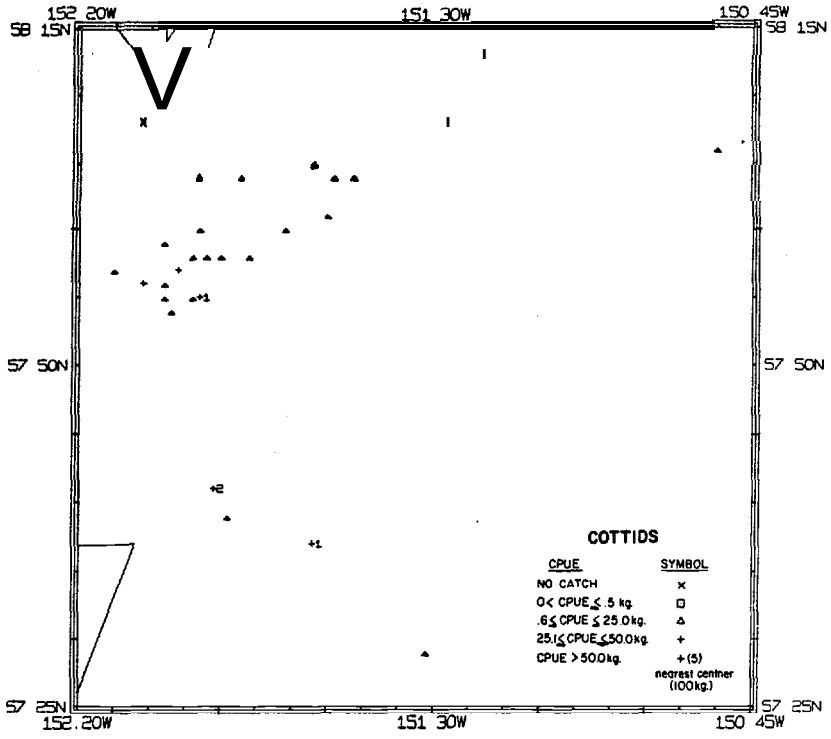


Figure X-182.--Distribution of yellowfin sole standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



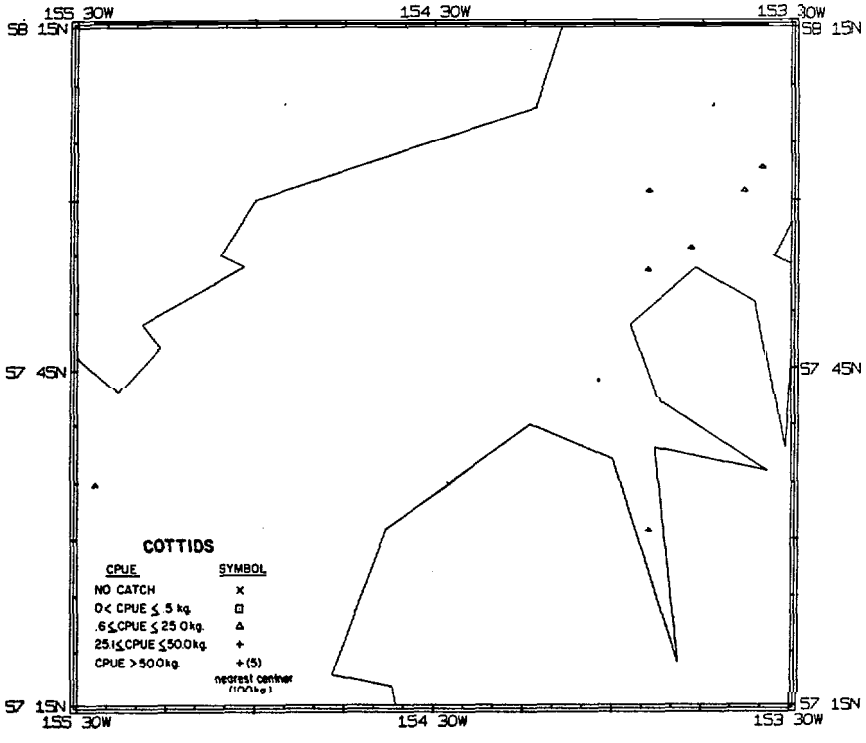
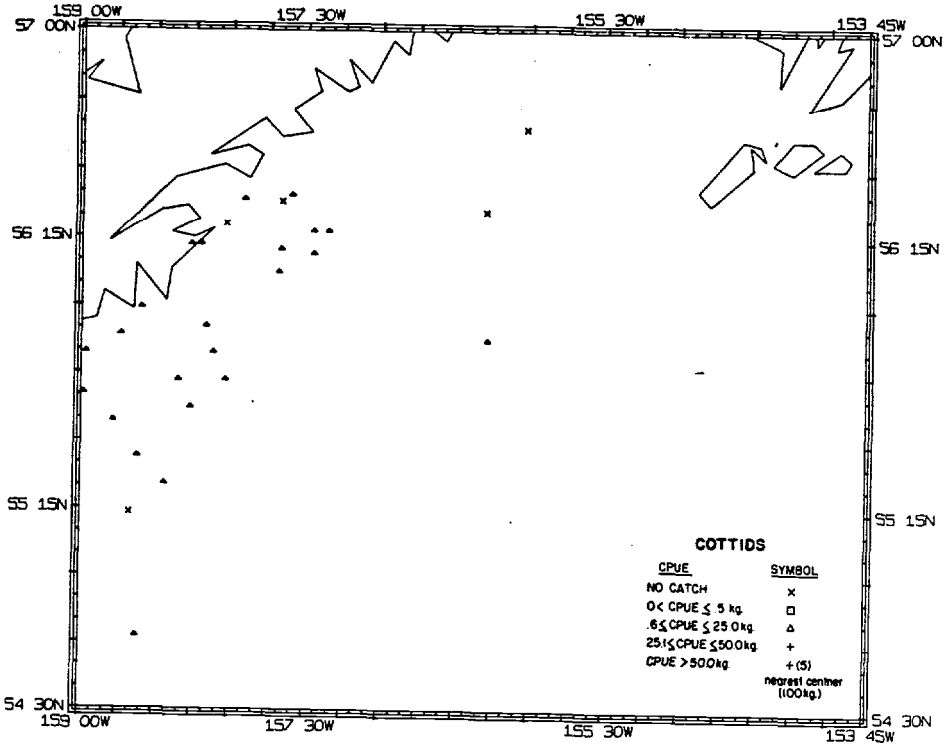


Figure X-183.--Distribution of cottids standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



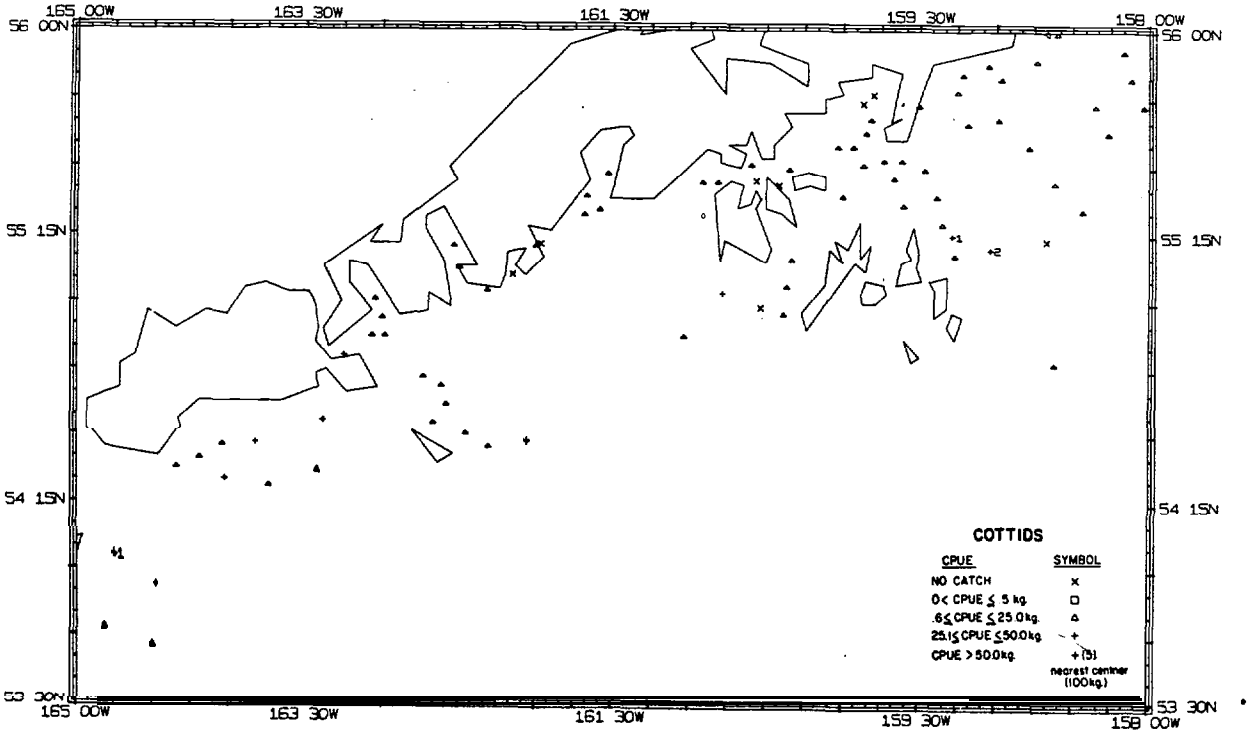
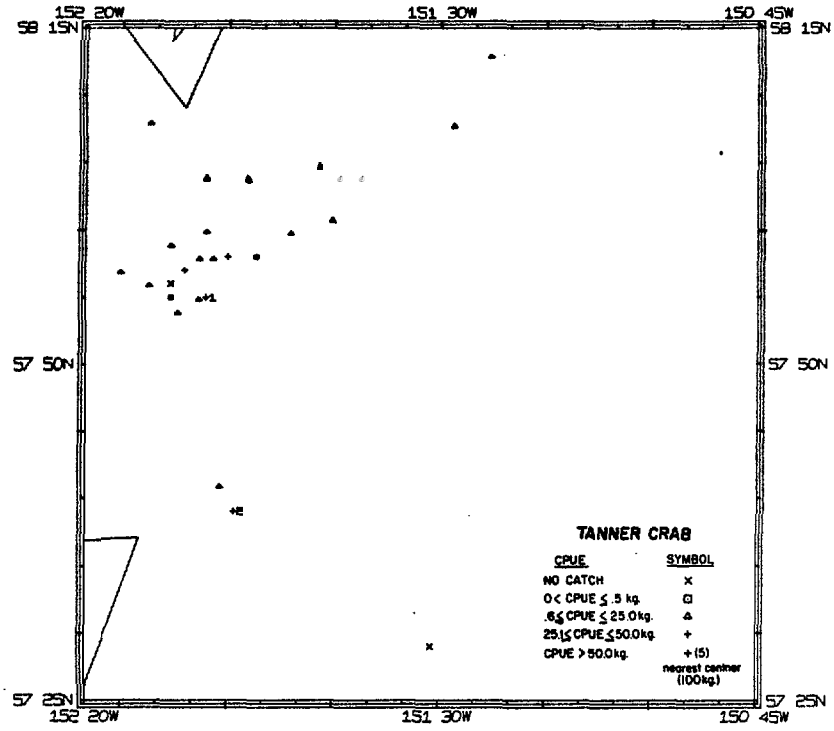


Figure X-184.--Distribution of cottids standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



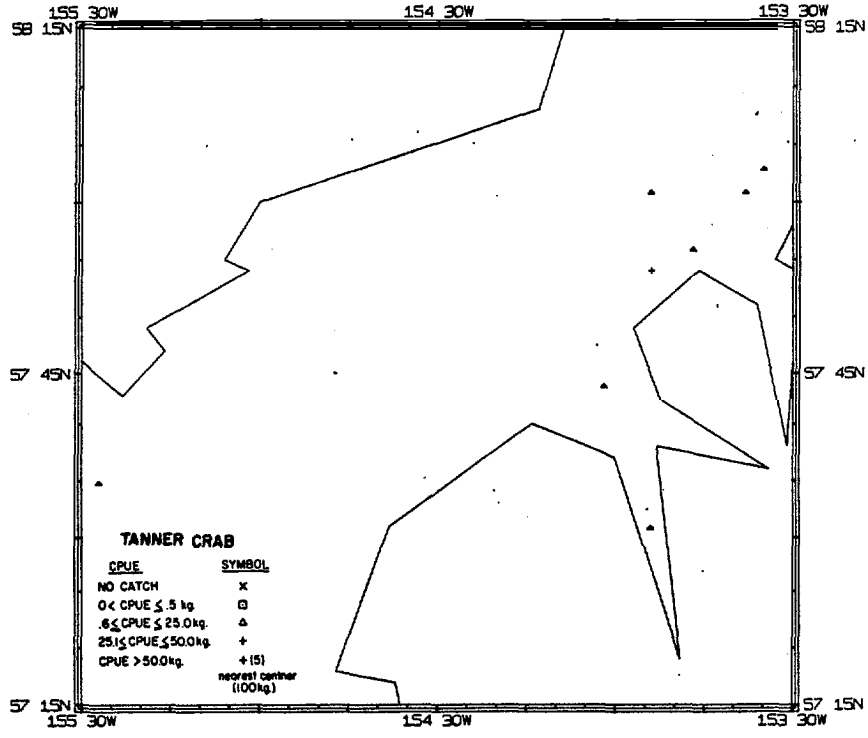
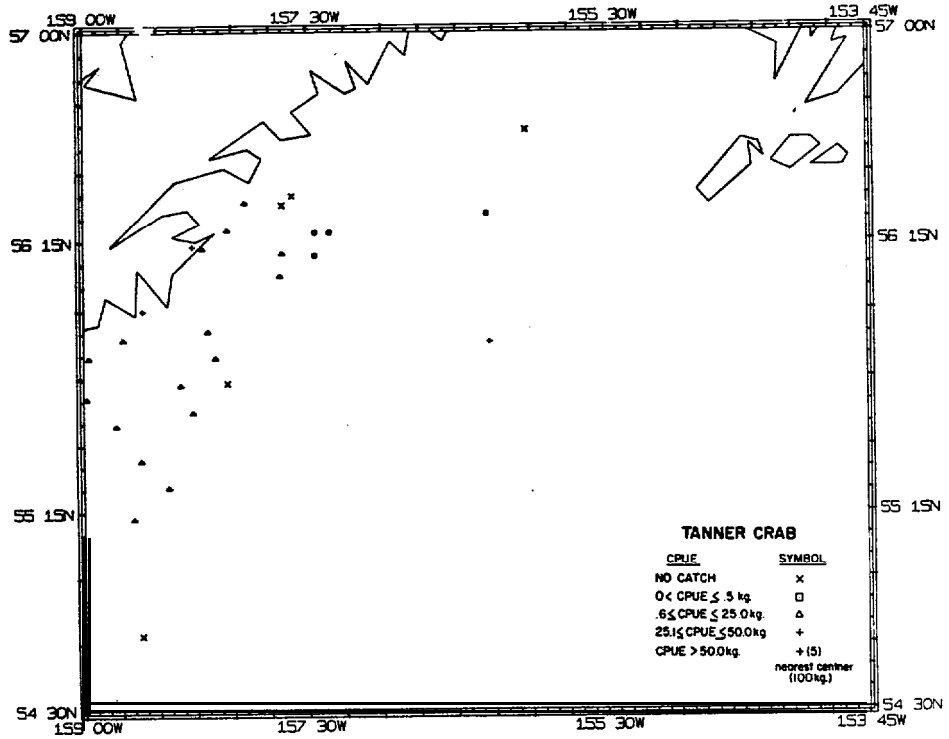


Figure X-185.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



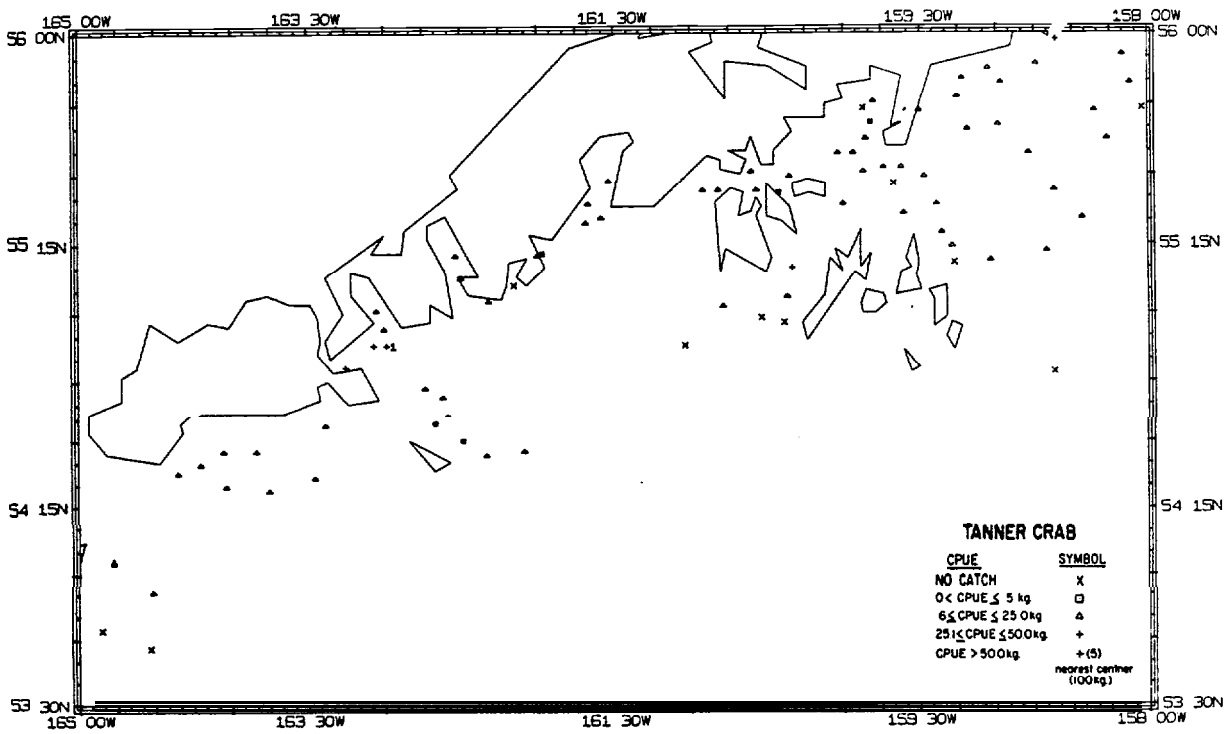
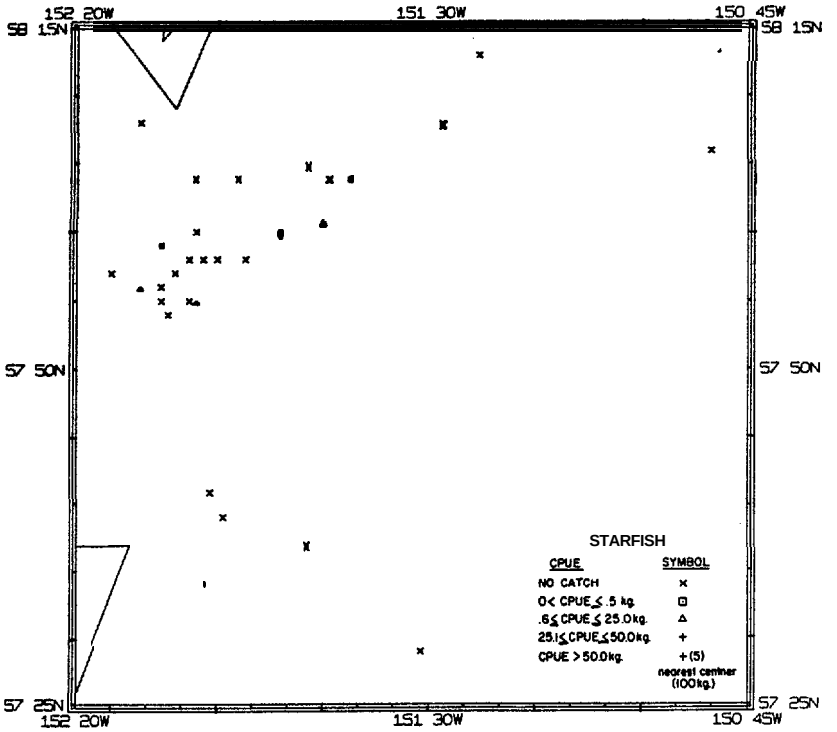


Figure X-186.--Distribution of Tanner crab standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



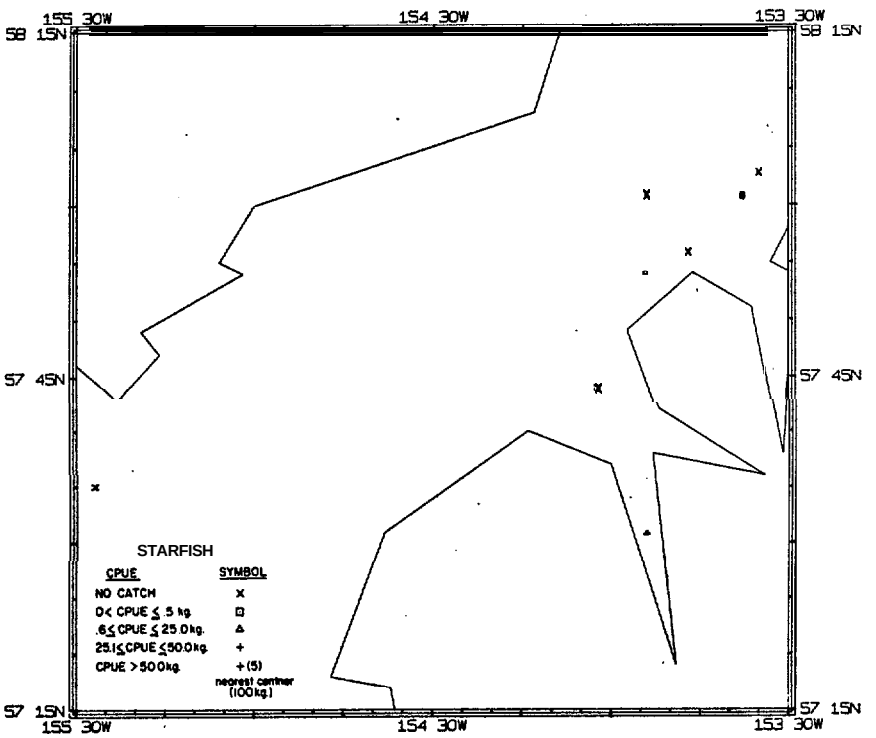
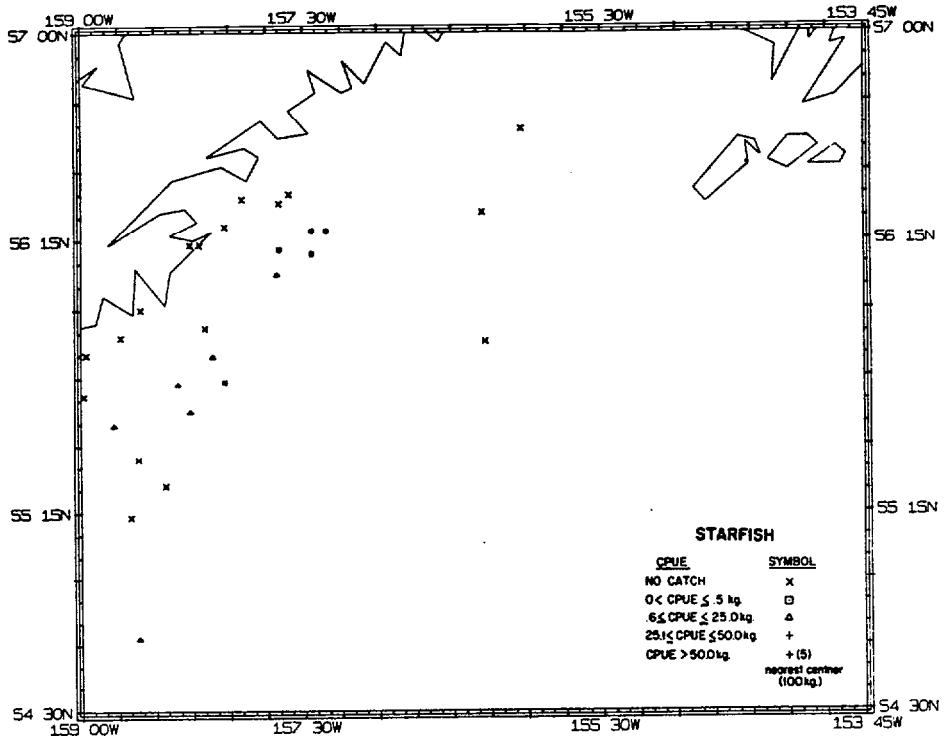


Figure X-187.--Distribution of starfish standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.



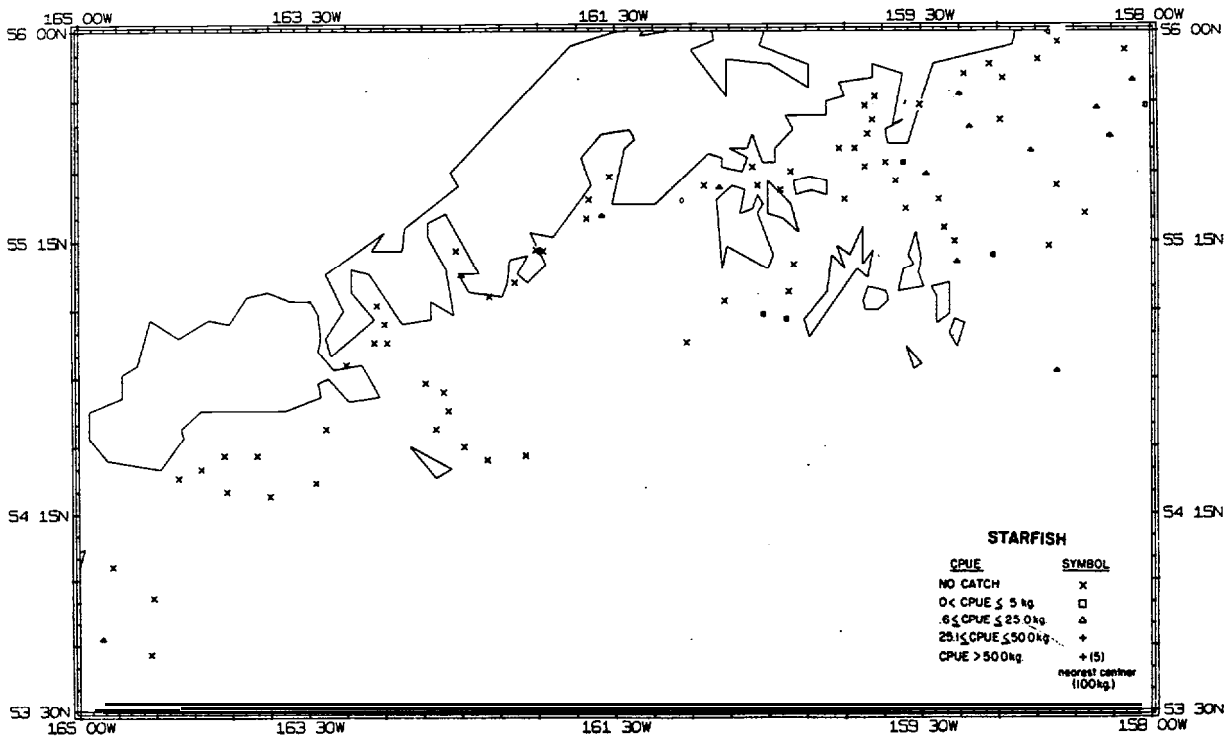
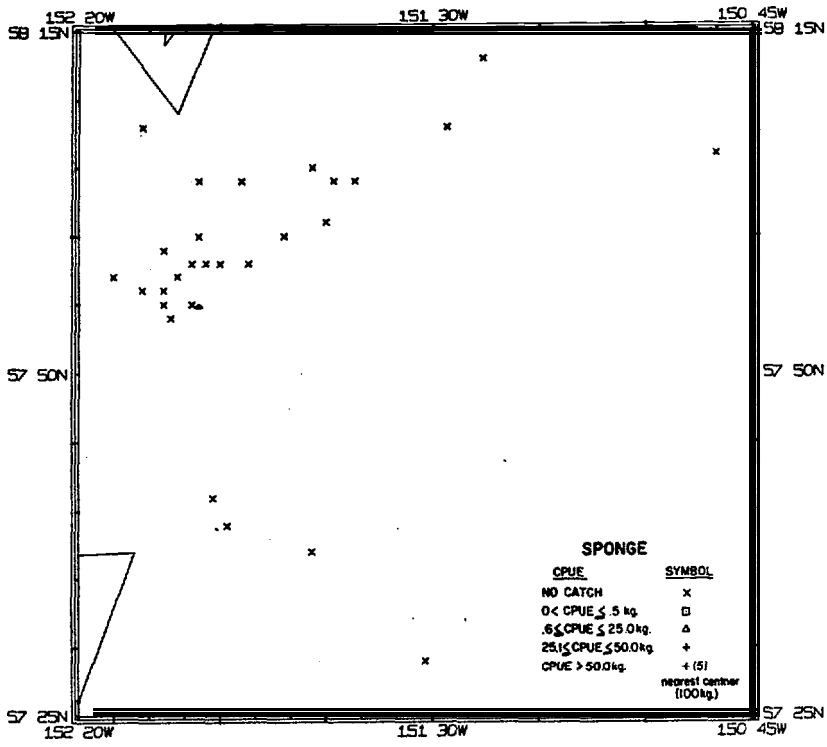


Figure X-188.--Distribution of starfish standardized catch rates in kg/hr, during cruise 642, 'charter vessel Paragon.



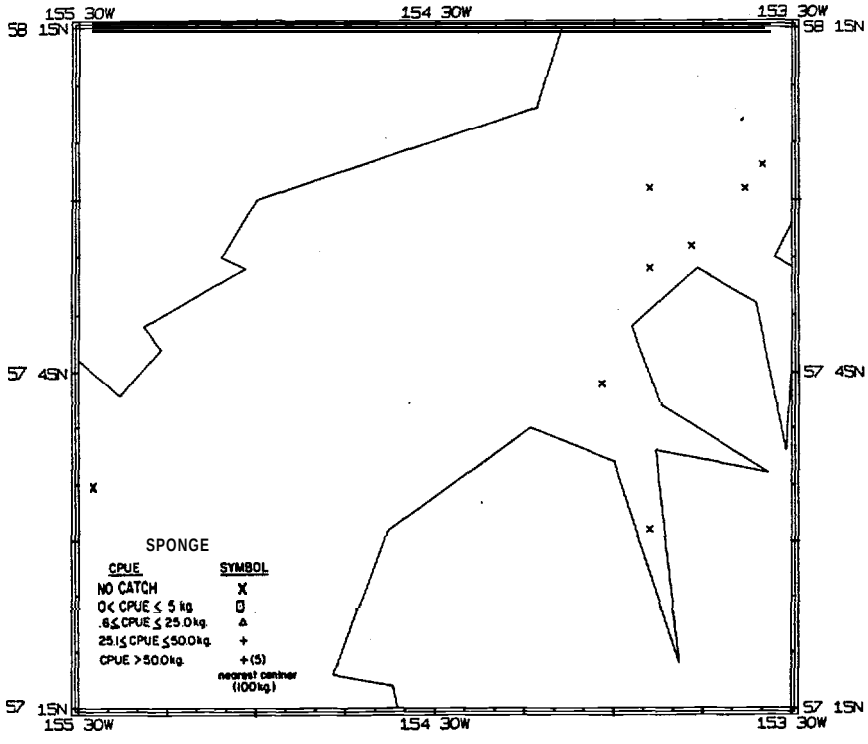
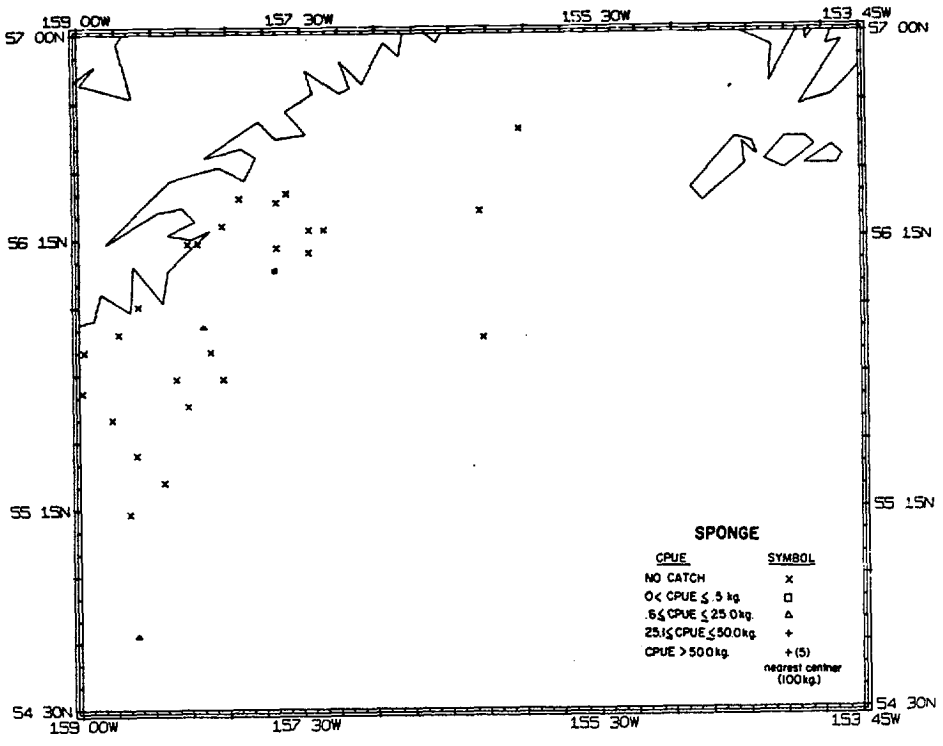


Figure X-189.--Distribution of sponge standardized catch rates in **kg/hr,** during cruise 642, charter vessel Paragon.



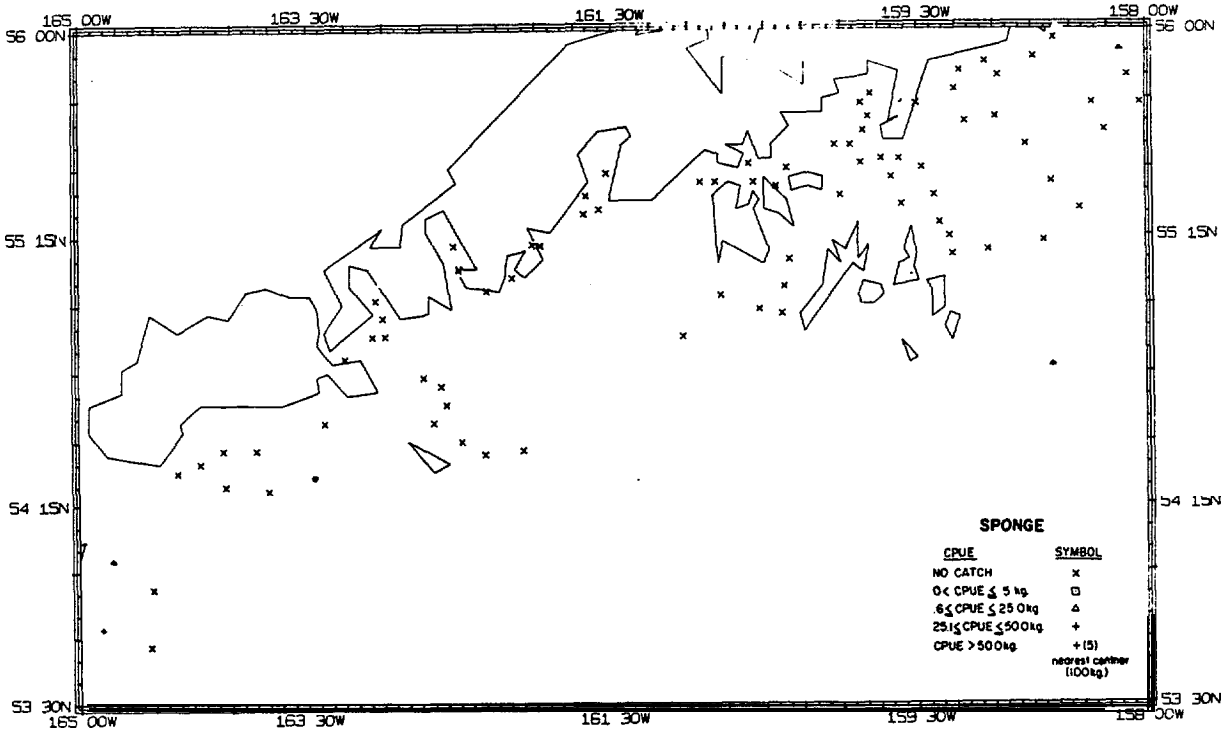


Figure X-190.--Distribution of sponge standardized catch rates in kg/hr, during cruise 642, charter vessel Paragon.

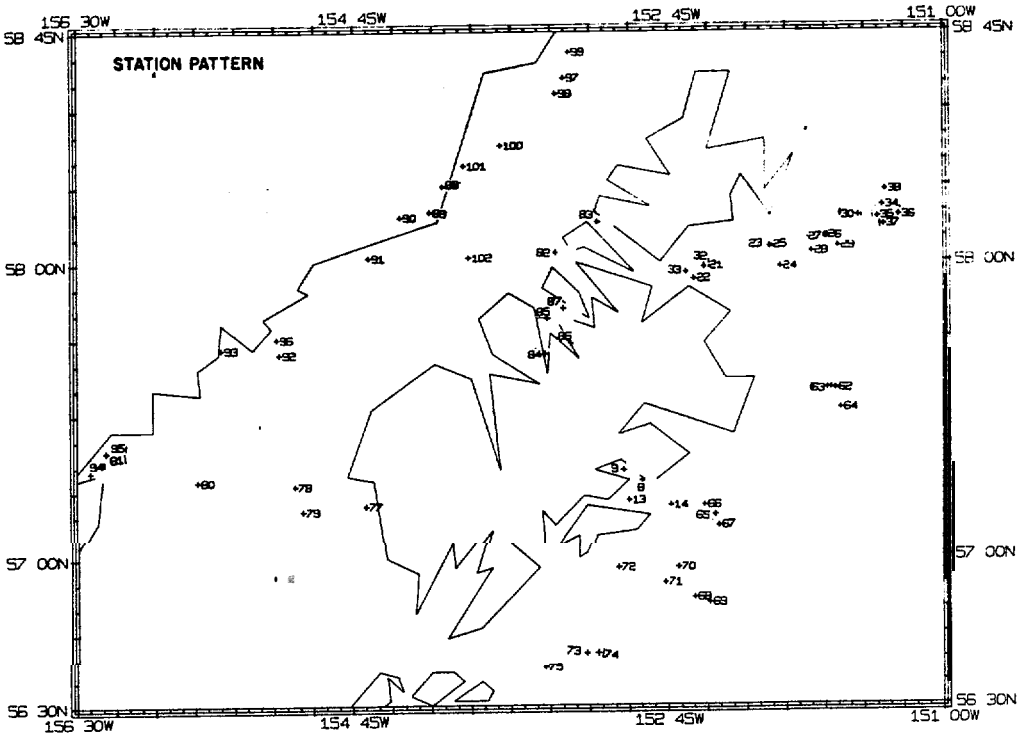


Figure X-191.--Stations successfully trawled (shrimp trawl) during cruise 682, R/V John R. Manning.

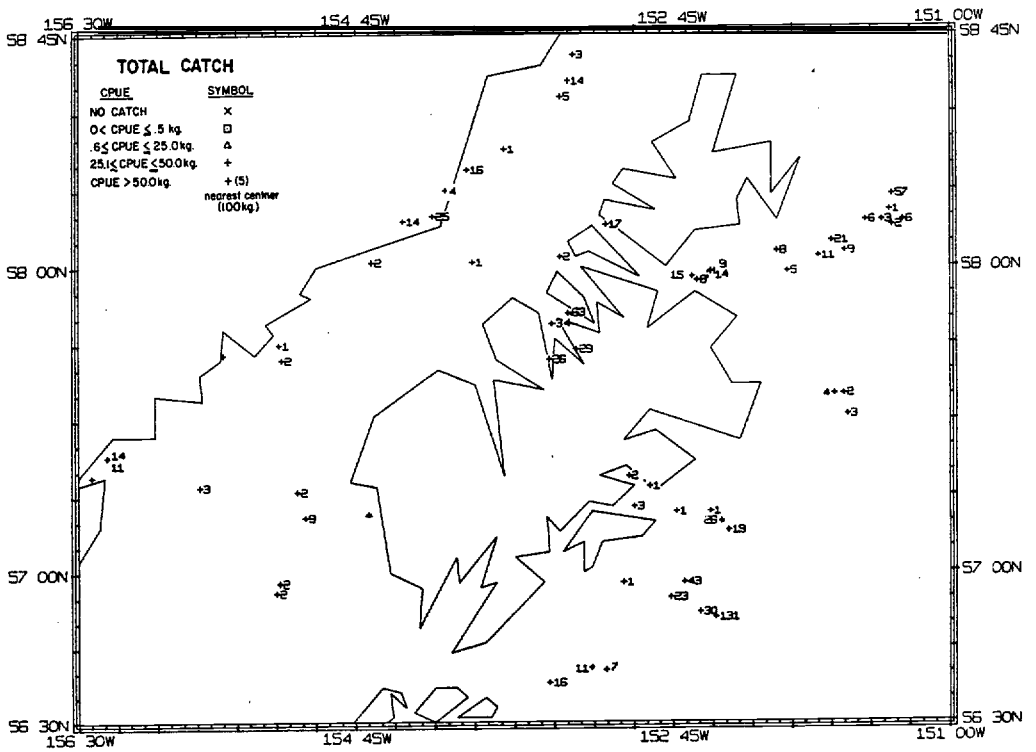
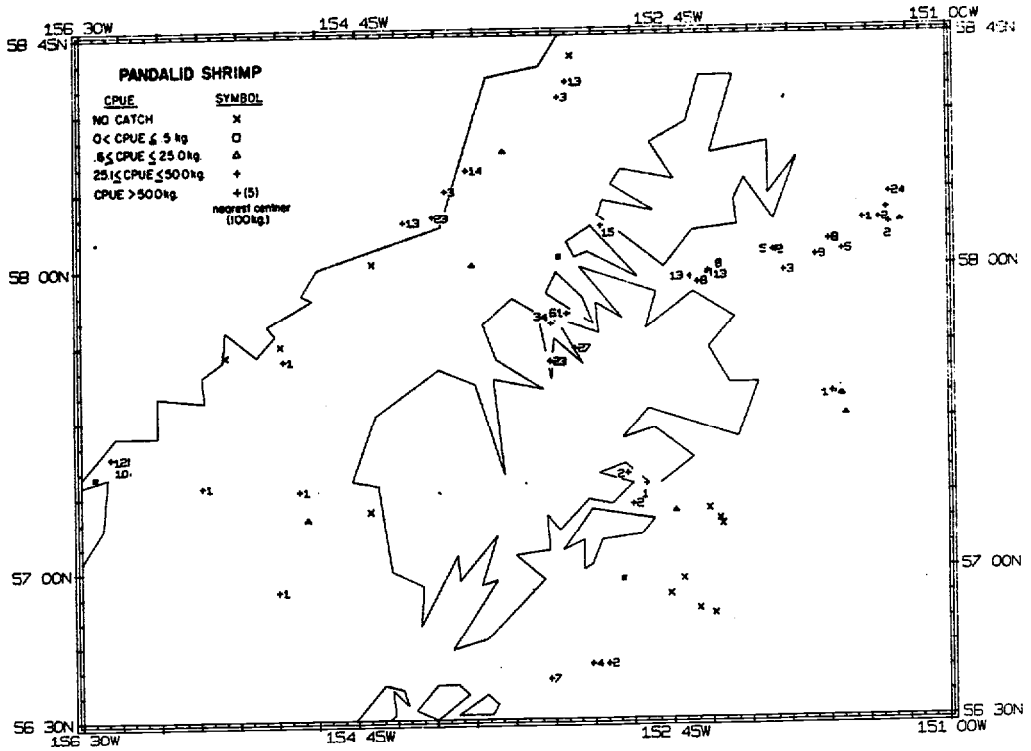
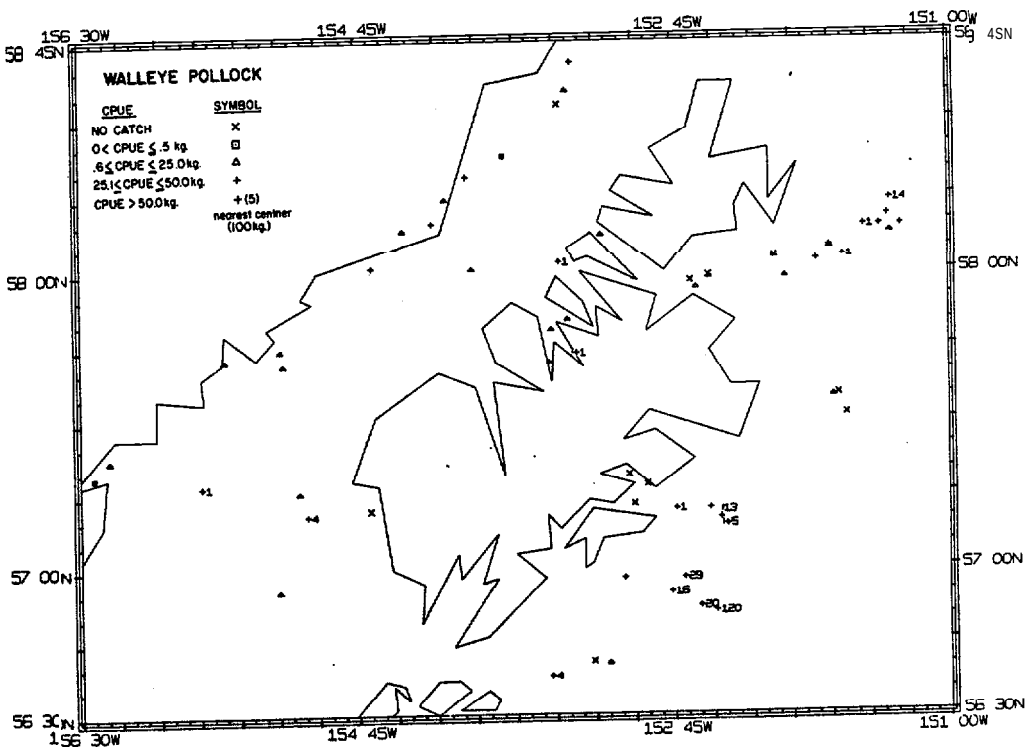


Figure X-192.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 682, R/V John R. Manning.

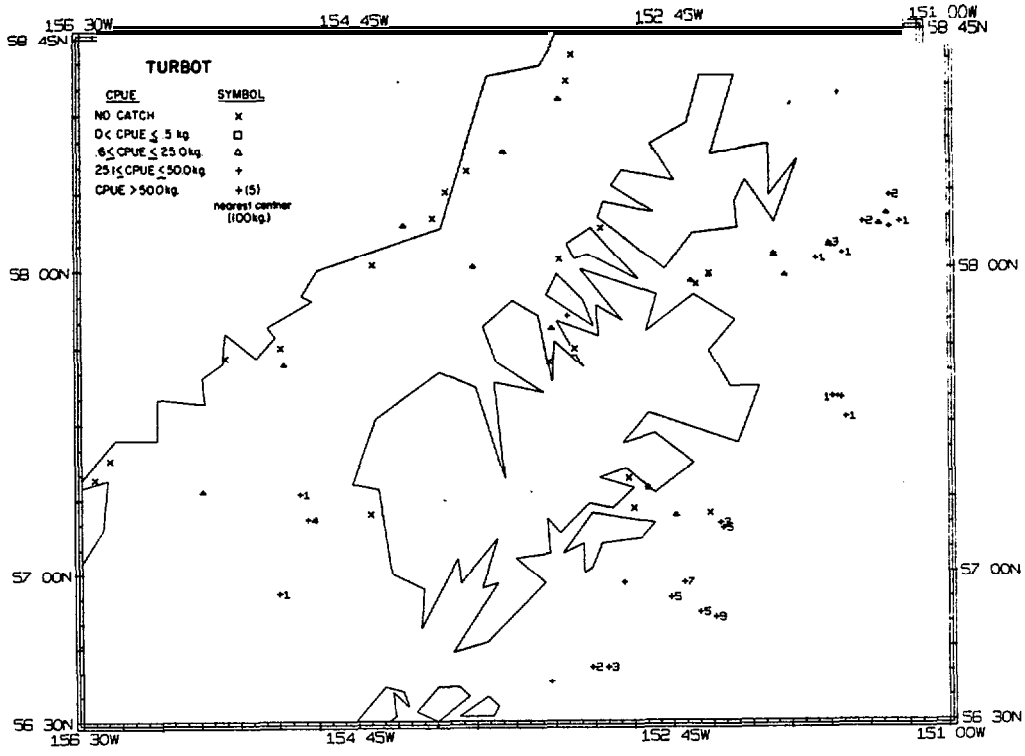
Table X-34.--A list of stations where the species or species group standardized catch rates exceeded 50 kg/hr and the total species standardized catch rates exceeded 950 kg/hr, cruise 682, R/V John R. Manning.

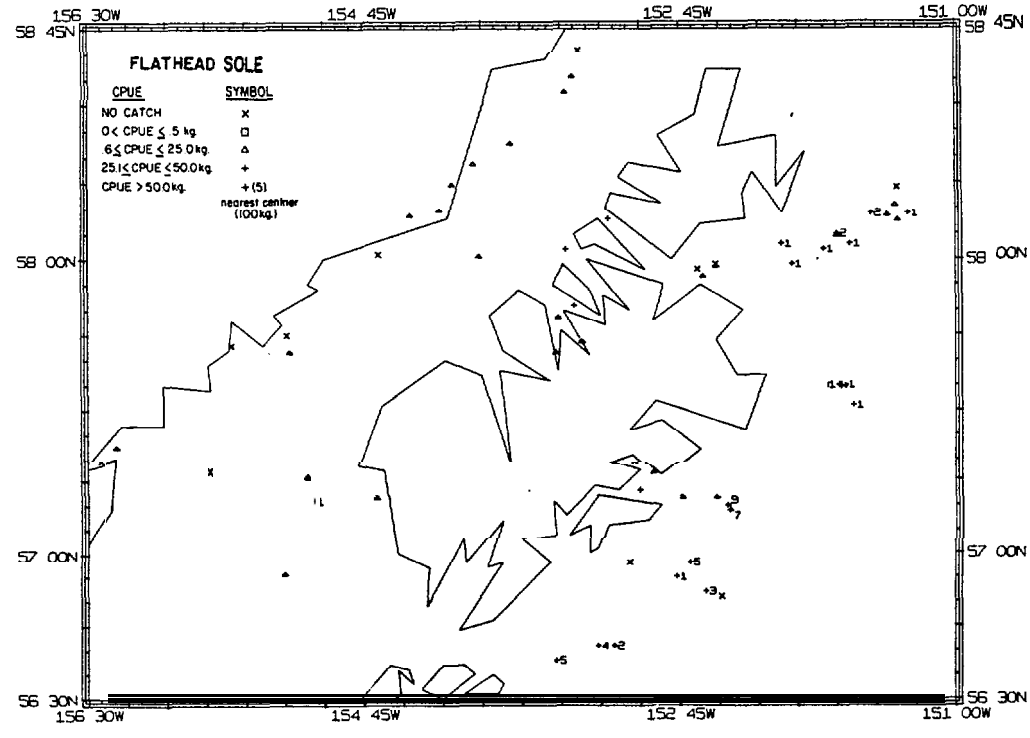
Species or Species groups	Station numbers
Total catch	21, 27, 28, 33, 38, 65, 67-71, 73, 75, 81, 83-87, 89, 90, 95, 97 and 101.
Pandalid shrimps	8, 9, 13, 21-30, 32, 33, 35, 37, 38, 63, 73-76, 78, 80, 81, 83-98 and 101,
Walleye pollock	14, 29, 30, 38, 66-71, 75, 79, 80, 82 and 86.
Turbot	27-30, 36, 38, 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.



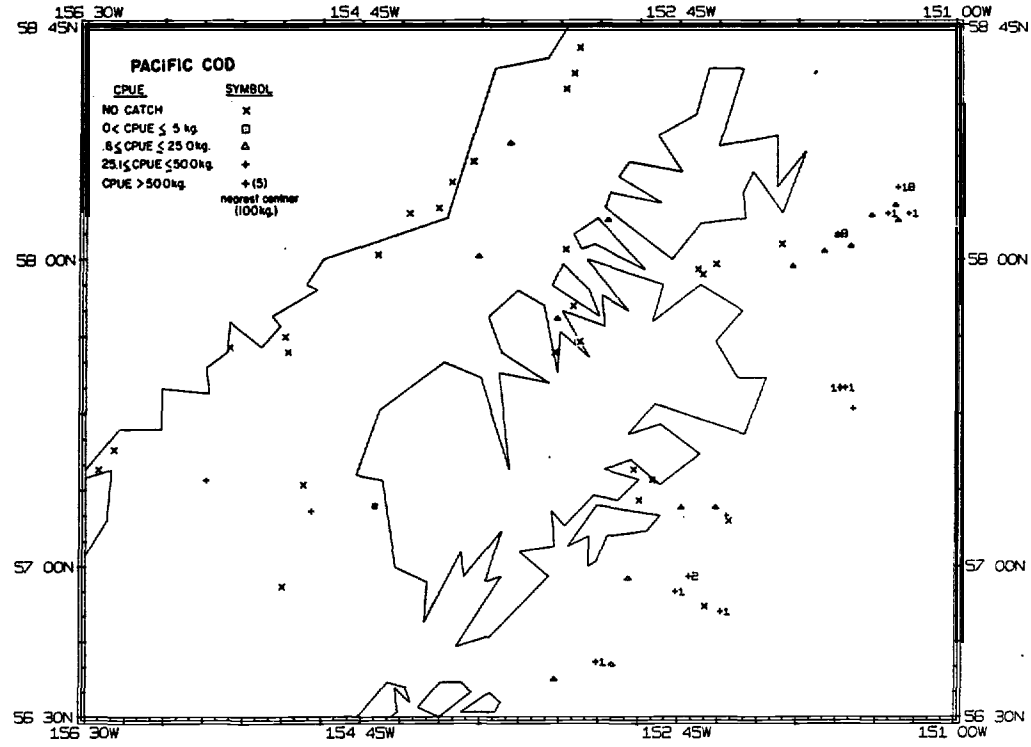


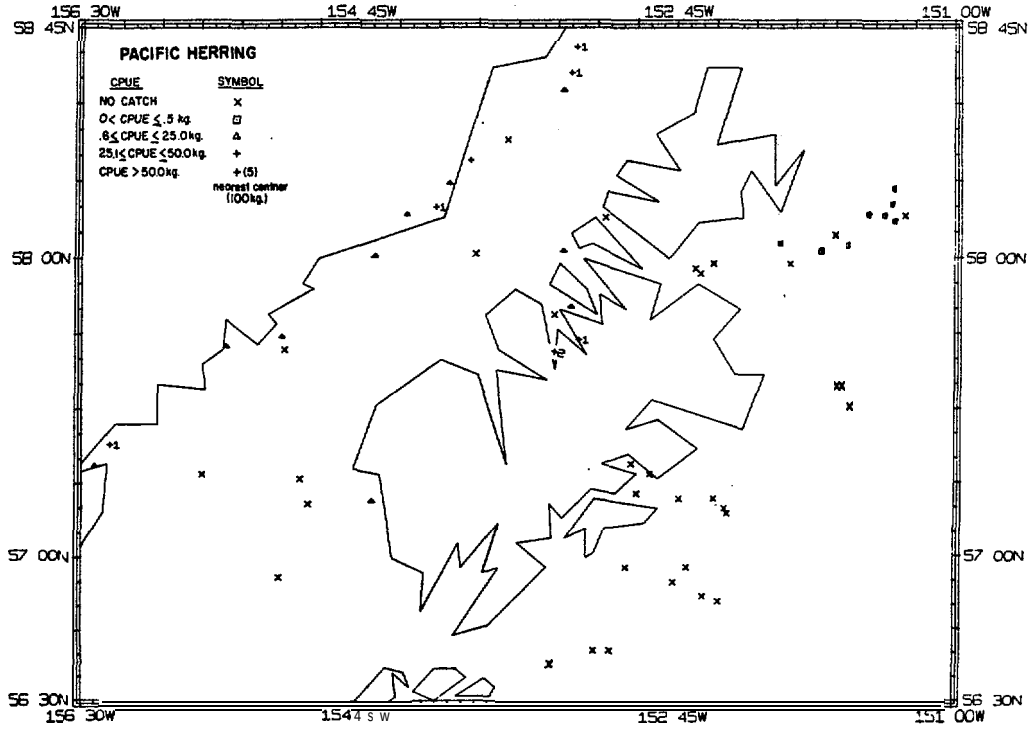
Figures X-193-194.--Distribution of **pandalid** shrimp and walleye pollock standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.



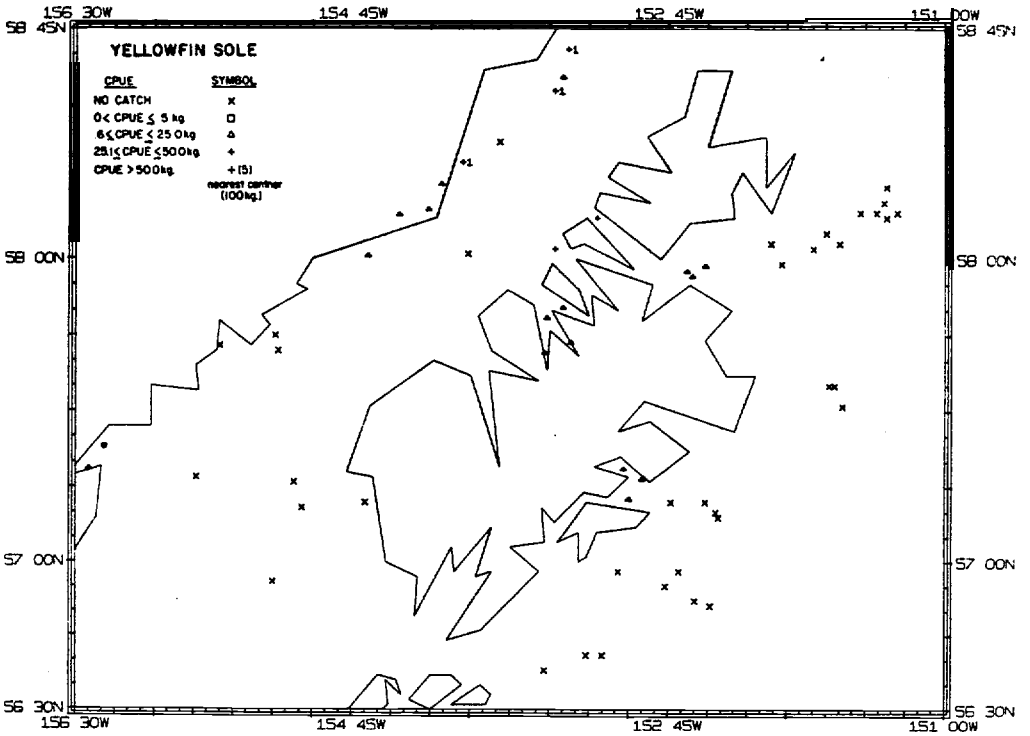


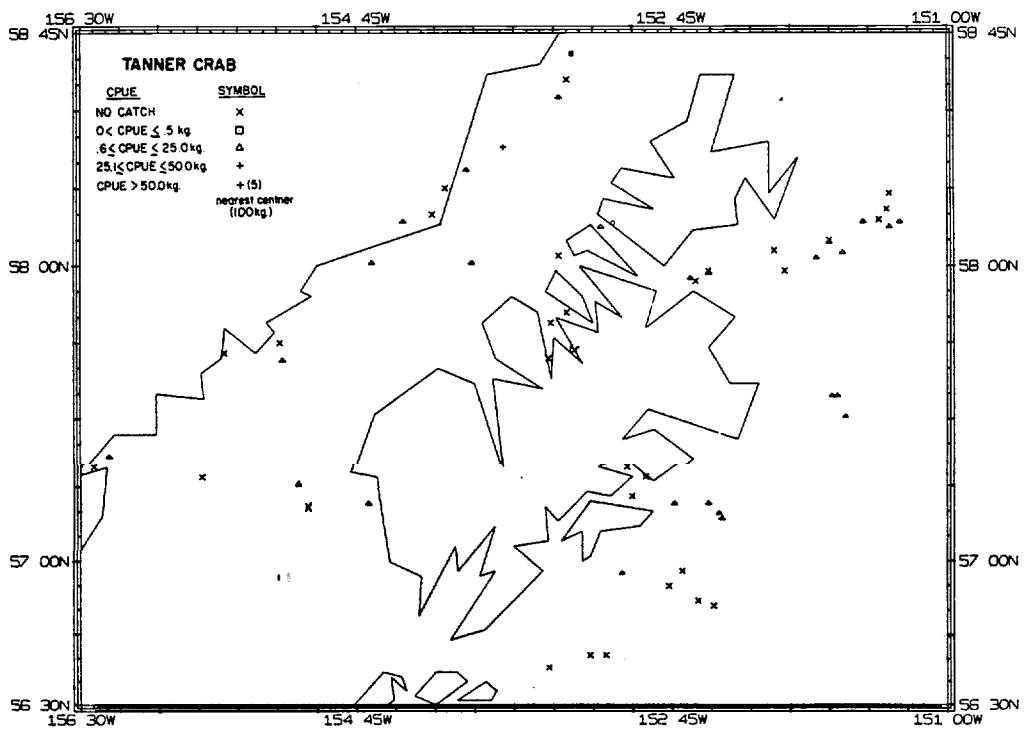
Figures X-195-196.--Distribution of turbot and **flathead** sole standardized catch rates in kg/hr, during cruise 682, R/V John R. Manning.





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 Kodiak, Kenai, and Prince William regions. One hundred thirteen stations were attemped with a 65' 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 Perenosa Bay on Afognak Island (Figure X-203).

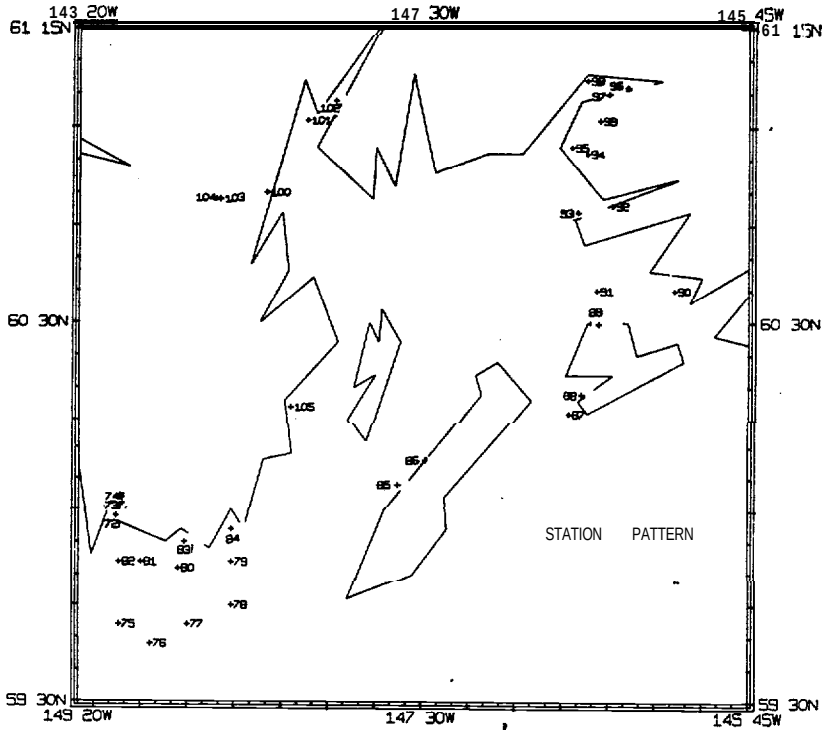
Walleye pollock and herring were the only other species to occur at mean catch rates greater than 10 kg/hr. Walleye pollock in the inner and outer shelf depth zones and Pacific herring in the inner shelf. Largest concentration of walleye pollock was located in Port Dick, Jack Bay in Prince William Sound, 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 a 8' New Beford 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 scallops averaged near 50 kg/hr respectively in both depth zones and constituted 88 and 77% of the total catch (Figure X-207). Tanner crabs and sidestripe shrimp were the only other species captured which produced a mean CPUE of 1 kg/hr or more.



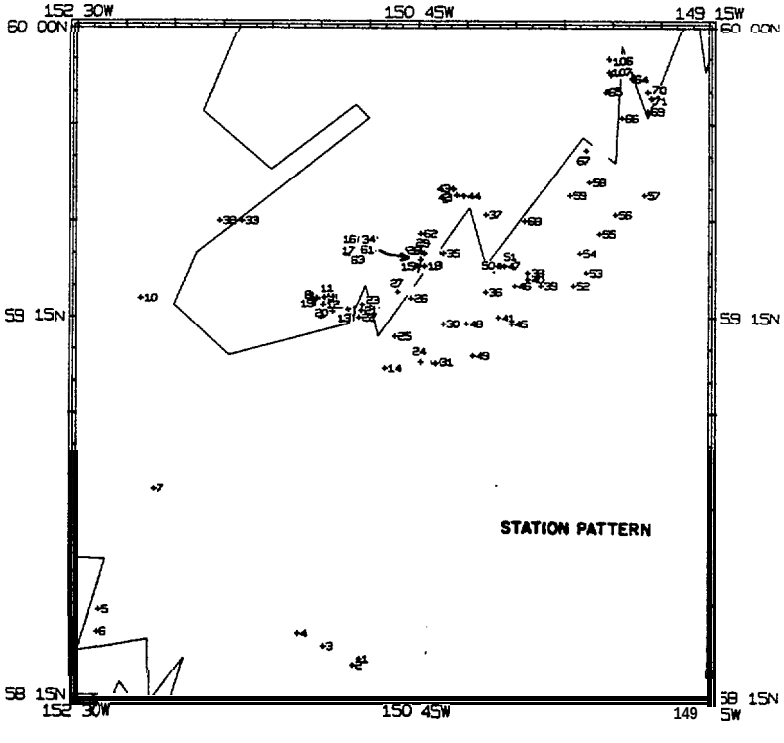
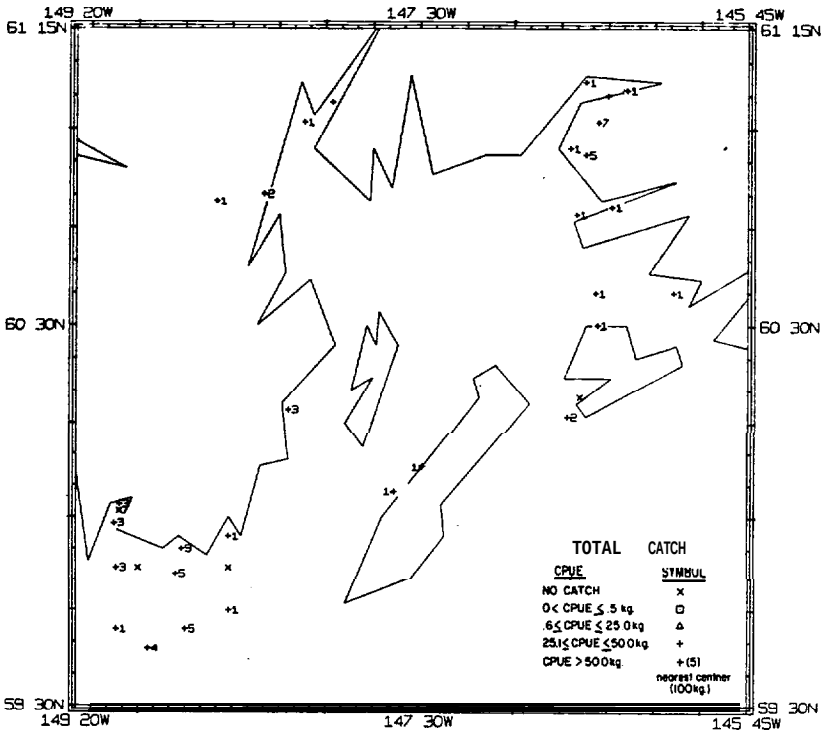


Figure X-201.--Stations successfully trawled (shrimp trawl) during cruise 703, charter vessel Pacific Lady.

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 shrimps	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,



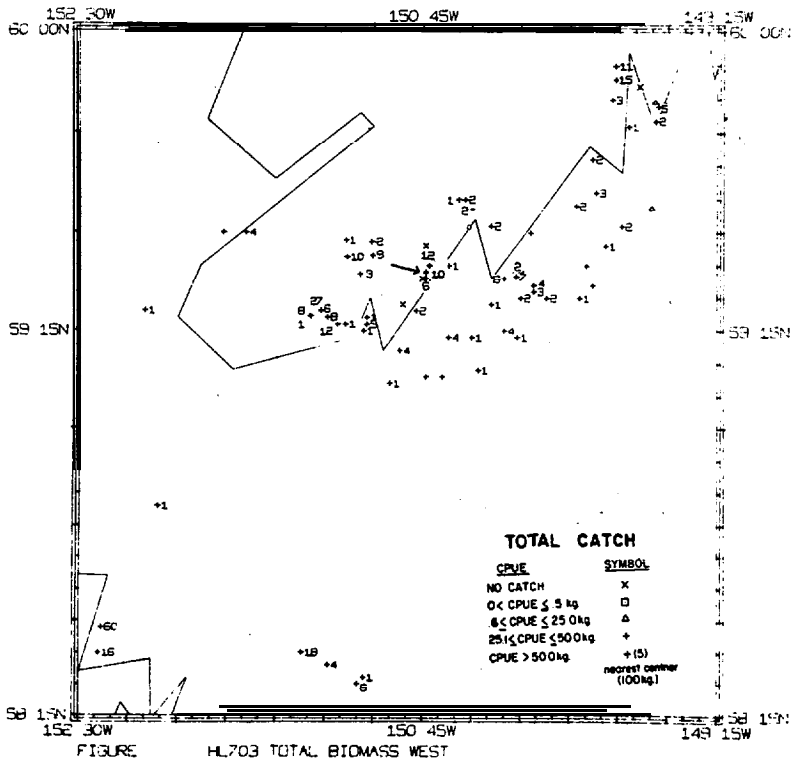
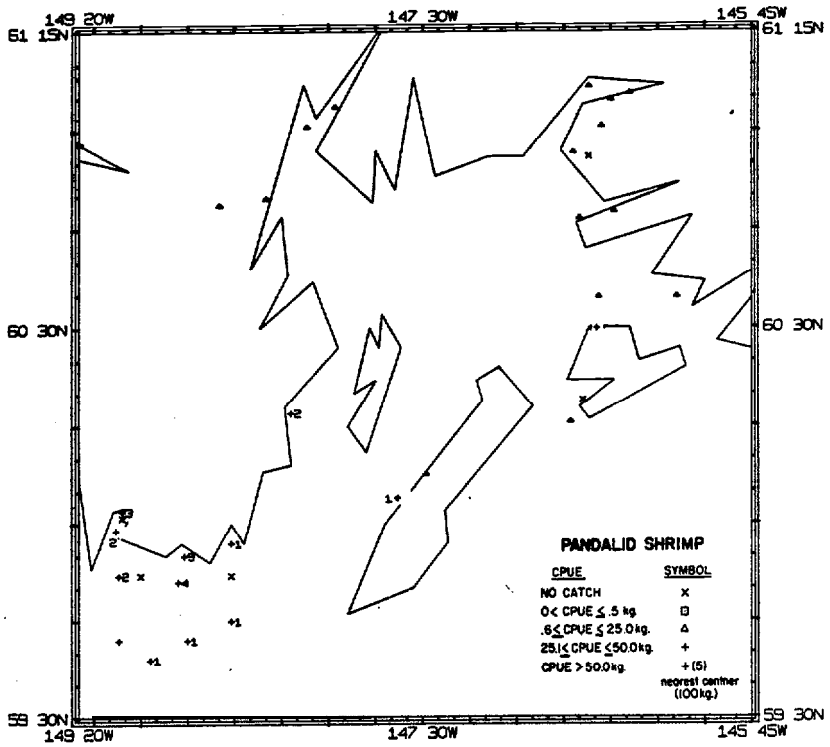
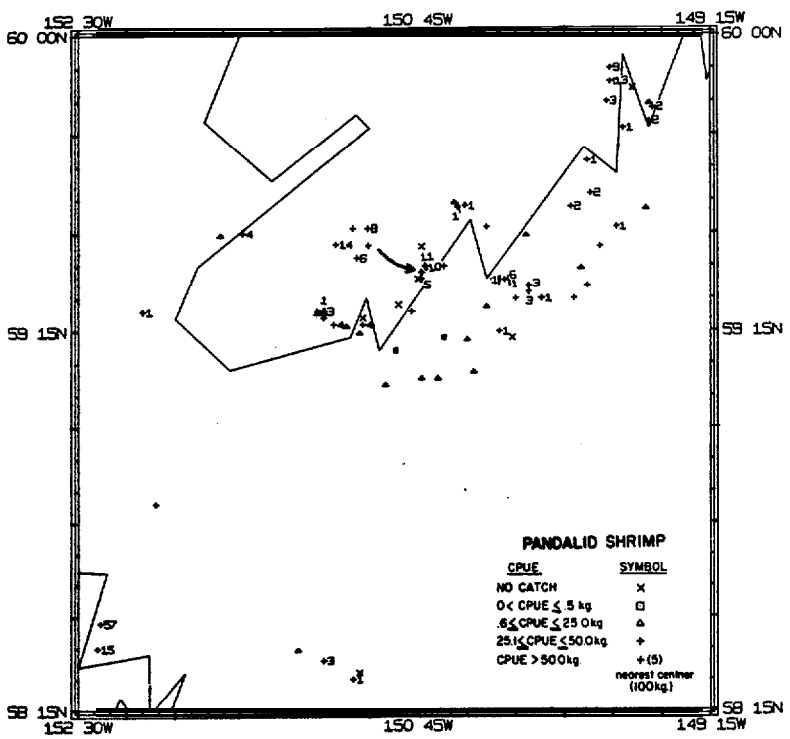


Figure X-202.--Distribution of standardized catch rates, all species combined in kg/hr, during cruise 703, charter vessel Pacific Lady.





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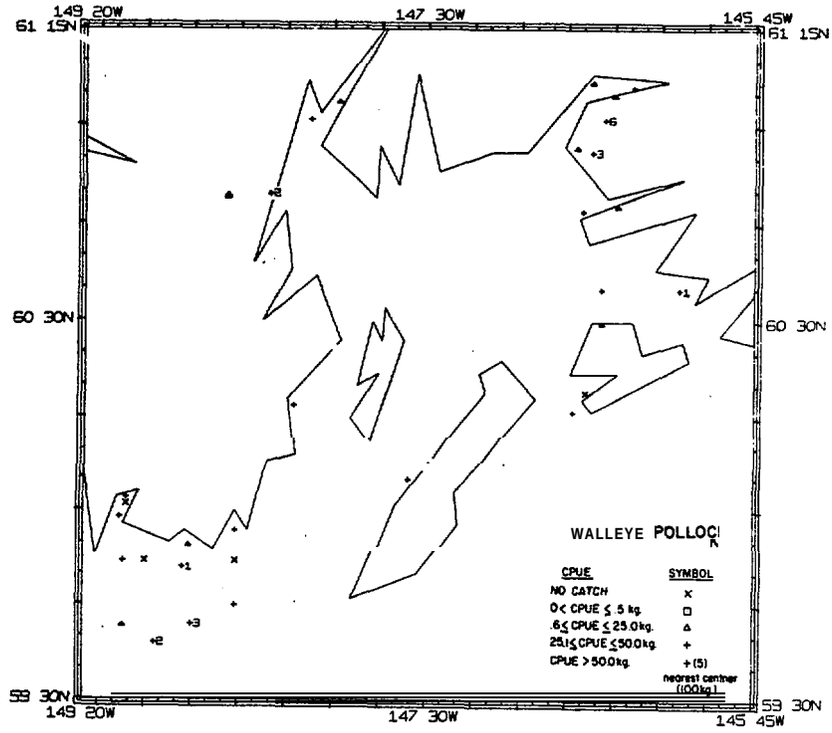


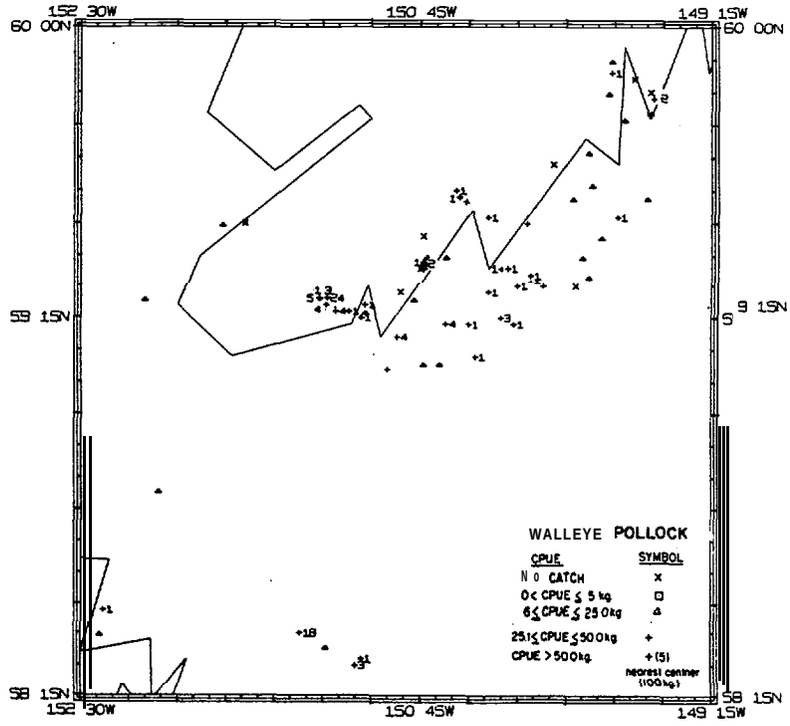
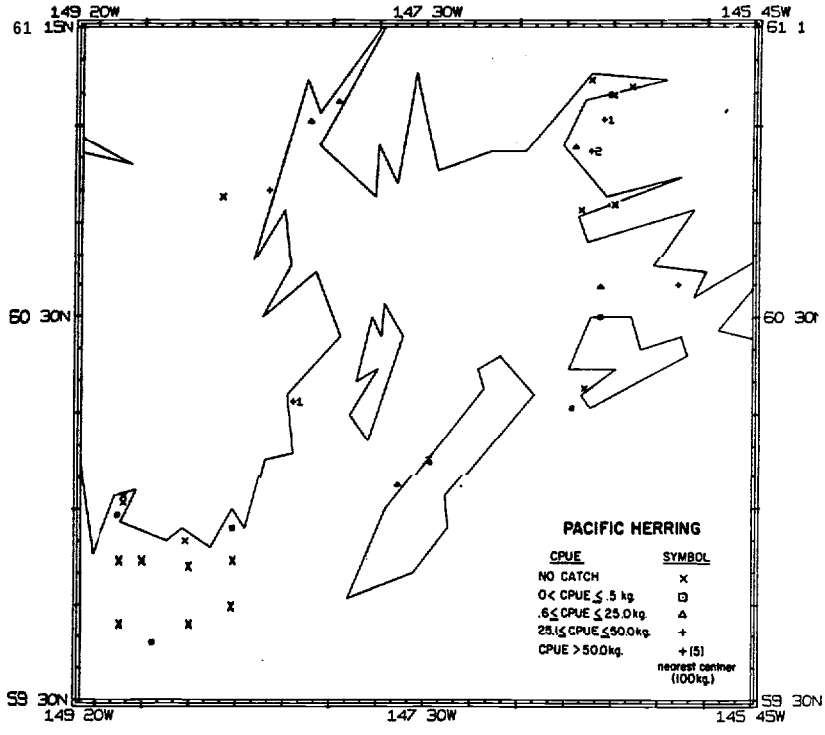
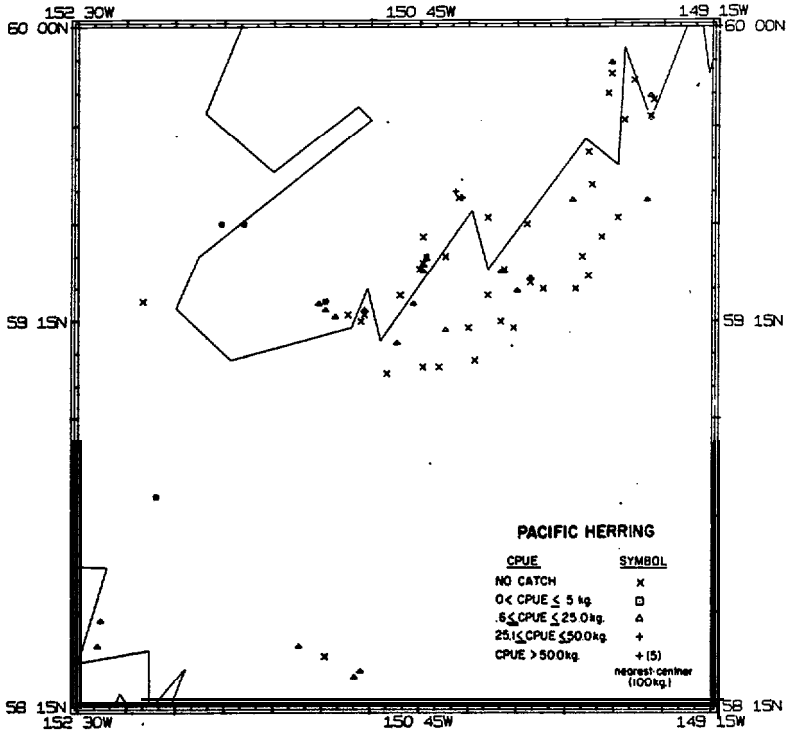


Figure X-204.--Distribution 'of walleyepollockstandardized catch rates in kg/hr, during cruise 703, **charter** vessel Pacific Lady.





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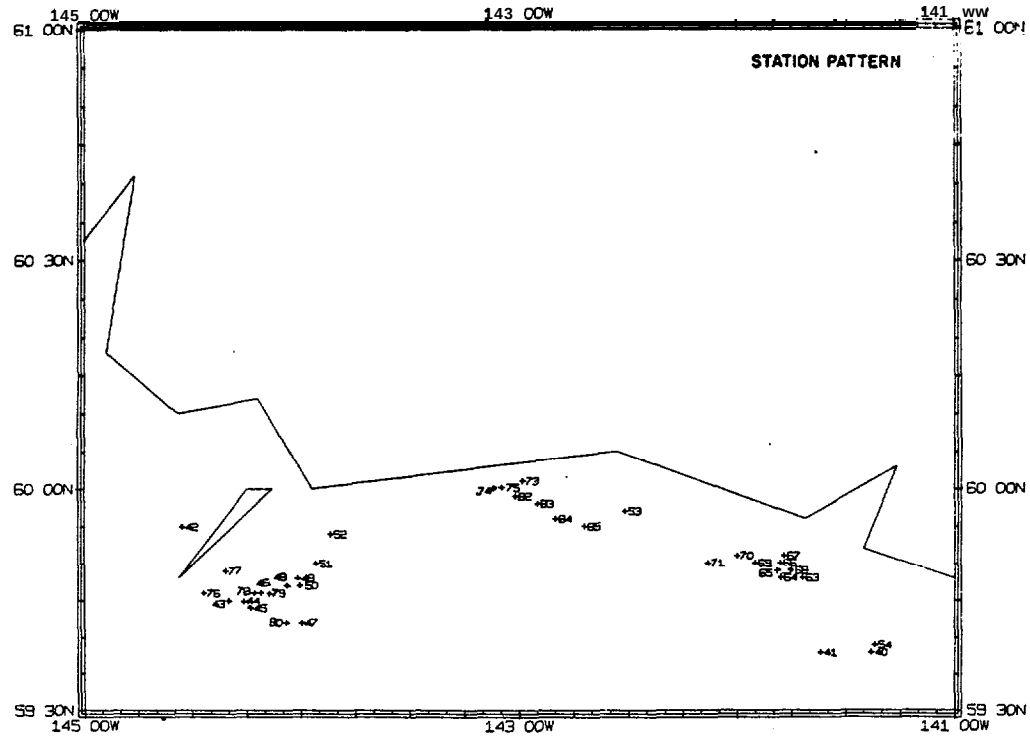


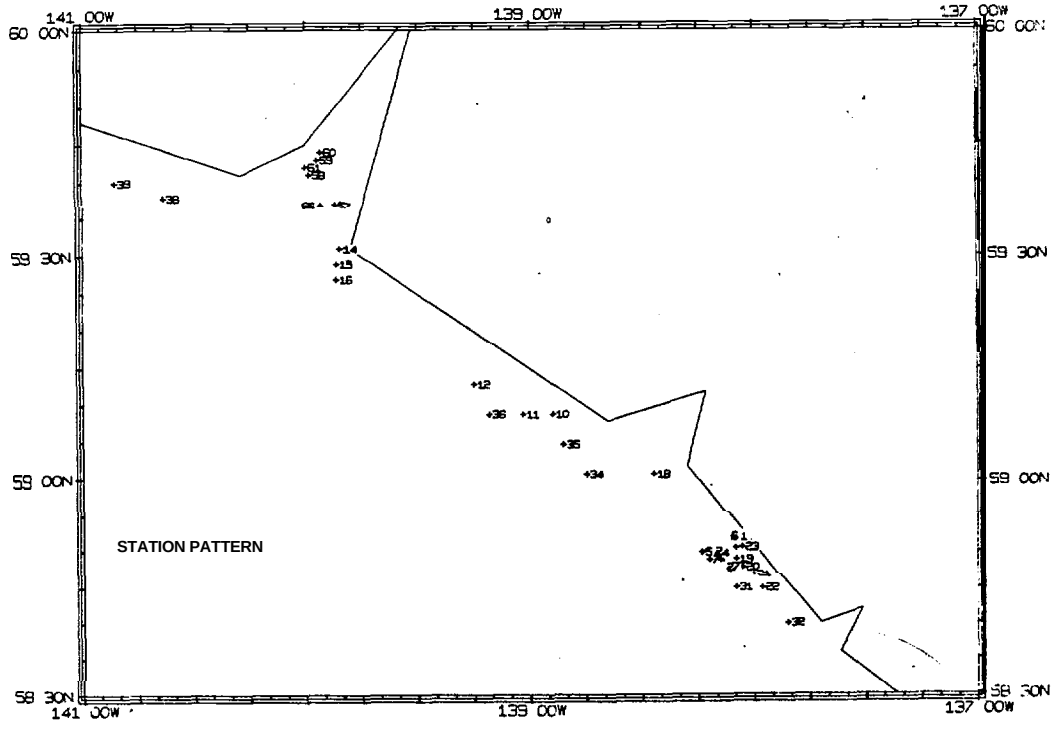


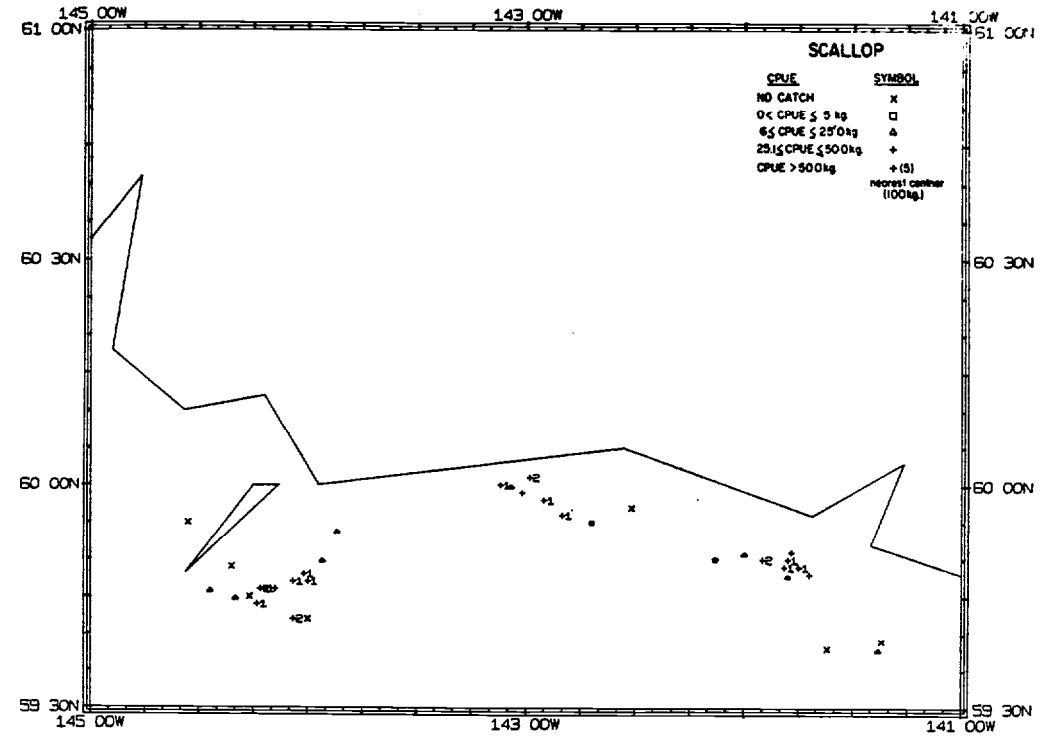
Figure X-206.--Stations successfully sampled (scallop dredge) during cruise 631, R/V John R. Manning.

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		**57.4**
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**



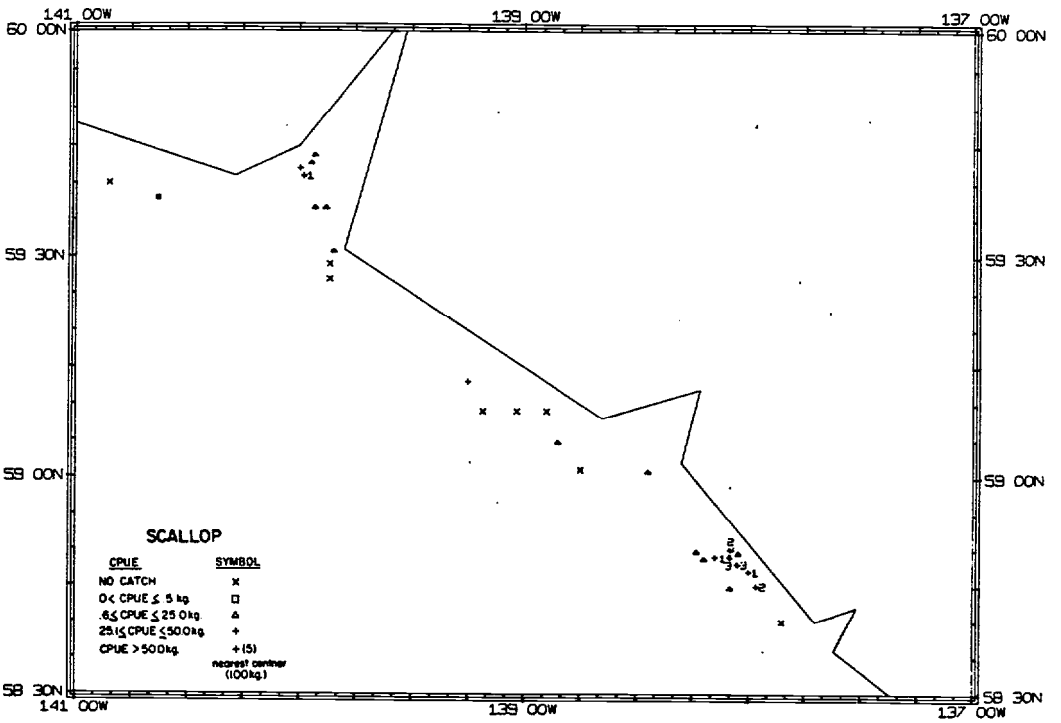


Figure X-207.--Distribution of scallops standardized catch rates in kg/hr, during cruise 631, R/V John R. Manning.

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

During July-September 1963 a scallop dredge was fished at 8 stations during *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 scallops 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 8' 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.

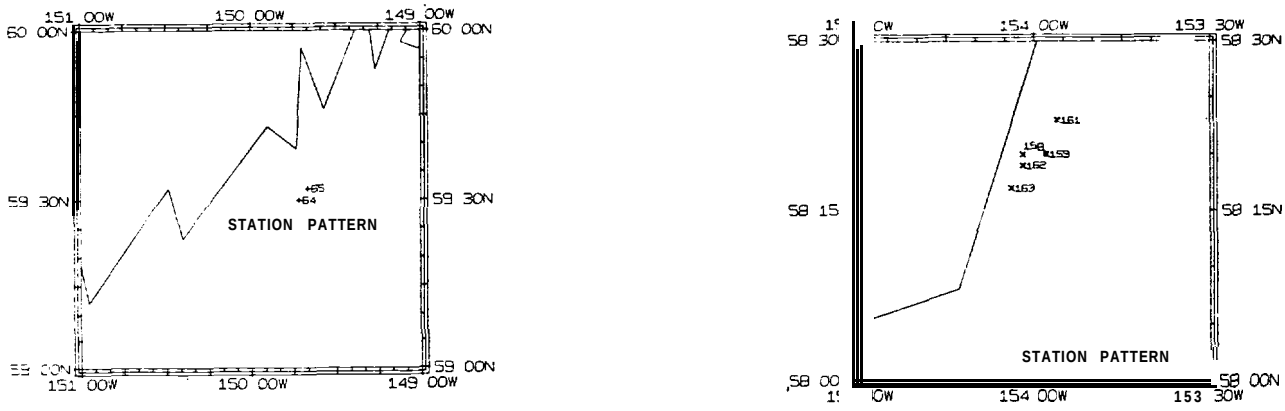
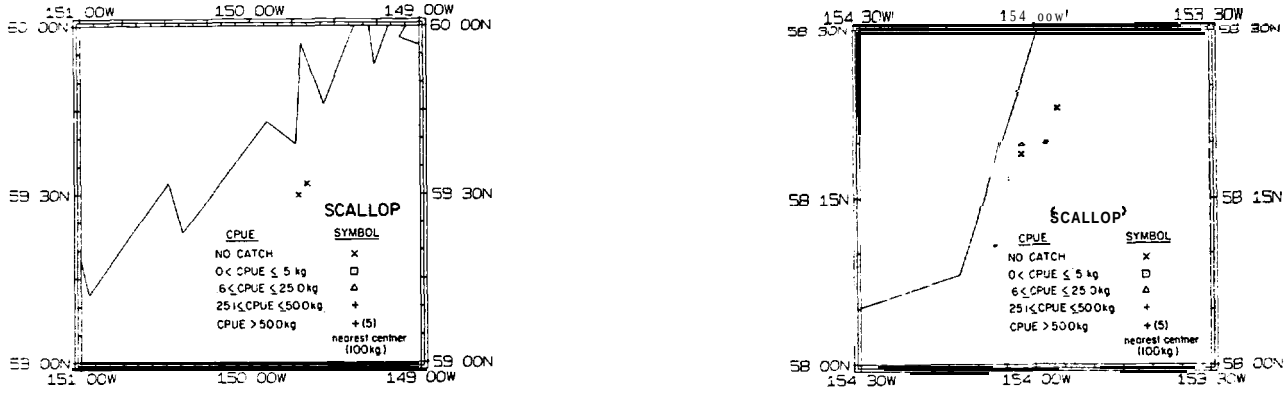


Figure X-208.--Stations successfully sampled (scallop dredge) during cruise 632, charter vessel Yaquina.



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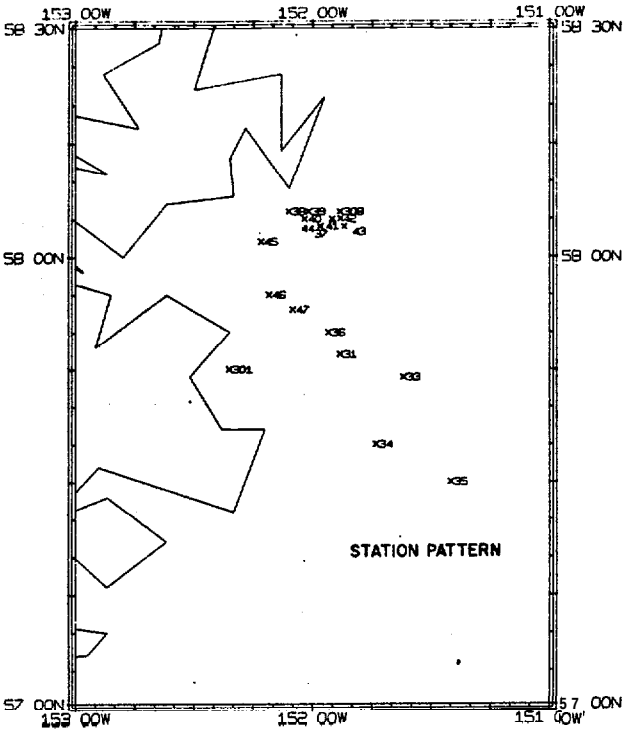


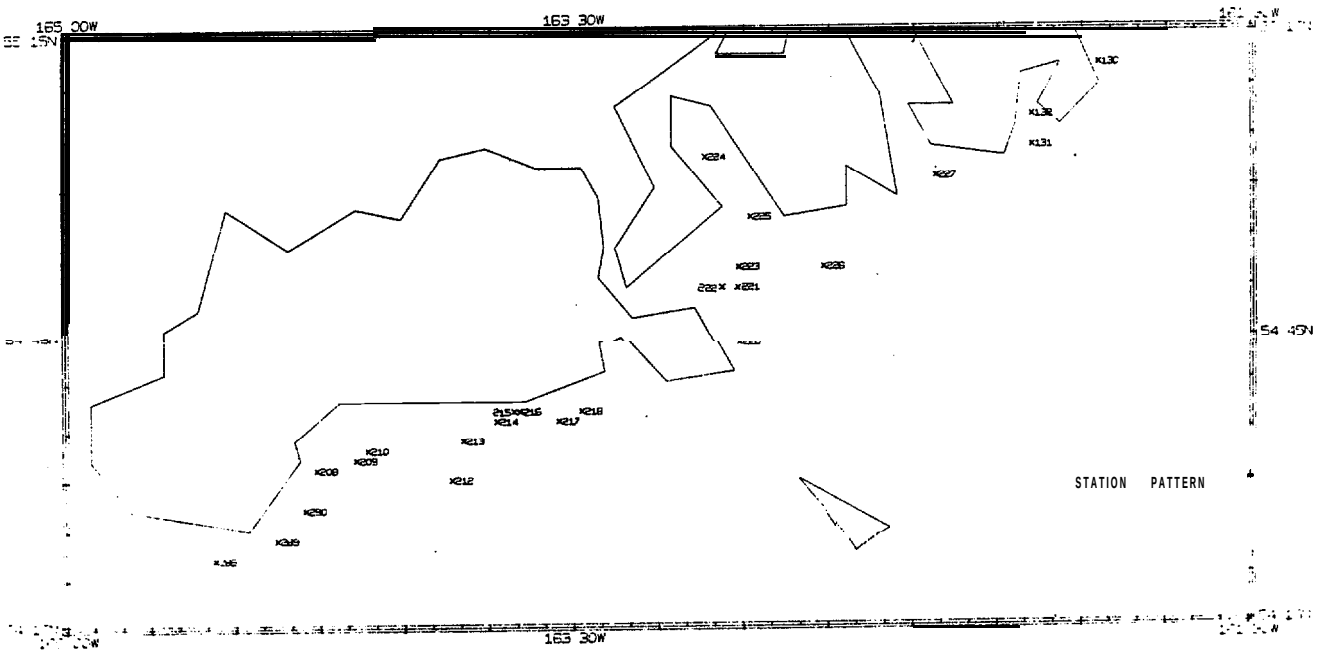
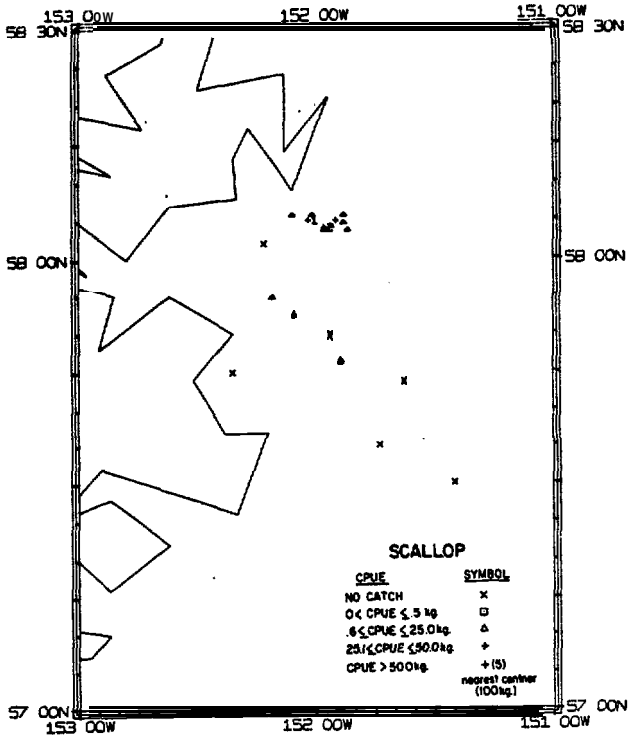
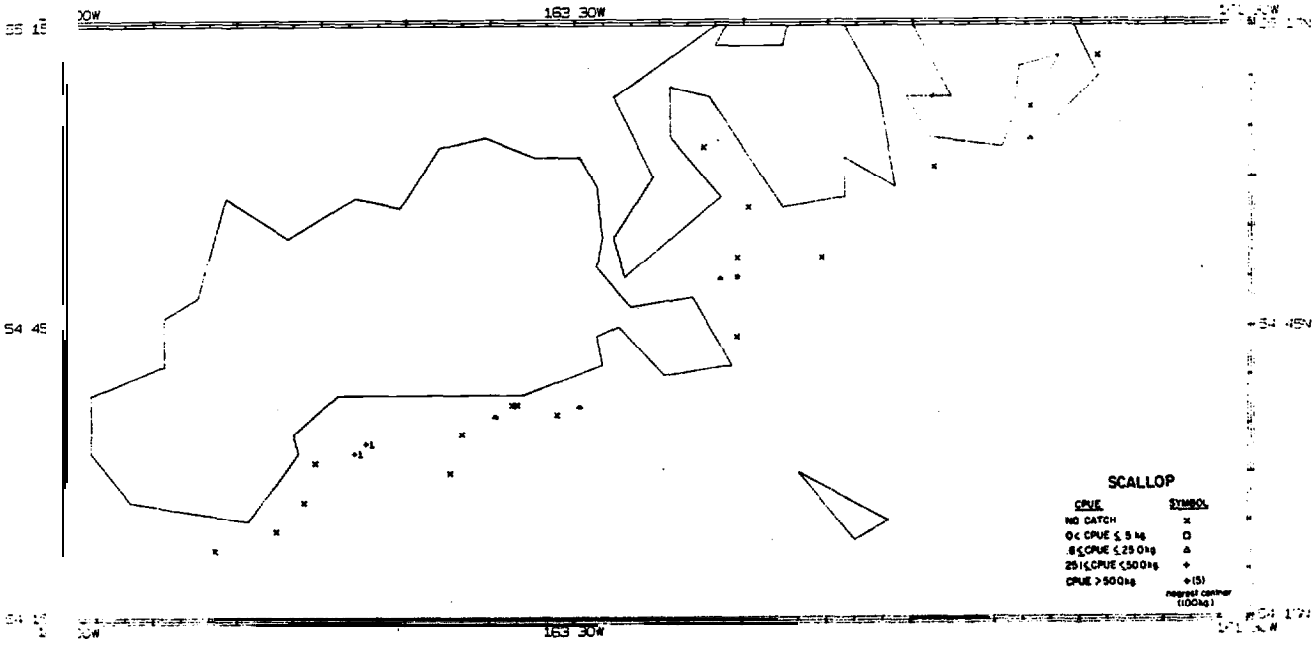


Figure X-210.--Stations successfully sampled (scallop dredge) during cruise 642, charter vessel Paragon.

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

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	91.4		42.1
Total all species	98.4		44.2





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RESEARCH UNIT 174

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976

A Historical Review

by

Lael L. Ronholt, Herbert H. Shippen and Eric S. Brown

December 1977

Volume 2

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Figure X1-190.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, May-July 1961 (Cruise 618).

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Figure X1-197.--Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

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Figure X1-204.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

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Figure X1-222.--Distribution of standardized catch rates in kg/hr of skates in the western Gulf of Alaska, May-July 1961 (Cruise 618).

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Figure XI-224.--Distribution of standardized catch rates in kg/hr of sablefish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

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Figure X1-239.--Distribution of standardized catch rates in kg/hr of Dover sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

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Figure XI-242.--Stations successfully trawled (otter trawl) during Cruise 619, Aug.-Sept. 1961.

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Figure X1-244.--Distribution of standardized catch rates in kg/hr of all species combined in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

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Figure XI-246.--Distribution of apparent relative abundance of invertebrates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-247.--Distribution of standardized catch rates in kg/hr of invertebrates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-248.--Distribution of standardized catch rates in kg/hr of invertebrates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-249.--Distribution of apparent relative abundance of flatfish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-250.--Distribution of standardized catch rates in kg/hr of flatfish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-251.--Distribution of standardized catch rates in kg/hr of flatfish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

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Figure XI-253.--Distribution of standardized catch rates 'in kg/hr of roundfish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

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Figure XI-258.--Distribution of apparent relative abundance of elasmobranchs in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-259.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-260.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-261.--Distribution of standardized catch rates in kg/hr of Tanner crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-262.--Distribution of standardized catch rates in kg/hr of Tanner crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-263.--Distribution of apparent relative abundance of Tanner crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-264.--Distribution of standardized catch rates in kg/hr of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-265.--Distribution of standardized catch rates in kg/hr of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-266.--Distribution of apparent relative abundance of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-267.--Distribution of standardized catch rates in kg/hr of turbot in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-268.--Distribution of standardized catch rates in kg/hr of turbot in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-269.--Distribution of apparent relative abundance of turbot in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-270.--Percentage length frequencies of turbot from the Gulf of Alaska (Cruise 619).

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Figure XI-272.--Distribution of standardized catch rates in kg/hr of cottids in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-273.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-274.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-275.--Distributon of apparent relative abundance of rock sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-276.--Percentage length frequencies of rock sole from the Gulf of Alaska (Cruise 619).

Figure X1-277.--Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-278.--Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-279.--Distribution of apparent relative abundance of flathead sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-280.--Distribution of standardized catch rates in kg/hr of walleye pollock in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure XI-281.--Distribution of standardized catch rates in kg/hr of walleye pollock in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure XI-282.--Distribution of apparent relative abundance of walleye pollock in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-283.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-284.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure XI-285.--Distributon of standardized catch rates in kg/hr of skates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-286.--Distribution of standardized catch rates in kg/hr of skates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure XI-287.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-288.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-289.--Distribution of apparent relative abundance of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-290.--Percentage length frequencies of Pacific ocean perch from the Gulf of Alaska (Cruise 619).

Figure X1-291.--Distribution of standardized catch rates in kg/hr of Pacific cod in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-292.--Distribution of standardized catch rates in kg/hr of Pacific cod in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-293.--Percentage length frequencies of Pacific cod from the Gulf of Alaska (Cruise 619).

Figure X1-294.--Distribution of standardized catch rates in kg/hr of Dungeness crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-295.--Distribution of standardized catch rates in kg/hr of Dungeness crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-296.--Distribution of standardized catch rates in kg/hr of rex sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-297.--Distribution of standardized catch rates in kg/hr of rex sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-298.--Percentage length frequencies of rex sole from the Gulf of Alaska (Cruise 619).

Figure X1-299.--Distribution of standardized catch rates in kg/hr of sablefish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Figure X1-300.--Distribution of standardized catch rates in kg/hr of sablefish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

XI

DEMERSAL RESOURCE ASSESSMENT SURVEYS IN THE GULF OF ALASKA

INTRODUCTION

Resource assessment surveys have been conducted in the Gulf of Alaska from 1961 to the present. The initial survey was conducted by the IPHC and BCF in 1961 and covered the entire Gulf of Alaska from Unimak Pass to Cape Spencer. The IPHC conducted additional surveys in 1961-1963. Although the IPHC surveys were primarily conducted to describe the distribution and availability of halibut, data were obtained on other associated demersal species. It was nearly 10 years until the next resource assessment cruise was conducted in the Gulf of Alaska. Under the NMFS, MARMAP program, pandalid shrimp resource assessment cruises were initiated in 1971 and were followed by demersal fish surveys in 1972. Both shrimp and demersal fish surveys are continuing yearly. In 1975 the first NMFS/OCSEAP/BLM-sponsored resource assessment survey was conducted in the Yakutat Bay to Cape Spencer portion of the Gulf of Alaska.

OBJECTIVES

The objectives of these surveys are: 1) define the distribution and relative abundance of demersal fish and shellfish resources available to otter trawls, 2) estimate the standing stock and size composition of the principal species, 3) define the composition of the demersal fish communities by area and depth, and 4) for principal species collect data on length-weight relationships, age and sexual maturity.

METHODS

1. Survey approach and rational

In the Gulf of Alaska surveys, two major sampling approaches or schemes have been used: (1) systematic, and (2) stratified random. In the systematic sampling scheme, stations were arranged along lines of longitude spaced 15° apart. Along each line, stations were located every 6 minutes of latitude apart from the shoreline to the 200 meter line with two additional stations to be attempted at deeper depths, approximately 256 and 457 meters. Initially the scheme was to sample all trawlable stations; however, weather and time precluded this plan and the sampling density varied considerably. Systematic sampling schemes were used for the IPHC and BCF 1961-1963 surveys and the 1975 NEGOA survey by NMFS.

In the stratified random sampling scheme the continental shelf and upper slope of the Gulf of Alaska was divided into strata based on water depth, species distribution and bottom type. Each stratum was further divided into stations or blocks of approximately uniform size. When the sampling density had been established for a stratum, the sampling stations were randomly selected. The stratified-random sampling scheme was used for the NMFS shrimp and demersal fish resource assessment surveys since 1971.

2. Vessels and Fishing Gear

During the 1961-1963 IPHC-BCF demersal resource surveys, 6 vessels were used, the R/V John N. Cobb and 5 charter vessels, Tordenskjold, Arthur H., Morning Star, St. Michael, and Western Flyer. With the exception of the John N. Cobb, which is 93' overall length, these vessels ranged from 65 t-3 feet. All sampling was conducted with 400-mesh eastern otter trawls with 1-1/4" mesh cod end liners.

Since 1971 NMFS has conducted Pandalid shrimp and demersal fish surveys in the Gulf of Alaska using the NOAA research vessels, John N. Cobb and Oregon and the chartered vessels, Commando and North Pacific (Tables x1-1-21. The vessels, with the exception of the Commando which is 65' in length, are from 87 to 100' in length.

Two types of shrimp trawls were used during pandalid shrimp surveys, the 80' Kodiak shrimp trawl in 1971 and 1972, and the NMFS 61' high opening shrimp trawl in subsequent years (Figures X1-1-2). Demersal fish surveys have been conducted with the 400-mesh eastern otter trawl with and without roller gear, and the modified 400-mesh eastern otter trawl (Figure X-l and Table X-l).

3. Sampling procedures

Before trawling, each station was surveyed with the echo sounder to determine the trawlability of the bottom. When the echo sounding recording indicated irregular and/or hard bottom, the vessel proceeded to the next station. When the echo indicated regular-soft bottom, the station was sampled with the trawl.

Since 1971 station positioning was by Loran A for offshore areas, and radar, for inshore areas, or a combination thereof. Since the loran data were not collected during the early IPHC surveys, it is assumed that positioning was by radar and dead reckoning. The start position was recorded when the brakes were set after the trawl had been let out; and the end position when the winches were started to retreive the trawl.

Sampling duration during the 1961-1963 cruises and the 75-l cruise of the North Pacific was 1 hour. For all other cruises, sampling duration was generally ½ hour.

Trawling distance varied over the years generally increasing in more recent years. Distance trawled for the IPHC and BCF 1961 surveys was estimated to be 2.7 nautical miles per hour. For other surveys the average distance towed was measured from the start and end positions of each trawling location.

Table X1-1. --Pandalid shrimp resource assessment surveys conducted in the Gulf of Alaska from 1971 - 1976.

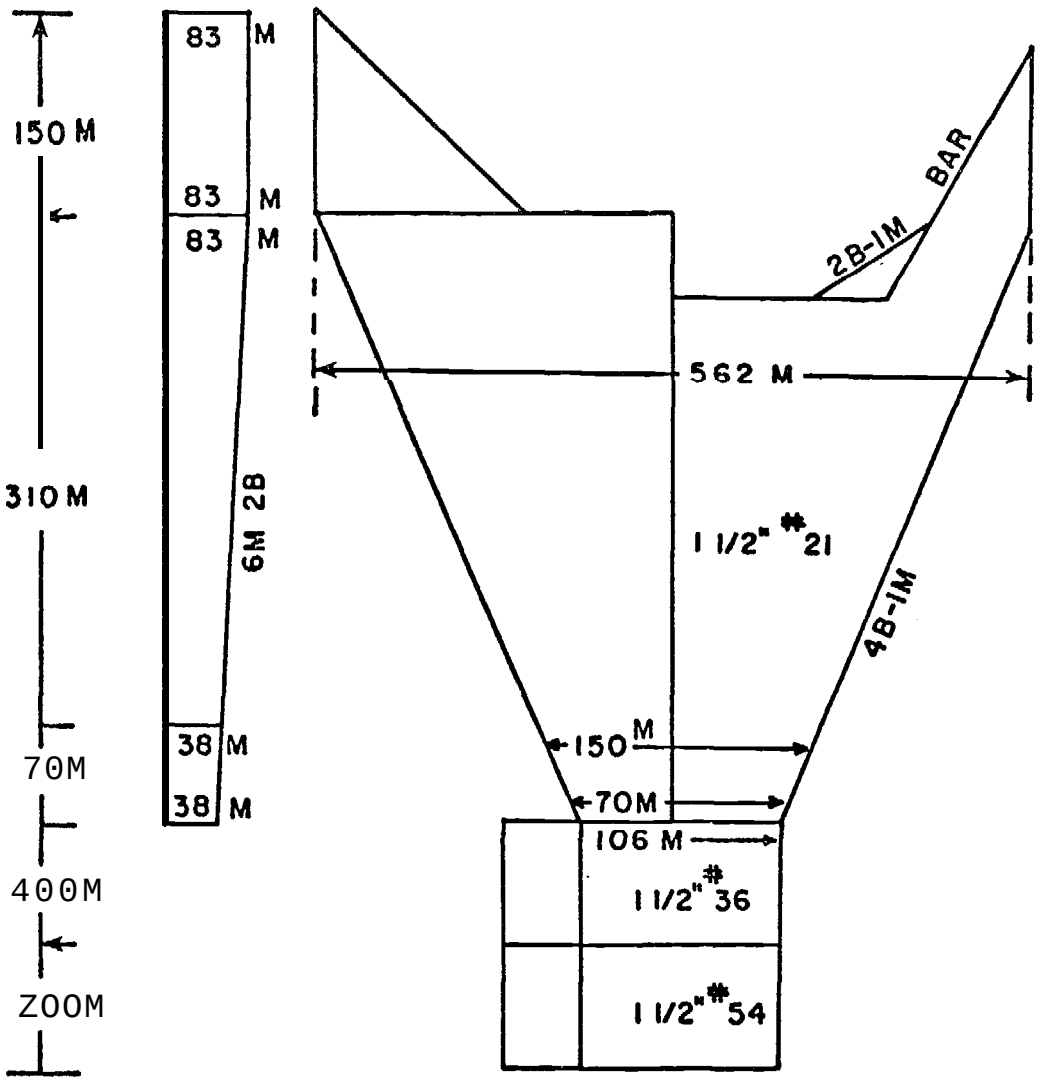
Cruise Number	Vessel Name	Vessel Length	Gear[1/]	Stations Attempted	Regions	Year	Months	Sampling Duration
712	Oregon	100'	ST80	67	Kodiak	1971	April-May	½ hr
713	Commando	65′	ST80	193	Kodiak	1971	June-July	½ hr
725	John N. Cobb	93'	ST80	60	Kodiak	1972	May	½ hr
723	Oregon	100'	ST61	103	Sanak-Shumagin	1972	August-September	½ hr
732	Commando	65′	ST6 1	52	Kodiak	1973	May-June	½ hr
735	Oregon	100'	ST61	145	Sanak-Shumagin	1973	August-October	½ hr
741	Oregon	100'	ST61	40	Kodiak	1974	April-May	½ hr
743	Oregon	100'	ST6 1	177	Sanak-Shumagin-Chirikof	1974	September-October	½ hr
751	Oregon	100'	ST6 1	57	Kodiak	1975	April-May	½ hr
753	Oregon	100'	ST6 1	167	Sanak-Shumagin-Chirikof	1975	September-October	½ hr
761	Oregon	100'	ST61	91	Kodiak	1976	April-May	½ hr
763	Oregon	100'	ST61	156	Sanak-Shumagin-Chirikof	1976	September-October	½ hr

1/ ST80 - 80' NORDBY shrimp trawl (Figure XI-l)
ST61 - 61' high opening NMFS trawl (Figure XI-2)

Table XI-2.--Demersal fish resource assessment surveys conducted in the Gulf of Alaska, 1961 - 1976.

Cruise Number	Vessel Name	Length	Gear[1/]	Stations Attempted	Regions	Year	Months	Sampling Duration
611	Tordenskjold	65'	OTE	206	Fairweather-Yakutat	1961	June-September	1 hr
052	John N. Cobb	93'	OTE	53	Prince William-Kenai	1961	September-October	1 hr
054	John N. Cobb	93'	OTE	82	Prince William-Kenai	1962	April-May	1 hr
618	Arthur H.	73'	OTE	599	Kodiak-Shelikof-Chirikof-Shumagin-Sanak	1961	May-July	1 hr
	Morning Star	65'						
	St. Michael	72'						
619	Arthur H.	73'	OTE	208	Kodiak-Shelikof-Chirikof-Shumagin-Sanak	1961	August-November	1 hr
	Morning Star	65'						
	St. Michael	72'						
628	Arthur H.	73'	OTE	291	Fairweather-Yakutat-Prince William-Kenai	1962	June-August	1 hr
	St. Michael	72'						
	Western Flyer	71'						
629	Arthur H.	73'	OTE	133	Fairweather-Yakutat-Prince William-Kenai	1962	September-November	1 hr
	St. Michael	72'						
	Western Flyer	71'						
726	John N. Cobb	93'	OTE-OTER	57	Kodiak-Shelikof	1972	July-August	4 hr
733	John N. Cobb	93'	OTM	45	Kodiak-Shelikof	1973	May-June	½ hr
734	John N. Cobb	93'	OTE	81	Kodiak-Kenai	1973	August-October	½ hr
744	John N. Cobb	93'	OTE	18	Sanak	1974	July-August	½ hr
751	North Pacific	87'	OTE	148	Prince William-Yakutat	1975	May-August	½ hr
753	John N. Cobb	93'	OTE	98	Chirikof-Kenai	1975	June-August	½ hr
762	John N. Cobb	93'	OTE	31	Fairweather	1976	April	½ hr

1/ OTE 400-mest Eastern otter trawl (Greenwood, 1958)
OTER 400-mesh Eastern otter trawl with roller gear
OTM 400-mesh modified Eastern otter trawl (Figure X-l)



80-ft. Shrimp Trawl

Netting:
Nylon

Headrope:
65' of 3/8", 6 x 19 galvanized wire rope

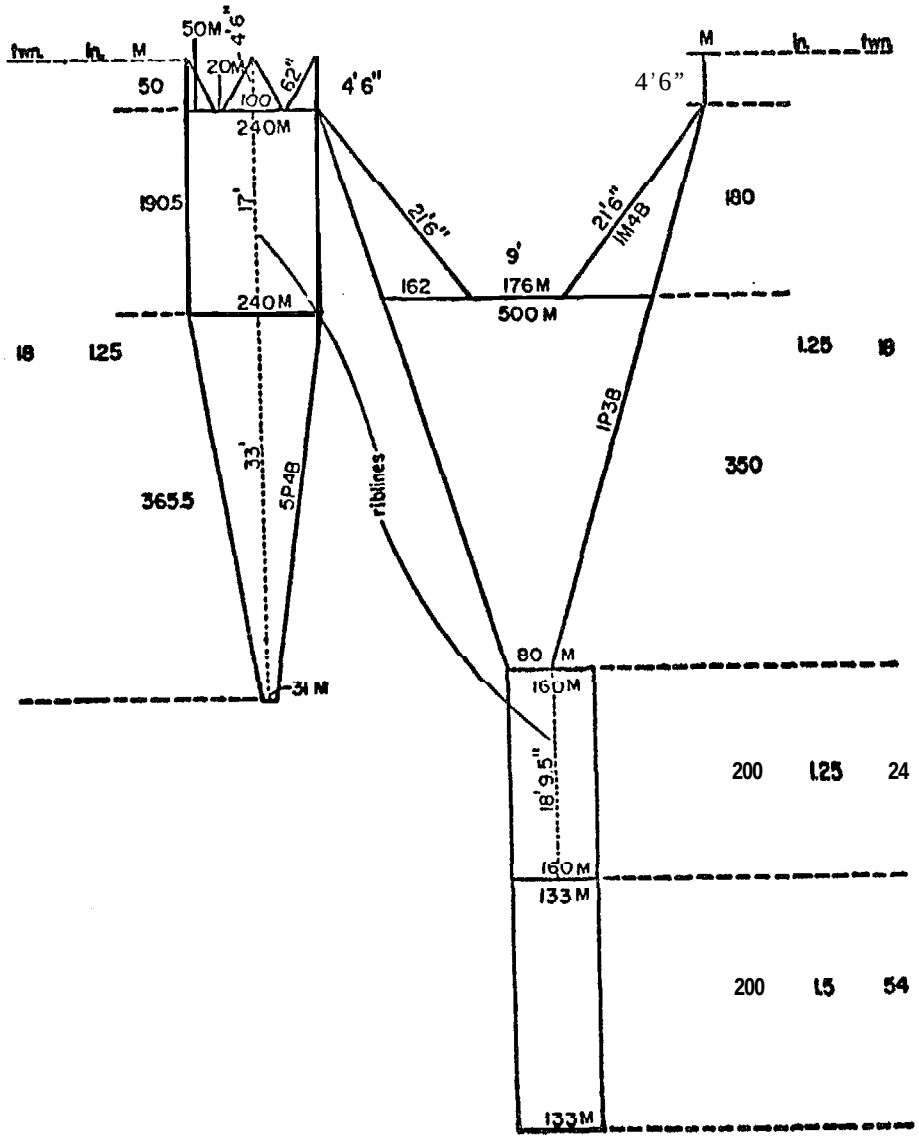
Footrope:
80' of ½", 6 x 19 galvanized wire rope

Flotation:
25-35 8" diameter trawl floats

Tickler chain:
74 ft of 3/8" galvanized chain

Otter boards:
5 x 7 ft. Vee design, 815 lbs.

Figure XI-l .--Schematic drawing and specifications of the 80' shrimp trawl.



Netting - nylon

Headrope:
61 ft. of 318 inch, 6 x 19 galvanized wire rope, tight wrapped with 5/16 inch polypropylene rope.

Footrope:
61 ft. of 1/2 inch, 6 x 19 galvanized wire rope, tight wrapped with 1/2 inch polypropylene rope.

Breastlfnes:
20 ft. of 1/2 inch braided nylon (Stable-braid).

Sidepanel ridlines:
73' 3-1/2" of 5/8 inch braided nylon (Stablebraid).

Flotation:
29 pieces, 8 in. diameter (5.5 lbs. buoyancy each).

Footrope chain:
60 ft. of 3/8 in. suspended with six 12-inch chain droppers (3/8 in. diameter).

Tickler chain:
55 ft. of 3/8 in. secured at wing tips.

Otterboards:
5 x 7 ft. Vee design, 815 lbs.

Dandylines (sweeplines)
3 pieces, 10 fathoms each, top & middle of 3/8 inch diameter, 6 x 19 galvanized wire rope, bottom of 1/2 inch diameter; top with 24 inch extension and middle with 18 inch extension - both of 3/8 inch proof coil chain.

Figure X1-2. --Schematic drawing and specifications of the 61' shrimp trawl.

4. Catch and biological sampling'

a. Catch handling

The procedure used for handling the catch has varied somewhat over the years. During the early surveys (1961-1963) total catches of less than about 680 kg were dumped directly into deck checkers and completely processed. Catches greater than 680 kg were subsampled by selecting certain splits, or portions of the total catch, to be dumped into checkers as they were brought onboard the vessel. In some instances, total catches were subsampled by shoveling the total catch into baskets and processing randomly selected baskets. During pandalid shrimp surveys the total catches were released into deck checkers before processing.

Since 1972 a new method of subsampling has been used during the demersal fish surveys for catches over 1000 kg (Hughes, 1976). Before the net is brought onboard the vessel, the checker or deck bin is lined with a small mesh retainer net. A second, subsampling, net is also spread in the deck bin covering only that portion of the bin to be subsampled. The codend is then brought onboard and secured directly above the deck bin so that the subsample net bisects the codend from top to bottom. The catch is then dumped into the bin and the subsample net lifted to take the desired sample. Total catch weights were obtained by weighing the codend and catch with a dynamometer or by recording the percentage of total catch obtained in the subsample and extrapolating. After the subsample was removed from the deck bin the catch was brailed overboard using the retainer net.

b. Sorting and weighing the catch

Methods for sorting and weighing the catches have remained fairly standard although several different containers, scales, etc. have been used. During the 1961-1963 period, the catch was sorted by species from the deck bin to wire baskets or other containers which were then weighed and the numbers counted. Since 1972, the subsample or total catch, depending on size, has been dumped into a waist-level sorting table. The catch is then sorted by species into baskets. When a catch contains dominant species, from three to six baskets are filled simultaneously following the method described by May and Hodder, 1966. When the baskets have been filled, they are removed from the table and placed on deck in ordered ***sets,*** after which this process is repeated until the dominant species are completely sorted. One basket from each ordered set is selected randomly and the basket weighed and the species counted. The remaining baskets from each set are weighed and dumped overboard. Baskets of fish were weighed to the nearest pound using platform scales. During **some cruises** species catches were not enumerated; however, since 1975 both number and weight data have been taken for most species.

During shrimp surveys the total catch was sorted into bushel baskets by shrimp and fish species. As the baskets of shrimp were filled they were released overboard except for randomly selected baskets of shrimp which were weighed and the average basket weight used to estimate the total catch of shrimp from the total number of baskets. Fish species were weighed separately. One randomly selected basket of shrimp was further separated into eight subsamples for estimating species composition of the shrimp catch. Two randomly selected subsamples were separated into individual shrimp species and each species component weighed on a triple beam balance. Total catch by species of shrimp was obtained by extrapolation from the subsamples to the total shrimp catch.

c. Subsampling for biological data

During the early 1960 surveys, length frequency samples were obtained for some dominant species, but not with any regularity. Fish were measured on specially built measuring boards to the nearest centimeter (fork length) and recorded on data sheets. Species of crabs were measured with vernier calipers, carapace length for king crab and width for Tanner crab. Other biological information, such as age, sex, and maturity composition, was rarely obtained,

Since 1972 more detailed and comprehensive biological sampling took place. Attempts were made to collect length-weight, length frequency, and age structure samples for the dominant or commercially important species. From 1972-1975 these data were collected on walleye pollock, the target species, but for other species only unsexed length frequency data were obtained. Since 1975, length and age data have been collected primarily on dominant species. Length frequency data are usually collected for the entire catch if it is less than 200-250 individuals. From the larger catches, one basket of each ordered set is randomly selected or the entire subsample used. After each species had been sexed, it was measured to the nearest centimeter (fork length) and recorded on plastic strips (Davenport and Harling, 1965).

Age structure and length-weight samples were selected to obtain representative length classes for both sexes, and were usually obtained in a stratified random manner.

Pandalid shrimp biological sampling included length frequencies by sex and length-weight relationships -but these data are not included in this report.

5. Analytical procedures

a. Geographic subdivisions

For analytical purposes the continental shelf and slope of the Gulf of Alaska was divided into 9 geographic regions; Fairweather, Yakutat, Prince William, Kenai, Kodiak, Shelikof, Chirikof, Shumagin and Sanak and 3 depth zones; the inner shelf (0-100 m), outer shelf (101-200 m) and upper slope (201-400 m). The exact boundaries varied for sane regions between the 1960's IPHC-BCF surveys and the 1970's NMFS surveys (Figures X1-3-4). When the boundaries did differ for a specific region, the area common to the earlier and later surveys in that region were used to compare survey results between the two.

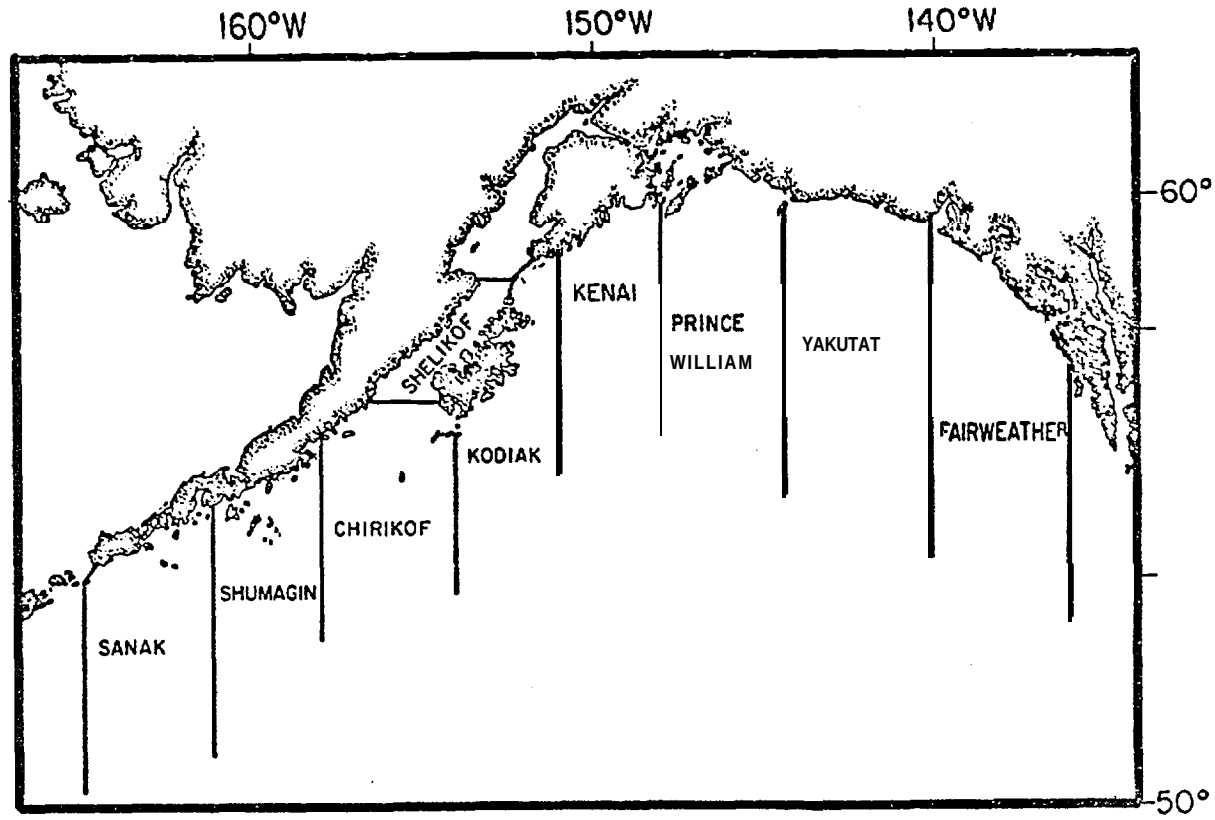


Figure X1-3. --Geographic regions for the 1960's surveys.

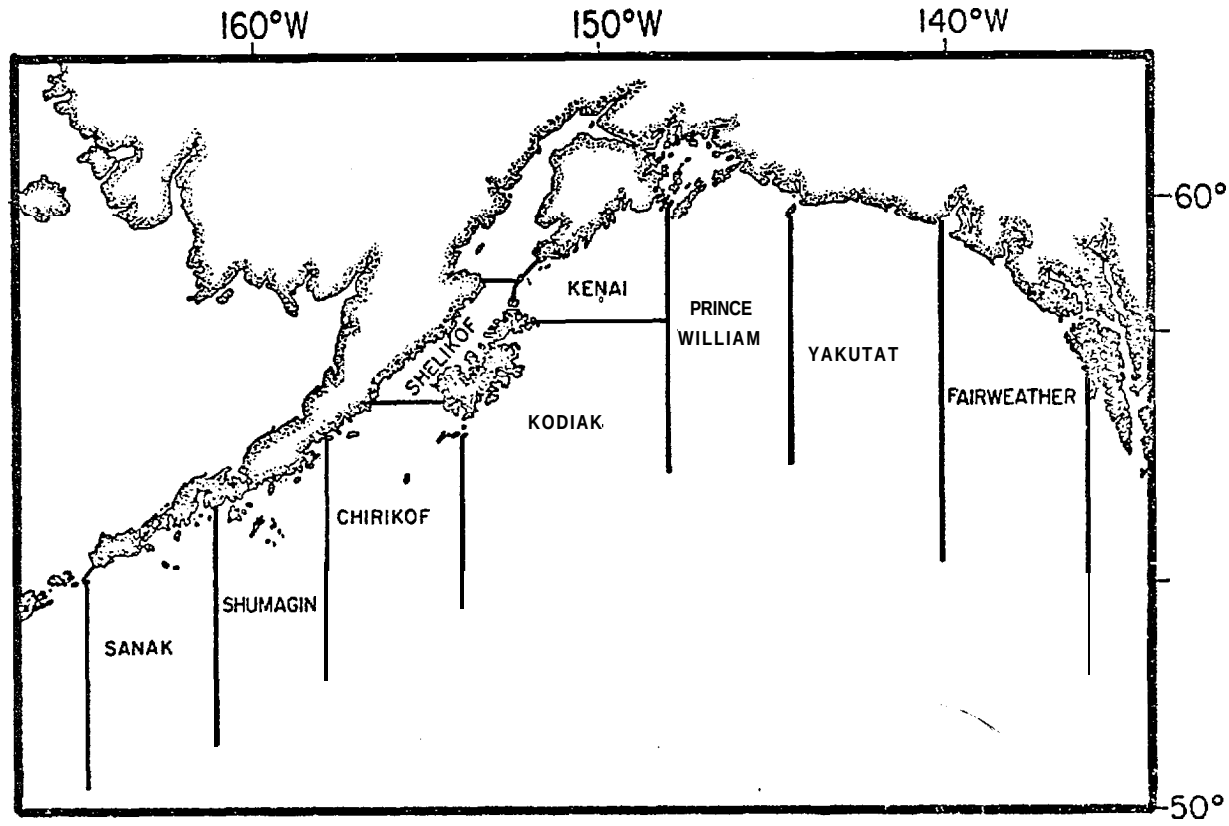


Figure X1-4. --Geographic regions for the 1970's surveys.

Boundaries for the geographic regions are:

Fairweather--Cape Spencer, 136°00'W longitude, to Yakutat Bay, 140°00'W longitude.

Yakutat--Yakutat Bay, 140°00'W longitude to Cape St. Elias, 144°30'W longitude.

Prince William-Cape St. Elias, 144°30'W longitude, to Cape Cleare, 148°00'W longitude.

Kenai--For the 1961 survey, Cape Cleare, 148°00'W longitude, to about Port Dick on the Kenai Peninsula, 151°00'W longitude; for the 1973-76 surveys, Cape Cleare, 148°00'W longitude, to the southern tip of the Kenai Peninsula to Cape Elizabeth and southwest to Amutulis Island, west to Ushagat Island in the Barren Islands group, south to Shuyak and Afognak Islands but north of 58°10'N latitude.

Kodiak--For the 1961 survey, from about Port Dick, 151°00'W longitude, to Sitkimak Island, 154°00'W longitude, and south of a line drawn from Cape Elizabeth on the Kenai Peninsula southwest to Amutuli Island and west to Ushagat Island in the Barren Islands group to Point Banks on Shuyak Island and south of Afognak and Kodiak Islands; for the 1973-76 surveys, west of Cape Cleare, 148°00'W longitude, and south of 58°10'N latitude and south of Kodiak Island to 154°00'W longitude.

Shelikof--For the 1961 survey, south of a line from Cape Douglas to Ushagat Island and thence south to Point Banks on Shuyak Island and north of Kodiak Island and 57°00'N latitude; for the 1973-76 surveys, south of a line from Cape Douglas to Ushagat Island and south to Point Banks on Shuyak Island and north of Kodiak Island; no comparison of the 1961 and 1973-76 survey results was attempted for this region because there was no area common to both survey periods.

Chirikof--Sitkinak Island, 154°00'W longitude, to Chignik Bay on the Alaska Peninsula, 158°00'W longitude, and south of 57°00'N latitude; 1973-76 surveys, the area of the continental shelf and slope west of Sitkinak Island 154°00'W longitude to Chignik Bay on the Alaska Peninsula, 158°00'W longitude, and south of a line drawn from Cape Unalishagvak to Cape Skolik;

Shumagin--For the 1961 survey, Chignik Bay, 158°00'W longitude, to about Beaver Bay on the Alaska Peninsula, 161°00'W longitude; for 1973-76, no surveys were conducted in this area.

Sanak-Beaver Bay, 161°00'W longitude, to Unimak Pass, 165°00'W longitude.

b. Standardization of catches

All catches were standardized to a trawling duration of one hour, These standardized catches were calculated:

$$CPUE_{ijk} = \frac{W_{iik}\ (60\ min)}{T_{ijk}}$$

where $CPUE_{ijk}$ refers to the catch per unit of effort, (kg/hr) for species k for the jth station in the ith region-depth zone. W_{ijk} equals the catch (kg), T_{ijk} equals the time trawled (minutes).

c. Catch per unit effort by regions, depth zones or region-depth zones were computed:

$$CPUE_{ik} = \frac{\sum_{j=i}^{n_i} CPUE_{ijk}}{n_1}$$

where n_i equals the number of successfully trawled stations in the ith region-depth interval. The variance of the CPUE was:

$$Var_{(\overline{CPUE}_{ik})} = \frac{\sum_{i-1}^{n_i} (CPUE_{iik} - \overline{CPUE}_{ik})^2}{n_i\ (n_i-1)}$$

Overall means for regions and total Gulf of Alaska were derived as a weighted sum of the mean CPUE's by region-depth zones:

$$\overline{CPUE}_{tk} = \frac{\sum_i (\overline{CPUE}_{ik}\ A_i)}{A_t}$$

where A_i equals the area in the ith region-depth interval and A_t equals the area of all region-depth zones being combined.

The variance of this estimate was determined as a weighted sum of the individual variances by region-depth zone:

$$Var_{(\overline{CPUE}_{tk}} = \sum_i \left(\frac{(A_i)}{(A_t)}\right)^2 \cdot Var\ (\overline{CPUE}_{ik})$$

d. Standing stock estimates

Biomass estimates by region-depth zone followed the methods described by Alverson and Pereyra (1969):

$$\hat{B}_{ik} = \overline{CPUE}_{ik}/q_k$$

where B_{ik} is the standing stock of available biomass (weight) of the kth species in the ith region-depth zone, and q_k is a coefficient of catchability:

$$q_k = C_k(\bar{a}/A_i)$$

and. C_k is the coefficient of vulnerability of species k for fish of sufficient size to be retained by the trawl which are within the area "swept" by the trawl. The coefficient of vulnerability consists of two components: (1) C_h, the vulnerability of those fish that actually come within the influence of the trawl, and (2) C_u, the proportion of the total fish in the volume of water above the seabed area swept by the trawl which would come within the trawl's influence. Species-specific coefficients of vulnerability are not known for the Gulf of Alaska but have been assumed to be constant and equal to 1.0. For each survey the mean trawl width, 12.19 m, times the average distance towed during 1 hour ranged from 5.00-6.48 km, therefore the biomass of species k within region-depth zone i can be estimated:

$$\hat{B}_{ik} \simeq (A_i/\bar{a})\ \overline{CPUE}_{ik}$$

which has the variance

$$\mathrm{Var}\ \hat{B}_{ik} = \left(\frac{A_i}{\bar{a}}\right)^2 \cdot (\mathrm{Var}\ \overline{CPUE}_{ik})$$

and confidence intervals of

$$\hat{B}_{ik} \pm t_{(\ ,n_e)} \sqrt{\mathrm{Var}\ \hat{B}_{ik}}$$

The biomass estimate for a given assemblage of species or species groups and its variance for the total survey area were obtained by summing the area-depth zone biomasses and variances, respectively:

$$\hat{B}_{Tk} = \sum_{i=1} \hat{B}_{ik}$$

$$\mathrm{Var}\ \hat{B}_{Tk} = \sum_{i=1} \mathrm{Var}\ (\hat{B}_{ik})$$

$$= \sum_{i=1} \left[\left(\frac{A_i}{\bar{a}}\right)^2 \cdot \mathrm{Var}\ \overline{CPUE}_{ik} \right]$$

Effective degrees of freedom (N_e) for the calculation of confidence limits for biomass estimates for the total survey area were not calculated but can be determined by following Cochran (1962):

$$N_e = \frac{\left(\sum_{i=1} f_i \cdot \text{Var CPUE}_{iik}\right)^2}{\dfrac{\sum_{i=1} f_i^2 \cdot (\text{Var CPUE}_{ijk})^2}{n - 1}} \qquad \text{and} \qquad f_i = \frac{N_i (N_i - n_i)}{n_i}$$

where N_i equals the total number of sampling units in the ith subarea (A_i/a) and n equals the number of stations in region-depth zone i.

Population numbers--Estimates of population numbers were determined by utilizing two methods depending upon which data were available. When both numbers and weight data were available for species catches the method was the same as for determining biomass or standing stock except that the calculations utilize the numbers of fish caught per hour rather than weight. Estimates of population numbers within region-depth zones were computed by dividing biomass estimates by the average weight per individual:

$$\hat{P}_{ik} = \frac{\hat{B}_{ik}}{\bar{w}_{ik}}$$

where P_{ik} is the estimated number of fish of species k in subarea i available to demersal trawling.

The second method was used, when length frequency data were available and length-weight relationships ($w = a \cdot 1$) for the species were known. The mean weight per fish was obtained by computing:

$$\bar{w}_{ijk} = \frac{\sum_{l=1}^{L_{ijk}} s_{ijkl} \cdot w_{ikl}}{\sum_{l=1}^{L_{ijk}} s_{ijkl}}$$

where w_{ikl} is the mean weight of species k of length l calculated from the length-weight relationship. S_{ijkl} is the number of fish of species k of length l and L is the number of size categories. The size composition of species at stations where length frequencies were not taken were assumed to be the same as the average size composition for that region-depth zone.

The numbers of fish caught per hour fished at each station was estimated as follows:

$$\hat{S}_{ijk} = \frac{CPUE_{ijk}}{\bar{w}_{ijk}}$$

The mean weight within each subarea was calculated:

$$\bar{w}_{ik} = \frac{\sum_{j=1}^{n_i} CPUE_{ijk}}{\sum_{j=1}^{n_i} \hat{S}_{ijk}}$$

where n_i equals the number of stations in region-depth zone i where length-frequency data were available for species k.

e. Size Composition and Length Frequency plots

Size composition by numbers in the population was estimated for those region-depth zones where sufficient length-frequency data were collected. Length-frequency data for individual stations were expanded by a weighting factor to provide an estimate of the total standard catch in numbers by size or by size and sex for a given species:

$$\hat{S}_{ijklm} = s_{ijklm} \cdot \hat{S}_{ijk} / \sum_{m=1}^{3} \sum_{l=1}^{L} s_{ijklm}$$

where S_{ijklm} equals the estimated number of individuals of size category l, sex m, and species.& at the jth station of region-depth zone i where length data were collected, and L is the total number of size categories. The variable s_{ijklm} is the number of fish in this category actually measured, and the weighting factor is the ratio of the total number of fish of species k per standard tow (S_{ijk}) to the number of fish of species k measured in the length frequency sample. The number of fish by size-sex category for individual region-depth zones (P_{iklm}) was obtained by summing the size-sex categories for those stations where data were available, and expanding this sum to the total standing stock of fish in each subarea:

$$\hat{P}_{iklm} = \frac{\sum_{j=1}^{n_i} \hat{S}_{ijklm}}{\sum_{j=1}^{n_i} \sum_{l=1}^{L} \hat{S}_{ijklm}} \cdot \hat{P}_{ik}$$

When size composition estimates were available for all region-depth zones, overall estimates of stock size composition for the total survey area were obtained by summing the population numbers- by size or size-sex category (P_{iklm}) for all region-depth zones.

In some instances, length frequency data were not extensive enough to provide size composition data for the entire population range, but would provide point samples of the size composition of the individual inhabiting a region-depth zone. If only one sample was available for a region-depth zone, these data were analyzed into a proportional length frequency and plotted:

$$PS_{ijklm} = \frac{s_{ijklm}}{\sum s_{ijklm}}$$

where PS_{ijklm} equals the proportion of sex m of length l that was in the jth station of the i region-depth zone, and s_{ijklm} equals the number of individuals of sex m, in length category l. When more than one sample was available the data were expanded by and weighted by the size of the catch and combined using the same techniques as previously stated in the size composition section.

f. Length Weight Relationships

Length-weight data were analyzed using a least-squares linear regression procedure. The relationship of length and weight normally utilizes the form:

These data were grouped by sex and region-depth zone and fitted to the logarithmic transformation of the equation:

Estimates of the coefficients a and b, and a coefficient of correlation r were determined. The correlation r was computed:

$$r = \sum_{i=1}^{n} (X \cdot Y) \Big/ \sqrt{\sum_{i=1}^{n} (x^2 \cdot Y^2)}$$

where X and Y are the deviations of observed length and weight values from their respective means, and n equals the number of observations.

Length-weight data for regions and depth zones were compared for marked differences and similar data combined.

g. Age-Length Tables

Age-length tables were developed by sex and species for each depth zone where sufficient data were collected in the Yakutat and Prince William regions. These tables show the number of actual observations in each size-age class, and estimates of mean length-at-age.

h. Assumptions and Data Limitations

We have provided for the various demersal species, indices of stock abundance, population and/or biomass estimates, composition, and distribu-

tion based on extensive trawl surveys. In providing these estimates, we have made certain assumptions regarding the adequacy of bottom trawls for sampling demersal populations and the time-space distribution of populations. We have assumed that the trawl obtained samples which were representative of the density and composition of the animals in the area sampled, and that the trawl's performance (vertical and horizontal width of the mouth opening and the bottom-tending characteristics) remained constant from station to station. A corollary to these assumptions is that changes in the catch of a species for a given unit of effort (distance or time fished) is directly proportional to changes in density. The other assumption regarding the time-space distribution of populations is that, during the period of the survey, populations were static, i.e., there were no shifts in abundance within the survey area as well as *no* movements of animals in and out of the survey area.

These assumptions need to be qualified. Although the trawl continues to be the most effective of gear for sampling bottomfish and large epibenthic invertebrates, it has certain limitations. Trawls are selective. Sizes, and even species, of *animals* captured are influenced by the mesh size, particularly in the bag or codend. Even species within the size range which theoretically should be captured, may differ in their ability to escape the influence of the trawl. Because trawling is necessarily restricted to relatively smooth bottom to avoid hanging up and damage to the net, animals over uneven and rocky bottoms are not adequately sampled. The selective features of trawls thus alter the species composition and sizes and quantities of species captured from,that which occur in its path. The degree to which the "apparent" distribution and relative abundance differs from the actual is unknown. Thus estimates of standing stock are representative only for those species which are vulnerable as well as accessible to the trawl. However, our estimates assume that for a given species and size, all animals are vulnerable and accessible (C_k = 1.0), since we do not know what the actual value of Ck is'for any of the species. For crabs the coefficient ckmay be close to 1.0, but for a semi-demersal fish like pollock, or for burrowing animals Ck may be much less than 1.0.

We hope that our findings provide some average conditions of resource abundance, distribution, and composition.

RESULTS

1. Pandalid Shrimp Surveys

a. Cruise 712, R/V Oregon (April-May 1971)

The first pandalid shrimp resource assessment survey was conducted during April-May 1971. Sixty-seven stations were attempted using an 80' Kodiak shrimp trawl (Figure X1-5). This survey was centered from the 12-mile fishery zone to the edge of the continental shelf.

Total catches for all species were small, averaging 28 kg/hr in the inner shelf and 154 kg/hr in the outer shelf and ranged up to 600 kg/hr (Figure X1-6). Pandalid shrimp catches average only 0.4 and 33 kg/hr in the inner and outer shelf depth zones and reached levels as high as 500 kg/hr (Figure X1-7). Pink shrimp made up 98% of the total shrimp catch (Table x1-3). Walleye pollock and Pacific cod were the only fish species with average catches of 10 kg/hr or more (Table X1-4). Pollock exceeded 10 kg/hr in both the inner and outer shelf depth zones and Pacific cod in the outer shelf (Figures X1-8-9). The combined catch of pollock, cod and pandalid shrimp made up over 80% of the total catch in both depth zones.

b. Cruise 713, R/V Commando (June-July 1971)

The second pandalid shrimp resource assessment survey was conducted primarily from 3-12 miles offshore along the southeast coast of Kodiak Island. One hundred and ninty-three stations were attempted using an 80' Kodiak shrimp trawl (Figures X-10-11).

The average catch for all species combined was 398 kg/hr in the outer shelf, 70 kg/hr in the upper slope and 16 kg/hr in the inner shelf. Catch rates ranged up to 6800 kg/hr with exceptionally large total species catches (over 1000 kg/hr) occurring off Aliulik Peninsula, south of Sitkalidak Island, and on the continental shelf (Figures X1-12-13). Pandalid shrimp catches in the survey area averaged 210 kg/hr in the inner shelf, 49 kg/hr in the upper slope, but did not occur in the inner shelf. Shrimp catch rates ranged up to 3100 kg/hr and consisted of over 90% pink shrimp (Table X1-3). Largest catch rates of pandalid shrimp occurred in the gully between Cape Kiavak and Sitkalidak Island and off Aliulik Peninsula (Figures X1-14-15). The biomass estimate for all pandalid species in the survey area was 2.4 thousand mt.

Only pollock, inner shelf, and outer shelf, and lumpsuckers, upper slope, occurred in abundances which produced average catches over 10 kg/hr. (Table X1-4). Largest catch rates of pollock occurred on the continental shelf (Figures X1-16-17) and lumpsuckers in the outer gully between Cape Kiavak and Sitkalidak Island (Figures X1-18-19). Pollock, lumpsuckers and pandalid shrimp made up over 89% of the total catch in all 3 depth zones.

Table XI-3.--Mean CPUE's for individual Pandalid shrimp species captured during shrimp surveys in the Gulf of Alaska from 1971-73.

		DEPTH INTERVAL (M)								
		0 - 100			101 - 200			201 - 400		
Cruise File	Species	CPUE kg/hr	% of Shrimp	Total Catch	CPUE kg/hr	% of Shrimp	Total Catch	CPUE kg/hr	% of Shrimp	Total Catch
712	Pink	0.4	100.0	1.4	32.4	98.2	21.1	--	--	--
	Sidestripe	1/	2/	0.2	0.6	0.8	0.3	--	--	--
	P. montagui	0	0	0	1/	2/	2/	--	--	--
		0.4	100.0	1.6	-33.0	100.0	-21.4	--	--	--
713	Pink	0	0	0	206.2	98.1	51.7	44.8	91.1	64.4
	Sidestripe	0	0	0	4.0	1.9	1.0	4.4	8.9	6.4
	Coonstripe	0	0	0	1/	2/	2/	0	0	0
	Humpy	0	0	0	1/	2/	2/	0	0	0
		0	0	0	210.2	100.0	52.7	49.2	100.0	70.8
723	Pink	790.8	42.9	34.0	801.6	68.4	43.5	--	--	--
	Sidestripe	0.7	2/	2/	70.4	6.0	3.8	--	--	--
	Coonstripe	125.5	6.8	5.4	54.5	4.7	3.0	--	--	--
	Humpy	926.5	50.3	39.8	245.2	20.9	13.3	--	--	--
		1843.5	100.0	79.2	1171.7	100.0	63.6	--	--	--
725	Pink	0.8	100.0	2.5	165.5	96.0	57.7	--	--	--
	Sidestripe	0	0	0	6.8	3.9	2.4	--	--	--
	Humpy	0	0	0	1/	2/	2/	--	--	--
	P. montagui	0.1	0	2/	0.1	5.1	2/	--	--	--
		0.9	100.0	2.5	172.4	100.0	60.1	--	--	--
732	Pfnk	--	--	--	32.5	96.4	2.2	--	--	--
	Sidestripe	--	--	--	0.6	1.8	2/	--	--	--
	Coonstripe	--	--	--	1/	2/	2/	--	--	--
	spot	--	--	--	1/	2/	2/	--	--	--
	P. montagui	--	--	--	0.6	1.8	2/	--	--	--
735	Pink	315.6	62.5	51.0	1223.3	92.1	57.2	1199.5	67.2	55.4
	Hunpy	168.4	33.4	27.2	41.4	3.1	1.9	13.7	0.8	0.6
	Coonstripe	19.6	3.9	3.2	16.2	1.2	0.8	40.2	2.3	1.9
	Sidestripe	1.4	0.3	0.2	46.4	3.5	2.2	533.0	29.8	24.6
	P. montagui	1/	2/	2/	0.5	2/	2/	0	0	0
		505.0	100.1	81.6	1327.8	99.9	62.-i-	1786.4	100.1	82.5

c. Cruise 725, R/V John N. Cobb (May 1972)

During the spring of 1972, the offshore region along the southeast coast of Kodiak Island was again surveyed. Sixty stations were attempted using the 80' Kodiak shrimp trawl (Figure X1-20). This survey covered the 3-12 mile offshore zone.

The mean catches for all species were highest in the outer shelf depth zone (287 kg/hr) and considerably lower (34 kg/hr) in the inner shelf (Figure X1-21). Large catch rates for all species occurred in the gully between Cape Kiavak and Sitkalidak Island. Pandalid shrimp catches followed the same pattern as the total catch, averaging 172 kg/hr in the outer shelf and 1 kg/hr in the inner shelf. Pink shrimp constituted over 95% of the total pandalid shrimp catch in both depth zones (Table X1-3). Only one exceedingly large catch occurred, and that was in the gully between Cape Kiavak and Sitkalidak Island (Figure X1-22). The estimated biomass of pandalid shrimp in the survey area was 10.0 thousand mt. No other species of pandalid shrimp occurred in significant quantities,

Only walleye pollock in the outer shelf and yellow Irish lord (in both the inner and outer shelves) produced mean catches of 10 kg/hr or more (Table X1-4). The largest catch rate for walleye pollock was found in the gully between Cape Kiavak and Sitkalidak Island and for yellow Irish lord off Sitkinak Island (Figures X1-23-24). These two species plus the pandalid shrimp made up 81% of the total catch in the outer shelf but only 39% in the inner shelf.

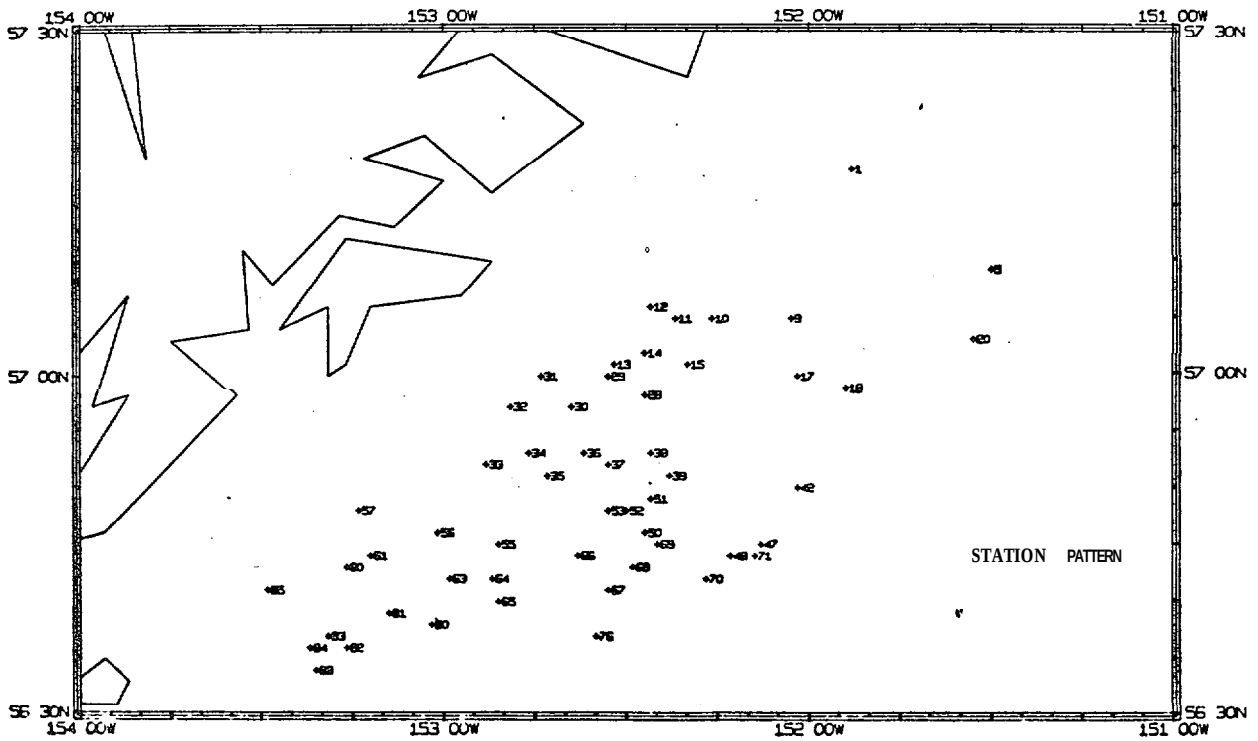


Figure XI-5.--Stations successfully trawled (shrimp trawl) by the R/V Oregon, Apr.-May 1971 (Cruise 712).

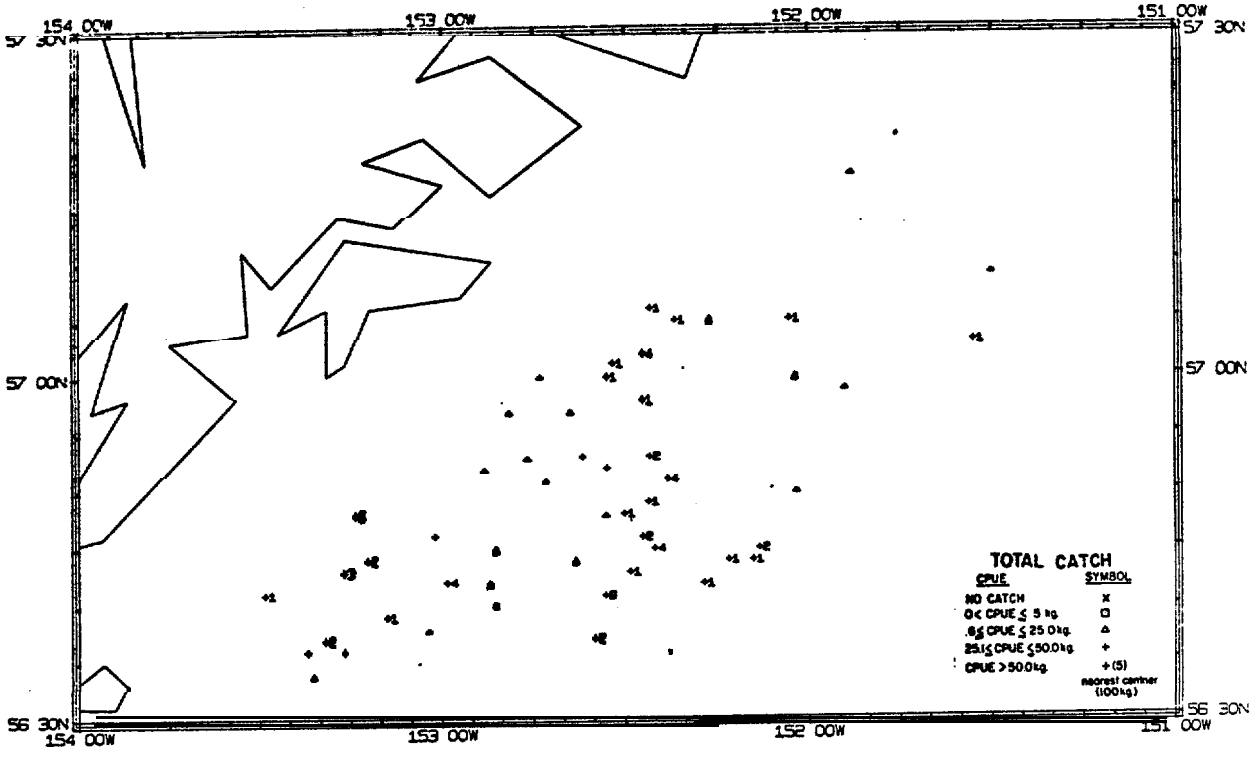


Figure X1-6.--Distribution of standardized catch rates in **kg/hr** of all species combined Apr.-May 1971 (Cruise 712).

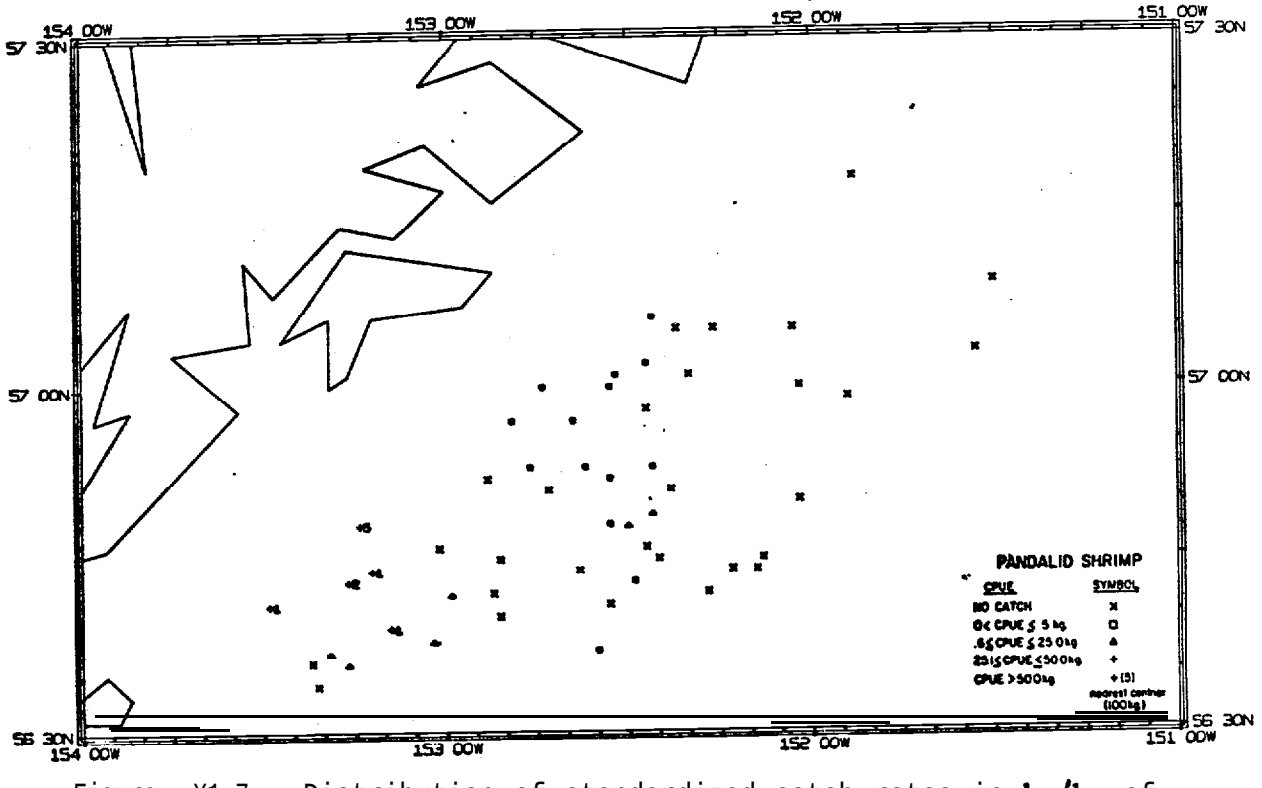
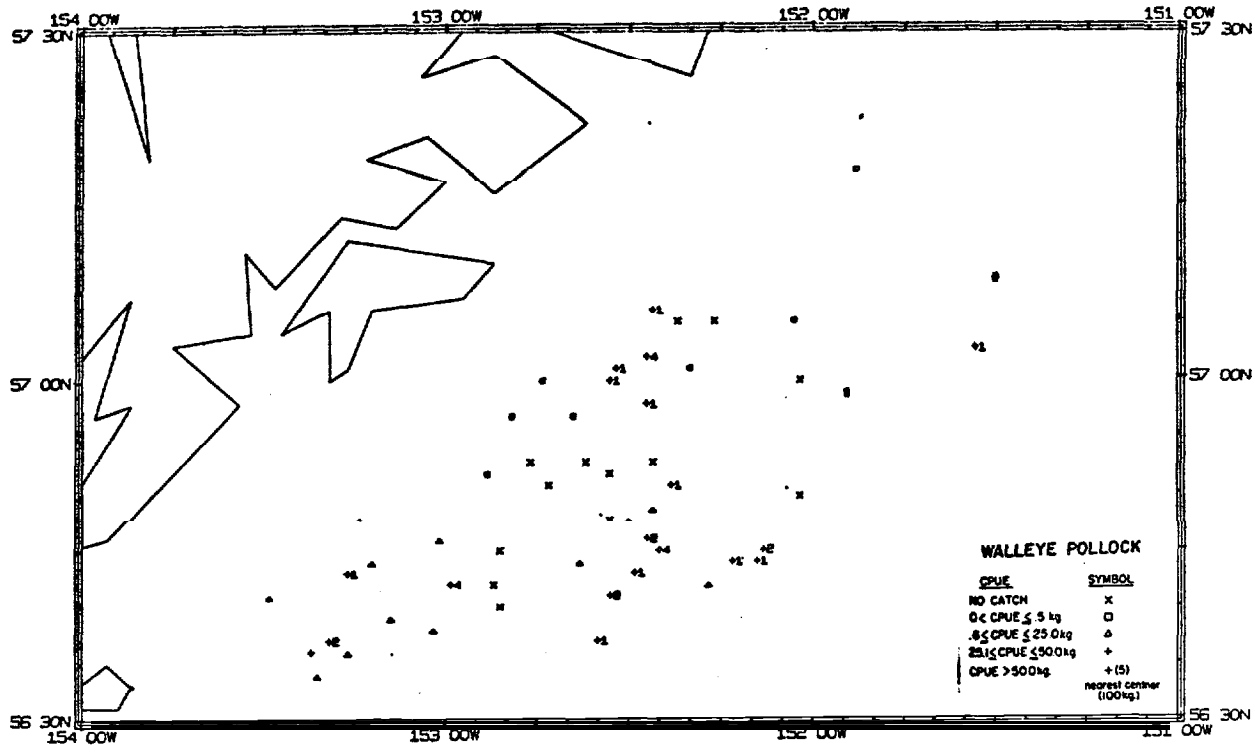
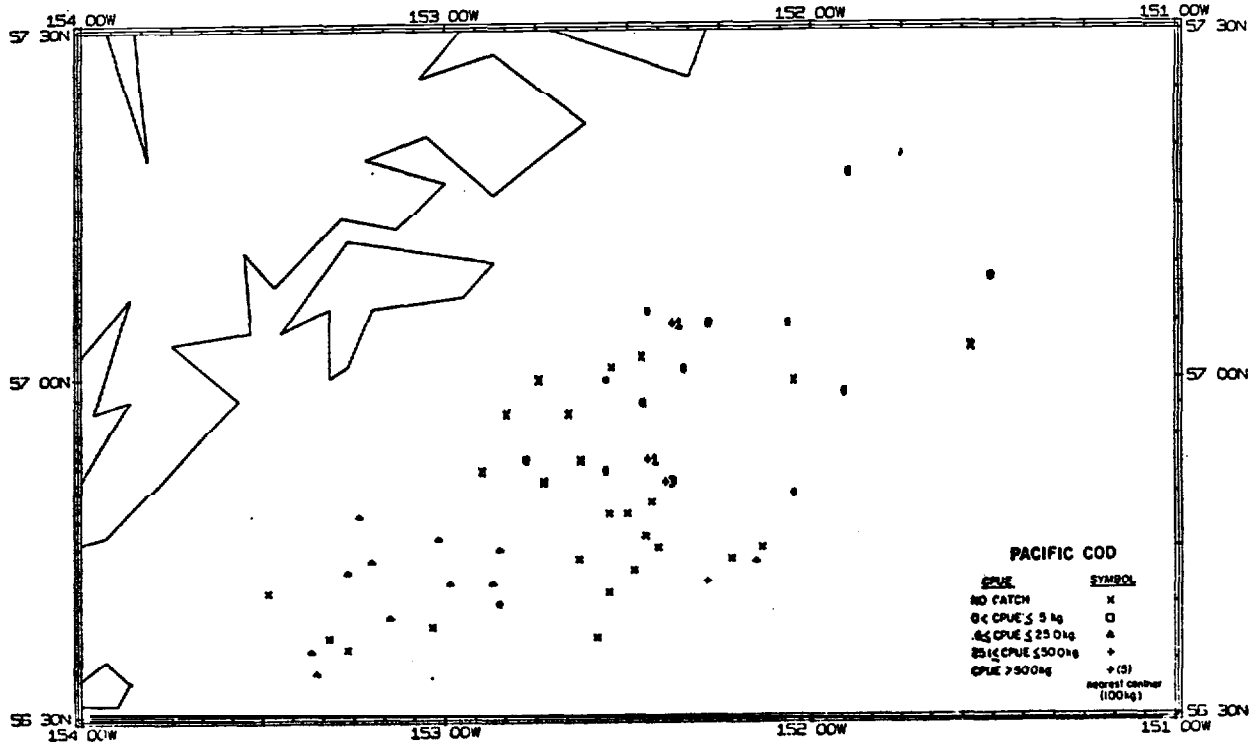


Figure X1-7.--Distribution of standardized catch rates in **kg/hr** of pandalid shrimp, Apr.-May 1971 (Cruise 712).

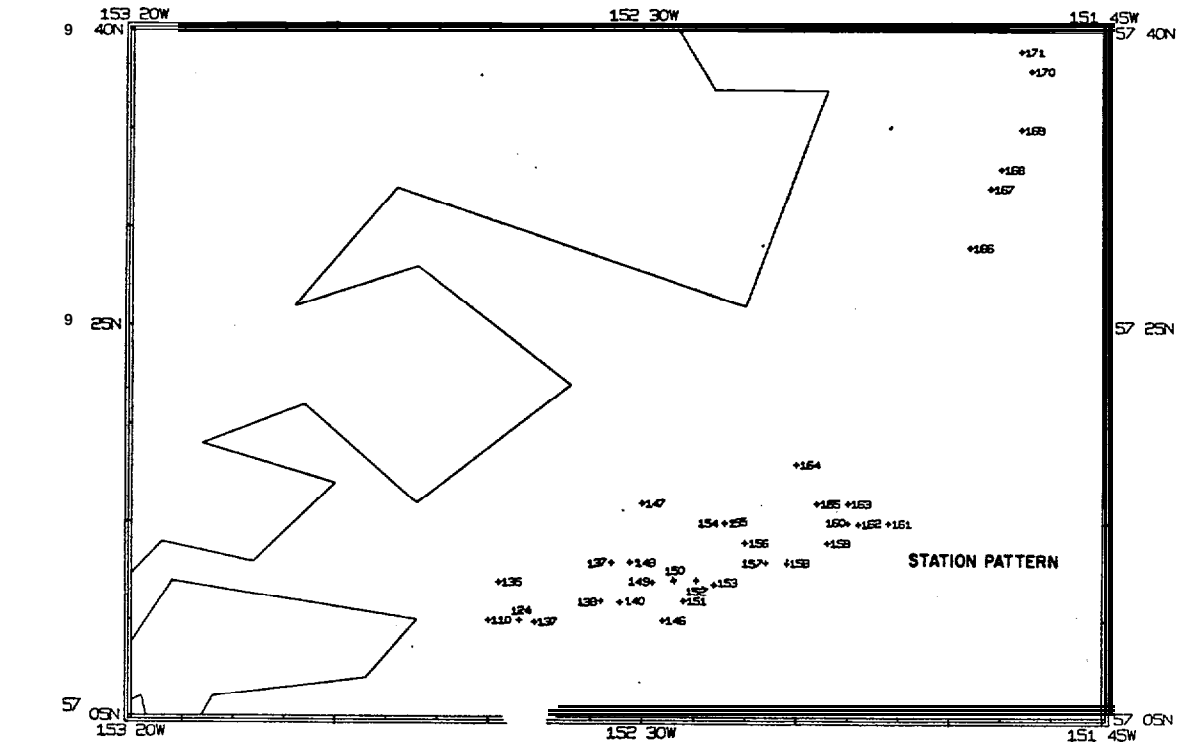
Table X1-4.--Mean CPUE's for species other than pandalid shrimp which averaged over 10 kg/hr during shrimp surveys in the Gulf of Alaska from 1971 - 1973.

Cruise File	Species	DEPTH INTERVAL (M) 0 - 100 CPUE kg/hr	% of total Catch	101 - 200 CPUE kg/hr	% of total Catch	201 - 400 CPUE kg/hr	% of total Catch
712	Walleye pollock	14.8	53.2	94.6	61.5	- -	- -
	Cod	7.1	25.4	11.7	7.6	- -	- -
		21.9	78.6	106.3	69.1	- -	- -
713	Walleye pollock	14.9	93.7	178.1	44.6	0.1	0.1
	Lumpsuckers	0	0	1/	2/	12.7	18.2
		14.9	93.7	178.1	44.6	12.8	18.3
723	Walleye pollock	160.2	6.9	433.4	23.5	- -	- -
	Capelin	89.4	3.8	15.9	0.8	- -	- -
	Hippolytid shrimp	65.0	2.8	13.6	0.7	- -	- -
	Tanner crab	55.3	2.4	20.5	1.1	- -	- -
	Yellowfin sole	41.2	1.8	2.1	0.1	- -	- -
	King crab	21.4	0.9	1.9	0.1	- -	- -
	Flathead sole	20.3	0.9	40.8	2.2	- -	- -
	Snake prickleback	11.4	0.5	6.5	0.4	- -	- -
	Pacific cod	0.2	2/	32.2	1.7	- -	- -
	Turbot	0	0	25.9	1.4	- -	- -
		464.4	20.0	592.8	32.0	- -	- -
725	Yellow Irish lord	10.7	31.4	10.6	3.7	- -	- -
	Walleye pollock	1.8	5.1	48.9	17.0	- -	- -
		12.5	36.5	59.5	20.7	- -	- -
732	Walleye pollock	80.7	52.9	1272.1	84.8	- -	- -
	Pacific cod	23.1	15.2	83.4	5.6	- -	- -
	Yellow Irish lord	18.1	11.9	23.0	1.5	- -	- -
	Rock sole	15.0	9.8	5.7	0.4	- -	- -
	Flathead sole	2.7	1.8	43.2	2.9	- -	- -
		139.6	91.6	1427.4	95.2	- -	- -
735	Walleye pollock	17.1	2.7	527.9	24.6	177.5	8.2
	Flathead sole	15.8	2.6	44.3	2.1	43.9	2.0
	Myoxocephalus	10.5	1.7	14.1	0.7	2.0	0.1
	Turbot	5.7	0.9	28.6	1.3	49.5	2.3
	Eelpout	0.1	2/	25.7	1.2	0	0
	Tanner crab	3.9	0.6	23.7	1.1	13.0	0.6
	Starfish	1/	2/	22.4	1.0	0.9	2/
	Longsnout prickleback	0	0	20.5	1.0	41.5	i.9
	Pacific cod	8.4	1.4	17.6	0.8	2.4	0.1
	Eulachon	2.9	0.5	15.1	0.7	3.2	0.1
	Jellyfish	1.3	0.2	14.6	0.7	0.7	2/
	Capelin	2.5	0.4	12.1	0.6	0	0
		68.2	11.0	766.6	36.8	334.6	15.3





Figures n-a-9.--Distributions of standardized catch rates in **kg/hr** of walleye pollock and Pacific cod, Apr.-May 1971 (Cruise 712).



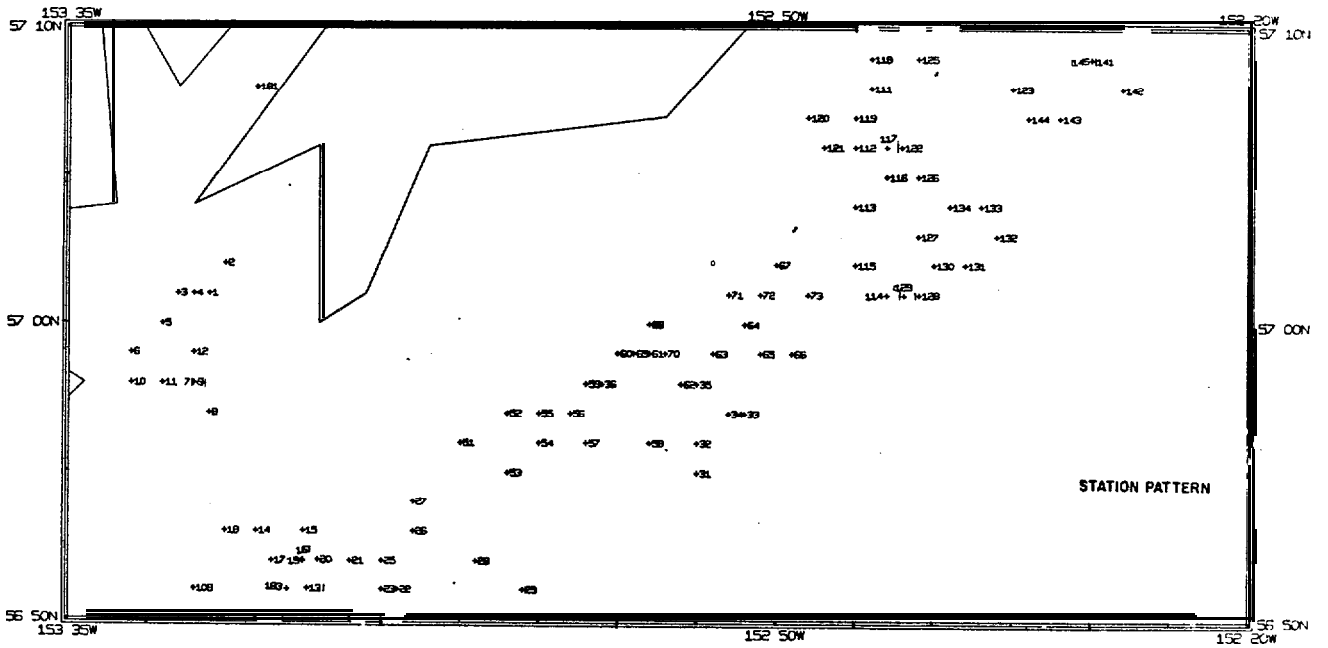


Figure XI-10.--Stations successfully trawled (shrimp trawl) by the R/V Commando, June-July 1971 (Cruise 713).

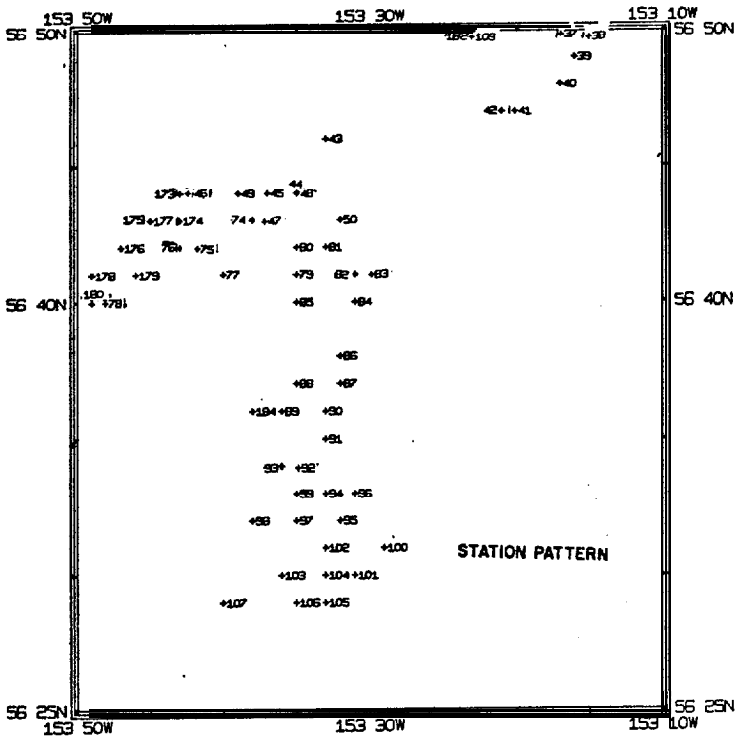


Figure XI-11.--Stations successfully trawled (shrimp trawl) by the R/V Commando, June-July 1971 (Cruise 713).

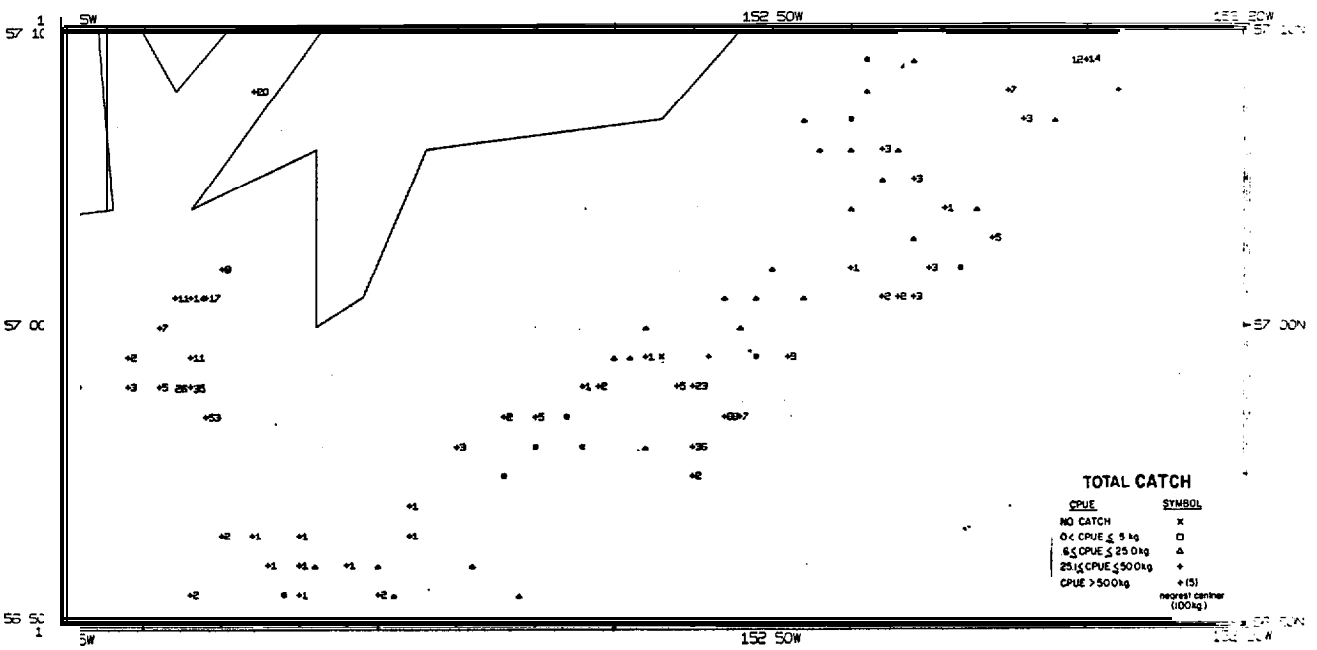
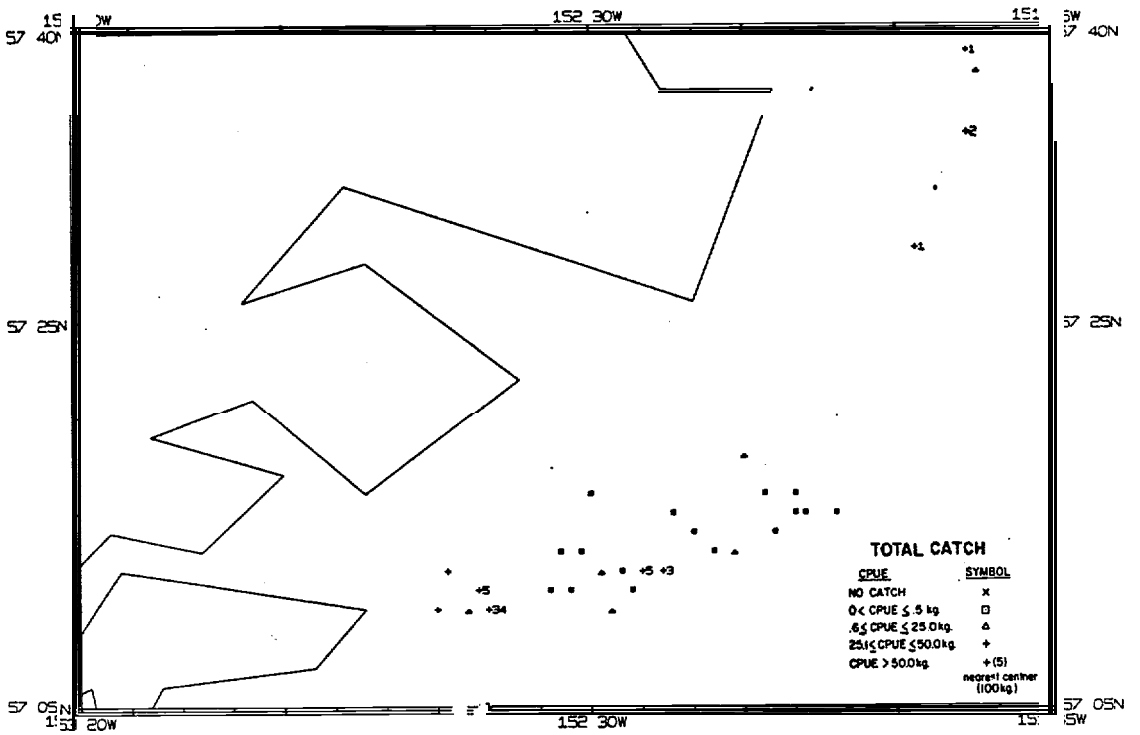


Figure XI-12.--Distribution of standardized catch rates in kg/hr of all species combined, June-July 1971 (Cruise 713).



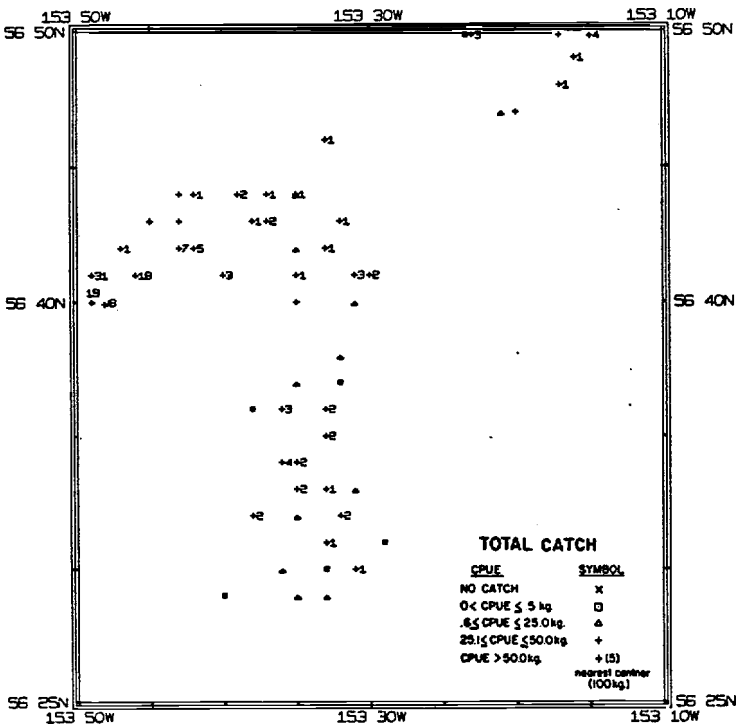


Figure X1-13.--Distribution of standardized catch rates in **kg/hr** of all species combined, June-July 1971 (Cruise 713).

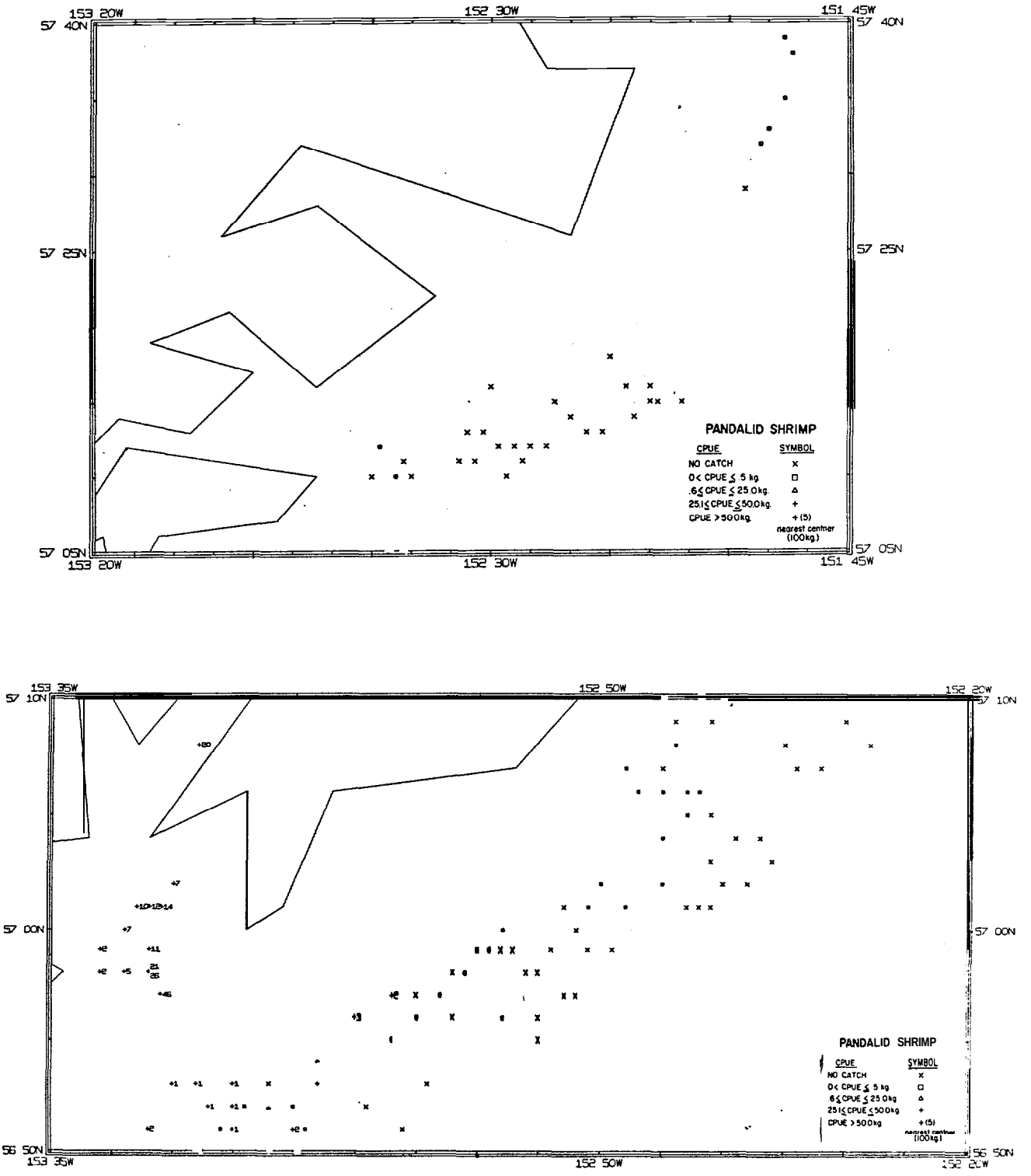


Figure X1-14.--Distribution of standardized catch rates in kg/hr of pandalid shrimp, June-July 1971 (Cruise 713).

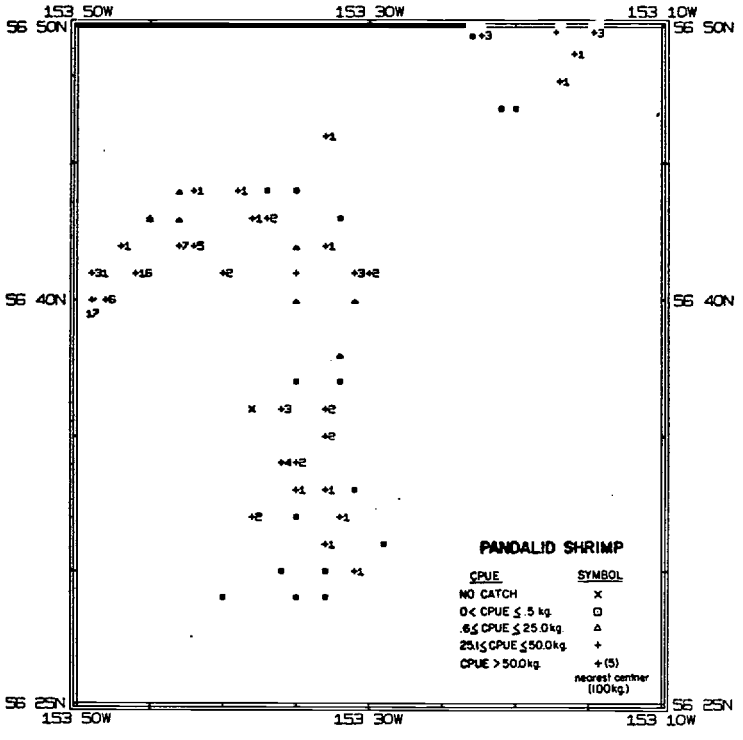


Figure X1-15.--Distribution of standardized catch rates in kg/hr of pan-* dalid shrimp, June-July 1971 (Cruise 713).

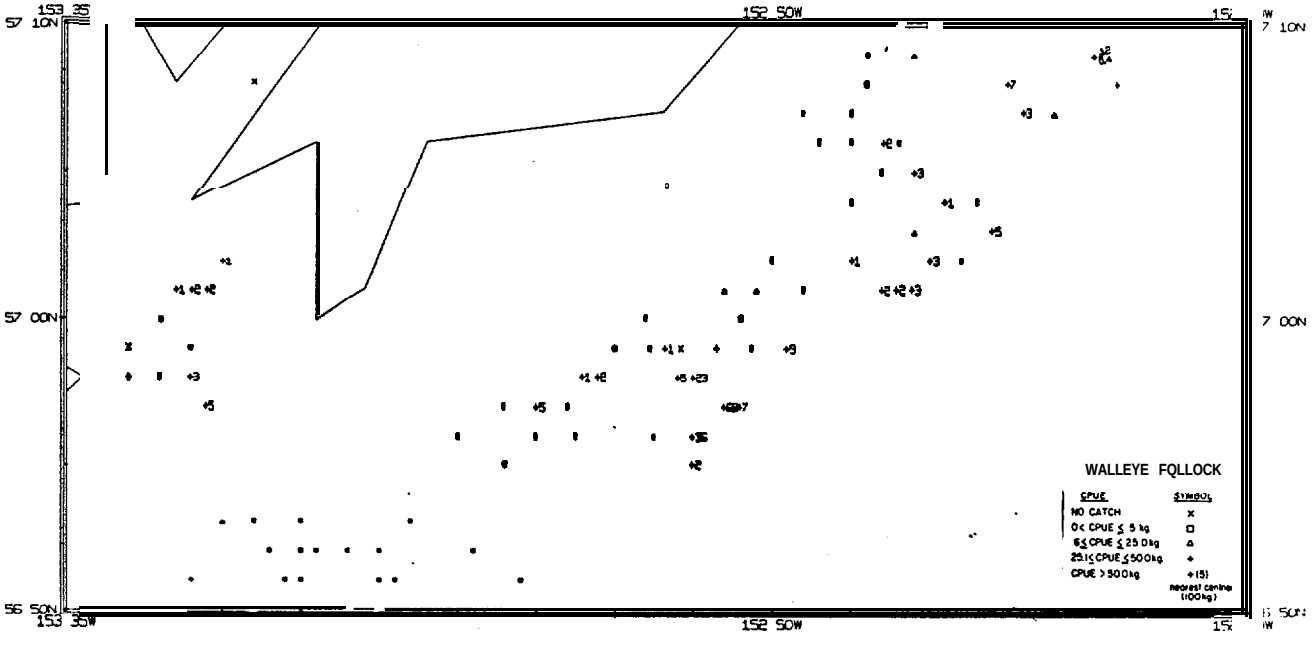
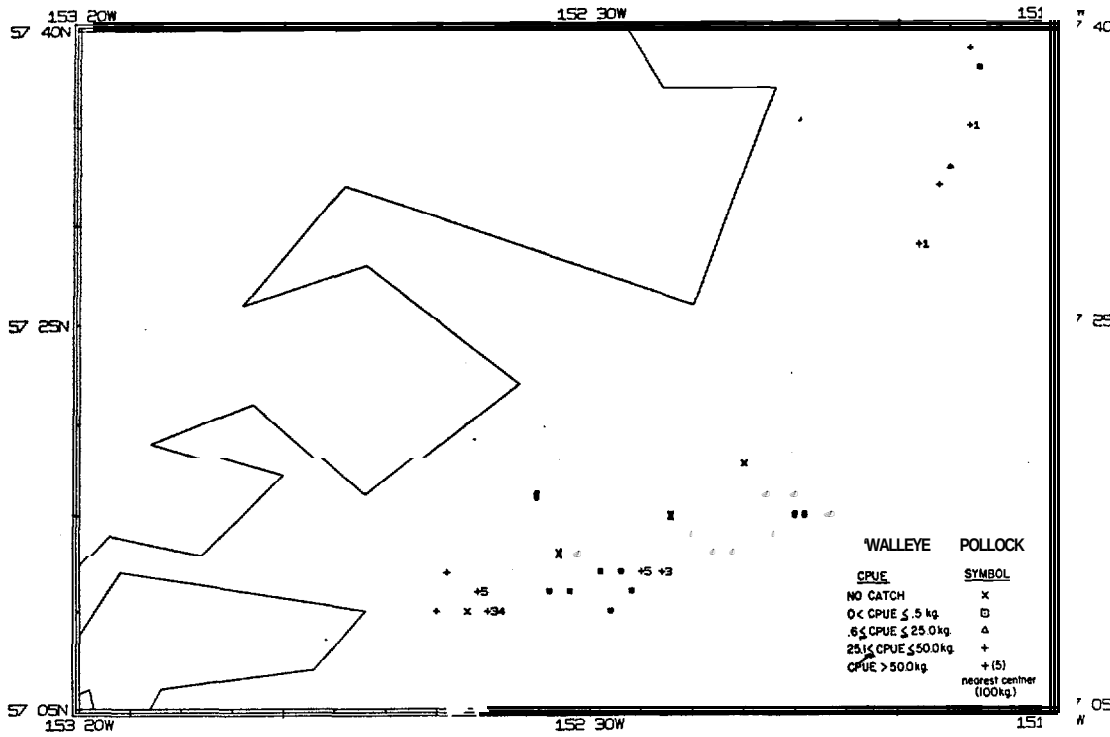


Figure X1-16.--Distribution of standardized catch rates in kg/hr of walleye pollock, June-July 1971 (Cruise 713).



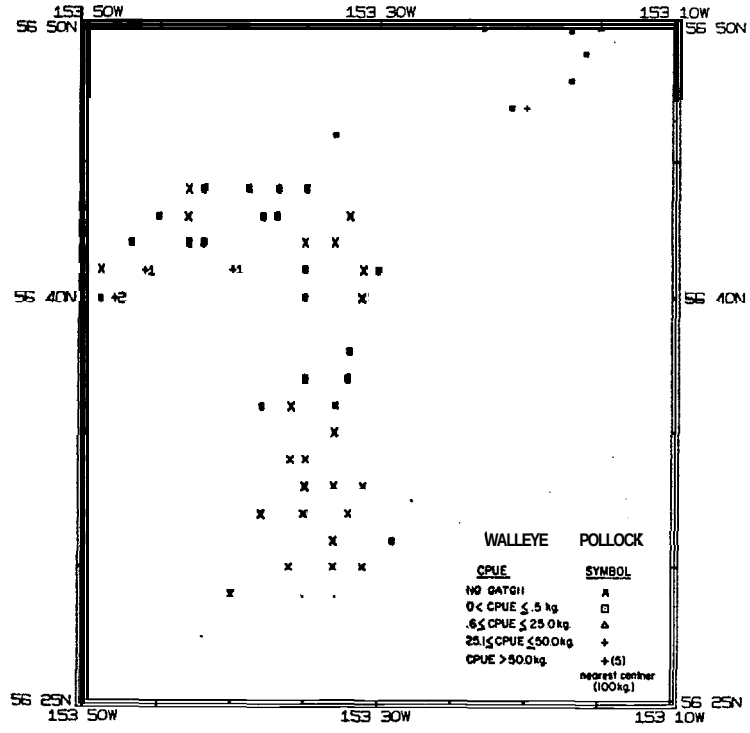
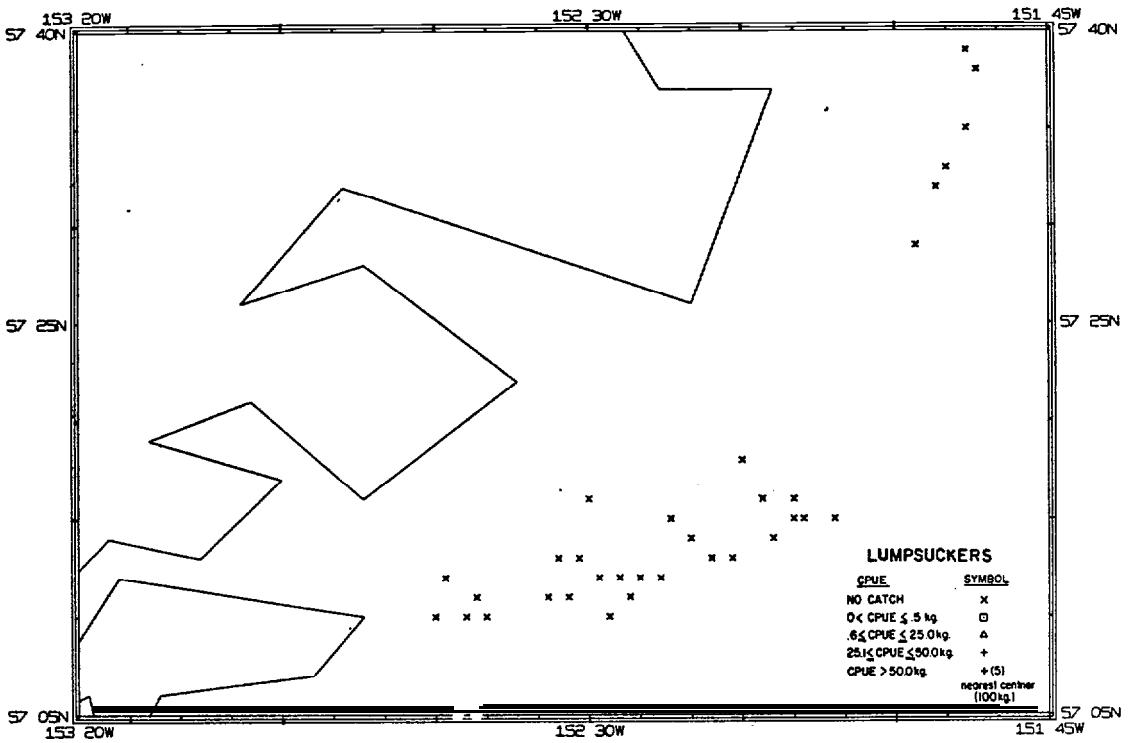


Figure X1-17.--Distribution of standardized catch rates in kg/hr of walleye pollock, June-July 1971 (Cruise 713).



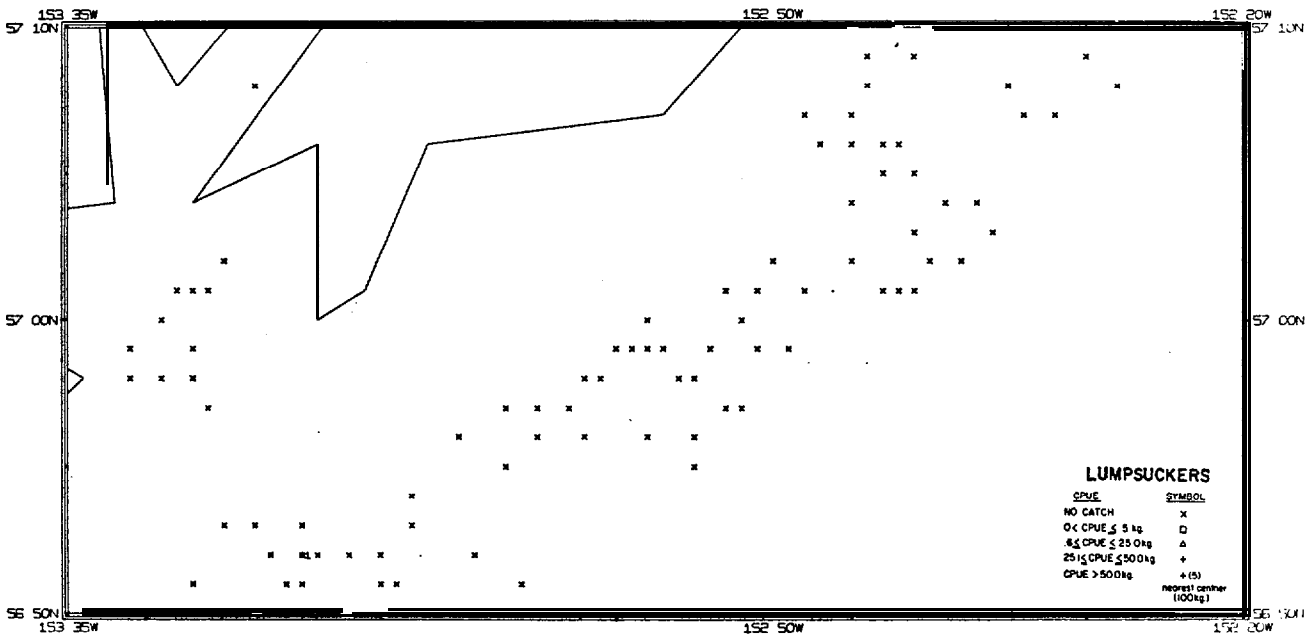


Figure XI-18.--Distribution of standardized catch rates in kg/hr of lumpsuckers, June-July 1971 (Cruise 713).

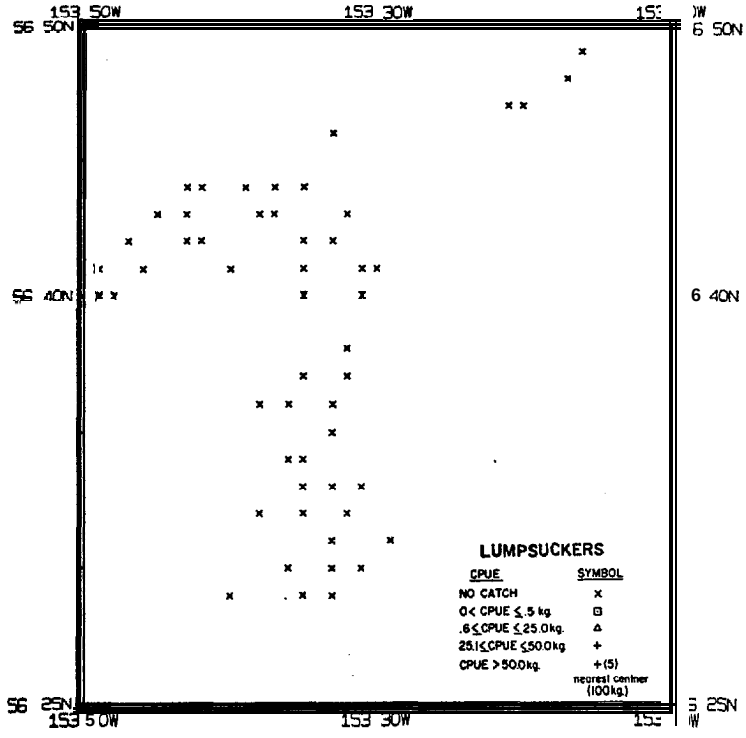


Figure **XI-19.--Distribution** of standardized catch rates in **kg/hr** of lumpsuckers, June-July 1971 (Cruise 713).

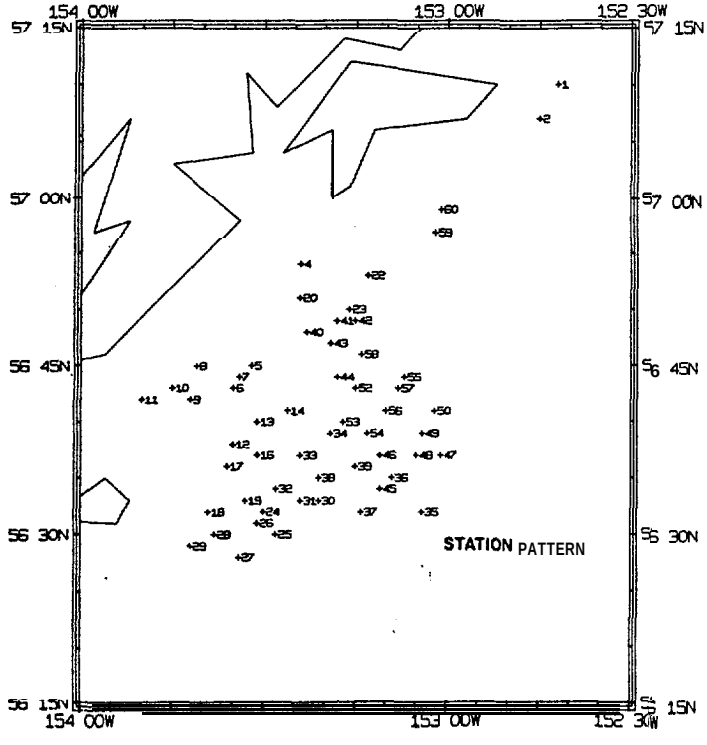


Figure X1-20.--Stations successfully trawled (shrimp trawl) by the R/V John **N.** Cobb', May 1972 (Cruise 725).

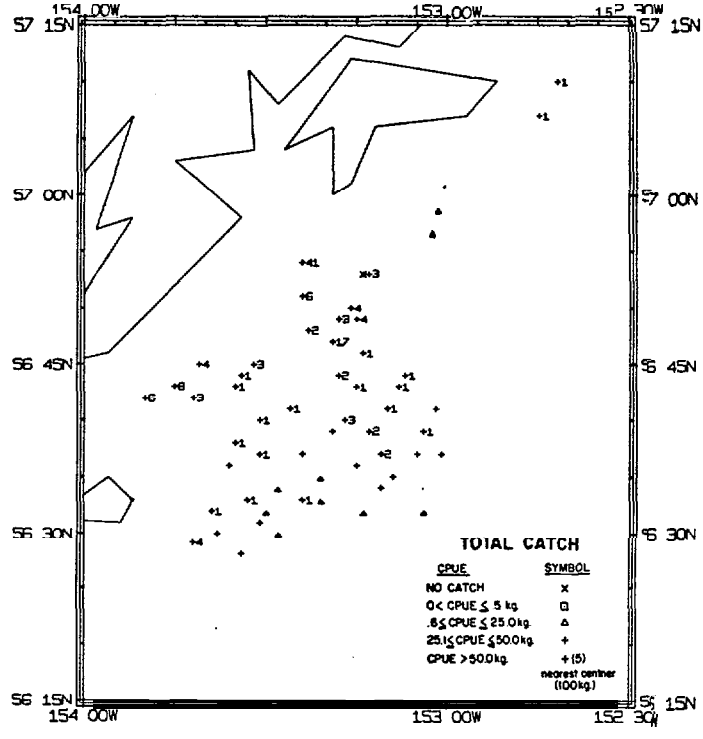


Figure X1-21.--Distribution of standardized catch rates in **kg/hr** of **all** species combined, May 1972 (Cruise 725).

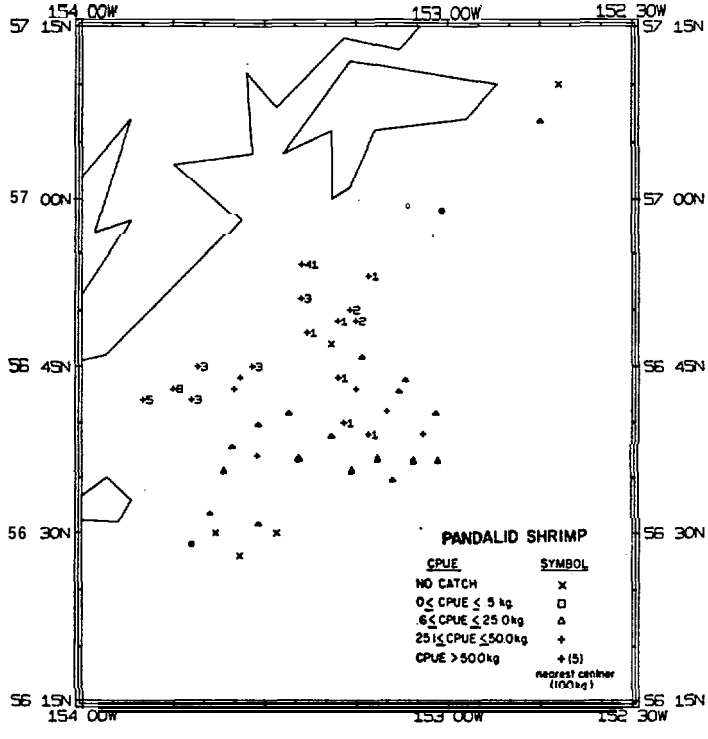
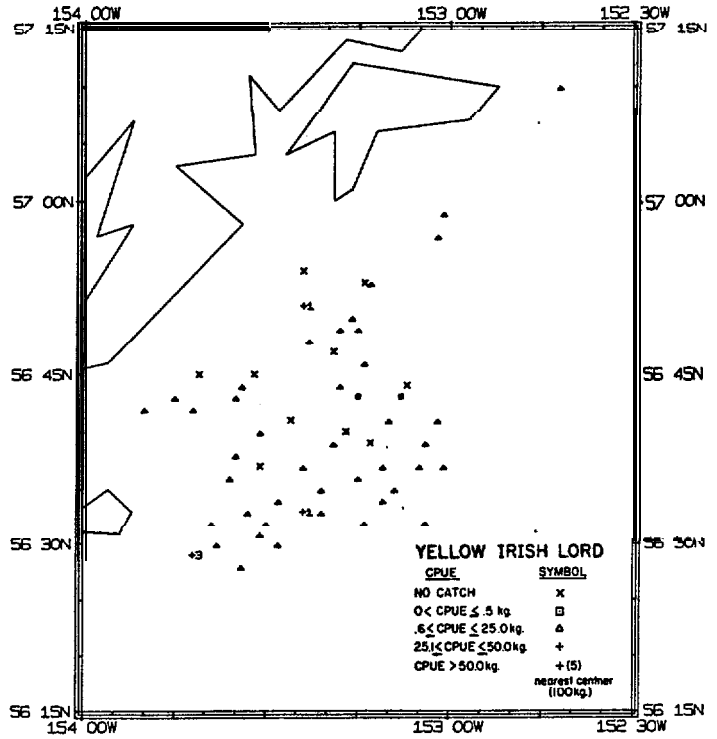
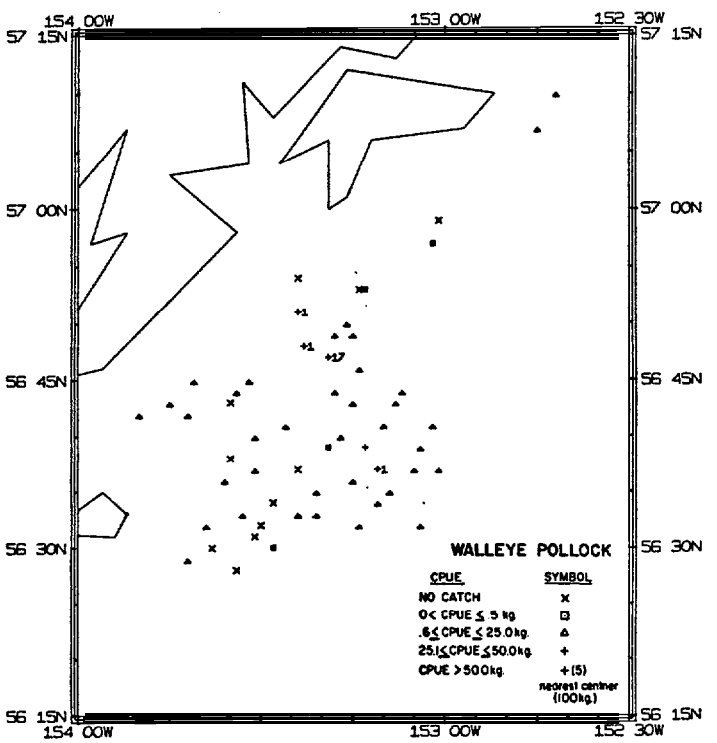


Figure XI-22--Distributions of standardized catch rates in **kg/hr** of **pandalid** shrimp, May 1972 (Cruise 725).





Figures X1-23-24--Distribution of standardized catch rates in **kg/hr** of yellow Irish lords and walleye pollock, May 1972 (Cruise 725).

d. Cruise 723, R/V Oregon (Aug. - Sept. 1972)

The R/V Oregon was used to conduct the first pandalid shrimp resource assessment survey in the Shumagin and Sanak regions. One hundred and three stations were attempted using the NMFS 61' high opening shrimp trawl (Figure X1-25).

The total average catch for all species was high throughout the survey area: 2326 kg in the inner shelf and 1843 kg/hr in the outer shelf. Large catch rates 1000 kg/hr or more were made in Sanak Gully, Belkofski Bay, Pavlof Bay, Beaver Bay, Unga Straits, Stepovak Bay, West Nagai Straits, south of Unga Island, and some offshore stations (Figure X1-26).

Pandalid shrimp were extremely abundant, averaging 1844 kg/hr in the inner shelf and 1172 kg/hr in the outer shelf (Table X1-3, Figure X1-27). Humpy (50%) and pink shrimp (43%) were the dominant species in the inner shelf where they constituted 93% of the total pandalid shrimp' catch. In the outer shelf depth zone, the situation was reversed: Pink shrimp made up 68% of the total pandalid catch and humpy shrimp, 21%. Mean catches of coonstripe shrimp were 126 and 55 kg/hr in both depth zones while the mean catch of sidestripe was 70 kg/hr in the outer shelf. Large catches of pandalid shrimp of 1000 kg/hr or more were made in Sanak Gully, Belkofski Bay, Pavlof Bay, Beaver Bay, Unga Straits, Stepovak Bay, West Nagai Strait, and south of Unga Island.

The total biomass of pandalid shrimp in the survey area was estimated to be 149.1 thousand metric tons.

Ten species of fish and invertebrates had mean catches of 10 kg/hr or more in at least one depth zone (Table X1-4). These species were walleye pollock, capelin, hippolytid shrimp, Tanner crab, and flathead sole in both depth zones; yellowfin sole, king crab, and snake prickleback in the inner shelf; and Pacific cod and turbot in the outer shelf. Large catches of 300 kg/hr or more'ofwalleye pollock were made'in Sanak Gully, Pavlof Bay, Beaver Bay, Unga Strait, Stepovak Bay, West Nagai Strait, south of Unga Island, and offshore; of Pacific cod offshore, capelin and Tanner crab in Beaver Bay (Figures X1-28-31). The distribution of the standardized catch rates for the remaining species averaging 10 kg/hr or more are presented in Figures X1-32-37. These 10 species and pandalid shrimps account for over 95% of the total catch in both depth zones.

e. Cruise 732, R/V Commando (May-June 1973)

The continental shelf southeast of Kodiak Island was surveyed in 1973. Fifty-two stations were attempted with the NMFS 61' high opening shrimp trawl (Figure X1-38).

The total catch, all species combined, averaged 1499 kg/hr in the outer shelf and only 153 kg/hr in the inner shelf but ranged up to 6000 kg/hr. Large catches (1000 kg/hr or more) occurred southeast of Cape Kiavak (Figure X1-39).

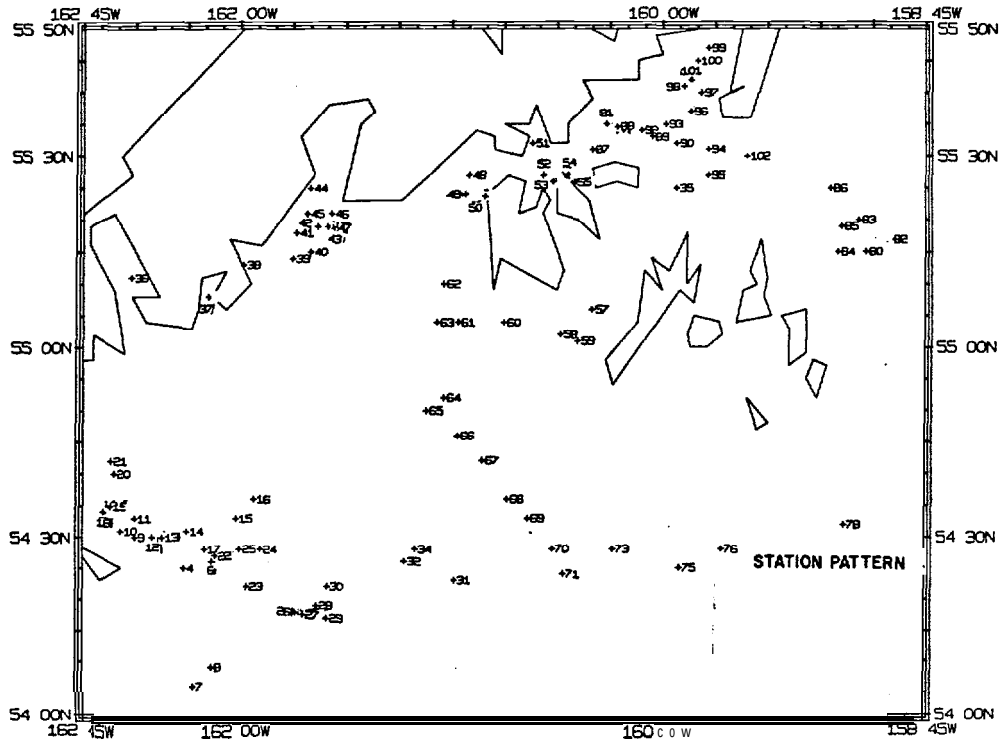


Figure XI-Z.--Stations successfully trawled (shrimp trawl) by the R/V Oregon,, Aug.-Sept. 1972 (Cruise 723).

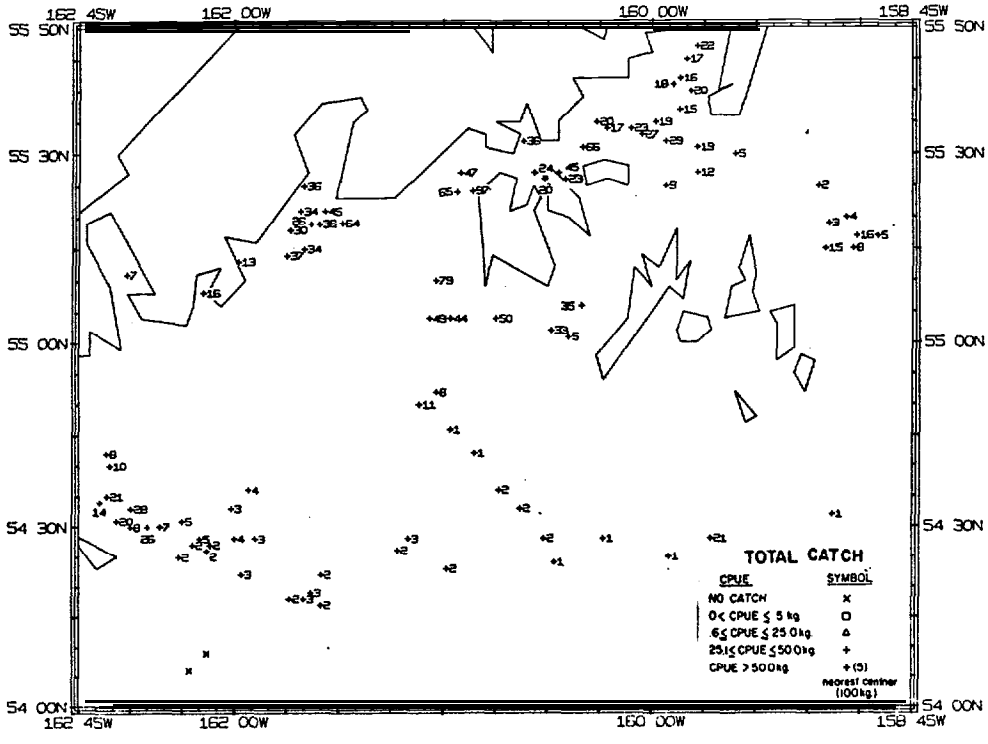
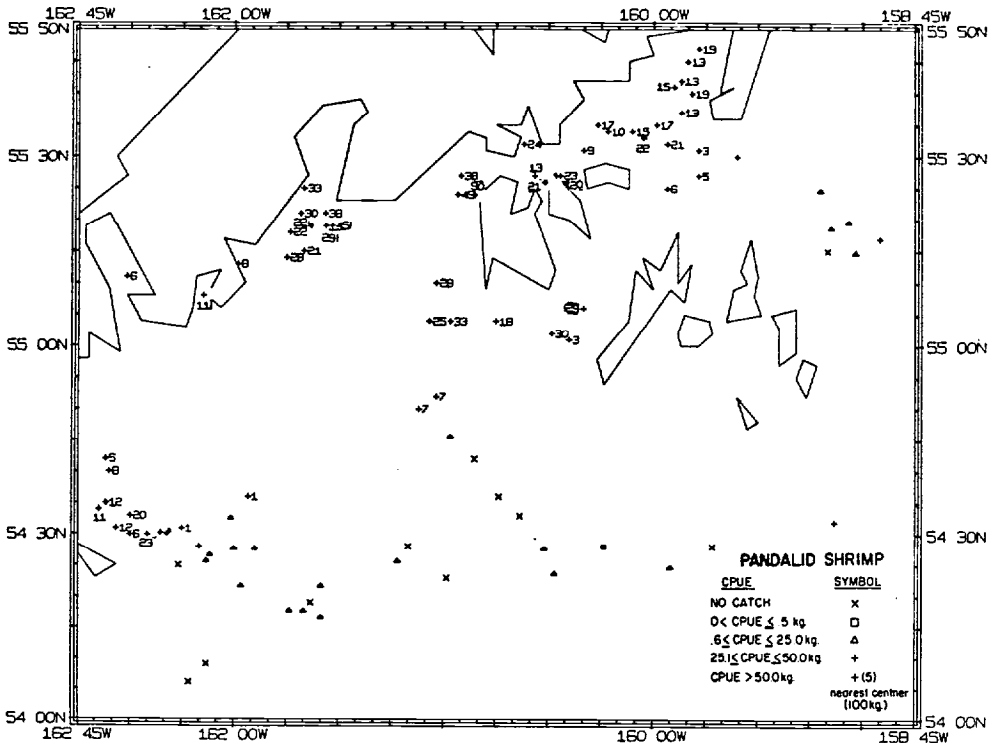
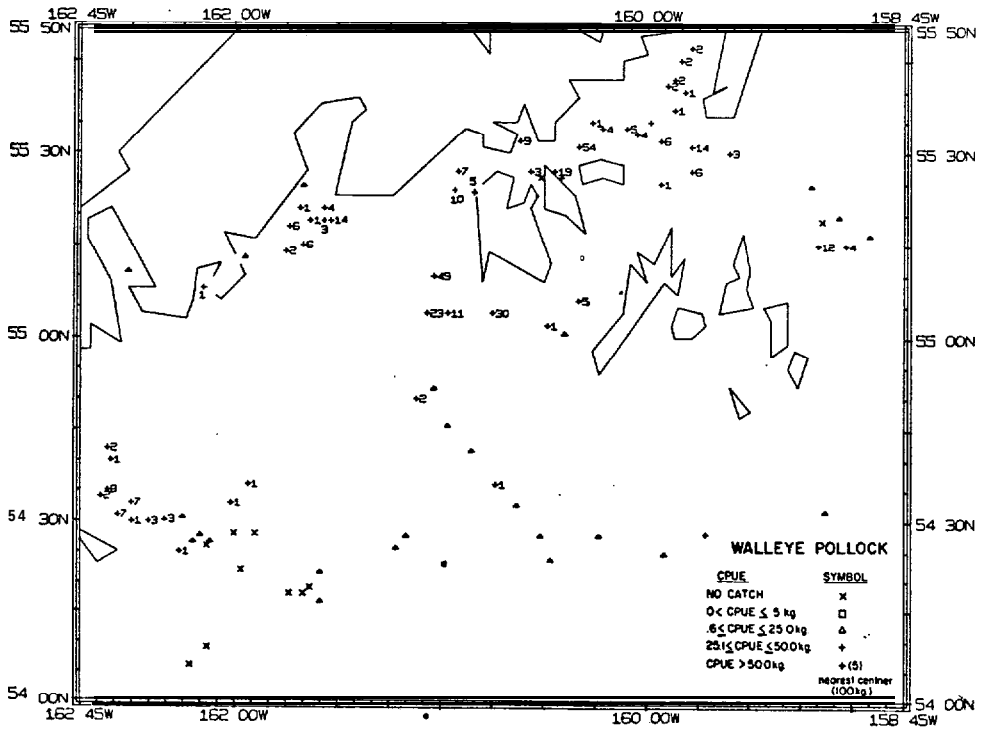
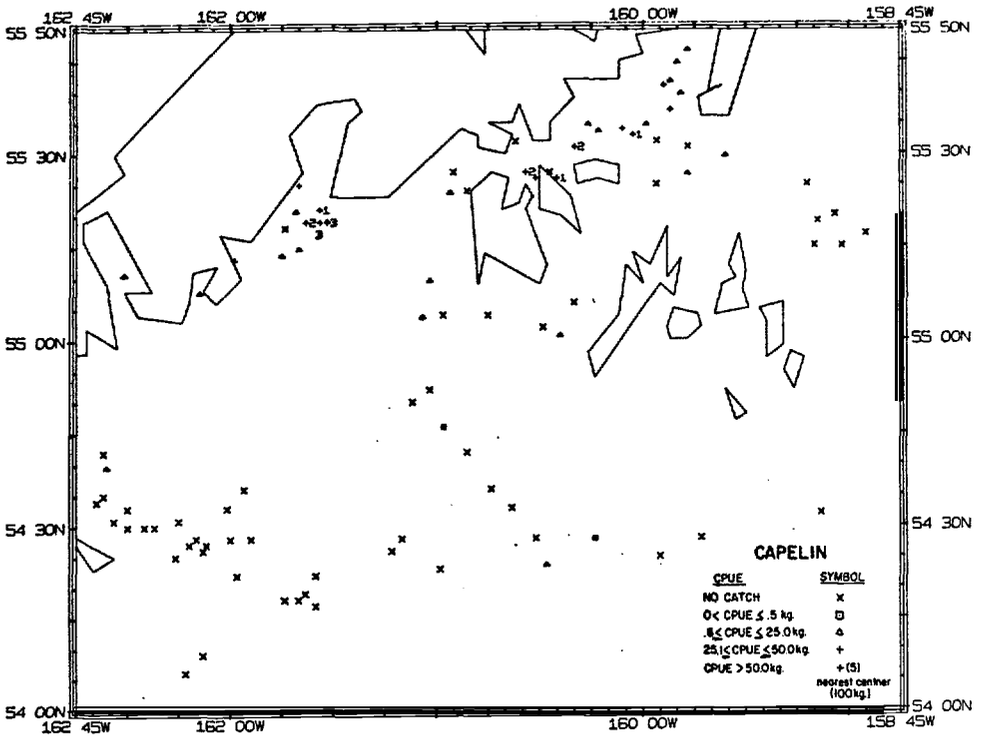


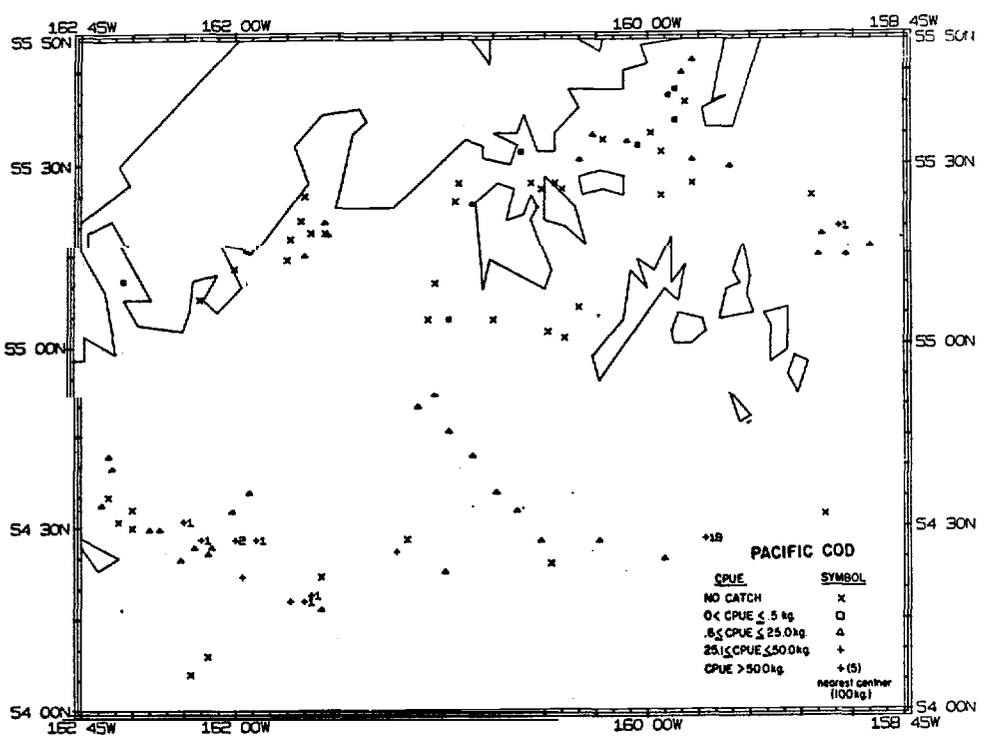
Figure X1-26.--Distribution of standardized catch rates in kg/hr for all species combined, Aug.-Sept. 1972 (Cruise 723).



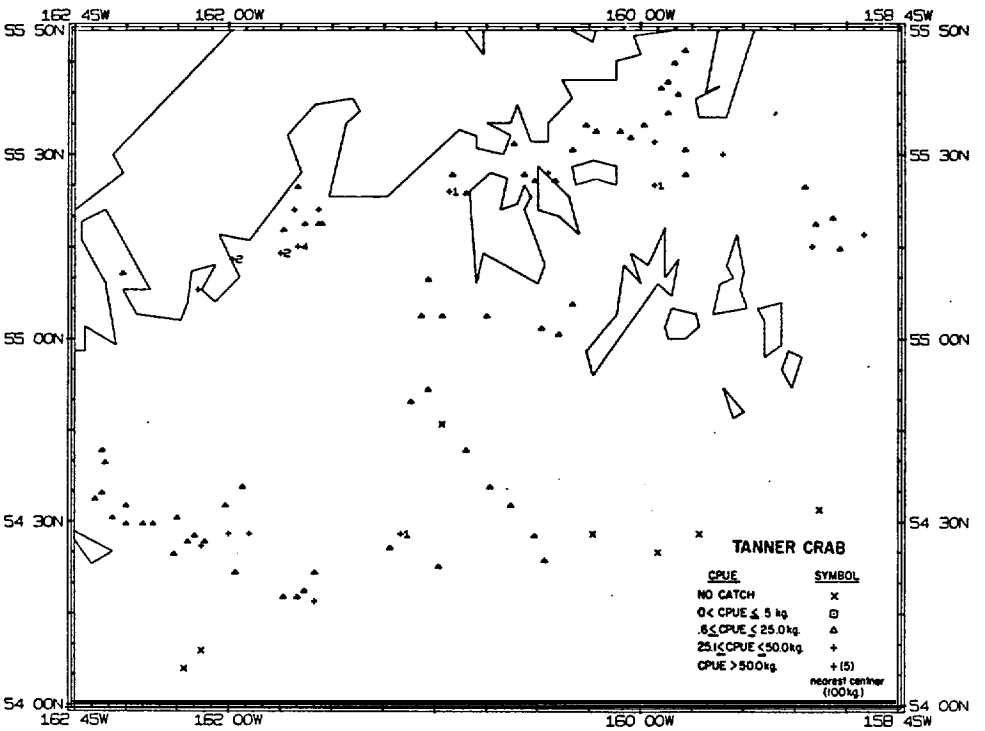


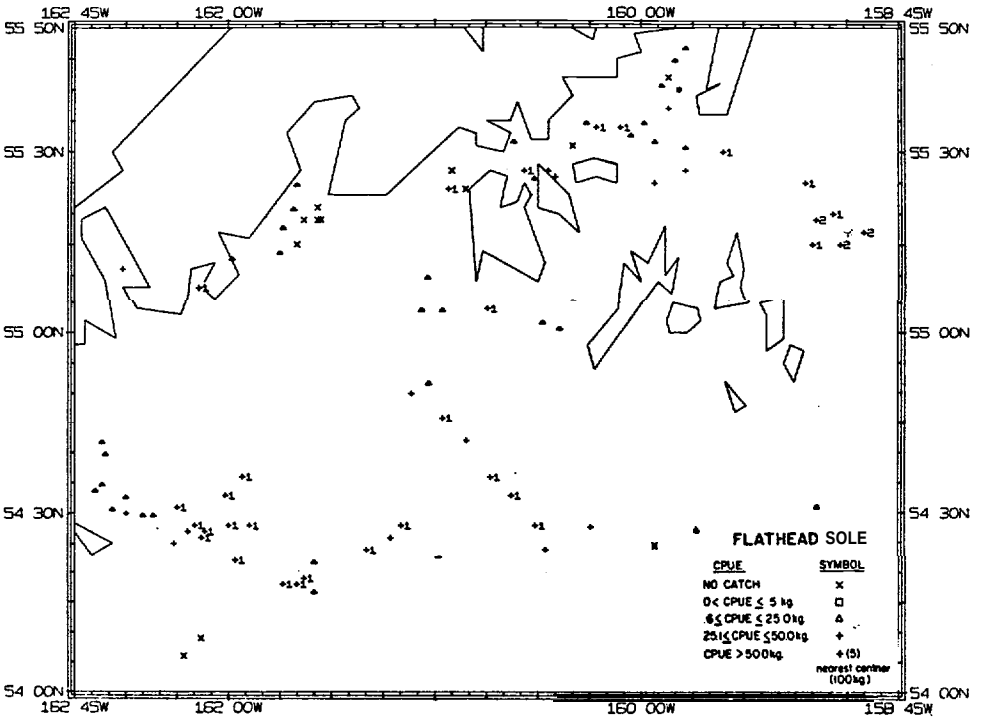
Figures XI-27-28.--Distributions of standardized catch rates in kg/hr for pandalid shrimp and walleye pollock, Aug.-Sept. 1972 (Cruise 723).



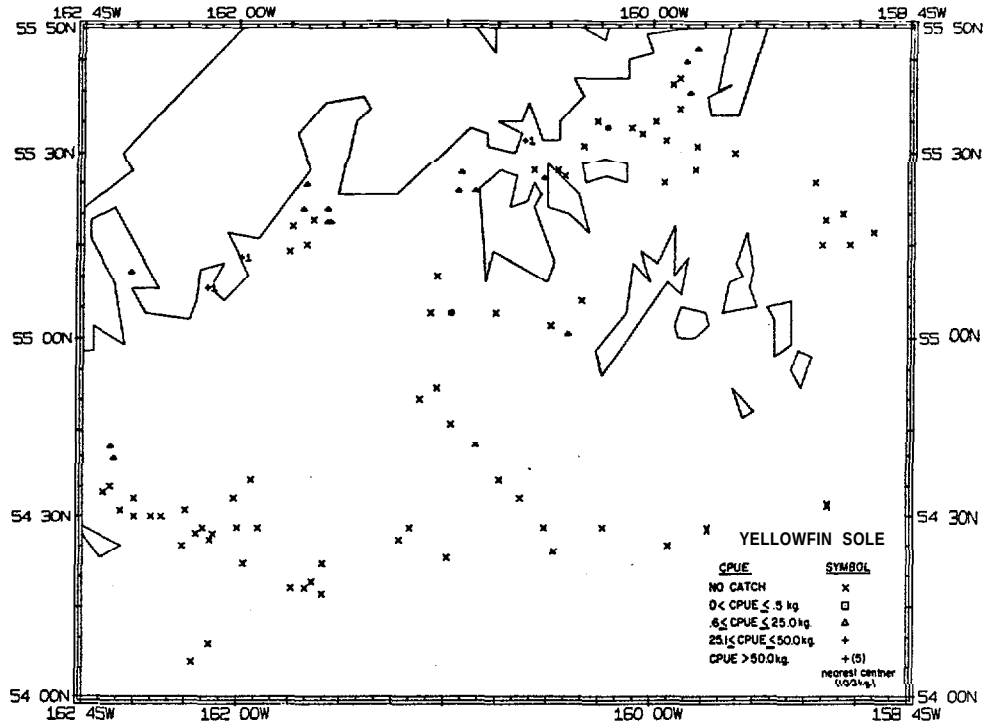


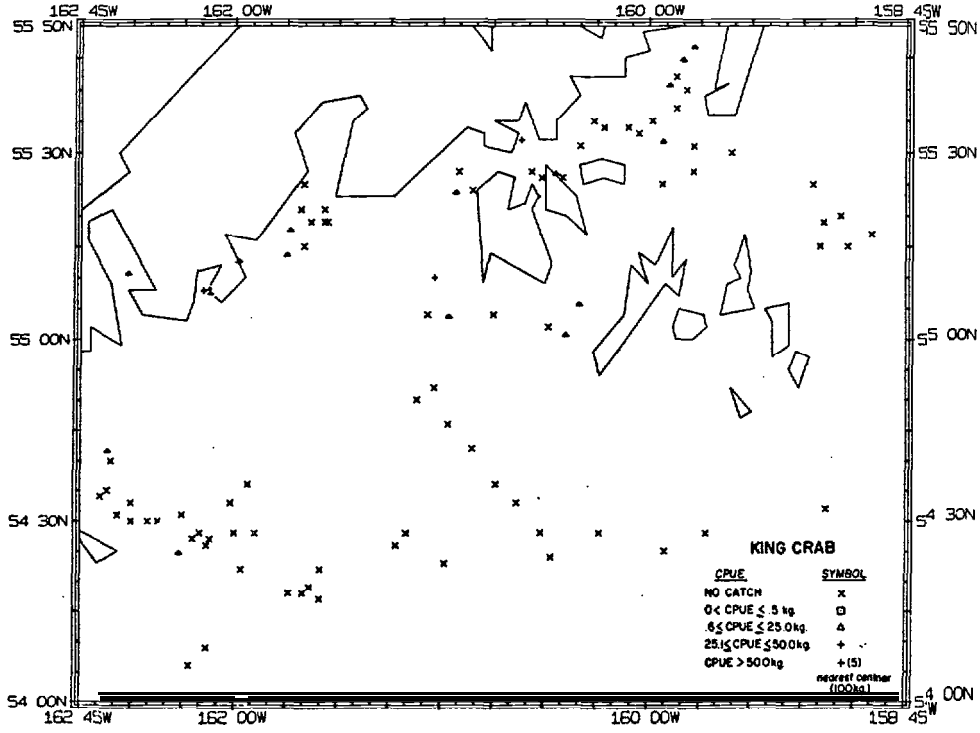
Figures X1-29-30.--Distributions of standardized catch rates in **kg/hr** for capelin and Pacific cod, Aug.-Sept. 1972 (Cruise 723).



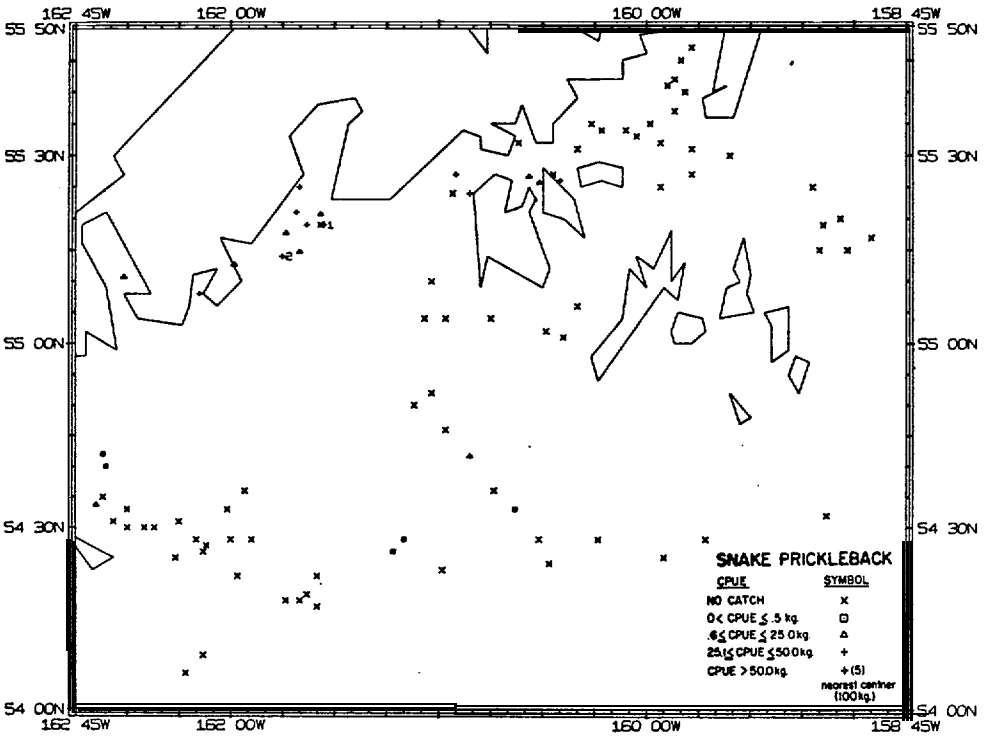


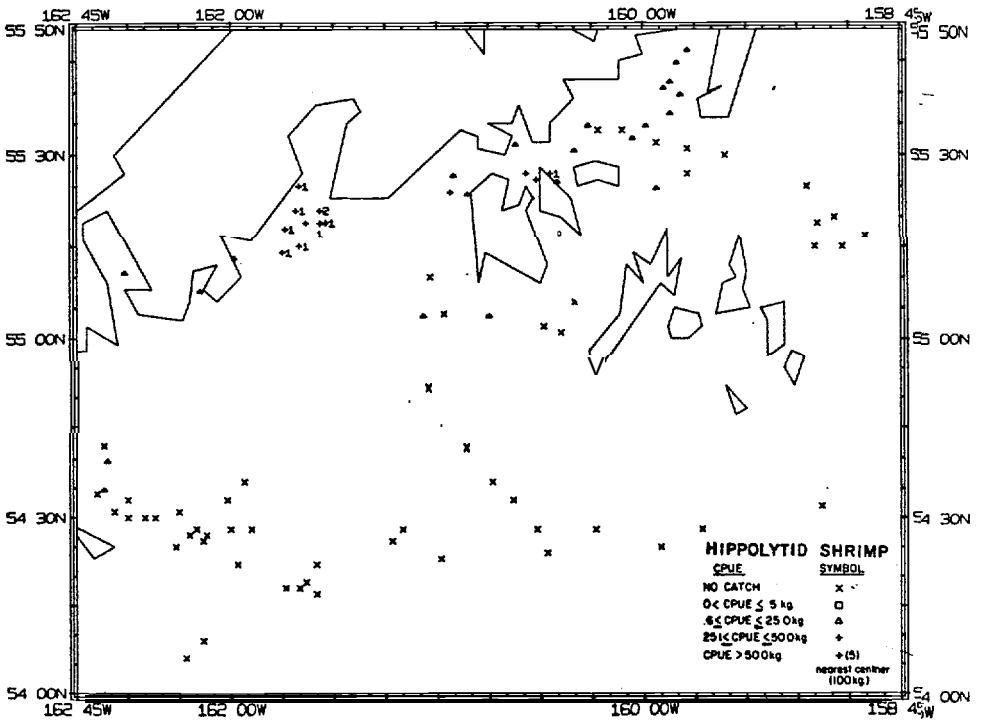
Figures X1-31-32.--Distributions of standardized catch rates in kg/hr for Tanner crab and flathead sole, Aug.-Sept. 1972 (Cruise 723).





Figures X1-33-34.--Distributions of standardized catch rates in **kg/hr** of yellowfin sole and king crab, Aug.-Sept. 1972 (Cruise 723).





Figures' X1-35-36 .--Distributions of standardized catch rates in kg/hr of snake prickleback and Hippolytid shrimp, Aug.-Sept. 1972 (Cruise 723).

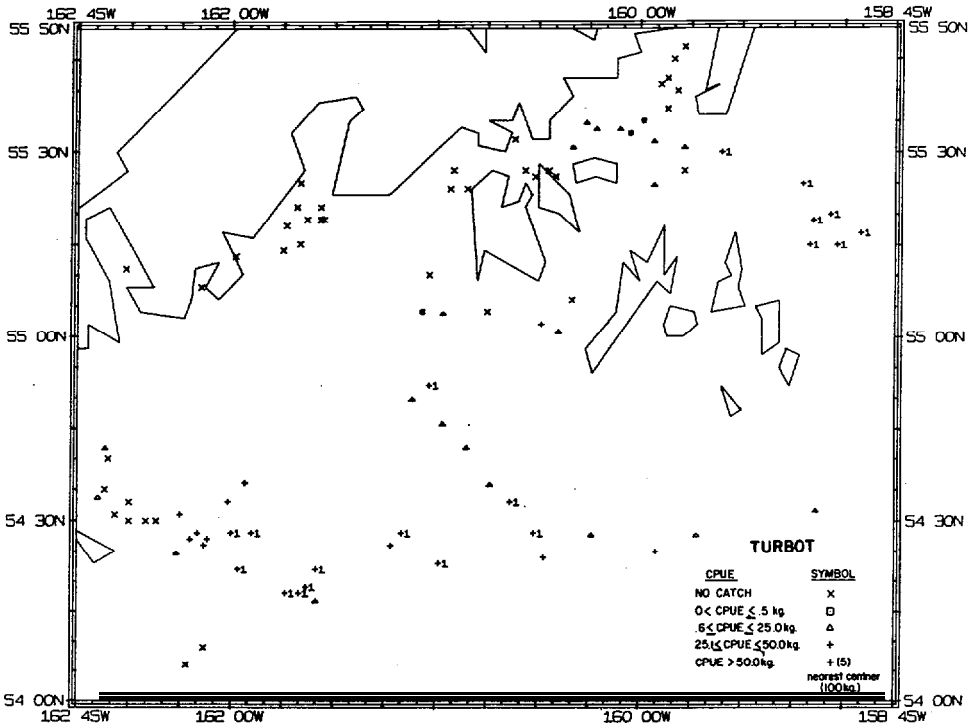


Figure XI-37.--Distribution of standardized catch rates in kg/hr of turbot, Aug.-Sept. 1972 (Cruise 723).

Pandalid shrimp, which were not captured in the inner shelf, averaged only 34 kg/hr in the outer shelf, and consisted of 96% pink shrimp (Table x1-3). No other pandalid species produced mean CPUE's of 10 kg/hr or more. The distribution of the standardized catch rates is presented in Figure XI-40.

Five fish species occurred at CPUE's greater than 10 kg/hr. These were walleye pollock in the outer shelf and inner shelf, Pacific cod and yellow Irish lord in both the inner and outer shelves, rock sole in the inner shelf and flathead sole in the outer shelf (Table X1-4). High catch rates of walleye pollock, 300 kg/hr or more, were made at 70% of the stations, Pacific cod at 4 stations, and flathead sole at 2 stations (Figures X1-41-43). The distribution of the standardized catch rates for other species exceeding 10 kg/hr are presented in Figures X1-44-45. Together, pandalid shrimps and the 5 fish species whose individual catch rates exceeded 10 kg/hr constituted 97% of the total catch in the outer shelf and 92% of the total catch in the inner shelf depth zone.

f. Cruise 735, R/V Oregon (Aug.-Oct. 1973)

The R/V Oregon returned to the Shumagin-Sanak area for a second survey in this region. One hundred forty-five stations were attempted with the 61' NMFS high opening shrimp trawl (Figure X1-46).

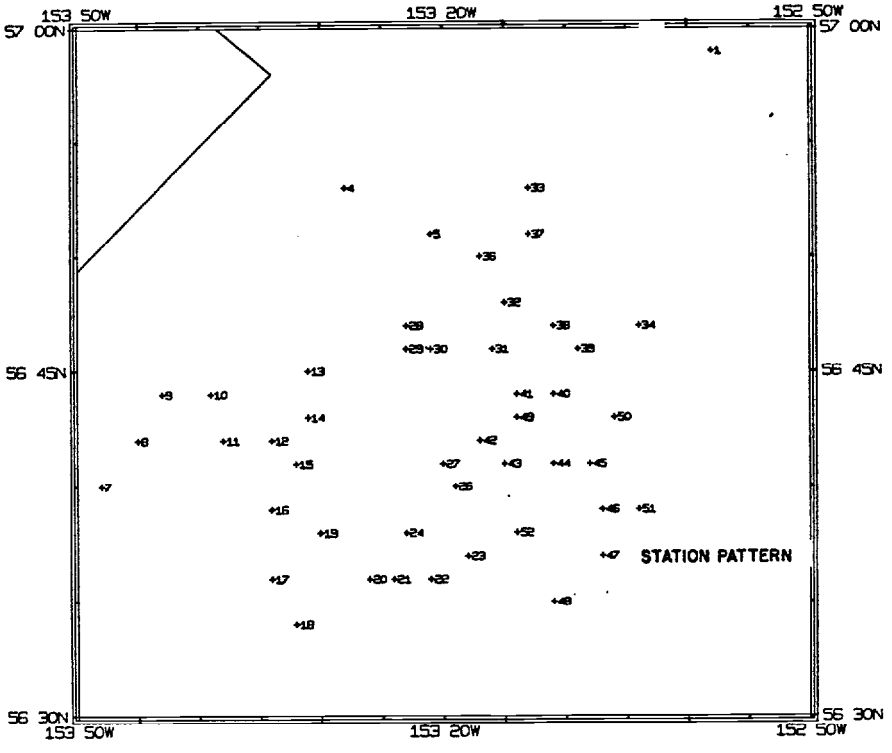


Figure XI-38 .--Stations successfully trawled (shrimp trawl) by the R/V Commando, May-June 1973 (Cruise 732).

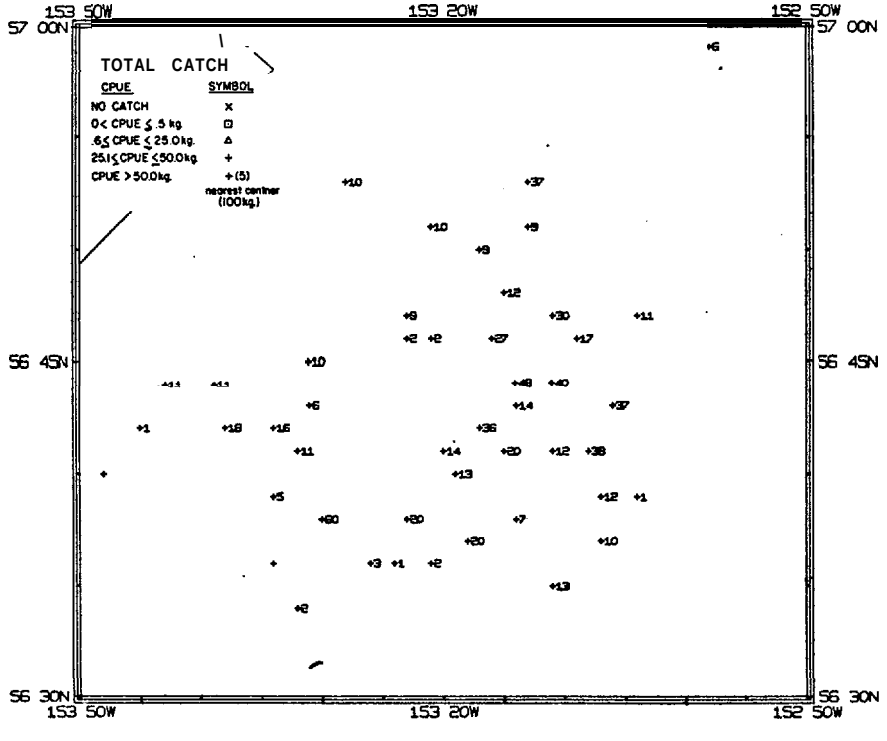
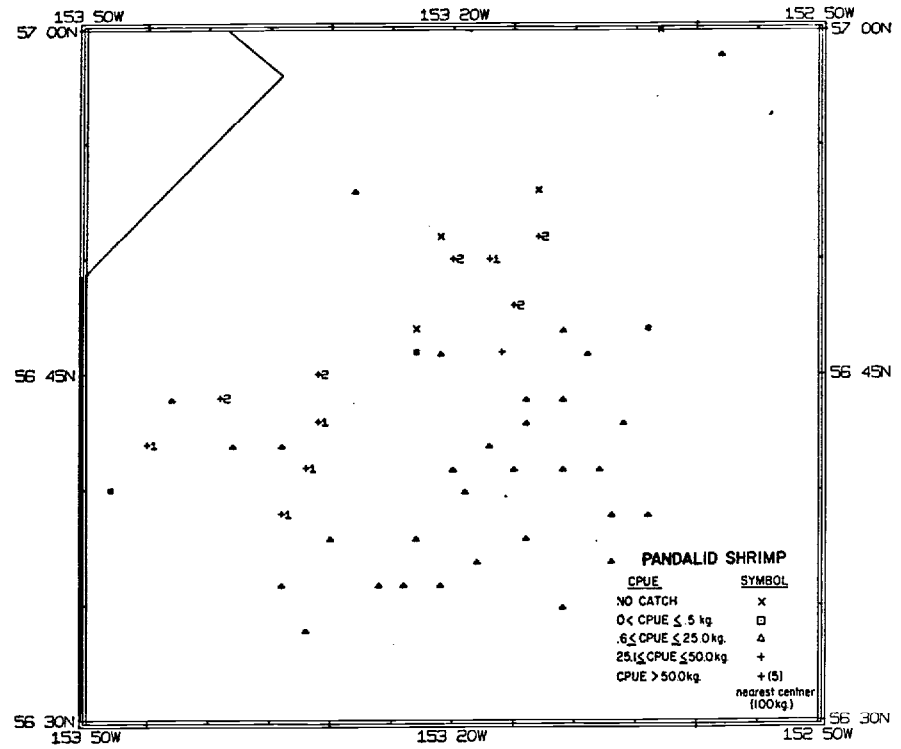
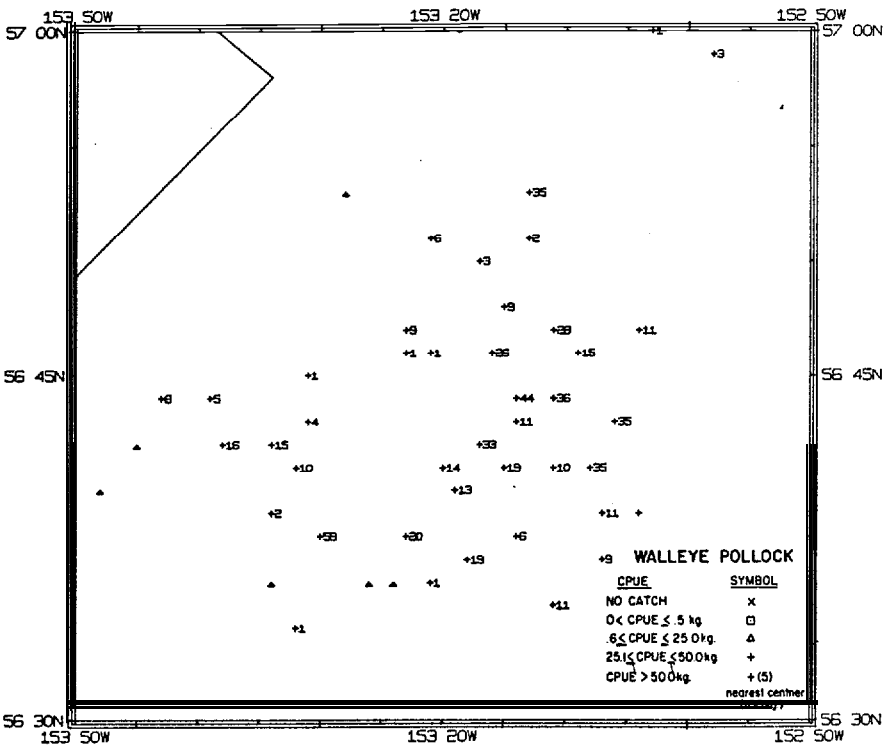
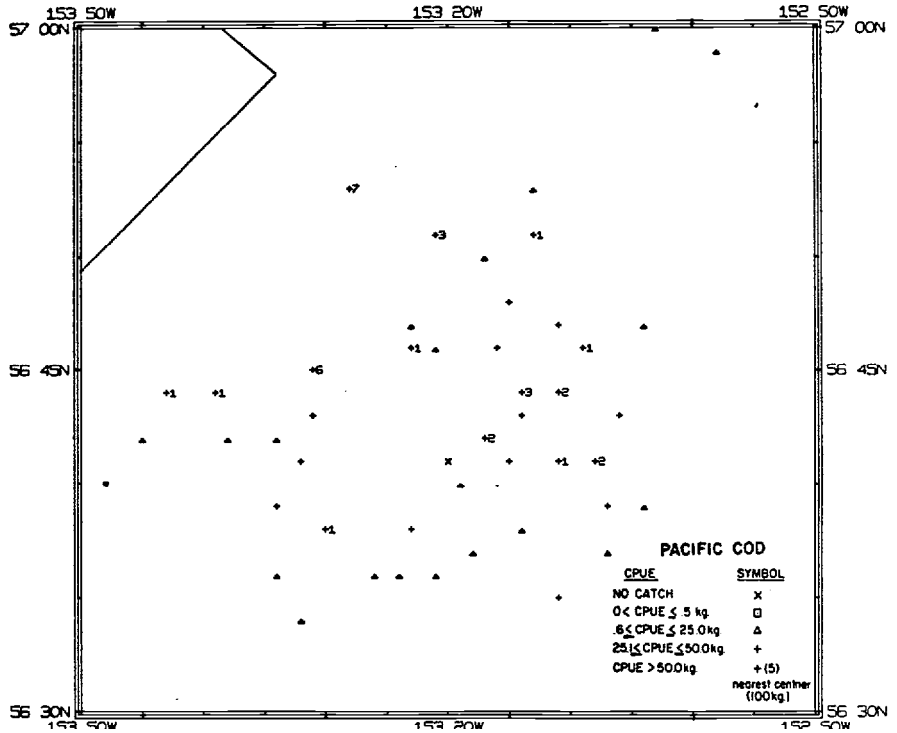


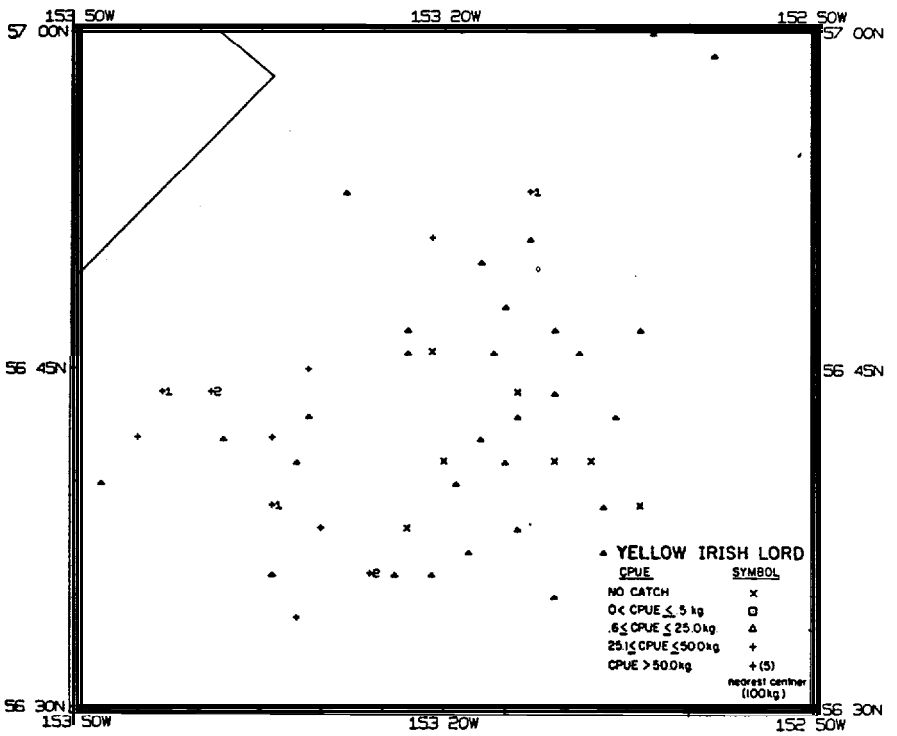
Figure XI-39 .--Distribution of standardized catch rates in kg/hr of all species combined, May-June 1973 (Cruise 732).



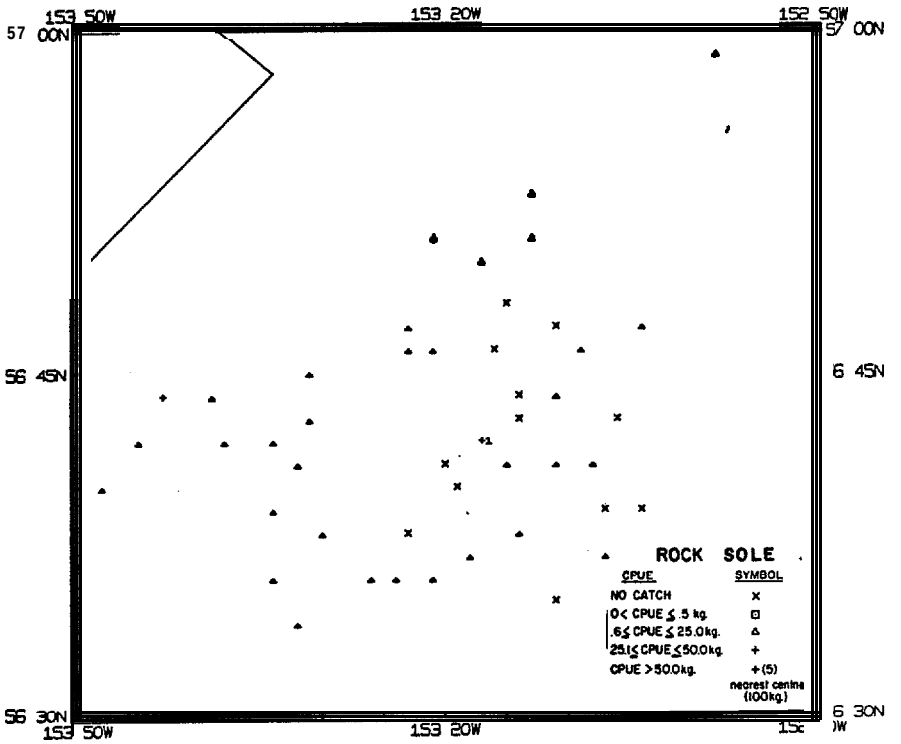


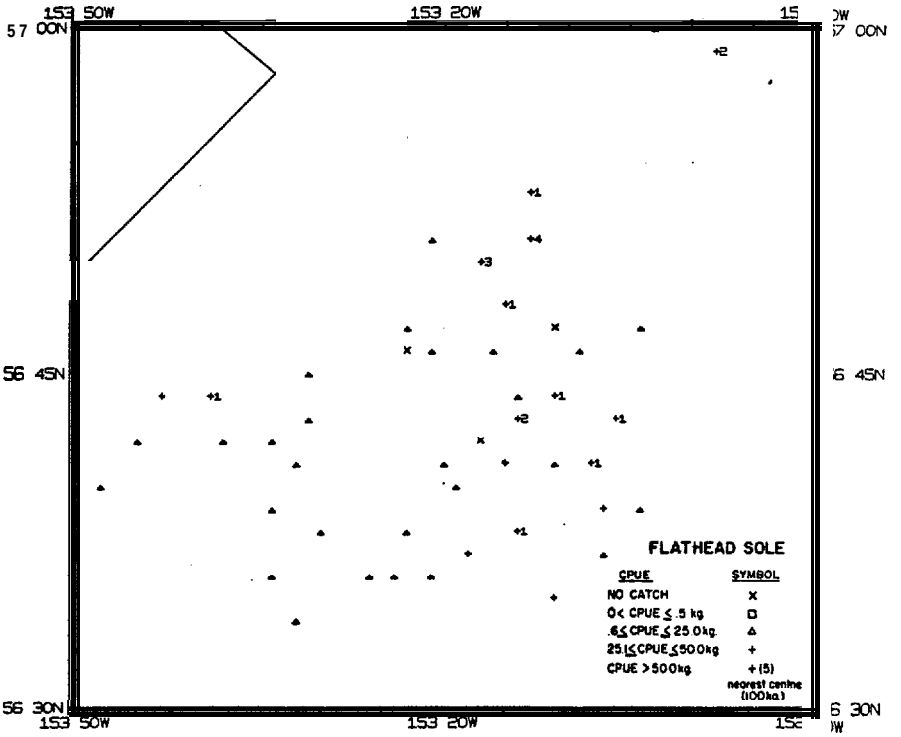
Figures X1-40-41.--Distributions of standardized catch rates in kg/hr of **pandalid** shrimp and walleye pollock, May-June 1973 (Cruise 732).



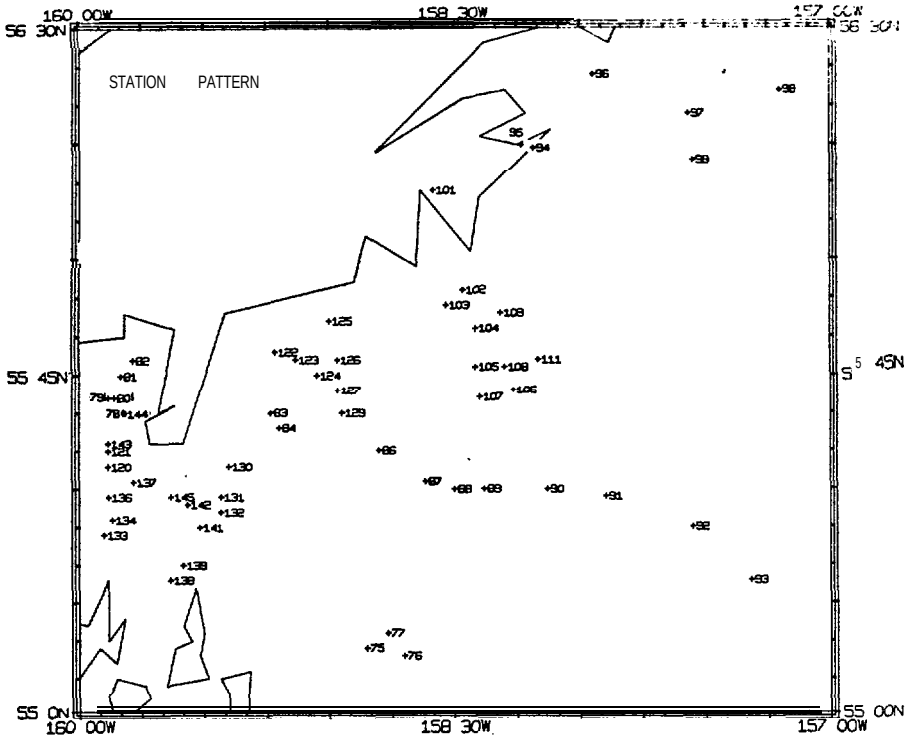


Figures X1-42-43.--Distributions of standardized catch rates in kg/hr of Pacific cod and yellow Irish lord, May-June 1973 (Cruise 732).





Figures XI-44-45.--Distributions of standardized catch rates in kg/hr of rock sole and flathead sole, Nay-June 1973 (Cruise 732).



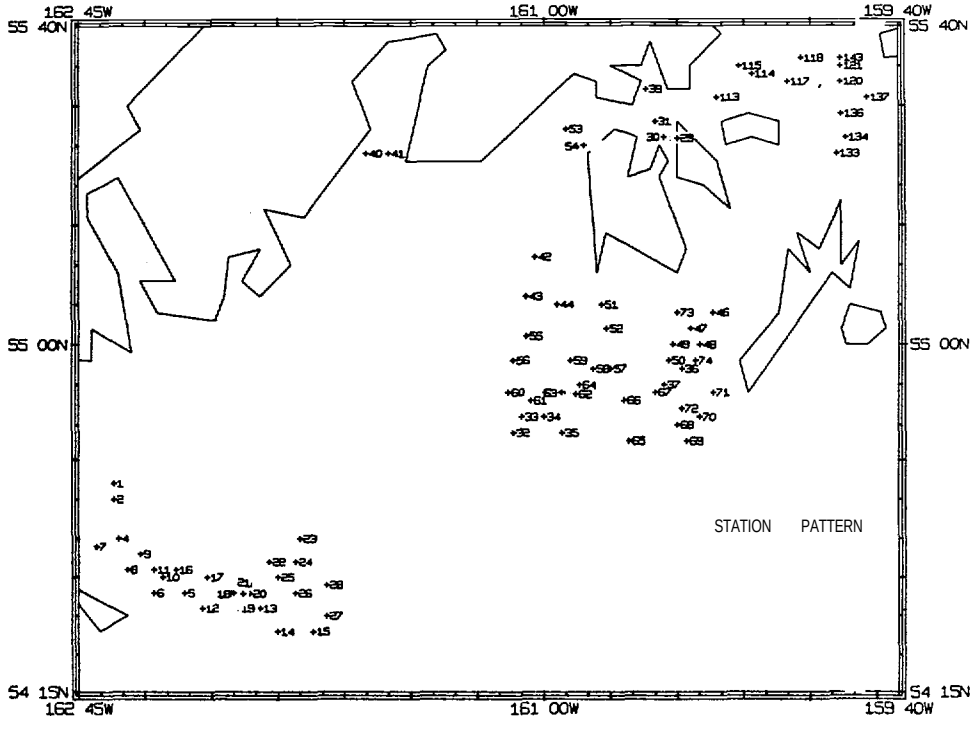


Figure X1-46.--Stations successfully trawled (shrimp trawl) by the R/V Oregon, Aug.-Oct. 1973 (Cruise 735).

The total catch of all species averaged over 2100 kg/hr in the outer shelf and upper slope and 618 kg in the inner shelf and standardized catch rates ranged up to 10,000 kg/hr. Total catches, all species combined, exceeded 1000 kg/hr and occurred at 73% of the stations in the survey area (Figure X1-47).

During the survey, pandalid shrimp catches averaged 505, 1328, and 1786 kg/hr in the inner and outer shelves and upper slope, respectively, and standardized catch rates ranged up to 4301 kg/hr. Pink shrimp was the dominant species making up 63, 92, and 67% of the total pandalid catch by depth zones (Table XI-3). The catches of humpy shrimp averaged 10 kg/hr or more in all 3 depth zones as did coonstripes. Sidestripe shrimp surpassed the 10 kg/hr or more catch level in 2 depth zones--the outer shelf and the upper slope. The estimated biomass for pandalid shrimp in the survey area was 355.2 thousand mt. Exceedingly large catches of pandalid shrimp, 1000 kg/hr or more, were made at 59% of the stations sampled (Figure X1-48).

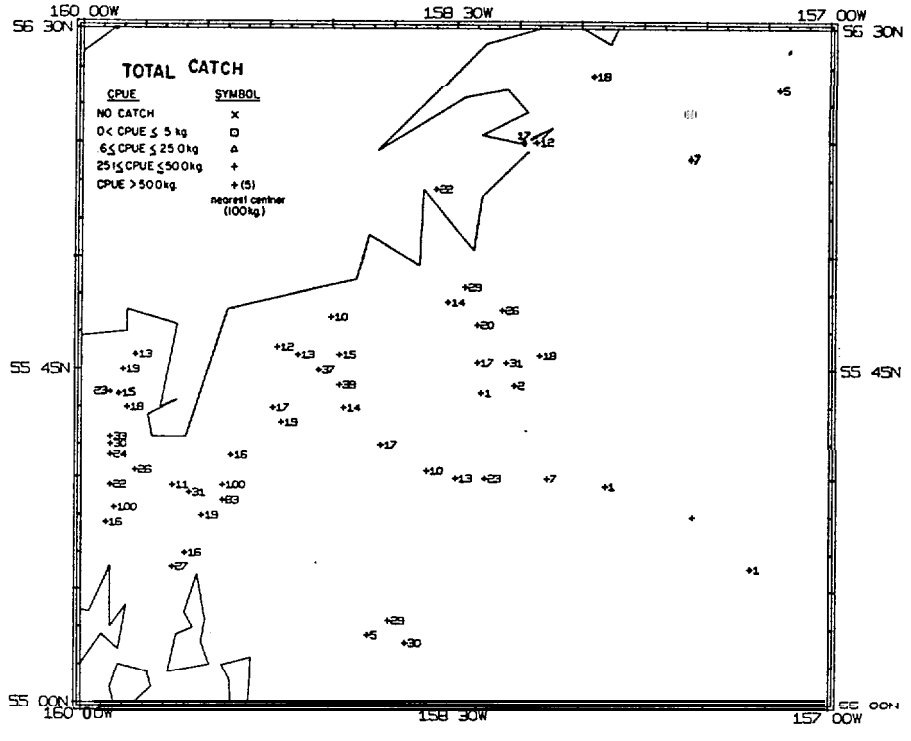
In addition to the shrimp species just discussed, twelve other species or species groups occurred at mean CPUE's of 10 kg/hr or more (Table X1-4). Only walleye pollock and flathead sole exceeded 10 kg/hr or more in all 3 depth zones. Myoxocephalus sp. exceeded this catch rate in the inner and outer shelves while turbot, Tanner crab and longsnout prickleback surpassed 10 kg/hr in the outer shelf and upper slope. Eelpouts, starfish, Pacific cod, eulachon, jellyfish, and capelin all exceeded 10 kg/hr in the outer shelf depth zone. Large catches of walleye pollock, 300 kg/kr or more, were made in Sanak Gully, south of Unga Island, Stepovak Bay, and offshore waters. Other species whose catch rates exceeded 300 kg/hr or more were Pacific cod in Stepovak Bay, eulachon in the offshore area, cape1 in in West Nagai Strait, flathead sole and turbot, eelpouts and starfish in outer Sanak Gully (Figures X1-40-56). The distribution of the standardized catches for the other species averaging 10 kg/hr or more in a depth zone are shown in Figures X1-57-60. Together, the dominant species and the pandalid shrimp made up over 92% of the total catch in all 3 depth zones.

g. Cruise 741, R/V Oregon (April-May 1974)

In 1974, a pandalid shrimp survey was conducted along the southeast coast of Kodiak Island. Only 40 stations were attempted with the 61' NMFS high opening shrimp trawl (Figure X1-61).

Sampling was only conducted in the outer shelf depth zone where the total catch for all species combined averaged 214 kg/hr. Catches greater than or equal to 1000 kg/hr were made only at two stations--in the gully between Cape Kiavak and Sitkalidak Island (Figure X1-62).

Pandalid shrimp catches averaged 126 kg/hr of which 98% consisted of pink shrimp. Large catch rates, over 1000 kg/hr, occurred only at the same two stations where the total catch exceeded 1000 kg/hr (Figure XI-63 and Table X1-5). The biomass of pandalid shrimp was estimated to be 2.0 thousand mt.



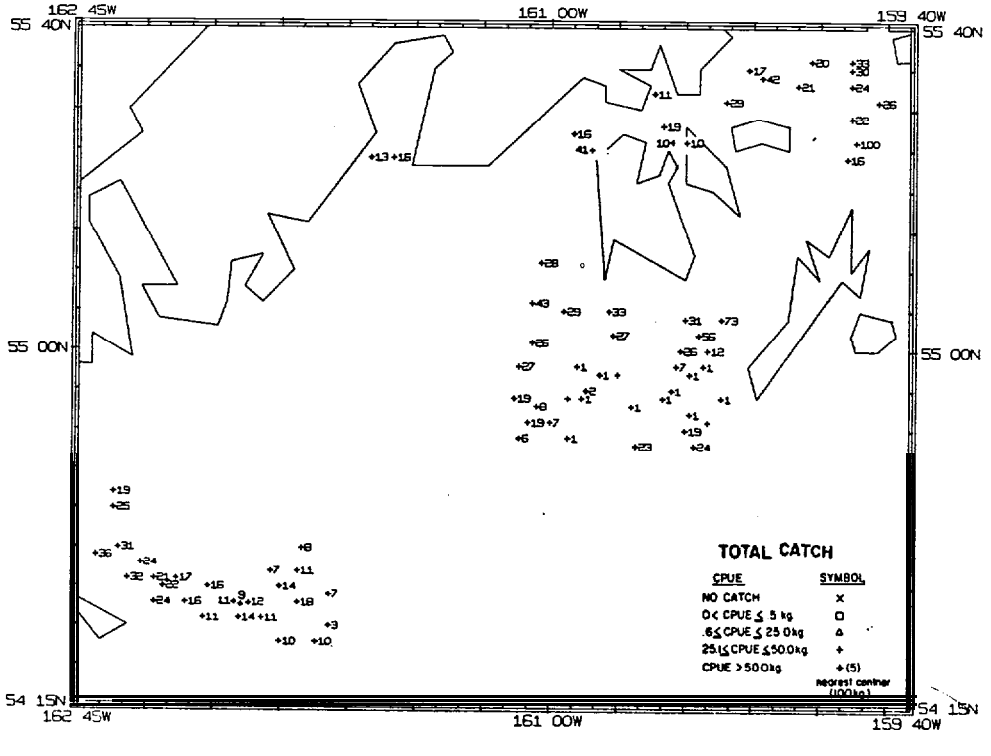


Figure X1-47.--Distribution of standardized catch rates in **kg/hr** of all **species** combined, Aug.-Oct. 1973 (Cruise 735).

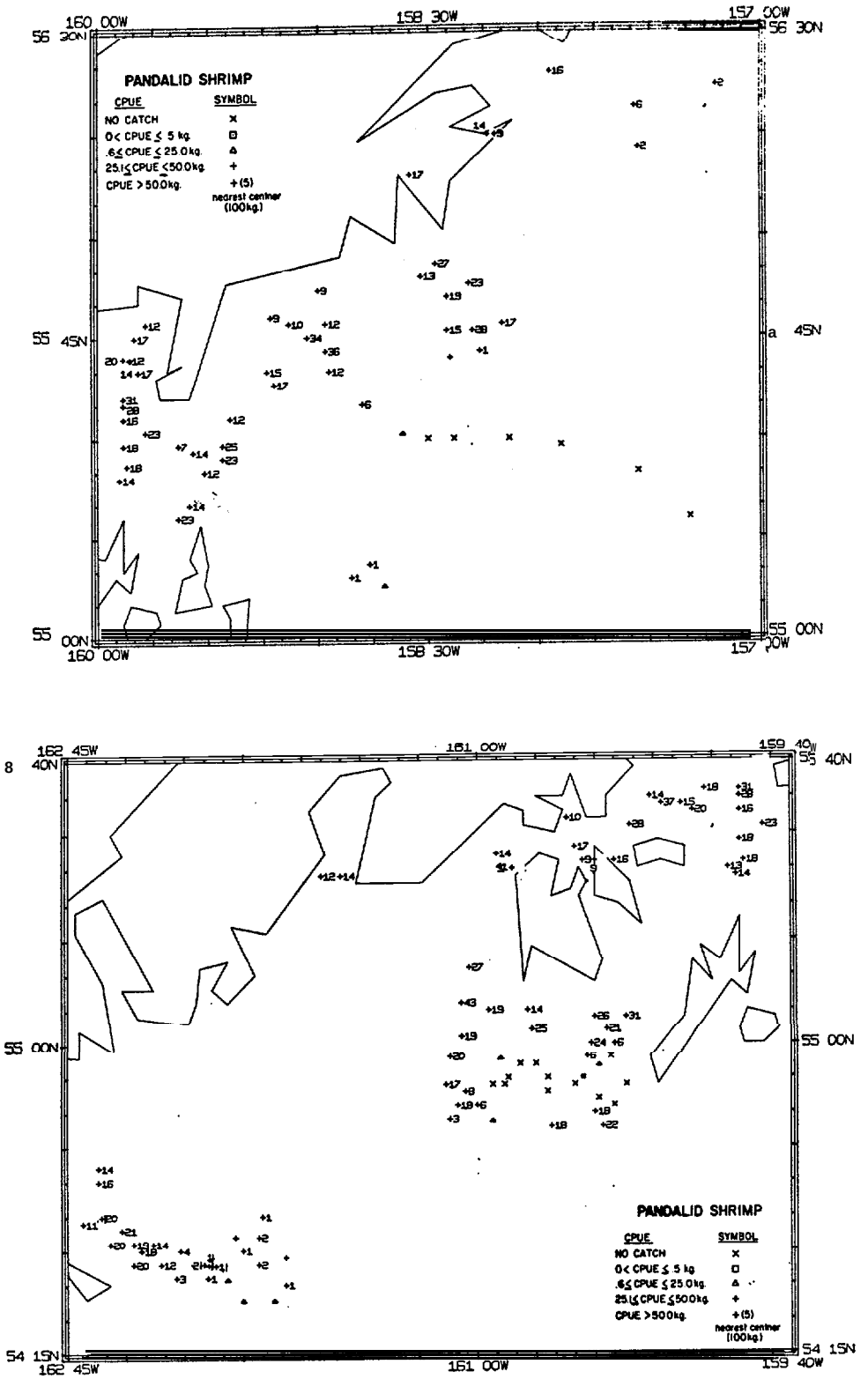
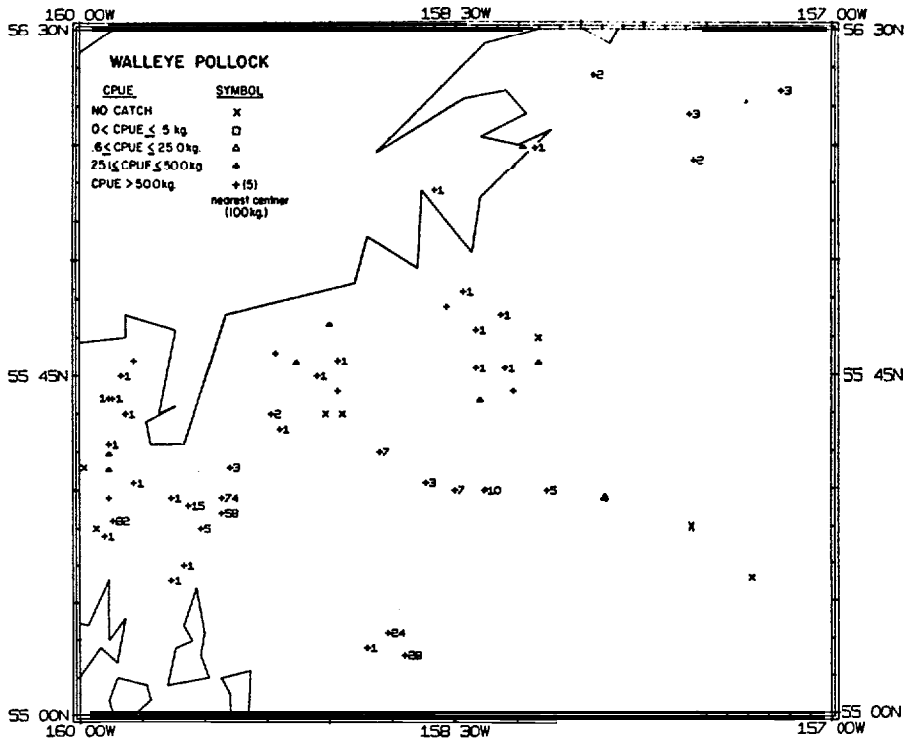


Figure X1-48.--Distribution of standardized catch rates in **kg/hr** of **pandalid** shrimp, Aug.-Oct. 1973 (Cruise 735).



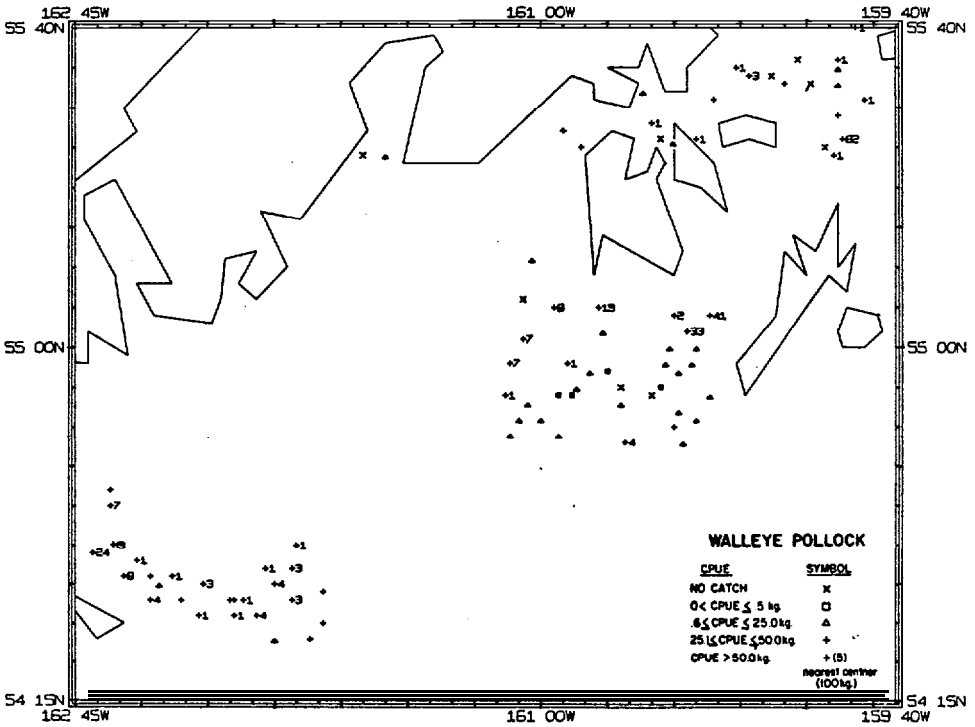


Figure X1-49.--Distribution of standardized catch rates in kg/hr of walleye pollock, Aug.-Oct. 1973 (Cruise 735).

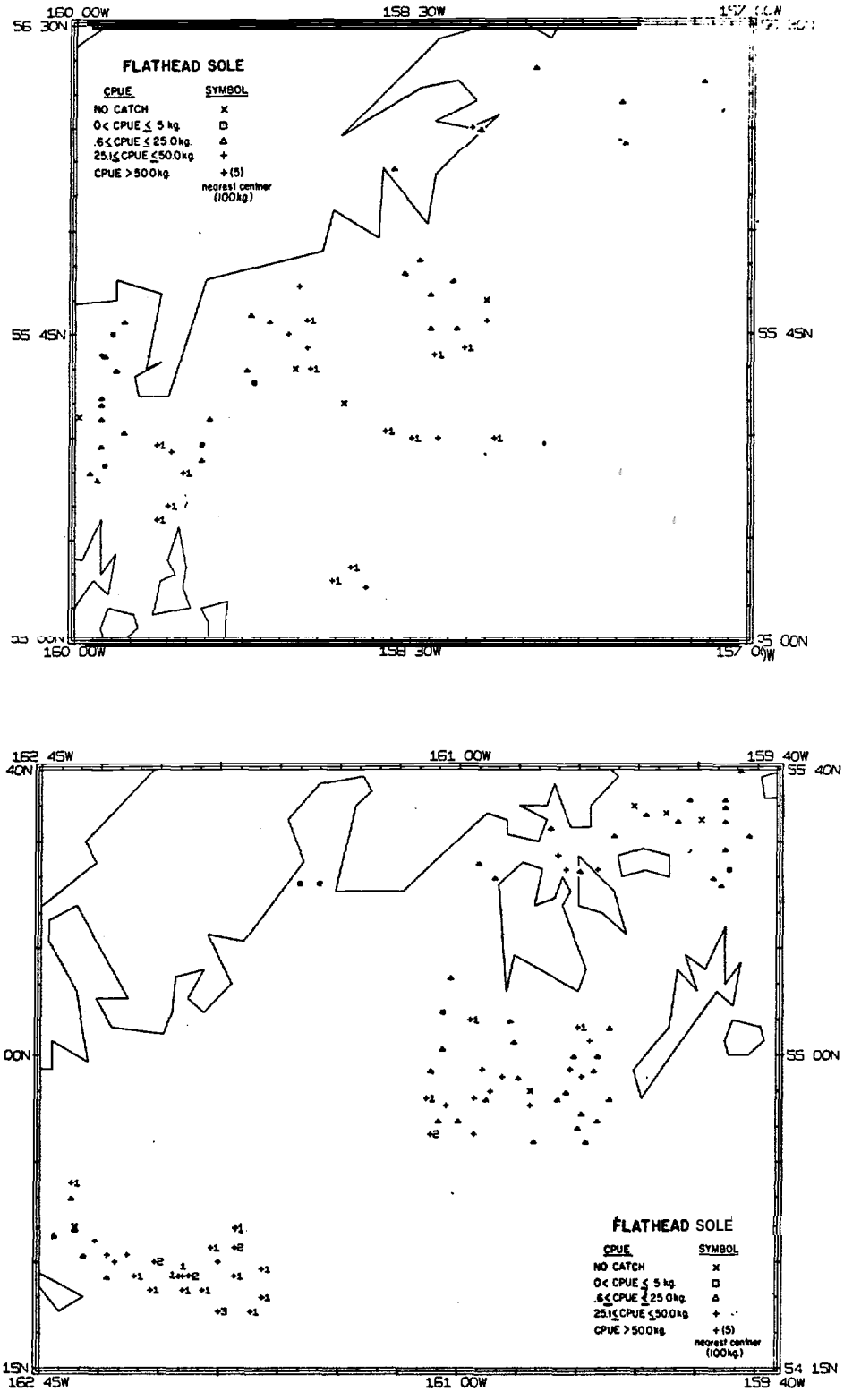
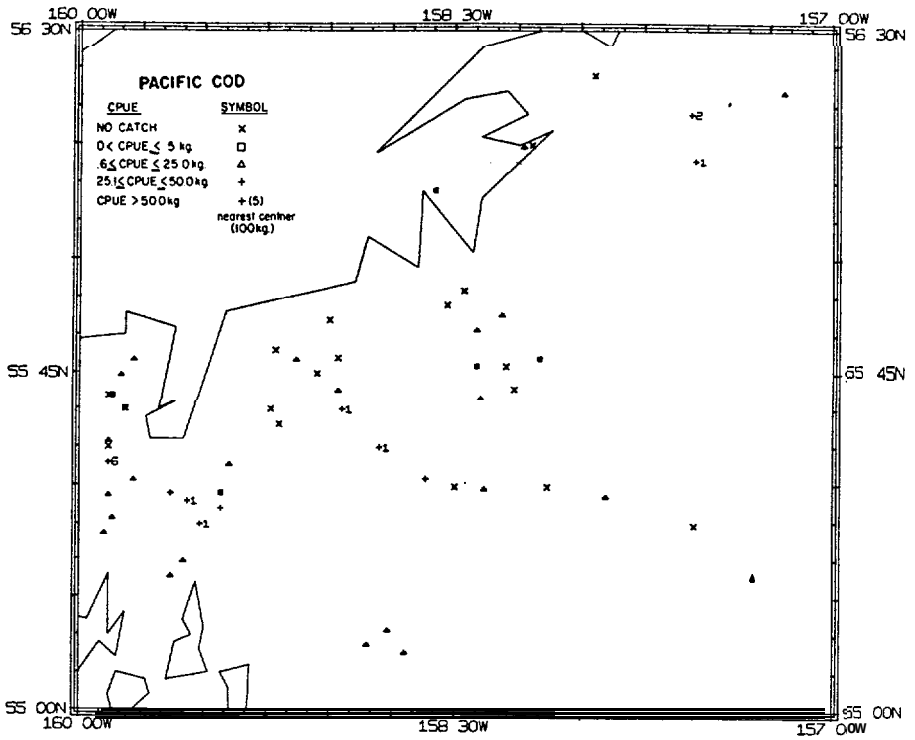


Figure XI-50.--Distribution of standardized catch rates in kg/hr of flathead sole, Aug.-Oct. 1973 (Cruise 735).



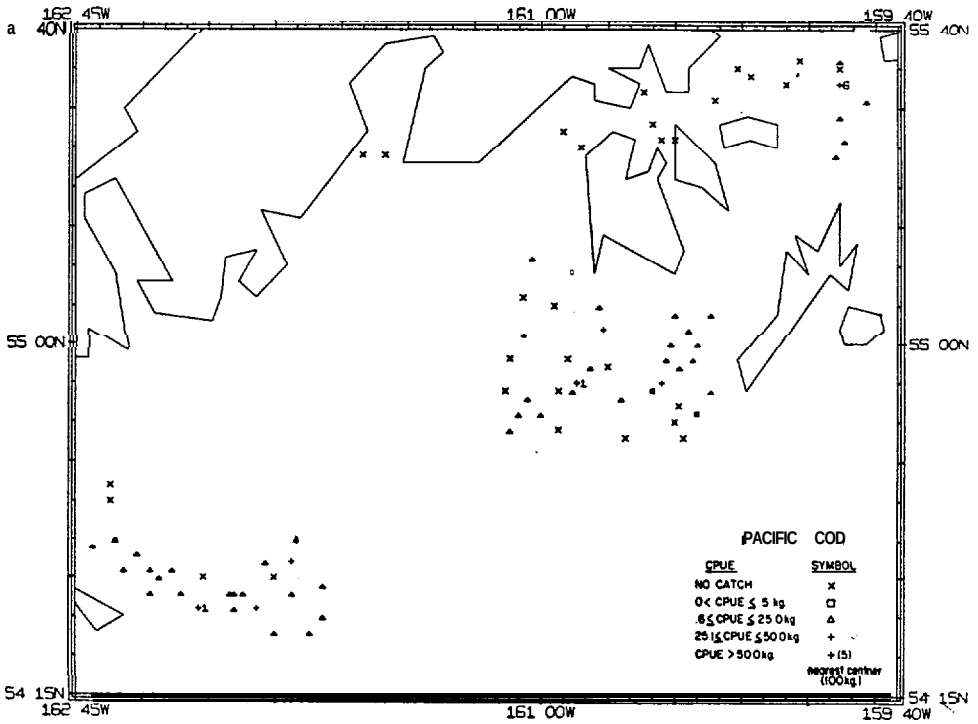
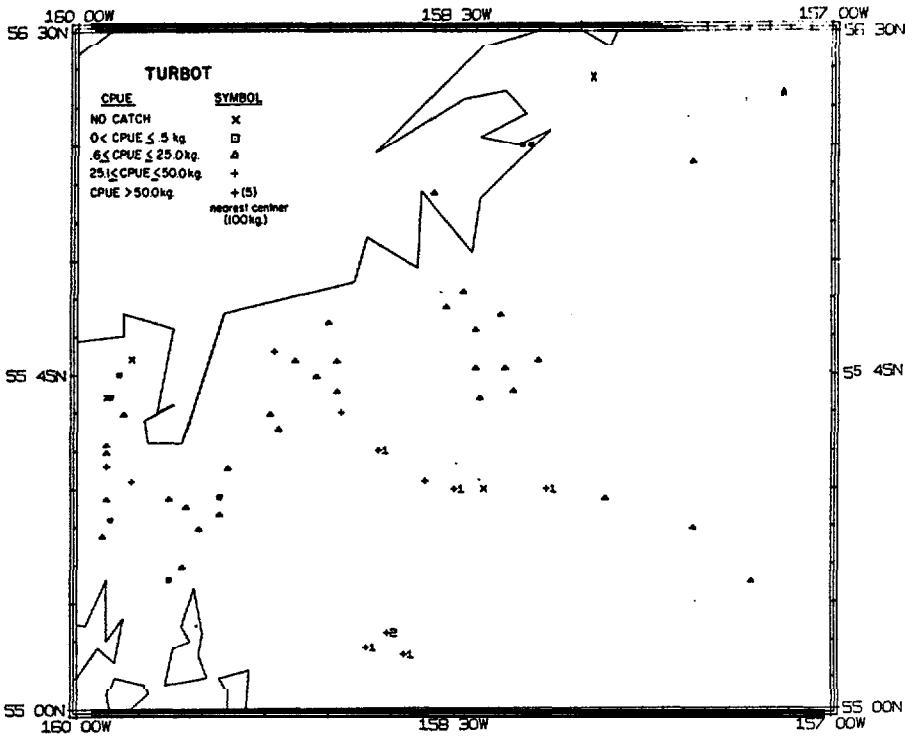


Figure XI-51.--**Distribution** of standardized catch rates in **kg/hr** of Pacific cod, Aug.-Oct. 1973 (Cruise 735).



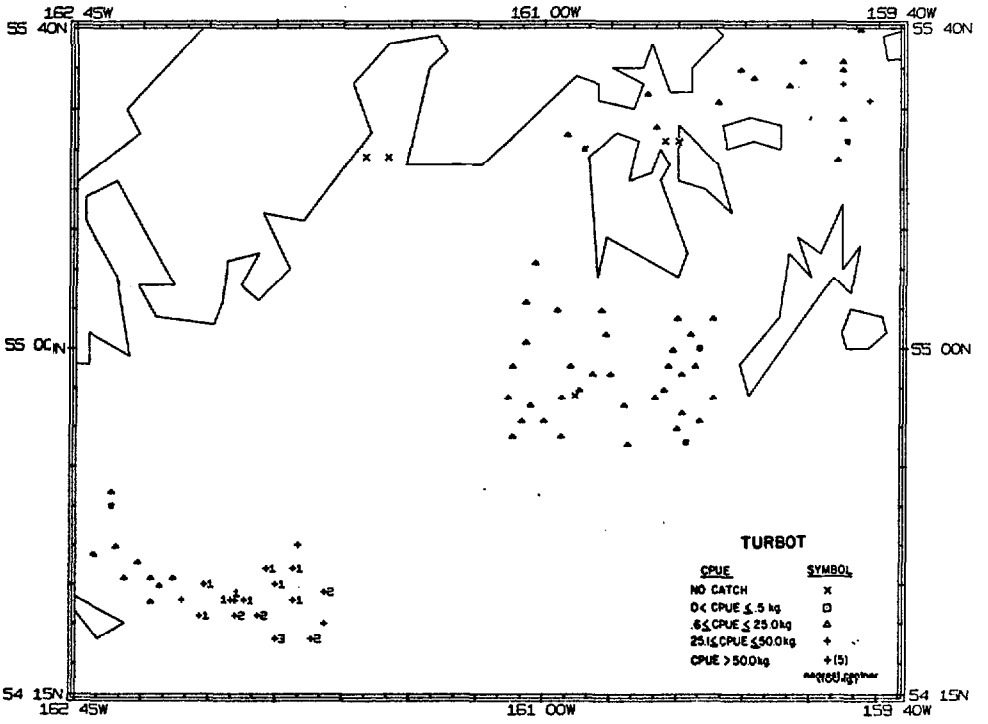
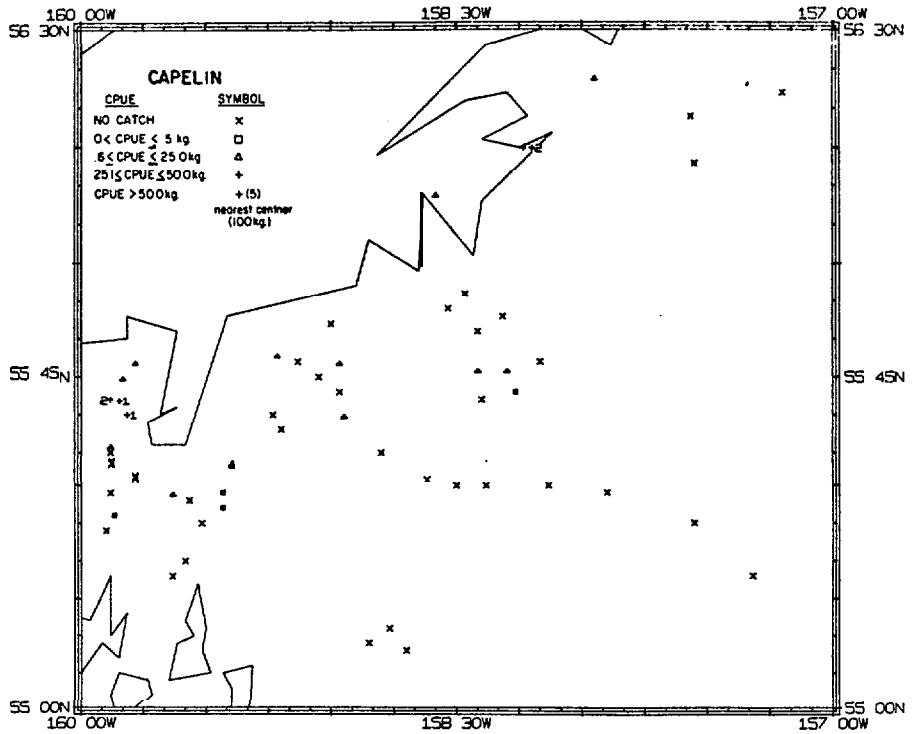


Figure X1-52.--Distribution of standardized catch rates in kg/hr of turbot, Aug.-Oct. 1973 (Cruise 735).



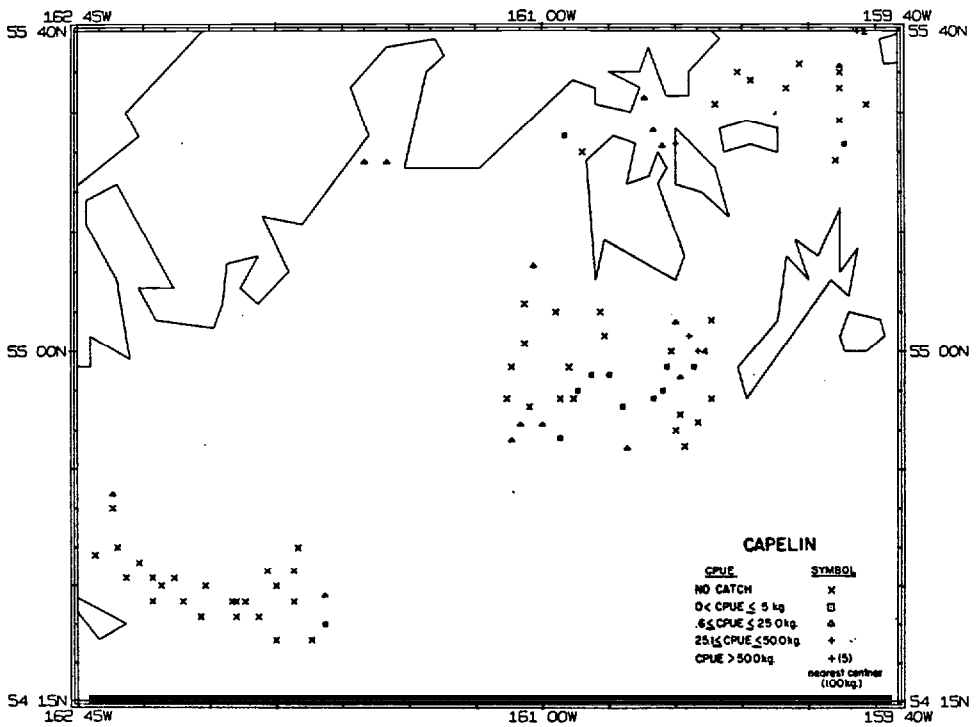
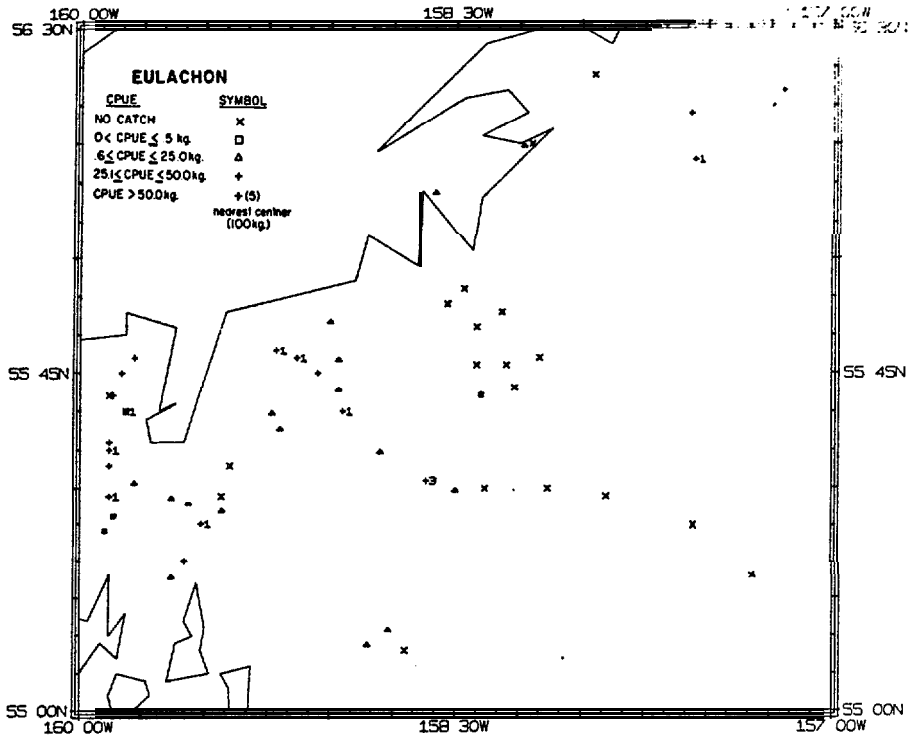


Figure X1-53.--Distribution of standardized catch rates in **kg/hr** of capelin, Aug.-Oct. 1973 (Cruise 735).



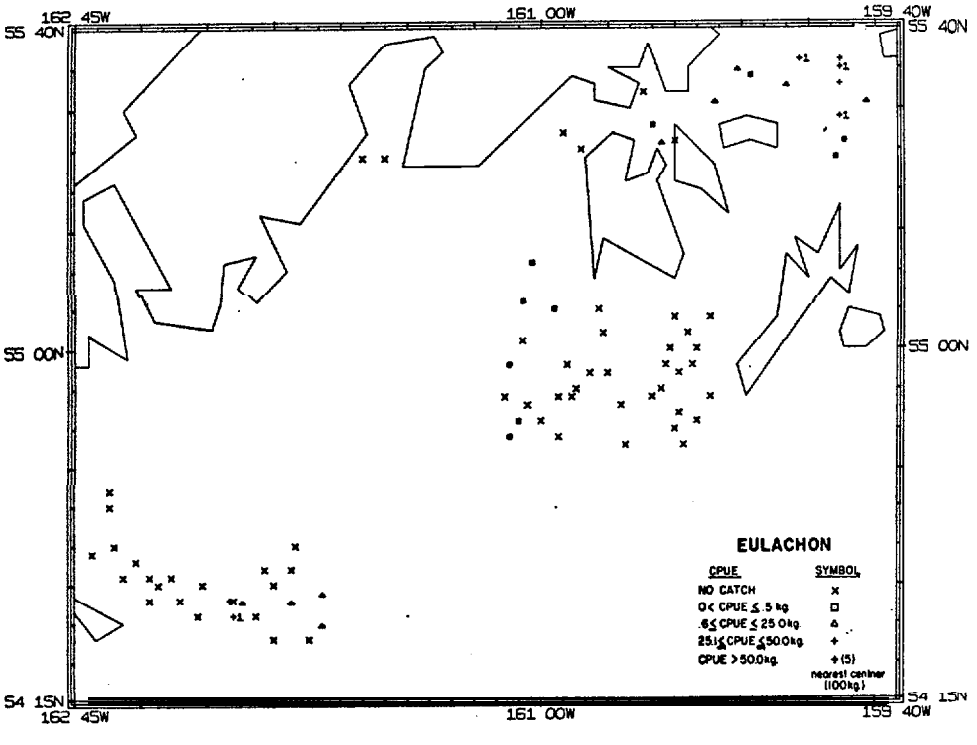
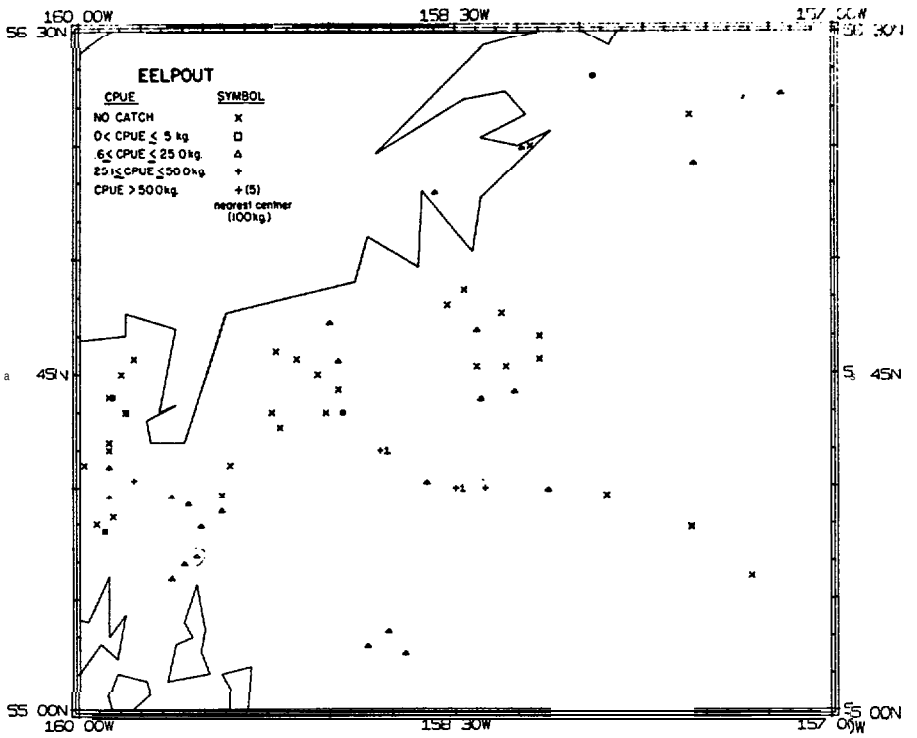


Figure X1-54.--Distribution of standardized catch rates in **kg/hr** of eulachon, Aug.-Oct. 1973 (Cruise 735).



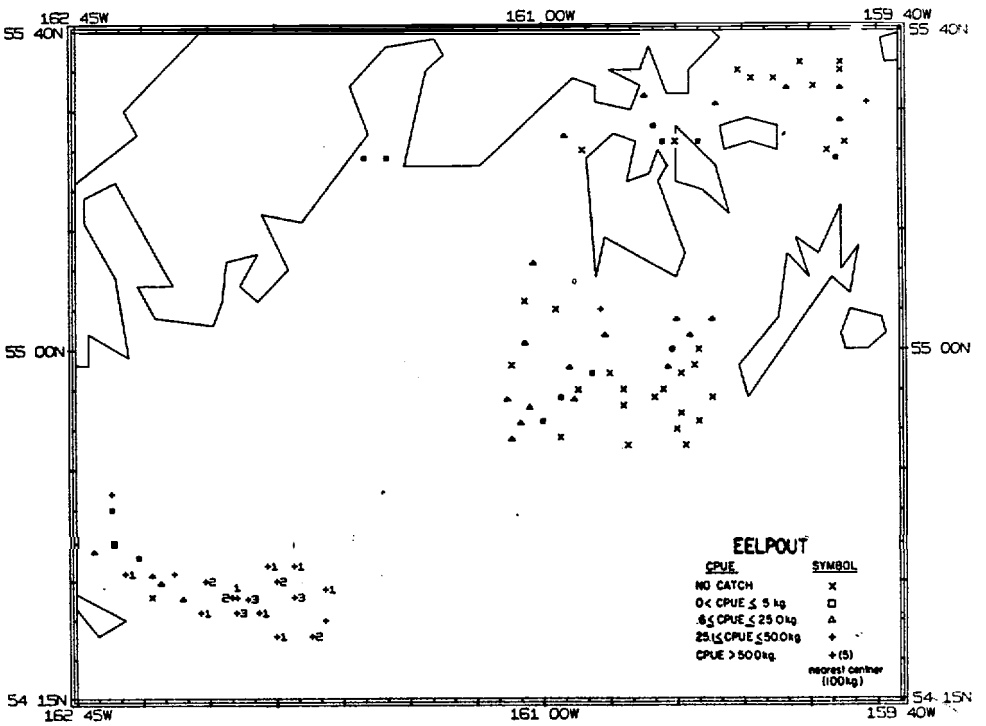
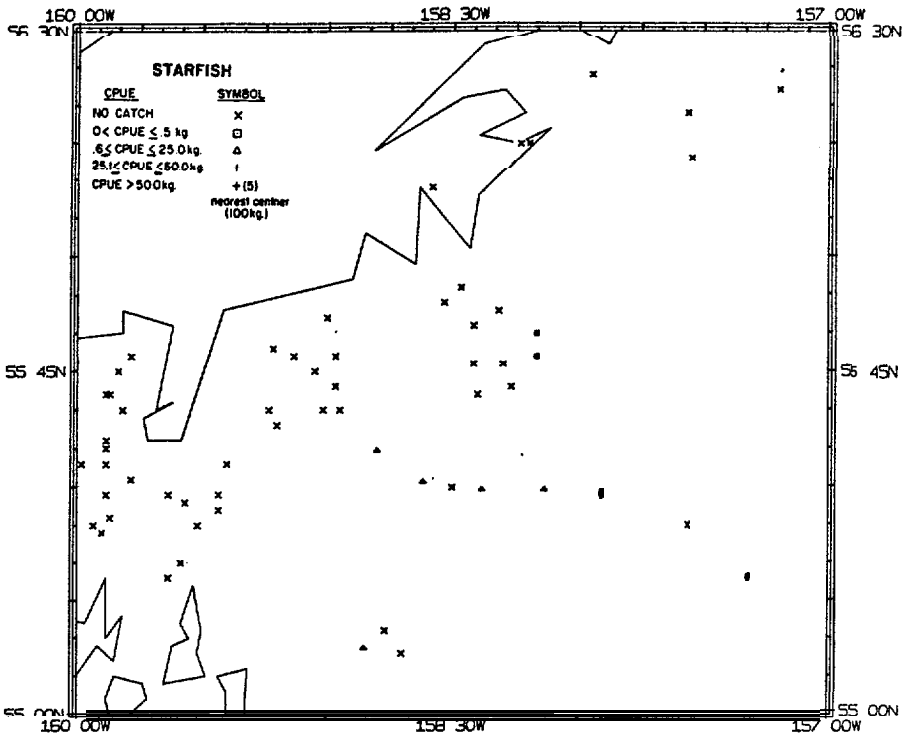


Figure X1-55.--Distribution of standardized catch rates in kg/hr of eelpouts, Aug.-Oct. 1973 (Cruise 735).



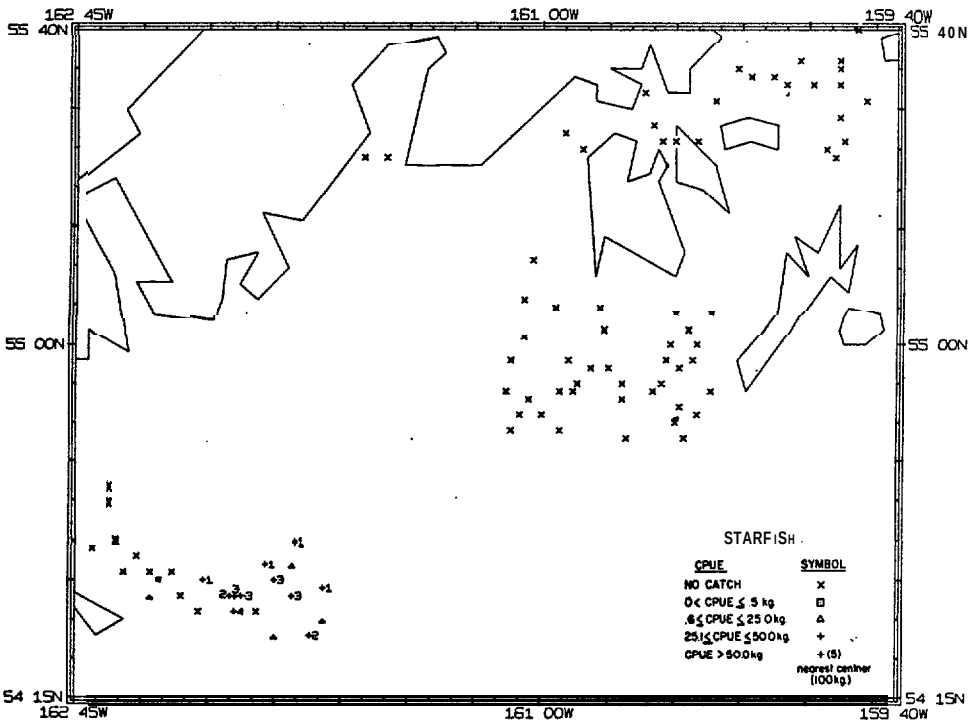
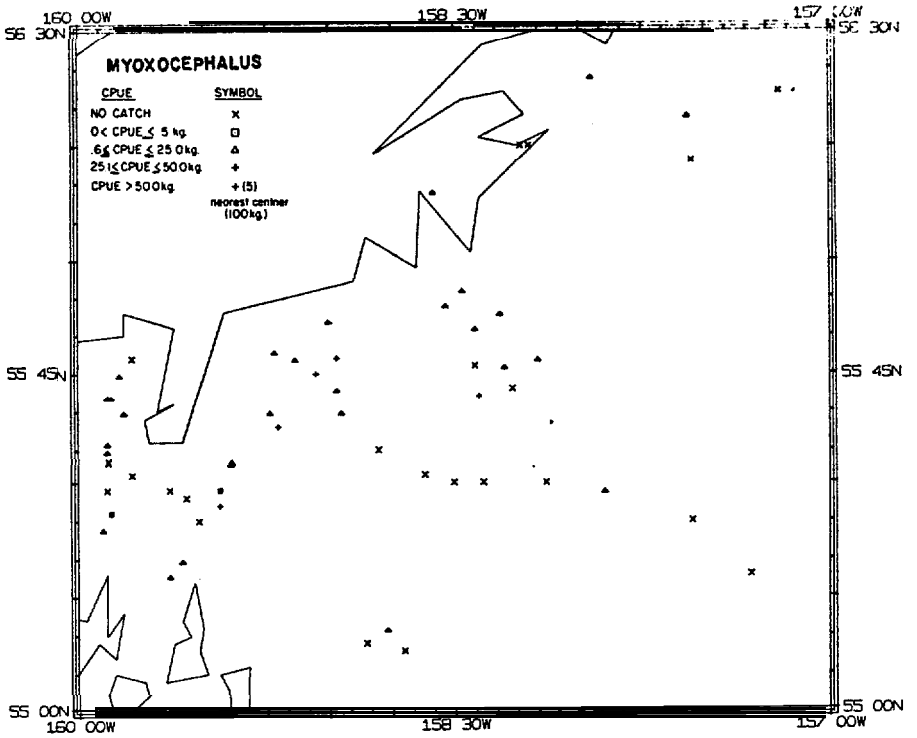


Figure X1-56.--Distribution of standardized catch rates in kg/hr of starfish, Aug.-Oct. 1973 (Cruise 735).



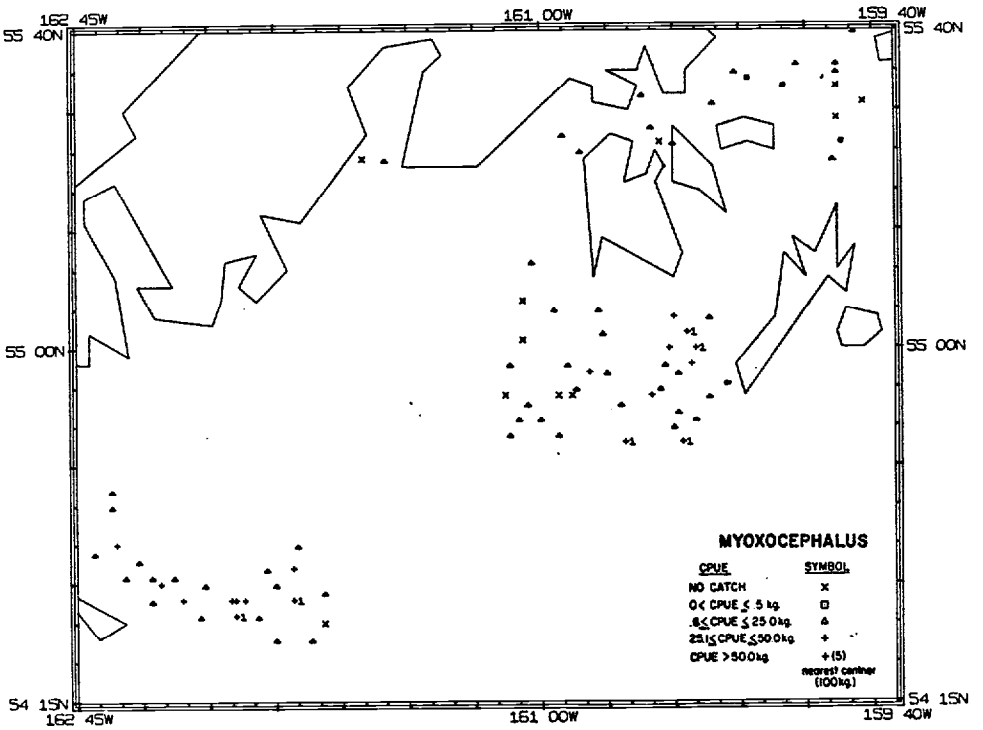


Figure XI-57 .--Distribution of standardized catch rates in kg/hr of Myoxocephalus sp., Aug.-Oct. 1973 (Cruise 735).

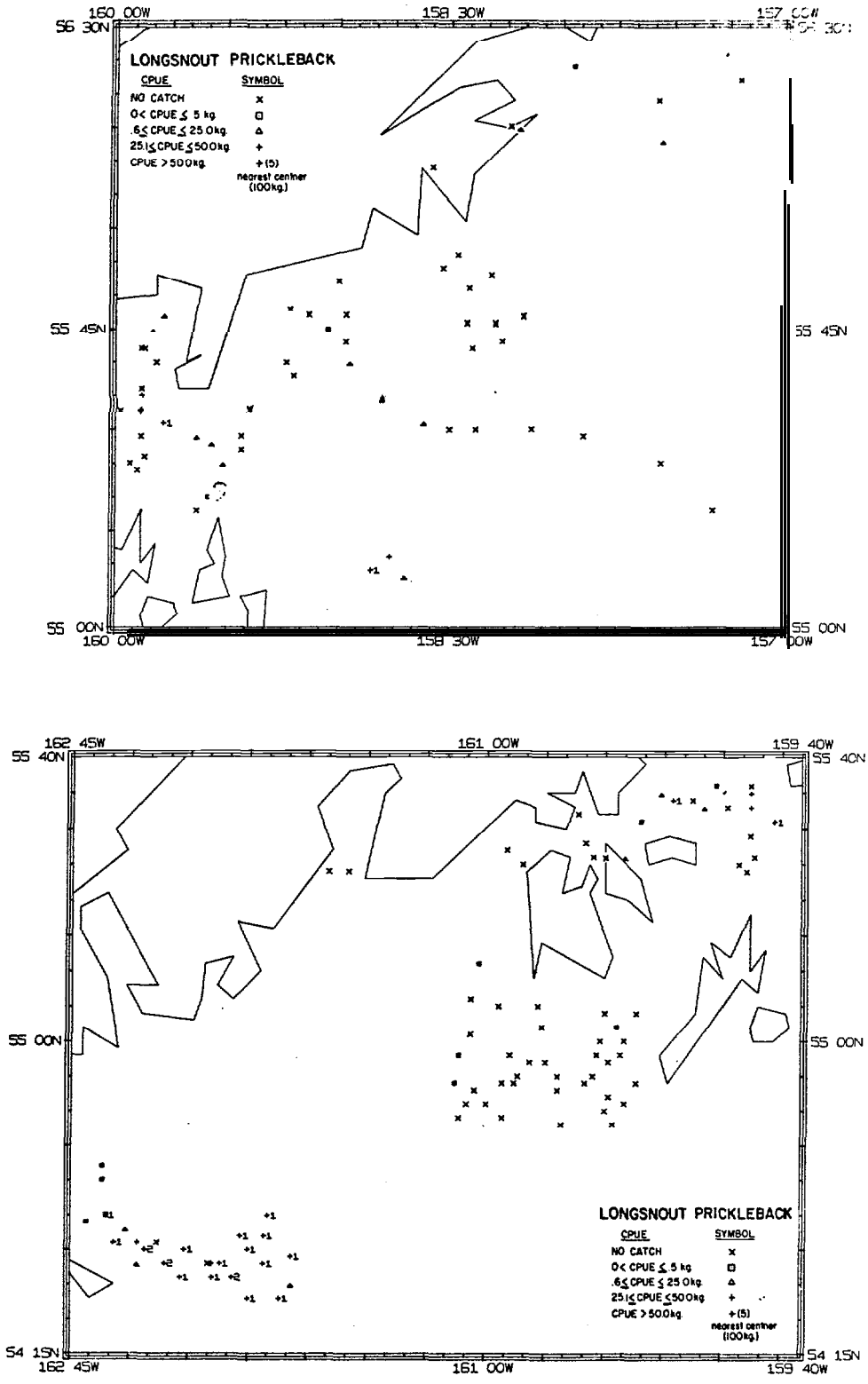
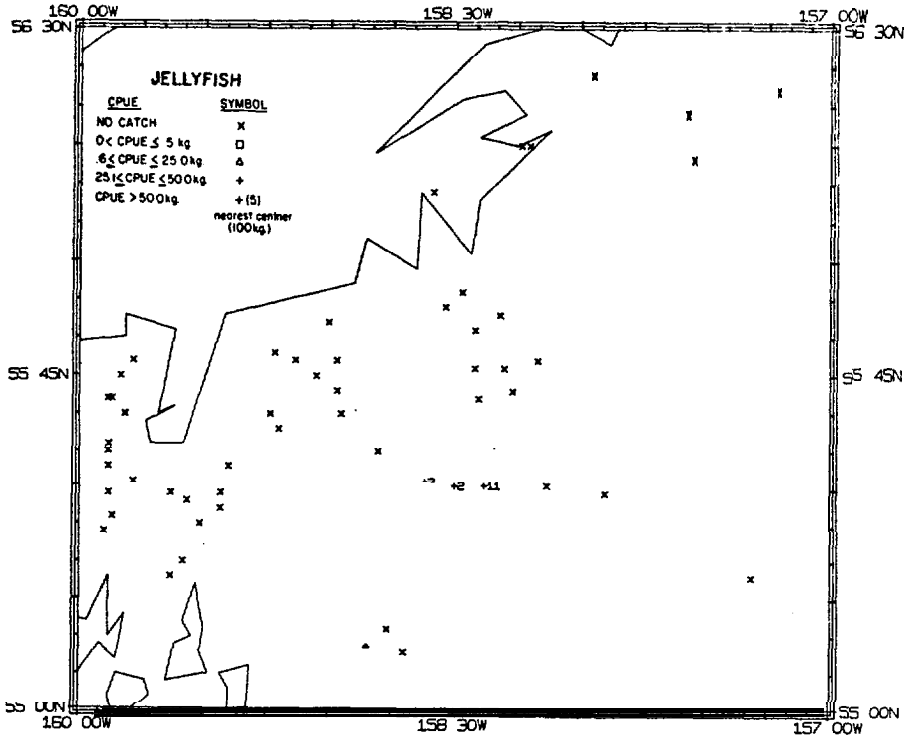


Figure XI-58.--Distribution of standardized catch rates in kg/hr of longsnout prickleback, Aug.-Oct. 1973 (Cruise 735).



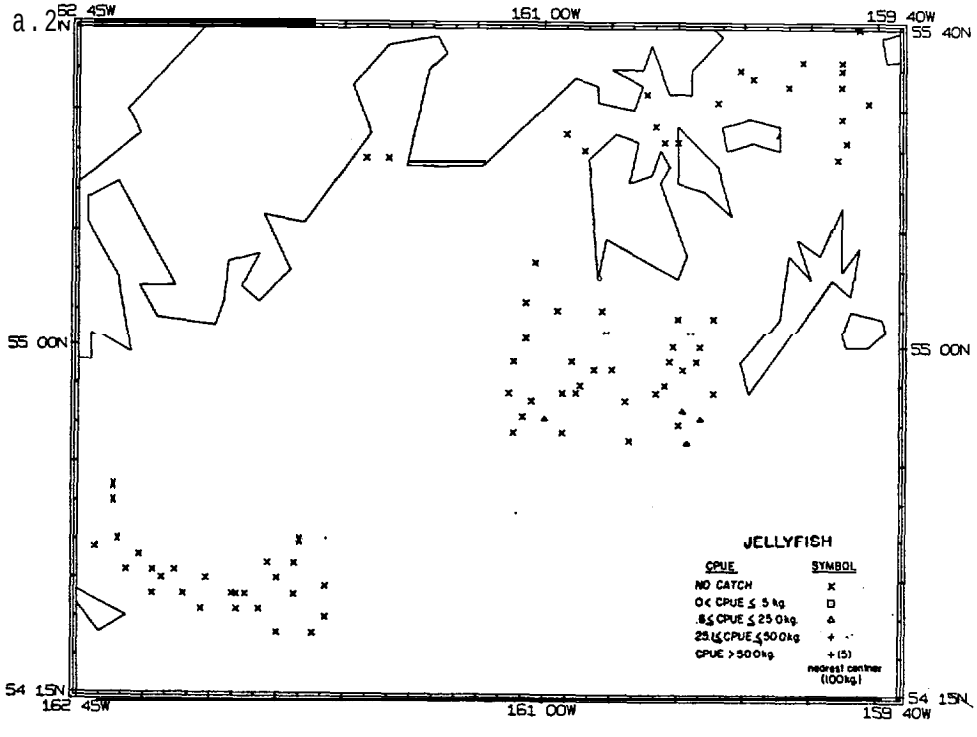
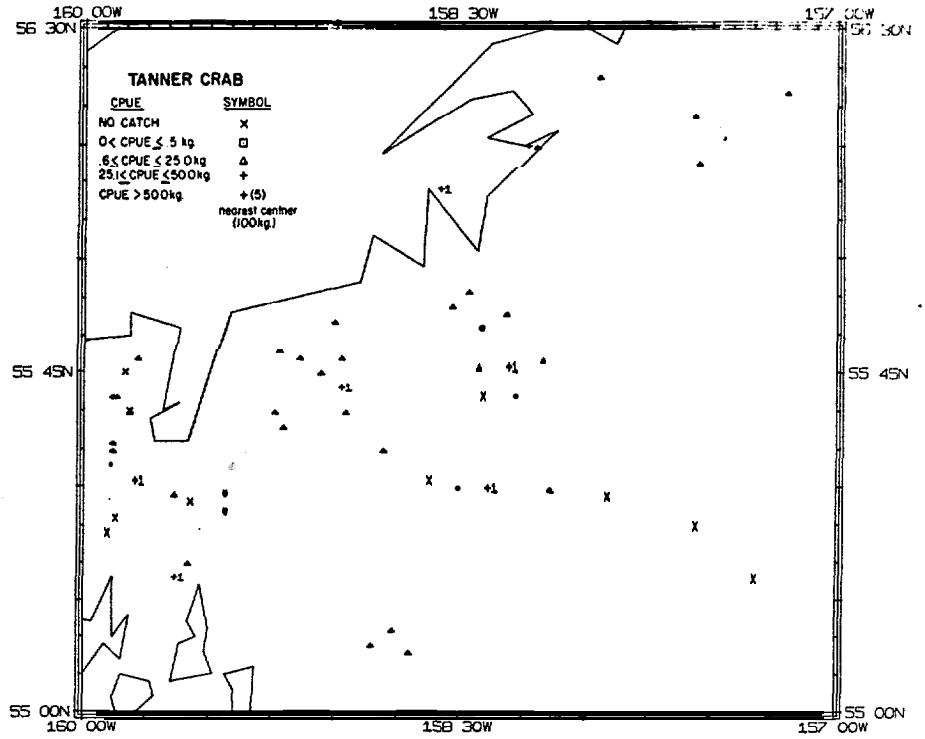


Figure XI-59.--Distribution of standardized catch rates in **kg/hr** of jellyfish, Aug.-Oct. 1973 (Cruise 735).



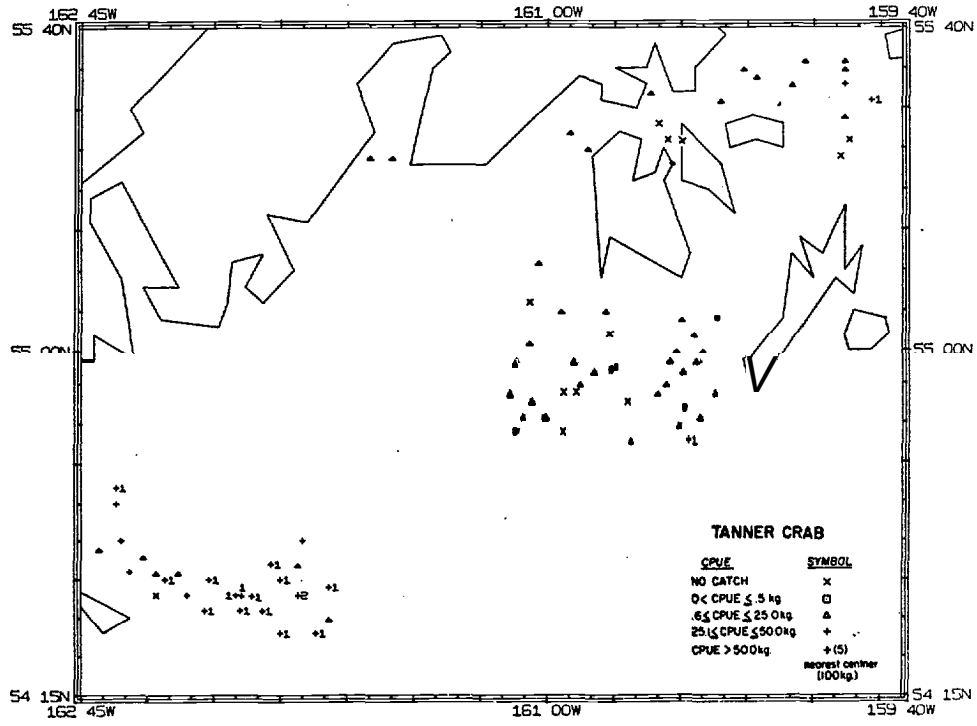


Figure X1-60.--Distribution of standardized catch rates in **kg/hr** of Tanner crab, Aug.-Oct. 1973 (Cruise 735).

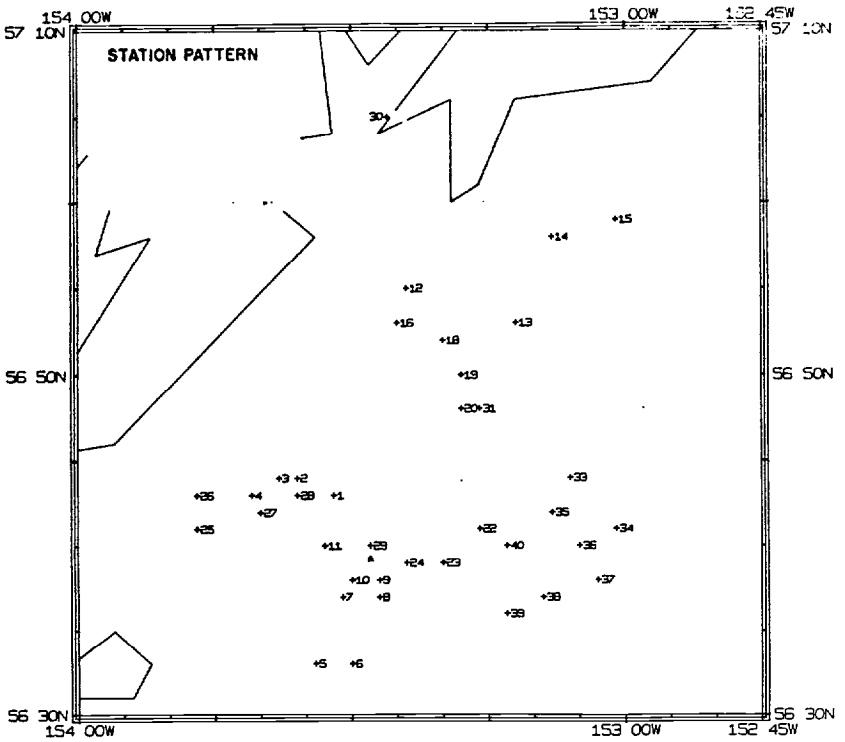


Figure X1-61.--Stations successfully trawled (shrimp trawl) by the R/V **Oregon,** Apr.-May 1974 (Cruise 741).

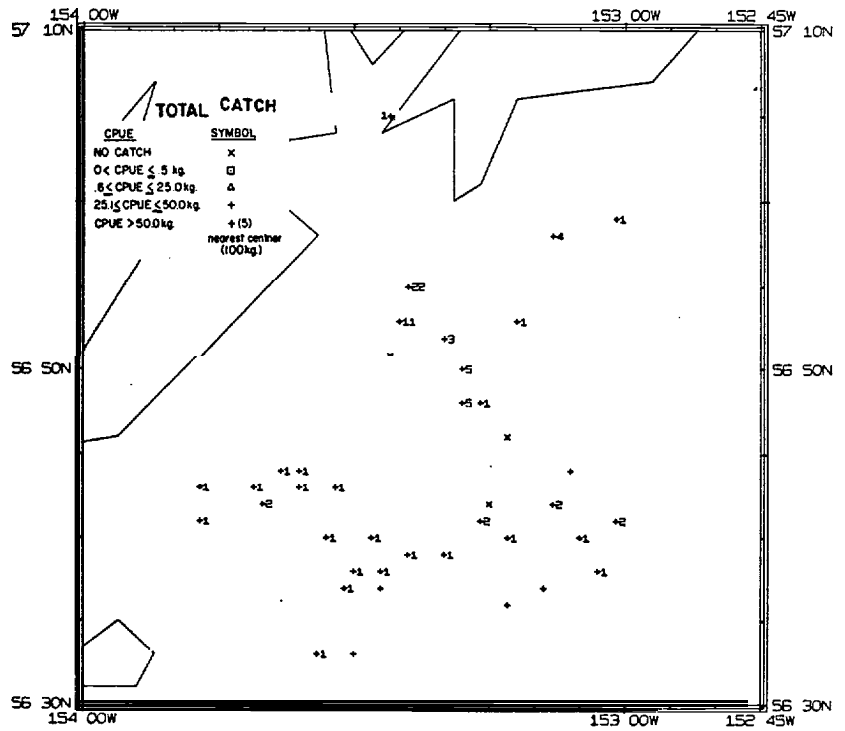
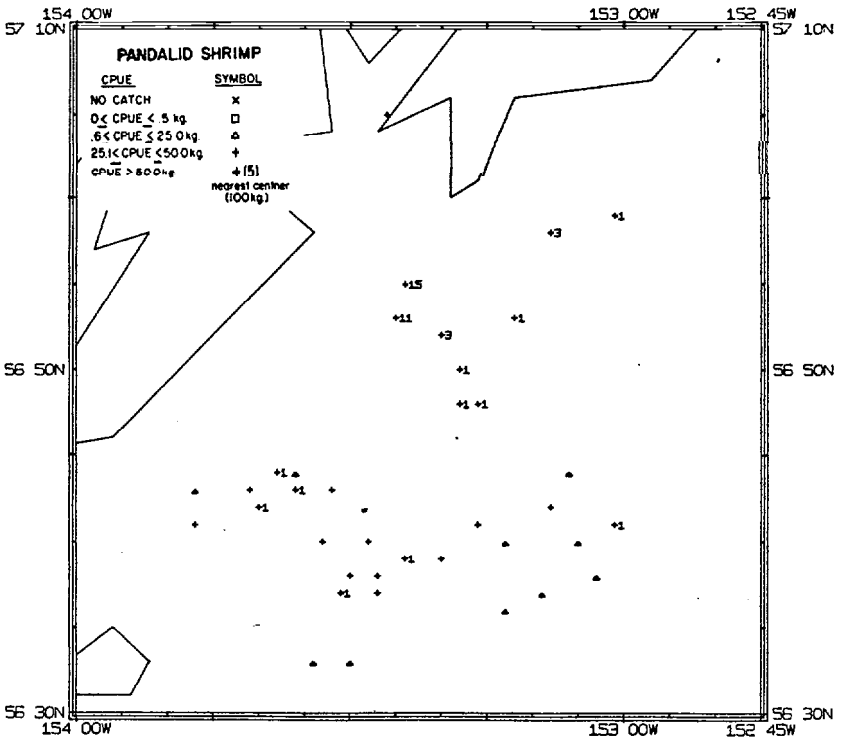
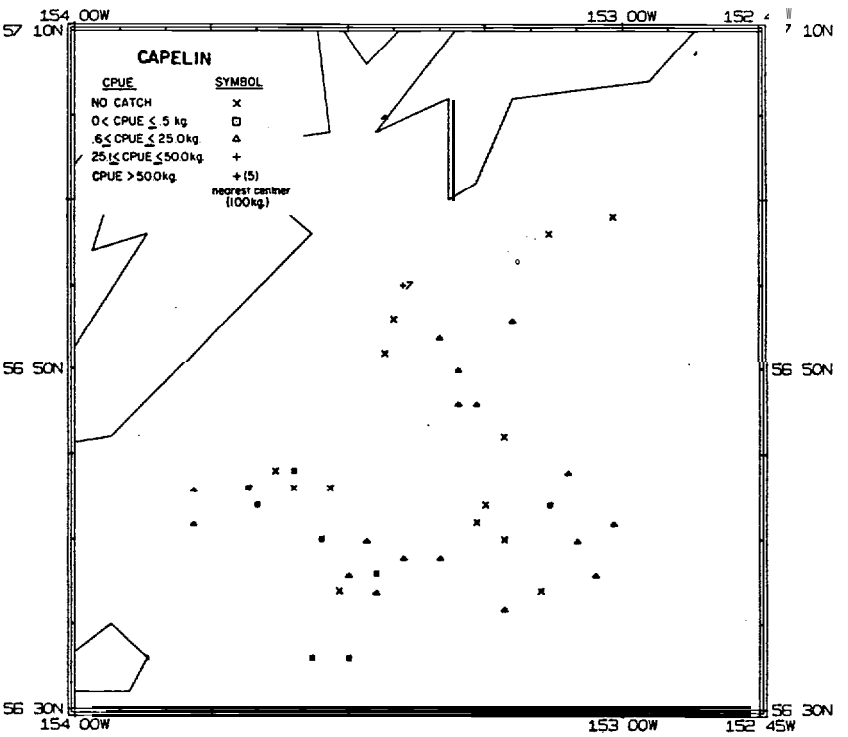


Figure XI-62 .--Distribution of standardized catch rates in **kg/hr** of all species combined, Apr.-May 1974 (Cruise 741).

Table XI-5.--Mean CPUE's for individual Pandalid shrimp species captured during shrimp surveys in the Gulf of Alaska from 1974-76.

		DEPTH INTERVAL (M)								
		0 - 100			101 - 200			201 - 400		
Cruise File	Species	CPUE kg/hr	% of Shrimp	Total Catch	CPUE kg/hr	% of Shrimp	Total Catch	CPUE kg/hr	% of Shrimp	Total Catch
741	Pink	--	--	--	123.3	98.1	57.7	--	--	--
	Sidestripe	--	--	--	1.7	1.4	0.8	--	--	--
	P. montagui	--	--	--	0.5	0.4	0.2	--	--	--
	Coonstripe	--	--	--	0.2	0.2	0.1	--	--	--
		--	--	--	125.7	100.1	58.8	--	--	--
743	Pink	1086.2	66.7	56.9	1075.9	82.4	53.4	155.1	51.7	14.8
	Humpy	460.7	28.3	24.1	112.5	8.6	5.6	0	0	0
	Coonstripe	78.8	4.8	4.1	25.8	2.0	1.3	0	0	0
	Sidestripe	3.9	0.2	0.2	91.0	7.0	4.5	145.1	48.3	13.8
		1629.6	100.0	85.3	1305.2	100.0	64.8	300.2	100.0	28.6
751	Pink	0	0	0	258.2	94.9	60.4	0	0	0
	Humpy	0	0	0	7.8	2.9	1.8	0	0	0
	Sidestripe	0	0	0	6.1	2.2	1.4	3.1	100.0	1.0
	P. montagui	0	0	0	0.1	2/	2/	0	0	0
		0	0	0	272.2	100.0	63.6	3.1	100.0	1.0
753	Pink	545.6	62.2	46.8	426.9	71.3	46.4	63.5	57.8	22.4
	Humpy	264.7	30.2	22.7	98.5	16.5	10.7	0	0	0
	Coonstripe	38.9	4.4	3.3	20.1	3.4	2.2	0	0	0
	Sidestripe	28.4	3.2	2.4	53.2	a.9	5.8	45.4	41.3	16.0
	P. montagui	0.3	2/	2/	1/	2/	2/	0	0	0
		877.9	100.0	74.2	598.7	100.1	65.1	109.9	100.1	-38.4
763	Pink	955.7	68.7	49.1	561.8	79.0	45.0	932.6	94.2	70.9
	Humpy	380.4	27.4	19.5	111.9	15.7	9.0	0	0	0
	Coonstripe	50.7	3.7	2.6	9.0	1.3	1.8	0.1	2/	2/
	Sidestripe	3.8	0.3	0.2	23.0	3.2	0.7	57.1	5.8	b.3
	P. montagui	1/	2/	2/	0.1	2/	2/	0	0	0
	Pandalopis ampla	0	0	0	5.8	0.8	0.5	0	0	0
		1390.6	100.1	71.4	711.6	100.0	57.0	989.8	100.0	75.2





Figures X1-63-64.--Distributions of standardized catch rates in kg/hr of pandalid shrimp and capelin, Apr.-May 1974 (Cruise 741).

Three species of fish, flathead sole, capelin and Pacific cod occurred at mean CPUE's exceeding 10 kg/hr (Table XI-6). Capelin was the only 'species for which the standardized catch rate was 300 kg/hr or more (Figure X1-64). The distribution of the standardized catch rates for flathead sole and Pacific cod are presented in figures X1-65-66. The three dominant species and the pandalid shrimp made up over 86% of the total catch of all species.

h. Cruise 743, R/V Oregon (Sept.-Oct. 1974)

During 1974, the R/V Oregon was used for the annual pandalid shrimp survey in the Sanak and Shumagin regions. One hundred and seventy-seven stations were attempted using the 61' NMFS high opening shrimp trawl (Figure X1-67).

The total catch for all species was again large, averaging over 1900 kg/hr in the inner shelf and outer shelf, and 1051 kg/hr in the upper slope and standardized catch rates ranged up to 8000 kg/hr. Large total catches, 1000 kg/hr or more, occurred at 68% of the stations sampled (Figure X1-68).

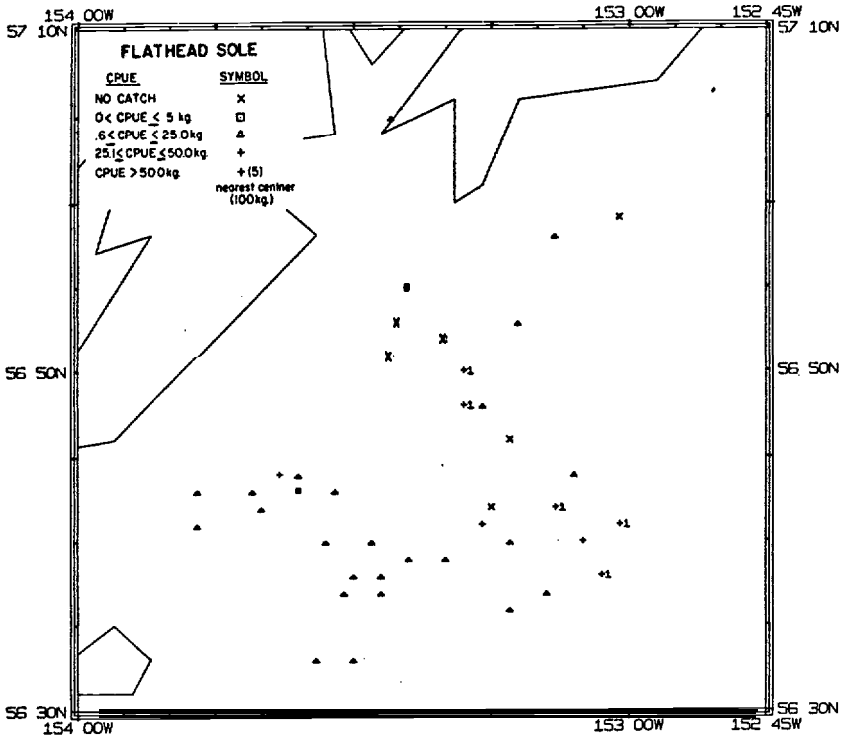
Catches of pandalid shrimp were high during this survey, averaging 1630 kg/hr in the inner shelf, 1305 kg/hr in the outer shelf and 300 kg/hr in the upper slope (Table X1-5). Pink shrimp was the dominant species in all 3 depth zones making up 67, 82, and 52% of the total pandalid catch.

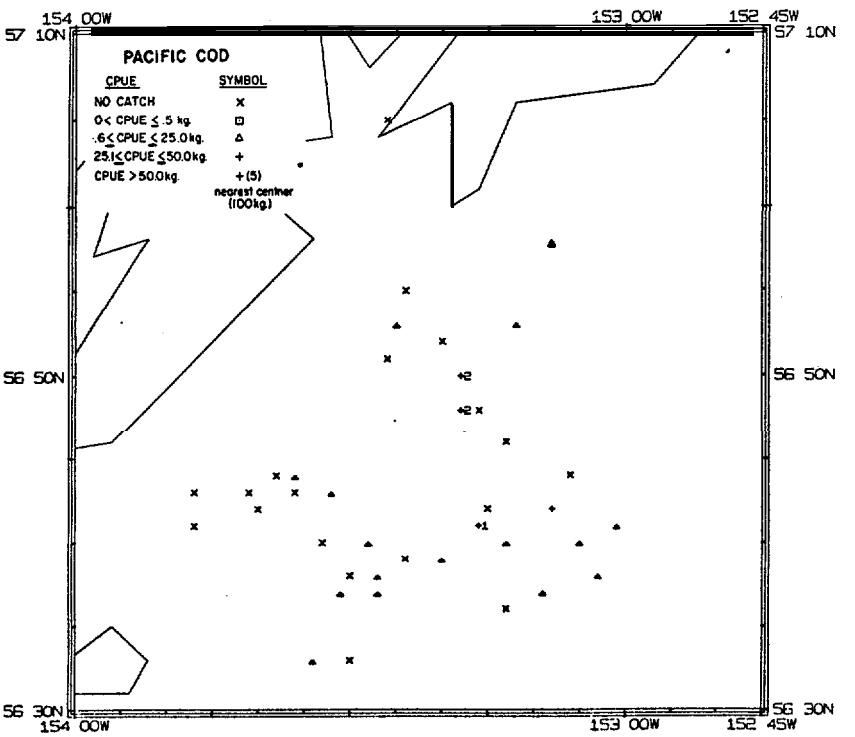
Other species occurring at catch rates of 10 kg/hr or more were humpy shrimp and coonstripe shrimp in the inner and outer shelf depths and side-stripe shrimp from the outer shelf and upper slope. The total biomass of pandalid shrimp in the survey area was estimated to be 202.7 thousand mt. Large catches of pandalid shrimp 1000 kg/hr or more occurred at 55% of the stations sampled (Figure X-69).

Fourteen species of fish and invertebrates other than pandalid shrimp had CPUE's of 10 kg/hr or more (Table X1-6). These were pollock, Tanner crab and flathead sole in all 3 depth zones, capelin and Myoxocephalus in the two shallower depth zones, Pacific cod, turbot, longsnout prickle-back and yellow Irish lord in the outer shelf and upper slope, shortfin eelpout in the inner shelf and upper slope, king crab, hippolytid shrimp and yellowfin sole in the inner shelf and wattled eelpouts in the upper slope. Species whose standardized catch rates were 300 kg/hr or more were walleye pollock in Sanak Gully, offshore from Sanak to Nagai Island; Stepovak Bay, and offshore from Nagai Island to Kujalik Bay, flathead sole in Sanak Gully and offshore from Sanak to Kujalik Bay, Tanner crab in Sanak Gully; Beaver Bay; and offshore from Sanak to Nagai Island, Myoxocephalus sp. in Sanak Gully and Beaver Bay, Pacific cod in Stepovak Bay and offshore, turbot in Sanak Gully, yellow Irish lord in Sanak Gully and Morzhovoi Bay, shortfin eelpouts in Morzhovoi Bay, and longsnout pricklebacks in Sanak Gully and offshore (Figures X1-70-76). The distribution of the standardized catch rates for the remaining species averaging 10 kg/hr or more are shown in Figures X1-77-83. The total catch of these 14 species plus the pandalid shrimp made up over 92% of the total catch.

Table XI-6.--Mean CPUE's for species other than pandalid shrimp which averaged over 10 kg/hr during shrimp surveys in the Gulf of Alaska from 1974 - 1976.

Cruise File	Species	DEPTH INTERVAL (M) 0 - 100 CPUE kg/hr	0 - 100 % of total Catch	101 - 200 CPUE kg/hr	101 - 200 % of total Catch	201 - 400 CPUE kg/hr	201 - 400 % of total Catch
741	Flathead sole	- -	- -	22.5	10.5	- -	- -
	Capelin	- -	- -	20.9	9.8	- -	- -
	Pacific cod	- -	- -	15.3	7.2	- -	- -
		- -	- -	58.7	27.5	- -	- -
743	Capelin	47.2	2.5	10.1	0.5	0	0
	Walleye pollock	48.1	2.5	434.5	21.5	165.1	15.7
	Tanner crab	30.0	1.6	34.1	1.7	68.0	6.5
	Shortfin eelpout	19.2	1.0	7.3	0.4	63.5	6.0
	King crab	17.7	0.9	4.6	0.2	4.5	0.4
	Eualus barbatus	17.7	0.9	3.0	0.1	0	0
	Wattled eelpout	1/	2/	1.0	2/	33.5	3.2
	Yellowfin sole	10.9	0.6	4.4	0.2	0	0
	Flathead sole	9.6	0.5	55.0	2.7	88.9	8.5
	Pacific cod	4.5	0.2	36.5	1.8	68.9	0.7
	Turbot	5.5	0.3	21.7	1.1	159.7	15.2
	Yellow Irish lord	7.3	0.4	18.9	0.9	27.2	2.6
	Myoxocephalus sp.	15.6	0.8	17.1	0.8	2.7	0.3
	Longsnout prickleback	1/	2/	14.0	0.7	45.4	4.3
		233.3	12.2	662.8	32.6	727.4	63.4
751	Rock sole	12.4	48.8	1.7	0.4	0.1	2/
	Walleye pollock	0.9	3.6	73.4	17.2	29.5	9.4
	Turbot	0.1	0.2	17.9	4.2	70.1	22.3
	Flathead sole	1/	2/	15.9	3.7	135.8	43.3
	Capelin	1/	2/	15.9	3.7	0.2	0.1
	Pacific halibut	.3	i 2	3.1	0.7	39.7	12.6
	Rex sole	1/	2;	1.8	0.4	12.4	3.9
		13.6	53.8	129.7	30.3	287.8	91.6
753	Walleye pollock	166.8	14.3	151.3	16.4	27.2	1.0
	Yellow Irish lord	15.5	1.3	16.7	1.8	0.1	2/
	Halibut	15.2	1.3	3.6	0.4	0	0
	Flathead sole	12.6	1.1	30.5	3.3	87.1	30.7
	Myoxocephalus sp.	11.8	1.0	4.2	0.5	0	0
	Pacific cod	7.1	0.6	43.6	4.7	27.2	1.0
	Turbot	3.9	0.3	22.5	2.4	25.4	9.0
		232.9	19.9	272.4	29.5	167.0	41.7
763	Pollock	307.6	15.8	294.4	23.6	90.7	6.9
	Tanner crab	30.8	1.6	10.2	0.8	10.9	0.8
	Pacific cod	29.8	1.5	52.4	4.2	8.2	0.6
	Yellowfin sole	28.7	1.5	7.4	0.6	0	0
	Hyoxocephalus sp.	22.4	1.2	13.8	1.1	5.4	0.4
	Yellow Irish Lord	21.6	1.1	20.2		101.6	7.7
	Flathead sole	20.1	1.0	55.4	2.4	22.7	1.7
	Sablef ish	12.5	0.6	3.2	0.3	0	0
	Capelin	11.1	0.6	7.1	0.6		0
	Sandfish	10.8	0.6	5.2	0.4	x.1	2/
	Turbot	3.9	0.2	12.3	1.0		0.2
	Crangonid	5.6	0.3	8.7	0.7	5:::	4.3
	Jellyfish	0.4	2/	4.9	0.4	16.3	1.2
		505.3	26.0	495.2	39.7	315.8	23.8





Figures X1-65-66.--Distributions of standardized catch rates in kg/hr of flathead sole and Pacific cod, Apr.-May 1974 (Cruise 741).

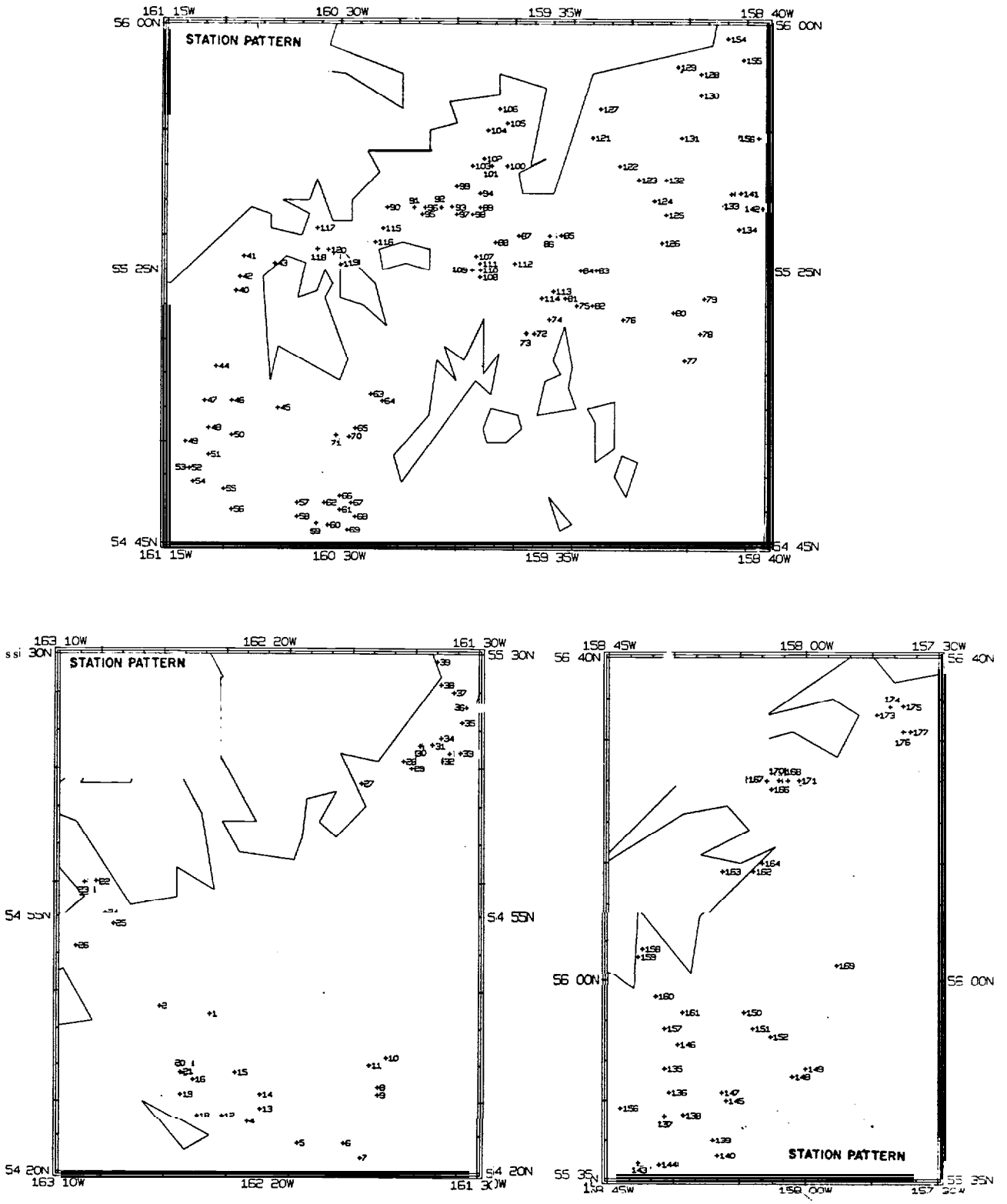


Figure X1-67.--Stations successfully trawled (shrimp trawl) by the R/V Oregon, Sept.-Oct. 1974 (Cruise 743).

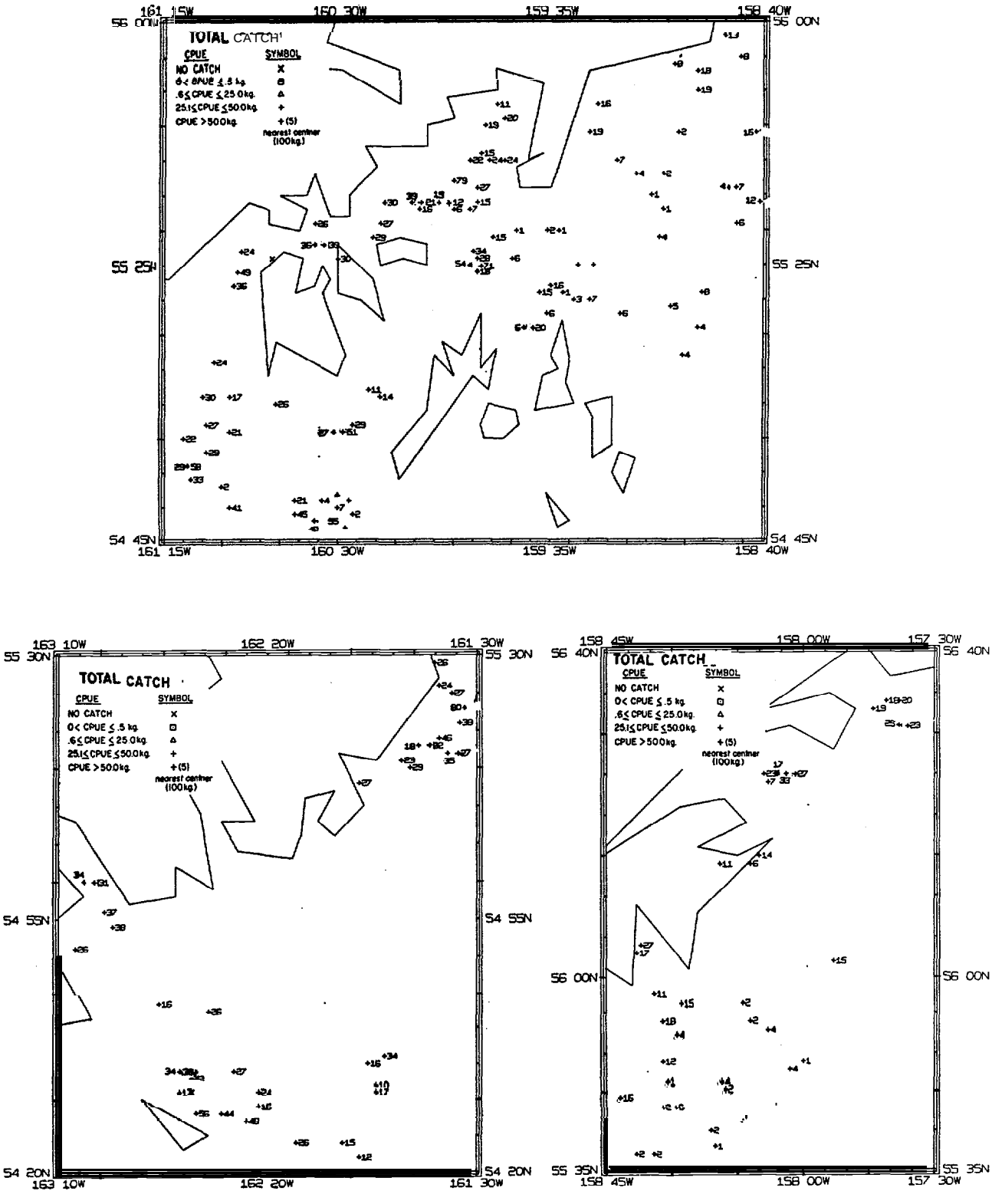


Figure X1-68. --Distribution of standardized catch rates in **kg/hr** of all species combined, Sept.-Oct. 1974 (Cruise 743).

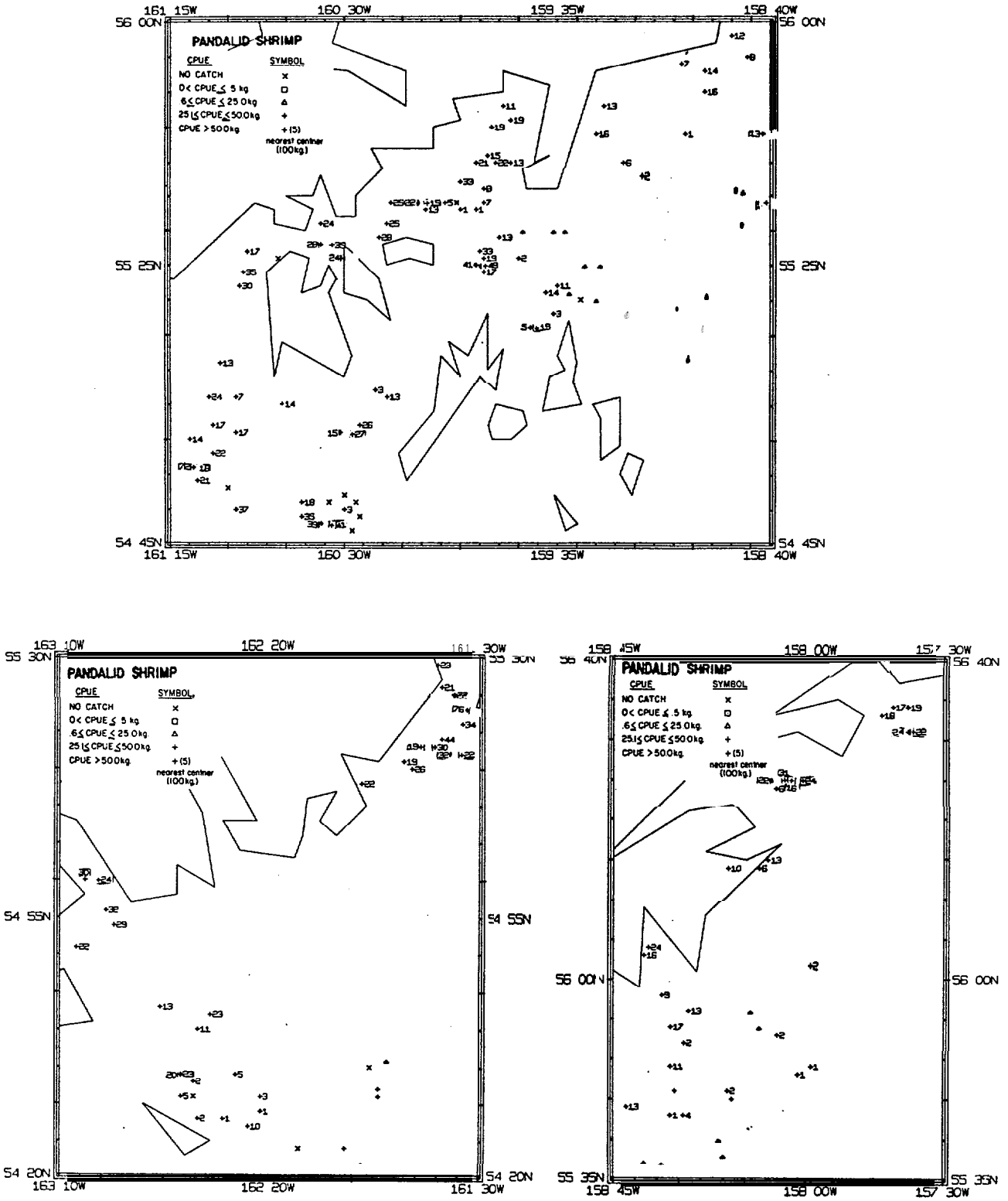


Figure XI-69.--Distribution of standardized catch rates in **kg/hr** of **pandalid** shrimp, Sept.-Oct. 1974 (Cruise 743).

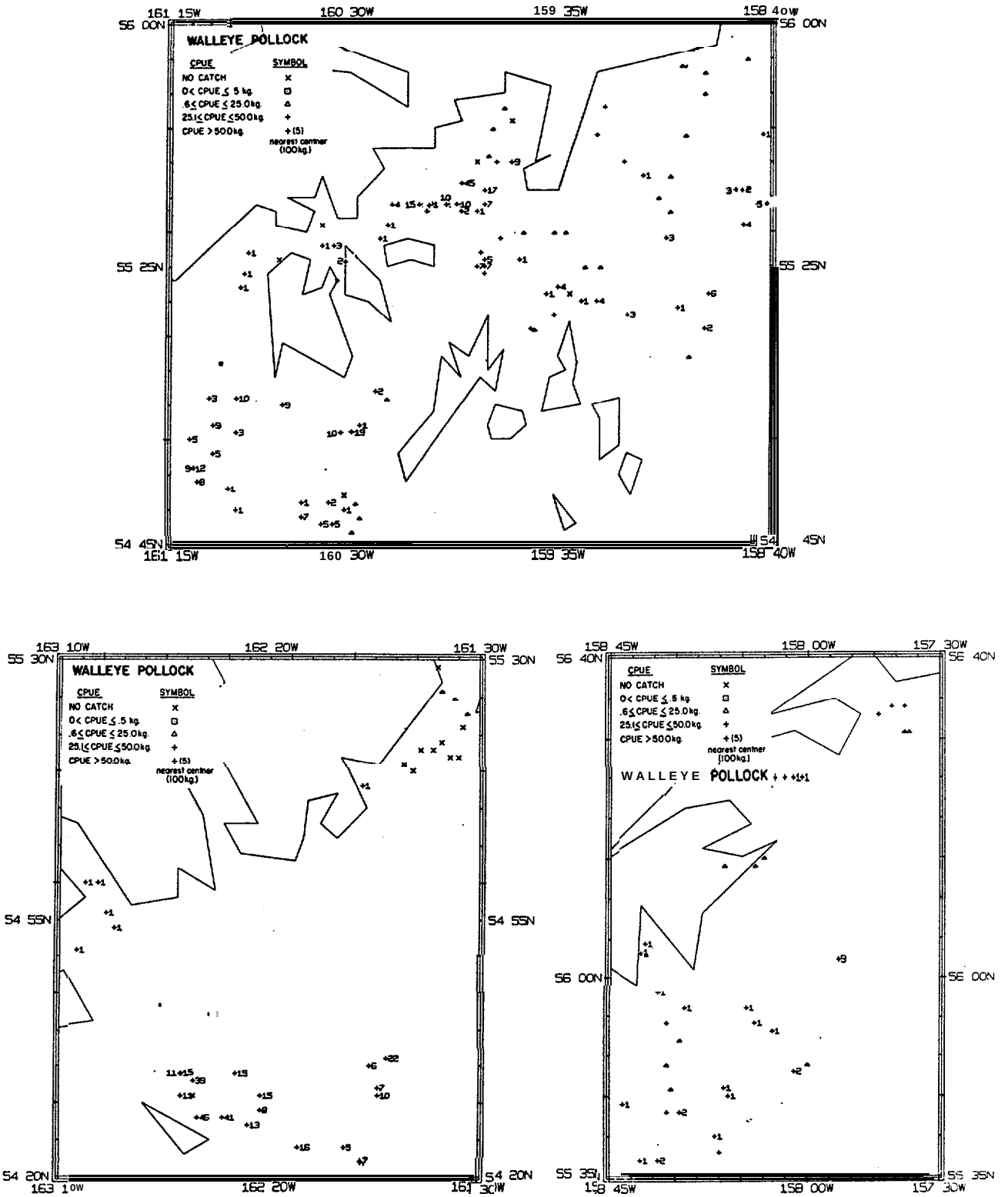


Figure X1-70.--Distribution of standardized catch rates in **kg/hr** of walleye pollock, Sept.-Oct. 1974 (Cruise 743).

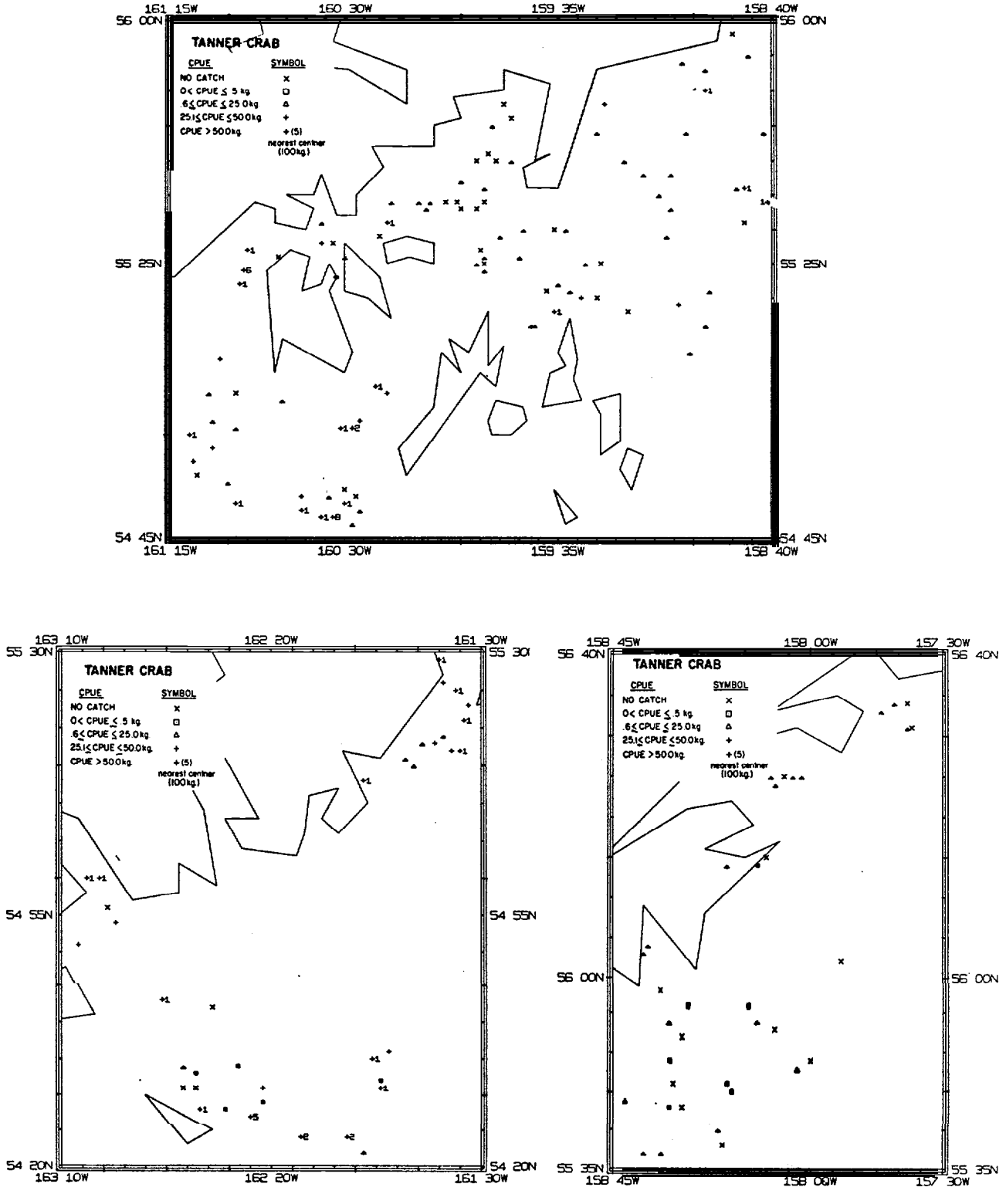


Figure X1-71.--Distribution of standardized catch rates in kg/hr of Tanner crab, Sept.-Oct. 1974 (Cruise 743).

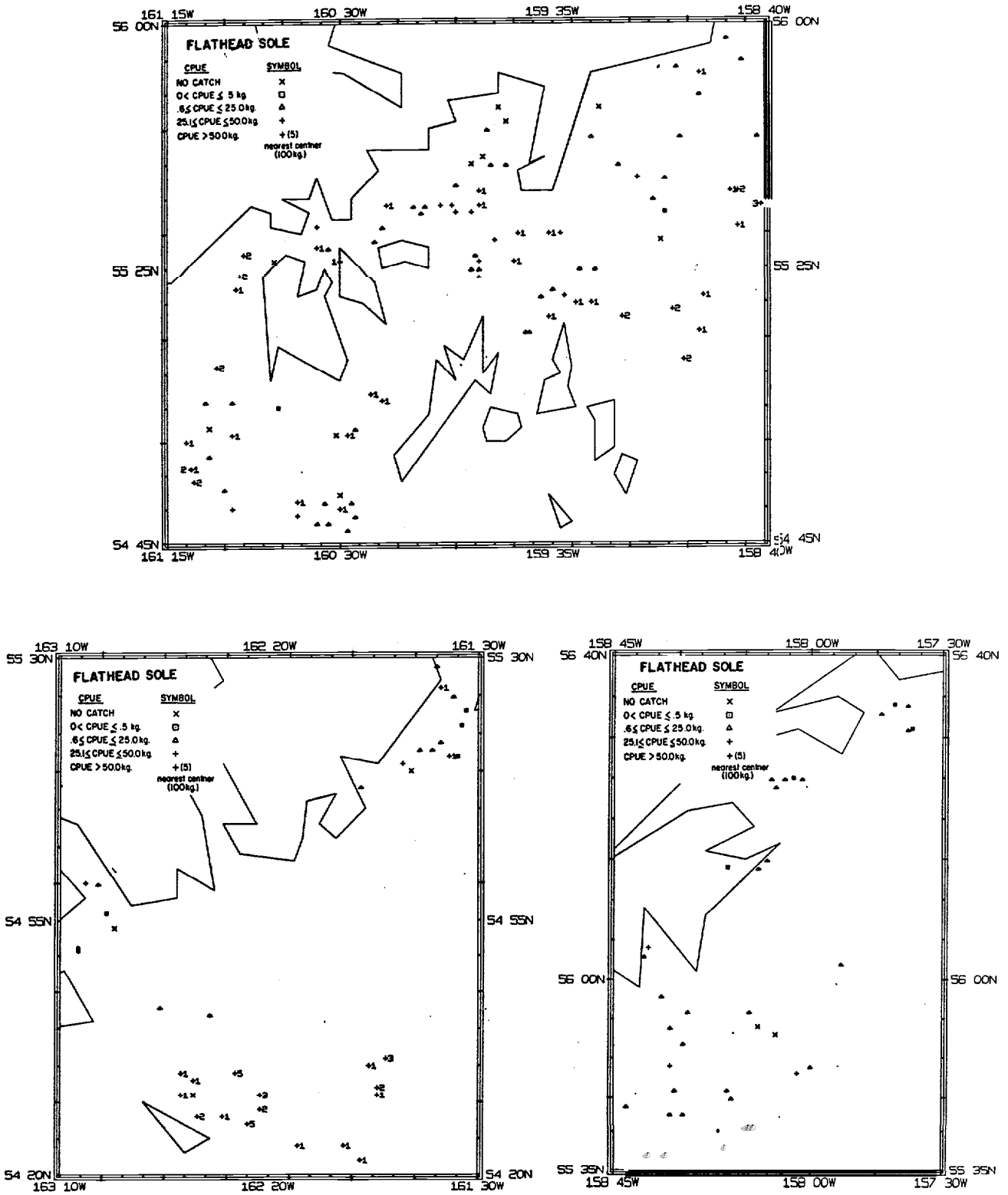


Figure XI-72.--Distribution of standardized catch rates in **kg/hr** of **flathead** sole, Sept.-Oct. 1974 (Cruise 743).

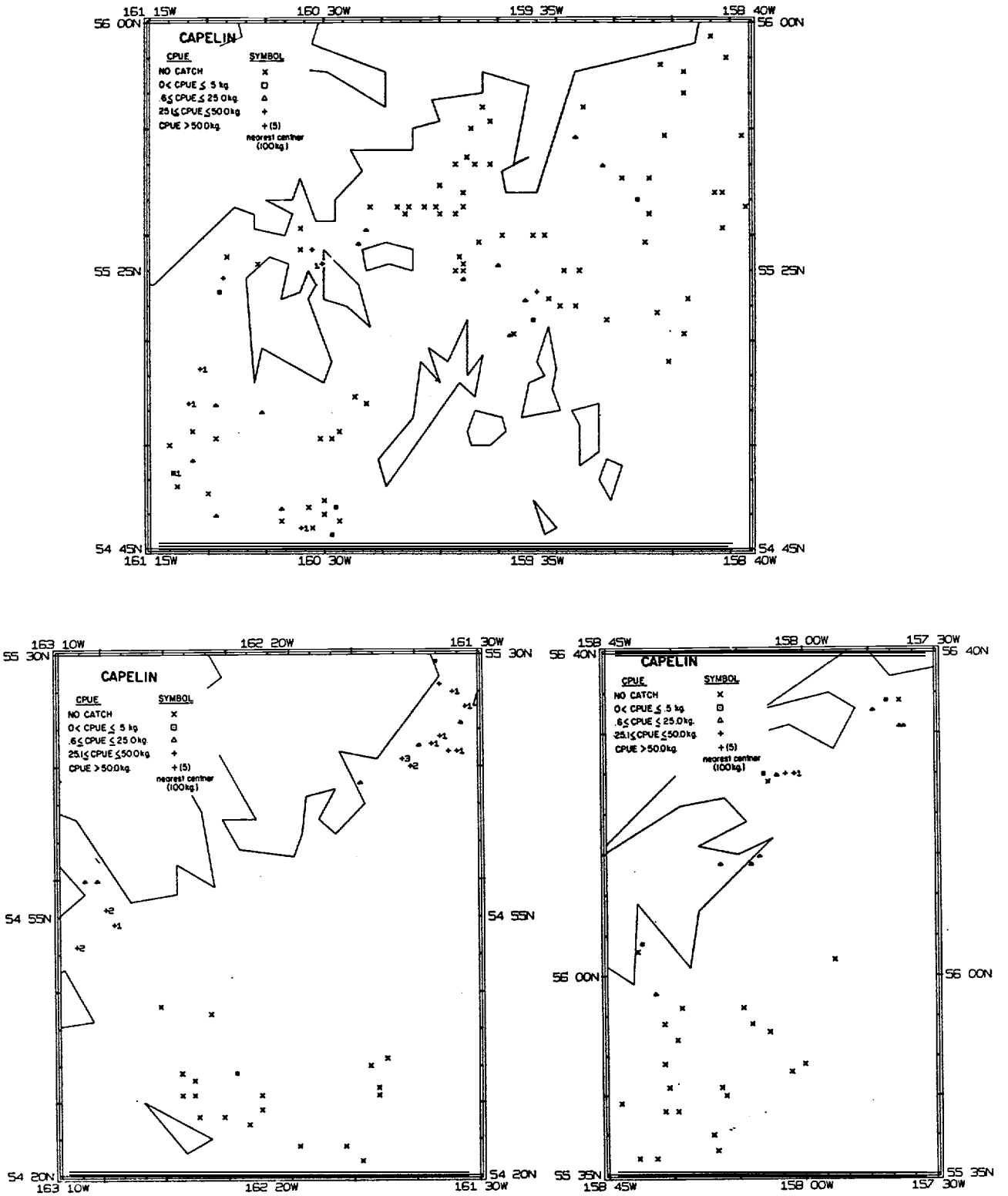


Figure X1-73.--Distribution of standardized catch rates in **kg/hr** of capelin, Sept.-Oct. 1974 (Cruise 743).

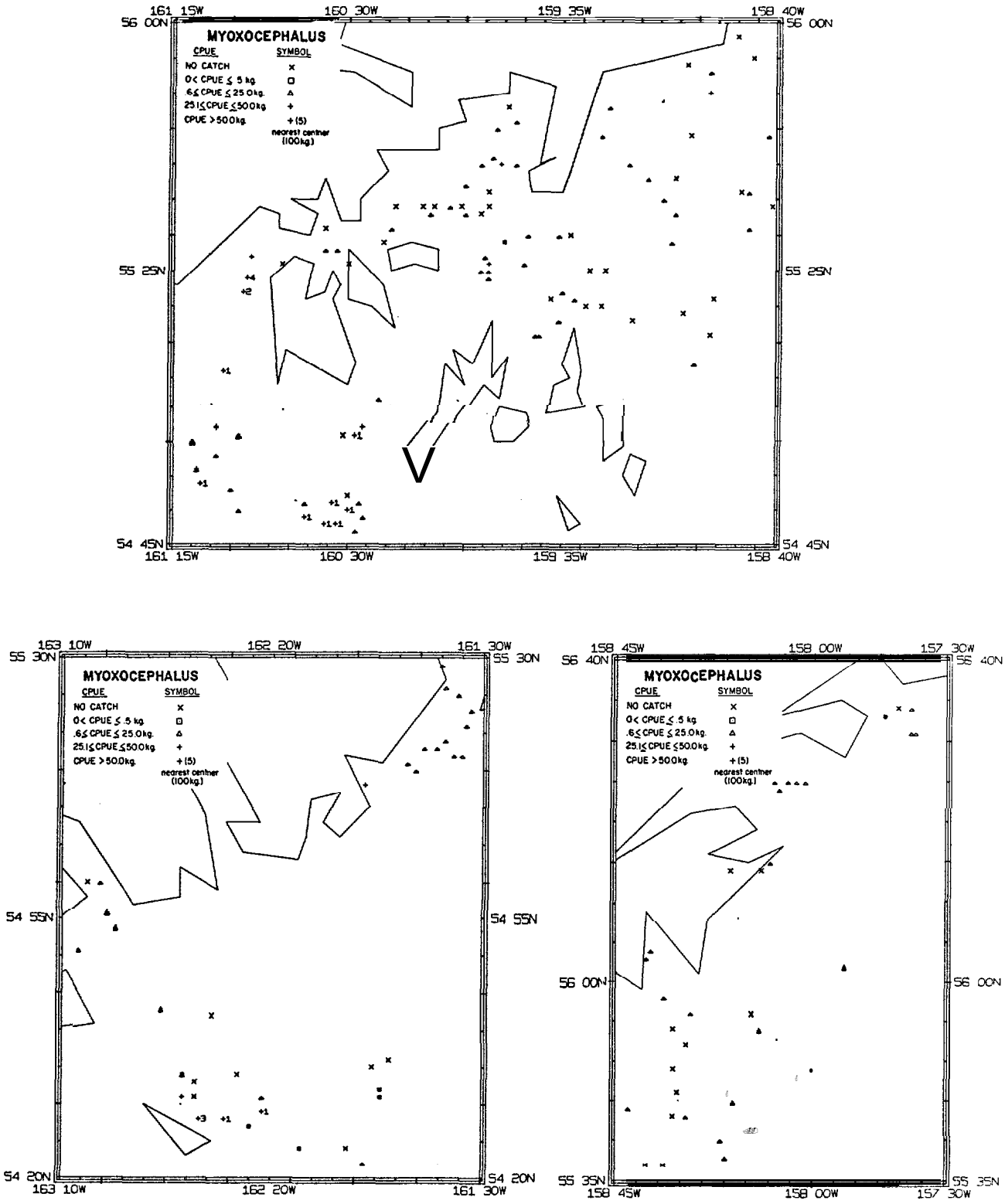


Figure XI-74.--Distribution of standardized catch rates in kg/hr of Myoxocephalus sp., Sept.-Oct. 1974 (Cruise 743).

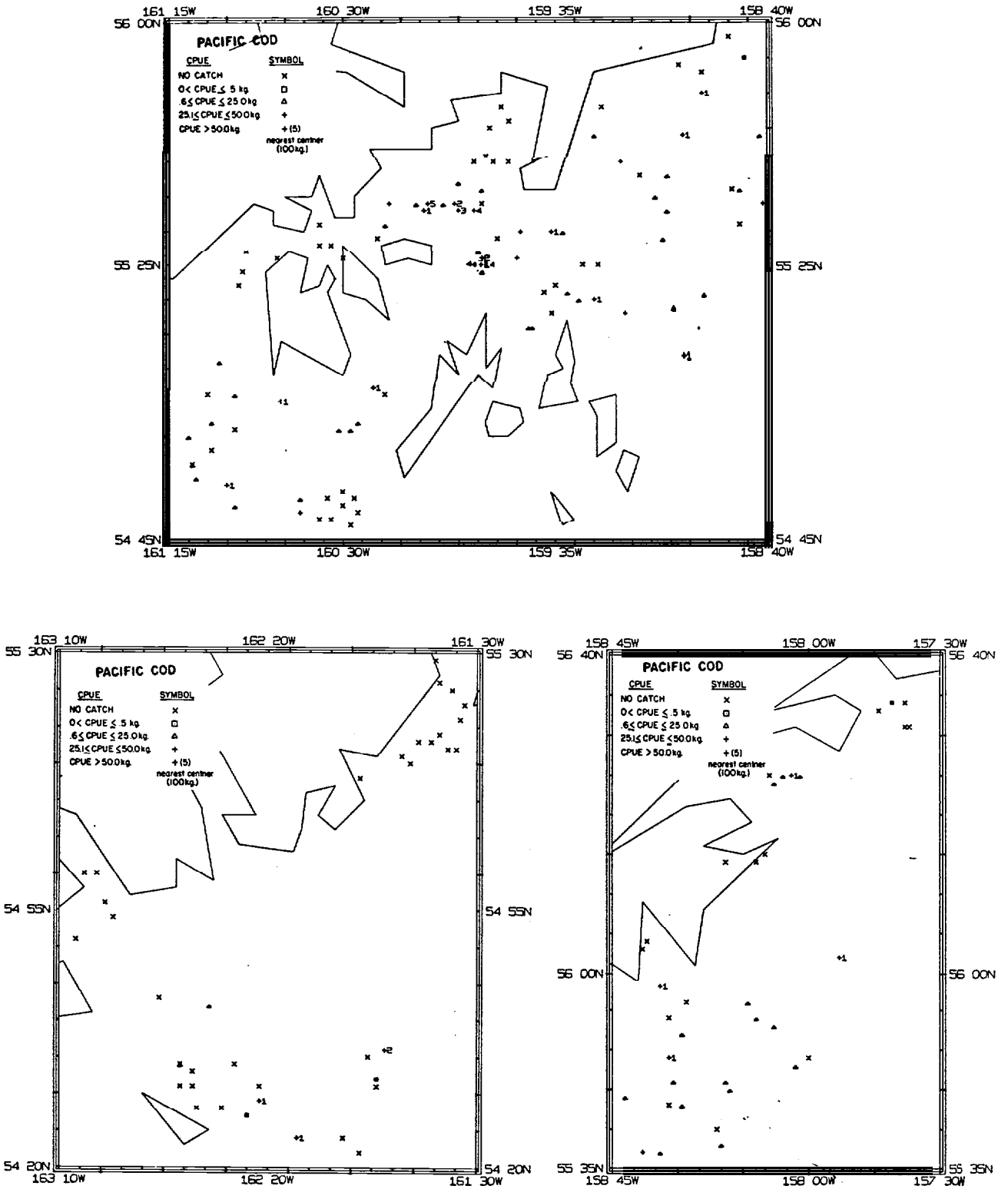


Figure X1-75.--Distribution of standardized catch rates in kg/hr of Pacific cod, Sept.-Oct. 1974 (Cruise 743).

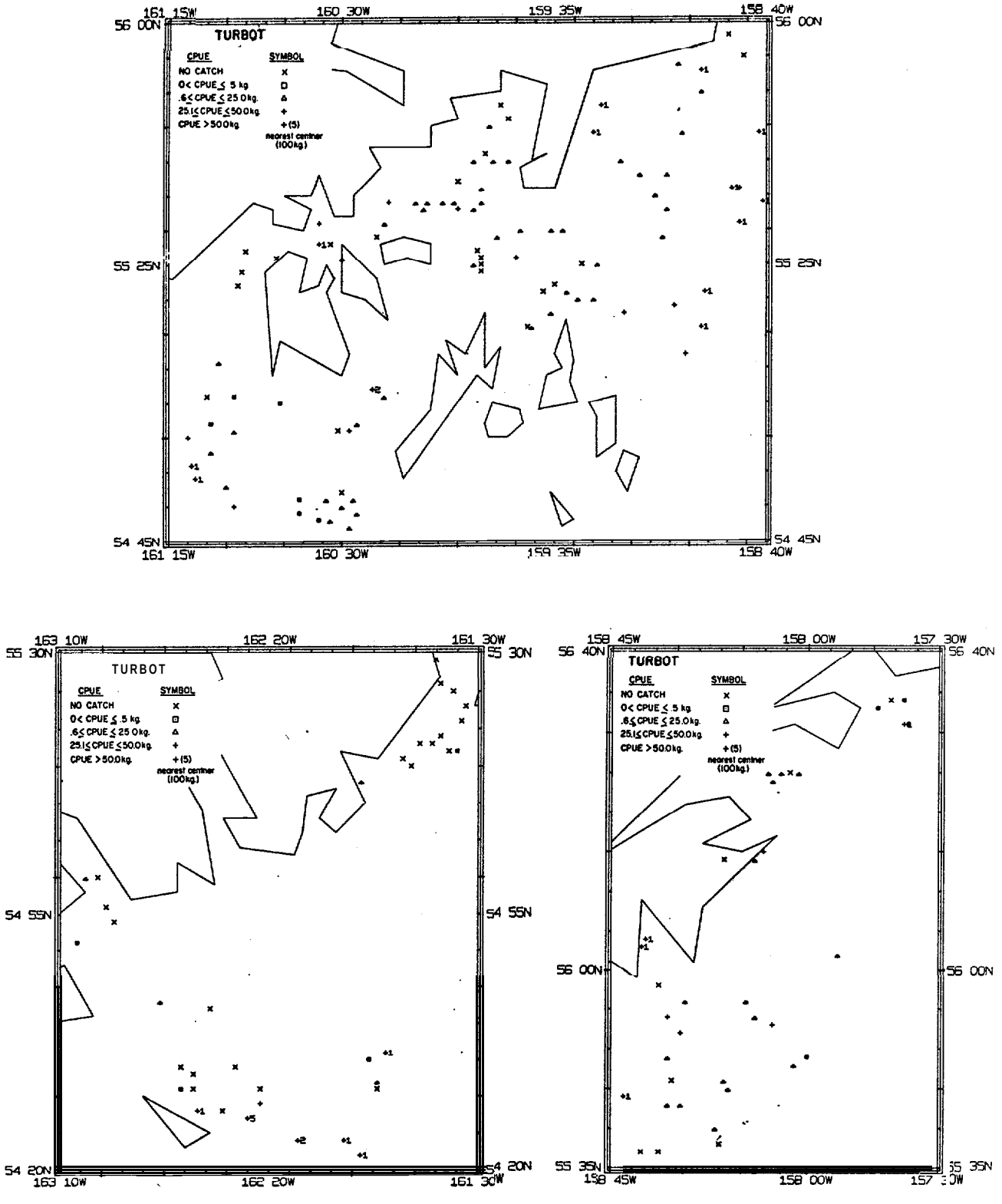


Figure XI-76.--Distribution of standardized catch rates in kg/hr of turbot, Sept.-Oct. 1974 (Cruise 743).

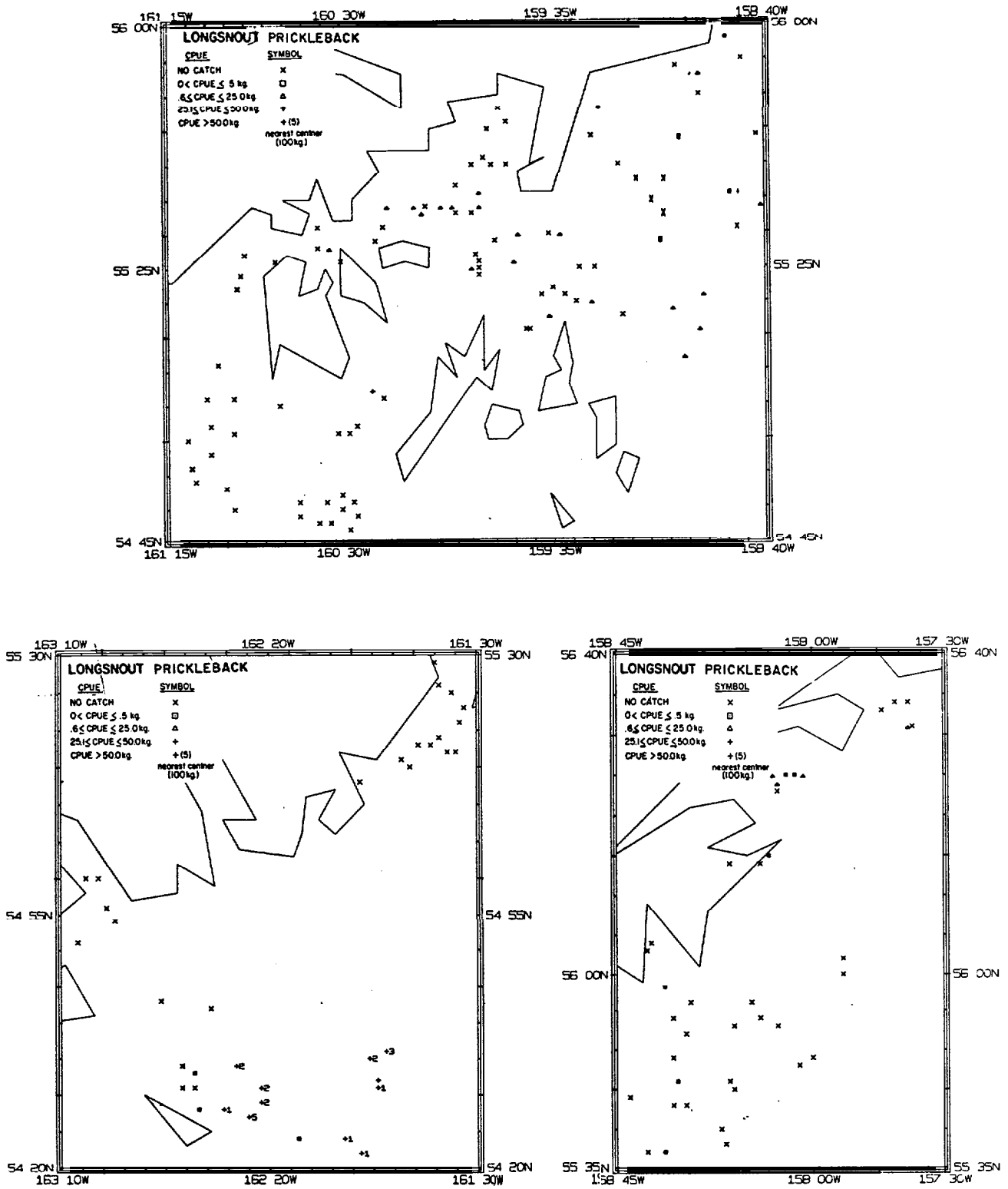


Figure XI-77.--Distribution of standardized catch rates in kg/hr of longsnout prickleback, Sept.-Oct. 1974 (Cruise 743).

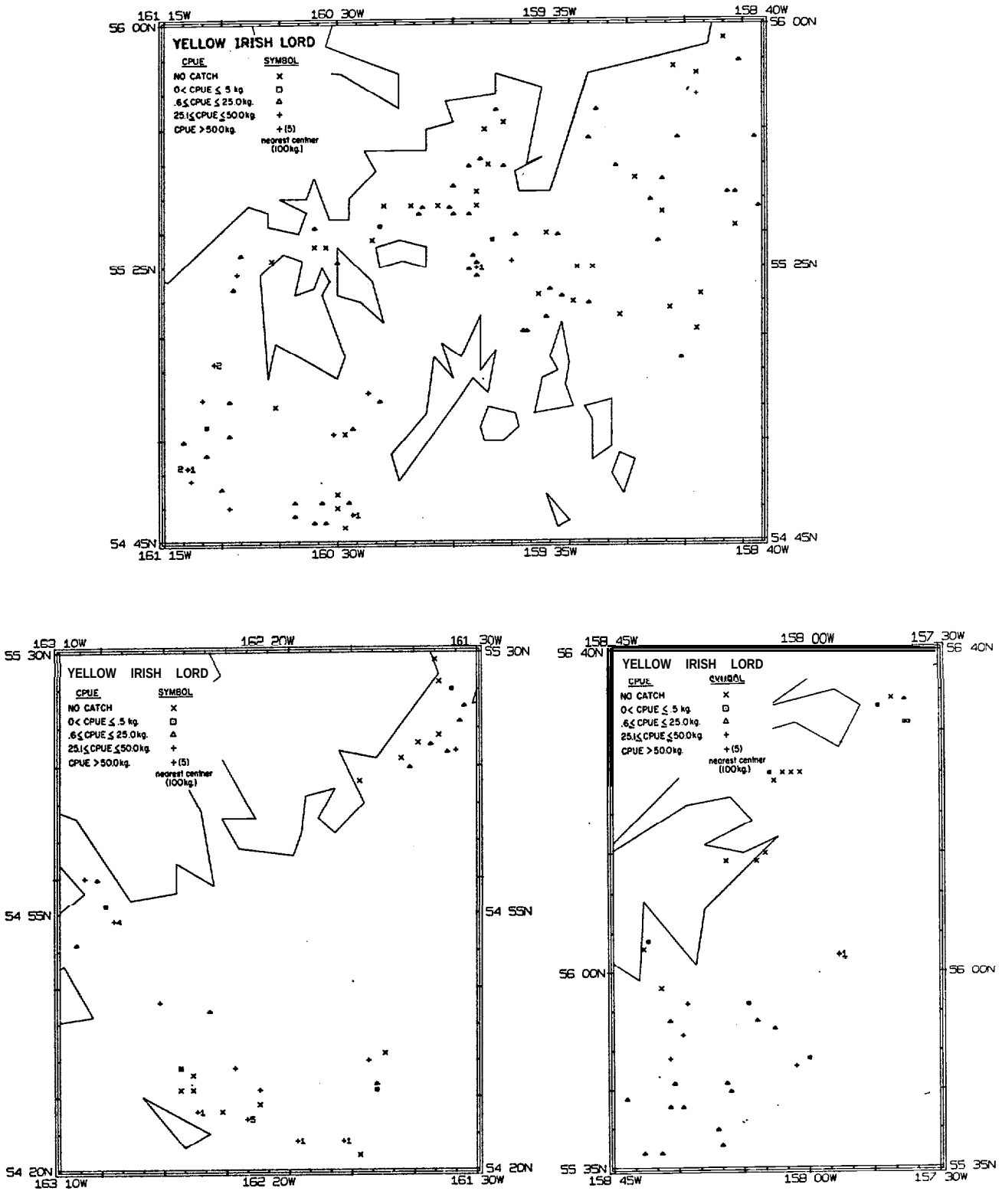


Figure X1-78.--Distribution of standardized catch rates in kg/hr of yellow Irish lord, Sept.-Oct. 1974 (Cruise 743).

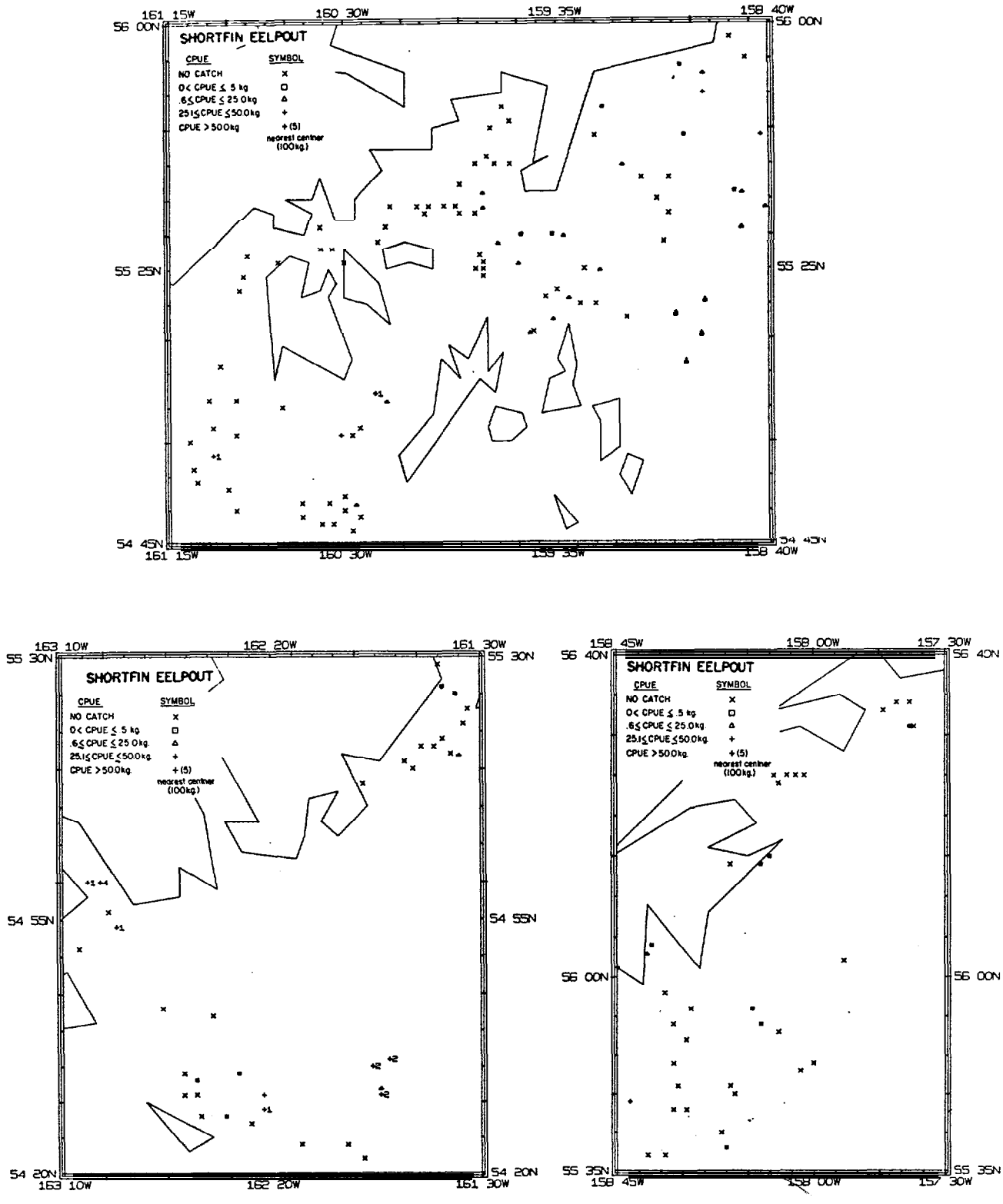


Figure X1-79. --Distribtuion of standardized catch rates in **kg/hr** of **shortfin eelpout,** Sept.-Oct. 1974 (Cruise 743).

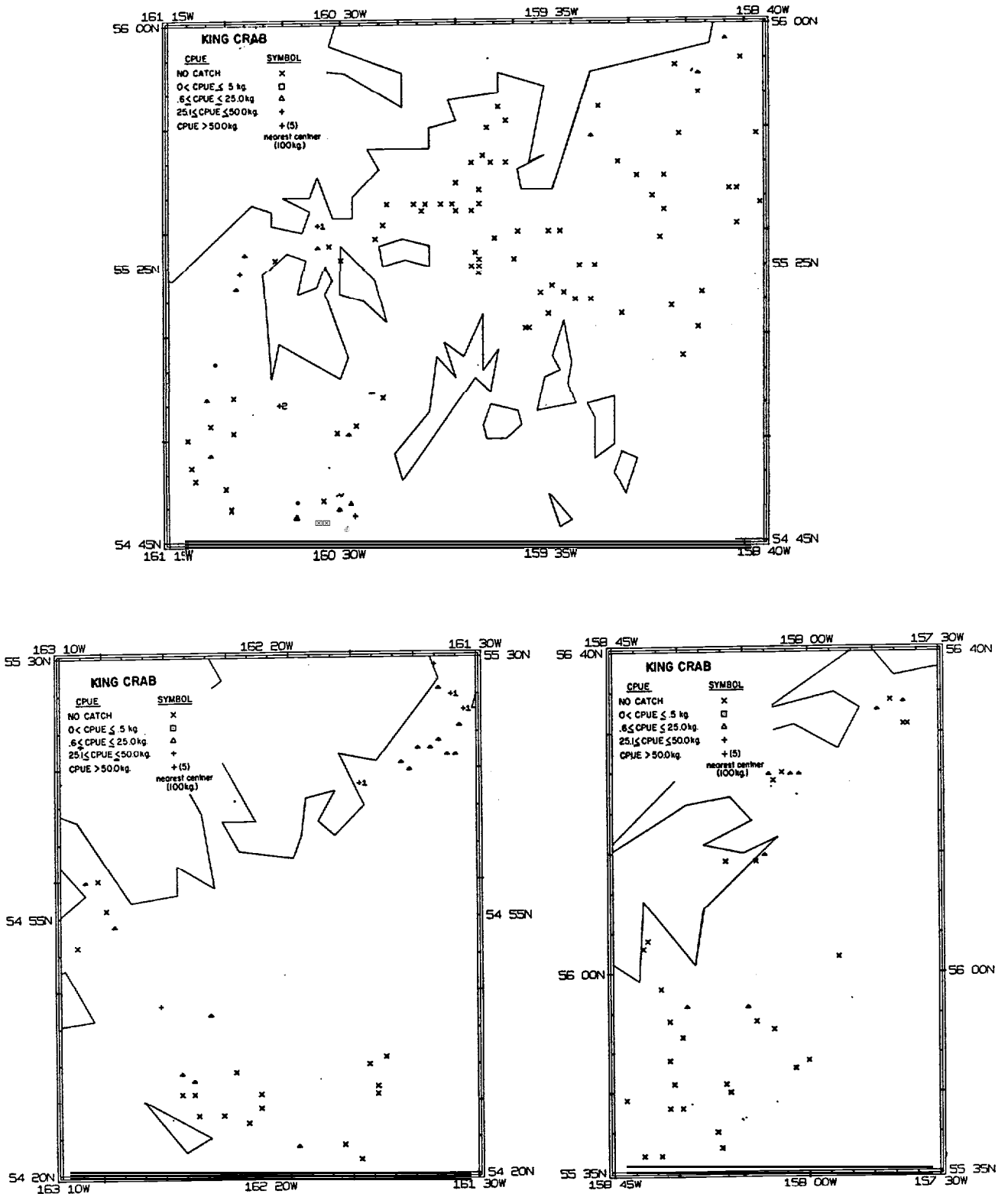


Figure XI-SO. --Distribution of standardized catch rates in **kg/hr** of king crab, **Sept.**–Oct. 1974 (Cruise 743).

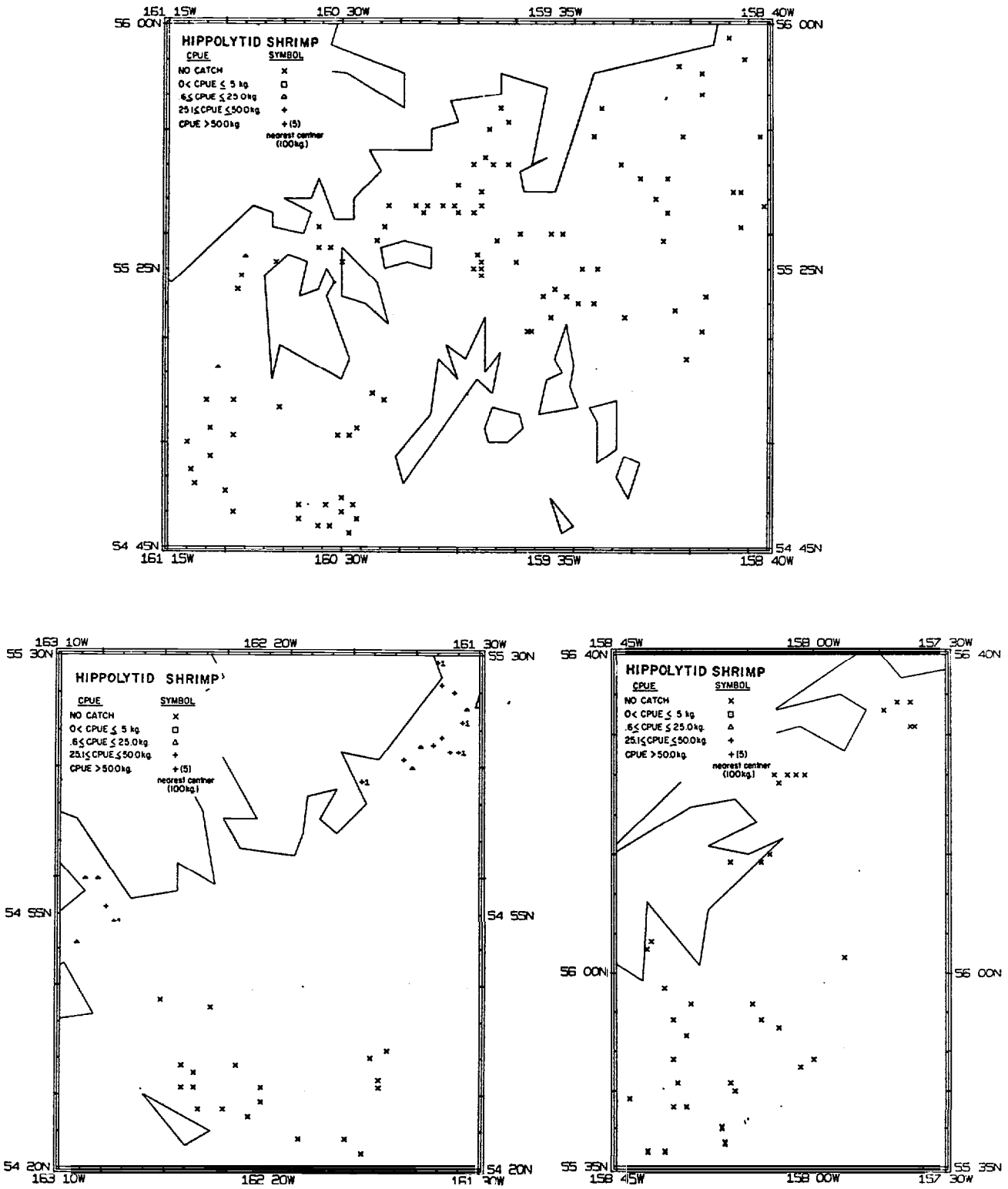


Figure XI-31.--Distribution of standardized catch rates in kg/hr of Hippolytid shrimp, Sept.-Oct. 1974 (Cruise 743).

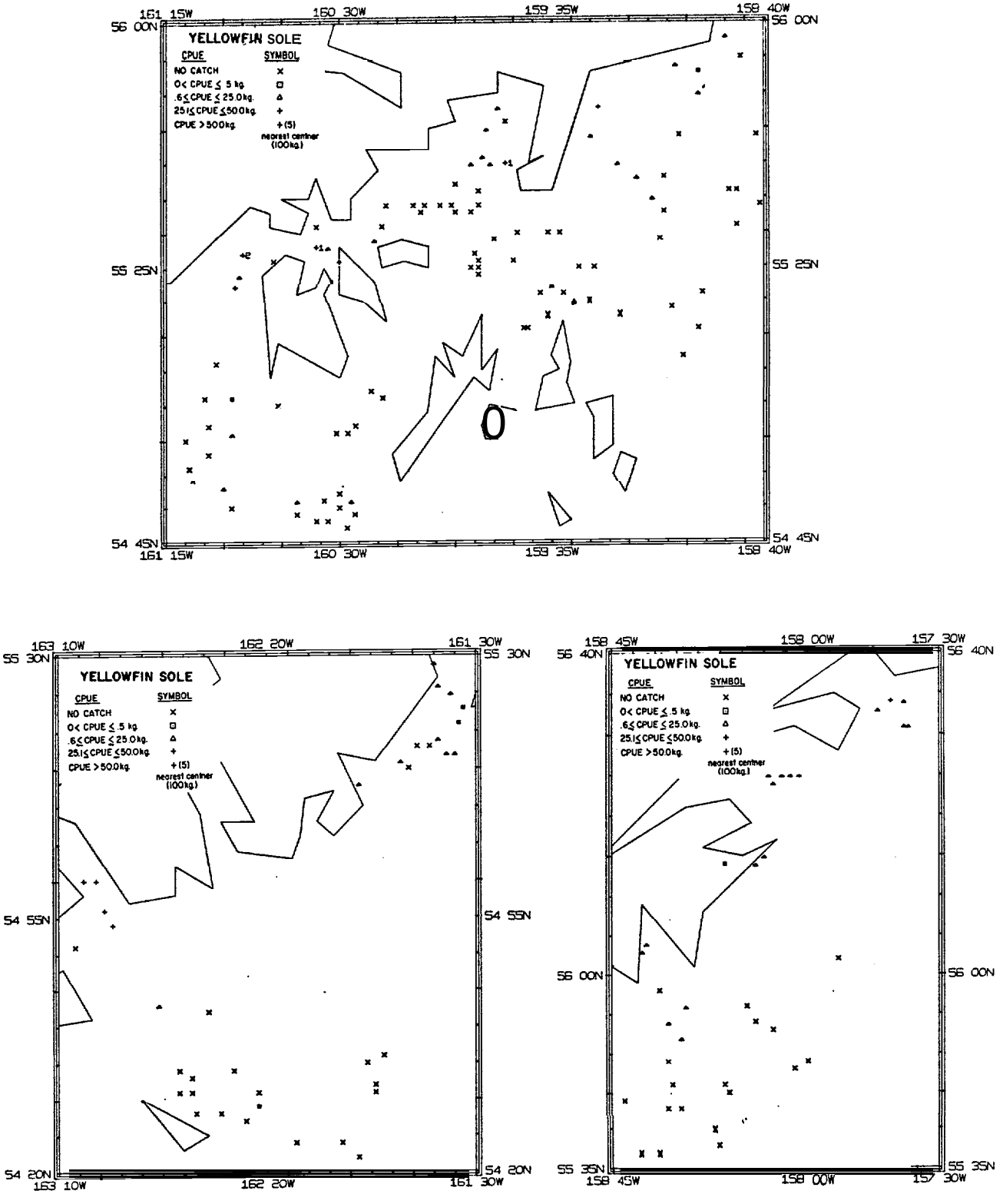


Figure X1-82.--Distribution of standardized catch rates in kg/hr of yellowfin sole, Sept.-Oct. 1974 (Cruise 743).

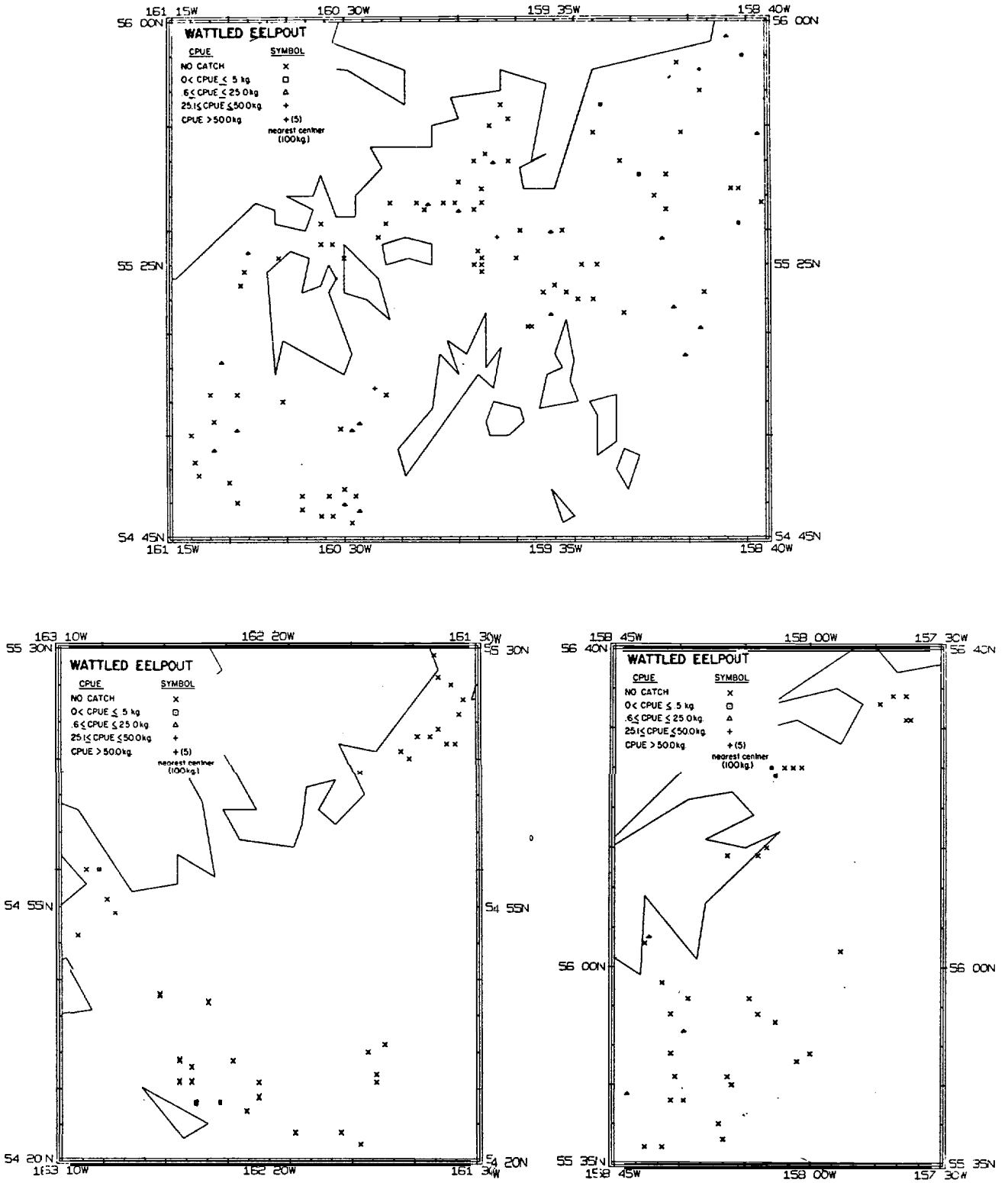


Figure X1-83.--Distribution of standardized catch rates in kg/hr of wattled eelpouts, Sept.-Oct. 1974 (Cruise 743).

i. Cruise 751, R/V Oregon (April-May 1975)

A pandalid shrimp survey was conducted in the outer Marmot Gully-Portlock Bank area. Fifty-seven stations were attempted with the 61' NMFS high opening shrimp trawl (Figure X1-84).

Mean catches for all species combined by depth zones were 25 kg in the inner shelf, 428 kg in the outer zone and 314 kg/hr in the upper slope. Large total catches of all species were made in Marmot Gully and Bay (Figure X1-85).

Pandalid shrimp were primarily taken in the outer shelf depth zone where they averaged 272 kg/hr and consisted of 95% pink shrimp (Table X1-5). Large catches of pandalid shrimp occurred in Marmot Bay and Gully (Figure XI-86). No biomass estimates of shrimp were made for this survey.

Seven species occurred at a mean catch rate of 10 kg/hr or more. Pollock, turbot, and flathead sole in the outer shelf and upper slope zones; rock sole in the inner shelf; capelin in the outer shelf and Pacific halibut and rex sole in the upper slope. Species having catches of 300 kg/hr or more were pollock off Shuyak Island and in Marmot Gully, turbot offshore from Shuyak Island and capelin offshore from Tonki Cape. The distribution of the standardized catches for other species averaging over 10 kg/hr are presented in Figures XI-87-93. These seven species plus pandalid shrimp made up over 91% of the total catch in the outer shelf and upper slope, and 53% in the inner shelf.

j. Cruise 753, R/V Oregon (Sept.-Oct. 1975)

During Cruise 753 of the R/V Oregon 167 stations were attempted with the NMFS 61' high opening shrimp trawl. The distribution of the successful stations is shown in Figure X1-94.

Total catches for all species combined were lower than during the 1974 survey, averaging 1165, 920, and 283 kg/hr in the inner shelf, outer shelf and upper slope, respectively. Large catches (1000 kg/hr or more) occurred in Sanak Gully, Morzhovoi and Ikatan Bays, Pavlof Bay, Beaver Bay and Unga Strait, south of Unga Island, Stepovak Bay, Mitrofania Bay and Gully, Kuiukta Bay, Castle Bay, Chignik Bay and Kujalik Bay (Figure X1-95).

Pandalid shrimp mean catches were lower than during the 1974 survey averaging 878, 599, and 110 kg/hr by the shallow to deeper water depth zones (Table X1-5). Pink shrimp remained the dominant species making up 62, 71, and 58% of the total catch by depth zones. Humpy and coonstripe shrimp exceeded the LO kg/hr mean catch level in the inner and outer shelves, and sidestripe in all 3 depth zones. Catches of pandalid shrimp of 1000 kg/hr or more were made in Morzhovoi and Ikatan Bay, Pavlof Bay, Beaver Bay and Unga Strait, Stepovak Bay, south of Unga Island, Mitrofania Bay and Gully, Kuiukla Bay, Chignik Bay and Kujalik Bay (Figure X1-96). The biomass estimate of pandalid shrimp for this survey was 78.8 thousand mt.

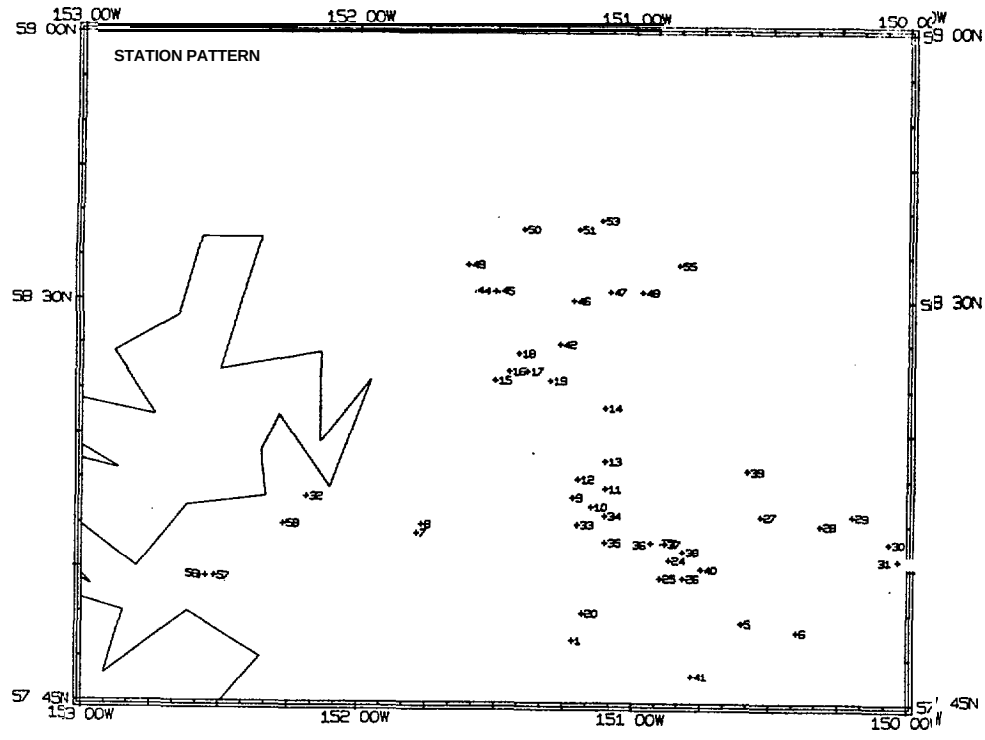


Figure X1-84.--Stations successfully trawled (shrimp trawl) by the R/V Oregon, Apr.-May 1975 (Cruise 751)

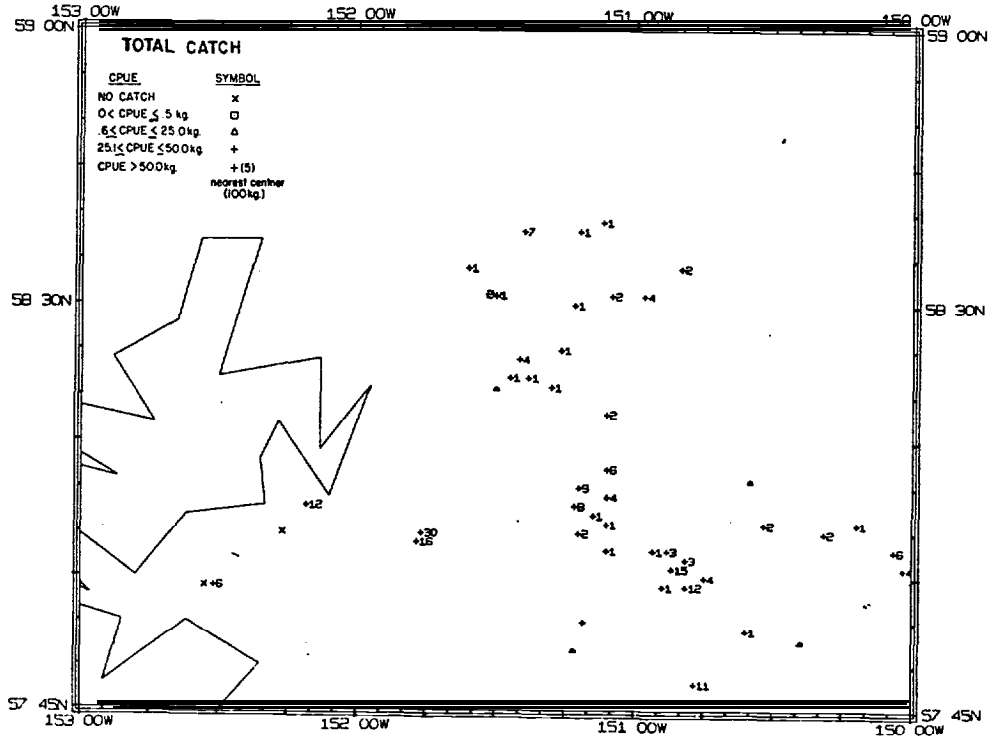
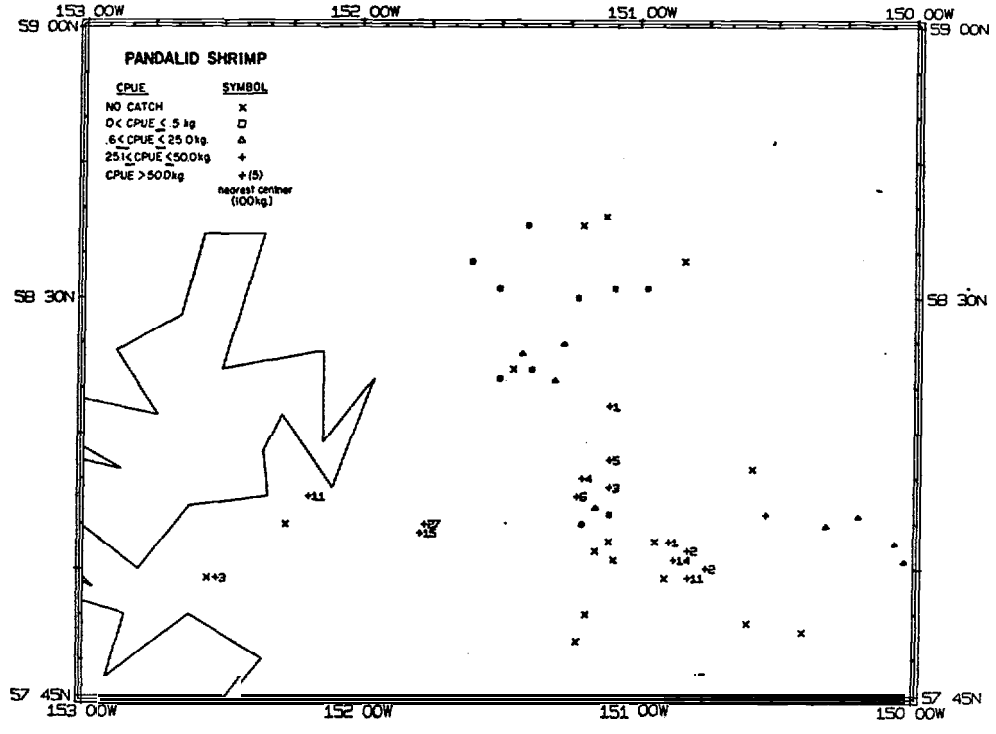
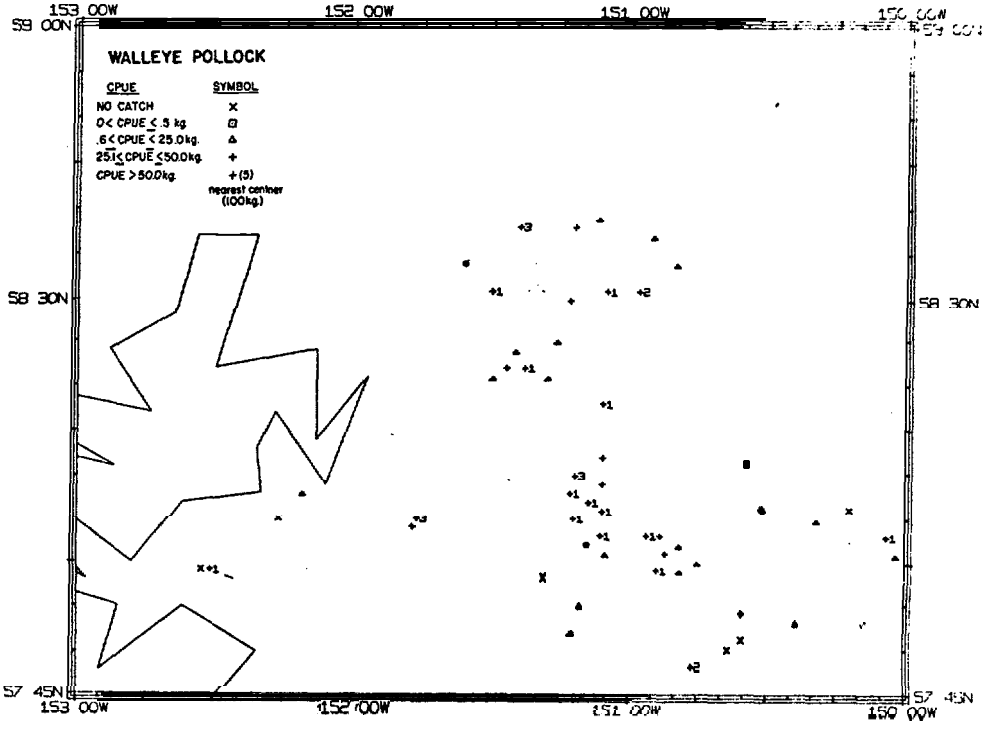
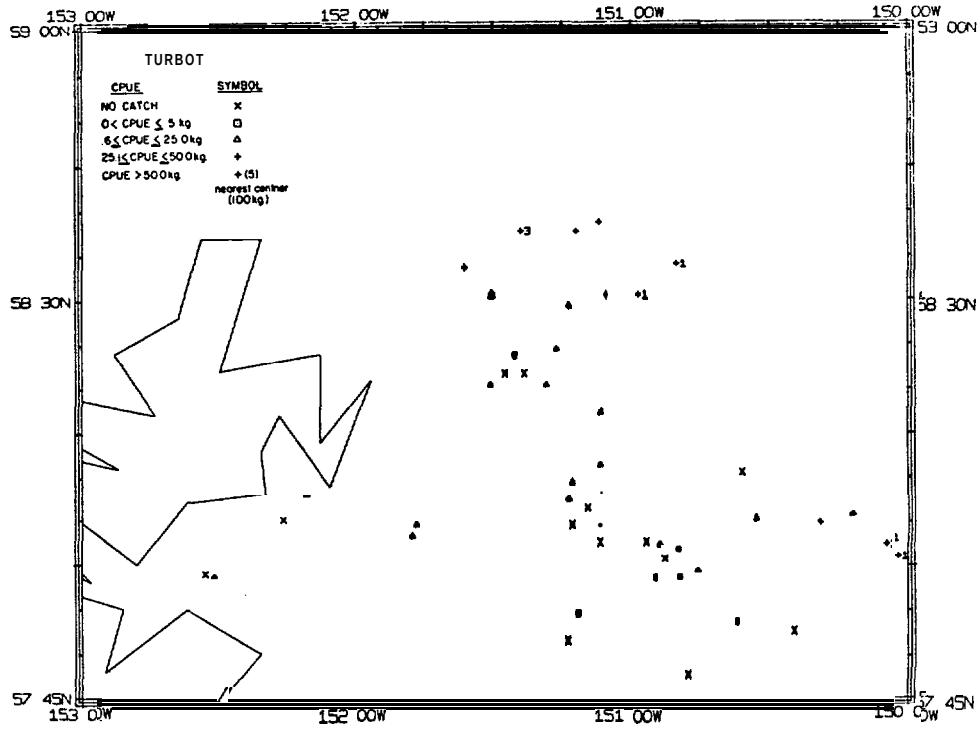


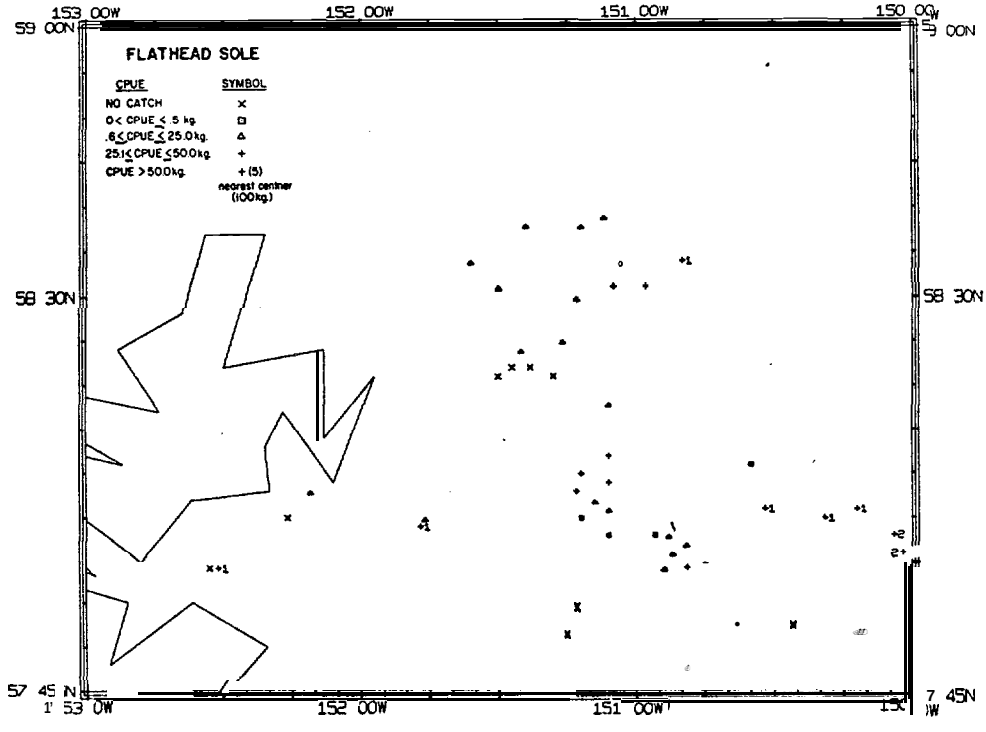
Figure XI-85.--Distribution of standardized catch rates in **kg/hr** of all species combined, Apr.-May 1975 (Cruise 751).



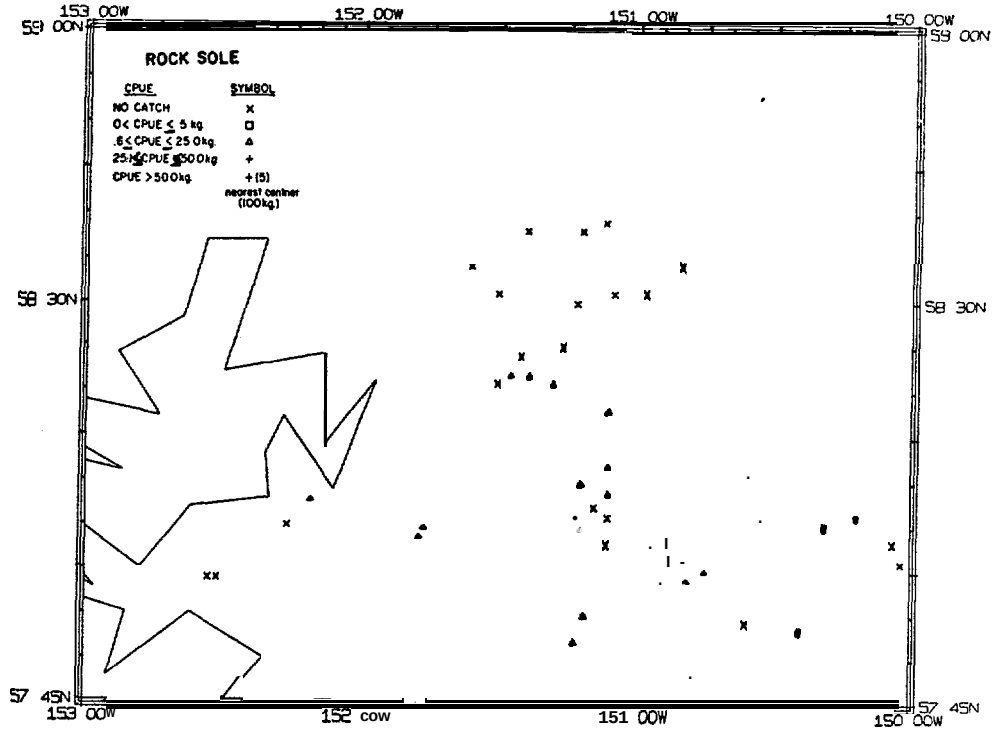


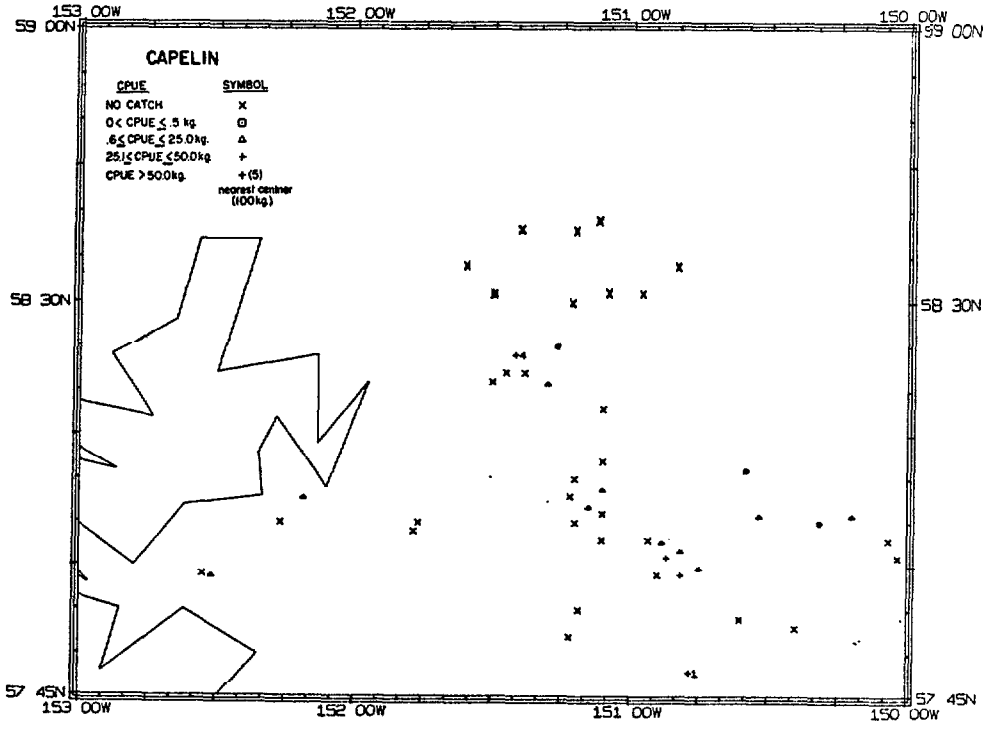
Figures X1-86-87.--Distributions of standardized catch rates in **kg/hr** of **pandalid** shrimp and walleye pollock, Apr.-May 1975 (Cruise 751).



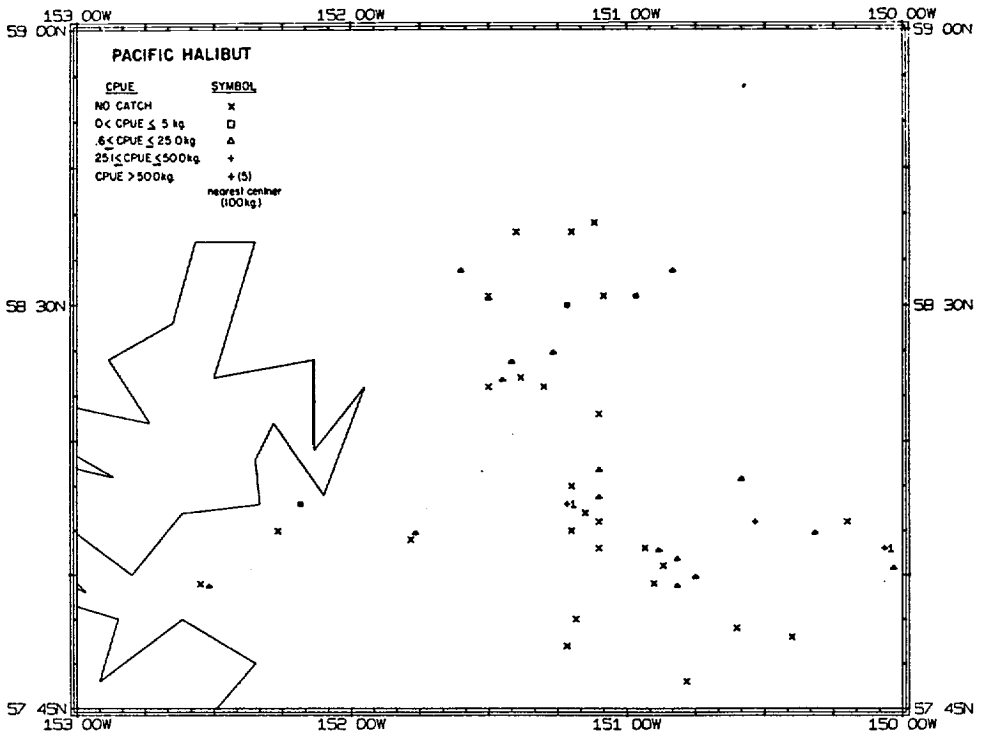


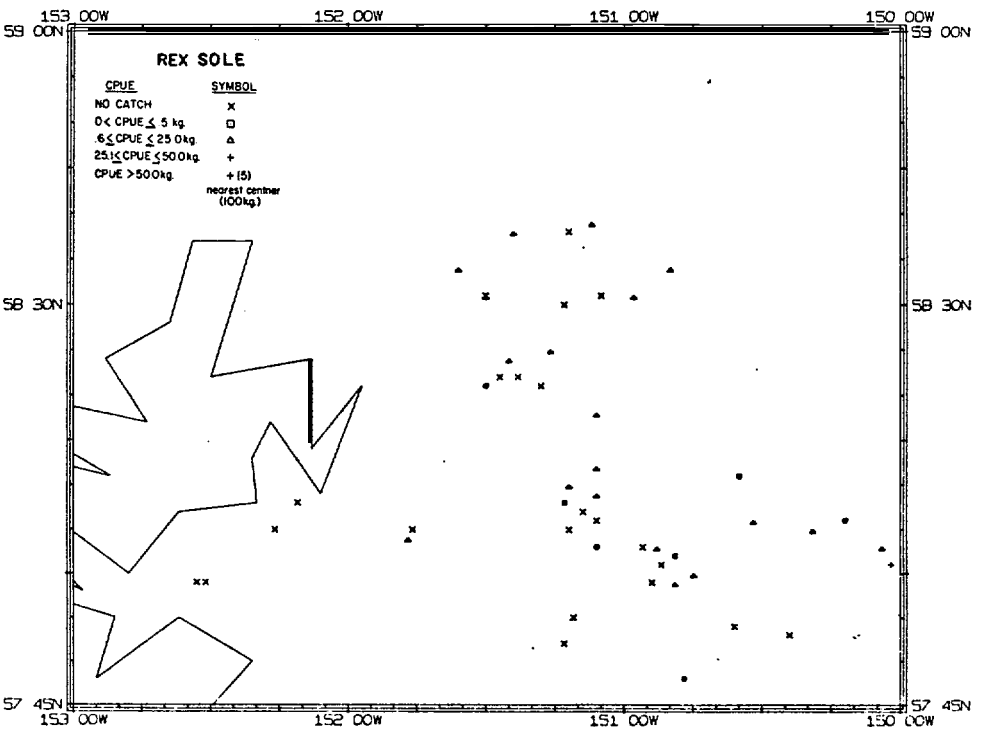
Figures X1-88-89.--Distributions of standardized catch rates in kg/hr of turbot and flathead sole, Apr.-May 1375 (Cruise 751).



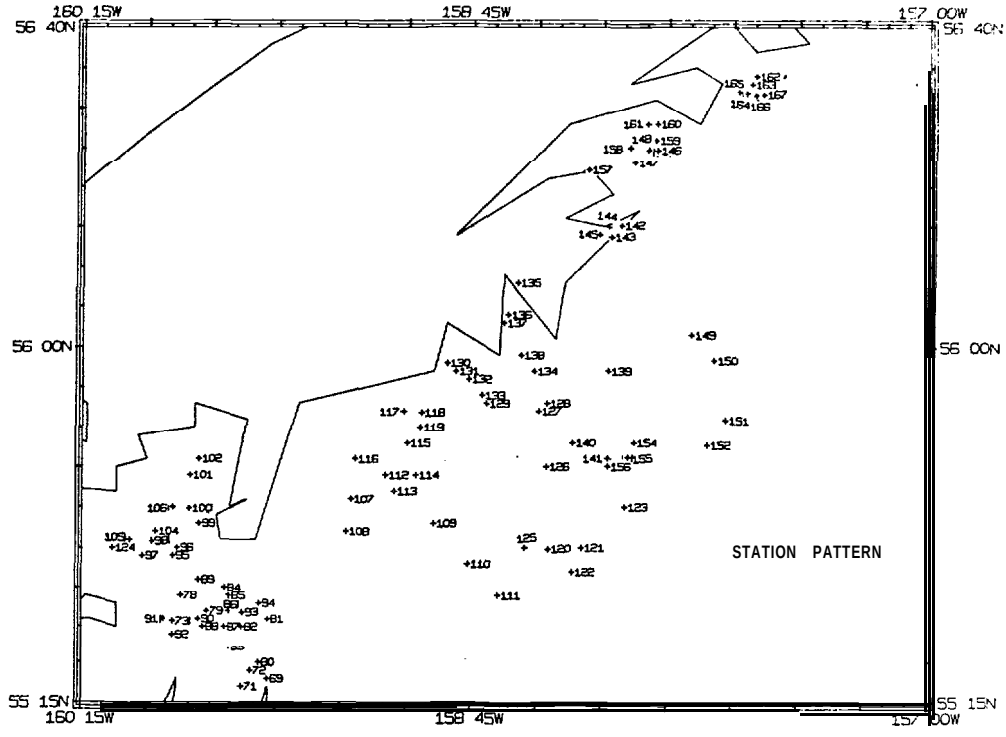


Figures X1-90-91.--Distributions of standardized catch rates in kg/hr of rock sole and capelin, Apr.-May 1975 (Cruise 751).





Figures X1-92-93.--Distributions of standardized catch rates in kg/hr of Pacific halibut and *rex* sole, Apr.-Flay 1975 (Cruise 751).



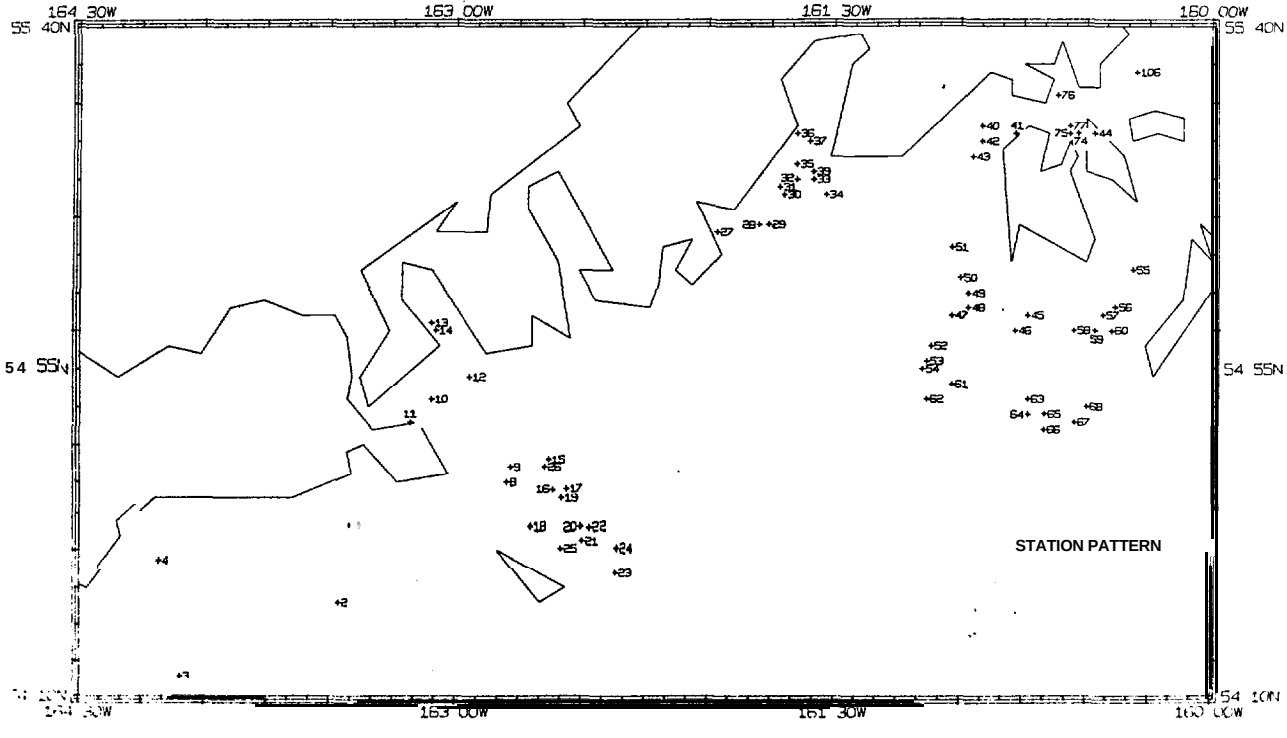
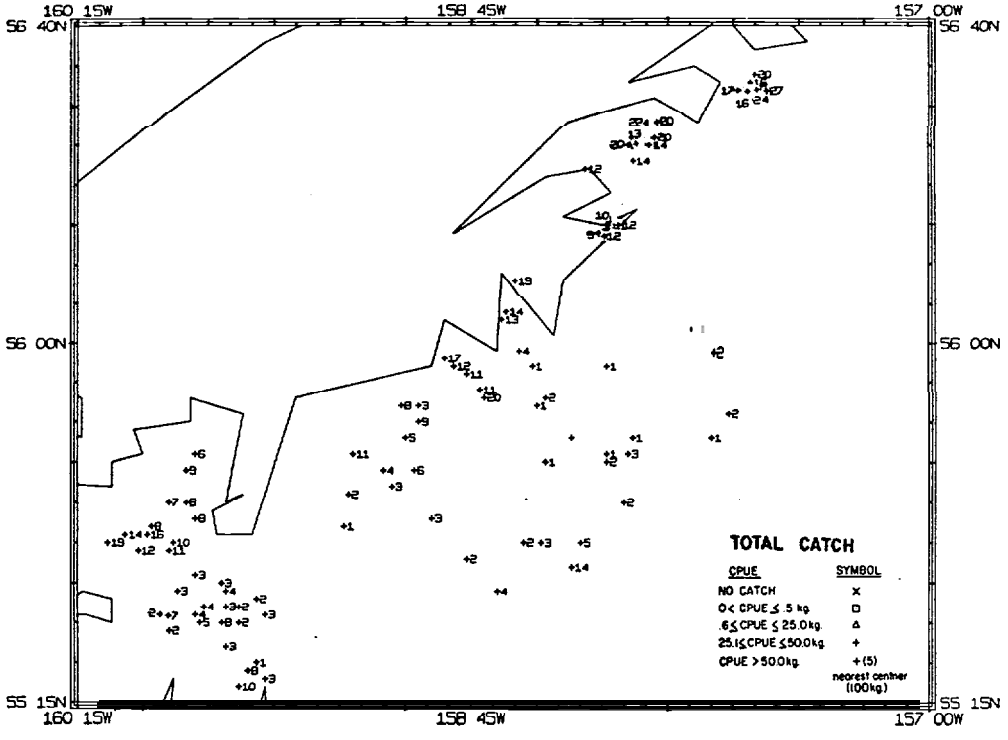


Figure X1-94.--Stations successfully trawled (shrimp trawl) by the R/V Oregon, Sept.-Oct. 1975 (Cruise 753).



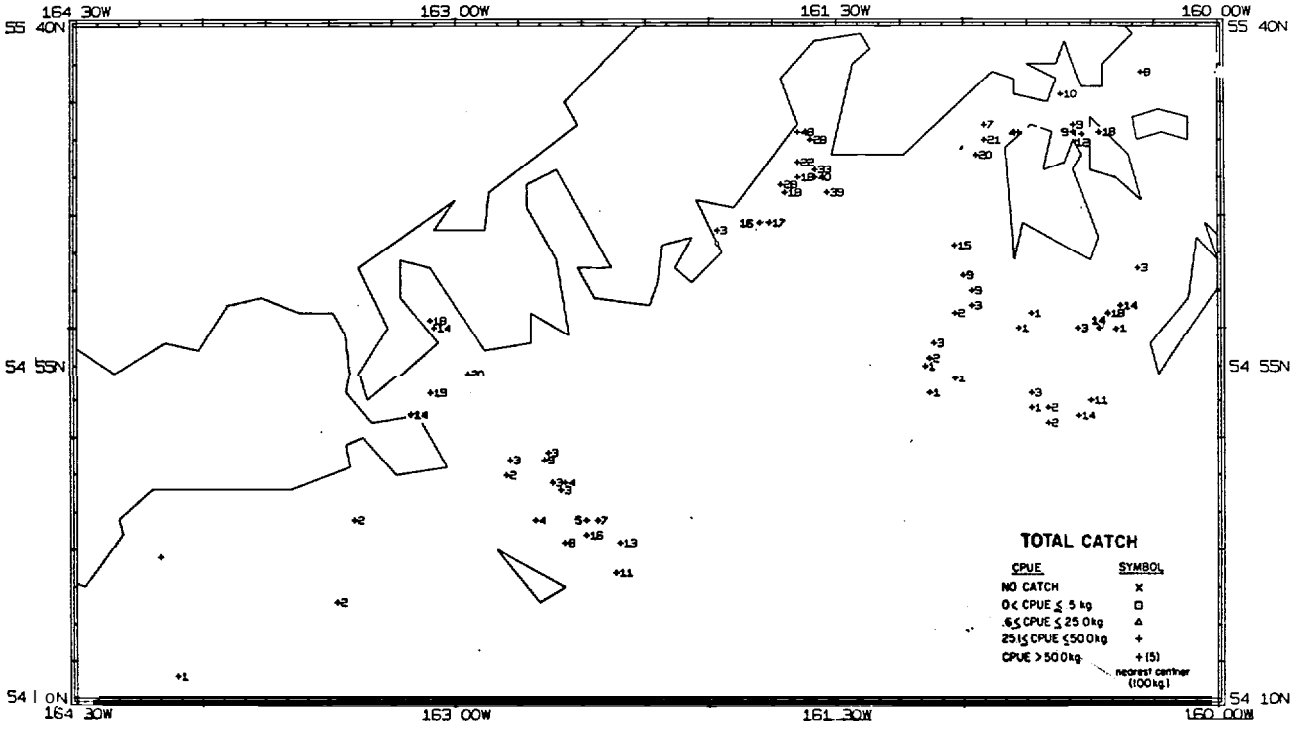


Figure X1-95.--Distribution of standardized catch rates in kg/hr of all species combined, Sept.-Oct. 1975 (Cruise 753).

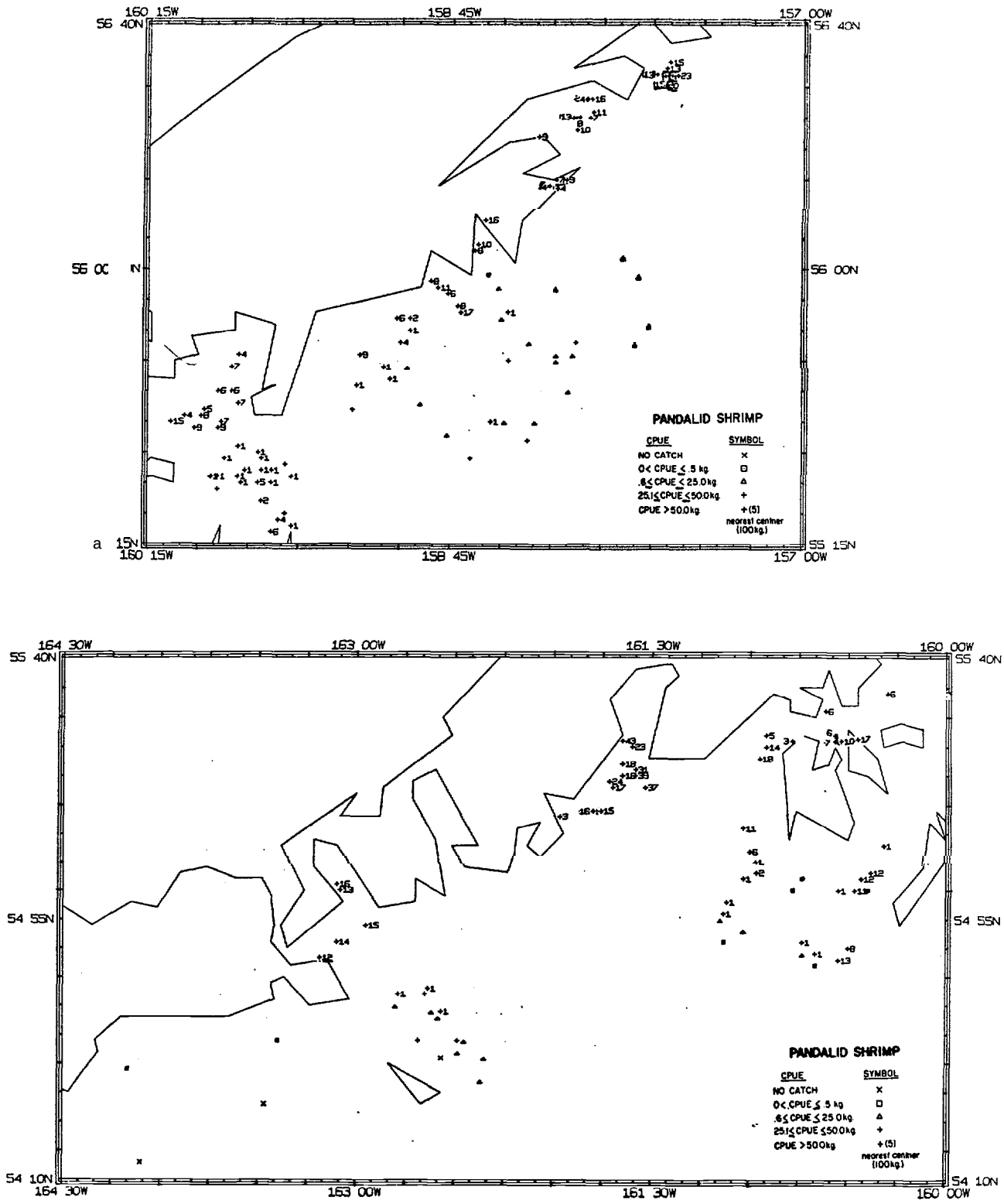


Figure XI-96 .--Distribution of standardized catch rates in **kg/hr** of pandnlid **shrimp,** Sept.-Oct. 1975 (Cruise 753).

The most abundant species in the trawl catches other than pandalid shrimp were walleye pollock, which, along with flathead sole, averaged over 10 kg/hr in all 3 depth zones (Table XI-6). Other species which averaged 10 kg/hr or more in a depth zone were: Pacific cod and turbot in the outer shelf and upper slope depth zones; yellow Irish lord in the inner and outer shelves; and Pacific halibut and Myoxocephalus sp. in the inner shelf. Catch rates of walleye pollock exceeding 300 kg/hr were made in Sanak Gully, Morzhovoi-Tkatan Bays, Pavlof Bay, Mitrofania Bay, Kuiukla Bay, Castle Bay, Chignik Bay and Kujalik Bay (Figure X1-97). Highest catches of Pacific cod occurred in Sanak Gully south of Unga Island, Stepovak Bay and offshore (Figure X1-98). Yellow Irish lord averaged 300 kg/hr or more in Beaver Bay (Figure X1-99). The standardized catches for the remaining species which averaged 10 kg/hr or more are plotted in Figures X1-100-103. Pandalid shrimp plus these species made up over 80% of the total catch in all depth zones.

k. Cruise 761, R/V Oregon (April-May 1976)

A pandalid shrimp survey was conducted along the northern side of Afognak Island, in Shelikof Strait and along the south side of the Alaska Peninsula to Mitrofania Island. Since data from this survey are not ready for ADP analysis, no results can be reported.

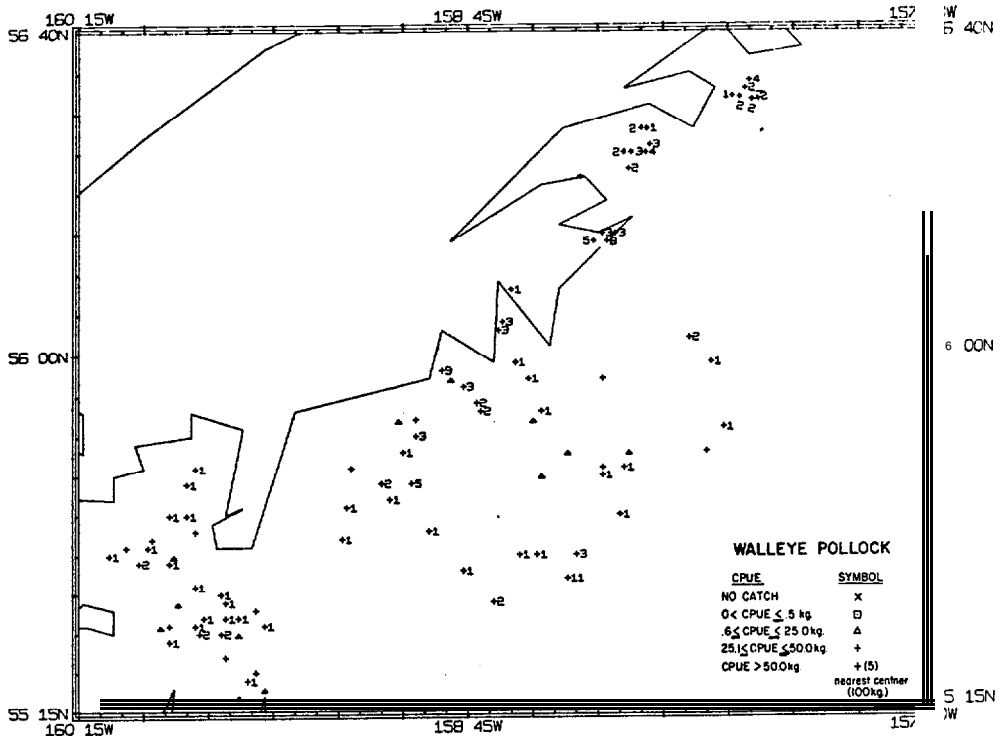
l. Cruise 763, R/V Oregon (Sept.-Oct. 1976)

A pandalid shrimp survey was conducted in the Sanak and Shumagin regions using the R/V Oregon. The 61' NMFS high opening shrimp trawl was used at 156 attempted stations (Figure X1-104).

The total catch for all species averaged 1946 kg/hr in the inner shelf, 1247 kg/hr in the outer shelf and 1316 kg/hr in the upper slope. High densities, standardized catch rates of 1000 kg/hr or more, occurred at 53% of the stations sampled (Figures X1-105).

Pandalid shrimp occurred in all 3 depth zones averaging 1390 kg/hr, 712 kg/hr and 990 kg/hr in the inner shelf, outer shelf and upper slope, respectively (Table X1-5). Pink shrimp remained the dominant species constituting 69, 79 and 94% of the total pandalid catch. Humpy shrimp also occurred in relatively large catches in the inner shelf and outer shelf depth zones as well as sidestripe shrimp in the outer shelf and upper slope. Catches of pandalid shrimp which exceeded 1000 kg/hr occurred at 31% of the stations in the area surveyed (Figure X1-106).

Thirteen species of fish and invertebrates other than pandalid shrimp produced mean CPUE's greater than 10 kg/hr. Walleye pollock, the most abundant species, Tanner crab, yellow Irish lord and flathead sole exceeded 10 kg/hr in all 3 depth zones while Pacific cod and Myoxocephalus sp. exceeded the 10 kg/hr catch rate in the inner and outer shelves (Table X1-6). Yellowfin sole, sablefish, capelin and sandfish all exceeded the 10 kg/hr level in the inner shelf along with turbot in the outer shelf and crangonid shrimp and jellyfish in the upper slope. Standardized catch



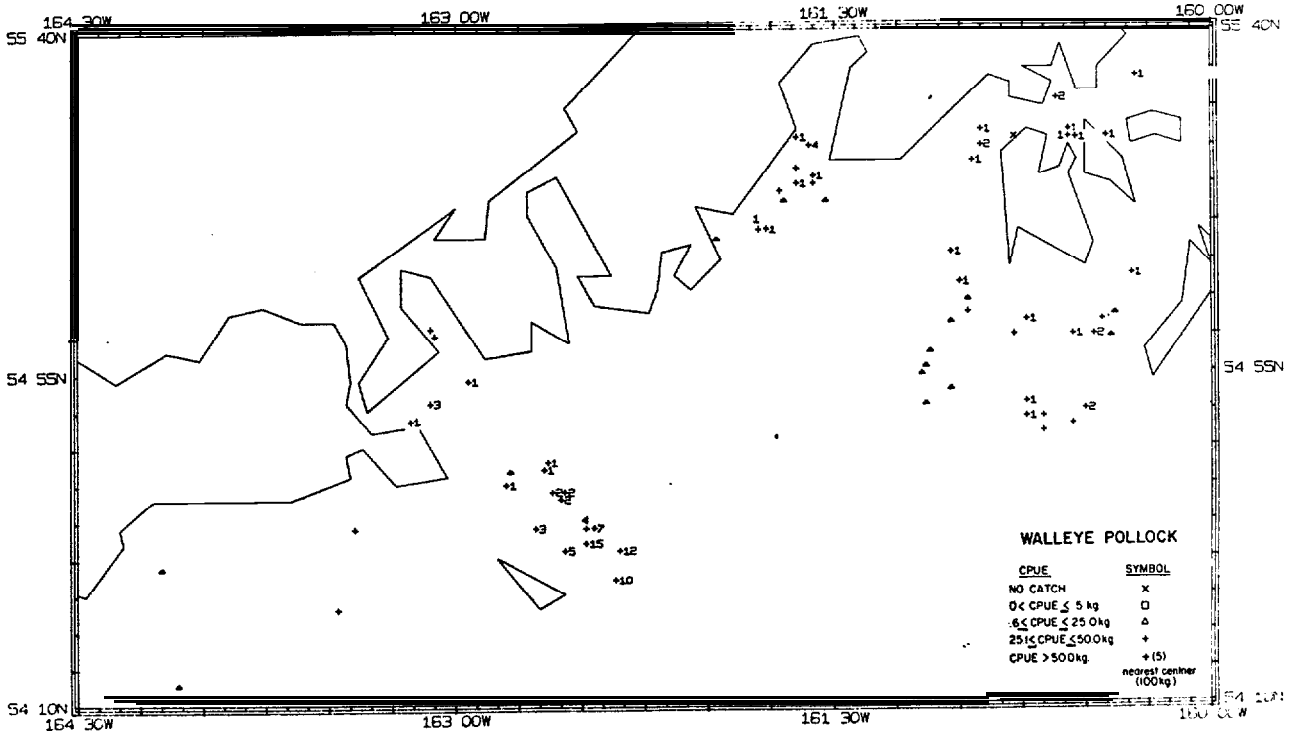
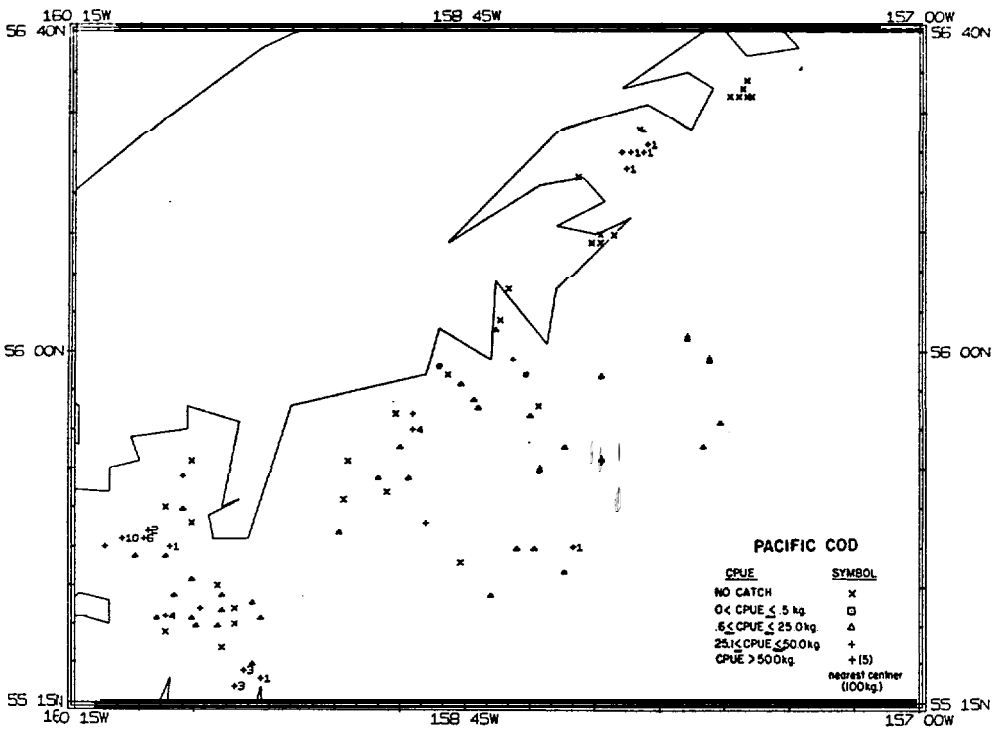


Figure X1-97.--Distribution of standardized catch rates in kg/hr of walleye pollock, Sept.-Oct. 1975 (Cruise 753).



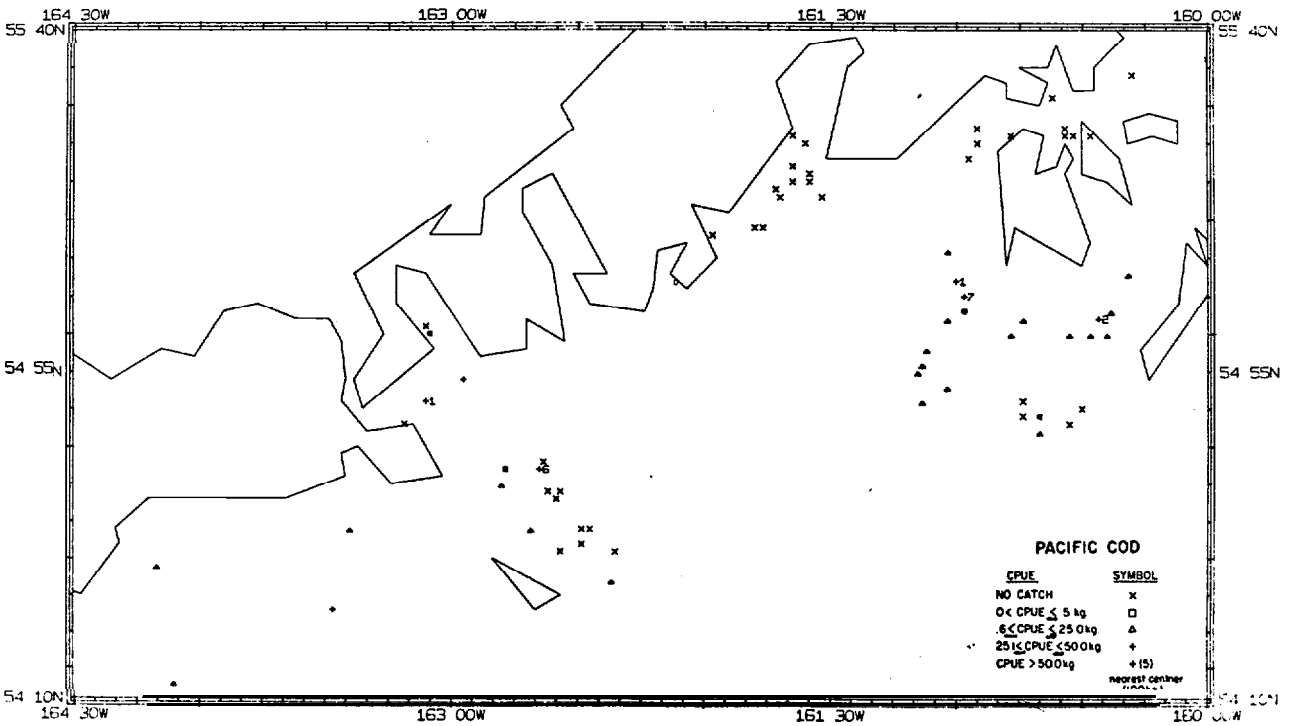
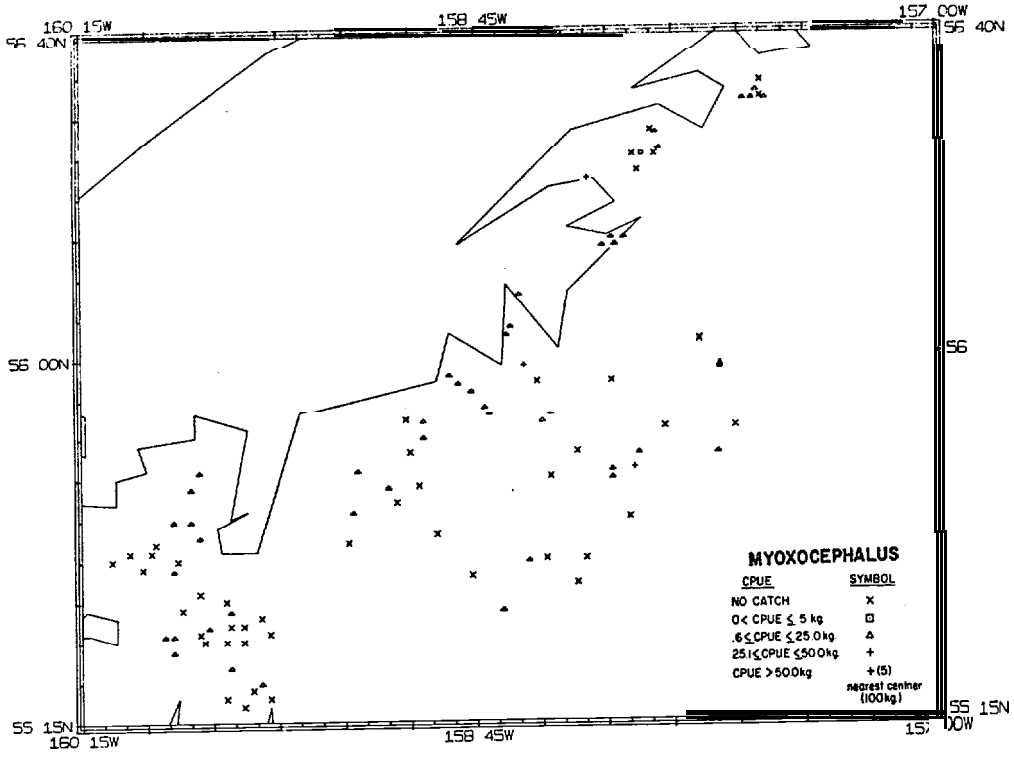


Figure XI-98.--Distribution of standardized catch rates in kg/hr of Pacific cod, Sept.-Oct. 1975 (Cruise 753).



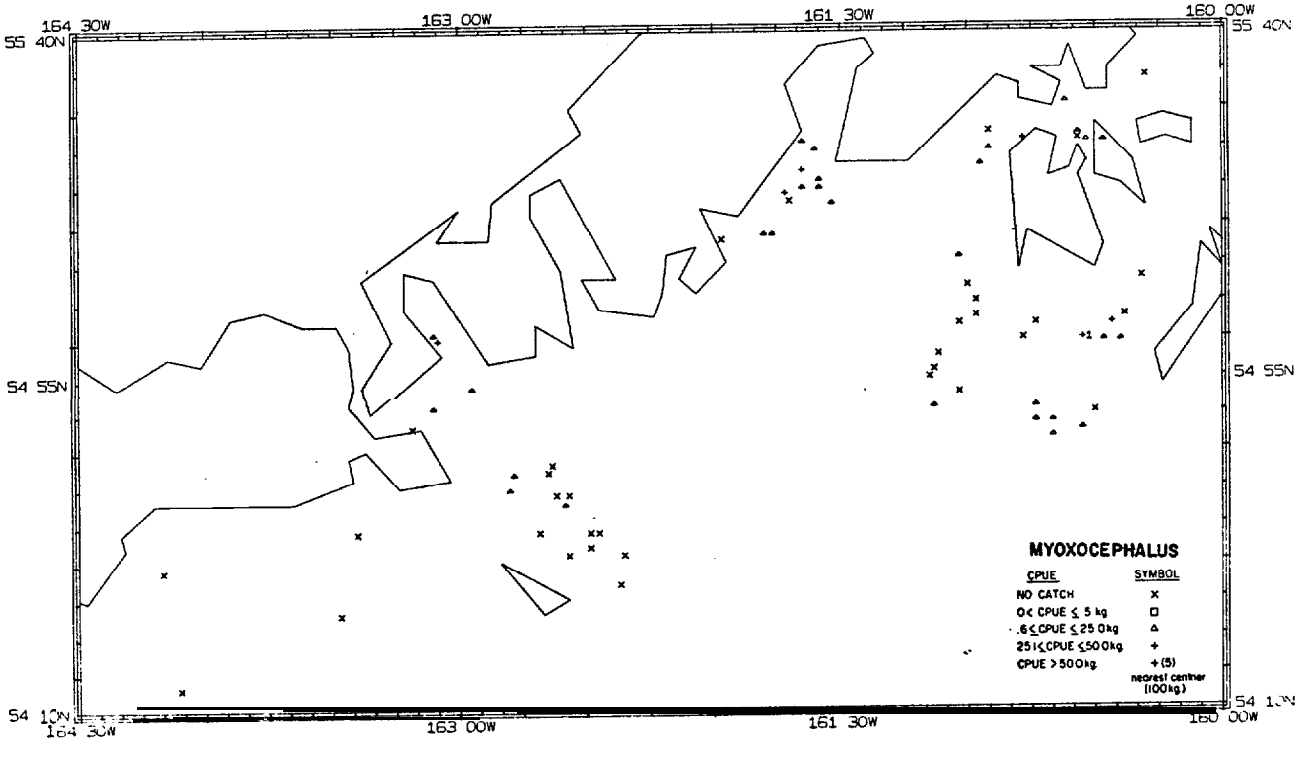
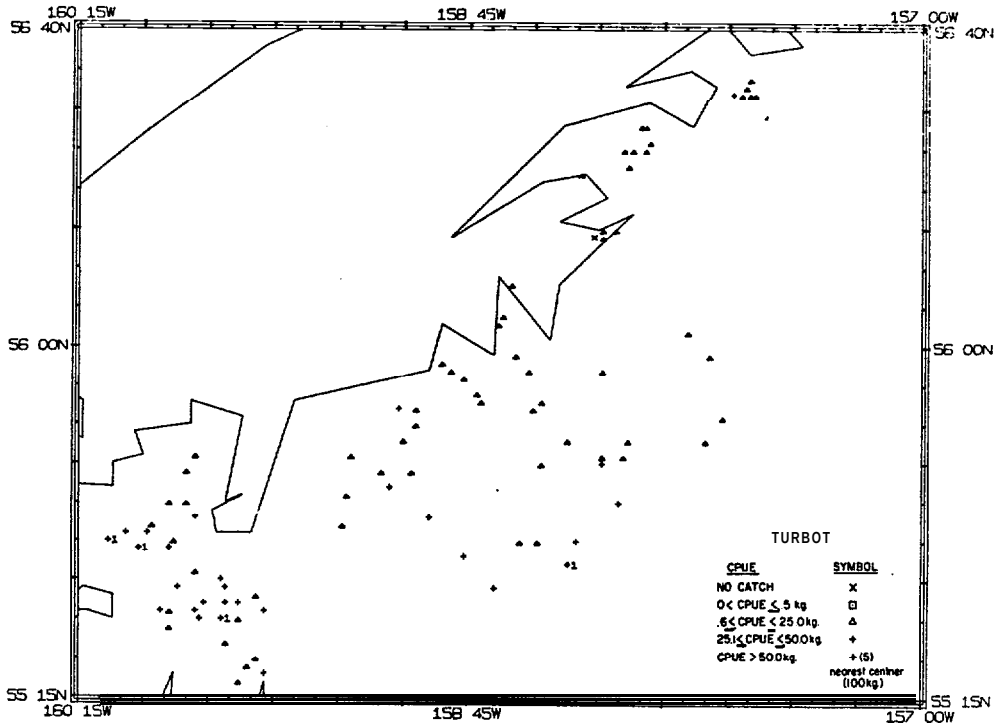


Figure X1-99.--Distribution of standardized catch rates in **kg/hr** of Myoxocephalus sp., Sept.-Oct. 1975 (Cruise 753).



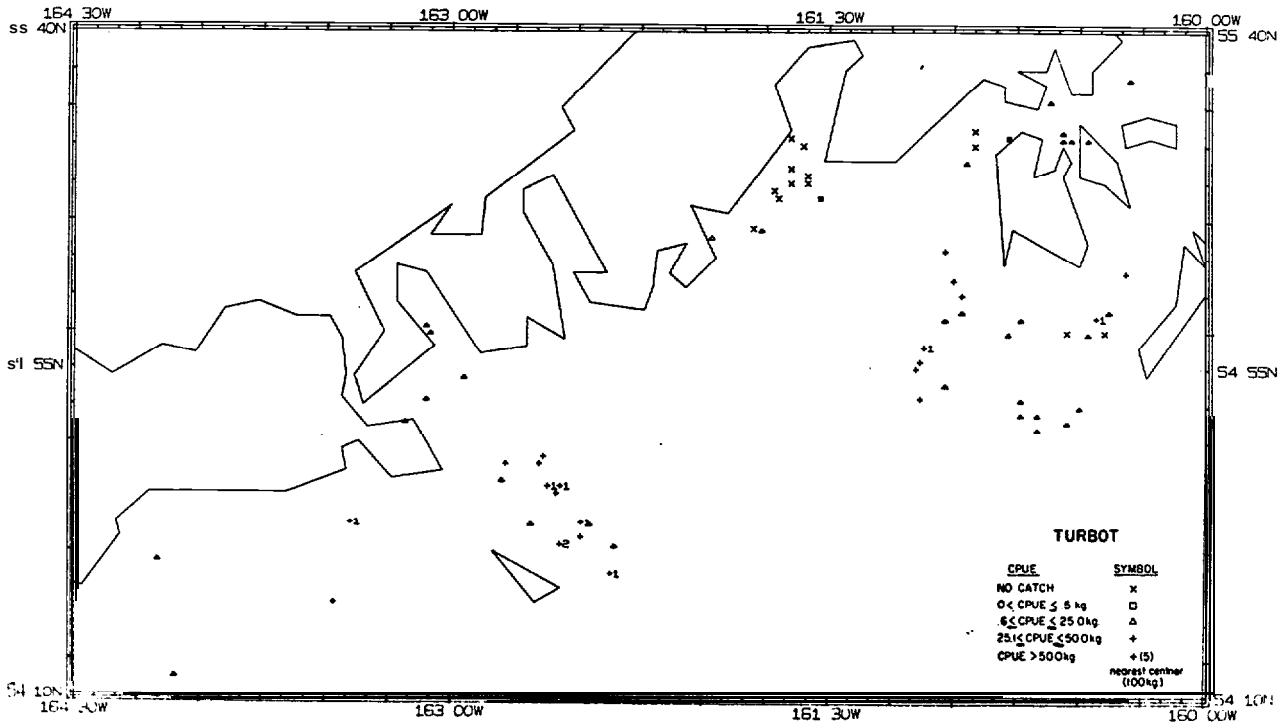
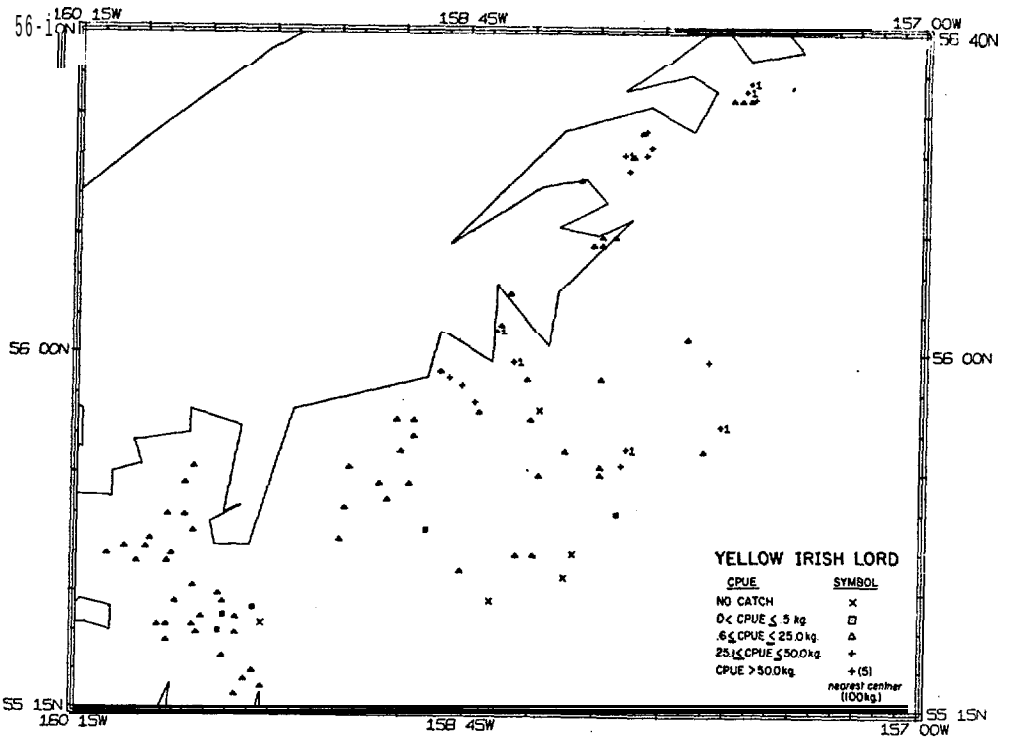


Figure XI-100.--Distribution of standardized catch rates in kg/hr of turbot, Sept.-Oct. 1975 (Cruise 753).



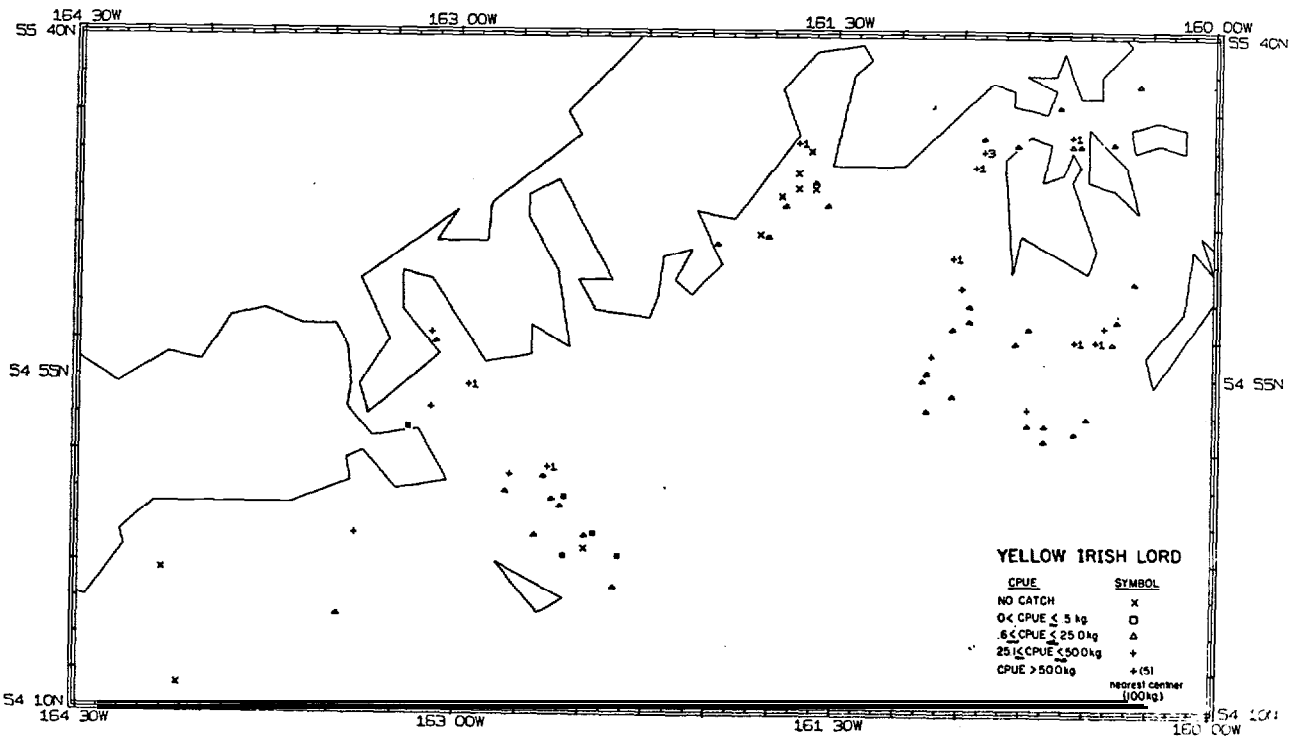
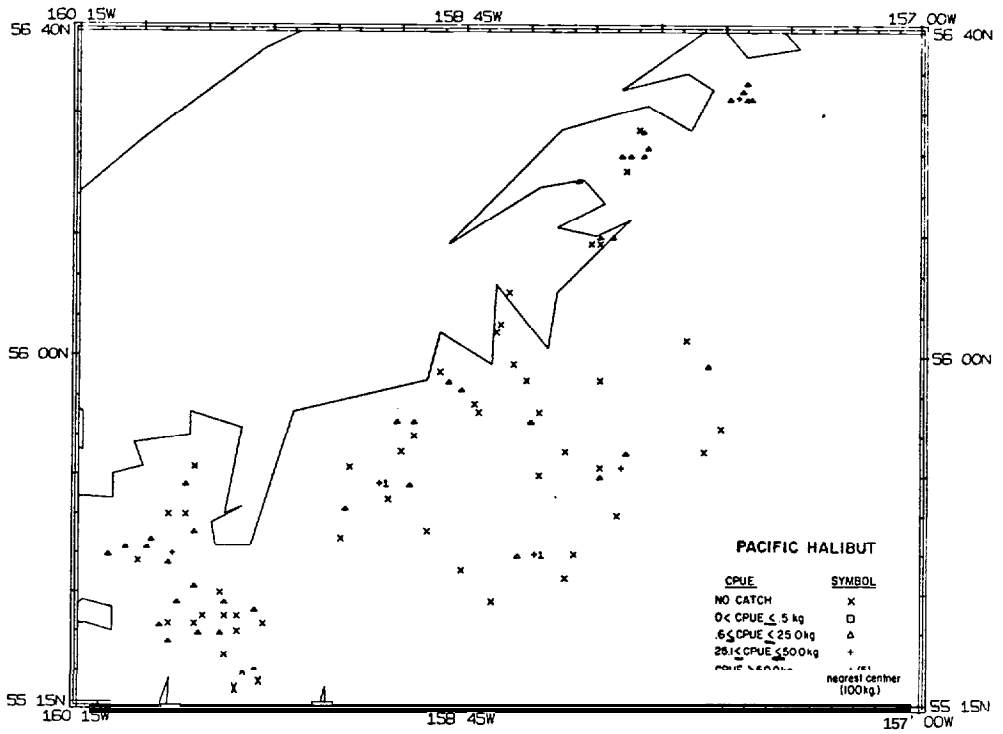


Figure XI-101.--Distribution of standardized catch rates in kg/hr of yellow Irish lord, Sept.-Oct. 1975 (Cruise 753).



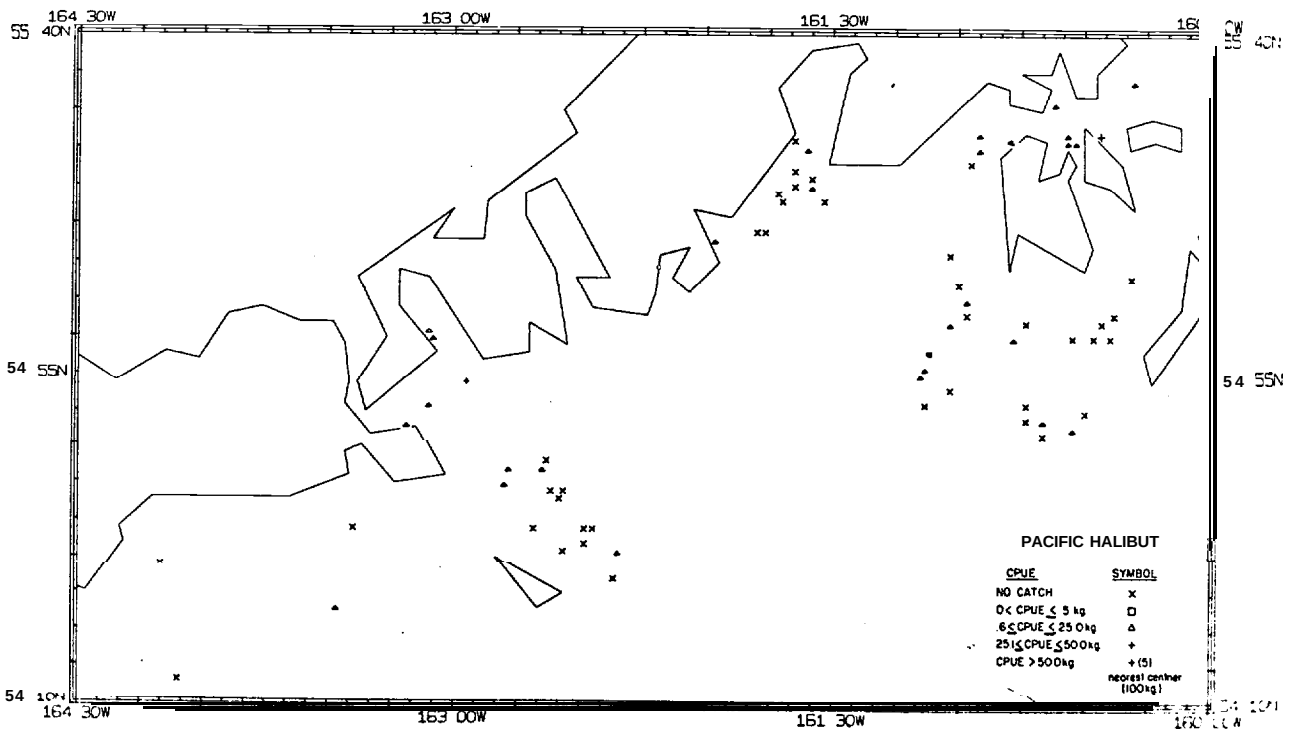
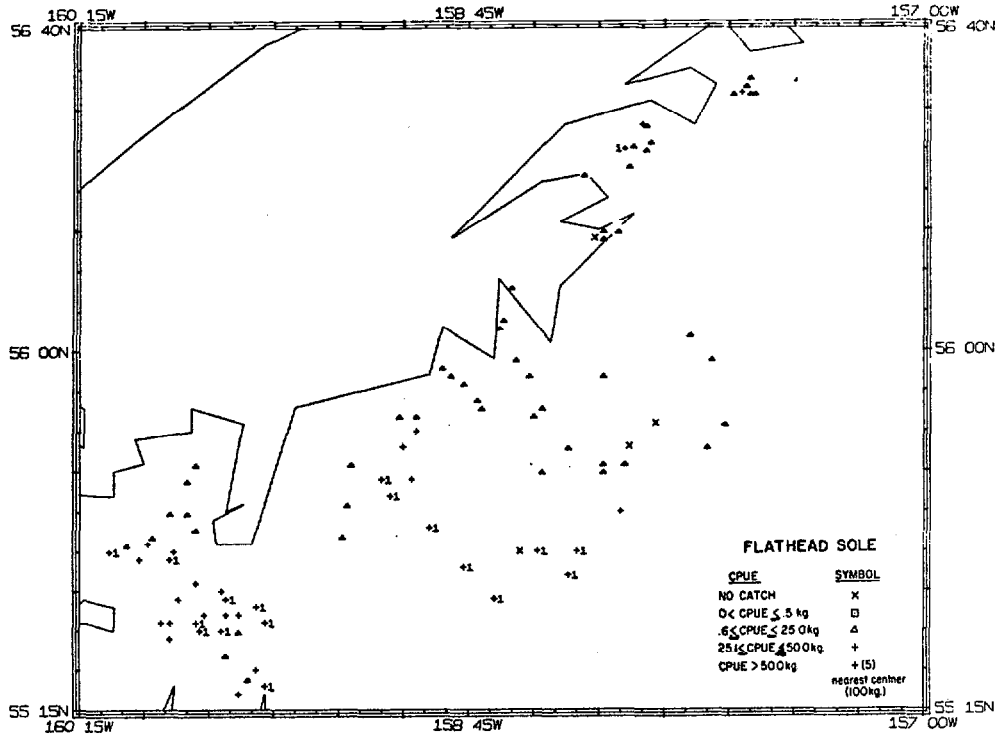


Figure XI-102.--Distribution of standardized catch rates in kg/hr of Pacific halibut, Sept.-act. 1975 (Cruise 753).



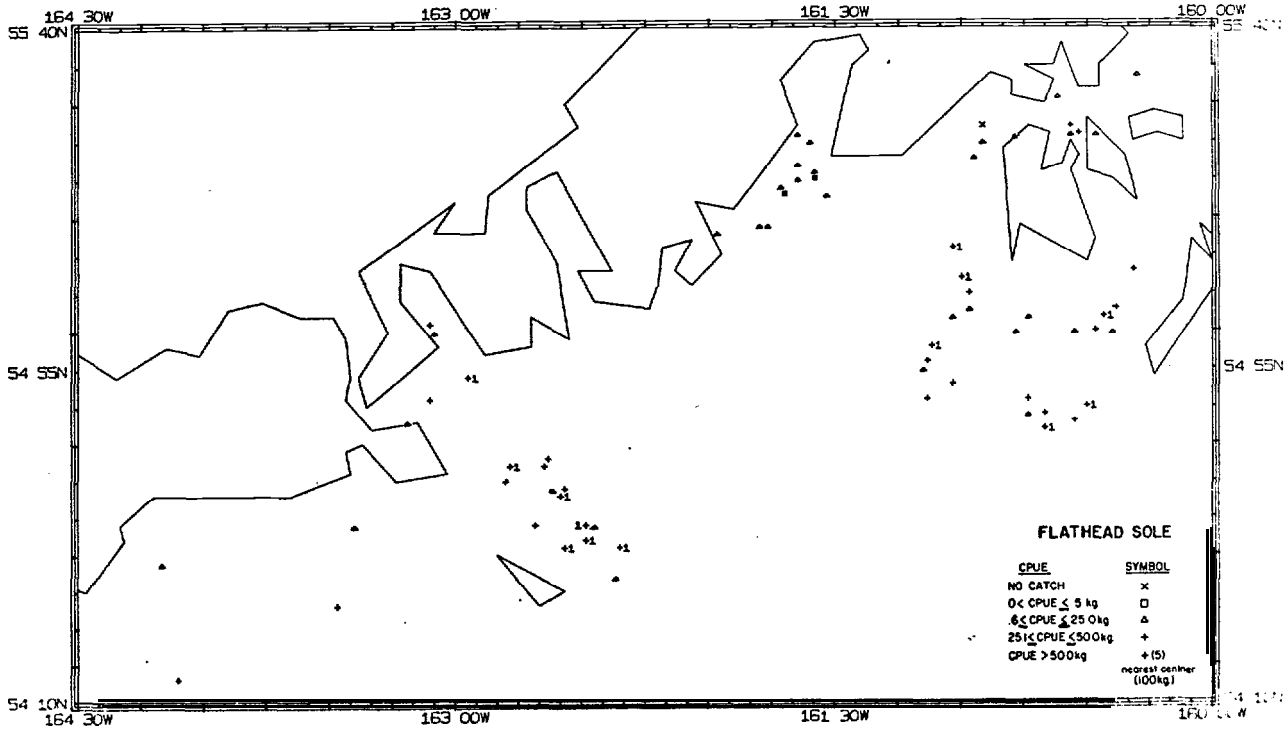


Figure X1-103.--Distribution of standardized catch rates in kg/hr of flathead sole, Sept.-Oct. 1975 (Cruise 753).

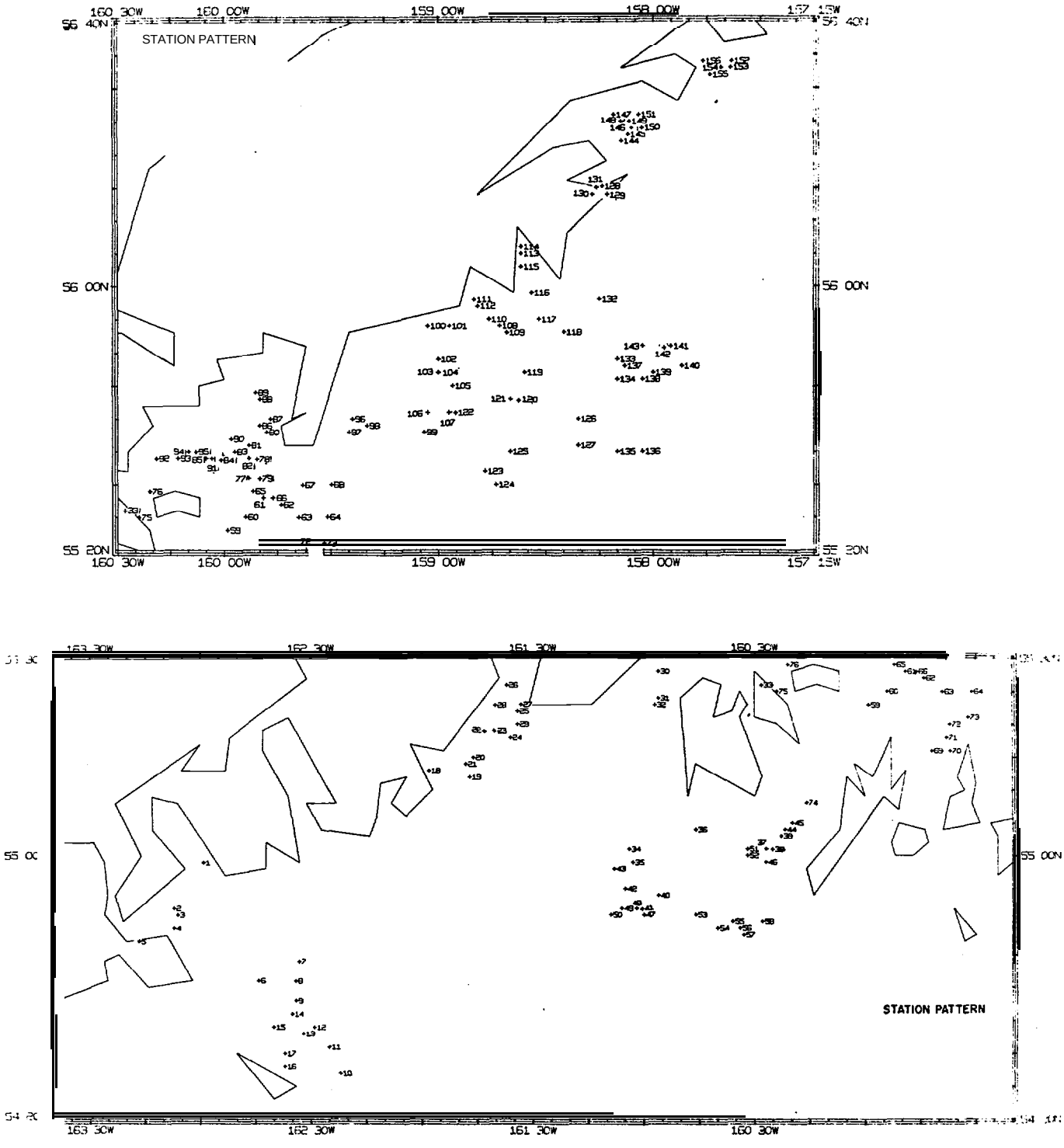


Figure XI-104.--Stations successfully trawled (shrimp trawl.) by the R/V Oregon, Sept.-Oct. 1976 (Cruise 763).

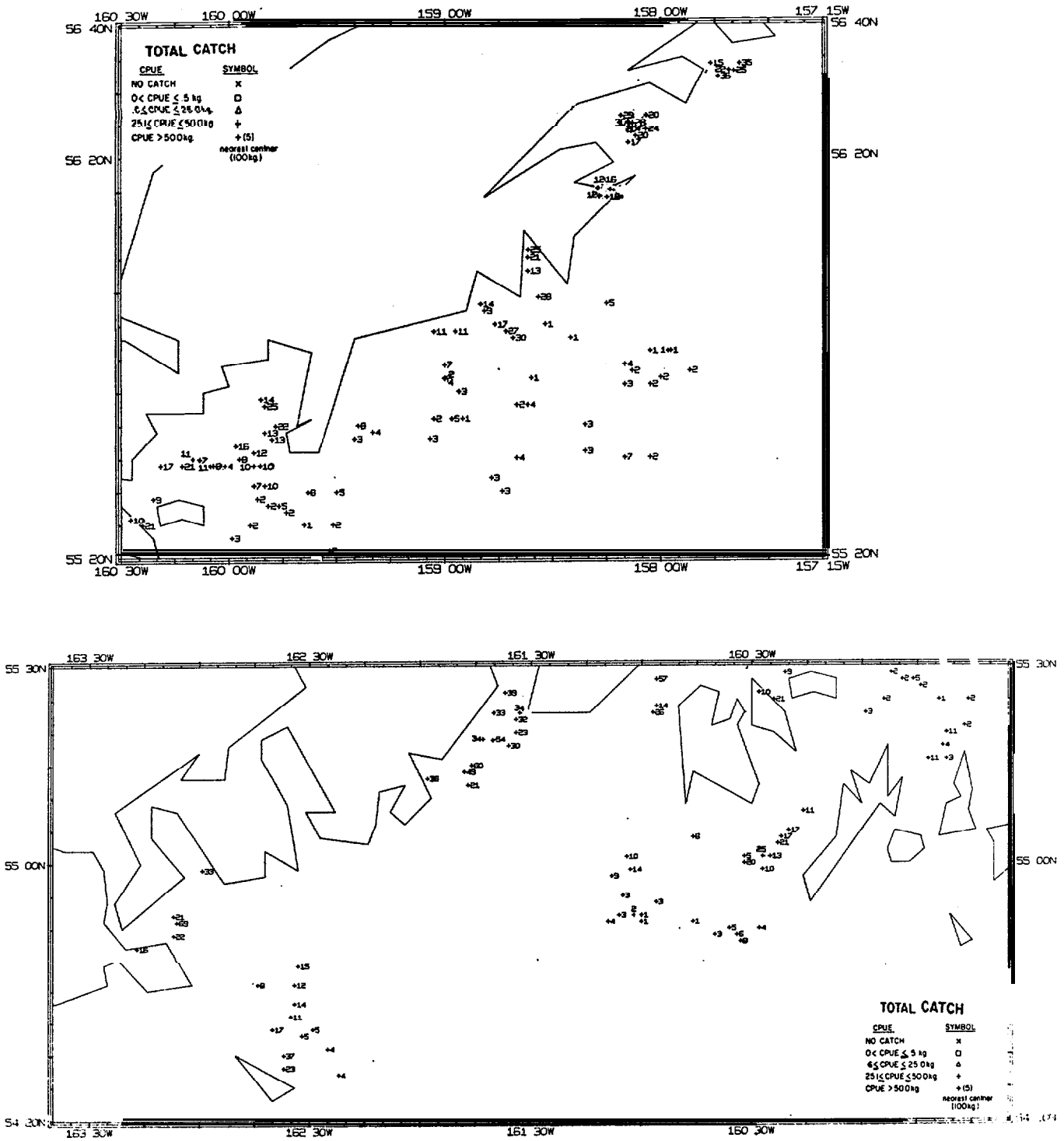


Figure X1-105.--Distribution of standardized catch rates in **kg/hr** of all species combined, Sept.-Oct. 1976 (Cruise 763).

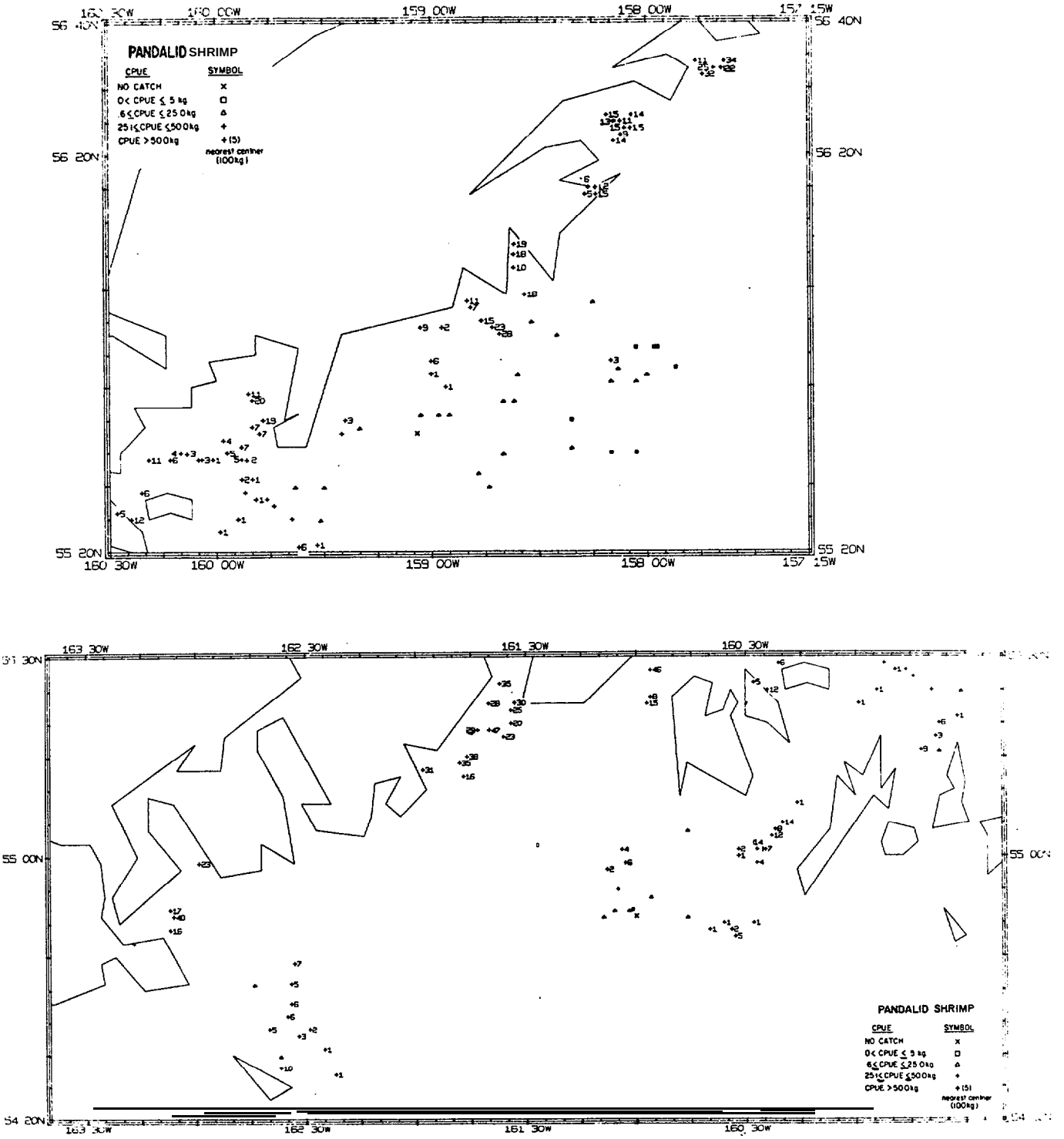
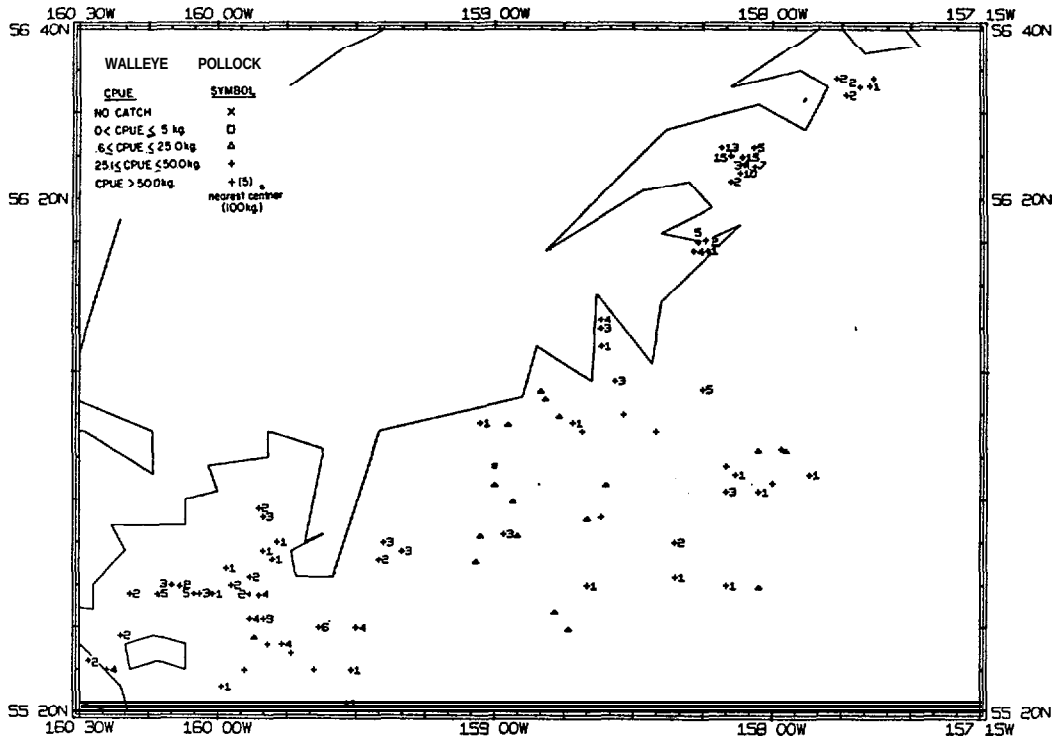


Figure X1-106.--Distribution of standardized catch rates in **kg/hr** of **pandalid** shrimp, Sept.-Oct. 1976 Cruise 763).

rates of 300 kg/hr or more of walleye pollock were made in Sanak Gully, Morzhovoi-Ikatan Bay, Pavlof Bay, Beaver Bay, south of Unga Island, Stepovak Bay, Korovin Strait, offshore from Nagai Island to Kujalik Bay, Kuiukla Bay, Castle Bay and Chignik Bay; Pacific cod in Stepovak Bay; Myoxocephalus sp. in Ikatan Bay; and yellow Irish lord in Kuiukla Bay (Figures X1-107-110). The distribution of the standardized catches for the remaining species which averaged 10 kg/hr or more are shown in Figures X1-111-119. Species having catch rates of more than 10 kg/hr and pandalid shrimps made up over 96% of the total catch in all 3 depth zones.



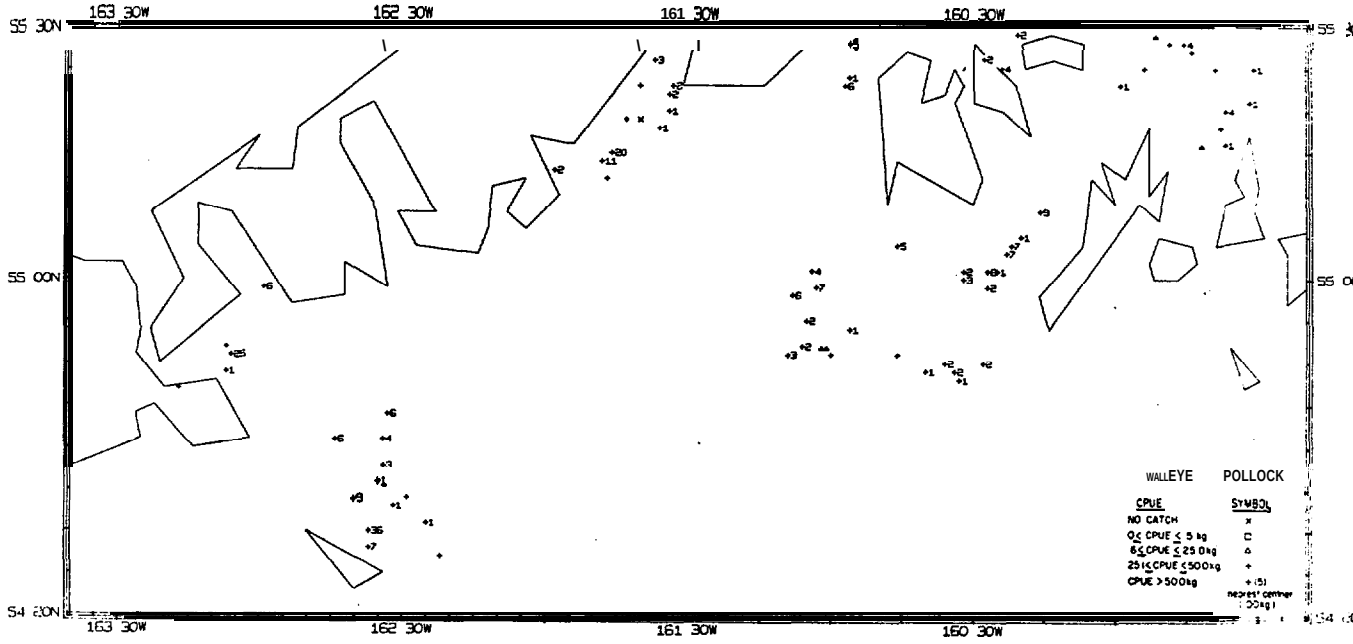


Figure X1-107.--Distribution of standardized catch rates in kg/hr of walleye pollock, Sept.-Oct. i976 (Cruise 763).

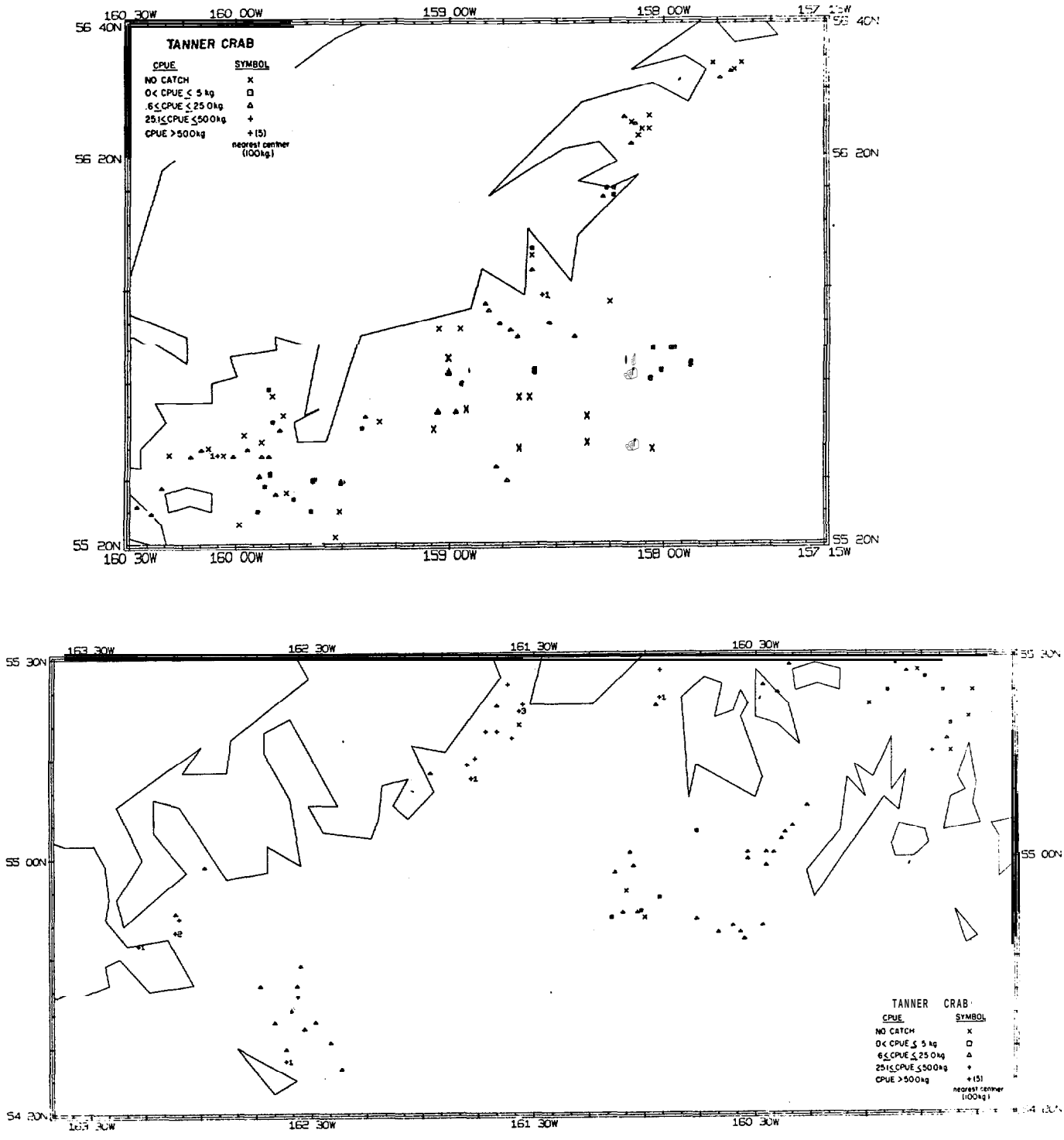
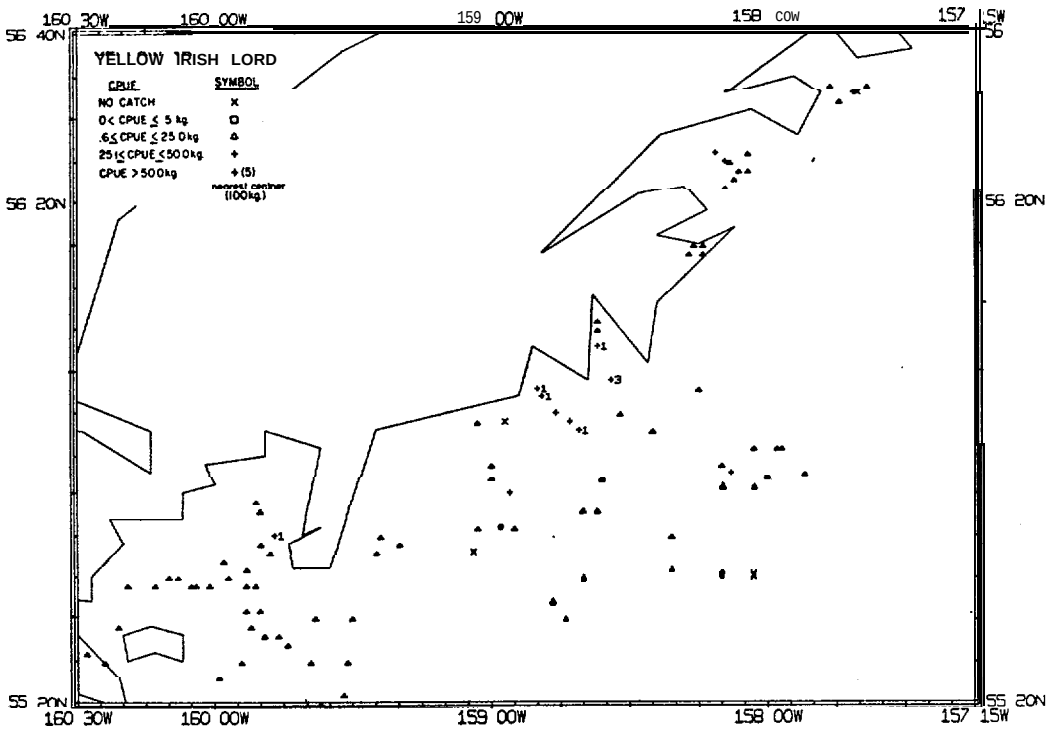


Figure X1-108.--Distribution of standardized catch rates in kg/hr of Tanner crab, Sept.-Oct. 1976 (Cruise 763).



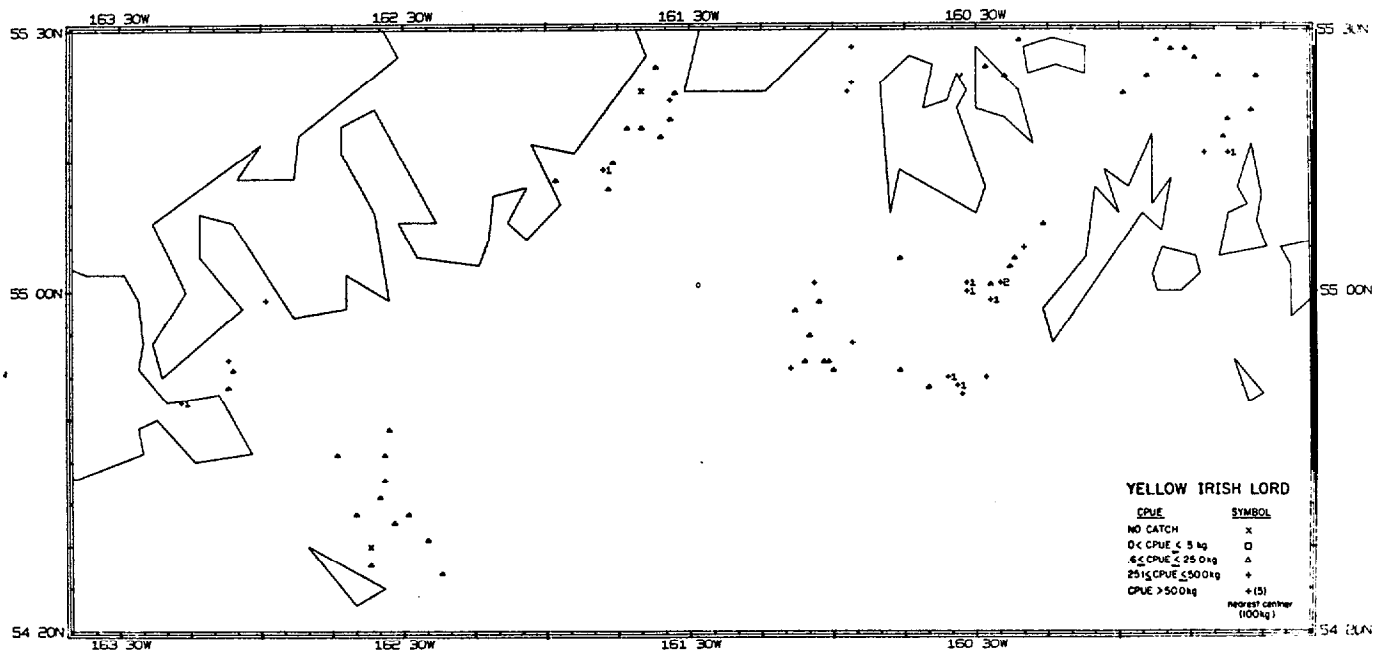


Figure X1-109.--**Distribution** of standardized catch rates in **kg/hr** of yellow Irish lord, Sept.-Oct. 1976 (Cruise 763).

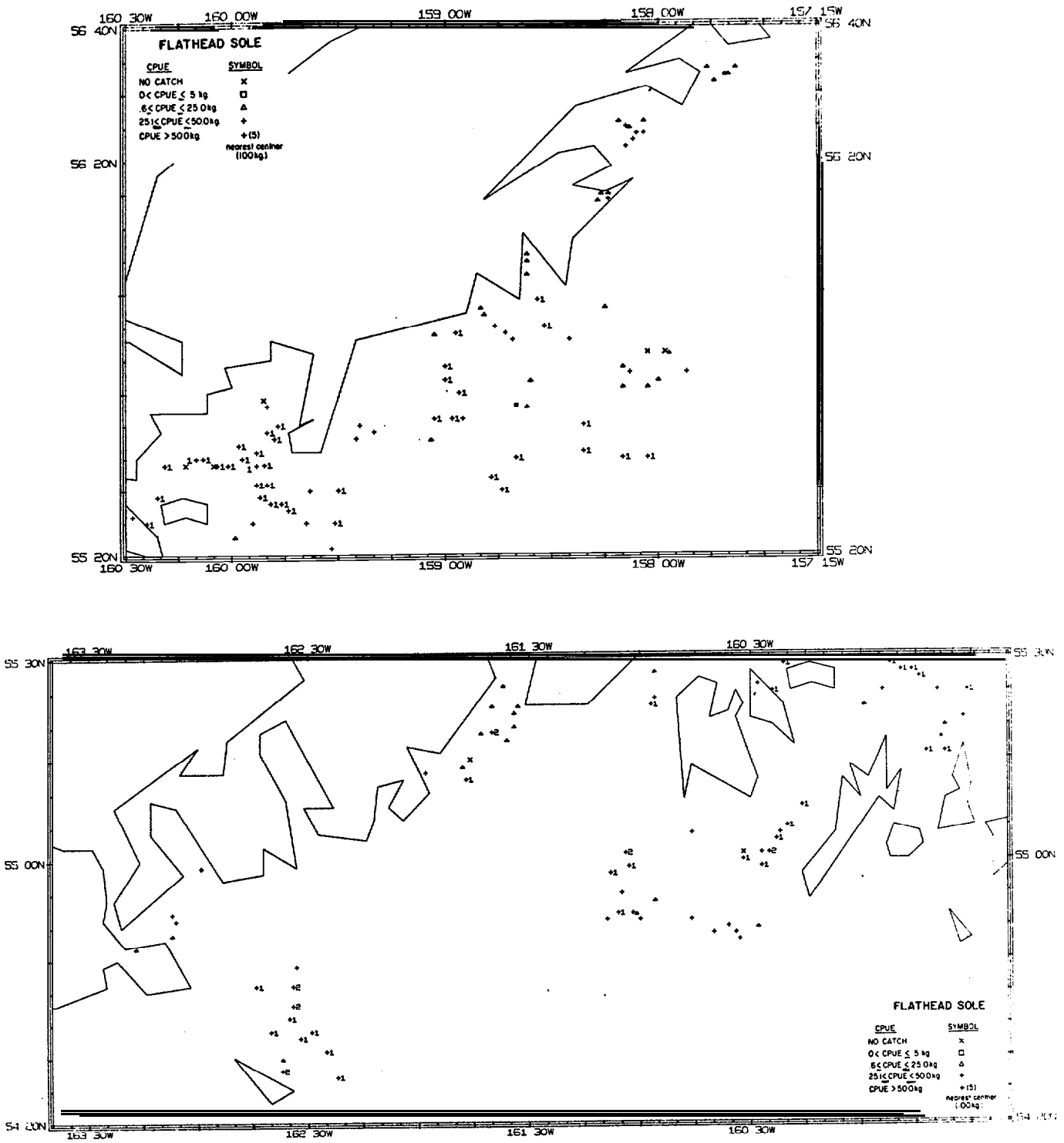
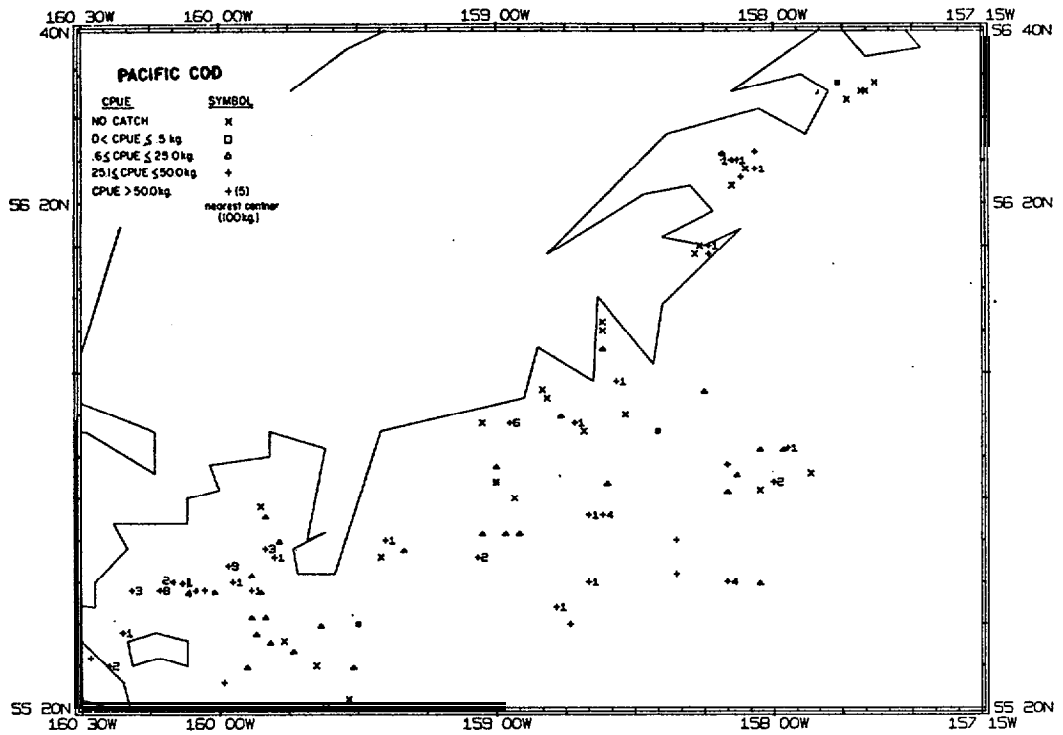


Figure X1-110.--Distribution of standardized catch rates in kg/hr of flathead sole, Sept.-Oct. 1976 (Cruise 763).



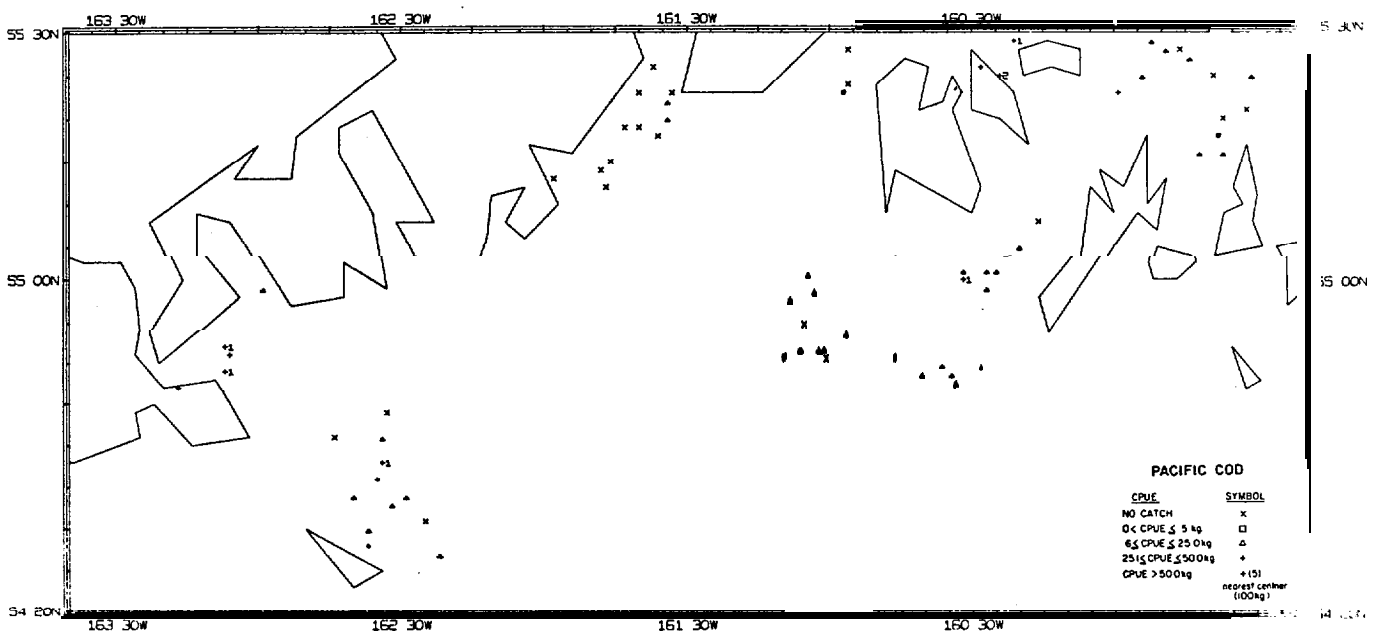


Figure XI-111.--Distribution of standardized catch rates in kg/hr of Pacific cod, Sept.-Oct. 1976 (Cruise 763).

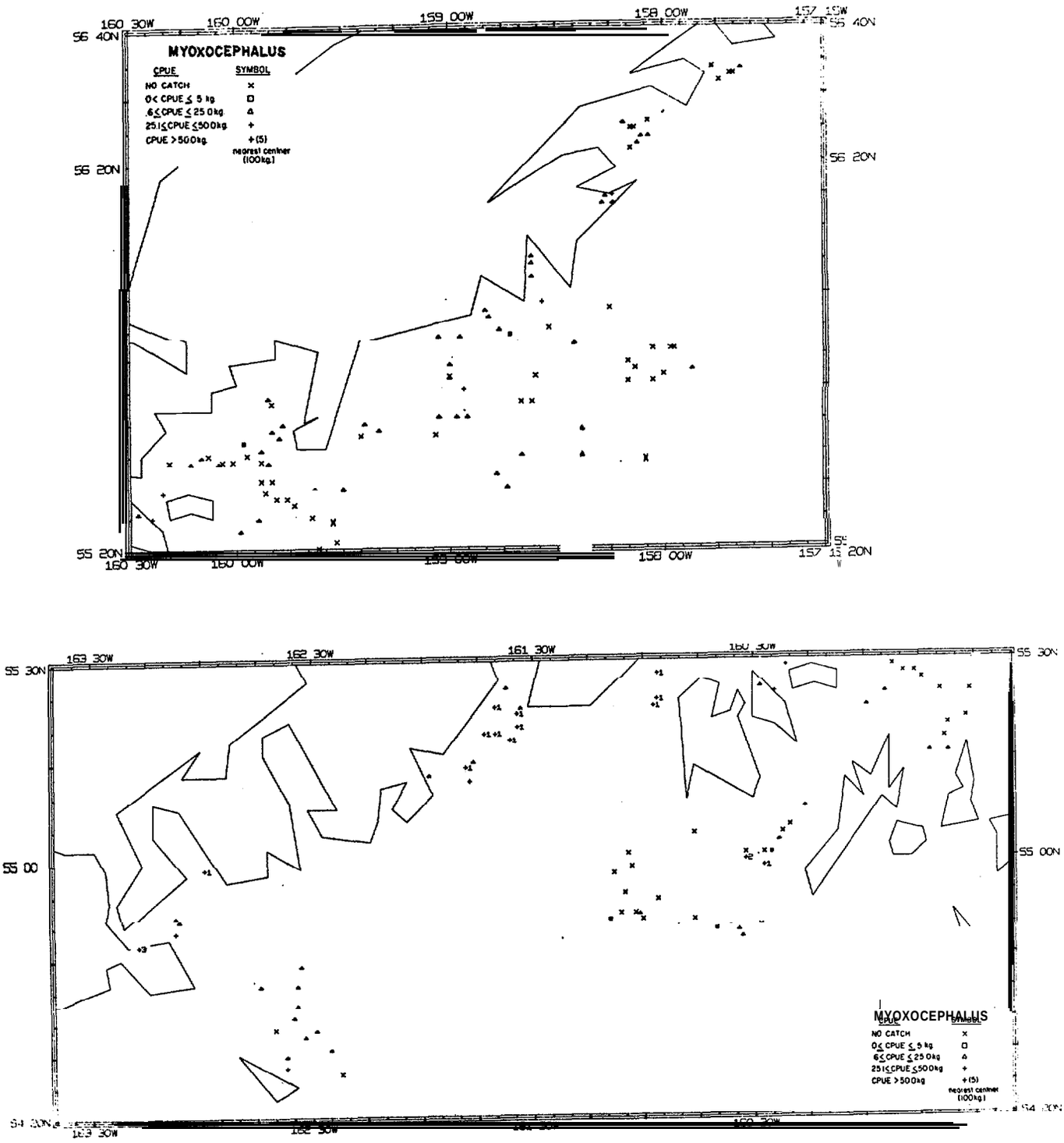
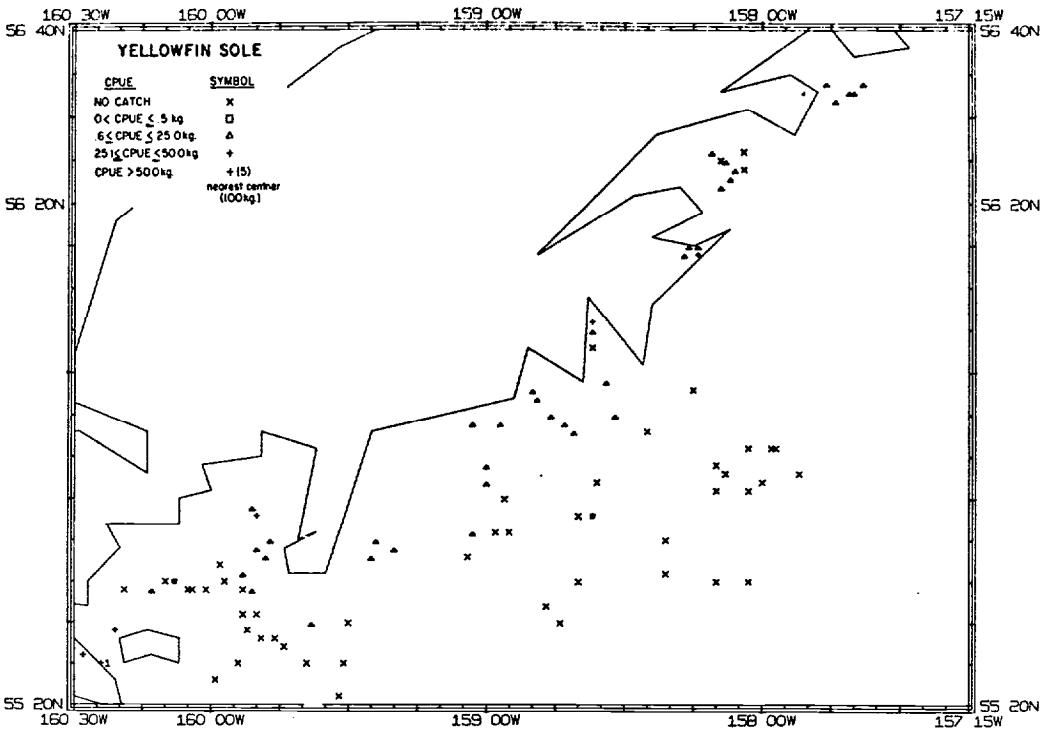


Figure X1-112,--Distribution of standardized catch rates in **kg/hr** of **Myoxocephalus** sp., Sept.-Oct. 1976 (Cruise 763).



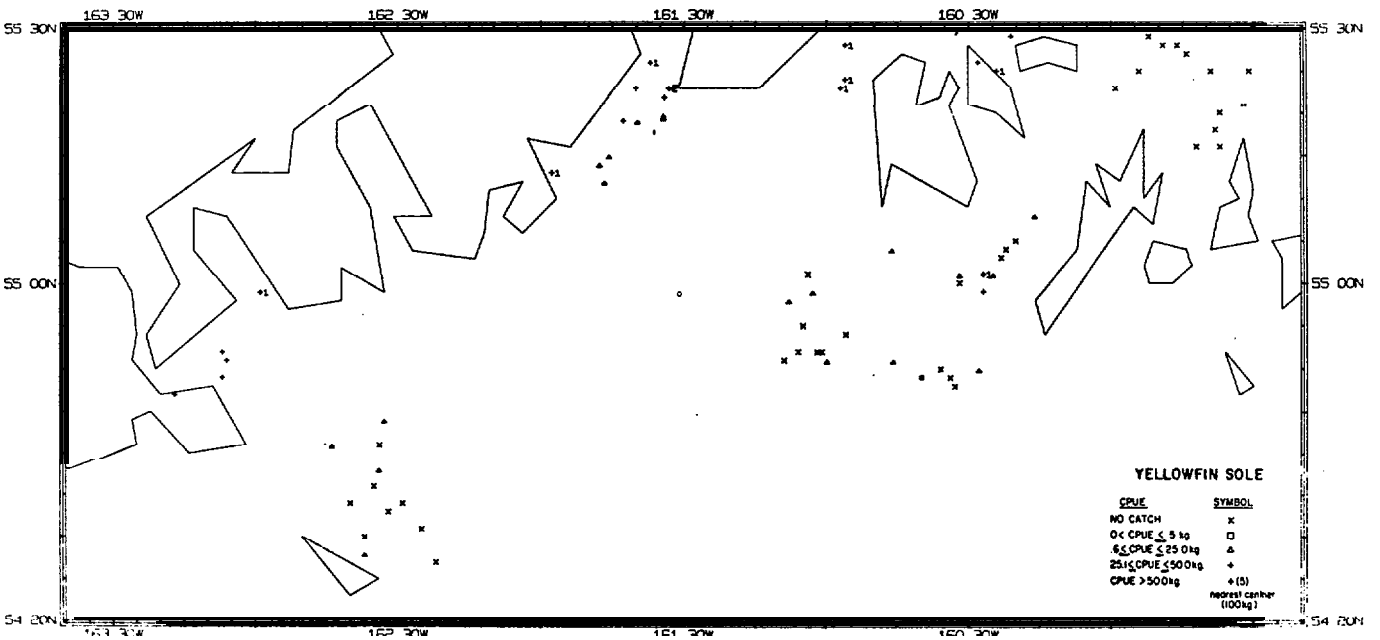
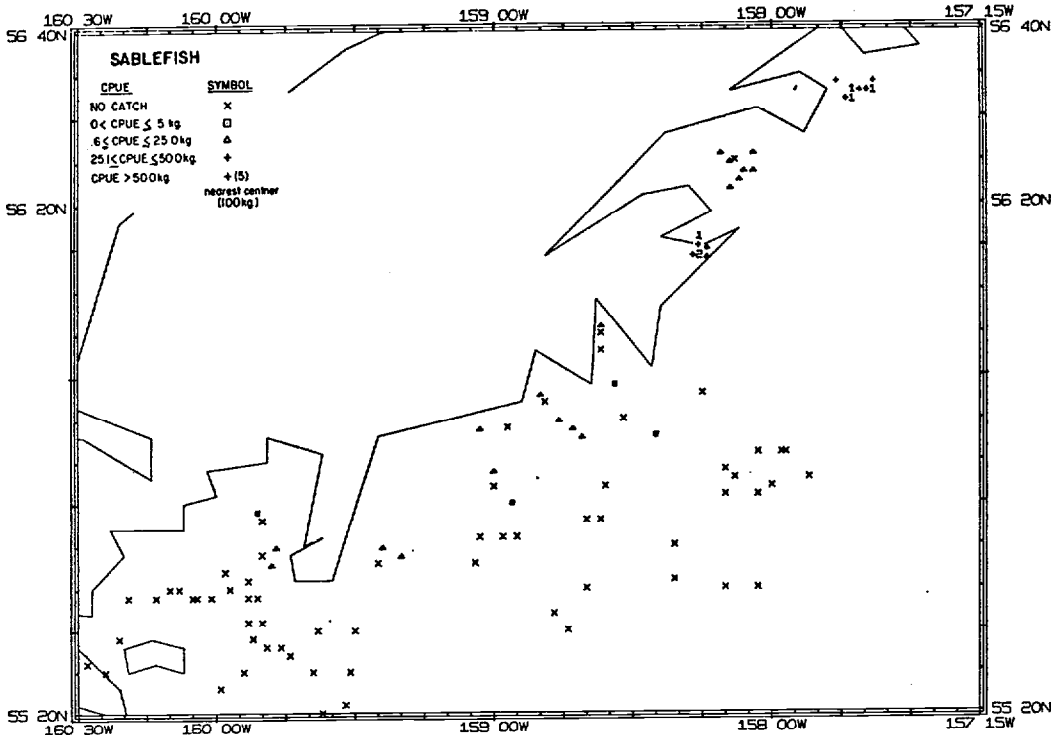


Figure X1-113.--Distribution of standardized catch rates in kg/hr of yellowfin sole, Sept.-Oct. 1976 (Cruise 763).



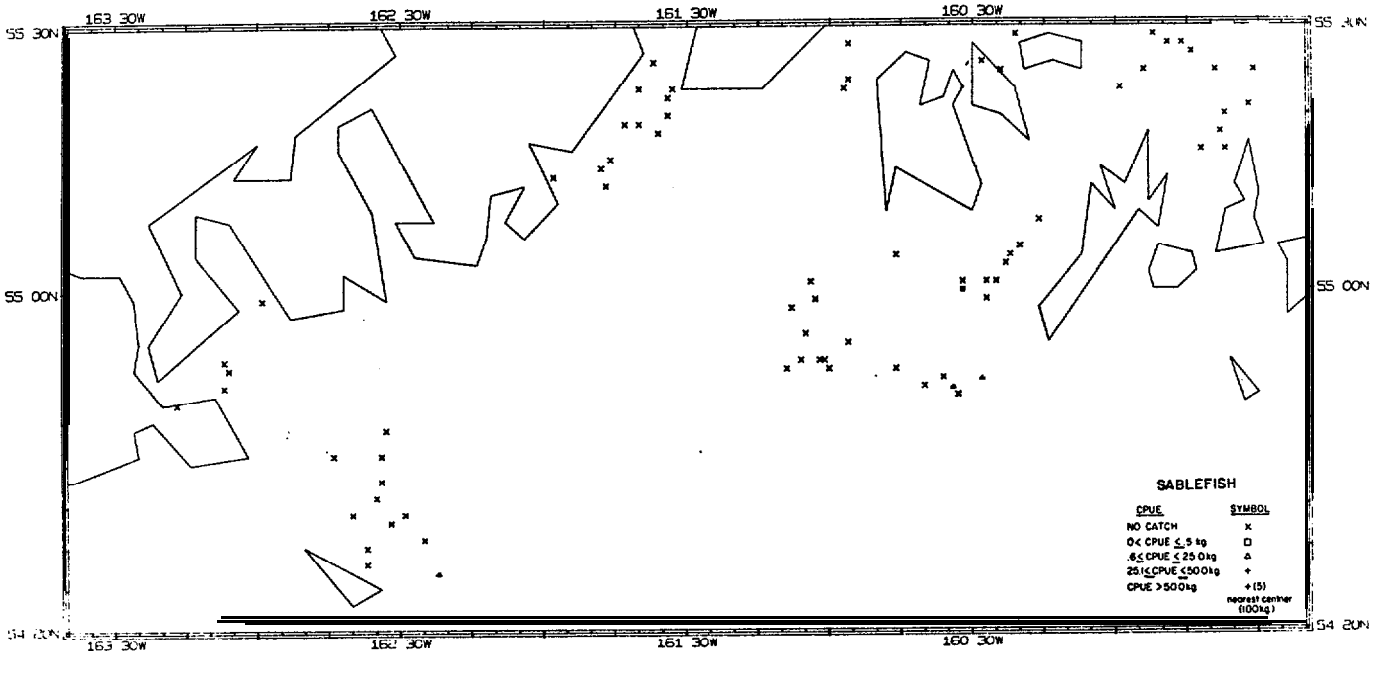
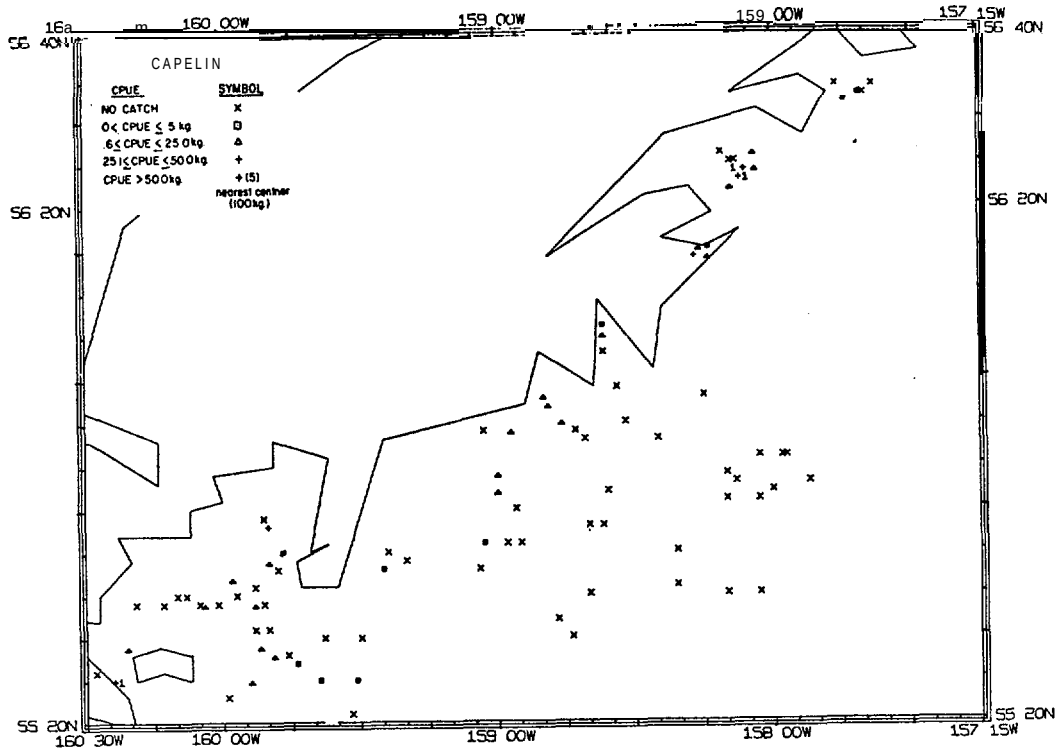
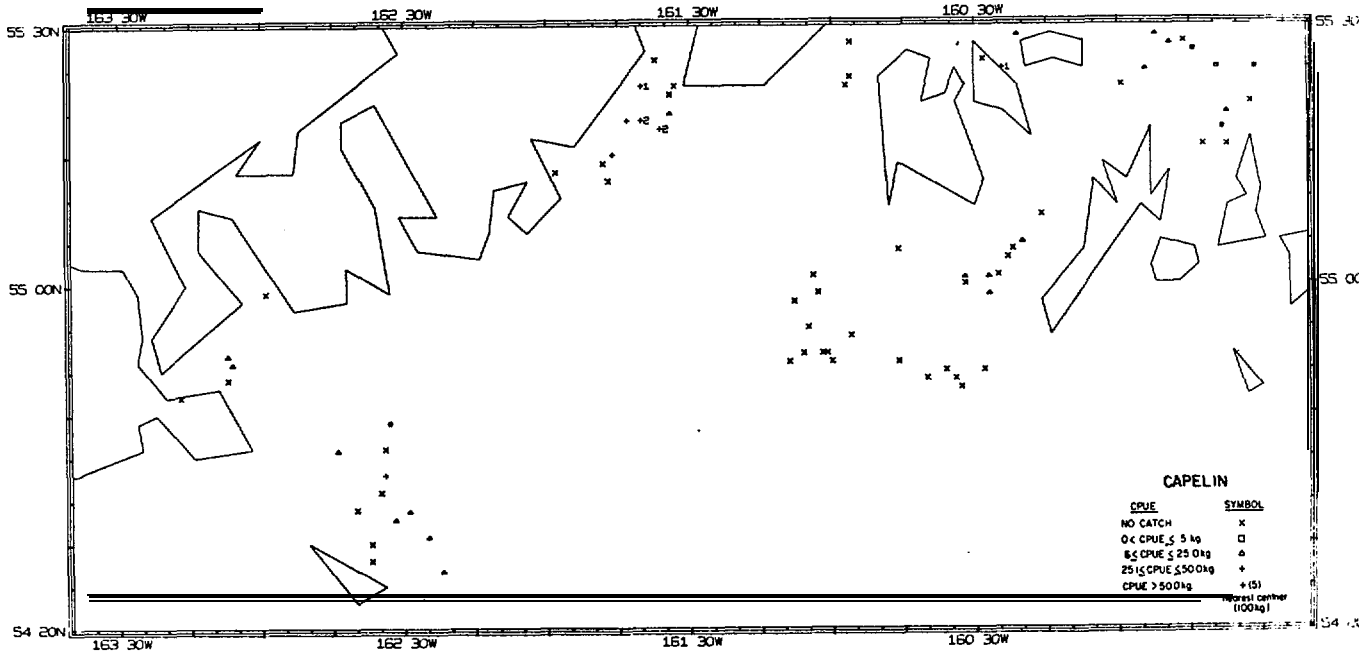
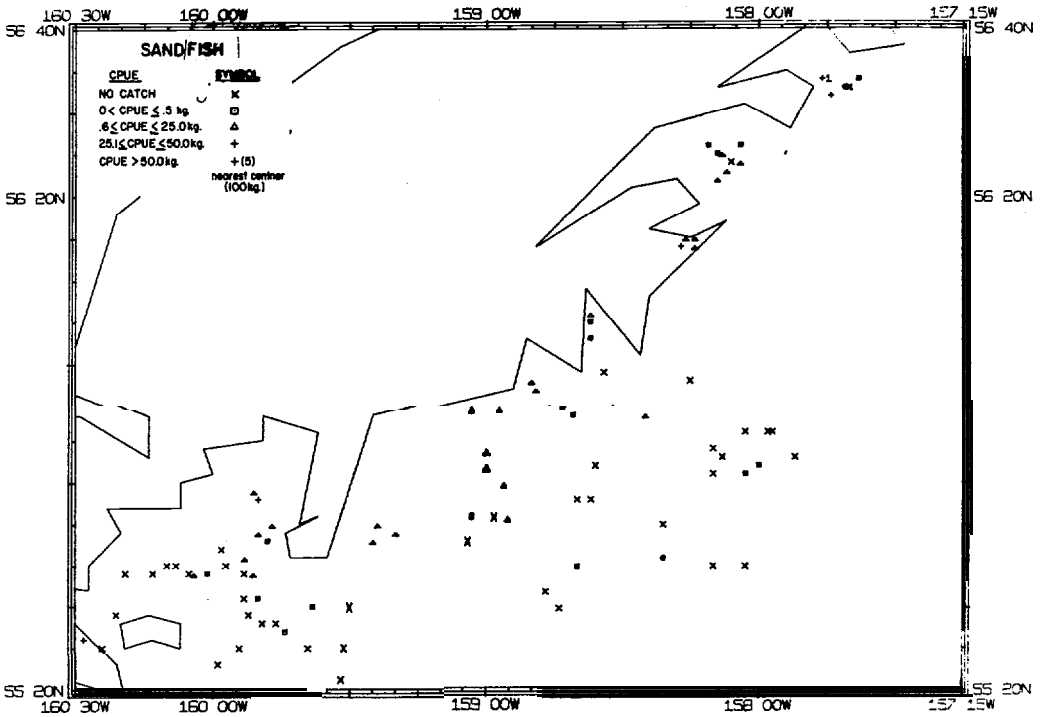


Figure X1-114.--Distribution of standardized catch rates in **kg/hr** of sablefish, Sept.-Oct. 1976 (Cruise 763).





Eigure X1-115.--Distribution of standardized catch rates in **kg/hr** of capelin, Sept.-Oct. **1976** (Cruise 763).



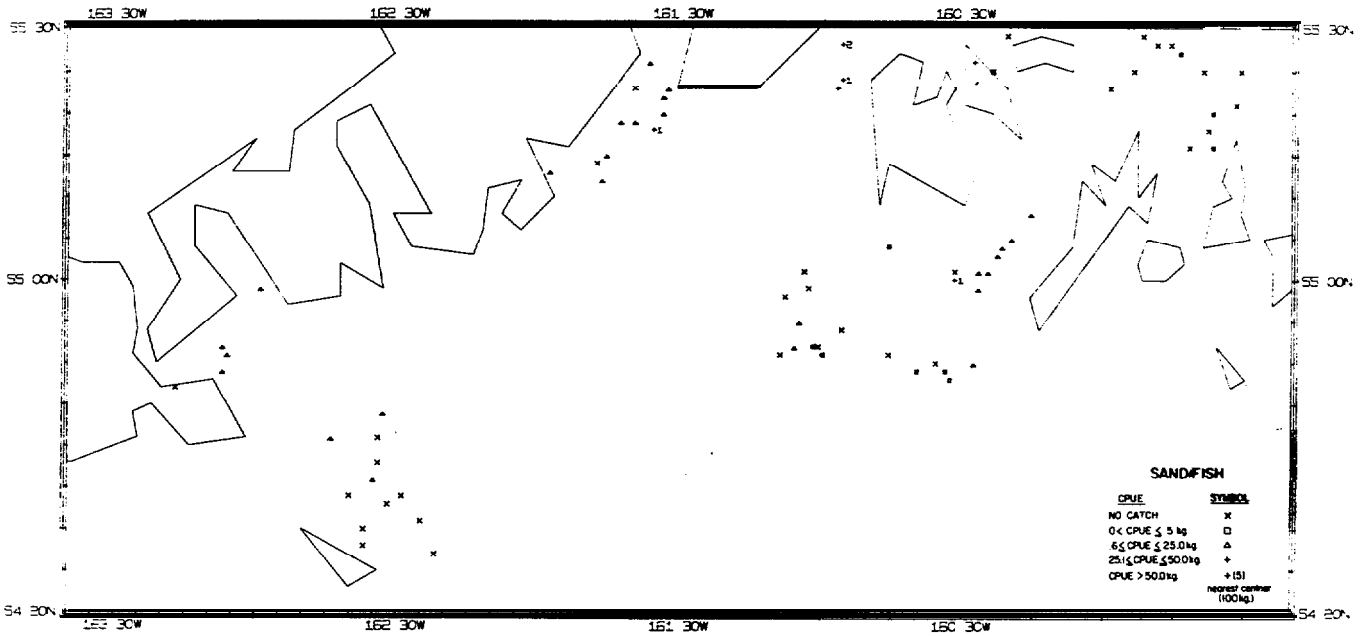
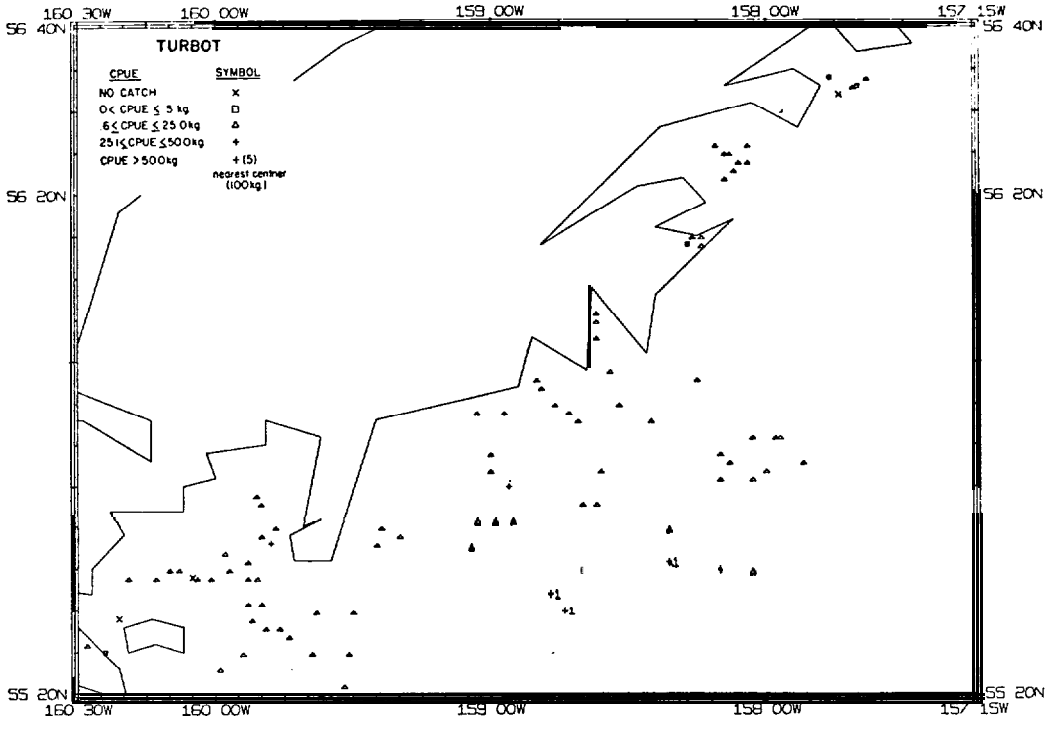


Figure XI-116.--Distribution of standardized catch rates in **kg/hr** of sandfish, Sept.-Oct. 1976 (Cruise 763).



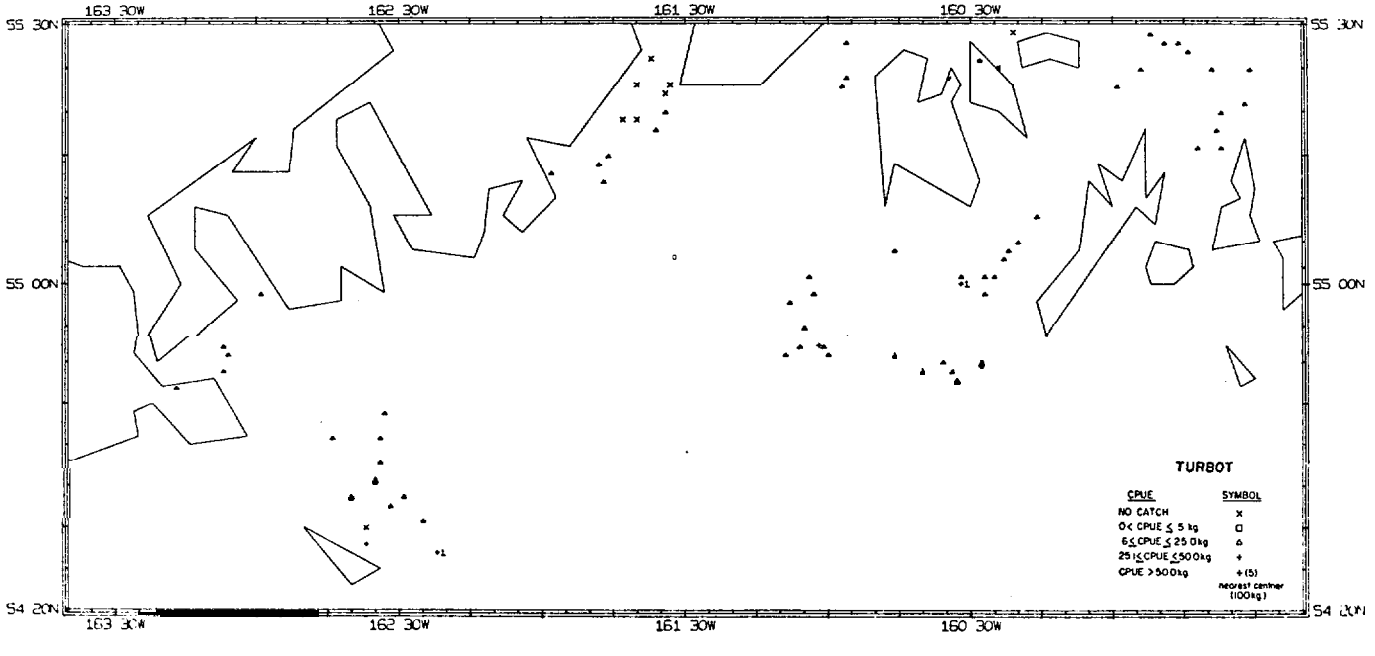


Figure X1-117.--Distribution of standardized catch rates in kg/hr of turbot, Sept.-Oct. 1976 (Cruise 763).

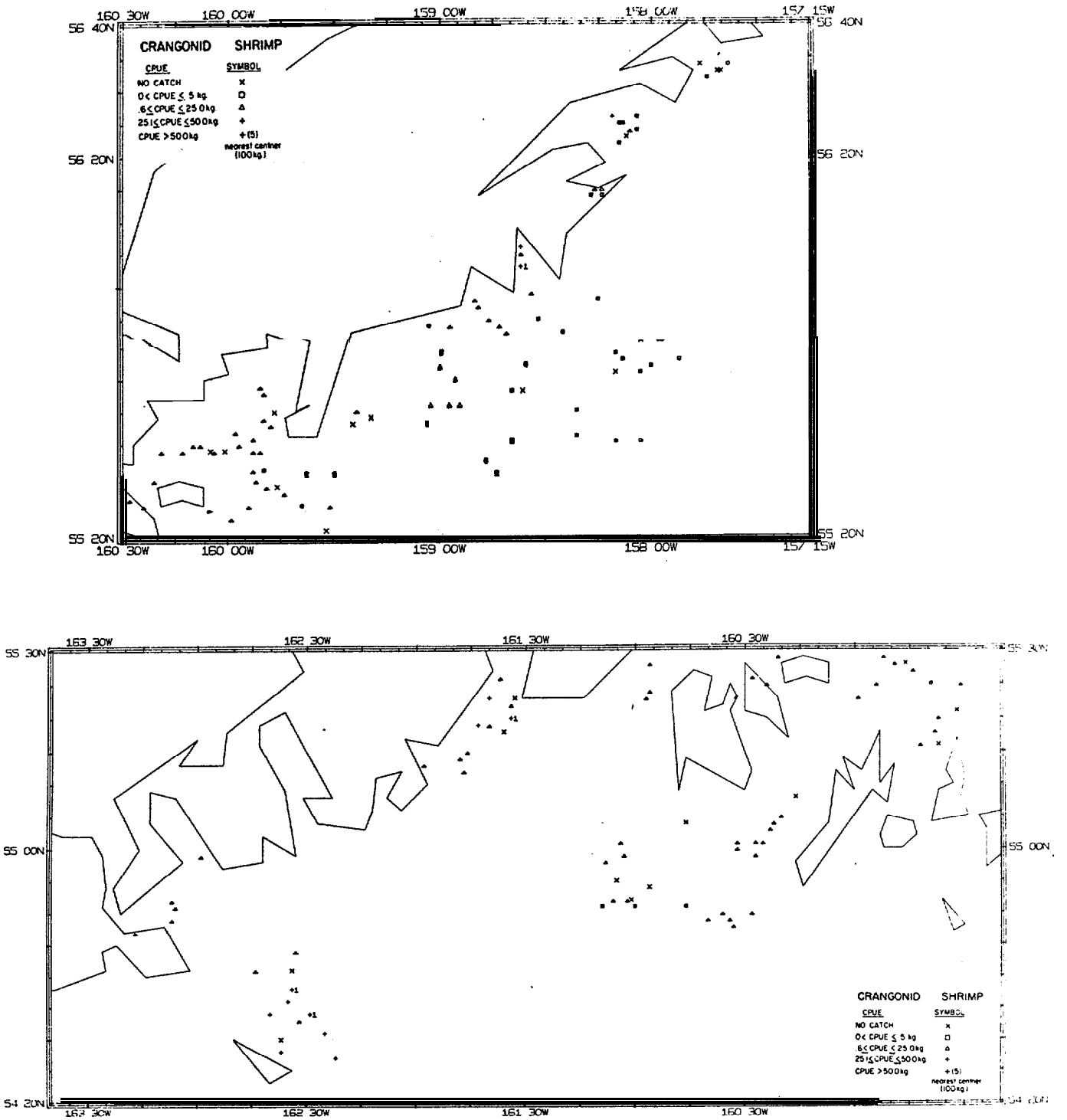
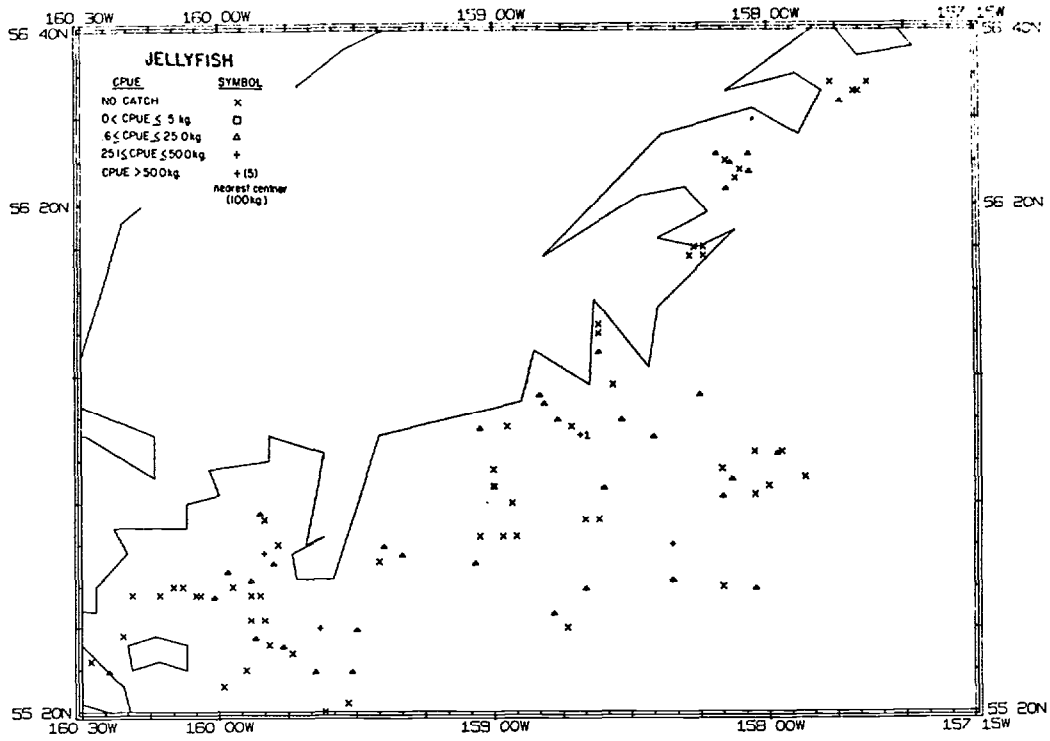


Figure X1-118.--Distribution of standardized catch rates in kg/hr of crangonid shrimp, Sept.-Oct. 1976 (Cruise 763).



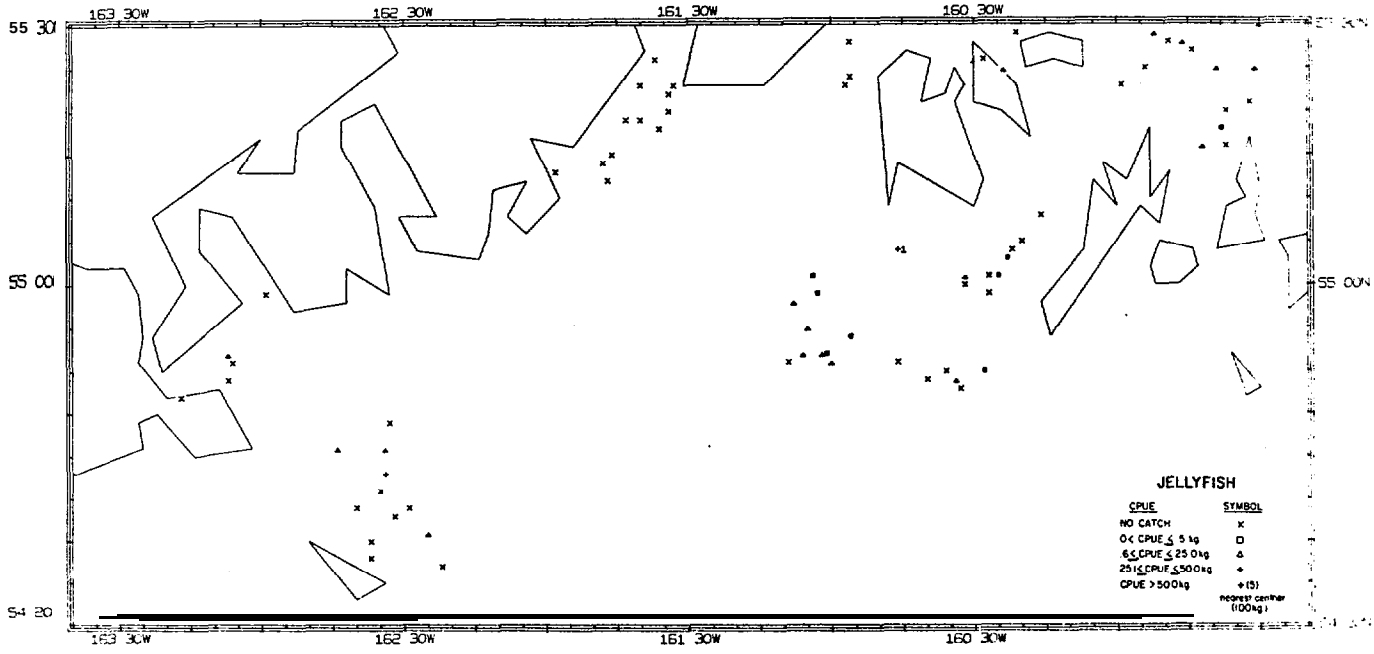


Figure X1-119.--Distribution of standardized catch rates in **kg/hr** of jellyfish, Sept.-Oct. 1976 (Cruise 763).

2. Demersal Resource Assessment Surveys

a. Cruises 052, 611, 618, R/V John N. Cobb and Chartered fishing vessels Tordenskjold, Morning Star, St. Michael and Arthur H. (May-October 1961)

During these surveys, 555 stations were successfully sampled in the Gulf of Alaska (Table X1-7). With the exception of the Kenai and Prince William regions- sampling densities were generally high, averaging one station per 397 km^2 over the entire Gulf. No sampling occurred in the Kenai inner shelf and only one successful station was completed in the Kenai upper slope and Shelikof inner shelf. Station numbers and positions for the successful tows are shown in Figures X1-120-123. Fish and commercially important invertebrate taxa encountered during these surveys are listed in Tables V-3-4).

TOTAL BIOMASS

The total apparent biomass available during this survey period was estimated at 1,969 thousand metric tons, of which 32% was located in the inner shelf, 50% in the outer shelf, and 18% in the upper slope depth zones (Table X1-8). Regions containing the largest percentages of the total biomass were Chirikof (21%), Fairweather (17%), Kodiak (15%), and Kenai (14%).

Biomass densities for the entire Gulf of Alaska averaged 8.9 mt/km^2 with the highest density occurring in the Fairweather region (20.4 mt/km^2), and ranging from 2.5 to 11.4 mt/km^2 in the remaining regions. By depth zones, the biomass density increased with depth with the highest density occurring in the upper slope (10.0 mt/km^2) followed by the outer shelf (9.4 mt/km^2) and inner shelf (8.0 mt/km^{-2}). The distribution of the standardized catch rates for all species combined are presented in Figures X1-124-127 and the relative apparent abundance in Figures X1-128-129.

RELATIVE IMPORTANCE OF SPECIES GROUPS

Over the entire Gulf of Alaska, the combined fish species accounted for nearly 70% of the total biomass. In the upper slope and outer shelf depth zones, fish constituted over 75% of the total biomass which decreased to 55% in the inner shelf. The flatfish species group made up the largest percentage of the total biomass (38%) followed in magnitude by the invertebrates (31%), roundfishes (22%), rockfishes (8%) and elasmobranchs (2%) (Table X1-9).

Of the total estimated flatfish biomass of 751 thousand mt, 48% occurred in the outer shelf depth zone while the inner shelf held 30% and the upper slope 22% (Table X1-10). The flatfish group was the most important constituent to the total biomass in the upper slope (47%) and outer shelf (37%) and was the second most important group in the inner shelf depth zone (35%). Three regions. Fairweather, Chirikof and Kodiak contained 59%

Table XI-7.--Number of stations successfully trawled and sampling densities 1/ of regions and depth tones In the Gulf of Alaska during May-October 1961 (Cruises 611, 052, and 618).

	DEPTH ZONES (M)											
	0-100			101-200			201-400			0-400		
Region	No. of stations	Area (km^2)	Sampling density	No. of stations	Area (km2)	Sampling density	No. of stations	Area (km2)	Sampling density	No. of stations	Area (km^2)	Sampli densit
Fairweather	9	2,566	285		11,617	374	8	2,144	268	48	16,327	340
Yakutat	14	4,418	316	3:	10,430	282	15	4,894	326	66	19,742	299
Prince William	7	7,885	1,126	15	8,990	599	3	2,600	867	25	19,475	779
Kenai	0	--	--	8	20,829	2,604	1	8,139	8,139	9	28,968	3,218
Kodiak	24	16,350	681	42	11,785	281	2	1,701	851	68	29,836	439
Sheli kof	1	3,759	3,759	28	5,574	199	44	6,287	143	73	15,620	214
Chiri kof	26	17.321	666	28	12,210	436	33	7,463	226	87	36.994	425
Shumagin	21	13,569	646	77	12,972	168	6	1,670	278	104	28,211	271
Sanak	37	12,773	345	33	11,607	352	5	888	178	75	25,268	337
Total	139	78,641	565	299	106,014	355	117	35,786	306	555	220,440	397

1/ Sampling density = $\frac{\text{No. of km}^2}{\text{No. of stations}}$

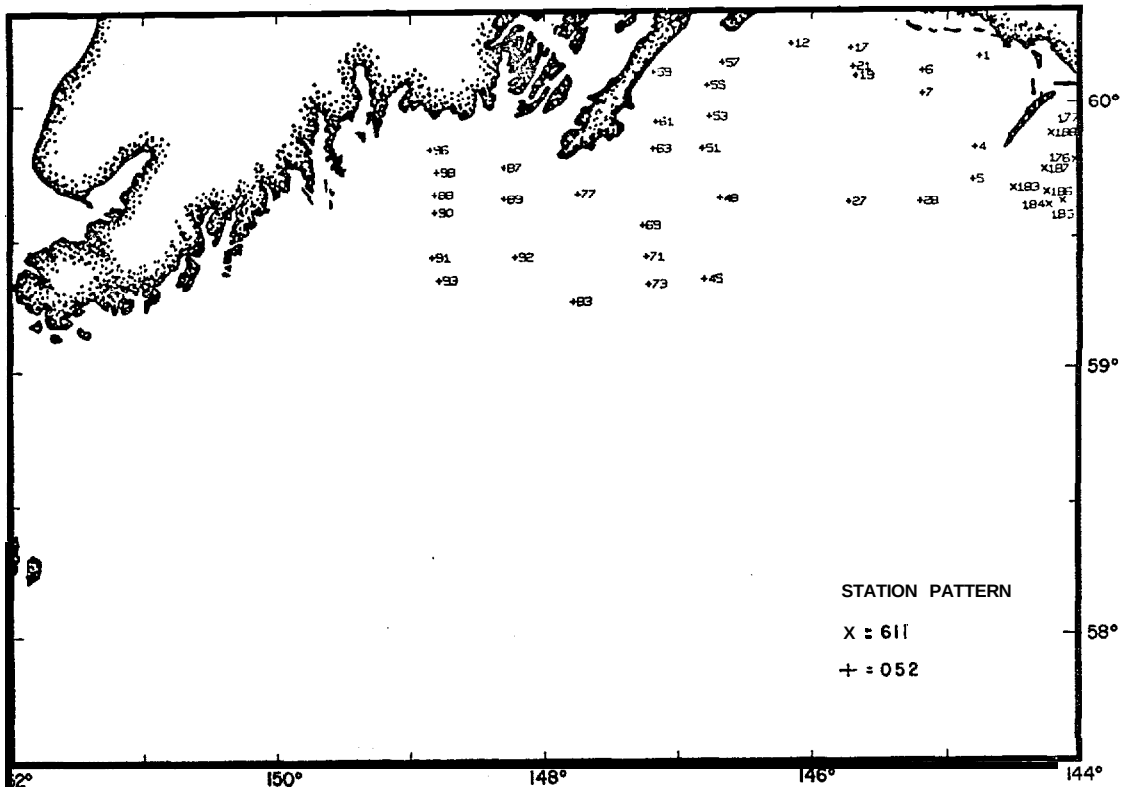


Figure X1-120. --Stations successfully trawled .(otter trawl) during cruises 611-052, June-Oct. 1961.

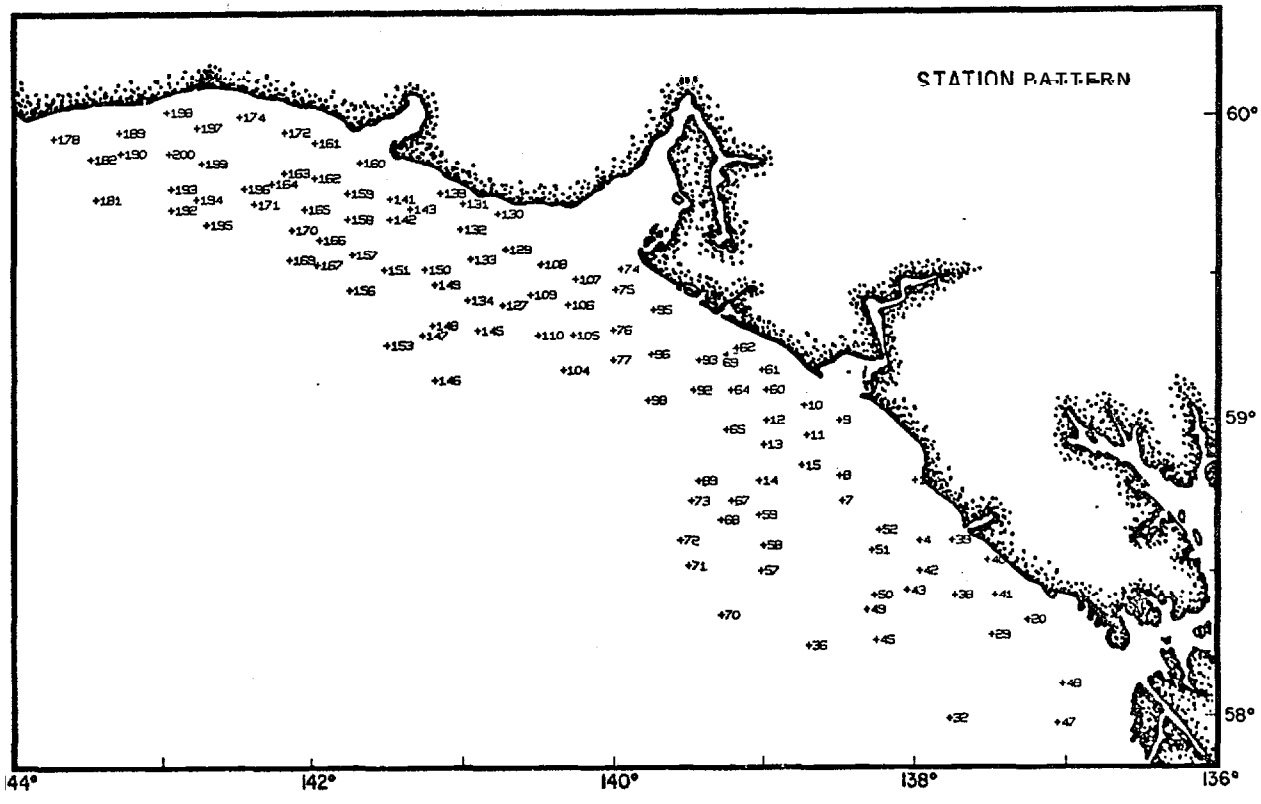
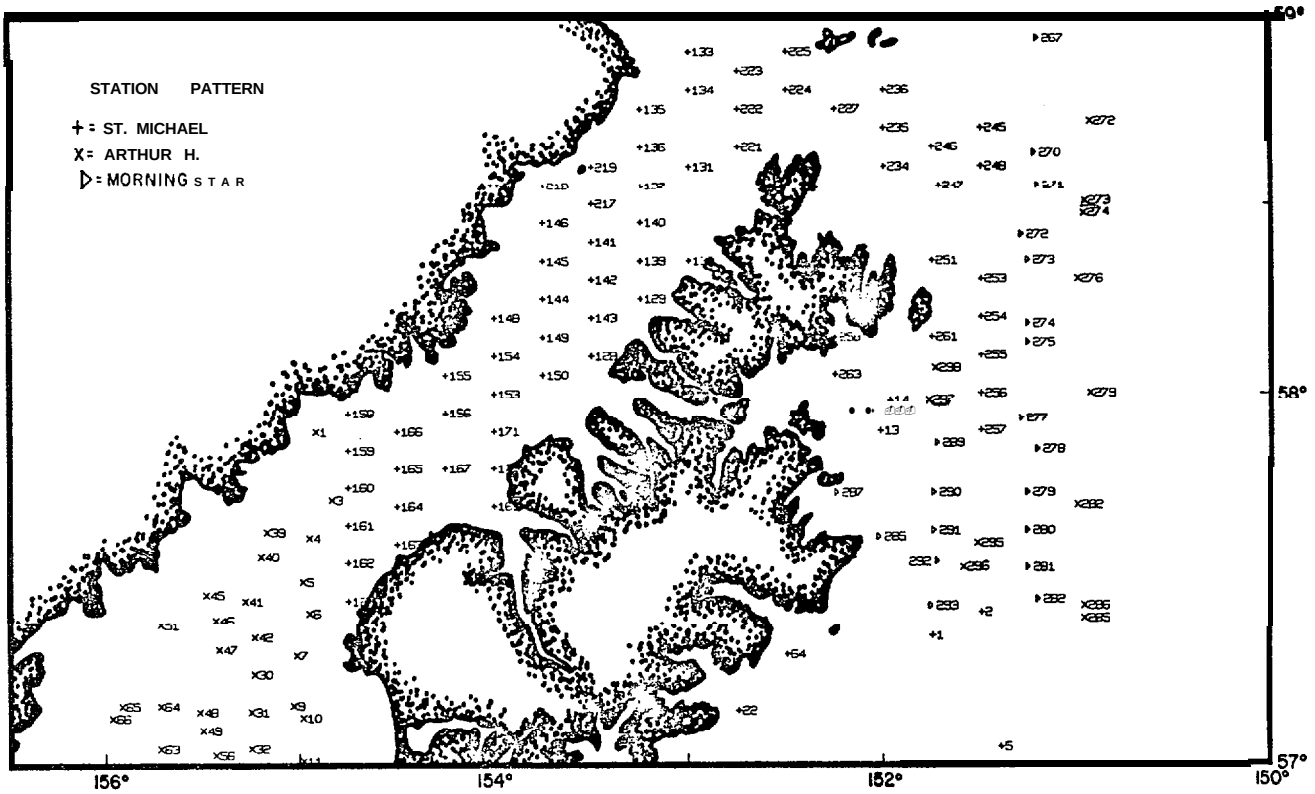


Figure X1-121. --Stations successfully trawled {otter trawl) during cruise 611, June-Sept. 1961.



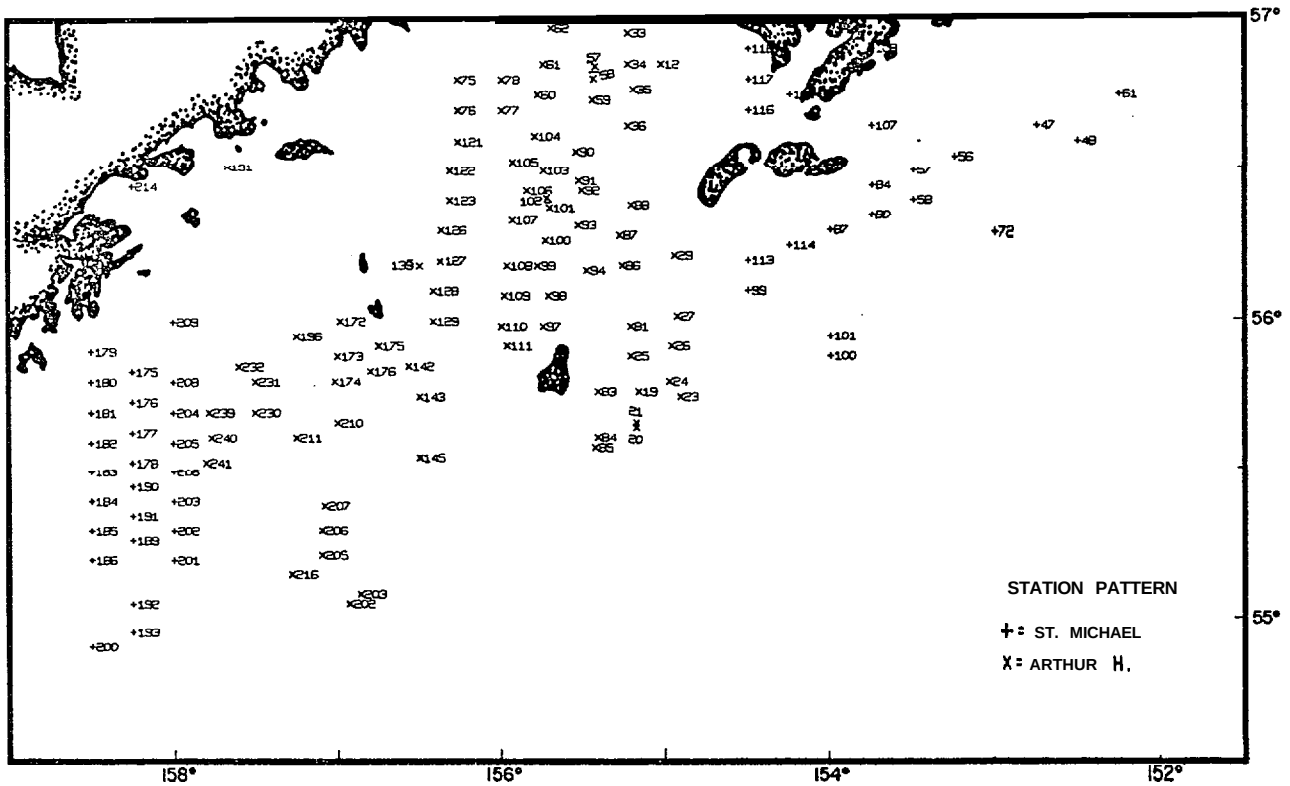


Figure xX-122. --Stations successfully trawled (otter trawl) during cruise 618, Play-July 1961.

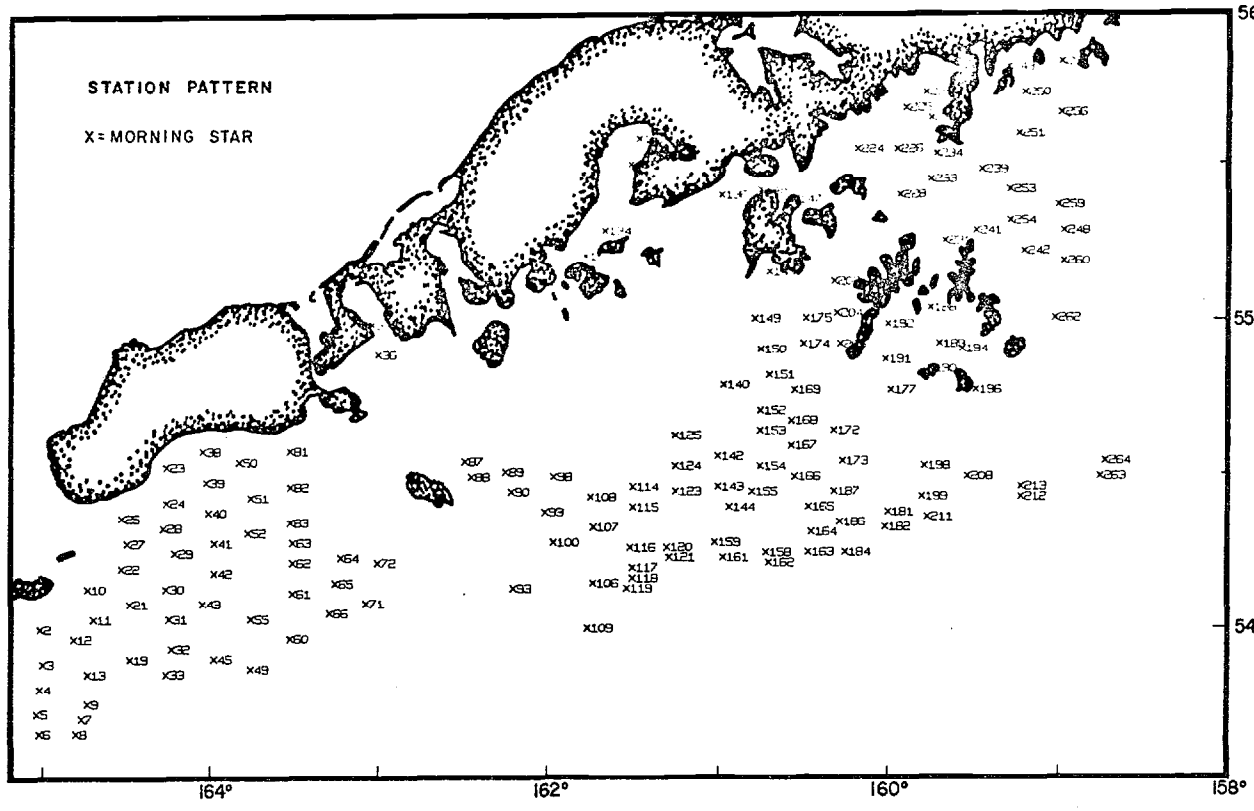


Figure X1-123.--Stations successfully trawled (otter trawl) during cruise 618, May-July 1961.

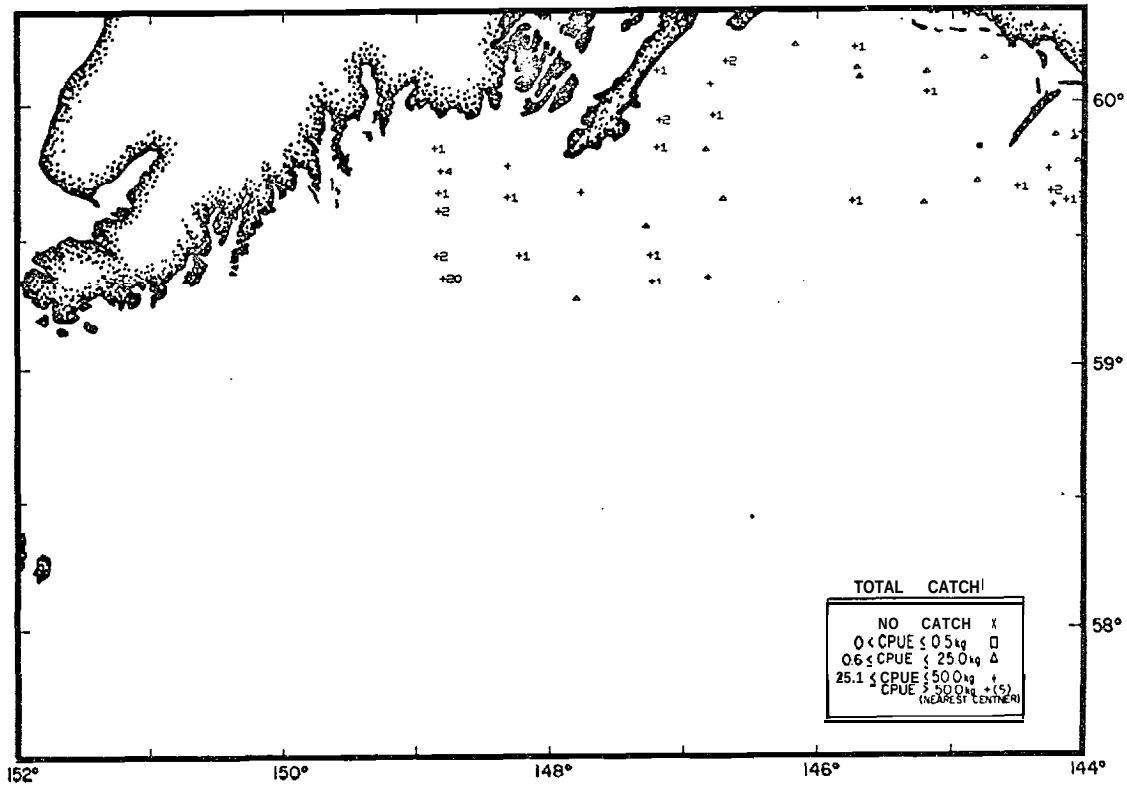


Figure xX-124.--Distribution of standardized catch rates in kg/hr of all species combined in the eastern Gulf of Alaska, June-Oct. 1361 (Cruise 611-052).

Table XI-8.--Estimated biomass in metric tons of all species combined during the May-October 1961 resource assessment survey in the Gulf of Alaska (Cruises 611, 052, 618).

Regions	DEPTH ZONES (M) 0-100	101-200	201-400	0-400
Fairweather				
mt x 103	56.2	232.3	43.8	332.3
mt/km^2	21.9	20.0	20.4	20.4
% biomass in depth zone	8.8	23.7	12.4	16.9
% regional biomass	16.9	69.9	13.2	100.0
Yakutat				
mt x 10^3	30.6	71.8	74.5	176.9
mt/km^2	6.9	6.8	15.2	9.0
% biomass in depth zone	4.8	7.3	21.0	9.0
% regional biomass	17.3	40.6	42.1	100.0
Prince William				
mt x 10^3	5.8	31.6	11.1	48.5
mt/km^2	0.7	1.6	4.3	2.5
% biomass in depth zone	0.9	3.5	3.1	2.5
% regional biomass	12.0	65.1	22.9	100.0
Kenai				
'mt x 10^3	--	212.3	53.0	265.3
mt/km^2	--	10.2	6.5	9.2
% biomass in depth zone	--	21.7	14.9	13.5
% regional biomass	--	80.0	20.0	100.0
Kodiak				
mt x 103	156.3	124.9	9.1	290.3
mt/km^2	9.6	10.6	5.4	9.7
% biomass in depth zone	24.6	12.8	2.6	14.7
% regional biomass	53.8	43.0.	3.2	100.0
Shelikof				
mt x 10^3	24.2	43.5	31.4	99.1
mt/km^2	6.4	7.8	5.0	6.3
% biomass in depth zone	3.8	4.4	8.9	5.0
% regional biomass	24.4	43.9	31.7	100.0
Chirikof				
mt x 103	215.9	120.7	85.6	422.2
mt/km^2	12.5	9.9	11.5	11.4
% biomass in depth zone	34.0	12.3	24.1	21.4
% regional biomass	51.1	28.6	20.3	100.0
Shumagin				
mt x 10^3	44.3	80.3	39.5	164.1
mt/km^2	3.3	6.2	1.4	5.8
% biomass in depth zone	7.0	8.2	11.1	8.3
% regional biomass	27:0	48.9	24.1	100.0
Sanak				
mt x 10^3	101.9	61.7	6.7	170.3
mt/km^2	8.0	5.3	7.6	6.7
% biomass in depth zone	16.0	6.3	1.9	8.7
% regional biomass	59.8	36.2	4.0	100.0
Total				
nit x 10^3	635.2	979.0	354.8	I ,969.0
mt/km^2	8.0	9.4	10.0	8.9
% biomass in depth zone	99.9	99.9	100.0	100.0
% of total biomass	32.3	49.7	18.0	100.0

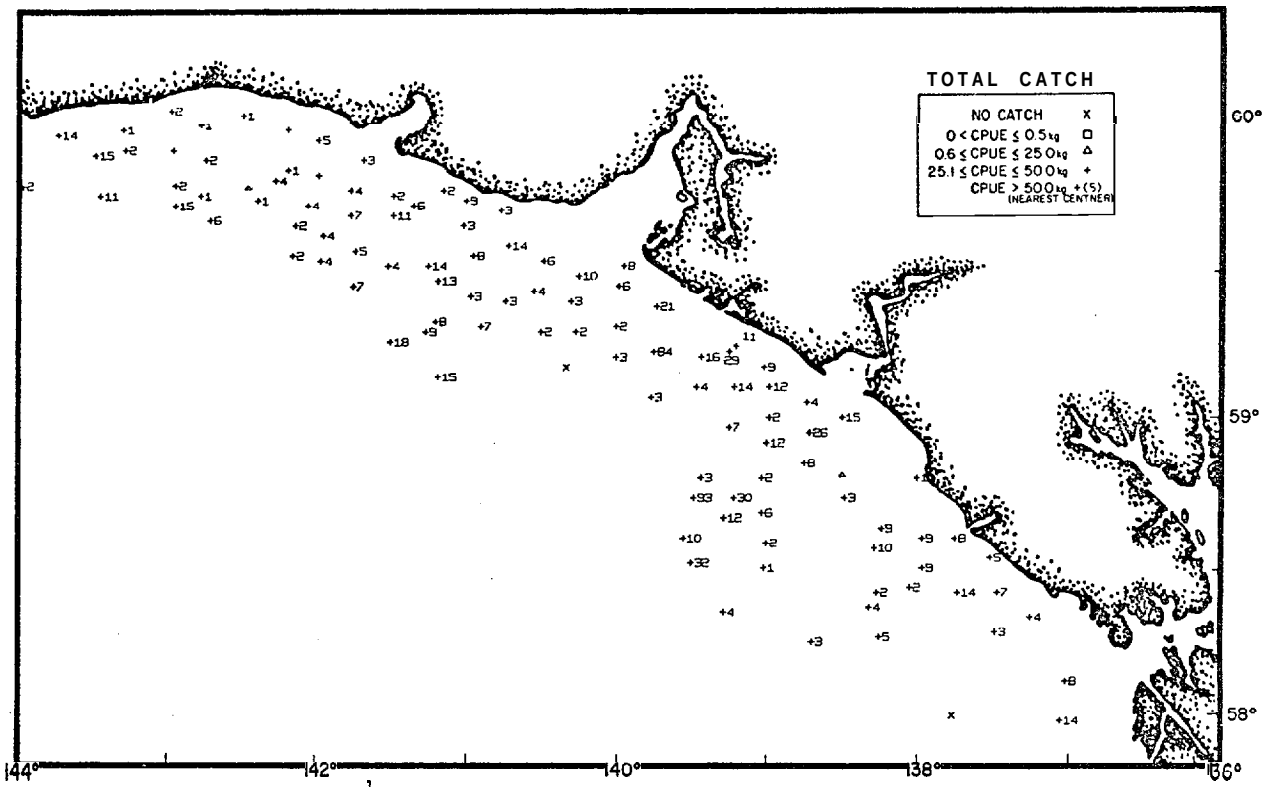


Figure X1-125.--Distribution of standardized catch rates in kg/hr of all species combined in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

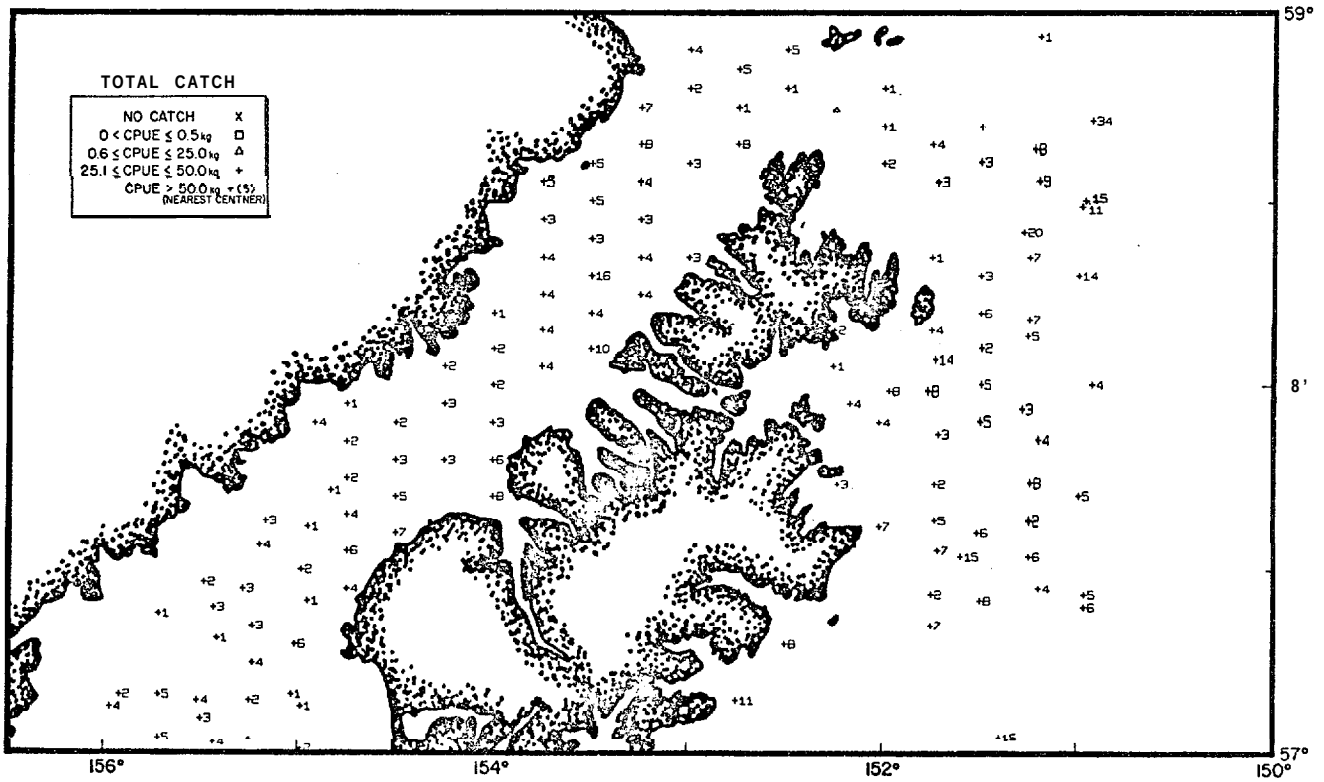
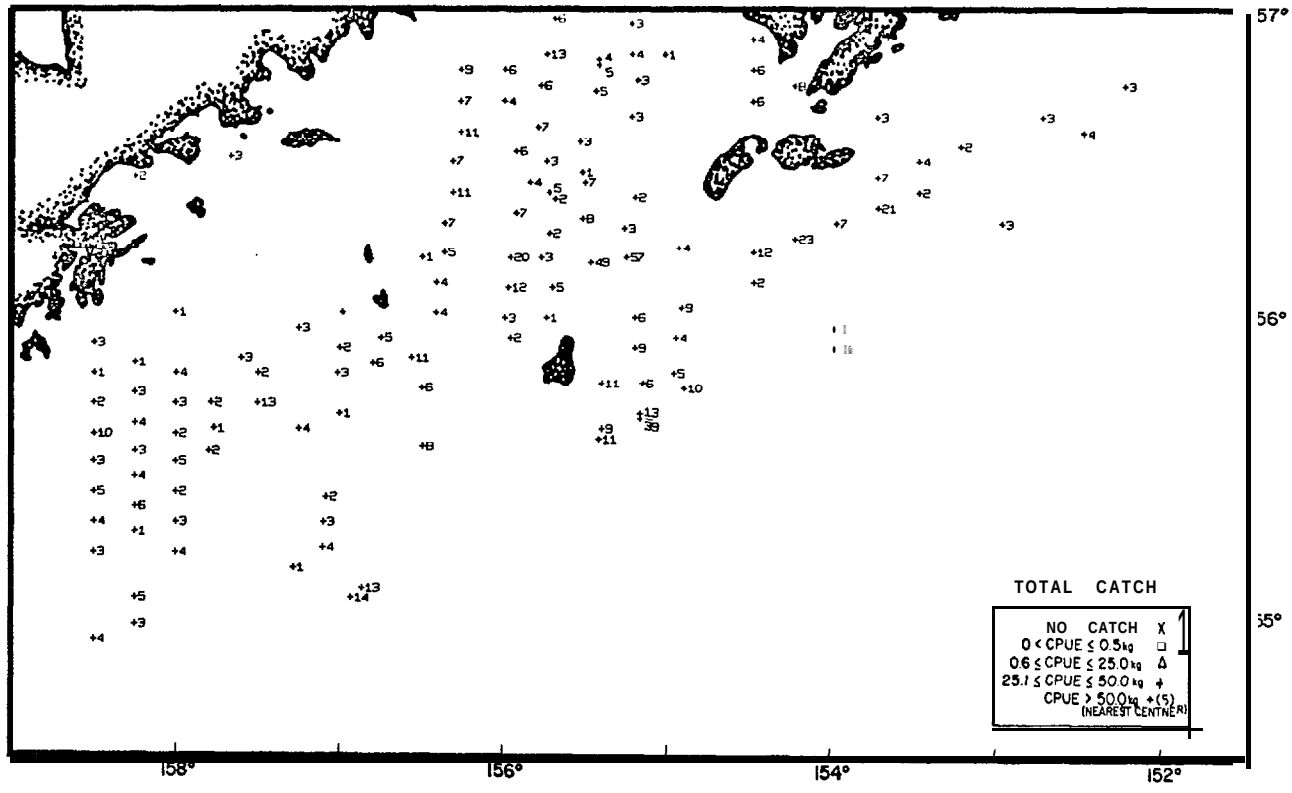


Figure X1-126.--Distribution of standardized catch rates in kg/hr of all species combined in the western Gulf of Alaska, May-July 1961 (Cruise 615).



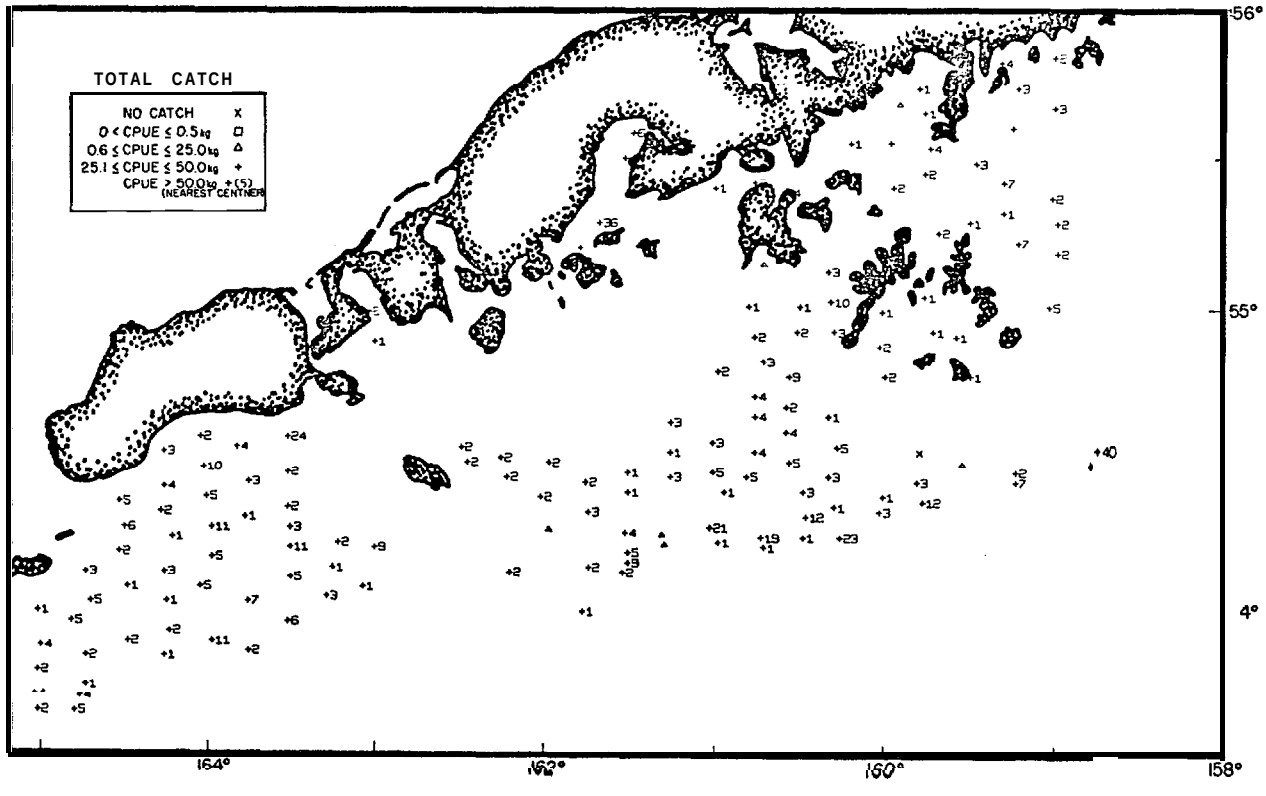


Figure XI-127.--Distribution of standardized catch rates in kg/hr of all species combined in the western Gulf of Alaska, May-July 1961 (Cruise 618).

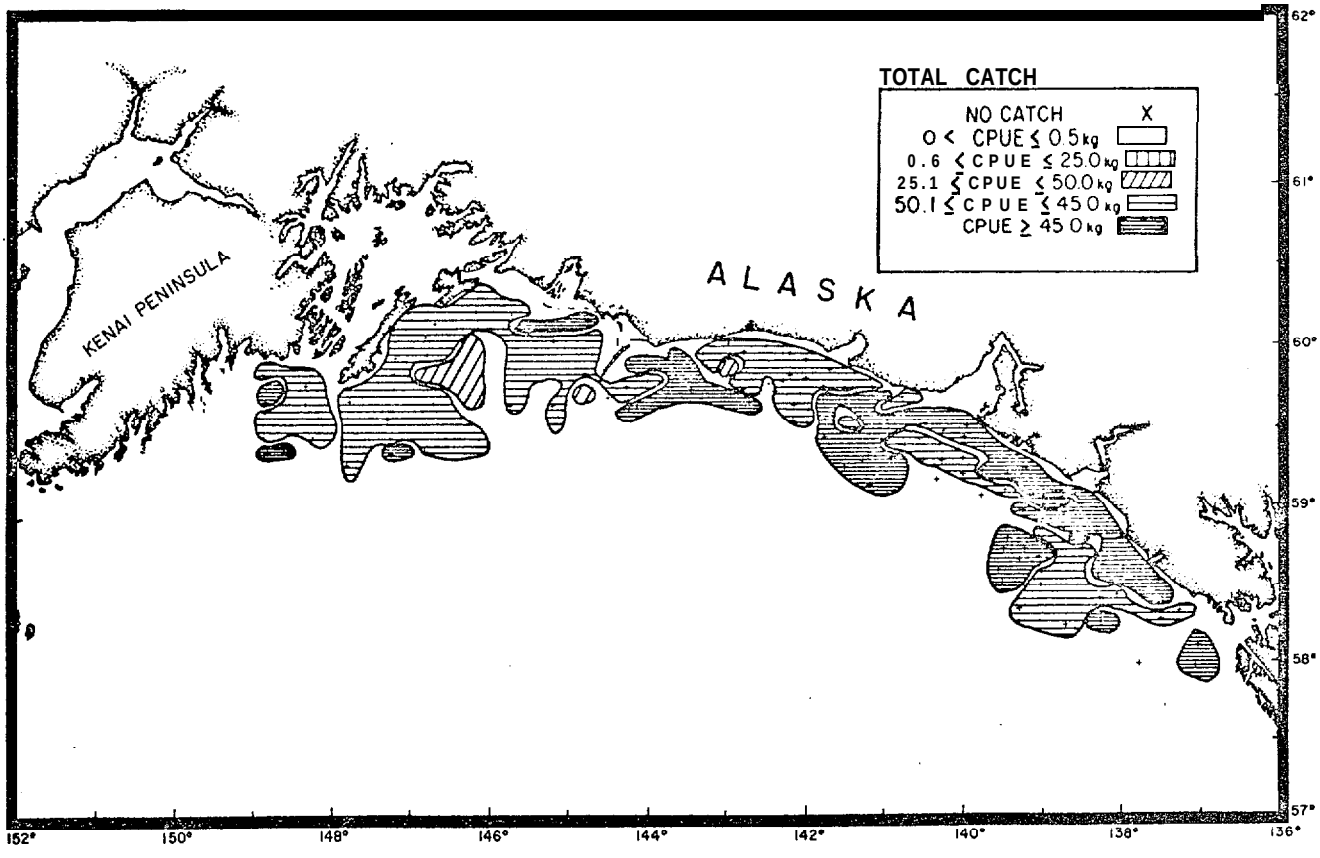


Figure X1-128.--Distribution of apparent relative abundance of all species combined in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

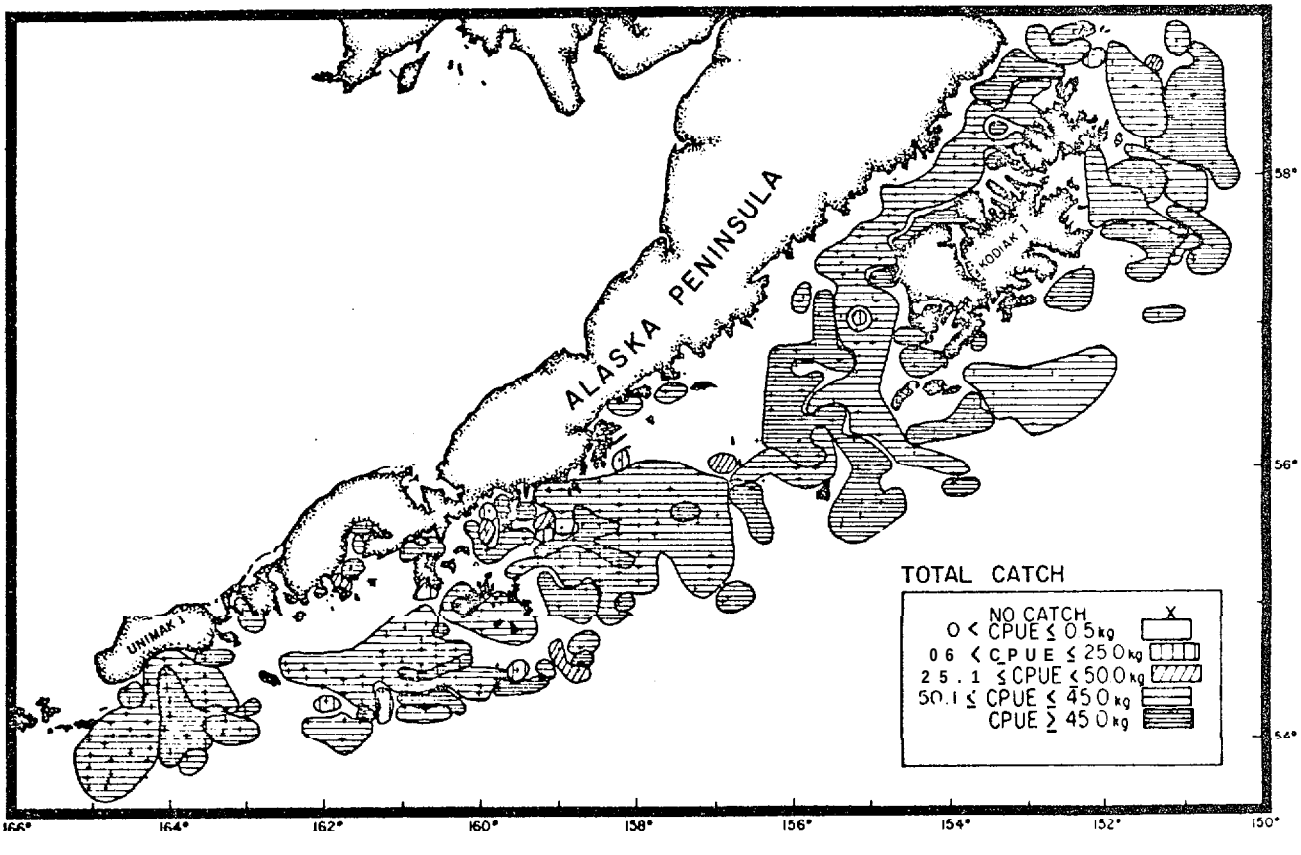


Figure X1-129.--Distribution of apparent relative abundance of all species combined in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table X1-9.--Relative importance of species groups based on the rank order of their total biomass (Cruises 611, 052, 618).

Species Group	DEPTH ZONES (M) 0-100	101-200	201-400	0-400
Flatfish				
mt x 103	221.8	360.9	168.1	750.8
mt/km^2	2.8	3.4	4.7	3.4
% biomass in depth zone	34.9	36.9	47.4	38.1
% of flatfish biomass	29.5	48.1	22.4	100: 0
Invertebrates				
mt x 0^3	287.9	233.1	78.8	599.8
mt/km^3	3.7	2.2	2.2	2.7
% biomasss in depth zone	45.3	23.8	22.2	30.5
% of invertebrate biomass	48:0	38.9	13.1	100: 0
Roundfish				
mt x 103	119.8	268.5	37.6	425.9
mt/km^2	1.5	2.5	1.1	1.9
% biomass in depth zone	18.9	27.4	10.6	21.6
% of roundfish biomass	28.1	63.0	8.8	99.9
Rockfish				
mt x 103	1.5	91.3	57.4	150.2
mt/km^2	1/	0.9	1.6	0.7
% biomass in depth zone	6.2	9.3	16.2	7.6
% of rockfish biomass	1.0	60.8	38.2	100.0
Elasmobranchs				
mt x 103	4.2	25.3	12.8	42.3
mt/km^2	0.1	0.2	0.3	0.2
% biomass in depth zone	0.7	2.6	3.6	2.2
% of elasmobranch biomass	9.9	59.8	30.4	100.1
Total				
mt x 10^3	635.2	979.1	354.7	1,969.0
mt/km^2	8.1	9.2	9.9	8.9
% biomass in depth zone	100.0	100.0	100.0	100.0
% of total biomass	32.3	49.7	18.0	100.0

1/ $<$ 0.1 mt/km^2

Table XI-10.--Estimated biomass and population size of flatfishes in the Gulf of Alaska, May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10)	Proportion of total estimated population	Mean size per individuals 2/ Weight (kg)	Length (cm)
Fairweather	l-100	836.4	35,878.4	20.6		--	--	--
	101-200	652.8	126,802.0	72.7	--	--	--	
	201-400	328.0	11.757.8	6.7	--	--		--
	All zones	639.0	174,438.2	23.2	--	--		--
Yakutat	l-101	225.5	16,654.5	28.8			--	--
	101-200	135.5	23.637.7	40.9	--	--		
	201-400	213.8	17,499.5	30.3	--			--
	All zones	175.0	57,791.7	7.7	--	--	--	--
Prince William	l-100	16.4	2,164.5	10.3	4.6	10.7	0.47	--
	101-200	98.9	14,864.5	71.0	31.8	74.0	0.47	--
	201-400	90.0	3.913.4	18.7	6.6	15.4	0.59	--
	All zones	64.3	20.942.4	2.8	43.0	--	--	--
Kenai	1-100		--			--		--
	101-200	143.4	49.931.8	63.0			--	--
	201-400	215.7	29,352.8	37.0	--	--		
	All zones	163.7	79,284.6	10.6		--		
Kodiak	l-100	270.9	74,059.0	57.7	241.5	59.5	0.31	--
	101-200	250.3	49,325.4	38.4	153.6	37.9	0.32	--
	201-400	176.8	5,029.1	3.9	10.7	2.6	0.47	--
	All zones	257.4	128,413.5	17.1	405.8	--	--	--
Shelikof	l-100	108.0	6,785.6	15.3	37.3	25.6	0.18	--
	101-200	178.5	16,631.6	37.5	53.4	36.7	0.31	--
	201-400	199.1	20,931.8	47.2	54.9	37.7	0.38	--
	All zones	169.8	44.x9.0	5.9	145.6		--	--
Chirikof	l-100	149.5	43,303.4	31.5	129.0	30.8	0.34	--
	101-200	163.4	33,368.3	24.3	147.1	35.1	0.23	--
	201-400	488.2	60,919.7	44.3	143.1	34.1	0.43	--
	All zones	222.4	137.591.4	18.3	419.2		--	
Shumagin	l-100	87.6	19,884.2	29.9	80.4	32.b	0.25	--
	101-200	135.a	29,323.0	44.1	125.0	SO.6	0.23	--
	201-400	619.4	17,298.6	26.0	41.5	16.8	0.42	
	All zones	175.9	66,505.8	8.9	246.9	--		
Sanak	l-100	108.0	23,066.6	'55.6	100.6	55.6	0.23	--
	101-200	87.7	17,010.5	41.0	77.3	42.7	0.22	--
	201-400	93.6	1,389.9	3.4	3.1	1.7	0.45	--
	All zones	98.2	41,467.0	5.5	181.0	--	--	--
Total	l-100	156.2	221,796.2	29.5			--	
	ioi-200	203.6	360,894.8	48.1		--		
	201-400	281.0	168,092.7	22.4	--		--	--
	All zones	203.7	750,783.7	100.0	--	--		--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

of the total estimated flatfish biomass. The average catch of the flatfish group increased with depth and for all depth zones averaged 204 kg/hr. Relative apparent abundance was highest in the Fairweather region where the trend of increasing average catch with increasing water depth found in the entire Gulf of Alaska (Figures X1-130-131) was reversed, with the highest relative apparent abundance being found in the inner shelf and the lowest in the upper slope. Other regions where the relative apparent abundance was above the Gulf of Alaska average, were Kodiak and Chirikof. The distribution of the standardized catch rates of flatfishes are presented in Figures X1-132-135.

Invertebrates, the second most important species group had an estimated biomass of 600 thousand mt, with the greatest portion occuring in the inner shelf (48%), followed by the outer shelf (39%) and upper slope (13%) (Table X1-11). The invertebrates were the largest contributor to the total biomass in the inner shelf (45%) while accounting for 24% and 22% of the total biomass in the outer shelf and upper slope depth zones, respectively. The catch of invertebrates in the Gulf of Alaska averaged 163 kg/hr overall and was highest in the inner shelf while decreasing in the outer shelf and upper slope. Regions where the relative apparent abundance was greater than the average for the Gulf of Alaska included Fairweather, Chirikof, Yakutat and Kodiak (Figures XI-136-137). The distribution of the standardized catch rates are plotted in Figures X1-138-141.

Roundfishes were the third most important species group, contributing 22% to the total biomass. Roundfishes, like the flatfishes, were most abundant in the outer shelf (63%) followed by the inner shelf (28%) and upper slope (9%) (Table X1-12). In terms of the total fish and invertebrate biomass, roundfishes comprised 27% of the total in the outer shelf, 19% in the inner shelf and 11% in the upper slope. For the Gulf of Alaska, the average roundfish catch ranged from 63 kg in the upper slope to 152 kg in the outer shelf and was 112 kg/hr for all depth zones. Regions where the relative apparant abundance was greater than the Gulf of Alaska average included Kenai, Sanak, and Kodiak (Figures XI-142-143). The distribution of the standardized catch rates of roundfishes are plotted in Figures X1-144-147.

The rockfishes species group was fourth in importance based on its contribution to the total biomass. This group was primarily restricted to the outer shelf and upper slope depth zones which together contained 99% of the estimated 150 thousand mt of biomass (Table X1-13). Highest relative apparent abundance occurred in the upper slope and decreased, with decreasing bottom depths in the outer and inner shelf, averaging 40 kg/hr over all depths (Figures X1-148-149). The standardized catch rates for rockfishes are presented in Figures XI-150-153.

The total elasmobranchs biomass, the species group contributing the least to the total biomass, was estimated at 42 thousand mt, of which 90% was found in the combined outer shelf and upper slope depth zones (Table X1-14). Elasmobranchs were most abundant in the eastern Gulf of Alaska where the Kenai, Fairweather, Yakutat and Prince William regions all contained relative apparent abundances greater than the average for the Gulf of Alaska (Figures X1-154-155). The distribution of the standardized catch rates for elasmobranchs are presented in Figures X1-156-159.

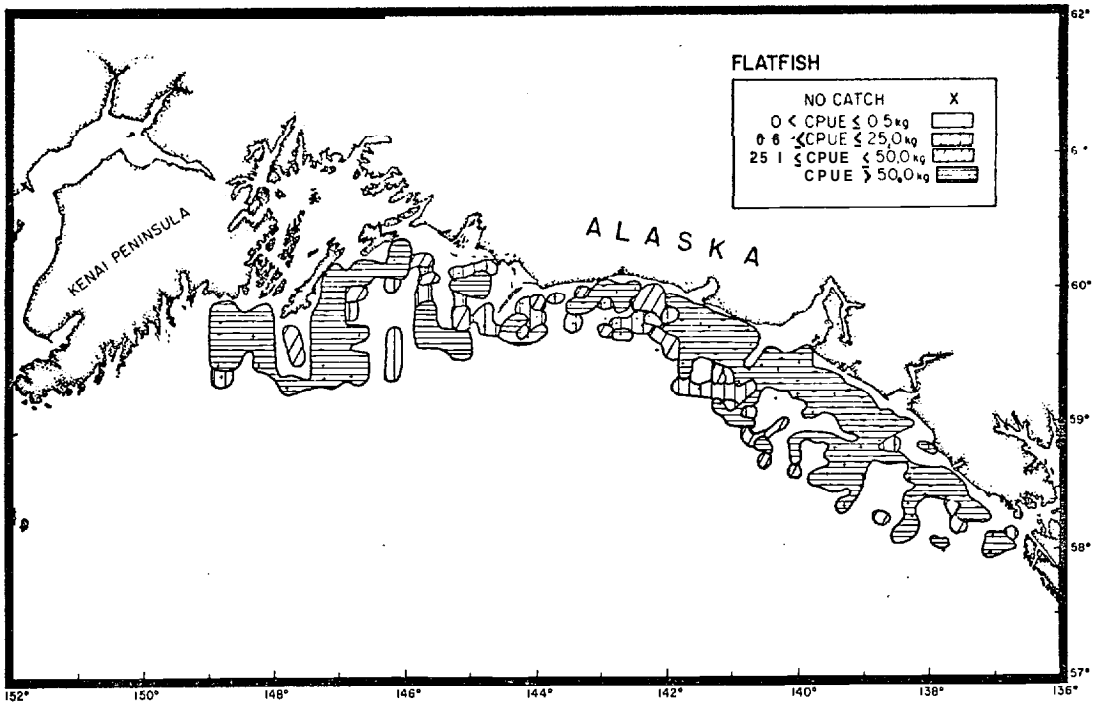


Figure X1-130.--Distribution of apparent relative abundance of **flatfish** in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

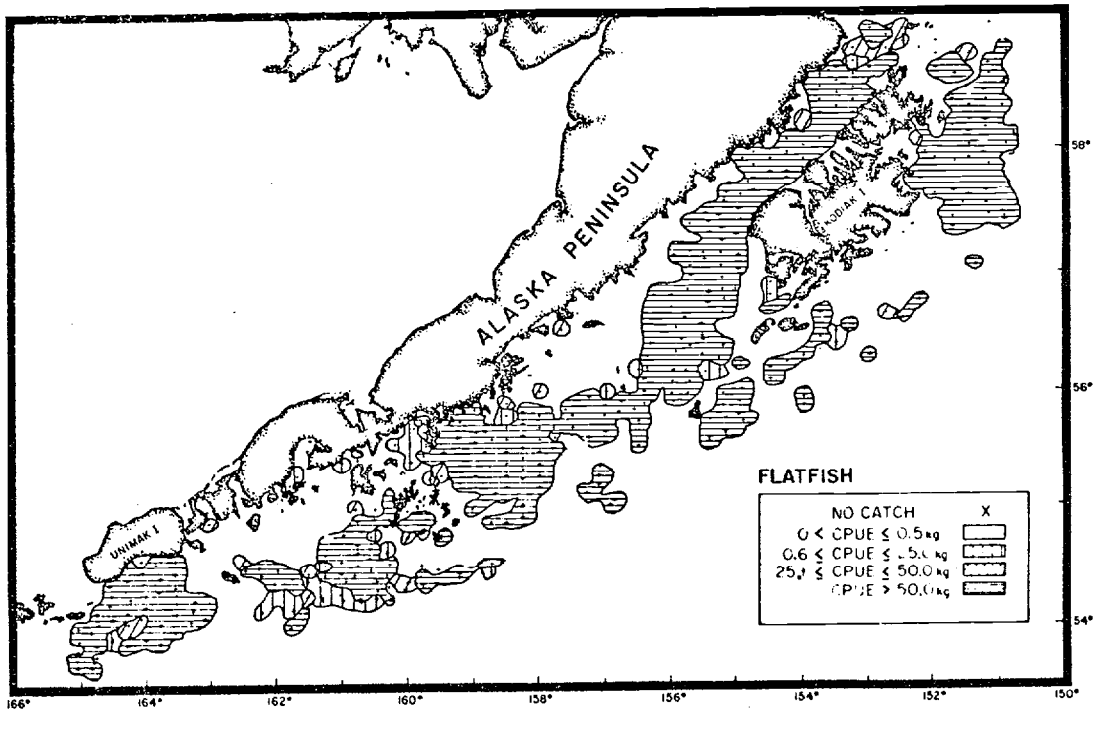


Figure X1-131.--Distribution of apparent relative abundance of **flatfish** in the western Gulf of Alaska, May-July 1961 (Cruise 618).

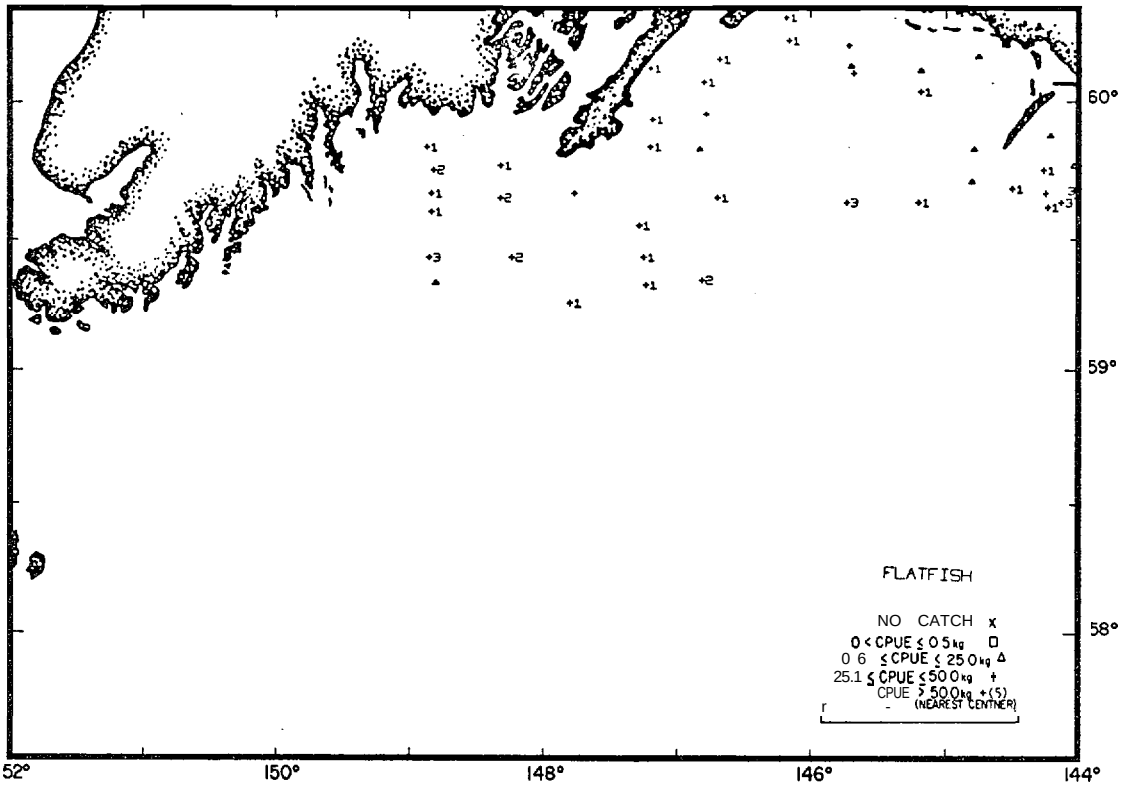


Figure X1-132.--Distribution of standardized catch rates in kg/hr of flatfish in the eastern Gulf of Alaska, June-Oct. 1361 (Cruise 611-052).

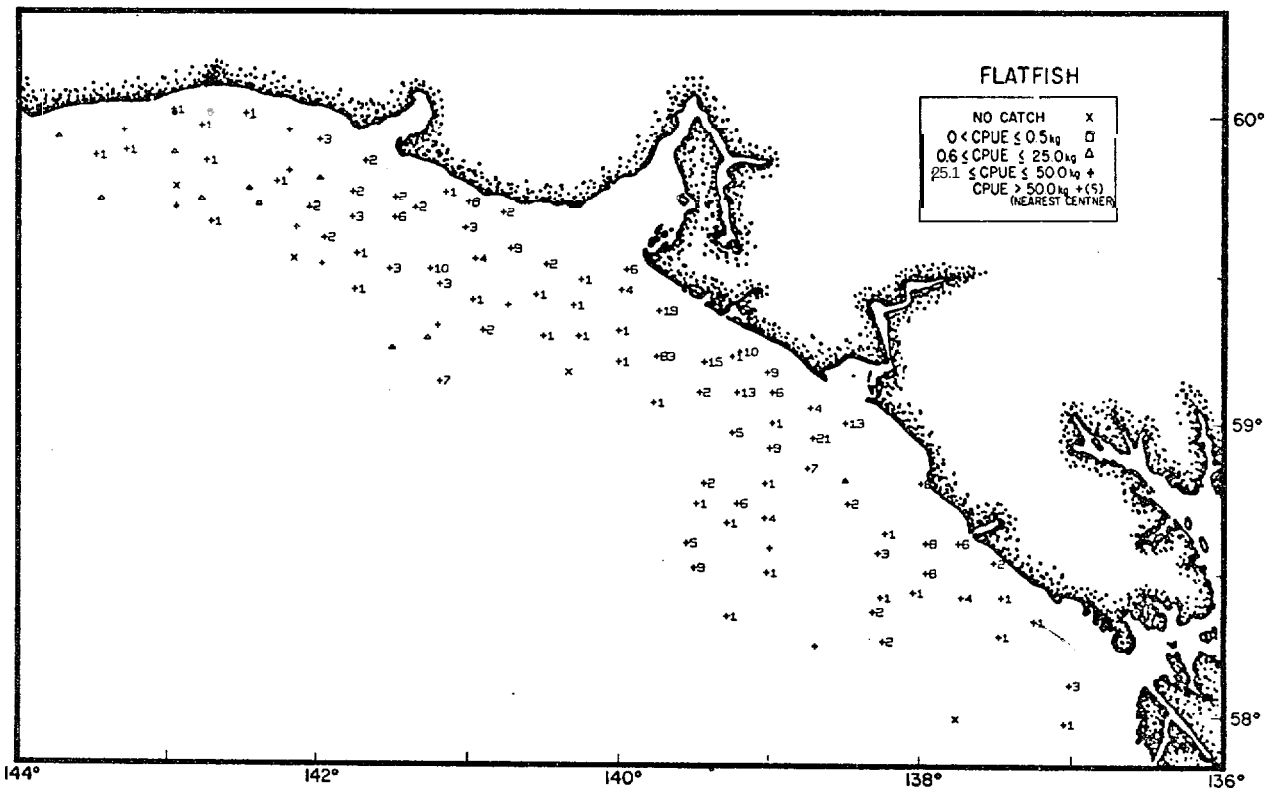
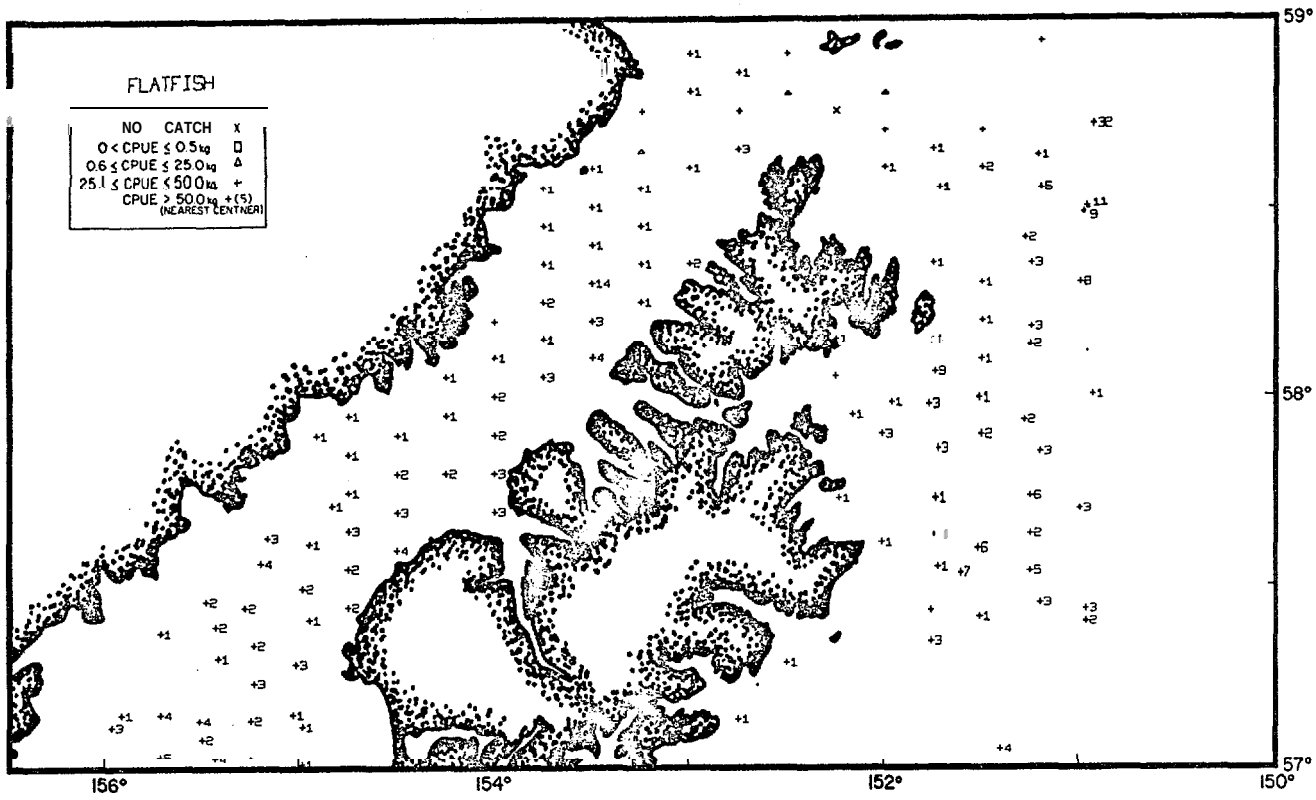


Figure XI-133.--Dfstributon of standardized catch rates in kg/hr of flatfish in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



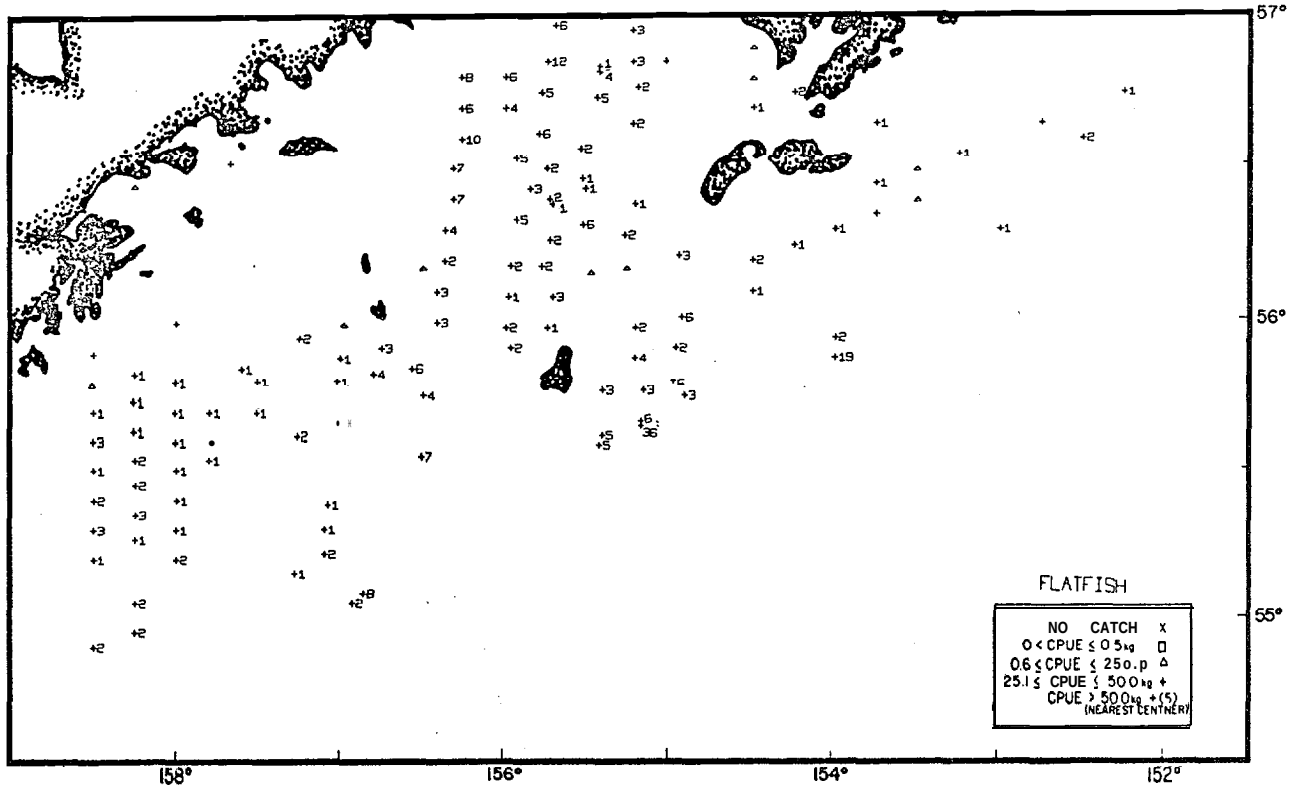


Figure X1-134.--Distribution of standardized catch rates in kg/hr of **flatfish** in the western Gulf of Alaska, May-July 1961 (Cruise 618).

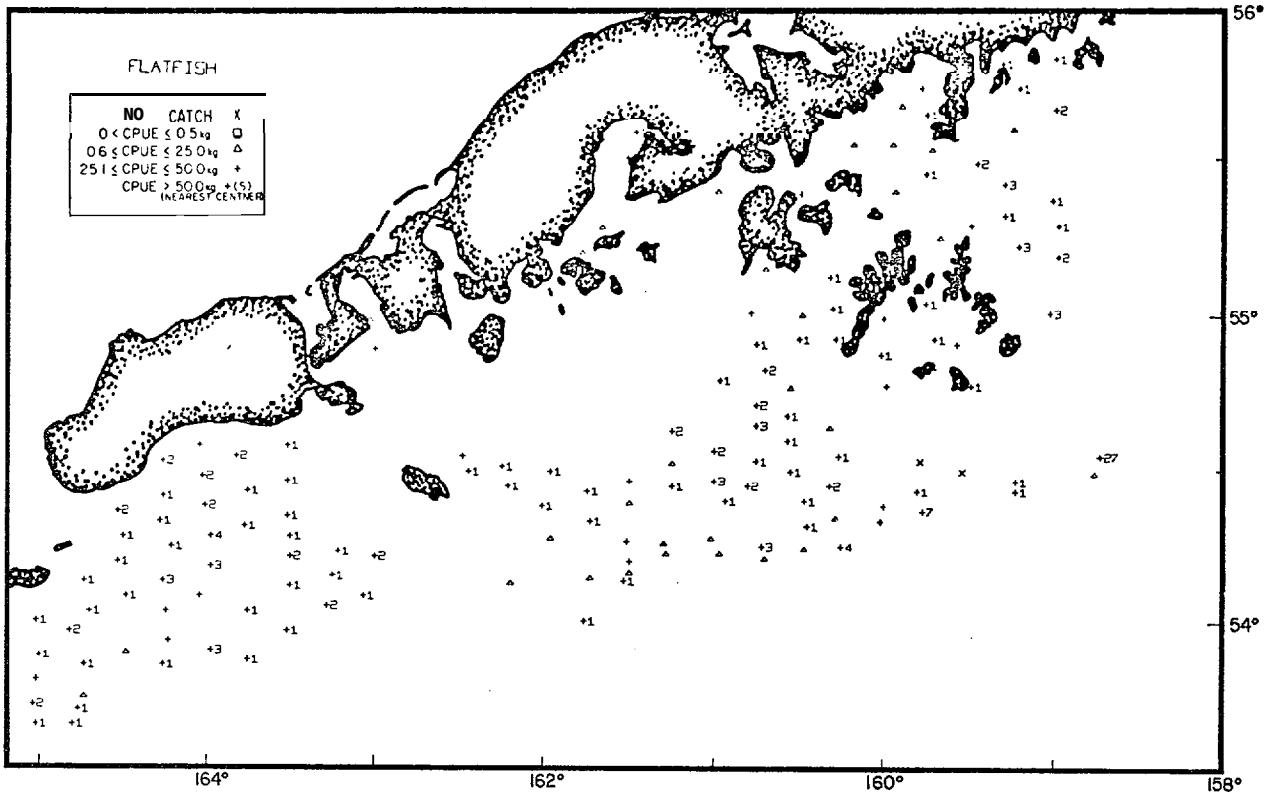


Figure X1-135.--Distribution of standardized catch rates in kg/hr of flatfish in the western Gulf of Alaska, May-July 1961 (Cruise 618).

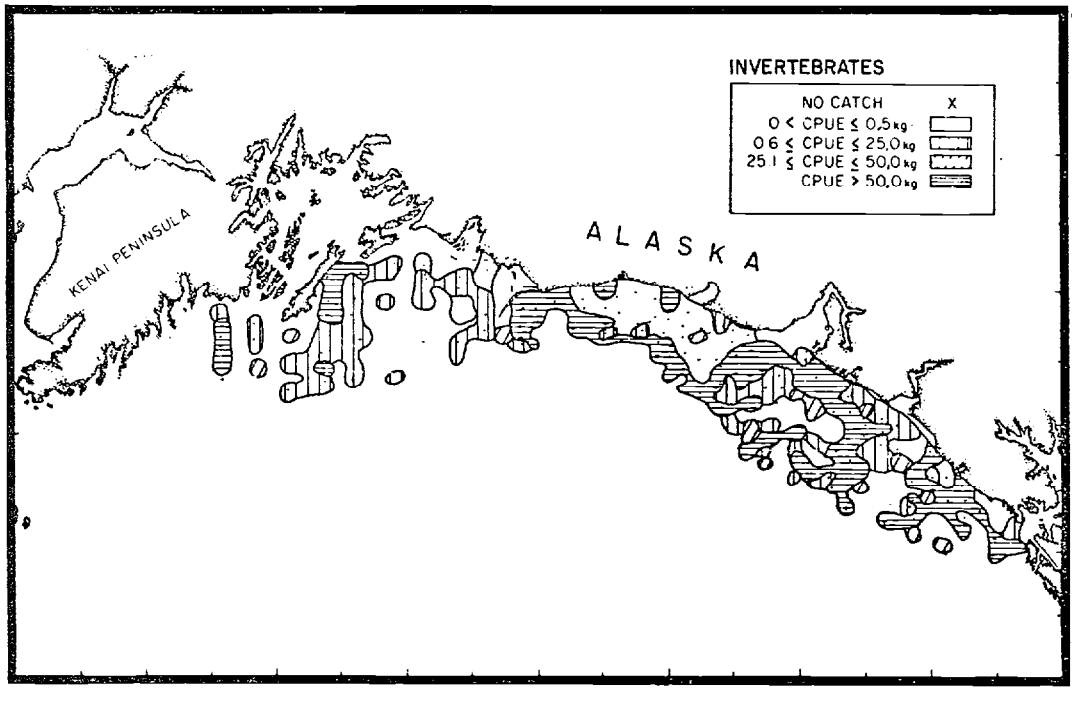


Figure 1X-136.--Distribution of apparent relative abundance of invertebrates in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table XX-ll.--Estimated biomass of invertebrates in the Gulf of Alaska, May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individuals 2/ Weight (kg)	Mean size per individuals 2/ Length (cm)
Fairweather	I-100	41.5	1,778.7	1.6	--	--	--	--
	101-200	466.9	90.682.6	83.3	--	--	--	--
	201-400	450.4	16,428.8	15.1	--	--	--	--
	All zones	398.9	108,890. 1	18.2	--	--	--	--
Yakutat	I-100	113.0	8,346.6	11.8	--	--	--	--
	101-200	121.4	21,165.4	30.0	--	--	--	--
	201-400	502.8	41,145.1	58.2	--	--	--	--
	All zones	214.1	70,657.1	11.8	--	--	--	--
Prince William	l-100	2.1	274.7	4.7			--	--
	101-200	21.9	3,296.8	56.9	--	--	--	--
	201-400	51.2	2,224.2	38.4	--	--	--	--
	All zones	17.8	5,795.7	1.0				
Kenai	l-100	--	--	--			--	--
	101-200	36.9	12,845.8	67.3	--	--	--	--
	201-400	45.8	6,234.8	32.7	--	--	--	--
	All zones	39.4	19.080.6	3.2	--	--	--	
Kodiak	1-100	162.9	44.546.1	51.5			--	--
	101-200	196.0	38,628.5	44.7			--	--
	201-400	116.3	3,309.2	3.8	--	--	--	--
	All zones	173.3	86,483.8	14.4	--	--	--	--
Shelikof	l-100	161.0	10.121.3	30.7			--	--
	101-200	187.8	17,504.0	53.1			--	--
	201-400	50.9	5,350.1	16.2	--	--	--	--
	All zone*	126.3	32,975.4	5.5	--	--	--	--
Chirikof	I-100	538.8	156.035.0	88.9	--	--	--	--
	101-200	77.1	15.730.8	9.0	--	--	--	--
	201-400	30.4	3,787.9	2.2			--	--
	All zones	283.8	175,553.7	29.3	--	--	--	--
Shumagin	l-100	64.3	14,588.3	40.9	--	--	--	--
	101-200	95.7	20.748.6	58.2	--	--	--	--
	201-400	12.1	338.0	1.0	--	--	--	--
	All zones	75.6	35,674.9	6.0	--	--	--	--
Sanak	l-100	244.6	52,229.0	80.7	--	--	--	--
	101-200	64.5	12,513.5	19.3	--	--	--	--
	201-400	0	0	0	--	--	--	--
	All zones	153.3	64,742.5	10.8	--	--	--	--
Total	1-100	219.0	287,919.7	48.0	--	--	--	--
	101-200	131.6	233,116.0	38.9	--	--	--	--
	201-400	131.7	78.818.1	13.1	--	--	--	--
	All zones	162.8	599,853.8	100.0			--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Loss than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

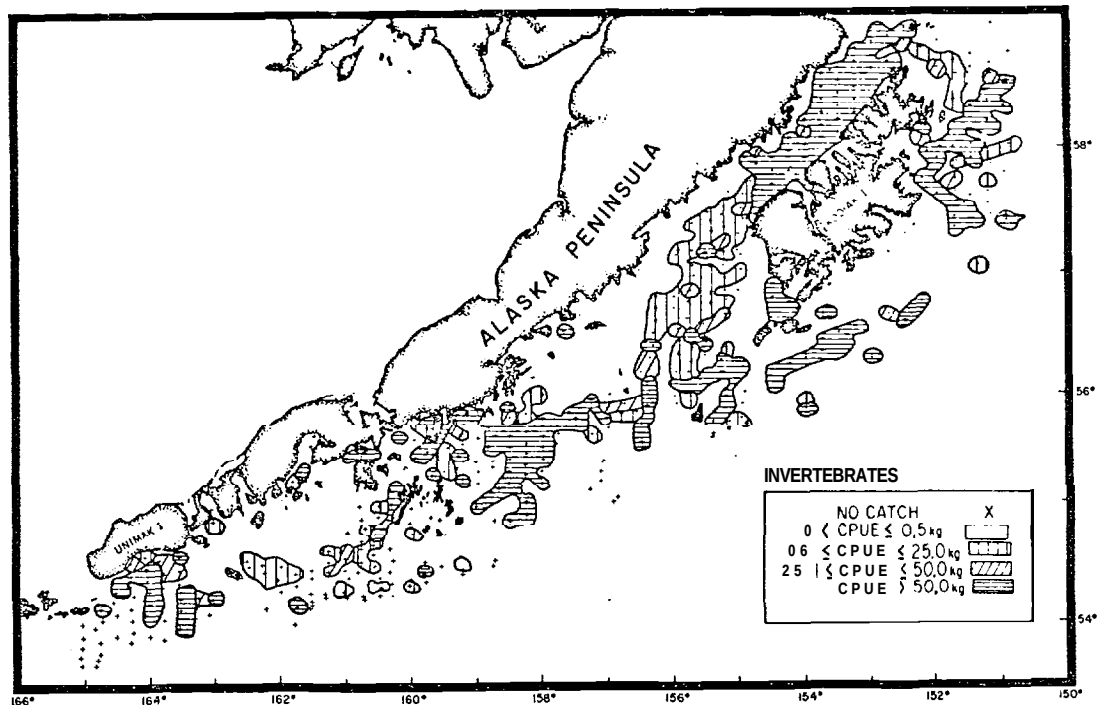


Figure X1-137.--Distribution of apparent relative abundance of invertebrates in the western Gulf of Alaska, May-July 1961 (Cruise 618).

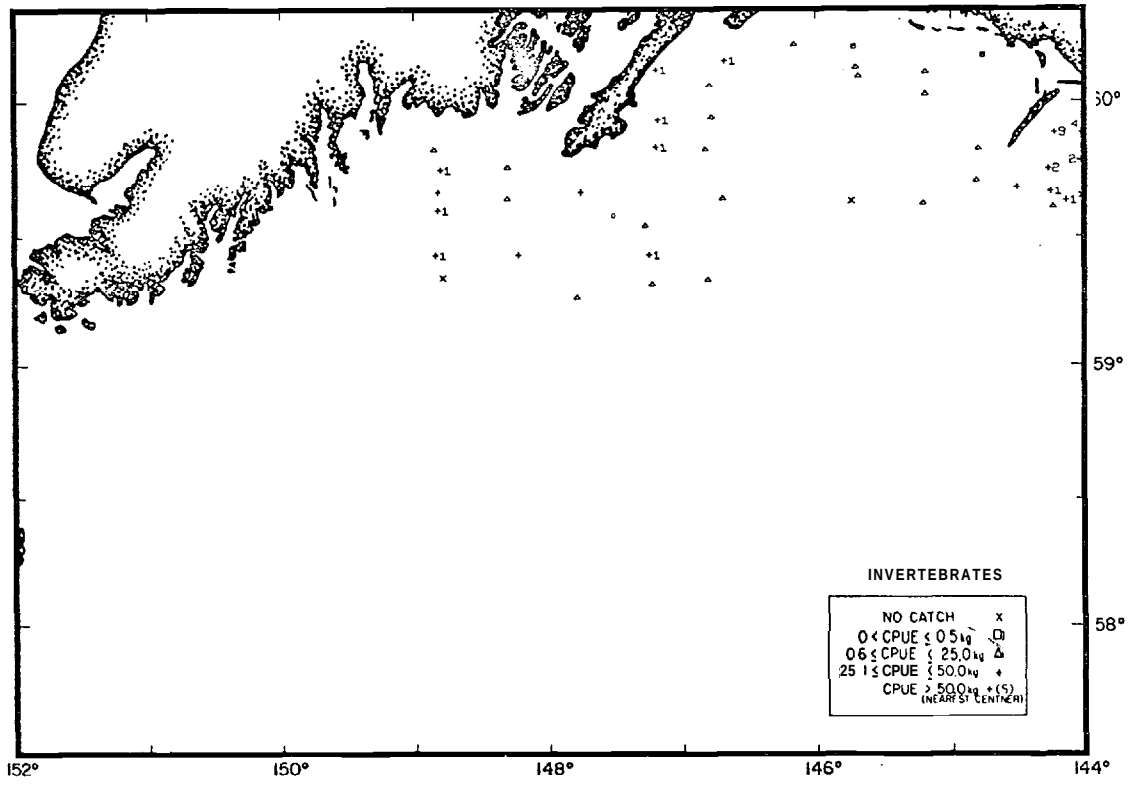


Figure X1-138.--Distribution of standardized catch rates in kg/hr of invertebrates in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

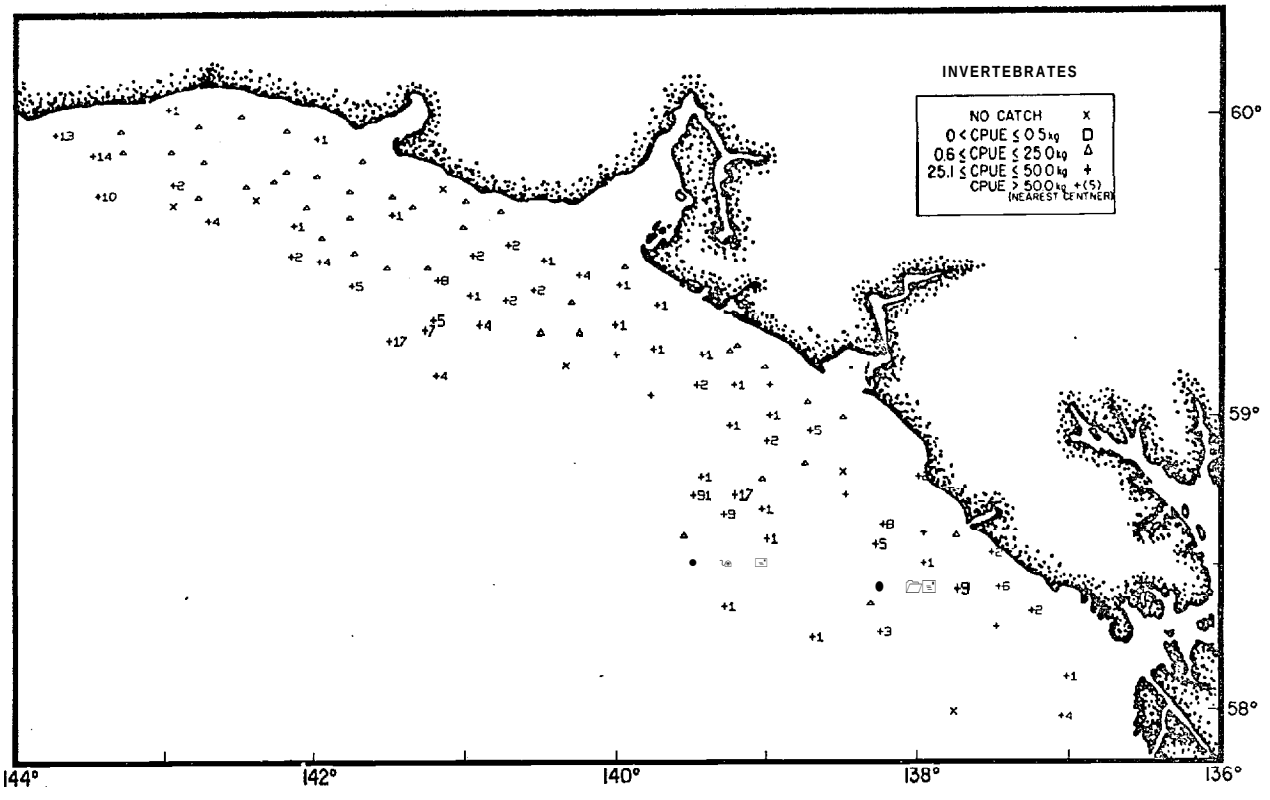


Figure X1-139.--Distribution of standardized catch rates in kg/hr of invertebrates in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

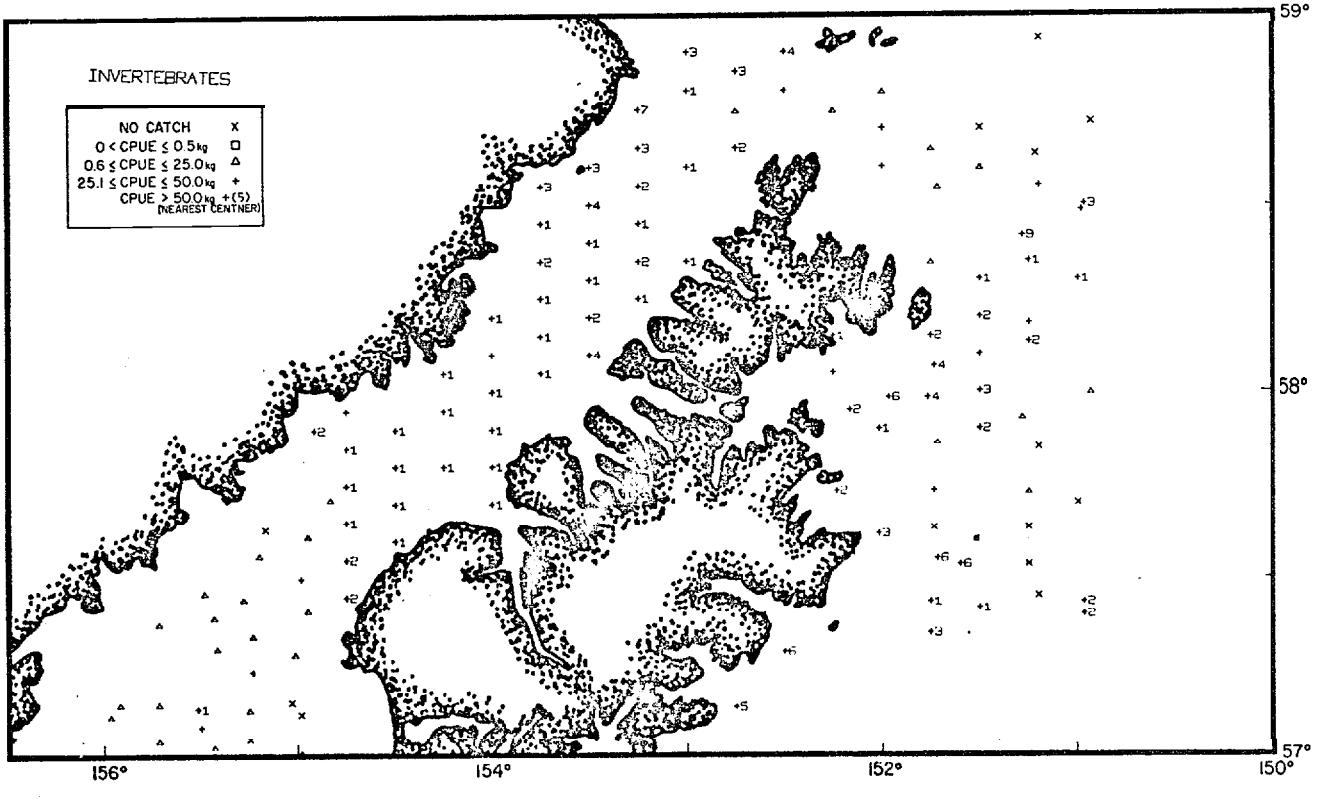
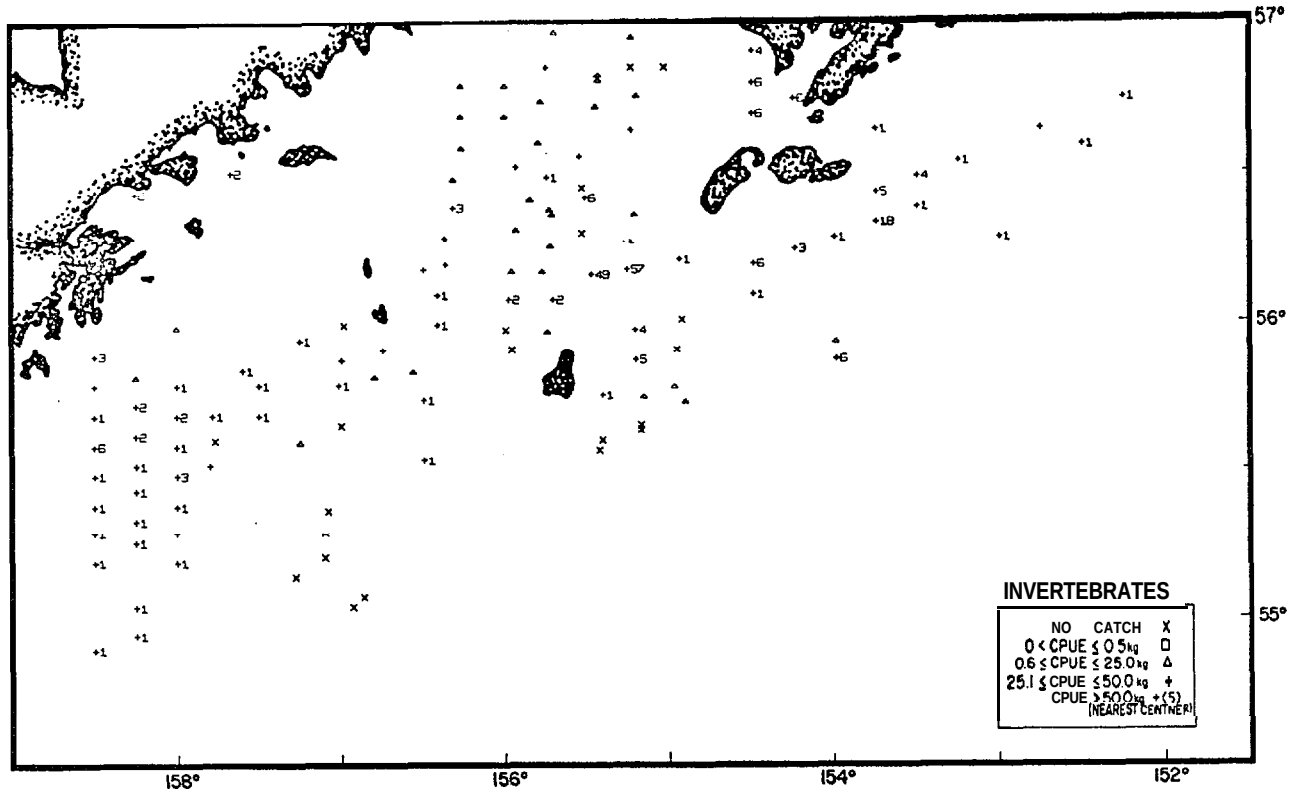


Figure X1-140.--Distribution of standardized catch rates in kg/hr of invertebrates in the western Gulf of Alaska, Play-July 1961 (Cruise 618).



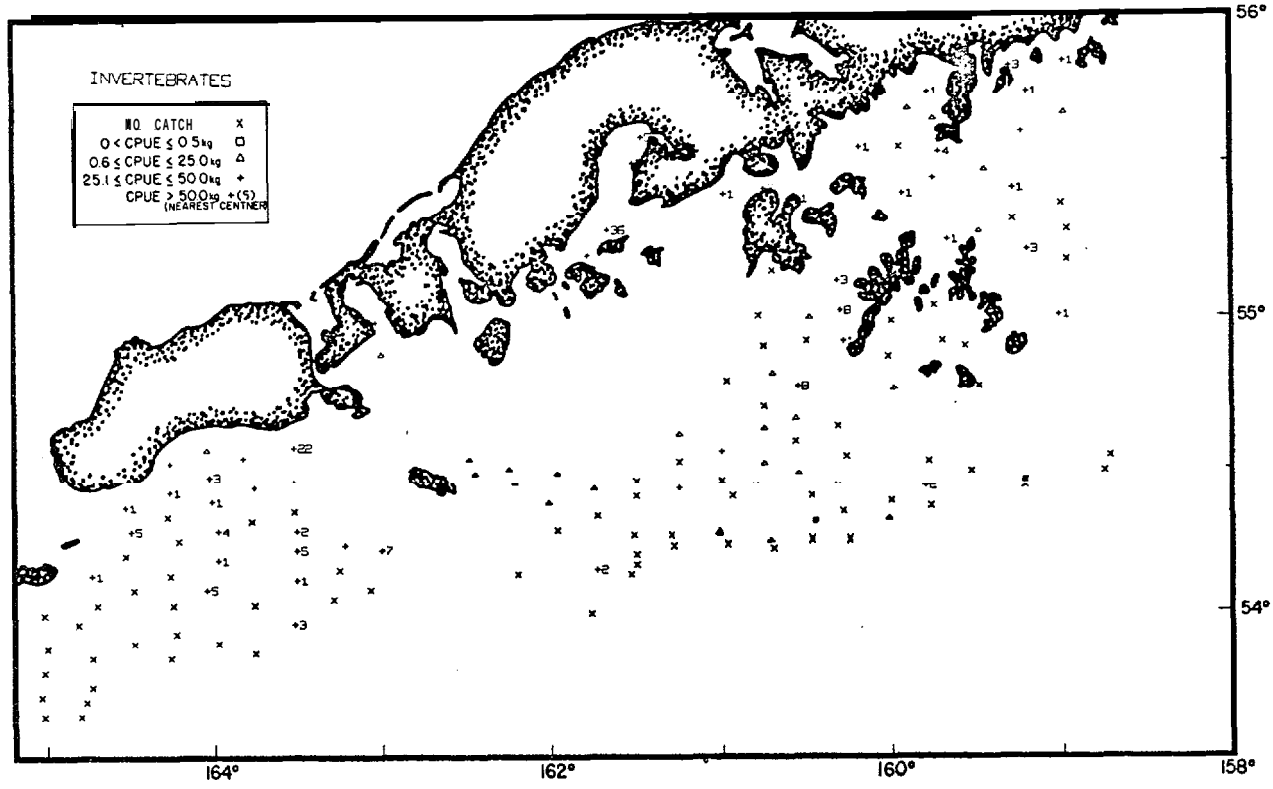


Figure XT-141.--Distribution of standardized catch rates in kg/hr of invertebrates in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-12.--Estimated biomass and population size of roundfishes in the Gulf of Alaska, May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individuals 2/ Weight (kg)	Length (cm)
Fait-weather	l-100	422.8	18,137.0	60.1	--	--	--	--
	101-200	36.4	7,077.1	23.4	--	--	--	--
	201-400	139.2	4,988.8	16.5	--		--	--
	All zones	110.7	30.202.9	7.1	--	--		--
Yakutet	l-100	52.6	3,885.8	23.3	--	--	--	--
	101-200	60.6	10,573.9	63.4	--	--	--	--
	201-400	27.1	2.220.6	13.3	--	--	--	--
	All zones	50.5	16,680.3	3.9		--	--	--
Prince William	l-100	15.0	1,979.3	35.2	8.2	52.9	0.24	--
	101-200	18.9	2,845.9	50.6	6.5	41.9	0.43	--
	201-400	18.4	801.9	14.3	0.8	5.2	1.02	--
	All zones	17.3	5,627.1	1.3	15.5	--	--	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	321.6	112.000.0	93.8	--	--	--	--
	201-400	54.0	7,345.9	6.2	--	--	--	--
	All zones	246.4	119,345.9	28.0	--	--	--	--
Kodiak	l-100	130.9	35,779.6	53.4	128.3	56.3	0.28	--
	101-200	155.1	30.563.0	45.6	99.1	43.5	0.30	--
	201-400	23.7	673.2	1.0	0.6	0.3	1.12	--
	All zones	134.3	67,015.8	15.7	228.0	--	--	--
Shelikof	l-100	112.3	7,059.3	37.7	46.8	53.3	0.15	--
	101-200	88.1	8,212.3	43.8	32.2	36.7	0.25	--
	201-400	32.9	3,461.6	18.5	8.8	10.0	0.39	--
	All zones	71. 7	18,733.2	4.4	87.8	--	--	--
Chirikof	l-100	57.1	16,550.6	24.6	58.4	22.3	0.06	--
	101-200	212.4	43,368.0	64.4	188.1	71.7	0.46	--
	201-400	59.8	7,456.8	11.1	16.0	6.1	0.43	--
	All zones	108.9	67,375.4	15.8	262.5	--	--	--
Shumagin	l-100	43.5	9,866.6	23.3	34.2	23.8	0.29	--
	101-200	107.9	23,400.4	55.3	95.7	66.7	0.24	--
	201-400	324.5	9,063.4	21.4	13.5	9.5	0.67	--
	All zones	89.7	42,330.4	9.9	143.5	--	--	--
Sanak	l-100	124.1	26.499.3	45.3	79.6	49.2	0.33	--
	101-200	156.9	30,443.4	52.0	80.5	49.8	0.38	--
	201-400	109.0	1,619.1	2.8	1.7	1.1	0.93	--
	All zones	138.6	58.561.8	13.8	161.7		--	--
Total	l-100	91.1	119,757.5	28.1	--	--	--	--
	101-200	151.5	268,484.0	63.0	--	--	--	--
	201-400	62.9	37,631.3	a.0	--	--	--	--
	All zones	115.6	425,872.8	99.9	--	--	--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

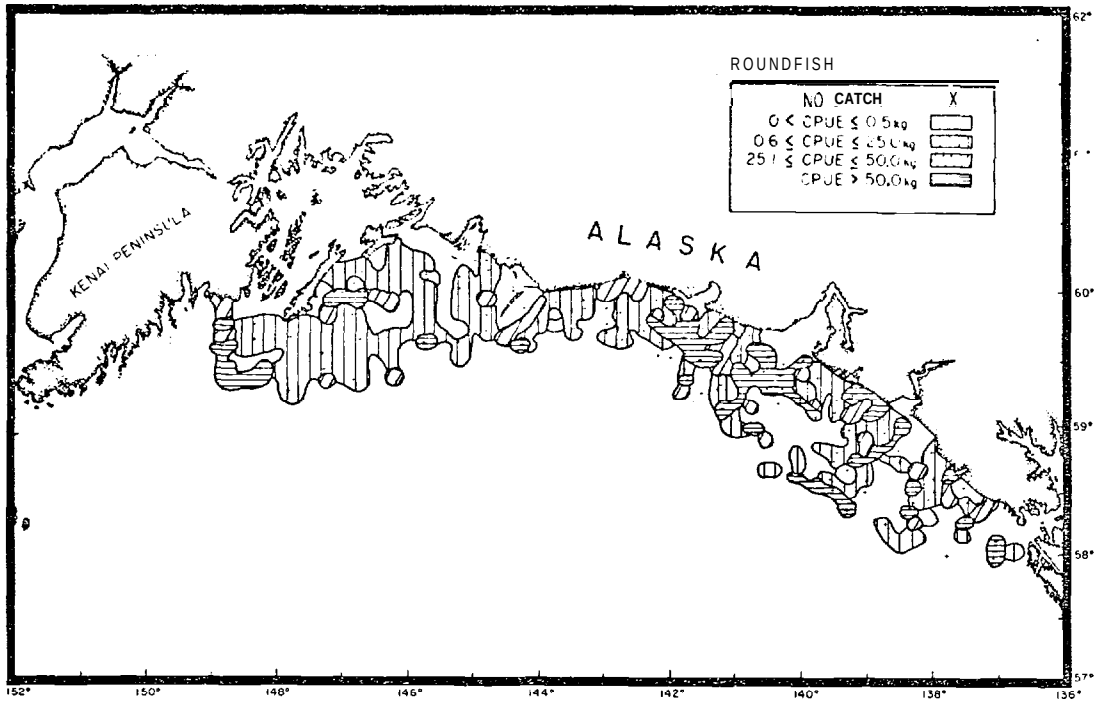


Figure XI-142 .--Distribution of apparent relative abundance of roundfish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

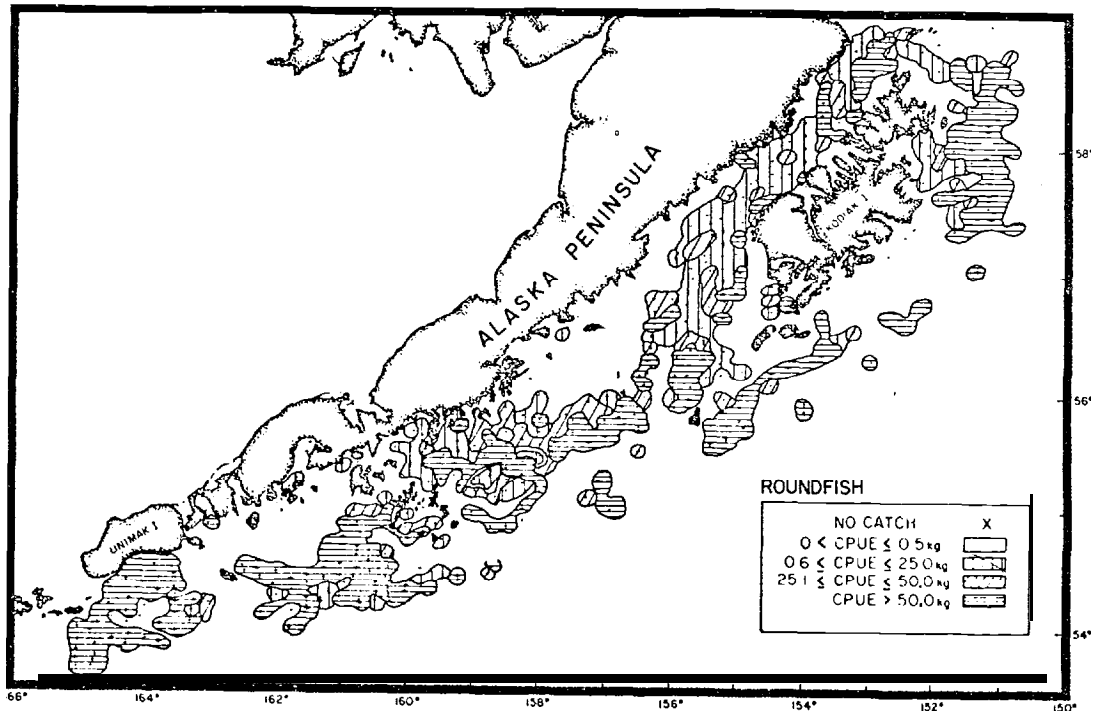


Figure X1-143.--Distribution of apparent relative abundance of roundfish In the western Gulf of Alaska, May-July 1961 (Cruise 618).

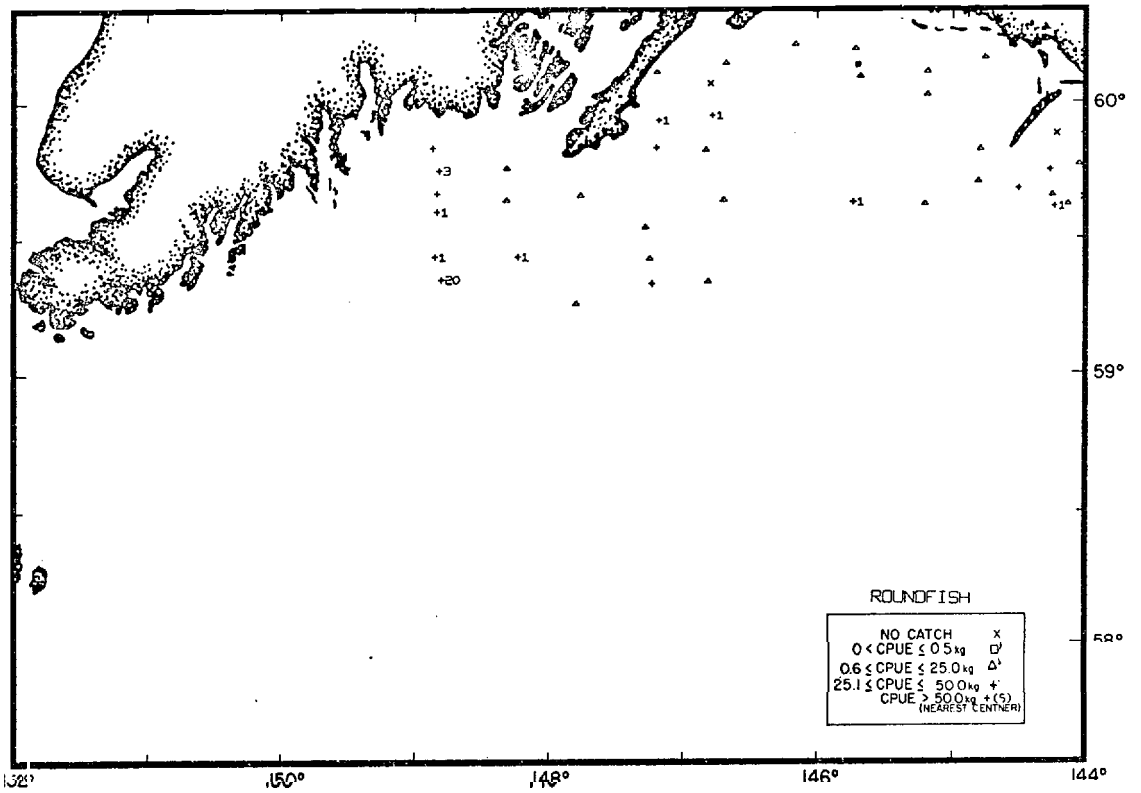


Figure X1-144.--Distribution of standardized catch rates in kg/hr of roundfish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

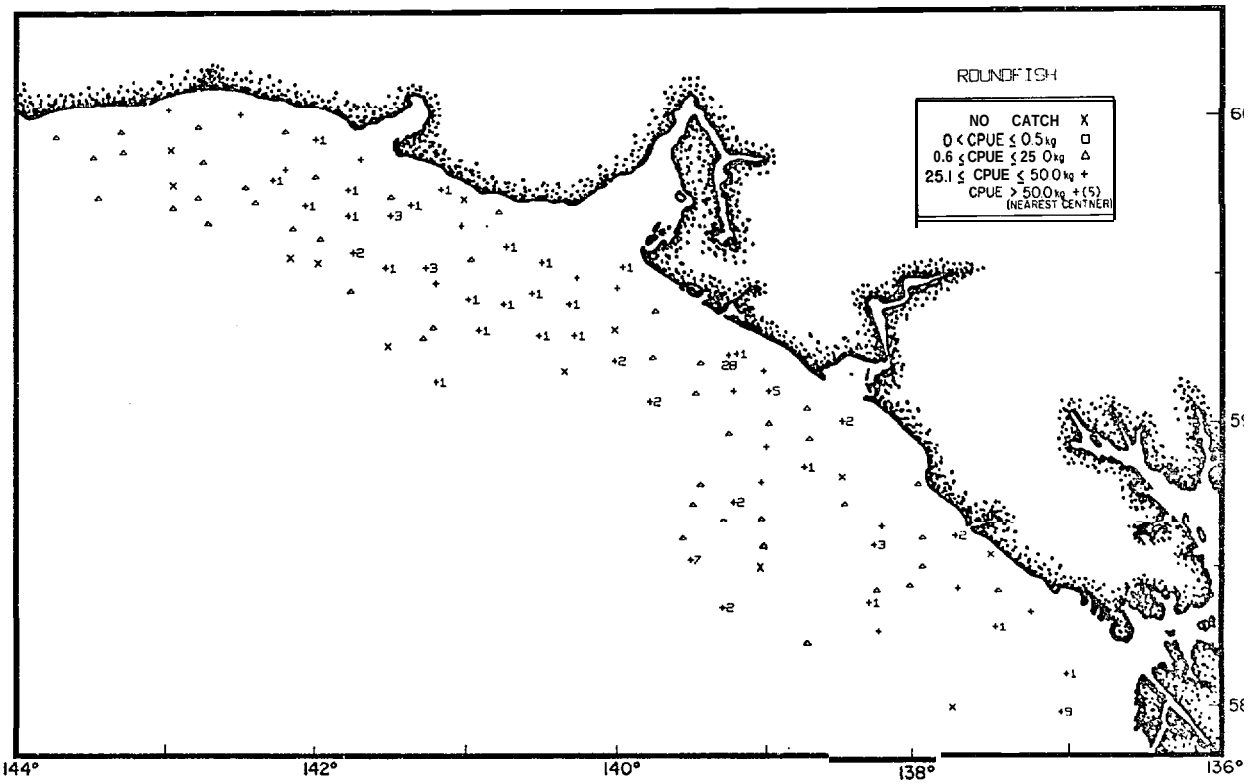
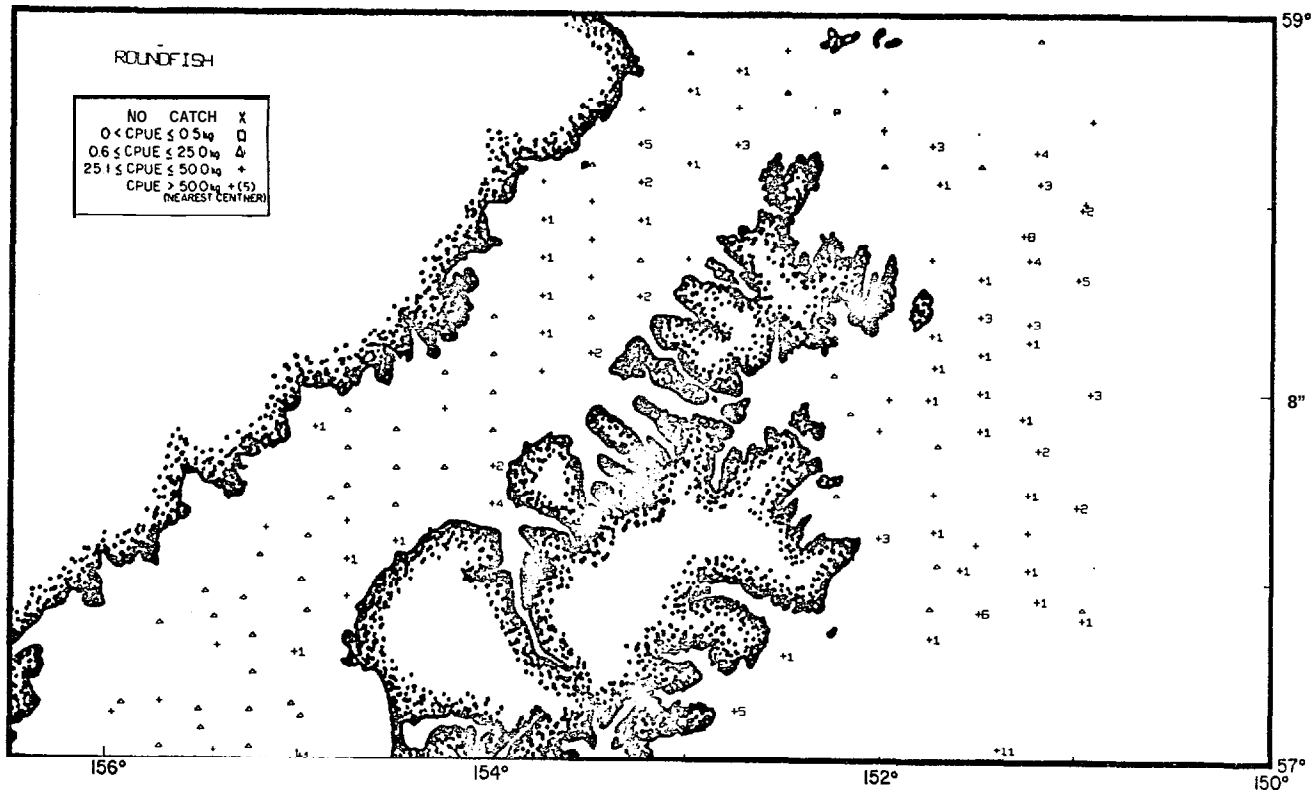


Figure XI-145.--Distributon of standardized catch rates in kg/hr of roundfish in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



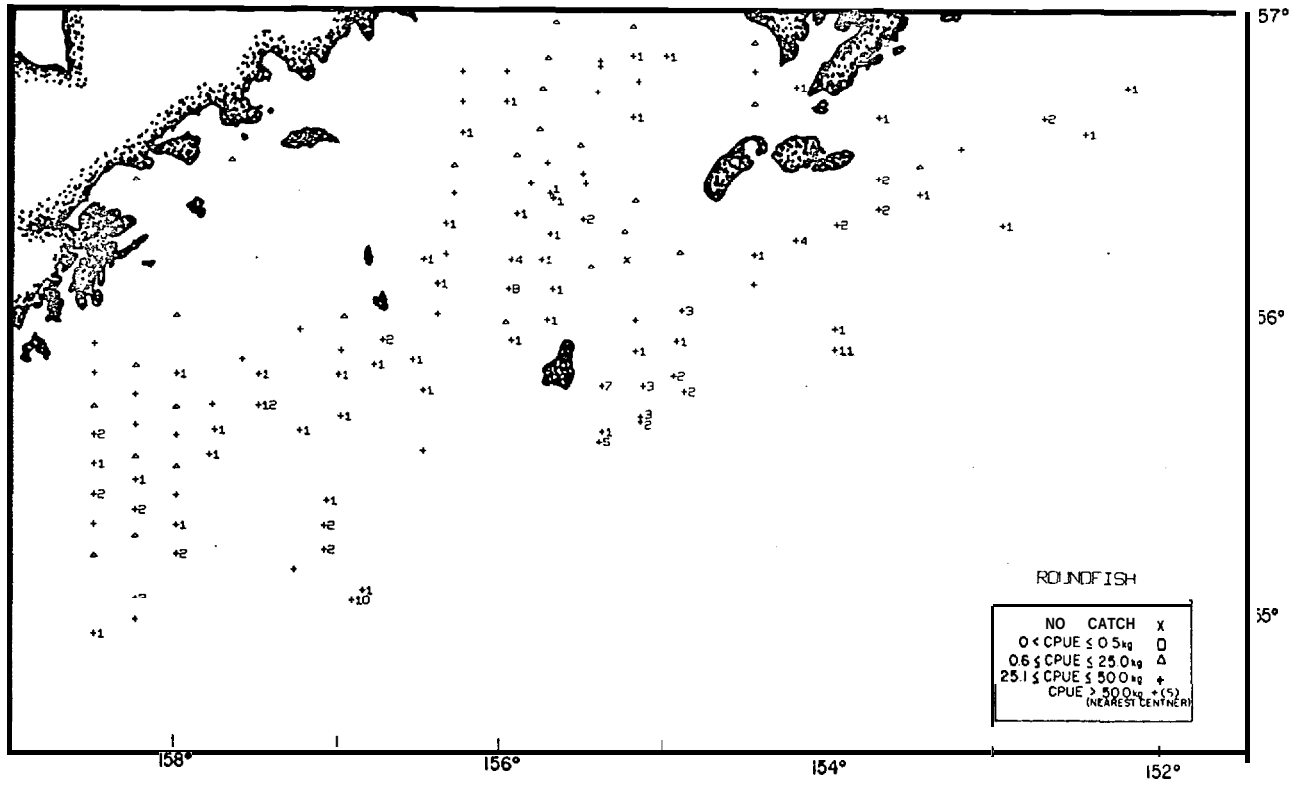


Figure XI-146.--Distribution of standardized catch rates in kg/hr of roundfish in the western Gulf of Alaska, Nay-July 1961 (Cruise 618).

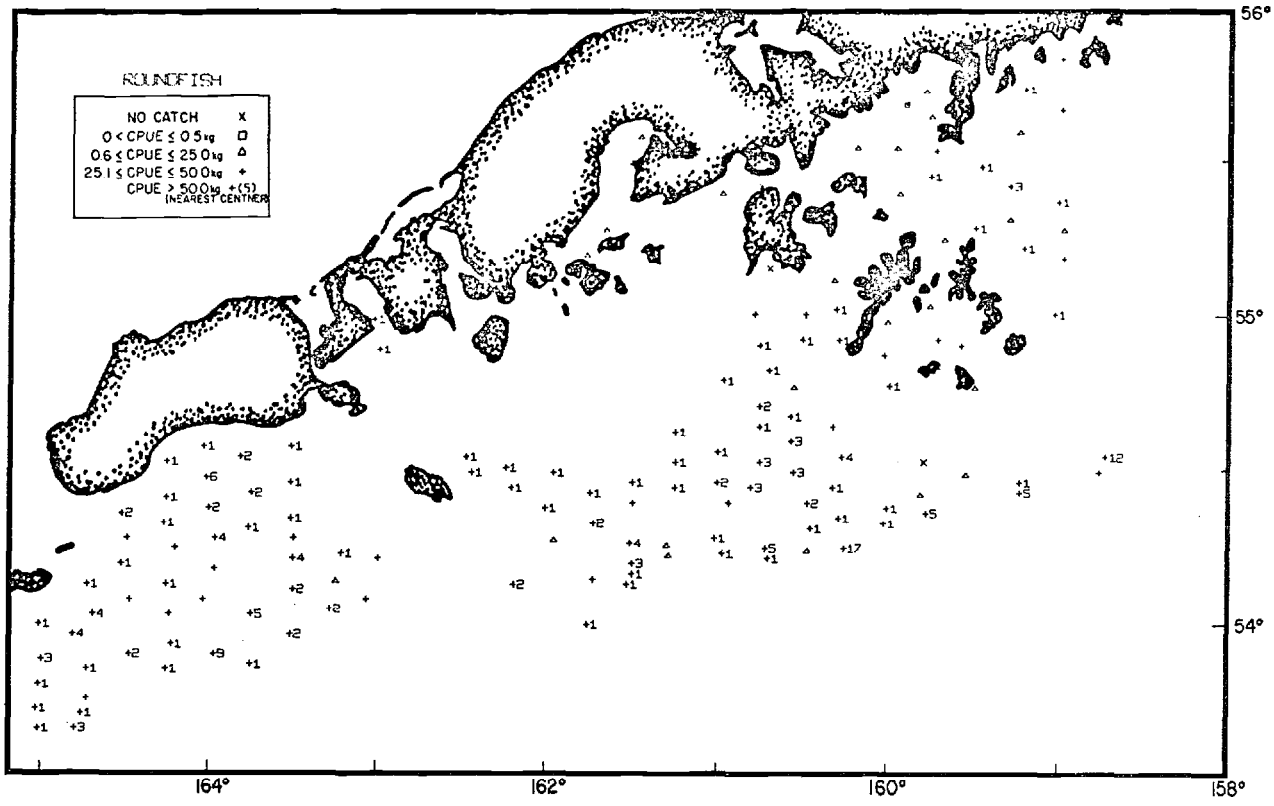


Figure X1-147.--Distribution of standardized catch rates in kg/hr of roundfish in the western Gulf of Alaska, May-July 1961 (Cruise 618).

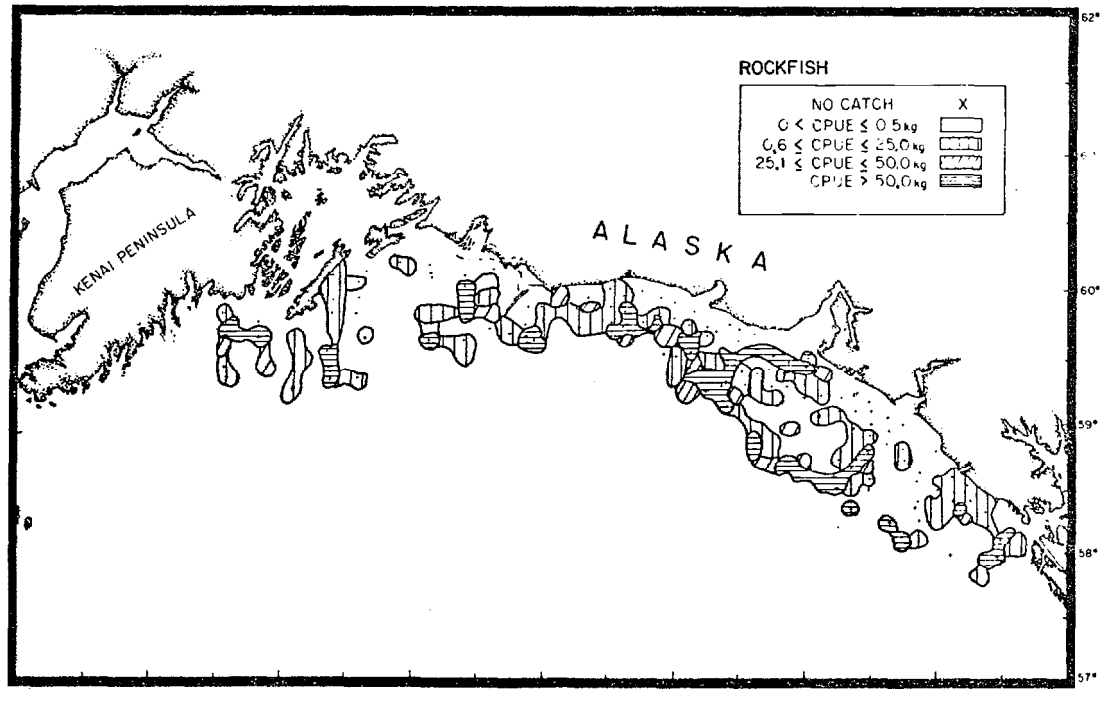


Figure X1-148.--Distribution of apparent relative abundance of rockfish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table XI-13.--Estimated biomass and population size of rockfishes in the Gulf of Alaska, May-October, 1961.

Region	zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean sire per individuals 2/ Weight (kg)	Length (cm)
Fairweather	1-100	0.3	10.8	0.1	--	--	--	--
	101-200	10.1	1,959.8	17.5	--	--	--	--
	201-400	257.4	9.226.3	82.4	--	--		--
	All zones	41.0	11,196.9	7 . 5	--	--	--	--
Yokutat	1-100	0.2	12.6	0.1	--	--	--	--
	101-200	73.4	12,795.8	51.3	--	--	--	--
	201-400	148.1	12,117.1	48.6	--	--	--	--
	All zones	75.5	24,925.5	16.6	--	--	--	--
Prince William	1-100		0	0	0	--	--	--
	101-200	50.20	7,545.4	67.3	10,301.4	70.8	0.73	--
	201-400	84.5	3,674.2	32.8	4,245.6	29.2	0.87	--
	All zones	34.5	11,219.6	7.5	14,547.0	--	--	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	81.8	28,239.0	86.2	--	--	--	--
	201-400	33.1	4,506.3	13.8	--	--	--	
	All zones	56.0	32,745.3	21.8	--		--	--
Kodiak	1-100	5.4	1,463.4	22.1	2.3	20.0	0.65	--
	101-200	25.6	5,045.5	76.2	9.0	78.3	0.56	--
	201-400	4.0	112.9	1.7	0.2	1.7	0.53	--
	All zones	13.3	6.621.8	4 . 4	11.5	--	--	
Shelikof	l-l.00	0	0	0	0	0	--	--
	101-200	2.6	239.5	17.4	521.3	16.1	0.46	--
	201-400	10.9	1,141.1	82.7	2,722.0	83.9	0.42	--
	All zones	5.3	1,380.6	0.9	3,243.3	--	--	--
Chirikof	1-100	3/	1.9	5/	4/	5.1	0.78	--
	101-200	135.4	27,635.4	7T.5	60.4	71.4	0.41	--
	201-400	83.8	10,463.1	27.5	24.2	28.6	0.40	--
	All zones	61.6	38.100.4	25.4	84.6	--		
Shumagin	1-100	0	0	0	0	0	--	--
	101-200	29.5	6,401.6	33.1	13.6	30.6	0.47	--
	201-400	451.4	12,606.1	66.3	30.9	69.4	0.41	--
	All zones	40.3	19,007.7	12.7	44.5	--	0.15	--
Sanak	1-100	0.1	27.9	0.6	0.2	1.4	0.15	--
	101-200	7.3	1,408.6	28.3	4.4	29.9	0.32	--
	201-400	238.7	3,545.0	71.2	10.1	68.7	0.35	--
	All zones	11.8	4, 981.5	3 . 3	14.7	--	--	--
Total	1-100	1.2	1,516.6	1.0	--	--		--
	101-200	52.9	91,270.6	60.8		--	--	--
	201-400	95.9	57,392.1	38.2	--	--		--
	All zones	41.4	150,179.3	100.0	--	--	--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

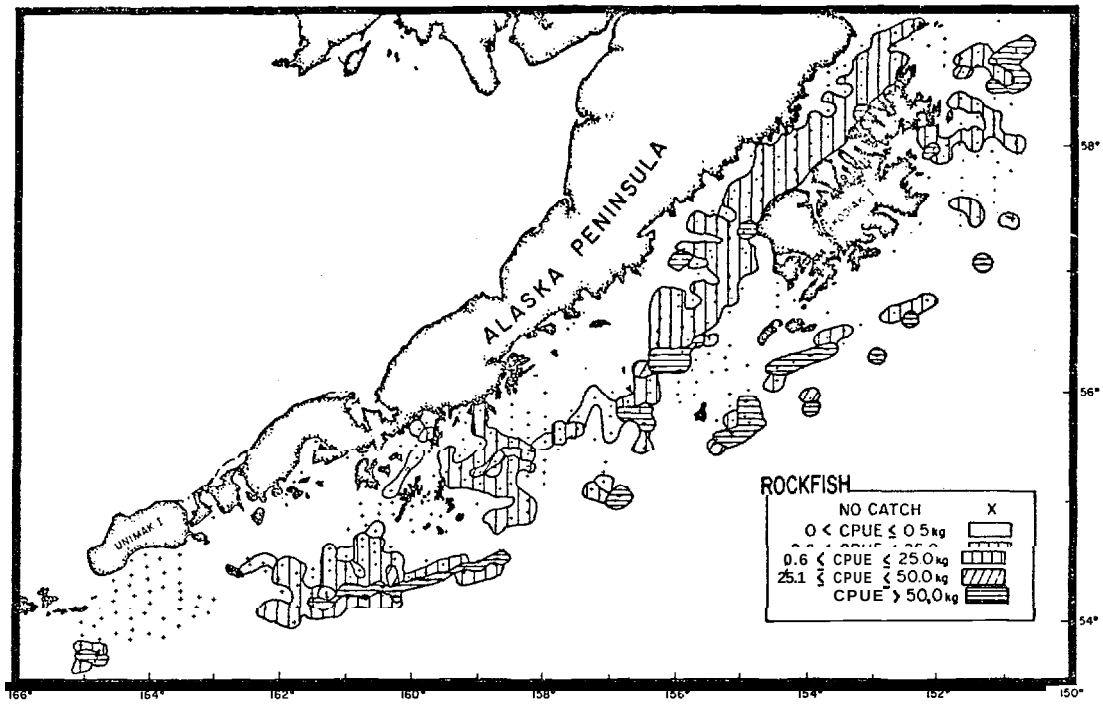


Figure X1-149. --Distribution of apparent relative abundance of rockfish in the western Gulf of Alaska, Nay-July 1961 (Cruise 618).

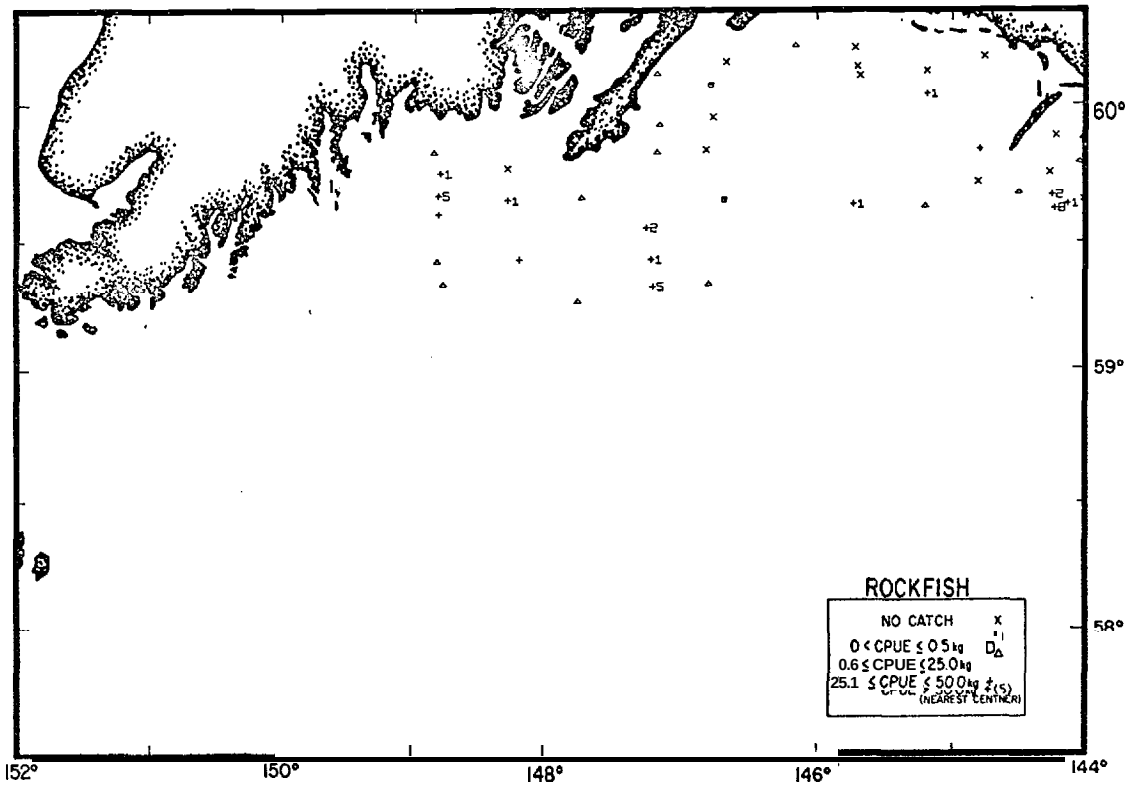


Figure X1-150.'--Distribution of standardized catch rates in kg/hr of rockfish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

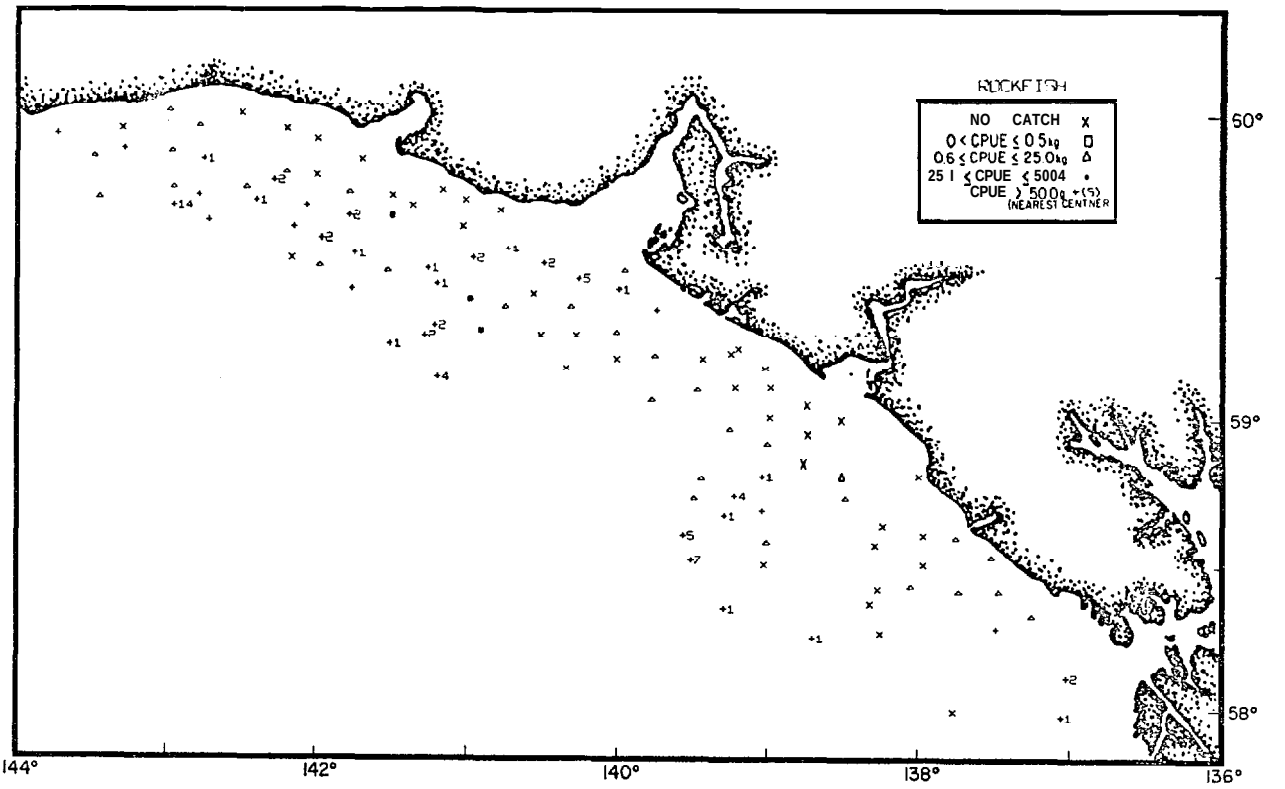


Figure X1-151.--Distribution of standardized catch rates in kg/hr of rockfish in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

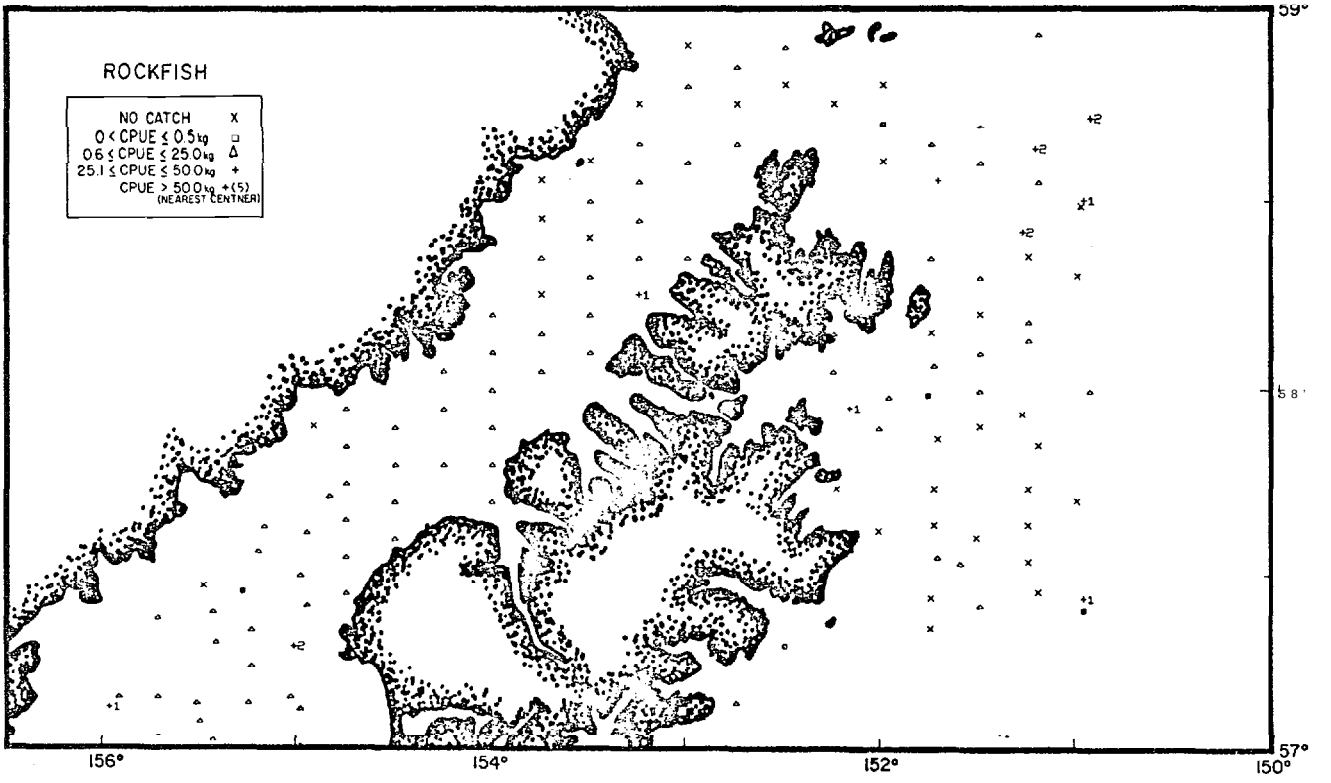
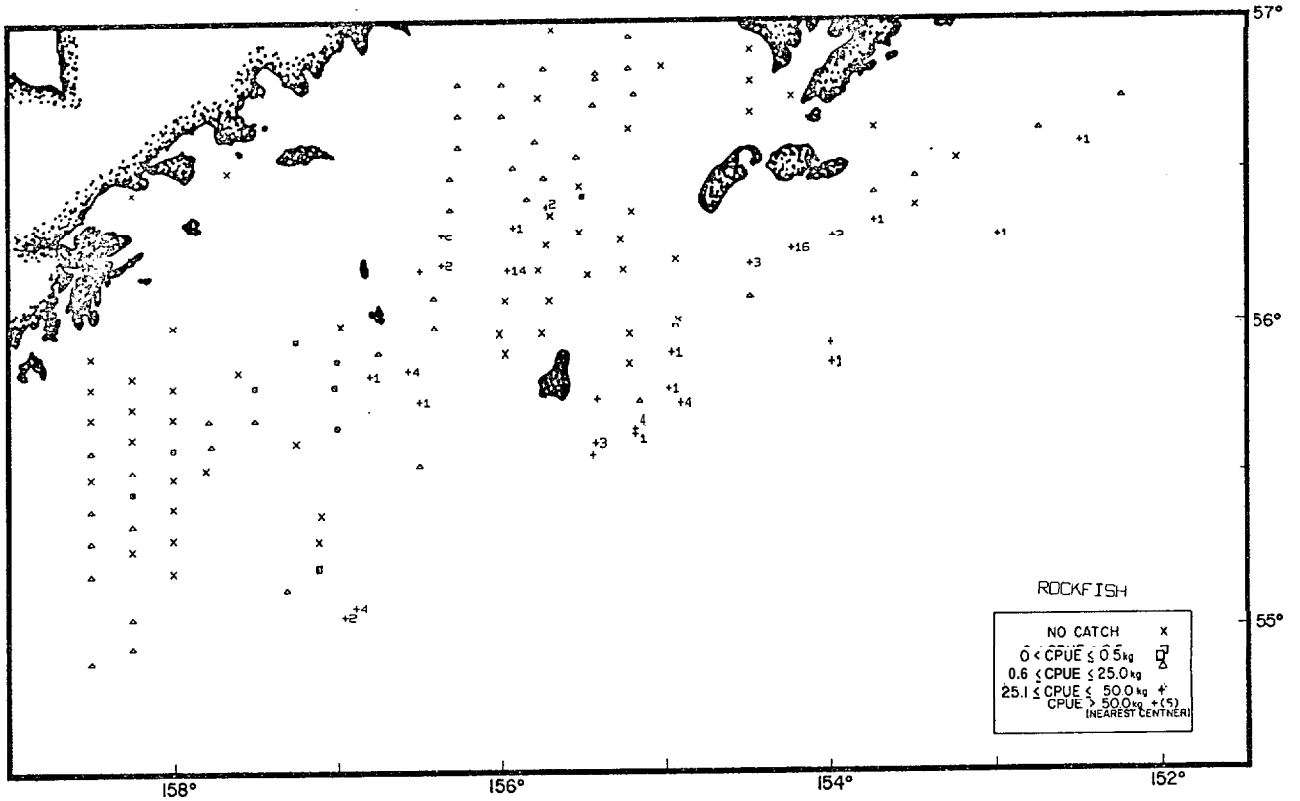


Figure X1-152.--Distribution of standardized catch rates in kg/hr of rockfish in the western Gulf of Alaska, May-July 1961 (Cruise 618).



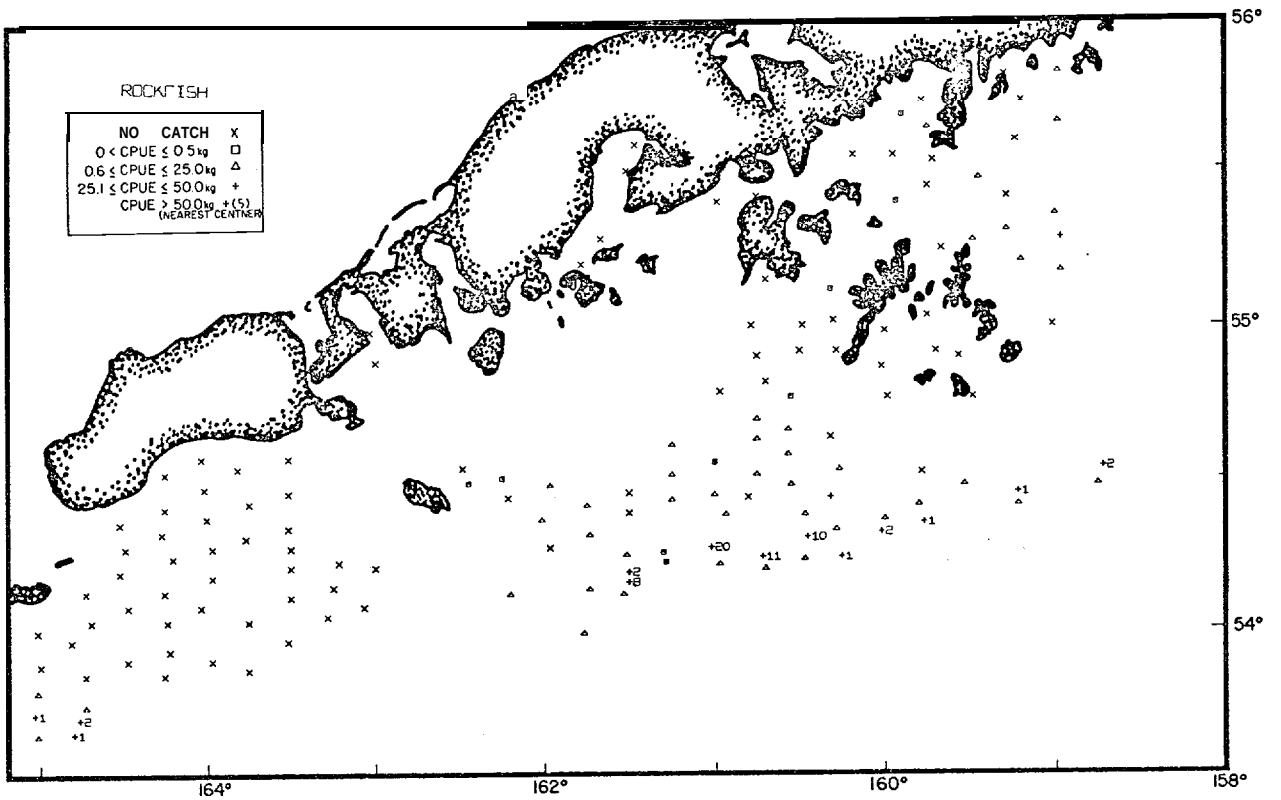


Figure X1-153.--Distribution of standardized catch rates in kg/hr of rockfish in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-14.--Estimated biomass and population size of Elasmobranchs in the Gulf of Alaska during May-October. 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per Individuals 2/ Weight (kg)	Mean size per Individuals 2/ Length (cm)
Fait-weather	l-100	8.6	367.7	4.8	--	--	--	--
	101-200	30.0	5.822.6	76.6	--	--	--	--
	201-400	33.4	1,411.4	18.6	--	--	--	--
	All zones	27.9	7,601.7	18.0	--	--	--	--
Yakutat	l-100	22.7	1,675.9	24.7	--	--	--	--
	101-200	20.7	3,610.3	53.1	--		--	--
	201-400	18.5	1,513.7	22.3	--	--	--	--
	All zones	20.6	6,799.9	16.1	--	--		--
Prince William	l-100	10.6	1,392.6	28.6	0.4	26.7	3.65	--
	101-200	20.0	3,002.3	61.8	0.7	46.7	4.34	--
	201-400	10.7	466.7	9.6	0.4	26.7	1.29	--
	All zones	15.0	4,861.6	11.5	1.5	--	--	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	26.7	9,291.3	62.6	2.4	57.1	3.81	--
	201-400	40.8	5,555.7	37.4	1.8	42.9	3.14	--
	All zones	34.7	14,847.0	35.1	4.2	--	--	--
Kodiak	1-100	.1.5	423.1	24.6	0.2	15.4	2.31	--
	101-200	6.6	1,298.4	75.4	1.1	84.6	1.17	--
	201-400	0.1	1.4	0.1	4/	5/	0.09	--
	All zones	3.4	1722.9	4.1	1.3	--	--	--
Shelikof	l-100	3.6	228.1	13.8	0.1	9.1	3.63	--
	101-200	9.4	879.0	53.3	0.6	54.6	1.37	--
	201-400	5.2	542.9	32.9	0.4	36.4	1.23	--
	All zones	6.1	1.650.0	3.9	1.1	--	--	--
Chirikof	l-100	0.2	43.8	1.2	4/	5/	4.06	--
	101-200	2.7	550.1	15.4	0.4	26.7	1.49	--
	201-400	23.9	2.984.9	83.4	1.1	73.3	2.69	--
	All zones	5.8	3,578.8	8.5	1.5	--	--	--
Shumagin	l-100	0	0	0	0	0	--	--
	101-200	2.2	466.4	72.1	0.1	100.0	3.34	--
	201-400	6.5	180.2	27.9	51	5/	1.95	--
	All areas	1.4	646.6	--ix	0.1	--	--	
Sanak	l-100	0.2	39.3	6.8	4/	5/	6.80	--
	101-200	1.9	359.3	62.1	0.2	55.0	1.87	--
	201-400	12.1	180.2	31.1	0.2	50.0	1.00	--
	All areas	1.4	578.8	1.4	b.4	--	--	--
Total	l-100	3.2	4,170.5	9.9		--	--	--
	101-200	14.3	25,279.7	59.8	--	--	--	--
	201-400	21.5	12,937.1	30.4	--	--	--	--
	All areas	11.5	42,287.3	100.1	--	--	--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data arc available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

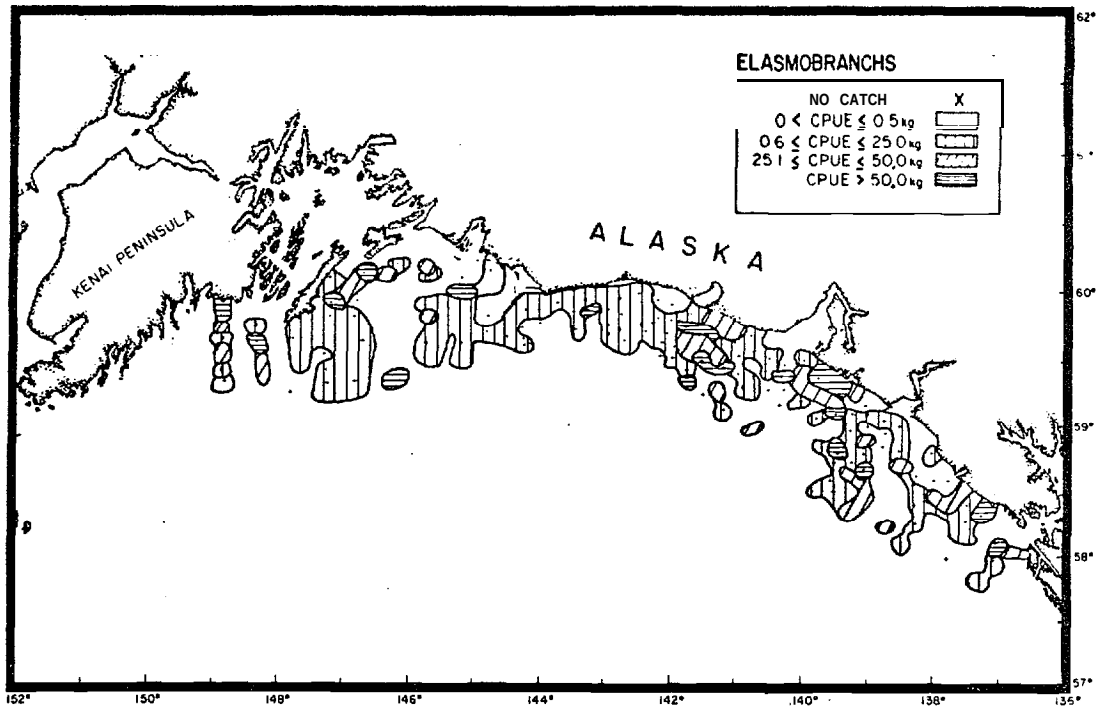


Figure X1-154.--Distribution of apparent relative abundance of elasmobranchs in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611, 052).

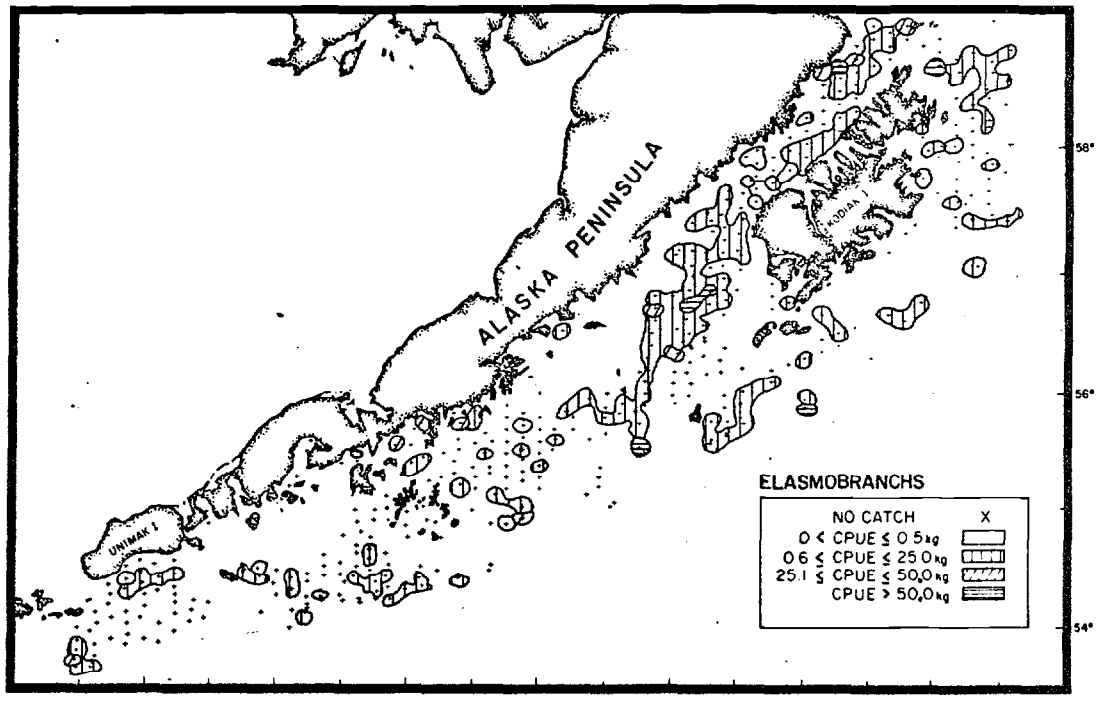


Figure X1-155.--Distribution of apparent relative abundance of elasmobranchs in the western Gulf of Alaska, May-July 1961 (Cruise 618).

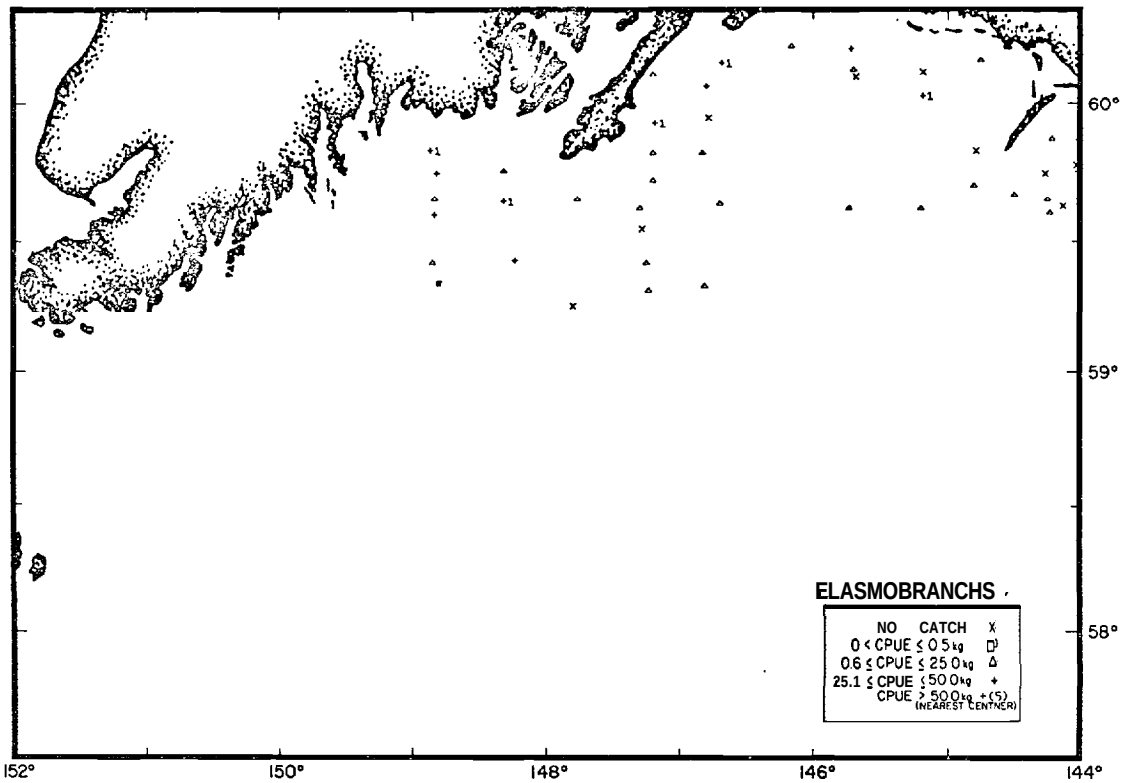


Figure X1-156. --Distribution of standardized catch rates in kg/hr of elasmobranchs in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

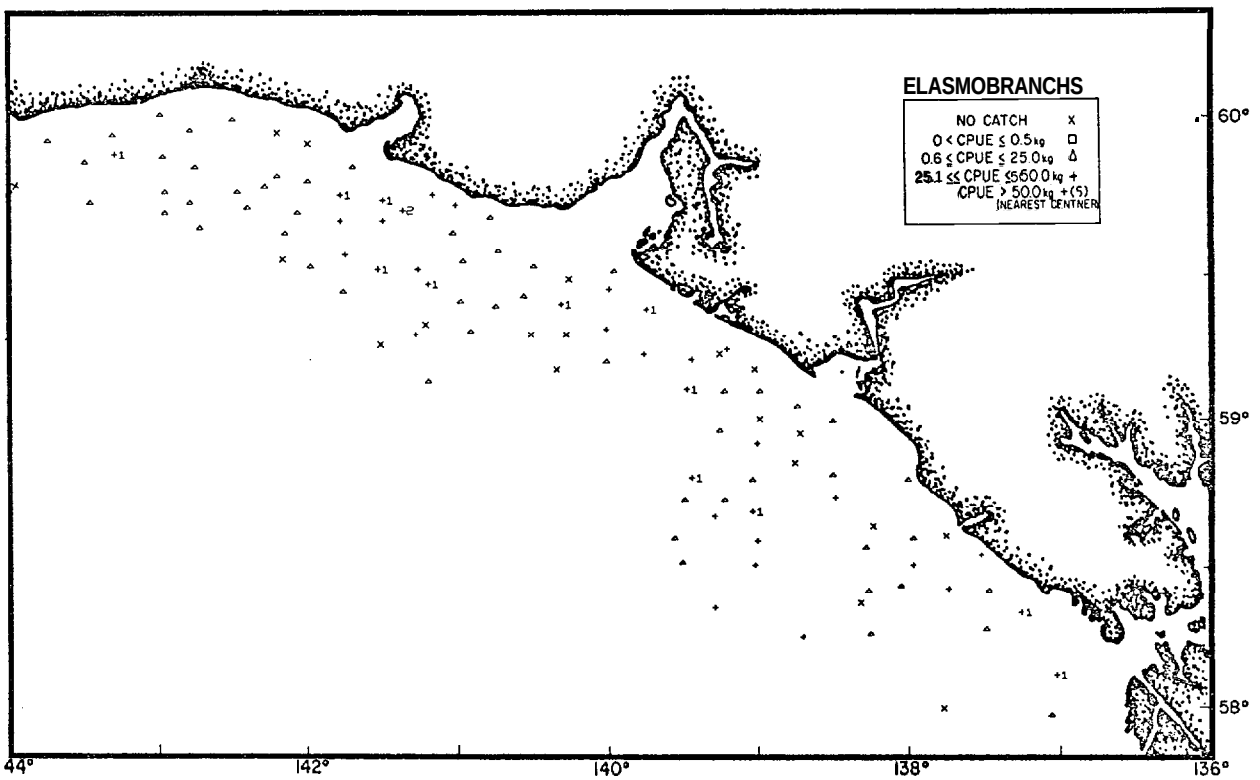
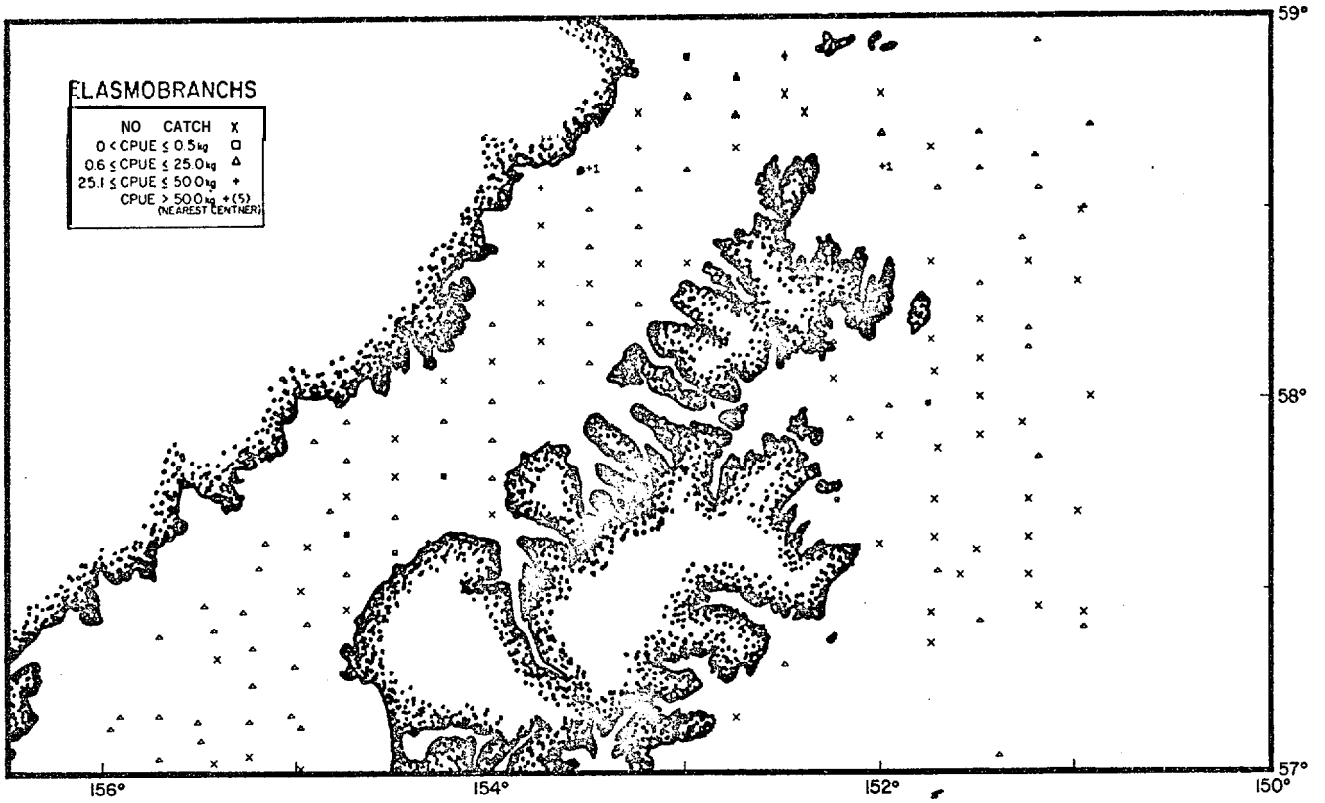


Figure XI-157 .--Distribution of standardized catch rates in kg/hr of elasmobranchs in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



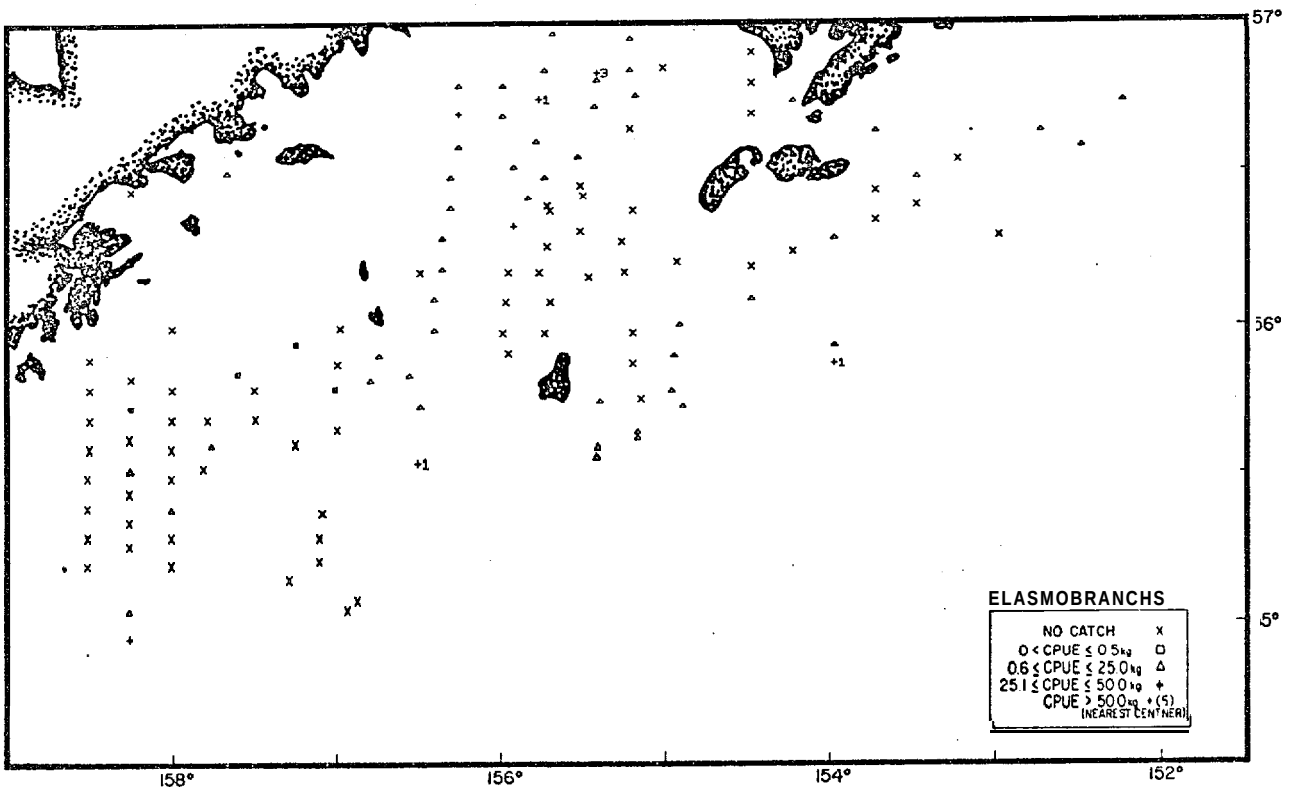


Figure X1-158.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, May-July 1961 (Cruise 618).

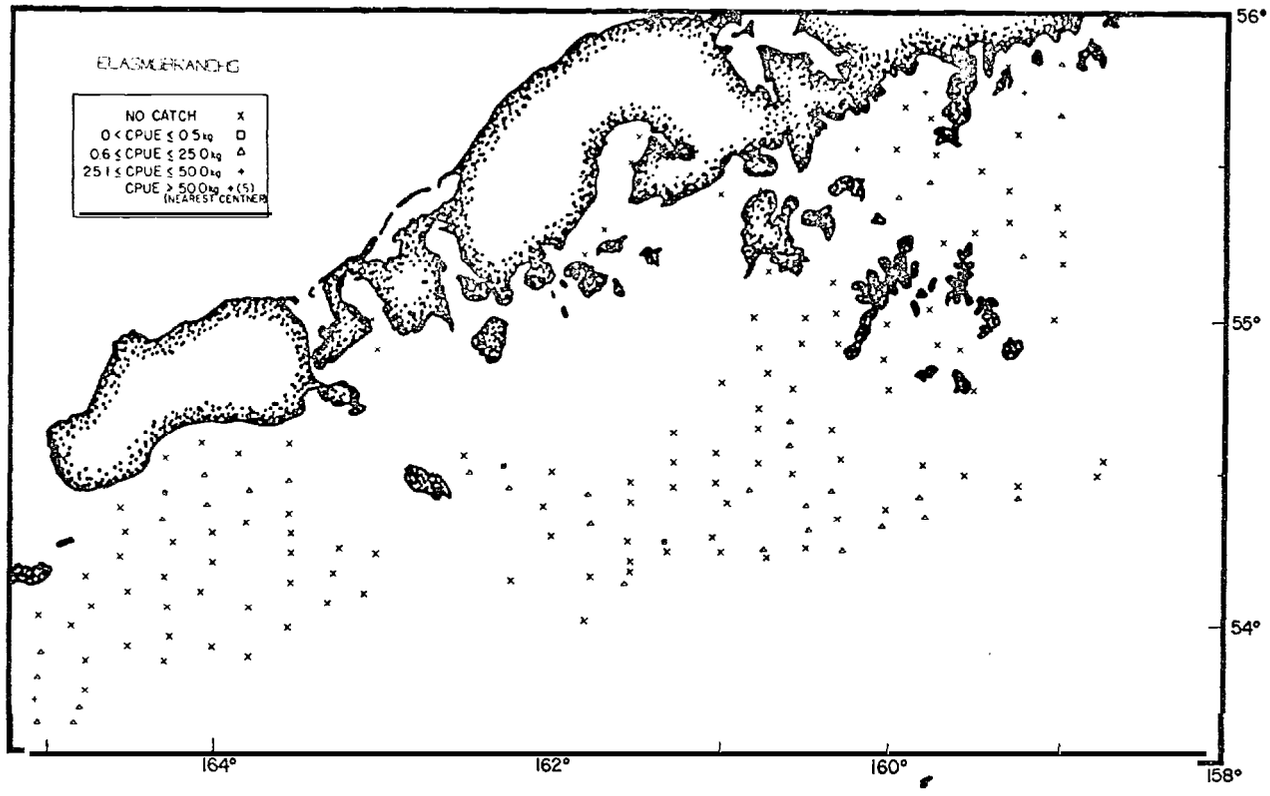


Figure X1-159.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, May-July 1961 (Cruise 618).

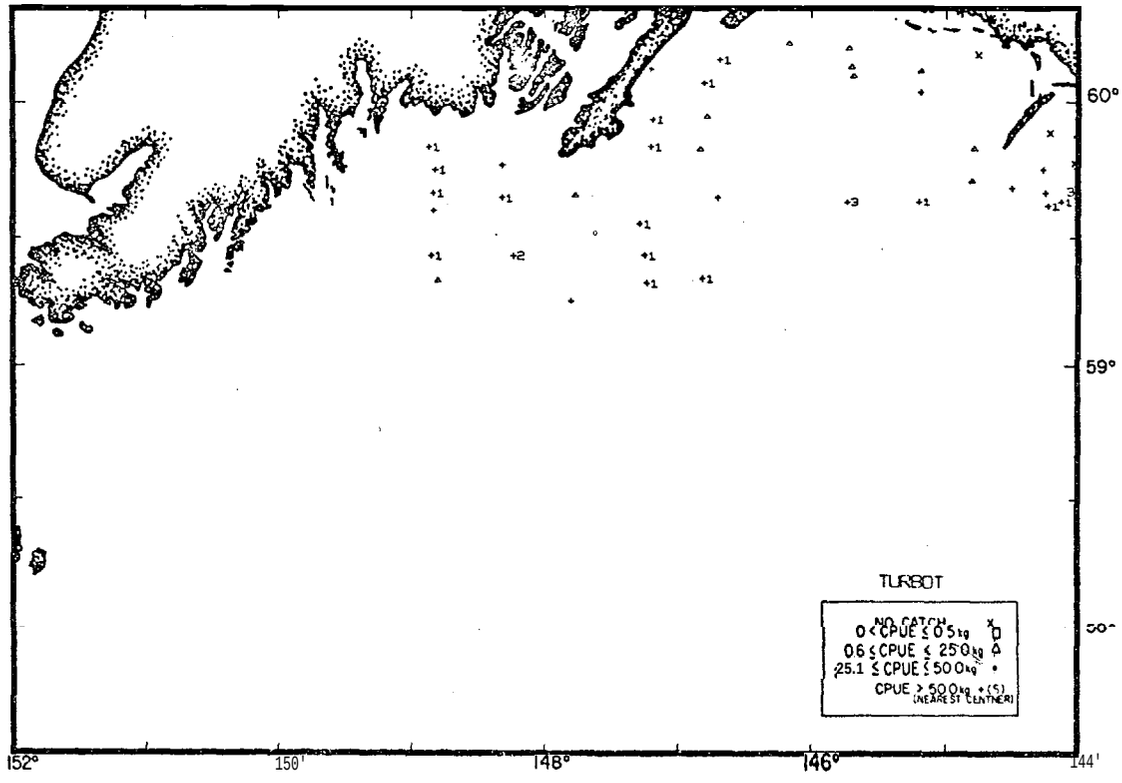


Figure XI-160.--Distribution of standardized catch rates in kg/hr of turbot in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Distribution, Relative Apparent Abundance, Biomass Estimates and Size Composition Features of Principal Species of Fish and Invertebrates

TURBOT

Distribution and Abundance--Turbot had the highest mean CPUE of all species found in the Gulf of Alaska (Figures X1-160-163). Occurring in all region-depth zones, turbot averaged 91 kg/hr over the entire Gulf of Alaska. Mean CPUE's for turbot increased with increasing bottom depth from 22 kg/hr in the inner shelf to 207 kg/hr in the upper slope (Table X1-15). The relative apparent abundance of turbot was greatest in the Fairweather region and was above or nearly average in Chirikof, Yakutat, Kenai and Kodiak (Figures X1-164-165). Lowest relative apparent abundance occurred in the Sanak region.

Biomass --The estimated apparent biomass for turbot was 323 thousand mt of which 57% was located in the outer shelf, 34% in the upper slope and 9% in the inner shelf depth zone. Regions which contained the largest percentage of the biomass were Fair-weather (24%), Chirikof (20%), Kenai (16%) and Kodiak (13%). The estimated biomass was fairly evenly divided between the eastern (53%) and western (47%) Gulf of Alaska.

Size Composition--Random length-frequency samples were taken from the Shumagin outer shelf and Chirikof upper slope. In the former region, turbot, sexes combined, ranged from 20-47 cm and averaged 30.0 cm while in the latter, turbot ranged from 22-65 cm and averaged 37.8 cm. (Figure X1-166).

KING CRAB[1/]

Distribution and Abundance--Although king crab had the second highest average CPUE of all species encountered, they were primarily captured in the western Gulf of Alaska (Figures X1-167-170). Mean CPUE's in the western Gulf of Alaska ranged from 21 kg/hr to 249 kg/hr and averaged 72 kg/hr with the highest relative apparent abundance occurring in the Chirikof and Kodiak regions (Table X1-16). The relative apparent abundance of king crab decreased with increasing bottom depth from an average of 180 kg/hr in the inner shelf to 7 kg/hr in the upper slope (Figures X1-171-172).

1/ Although king crab were not recorded to species during some of these early cruises, more recent surveys indicate that the species were primarily the blue king crab Paralithodes camtschatica and a small percentage of gold king crab, Lithodes aequispinus.

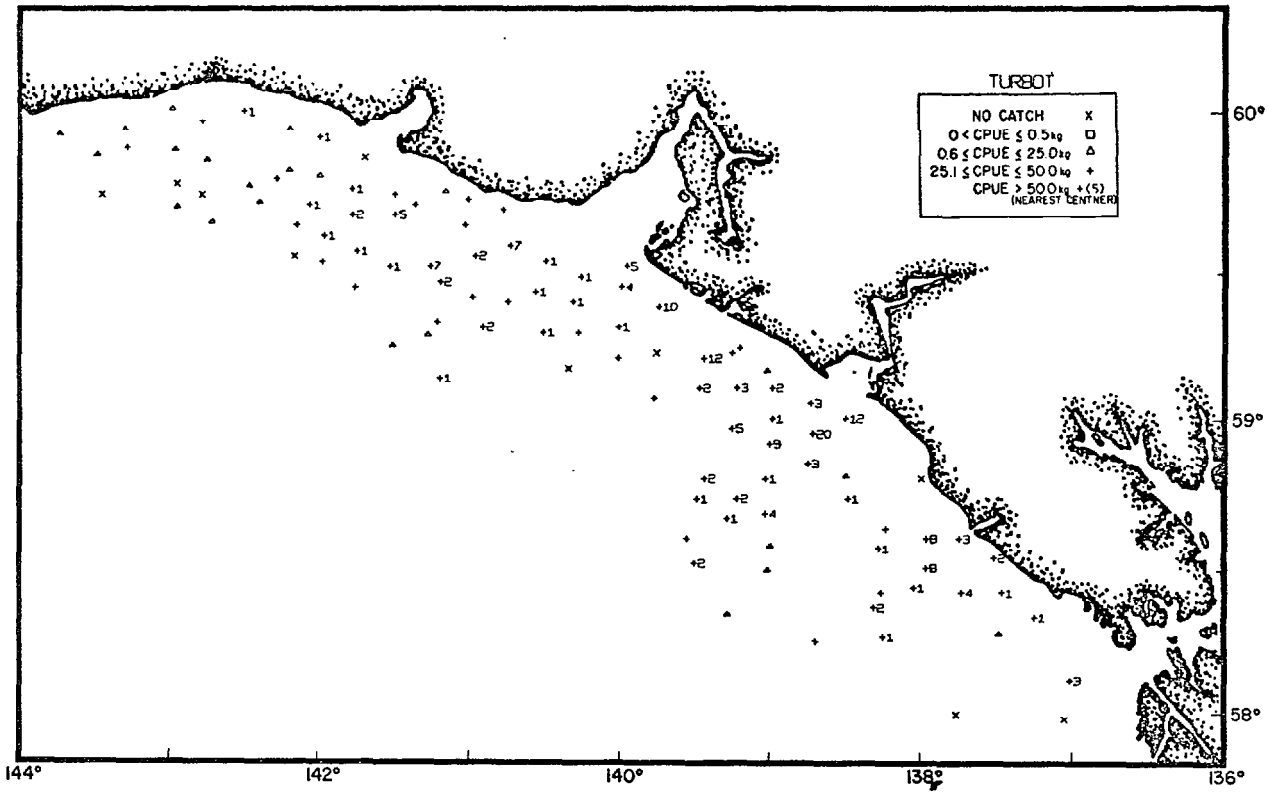


Figure XI-161.--Distribution of standardized catch rates in kg/hr of turbot in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

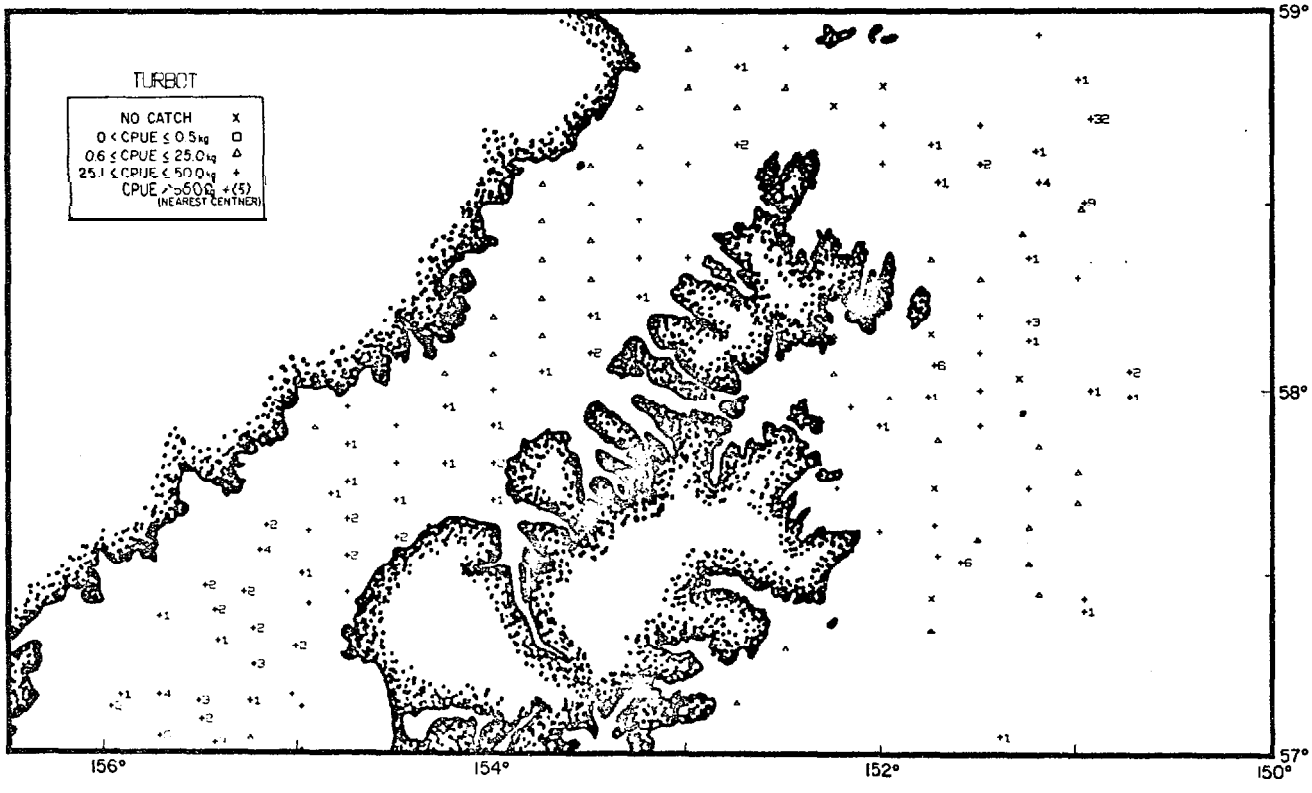
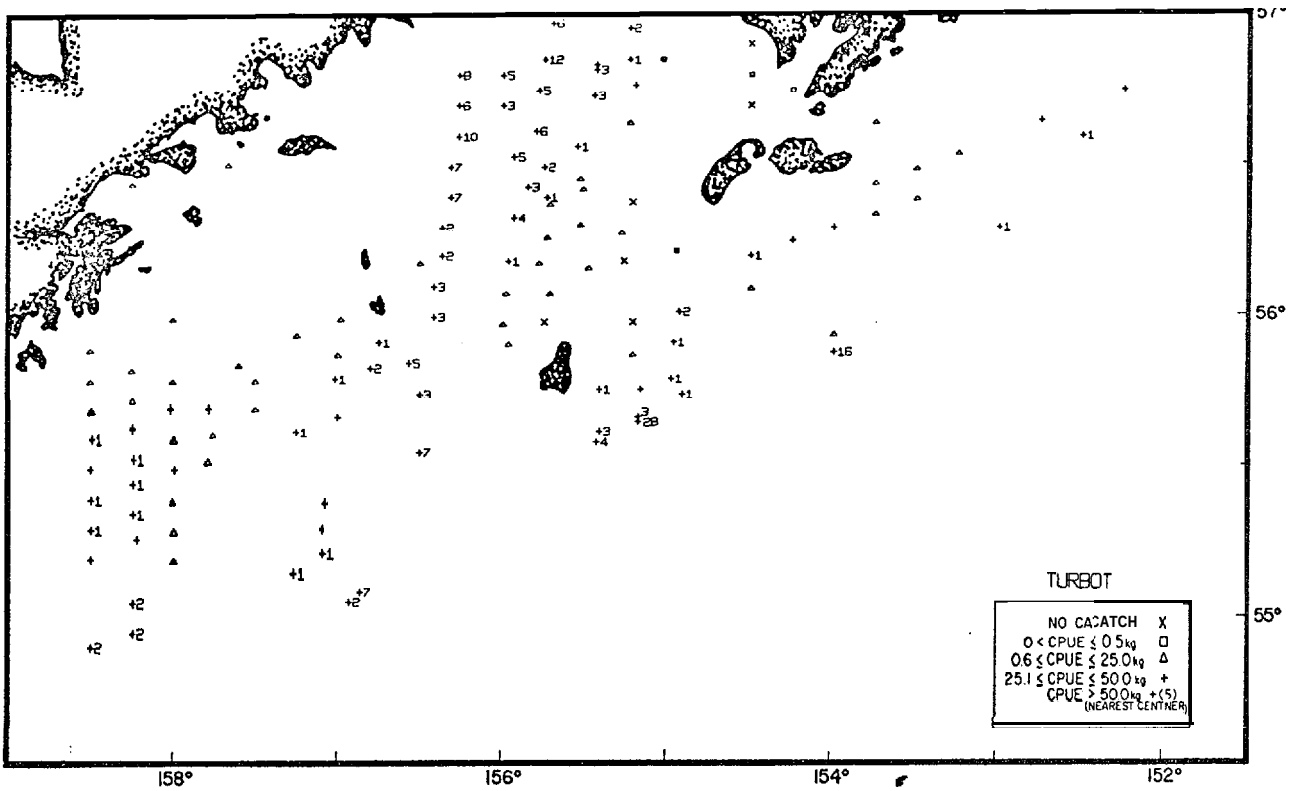


Figure X1-162.--Distribution of standardized catch rates in kg/hr of turbot in the western Gulf of Alaska, May-July 1961 (Cruise 618).



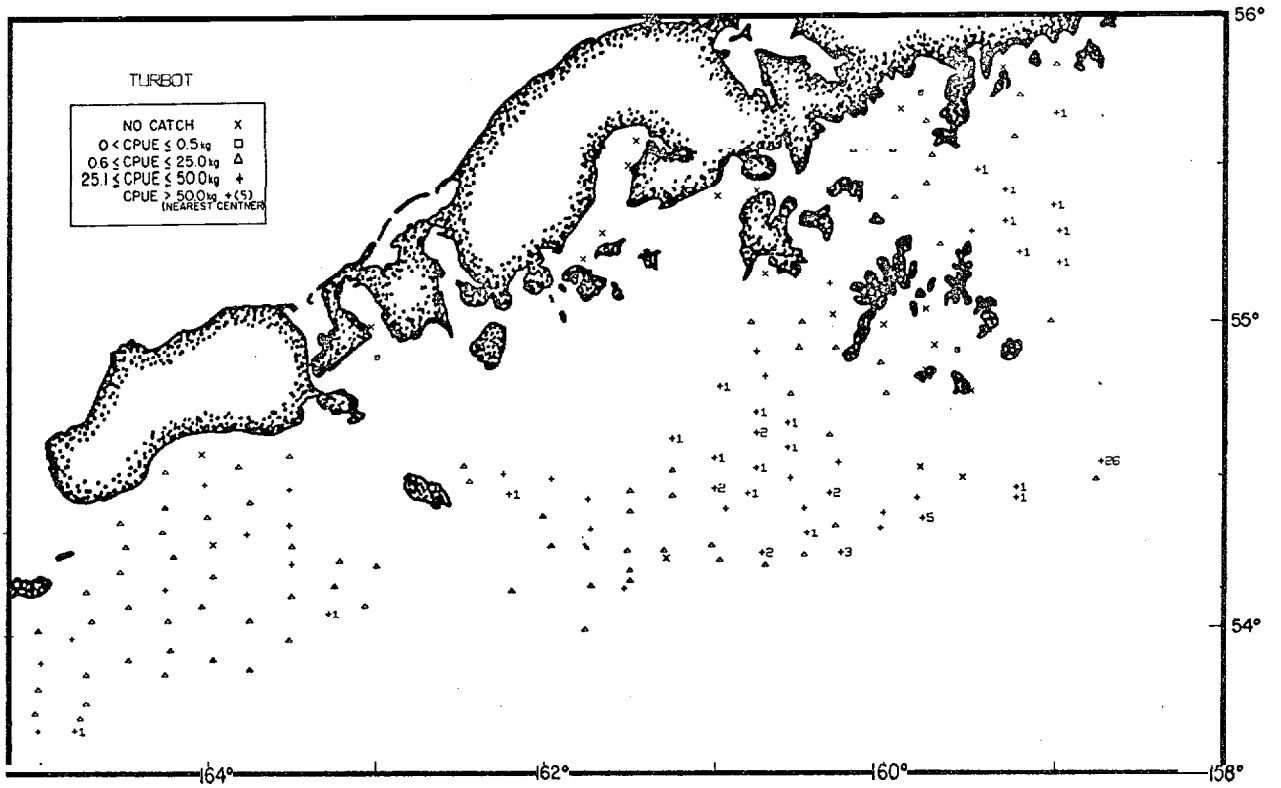


Figure X1-163.--Distribution of standardized catch rates in kg/hr of turbot in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-15.--Estimated biomass and population size of turbot (*Atheresthes stomias*) in the Gulf of Alaska during Hay-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	320.2	13,735.4	17.5			--	--
	101-200	314.4	61.076.9	77.7	--		--	--
	201-400	105.7	3,789.3	4.8	--	--	--	--
	All zones	287.9	78,601.6	24.4	--	--	--	--
Yakutat	l-100	61.2	4,525.0	15.6	--	--	--	--
	101-200	87.2	15,200.1	52.5	--	--	--	--
	201-400	112.7	9,220.7	31.9	--	--		--
	All zones	87.7	28,945.8	9.0			--	--
Prince William	l-100	2.3	305.4	2.3	0.6	2.5	0.48	--
	101-200	67.6	10.161.3	75.3	19.2	79.7	0.53	--
	201-400	69.6	3,023.5	22.4	4.3	17.8	0.70	--
	All zones	41.4	13,490.2	4.2	24.1	--	0.56	--
Kenai	l-100	--	--		--	--	--	--
	101-200	72.3	25.178.2	50.5	--	--		--
	201-400	181.4	24,692.1	49.5	--	--	--	--
	All zones	103.0	49,870.3	15.5	--	--	--	--
Kodiak	l-100	15.6	4.277.3	10.2	23.3	17.4	0.18	--
	101-200	180.7	35,597.6	85.2	106.9	79.8	0.33	--
	201-400	67.0	1,904.4	4.6	3.8	2.8	0.50	--
	All zones	83.7	41,779.3	13.0	134.0	--	0.31	--
Shelikof	l-100	0.8	51.3	1.0	0.3	1.5	0.16	--
	101-200	41.2	3,840.0	72.5	16.7	83.1	0.23	--
	201-400	133.5	1,403.1	26.5	3.1	15.4	0.45	--
	Ail zones	68.6	5.294.4	1.6	20.1	--	0.27	--
Chirikof	l-100	7.5	2.172.9	3.3	12.9	7.1	0.17	--
	101-200	58.0	11,827.6	18.1	61.7	33.0	0.19	--
	201-400	413.0	51,530.2	78.6	107.8	59.1	0.48	37.8
	All zones	106.0	65.630.7	20.3	162.4	--	0.36	--
Shumagin	l-100	5.5	1,246.4	3.9	4.2	4.3	0.30	--
	101-200	71.3	15,463.1	48.3	61.9	64.0	0.25	30.0
	201-400	542.4	15,147.;	47.6	30.6	31.6	0.49	--
	All zones	67.5	31,857.0	9.Y	96.7	--	0.33	
Sanak	l-100	10.7	2.279.4	31.0	12.1	34.3	0.19	
	101-200	24.2	4,690.9	63.7	22.6	64.0	0.21	
	201-400	26.3	390.5	5.3	0.6	1.7	0.69	
	All zones	17.4	7,360.8	2.3	35.3	--	0.21	
Total	l-100	21.7	28,593.1	a.9	--	--	--	
	101-200	103.3	183,035.7	56.7			--	
	201-400	206.8	111,101.3	34.4			--	
	All zones	91.0	322,730.1	100.0				

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 Individuals.

5/ Less than 0.1 percent.

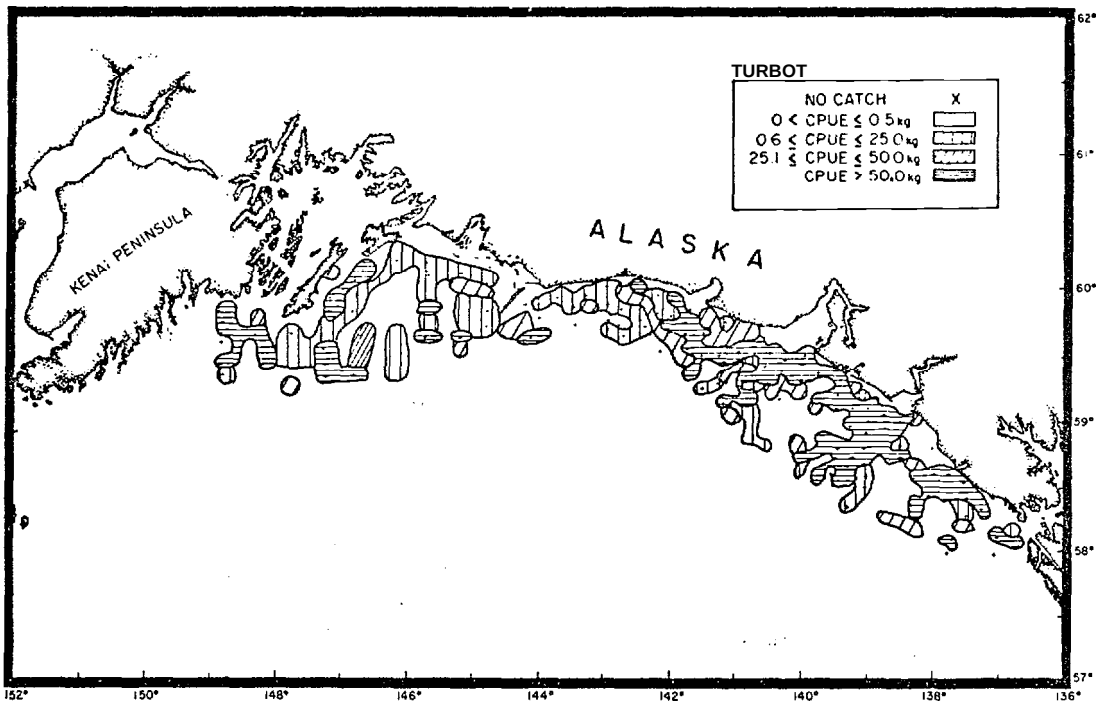


Figure X1-164.--Distribution of apparent relative abundnace of turbot in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

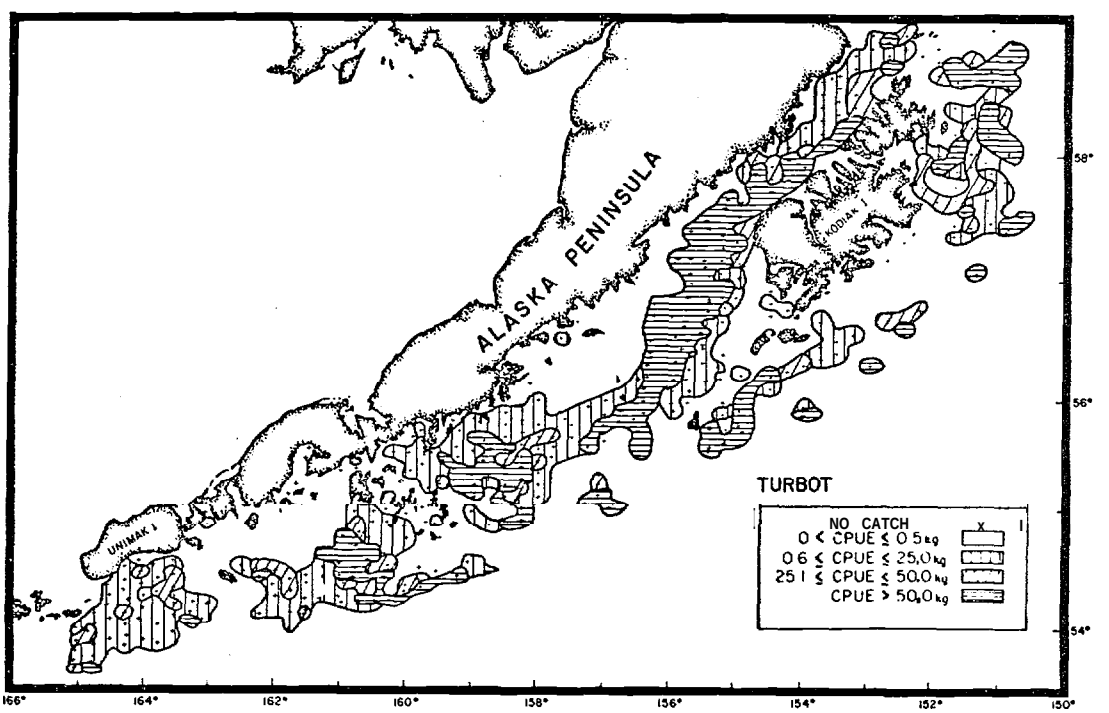


Figure X1-165.--Distribution of apparent relative abundance of turbot in the western Gulf of Alaska, May-July 1961 (Cruise 618).

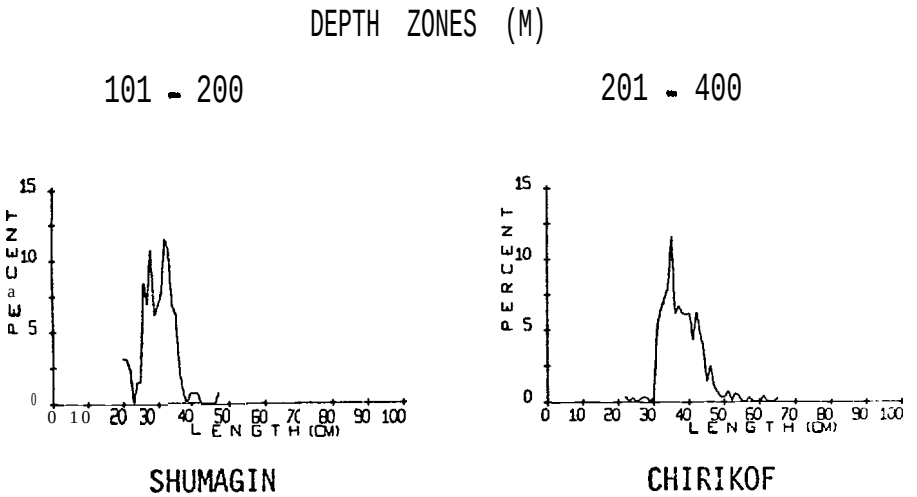


Figure X1-166.--Percentage length frequencies of turbot from the Gulf of Alaska (Cruises 618, 611, 052).

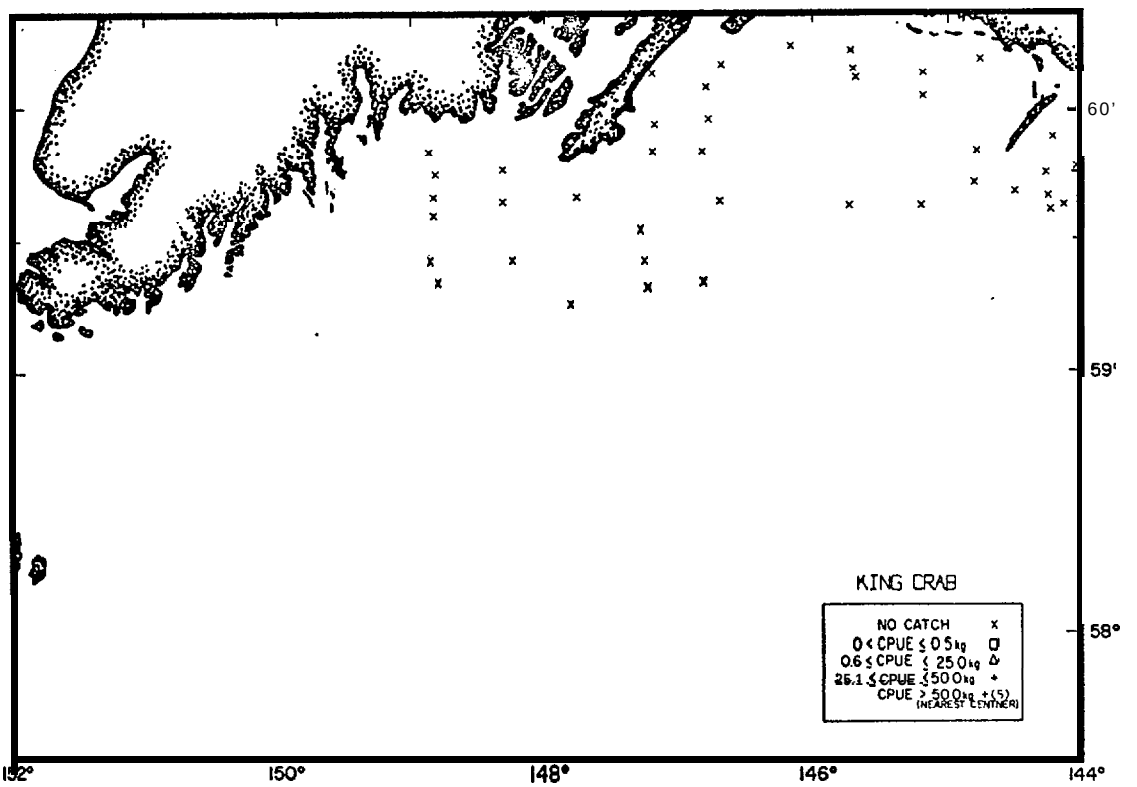


Figure X1-167.--Distribution of standardized catch rates in kg/hr of king crab in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

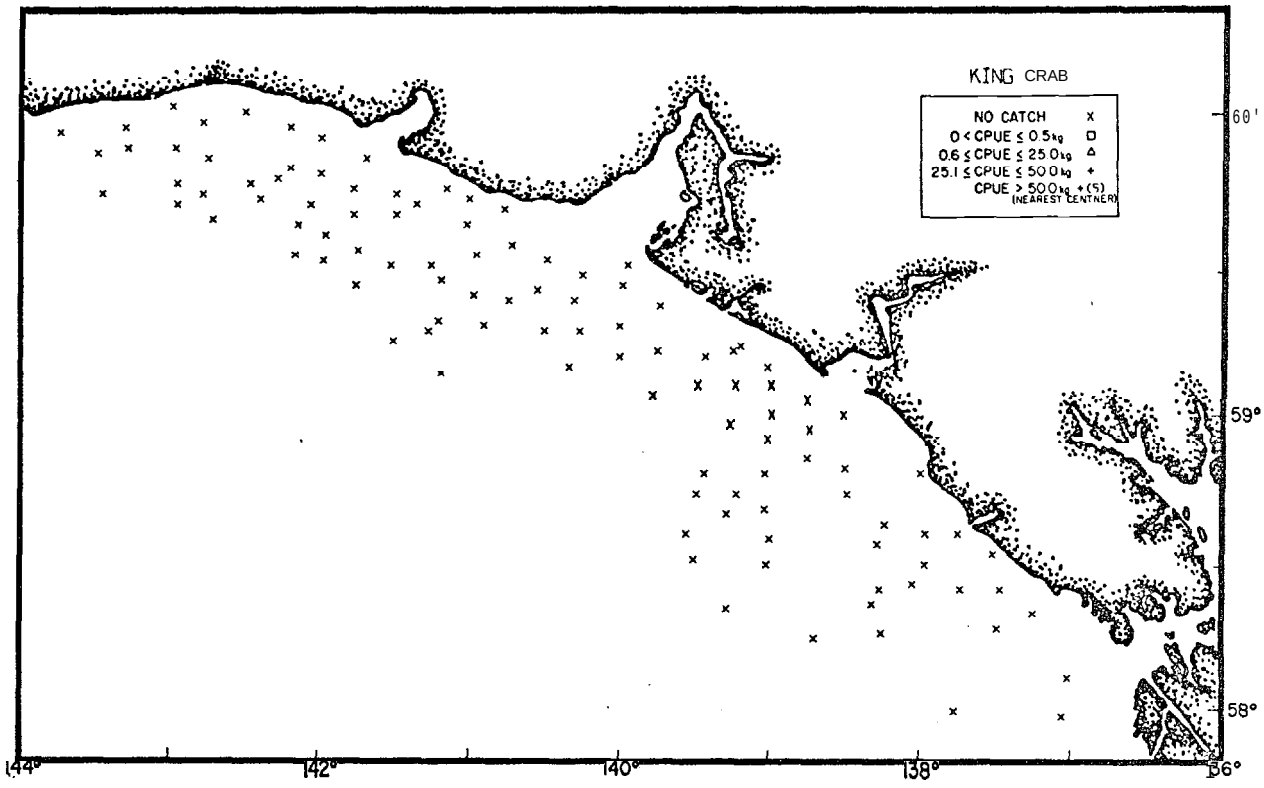


Figure X1-168.--Distribution of standardized catch rates in kg/hr of king crab in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

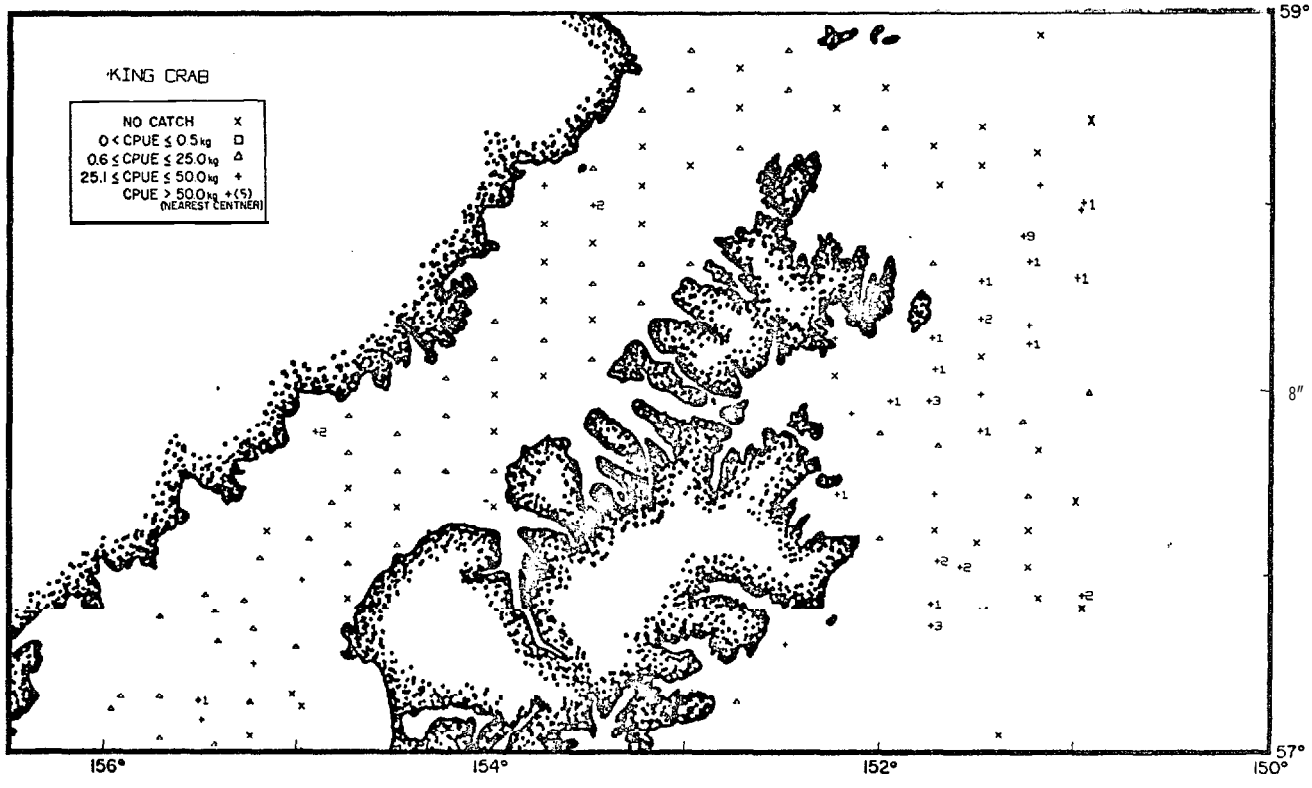


Figure X1-169.--Distribution of standardized catch rates in kg/hr of king crab *in* the *western* Gulf of Alaska, May-July 1961 (Cruise 618).

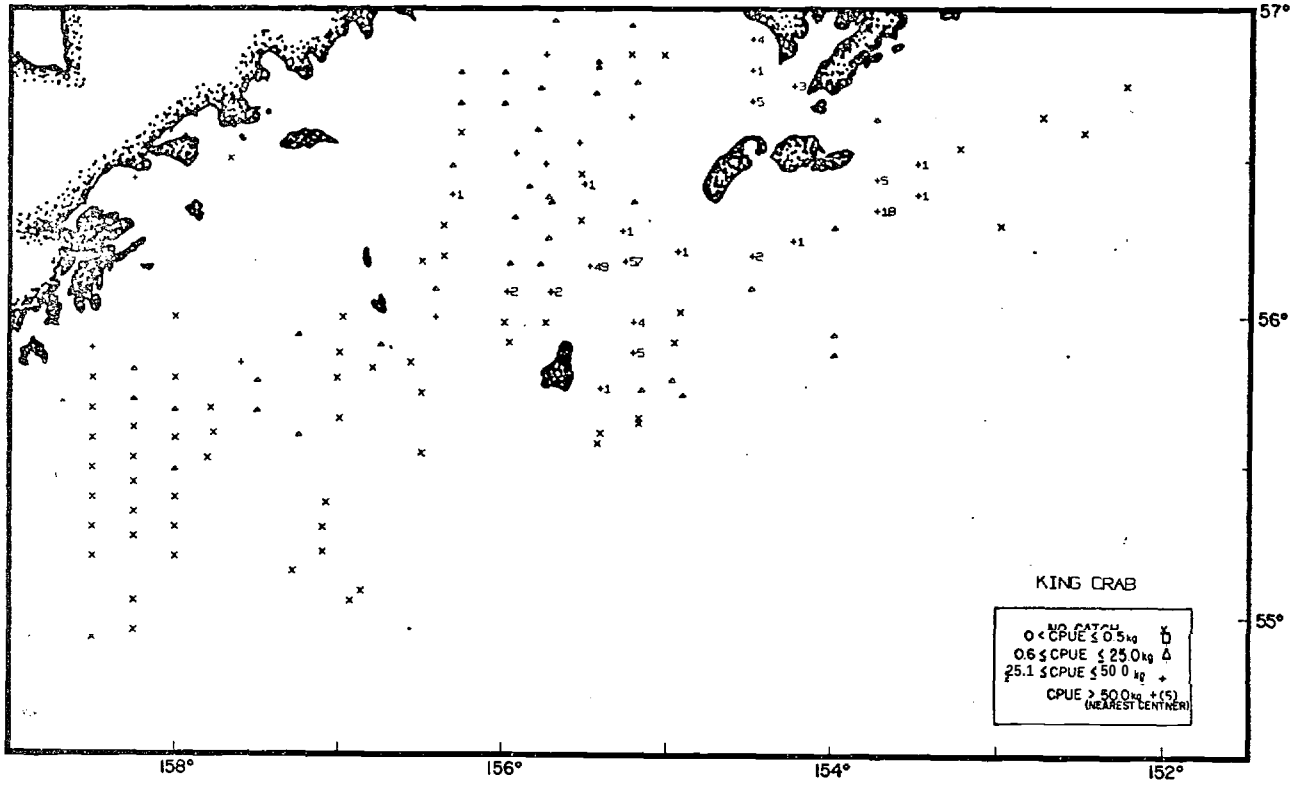


Figure X1-170. --Distribution of standardized catch rates in kg/hr of king crab in the western Gulf of Alaska, May-July 1961 (Cruise 618).

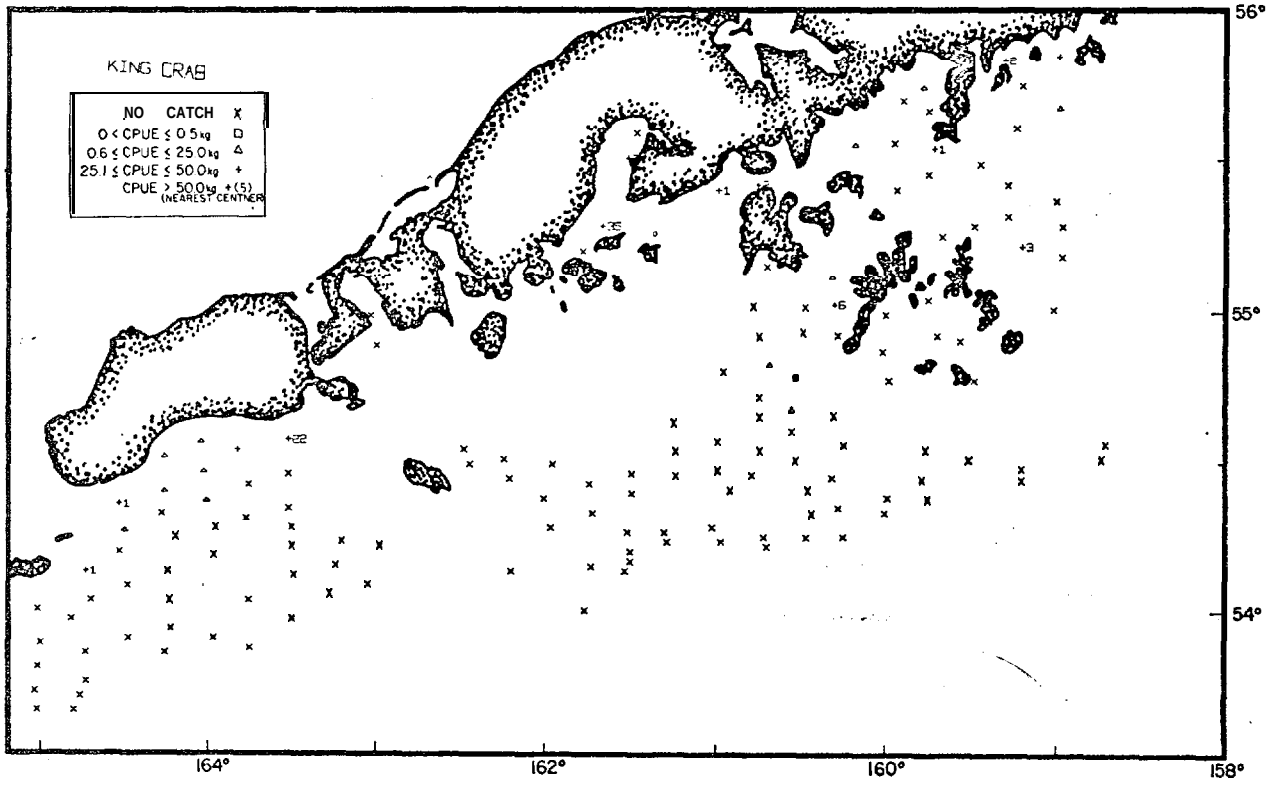


Figure XI-171 .--Distribution of standardized catch rates in kg/hr of king crab in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-16.--Estimated biomass and population size of king crab (Lithodidae) in the Gulf of Alaska during Hay-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	1-100	0	0	0	0	0	--	--
	101-200	0.1	18.9	14.7	--		--	--
	201-400	3.1	109.7	85.3	--		--	
	Ml zones	0.5	128.6	0.1	--	--	--	--
Yakutat	l-100	0	0	0	--		--	
	101-200	0.5	0	0			--	--
	201-400	0.1	37.1	100.0	--			--
	All zones		37.1	5/	--			--
Prince William	l-100	0	0		0	0	--	
	101-200	0	0	8	0	0	--	
	201-400	0	0	0	0	0	--	
	All zones	0	0	0	0			
Kenai	l-100	--		--				--
	101-200		0	0	0	0	--	
	201-400	8	0	0	0	0	--	
	All zones	0	0	0	0		--	--
Kodiak	l-100	128.0	34.988.6	65.9	14.8	52.9	2.37	14.9
	101-200	87.4	17.228.3	32.4	12.8	45.7	1.34	12.5
	201-400	31.9	907.5	1.7	28.4	1.4	2.33	--
	All zones	106.5	53.124.4'	20.1			1.90	--
Shelikof	l-100	161.0	10.121.3	89.4	4.5		2.27	--
	101-200	11.6	1,077.7	9.5	0.6	11.5 86.5	1.93	--
	201-400	11.1	116.7	1.0	0.1		2.12	--
	All zones	47.3	11,315.7	4.3	5.2	1.9	2.23	
Chirikof	l-100	511.8	'148.233.0	96.3	181.8	95.6	0.82	9.9
	101-200	21.5	4,380.8	2.8	7.8	4.1	1.58	11.2
	201-400	11.2	1.399.3	0.9	0.6	0.3	2.73	15.5
	All zones	-249.0	154,013.1	58.2	190.2	--	0.83	--
Shumagin	l-100	30.4	6.904.8	70.1	3.6		1.90	16.0
	101-200	13.6	2,940.2	29.9	1.0	78.3	2.81	--
	201-400	0	0	0	0	21.7		--
	All zones	20.9	9,845.0	3,7	4,6	0	2,10	--
Sanak	l-100	168.4	35,968.4	99.1	15.5	98.1	2.31	--
	101-200	1.6	311.5	0.9	0.3	1.9	0.90	--
	201-400	0	0	0	0	0	--	--
	All zones	85.9	36,279.9	13.7	15.8		2.28	
Total	l-100	179.6	236.216.1	89.2				
	101-200	14.7	25,957.4	9.8	--			
	201-400	7.1	2,570.3	1.0				
	All zones	72.3	264,743-a	100.0				

1/ Mean catch par unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

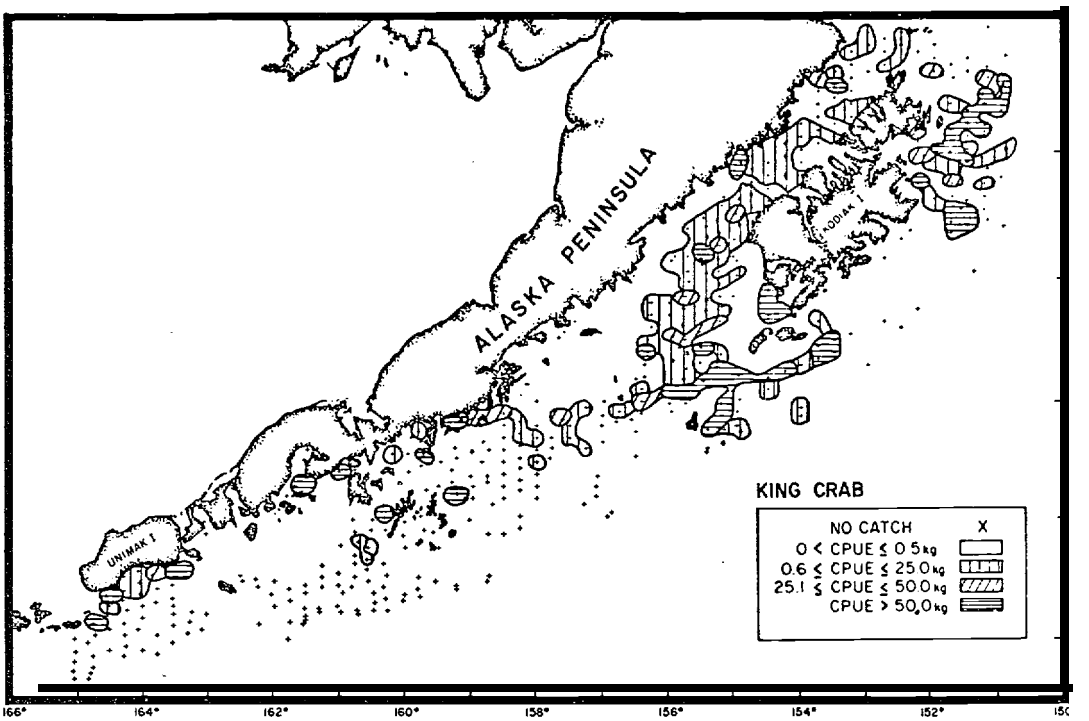


Figure X1-172.--Distribution of apparent relative abundance of king crab in the western Gulf of Alaska, Nay-July 1961 (Cruise 618).

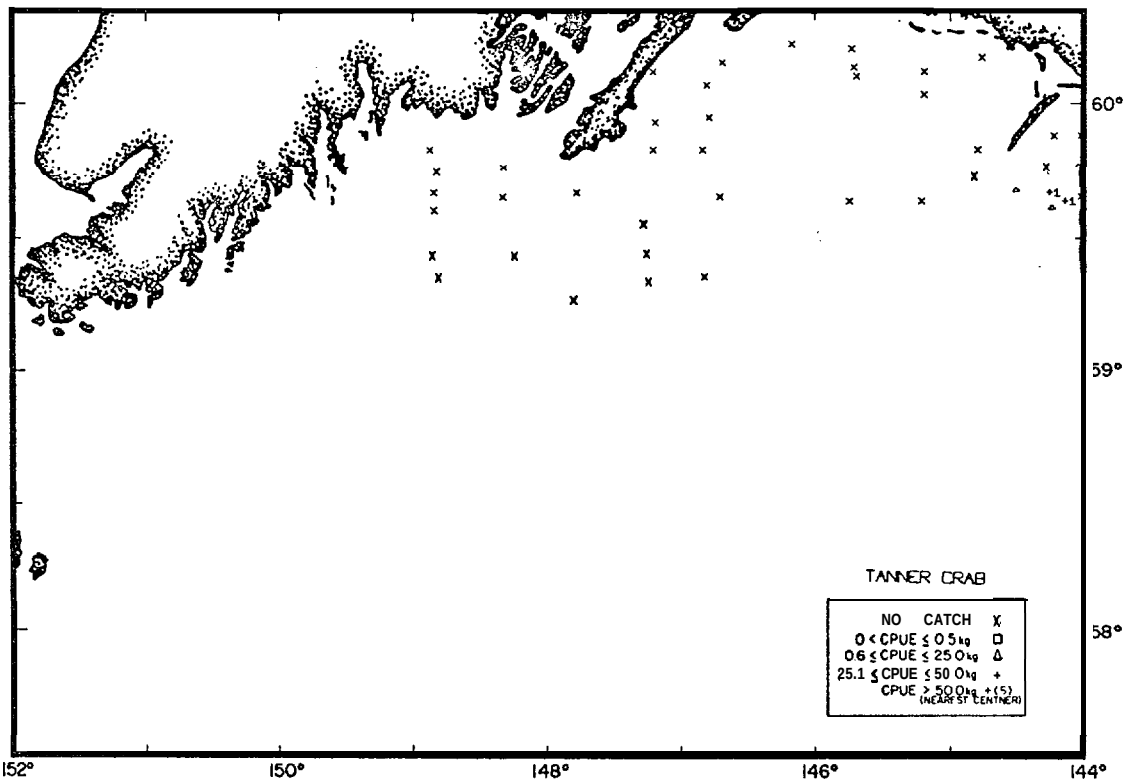


Figure X1-173.--Distribution of standardized catch rates in kg/hr of Tanner crab in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Biomass--The apparent biomass of king crab was estimated to be 265 thousand mt of which over 99% occurred in the western Gulf of Alaska. Eighty-nine percent of the total biomass was located in the inner shelf, 10% in the outer shelf and 1% in the upper slope depth zone. The Chirikof region, with an estimated 58% of the total, held nearly 3 times as much biomass as the second highest region, Kodiak, with 20% while the Sanak region accounted for 14%. King crab biomass estimates should be considered minimal due to the inability of the otter trawl to adequately sample the largest male crabs when towed at speeds utilized during this survey.

Size Composition--No length frequency samples were taken during these surveys.

TANNERCRAB

Distribution and Abundance--Tanner crab ranked third in relative apparent abundance and were more widely distributed than king crabs, occurring in all regions of the Gulf of Alaska (Figures XI-173-176). Catch data for Tanner crabs were not recorded to species during some of the early surveys however, recent information indicates that these crabs were primarily Chionoecetes bairdi. The mean CPUE for Tanner crabs was highest in the outer shelf depth zone followed by the inner shelf and upper slope, and averaged 48 kg/hr over all depth zones (Table XI-17). Relative apparent abundance was highest in the Fairweather and Kodiak regions, where the CPUE's averaged 77 kg/hr (Figures X1-177-178). Other regions where the relative apparent abundance was near or greater than the Gulf of Alaska average were Sanak, Kodiak and Chirikof. Lowest CPUE's were recorded in the Yakutat and Prince William regions.

Biomass -The apparent biomass of Tanner crab was estimated at 173 thousand mt, of which 66% occurred in the outer shelf, 25% in the inner shelf and 9% in the upper slope. The Tanner crab biomass was more evenly distributed over the survey area than king crabs. Four regions, Kodiak, Chirikof, Sanak and Shumagin, contained from 15-17% of the total biomass, followed by Fairweather with 12% and Kenai and Shelikof with 10%. The western Gulf of Alaska contained 72% of the total Tanner crab biomass, while the eastern portion contained 28%.

Size composition-No length frequency samples were taken during the surveys.

PACIFIC COD

Distribution and abundance--Pacific cod were widely distributed throughout the Gulf of Alaska (Figures XI-179-182) occurring in all regions and averaging 44 kg/hr. Highest relative apparent abundance was found in the Kenai and Fairweather regions while mean catches were highest in the outer and inner shelves (Table XI-18).

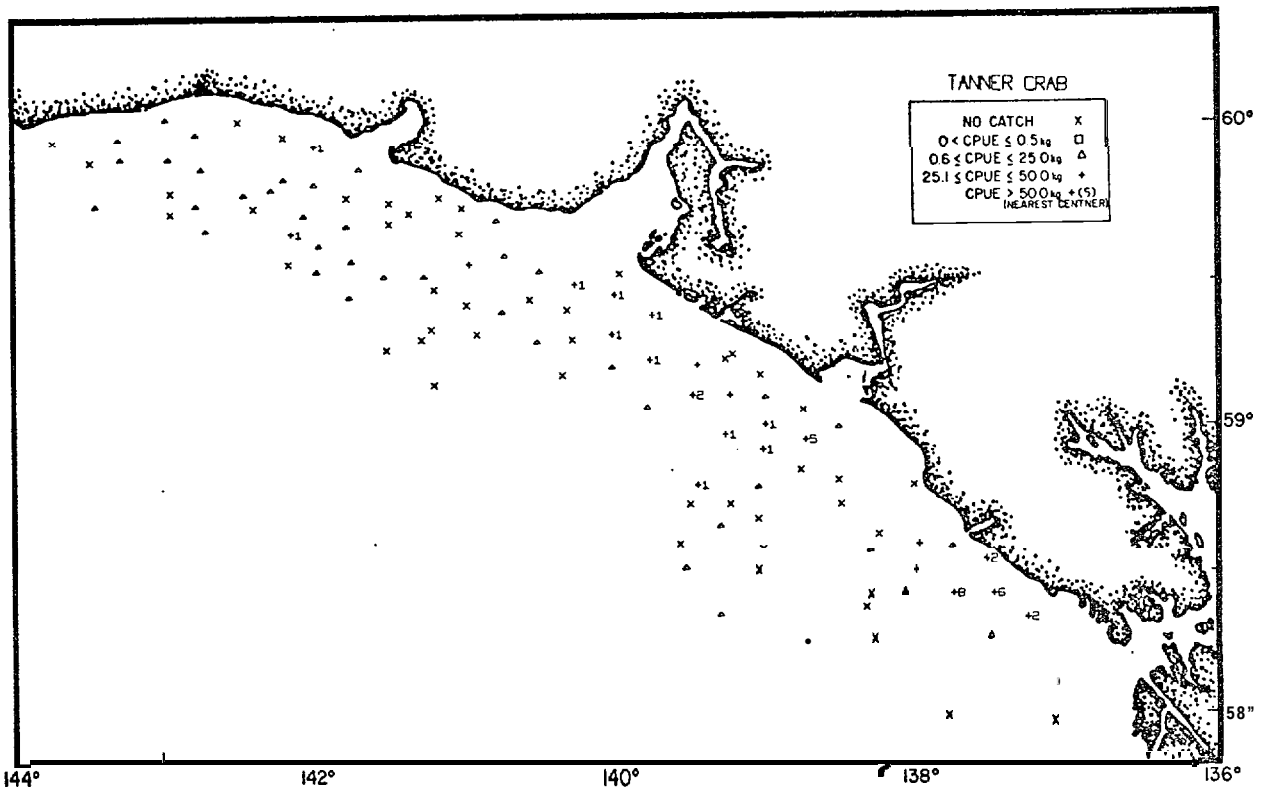


Figure X1-174.--Distribution of standardized catch rates in kg/hr of Tanner crab in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

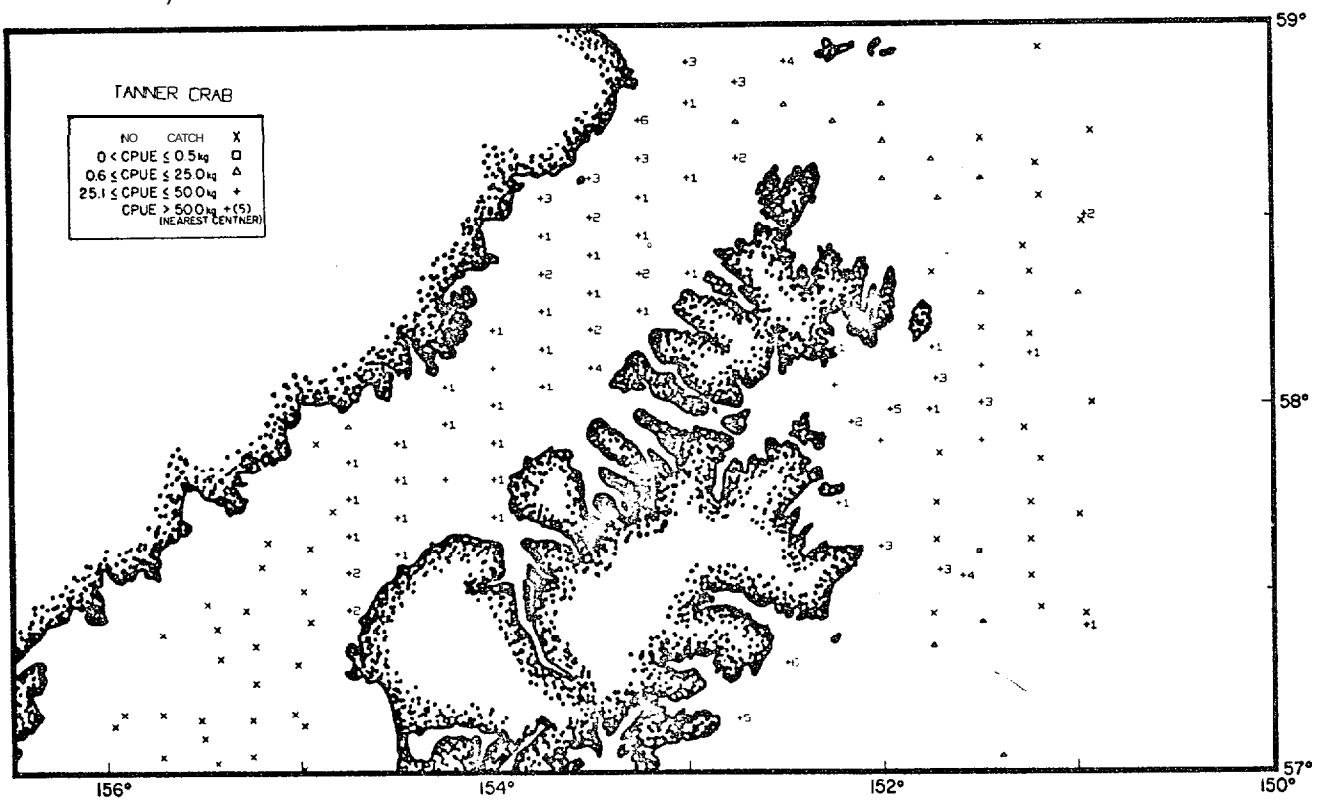
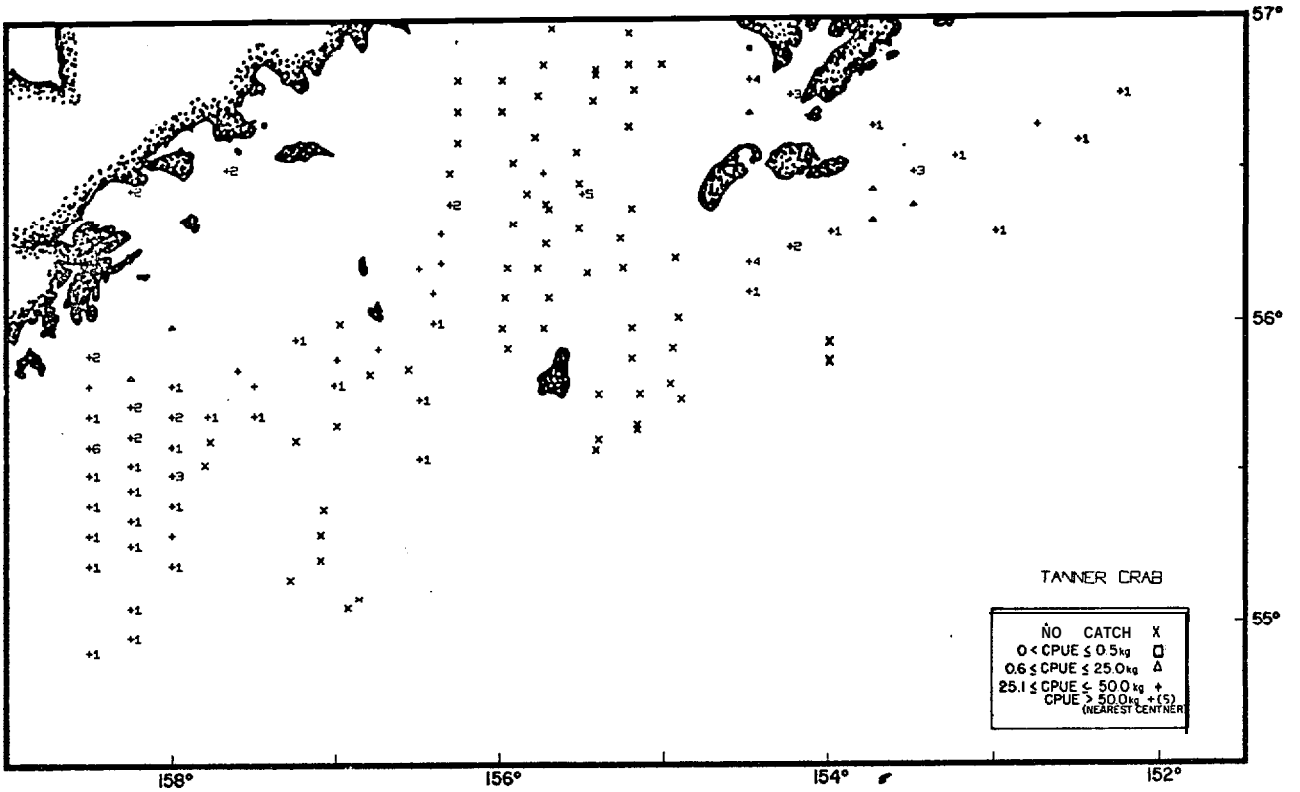


Figure XI-175.--Distribution of standardized catch rates in kg/hr of Tanner crab in the western Gulf of Alaska, May-July 1961 (Cruise 618).



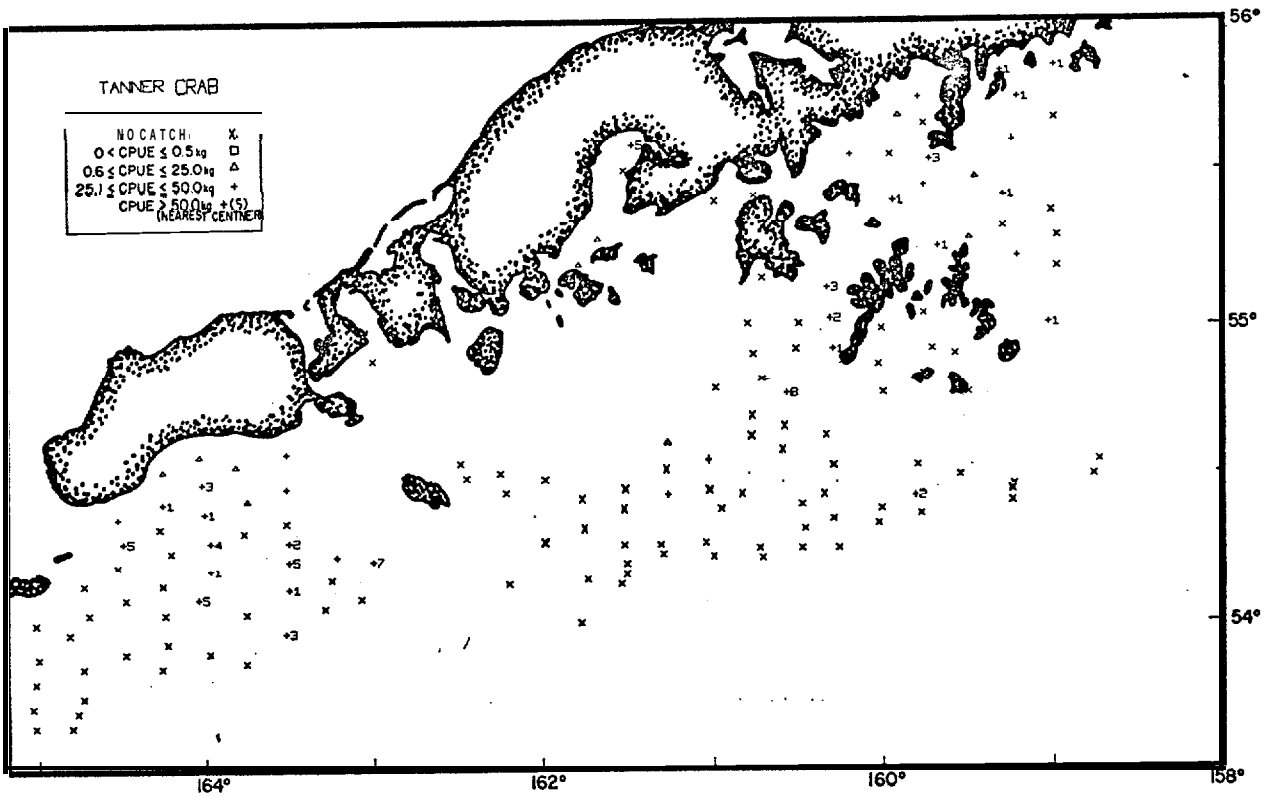


Figure X1-176.--Distribution of standardized catch rates in kg/hr of Tanner crab in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-17.--Estimated biomass and population size of Tanner crab (*Chionoecetes* sp.) in the Gulf of Alaska during Hay-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	11.6	496.6	2.4		--	--	
	101-200	103.0	20,008.0	95.6				
	201-400	12.1	434.6	2.1			--	--
	Nl zones	76.7	20,939.2	12.1			--	
Yakutat	l-100	4.8	355.4	8.8				
	101-200	10.1	1.754.1	43.6				--
	206400	23.4	1,911.7	47.5				
	Ml zones	12.2	4.021.2	2.3			--	--
Prince William	1-100	0.5	64.0	1.3	0.1	0.8	0.52	
	101-200	18.9	2,836.4	55.5	7.1	59.7	'0.40	--
	201-400	51.0	2.215.0	43.3	4.7	39.5	0.48	--
	All *ones	15.7	5,115.4	3.0	11.9	--	0.43	--
Kenai	l-100			--		--		
	101-200	35.6	12.411.3	66.8				
	201-400	45.4	6,173.0	33.2				
	All zones	38.4	18,584.3	10.8			--	--
Kodiak	l-100	22.9	6.271.1	21.3	19.5	28.9	0.32	
	101-200	107.5	21,190.3	71.9	42.4	62.9	0.50	
	201-400	70.9	2.017.9	6.9	5.5	8.2	0.37	--
	Nl zones	59.1	29,479.3	17.0	67.4		0,44	
Shelikof	l-100	0	0	0	0	0	--	
	101-200	172.3	16.056.5	97.5	39.0	98.0	0.41	--
	20X-400	39.2	412.0	2.5	0.8	2.0	0.54	
	All zones	77.3	16,468.	9.5	39.8		0.41	--
Chirikof	l-100	46.2	13.391.0	50.2	24.5	42.0	0.55	--
	101-200	53.8	10,994.0	41.2	28.5	48.9	0.39	--
	201-400	18.5	2,304.3	8.6	5.3	9.1	0.44	
	Nl zones	43.1	26,689.3	15.4	58.3		0.46	--
Shumagin	L-100	32.5	7,377.3	29.5	17.0	32.6	0.43	
	101-200	80.1	17.380.3	69.4	34.9	66.9	0.50	--
	201-400	9.8	274.8	1.1	0.3	0.6	0.80	--
	Nl zones	53.0	25,032.4	14.5	52.2	--	0.48	--
Sanak	l-100	70.2	14,998.5	56.3	33.6	52.0	0.45.	--
	101-200	59.9	11,627.4	43.7	31.0	48.0	0.38	
	201-400	0	0	0	0	0	--	
	Nl zones	63.0	26.625.9	15.4	64.6	--	0.41	--
Total	l-100	32.6	42.953.9	24.8		--	--	
	101-200	64.5	114.258.3	66.1		--		--
	201-400	32.5	15.743.5	9.1				
	All zones	47.9	172,955.5	100.0	--	--	--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

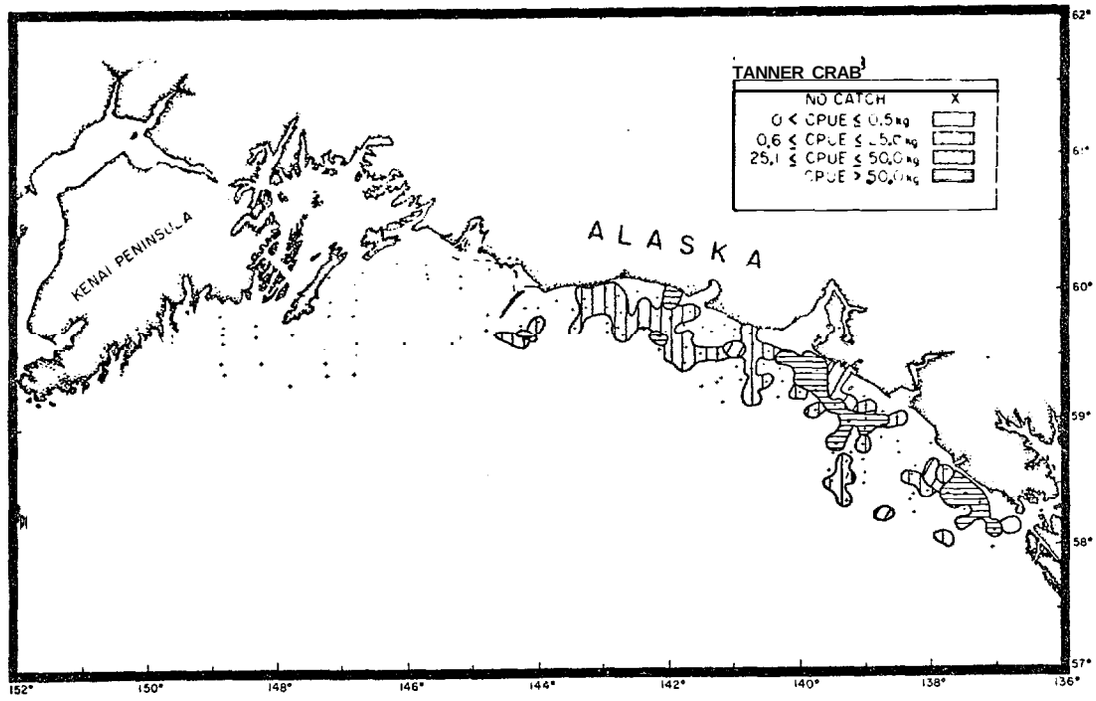


Figure X1-177.--Distribution of apparent relative abundance of Tanner crab in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

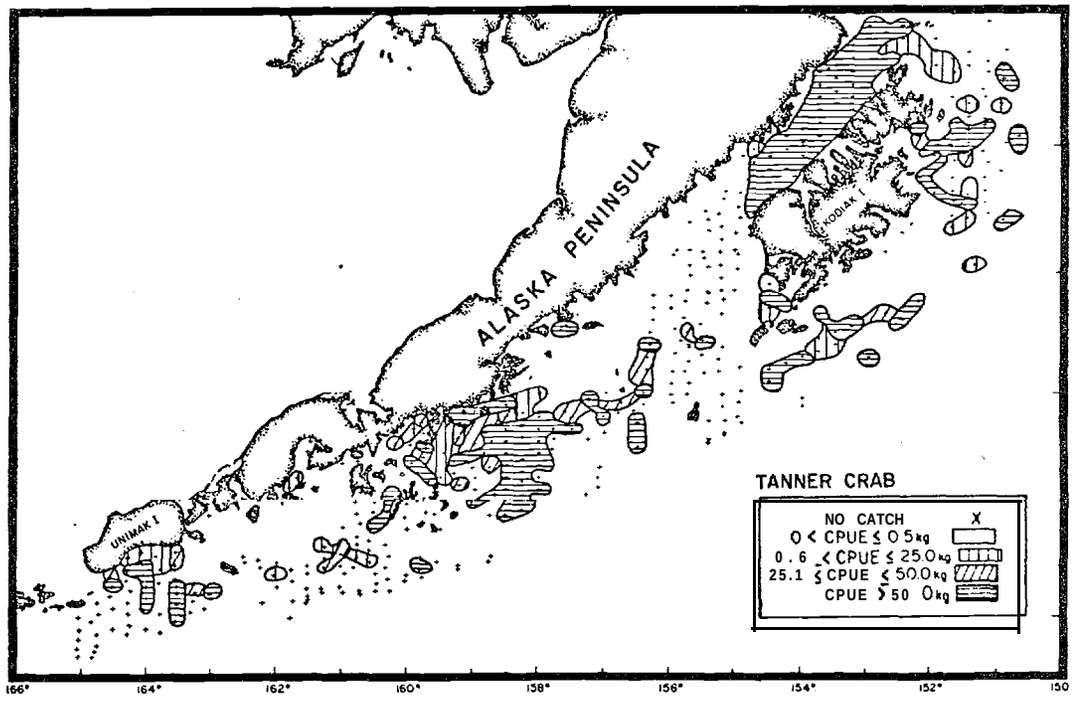


Figure X1-178.--Distribution of apparent relative abundance of Tanner crab in the western Gulf of Alaska, May-July 1961 (Cruise 618).

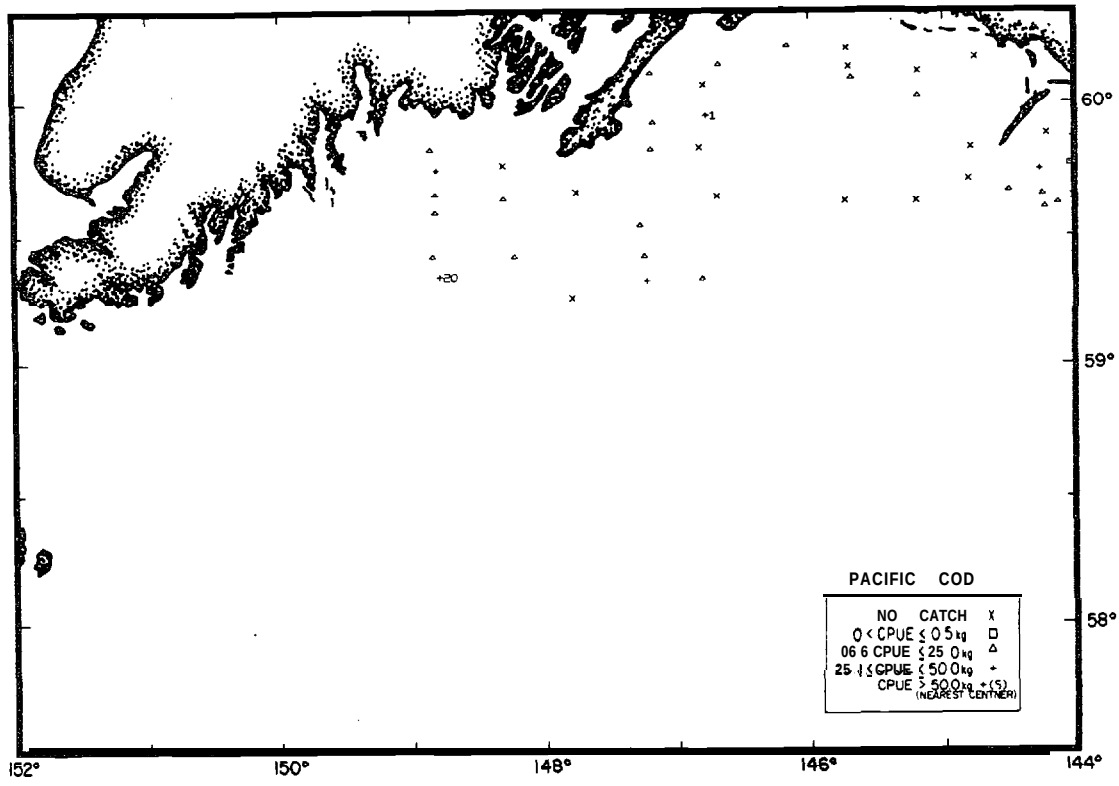


Figure X1-179.--Distribution of standardized catch rates in kg/hr of Pacific cod in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

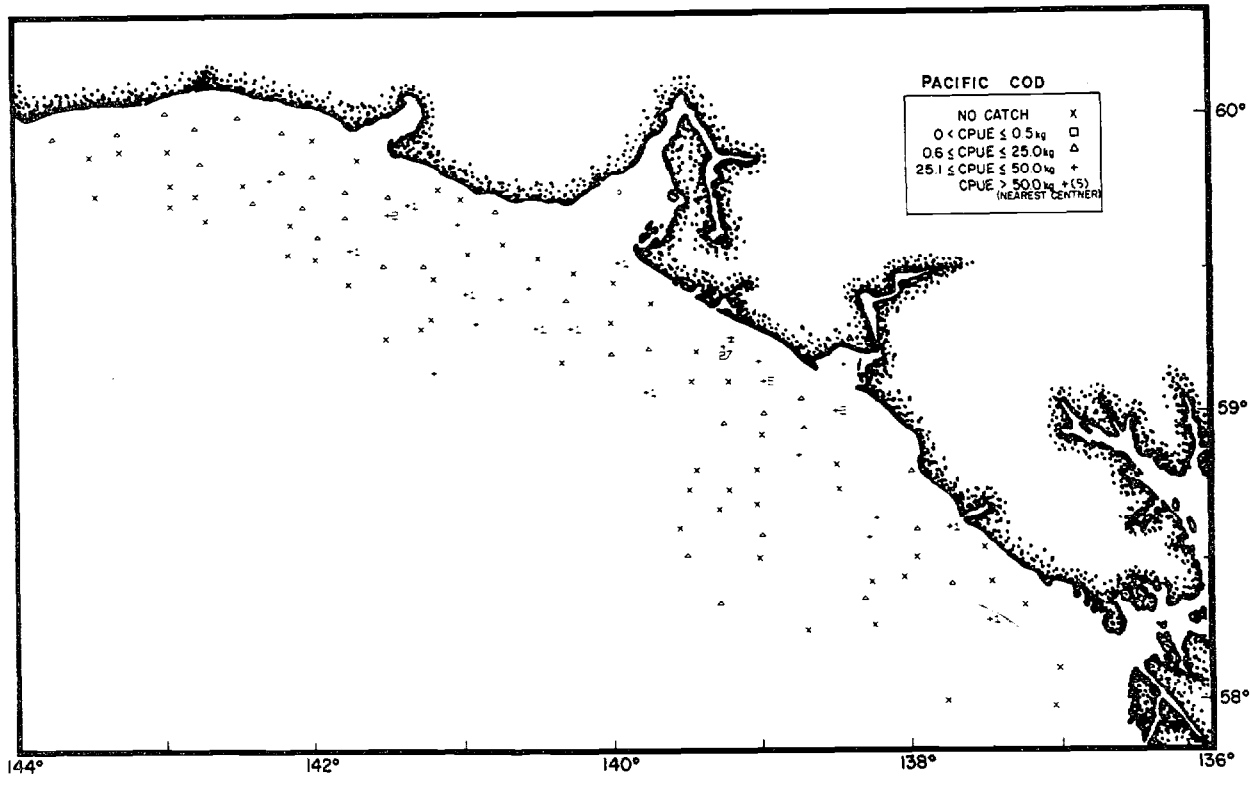
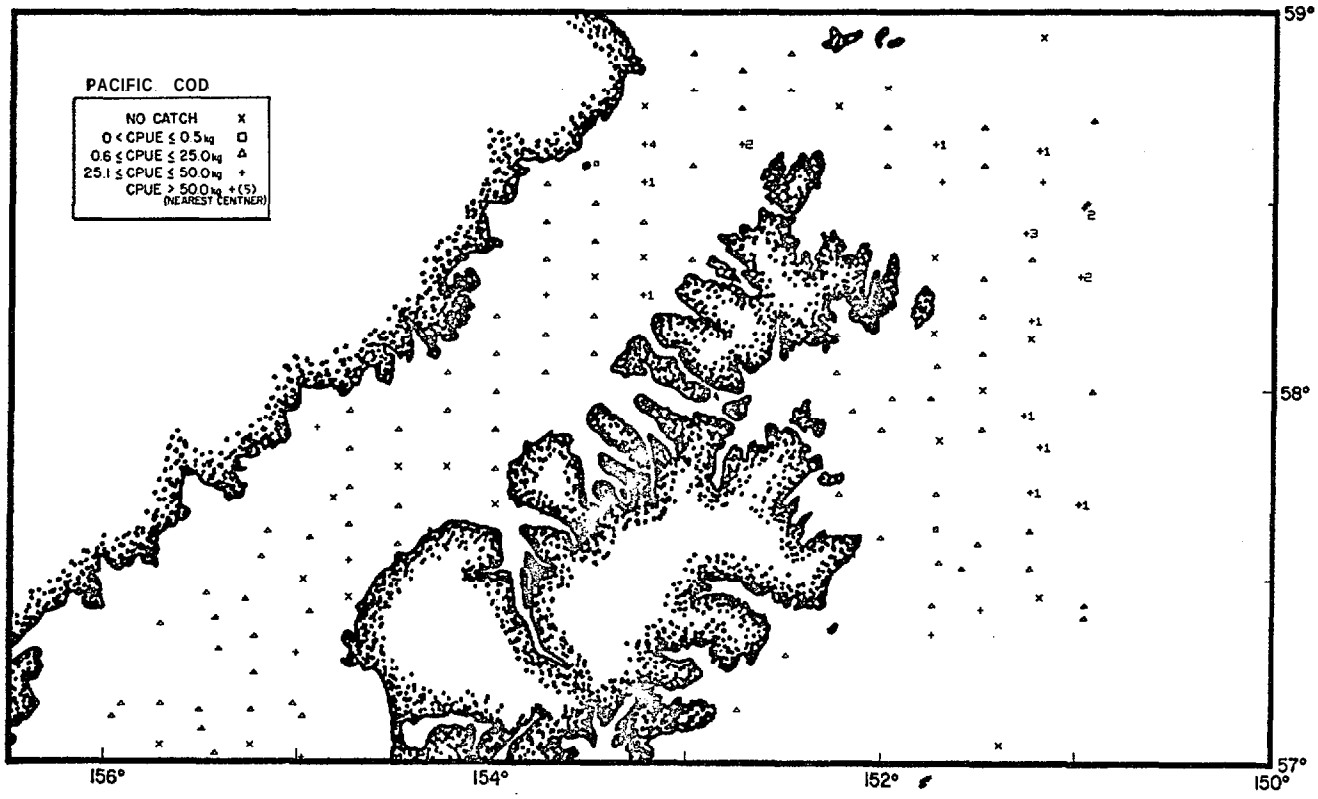


Figure X1-180.--Distribution of standardized catch rates in kg/hr of Pacific cod in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



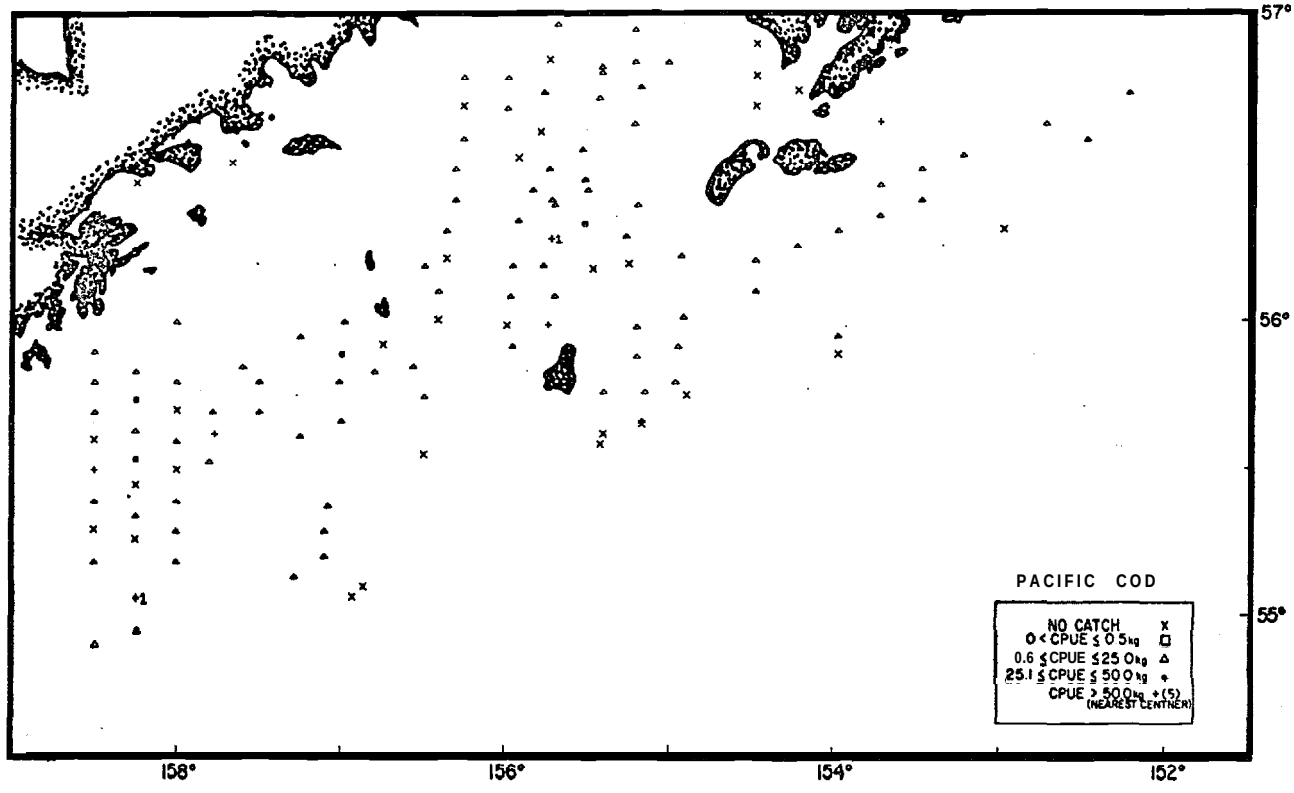


Figure X1-181.--Distribution of standardized catch rates in kg/hr of Pacific cod in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table X1-18.-- Estimated biomass and population size of Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska during Hay-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual. 2/ Weight (kg)	Length (cm)
Fairweather	l-100	392.6	16.840.4	87.5	--			
	101-200	12.1	2,355.9	12.2	--		--	--
	201-400	1.4	50. a	0.3	--			--
	All zones	70.5	19.247.1	12.1	--		--	
Yakutat	l-100	24.4	1,800.7	31.1	--			--
	101-200	21.5	3.743.3	64.6	--			--
	201-400	3.1	252.4	4.4	--		--	
	All zones	17.6	5,796.4	3 . 6	--			--
Prince William	l-100	10.4	1,367.0	59.9	1.0	62.5	1.37	--
	101-200	5.4	804.5	35.2	0.5	31.3	1.49	
	201-400	2.6	111.7	4.9	0.1	6.3	1.54	
	All zone.5	7.1	2,283.2	1 . 4	1.6		1.42	--
Kenai	l-100		--	--	--		--	--
	101-200	267.9	93,297.6	99.5	--	--	--	--
	201-400	3.6	493.8	0.5	--			--
	All zones	193.6	93,791.4	38.9	--		--	
Kodiak	l-100	31.8	8,694.9	62.1	13.5	71.1	0.64	
	101-200	25.4	4,999.1	35.7	5.3	27.9	0.94	--
	201-400	11.1	315 . 3	2.3	0.2	1.1	1.86	
	All zones	28.1	14,009.3	8.8	19.0	--	0.74	--
Shelikof	l-100	30.6	1,924.5	43.5	--	--	--	
	101-200	25.5	2,372.0	53.6	2.1	10.8	1.14	
	201-400	12.1	127.4	2.9	0.1	0.5	a.93	--
	All zones	21.3	4,423.9	2 . 8	--	--	0.23	--
Chirikof	l-100	8.6	2,488.3	52.0	5.7	63.3	0.44	36.S
	101-200	8.2	1.666.8	34.9	2.6	28.9	0.65	38.3
	201-400	5.0	627.7	13.1	0.7	7.8	0.86	--
	All zones	7.7	4,782.8	3 . 0	9.0		0.54	
Shumagin	1-100	10.3	2.328.1	53.0	6.4	69.6	0.36	--
	101-200	5.1	1,102.6	25.1	1.5	16.3	0.75	--
	201-400	34.6	965.5	22.0	1.3	14.1	0.72	--
	All zones	9.3	4,396.2	2.8	9.2	--	0.48	--
Sanak	l-100	20.2	4,304.6	41.0	8.8	53.7	0.49	--
	101-200	30.3	5,873.8	55.9	7.3	44.5	0.80	--
	201-400	22.0	326.5	3.1	0.3	1.8	0.99	
	All zones	24.9	10.504.9	6 . 6	16.4		0.64	--
Total	r-100	30.3	39,748.5	25.0	--		--	--
	101-200	65.6	116.215.6	73.0	--			
	201-400	7.4	3.271.1	2.1	--			--
	All zones	43.6	159.235.2	100.0	--		--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent,

Biomass--The total apparent biomass of Pacific cod was estimated to be 159 thousand mt of which 59% was located in the Kenai and 12% in the Fair-weather regions. Over the entire Gulf of Alaska. 73% of the total biomass was located in the outer shelf, 98% in the combined inner and outer shelf depth zones and 70% in the eastern Gulf of Alaska. The biomass estimate of Pacific cod should be considered minimal as this species is known to be semi-pelagic and an unknown proportion of the biomass may have congregated in the water column above the headrope and have been unavailable to the trawl.

Size composition-Length frequency samples for Pacific cod were taken in the Chirikof inner and outer shelf depth zones. In the inner shelf, Pacific cod, sexes combined, ranged from 22-50 cm and averaged 36.8 cm while varying from 29-51 cm and averaging 38.8 cm in the outer shelf depth zone (Figure X1-183).

COTTIDS

Distribution and abundance-During many of the early surveys, members of the family Cottidae were placed in a common group called "cottids" and not identified to species. Cottids were found in all regions of the-Gulf of Alaska but, as with king and Tanner crabs, the highest relative apparant abundance was found primarily in the continental shelf depth zones of the western Gulf of Alaska (Figures XI-184-187). The mean CPUE's of cottids were highest in the outer and inner shelf depth zones where catches averaged 48 and 46 kg/hr, respectively. The overall CPUE for cottids averaged 40 kg/hr and in the western Gulf, ranged from 20 kg/hr in the Shelikof region to 97 kg/hr in the Sanak region (Table XI-19). Other regions in which the mean CPUE was higher than the overall mean included Chirikof, Kodiak and Shumagin.

Biomass --The apparent biomass of cottids in the Gulf of Alaska was estimated to be 148 thousand mt. The combined Chirikof (30%), Sanak (28%) and Kodiak (24%) regions contained over 80% of the total biomass. Cottids were found primarily in the inner shelf (41%) and outer shelf (58%) depth zones.

Size composition--No length measurements were taken for this species group.

PACIFIC OCEAN PERCH

Distribution and.abundance-Pacific ocean perch were widely distributed throughout the Gulf of Alaska and were primarily found in the outer shelf and upper slope depth zones (Figures X1-188-191). Mean CPUE's by regions ranged from 5 to 67 kg/hr and averaged 37 kg/hr for the entire Gulf (Table x1-20). Relative apparent abundance greater than the Gulf of Alaska average occurred in the Chirikof, Yakutat, Kenai, and Shumagin regions (Figures X1-192-193). Mean CPUE's were directly related to bottom depth, increasing from 1 kg/hr in the inner shelf to 76 kg/hr in the upper slope.

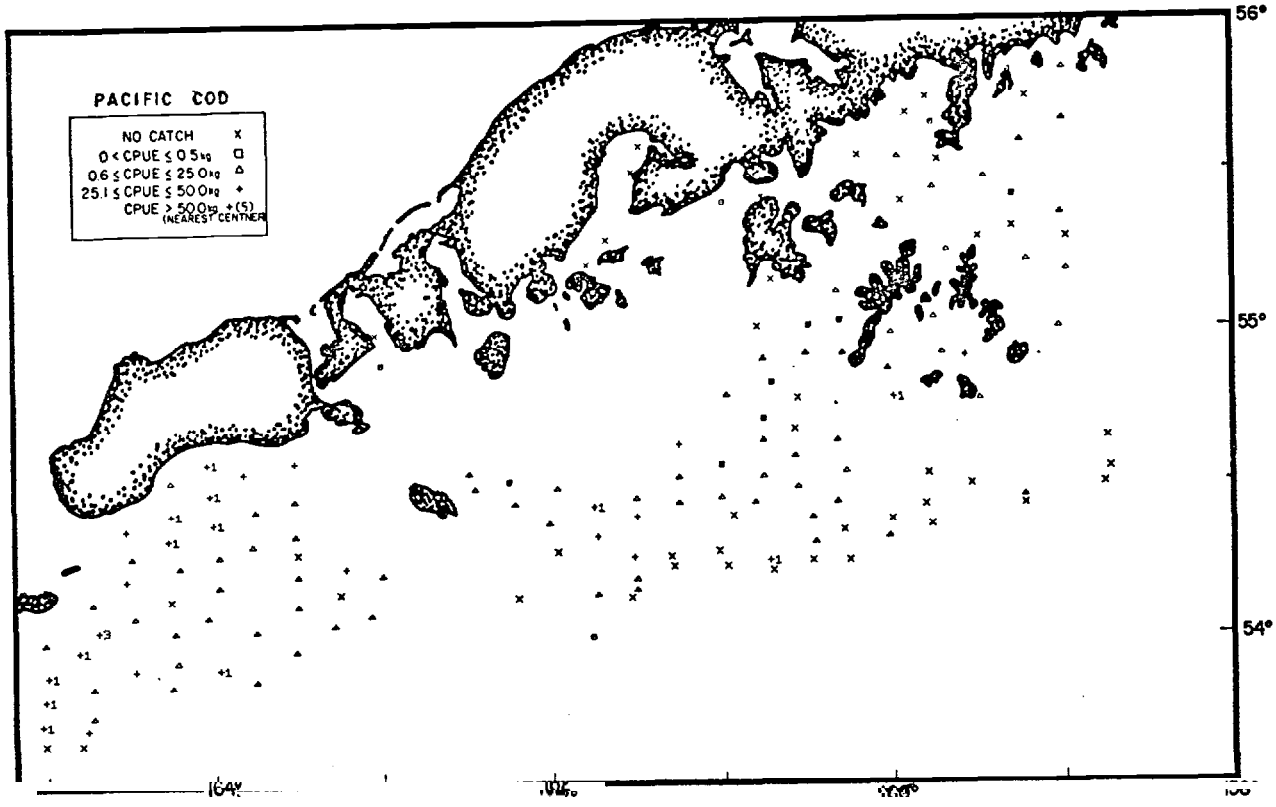


Figure X1-182. T-Distribution of standardized catch rates in kg/hr of Pacific cod in the western Gulf of Alaska, May-July 1961 (Cruise 618).

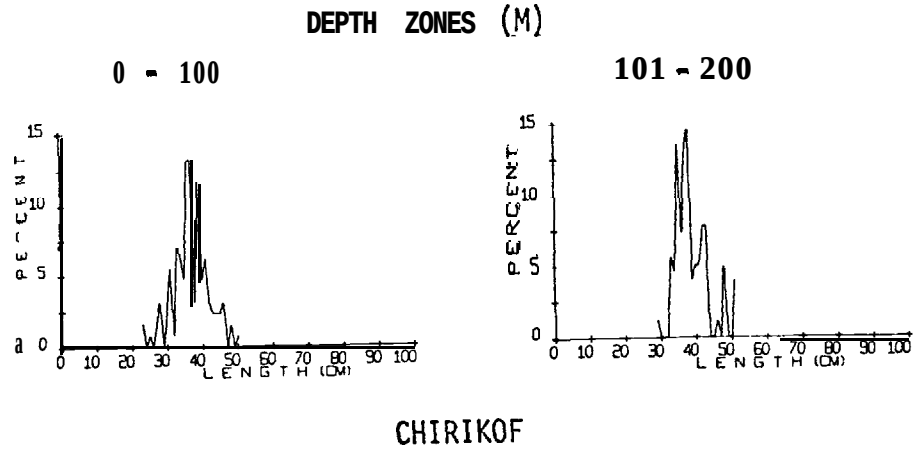


Figure X1-183.--Percentage length frequencies of Pacific cod from the Gulf of Alaska (Cruises 618,611,052).

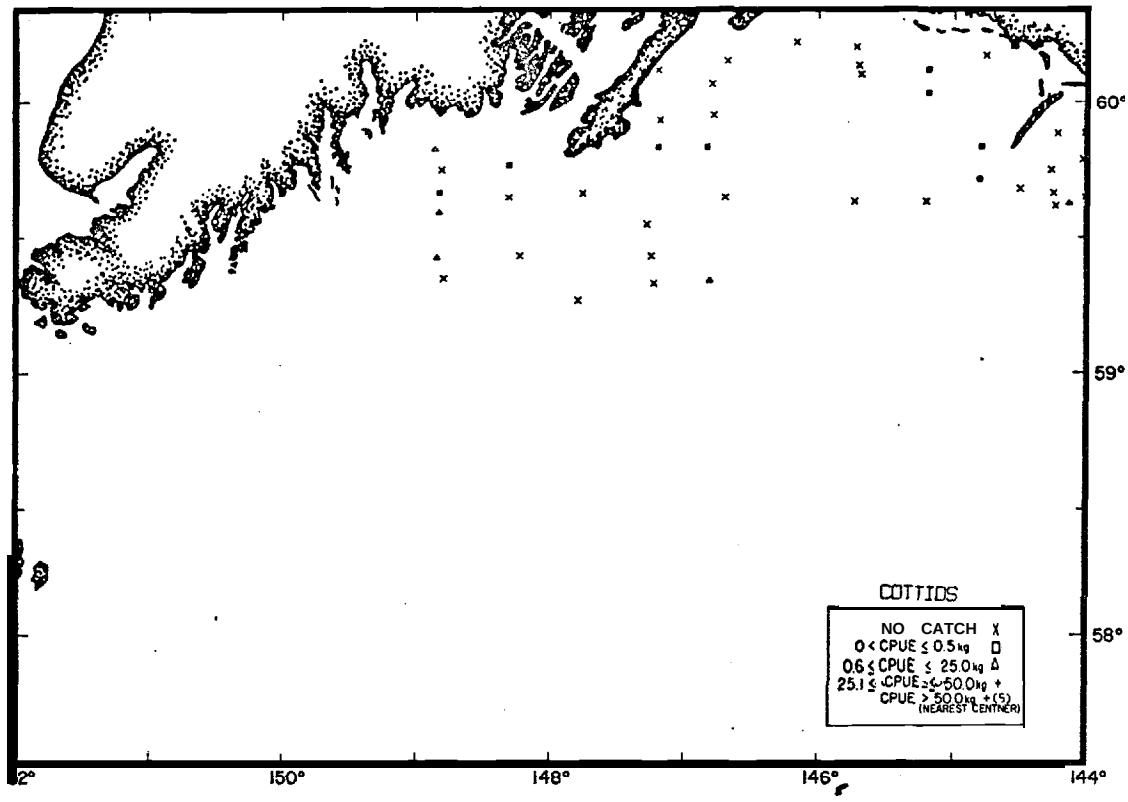


Figure XI-184.--Distribution of standardized catch rates in kg/hr of dottids in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

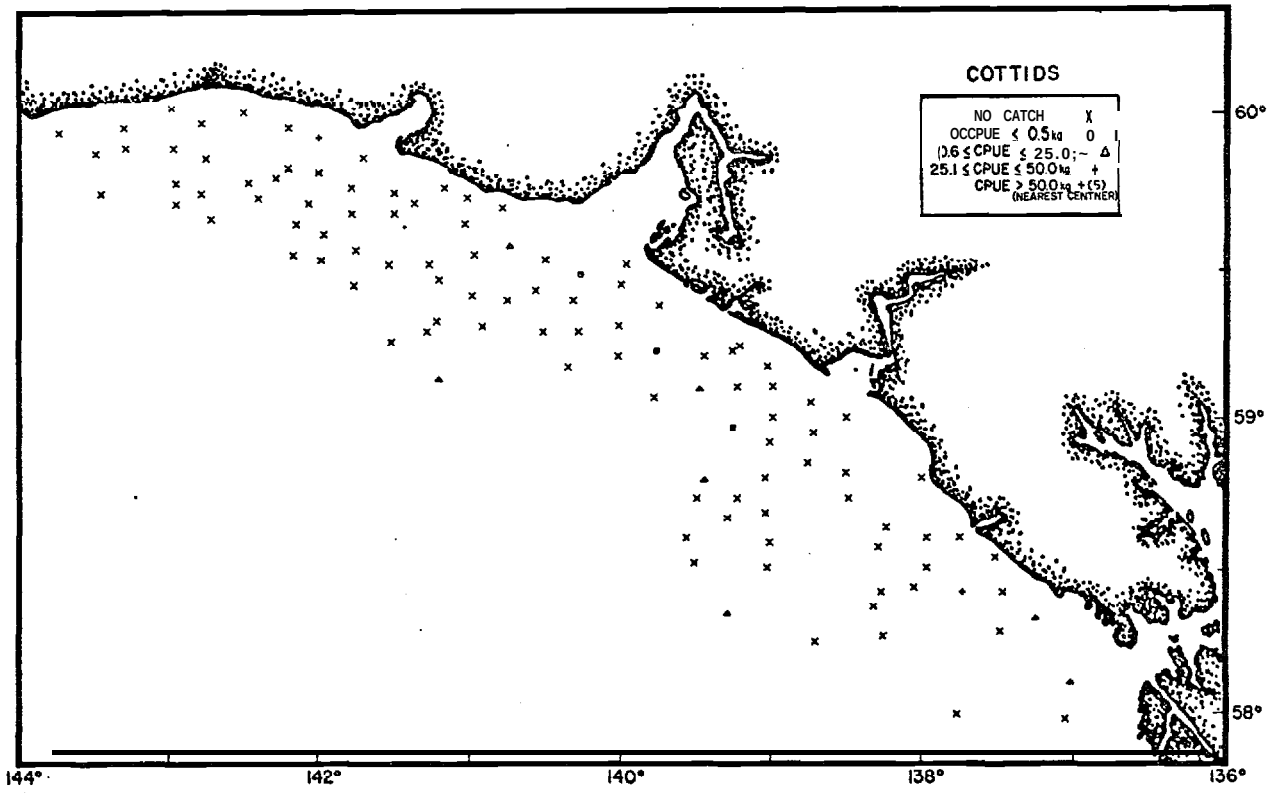
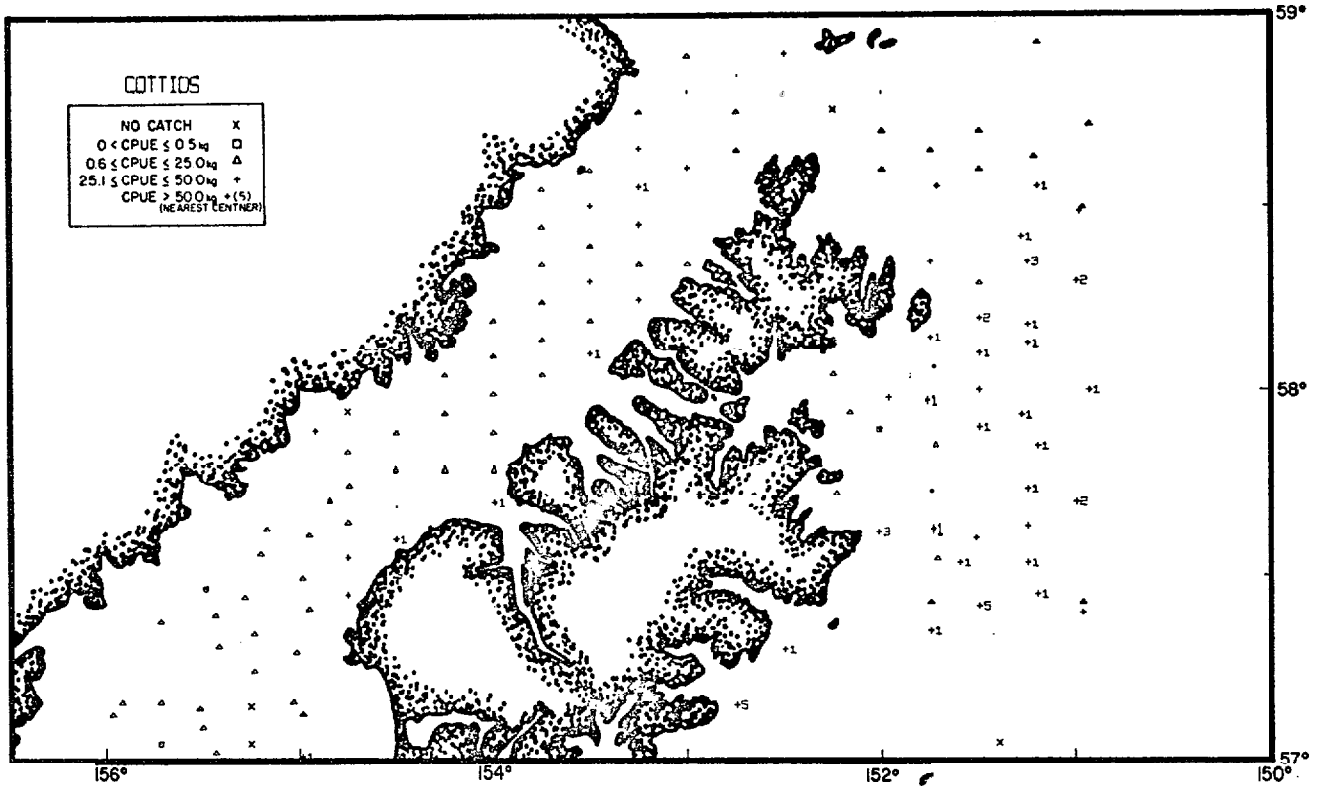


Figure XI-185.--Distribution of standardized catch rates in kg/hr of cottids in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



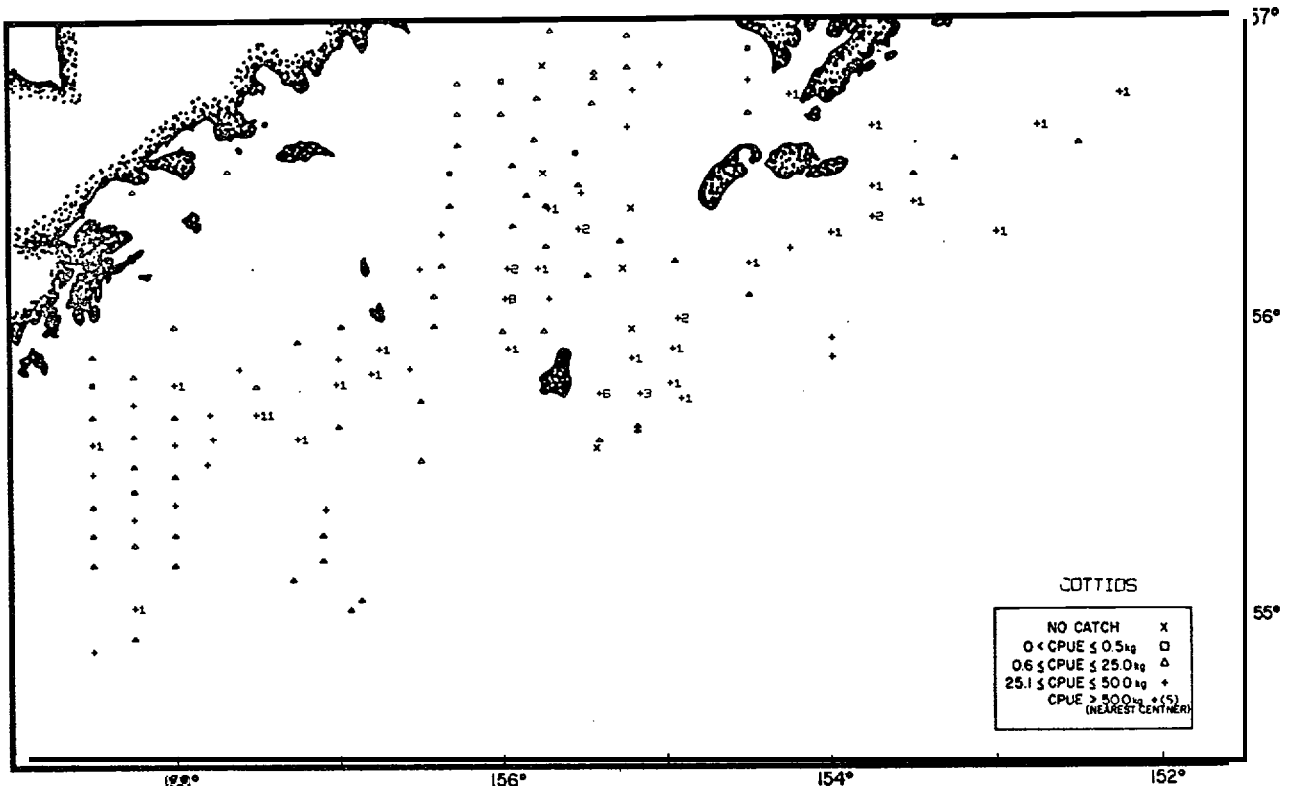


Figure X1-186.--Distribution of standardized catch rates in **kg/hr** of cottids in the western Gulf of Alaska, May-July 1961 (Cruise 618).

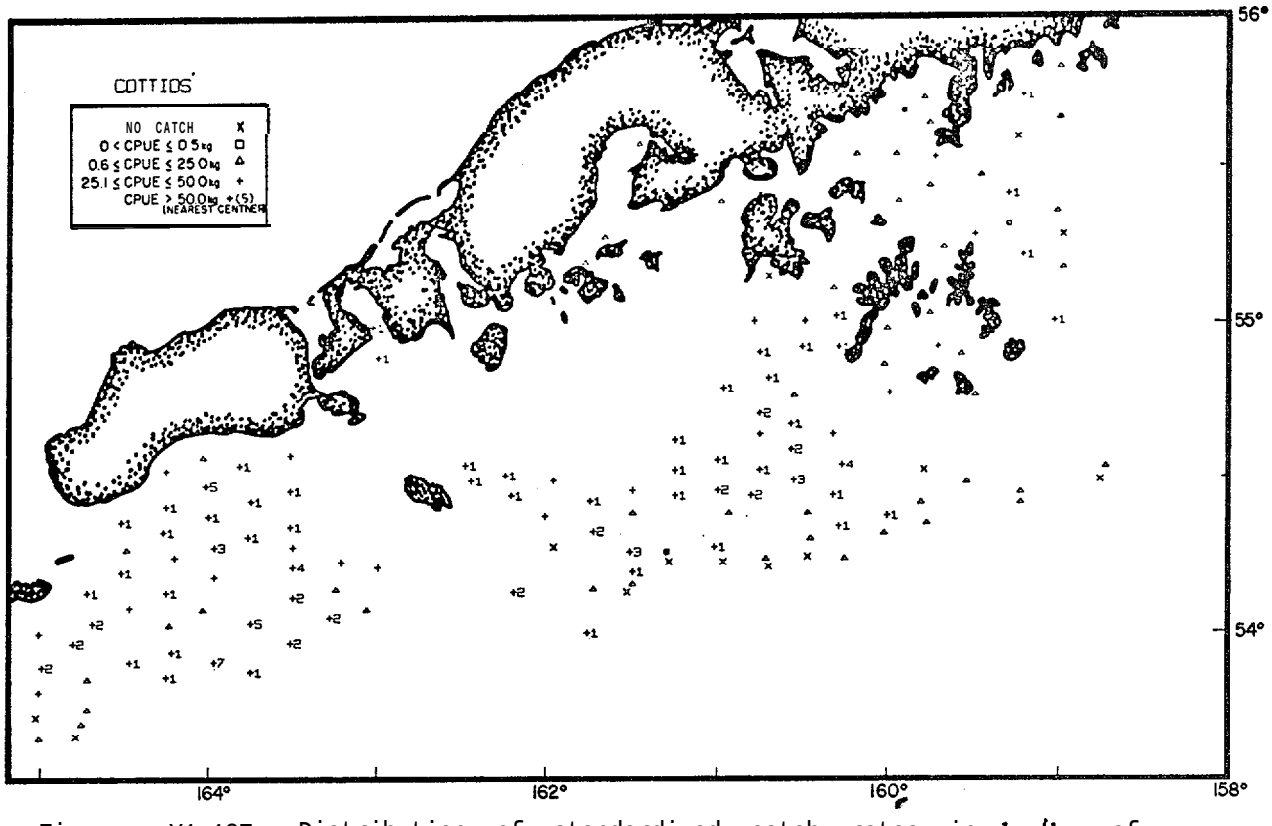


Figure X1-187.--Distribution of standardized catch rates in kg/hr of cottids in the western Gulf of Alaska, May-July 1961 (Cruise 618).

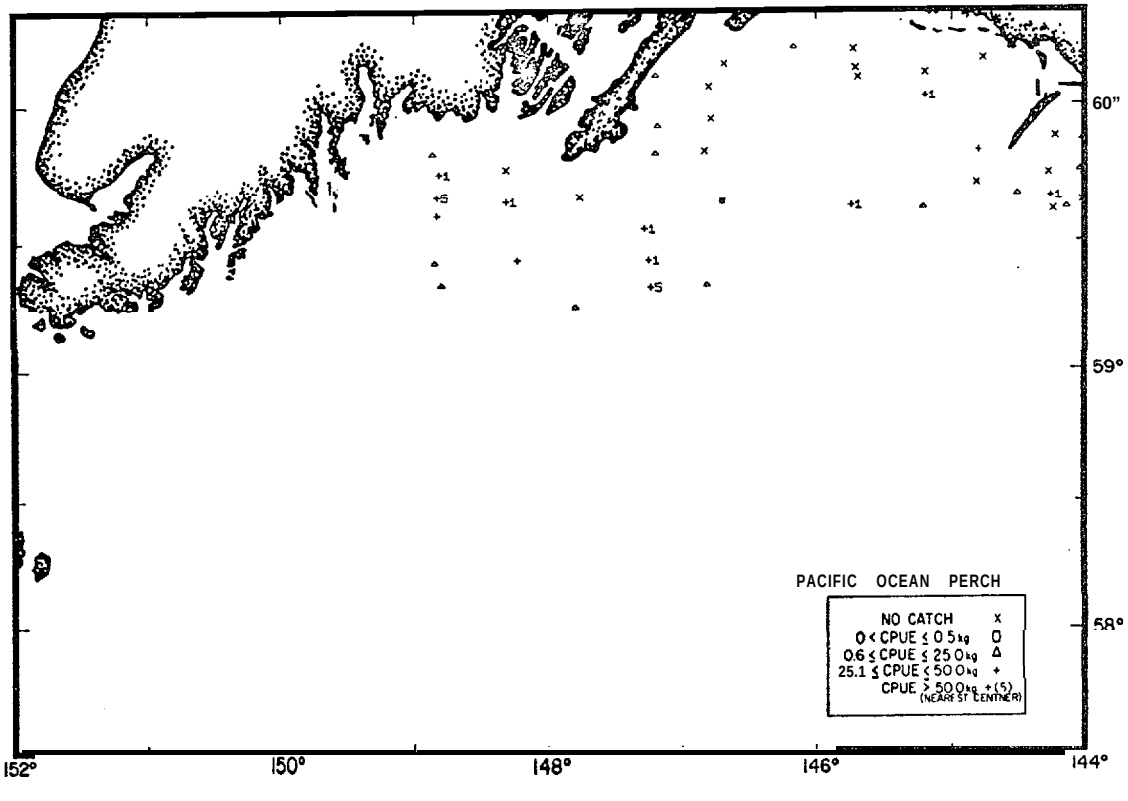


Figure X1-188.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table XI-19.--Estimated biomass nnd population sire of cottids (Cottidae) in the Gulf of Alaska during May-October, 1961.

Region	Depeh zone m	CPUE 1/ (kg/hr)	Estimated biomass mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	L-100	0	0	0				--
	101-200	1.9	364.4	94.7				
	201-400	0.6	20.3	5.3			--	--
	All zones	1.4	384.7	0.3			--	--
Yakutat	l-100	3.3	241.7	98.9			--	
	101-200	0	0	0			--	--
	201-400	3/	2.5	1.0				--
	All tones	0.7	244.2	0 . 2			--	--
Prince William	l-100	0.1	13.9	29.0	0.1	50.0	0.16	--
	101-200	0.2	34.1	71.0	0.1	50.0	0.49	
	201-400	0	0	0	0	0	--	
	All zones	0.1	48.0	5/	0.2		0.31	--
Kenai	l-100		--				--	
	101-200	2.1	730.7	100.0	1.8	100.0	0.40	--
	201-400	0	0	0	0	0	--	--
	All zones	1.5	730.7	0.5	1 . 8	--	0.40	--
Kodiak	I-100	74.4	20,327.9	56.7	76.0	58.6	0.27	
	101-200	78.6	15,480.5	43.2	33.7	41.4	0.29	--
	201-400	1.6	44.3	0.1	0.1	0.1	0.41	--
	All zones	71.9	35,852.7	24.2	129.8		0.28	--
Shelikof	l-100	34.2	2,155.4	65.8	11.9	44.9	0.18	
	101-200	26.6	2,483.1	52.8	14.3	54.0	0.17	--
	201-400	6.1	64.0	1.4	0.3	1.1	0.25	--
	All zones	20.2	4,702.5	3 . 2	26.5		0.18	--
Chirikof	l-100	38.6	11.111.1	24.7	31.5	18.3	0.35	--
	101-200	159.9.	32,640.7	72.6	137.5	79.7	0.37	--
	201-400	9.8	1,219.8	2.7	3.6	2.1	0.33	
	All zones	72.1	44,971.6	30.4	172.6		0.26	--
Shumagin	l-100	31.8	7,197.7	35.7	24.3	34.1	0.30	--
	101-200	58.2	12,628.2	62.7	45.7	64.2	0.28	--
	201-400	11.9	331.8	1.7	1.2	1.7	0.27	
	All tones	42.8	20,157.7	13.6	71.2		0.28	--
Sanak	l-100	93.1	19,875.9	48.6	59.0	51.9	0.34	--
	101-200	107.8	20,911.8	51.1	54.5	47.9	0.38	--
	201-400	8.6	127.3	0.3	0.3	0.3	0.46	--
	All zones	96.9	40,915.0	27.6	113.8		0.36	--
Total	l-100	46.4	60,923.6	41.2				--
	101-200	48.1	85,273.5	57.6			--	--
	201-400	4.0	1,810.0	1.2			--	--
	All zones	40.3	148,007.1	100.0			--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

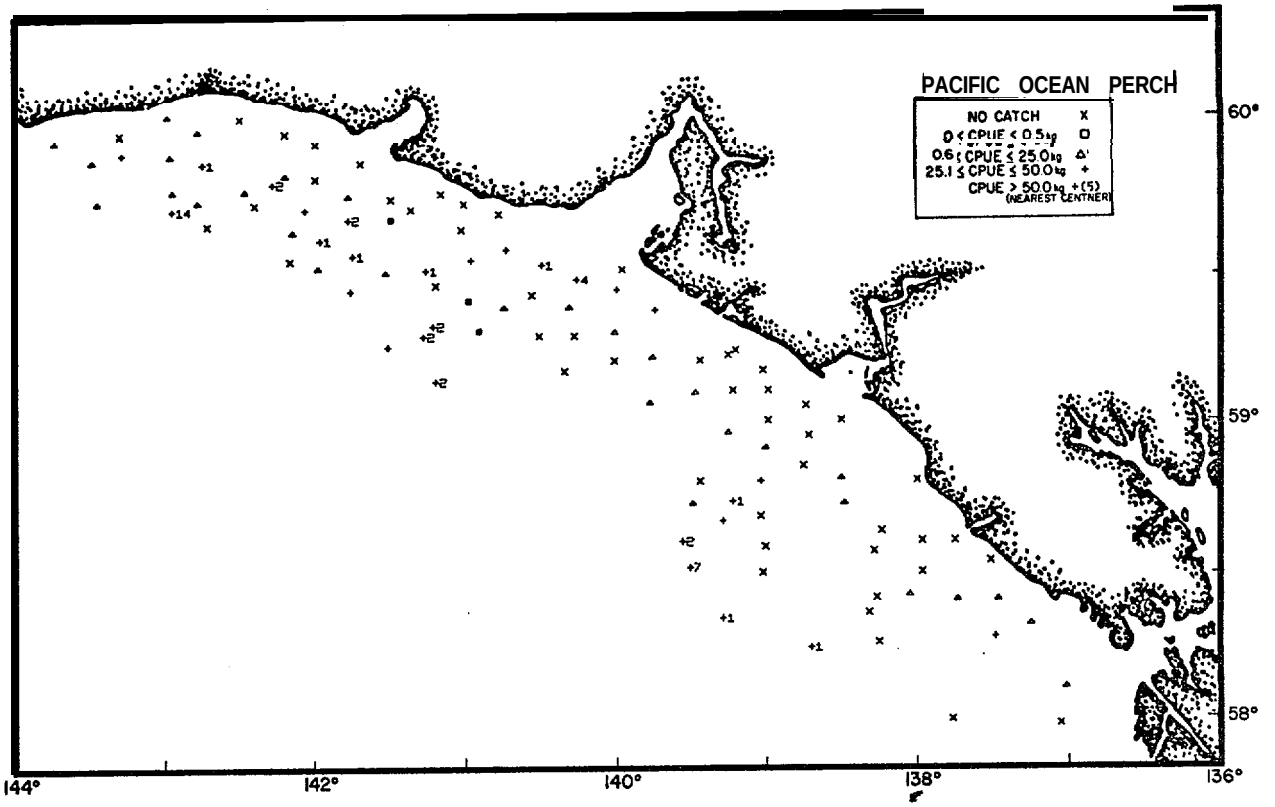


Figure X1-189.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

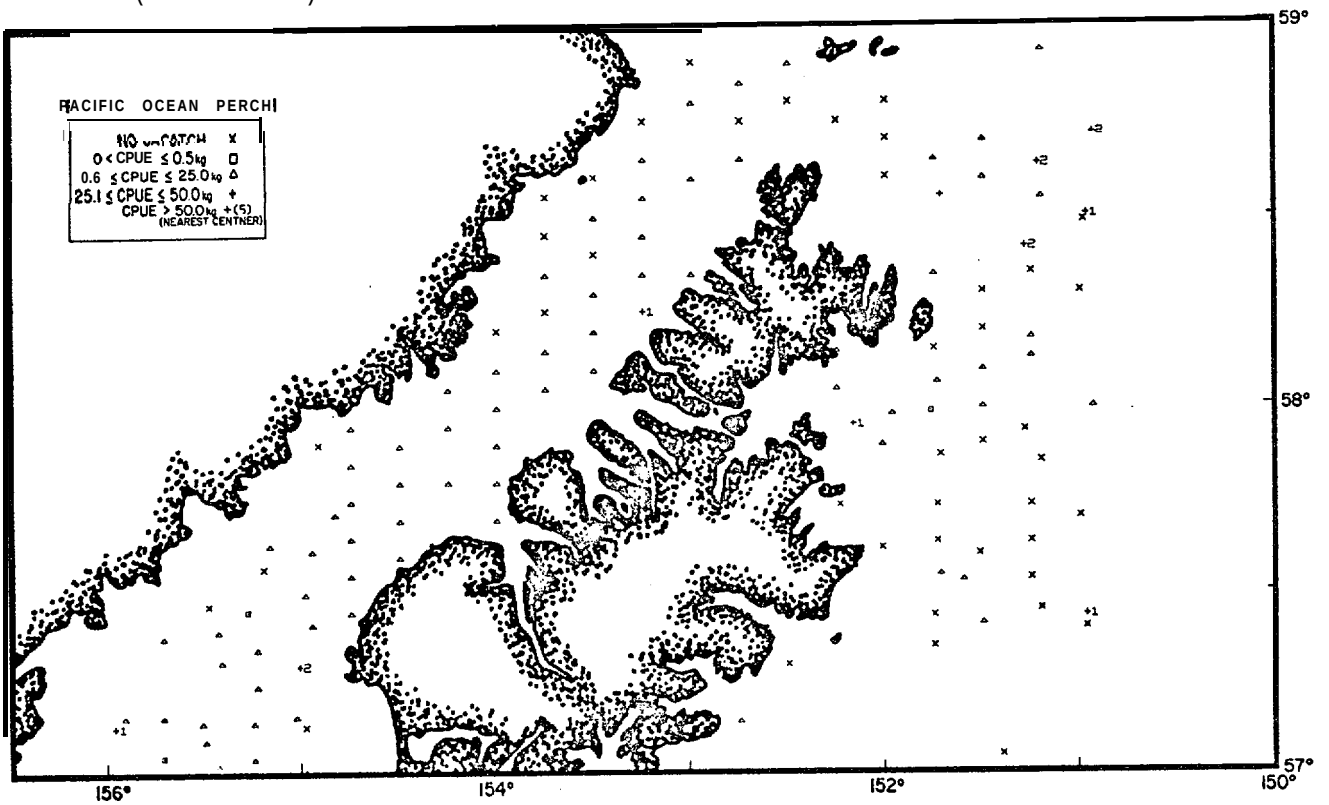
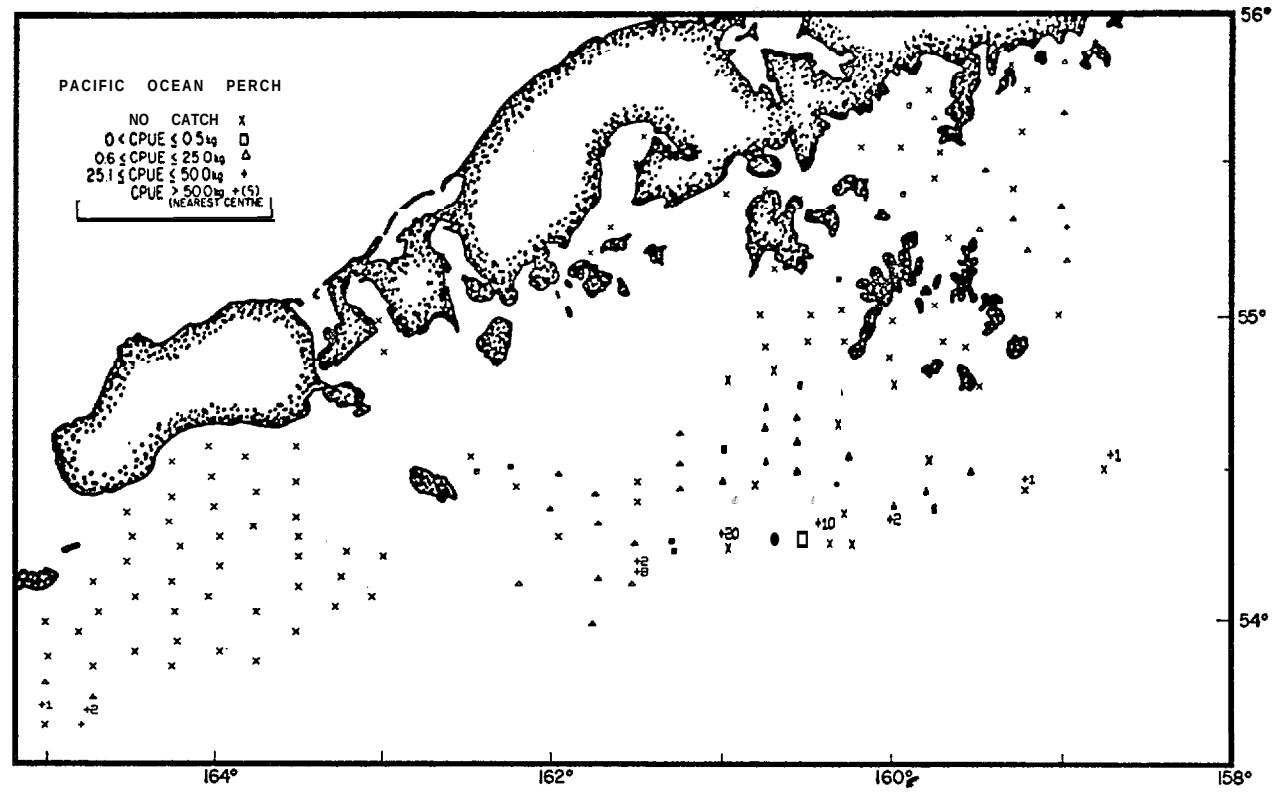


Figure X1-190.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, May-July 1961 (Cruise 618).



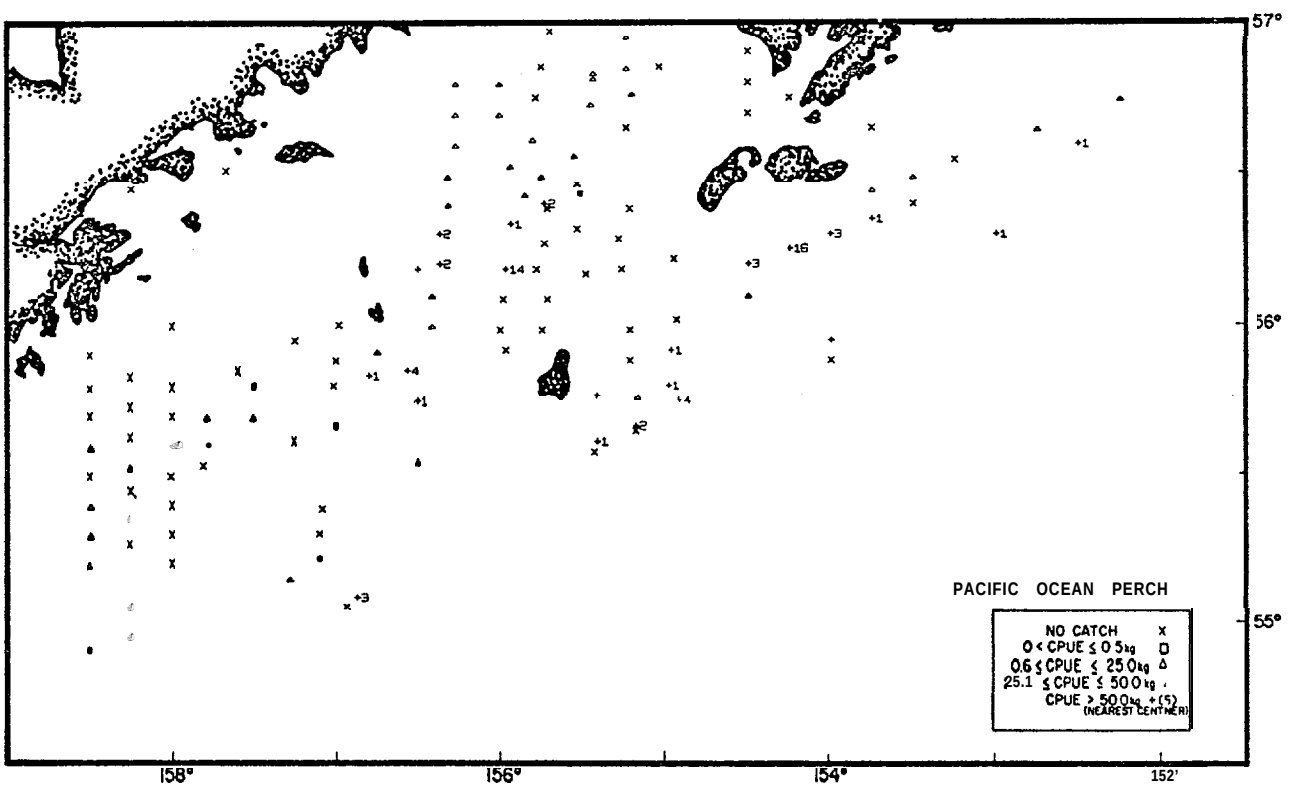


Figure X1-191.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-20.--Estimated biomass and population sire of Pacific ocean perch (*Sebastes alutus*) in the Gulf of Alaska during Nay-October, 1961.

Region	Depth tone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean sire per Individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0	0	0			--	--
	101-200	7.4	1,446.5	21.2	--		--	--
	201-400	149.7	5.364.4	78.8				
	All zones	24.9	6,810.9	5.0				
Yakutat	l-100	0.2	12.6	0.1	--		--	
	101-200	66.3	11.568.8	62.4				
	201-400	85.0	6,957.2	37.5			--	--
	All zones	56.1	18,538.6	13.8	--		--	--
Prince William	l-100	0	0	0	0	0	--	
	101-200	48.8	7.331.8	68.7	9.9	72.8	0.74	--
	201-400	80.1	3.483.6	32.2	3.7	27.2	0.93	--
	All zones	33.2	10,815.4	8.0	13.6		0.79	--
Kenai	1-100						--	--
	101-200	80.4	28,011.9	86.6				
	201-400	31.8	4,321.1	13.4				
	Ml zones	66.8	32,333.0	24.0				--
Kodiak	1-100	5.1	1,396.4	21.6	2.1	19.3	0.68	
	101-200	25.2	4,971.9	77.1	8.7	79.8	0.57	--
	201-400	2.9	83.9	1.3	0.1	0.9	0.66	--
	All zones	12.9	6,452.2	4.8	10.9		0.59	
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	2.4	226.6	67.3	0.5	62.5	0.46	
	201-400	10.5	110.0	32.7	0.3	37.5	0.42	--
	All zones	5.1	336.6	0.3	0.8	--	0.45	--
Chirikof	l-100	3/		5/	4/	5/	0.06	
	101-200	135.0	27.5527::	76.5	27.6	62.7	0.46	31.7
	201-400	67.8	8.461.0	23.5	16.4	37.3	0.52	34.[illegible]
	All zones	58.2	36,020.6	26.8	44.0	--	0.47	--
Shumagin	I-100	0	0	0	0	0		
	101-200	29.3	6,352.8	34.5	13.4	32.1	0.47	35.4
	201-400	431.4	12,047.7	65.5	28.3	67.9	0.43	--
	All tones	39.0	18,400.5	13.7	41.7		0.44	--
Sanak	l-100	0.1	27.9	0.6	0.2	1.4	0.15	--
	101-200	7.2	1,397.9	29.0	4.3	30.3	0.32	--
	201-400	228.6	3,395.1	70.4	9.7	68.3	0.35	--
	All zones	11.4	4,820.9	3.6	14.2		0.34	--
Total	s-100	1.1	1,438.9	1.1				--
	101-200	50.1	88.865.8	66.1				--
	201-400	15.6	44.224.0	32.9			--	--
	All zones	36.8	134.528.7	100.1			--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Lees than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

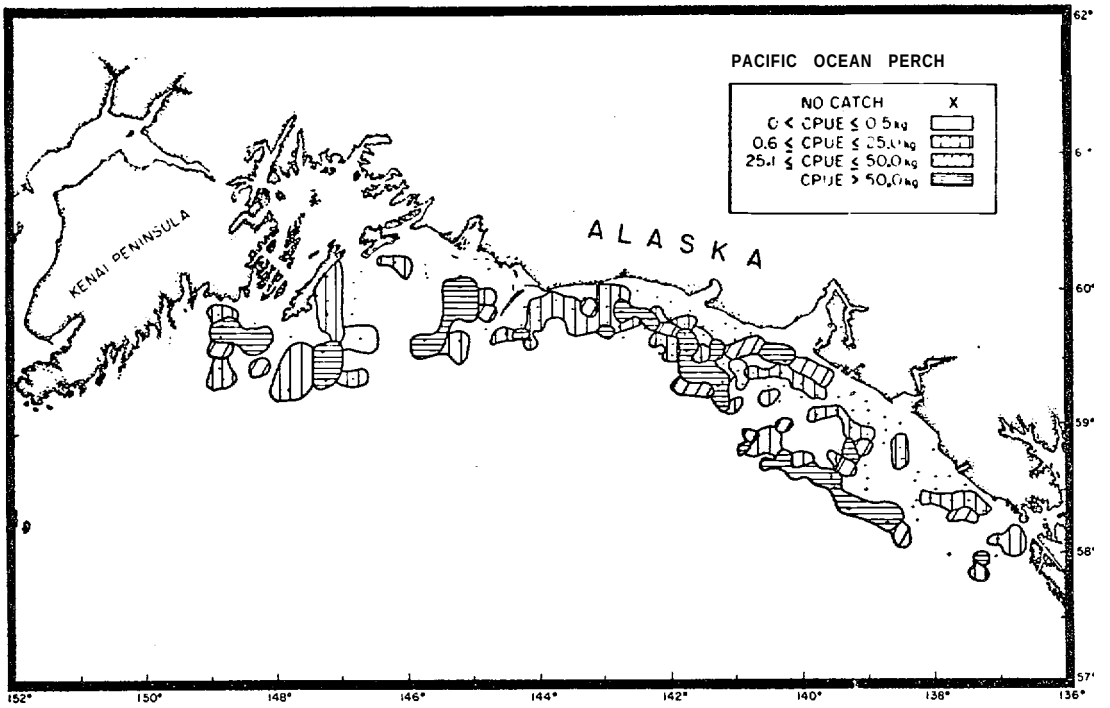


Figure X1-192.--Distribution of apparent relative abundance of Pacific ocean perch in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-952).

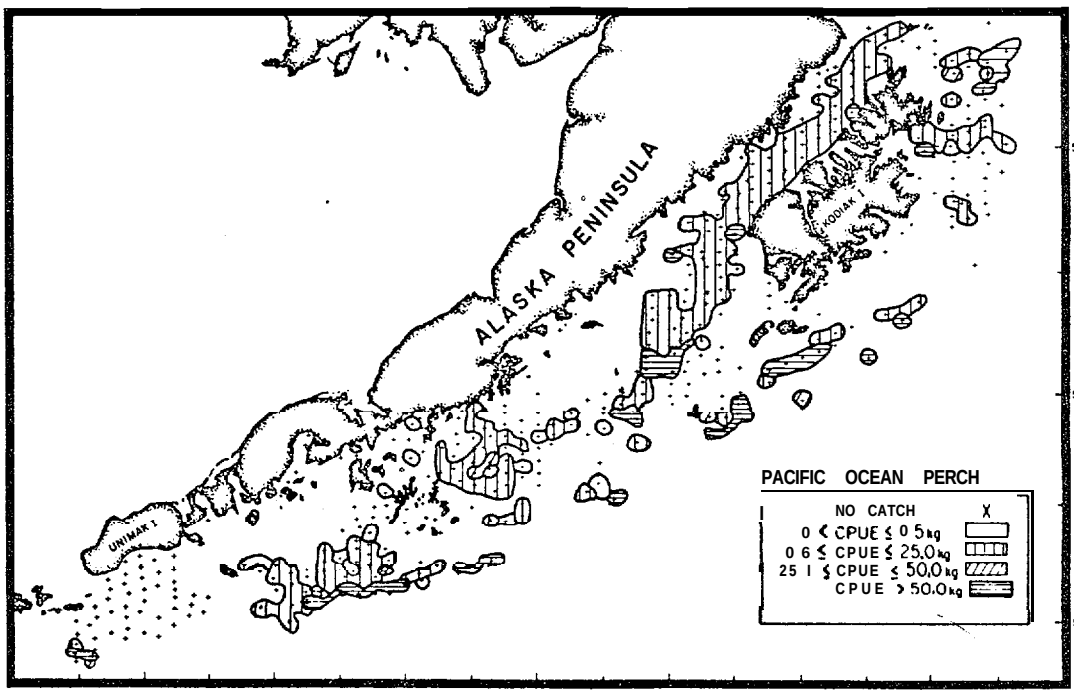


Figure XI-193.--Distribution of apparent relative abundance of Pacific ocean perch in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Biomass—The apparent biomass of Pacific ocean perch was estimated to be 135 thousand mt and is probably an extremely low estimate as this species is semi-pelagic and is known to be abundant in hard rocky areas which could not be adequately sampled with the trawl gear utilized in these surveys. Regions which were the largest contributors to the total biomass included Chirikof (27%), Kenai (24%), and Yakutat and Shumagin (14%). The outer shelf and upper slope depth zones contained 99% of the total biomass which was evenly divided between the eastern (51%) and western (49%) Gulf regions.

Size composition-Length frequency samples were taken in the outer shelf and upper slope depth zones of the Chirikof region. In the outer shelf, Pacific ocean perch, sexes combined, ranged from 20-41 cm and averaged 31.7 cm while in the upper slope they ranged from 21-44 cm and averaged 34.2 cm (Figure X1-194).

FLATHEAD SOLE

Distribution and abundance-Flathead sole were found in all regions and depth zones in the Gulf of Alaska with the exception of the Sanak upper slope (Figures X1-195-198). Flathead sole averaged 31 kg/hr over the entire Gulf with the highest relative apparent abundance occurring in the outer shelf and upper slope depth zones (Table X1-21, Figures XI-199-200). By geographical areas, highest concentrations of flathead sole were found in the Shelikof, Fairweather and Kenai regions.

Biomass-Of the estimated apparent biomass of flathead sole, 109 thousand mt, 71% was located in the outer shelf, 16% in the upper slope and 13% in the inner shelf depth zone. Regions which contained the greatest percentage of the biomass were Kenai (24%) and Fairweather (16%) with the Chirikof, Shumagin, Shelikof and Kodiak regions each contributing 11%. The total biomass was evenly divided between the eastern (49%) and western (51%) Gulf of Alaska.

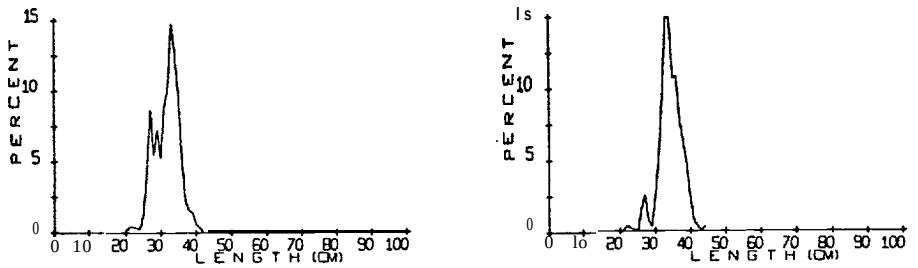
Size composition--Flathead sole length frequency samples were taken from the Chirikof region. Flathead sole ranged from 12-45 cm in the outer shelf and averaged 27.3 cm and varied from 21-48 cm in the upper slope where they averaged 31.5 cm. (Figure XI-201).

ROCK SOLE

Distribution and abundance-Although rock sole were captured in all regions except Kenai, they were primarily found on the continental shelf of the western Gulf regions. (Figures X1-202-205). Highest relative apparent abundance was found in the Kodiak region where the mean CPUE was 106 kg/hr (Table X1-22, Figures X1-206-207) while the Sanak and Chirikof regions had mean CPUE's greater than the Gulf of Alaska average (29 kg/hr). The relative apparent abundance of rock sole was inversely related with bottom depth averaging 73 kg/hr in the inner shelf and decreasing to 0.4 kg/hr in the upper slope.

DEPTH ZONES (M)

101 - 200 | **201 - 400**



CHIRIKOF

Figure X1-194.--Percentage length frequencies of Pacific ocean perch from the Gulf of Alaska (Cruises 618, 611, 052).

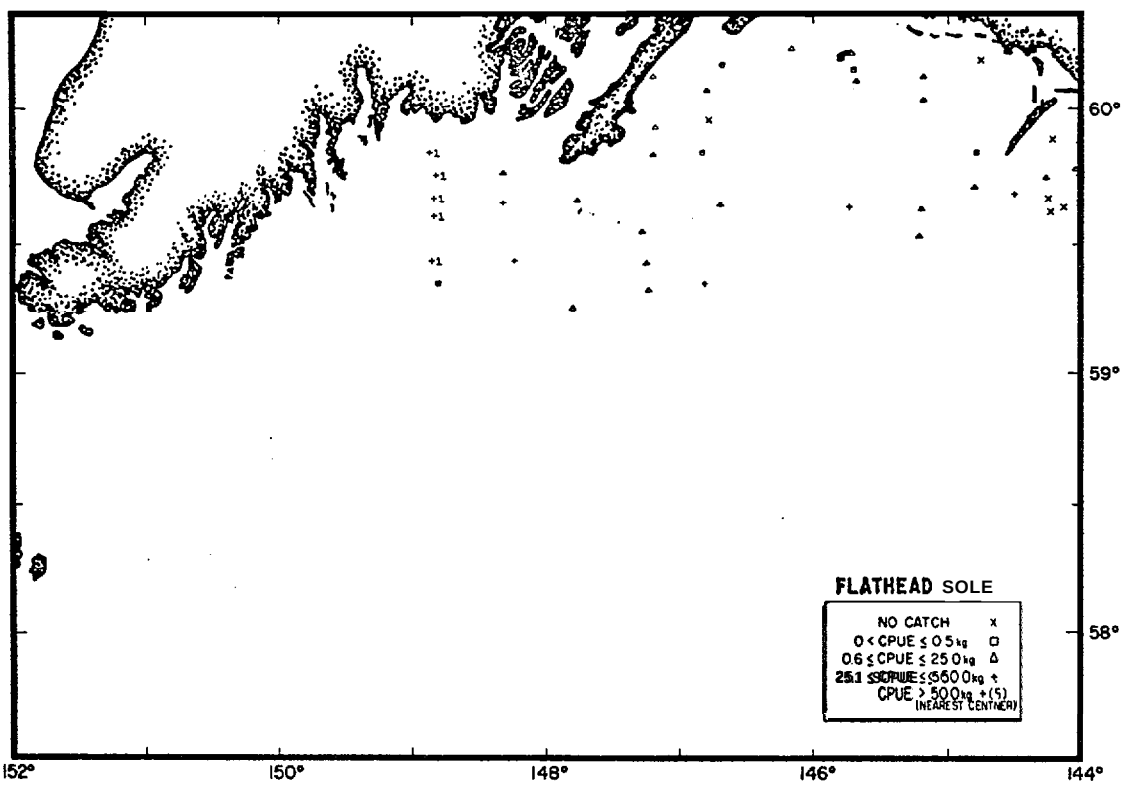


Figure X1-195.--Distribution of standardized catch rates in kg/hr of flathead sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

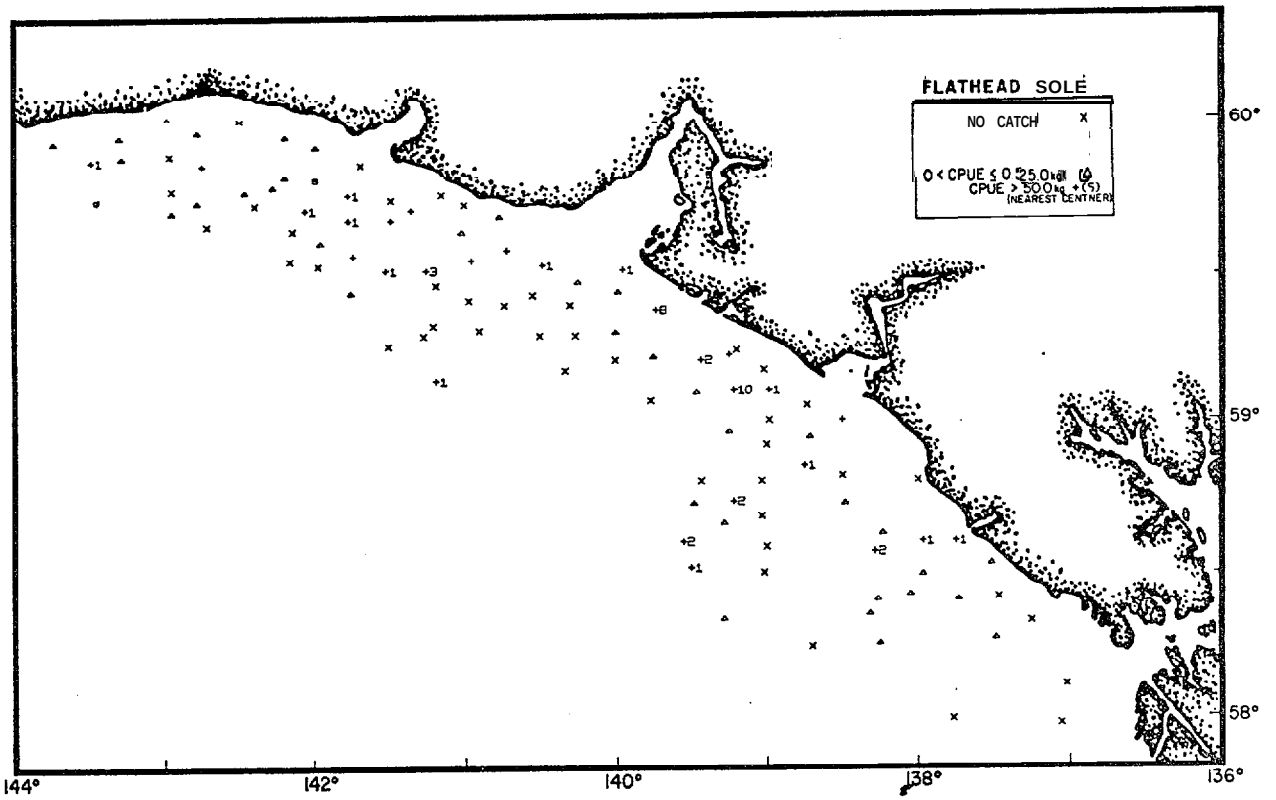


Figure X1-196.--Distribution of standardized catch rates in kg/hr of flathead sole in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

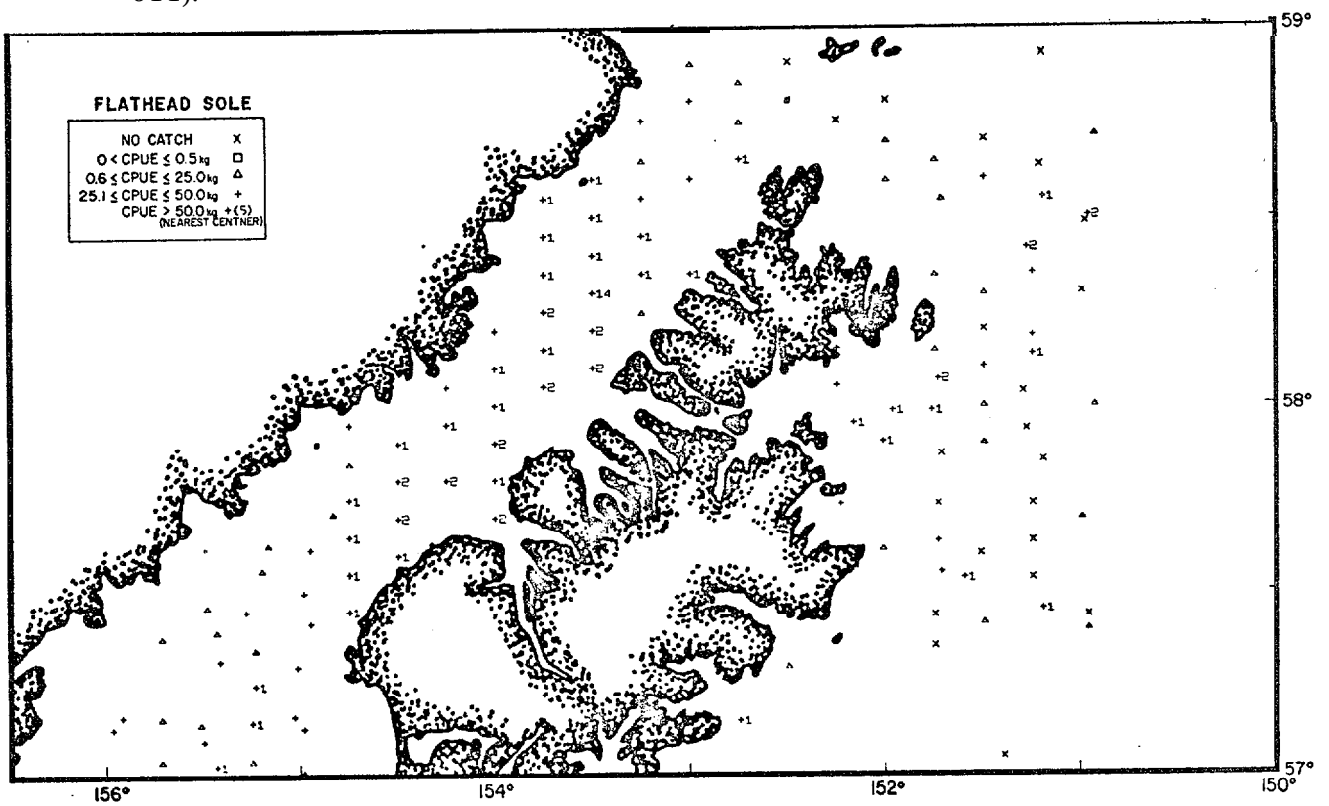
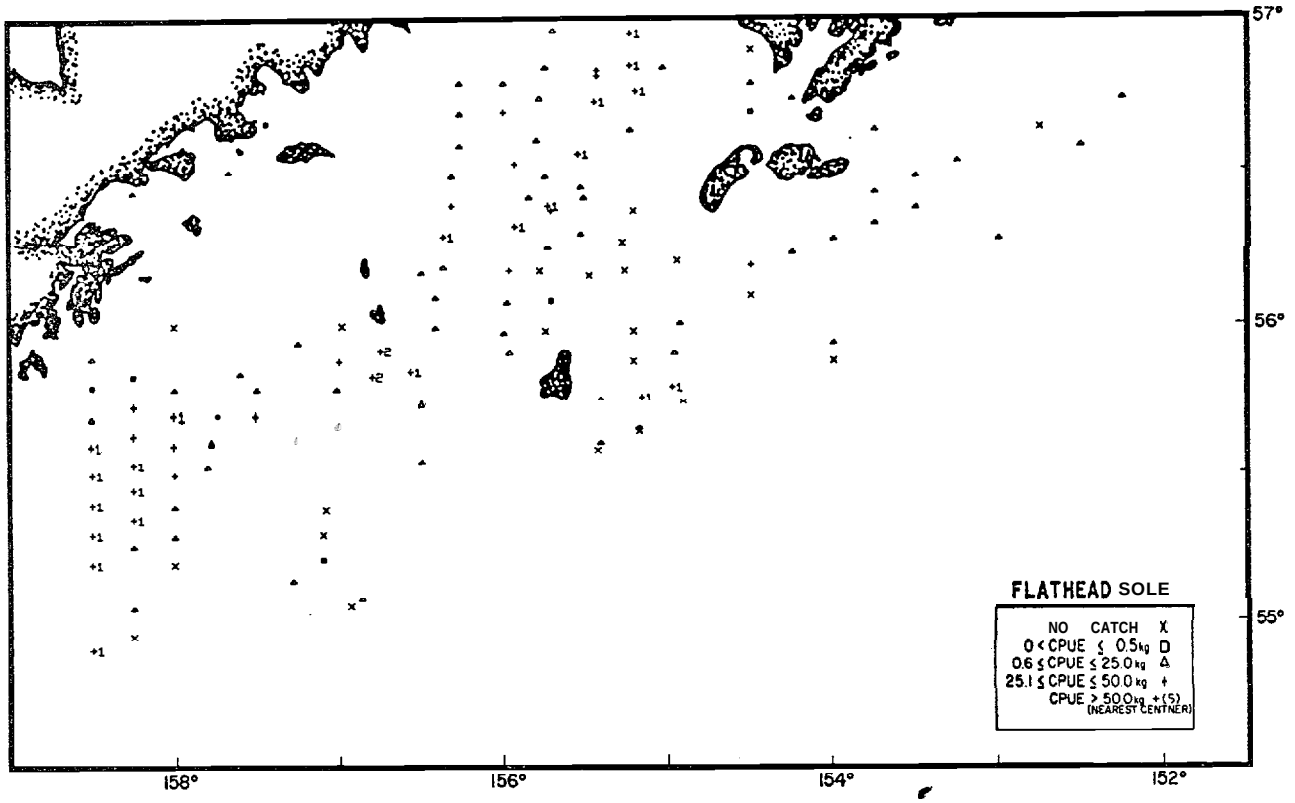


Figure XI- 197. --Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).



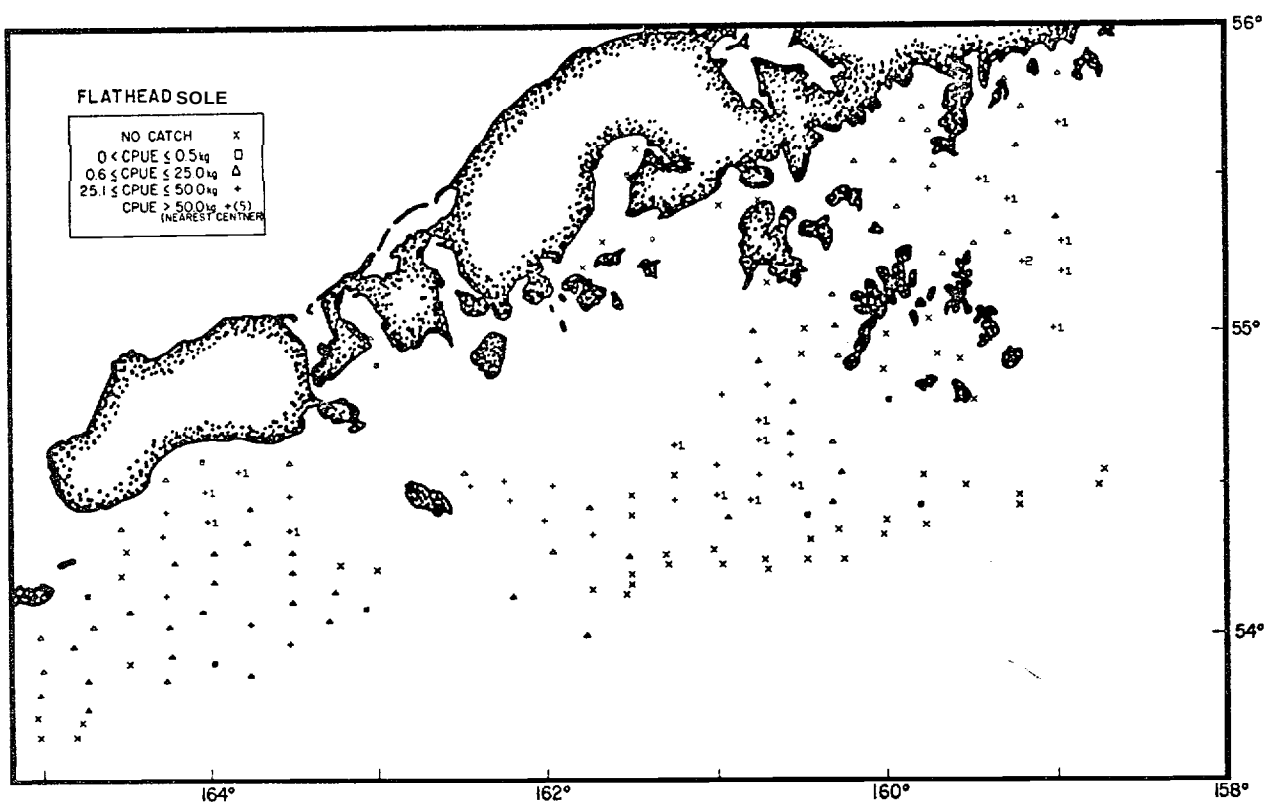


Figure X1-198. --Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, May-July 1961 (Cruise 418).

Table XI-21.--Estimated biomass and population size of flathead sole (Hippoglossoides elassodon) in the Gulf of Alaska during May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	I-100	149.3	6,405.9	36.6	--	--	--	
	101-200	46.2	8,970.7	51.3	--	--		
	201-400	59.1	2.117.3	12.1		--	--	--
	All zones	64.1	17,493.9	16.1		--		
Yakutat	I-100	12.0	889.1	13.2	--	--		--
	101-200	23.5	4.096.4	60.9	--	--	--	--
	201-400	21.2	1.738.0	25.9	--			
	All zones	20.4	6,723.5	6 . 2				--
Prince William	I-100	1.4	179.8	6.6	0.9	7.2	0.19	
	101-200	12.9	1,934.1	70.6	9.7	77.6	0.20	--
	201-400	14.4	624.4	22.8	1.9	15.2	0.22	--
	All zones	8 . 4	2,738.3	2 . 5	12.5	--	0.22	--
Kenai	I-100			--			--	--
	101-200	63.8	22.235.8	83.7	--	--	--	--
	201-400	31.8	4.321.1	16.3	--			--
	M l zones	54.8	26.556.9	24.4		--		--
Kodiak	I-100	9.3	2,531.7	21.9.	12.4	25.4	0.20	--
	101-200	35.5	7,003.5	60.7	30.1	61.6	0.23	--
	201-400	70.4	2,003.6	17.4	6.4	13.1	0.31	--
	All *ones	23.1	11,538.8	10.6	48.9	--	0.24	--
Shelikof	I-100	0.2	14.3	0.1	0.1	0.3	0.23	
	101-200	121.8	11,354.0	94.8	33.8	93.4	0.34	
	201-400	57.9	608.3	5.0	2.3	6.4	0.26	--
	All zones	66.8	11,976.6	11.0	36.2	--	0.33	--
Chirikof	I-100	2.5	734.2	5.9	3.9	6.0	0.19	--
	101-200	34.8	7.111.6	57.0	41.0	63.4	0.17	27.3
	201-400	37.2	4,637.1	37.2	19.8	30.6	0.23	31.5
	All zones	20.2	12.482.9	11.5	64.7	--	0.19	--
Shumagin	I-100	4.0	1,082.6	8.8	4.8	7.1	0.22	--
	101-200	43.7	9,479.6	77.0	54.2	79.9	0.18	
	201-400	62.8	1,755.1	14,3	8.8	13,0	0.20	--
	All zones	26,1	12,317.3	11.3	62.9	--	4.18	
Sanak	I-100	a.3	1,771.1	25.5	10.5	25.2	0.17	--
	101-200	26.7	5,175.1	74.5	31.1	74.8	0.17	
	201-400	0	0	0	0	0		--
	All zones	16.5	6.946.2	6 . 4	41.6	--	0.17	
Total	I-100	10.4	13,608.7	12.5	--	--		--
	101-200	43.6	77,360.8	71.1	--	--	--	
	201-400	38.9	17.804.9	16.4	--	--	--	
	All zones	31.0	x08.774.4	100.0		--		--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

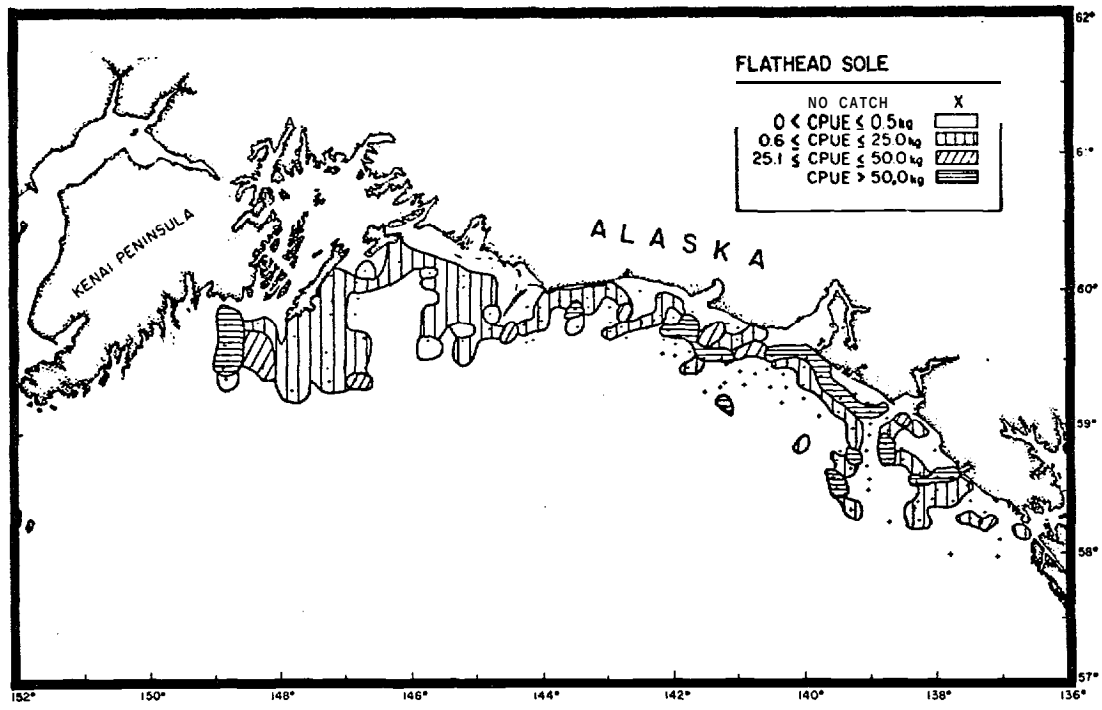


Figure X1-199.--Distribution of apparent relative abundance of flathead sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

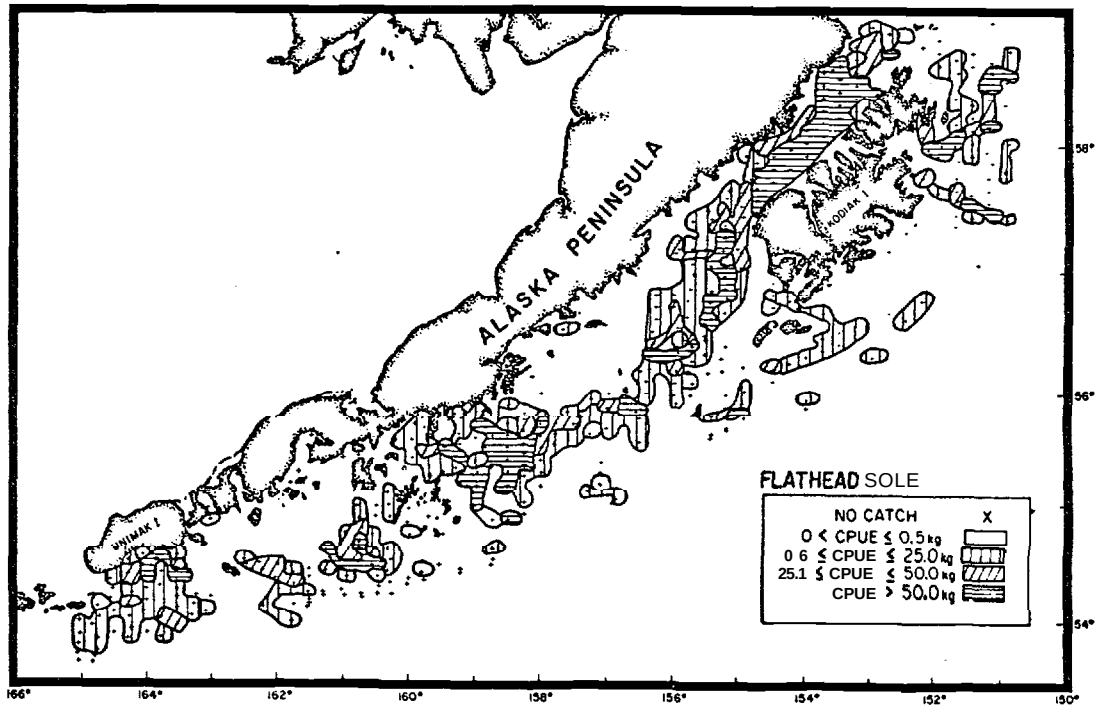
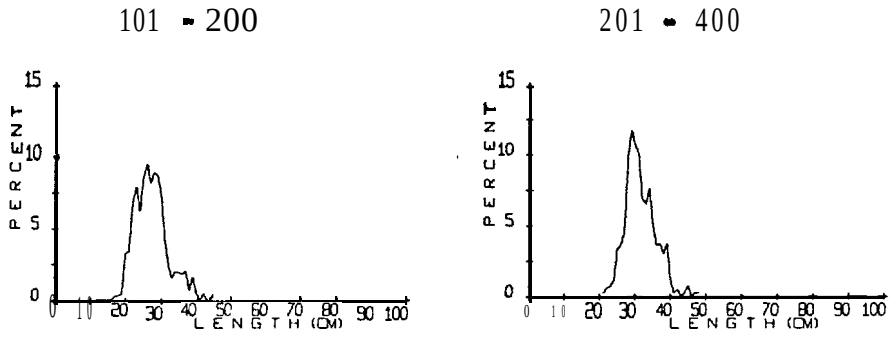


Figure X1-200.--Distribution of apparent relative abundance of flathead 'sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

DEPTH ZONES (M)



CHIRIKOF

Figure X1-201.--Percentage length frequencies of **flathead** sole from the Gulf of Alaska (Cruises 618, 611, 052).

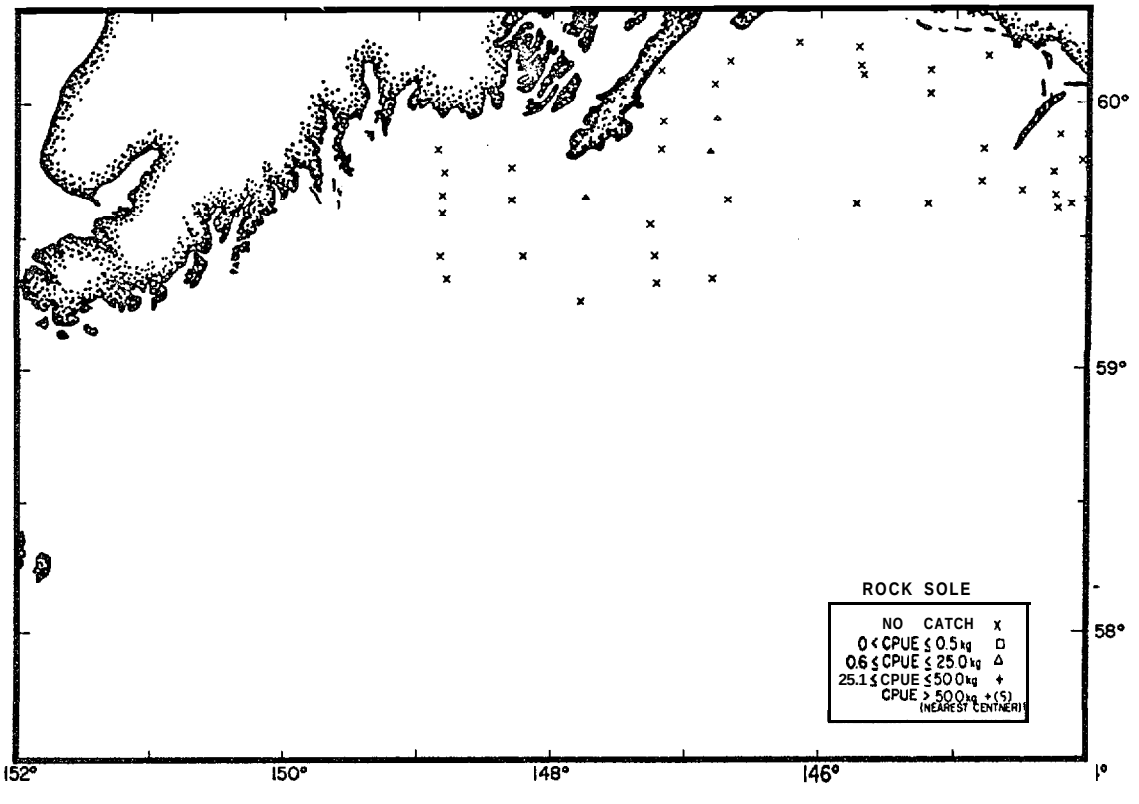


Figure X1-202.--Distribution of standardized catch rates in **kg/hr** of rock sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-**052).**

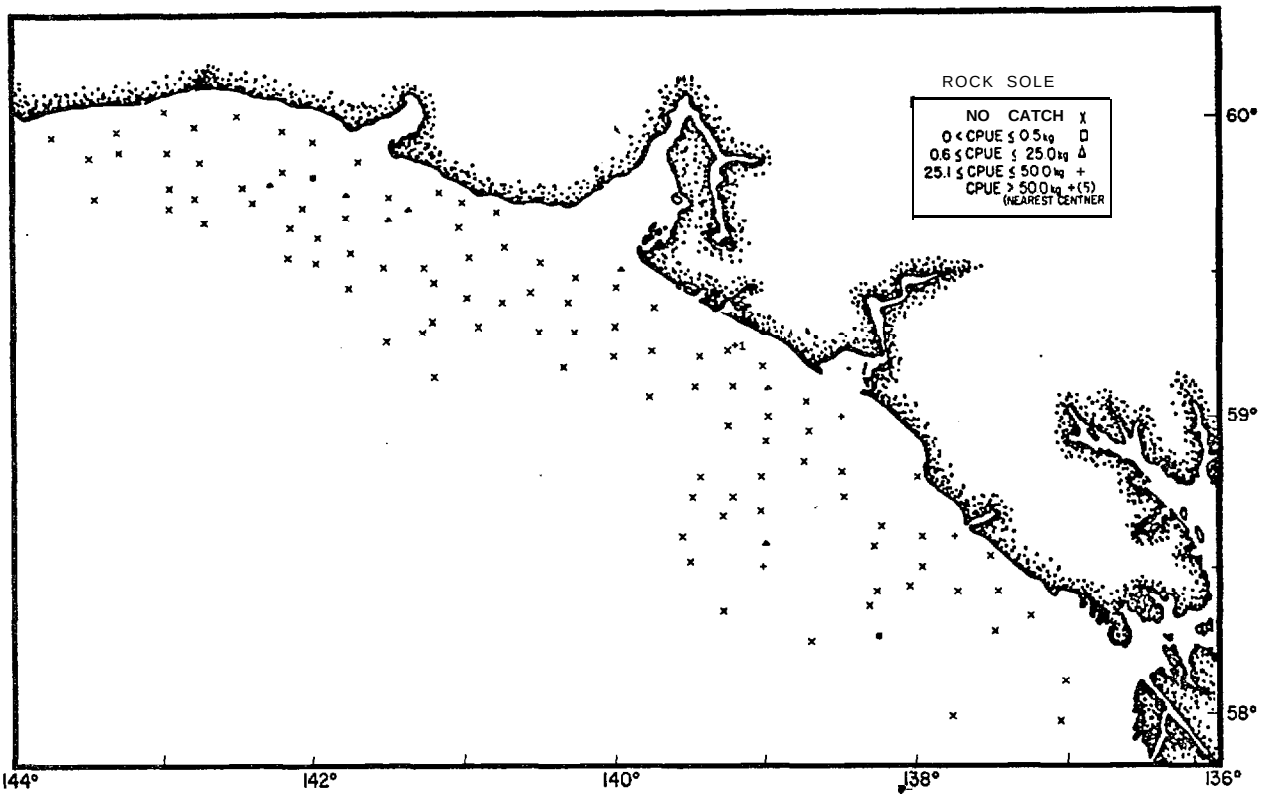


Figure X1-203.--Distribution of standardized catch rates in kg/hr of rock sole in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611)

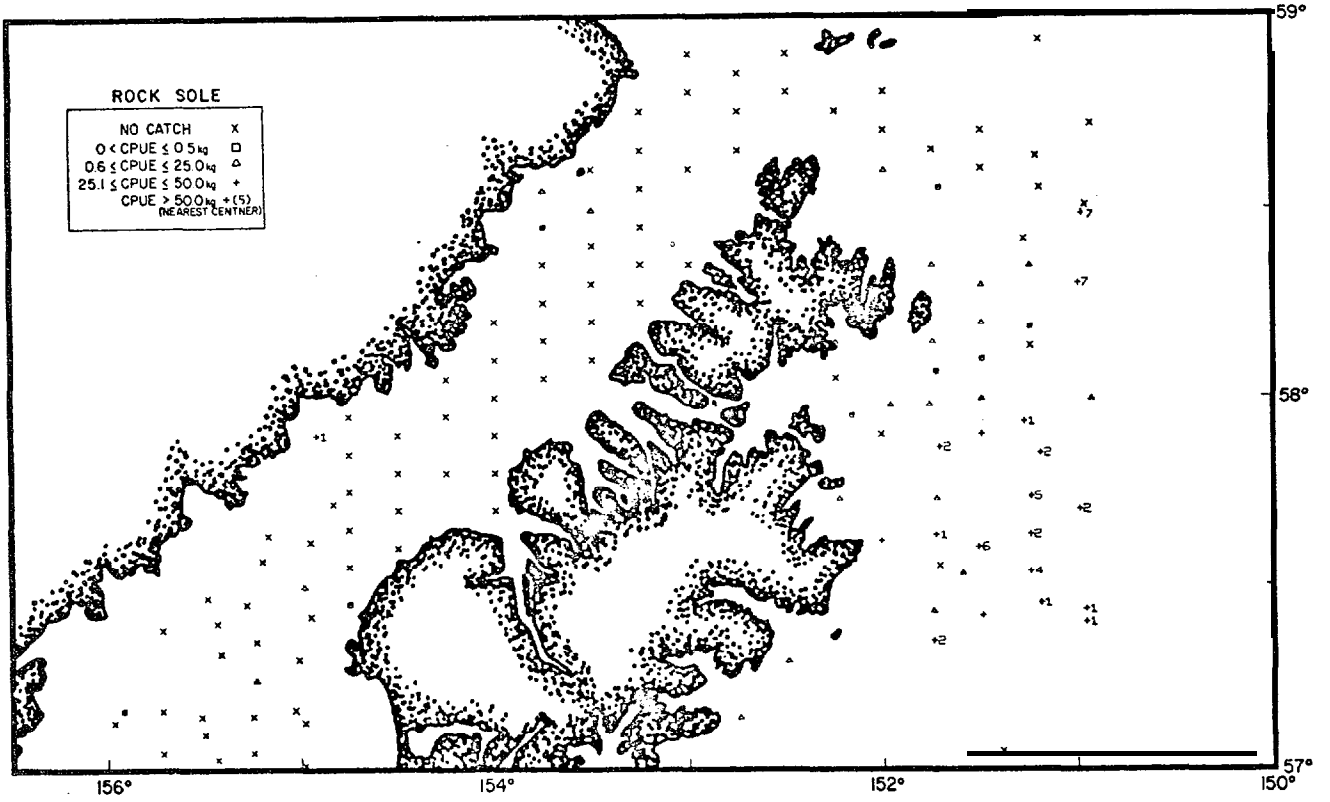
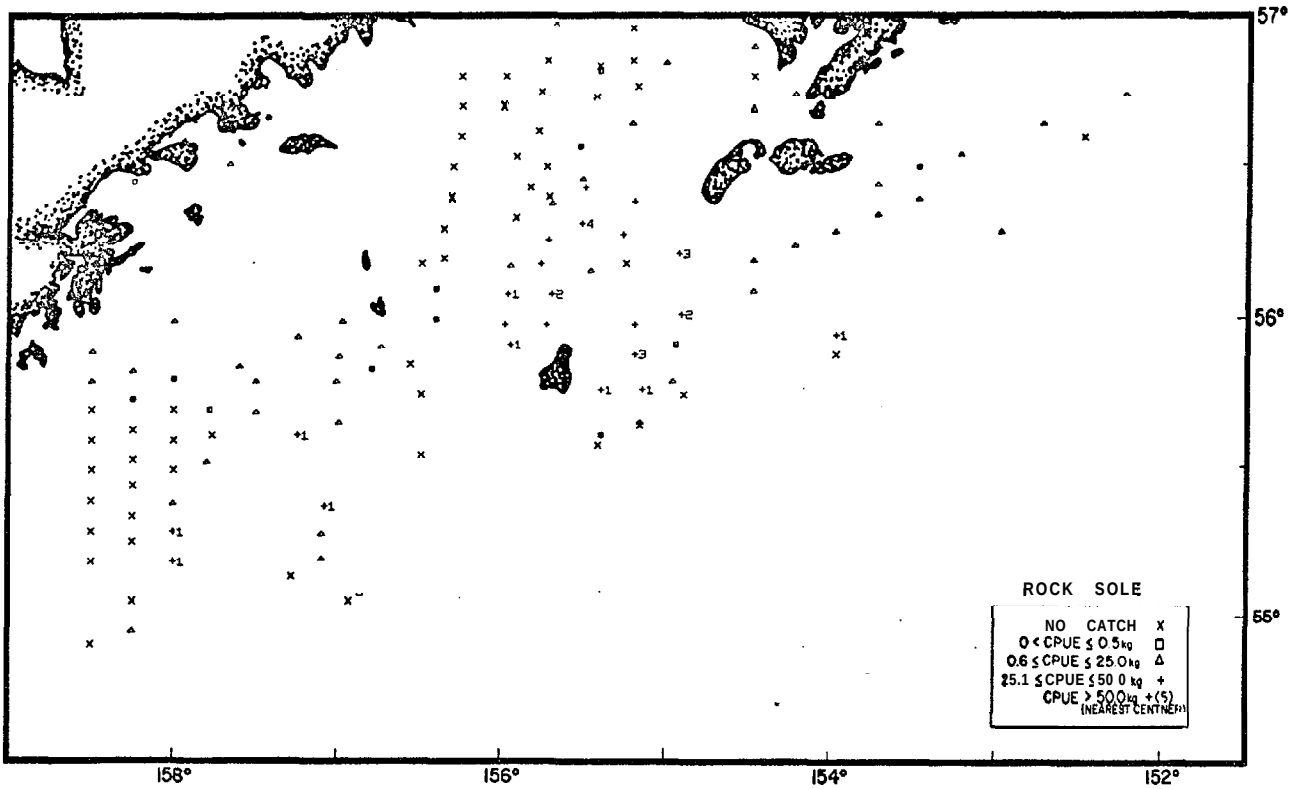


Figure X1-204.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).



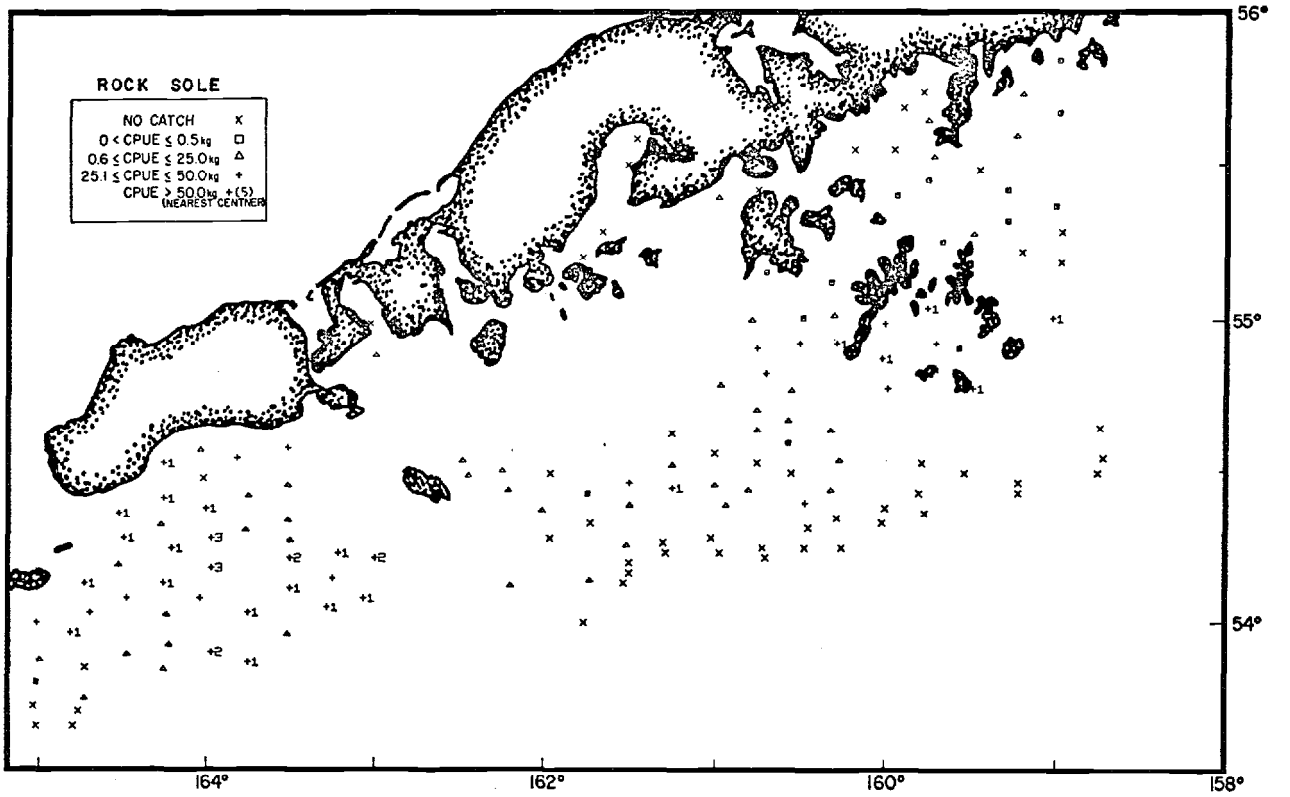


Figure X1-205.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-22.--Estimated biomass and population size of rock sole (Lepidopsetta bilineata) in the Gulf of Alaska during Hay-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean sire per individual 2/ Weight (kb)	Length (cm)
Fairweather	l-100	16.3	699.7	72.5	--	--	--	--
	101-200	1.4	266.1	27.6	--	--	--	--
	201-400	0	0	0	--	--		--
	All zones	3 . 6	965.8	0.9	--	--		--
Yakutat	I-100	1.4	104.1	48.9	--	--		--
	101-200	0.6	109.0	51.2	--	--	--	--
	201-400	0	0	0	--	--		
	Ml zones	0.6	213.1	0.1	--	--		--
Prince William	l-100	2.8	313.8	97.6	1.0	100.0	0.36	--
	101-200	0.1	9.1	2.4	4/	5/	0.45	
	201-400	0	0	0	0	0	--	
	All tones	1.2	382.9	0 . 4	--	--	0.36	--
Kenai	l-100				--	--		
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	--	--	
Kodiak	l-100	i88.6	51,566.6	97.1	184.9	96.4	0.28	29.8
	101-200	7.6	1,489.6	2.8	6.7	3.5	0.22	25.6
	201-400	1.5	43.0	0.1	0.2	0.1	0.23	--
	All zones	106.4	53,099.2	49.3	191.8		0.28	
Shelikof	I-100	66.3	4.168.3	99.8	34.0	100.0	0.12	
	101-200	0.1	7.2	0.2	4/	5/	0.32	--
	201-400	3/	0.4	5/	4/	5/	0.20	--
	All zones	16.0	4,175.9	3.9	34.0	--	0.12	
Chirikof	I-100	b4.3	18,612.9	79.6	77.7	78.1	0.24	25.2
	101-200	22.4	4,568.9	19.5	21.3	21.4	0.21	23.7
	201-400	1.7	208.3	0.9	0 . 5	0.5	0.40	--
	All zones	37.8	23,390.1	21.7	99.5		0.24	--
Shumagin	l-100	36.2	8,223.3	91.6	35.8	90.4	0.23	--
	101-200	3.5	759.3	8.5	3.8	9.6	0.20	26.7
	201-400	0	0	0	0	0	--	
	All zones	9.0	8,982,6	8 . 4	39.6	--	0,23	
Sanak	l-100	57.5	12,273.2	74.7	59.5	15.3	0.21	--
	101-200	21.4	4,151.5	25.3	19.5	24.7	0.21	--
	201-400	0	0	0	0	0		
	All zones	38.9	16,424.7	15.3	79.0	--	0.21	--
Total	l-100	73.0	96.021.9	89.2	--			--
	101-200	6.4	11,360.7	10.6	--			
	201-400	0.4	251.7	0.2	--	--		--
	All zones	29.2	107.634.3	Loo.0	--	--	--	--

1/ Kean catch per unit effort In kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 p&cent.

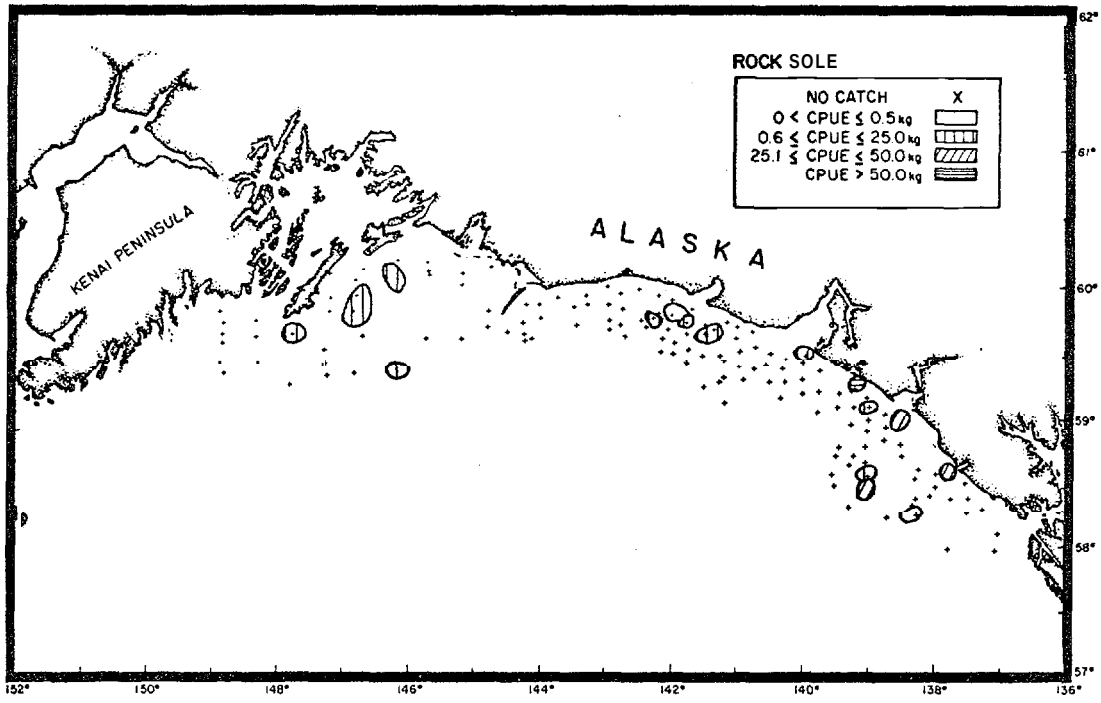


Figure X1-206.--Distribution of apparent relative abundance of rock sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611, 052).

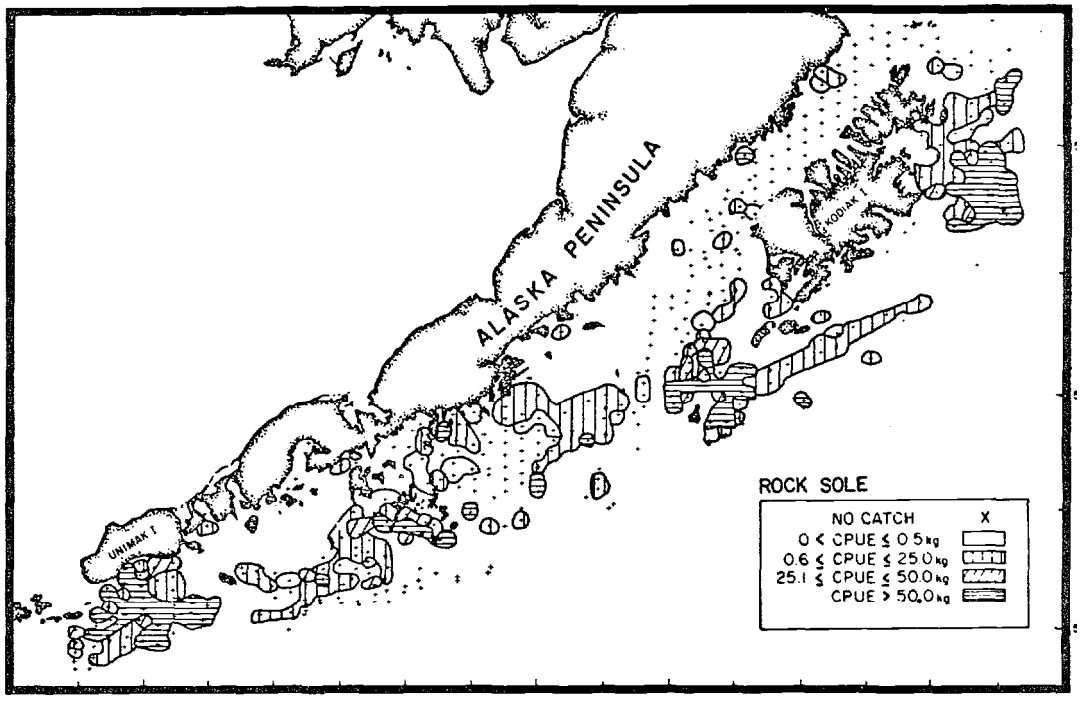


Figure X1-207.--Distribution of apparent relative abundance of rock sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Biomass -The estimated apparent biomass of rock sole in the Gulf of Alaska was 108 thousand mt of which 49% occurred in the Kodiak and 22% in the Chirikof regions. Over the survey area, the vast majority of the rock sole biomass was found at depths less than 100 meters (89%) and in the western Gulf of Alaska (98%). The biomass estimate for rock sole in the Gulf of Alaska is probably low as this species occurs in dense concentrations during the summer months in the shallower water banks where sampling is limited because of hard untrawlable areas,

Size composition-Random length frequency samples were taken in the inner shelf depth zone of the Kodiak and Chirikof regions and the outer shelf depth zone of the Shumagin, Chirikof and Kodiak regions. In the Kodiak and Chirikof regions, the average size of rock sole, sexes combined, was greatest in the inner shelf depth zone (Figure X1-208). Over all regions, the mean lengths of rock sole ranged from 23.7-29.8 cm.

PACIFIC HALIBUT

Distribution and abundance--Pacific halibut were widely distributed throughout the Gulf of Alaska, occurring in all region-depth zones sampled with the exception of the Fairweather upper slope (Figures X1-209-212). Over the survey area, Pacific halibut averaged 21 kg/hr with the highest relative apparent abundance occurring in the Chirikof and Kodiak regions (Table XI-23). The mean catch of Pacific halibut decreased with increasing bottom depth from 35 kg/hr in the inner shelf to 6 kg/hr in the upper slope.

Biomass-The apparent biomass of Pacific halibut in the Gulf of Alaska was estimated to be 76 thousand mt, of which 61% was found in the inner shelf and 35% in the outer shelf depth zone. The combined Chirikof (34%) and Kodiak (24%) regions contained 58% of the estimated biomass, while the remaining portion was fairly evenly distributed over the remaining regions which contained from 4 to 10% each. The biomass estimate of Pacific halibut should be considered minimal as large halibut appear to be able to escape the trawl gear when towed at speeds utilized during this survey.

Size composition--Length frequency data for Pacific halibut are available through the International Pacific Halibut Commission (INPHC).

WALLEYE POLLOCK

Distribution and abundance-Walleye pollock were widely distributed throughout the Gulf of Alaska occurring in all region-depth zones with the exception of the Shelikof-inner shelf (Figures X1-213-216). The overall mean CPUE for walleye pollock was 16 kg/hr. Highest relative apparent abundance was in the Kenai region (Table XI-24, Figures X1-217-218) with the Shumagin and Shelikof regions also having mean CPUE's greater than the Gulf of Alaska average. Walleye pollock were principally found in the outer shelf and upper slope depth zones where mean CPUE's averaged 24 and 20 kg/hr, respectively.

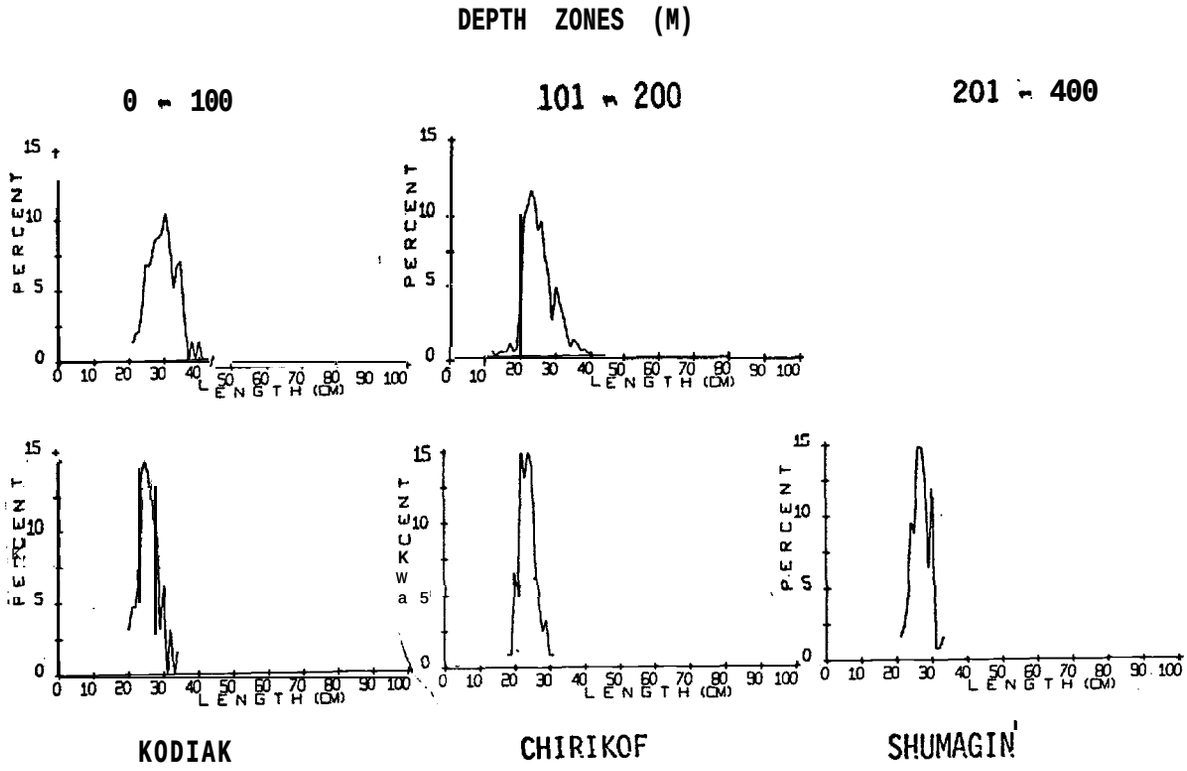


Figure X1-208.--Percentage length frequencies of rock sole from the Gulf of Alaska (Cruises **618, 611, 052).**

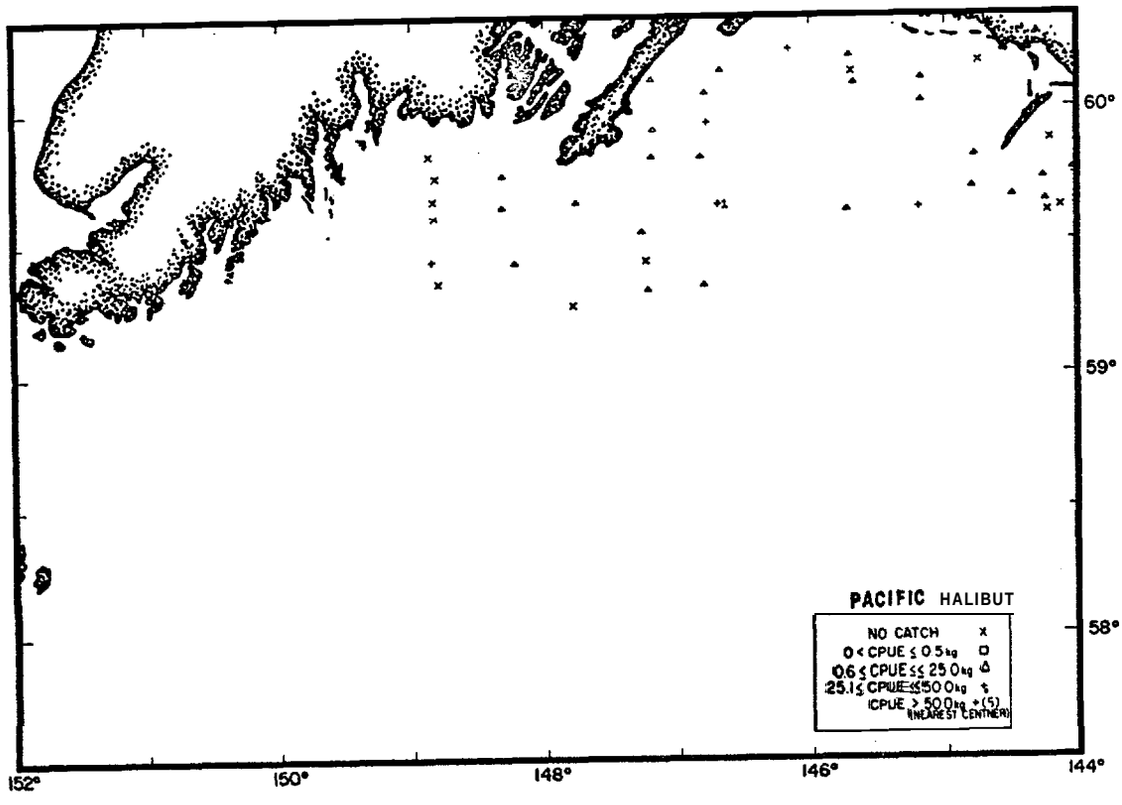


Figure X1-209.--Distribution of standardized catch rates in **kg/hr** of Pacific halibut in the eastern Gulf of **Alaska, June-Oct.** 1961 (Cruise **61** l-052).

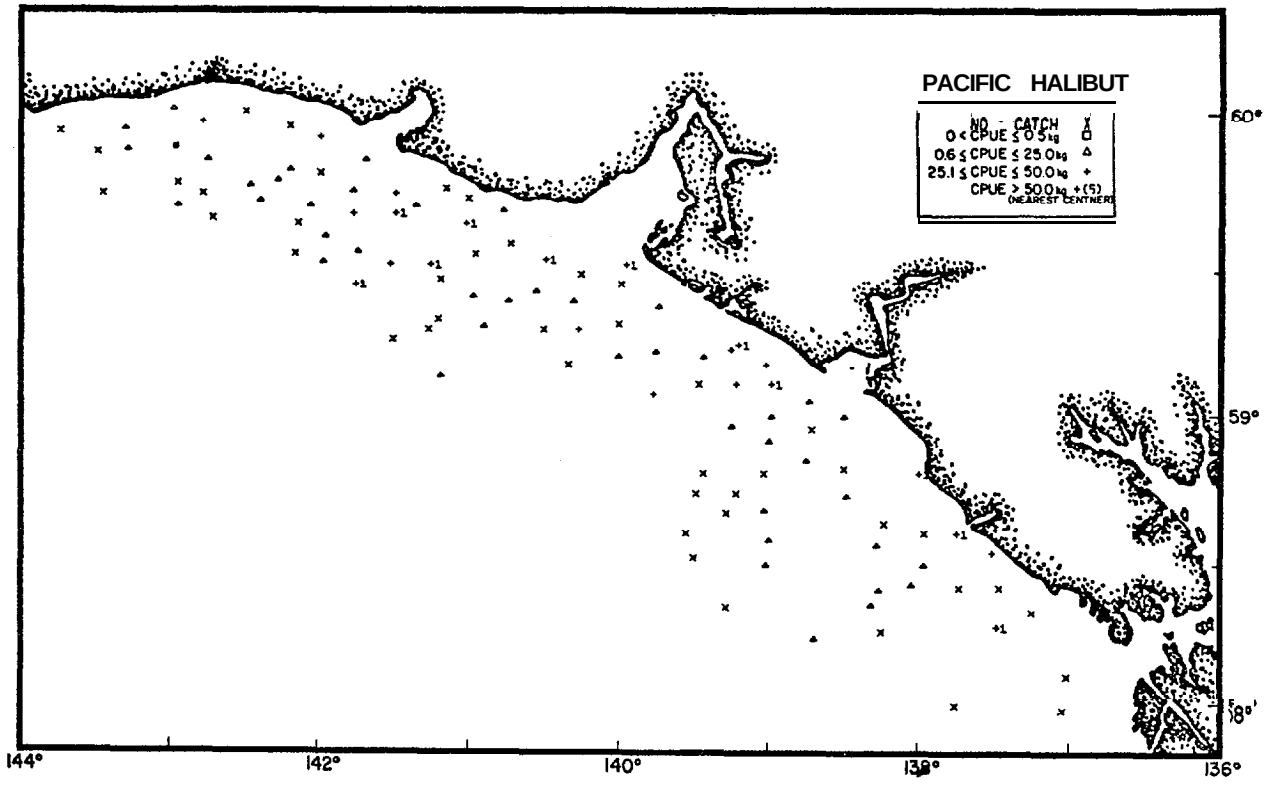


Figure m-210.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

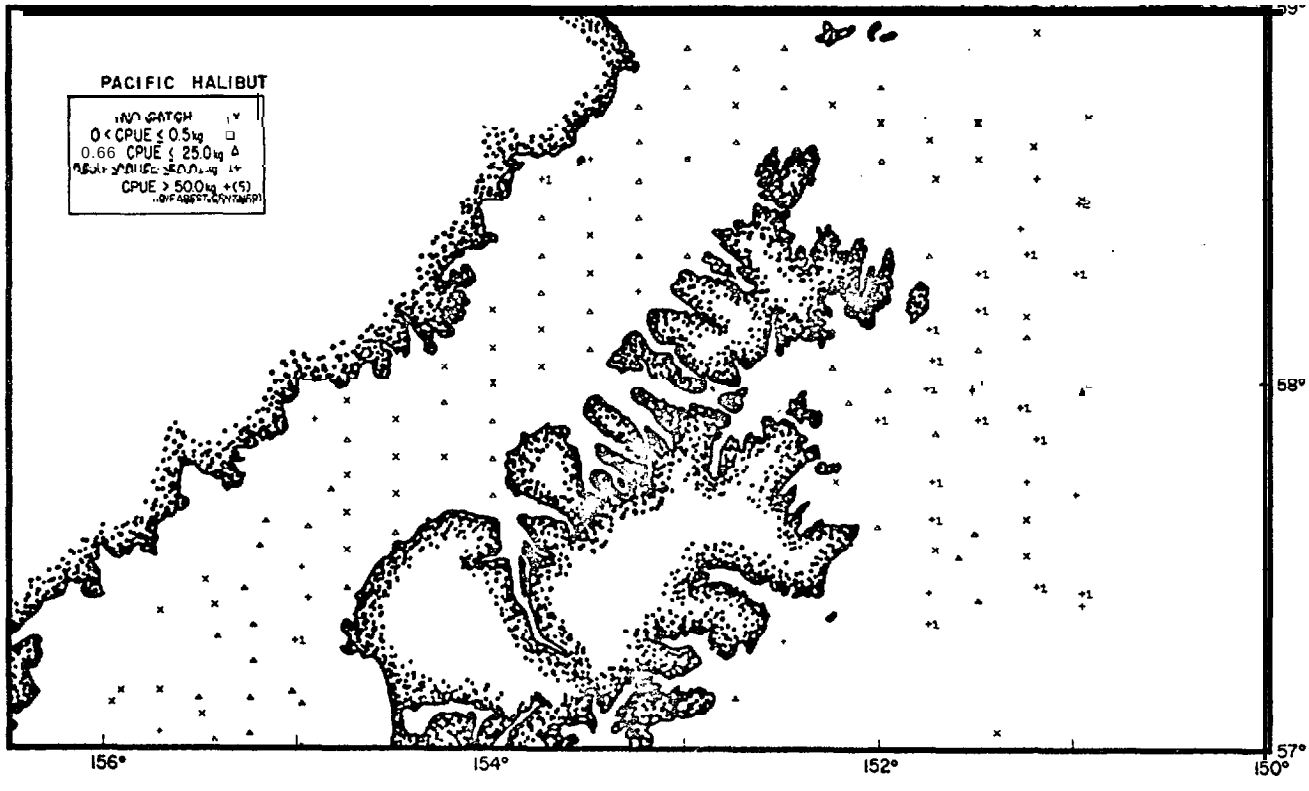
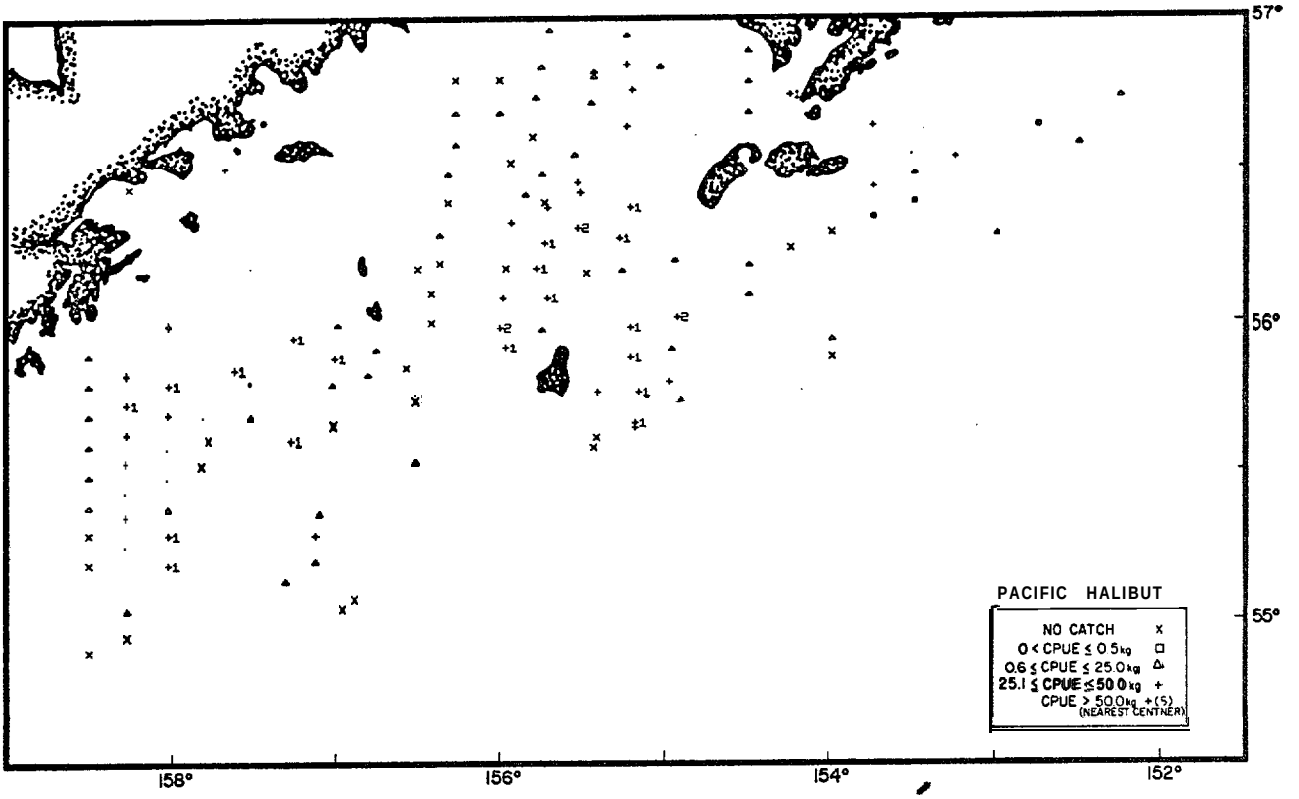


Figure XI-211.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the western Gulf of Alaska, May-July 1961 (Cruise 618).



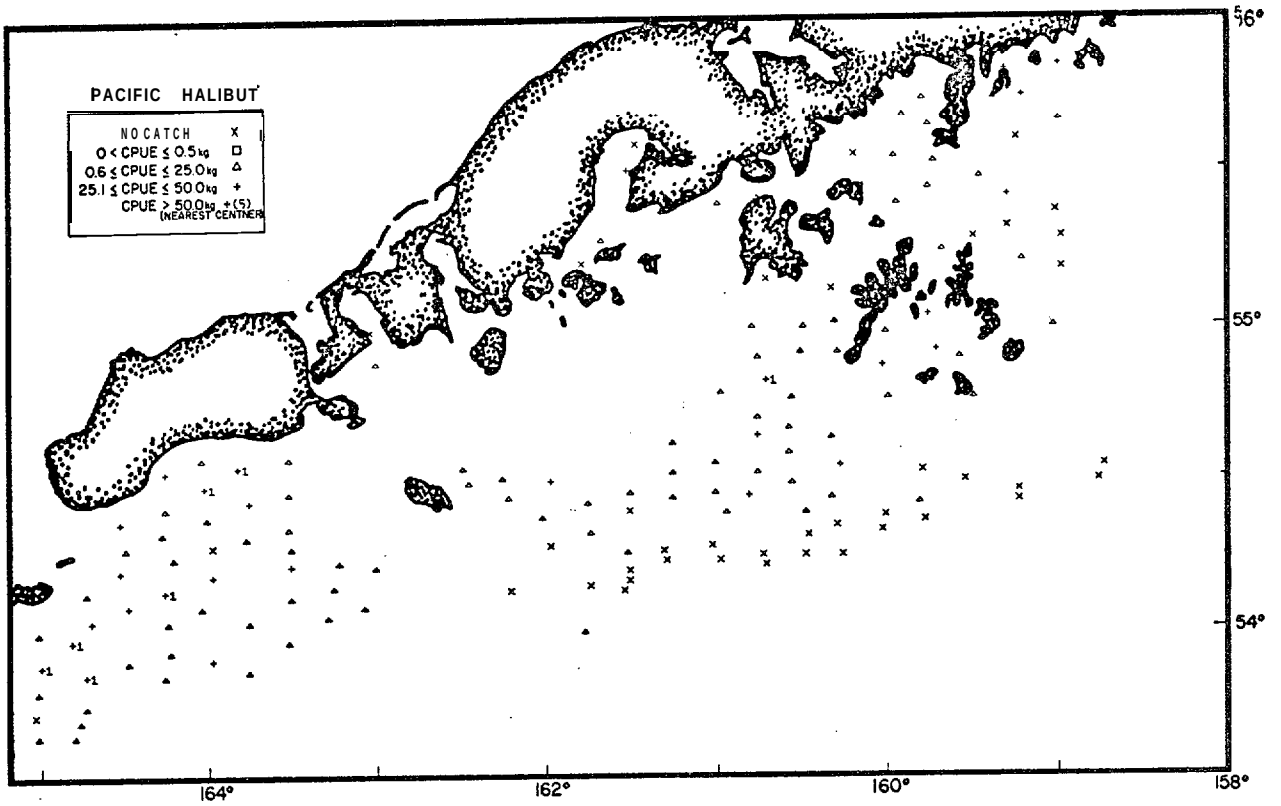


Figure X1-212.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-23.--Estimated biomass and population sire of Pacific halibut (*Hippoglossus stenolepis*) in the Gulf of Alaska during thy-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	I-100	43.1	1,846.7	48.0	--	--	--	
	101-200	10.3	2,002.4	52.0	--	--		
	201-400	0	0	0	--	--		
	All zones	14.1	3,849.1	5.1	--	--		--
Yakutat	l-100	16.1	1,192.4	29.1		--		
	101-200	13.9	2,422.1	59.2				--
	201-400	5.9	478.8	11.7	--	--		
	All zones	12.4	4,093.3	5.4	--			
Prince William	l-100	a.5	1.114.9	30.7	0.7	46.7	1.67	
	101-200	15.9	2,386.4	65.7	0.7	46.7	3.50	--
	201-400	3.0	131.5	3.6	0.1	6.7	2.27	
	All tones	11.2	3,632.8	4.8	1.5		2.58	--
Kenai	l-100	--	--	--	--		--	
	101-200	6.7	2,350.0	88.4	0.6	85.7	4.15	
	201-400	2.3	308.7	11.6	0.1	14.3	2.27	--
	All *ones	5.5	2,658.7	3.5	0.7		3.79	--
Kodiak	l-100	47.1	12.879.2	70.5	a.5	79.4	1.51	
	101-200	22.0	4,325.3	23.7	2.0	18.7	2.18	
	201-400	37.7	1,071.6	5.9	0.2	1.9	5.00	--
	All zones	36.6	18,276.1	24.1	10.7		1.71	--
Shelikof	l-100	34.2	2.152.6	68.1	1.7	81.0	1.27	--
	101-200	10.1	939.4	29.7	0.4	19.0	2.17	--
	201-400	6.7	70.7	2.2	4/	5/	2.83	--
	All zones	14.5	3,162.7	4.1	2.1		1.51	--
Chirikof	l-100	63.5	18,403.1	71.5	19.1	77.6	0.97	
	101-200	31.3	6,381.7	24.8	4.9	19.9	1.31	--
	201-400	7.5	941.4	3.7	0.6	2.4	1.47	--
	All zones	41.6	25,726.2	33.9	24.6	--	1.05	
Shumagin	I-100	17.4	3,954.7	55.9	3.9	65.0	1.01	
	101-200	14.2	3,078.1	43.5	2.1	35.0	1.49	
	201-400	1.6	43.8	0.6	4/	5/	3.76	--
	All zones	15.0	7,076.6	9.3	6.0		1.18	
Sanak	l-100	22.0	4,697.5	63.1	6.1	72.6	0.76	
	101-200	14.0	2,720.9	36.6	2.2	26.2	1.23	--
	201-400	1.8	26.2	0.3	0.1	1.2	3.93	--
	All zones	17.6	7,444.6	9.8	8.4	--	6.89	--
Total	l-100	35.1	46.241.1	60.9			--	--
	101-200	15.0	26,606.3	35.1	--	--	--	
	201-400	6.2	3,072.7	4.1	--	--	--	--
	All zones	20.7	75.920.1	100.0	--	--	--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

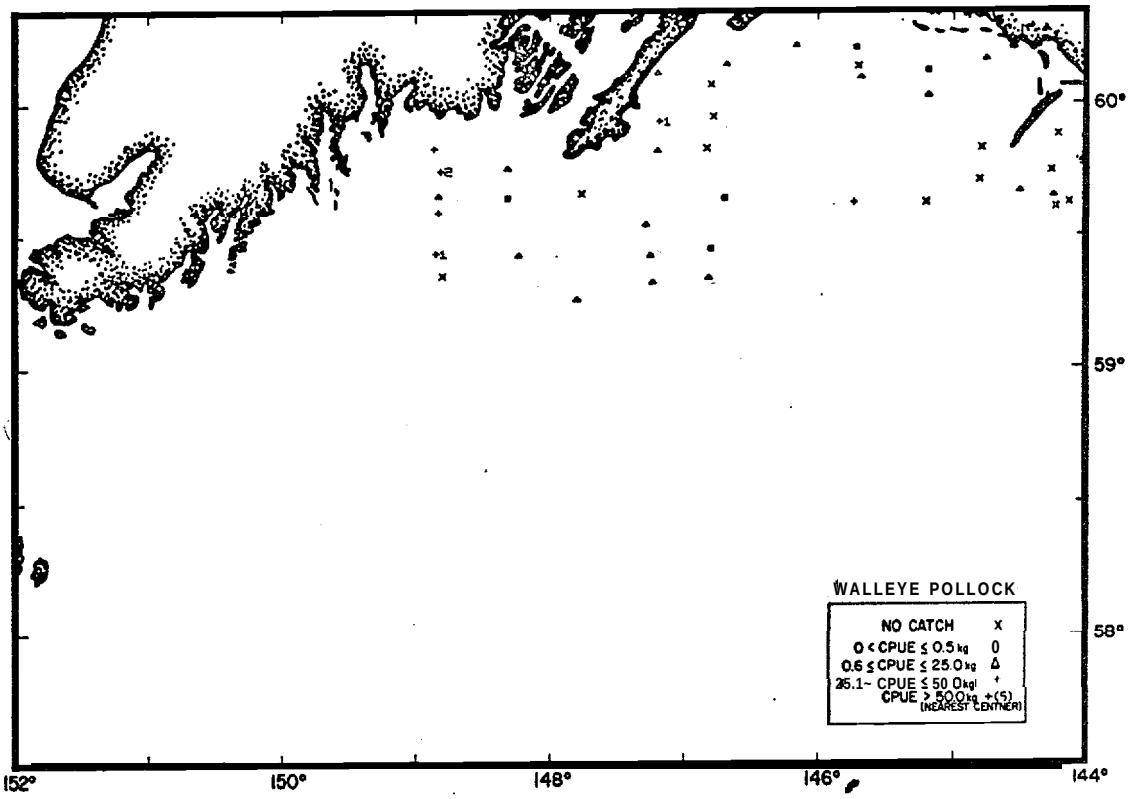


Figure X1-213.--Distribution of standardized catch rates in kg/hr of walleye pollock in the eastern Gulf of Alaska, June-Ott 1961 (Cruise 611-052).

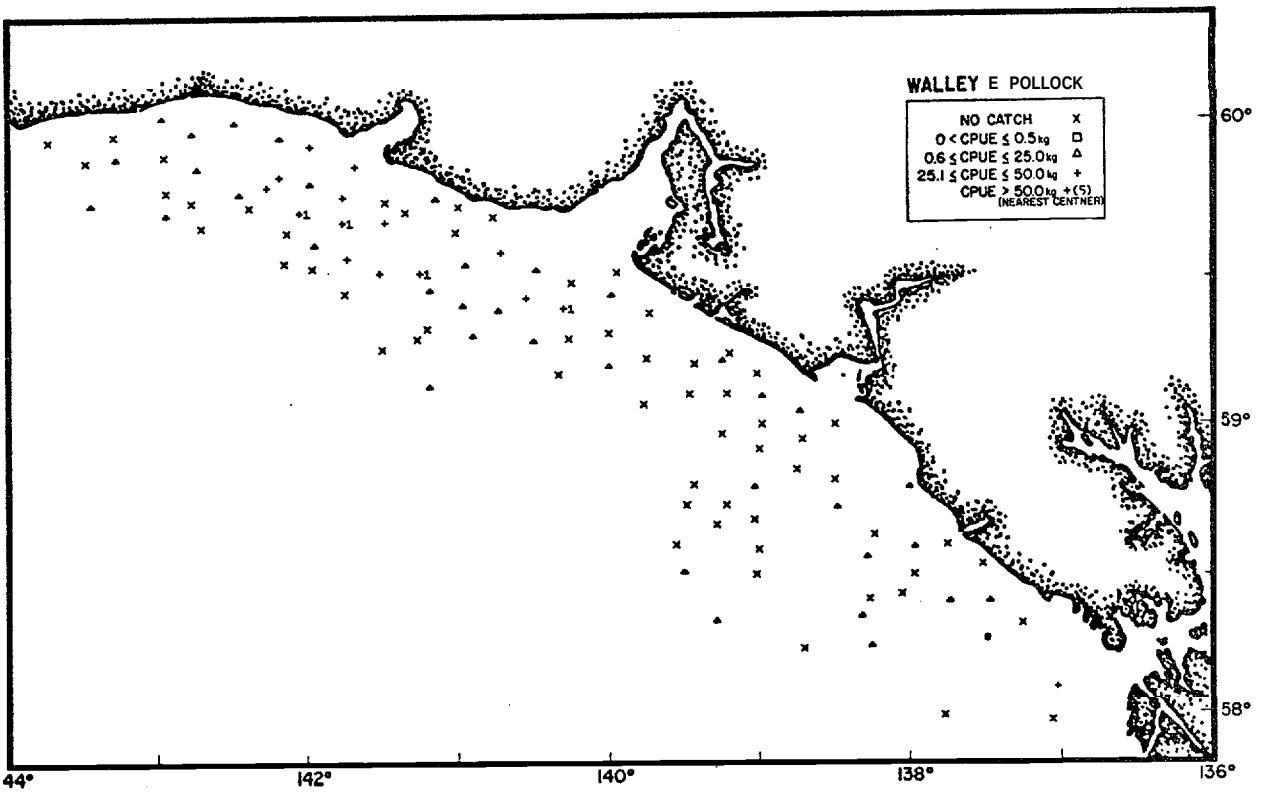


Figure X1-214.--Distribution of standardized catch rates in kg/hr of walleye pollock in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

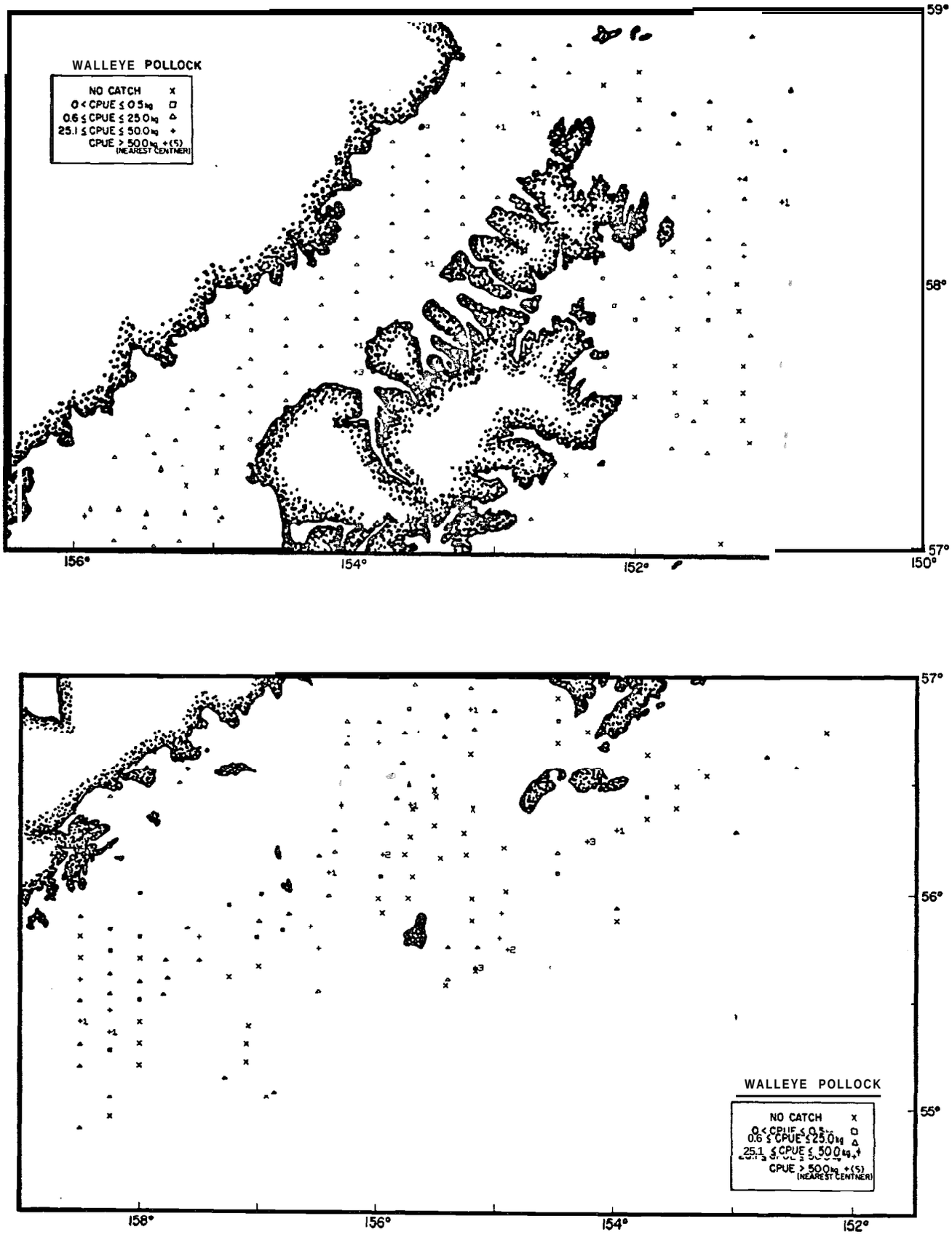


Figure XI-215.--Distribution **of standardized** catch rates in **kg/hr** of walleye pollock in the western Gulf of Alaska, May-July 1961 (Cruise **618).**

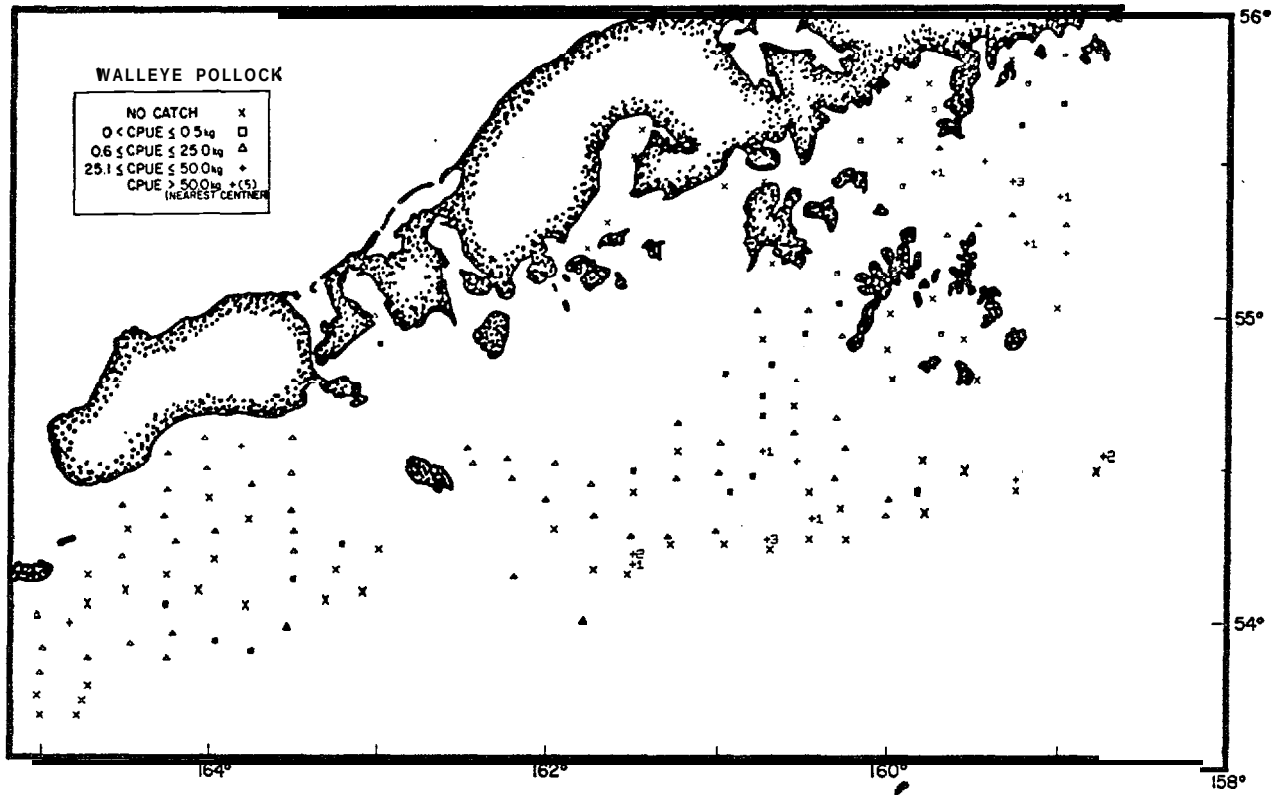


Figure X1-216.--Distribution of standardized catch rates in kg/hr of walleye pollock in the western Gulf of Alaska, May-July 1961 (Cruise 618).

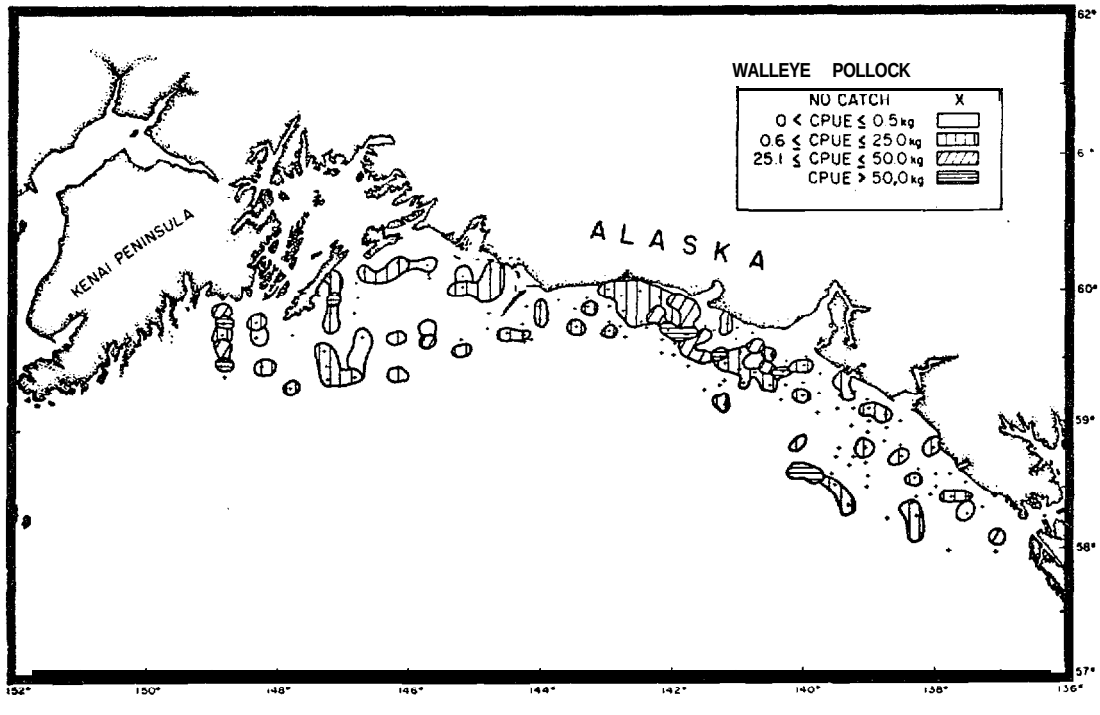


Figure X1-217.--Distribution of apparent relative abundance of walleye pollock in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table X1-21.-- Estimated biomass and population site of walleye pollock (Theragra chalcogramma) in the Gulf of Alaska during May-October, 1961.

Region	Depth tone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10⁶)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	4.1	176.6	26.6				--
	101-200	1.3	250.6	37.7				--
	201-400	6.6	237.8	35.8			--	--
	All zones	2.6	665.0	1.2			--	--
Yakutat	i-loo	15.1	1.118.8	24.0			--	
	101-200	18.4	3.200.4	68.6				--
	201-400	4.2	343.5	7.4				
	All zones	14.1	4.662.7	8.1			--	--
Prince William	l-100	0.3	34.1		0.5	13.5	4.06	--
	101-200	10.6	1.594.5	3::	2.6	70.3	0.61	--
	201-400	8.3	361.5	18.2	0.6	16.2	0.64	--
	All zones	6.1	1,990.1	3.5	3.7		0.54	--
Kenai	l-100	--	.			--		
	101-200	48.9	17,022.4	84.7				
	201-400	22.7	3,086.5	15.4				--
	All zones	41.5	20.108.9	35.0				
Kodi Ak	P-100	6.7	1,838.5	34.7	8.5	'34.1	0.22	
	101-200	17.5	3.448.5	65.1	16.3	65.5	0.21	30.5
	201-400	0.4	12.5.	0.2	0.1	0.4	0.10	--
	All zones	10.6	5,299.5	9.2	24.9		0.21	--
Shelikof	l-100	0	0	0	0	0	--	
	101-200	30.4	2,833.5	95.9	13.5	97.1	0.21	--
	201-400	11.5	121.1	4.1'	0.4	2.9	0.33	--
	All zones	15.5	2,954.6	5.1	13.9		in-r	
Chirikof	l-100	0.1	15.7	0.2	0.5	1.2	0.03	--
	101-200	27.2	5,552.4	59.8	31.8	76.6	0.17	
	201-400	29.7	3,711.6	40.0	9.2	22.2	0.40	36.5
	All zones	15.0	4,279.7	16.2	41.5		0.22	--
Shumagin	l-100	0.4	88.3	0.9	0.5	1.3	0.16	
	101-200	29.3	6,360.4	67.5	30.6	80.7	0.21	
	201-400	106.4	2,970.7	31.5	6.8	17.9	0.44	
	All zones	20.0	9,419.4	16.4	37.9		0.25	
Sanak	l-100	3.3	706.8	23.0	2.3	20.4	0.30	
	101-200	11.1	2,146.9	70.0	8.5	75.2	0.25	--
	201-400	14.5	215.2	7.0	0.5	4.4	0.41	
	All zones	7.3	3,068.9	5.3	11.3		0.27	--
Total	I-100	3,0	3,978.8	6.9				--
	101-200	23.9	42,409.6	73.8				--
	201-400	20.3	11.060.4	19.3				
	All zones	15.9	57.448.8	100.0				--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

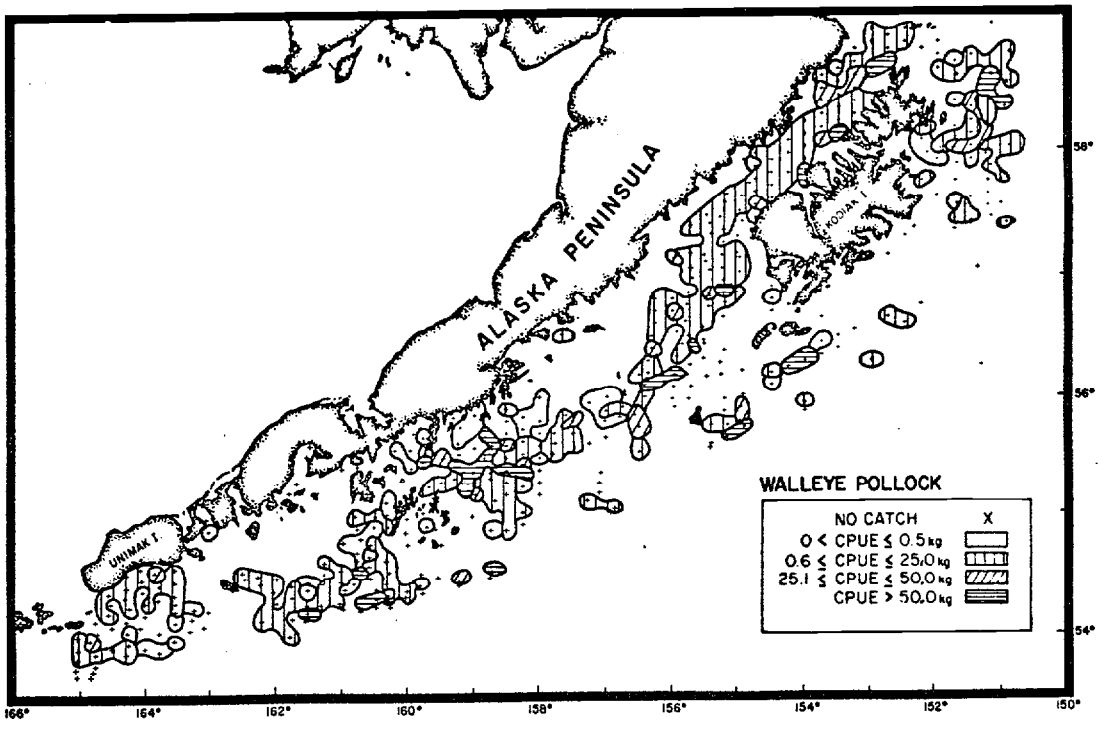


Figure X1-218.--Distribution of apparent relative abundance of walleye pollock in the western Gulf of Alaska, May-July 1961 (Cruise 618).

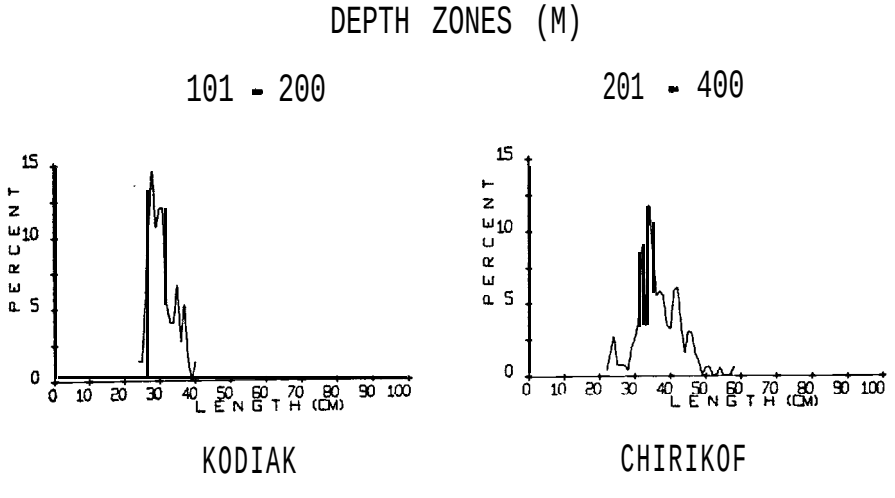


Figure X1-219.--Percentage length frequencies of-walleye pollock from the Gulf of Alaska (Cruises 618, 611, 052).

Biomass-The apparent biomass of walleye pollock was estimated to be 57 thousand mt of which 93% was located in the outer shelf (74%) and upper slope (19%) depth zones. Regions which contained the largest percentage of the biomass were Kenai (35%), and Chirikof and Shumagin (16%). The biomass estimate of pollock should be considered minimal as this species is known to be semi-pelagic and some proportion of the population may have occupied the water column above the height of the trawl headrope and may have been, therefore, unavailable to the gear.

Size composition--Random length frequency samples of walleye pollock were measured in the Kodiak outer shelf and the Chirikof upper slope. In the Kodiak outer shelf, walleye pollock, sexes combined, ranged from 24-40 cm and averaged 30.5 cm and in the Chirikof upper slope they ranged from 21-58 cm and averaged 36.5 cm (Figures XI-219).

SKATES

Distribution and abundance--During these 1961 surveys, skates were not identified to species but were combined into a general "skate" classification. Skates were found throughout the Gulf of Alaska region but were not captured in the inner shelf depth zone of the Kenai, Shelikof or Shumagin regions (Figures X1-220-223). Over the entire survey area, the relative apparent abundance of skates increased with increasing bottom depth and averaged 10 kg/hr (Table XI-25). The densest concentration of skates were found in the Kenai and Fairweather regions with only one other region, Yakutat, having a CPUE greater than the average for the Gulf of Alaska.

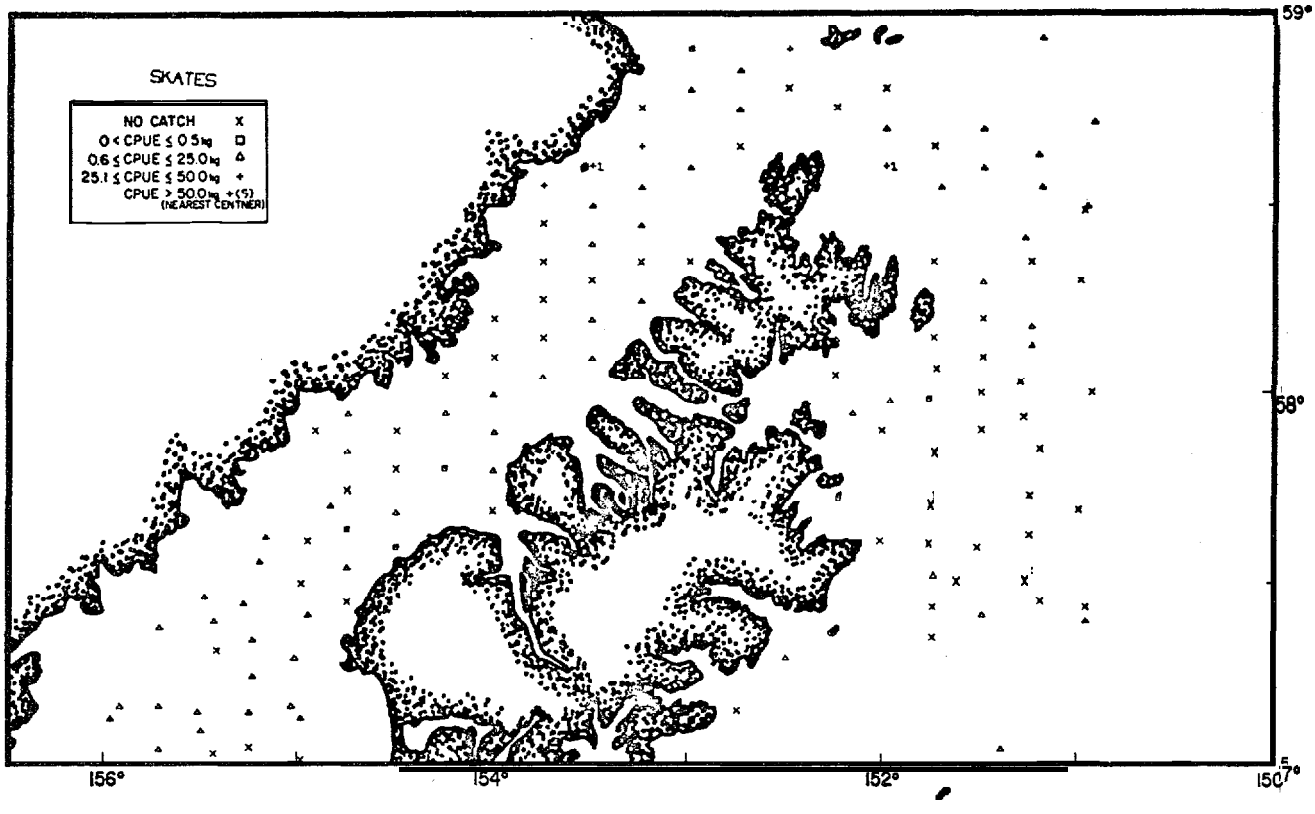
Biomass--The estimated skate apparent biomass in the Gulf of Alaska was 35 thousand mt. Ninety-three percent was located in the combined outer shelf (60%) and upper slope (33%) depth zones. The majority of the skate biomass was concentrated in the eastern Gulf of Alaska, which contained 79% of the total biomass.

Size composition-No length frequency data were collected from this species group.

SABLEFISH

Distribution and abundance-With the exception of the inner shelf depth zone in the Prince William and Shelikof regions, sablefish occurred in all region-depth zones sampled (Figures XI-224-227). Sablefish catches for the Gulf of Alaska averaged 8 kg/hr and were directly related to bottom depth (Table X1-26). Mean CPUE's were largest in the Fairweather, Yakatut and Shumagin regions.

Biomass--The apparent sablefish biomass was estimated at 30 thousand mt of which 96% was found in the combined outer shelf and upper slope depth zones. Regions which contained the largest percentage of the biomass were Fairweather (31%), Shumagin (18%) and Yakutat (17%). The eastern Gulf of



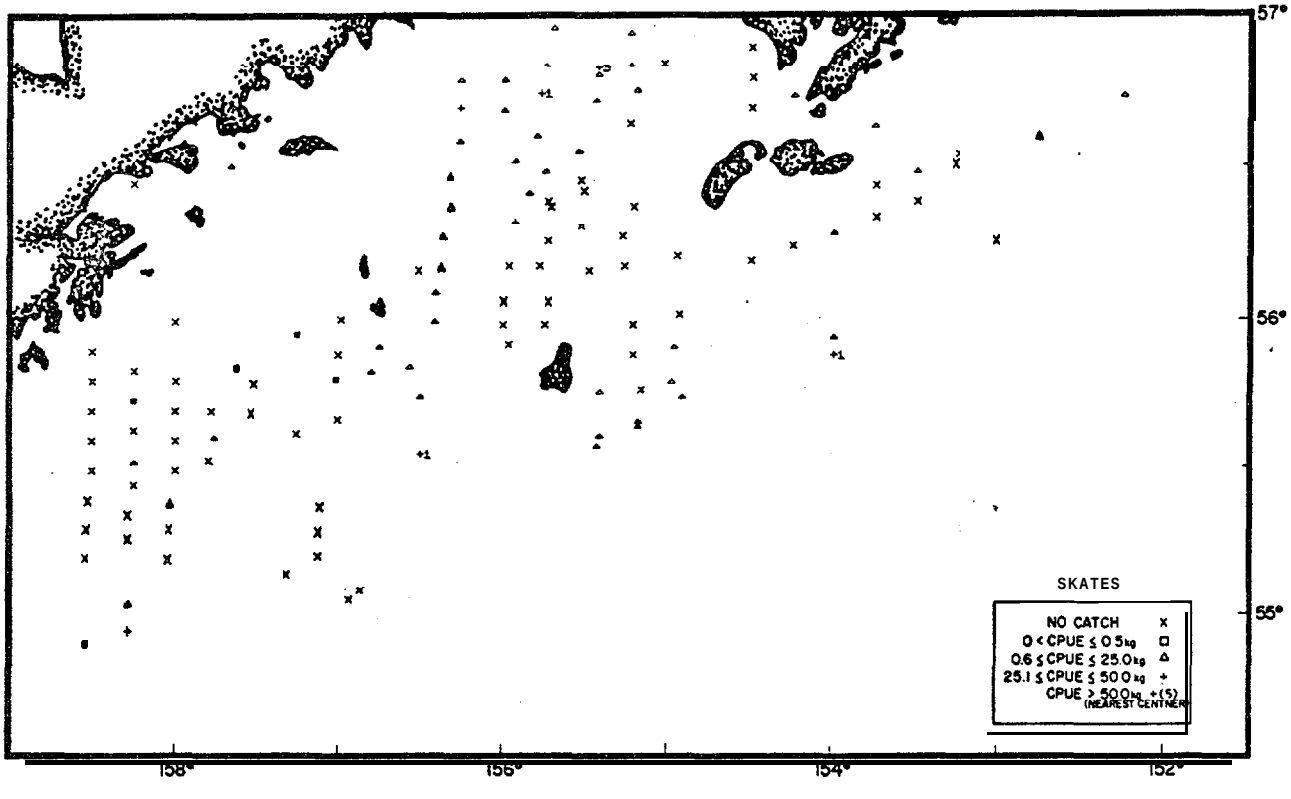


Figure XI-220.--Distribution of standardized catch rates in kg/hr of skates in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

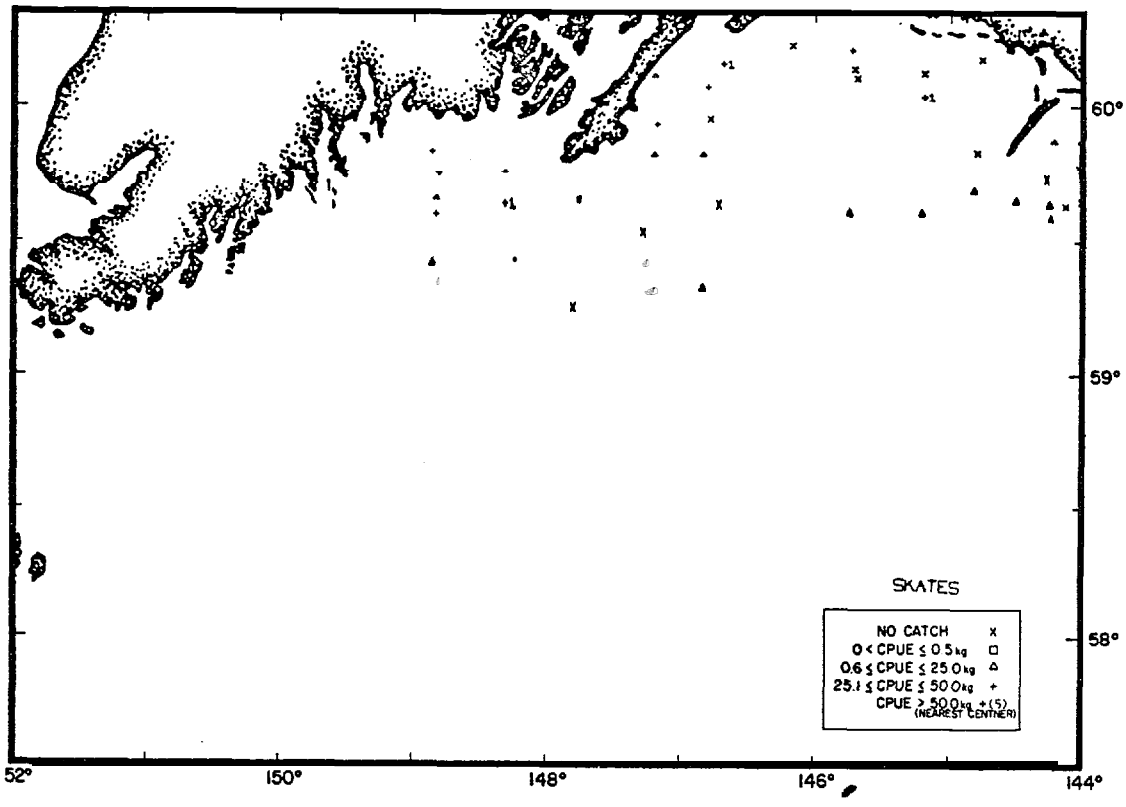


Figure XI-221.--Distribution of standardized catch rates in kg/hr of skates in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

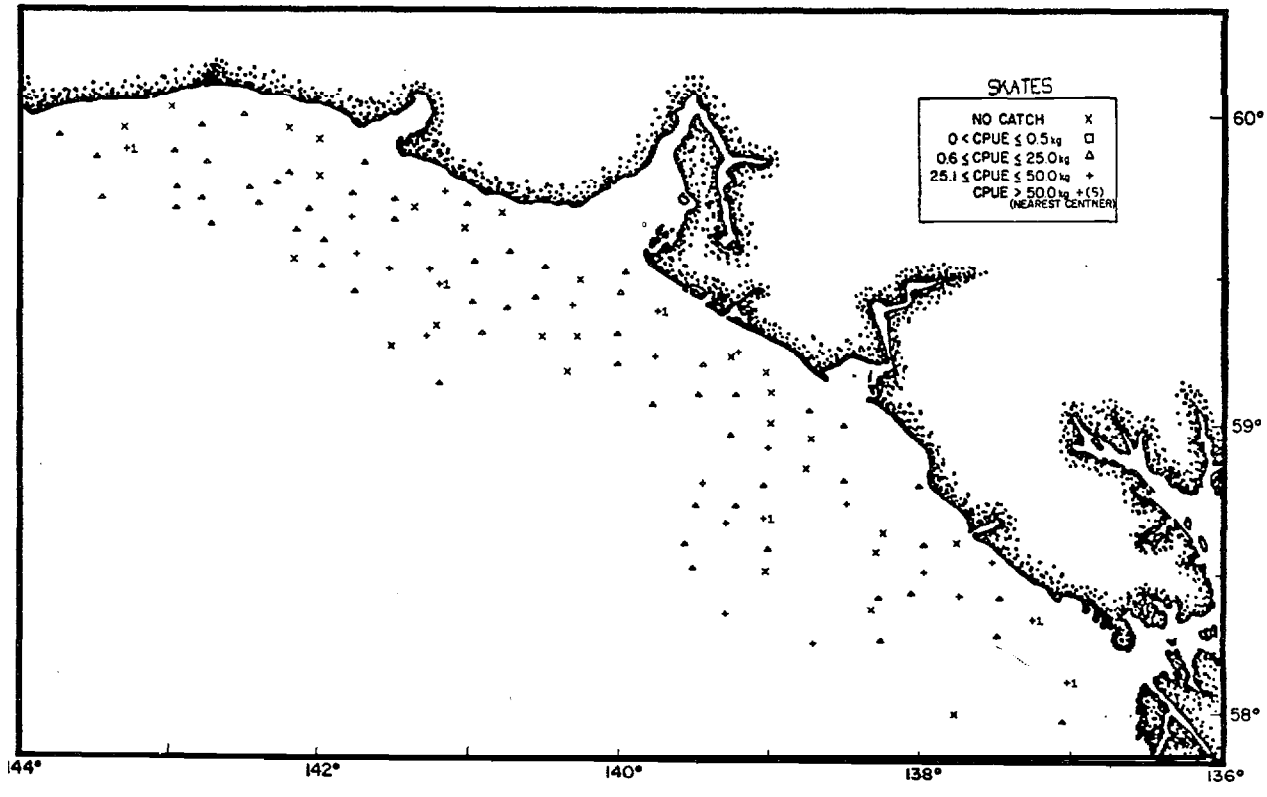


Figure XI-222.--Distribution of standardized catch rates in kg/hr of skates in the western Gulf of Alaska, May-July 1961 (Cruise 618).

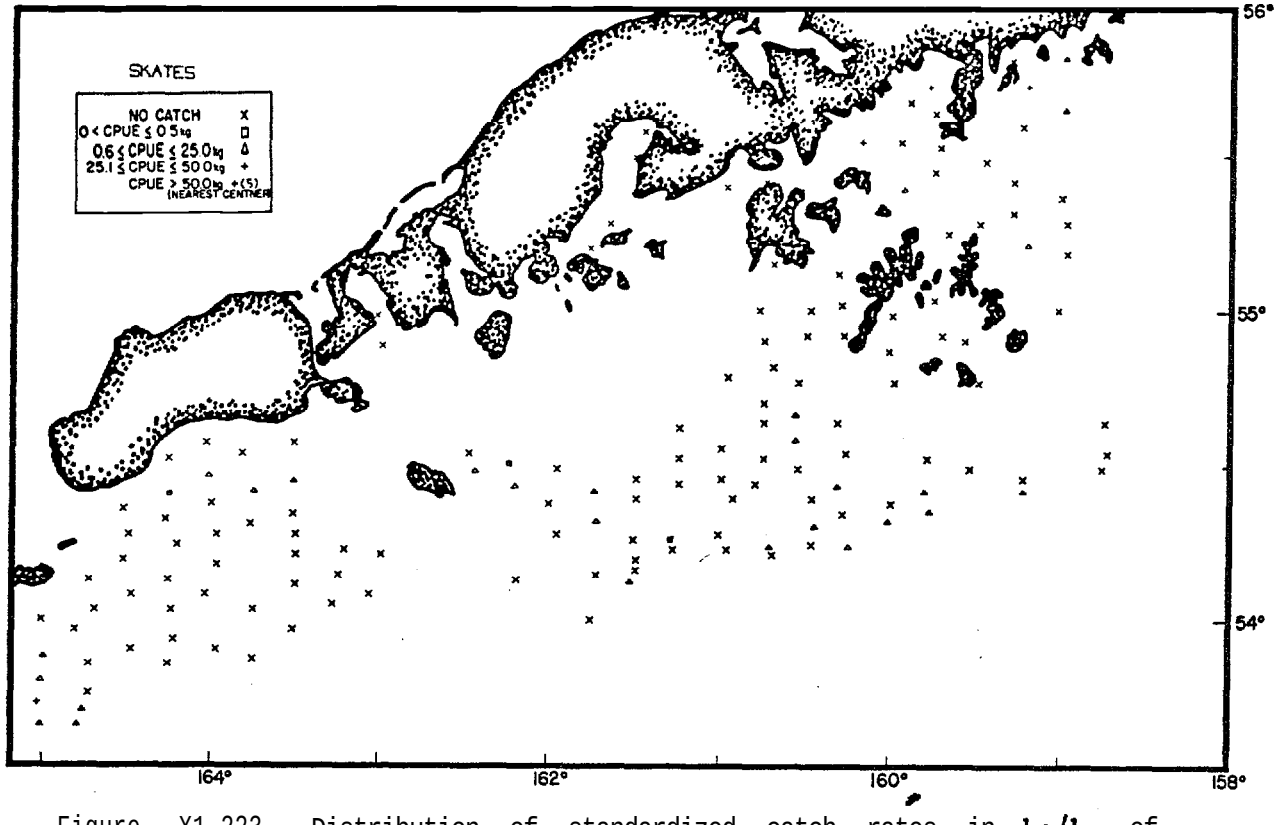


Figure XI-223.--Distribution of standardized catch rates in kg/hr of skates in the western Gulf of Alaska, May-July 1961 (Cruise 618).

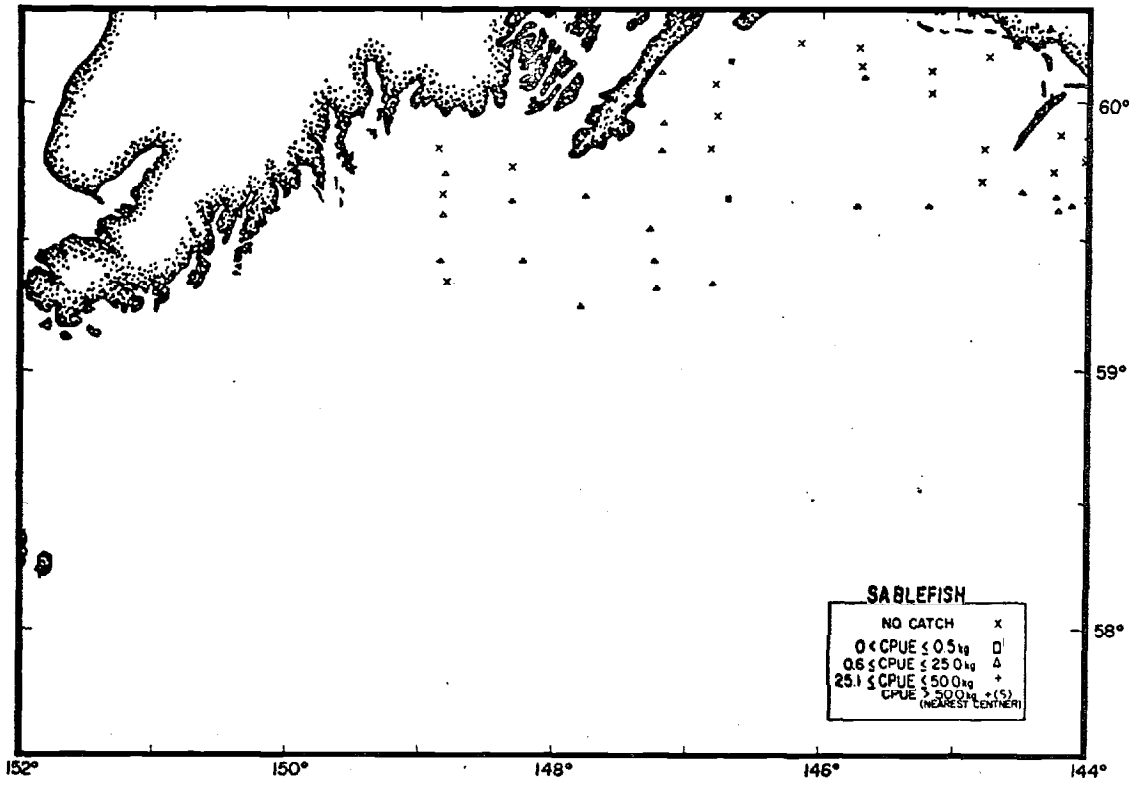


Figure XI-224.--Distribution of standardized catch rates in kg/hr of sablefish in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table XI-25.--Estimated biomass and population size of skates (Rajidae) in the Gulf of Alaska during hay-October, 1961.

Region	Depth tone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	5.3	227.2	4.0	--			--
	101-200	21.5	4.184.2	74.0				
	201-400	39.6	1,242.1	22.0				
	All zones	21.3	5.653.5	16.3				
Yakutat	l-100	10.6	794.1	17.6				
	101-200	12.8	2.238.1	49.5			--	
	201-400	18.2	1,489.0	32.9	--			
	All zones	13.7	4,521.2	13.0				
Prince William	l-100	7.9	1,046.6	25.3	0.1	10.0	8.90	
	101-200	18.0	2.704.5	65.2	0.6	60.0	4.82	
	201-400	9.1	394.4	9.5	0.3	30.0	1.24	
	All zones	12.7	4,145.5	12.0	1.0		1.16	
Kenai	l-100	--	--	--	--	--	--	
	101-200	23.8	8,294.0	63.3	1.6	61.5	5.15	
	201-400	35.4	4,815.0	36.7	1.0	38.5	5.05	--
	All zones		13,109.0	37.8	2.6	--	5.11	
Kodiak	l-100	i.4	392.7	24.1	0.2	15.4	2.30	
	101-200	6.3	1,236.7	0.1	1.1	84.6	1.15	
	201-400	0.1	1 . 4	8.0	4/	5/	.09	
	All zones	3.3	1,630.8		1.3	--	1.29	
Shelikof	l-100	0	0	0	0	0		
	101-200	9.4	879.0	94.9	0.6	100.0	1.37	--
	201-400	4.5	47.2	5.1	4/	5/	1.15	
	All zones	5.2	926.2	2.7	0.7		1.35	
Chirikof	l-100	0.2	45.5	1.3	4/	5/	4.08	
	101-200	2.6	536.9	15.2	0.4	26.7	1.48	
	201-400	23.6	2,948.1	83.5	1.1	73.3	2.70	--
	All zones	5.7	3,530.5	10.2	1.5		2.41	
Shumagin	l-100	0	0	0	0			
	101-200	2.0	436.1	70.8	0.1	50.8	3.50	--
	201-400	6.5	180.2	29.2	0.1	50.0	2.00	
	All zones	1.3	616.3	1.2	0.2	--	2.83	
Sanak	l-100	0.2	39.3	7.2	4/	5/	6.80	
	101-200	1.7	327.2	59.9	0.2	50.0	1.94	
	201-400	12.1	180.2	33.0	0.2	50.0	1.00	
	All zones	1.3	546.7	1.6	0.4		1.54	
Total	l-100	1.8	2,545.4	7.3				
	101-200	11.7	20,836.7	60.1		--		
	201-400	19.9	11,297.6	32.6				--
	All zones	9.5	34,679.7	100.0				

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

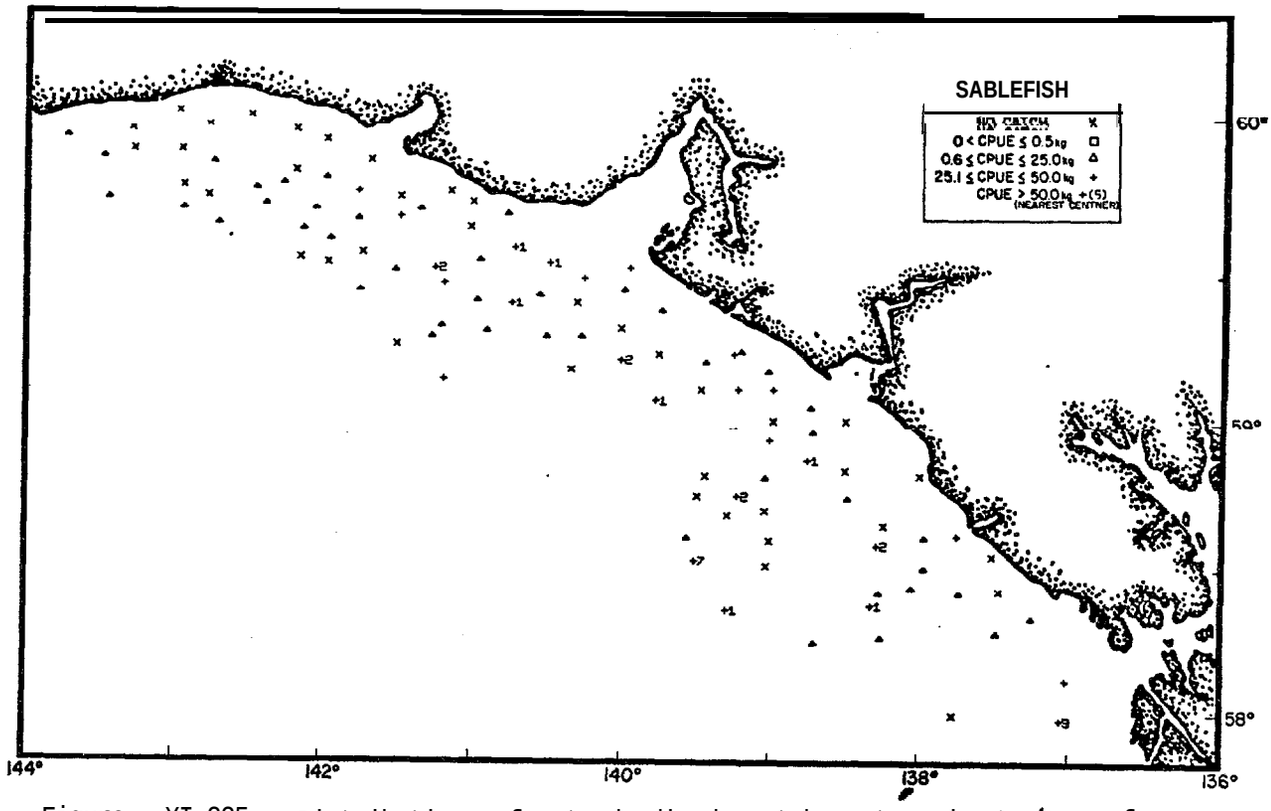


Figure XI-225.--Distribution of standardized catch rates in kg/hr of sablefish in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

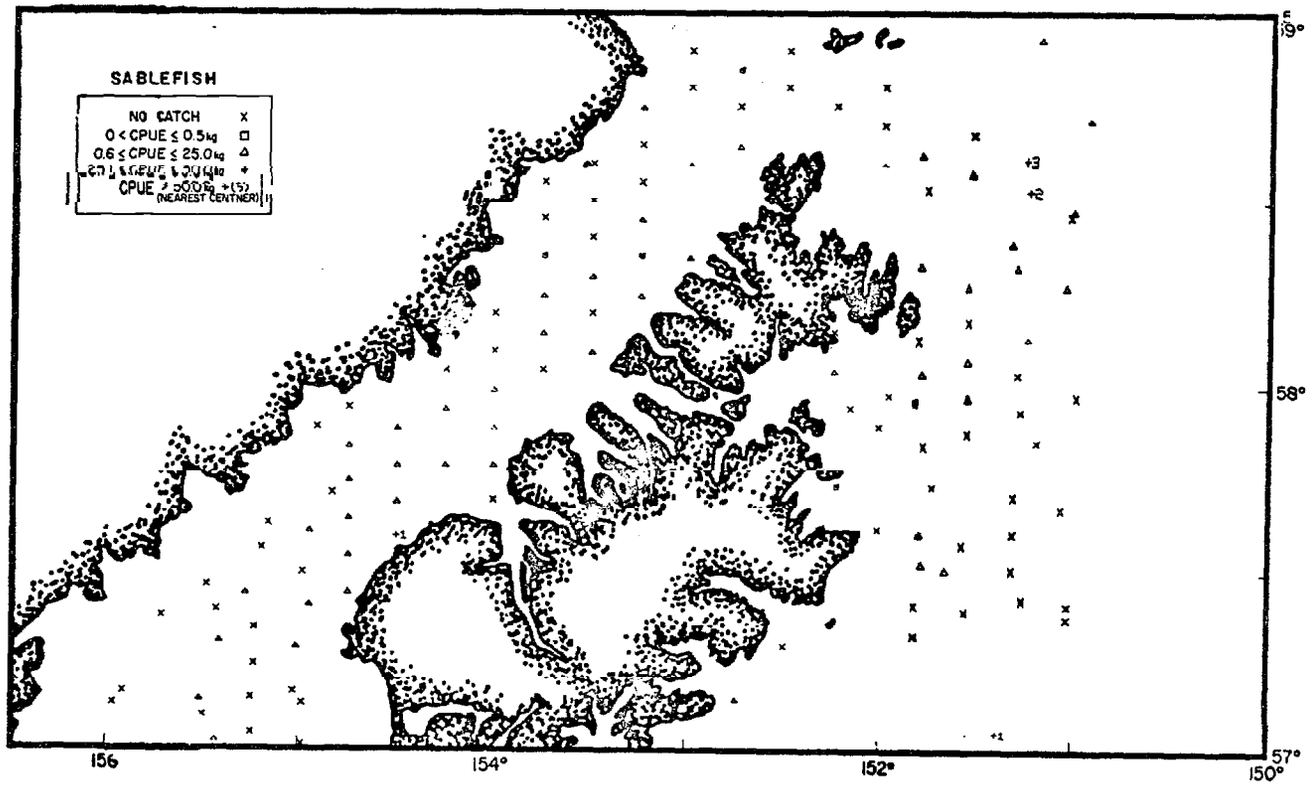
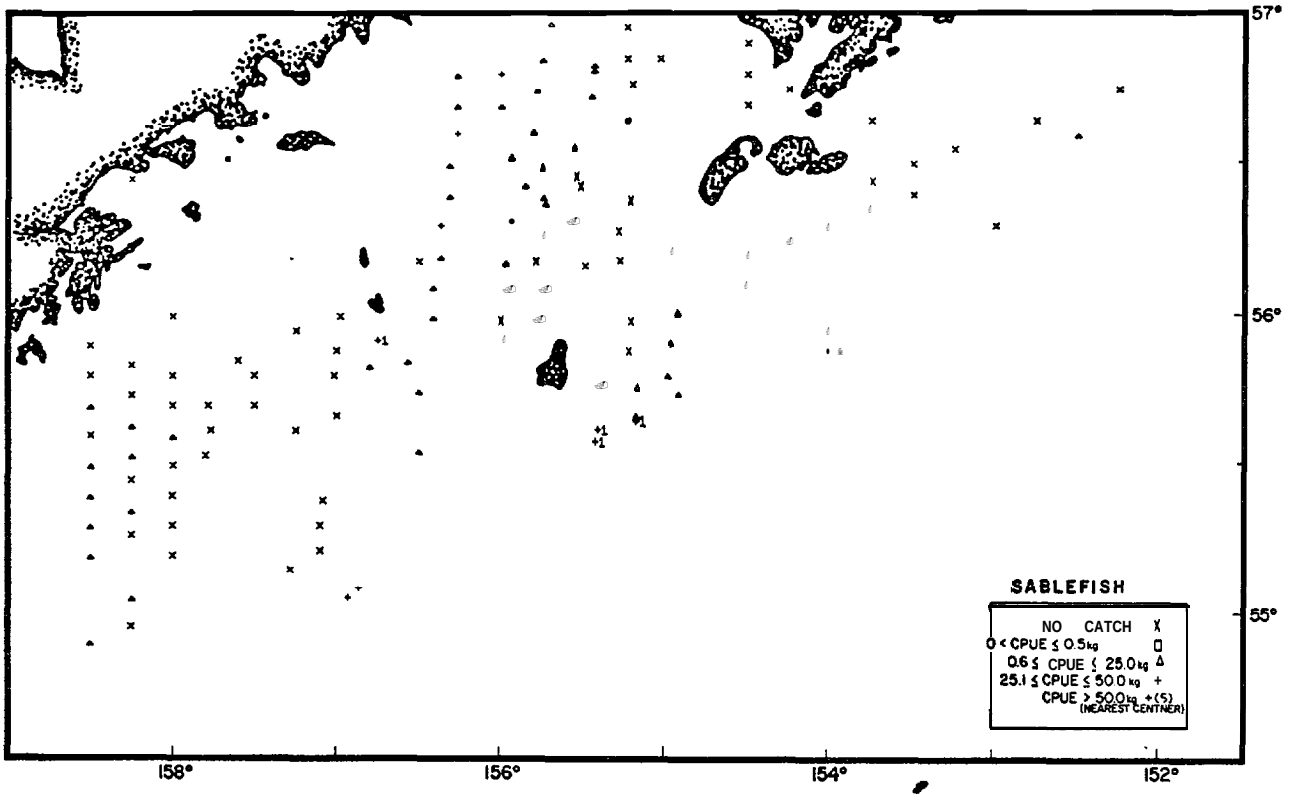


Figure XI-226.--Distribution of standardized catch rates in kg/hr of sablefish in the western Gulf of Alaska, May-July 1961 (*Cruise* 618).



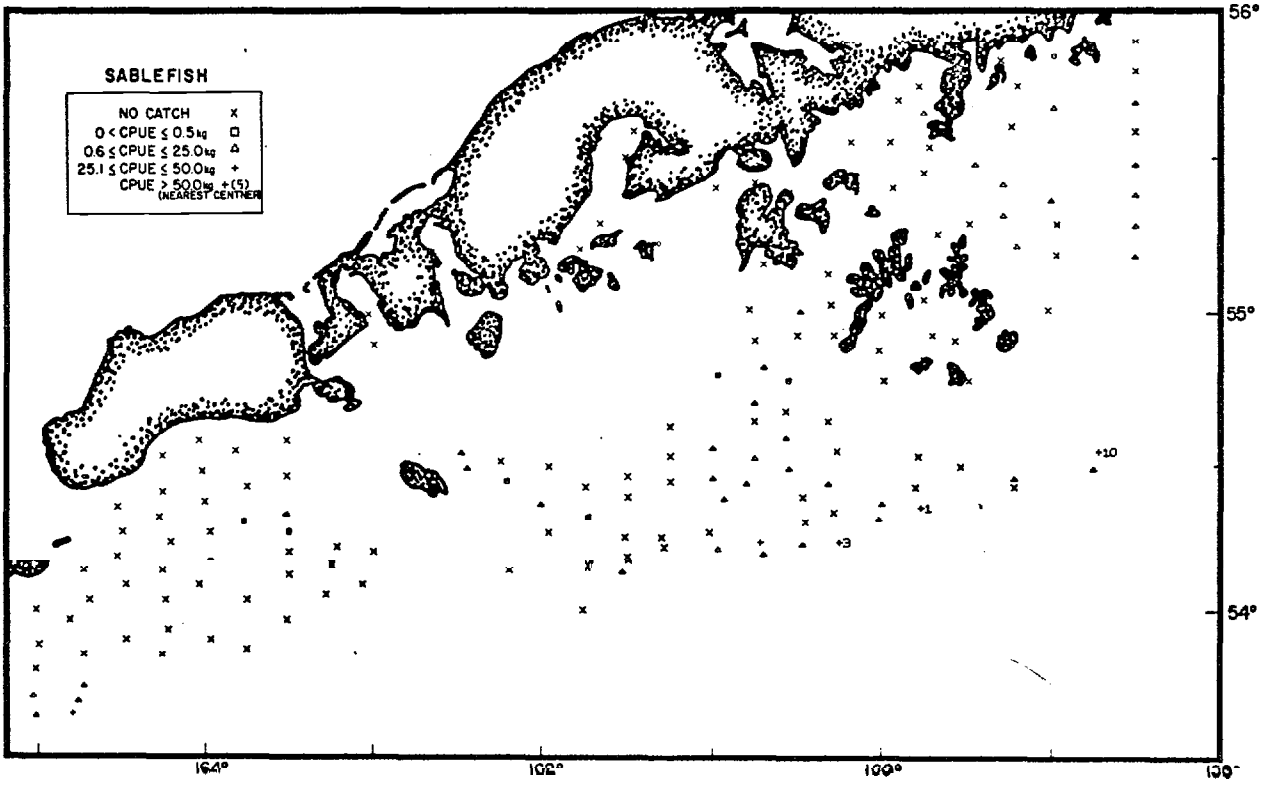


Figure XI-227.--Distribution of standardized catch rates in kg/hr of sablefish in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-26.--Estimated biomass and population size of sablefish (Anoplopoma fimbria) in the Gulf of Alaska during May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	19.3	828.8	8.9			--	
	101-200	19.6	3,806.9	41.0				
	201-400	129.9	4,657.7	50.1	--			--
	All zones	36.0	9,293.4	31.1				
Yakutat	l-100	5.7	421.8	8.6	—			
	101-200	16.9	2,942.9	60.0	—			
	201-400	18.8	1,538.9	31.4	—			--
	All zones	14.9	4,903.6	16.5	—	--		
Prince William	l-100	0	0	0	0			
	101-200	2.2	325.0	51.3	0.3	75.:	0.95	--
	201-400	7.1	308.9	48.7	0.1	25.0	2.37	
	Nl zones	2.0	633.9	2.1	0.4		1.34	
Kenai	l-100				--			
	101-200	2.3	609.7	24.7	—			
	201-400	18.1	2,469.2	75.3	—		--	
	Nl zones	5.5	3,278.9	Il.0	—			
Kodiak	l-100	0.1	27.4	0.9	4/	5/	0.60	
	101-200	16.2	3,200.2	99.0	3.1	100.0	1.02	49.2
	201-400	0.2	5 . 7	0.1	4/	5/	0.36	
	All zones	6.5	3.233.3	10.8	3.1		1.01	
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	3.7	348.0	94.1	0.6	100.0	0.59	
	201-400	2.1	22.0	6.0	4/	5/	1.12	--
	All zones	2.2	370.0	1.2	0.6		0.61	
Chirikof	l-100	3/	1.0	5/	4/	5/	0.05	--
	101-200	3.8	773.2	31.2	1.1	40.7	0.73	42.5
	201-400	13.7	1,708.3	68.8	1.6	59.3	1.07	55.1
	Nl zones	4.0	2,482.5	a.3	2.7	--	0.93	--
Shumagin	l-100	31	9	0.1	4/	5/	0.14	--
	101-200	2.3	502: 9	9.5	1.0	19.6	0.52	
	201-400	171.6	4,793.1	0.4	4.1	80.4	1.16	
	All zones	11.2	5,301.9	17.0	5.1		1,03	
Samak	l-100	3/	1.0	0.3	4/	5/	0.09	--
	101-200	1.0	191.5	53.8	0.8	80.0	0.24	--
	201-400	11.0	163.4	45.9	0.2	20.0	0.96	--
	NI zones	0.8	355.9	1.2	1.0		6.37	--
Total	1-100	0.9	1285.9	4.3	—		--	
	101-200	7.3	12.900.3	43.2	—			
	201-400	26.5	15,667.2	52.5	—			--
	All zones	7.9	29,853.4	loo.0	—			

1/ Mean catch per unit effort in kilograms per hour travled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 10^6 individuals.

5/ Less than 0.1 percent.

Alaska contained 57% of the total biomass and the western Gulf 43%. The biomass estimate for sablefish should be considered extremely low as a considerable and unknown portion of the population resides in the depths of the lower slope (400-1500 m) which were not sampled during the survey.

Size composition-Random length frequency samples of sablefish were obtained in the outer shelf depth zone of the Chirikof region. In the Chirikof outer shelf, sablefish, sexes combined, ranged from 32-67 cm and averaged 55.1 cm. (Figure X1-228).

REX SOLE

Distribution and abundance--Rex sole were widely distributed throughout the Gulf of Alaska and were captured in all region-depth zones with the exceptions of Kenai upper slope and Shelikof-inner shelf (Figures XI-229-232). The relative apparent abundance of rex sole increased with bottom depth and averaged 4 kg/hr over the entire Gulf (Table XI-27). The Fair-weather region contained the densest concentrations of rex sole followed by Yakutat and Chirikof.

Biomass-The apparent biomass of rex sole was estimated to be 16 thousand mt with the combined outer shelf and upper slope containing 87% of the total. Three regions-Chirikof (36%), Fairweather (21%), and Yakutat (22%) contained 79% of the total biomass which was relatively evenly divided between the eastern (47%) and western (53%) Gulf of Alaska.

Size composition--No length frequency data were collected for this species.

SHORTSPINE THORNYHEAD

Distribution and abundance-Shortspine thornyheads were not encountered in the central Gulf (Kenai, Kodiak and Shelikof regions) and the inner shelf depth zone (Figures X1-233-236). By depth zones the largest CPUE for this species occurred in the upper slope while regional catches were highest in the Yakutat and Fairweather regions (Table XI-28).

Biomass-The estimated apparent biomass for the shortspine thornyhead was 12 thousand mt most of which was located in the combined Fairweather and Yakutat regions (75%). Over the entire Gulf, 88% of the biomass was located in the upper slope depth zone. The biomass estimate for this species should be considered minimal because the survey covered only a portion of its bathymetric range which includes the steep, rugged bottom of the continental slope.

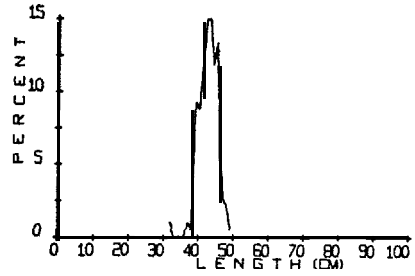
Size composition--No length frequency data were collected for this species.

DOVER SOLE

Distribution and abundance--Dover sole were found in all region-depth zones with the exception of Kodiak-upper slope (Figures XI-237-240). The relative apparent abundance was greatest in the Fairweather and Yakutat

DEPTH ZONE (M)

101 - 200



CHIRIKOF

Figure X1-228.--Percentage length frequencies of sablefish from the Gulf of Alaska (Cruises 618, 611, 052).

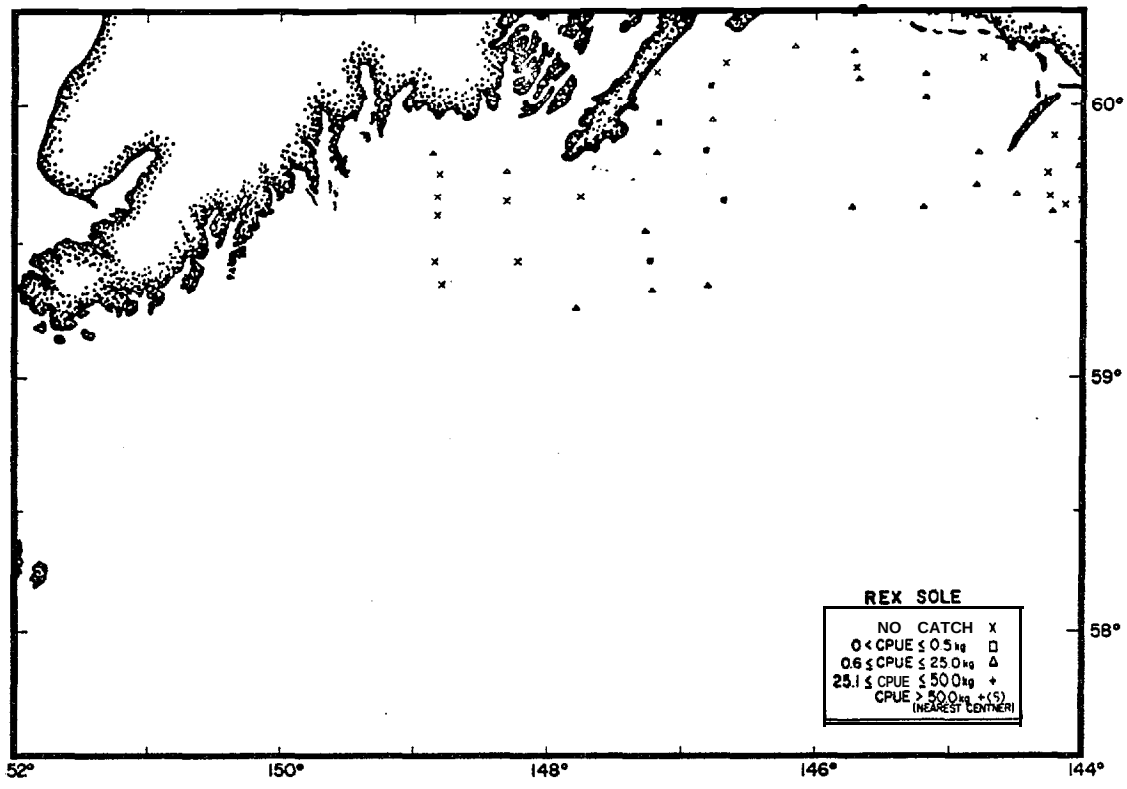


Figure X1-229.--Distribution of standardized catch rates in kg/hr of rex sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

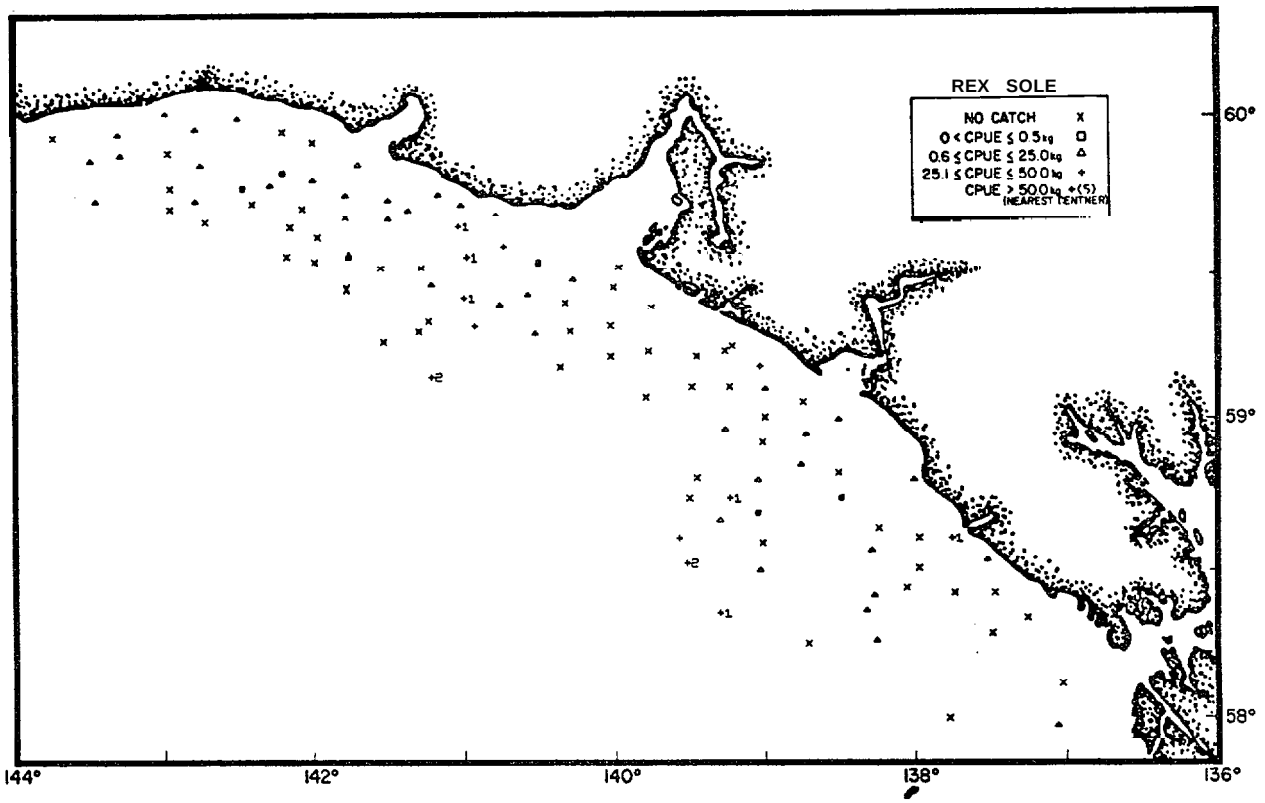


Figure X1-230. -Distribution of standardized catch rates in kg/hr of , rex sole in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).

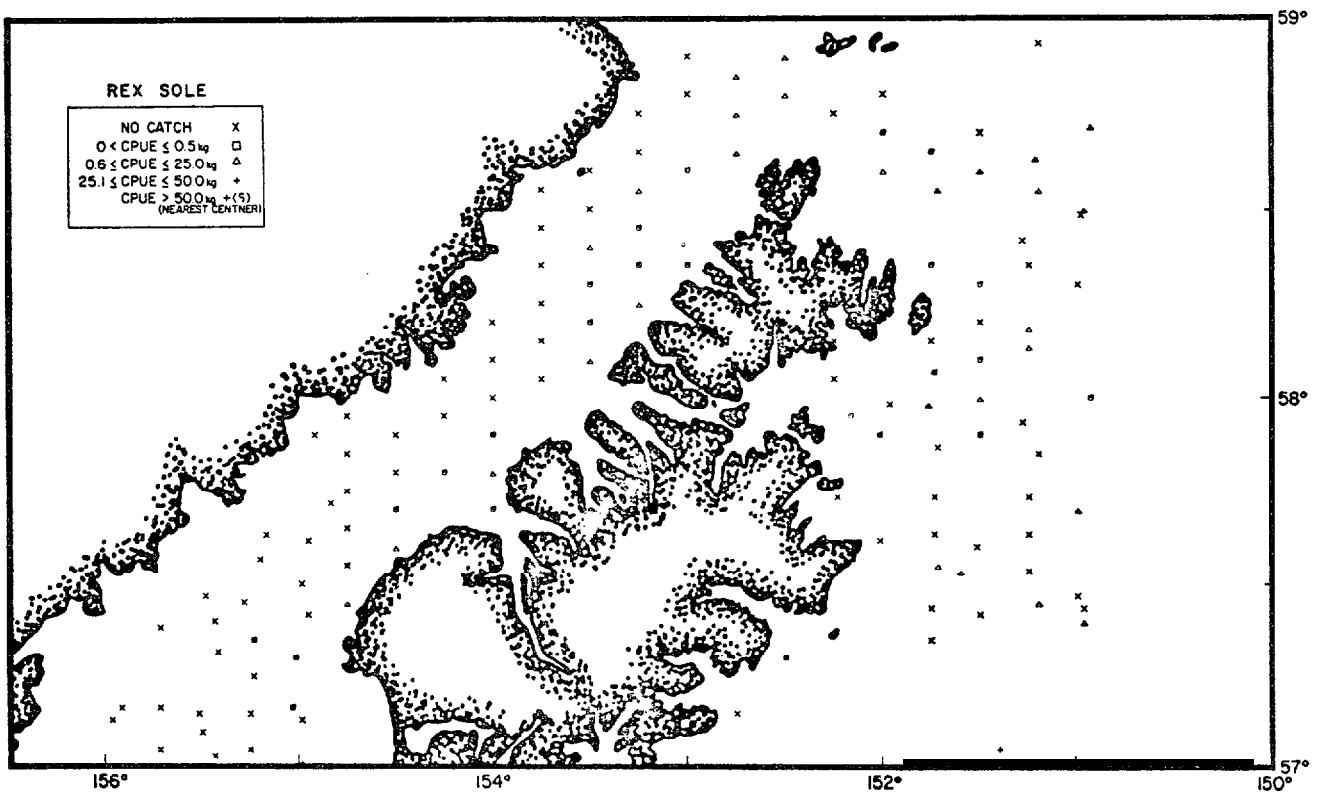
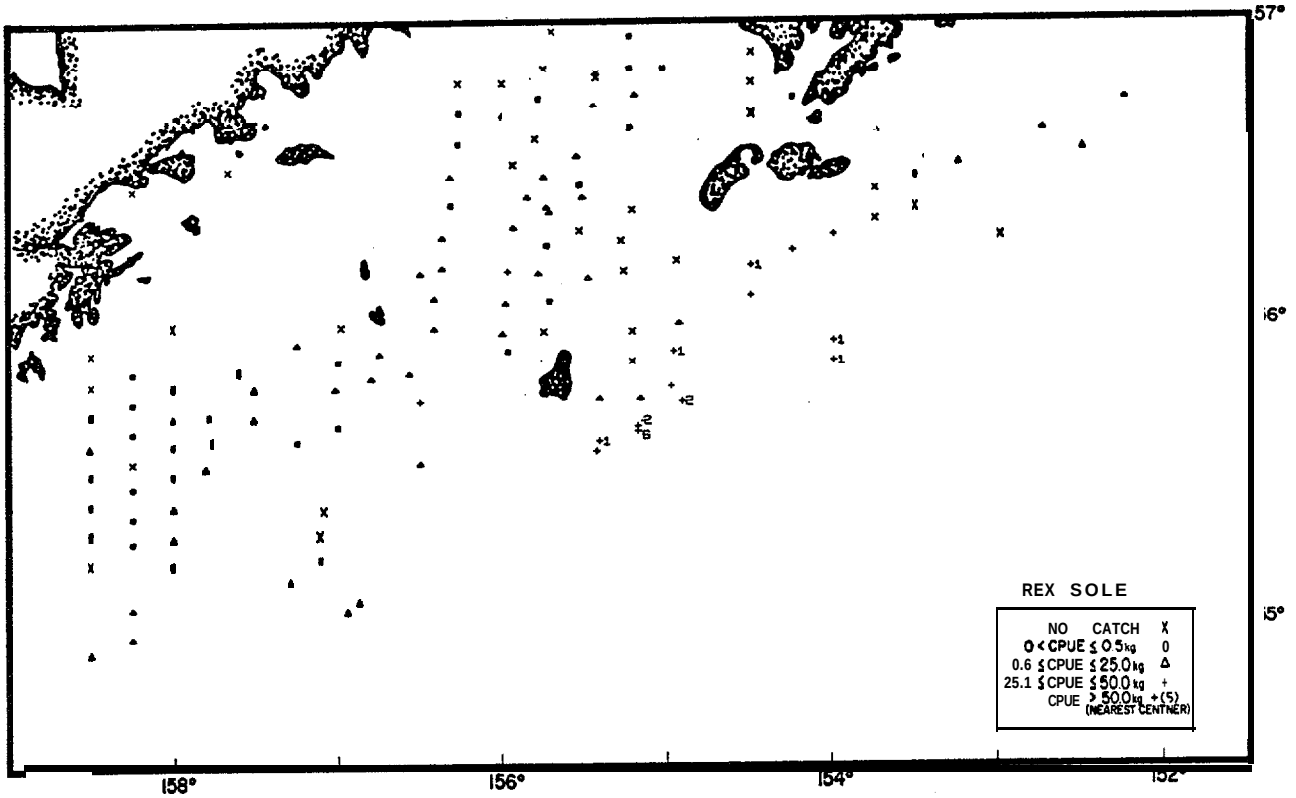


Figure XI-231 .--Distribution of standardized catch rates in kg/hr of rex sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).



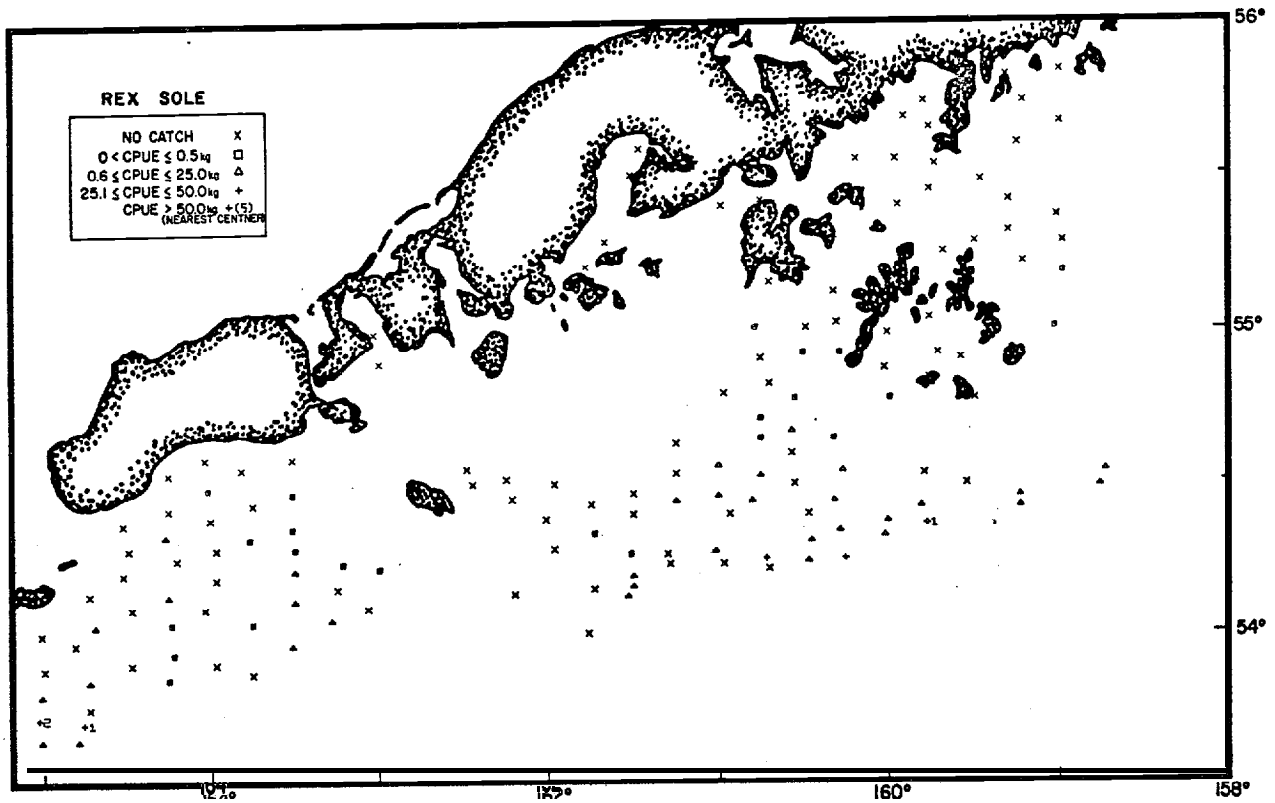


Figure XI-232.--Distribution of standardized catch rates in kg/hr of rex sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

Table XI-27.--Estimated biomass and population size of rex sole (Glyptocephalus zachirus) in the Gulf of Alaska during May-October, 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of rota1 estimated population	Mean size per Individuals 2/ Weight (kg)	Length (cm)
Fairweather	l-100	15.0	644.1	19.4				
	101-200	4.3	844.1	25.4				--
	201-400	51.3	1,838.3	55.3				
	All zones	12.2	3,326.5	21.3				--
Yakutat	l-100	7.6	562.4	16.1		--		--
	101-200	4.7	820.7	23.5				
	201-400	25.8	2.111.2	60.4				
	All zones	10.6	3.494.3	22.3				--
Prince William	l-100	0.8	102.5	21.5	1.1	35.5	0.09	--
	101-200	2.0	305.5	64.1	1.8	58.1	0.17	--
	201-400	1.6	68.4	14.4	0.2	6.4	0.34	--
	All zones	1.5	476.4	3.0	3.1		0.15	--
Kenai	l-100							--
	101-200	0.3	108.6	100.0				--
	201-400	0	0	0				
	All zones	0.2	108.6	0.7				
Kodiak	l-100	0.9	240.6	32.8	1.1	18.0	0.22	--
	101-200	2.5	485.8	66.3	5.0	82.0	0.10	--
	201-400	0.2	6.5	0.9	4/	5/	0.15	
	All tones	1.5	732.9	4.7	6.1		0.12	
Shelikof	l-100	0	0	0	0	0		
	101-200	1.1	104.8	98.5	1.2	100.0	0.09	
	201-400	0.2	1.6	1.5	4/	5/	0.10	--
	All zones	0.5	106.4	0.7	1.2		0.09	--
Chirikof	l-100	0.3	93.1	1.7	1.1	4.0	0.09	--
	101-200	14.6	2,986.0	53.4	15.1	55.5	0.20	
	201-400	20.2	2.510.2	44.9	11.0	40.4	0.23	
	All zones	9.0	5,589.3	35.7	27.2		0.21	
Shumagin	l-100	0.1	15.2	2.4	0.1		0.12	
	101-200	1.5	333.0	52.7	2.4	5:::	0.14	
	201-400	10.1	283.5	44.9	1.6	39.0	0.18	--
	All zones	1.3	631.7	4.0	4.1		0.15	--
Sanak	l-100	0.6	124.2	10.5	0.9	22.5	0.14	--
	101-200	0.5	94.0	8.0	0.7	17.5	0.14	--
	201-400	64.8	961.9	81.5	2.4	60.0	0.40	--
	All zones	2.8	1J80.1	7.5	4.0	--	0.29	--
Total	l-100	1.5	1,782.1	11.4				--
	101-200	3.4	6,082.5	38.9		--	--	--
	201-400	13.1	7,781.6	47.7	--			--
	All zones	4.1	15.646.2	100.0	--		--	--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 106 individuals.

5/ Less than 0.1 percent.

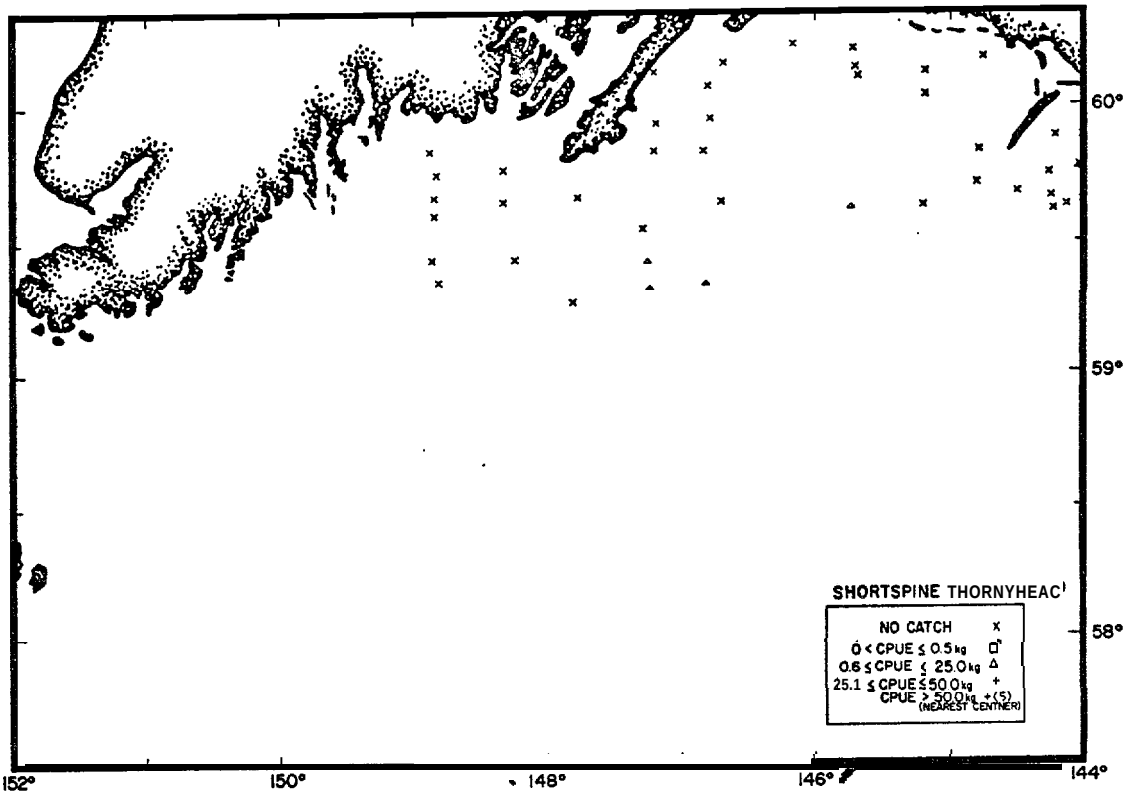


Figure XI-233.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the eastern Gulf of Alaska, June-Oct. 1961 '(Cruise 611-052).

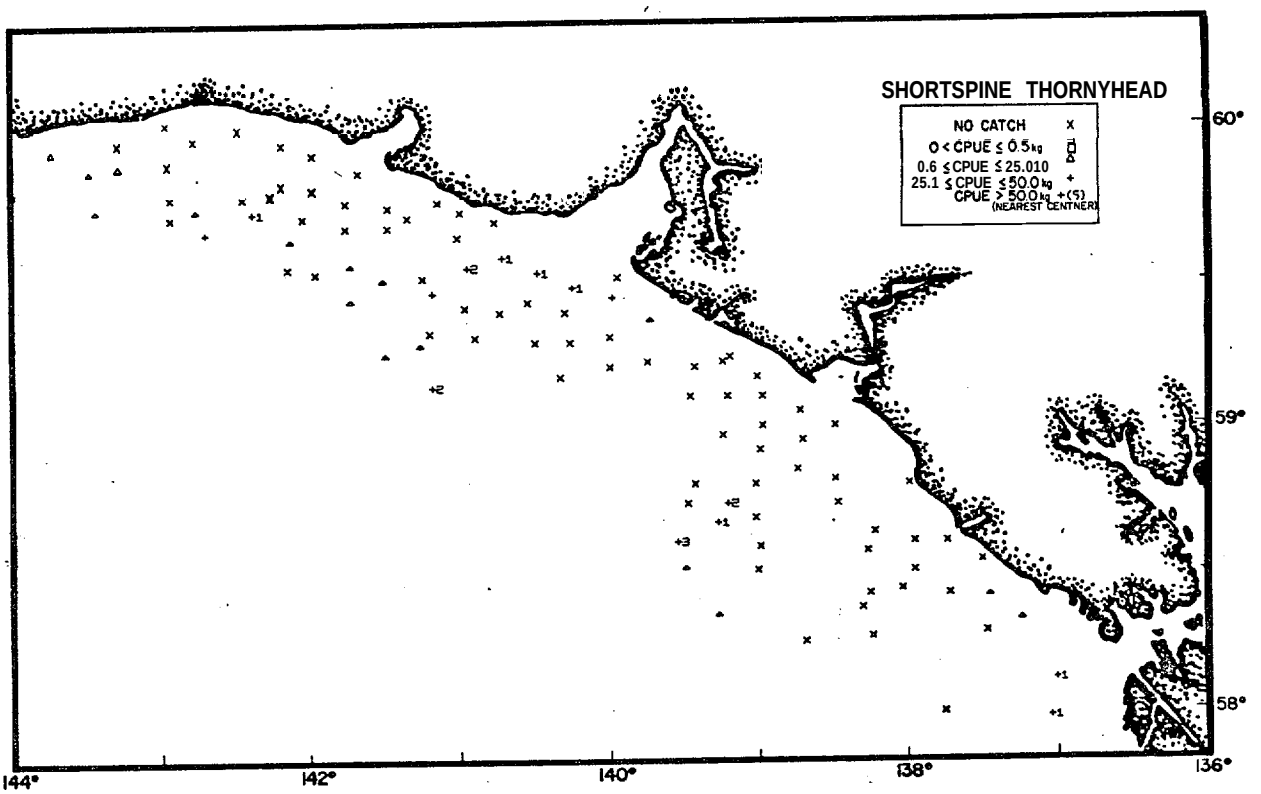
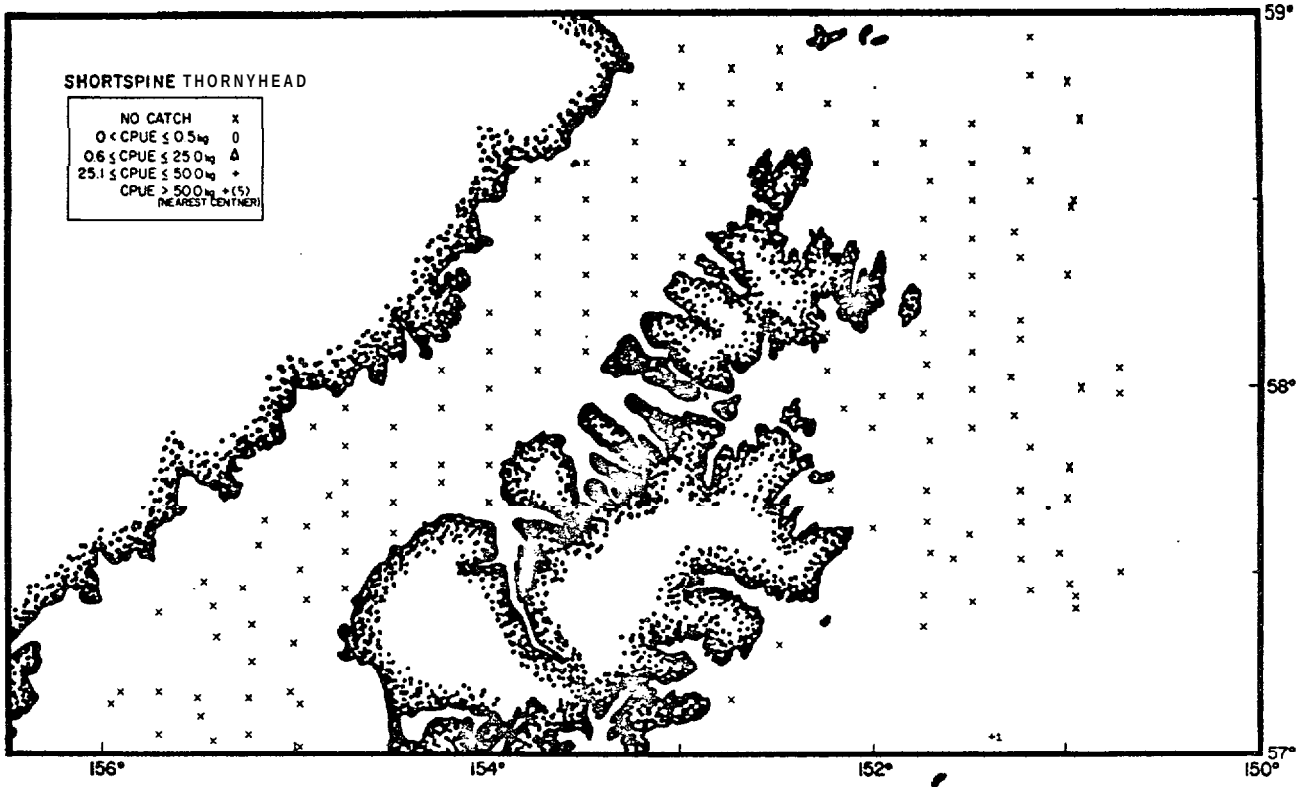


Figure XI-234.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the eastern Gulf of Alaska, June-Sept. 1961 (Cruise 611).



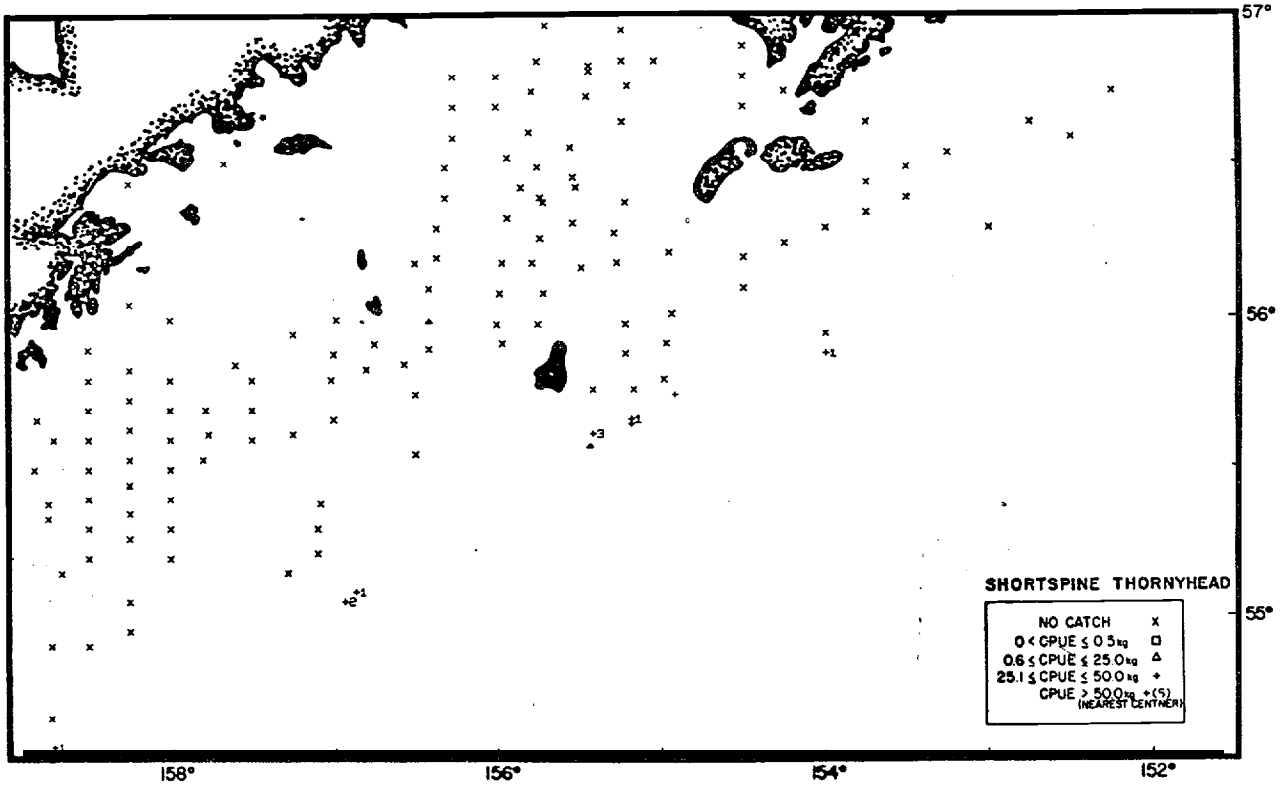


Figure XI-235.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the western Gulf of Alaska, May-July 1961 (Cruise 618).

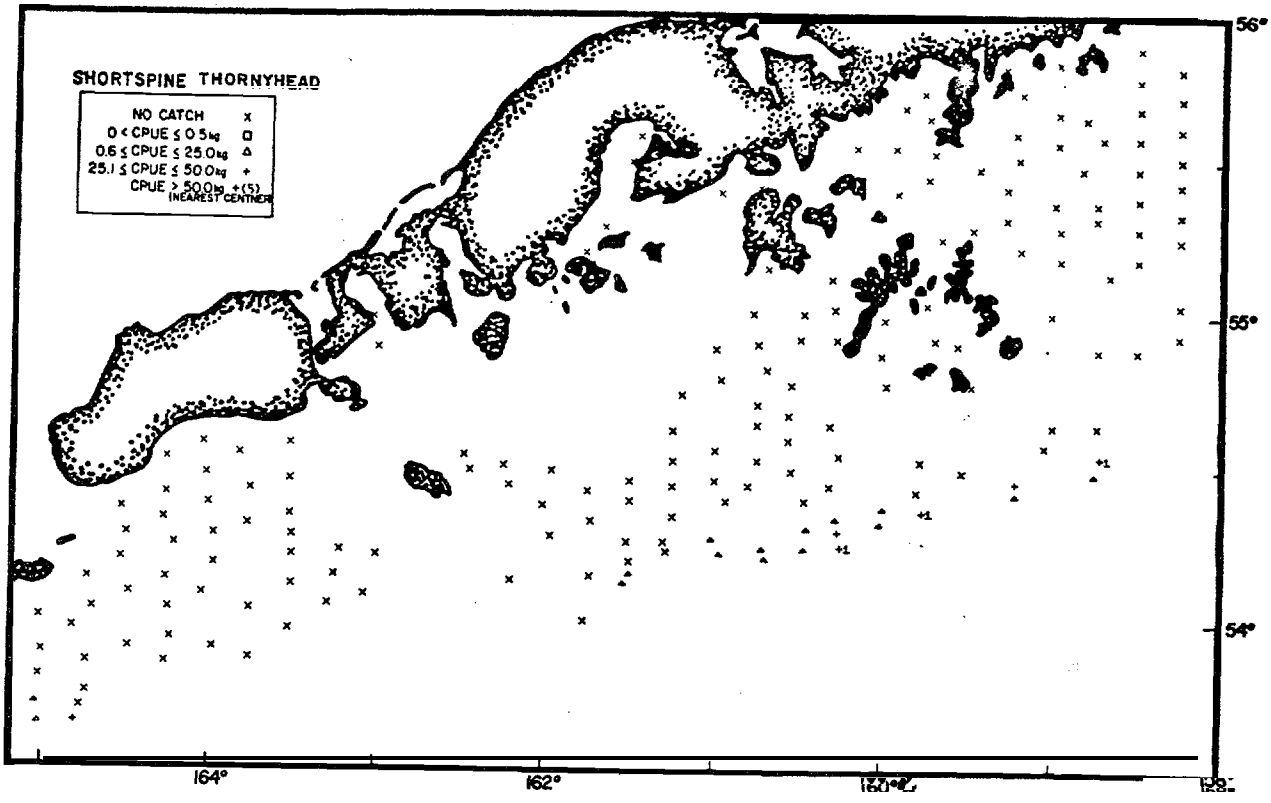


Figure XI-236.--Distribution of standardized catch'rates in kg/hr of shortspine thornyhead in the western Gulf of Alaska, May-July 1961 (Cruise 618).

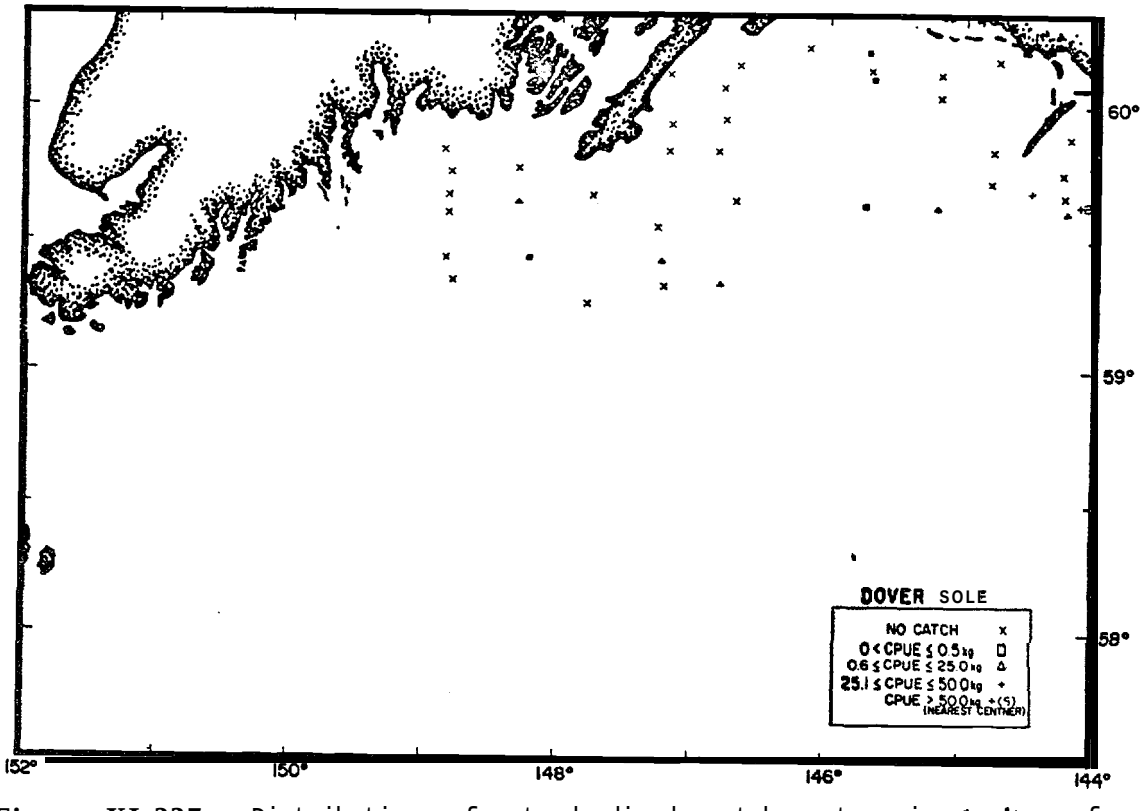


Figure XI-237.--Distribution of standardized catch rates in kg/hr of Dover sole in the eastern Gulf of Alaska, June-Oct. 1961 (Cruise 611-052).

Table XI-28.--Estimated biomass and population size of shortspine thornyhead (Sebastolobus alascanus) in the Gulf of Alaska during May-October, 1961.

Region	Depth tone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean site per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	0	0	0				
	101-200	0.5	105.9	3.4			--	--
	201-400	84.3	3.020.8	96.6				
	All zones	11.4	3,126.7	26.1				
Yakutat	1-100	0	0	0				
	101-200	6.8	1,187.6	20.1				
	201-400	57.8	4.730.8	79.9				
	Nl zones	7.9	5.918.4	49.4				
Prince William	1-100	0	0	0	0	0		
	101-200	1.1	159.1	75.2	0.2	50.0	0.69	--
	201400	1.2	52.5	24.8	0.2	50.0	0.21	--
	All zones	0.7	211.6	1.8	0.4		0.44	--
Kenai	1-100							
	101-200	0	0	0				
	201-400	0	0	0				
	All zones	0	0	0	--			
Kodiak	L-100	a		0	0	0		
	101-200	0	8	0	0	0		
	201-400	0	0	0	0	0		--
	All zones	0	0	0	0	0		
Shelikof	1-100	0		0		0		
	101-200	0	8	0	8			
	201-400	0	0	0	0	8		
	All zones	0	0	0	0	0		--
Chirikof	1-100	0		0	0	0		
	101-200	0	8	0	0	0		
	201400	15.9	1,982.1	100.0	7.8	100.0	0.25	--
	All zones	3.2	1,982.1	16.5	7.8		0.25	--
Shumagin	1-100	0	0	0	0			--
	101-200	0.2	33.2	5,6	0.1	3.x	0.26	--
	201-400	20.0	S58.4	94.4	2.5	96.2	0.22	--
	Nl zones	1.3	591.6	4:9	2.6		3.22	--
Sanak	I-100	0	0	0	0	0		
	101-200	0	0	0	0	0		--
	201-400	10.1	149.9	100.0	0.4	100.0	0.41	--
	Nl zones	0.4	149.9	1.3	0.4		0.41	--
Tots1	1-100	0	0	0			--	--
	101-200	0.8	1.485.8	12.4				--
	201400	17.5	10.494.5	87.6				--
	Nl zones	3.2	11,980.3	100.0	--			--

1/ Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ Less than 0.1 kg/hr.

4/ Less than 0.1 X 106 individuals.

5/ Less than 0.1 percent

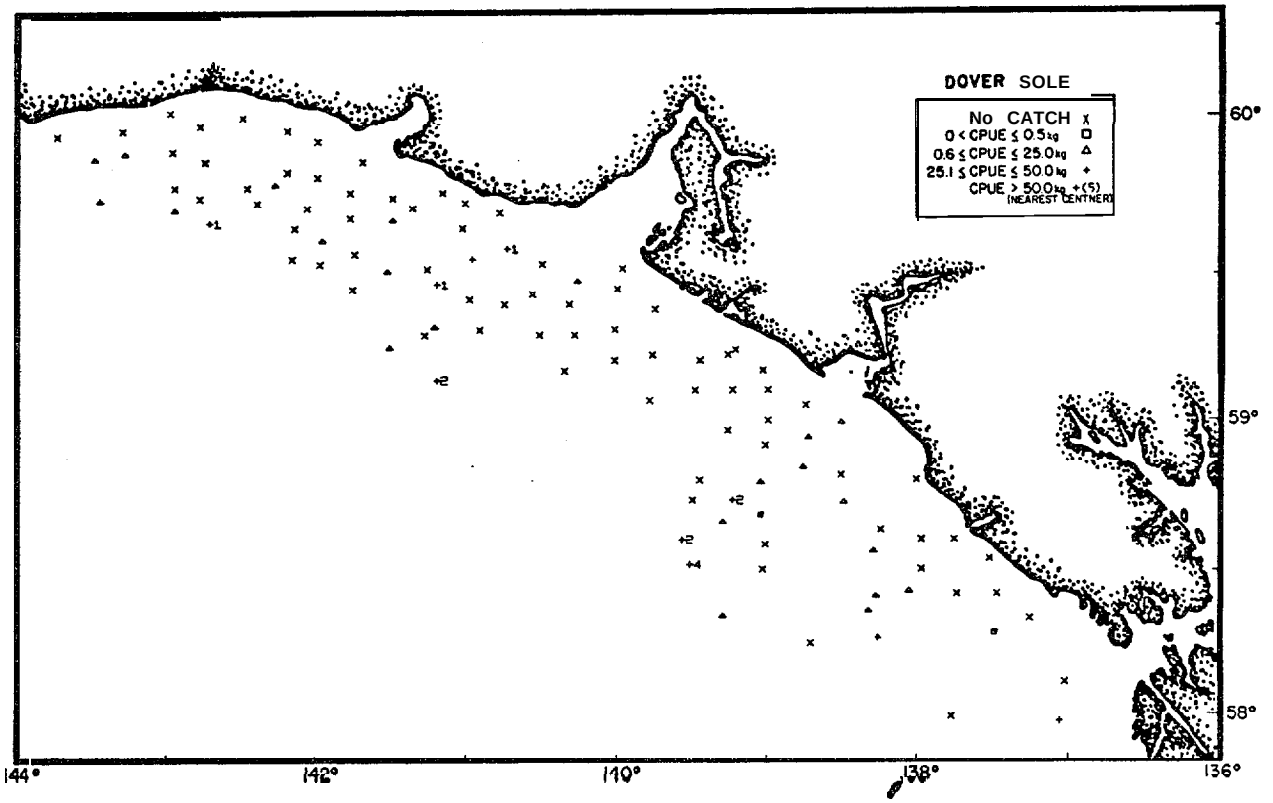


Figure XI-238.--Distribution of standardized catch rates in kg/hr of Dover sole in the eastern Gulf of Alaska, June-Sept.- 1961 (Cruise 611).

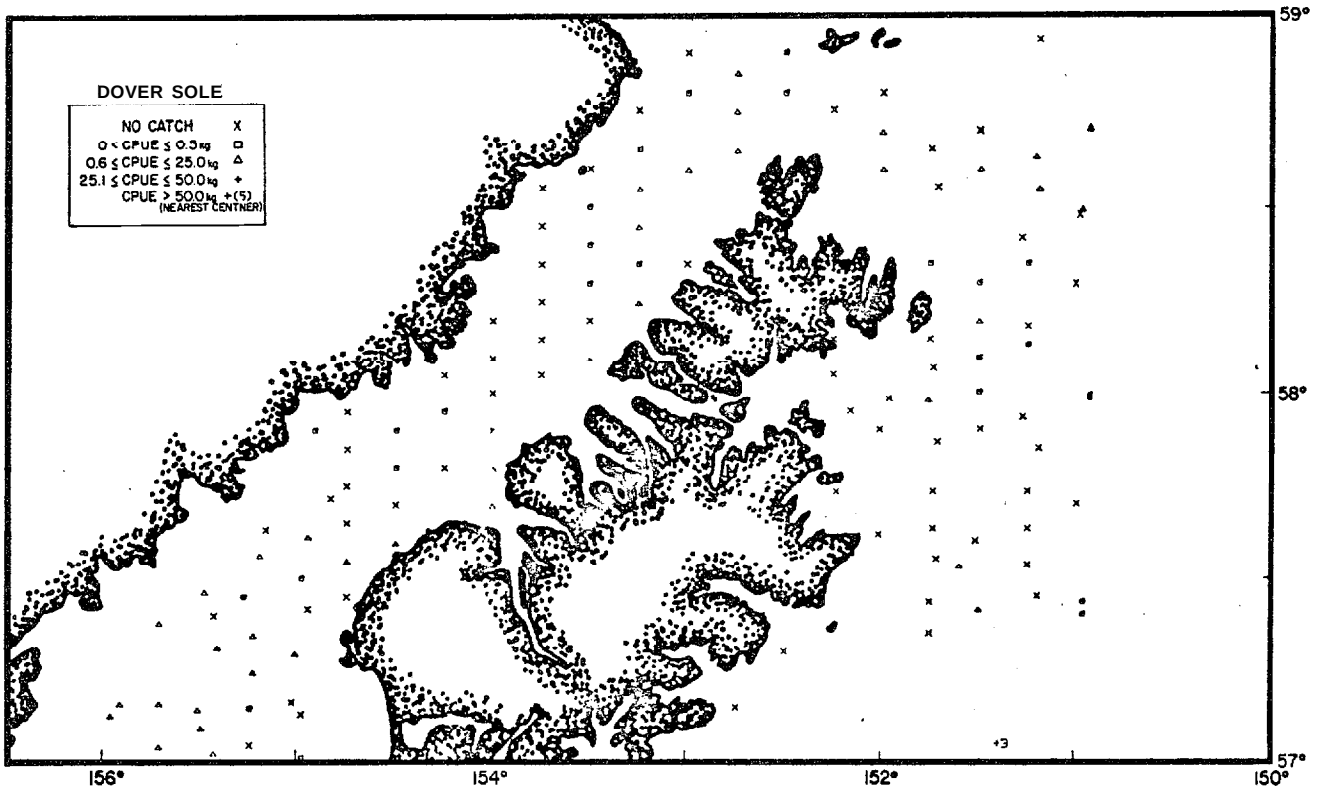
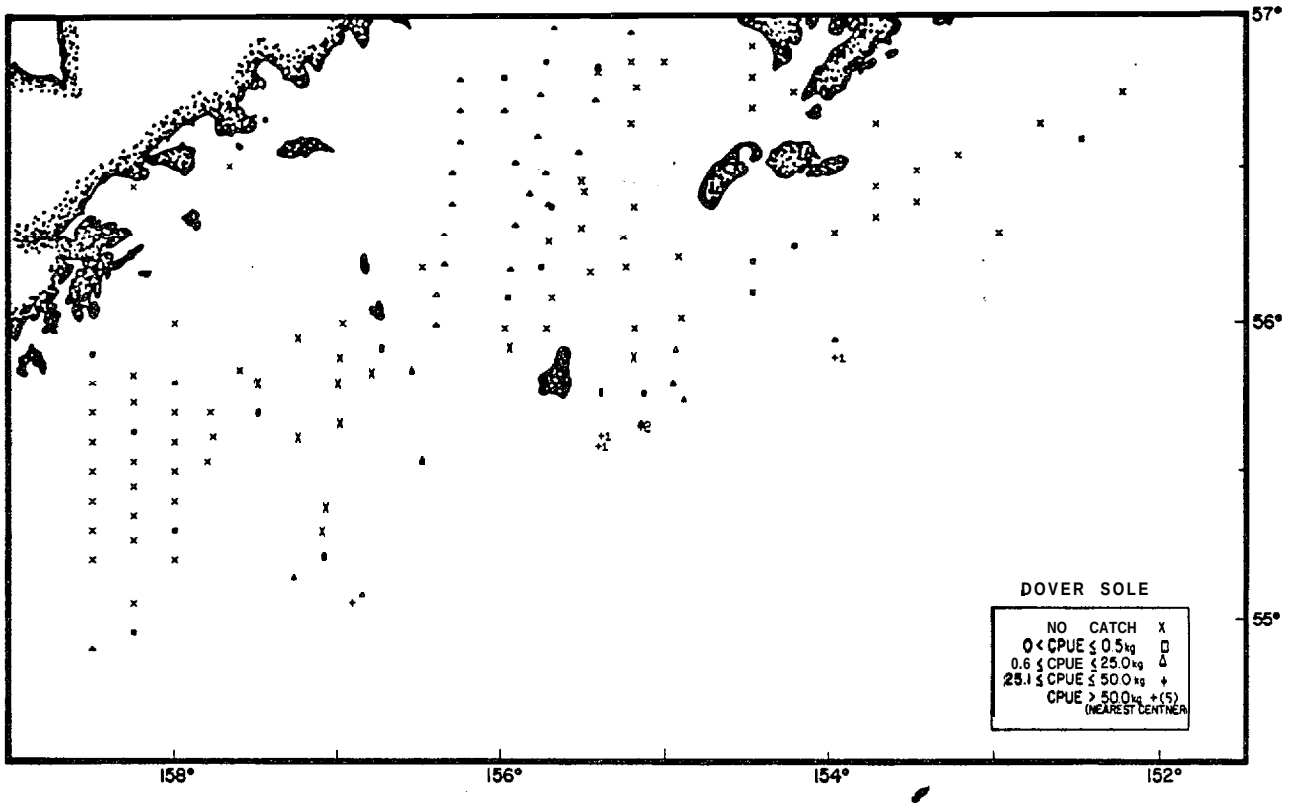


Figure X1-239.--Distribution of standardized catch rates in kg/hr of Dover sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).



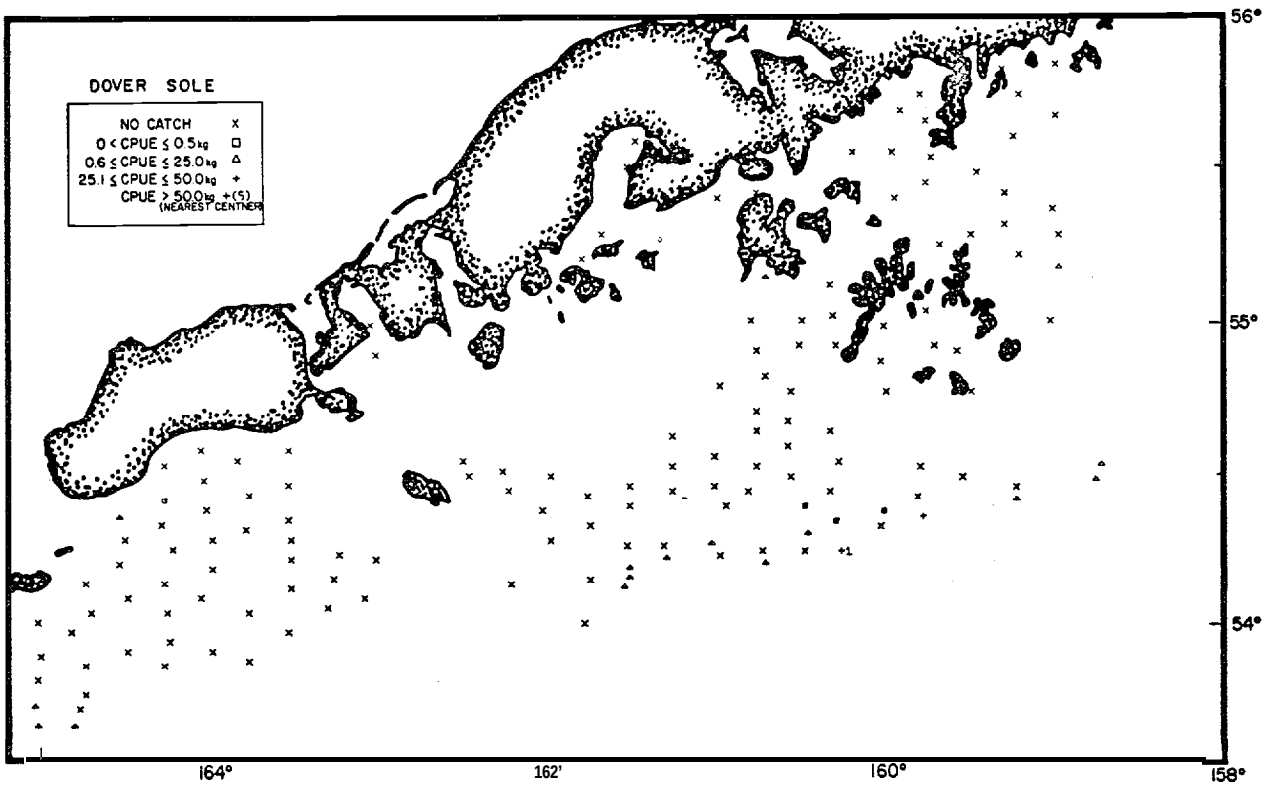


Figure X1-240.--Distribution of standardized catch rates in kg/hr of Dover sole in the western Gulf of Alaska, May-July 1961 (Cruise 618).

regions and averaged 3 kg/hr over the entire Gulf of Alaska (Table X1-29). Mean CPUE's were extremely low in the inner and outer shelf depth zones but increased significantly in the upper slope.

Biomass-The apparent biomass estimate for Dover sole was 11 thousand mt, of which 85% was located in the upper slope depth zone and 82% within the combined Yakutat and Fairweather regions. The biomass estimate for Dover sole should be considered minimal as the total range of the species was inadequately surveyed due to the steep and rugged bottom topography associated with the lower slope.

Size composition-No length-frequency data were collected for this species.

OTHER SPECIES

During the May-October 1961 surveys, several species which did not produce mean CPUE's greater than 2 kg/hr did occur at significant levels of abundance in restricted distributions (Table X1-30). In the eastern Gulf of Alaska, three species of flatfish; butter sole, English sole, and starry flounder; occurred in the Yakutat and Fairweather regions along with one elasmobranch species, the dogfish shark, and 7 species of invertebrates in one or both areas. In the western Gulf of Alaska, yellowfin sole was important in the Shumagin region, and four species groups; ronquils, eelpouts, pricklebacks, and grenadiers; occurred in one or more region-depth zones with mean CPUE's exceeding 10 kg/hr.

Table XI-29.--Estimated biomass and population size of Dover sole (Microstomus pacificus) in the Gulf of Alaska during Hay-October. 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0.5	19.7	0.4			--	
	101-200	2.8	538.8	11.8				--
	201-400	112.0	4,012.9	87.8				
	All zones	16.8	4,571.4	42.2				
Yakutat	l-loo	0.1	7.2	0.2	--			
	101-200	1.7	299.3	7.0				--
	201-400	48.3	3,950.9	92.8				
	All zones	12.9	4.257.4	39.4				--
Prince William	l-100	0.1	8.5	6.7	4/	5/	0.23	--
	101-200	0.4	53.1	41.7	0.3	60.0	0.16	--
	201-400	1.5	65.7	51.6	0.2	40.0	0.38	
	All zones	0.4	127.3	1.2	0.5		0.23	--
Kenai	l-loo							
	101-200	0.2	59.2	65.7				
	201-400	0.2	30.9	34.3				
	All zones	0.2	90.1	0.8				
Kodiak	l-100	3/	0.5	0.2	4/	5/	0.05	--
	101-200	1.3	260.2	99.8	2.2	100.0	0.12	
	201-400	0	0	0	0	0		--
	All zones	0.5	260.7	2.4	2.2	--	0.12	--
Shelikof	l-100	0.3	17.1	15.0	0.2	18.2	0.09	--
	101-200	1.0	89.1	78.1	0.9	81.8	0.10	
	201-400	0.8	7.9	6.9	4/	5/	0.21	
	All zones	0.8	114.1	1.1	1.1	--	0.10	--
Chirikof	l-100	3/	2.0	0.2	4/	5/	0.18	--
	101-200	0.7	148.8	12.0	1.0	22.7	0.15	
	201-400	8.8	1,092.5	87.9	3.4	77.3	0.32	
	All zones	2.0	1,243.3	11.5	4.1		0.28	
Shumagin	1-100	0.1	24.5	21.6	0.1	14.3	0.32	
	101-200	0.1	20.2	17.8	0.1	14.3	0.19	
	201-400	2.5	68.6	60.6	0.5	71.4	0.15	--
	All zones	0.2	113.3	1.1	0.7	--	0.18	
Sanak	l-100	0.1	20.9	49.5	0.1	33.3	0.20	
	101-200	0.1	10.1	23.9	0.1	33.3	0.19	
	201-400	0.8	11.2	26.5	0.1	33.3	0.15	--
	All zones	0.1	42.2	0.4	0.3		0.18	--
Total	l-100	0.1	100.4	0.9			--	
	101-200	0.8	1,478.8	13.7				
	201-400	15.6	9,240.6	85.6				
	All zones	2.9	10,819.8	100.0				

&i Mean catch per unit effort in kilograms per hour trawled.

2/ Where data are available.

3/ LCSS than 0.1 kg/hr.

4/ Lees than 0.1 X 10^6 individuals,

5/ Less than 0.1 percent.

Table XI-30.--Species of fish and invertebrates which occurred at mean CPUE's greater than 10 kg/hr in restricted distributions (Cruises 611, 052, 618).

Area	Species	DEPTH ZONE (m) 0-100	101-200	201-400
Yakutat	Sea urchin	--	11	352
	Brittlestars	89	52	--
	Butter sole	49	--	--
	Starry flounder	20	--	--
	Starfish	--	20	--
	Sponge	--	--	20
	Dogfish shark	12	--	--
	Scallop	11	--	
Fairweather	Coral	--	293	--
	Sea urchin	--	43	251
	Butter sole	188	--	--
	English sole	52	--	--
	Starry flounder	51	--	--
	Dungeness crab	26	--	--
	Snails	--	13	--
Kodiak	Ronquils	--	14	--
	Eelpouts	13	--	--
	Scallop	12	--	--
	Pricklebacks	--	--	10
Shelikof	Ronquils	45	--	--
Chirikof	Ronquils	--	12	--
Shumagin	Yellowfin sole	23	--	--
	Ronquils	--	10	--
Sanak	Grenadiers	--	--	51

b. Cruise 619, Chartered Fishing vessels Morning Star, St., Michael and Arthur H., (Sept-Nov. 1961).

During September to November of 1961, 184 stations were successfully trawled in the western Gulf of Alaska, Kodiak to Sanak regions. (Table X1-31). Within the five regions. the sampling densities ranged from 1 station per 289 km^2 in the Shelikof region to 1 station per 1,121 km^2 in the Chirikof region. The distribution of the successful sampling stations are presented in Figures X1-241-242. Fish and invertebrate taxa encountered during this survey are listed in table V-3-4.

TOTAL BIOMASS

During this western Gulf of Alaska survey, the total apparent biomass was estimated to be 1,555 thousand mt. An estimated 750 thousand mt (48%) of the total biomass was located in the outer shelf depth zone, 38% in the inner shelf, and 14% in the upper slope (Figure XI-243). Of the five regions which constituted the survey area, Chirikof contained the largest portion 37% and was followed in rank order by Kodiak with 24%, Sanak 21%, Shumagin 12%, and Shelikof 5 (Table X1-32).

The Chirikof region had the highest average biomass density which was estimated at 15.7 mt/km^2. Both Sanak and Kodiak attained a density of 13 mt/km^2, and were followed by Shumagin and Shelikof with 7 mt/km^2. The biomass density over the entire survey area averaged 11.8 mt/km^2 and by depth zones ranged from 10 mt/km^2 to 14 mt/km^2. The distribution of the standardized catch rates for all species combined are presented in Figures XI-244-245.

RELATIVE IMPORTANCE OF SPECIES GROUPS

The proportion which the combined fish species contributed to the total apparent biomass increased with depth and averaged 46% over all regions. By species groups, the invertebrates represented the greatest portion of the total biomass (54%), followed by the f'.tfishes (27%), roundfishes (17%), rockfishes (3%) and elasmobranchs (1%) (Table X1-33).

During this survey, the invertebrate species group constituted nearly 54% (838 thousand mt) of the total biomass (Table XI-34). Ninety five percent of the invertebrate biomass was contained in the inner shelf (46%) and outer shelf (49%. The Chirikof region contained the largest percentage of the total invertebrate biomass (42%) followed by Sanak (24%), Kodiak (22%) Shumagin (9%) and Shelikof (3%). Mean CPUE's ranged from 449 kg/hr in the outer shelf to 155 kg/hr in the upper slope, and averaged 369 kg/hr. (Figure X1-246). The Chirikof region had the highest relative apparent abundance, 566 kg/hr, while catch rates in the Kodiak and Sanak regions, also,, were above the Gulf of Alaska average. The distribution of the mean CPUE's for successful stations are plotted in Figures X1-247-248.

Table XI-31.--Number of stations successfully trawled and sampling densities[1/] by regions and depth zones in the Gul of Alaska during September-November 1961 (Cruise 619).

Region	DEPTH ZONES (M) 0 - 100 No. of stations	0 - 100 Area (km^2)	0 - 100 Sampling density	101 - 200 No. of stations	101 - 200 Area (km^2)	101 - 200 Sampling density	201 - 400 No. of stations	201 - 400 Area (km^2)	201 - 400 Sampling density	0 - 400 No. of stations	0 - 400 Area (km^2)	0 - 400 Samp dens
Kodiak	7	16,350	2,335	22	11,785	536	2	1,701	851	31	29,836	9
Shelikof	0	--	--	13	5,574	429	28	6,287	225	41	11,861	2
Chirikof	10	17,321	1,732	11	12,210	1,110	12	7,463	622	33	36,994	1,1
Shumagin	8	13,569	1,696	33	12,972	393	3	1,670	557	44	28,211	6
Sanak	15	12,773	852	19	11,607	611	1	888	888	35	25,268	7
Total	40	60,013	1,500	98	54,148	553	46	18,009	392	184	132,170	7

[1/] Sampling density = $\frac{\text{No. of } km^2}{\text{No. of stations}}$

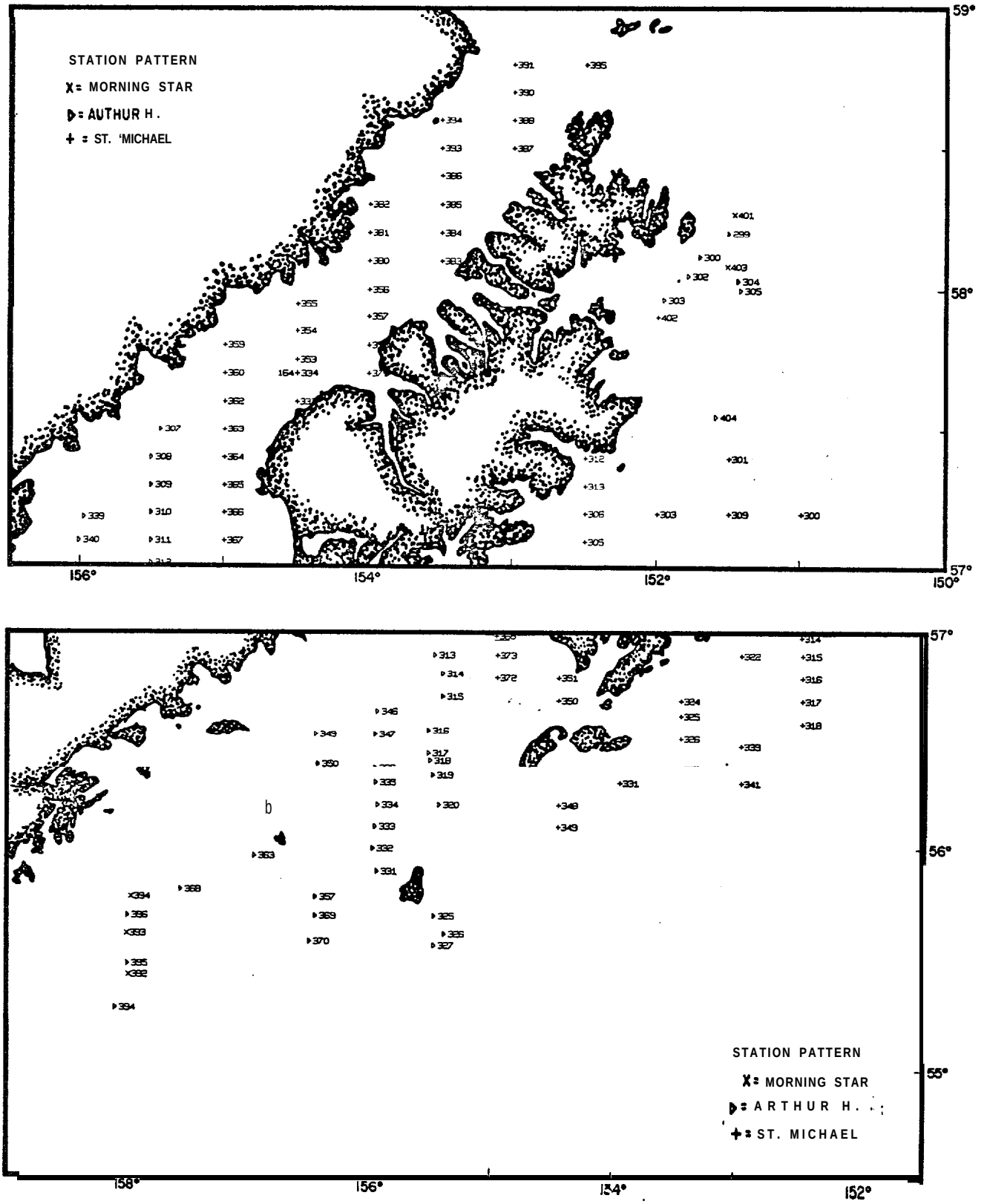


Figure XI-241.--Stations successfully trawled **(otter trawl) during cruise 619,** Aug.-Sept. 1961.

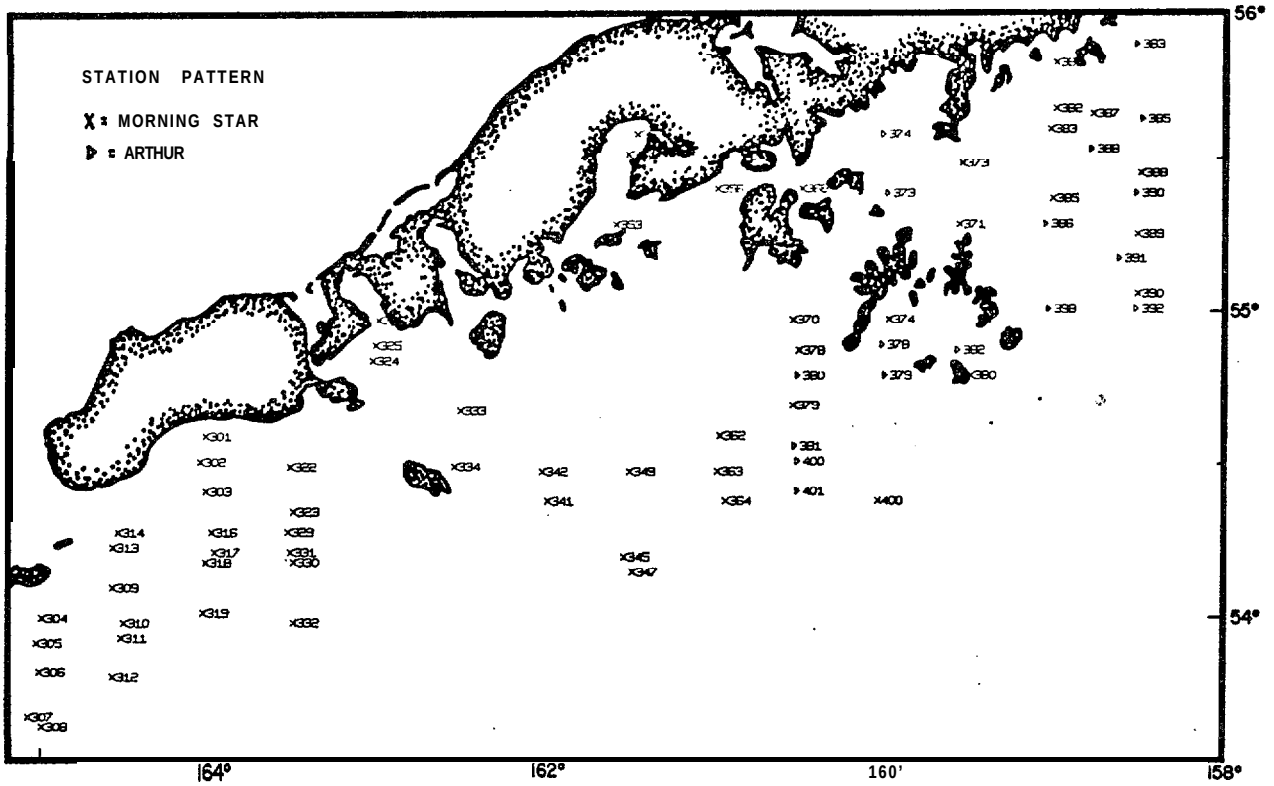


Figure X1-242.-Stations successfully trawled (otter' trawl) during Cruise 619, Aug.-Sept. 1961.

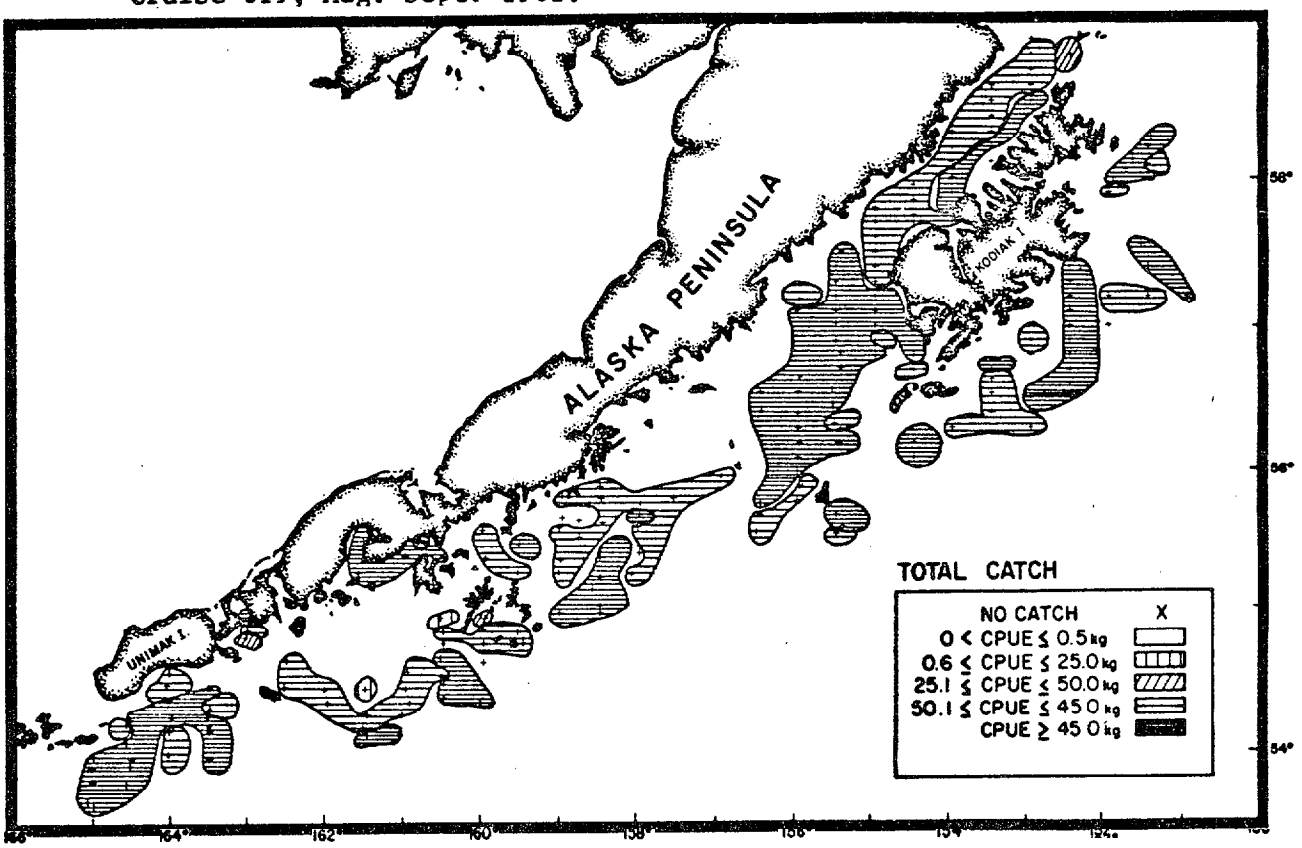


Figure X1-243.--Distribution of apparent relative abundance of all species combined in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-32.--Estimated biomass in metric tons for all species combined during the September-November 1961 resource assessment survey in the Gulf of Alaska (Cruise 619).

Regions	DEPTH ZONES (M) O-100	101-200	201-400	O-400
Kodiak				
mt x 10^3	142.3	230.5	6.6	379.4
mt/km^2	8.7	19.6	3.9	12.7
% biomass in depth zone	24.0	30.7	3.1	24.4
% regional biomass	37.5	60.8	1.7	100.0
Shelikof				
mt x 103	--	38.2	46.4	84.6
mt/km^2	--	6.9		7.1
% biomass in depth zone		5.1	7.4	5.4
% regional biomass	--	45.2	54.8	100.0
Chirikof				
mt x 103	256.6	231.4	92.6	580.6
mt/km^2	14.8	18.9	12.4	15.7
% biomass in depth zone	43.2	30.9	43.8	37.3
% regional biomass	44.2	39.8	16.0	100.0
Shumagin				
mt x 103	54.3	97.3	35.4	187.0
mt/km^2	9.1	7.5	21.2	6.6
% biomass in depth zone	29.0	13.0	16.7 18.9	12.0
% regional biomass				
Sanak				
mt x 103	140.7	152.5	30.6	323.8
mt/km^2	11.0	13.1	34.5	12.8
% biomass in depth zone	23.7	20.3	14.5	20.8
% regional biomass	43.5	47.1	9.4	100.0
Total				
mt x 10^3	9.9	749.9	211.6	1,555.4
mt/km^2	100.0	100.0 13.9	100.0 11.8	99.9 11.8
% biomass in depth zone	[illegible]			
% total biomass	38.2	48.2	13.6	100.0

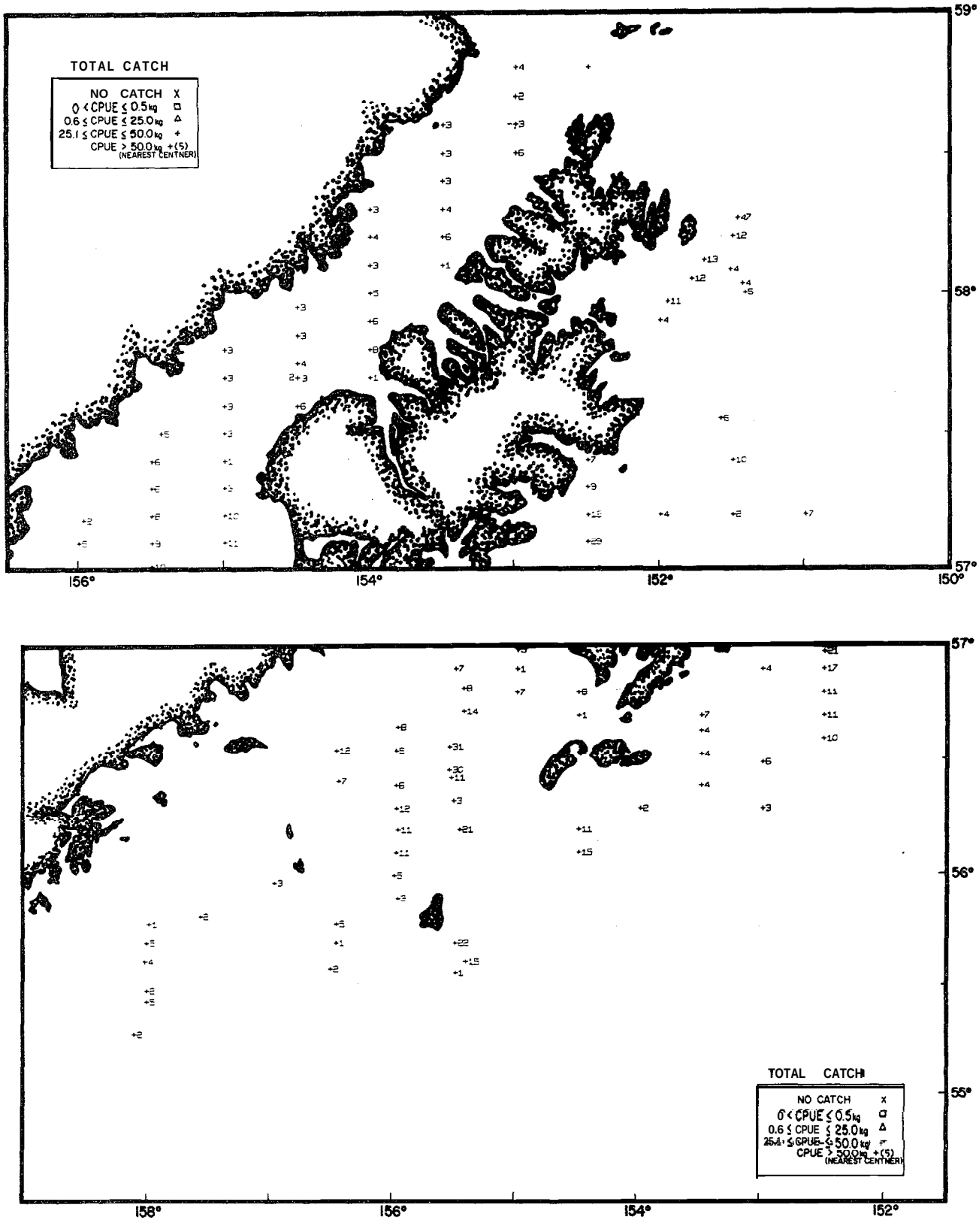


Figure X1-244.--Distribution of standardized catch rates in kg/hr of all species combined in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

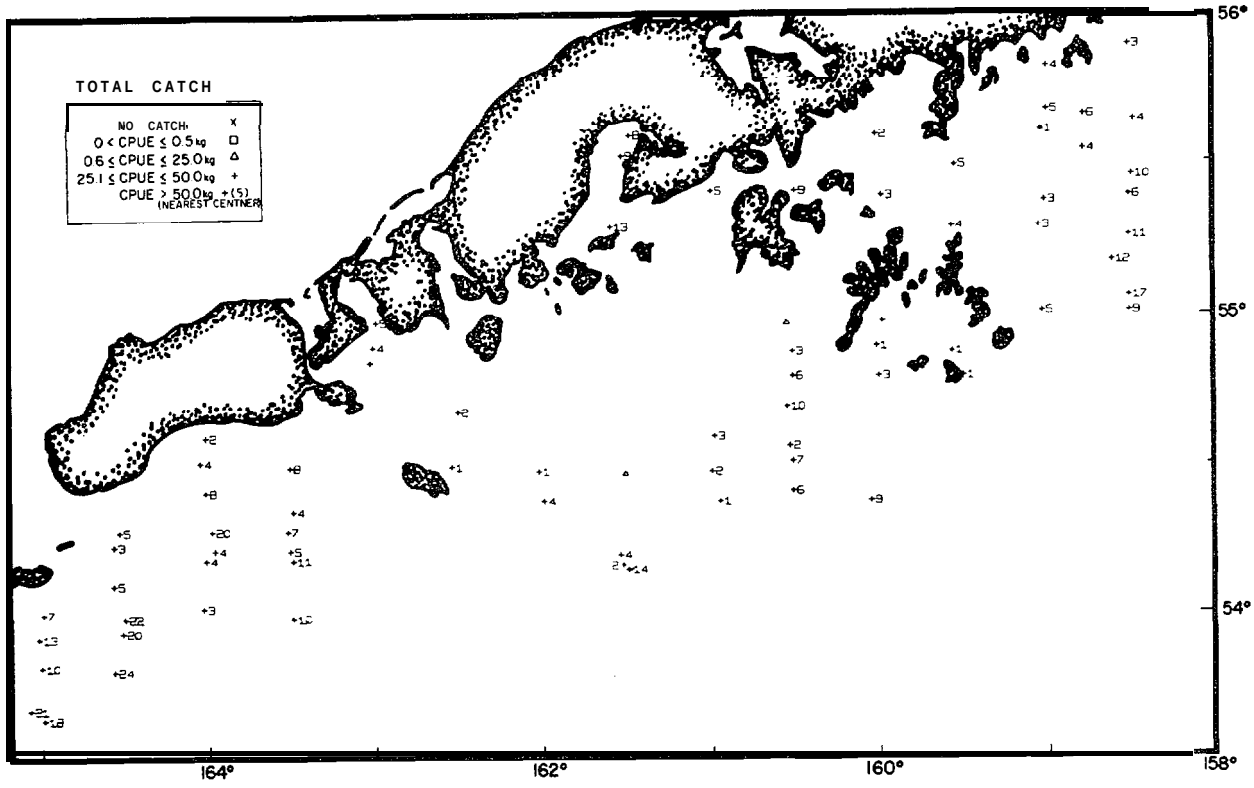


Figure X1-245.--Distribution of standardized catch rates in kg/hr of all species combined in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

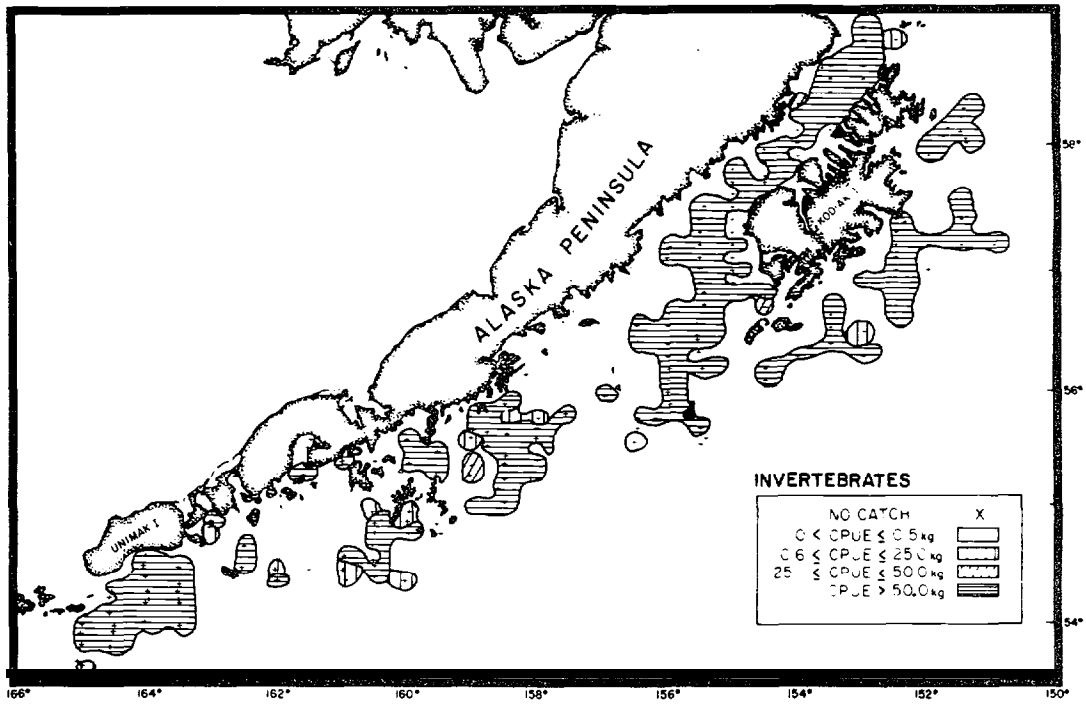


Figure X1-246.--Distribution of apparent relative abundance of invertebrates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-33.--Relative importance of species groups based on the rank order of their total biomass (Cruise 619).

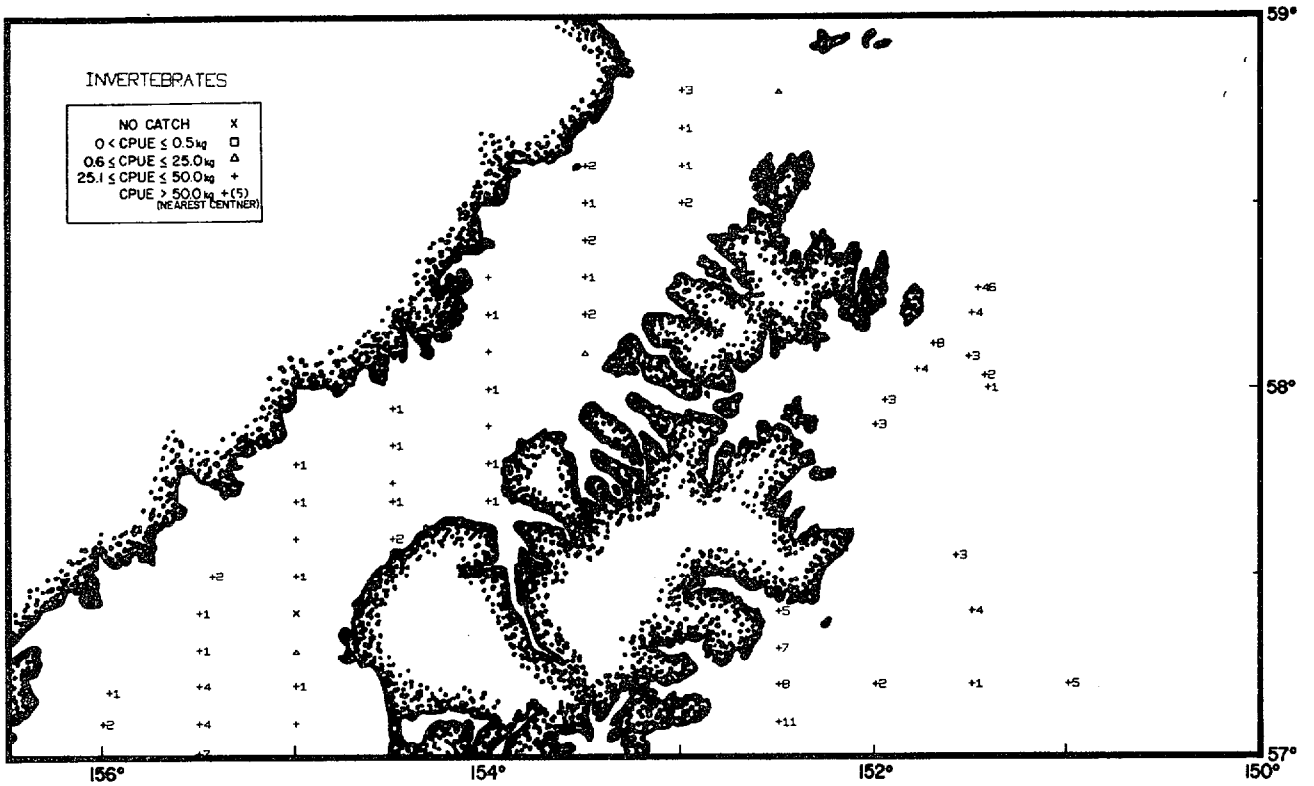
Species Group	DEPTH ZONES (M) 0-100	101-200	201-400	0-400
Invertebr tes				
mt x 10^3	384.7	406.5	46.5	837.8
mt/km^2	6.4	7.5	2.6	6.3
% biomass in depth zone	64.8	54.2	22.0	53.9
% invertebrate biomass	45.9	48.5	5.6	100.0
Flatfish				
mt x 103	135.5	190.2	87.0	412.7
mt/km^2	2.3	3.5	4.8	3.1
% biomass in depth zone	22.8	25.3	41.1	26.5
% flatfish biomass	32.8	46.1	21.1	100: 0
Roundfish				
mt x 10^3	70.9	139.9	48.2	259.0
mt/km^2	1.2	2.6	2.7	2.0
% biomass in depth zone	11.9	18.7	22.8	16.6
% roundfish biomass	27.4	54:o	18.6	100.0
Rockfish				
mt x 103	0.1	11.0	27.7	38.8
mt/km^2	1/	0.2		0.3
% biomass in depth zone	2/	1.5	1:::	2.5
% rockfish biomass	0.1	28.4	71.5	100: 0
Elasmobranchs				
mt x 103	2.7	2.3	2.1	7.1
mt/km^2	1/	1/	0.1	0.1
% biomass in depth zone	0.5	0.3	1.0	0.5
% elasmobranch biomass	38.0	32.4	29.6	100.0
Total				
mt x 10^3	9.9	749.9	211.6	1,555.4
mt/km	100.0	13.8	11.7	11.8
% biomass in depth zone	[illegible]	100.0	100.0	100.0
% of total biomass	38.2	48.2	13.6	100.0

1/ Less than 0.1 mt/km^2.
2/ Less than 0.1%.

Table XI-34.--Estimated biomass of invertebrates in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Kodiak	l-100	219.1	59,898.0	32.1	--	--	--	--
	101-200	622.2	122,603.0	65.7	--	--	--	--
	201-400	144.7	4,115.8	2.2	--	--	--	--
	All zones	374.1	186,616.8	22.3	--	--	--	--
Shelikof	1-100	--	--	--	--	--	--	--
	101-200	138.1	12,874.4	53.2	--	--	--	--
	201-400	108.0	11,350.4	46.8	--	--	--	--
	All zones	92.8	24,224.8	2.9	--	--	--	--
Chirikof	l-100	704.1	203,902.0	58.3	--	--	--	--
	101-200	570.7	116,519.0	33.3	--	--	--	--
	201-400	235.3	291369.1	8.4	--	--	--	--
	All zones	565.5	349,790.1	41.7	--	--	--	--
Shumagin	1-100	133.8	30,351.6	40.8	--	--	--	--
	101-200	195.0	42,296.0	56.8	--	--	--	--
	201-400	64.5	1,801.1	2.4	--	--	--	--
	All zones	157.8	74,448.7	8.9	--	--	--	--
Sanak	l-100	424.2	90,590.0	44.7		--	--	--
	101-200	578.4	112,254.0	55.3	--	--	--	--
	201-400	0	0	0	--	--	--	--
	All zones	480.1	202,844.0	24.2		--	--	--
Total	k-100	360.1	384,741.6	45.9	--	--	--	--
	101-200	449.0	406,546.4	48.5	--	--	--	--
	201-400	154.9	46,636.4	5.6	--	--	--	--
	All zones	368.7	837,924.4	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



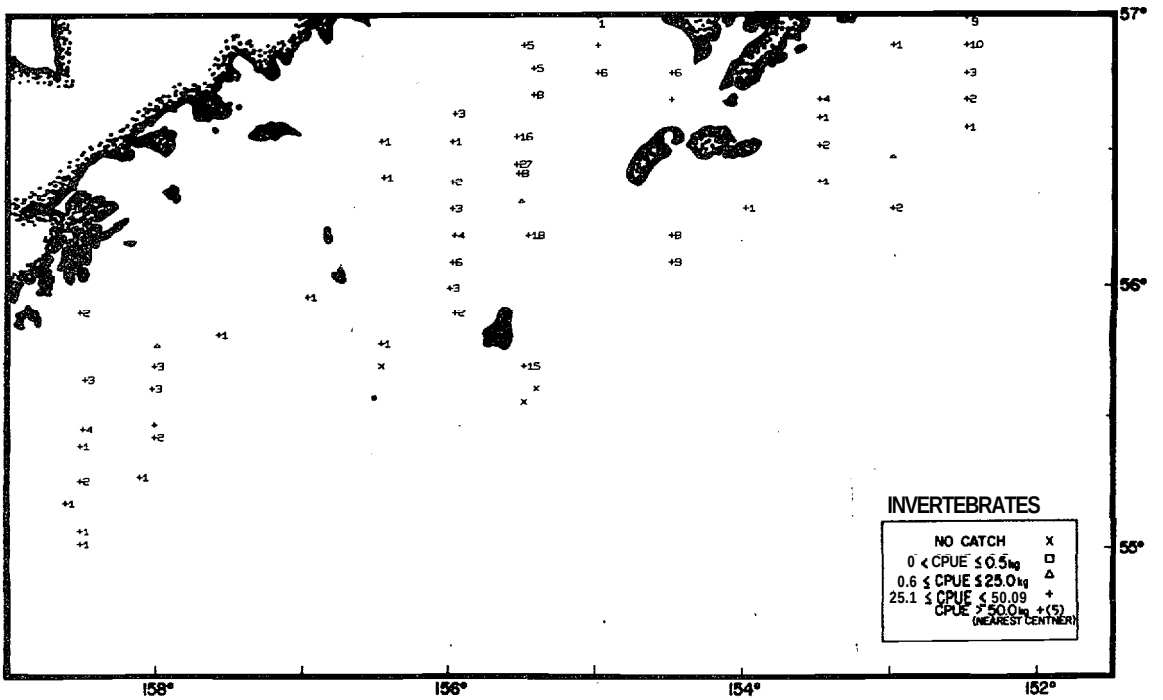


Figure XI-247.--Distribution of standardized catch rates **in kg/hr** of **invertebrates in** the **western Gulf** of **Alaska**, **Aug.-Nov. 1961 (Cruise 619).**

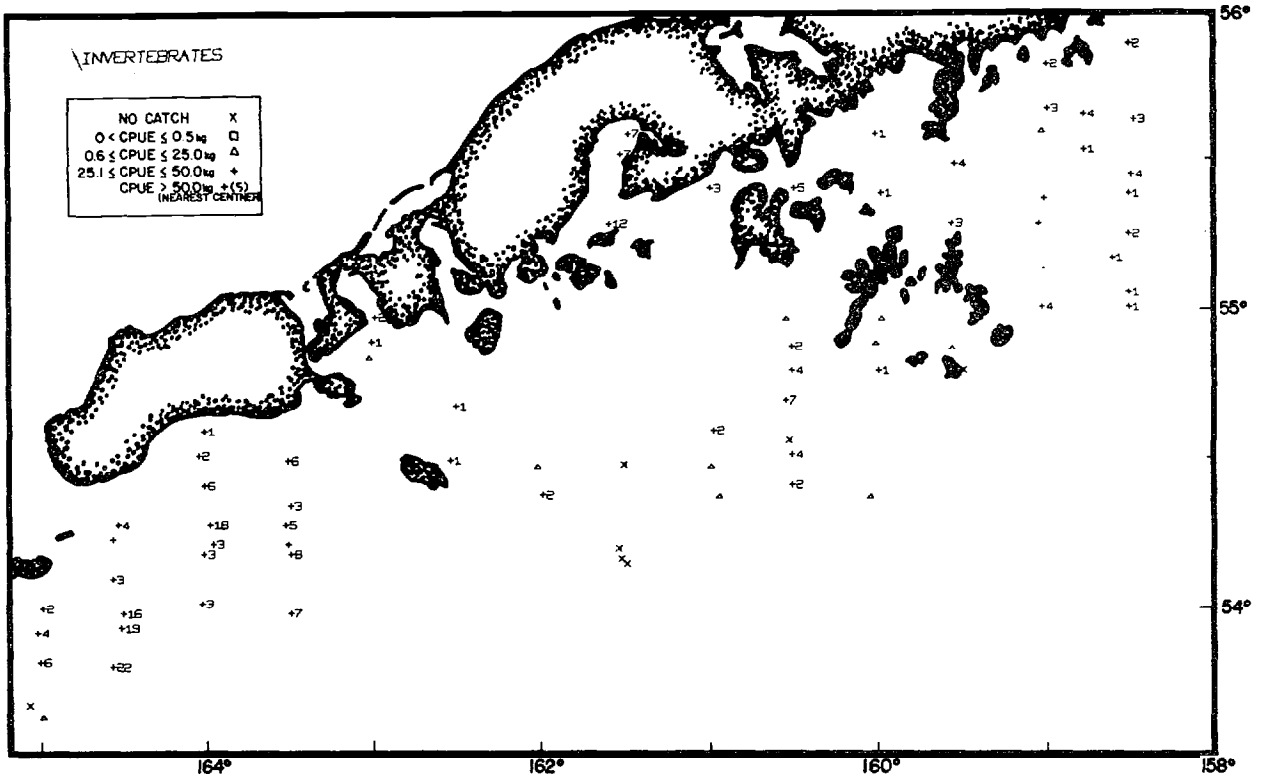


Figure XI-248.—**Distribution** of **standardized** catch rates in **kg/hr** of invertebrates in the **western** Gulf **of Alaska, Aug.-Nov. 1961** (Cruise 619).

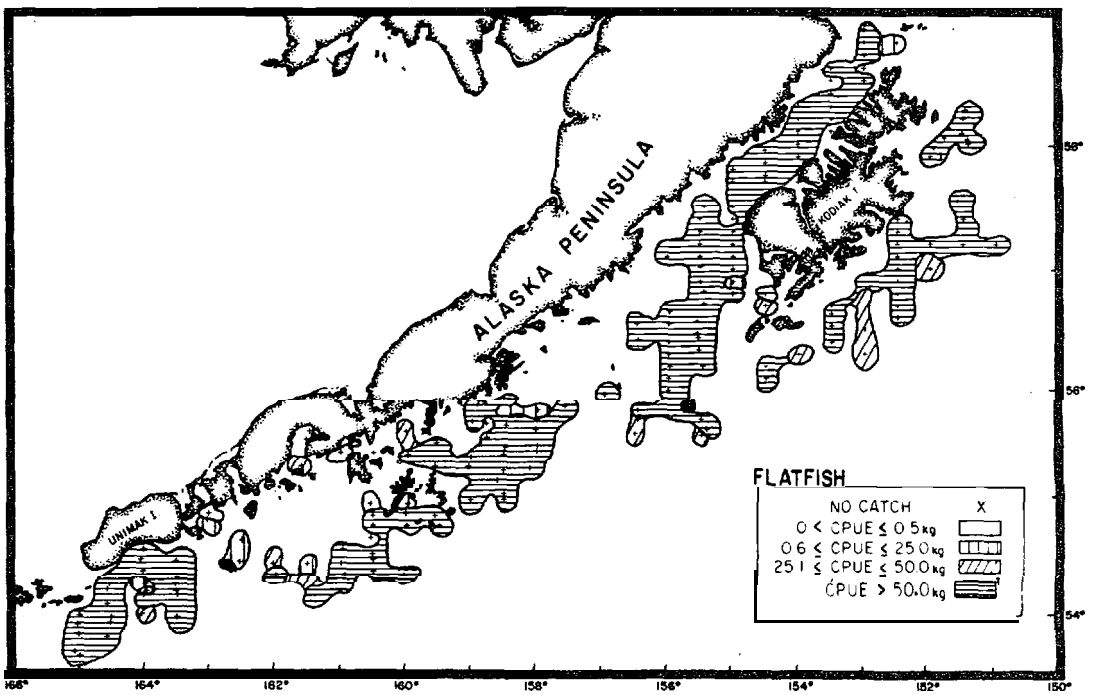


Figure XI-249. --Distribution of apparent relative **abundance** of **flatfish** la the western **Gulf** of Alaska, Aug.-Nov. 1961 **(Cruise 619).**

Table XI-35.--Estimated biomass and population size for flatfishes in the Gulf of Alaska, September-November, 1961

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean site individual, 2/ Weight (kg)	Len (c
Kodiak	l-100	172.5	47,172.4	48.0	175.8	50.0	0.27	-
	101-200	253.7	49,997.6	50.9	171.5	48.8	0.30	-
	201-400	38.3	1,090.7	1.1	4.5	1.3	0.24	-
	All zones	197.0	98,260.7	23.8	351.8	25.0	0.27	-
Shelikof	l-100	--	--	--	--		--	-
	101-200	207.9	19,373.1	44.7	64.0	51.9	0.30	-
	201-400	227.7	23,938.1	55.3	59.3	48.1	0.40	-
	All zones	165.8	43,311.2	10.5	123.3	8.8	0.35	-
Chirikof	l-100	142.5	41,282.6	28.6	80.9	19.6	0.51	-
	101-200	344.2	70,266.2	48.6	255.1	61.9	0.28	-
	201-400	264.7	33,034.5	22.9	76.0	18.6	0.43	-
	All zones	233.7	144,583.3	35.0	412.0	29.3	0.35	-
Shumagin	l-100	90.1	20,442.9	31.5	104.0	38.1	0.20	-
	101-200	133.2	28,898.4	44.5	125.6	46.0	0.23	-
	201-400	557.8	15,579.8	24.0	43.2	15.8	0.36	-
	All zones	137.6	64,921.1	15.7	272.8	19.4	0.24	-
Sanak	l-100	125.0	26,688.8	43.2	117.2	47.5	0.23	-
	101-200	111.8	21,710.1	35.2	93.0	37.7	0.23	-
	201-400	897.4	13,328.8	21.6	36.7	14.9	0.36	-
	All zones	146.1	61,727.7	15.0	246.9	17.6	0.25	-
Total	l-100	127.1	135,586.7	32.9	477.9	34.0	0.28	-
	101-200	210.1	190,245.4	46.1	709.2	50.4	0.27	-
	201-400	288.5	86,971.9	21.1	219.7	15.6	0.40	-
	All zones	181.6	412,804.0	100.1	1,406.8	100.0	0.29	-

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

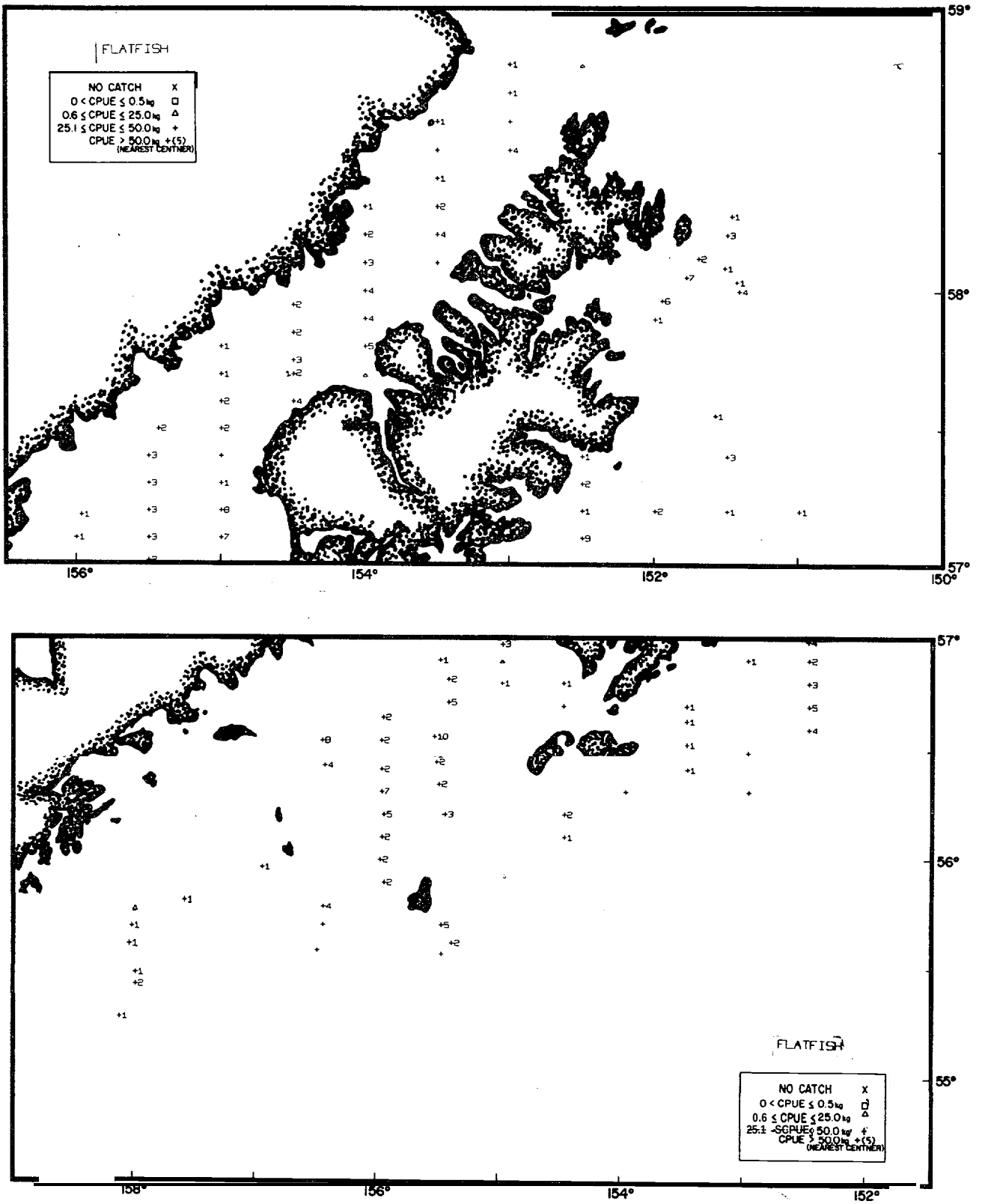


Figure XI-250.--Distribution of **standardized** catch rates in **kg/hr of flatfish in the western** Gulf of Alaska, **Aug.-Nov.** 1961 (Cruise 619).

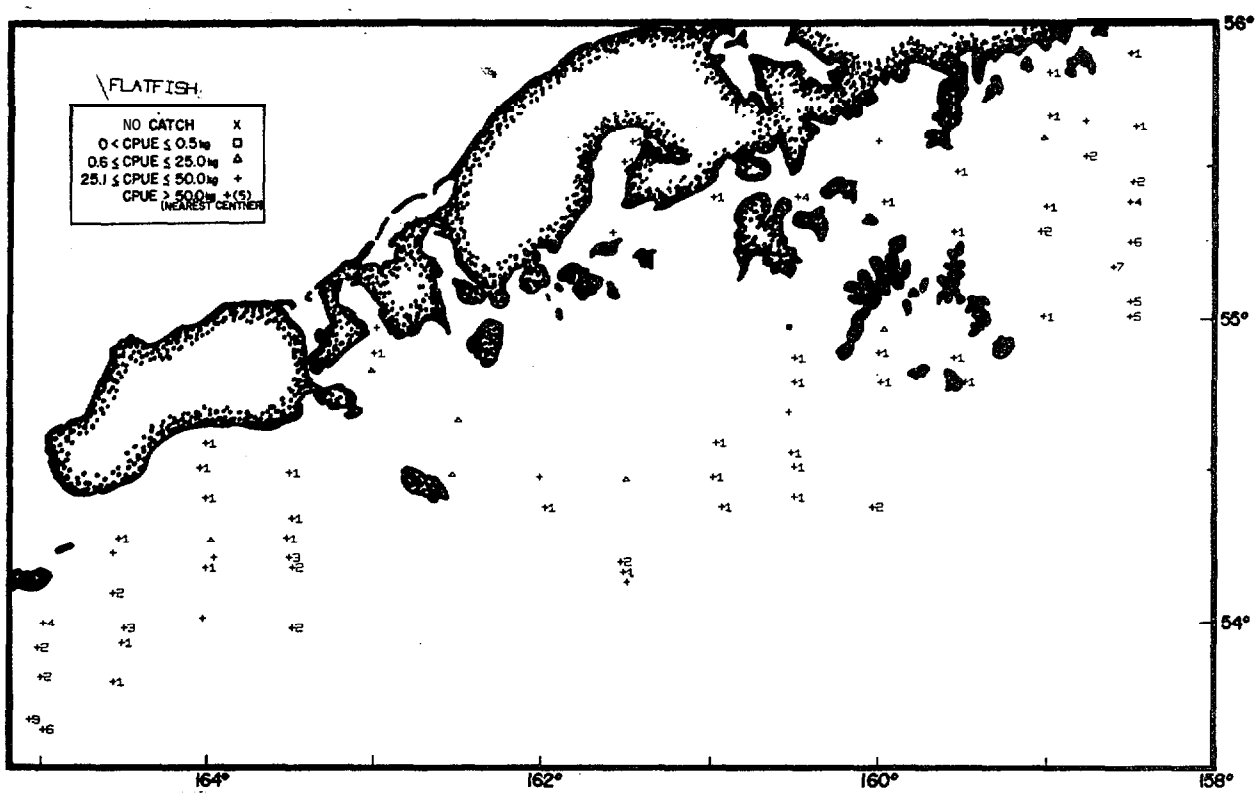


Figure XI-251.--Distribution of **standardized catch** rates la **kg/hr of flatfish** in thr **western Gulf** of Alaska, **Aug.-Nov. 1961 (Cruise 619).**

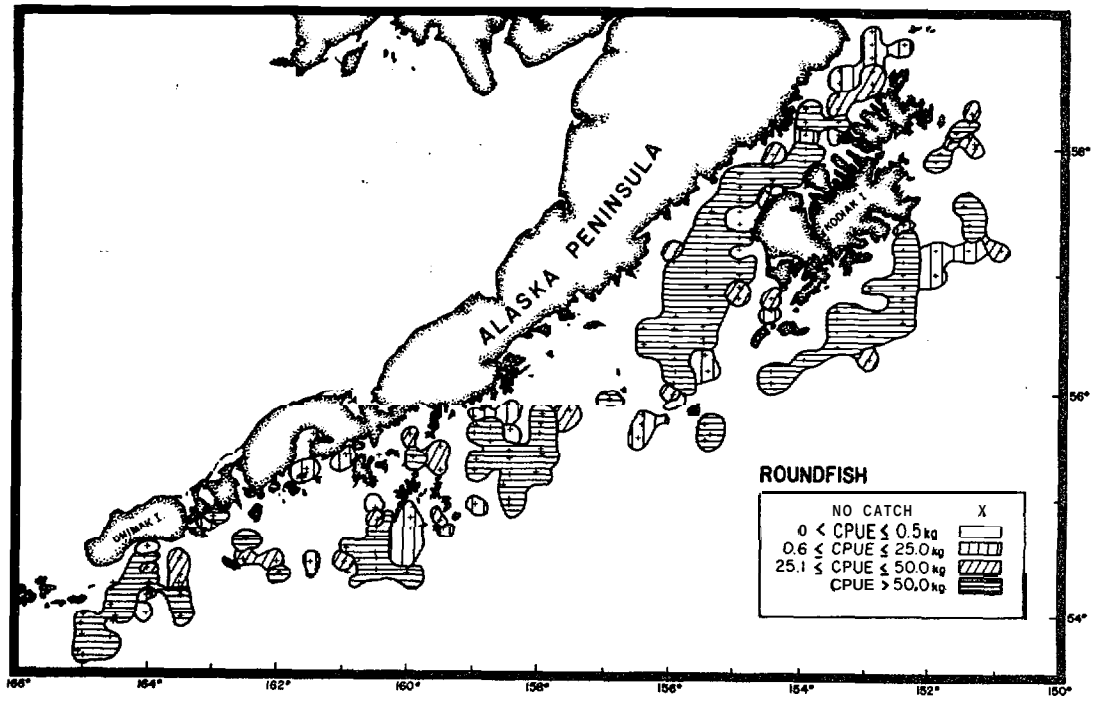


Figure XI-252.**--Distribution** of apparent relative abundance of **round-**fish **in** the western Gulf **of** Alaska, Aug.-Nov. 1961 (Cruise 619).

The flatfish species group was second in total apparent biomass with an estimated 413 thousand mt (27%). Almost half (46%) of the total biomass was found on the outer shelf, while the inner shelf contained 33% and the outer slope 21%. The largest portion of the biomass, occurred in the Chirikof region which, with the Kodiak region contained 59% of the total flatfish biomass (table X1-35). The relative apparent abundance was highest in the Chirikof and Kodiak regions (Figure X1-249). During this survey the flatfish were primarily found in the outer shelf and upper slope where the CPUE averaged 210 and 289 kg/hr. The distribution of the standardized catch rates for flatfishes is presented in Figures X1-250-251.

The third most important species group was the roundfishes which contributed 17% (259 thousand mt) of the total apparent biomass. Fifty-four percent of this total was distributed in the outer shelf, 27% in the inner shelf, followed by 19% in the upper slope. Largest contributors to the total biomass were the Kodiak and Chirikof regions which together made up 61% of the total roundfishes biomass (Table X1-36). CPUE's increased with water depth from 67 kg/hr in the inner shelf to 154 kg/hr in the outer shelf and 160 kg/hr in the upper slope. The mean CPUE for all zones was 114 kg/hr. Highest relative abundance occurred in the Kodiak, Sanak and Chirikof regions (Figure X1-252). The distribution of the standardized catch rates for roundfishes is presented in Figure X1-253-254.

Rockfishes ranked fourth in total apparent biomass, contributing 39 thousand mt (3%). Seventy-one percent of the total was contained in the upper slope and 29% in the outer shelf. The Chirikof region contained the largest percentage of the total biomass, and was followed by Sanak with 25%, and Shumagin, 20%. Relative apparent abundance ranged from 7 kg/hr in the Kodiak region to 25 kg/hr in the Chirikof region (Table X1-37, Figure X1-255). Sanak and Shumagin were the only regions other than Chirikof where the CPLJE exceeded or equaled the average for the western Gulf of Alaska. The average CPUE for the rockfishes increased with increasing water depth from 0.1 kg/hr in the inner shelf to 92 kg/hr in the upper slope. The distribution of the standardized catch rates is presented in Figure X1-256-257.

The smallest contributor to the total apparent biomass was the elasmobranch species group with an estimated 7 thousand mt (0.5% of the total biomass). Although the total biomass of the elasmobranch group was fairly evenly divided between the three depth zones, the largest portion (3 thousand mt) was contained in the inner shelf and 2 thousand mt in the outer shelf and upper slope. The Kodiak, Shelikof, and Chirikof regions which contained 2 thousand mt each, contained 79% of the total biomass (Table X1-38). The relative apparent abundance for elasmobranchs averaged 3 kg/hr in the inner and outer shelves, and 7 kg/hr in the upper slope (Figure X1-258). Largest average CPUE's occurred in the Shelikof and Kodiak regions and overall averaged 3 kg/hr for the western Gulf of Alaska (Figure X1-259-260).

Table XI-36.--Estimated biomass and population size of roundfishes in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass. (mt)	Proportion of total estimated biomass	Estimated population (x 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	122.0	33,365.0	37.5	136.8	42.5	0.24	--
	101-200	276.6	54,507.2	61.2	182.4	56.7	0.30	--
	201-400	41.1	1,169.6	1.3	2.5	0.8	0.47	--
	All zones	178.5	89,041.8	34.4	321.7	41.0	0.28	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	46.0	4,288.8	34.3	17.5	58.5	0.25	--
	201-400	78.3	8,229.5	65.7	12.4	41.5	0.66.	--
	All zones	48.0	12,518.3	4.8	29.9	3.8	0.42	--
Chirikof	l-100	36.7	109614.6	15.4	37.0	20.0	0.29	--
	101-200	186.2	38,010.9	55.1	113.3	61.1	0.34	--
	201-400	163.0	20,336.1	29.5	35.0	18.9	0.58	--
	All zones	111.5	68,961.S	26.6	185.3	23.6	0.37	--
Shumagin	l-100	15.9	3,608.2	9.1	18.7	13.3	0.19	--
	101-200	117.4	25,461.6	64.2	95.9	68.0	0.27	--
	201-400	379.7	10,604.6	26.7	26.4	18.7	0.40	--
	All zones	84.1	39,674.4	15.3	141.0	18.0	0.28	--
Sanak	l-100	109.5	23,387.8	47.8	47.2	44.6	0.50	--
	101-200	91.1	17,671.1	36.1	49.0	46.3	0.36	--
	201-400	527.7	7,838.5	16.0	9.7	9.2	0.80	--
	All zones	115.7	48,897.4	18.9	105.9	13.5	0.46	--
Total	l-100	66.6	70,975.6	27.4	239.7	30.6	0.30	--
	101-200	154.6	139,939.6	54.0	458.1	58.5	0.31	--
	201-400	160.0	48,178.3	18.6	86.0	11.0	0.56	--
	All zones	114.0	259,093.5	100.0	783.8	100.1	0.33	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

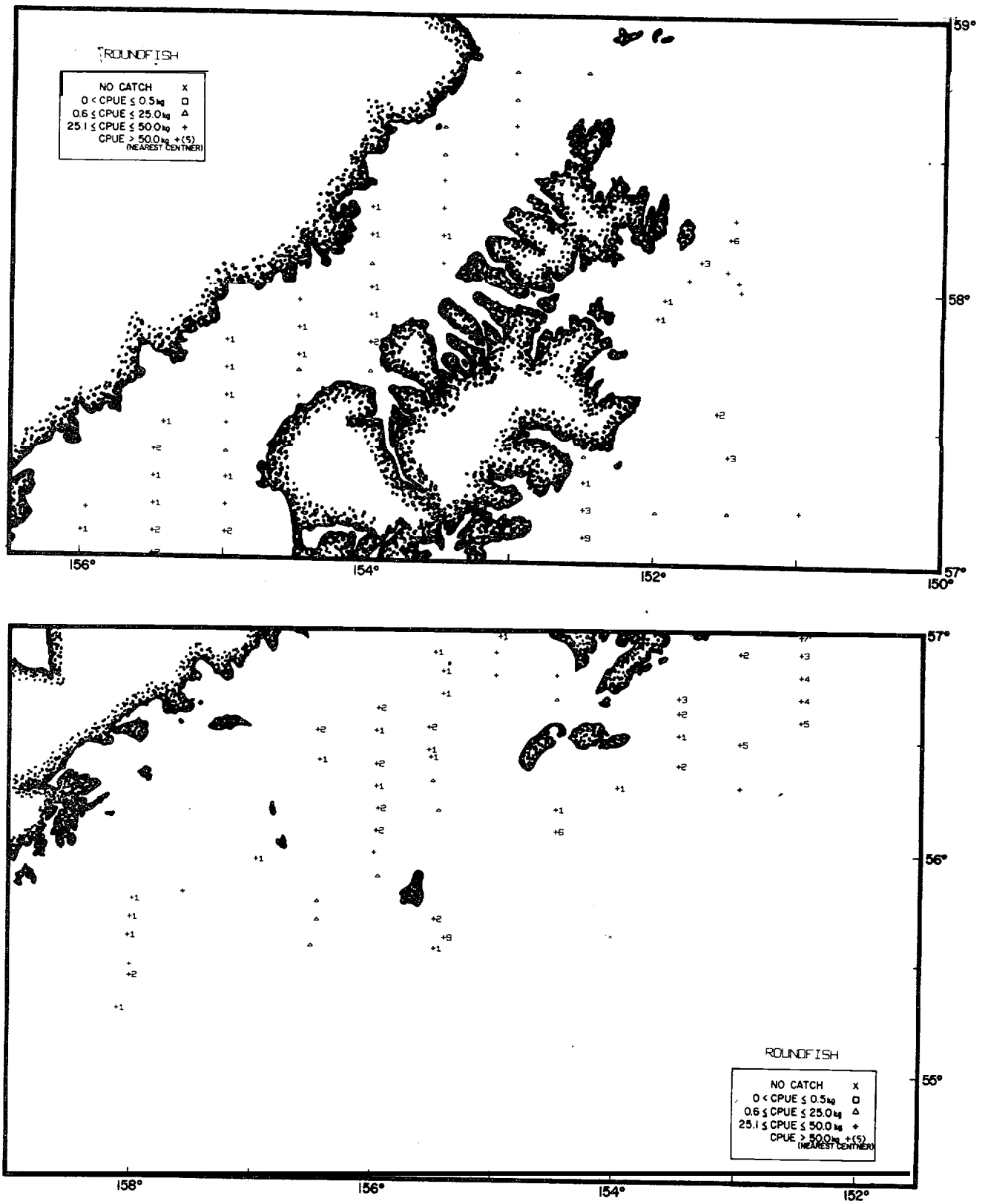


Figure XI-253.--Distribution of standardized catch rates in **kg/hr** of **roundfish** in the **western Gulf of** Alaska, **Aug.-Nov.** 1961 (Cruise 619).

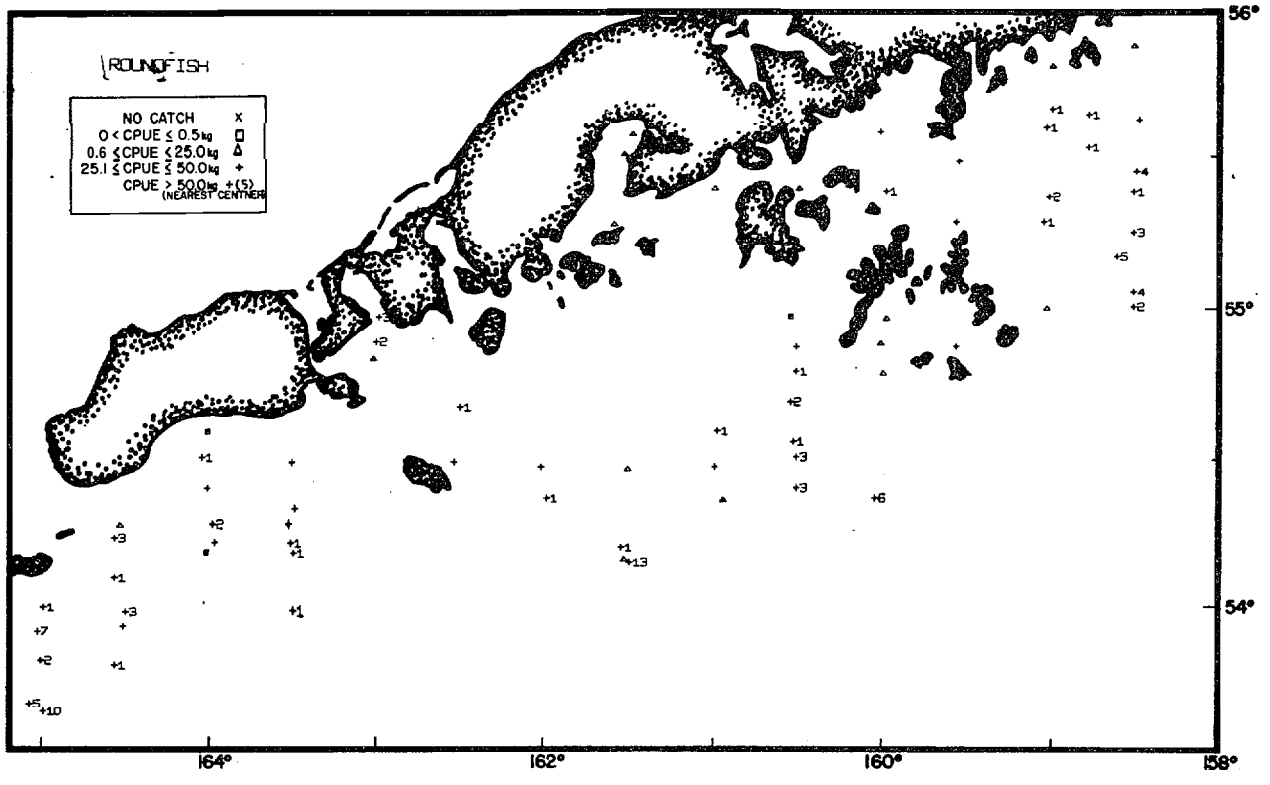


Figure X1-454.--Distribution of standardized catch rates **in kg/hr of roundfish** in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

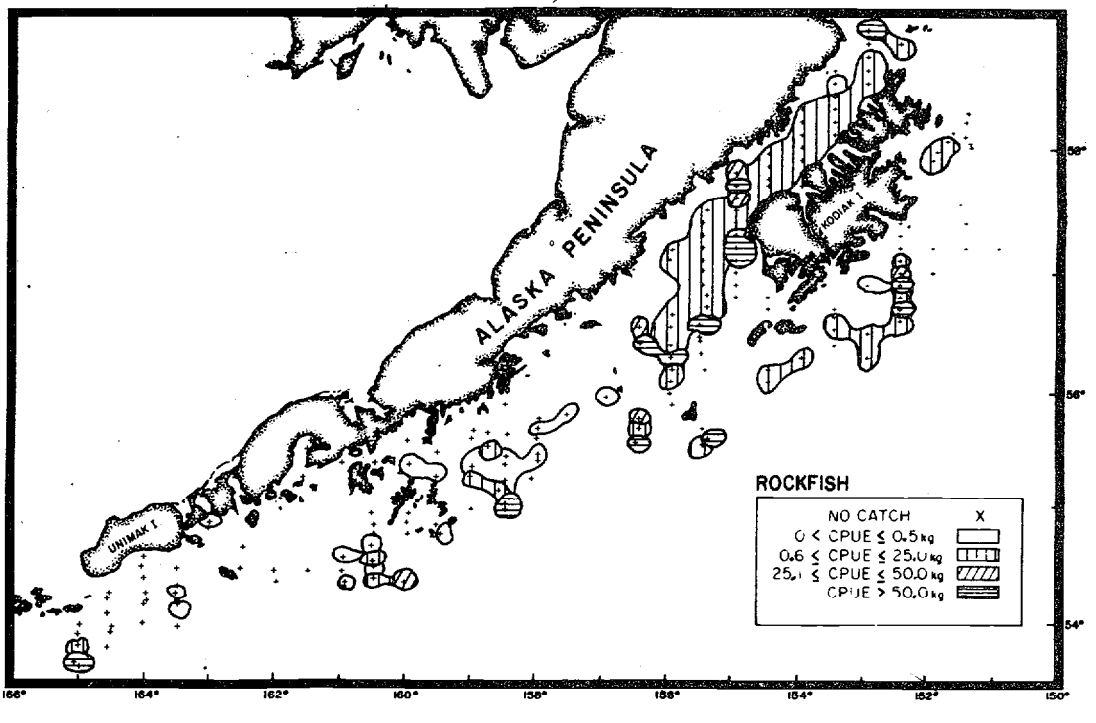
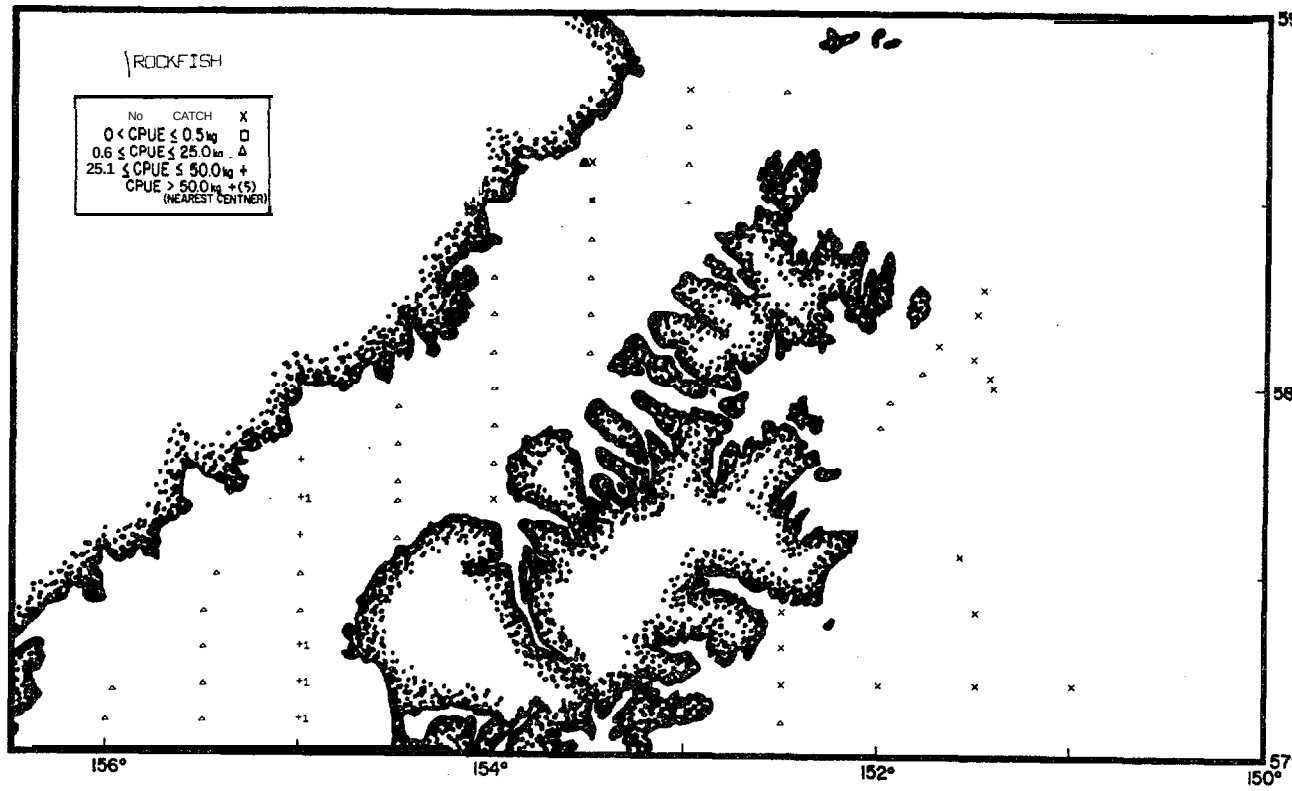


Figure X1-255.--Distribution of apparent **relative abundance** of **rockfish** in the western Gulf of **Alaska,** Aug.-Nov. 1961 **(Cruise 619).**

Table XI-37 .--Estimated biomass and population size of rockfishes in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Leng (cm:
Kodiak	l-100	0.1	40.7	1.2	0.1	1.6	0.52	--
	101-200	16.5	3,254.7	96.2	6.0	95.2	0.54	--
	201-400	3.2	89.7	2.7	0.2	3.2	0.54	--
	All zones	6.8	3,385.1	8.7	6.3	8.9	0.54	--
Shelikof	1-100	--	--	--	--	--	--	--
	101-200	4.2	396.0	14.3	0.9	1&.8	0.46	--
	201-400	22.6	2,374.3	85.7	3.9	81.3	0.60	--
	All zones	10.6	2,770.3	7.1	4.8	6.8	0.58	--
Chirikof	l-100	0	0	0	0	0	- -	--
	101-200	32.0	6,518.5	42.4	11.1	37.9	0.59	--
	201-400	71.1	8,868.0	57.6	18.2	62.1	0.49	--
	All zones	24.9	15,386.5	39.7	29.3	41.6	0.52	--
Shumagin	l-100	3/	1.3	5/	4/	5/	0.05	--
	101-200	1.6	341.4	x.4	1.1	9.3	0.31	--
	201-400	265.6	7,417.2	95.6	10.7	90.7	0.70	--
	All zones	16.5	7,759.9	20.0	11.8	16.7	0.65	--
Sanak	l-100	3/	6.5	0.1	0	0	0.23	--
	101-200	2.8	549.5	5.8	1.7	9.3	0.33	--
	201-400	602.5	8,949.5	94.2	16.6	90.7	0.54	--
	All zones	22.5	9,505.5	24.5	18.3	26.0	0.52	--
Total	l-100	0.1	48.5	0.1	0.1	0.1	0.49	--
	101-200	12.2	11,060.1	28.5	20.8	29.5	0.53	--
	201-400	92.0	27,698.7	71.4	49.6	70.4	0.56	--
	All zones	17.1	38,807.3	100.0	70.5	100.0	0.55	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



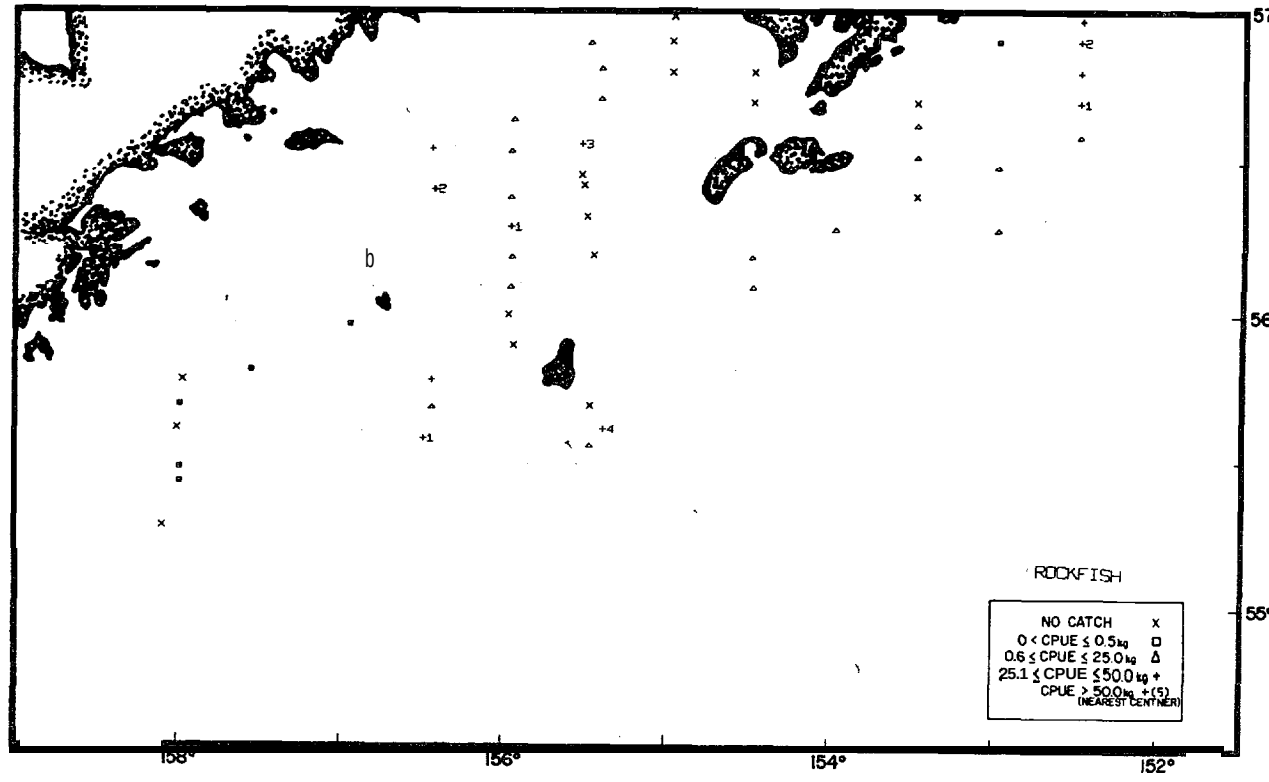


Figure XI-256.--Distribution of standardized catch rates **in kg/hr** of **rockfish in the western Gulf** of **Alaska, Aug.-Nov. 1961 (Cruise 619).**

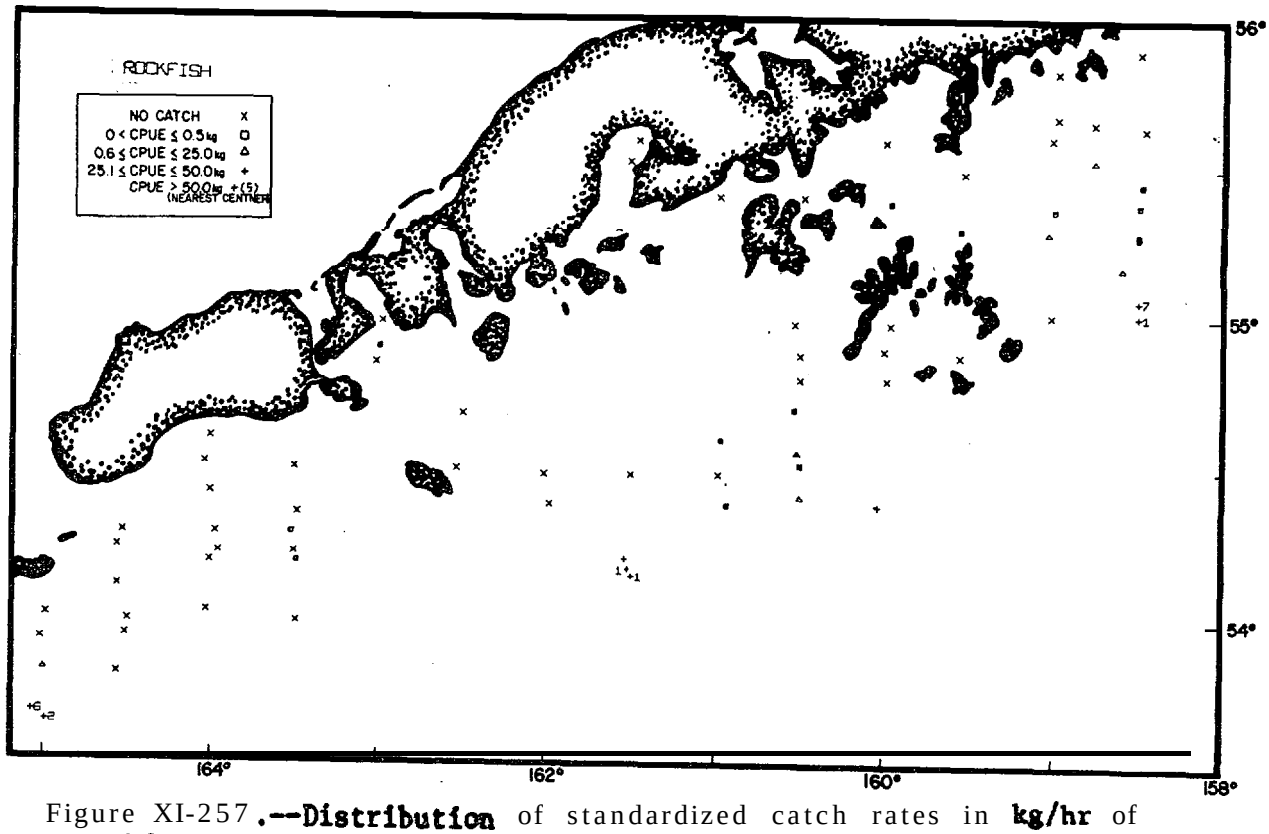


Figure XI-257.--**Distribution** of standardized catch rates in **kg/hr** of **rockfish** in the **western** Gulf of Alaska, Aug.-t&v. 1961 (Cruise 619).

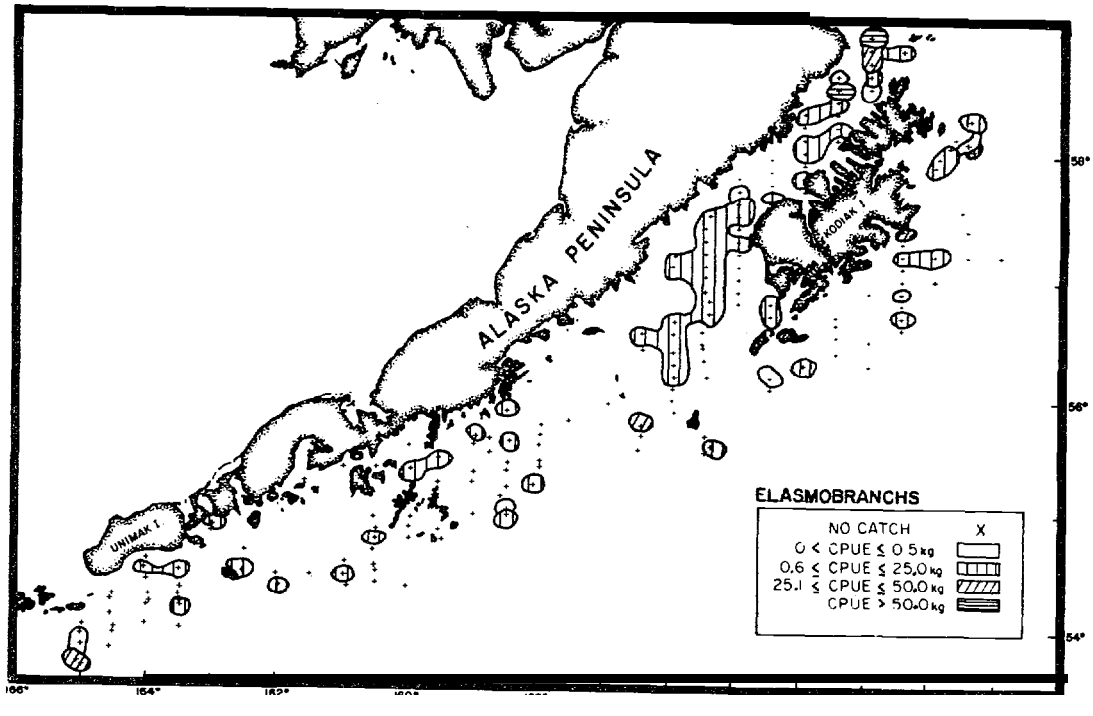
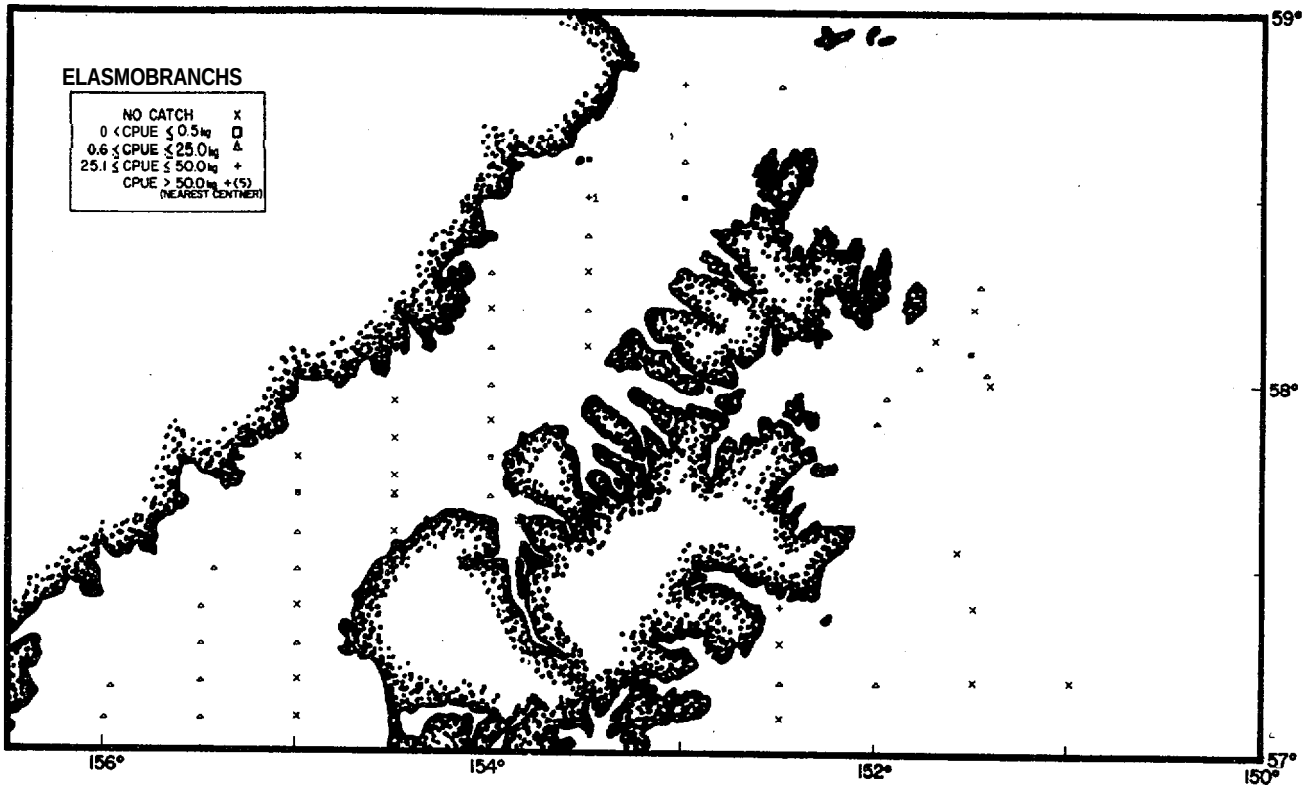


Figure XI-258*--Distribution of apparent relative abundance of **elasmo-**btanchs in the western Gulf of Alaska, **Aug.-Nov. 1961** (Cruise 619).

Table XI-38.--Estimated biomass and population size of elasmobranchs in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	6.7	1,827.9	87.2	0.2	33.3	10.09	--
	101-200	0.8	150.5	7.2	0.2	33.3	0.74	--
	201-400	4.1	117.2	5.6	0.2	33.3	0.50	--
	All zones	4.2	2,095.6	29.2	0.6	18.2	3.56	--
Shelikof	1-100	--	--	--	--	--	--	--
	101-200	14.1	1,310.6	70.7	0.5	50.0	2.52	--
	201-400	5.2	543.1	29.3	0.5	50.0	1.11.	--
	All zones	7.1	1,853.7	25.8	1.0	30.3	1.83	--
Chirikof	l-100	2.4	698.9	40.6	0.1	11.1	4.83	--
	101-200	0.4	89.6	5.2	0.1	11.1	0.75	--
	201-400	7.5	933.1	54.2	0.7	77.8	1.30	--
	All zones	2.7	1,721.6	24.0	0.9	27.3	1.75	--
Shumagin	l-100	0	0	0	0	0	--	--
	101-200	1.9	401.6	97.3	0.2	100.0	2.13	--
	201-400	0.4	11.1	2.7	4/	5/	0.57	--
	All zones	0.9	412.7	5.7	0.2	6.1	1.98	--
Sanak	l-100	1.1	240.5	21.8	0.1	16.7	2.34	--
	101-200	1.8	357.7	32.4	0.1	16.7	3.05	--
	201-400	34.0	505.3	45.8	0.4	66.7	1.36	--
	All zones	2.6	1,103.5	15.4	0.6	18.2	1.87	--
Total	l-100	2.6	2,767.3	38.5	0.4	12.1	6.92	--
	101-200	2.6	2,310.0	32.1	1.1	33.3	2.10	--
	201-400	7.0	2,109.8	29.4	1.8	54.6	1.17	--
	All zones	3.1	7,187.1	100.0	3.3	100.0	2.18	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



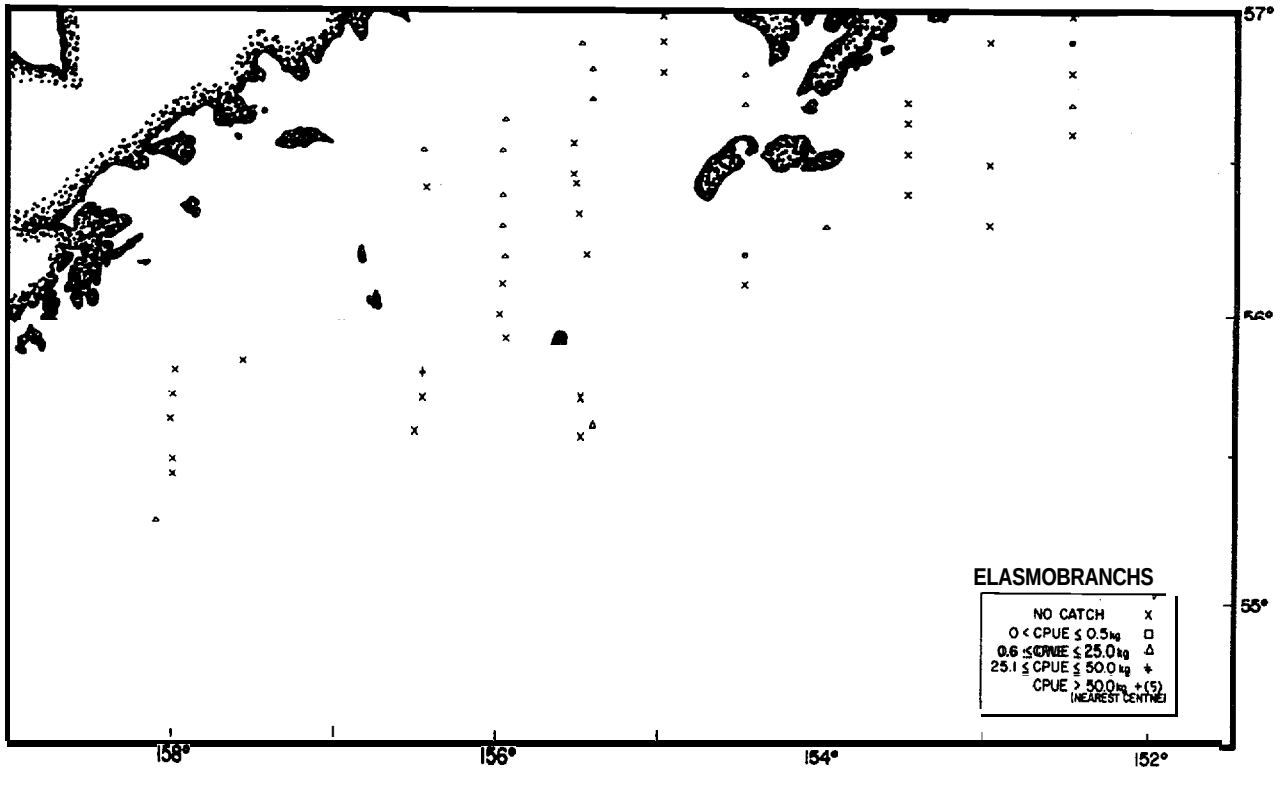


Figure XI-259.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

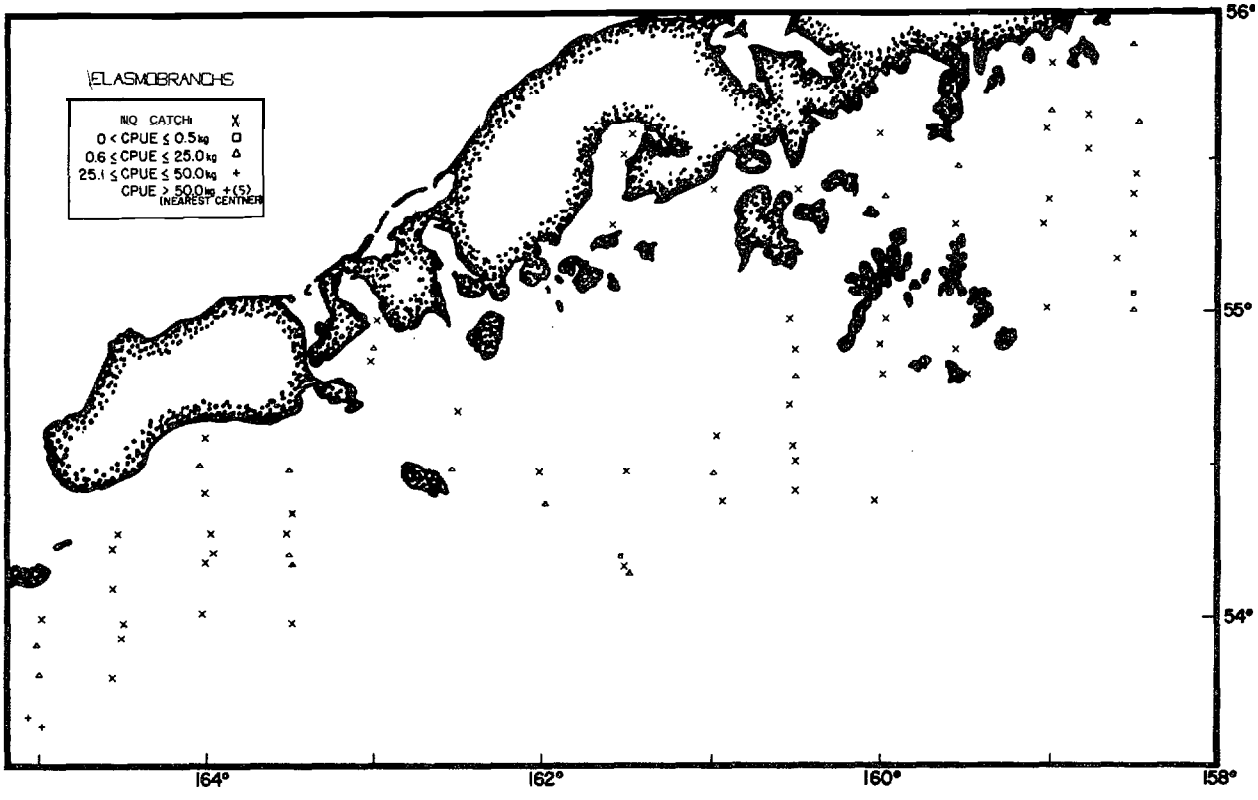


Figure XI-260.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

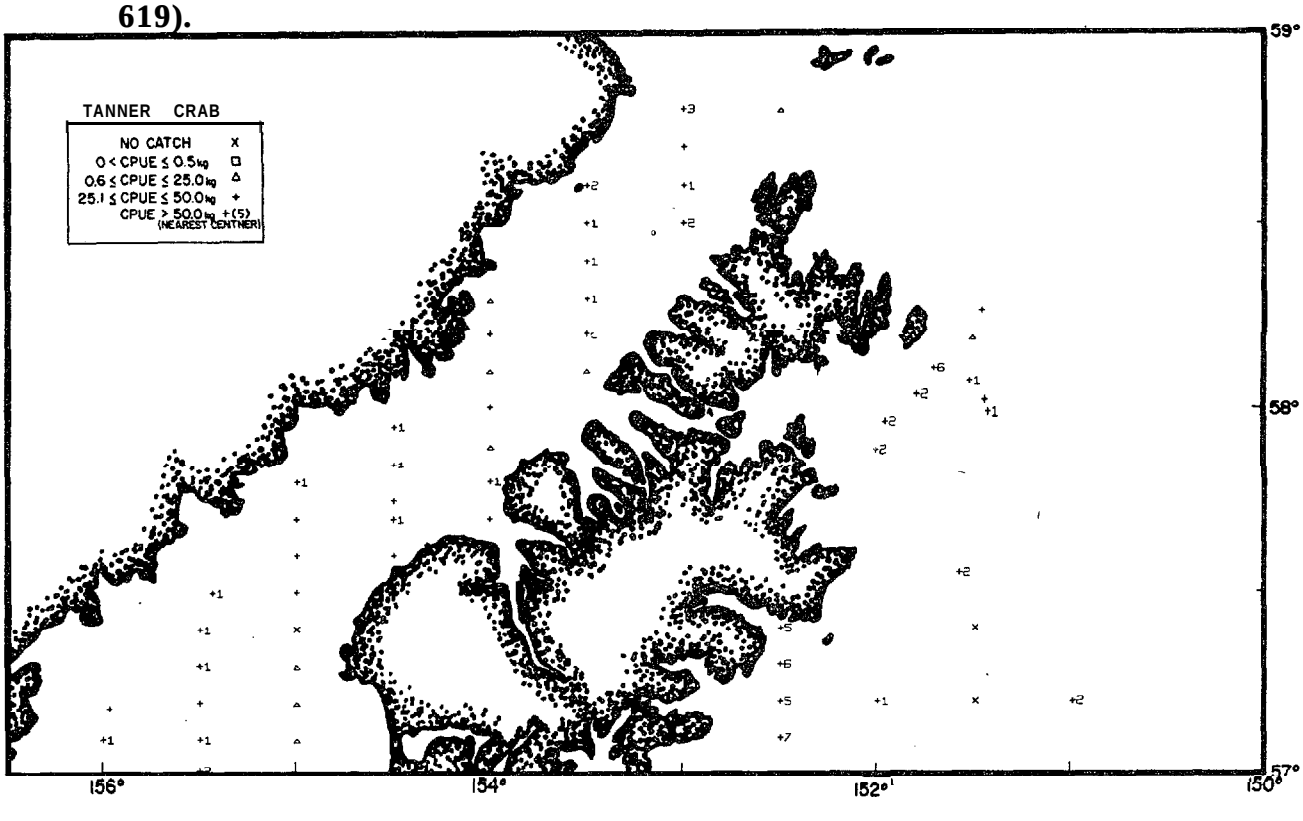


Figure XI-261.--Distribution of standardized catch rates in kg/hr of Tanner crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Distribution, Relative Apparent Abundance, Biomass, and Size Composition Features of Principal Species of Fish and Invertebrates

TANNERCRAB

Distribution and Abundance--In the western Gulf of Alaska, Tanner crab had the highest species mean CPUE (187 kg/hr) and were widely distributed through&t the survey area (Figures X1-261-262). Highest relative apparent abundance (426 kg/hr) occurred in the Sanak region which was the only region with a mean catch rate greater than the average of the western Gulf of Alaska. However, all regions except Shelikof produced mean CPUE's exceeding 100 kg/hr. Relative apparent abundance was highest in the outer shelf (277 kg/hr) and lowest in the upper slope (83 kg/hr) (Figure X1-263).

Biomass-The estimated biomass for Tanner crab was 425 thousand mt, of which 59% was contained in the outer shelf, 35% in the inner shelf, and 6% in the upper slope (Table XI-39). The Sanak region contained the largest portion of the biomass (42%), and along with the Kodiak (21%) and Chirikof (19%) regions contained 82% of the total Tanner crab biomass. The Tanner crab biomass estimate should be considered minimal as otter trawls fished at the towing speeds used during these surveys do not adequately sample the larger male crabs.

Size composition-No length frequency data were collected for this species.

KING CRAB

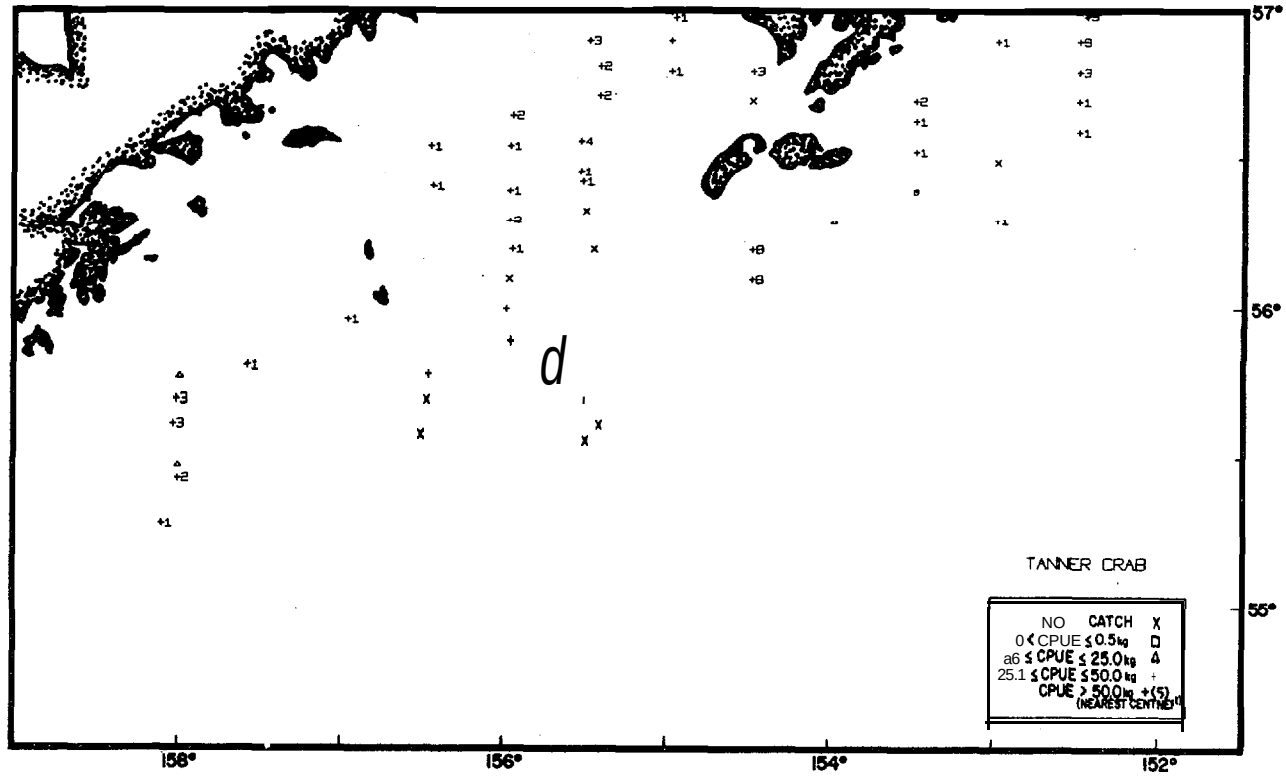
Distribution and Abundance--King crab ranked second in relative apparent abundance in the western Gulf of Alaska. The mean CPUE was highest in the inner shelf and outer shelf depth zones and decreased in the upper slope (Figures XI-264-265). Chirikof and Kodiak were the only regions where the mean CPUE exceeded the average for the western Gulf of Alaska (Figure X1-266).

Biomass -The total apparent biomass of king crab was estimated to be 390 thousand mt. Sixty-eight percent was located in the Chirikof region, which together with the Kodiak region contained 92% of the total biomass (Table X1-40). The majority of the total biomass was also contained on the continental shelf where the inner shelf and outer shelf held 94% of the total. The King crab biomass estimate should be considered minimal due to the inability of the otter trawl to adequately sample the larger male crabs when towed at speeds utilized during this survey.

Size composition. -No length frequency data were taken for this species.

TURBOT

Distribution and Abundance-Turbot, the third most abundant species, were orevalent throughout the western Gulf of Alaska (Figures X1-267-268). Mean catch rates, which increased with depth, averaged 10 kg/hr in the inner shelf, 94 kg/hr in the outer shelf, and 184 kg/hr in the upper slope and averaged 66 kg/hr over all depth zones. The highest relative apparent abundance occurred in the Chirikof and Shelikof regions (Figure X1-269).



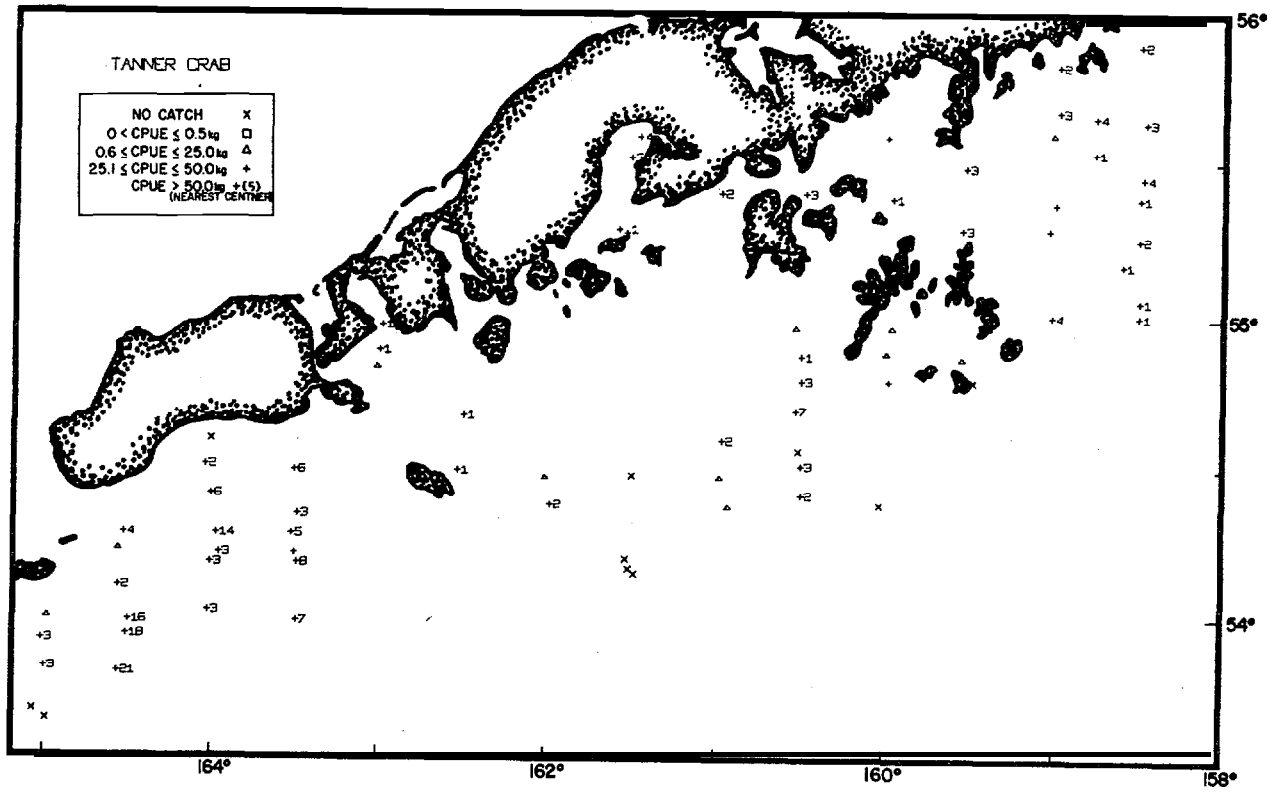


Figure XI-262.--Mstribution of standardized catch rates in kg/hr of Tanner crab in the western **Gulf of Alaska, Aug.-Nov. 1961** (Cruise **619).**

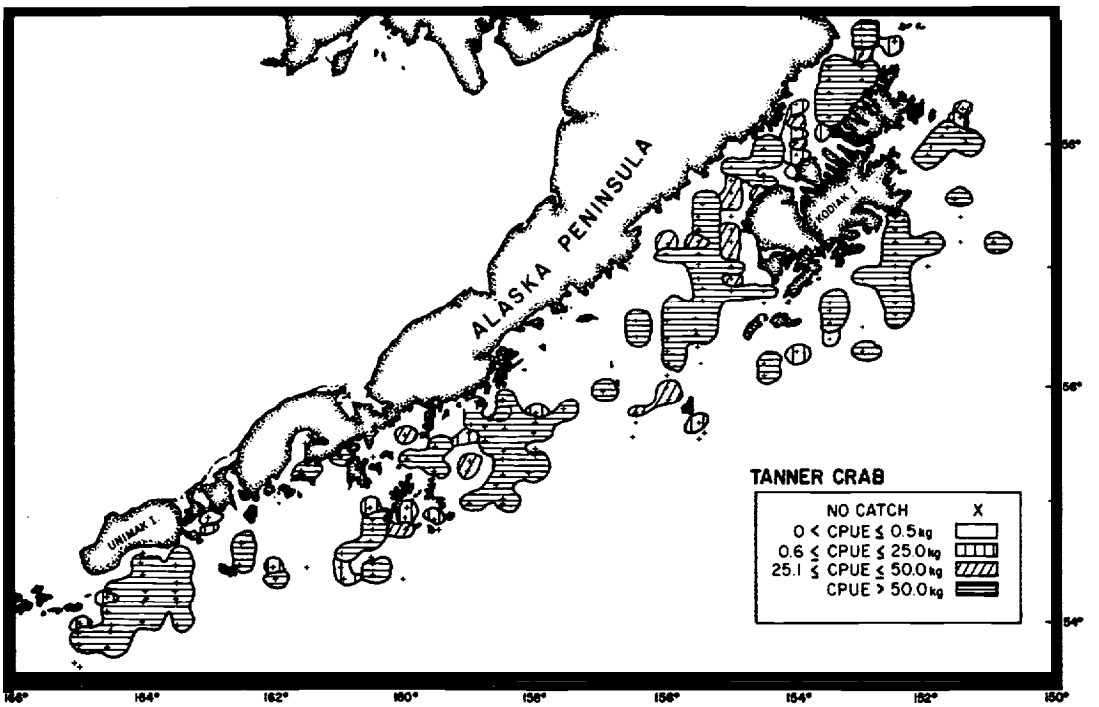


Figure X1-263.--**Distribution** of apparent relative abundance **of Tanner** crab in the western Gulf **of** Alaska, **Aug.-Nov. 1961** (Cruise 619).

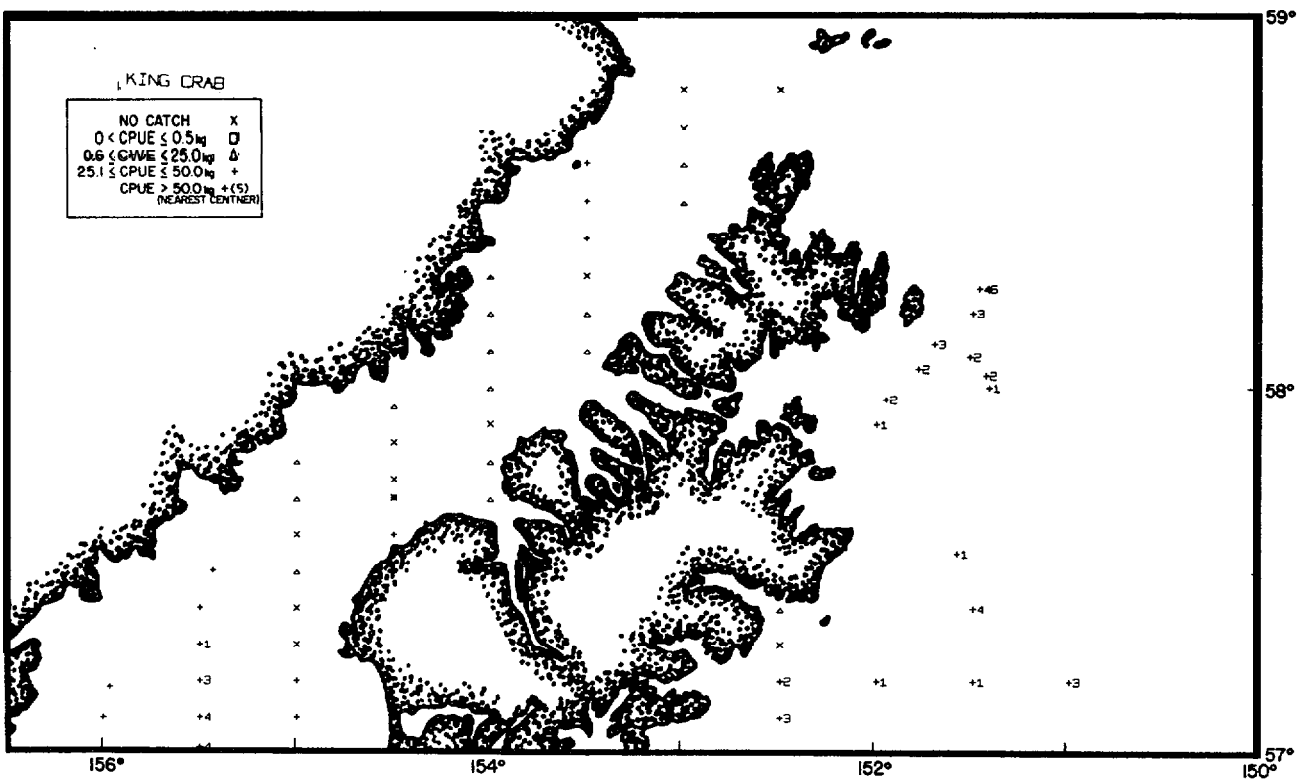
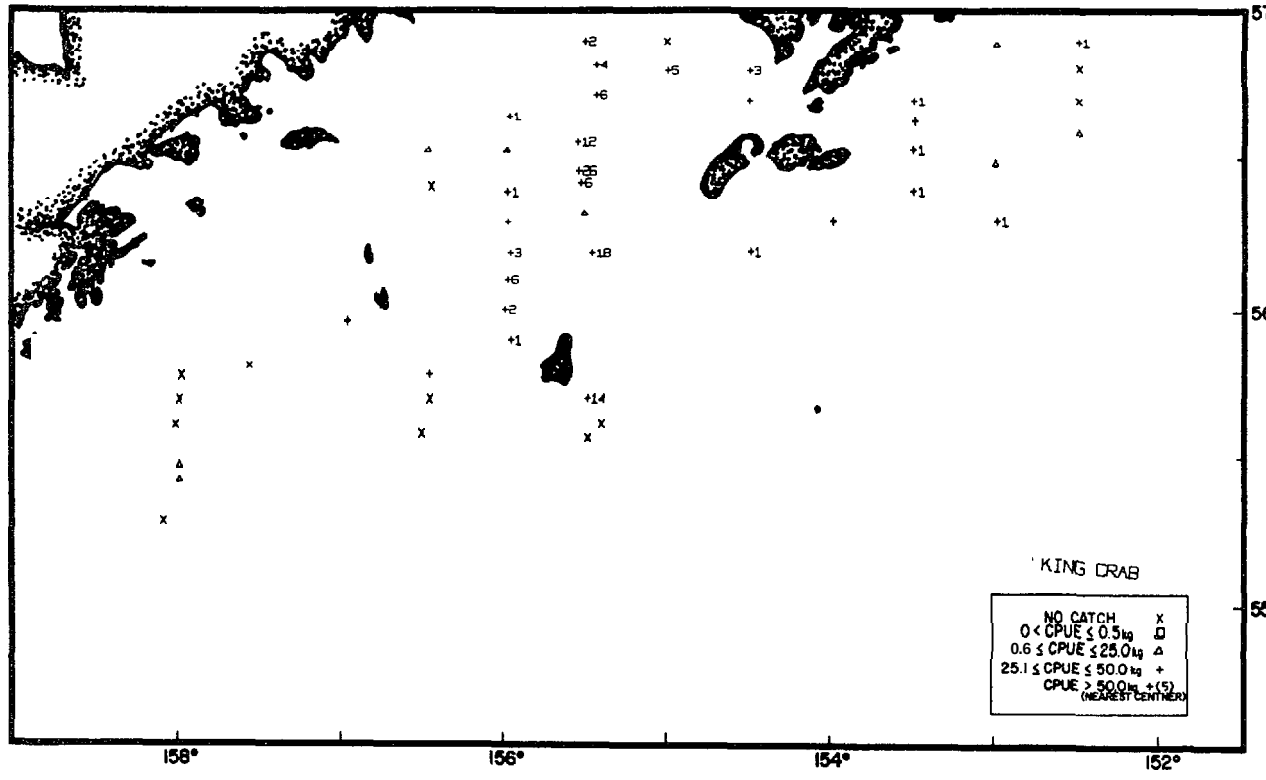


Figure xX-264.--Distribution of **standardized** catch rates in **kg/hr** of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-39.--Estimated biomass and population size of Tanner crab (*Chionoecetes sp.*) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	113.8	31,105.3	35.4	63.5.	41.3	0.49	--
	101-200	272.4	53,683.7	61.1	85.1	55.3	0.63	--
	201-400	108.4	3.083.8	3.5	5.2	3.4	0.59	--
	All zones	176.1	87,872.8	20.7	153.8	18.5	0.57	--
Shelikof	1-100	--	--	--	--	--	--	--
	101-200	112.0	10,439.6	65.7	25.3	64.9	0.41	--
	201-400	51.8	5,442.1	34.3	13.7	35.1	0.40	--
	All zones	60.8	15,881.7	3.7	39.0	4.7	0.41'	--
Chirikof	l-100	77.8	22,535.0	27.3	61.7	28.9	0.37	--
	101-200	223.5	45,638.6	55.2	130.2	61.0	0.35	--
	201-400	116.3	14,518.0	17.6	21.6	10.1	0.67	--
	All zones	133.7	82,691.6	19.4	213.5	25.7	0.39	--
Shumagin	l-100	88.0	19,970.8	33.9	48.2	45.6	0.41	--
	101-200	171.1	37,113.6	63.0	55.1	52.1	0.67	--
	201-400	64.3	1.796.0	3.1	2.4	2.3	0.76	--
	All zones	124.8	58,880.4	13.8	105.7	12.7	0.56	--
Sanak	l-100	358.8	76,635.5	42.5	162.1	51.0	0.47	--
	101-200	533.4	103,519.0	57.5	155.8	49.0	0.66	--
	201-400	0	0	0	0	0	--	--
	All zones	426.4	180,154.5	42.3	317.9	38.3	0.57	--
Total	l-100	140.9	150,246.6	35.3	335.5	40.4	0.45	--
	101-200	276.6	250,394.5	58.9	451.5	54.4	0.55	--
	201-400	82.5	24,839.9	5.8	42.9	5.2	0.58	--
	All zones	187.2	425,481.0	100.0	829.9	100.0	0.51	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



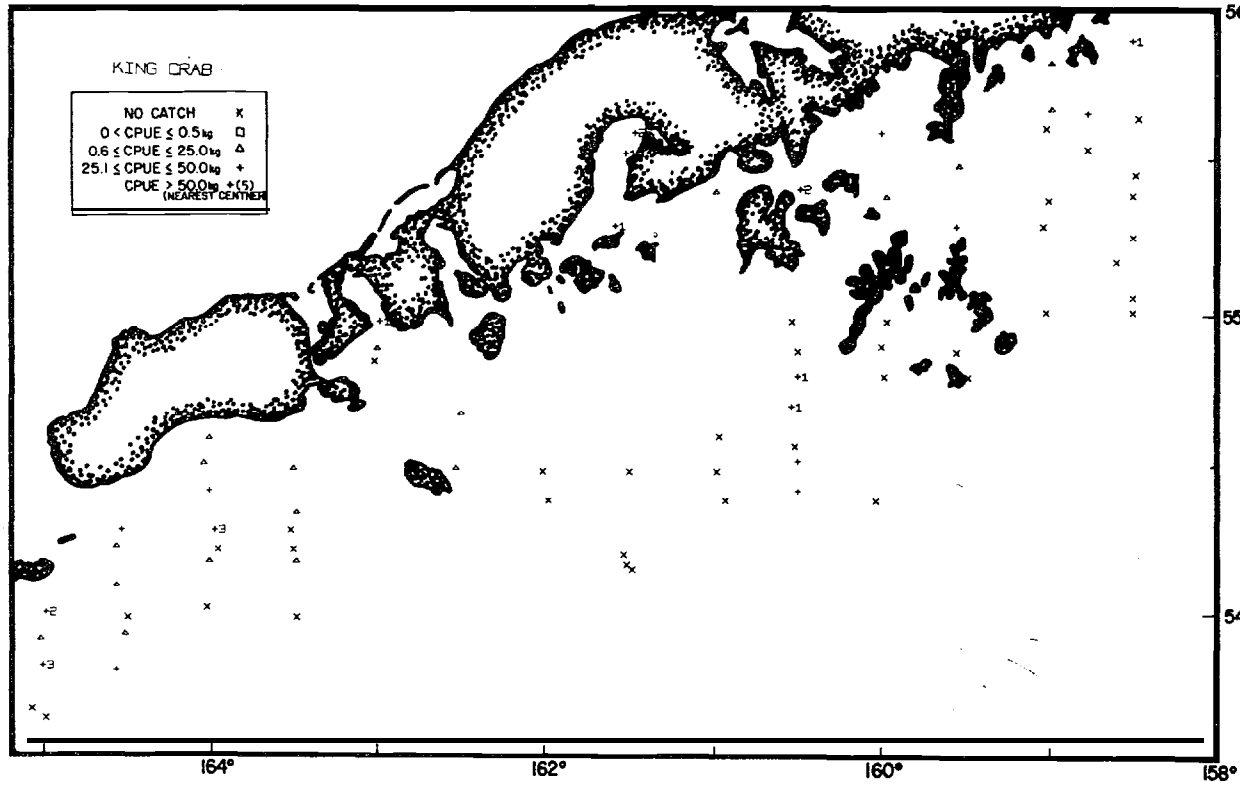


Figure XI-265.--Distribution of standardized catch rates in kg/hr of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

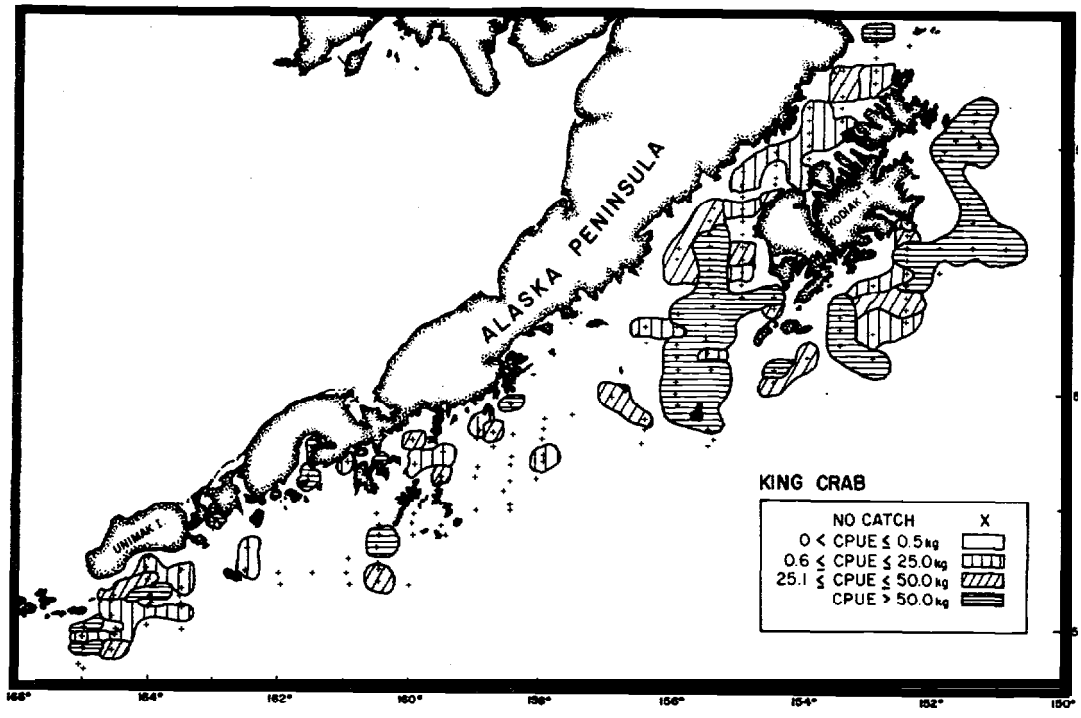


Figure XI-266.--Distribution of apparent relative abundance of king crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

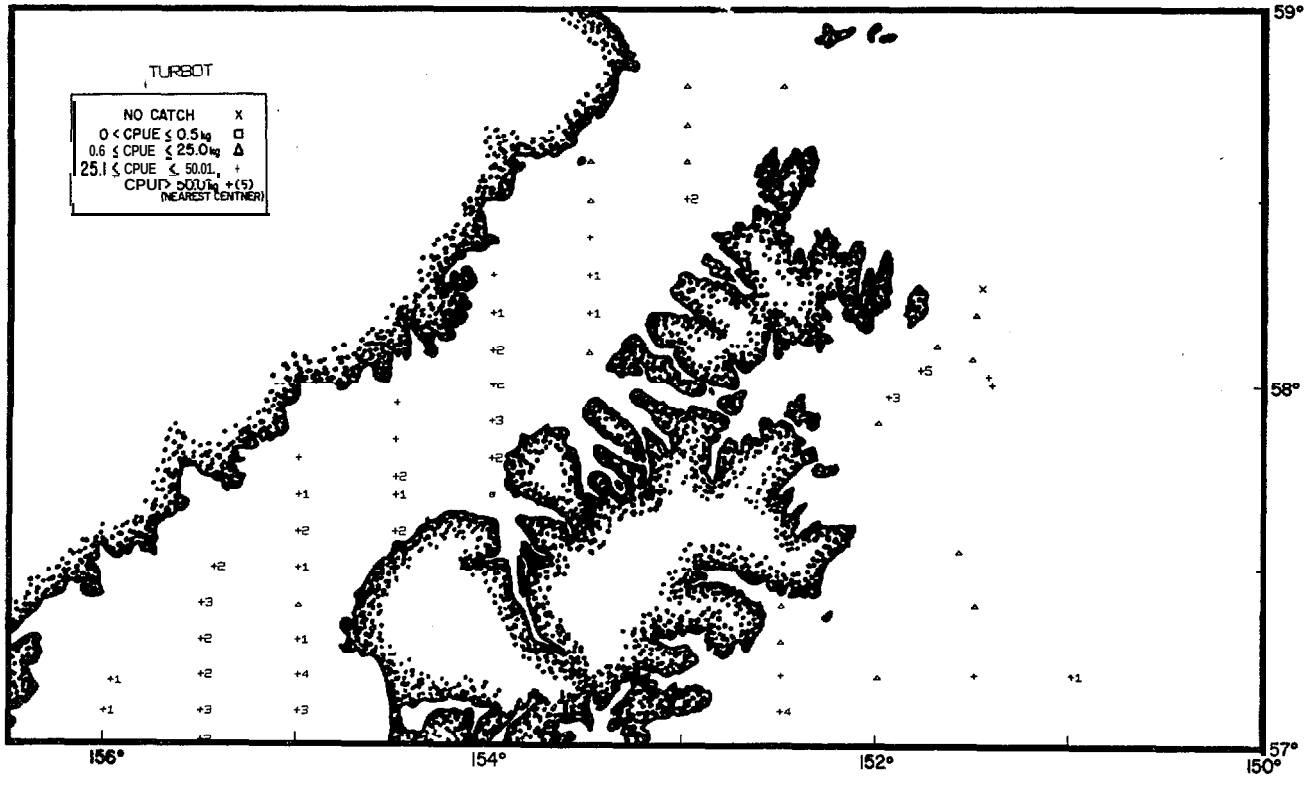
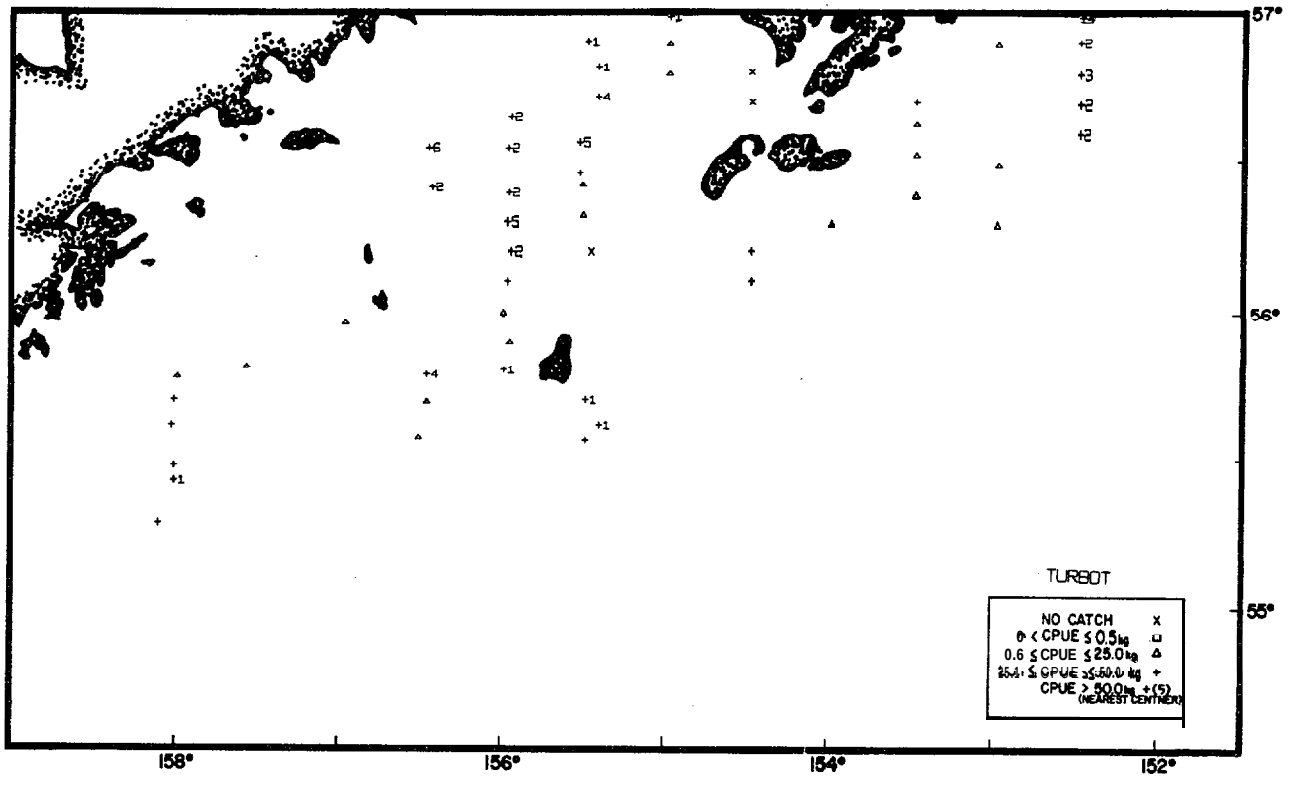


Figure XI-267.--Distribution of standardized catch rates in kg/hr of turbot in the western Gulf of Alaska, Aug.-&w. 1961 (Cruise 619).

Table XI-40.--Estimated biomass and population size of king crab (Lithodidae) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Mean size per individual[2/] Length (cm)
Kodiak	l-100	94.1	25,737.2	27.7	25.5	42.9	1.01	--
	101-200	336.9	66,380.0	71.4	33.4	56.1	1.98	--
	201-400	30.5	-867.7	0.9	0.6	1.0	1.65	--
	All zones	186.4	92,984.9	23.9	59.5	27.1	1.56	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	16.4	1,528.0	20.7	0.5	22.7	3.18	--
	201-400	55.7	5,858.4	79.3	1.7	77.3	3.39	--
	All zones	28.3	7,386.4	1.9	2.2	1.0	3.35	--
Chirikof	1-100	625.7	181,212.0	68.1	79.6	54.8	2.28	--
	101-200	342.6	69,937.4	26.3	61.0	42.0	1.15	--
	201-400	118.9	14,839.0	5.6	4.8	3.3	3.06	--
	All zones	429.9	265,988.4	68.2	145.4	66.3	1.83	--
Shumagin	l-100	2.3	514.6	10.0	0.6	20.7	0.86	--
	101-200	21.5	4,655.8	90.0	2.3	79.3	1.99	--
	201-400	0	0	0	0	0	--	--
	All zones	11.0	5,170.4	1.3	2.9	1.3	1.76	--
Sanak	l-100	45.5	9,712.6	53.1	7.5	79.8	1.29	--
	101-200	44.2	8,569.7	46.9	1.9	20.2	4.50	--
	201-400	0	0	0	0	0	--	--
	All zones	43.3	18,282.3	4.7	9.4	4.3	1.94	--
Total	l-100	203.7	217,176.4	55.7	113.2	51.6	1.92	--
	101-200	166.9	151,070.9	38.9	99.1	45.2	1.52	--
	201-400	71.6	21,565.1	5.5	7.1	3.2	3.04	--
	All zones	171.5	389,812.4	100.1	219.4	100.0	1.78	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



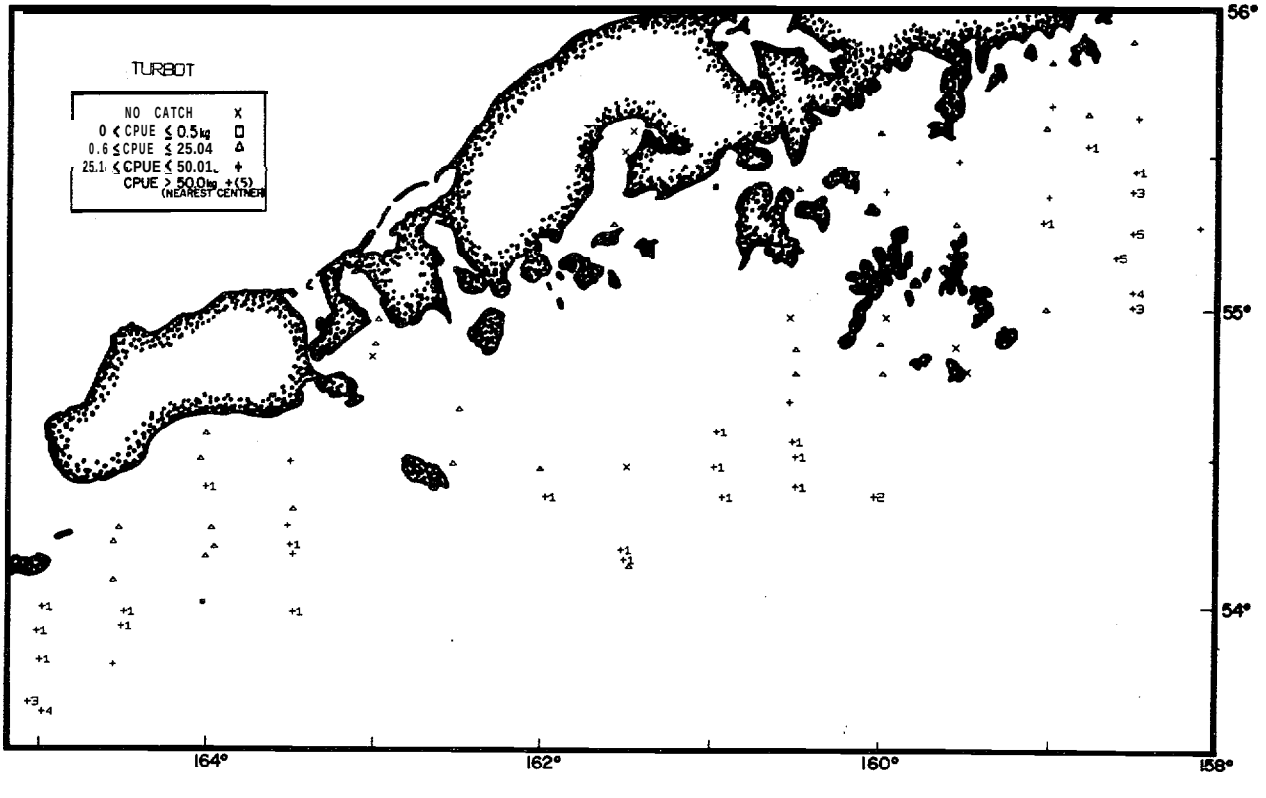


Figure XI-268 .--Distribution of standardized catch **rates** in **kg/hr** of turbot in the western Gulf of Alaska, **Aug.-Nov.** 1961 (Cruise 619).

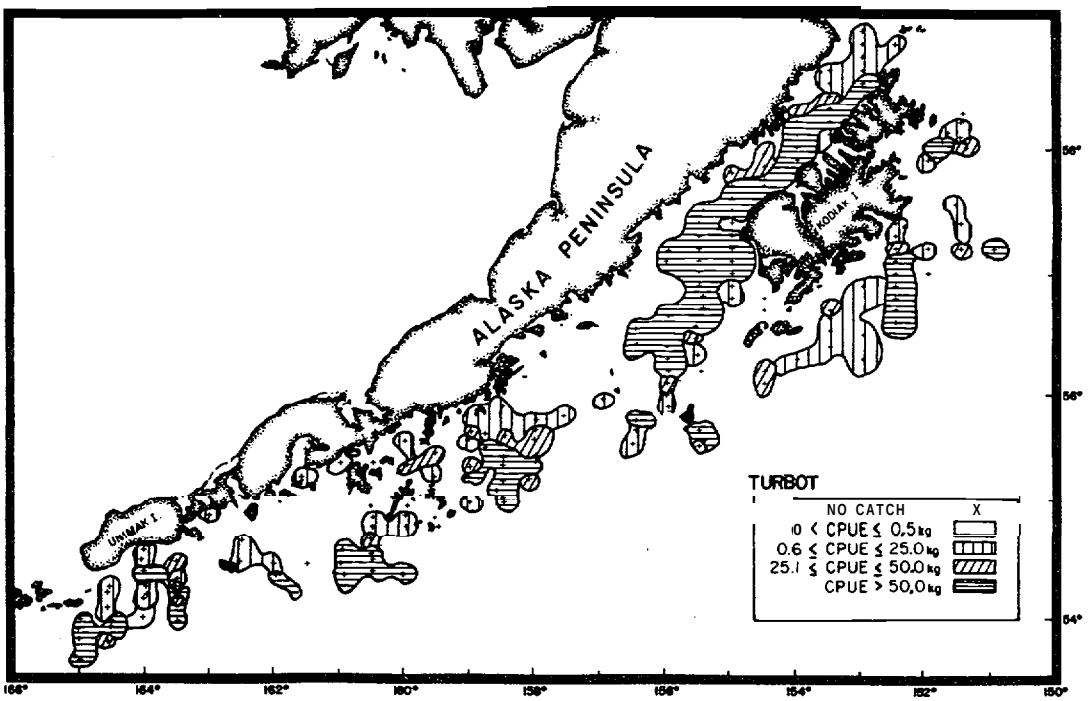


Figure X1-269.--Distribution of apparent relative abundance of turbot in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

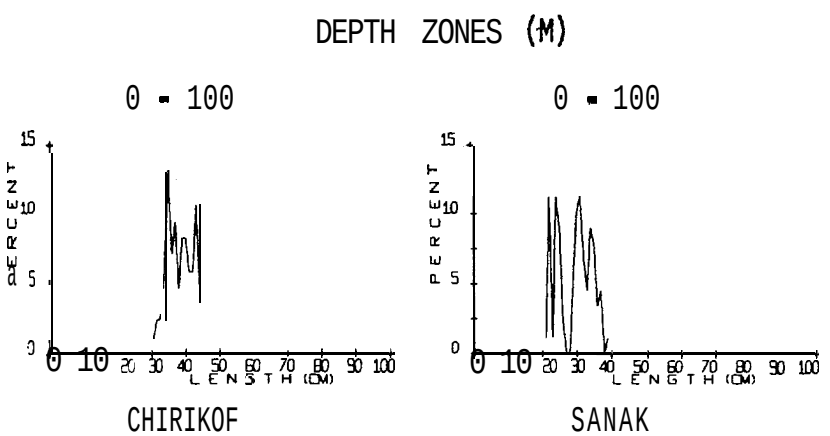


Figure X1-270.-Percentage length **frequencies** of **turbot** from the **Gulf** of **Alaska** (Cruise **619).**

Biomass --Total apparent biomass of turbot was estimated to be 151 thousand mt, of which the outer shelf held 85 thousand mt and upper slope 56 thousand mt. Together these depth zones contained 93% of the total biomass (Table X1-41). The Chirikof region contained the largest part of the total biomass, (39%), while the remainder was fairly evenly divided amongst the other four areas.

Size composition-Random length frequency samples of turbot were measured on the inner shelf depth zone of the Sanak region where the sexes combined ranged from 21 to 39 cm and averaged 29.4 cm and in the inner shelf depth zone of the Chirikof region where sexes combined ranged from 30 to 47 cm and averaged 37.9 cm. (Figure XI-270).

COTTIDS

Distribution and Abundance-During this survey, members of the family Cottidae were not identified to species, but were lumped together as cottids. In the western Gulf of Alaska, cottids attained a relative apparent abundance of 55 kg/hr (Figures X1-271-272). Mean CPUE's greater than the western Gulf of Alaska average were obtained in the Kodiak and Sanak regions (Table X1-42). Cottids attained the highest CPUE's on the continental shelf where they averaged 75 kg/hr in the outer shelf and 51 kg/hr in the inner shelf.

Biomass -Total apparent biomass for cottids was estimated at 124 thousand mt, of which 55% was found in the outer shelf, 43% in the inner shelf, and 2% in the upper slope. Kodiak had the largest portion of the biomass, (37%), and along with the Sanak (26%) and Chirikof regions (21%) contained 84% of the total.

Size Composition-No length frequency data were collected for this species.

ROCK SOLE

Distribution and Abundance-Rock sole, which are primarily found on the continental shelf, produced an overall mean CPUE of 35 kg/hr. Highest relative apparent abundance occurred in the inner shelf depth zone and decreased with increasing water depth to 19 kg/hr in the outer shelf and 0.1 kg/hr in the upper slope (Figures XI-273-274). Regions which produced the highest CPUE's were Kodiak and Sanak (Figure XI-275).

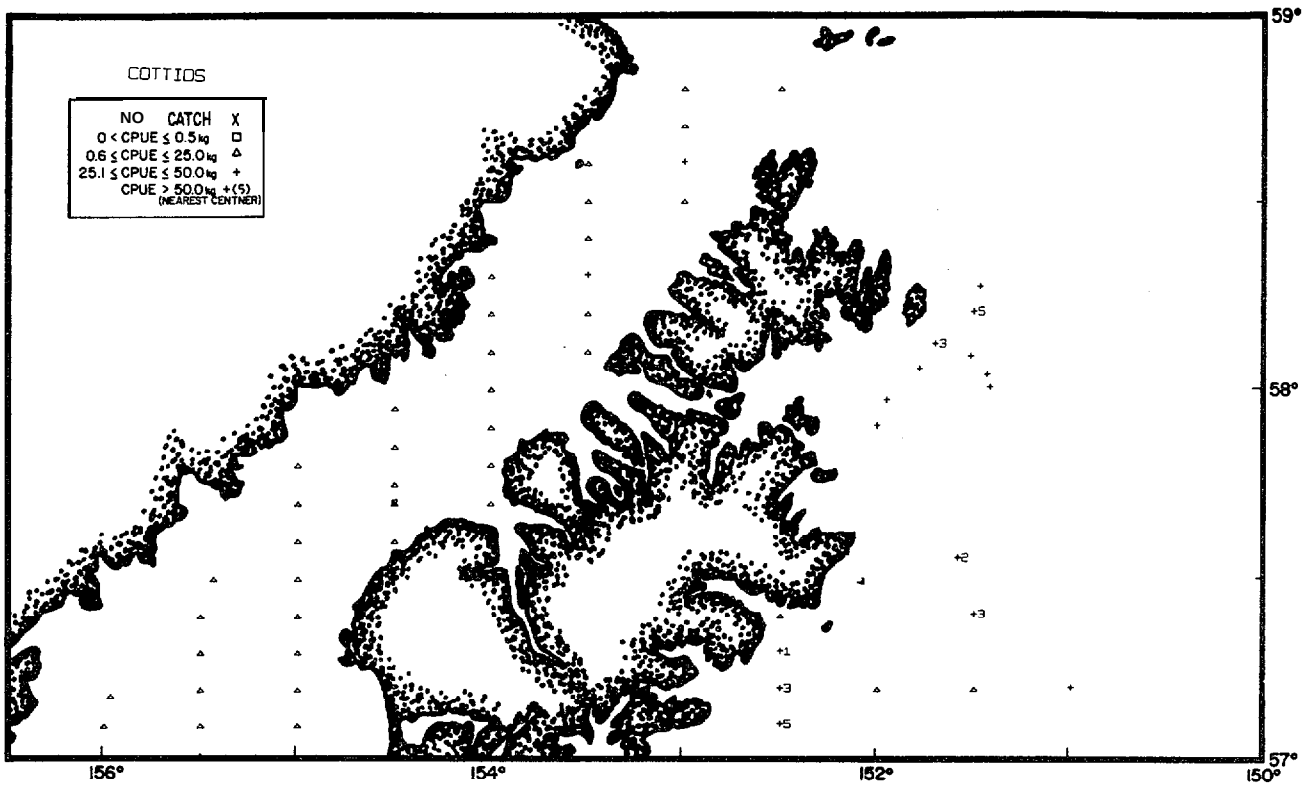
Biomass-In the western Gulf of Alaska, rock sole produced the fifth largest apparent biomass of which over 99% was found on the continental shelf, 78% in the inner shelf and almost 22% in the outer shelf (Table X1-43). The Kodiak region contributed 43% (34 thousand mt) to the total biomass while the remaining portion was divided primarily between Sanak (25%), Shumagin (17%), and Chirikof (16%). Biomass estimates for rock sole are probably low as this species is abundant during summer months in shallow, untrawlable areas.

Size Composition--Random length frequency samples of rock sole were measured only in the inner shelf depth zone of the Chirikof region where the sexes combined ranged from 17 to 40 cm and averaged 25.7 cm. (Figure X1-276).

Table XI-41,--Estimated biomass and population size of turbot (Atheresthes stomias) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Kodiak	l-100	12.9	3,515.7	12.6	25.5	22.4	0.14	--
	101-200	121.9	24,010.9	86.0	85.9	75.3	0.28	--
	201-400	14.4	408.6	1.5	2.7	2.4	0.15	--
	All zones	56.0	27,935.2	18.5	114.1	24.2	0.24	--
Shelikof	1-100	--	--	--	--	--	--	--
	101-200	75.1	6,999.6	3117	21.1	42.6	0.33	--
	201-400	143.5	15,082.5	68.3	28.4	57.4	0.53	--
	All zones	84.5	22,082.1	14.6	49.5	10.5	0.45	--
Chirikof	l-100	8.5	2,454.6	4.2	11.8	8.0	0.21	37.9
	101-200	156.2	31,891.0	54.3	94.7	64.3	0.34	--
	201-400	195.9	24,441.2	41.6	40.8	27.7	0.60	--
	All zones	95.0	58,786.2	39.0	147.3	31.3	0.40	--
Shumagin	1-100	3.0	688.7	2.7	11.5	11.4	0.06	--
	101-200	65.5	14,215.4	55.8	65.3	64.9	0.22	--
	201-400	377.9	10,555.5	41.5	23.9	23.7	0.44	--
	All zones	53.9	25,459.6	16.9	100.7	21.4	0.25	--
Sanak	l-100	18.4	3,939.8	23.7	14.4	24.1	0.27	29.4
	101-200	39.3	7,623.5	45.9	31.4	52.5	0.24	--
	201-400	339.2	5,037.6	30.4	14.0	23.4	0.36	--
	All zones	39.3	16,600.9	11.0	59.8	12.7	0.28	--
Total	l-100	9.9	10,598.2	7.0	63.2	13.4	0.17	--
	101-200	93.6	84,740.4	56.2	298.4	63.3	0.28	--
	201-400	184.4	551525.4	36.8	109.8	23.3	0.51	--
	All zones	66.4	150,864.0	100.0	471.4	100.0	0.32	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



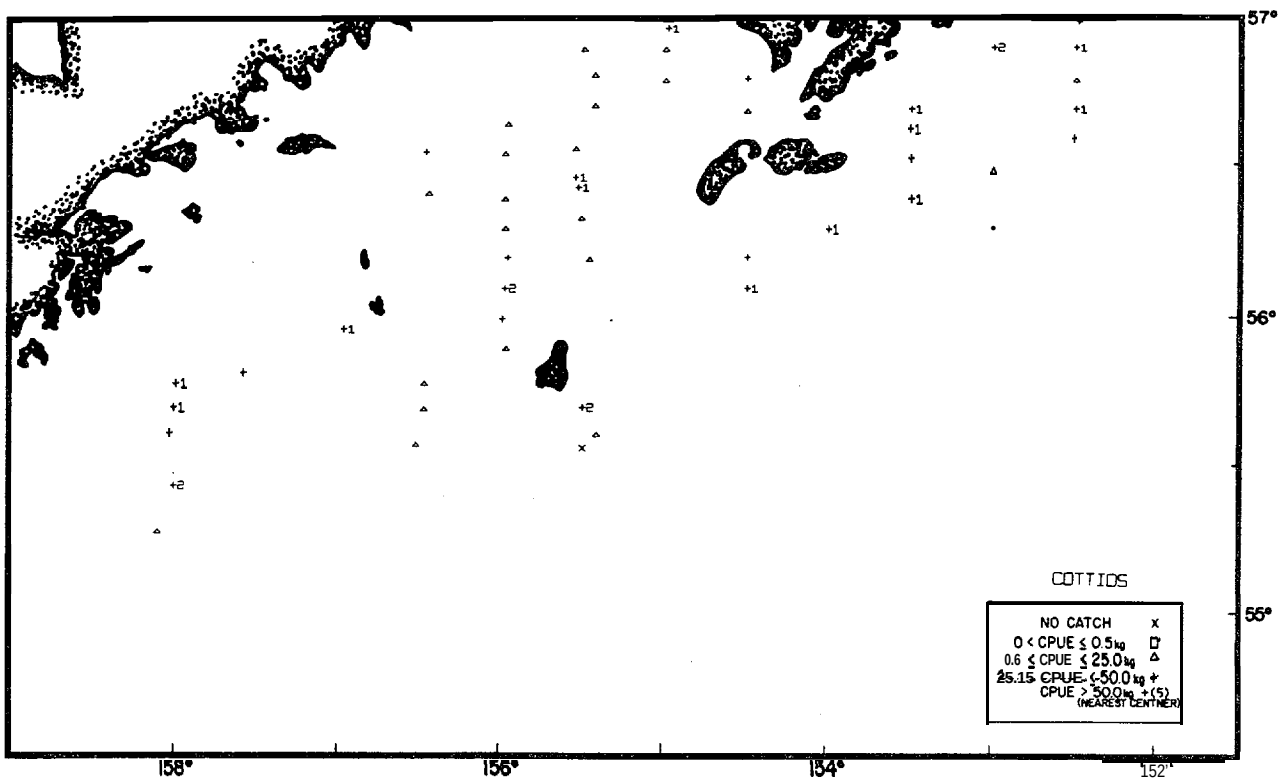


Figure XI-271.--Distribution of standardized catch rates in kg/hr of cottids in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

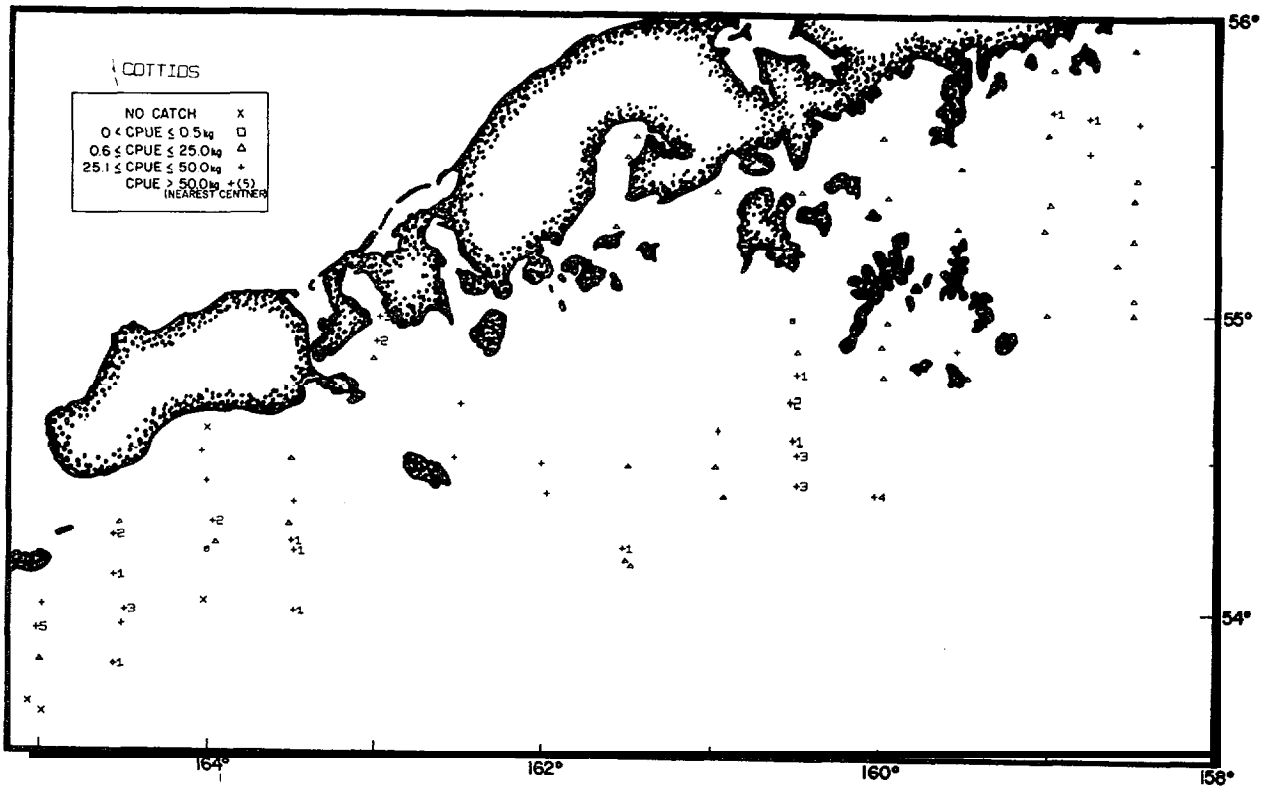


Figure XI-272.--Distribution of standardized catch rates in kg/hr of cottids in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

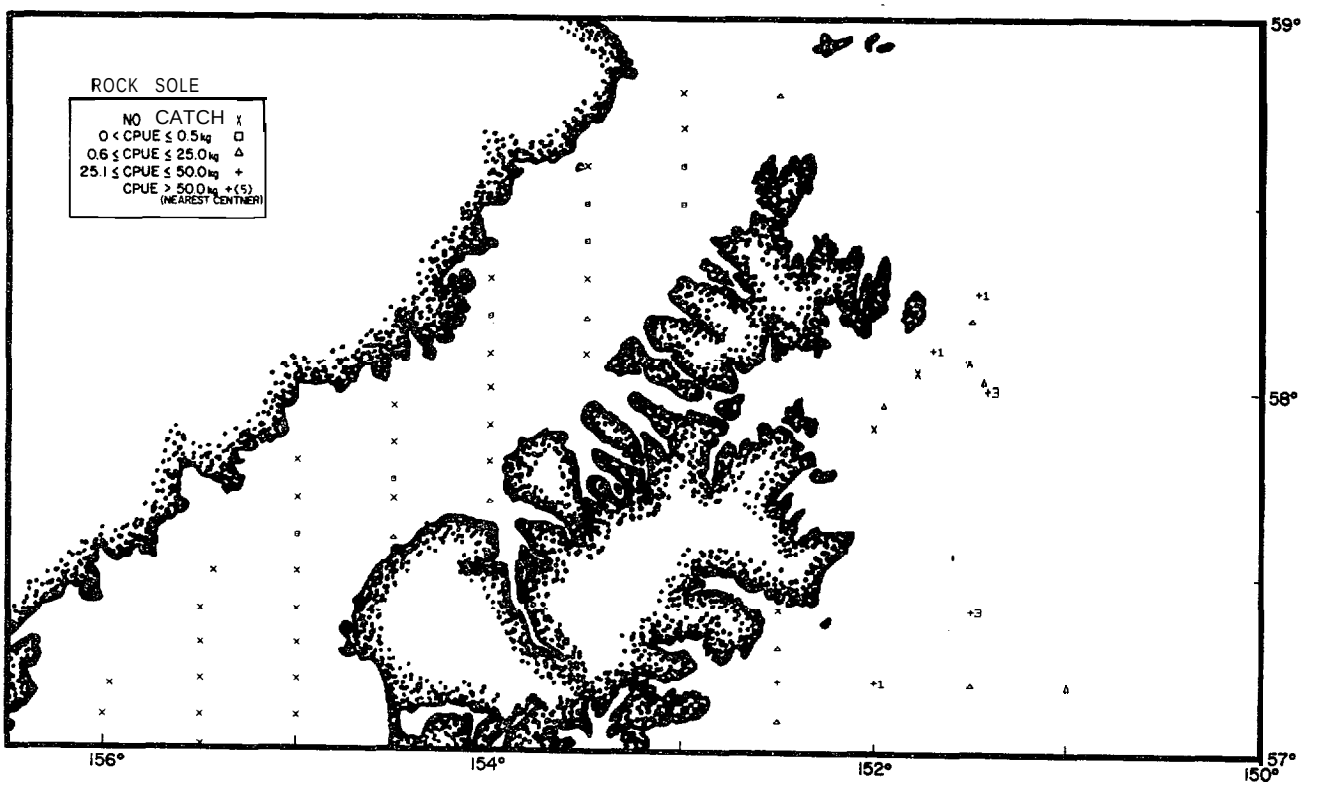
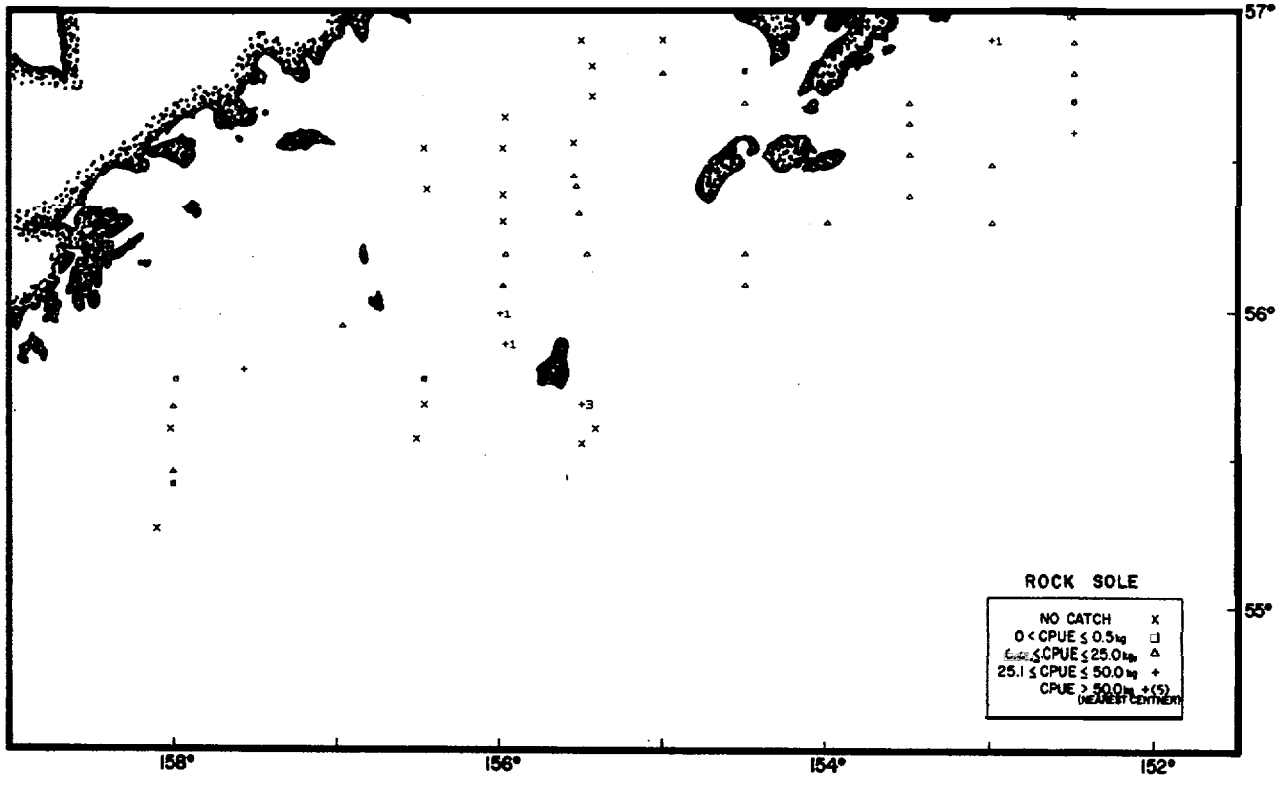


Figure XI-273.--Distribution of standardized catch rates la kg/hr of rock sole in the western Gulf of Alaska, Aug.-k&v. 1961 (Cruise 619).

Table XI-42.--Estimated biomass and population size of cottids (Cottidae) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Kodiak	l-100	82.3	22,501.8	48.9	87.5	60.6	0.26	--
	101-200	115.7	22,789.3	49.6	55.8	38.6	0.41	--
	201-400	24.3	-691.2	1.5	1.1	0.8	0.65	--
	All zones	92.2	45,982.3	37.1	144.4	40.6	0.32	--
Shelikof	l-100	--	--		--	--	--	--
	101-200	19.7	1,834.0	76.3	10.8	90.0	0.17	--
	201-400	5.4	570.6	23.7	1.2	10.0	0.46	--
	All zones	9.2	2,404.6	1.9	12.0	3.4	0.20	--
Chirikof	l-100	33.0	9,567.7	36.7	28.4	39.9	0.34	--
	101-200	77.9	15,898.7	61.0	41.6	58.5	0.38	--
	201-400	5.0	617.9	2.4	1.1	1.6	a.55	--
	All zones	42.2	26,084.2	21.0	71.1	20.0	0.37	--
Shumagin	l-100	14.3	3,255.6	18.4	16.4	27.9	0.19	--
	101-200	65.2	14,140.4	79.8	42.0	71.4	0.34	--
	201-400	11.4	317.9	1.8	0.4	0.7	0.71	--
	All zones	37.6	17,713.9	14.3	58.8	16.6	0.30	--
Sanak	l-100	88.6	18,922.7	59.5	38.0	55.1	0.50	--
	101-200	66.4	12,896.0	40.5	31.0	44.9	0.42	--
	201-400	0	0	0	0	0	0	--
	All zones	75.3	31,818.7	25.7	69.0	19.4	0.46	--
Total	l-100	50.9	54,247.7	43.7	17r1.3	47.9	0.32	--
	101-200	74.6	67,558.4	54.5	181.2	51.0	0.37	--
	201-400	7.3	2,197.6	1.8	3.P	1.1	0.58	--
	All zones	54.6	124,003.7	100.0	355.3	100.0	0.35	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



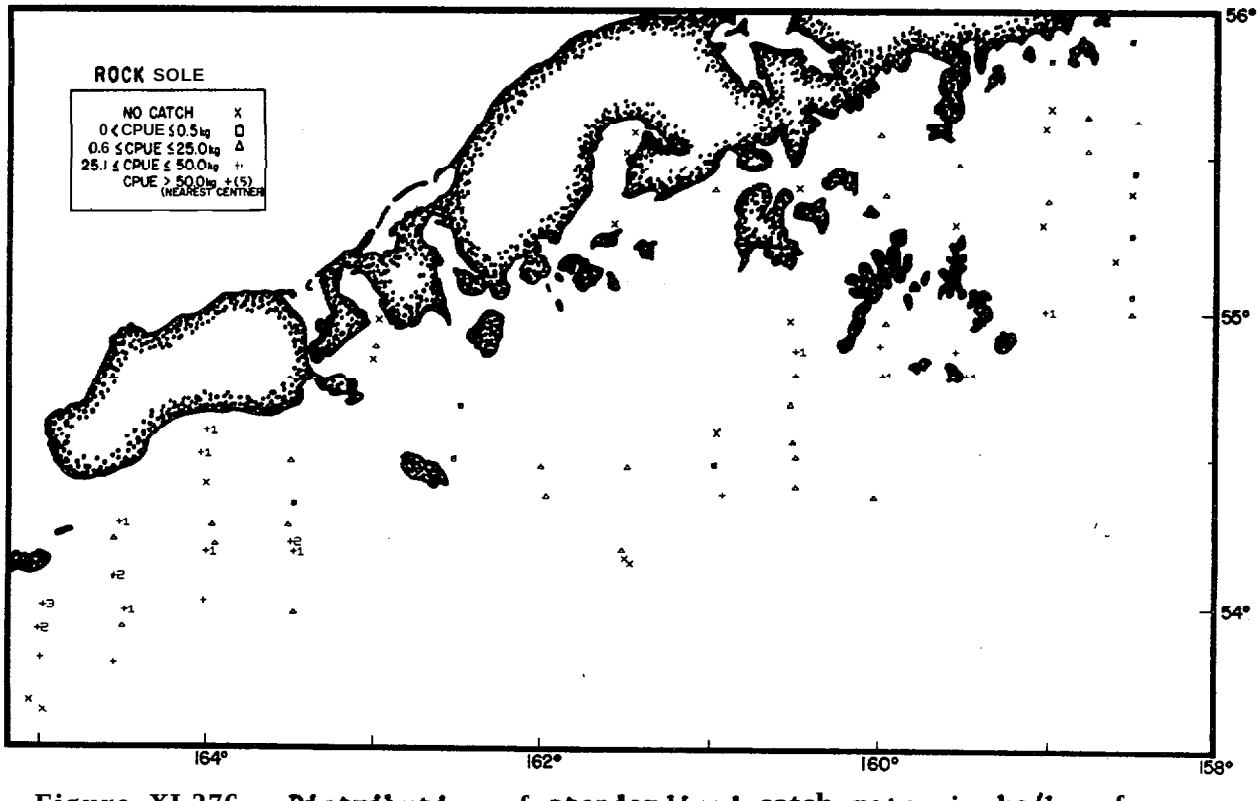


Figure XI-276.--Distribution of standardized catch rates in kg/hr of rock sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

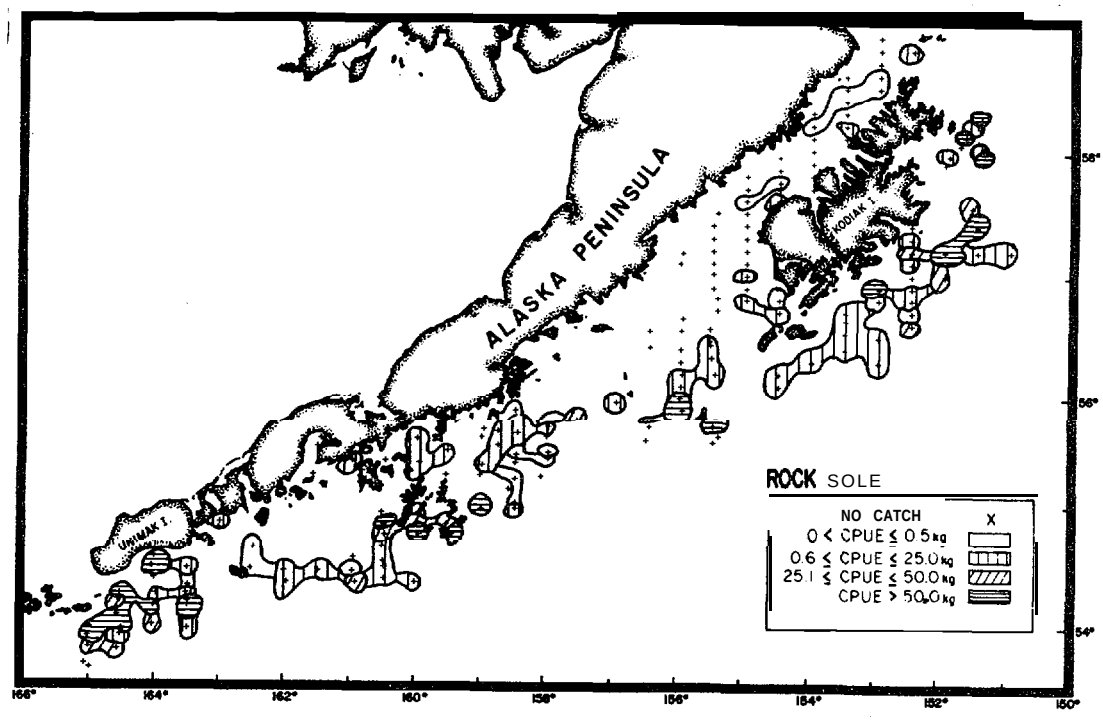


Figure H-275.--**Distributon** of apparent **relative abundance** *of* **rock** role **in** the **western** Gulf of **Alaska, Aug.-Nov. 1961 (Cruise** 619).

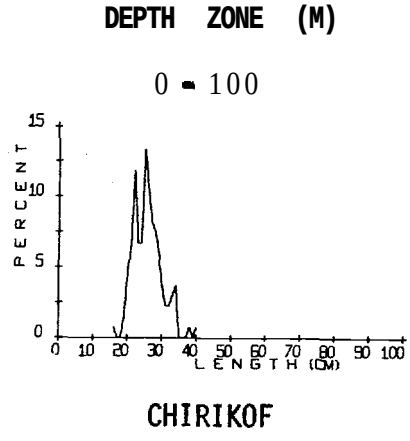


Figure XI-276.--Percentage length frequencies of rock sole **from** the Gulf of Alaska (Cruise 619).

Table XI-43.--Estimated biomass and population size of rock sole (Lepidopsetta bilineata) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	113.5	31,035.4	90.6	118.5	91.7	0.26	--
	101-200	16.3	3,217.0	9.4	10.7	8.3	0.30	--
	201-400	0.3	7.5	51	4/	5/	0.32	--
	All zones	68.7	34,259.9	42.8	129.2	38.8	0.27	--
Shelikof	d-100	--	--	--	--	--	--	--
	101-200	0.3	29.6	88.1	0.1	100.0	0.26	--
	201-400	3/	4.0	11.9	4/	51	0.24	--
	All zones	0.1	33.6	5/	0.1	5/	0.26	--
Chirikof	l-100	15.7	4,536.2	36.0	24.0	44.2	0.19	--
	101-200	39.6	8,079.1	64.0	30.3	55.8	0.27	25.7
	201-400	3/	2.4	5/	4/	5/	0.23	--
	All zones	20.4	12,617.7	15.8	54.3	16.3	0.23	
Shumagin	l-100	54.6	12,393.1	93.1	67.8	95.1	0.18	
	101-200	4.2	912.9	6.9	3.5	4.9	0.26	
	201-400	0.4	10.3	5/	4/	5/	0.35	
	All zones	28.2	13,316.3	16.6	71.3	21.4	0.19	
Sanak	l-100	68.8	14,699.4	74.1	59.0	75.4	0.25	
	101-200	26.5	5,141.2	25.9	19.3	24.7	0.27	
	201-400	0	0	0	0	0	0	
	All zones	47.0	19,840.6	24.8	78.3	23.5	0.25	
Total	l-100	58.8	62,664.1	78.3	269.3	80.8	0.23	
	101-200	19.2	17,379.8	21.7	63.9	19.2	0.27	
	201-400	0.1	24.2	5/	4/	5/	0.30	
	All zones	35.2	80,068.1	100.0	333.2	100.0	0.24	

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

FLATHEAD SOLE

Distribution and Abundance--The relative apparent abundance of flathead sole averaged 35 kg/hr for the survey area (Figures XI-277-278). Highest catch rates, 66 and 50 kg/hr, occurred in the Shelikof and Chirikof regions and the upper slope (64 kg/hr) and outer shelf (61 kg/hr) depth zones (Figure X1-279).

Biomass-The estimated total apparent biomass for flathead sole is 78 thousand mt of which 70% was located in the outer shelf depth zone, 25% in the upper slope, and 5% in the inner shelf (Table X1-44). Chirikof contained the largest portion of the biomass (40%), and was followed by Shelikof (22%), and Kodiak and Shumagin with (15%).

Size Composition-No length frequency data were collected for this species.

WALLEYE POLLOCK

Distribution and Abundance-In the western Gulf of Alaska, pollock produced a mean CPUE of 33 kg/hr, with the largest concentrations occurring in the upper slope, where catches attained an average rate of.105 kg/hr and decreased with decreasing water depth to 0.6 kg/hr in the inner shelf (Figures XI-280-282). Mean CPUE's were highest in the Kodiak, Chirikof and Shumagin regions.

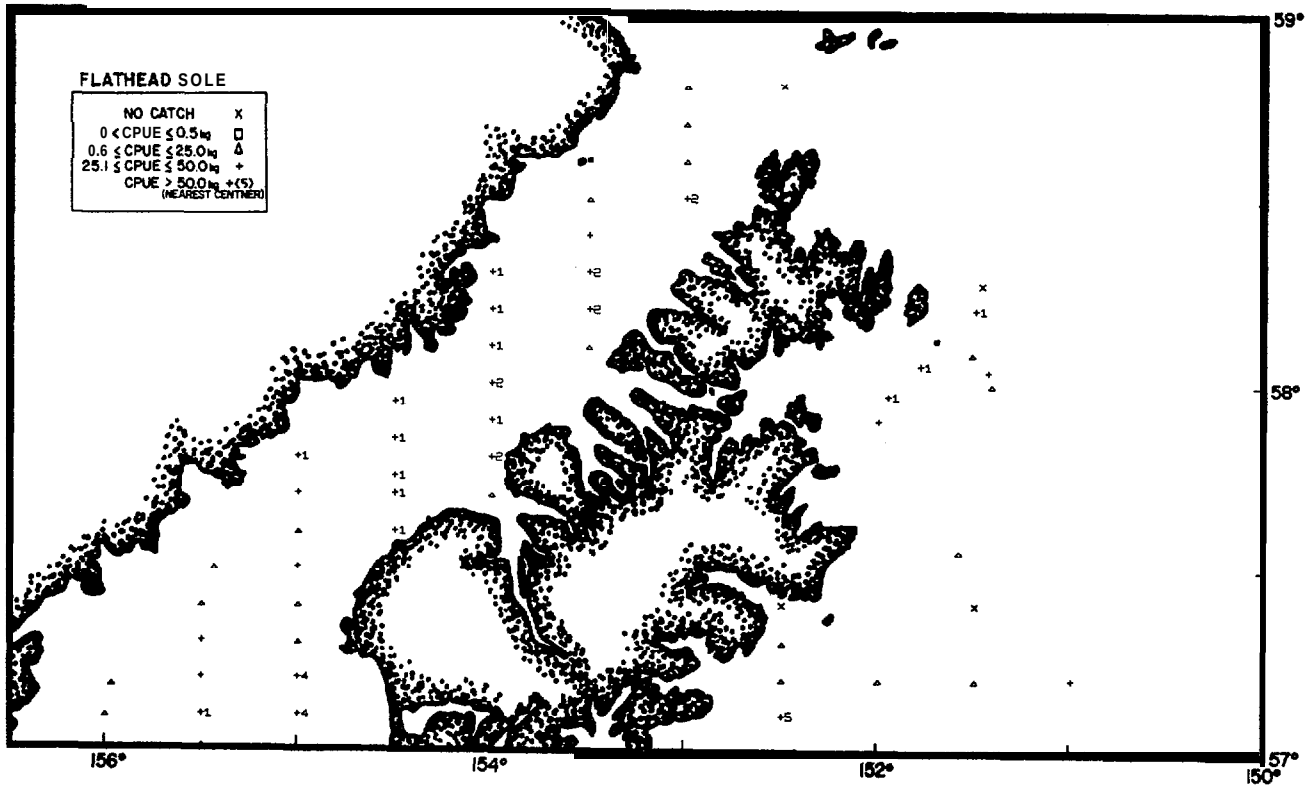
Biomass-The total apparent biomass of pollock for the entire survey area was estimated at 69 thousand mt. (Table X1-45). This should be considered a minimal estimate since pollock are semi-pelagic and an unknown proportion of the biomass may have congregated in the water column above the headrope and have been unavailable to the trawl. The largest portion (61%) occurred in the outer shelf regions, with 38% in the upper slope, and only 1% in the inner shelf. The regions with the largest percentage of the biomass were Chirikof (45%), Kodiak (26%), and Shumagin (22%).

Size Composition--No length frequency data were collected for this species.

PACIFIC HALIBUT

Distribution and Abundance-Pacific halibut ranked eighth in relative apparent abundance with a mean CPUE of 30 kg/hr. Mean CPUE's were inversely correlated to water depth, decreasing from 42 kg/hr in the inner shelf, to 6 kg/hr in the upper slope. Mean catch rates higher than the average for the western Gulf of Alaska were attained in both the Chirikof and Kodiak regions. The distribution of the standardized catch rates are presented in figures XI-283-284.

Biomass-The total apparent biomass for Pacific halibut was estimated at 68 thousand mt, of which 98% was found on the continental shelf, 67% in the inner shelf and 31% in the outer shelf. The Chirikof (51%) and Kodiak (25%) regions together held the majority (76%) of the total biomass (Table XI-46). Biomass estimates for Pacific halibut should be considered minimal as large halibut appear to be able to escape the trawl gear when towed at speeds utilized during this survey.



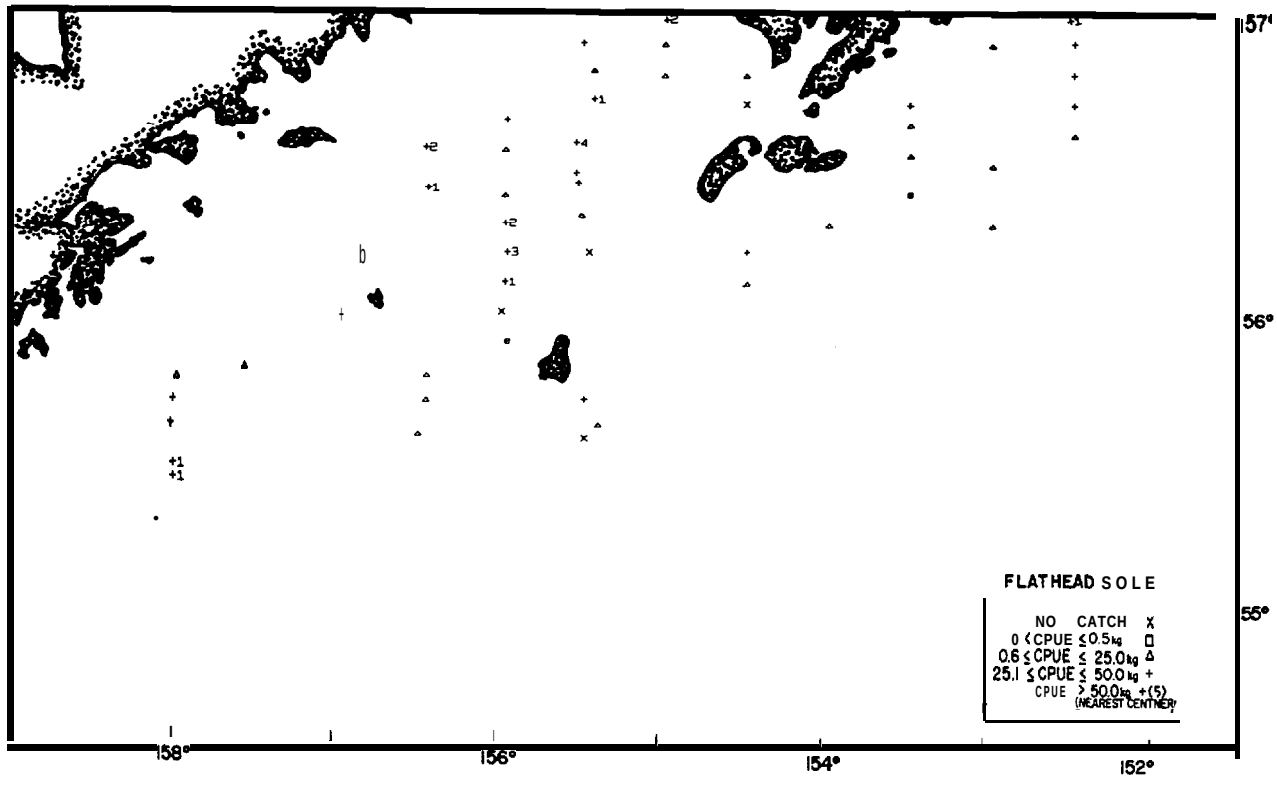


Figure XI-277.--Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, A&g.-Nov. 1961 (Cruise 619).

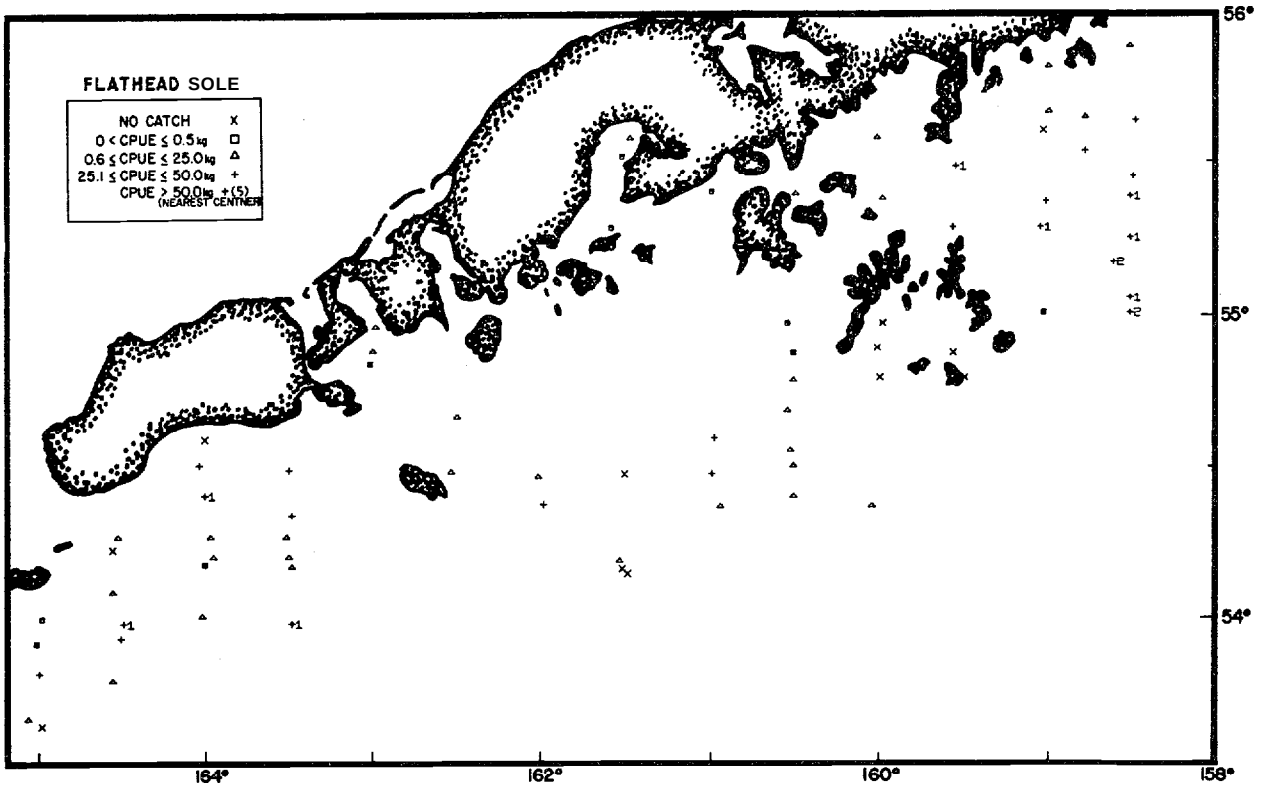


Figure **XI-278.**--Distribution of standardized catch rates in **kg/hr** of **flathead** sole **in** the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

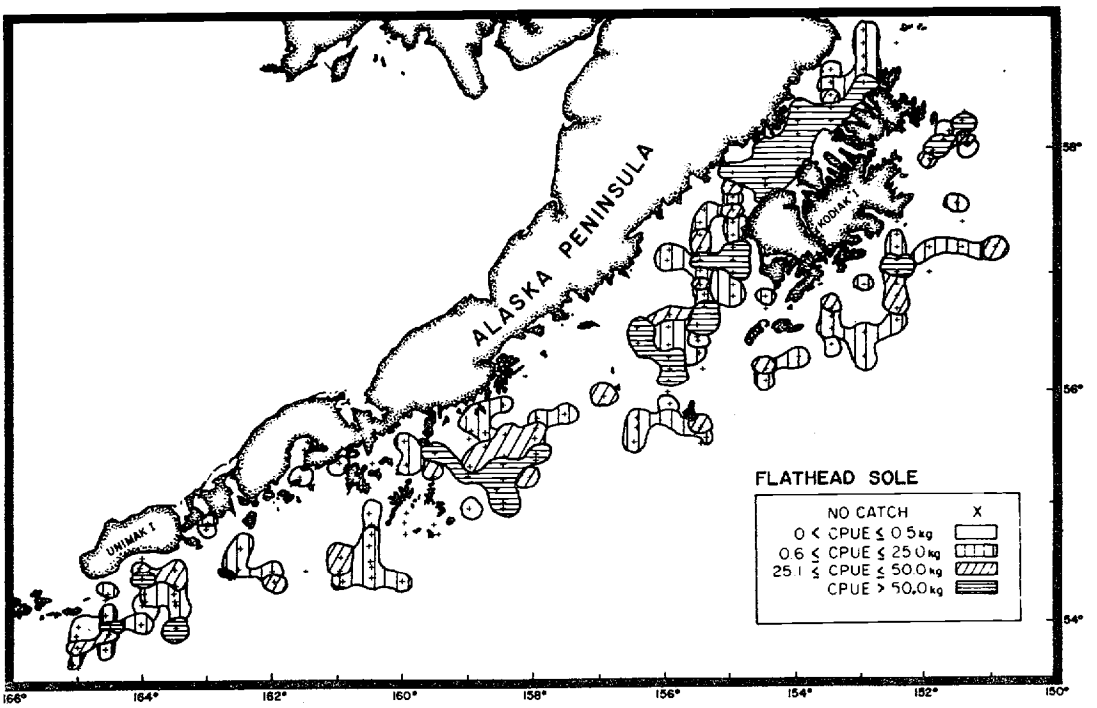
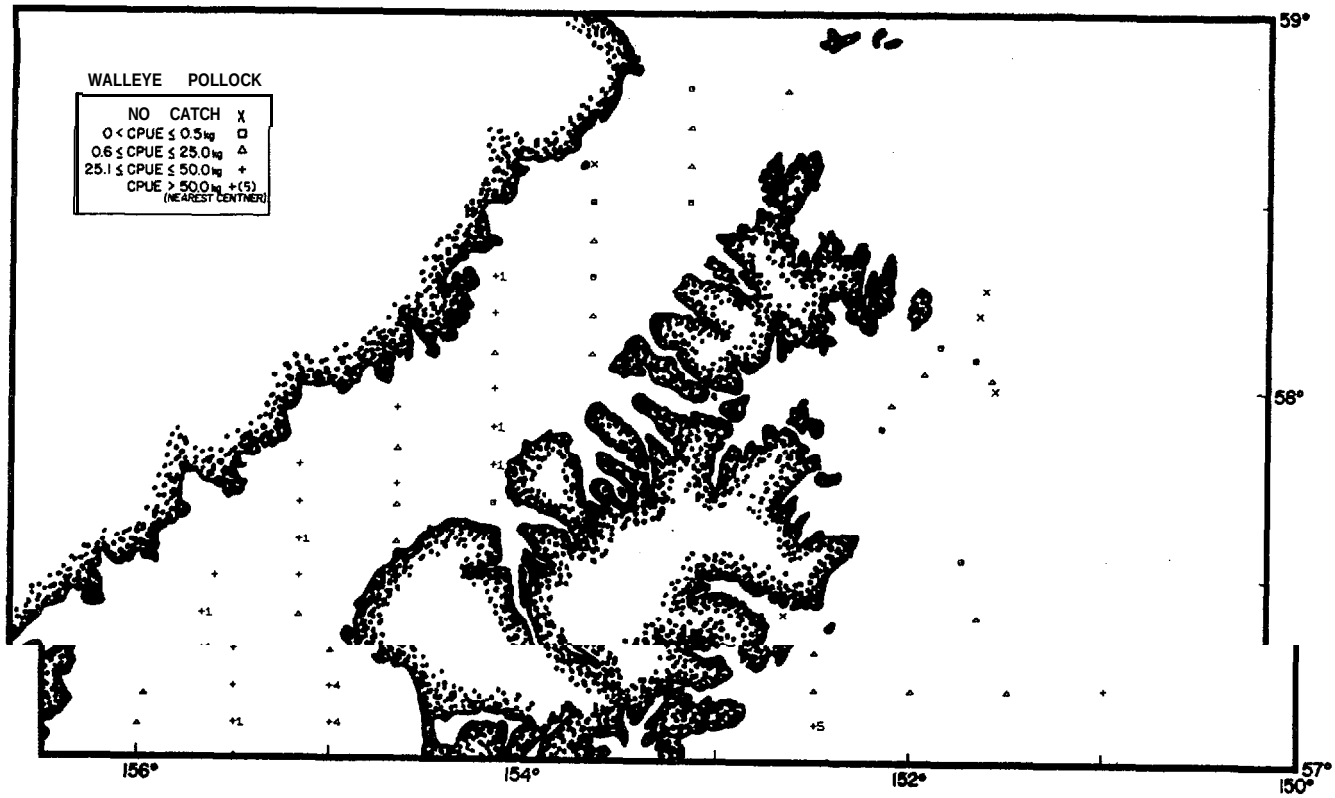


Figure XI-279, --Distribution of apparent relative abundance of **flathead** sole **in** the western Gulf of Alaska, Aug.-Nov. **1961** (Cruise 619).

Table XI-44.--Estimated biomass and population size of flathead sole (Hippoglossoides elassodon) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	2.8	772.4	6.7	3.9	6.1	0.20	--
	101-200	52.5	10,343.7	89.7	58.9	91.5'	0.18	--
	201-400	14.7	-419.3	3.6	1.6	2.5	0.27	--
	All zones	23.1	11,535.4	14.7	64.4	17.0	0.18	--
Shelikof	l-100	--	--	--	--	--	0	--
	101-200	94.2	8,781.2	51.2	39.2	56.3	0.22	--
	201-400	79.6	8,372.2	48.8	30.4	43.7	0.28	--
	All zones	65.7	17,153.4	21.9	69.6	18.4	0.25	--
Chirikof	l-100	8.8	2,540.7	2.2	11.8	8.0	0.22	--
	101-200	112.3	22,931.4	73.5	110.0	74.6	0.21	--
	201-400	45.8	5,791.0	18.3	25.6	17.4	0.22	--
	All zones	50.4	31,191.1.	39.8	147.4	38.9	0.21	--
Shumagin	l-100	3/	7.9	5/	0.2	0.4	0.05	--
	101-200	32.3	7,006.7	59.7	38.2	66.9	0.18	--
	201-400	169.2	4,725.9	40.3	18.7	32.8	0.25	--
	All zones	24.9	11,740.5	15.0	57.1	15.1	0.21	--
Sanak	l-100	4.8	1,024.8	15.0	5.9	14.7	0.17	--
	101-200	29.4	5,700.4	83.3	34.0	84.6	0.17	--
	201-400	8.0	118.0	1.7	0.3	0.8	0.44	--
	All zones	16.2	$843.2	8.7	40.2	10.6	0.17	--
Total	l-100	4.1	4,345.8	5.5	21.8	5.8	0.20	
	101-200	60.5	54,763.4	69.8	280.3	74.0	0.20	--
	201-400	64.2	19,354.4	24.7	76.6	20.2	0.25	--
	All zones	34.5	78,463.6	100.0	378.7	100.0	0.21	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



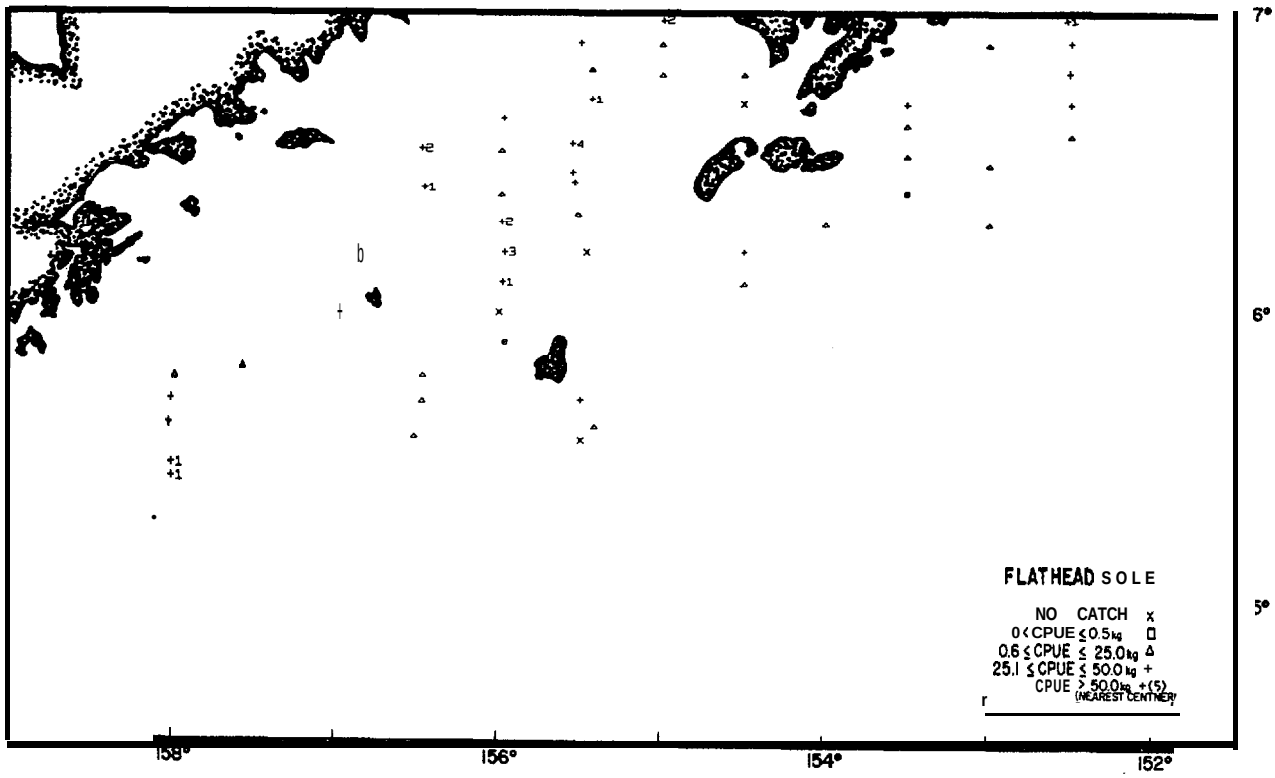


Figure XI-277 .--Distribution of standardized catch rates in kg/hr of flathead sole in the western Gulf of Alaska, A&g.-Nov. 1961 (Cruise 619).

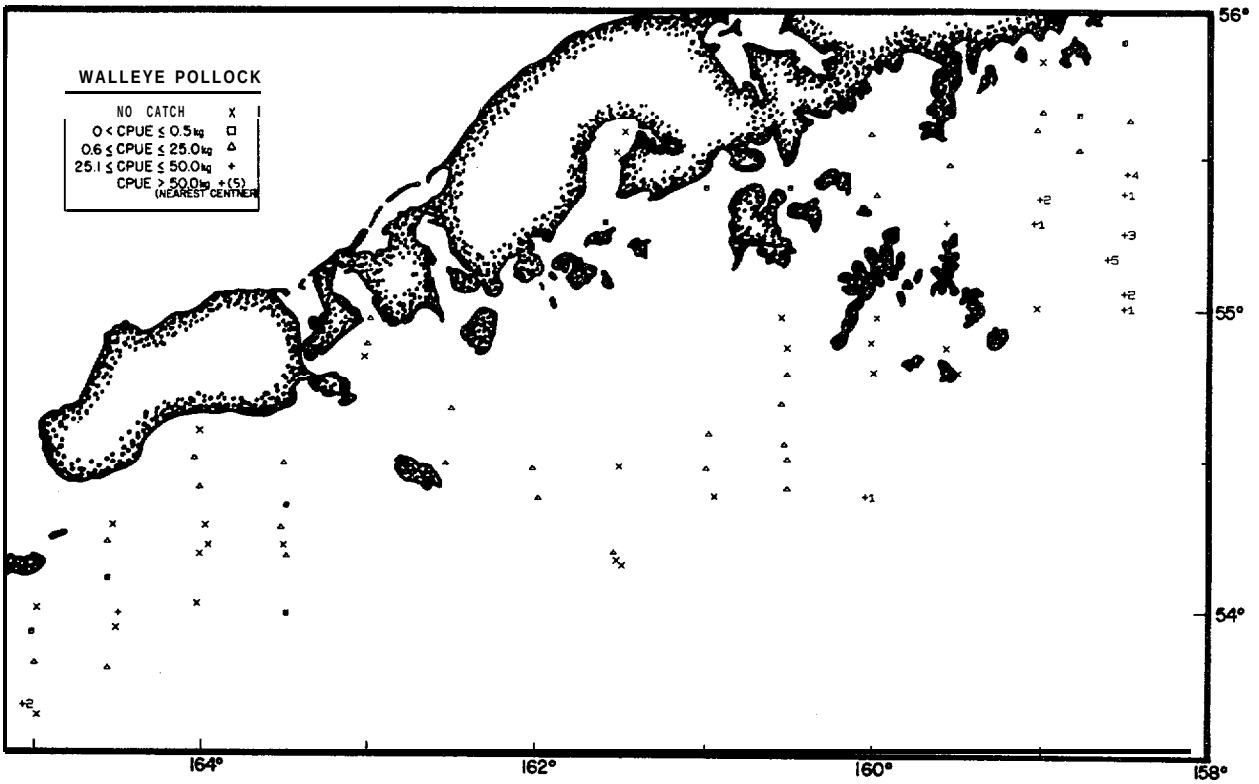


Figure XI-281.--**Distribution** *of* **standardized catch** rates in **kg/hr** of **walleye** pollock in the western Gulf *of* **Alaska, Aug.-Nov.** 1961 (Cruise 619).

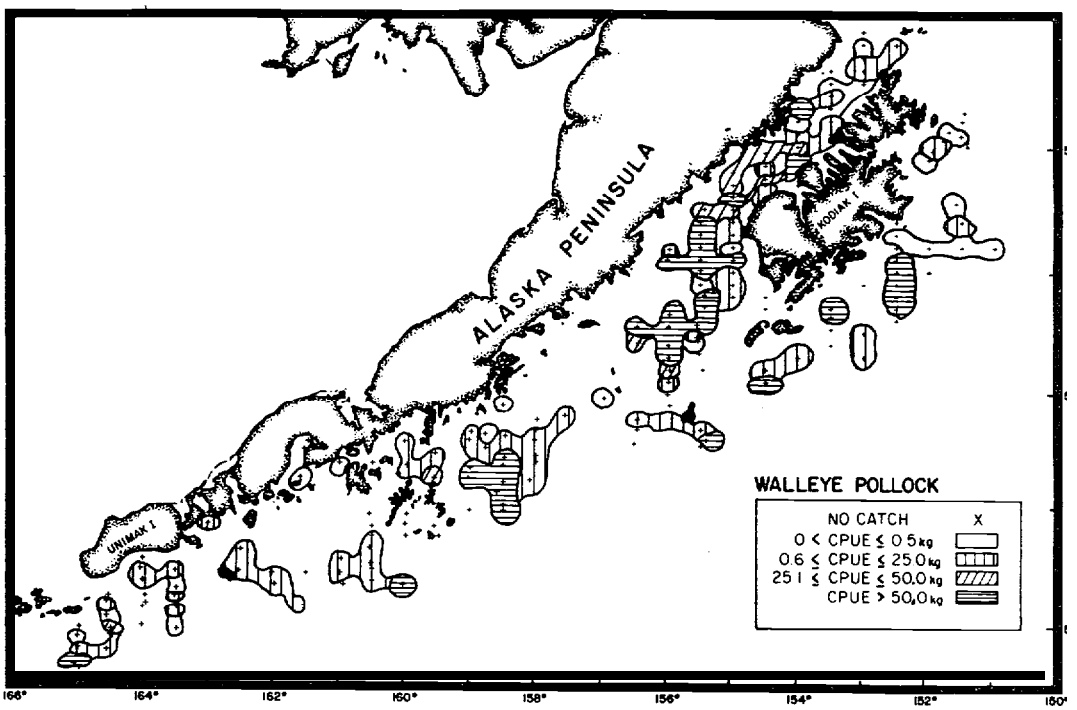
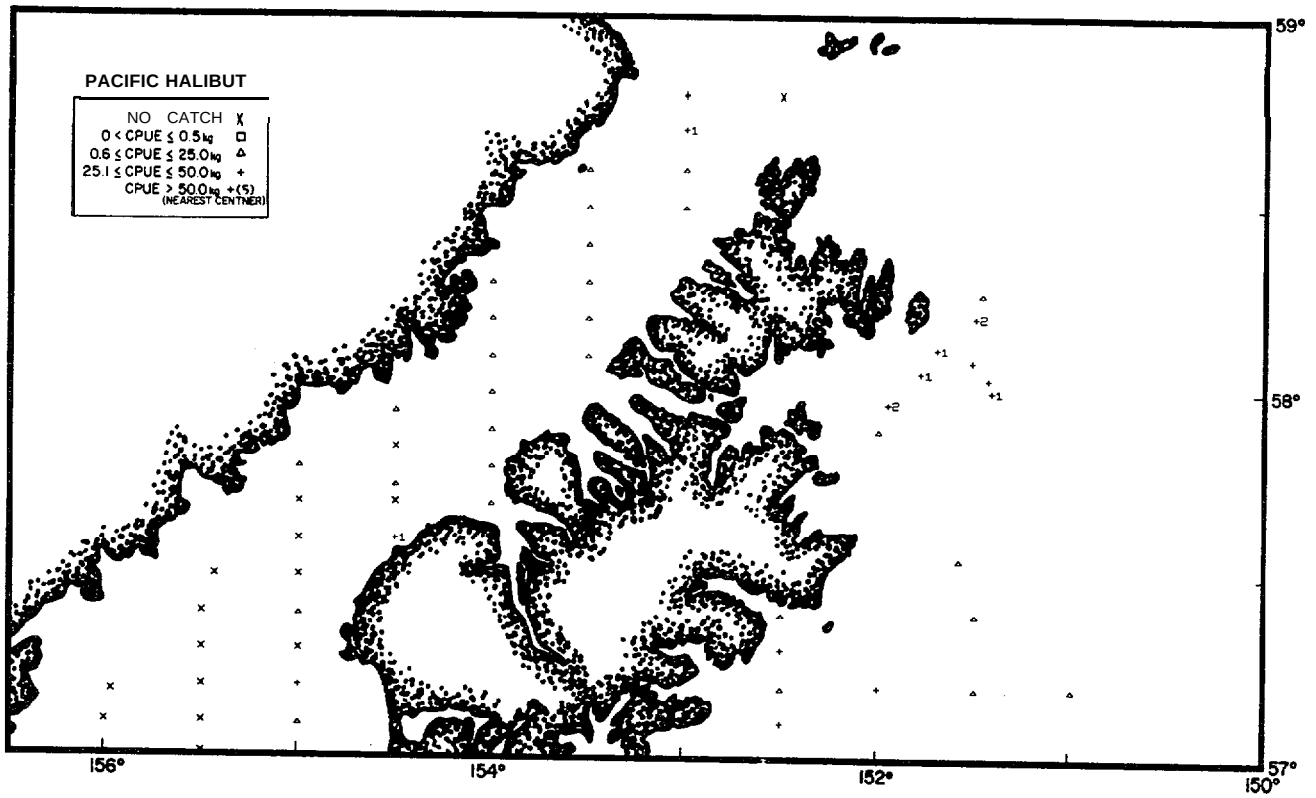


Figure XI-282.--Distribution of apparent relative abundance of walleye pollock in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-45.--Estimated biomass and population size of walleye pollock (Theragra chalcogramma) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Kodiak	l-100	0.4	118.7	0.7	0.8	0.9	0.14	--
	101-200	89.5	17,637.0	99.2	87.0	99.0	0.20	--
	201-400	0.6	15.9	0.1	0.1	5/	0.21	--
	All zones	35.6	17,771.6	25.6	87.9	32.4	0.20	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	13.7	1.273.5	19.3	4.2	31.1	0.30	--
	201-400	50.6	5,324 .1	80.7	9.3	68.9	0.57	--
	All zones	25.3	6,597.6	'9.5	13.5	5.0	0.49	--
Chirikof	l-100	1.0	303.5	1.0	3.4	3.6	0.09	--
	101-200	72.3	14,756.2	47.0	59.4	62.9	0.25	--
	201-400	131.1	16,360.1	52.1	31.7	33.5	0.52	--
	All zones	50.8	31,428.8	45.3	94.5	34.9	0.33	--
Shumagin	l-100	3/	2.6	5/	0.1	0.2	0.05	--
	101-200	36.3	7,878.7	52.3	38.5	62.4	0.20	--
	201-400	257.1	7,179.4	47.7	23.1	37.4	0.31	--
	All zones	32.0	15,060.7	21.7	61.7	22.8	0.24	--
Sanak	L-100	1.2	252.0	6.5	2.3	16.9	0.11	--
	101-200	4.4	854.6	21.9	6.3	46.3	0.14	--
	201-400	188.0	2,792.7	71.6	5.0	36.8	0.56	--
	All zones	9.2	3,899.3	5.6	13.6	5.0	0.29	--
Total	l-100	0.6	676.8	1.0	6.6	2.4	0.10	--
	101-200	46.8	42,409.0	61.1	195.4	72.1	0.22	--
	201-400	105: 2	26,348.1	38.0	69.2	25.5	0.38	--
	All zones	32.9	69,433.9	100.1	271.2	100.0	0.26	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



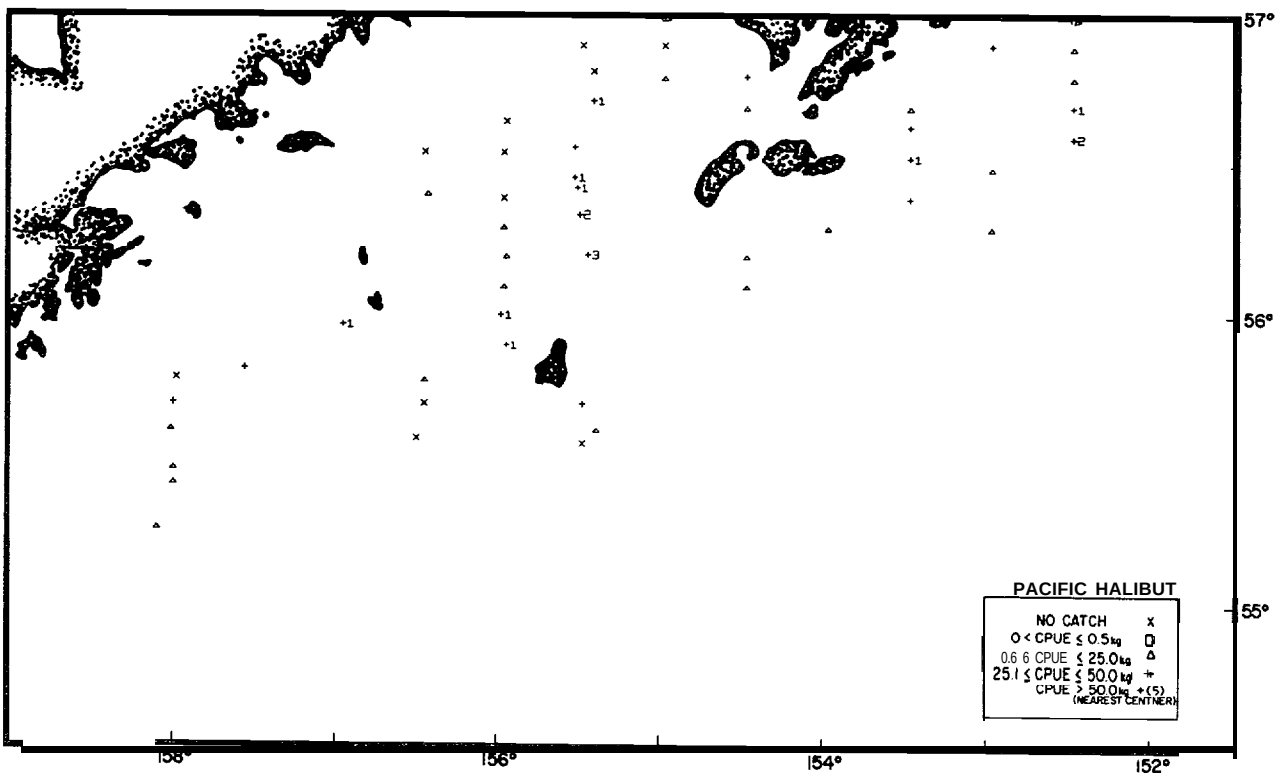


Figure a-283.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

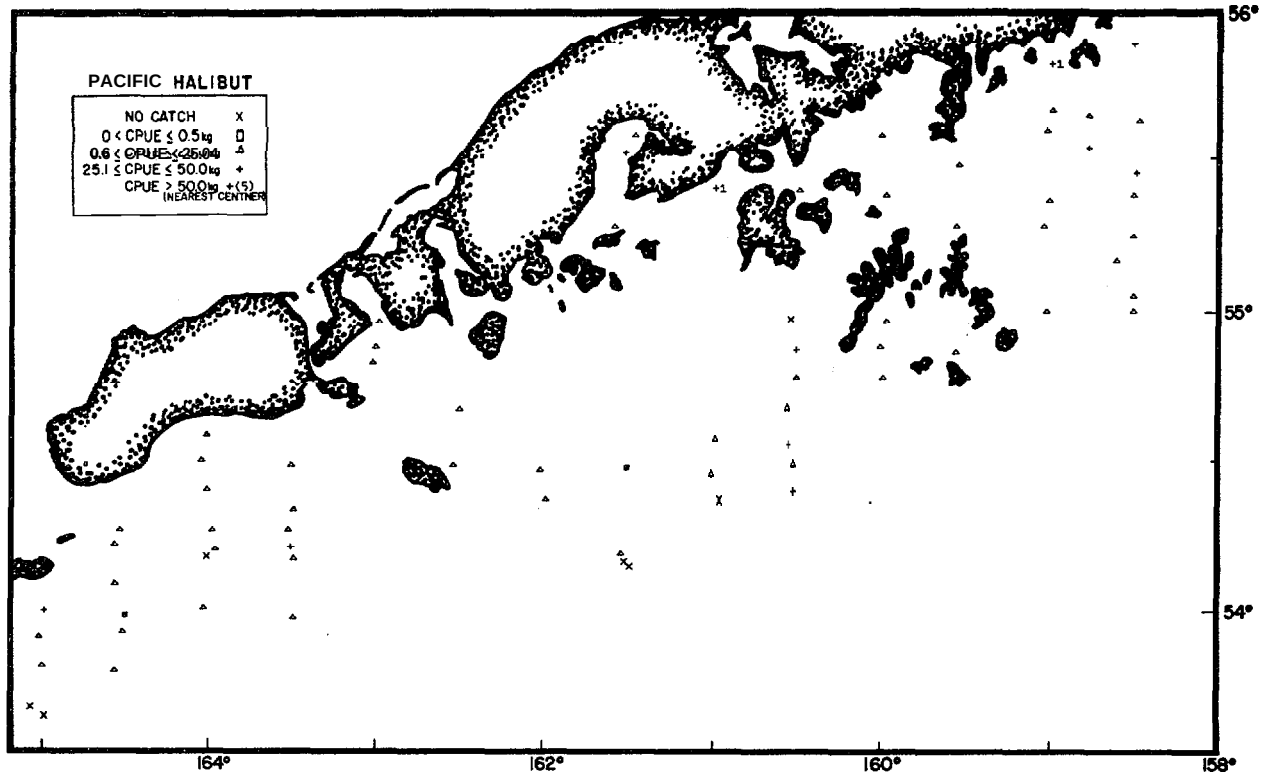


Figure X-284.-Distribution *of* standardized catch rates in **kg/hr** of Pacific halibut in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

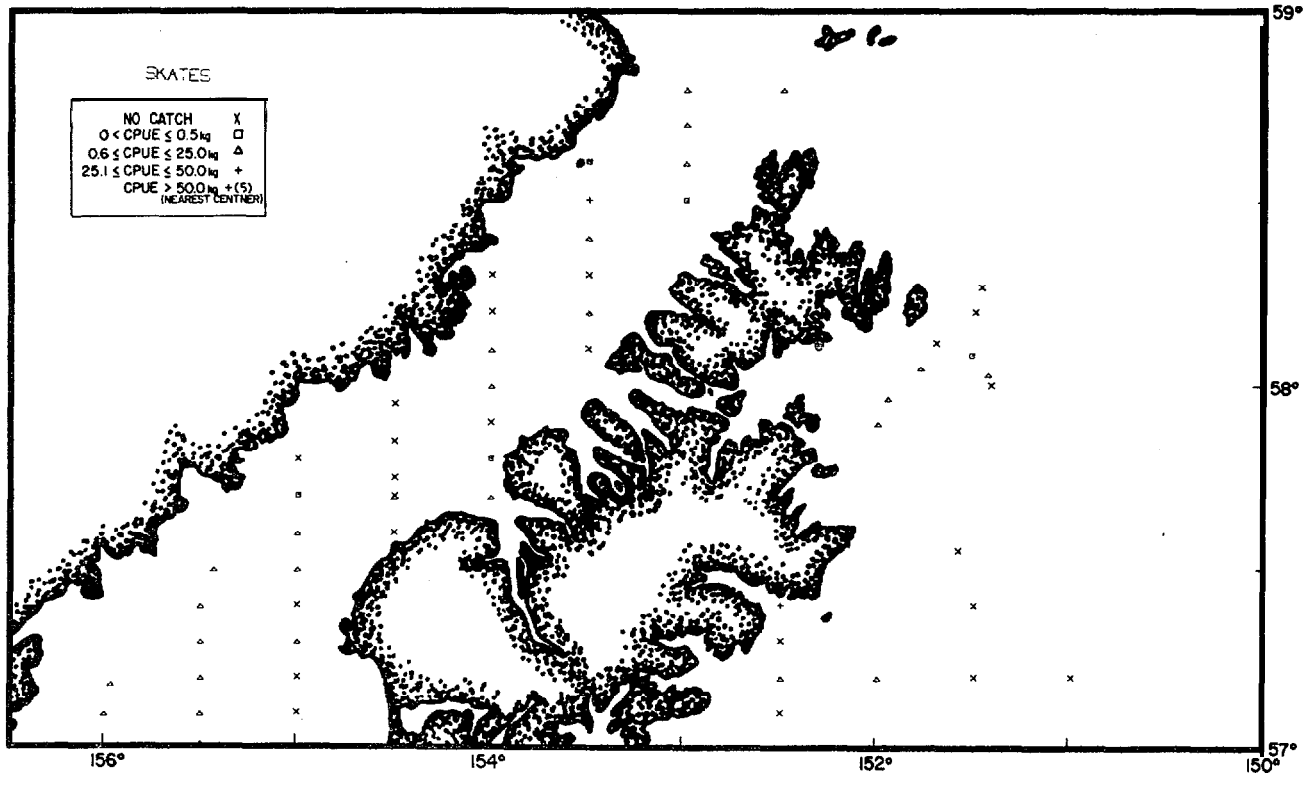


Figure X1-285.--Distributon of standardized catch rates in **kg/hr** of skates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-46.--Estimated biomass and population size of Pacific halibut (Hippoglossus stenolepis) in the Gulf of Alaska, September-November 1961,

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Kodiak	l-100	27.7	7,580.1	43.9	6.3	65.6	1.20	--
	101-200	47.9	9,434.3	54.7	3.2	33.3	2.92	--
	201-400	8.7	246.4	1.4	0.1	1.0	2.17	--
	All zones	34.6	17,260.8	25.4	9.6	17.0	1.79	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	24.8	2,313.4	85.5	1.5	94.0	1.56	--
	201-400	3.7	393.1	14.5	0.1	6.0	2.74	--
	All zones	10.4	2,706.5	4.0	1.6	2.8	1.67	--
Chirikof	l-100	101.6	29,438.4	85.0	24.2	90.3	1.22	--
	101-200	21.5	4,381.5	12.7	2.5	9.3	1.77	--
	201-400	6.6	826.4	2.4	0.1	0.4	6.78	--
	All zones	56.0	34,646.3	51.0	26.8	47.4	1.29	--
Shumagin	l-100	24.2	5,500.4	58.2	7.4	71.2	0.74	--
	101-200	17.2	3,722.0	39.4	2.8	26.9	1.32	--
	201-400	8.4	233.6	2.5	0.2	1.9	1.18	--
	All zones	20.0	9,456.0	13.9	10.4	18.4	0.90	--
Sanak	l-100	12.5	2,659.4	68.1	6.4	78.1	0.42	29
	101-200	6.4	1,246.3	31.9	1.8	22.0	0.70	--
	201-400	0	0	0	0	0	0	--
	All zones	9.2	3,905.7	5.8	8.2	14.5	0.48	--
Total	l-100	42.3	45,178.3	66.5	44.3	78.3	1.02	--
	101-200	23.3	21,097.5	31.0	11.8	20.9	1.79	--
	201-400	5.6	1,699.5	2.5	0.5	0.9	3.40	--
	All zones	29.7	67,975.3	100.0	56.6	100.1	1.20	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Size Composition-Length frequency data for this species is available through the International Pacific Halibut Commission.

SKATES

Distribution and Abundance-During this survey, members of the family Rajidae were not identified to species but were placed in a general classification--skates. Skates were distributed in all regions and depth zones, with the exception.of the Shumagin-inner shelf region-depth zone (Figures X1-285-286). The mean CPUE for the western Gulf of Alaska was 3 kg/hr and ranged from 2 kg/hr in the inner shelf and outer shelf to 7 kg/hr in the upper slope. The Kodiak and Shelikof regions produced the highest average CPUE's (4 kg/hr).

Biomass-The total apparent biomass of skates was estimated at 6 thousand *mt in the* western Gulf of Alaska (Table XI-47). Forty percent of the biomass was contained in the inner shelf, 26% in the outer shelf, and 34% in the upper slope. Largest portions of the biomass were contained in the Kodiak (34%) and Chirikof (24%) regions which together contained 58% of the total.

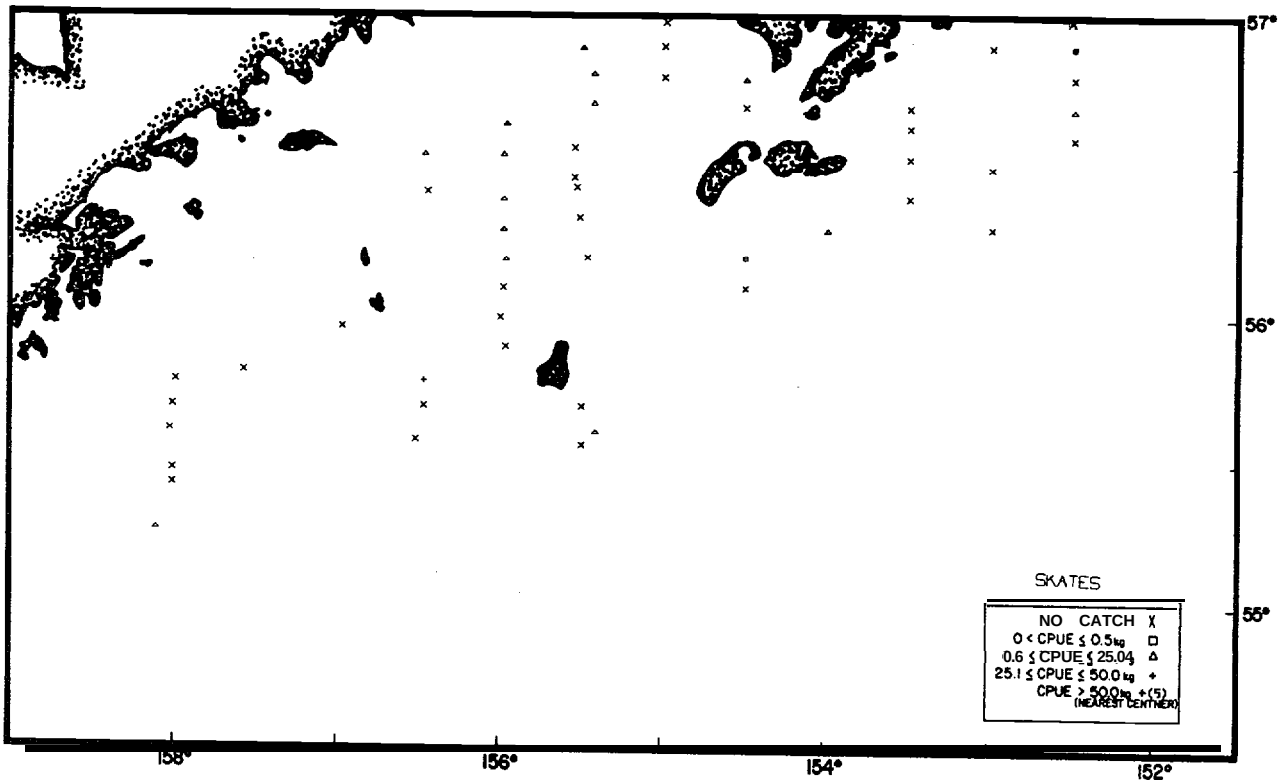
Size Composition--No Length frequency data were collected for these species.

PACIFIC OCEAN PERCH

Distribution and Abundance--Although Pacific ocean perch are widely distributed throughout the survey area, their greatest concentrations were found in the outer shelf and upper slope (Figures XI-287-288). For the entire western Gulf of Alaska, Pacific ocean perch had a mean CPUE of 17 kg/hr (Table X1-48). Relative apparent abundance was highest in the Chirikof and Sanak regions and was directly correlated with water depth, increasing from 0.1 kg/hr in the inner shelf to 90 kg/hr in the upper slope (Figure X1-289).

Biomass-- The relative apparent biomass of Pacific ocean perch, the tenth-largest among all species, was estimated at 378 thousand mt. Seventy two percent of the Pacific ocean perch biomass was found in concentrations throughout the upper slope, 28% in the outer shelf, and 0.1% in the inner shelf. The Chirikof region contained the largest biomass portion of the regional estimate (40%), followed by Sanak and Shumagin respectively. The biomass estimate for Pacific ocean perch should be considered minimal as this species is semi pelagic and is known to be abundant in hard-rocky areas which could not be adequately sampled with the trawl gear utilized in these survey operations.

Size Composition--Random length frequency samples of Pacific ocean perch were measured in the outer shelf and upper slope depth zones of the Chirikof region. Pacific ocean perch were of a slightly larger mean size in the outer shelf where they ranged from 20 to 44 cm and averaged 34.1 cm. In the upper slope depth *zones,* Pacific ocean perch ranged from 27 to 40 cm and averaged 37.3 cm (Figure X1-290).



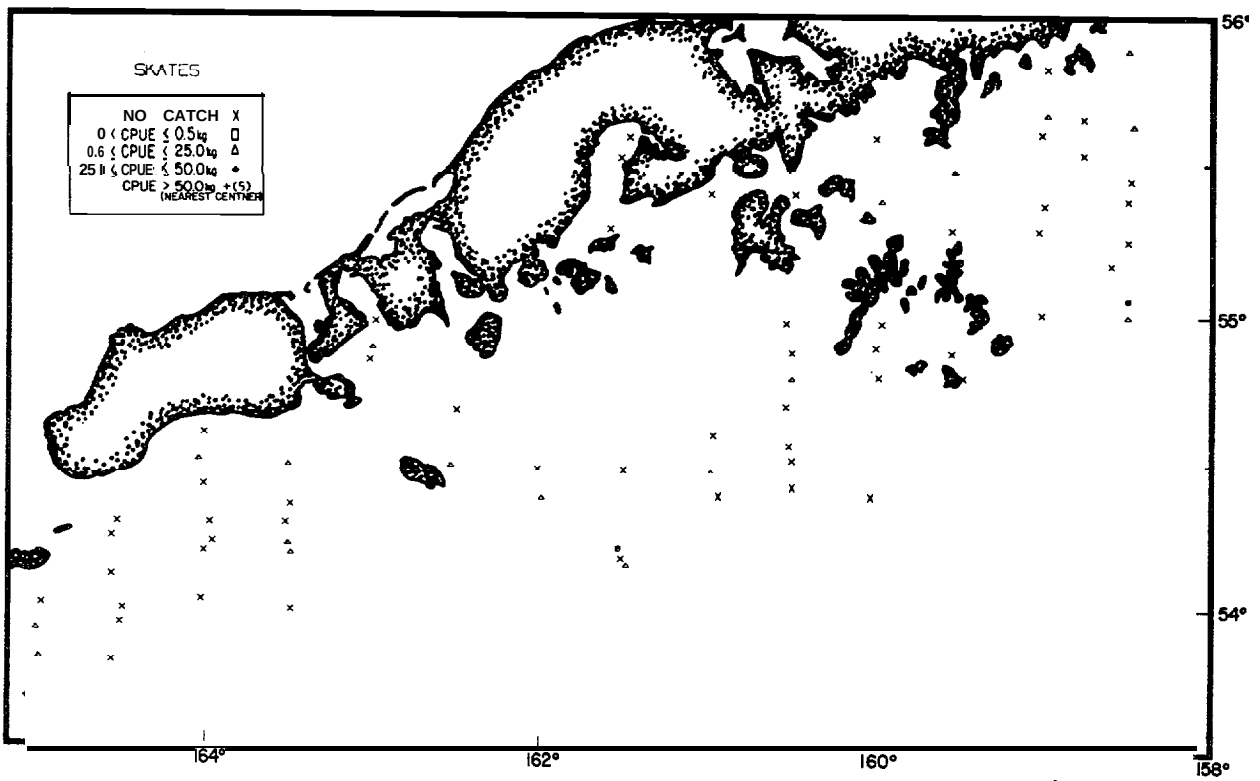
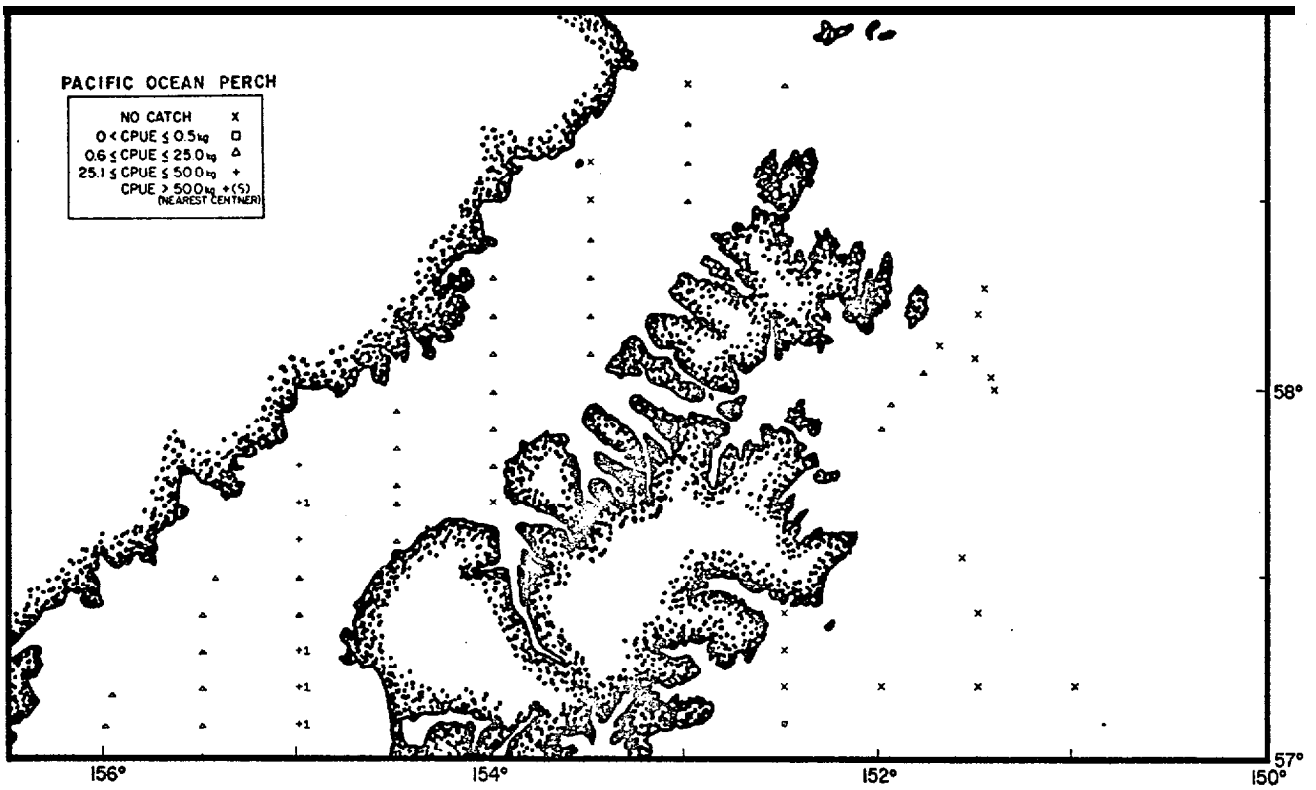


Figure XI-286.--Distribution of **standardized catch** rates in **kg/hr** of skates in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-47 .--Estimated biomass and population size of skates (Rajidae) in the Gulf of Alaska, September-November 196i

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated. biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Kodiak	l-100	6.7	1,827.9	88.3	0.2	33.3	10.10	--
	101-200	0.6	124.1	6.0	0.2	33.3	0.74	--
	201-400	4.1	117.2	5.7	0.2	33.3	0.50	--
	All zones	4.1	2,069.2	33.8	0.6	20.0	3.56	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	6.4	592.0	53.A	0.2	28.6	2.39	--
	201-400	5.0	515.8	46.6	0.5	71.4	1.08	--
	All zones	4.3	1,107.8	18.1	0.7	23.3	1.52	--
Chirikof	l-100	1.5	420.4	29.1	0.1	11.1	7.26	--
	101-200	0.4	89.6	6.2	0.1	11.1	0.75	--
	201-400	7.5	933.1	64.7	0.7	77.8	1.30	--
	All zones	2.3	1,443.1	23.6	0.9	30.0	1.61	--
Shumagin	l-100	0	0	0	0	0		--
	101-200	1.9	401.6	97.3	0.2	100.0	2.13	--
	201-400	0.4	11.1	2.7	4/	4/	0.57	--
	All zones	0.9	412.7	6.8	0.2	6.7	1.98	--
Sanak	l-100	1.0	220.4	20.3	0.1	16.7	2.53	--
	101-200	1.8	357.7	33.0	0.1	16.7	3.05	--
	201-400	34.0	505.3	46.6	0.4	66.7	1.36	--
	All zones	2.6	1,083.4	17.7	0.6	20.0	1.88	--
Total	l-100	2.3	2,468.7	40.4	0.4	8.3	6.17	--
	101-200	1.7	1,565.0	25.6	0.8	25.0	1.96	--
	201-400	7.0	2,082.5	3 4 . 1	1.8	66.7	1.16	--
	All zones	2.7	6,116.2	100.1	3.0	100.0	2.04	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available,
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



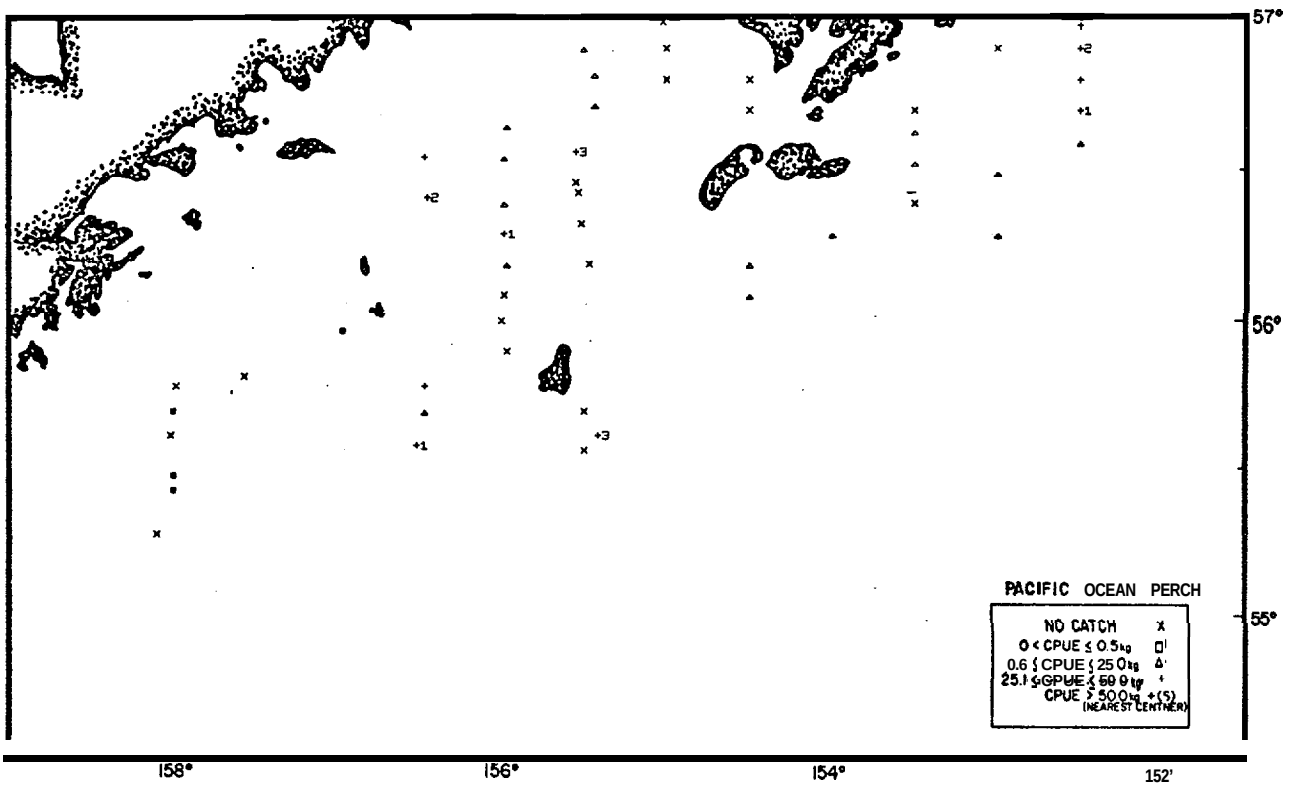


Figure X1-287.--Distributon of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

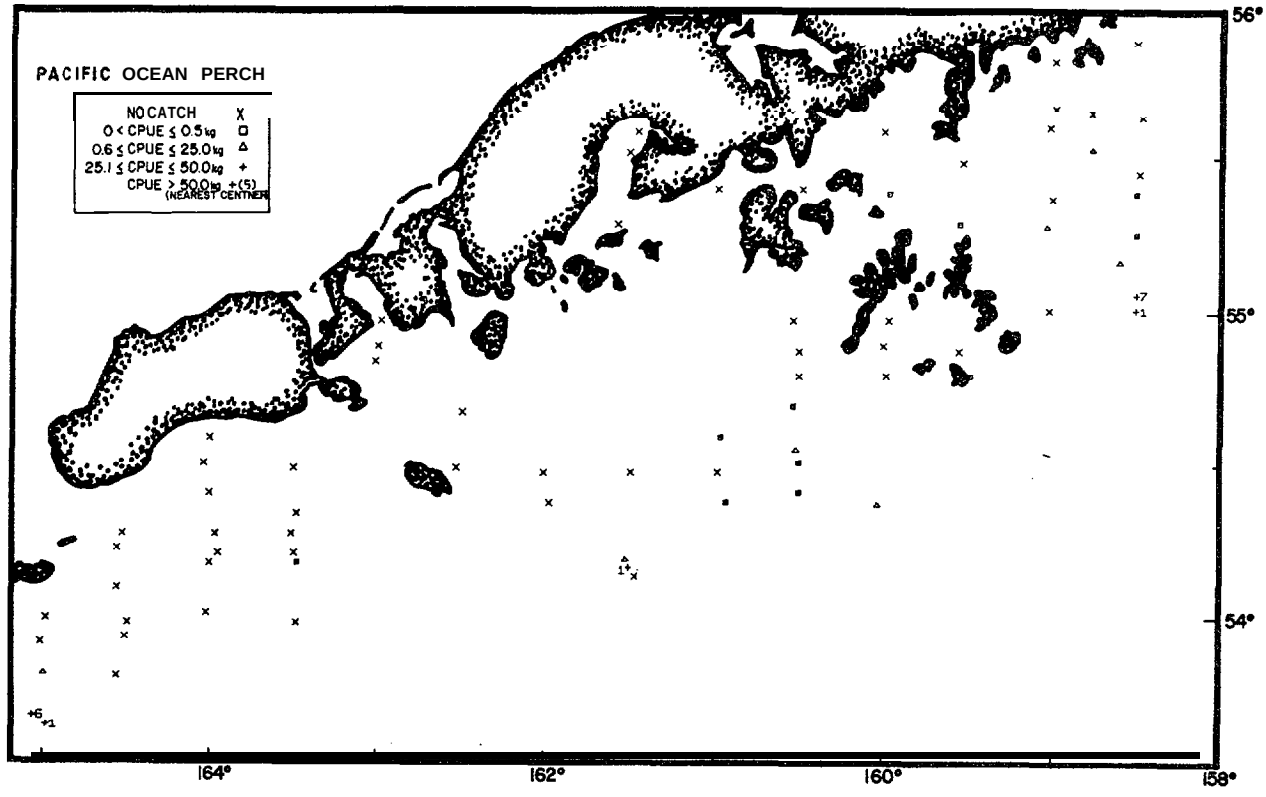


Figure XI-288.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

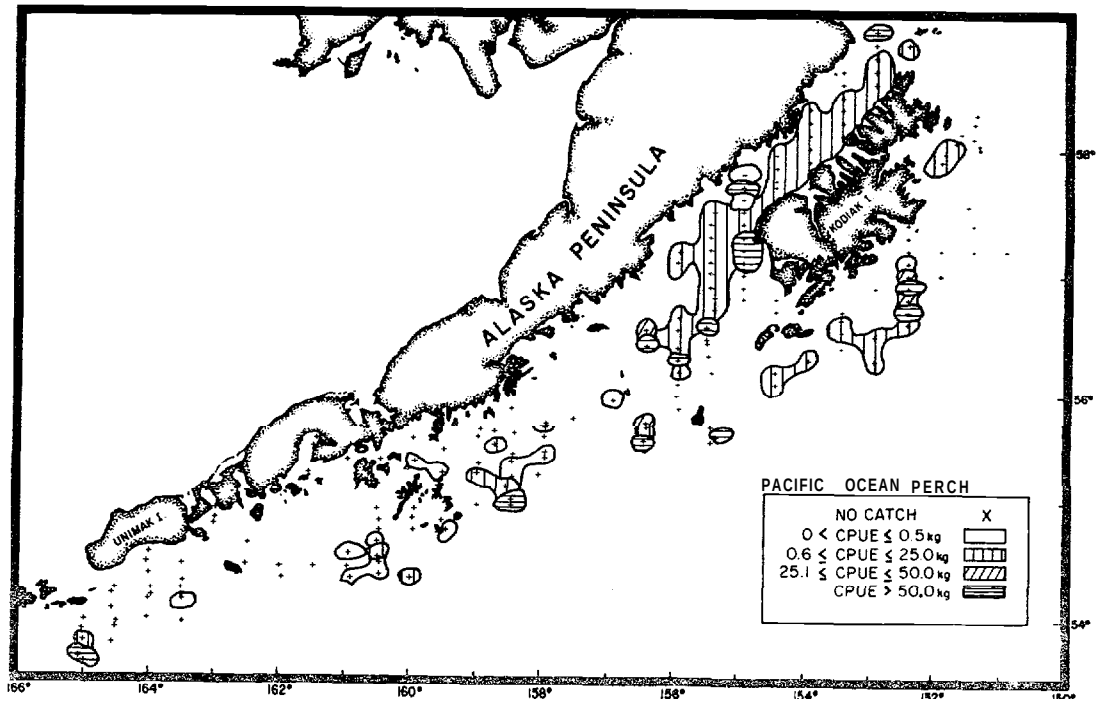


Figure XI-289.--Distribution of apparent relative abundance of Pacific ocean perch in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-48 .--Estimated biomass and population size of Pacific ocean perch (*Sebastes alutus*) in the Gulf of
September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean indi Weigh (kg)
Kodiak	l-100	0.1	35.4	1.1	4/	5/	0.91
	101-200	15.9	3,148.7	96.5	5.7	98.3	0.55
	201-400	2.8	80.0	2.5	0.1	1.7	0.65
	All zones	6.5	3,264.1	8.7	5.8	8.7	0.55
Shelikof	l-100	--	--	--	--	--	--
	101-200	3.7	346.3	12.8	0.7	15.2	0.47
	201-400	22.4	2,353.7	87.2	3.9	84.8	0.60
	All zones	10.3	2,700.0	7.2	4.6	6.9	0.58
Chirikof	l-100		0	0	0	0	0
	101-200	310.8	6,498.3	43.7	11.0	39.9	0.59
	201-400	67.1	8,379.7	56.3	16.6	60.1	0.50
	All zones	24.1	14,878.0	39.6	27.6	41.4	0.54
Shumagin	l-100	4/	1.3	5/	4/	5/	0.05
	101-200	0.5	115.2	1.5	0.5	6.5	0.21
	201-400	265.6	7,417.2	98.5	10.7	95.5	0.69
	All zones	16.0	7,533.7	20.1	11.2	16.8	0.67
Sanak	l-100	4/	2.6	5/	4/	5/	0.18
	101-200	1.3	254.8	2.8	ii.8	4.6	0.31
	201-400	602.5	8,949.5	97.2	16.6	95.4	0.54
	All zones	21.8	9,206.9	24.5	17.4	26.1	0.53
Total	l-100	0.1	39.3	0.1	4/	5/	0.48
	101-200	11.4	10,363.3	27.6	18.7	28.1	0.55
	201-400	90.2	27,180.1	72.3	47.9	71.9	0.57
	All zones	16.5	37,582.7	100.0	66.6	100.0	0.56

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

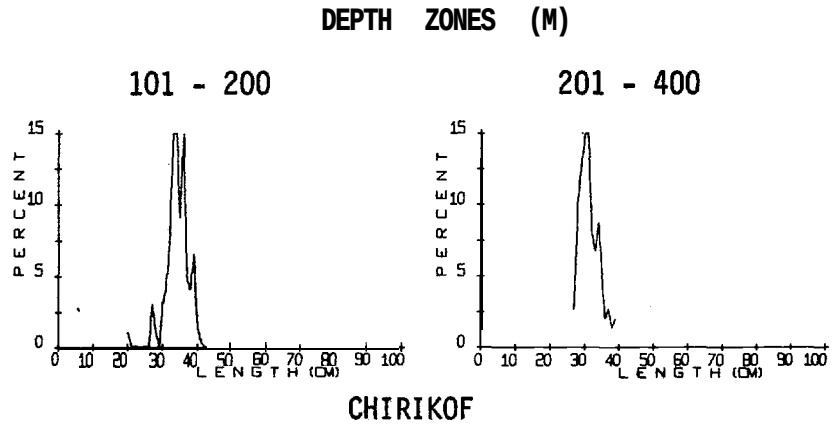


Figure X1-290.--Percentage length frequencies of Pacific ocean perch from the Gulf of Alaska (Cruise 619).

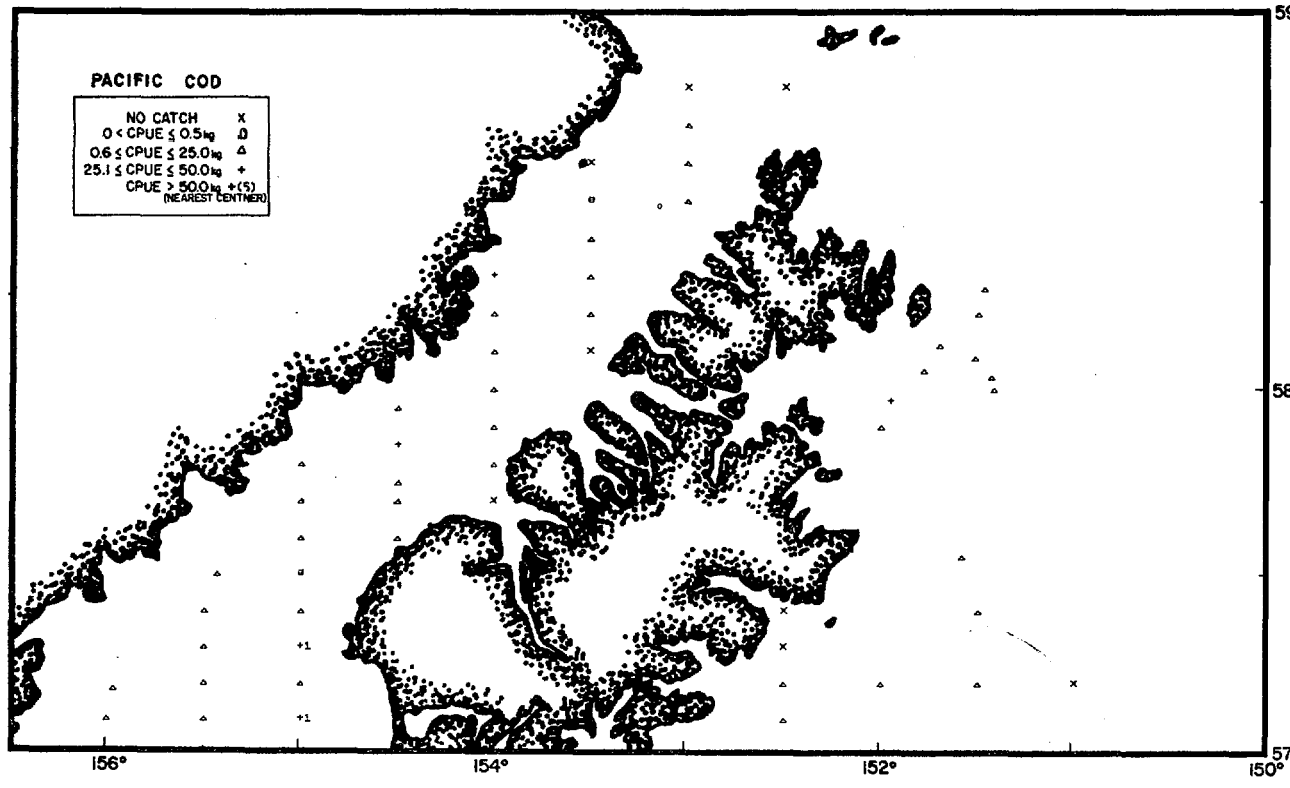


Figure XI-291.--Distribution of standardized catch rates in kg/hr of Pacific cod in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

PACIFIC COD

Distribution and Abundance--Pacific cod were found throughout the western Gulf of Alaska (Figures X1-291-292). The relative apparent abundance was highest in the easternmost region, Kodiak (21 kg/hr) and the westernmost region, Sanak (18 kg/hr), and averaged 13 kg/hr for the entire western Gulf. Pacific cod were primarily located in the deeper water zones where they produced a mean CPUE of 19 kg/hr in both the outer shelf and upper slope.

Biomass--The total apparent biomass of Pacific cod was estimated at 30 thousand mt, 56% of which was contained in the outer shelf, 25% in the inner shelf, and 19% in the upper slope (Table XI 49). Largest percentages of the biomass were contained in the Kodiak (35%), and Sanak (25%) regions which together contained 60% of the total. Biomass estimates of Pacific cod should be considered minimal as this species is known to be semi pelagic and an unknown proportion of the biomass may have congregated in the water column above the headrope and have been unavailable to the trawl.

Size Composition--Pacific cod random length frequency samples were measured in the outer shelf depth zone of the Kodiak and Chirikof regions (Figure XI-293). Pacific cod in-the Chirikof-outer shelf ranged from 38 to 57 cm and averaged 44.4 cm and in the Kodiak-outer shelf ranged from 30 to 56 cm and averaged 42.5 cm.

DUNGENESS CRAB

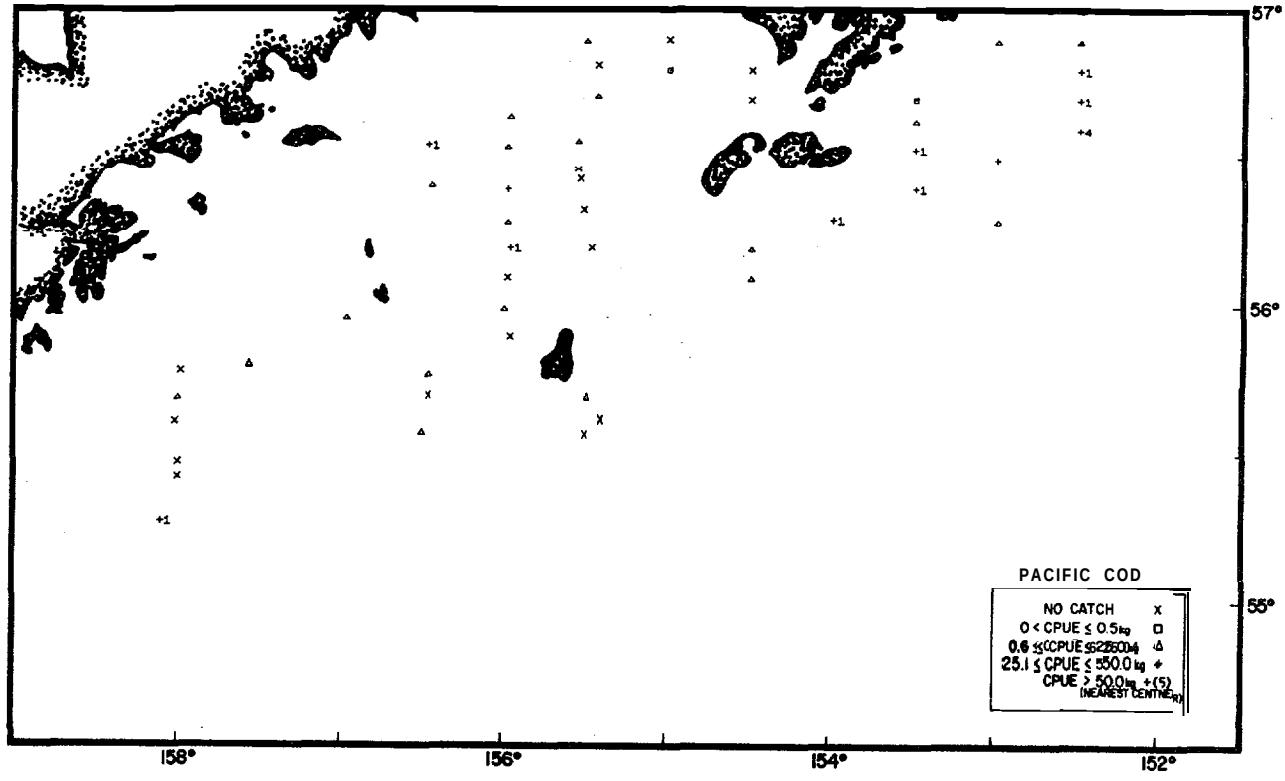
Distribution and Abundance-Dungeness crab were concentrated primarily in the inner shelf depth zone, 15 kg/hr, decreasing to 5 kg/hr in the outer shelf and no catch in the upper slope (Figure XI-294-295), (Table X1-50). Relative apparent abundance was greatest in the Shumagin, Kodiak and Sanak regions which had average CPUE's equal to or greater than the western Gulf average of 9 kg/hr

Biomass—The relative apparent biomass for Dungeness crab was estimated to be 20 thousand mt, 79% in the inner shelf and 21% in the outer shelf. Largest portions of the biomass occurred in the Shumagin, Kodiak and Sanak regions. The biomass estimate for Dungeness crab should be considered minimal as most of the population normally occurs in water depths shallower than were adequately sampled during this survey.

Size Composition-No length frequency data were collected for this species.

REX SOLE

Distribution and Abundance--Rex sole were widely distributed throughout the western Gulf of Alaska (Figures X1-296-297). Relative apparent abundance averaged 7 kg/hr and was directly correlated with water depth increasing from 0.4 kg/hr in the inner shelf to 30 kg/hr in the upper slope (Table X1-51). The Sanak region was the only region where the mean CPUE exceeded that of the western Gulf of Alaska.



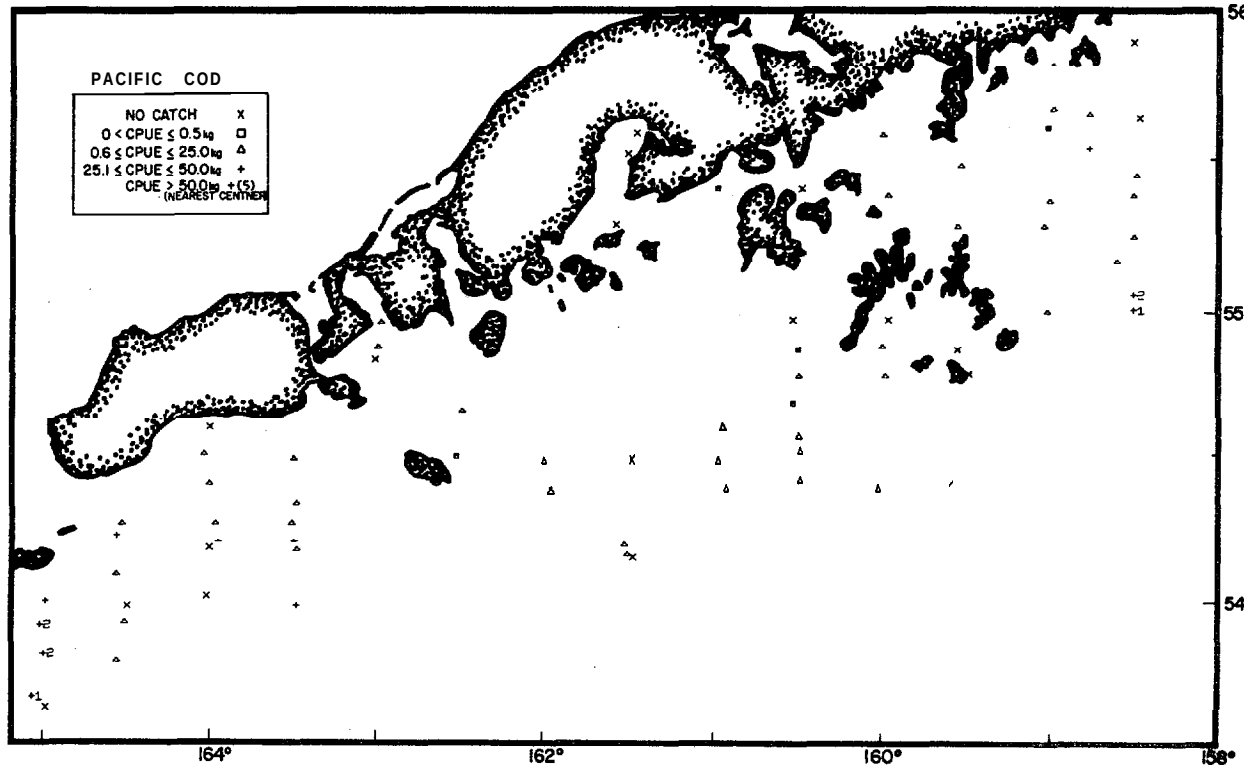


Figure xx-292.--Distribution of standardized catch rates in **kg/hr** of **Pacific** cod in the western Gulf of Alaska, **Aug.-Nov.** 1961 (Cruise 619).

Table XI-49.--Estimated biomass and population size of Pacific cod (*Gadus macrocephalus*) in the Gulf of Ala
September-November 1961.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mear indi Weigl (kg
Kodiak	l-100	12.5	3,429.7	33.2	4.4	36.4	0.71
	101-200	34.7	6,844.7	66.3	7.7	63.6	0.81
	201-400	1.8	51.6	0.5	4/	5/	1.2:
	All zones	20.7	10,326.0	34.5	12.1	38.4	0.8
Shelikof	l-100	--	--	--	--	--	--
	101-200	6.0	561.0	26.9	0.5	27.8	1.0:
	201-400	14.5	1,526.4	73.1	1.3	72.2	1.1;
	All zone8	8.0	2,087.4	7 . 0	1.8	5.7	1.1:
Chirikof	l-100	0.1	30.2	0.5	0.1	1.5	0.3
	101-200	23.8	4.867.6	86.8	5.9	90.8	0.8:
	201-400	5.7	711.2	12.7	0.5	7.7	1.51
	All zones	9.1	5,609.0	18.7	6.5	20.6	0.8'
Shumagin	l-100	0.7	169.4	3.9	0.6	12.8	0.28
	101-200	7.5	1,623.9	36.9	2.0	42.6	0.80
	201-400	93.2	2,603.8	59.2	2.1	44.7	1.27
	All zones	9.3	4,397.1	14.7	4.7	14.9	0.9
Sanak	l-100	17.7	3,779.1	50.2	3.3	51.6	1.13
	101-200	15.0	2,906.6	38.6	2.7	42.2	1.09
	201-400	56.7	842.2	11.2	0.4	6.3	1.89
	All zones	17.8	7,527.9	25.1	6.4	20.3	1.1
Total	l-100	6.9	7,408.4	24.7	8.4	26.7	0.88
	101-200	18.5	16,803.8	56.1	18.8	59.7	0.89
	201-400	19.0	5,735.2	19.2	4.3	13.7	1.33
	All zones	13.2	29,947.4	100.0	31.5	100.1	0.95

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

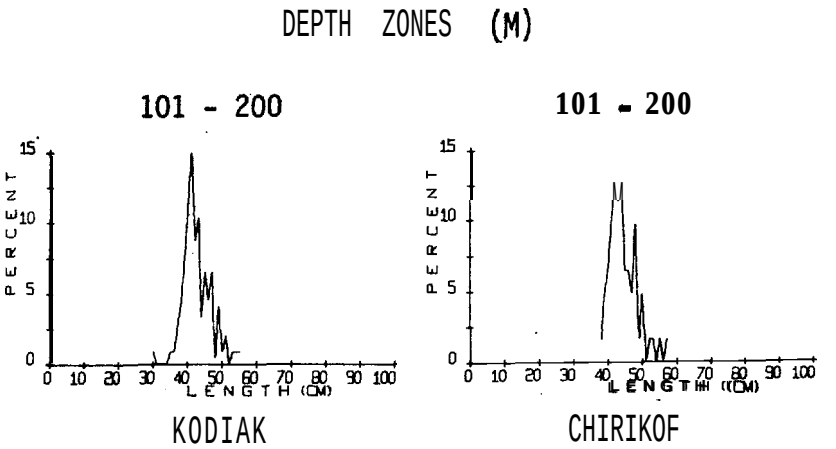
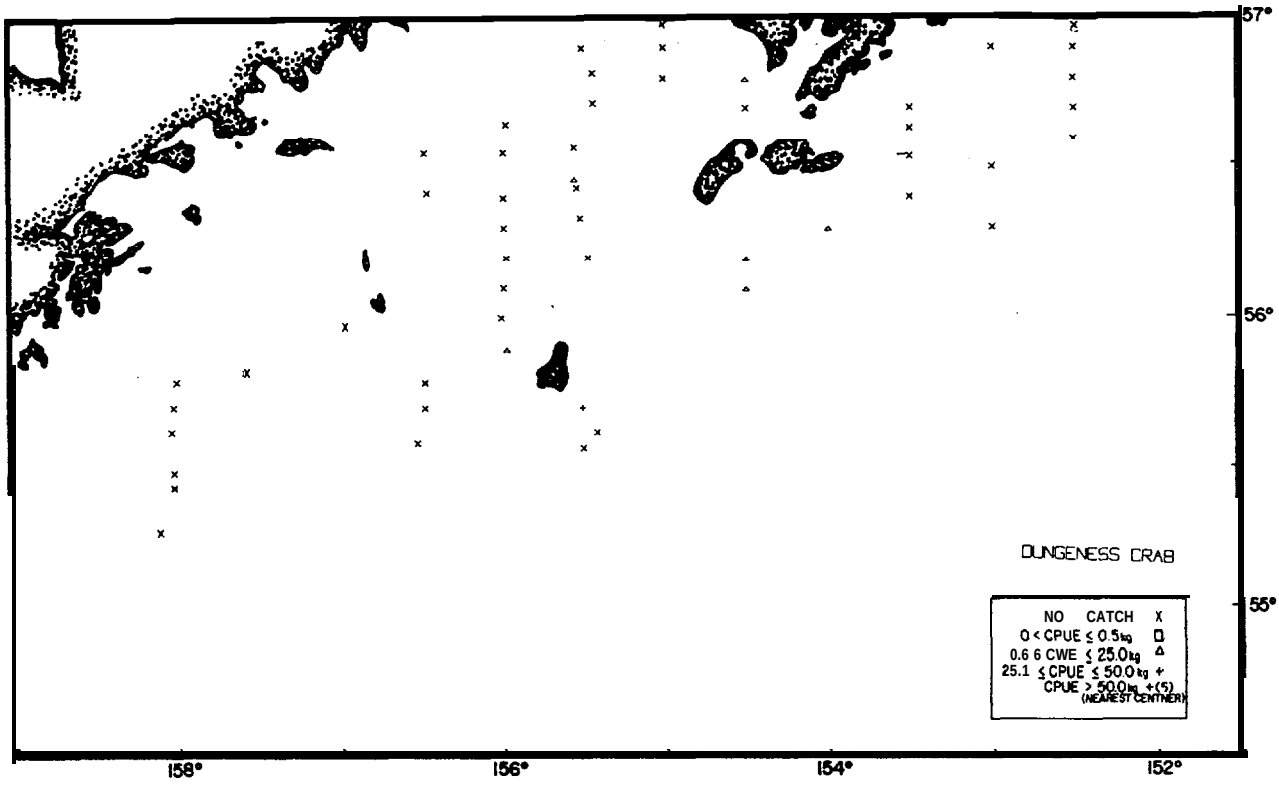


Figure XI-293.--Percentage length frequencies of Pacific cod from the **Gulf of Alaska** (Cruise 619).

Figure X1-294.--Distribution of standardized catch rates in kg/hr of Dungeness crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).



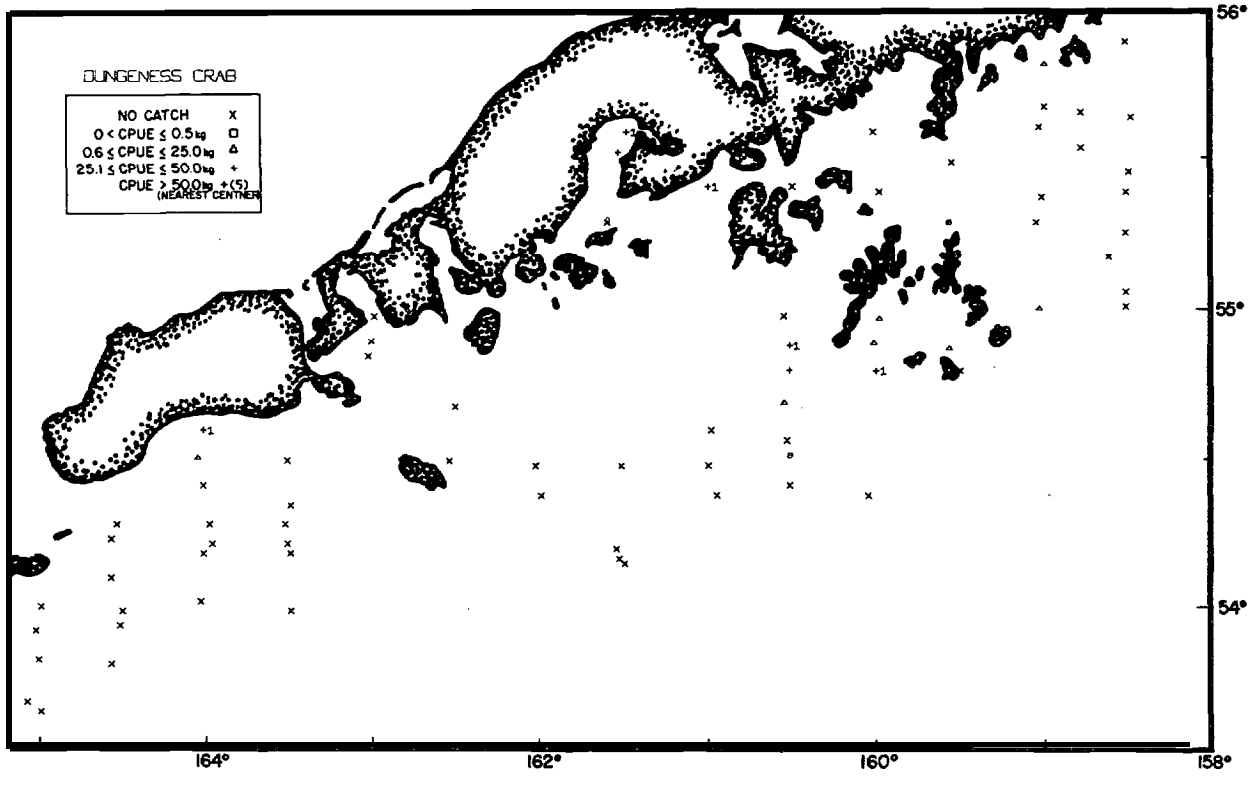
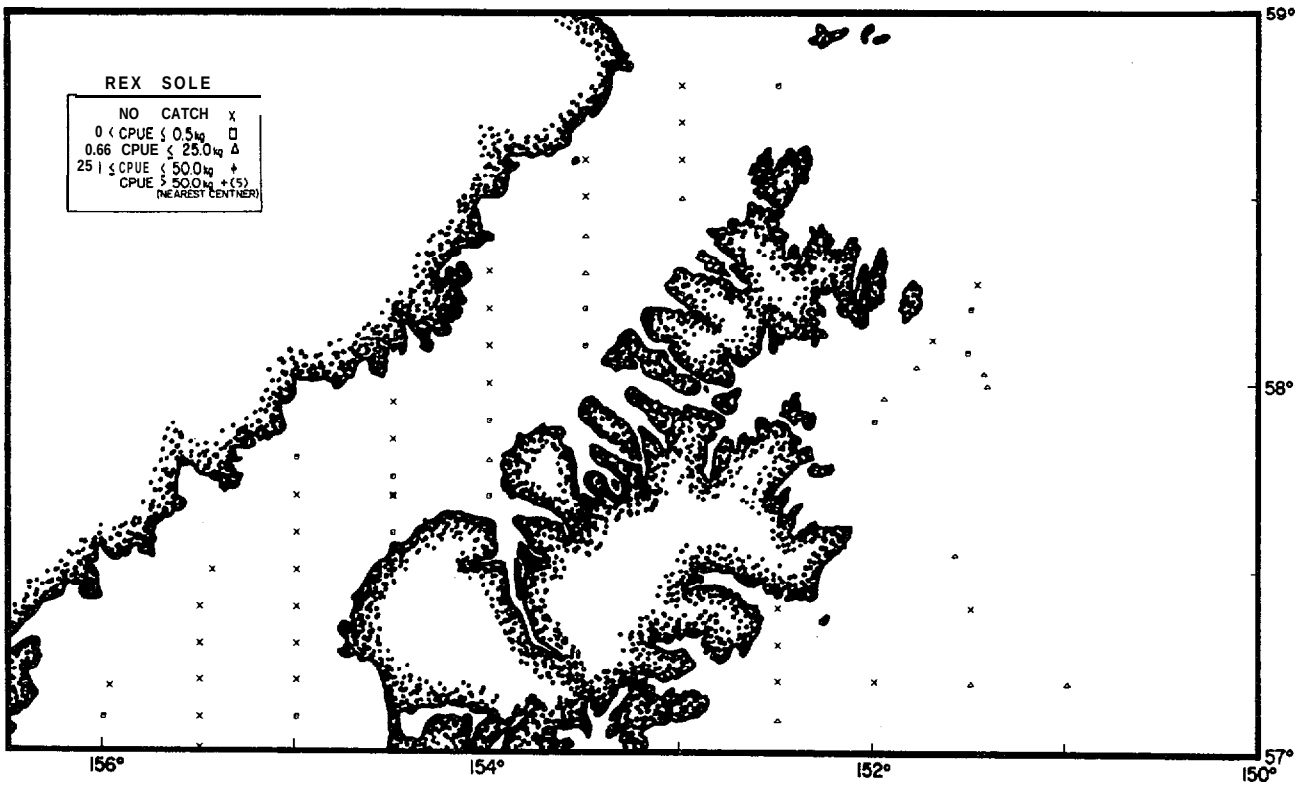


Figure X1-295.--Distribution of standardized catch rates in kg/hr of Dungeness crab in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-50.--Estimated biomass and population size of Dungeness crab (*Cancer magister*) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Rodiak	l-100	10.6	2,894.0	58.7	2.6	63.4	1.10	--
	101-200	10.3	2,033.5	41.3	1.5	36.6	1.36	--
	201-400	0 0	0	0	0	0	--	--
	All zones	9.9	4,927.5	25.3	4.1	14.6	1.20	--
Shelikof	l-100	--	a-	--	--	--	--	--
	101-200	6.3	584.0	100.0	0.6	100.0	0.95	--
	201-400	0	0	0	0	0	--	--
	All zones	2.2	584.0	3.0	0.6	2.1	0.95	--
Chirikof	l-100	0.5	141.9	13.1	0.1	10.0	0.98	--
	101-200	4.6	940.6	86.9	0.9	90.0	1.11	--
	201-400	0	0	0	0	0	--	--
	All zones	1.7	1,082.5	5.6	1.0	3.6	1.09	--
Shumagin	l-100	38.8	8,811-S	95.5	17.0	96.6	0.52	--
	101-200	2.0	420.4	4.6	0.6	3.4	0.71	--
	201-400	0	0	0	0	0	--	--
	All zones	19.6	9,231.9	47.3	17.6	62.6	0.53	--
Sanak	l-100	16.7	3,568.5	96.7	4.6	95.8	0.77	--
	101-200	0.6	120.5	3.3	0.2	4.2	0.79	--
	201-400	0	0'	0	0	0	--	--
	All zones	8.7	3,689.0	18.9	4.8	17.1	0.77	--
Total	l-100	14.5	15,415.9	79.0	24.3	86.5	0.63	--
	101-200	4.5	4,099.0	21.0	3.8	13.5	1.08	--
	201-400	0	0	0	0	0	--	--
	All zones	8.6	19,514.9	100.0	28.1	100.0	0.69	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



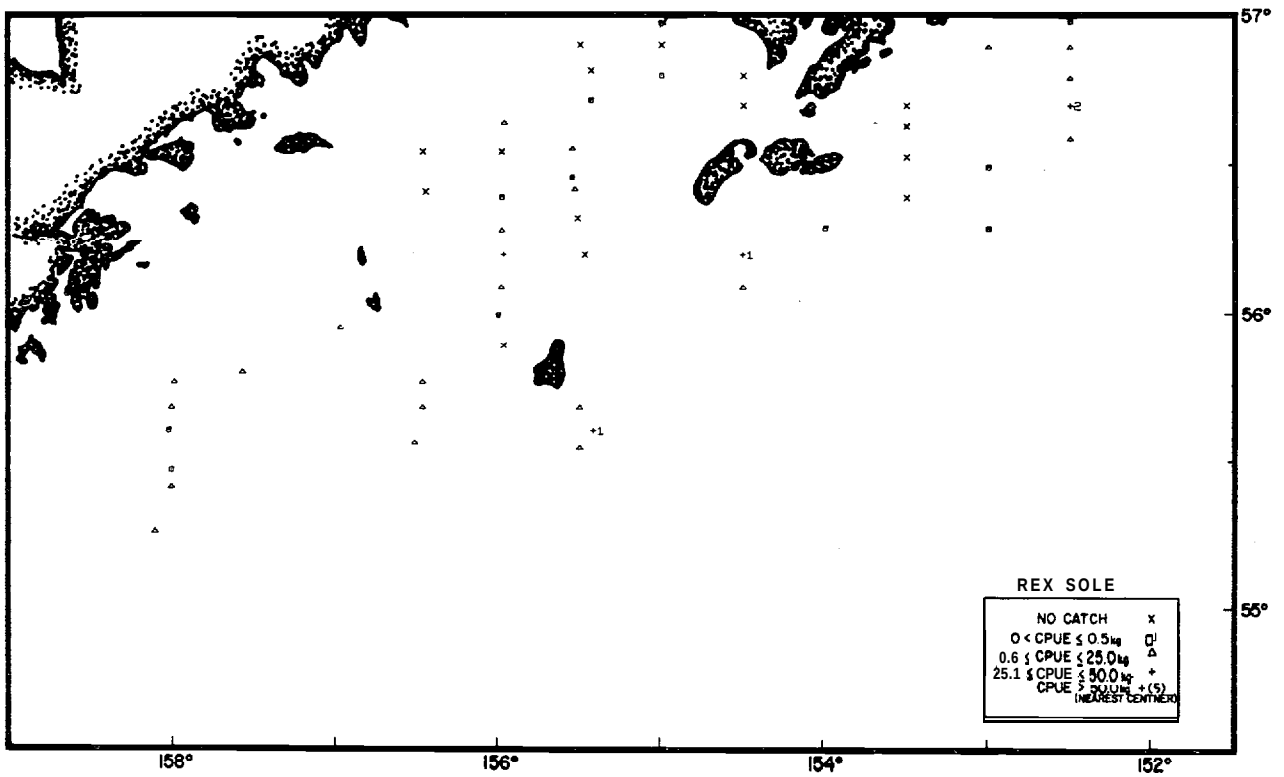


Figure XI-296.--Distribution of standardized catch rates in kg/hr of rex sole in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

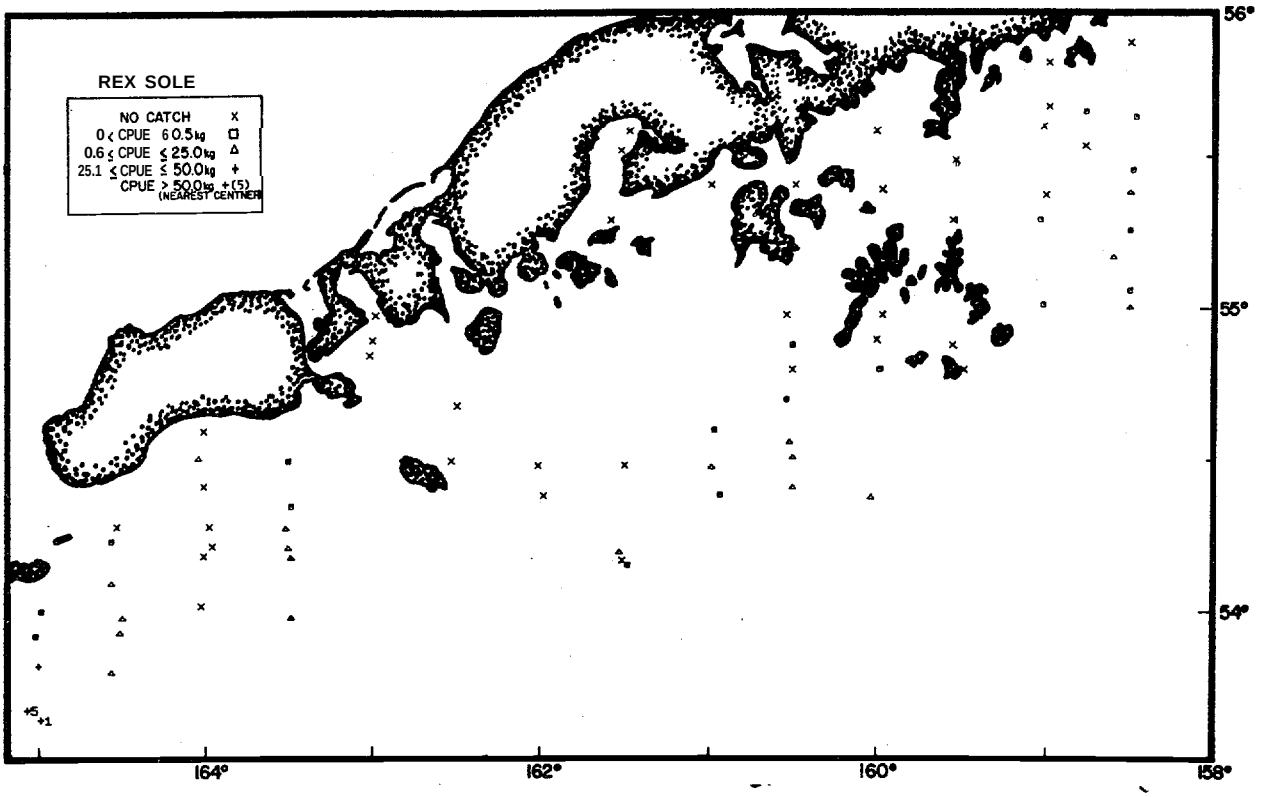


Figure XX-297.—Distribution of **standardized catch** rates **in kg/hr of rex sole in the** western Gulf *of* **Alaska, Aug.-Nov.** 1961 **(Cruise 619).**

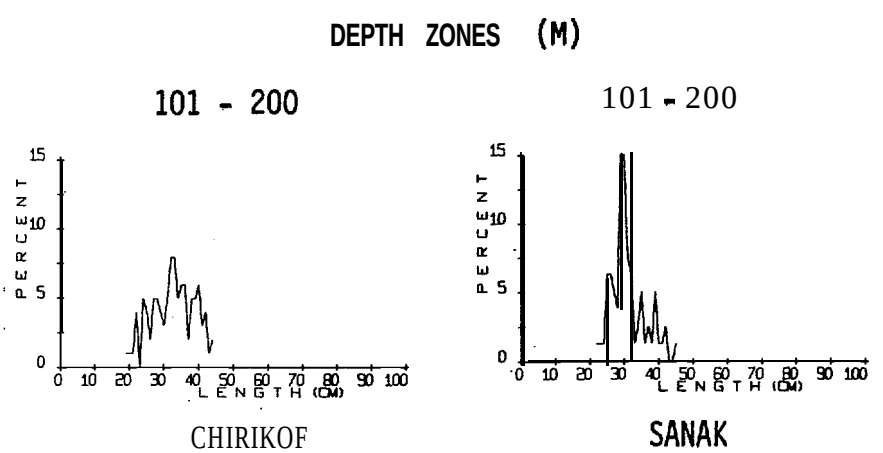


Figure XI-298.—Percentage length **frequencies of** rex **sole** from the **Gulf** *of* **Alaska** (Cruise **619).**

Table XI-51.--Estimated biomass and population size of rex sole (Glyptocephalus zachirus) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPU&' (kg/hr)	Estimated biomass. (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size p individual Weight (kg)	Len (Cl
Kodiak	l-100	0.5	147.0	7.6	1.6	17.0	0.09	--
	101-200	9.0	1,780.9	92.2	7.7	81.9	0.23	--
	201-400	0.1	3.0	0.2	0.1	1.1	0.06	--
	All zones	3.9	1,930.9	13.1	9.4	15.9	G.21	--
Shelikof	l-100	--	--	--	--	--	--	--
	101-200	0.5	43.9	94.6	0.5	100.0	0.09	--
	201-400	3/	2.5	5.4	4/	5/	0.07	--
	All zones	0.2	46.4	0.3	0.5	5/	0.09	--
Chirikof	l-100	0.2	44.7	1.3	0.6	3.1	0.08	--
	101-200	12.3	2,519.2	72.9	14.3	72.6	0.18	
	201-400	7.2	893.9	25.9	4.8	24.4	0.19	--
	All zones	5.6	3,457.8	23.4	19.7	33.3	0.18	--
Shumagin	l-100	3/	8.5	3.7	0.1	4.0	0.08	--
	101-200	0.8	180.0	77.6	2.0	80.0	0.09	--
	201-400	1.6	43.6	18.8	0.4	16.0	0.12	--
	All zones	0.5	232.1	1.6	2.5	4.2	0.09	--
Sanak	l-100	1.0	221.0	2.4	1.8	6.7	0.12	--
	101-200	3.7	726.8	8.0	2.8	10.4	0.26	
	201-400	548.5	8,147.7	89.6	22.4	83.0	0.36	--
	All zones	21.5	9,095.5	61.6	27.0	45.7	0.34	--
Total	l-100	0.4	421.2	2.8	4.1	6.9	0.10	--
	101-200	5.8	5,250.8	35.6	27.3	46.2	0.19	--
	201-400	30.2	9,090.7	61.6	27.7	46.9	0.33	--
	All zones	6.5	14,762.7	100.0	59.1	100.0	0.25	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Biomass-The total apparent biomass of rex sole was estimated to be 15 thousand mt of which 62% was contained in the upper slope, 36% in the outer slope, and 3% in the inner shelf. Largest portions of the biomass were contained in the Sanak (62%), Chirikof (23%) and Kodiak (13%), regions which together accounted for 98% of the total.

Size Composition--Random length frequency samples were taken in the Sanak and Chirikof outer shelf depth zones (Figure XI-298). Rex sole, sexes combined, ranged from 22 to 45 cm and averaged 30.9 cm in Sanak and ranged from 19 to 44 cm and averaged 32.6 cm in the Chirikof region.

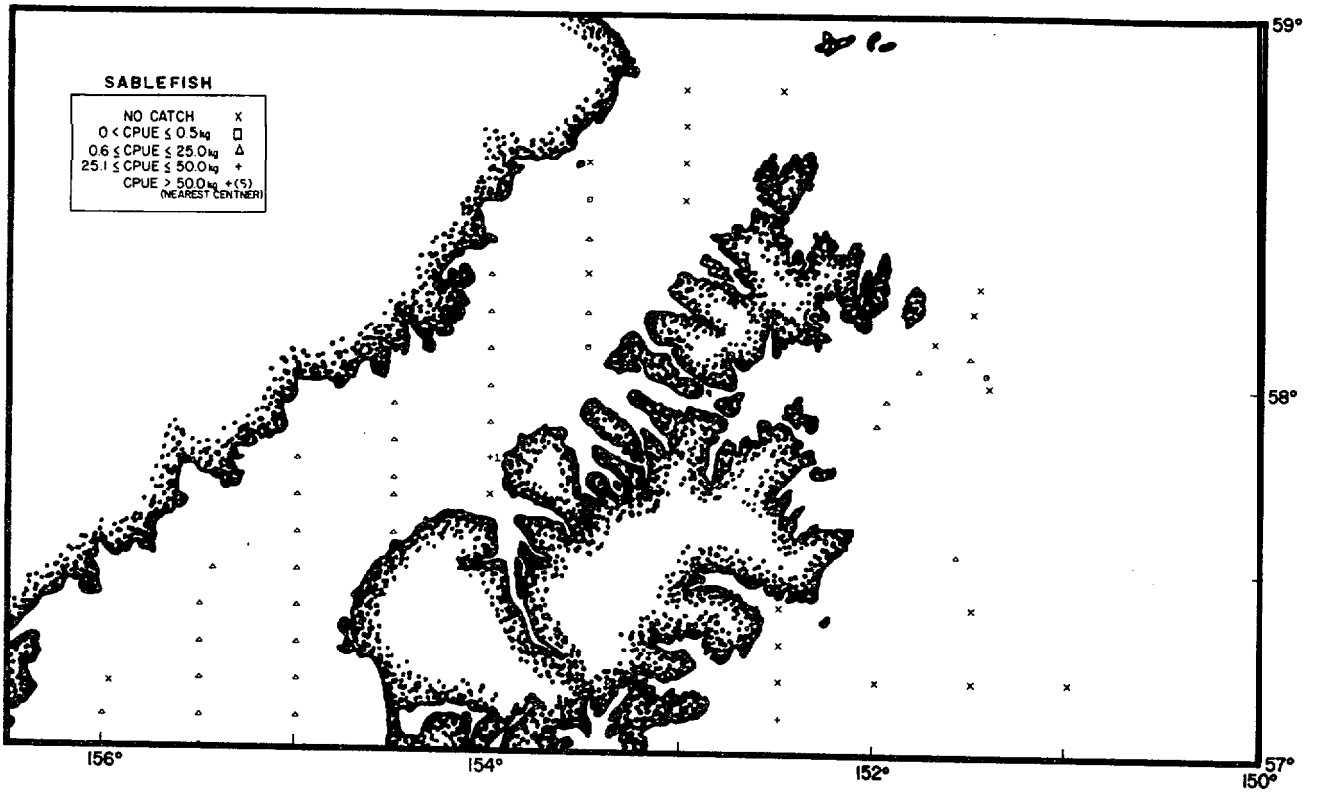
SABLEFISH

Distribution and Abundance--Sablefish were found throughout the western Gulf of Alaska with' the exception of the inner shelf depth zone of the Kodiak and Shumagin regions (Figures X1-299-300). Relative apparent abundance averaged 6 kg/hr and was directly correlated with water depth, increasing from 0.3 kg/hr in the inner shelf to 27 kg/hr in the upper slope. Greatest species density occurred in the Sanak and Chirikof regions.

Biomass-For sablefish the total apparent abundance was estimated to be 13 thousand mt. Largest portions of the biomass were found in the Chirikof (38%) and Sanak (35%) regions, which together contained 73% of the total (Table X1-52). The total biomass of sablefish was primarily found in deeper water, 66% in the upper slope depth zone. The biomass estimated for sablefish should be considered minimal as only a portion of their bathymetric distribution was sampled and due to untrawlable substrate at deeper depths.

OTHER SPECIES

During this September-November 1961 survey, only two species or species groups which had overall mean CPUE's of less than 1 kg/hr occurred at significant levels of abundance within restricted distributions. In the Kodiak region, the ronquil group accumulated mean CPUE's of 24 and 30 kg/hr in the inner and outer shelf depth zones while in the Sanak-inner shelf and Shumagin-outer shelf, yellowfin sole occurred at catch rates of 18 and 13 kg/hr respectively.



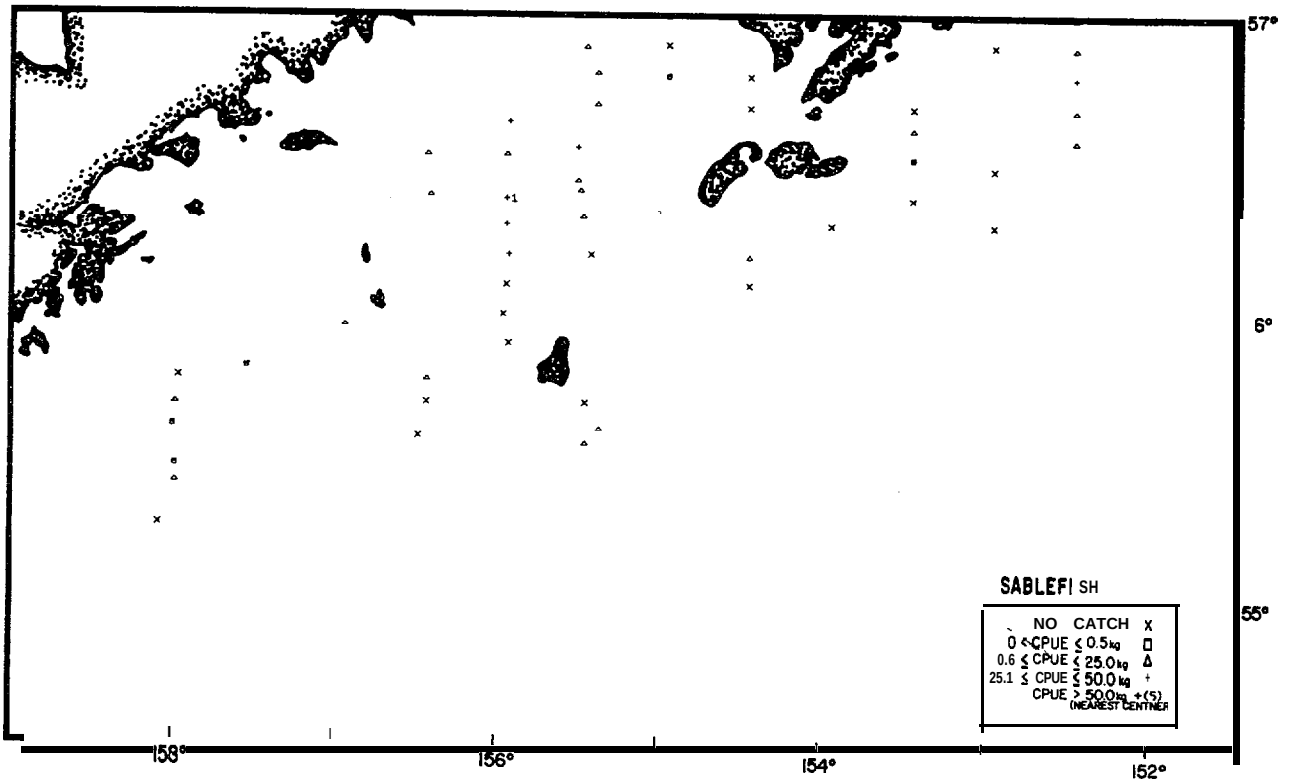


Figure XI-299.--Distribution of standardized catch rates in kg/hr of aablefish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

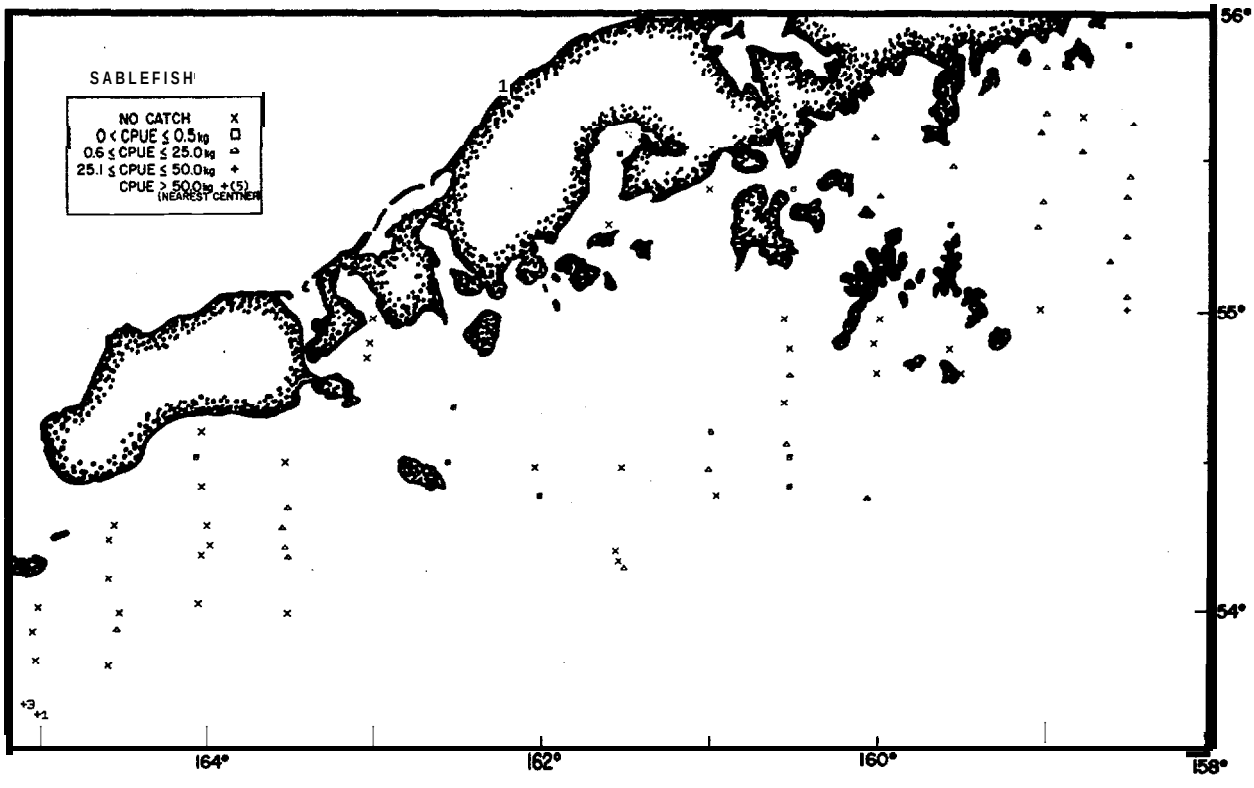


Figure XI-300. --Distribution of standardized catch rates in kg/hr of sablefish in the western Gulf of Alaska, Aug.-Nov. 1961 (Cruise 619).

Table XI-52.--Estimated biomass and population size of sablefish (Anoplopoma fimbria) in the Gulf of Alaska, September-November 1961.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Kodiak	l-100	0	0	0	0	0	--	--
	101-200	4.7	917.7	74.0	1.4	63.6	0.65	--
	201-400	11.3	322.6	26.0	0.8	36.4	0.39	--
	All zones	2.5	1,240.3	9.9	2.2	15.5	0.56	--
Shelikof	l-100		--		--	--	--	--
	101-200	5.6	526.5	42.2	0.7	63.6	0.77	--
	201-400	6.9	721.8	57.8	0.4	36.4	1.76	--
	All zones	4.8	1,248.3	10.0	1.1	7.8	1.14	--
Chirikof	l-100	0.8	235.2	4.9	0.6	14.0	037	--
	101-200	9.7	1,982.7	41.6	2.4	55.8	0.82	--
	201-400	20.4	2,545.2	53.4	1.3	30.2	1.90	--
	All zones	7.7	4,763.1	38.1	4.3	30.3	1.09	--
Shumagin	l-100	0		0	0	0	--	--
	101-200	2.2	4708.9	51.5	1.7	85.0	0.29	--
	201-400	16.2	451.4	48.5	0.3	15.0	1.33	--
	All zones	2.0	930.3	7.4	2.0	14.1	0.46	--
Sanak	l-100	0.3	73.0	1.7	0.2	4.4	0.37	--
	101-200	0.3	64.3	1.5	0.2	4.4	0.29	--
	201-40.0	282.7	42198.8	96.8	4.2	91.3	1.00	--
	All zones	10.3	4,336.1	34.6	4.6	32.4	0.94	--
Total	l-100	0.3	308.2	2.5	0.8	5.6	0.39	--
	101-200	4.4	3,970.1	31.7	6.4	45.1	0.62	--
	201-400	27.4	8,239.8	65.8	7.0	49.3	1.18	--
	All zones	5.5	12,518.1	100.0	14.2	100.0	-0.88	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

RESEARCH UNIT 174

Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass 1948 - 1976

A Historical Review

by

Lael L. Ronholt, Herbert H. Shippen and Eric S. Brown

December 1977

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Page	Paragraph	Line	
599	Footnote 4		should read 0.1 X 10^6 individuals
740	2	2 & 3	mean lengths for females should read 23.7-44.7 cm mean lengths for males should read 28.3-41.7 cm.
755	1	2	should read Fairweather-upper slope
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Figure X1-539. --Distribution of standardized catch rates in kilograms/ hour of Pacific ocean perch in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

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Figure XI-542.--Distribution of standardized catch rates in kilograms/ hour of Pacific ocean perch in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Figure X1-543.--Length frequency distributions of Pacific ocean perch in the Gulf of Alaska by region-depth zones, 1973-1976.

Figure X1-544.--Weight at length observations for Pacific ocean perch in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).

Figure XI-545.--Distribution of standardized catch rates in kilograms/ hour of weathervane scallop in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

Figure XI-546.--Distribution of standardized catch rates in kilograms/ hour of weathervane scallop in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

Figure X1-547.--Distribution of standardized catch rates in kilograms/ hour of weathervane scallop in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

Figure X1-548.--Distribution of standardized catch rates in kilograms/ hour of weathervane scallop in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

Figure XI-549.--Distribution of standardized catch rates in kilograms/ hour of weathervane scallop in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Figure XI-550.--Distribution of standardized catch rates in kilograms/ hour of smelts in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

Figure XI-551.--Distribution of standardized catch rates in kilograms/ hour of smelts in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

Figure X1-552.--Distribution of standardized catch rates in kilograms/ hour of smelts in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

Cruise 628, Chartered Fishing Vessels, Arthur H., St. Michael and Western Flyer (June-August 1962)

During the 1962 resource assessment survey 232 stations were successfully sampled in the eastern Gulf of Alaska (Table X1-53). Sampling densities were generally high throughout the survey area ranging from one station per 256 km2 in the Prince William region to one station per 628 km^2 in the Fairweather region. Highest densities by depth zones occurred in the outer shelf and upper slope and averaged one station per 391 km^2 over the entire survey area. Station numbers and positions for all successful tows are presented in Figures XI-301-302. Fish and commercially important invertebrate species taken during the survey are listed in Table V-3-4. Random length frequencies were taken for several fish species in the Kenai outer shelf and upper slope but data were insufficient to construct population size-sex composition over the entire survey area.

TOTAL BIOMASS

The total apparent biomass between June and August of the survey period has been estimated at 607 thousand mt, of which 52% occurred in the outer shelf, 25% in the inner shelf and 23% in the upper slope (Table XI-54 and Figure X1-303). The combined Fairweather and Kenai regions accounted for 63% of the total biomass, while Prince William (21%) and Yakutat (16%) accounted for the remainder.

The Fairweather region had the highest biomass density (11.6 mt/km^2) with values in the remaining regions ranging from 4.9 to 6.5 mt/km^2. By depth zones, the highest biomass density occurred in the upper slope followed by the inner and outer shelf and averaged 6.7 mt/km^2 over the entire survey area. The total catch encountered at each successful sampling station is plotted in Figure XI-304.

RELATIVE IMPORTANCE OF SPECIES GROUPS

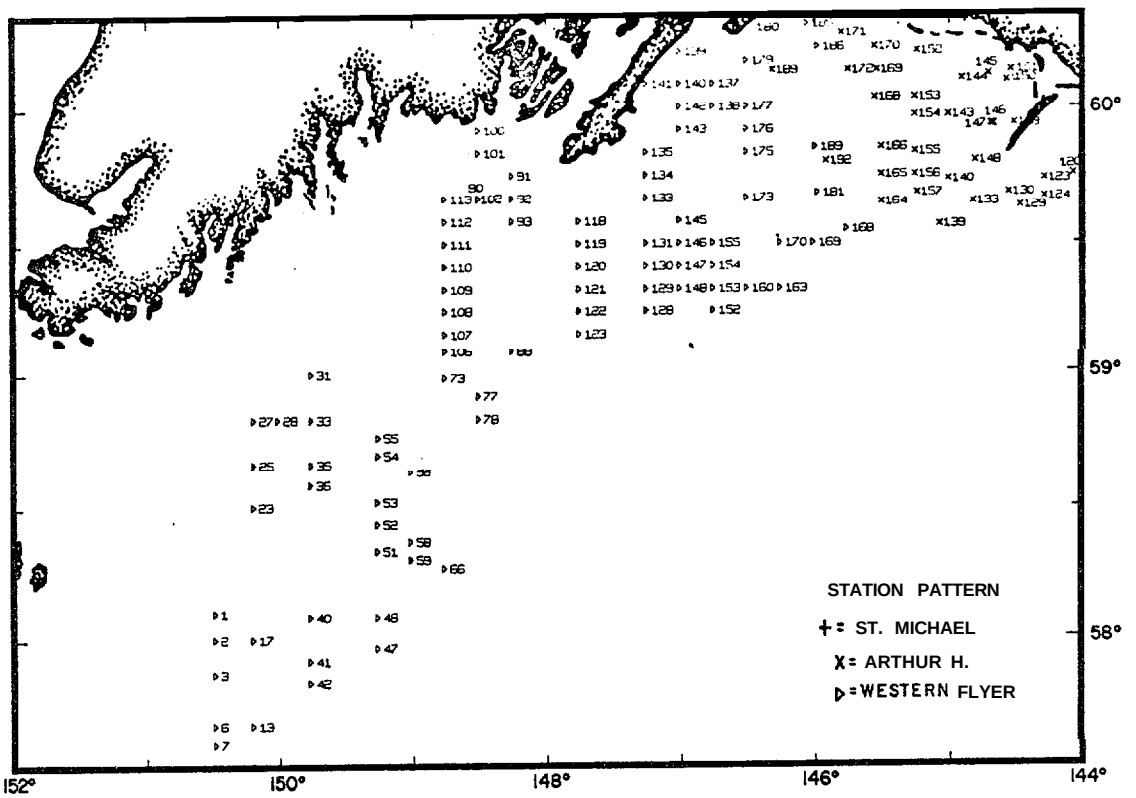
The proportion the combined fishes contributed to the total biomass was highest in the upper slope depth zone (94%), lowest in the inner shelf (82%), and averaged 89% over all depths. By species groups, the flatfishes represented the greatest portion of the total biomass (61%) followed in rank order by the roundfishes (12%), invertebrates and rockfish (11%) and elasmobranchs (5%) (Table X1-55).

Of the total estimated flatfish biomass of 368 thousand mt, the outer shelf depth zone contained the largest portion (49%) followed by the inner shelf (27%) and upper slope (24%) (Table XI-56). Sixty-seven percent of the flatfish biomass was concentrated in the Fairweather and Kenai regions with Prince William and Yakutat accounting for the remainder. The mean CPUE for the flatfish group over the entire survey area was 242 kg/hr. By depth zone the highest mean catch rate occurred in the upper slope followed by the inner and outer shelf. The Fairweather region had the

Table XI-53.-Number of stations successfully trawled and sampling densities[1/] by regions and depth zones in the Gulf of Alaska during June-August 1962 (Cruise 628).

Region	DEPTH ZONES (M) 0 - 100			101 - 200			201 - 400			0 - 400		
	No. of stations	Area (km^2)	Sampling density	No. of stations	Area (km^2)	Sampling density	No. of stations	Area (km^2)	Sampling density	No. of stations	Area (km^2)	Sampling density
Fairweather	2	2,566	1,283	21	11,617	553	3	2,144	715	26	16,327	628
Yakutat	5	4,418	884	24	10,430	435	6	4,894	816	35	19,742	564
Prince William	15	7,885	526	48	8,990	187	13	2,600	200	76	19,475	256
Kenai	3	6,239	2,080	62	20,829	341	31	8,139	263	95	35,207	371
Total	25	21,108	844	154	51,866	337	53	17,777	335	232	90,751	391

[1/] Sampling density = $\frac{\text{No. of } km^2}{\text{No. of stations}}$



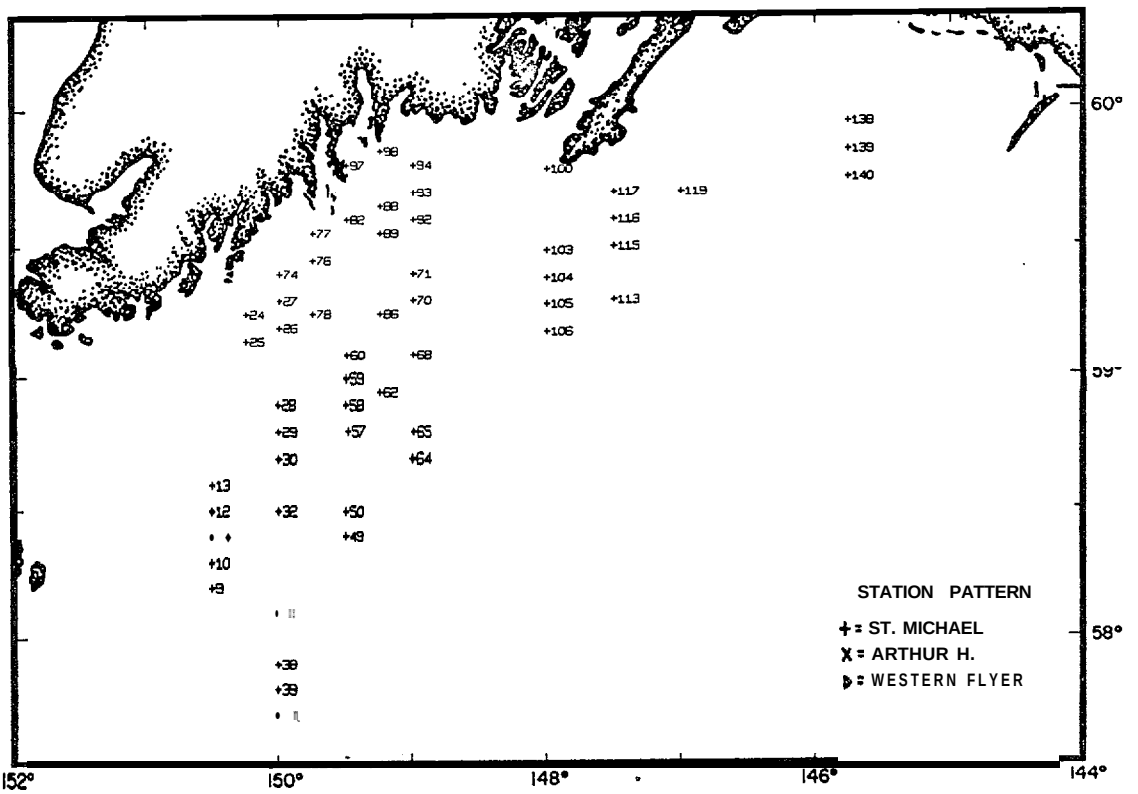


Figure XI-301.--Stations successfully trawled (otter trawl) during Cruise 628, June-Aug. 1962.

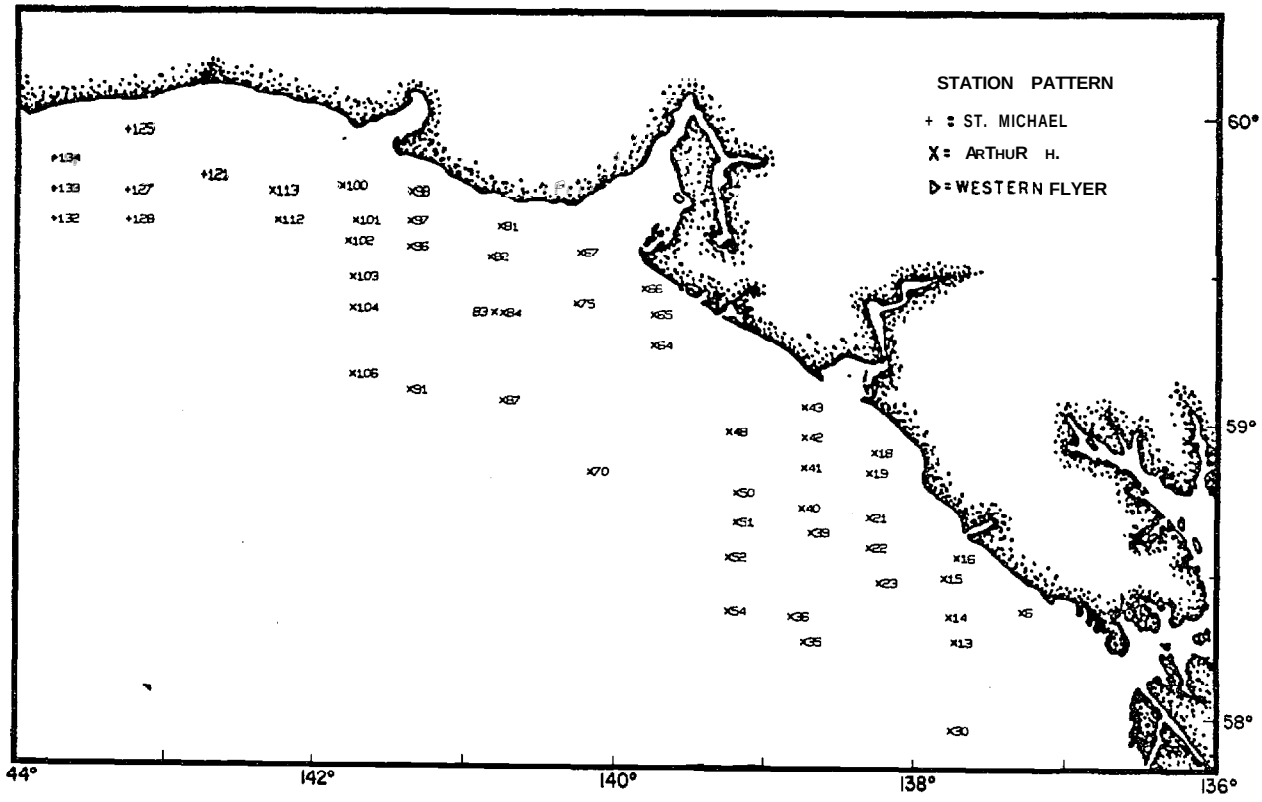


Figure XI-302.--Stations successfully trawled (otter trawl) during Cruise 628, June-Aug. 1962.

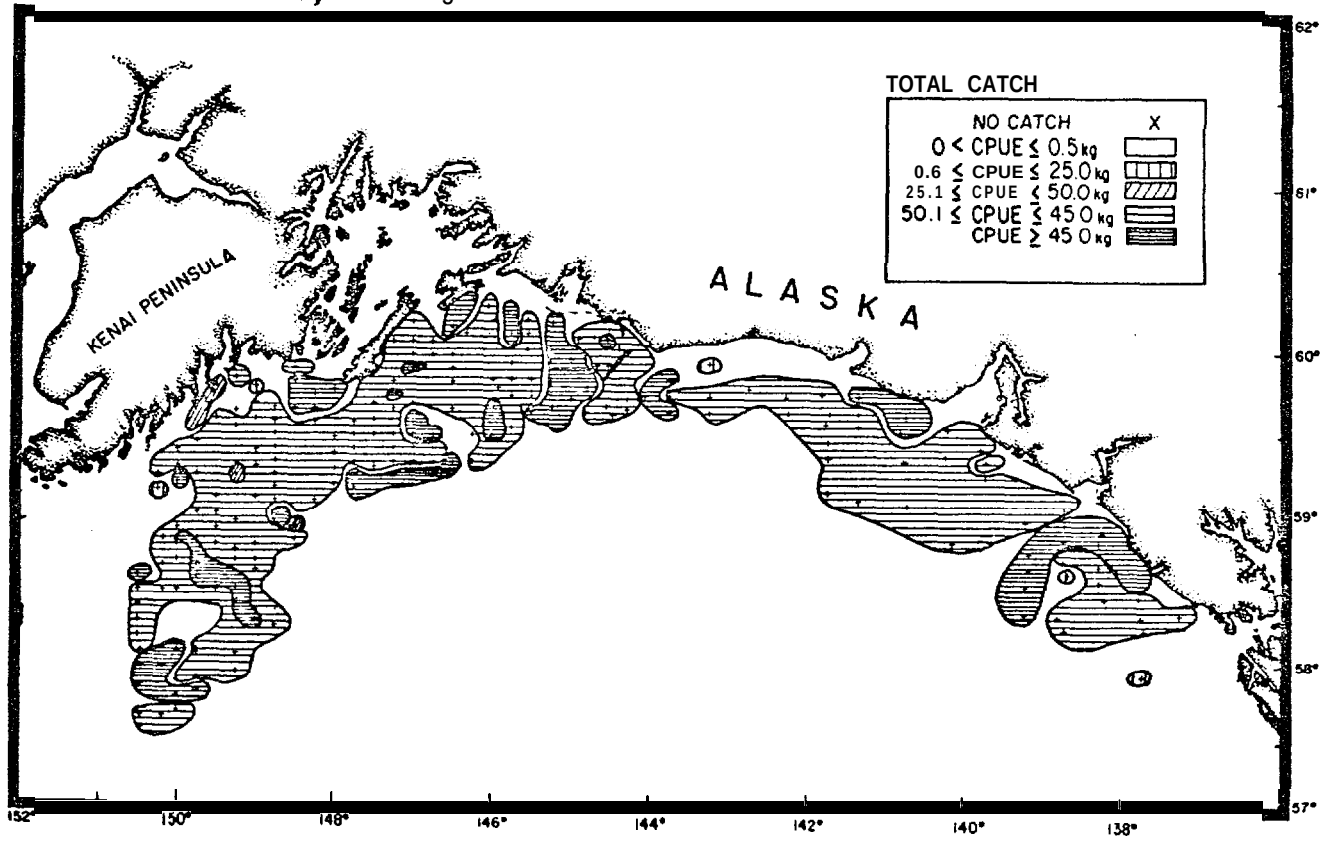
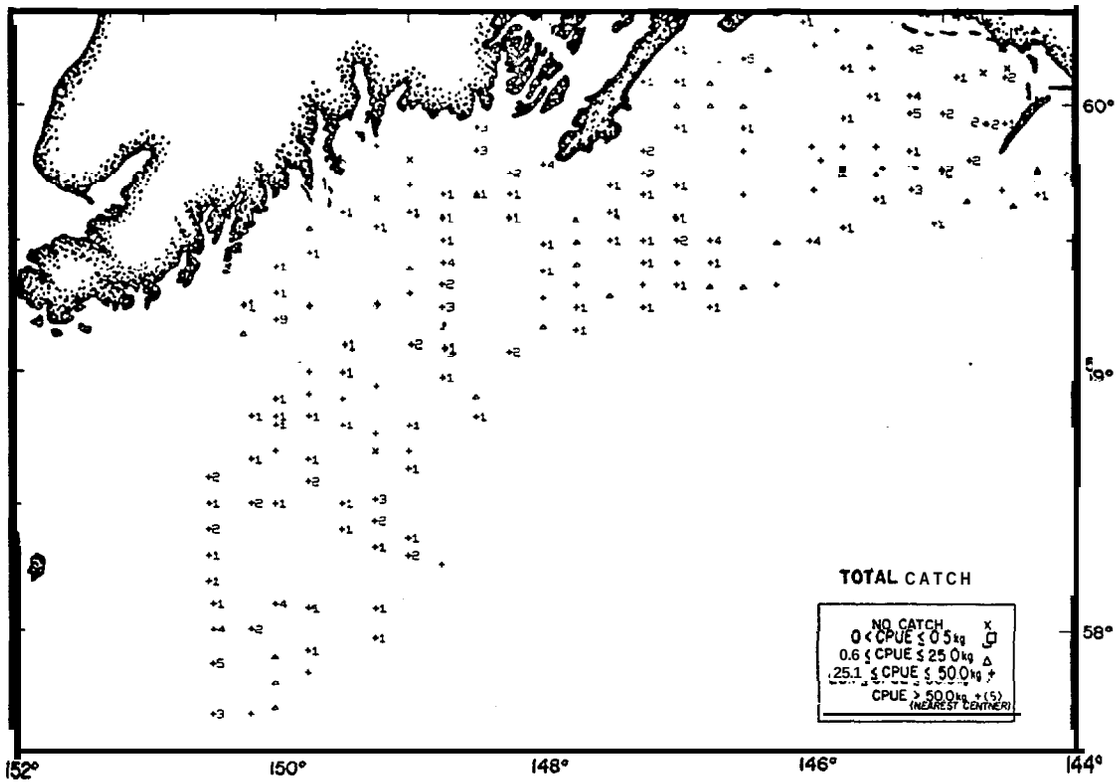
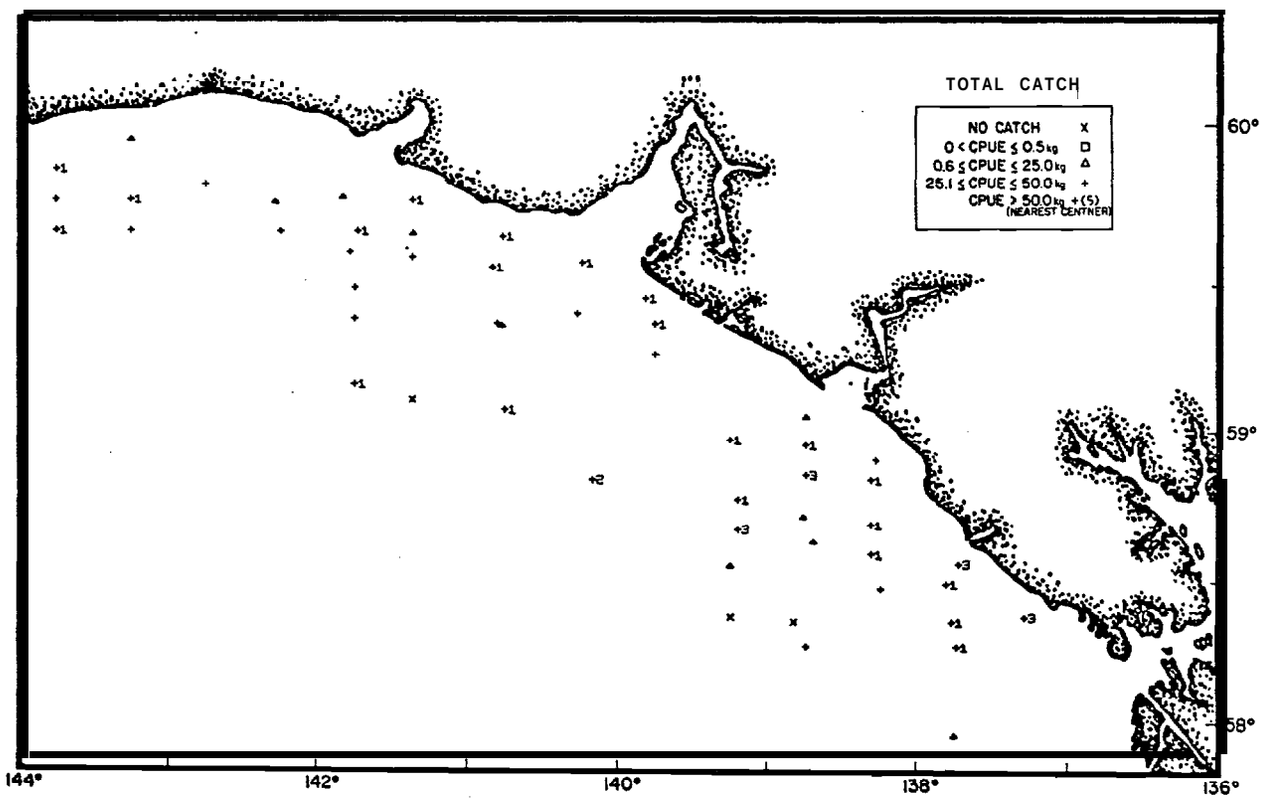


Figure XI-303.--Distribution of apparent relative abundance of all species combined in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-54.--Estimated biomass in metric tons for all species combined during the June-August 1962 resource assessment survey in the Gulf of Alaska (Cruise 628).

Regions	DEPTH ZONES (M) 0-100	101-200	201-400	0-400
Fairweather				
mt x 10^3	66.6	66.8	55.8	189.2
mt/km^2	25.9	5.7	26.0	11.6
% biomass in depth zone	44.8	21.0	39.8	31.2
% regional biomass	35.2	35.3	29.5	100.0
Yakutat				
mt x 10^3	19.7	55.2	22.5	97.4
mt/km2	4.5	5.3	4.6	4.9
% biomass in depth zone	13.3	17.3	16.1	16.0
% regional biomass	20.2	56.7	23.1	100: 0
Prince William				
mt x 10^3	35.5	74.6	16.9	127.0
mt/km^2	4.5	8.3	6.5	6.5
% biomass in depth zone	23.9	23.4	12.1	20.9
% regional biomass	28:0	58.7	13.3	100: 0
Kenai				
mt x 103	26.8	121.6	44.8	193.2
mt/km2	4.8	5.8	5.5	5.5
% biomass in depth zone	18.0	38.2	32.0	31.9
% regional biomass	13.9	62.9	23.2	100: 0
Total				
mt x 10^3	148.6	318.2	140.0	606.8
mt / km^2	7.0	6.1	7.9	6.7
% biomass in depth zone	100.0	99.9	100.0	100.0
% total biomass	24.5	52.4	23.1	100: 0





Figures XI-304.--Distribution of standardized catch **rates** in **kg/hr** of all species combined in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-55.--Relative importance of species groups based on the rank order of their total biomass (Cruise 628).

Species Groups	DEPTH ZONES (M) 0-100	101-200	201-400	O-400
Flatfish				
mt x 10^3	101.1	178.9	87.7	367.7
mt/km^2	4.8	3.4	4.9	4.1
% biomass in depth zone	68.0	56.3	62.6	60.6
% flatfish biomass	27.5	48.7	23.8	100.0
Roundfish				
mt x 103	15.9	46.3	11.9	74.1
mt/km2	0.8	0.9	0.7	0.8
% biomass in depth zone	10.7	14.6	8.5	12.2
% roundfish biomass	21.5	62.5	16.0	100.0
Invertebr tes				
mt x 10^3	27.2	33.8	8.1	69.1
mt/km^2	1.3	0.7	0.5	0.8
% biomass in depth zone	18.3	10.6	5.8	11.4
% invertebrate biomass	39.4	48.9	11.7	100: 0
Rockfish				
mt x 10^3	0.2	41.7	25.0	66.9
mt/km^2	1/	0.8	1.4	0.7
% biomass in depth zone	0.1	13.1	17.8	11.0
% rockfish biomass	0.3	62.3	37.4	100.0
Elasmobranchs				
mt x 10^3	4.3	17.3	7.4	29.0
mt/km^2	0.2	0.3	0.4	0.3
% biomass in depth zone	2.9	5.4	5.3	4.8
% elasmobranch biomass	14.8	59.7	25.5	100.0
Total				
mt x 10^3	148.7	318.0	140.1	606.8
mt/km^2	7.1	6.1	7.9	6.7
% biomass in depth zone	100.0	100.0	100.0	100.0
% total biomass	24.5	52.4	23.1	100.0

1/ Less than 0.1 mt/km^2.

Table XI-56.--Estimated biomass and population size of flatfishes in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPU&' (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	1254.8	53,828.2	36.7	81.0	33.3	0.66	--
	101-200	259.i	50,329.4	34.4	94.7	39.0	0.53	--
	201-400	1183.2	42,409.8	28.9	67.4	27.7	0.63	--
	All zones	537.0	146,567.4	39.9	243.1	28.9	0.60	--
Yakutat	l-100	157.2	11,611.0	23.3	29.7	24.7	0.40	--
	101-200	153.3	26,737.5	53.7	68.9	57.2	0.39	--
	201-400	139.8	11,442.6	23.0	21.8	18.1	0.52	--
	All zones	150.8	49,791.1	13.5	120.4	14.3	0.41	--
Prince William	l-100	147.4	19,433,3	27.4	45.9	28.8	0.42	--
	101-200	284.9	42,824.8	60.4	96.7	60.7	0.44	--
	201-400	198.7	8,639.5	12.2	16.7	10.5	0.52	--
	All zones	217.7	70,897.6	19.3	159.3	19.0	0.45	--
Kenai	l-100	155.3	16,201.4	16.1	63.0	19.9	0.46	--
	101-200	169.5	59,024.0	58.8	201.5	63.5	0.30	--
	201-400	184.9	25,169.8	25.1	52.5	16.6	0.48	--
	All zones	170.5	100,395.2	27.3	317.0	37.8	0.32	--
Total	l-100	286.5	101,073.9	27.5	219.6	26.2	0.46	--
	101-200	206.3	178,915.7	48.7	461.8	55.0	0.39	--
	201-400	294.9	87,661.7	23.8	158.4	18.8	0.55	--
	All zones	242.3	367,651.3	100.0	839.8	100.0	0.44	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

highest apparent relative abundance with particularly high mean CPUE's occurring in the inner shelf and upper slope depth zones of this region (Figure X1-305). Mean CPUE's decreased to slightly below the survey average in the Prince William region and declined further in Kenai and Yakutat. The distribution of the standardized catch rates for the flatfish group is plotted in Figure XI-306 for all stations successfully sampled.

The roundfish group had the second highest estimated biomass of 74 thousand mt. Sixty-four percent of this biomass was concentrated in the Kenai region while contributions generally declined to the east with Yakutat accounting for the smallest portion (8%) (Table X1-57). The outer shelf depth zone contained nearly 63% of the roundfish biomass while the inner shelf and upper slope contained 21% and 16% respectively. Mean catch rates for the roundfish group did not vary significantly with depth. The outer shelf depth zone was highest followed by the inner shelf and upper slope. The Kenai region had the highest relative apparent abundance where particulary high CPUE's occurred in the inner and outer shelf (Figure X1-307). The remaining regions had mean catch rates which fell below the survey average. The distribution of the standardized catch rates for this group is plotted for all successful stations in Figure X1-308.

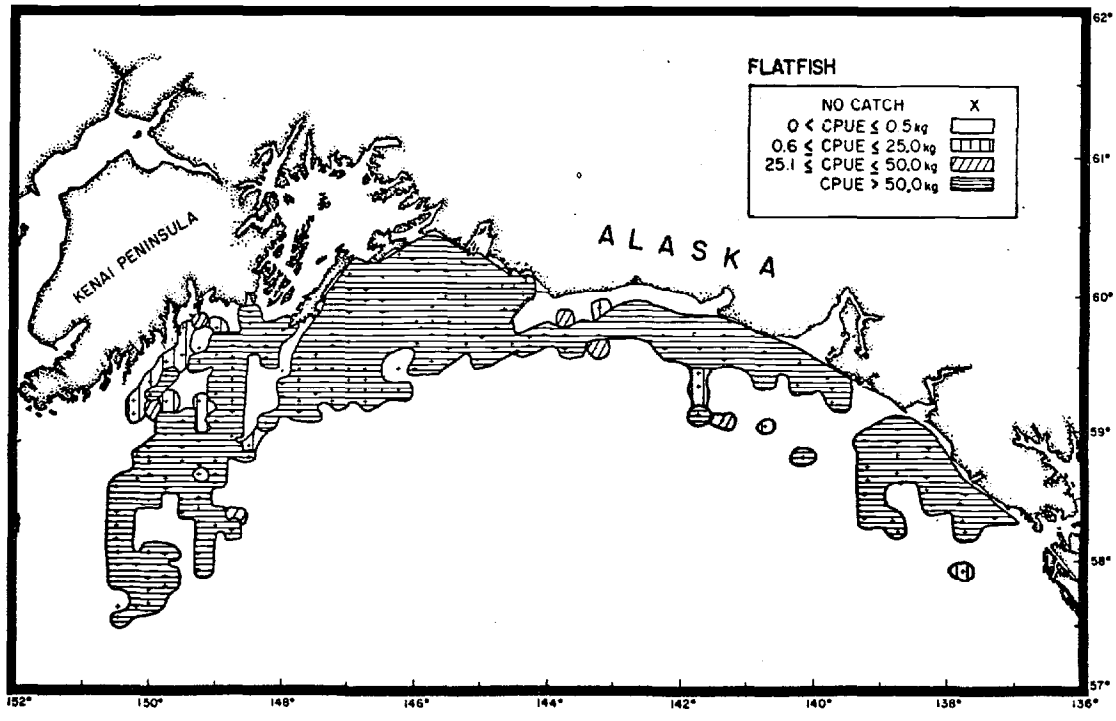
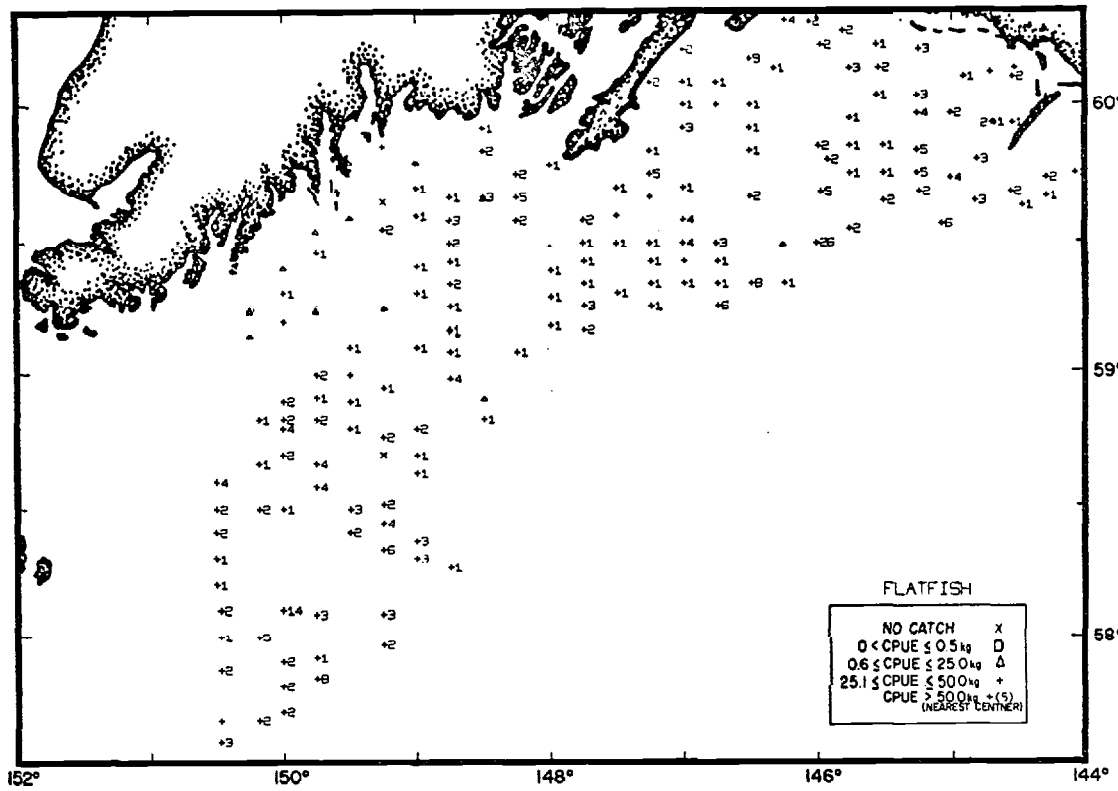


Figure X1-305.--Distribution of apparent relative abundance of flatfish in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).



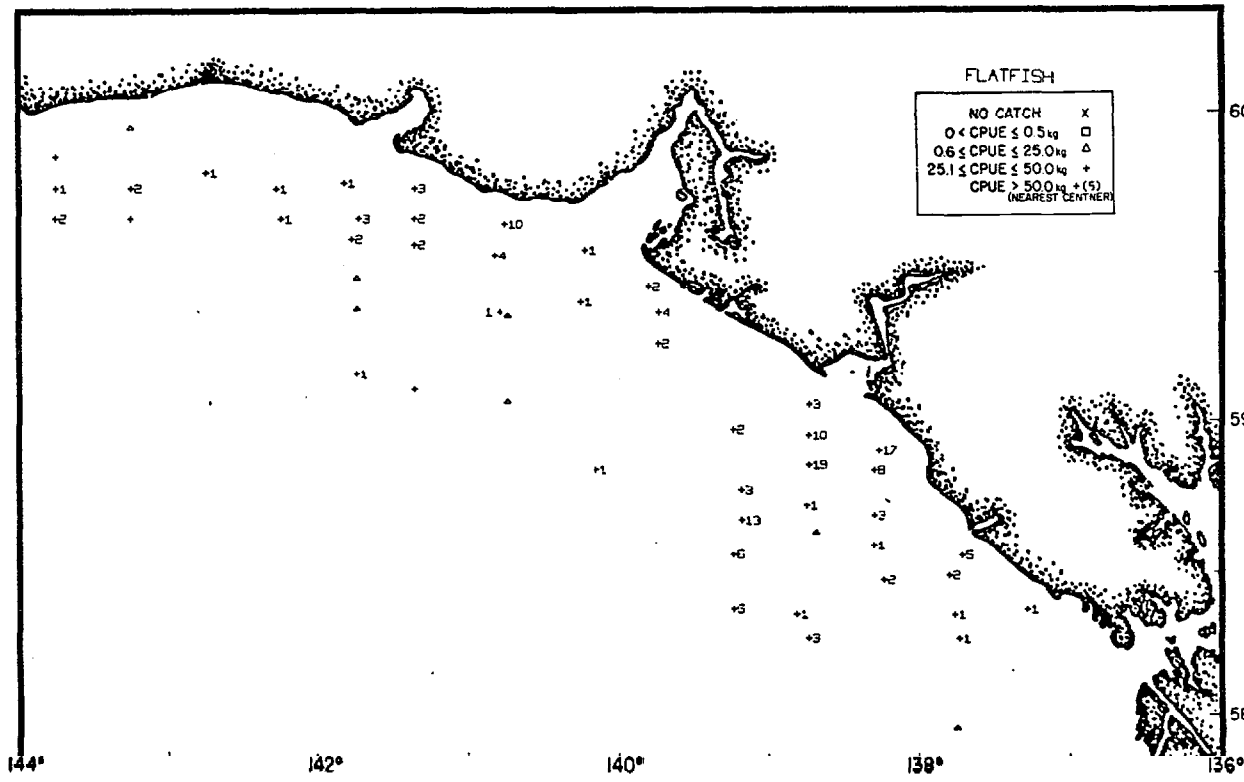


Figure X1-306.--Distribution of standardized catch rates in **kg/hr** of **flatfish** in the-eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-57.--Estimated biomass and population size of roundfishes in the Gulf of Alaska during June-August, 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	1-100	65.4	2,806.8	37.8	1.5	16.7	1.82	--
	101-200	11.0	2,121.5	28.6	5.2	57.8	0.41	--
	201-400	69.6	2,496.2	33.6	2.3	25.5	1.09	--
	All zones	27.2	7,424.5	10.0	9.0	4.7	0.82	--
Yakutat	1-100	19.4	1,435.4	24.8	3.0	25.4	0.47	
	101-200	12.3	2,151.9	37.2	4.3	36.5	0.50	--
	201-400	26.8	2,195.7	38.0	4.5	38.1	0.49	--
	All zones	17.5	5,783.0	7.8	11.8	6.3	0.49	
Prince William	1-100	12.0	1,576.7	11.7	6.1	25.2	0.26	--
	101-200	67.7	10,176.3	75.4	16.5	68.2	0.62	--
	201-400	40.3	1,750.7	12.9	1.6	6.6	1.10	--
	All zones	41.5	13,503.7	18.2	24.2	12.8	0.56	--
Kenai	1-100	96.7	10,089.4	21.3	26.2	18.2	0.39	--
	101-200	91.5	31,858.7	67.3	111.0	77.2	0.29	--
	201-400	39.8	5,412.8	11.4	6.6	4.6	0.82	--
	All zones	80.5	47,360.9	64.0	143.8	76.2	0.33	--
Total	1-100	45.1	15,908.3	21.5	36.8	19.5	0.43	--
	101-200	53.4	46,308.4	62.5	137.0	72.6	0.34	--
	201-400	39.9	11,855.4	16.0	15.0	7.9	0.79	--
	All zones	48.8	74,072.1	100.0	188.8	100.0	0.39	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

The invertebrates had the third highest estimated biomass of 69 thousand mt of which 49% occurred in the outer shelf, 39% in the inner shelf and 12% in the upper slope (Table X1-58). The invertebrate biomass was evenly divided between the four regions with the largest estimate occurring in the Prince William region (27%) and the lowest in the Yakutat region (22%). The relative apparent abundance of the invertebrate group decreased with increasing depth with values ranging from 77 kg/hr in the inner shelf to 27 kg/hr in the upper slope (Figure X1-309). Mean CPUE's were generally highest in the easternmost regions with the highest density occurring in the Fairweather region; a result of relatively high concentrations on the inner shelf. Other regions where the relative apparent abundance was higher than the survey average included Prince William and Yakutat. The distribution of the standardized catch rates is plotted in Figure X1-310.

The fourth most important species group contributing to the total biomass were the rockfishes. This group was primarily restricted to the outer shelf and upper slope depth zones which together contained over 99% of the estimated biomass (67 thousand mt) (Table XI-59 and Figure X1-311). By depth zones, the highest mean catch rate occurred in the upper slope followed by the outer shelf and regional mean CPUE's were lowest in the Fairweather region and highest in the Yakutat region. The distribution of the standardized catch rates is plotted in Figure X1-312.

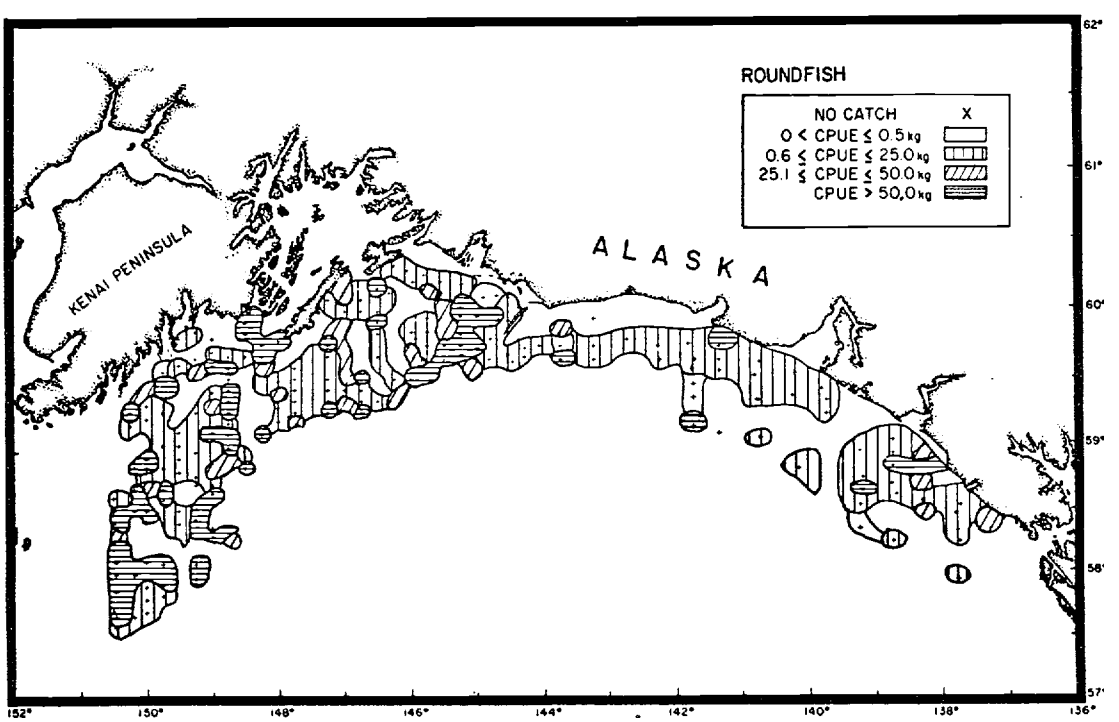
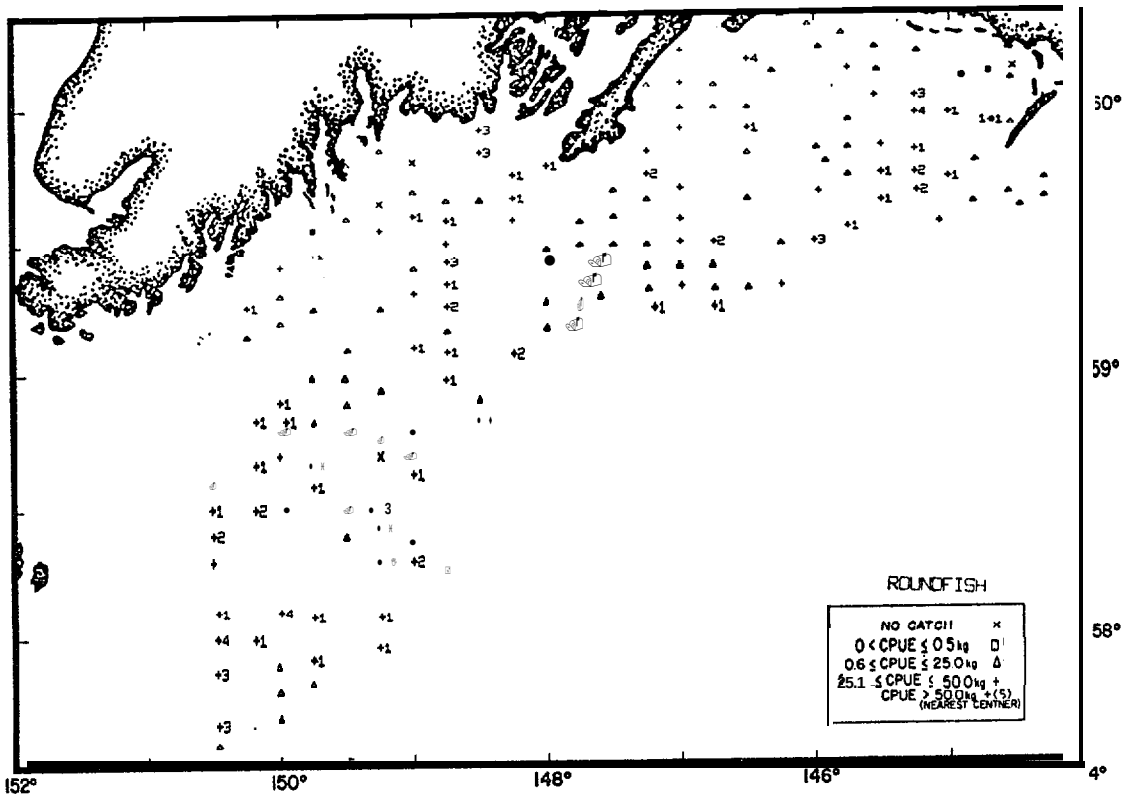


Figure X1-307.--Distribution of apparent relative abundance of roundfish in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).



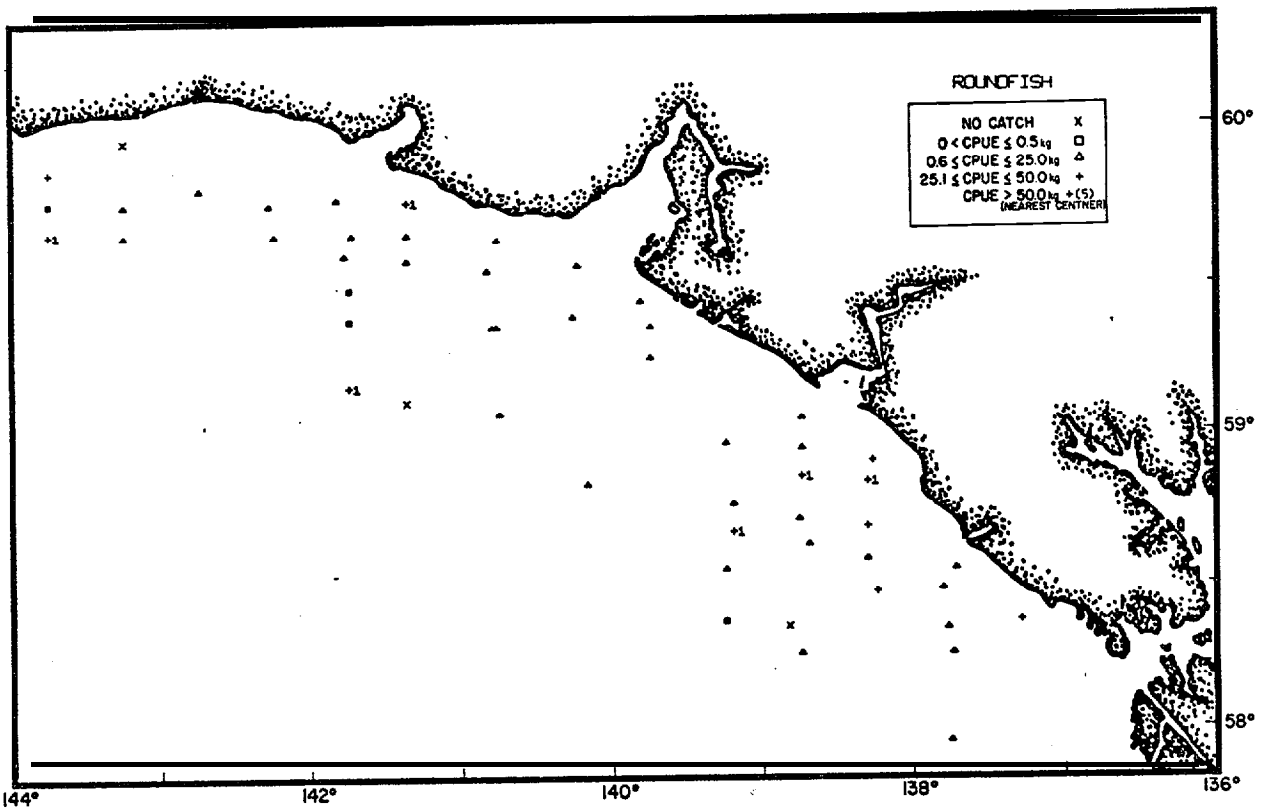


Figure XI-308.--Distribution of standardized catch rates in kg/hr of roundfish in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-58.--Estimated biomass of invertebrates in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	l-100	227.0	9,379.8	57.4	--	--	--	
	101-200	26.9	5,218.9	30.7	--	--	--	
	201-400	56.2	2,016.1	11.9	--	--	--	--
	All zones	62.2	16,974.8	24.6	--	--	--	--
Yakutat	l-100	82.4	6,083.1	39.3	--	--	--	
	101-200	43.4	7,561.4	48.8		--	--	--
	201-400	'22.5	1,838.1	11.9	--	--	--	--
	All zones	46.9	15,482.6	22.4	--	--	--	--
Prince William	l-100	82.9	10,925.6	57.7	--	--	--	--
	101-200	39.2	5,892.0	31.1	--	--	--	--
	201-400	48.7	2,116.7	11.2	--	--	--	--
	All zones	58.2	18,934.3	27.4	--	--	--	--
Kenai	l-100	4.0	420.6	2.4	--	--	--	--
	101-200	43.5	15,163.9	85.5	--	--	--	--
	201-400	15.7	2,141.7	12.1	--	--	--	--
	All zones	30.1	17,726.2	25.6	--	--	--	--
Total	l-100	77.0	27,169.1	39.3		--	--	--
	101-200	39.0	33,836.2	49.0	--	--	--	--
	201-400	27.3	8,112.6	11.7	--	--	--	--
	All zones	45.6	69,117.9	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

The elasmobranchs made the smallest contribution to the total biomass (5%) with an estimated 29 thousand mt. Mean CPUE's increased with depth, varying from 12 kg/hr in the inner shelf to 25 kg/hr in the upper slope (Table XI-60 and Figure X1-313). Nearly 60% of the estimated biomass was contained in the outer shelf with lower values in the upper slope (26%) and inner shelf (15%). The Fairweather region contained 40% of the elasmobranch biomass and had the highest regional mean catch, a result of relatively high concentrations in the upper slope and outer shelf. The distribution of the standardized catch rates is plotted in Figure X1-314.

DISTRIBUTION, RELATIVE ABUNDANCE, BIOMASS AND SIZE COMPOSITION FEATURES OF PRINCIPAL SPECIES OF FISH AND INVERTEBRATES

TURBOT

Distribution and abundance.--Turbot were taken in each region-depth zones sampled and had the highest relative apparent abundance (127 kg/hr) of any species encountered in the survey area. Mean CPUE's increased with depth, ranging from 84 kg/hr in the inner shelf to 188 kg/hr in the upper slope (Table XI-61 and Figure X1-315). The Fairweather region had the highest apparent relative abundance, a result of high catch rates in all 3 depth zones (Figure X1-316). Mean CPUE's in the remaining regions were all below the survey average for this species.

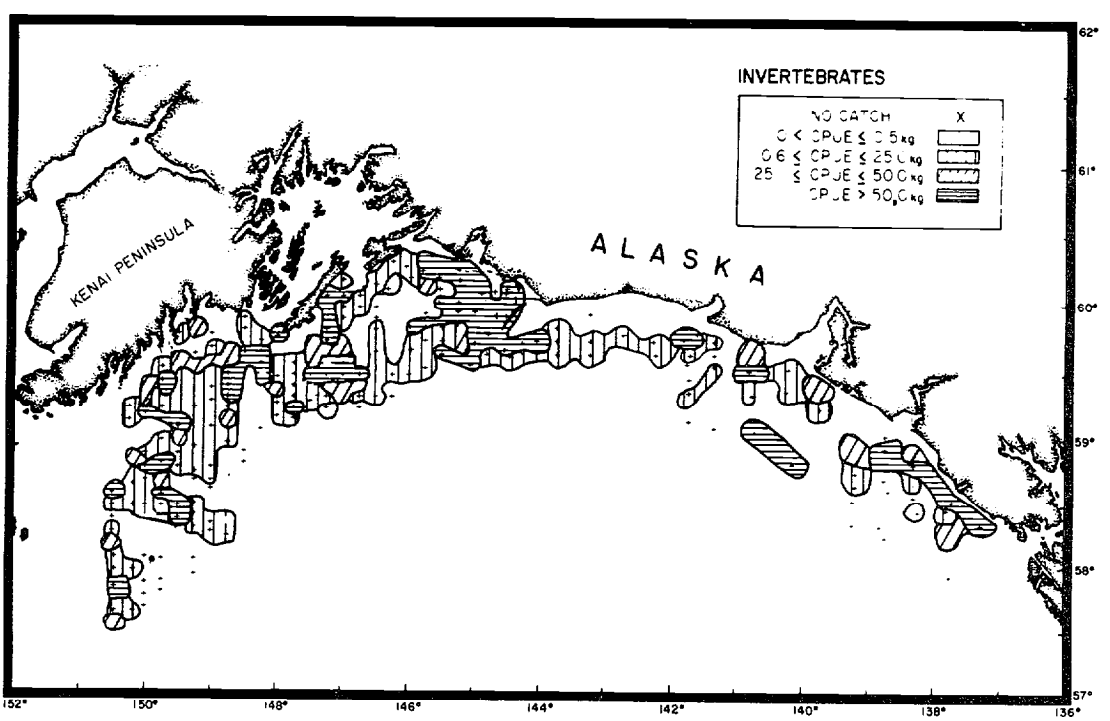
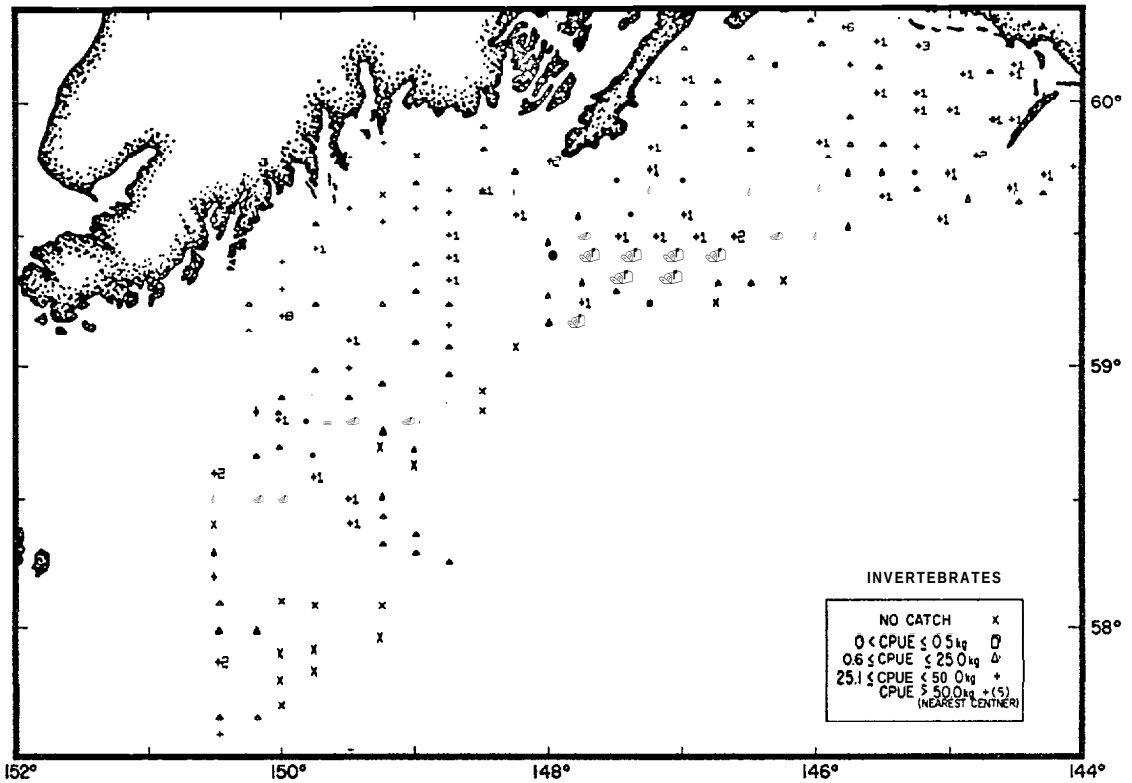


Figure XI-309.--Distribution of apparent relative abundance of invertebrates in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).



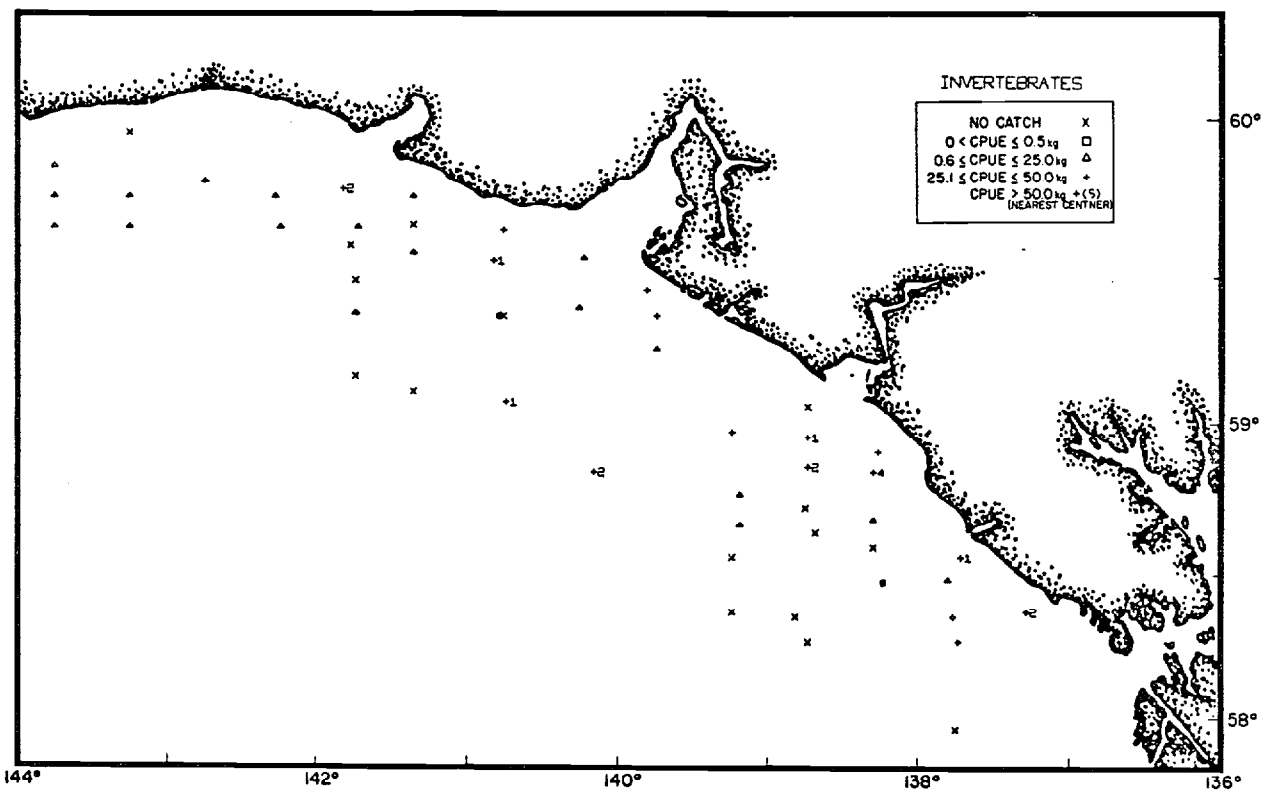


Figure X1-310. --Distribution of standardized catch rates in kg/hr of invertebrates in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table X1-59.--Estimated biomass and population size of rockfishes in the Gulf of Alaska during June-August, 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	0	0	0	0	0	--	--
	101-200	7.9	1,521.1	23.5	3.6	25.3	0.43	
	201-400	138.6	4,969.2	76.5	10.6	74.7	0.47	--
	All zones	23.8	6,494.3	9.7	14.2	10.2	0.46	--
Yakutat	l-100	0	0	0	0	0		--
	101-200	87.7	15,287.0	72.0	30.5	64.1	0.50	
	201-400	72.6	5,940.0	28.0	17.1	35.9	0.35	--
	All zones	64.3	21,227.0	31.8	47.6	34.2	0.45	--
Prince William	l-100	0.4	48.4	0.3	0.1	0.3	0.79	--
	101-200	86.1	12,938.5	77.9	24.3	77.4	0.53	--
	201-400	83.5	3,630.1	21.8	7.0	22.3	0.52	--
	All zones	51.1	16,617.0	24.8	31.4	22.6	0.53	--
Kenai	l-100	1.0	105.2	0.5	0.2	0.4	0.45	--
	101-200	34.4	11,997.5	53.2	24.2	52.7	0.50	--
	201-400	76.6	10,422.7	46.3	21.5	46.9	0.48	--
	All zones	38.2	22,525.4	33.7	45.9	33.0	0.49	--
Total	l-100	0.4	153.6	0.2	0.3	0.2	0.51	--
	101-200	48.1	41,748.1	62.5	82.6	59.4	0.51	
	201-400	84.0	24,962.0	37.3	56.2	40.4	0.44	--
	All zones	44.1	66,863.7	100.0	139.1	100.0	0.48	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Biomass.--The apparent biomass of turbot was estimated at 242 thousand mt, of which 60% occurred in the outer shelf, 28% in the upper slope and 12% in the inner shelf. The highest contribution came from the Fairweather region (57%) where large portions occurred in the outer shelf and upper slope. Proportions contributed from the remaining regions ranged from 12% in Yakutat to 17% in Kenai.

Size composition.--Random length frequencies for turbot are available from the Kenai region. On the outer shelf turbot, sexes combined, ranged in size from 21-56 cm and averaged 33 cm while on the upper slope turbot ranged from 28-68 cm and averaged 39 cm (Figure XI-317).

FLATHEAD SOLE

Distribution and abundance.--Flathead sole occurred throughout all regions and depth zones averaging 40 kg/hr over the entire survey area (Table X1-62). Mean CPUE's were highest in the outer shelf and upper slope depth zones while the inner shelf had the lowest apparent density distribution (Figures X1-318-319). The Prince William region accumulated the highest regional CPUE's while mean catch rates from the remaining regions were below the survey average. Particularly high mean CPUE's in excess of 100 kg/hr occurred in the Prince William outer shelf and the Fairweather upper slope.

Biomass.--Of the estimated 61 thousand mt of apparent biomass, 72% occurred on the outer shelf, 21% on the upper slope and 7% on the inner shelf. The Prince William and Kenai regions contributed 32% and 36% respectively to the total biomass while the Fairweather and Yakutat regions each contributed 16%. Particularly high biomass estimates occurred in the Prince William and Kenai outer shelf depth zones.

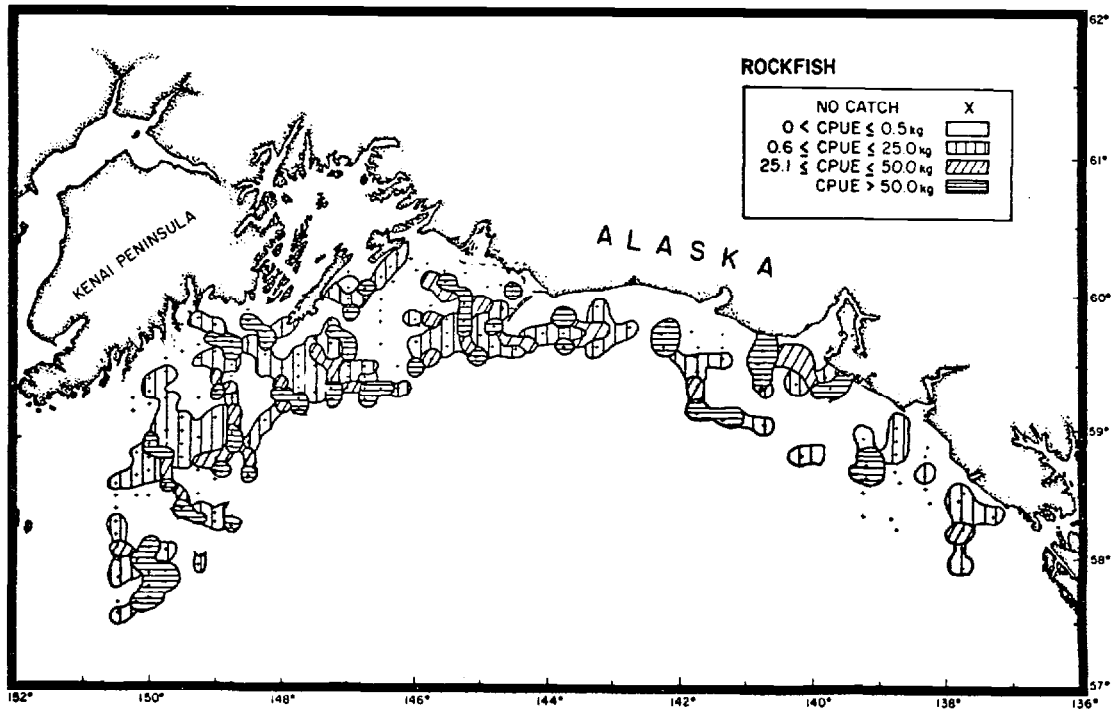
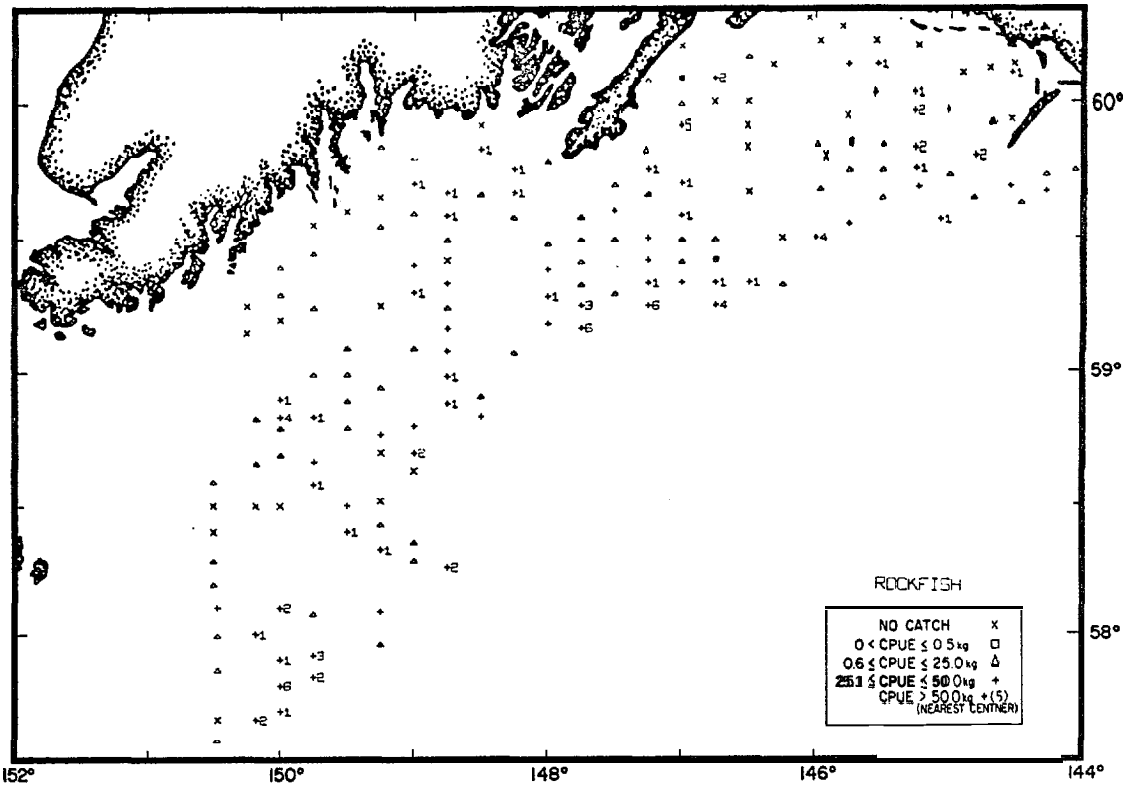


Figure XI-311.--Distribution of apparent relative abundance of rockfish in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).



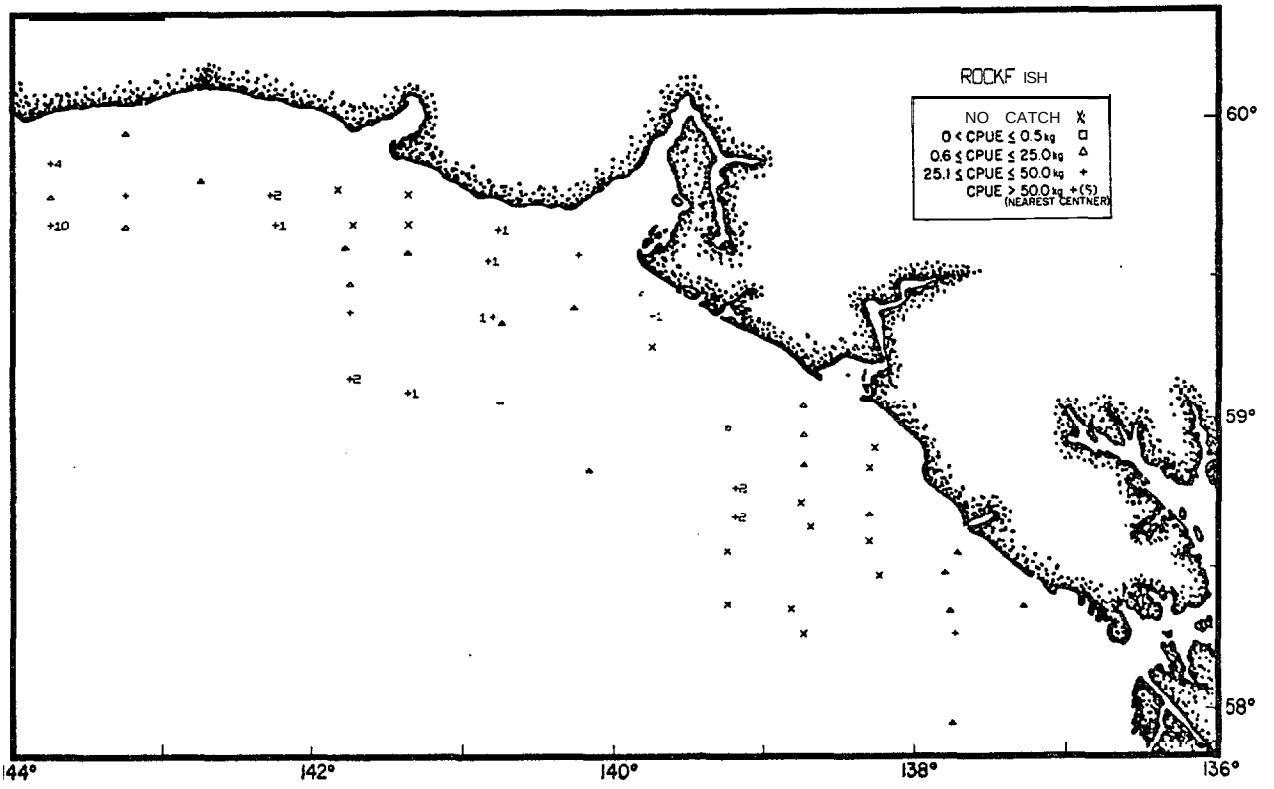


Figure XI-312.--Distribution of standardized catch rates in **kg/hr** of **rockfish** in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Size composition.-Random length frequencies were taken in the Kenai upper slope where flathead sole, sexes combined, ranged in size from 22-39 cm averaging 28.6 cm (Figure X1-320).

PACIFIC OCEAN PERCH

Distribution and abundance.--Pacific ocean perch were widely distributed throughout the survey area but were primarily concentrated on the outer shelf and upper slope (Table X1-63). Relative apparent abundance increased with depth with the upper slope accumulating the largest mean CPUE followed by the outer and inner shelf (Figure X1-321-322). The Yakutat and Prince William regions had similar mean CPUE's which exceeded the survey average of 39 kg/hr and were followed in order by Kenai and Fairweather. Highest CPUE's occurred in the Fairweather upper slope and the Yakutat and Prince William outer shelf.

Biomass.-The total biomass for Pacific ocean perch was estimated at 59 thousand mt, of which 68% occurred in the outer shelf and 32% in the upper slope. Relatively equal contributions from the Yakutat, Prince William and Kenai outer shelf accounted for 66% of the total biomass with the remainder being divided between the upper slope depth zones of all regions. The biomass estimate for this species should be considered low, as this species is known to be abundant in hard-rocky areas, which can not be adequately sampled with the trawls used during these surveys.

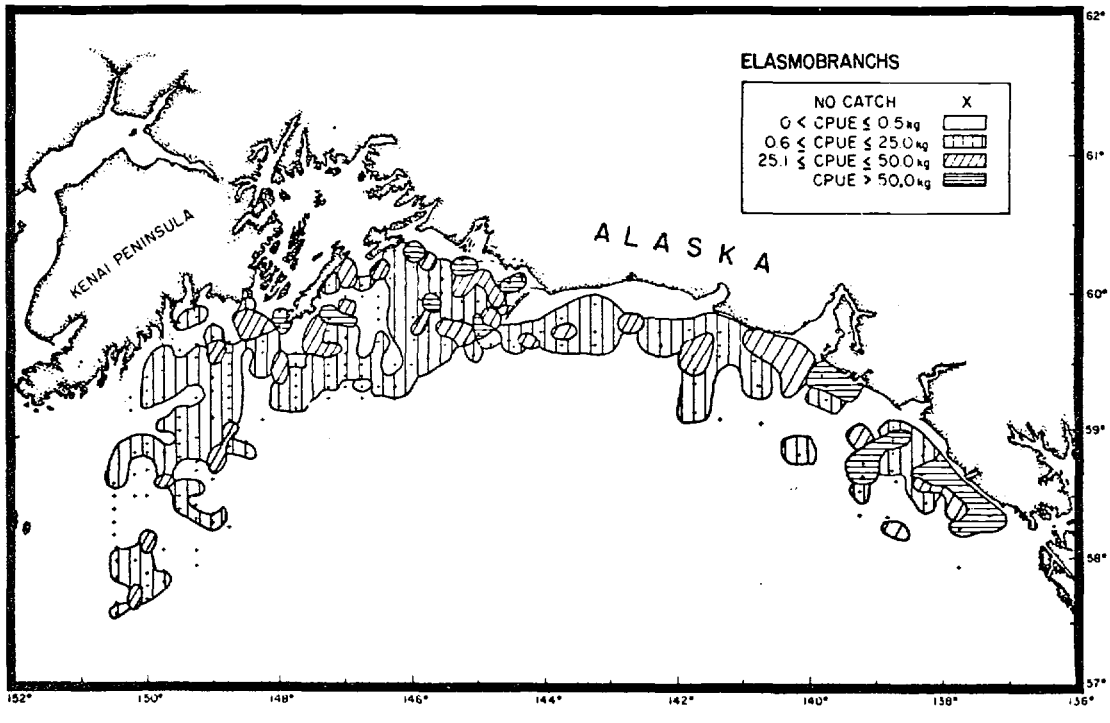
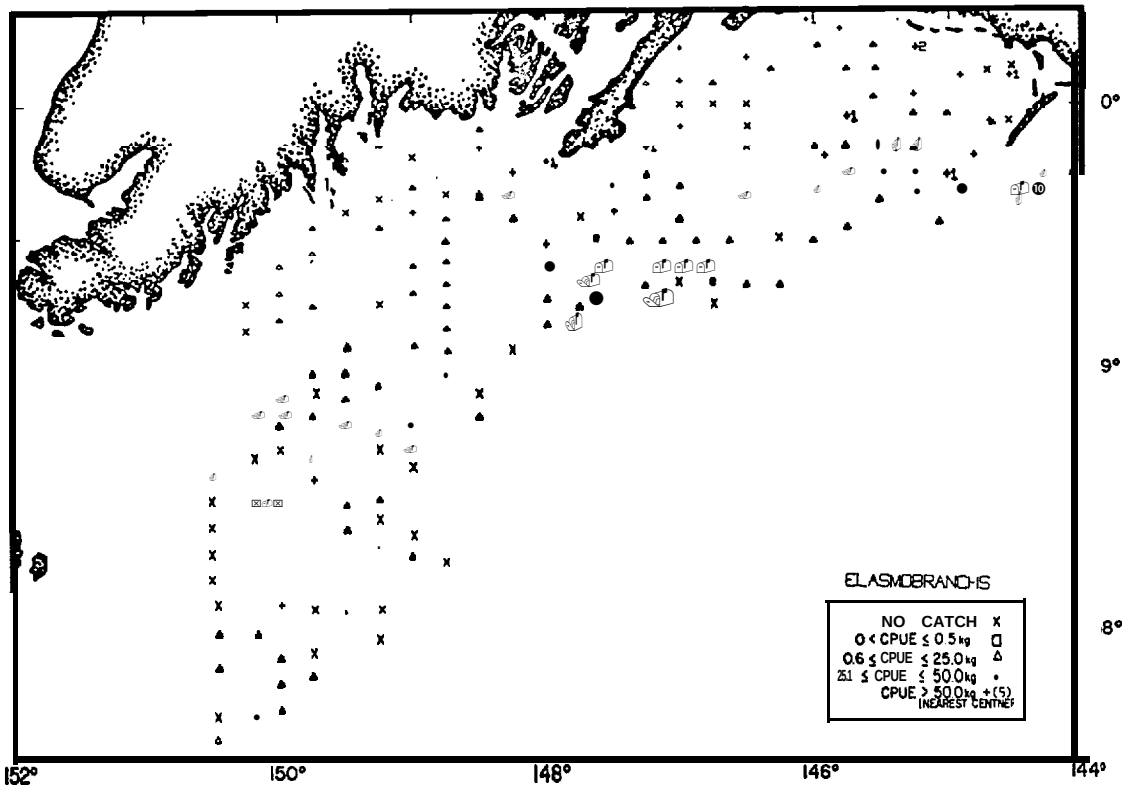


Figure X1-313.--Distribution of apparent relative abundance of elasmobranchs in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-60.--Estimated biomass and population size of elasmobranchs in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	4.1	177.1	1.5	0.1	1.6	2.06	--
	101-200	39.0	7,560.2	65.1	4.0	65.6	1.93	
	201-400	108.4	3,884.7	33.4	2.0	32.8	1.94	--
	All zones	42.6	11,622.0	40.1	6.1	40.9	1.93	--
Yakutat	l-100	7.9	583.7	11.5	0.3	10.7	1.98	--
	101-200	19.6	3,424.1	67.6	1.7	60.7	1.97	--
	201-400	12.9	1,059.2	20.9	0.8	28.6	1.39	--
	All zones	15.3	5,067.0	17.5	2.8	18.8	1.81	--
Prince William	l-100	26.8	3,532.9	50.2	0.8	32.0	4.28	--
	lbl-200	18.2	2,731.1	38.8	1.2	48.0	2.29	--
	201-400	17.8	771.7	11.0	0.5	20.0	1.71	--
	All zones	21.6	7,035.7	24.3	2.5	16.8	2.81	--
Kenai	l-100	0	0	0	0	0	--	--
	101-200	10.2	3,551.4	67.9	2.6	74.3	1.35	
	201-400	12.4	1,681.7	32.1	0.9	25.7	1.93	--
	All zones	8.9	5,233.1	18.1	3.5	23.5	1.50	--
Total	l-100	12.2	4,293.7	14.8	1.2'	8.0	3.58	--
	101-200	19.9	17,266.8	59.6	9.5	63.8	1.82	
	201-400	24.9	7,397.3	25.6	4.2	28.2	1.76	--
	All zones	19.1	28,957.8	100.0	14.9	100.0	1.94	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



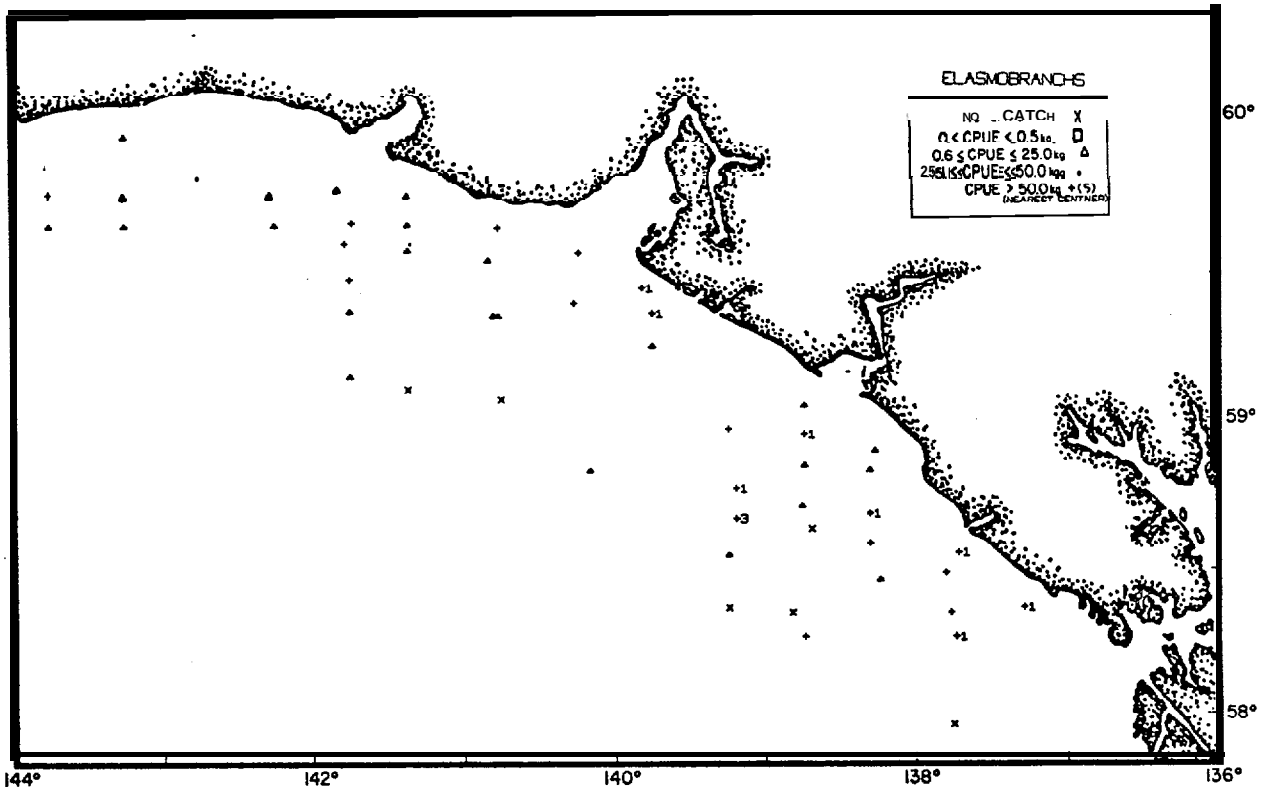
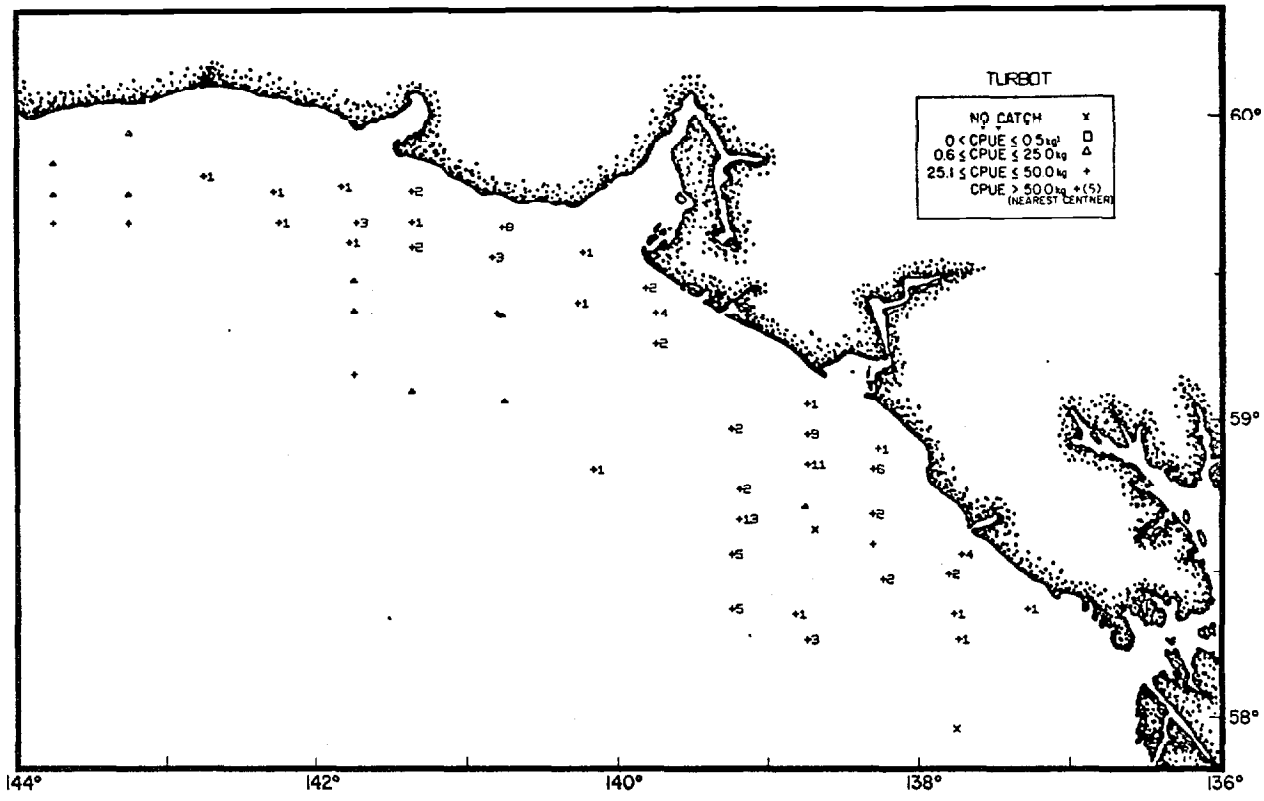


Figure X1-314.--Distribution of standardized catch rates in kg/hr of elasmobranchs in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-61.--Estimated biomass and population size of turbot (Atheresthes stomias) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	338.5	13,619.8	9.8	13.6	9.8	1.07	--
	101-200	229.7	82,527.2	59.3	82.5	59.3	0.54	--
	201-400	860.9	42,952.2	30.9	43.0	30.9	0.72	--
	All zones	329.7	139,099.2	57.4	139.1	39.4	0.65	--
Yakutat	1-100	71.2	5,262.2	18.5	11.9	19.4	0.44	--
	101-200	99.5	17,347.2	61.1	42.4	69.2	0.41	--
	201-400	70.7	5,786.6	20.4	7.0	11.4	0.83	--
	All zones	86.0	28,396.0	11.7	61.3	17.4	0.46	--
Prince William	1-100	48.7	6,414.5	18.5	12.5	20.5	0.51	--
	101-200	150.1	22,563.0	65.3	40.8	66.8	0.55	--
	201-400	128.5	5,585.4	16.2	7.8	12.7	0.71	--
	All zones	106.2	34,562.9	14.3	61.1	17.3	0.57	--
Kenai	1-100	31.7	3,307.1	8.2	12.5	13.7	0.27	--
	101-200	67.1	23,373.4	58.2	64.9	70.9	0.36	32.9
	201-400	99.2	13,501.1	33.6	14.1	15.4	0.96	39.1
	All zones	68.2	40,181.6	16.6	91.5	25.9	0.44	--
Total	1-100	83.6	28,603.6	11.8	50.5	14.3	0.57	--
	101-200	124.4	145,810.8	60.2	230.6	65.3	0.63	--
	201-400	187.5	67,825.3	28.0	71.9	20.4	0.94	--
	All zones	127.3	242,239.7	100.0	353.0	100.0	0.69	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



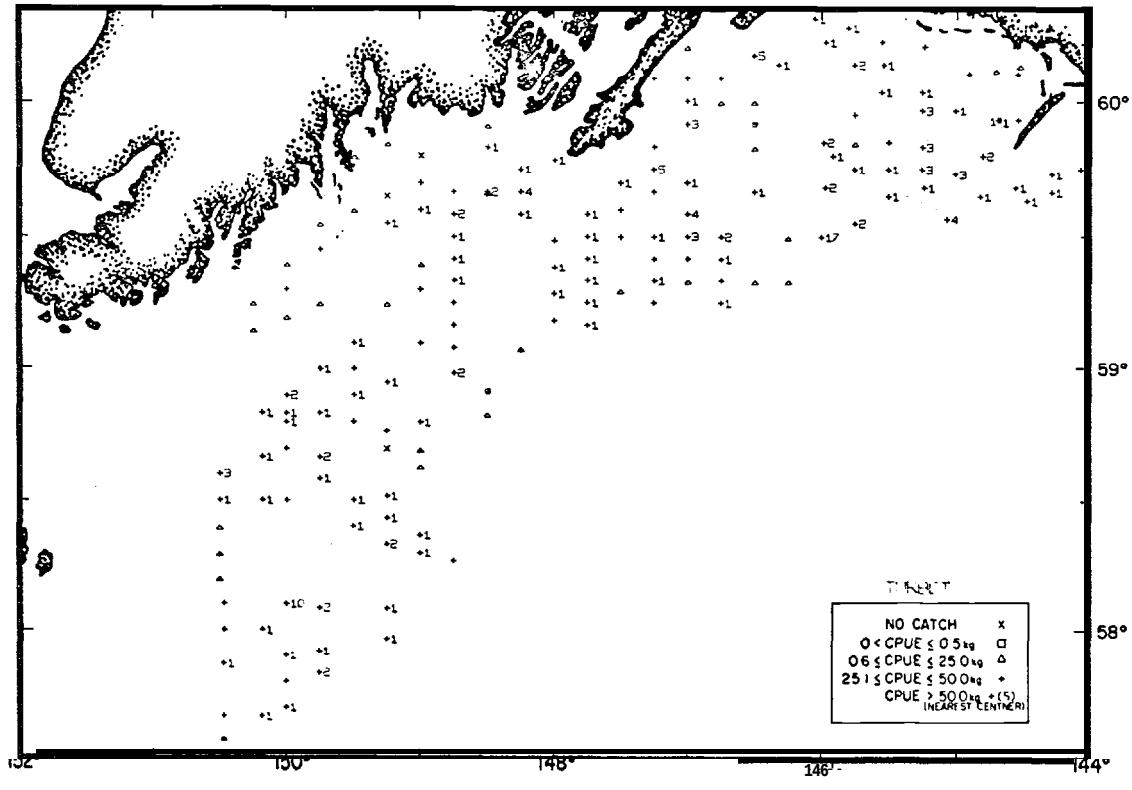


Figure XI-315.--Distribution of standardized catch rates in kg/hr of turbot in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

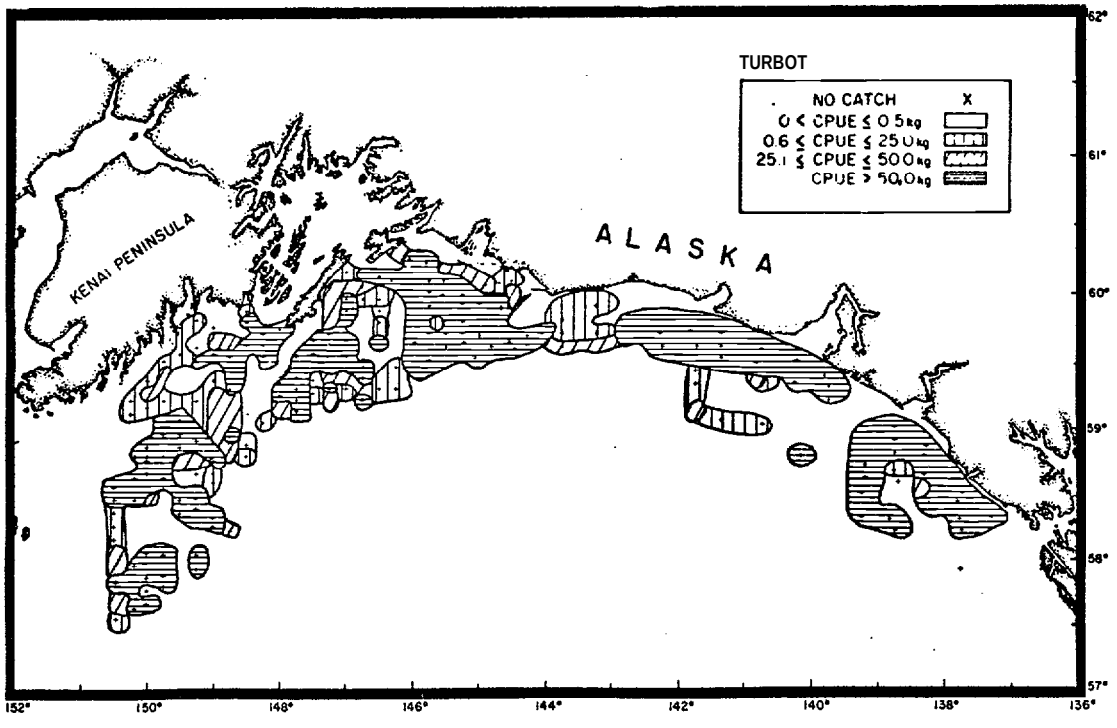


Figure X1-316. --Distribution of apparent relative abundance of turbot in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

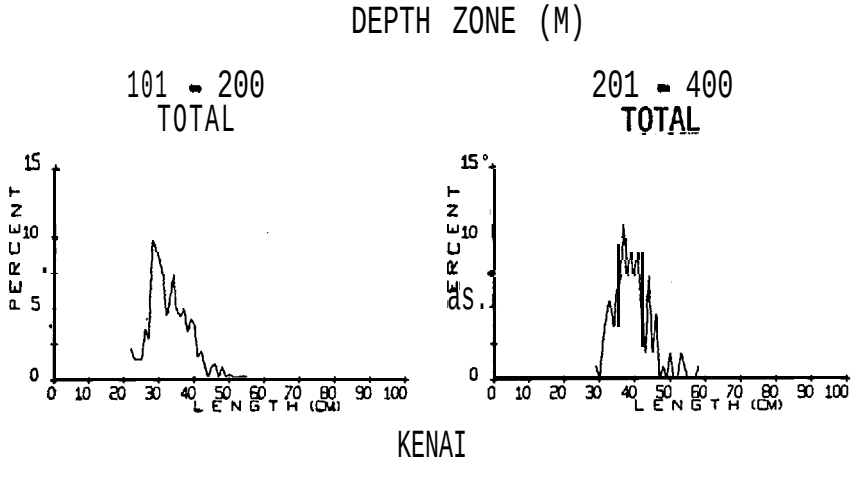
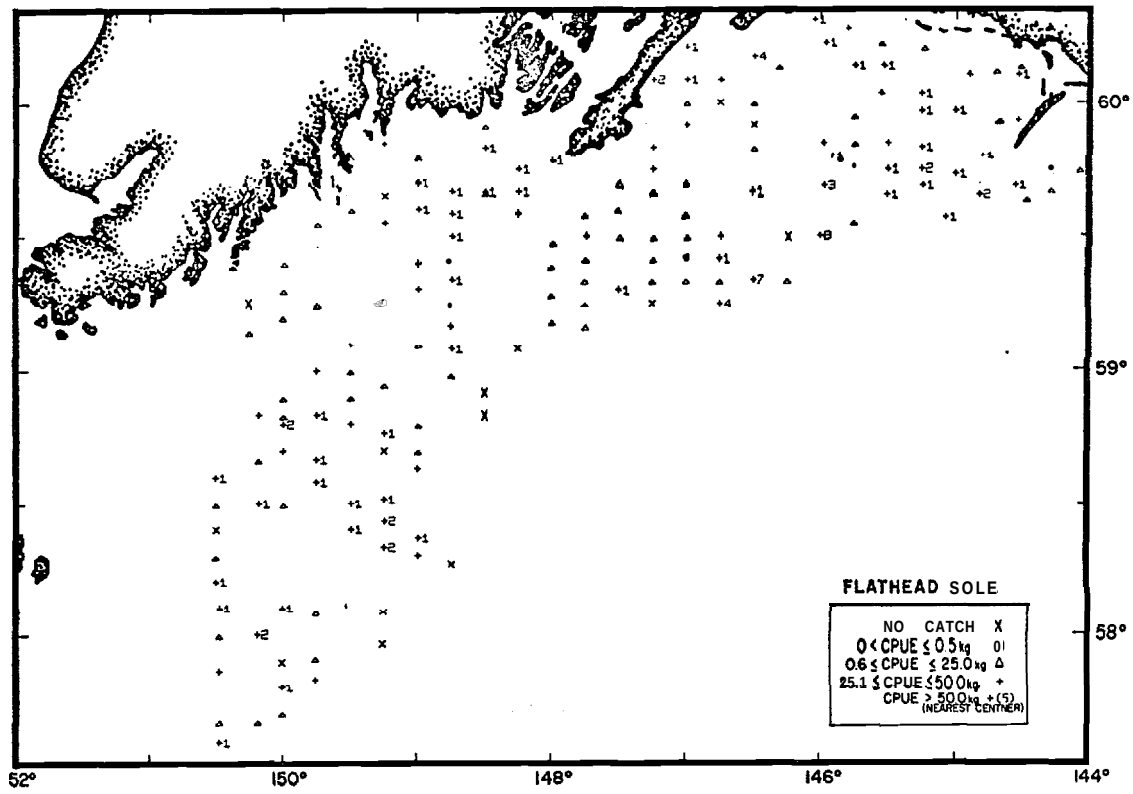


Figure XI-317 .--Percentage length frequencies of turbot from the Gulf of Alaska (Cruise 628).

Table XI-62.--Estimated biomass and population size of flathead sole (Hippoglossoides elassodon) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	l-100	3.0	126.5	1.4	0.4	2.1	0.29	--
	101-200	14.1	2,747.1	29.0	5.8	30.2	0.47	--
	201-400	183.9	6,591.2	69.6	13.0	67.7	0.51	--
	All zones	34.6	9,464.8	15.6	19.2	9.6	0.49	--
Yakutat	l-100	16.7	1,233.0	12.5	4.5	15.9	0.27	--
	101-200	38.1	6,633.3	67.1	20.0	70.7	0.33	--
	201-400	24.7	2,021.9	20.4	3.8	13.4	0.53	--
	All zones	30.0	9,888.2	16.3	28.3	14.2	0.35	--
Prince William	l-100	19.6	2,578.5	13.1	9.5	17.4	0.27	--
	101-200	104.3	15,671.6	79.6	42.2	77.3	0.37	--
	201-400	33.0	1,435.0	7.3	2.9	5.3	0.49	--
	All zones	60.5	19,685.1	32.4	54.6	27.4	0.36	
Kenai	l-100	4.3	447.0	2.1	2.4	2.5	0.18	--
	101-200	53.4	18,599.6	85.6	83.6	85.7	0.22	--
	201-400	19.6	2,672.3	12.3	11.5	11.8	0.23	28.6
	All zones	36.9	21,718.9	35.7	97.5	48.8	0.22	
Total	l-100	12.5	4,385.0	7.2	16.8	8.4	0.26	--
	101-200	50.3	43,651.6	71.9	151.6	76.0	0.29	--
	201-400	42.8	12,720.4	20.9	31.2	15.6	0.41	--
	All zones	40.1	60,757.0	100.0	199.6	100.0	0.30	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



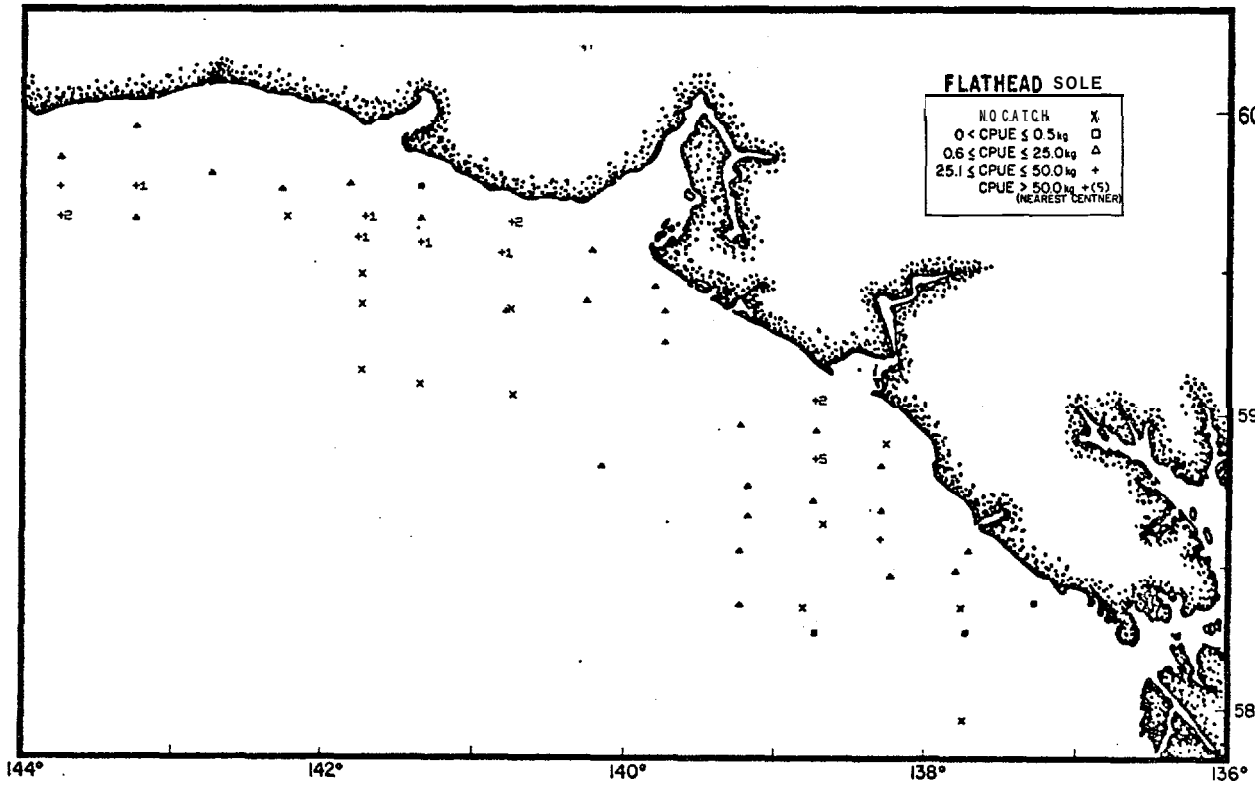


Figure X1-318.--Distribution of standardized catch rates in **kg/hr** of **flathead** sole in **the** eastern Gulf of Alaska, June,-Aug. 1962 (Cruise '628).

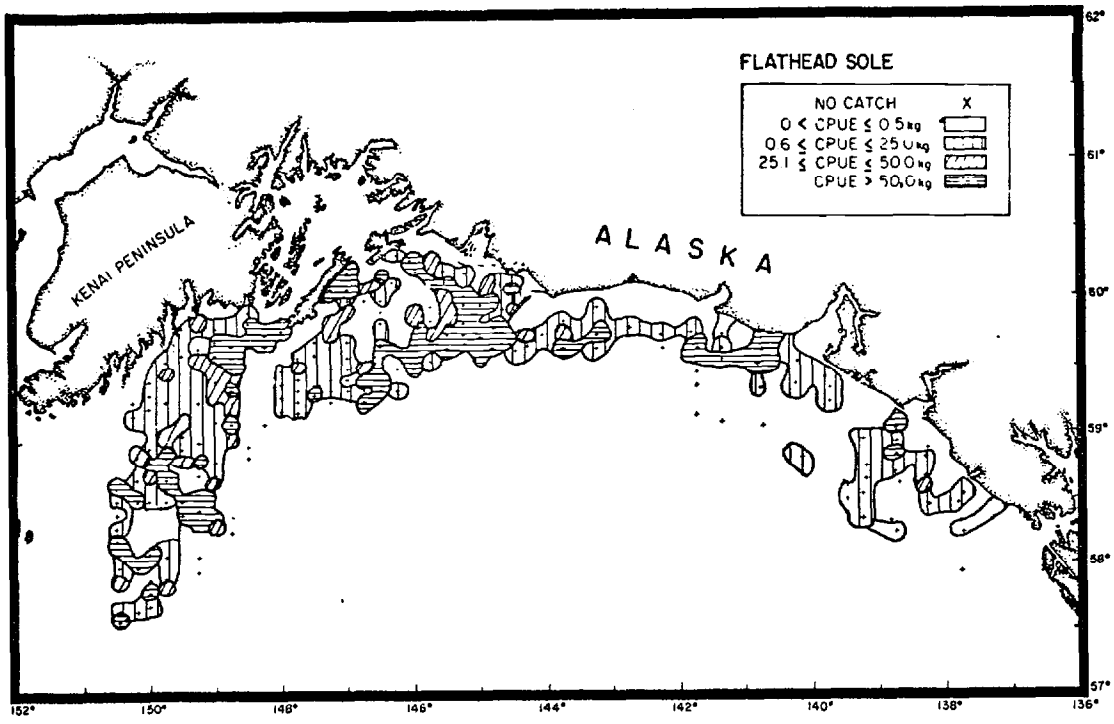
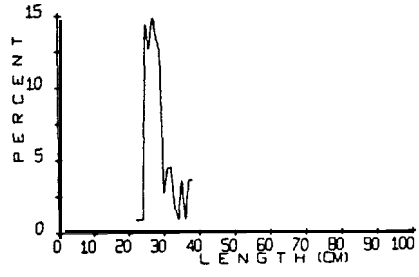


Figure X1-319.--Distribution of apparent relative abundance of flathead sole in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

DEPTH ZONE (M)

201 - 400



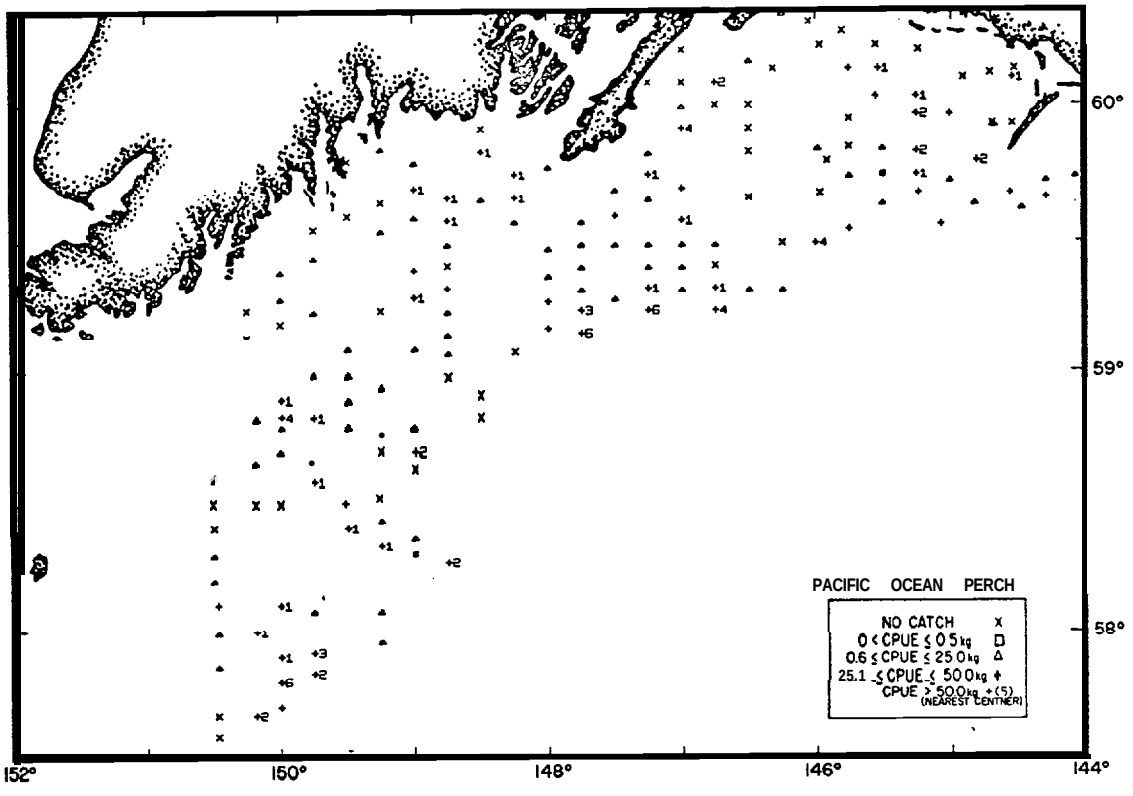
KENAI

Figure X1-320.-Percentage length frequencies of flathead sole from the Gulf of Alaska (Cruise 628).

Table XI-63.--Estimated biomass and population size of Pacific ocean perch (*Sebastes alutus*) in the Gulf of Alaska during June-August, 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	% of Total	Estimated population NO. 10^6	% of Total	Mean size per individual Weight (kg)	Mean size per individual Length (cm)
Fairweather	l-100	0	0	0	0	0		--
	101-200	6.7	1,303.6	24.9	2.7	24.3	0.48	--
	201-400	109.6	3,929.1	75.1	8.4	75.7	0.47	--
	All zones	19.2	5,232.7	8.9	11.1	9.7	0.47	--
Yakutat	l-100	0	0	0	0	0	--	--
	101-200	85.5	14,913.8	83.3	29.5	79.7	0.51	--
	201-400	36.5	2,985.8	16.7	7.5	20.3	0.40	--
	All zones	54.2	17,899.6	30.6	37.0	32.4	0.49	--
Prince William	l-100	0.4	47.2	0.3	0.1	0.4	0.90	--
	101-200	81.7	12,283.7	81.9	22.3	83.2	0.55	--
	201-400	61.4	2,670.0	17.8	4.4	16.4	0.61	--
	All zones	46.1	15,000.9	25.7	26.8	23.5	0.56	--
Kenai	l-100	1.0	105.2	0.5	0.2	0.5	0.45	--
	101-200	32.0	11,132.8	54.6	21.4	54.6	0.52	--
	201-400	67.3	9,152.3	44.9	17.6	44.9	0.52	--
	All zones	34.7	20,390.3	34.8	39.2	34.4	0.52	--
Total	l-100	0.4	152.4	0.3	0.3	0.3	0.60	--
	101-200	45.7	39,633.9	67.7	75.9	66.5	0.68	--
	201-400	63.1	18,737.2	32.0	37.9	33.2	0.60	--
	All zones	38.6	58,523.5	100.0	114.1	100.0	0.65	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr
4/ Less than 0.1 X 10^0 individuals
5/ Less than 0.1 percent



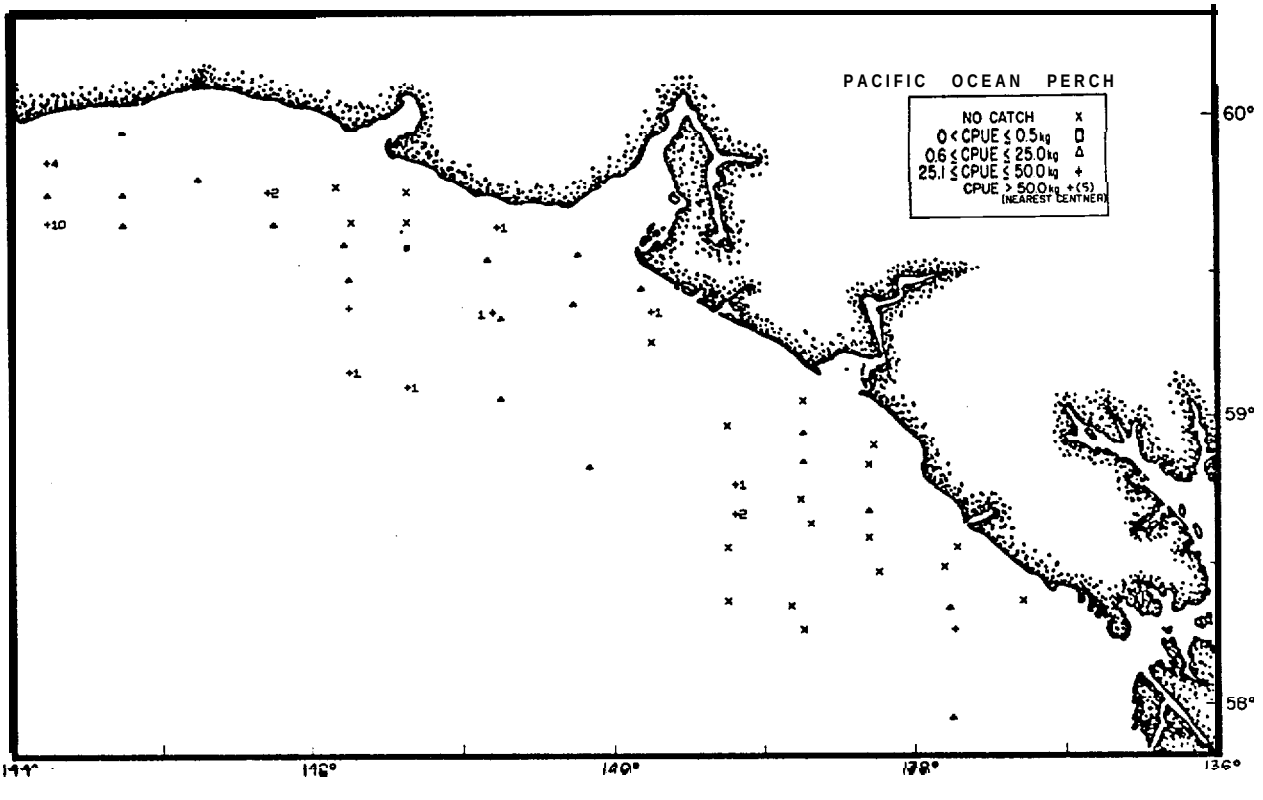


Figure XI-321.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

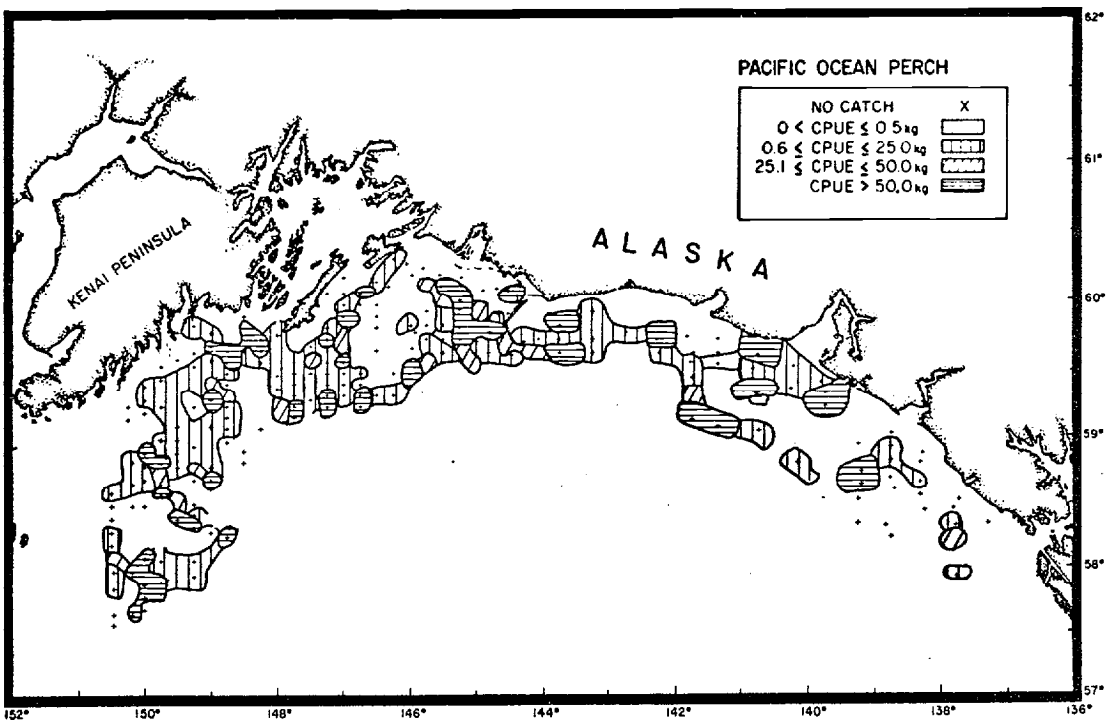


Figure XI-322.--Distribution of apparent relative abundance of Pacific ocean perch in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

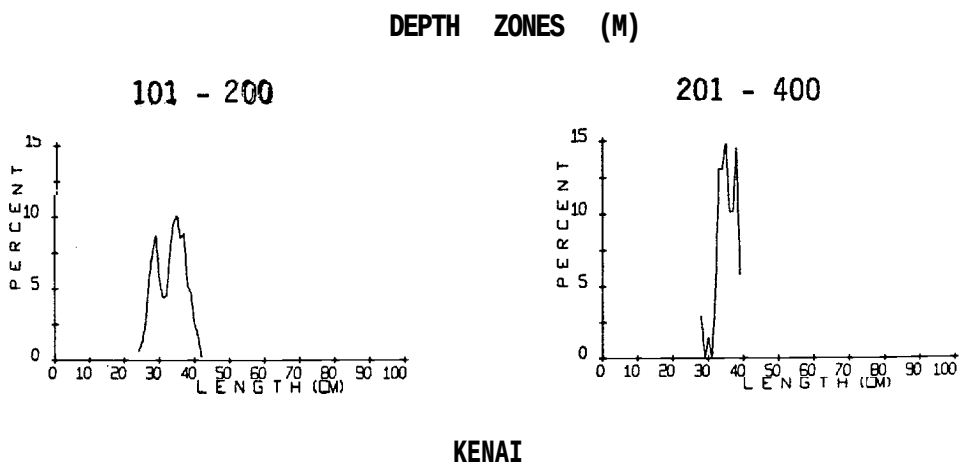
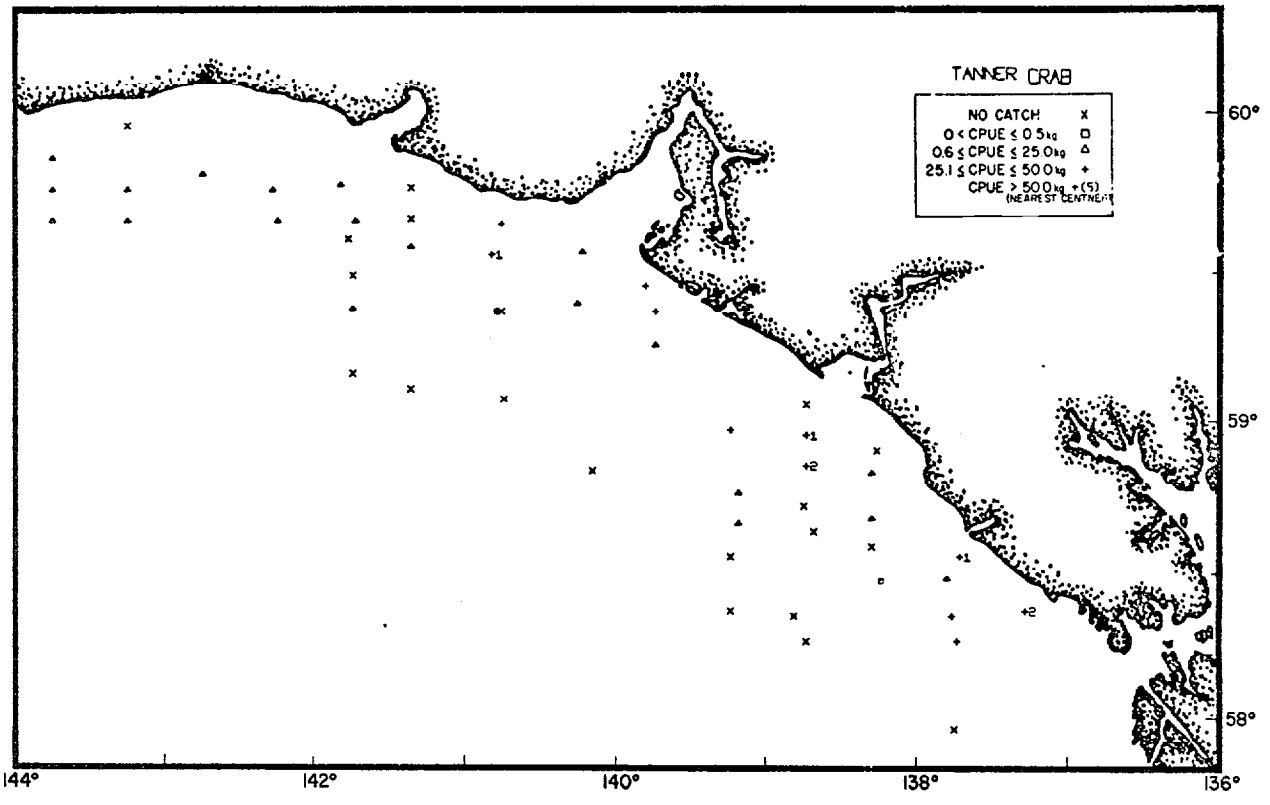


Figure X1-323.--Percentage length frequencies of Pacific ocean perch from the Gulf of Alaska (Cruise 628).



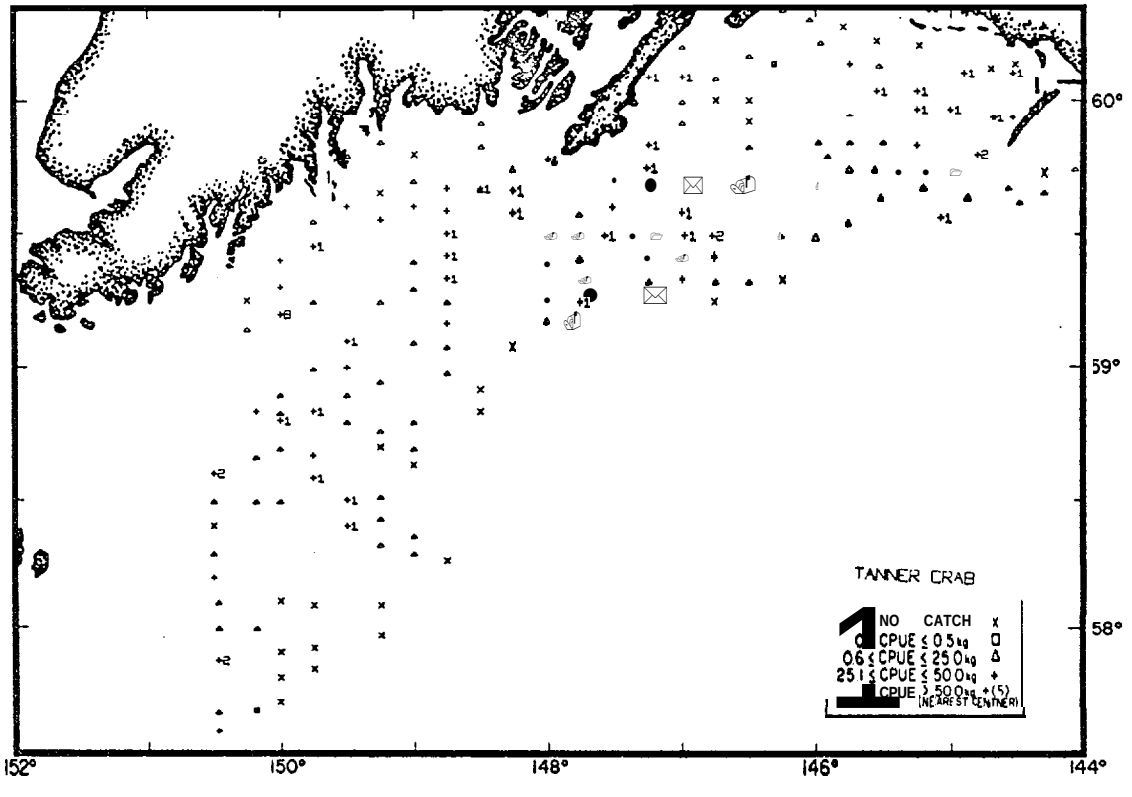


Figure XI-324.--Distribution of standardized catch rates in kg/hr of Tanner crab in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Size composition.--Random length frequencies taken in the Kenai outer shelf indicated a range of 23-42 cm with an average of 33.0 cm while in the upper slope the specimens ranged from 28-39 cm and averaged 35.1 cm (Figure X1-323).

TANNER CRAB

Distribution and abundance.--Tanner crab were taken from all regions-depth zones sampler and averaged 25 kg/hr over the entire survey area (Table X1-64). Mean CPUE's were highest in the outer shelf and upper slope but declined considerably in the inner shelf (Figures X1-324-325). The Prince William, Fairweather and Kenai regions had similar mean CPUE's which ranged from 26-30 kg/hr while the Yakutat region was considerably below the survey average for the species.

Biomass. --The apparent biomass of Tanner crab has been estimated at 37 thousand mt, of which 73% occurred in the outer shelf, 22% in the upper slope, and 5% in the inner shelf. The Kenai region accounted for 47% of the biomass with most of this estimate coming from the outer shelf. Contributions from the remaining regions ranged from 11-23% of the total biomass of this species. Tanner crab biomass estimates should be considered minimal as otter trawls fished at the towing speeds used during these surveys do not adequately sample the larger male crabs.

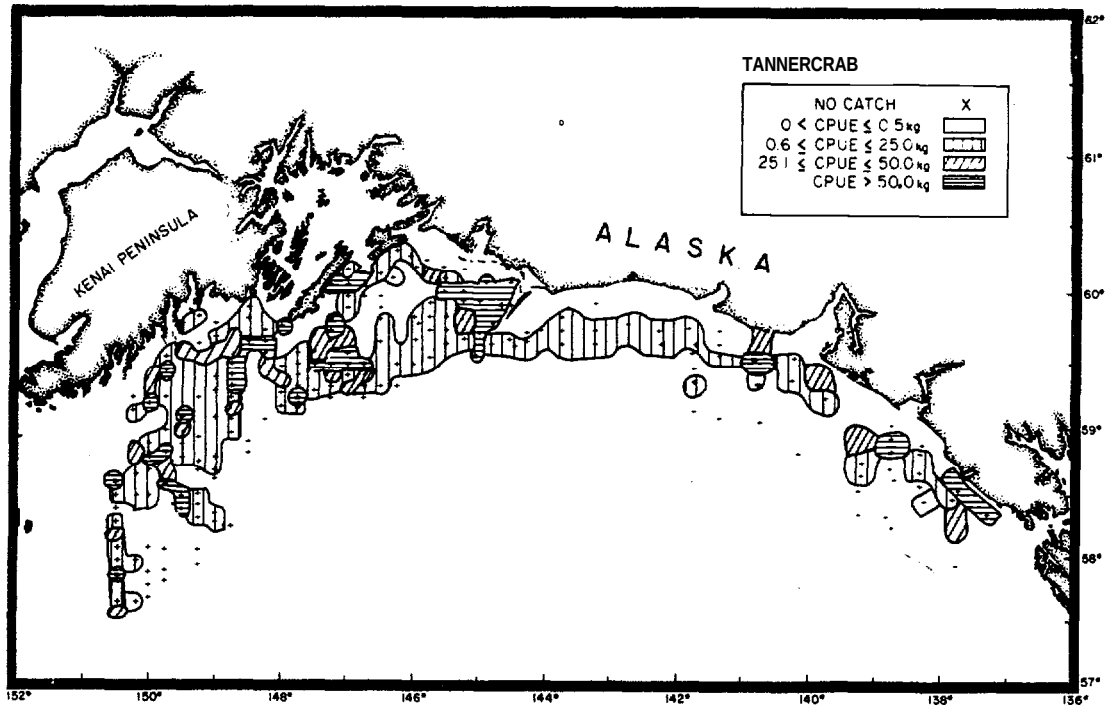


Figure XI-325 .--Distribution of apparent relative abundance of Tanner crab in the eastern Gulf of Alaska,.June-Aug. 1962 (Cruise 628).

Table XI-64.--Estimated biomass and population size of Tanner crab (*Chionoecetes sp.*) in the Gulf of Alaska during June-August. 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	l-100	0.6	24.3	0.3	0.1	0.5	0.38	--
	101-200	26.6	5,161.8	71.7	17.8	86.0	0.29	--
	201-400	56.2	2,016.1	28.0	2.8	13.5	0.73	--
	All zones	26.4	7,202.2	19.4	20.7	23.8	0.35	--
Yakutar	l-100	7.1	526.7	13.3	1: 3	22.0	0.41	--
	101-200	9.2	1,608.5	40.5	2.5	42.4	0.64	--
	201-400	22.5	1,838.1	46.2	2.1	35.6	0.86	--
	All zones	12.0	3,973.3	10.7	5.9	6.8	0.67	--
Prince William	l-100	7.3	956.1	11.4	1.4	6.7	0.69	--
	101-200	35.6	5,351.8	63.5	15.4	73.7	0.35	--
	201-400	48.6	211.2	25.1	73.7	19 16	0.51	--
	All zones	25.9	8,420.0	22.7	20.9	24.1	0.40	--
Kenai	l-100	4.0	420.6	2.4	1.3	3.3	0.33	--
	101-200	43.1	14,999.7	85.6	32.7	83.0	0.46	--
	201-400	15.4	2,092.1	12.0	5.4	13.7	0.39	--
	All zones	29.8	17,512.4	47.2	39.4	45.3	0.44	--
Total	l-100	5.5	1,927.7	5.2	4.1	4.7	0.47	--
	101-200	31.3	27,121.8	73.1	68.4	78.7	0.40	--
	201-400	27.1	8,058.4	21.7	14.4	16.6	0.56	--
	All zones	24.5	37,107.9	100.0	86.9	100.0	0.43	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

PACIFIC HALIBUT

Distribution and abundance.--Pacific halibut occurred in all regions-depth zones surveyed and had a relative apparent abundance of 16 kg/hr. (Table X1-65). Mean CPUE's increased with decreasing bottom depth with the highest mean catch rate occurring on the inner shelf followed by the outer shelf and upper slope (Figure X1-326). The Fairweather, Prince William, and Kenai regions exceeded the survey average with a particularly high catch rate (91 kg/hr) occurring in the Fairweather inner shelf.

Biomass. --The biomass of Pacific halibut has been estimated at 25 thousand mt, of which 58% occurred on the inner shelf, 40% on the outer shelf, and 2% on the upper slope. The total biomass was relatively evenly divided among the four regions with Kenai making the largest contribution (39%) and Yakutat the smallest (14%). Because of the relatively low speeds utilized during trawling operations, the larger, more powerful halibut probably escape the sampling gear resulting in a low biomass estimate.

Size composition.--No length frequency data are available for this species.

REX SOLE

Distribution and abundance.--Rex sole were taken throughout all regions and depth zones, with an apparent relative abundance of nearly 15 kg/hr (Table'XI-66). Mean CPUE's increased significantly with depth; the highest density distribution occurring in the upper slope followed by the outer and inner shelf (Figure XI-327). In the Kenai region, the mean catch rate exceeded the survey average but declined to below average in the remaining regions. Highest mean CPUE's occurred in the Fairweather upper slope and the Kenai outer shelf and upper slope.

Biomass .-The biomass of rex sole has been estimated at 22 thousand mt, of which 53% occurred in the outer shelf, 39% in the upper slope and only 8% in the inner shelf. The Kenai region made the largest contribution (60%) while the remaining regions made relatively equal contributions which ranged from 12-15%.

Size composition.--Length frequency distributions are available from the Kenai upper slope where rex sole, sexes combined, ranged in size from 25-47 cm and averaged 36 cm (Figure X1-328).

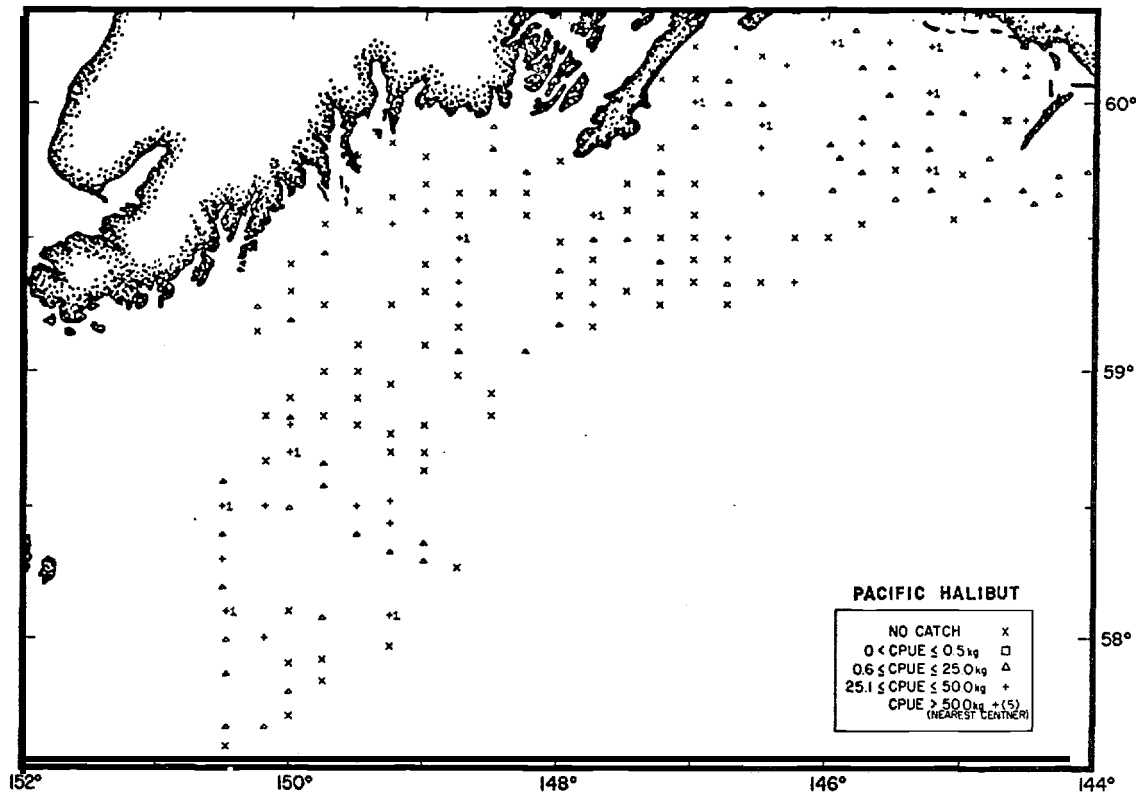
WALLEYE POLLOCK

Distribution and abundance.--Walleye pollock were not taken from the Kenai inner shelf but appeared in the remaining regions-depth zones averaging 14 kg/hr over the entire survey area (Table XI-67). The highest relative apparent abundance occurred in the outer shelf depth zone followed by the upper slope and inner shelf (Figure X1-329). The largest concentrations of pollock were found in the Prince William region (26 kg/hr) where mean CPUE's were highest in the outer shelf and upper slope (Figure X1-330). Mean catch rates in the remaining regions varied from 3-16 kg/hr.

Table XI-65.--Estimated biomas's and population size of halibut (Hippoglossus stenolepis) in the Gulf of Alaska During June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	90.9	3,898.5	72.7	2.3	85.2	1.67	--
	101-200	7.0	1,366.9	25.5	0.4	14.8	3.21	--
	201-400	2.6	93.8	1.8	4/	5/	3.92	--
	All zones	19.6	5,359.2	21.4	2.7	23.1	1.98	--
Yakutat	l-100	26.7	1,970.6	55.9	1.5	75.0	1.29	--
	101-200	8.7	1,519.2	43.1	0.5	25.0	3.21	--
	201-400	0.4	33.4	1.0	4/	5/	2.45	--
	All zones	10.7	3,523.2	14.1	2.0	17.1	1.76	--
Prince William	101-200	33.2	1,978.2	68.7	2.4	85.7	1.82	--
	201-400	0.3	15.0	31.1	0.4	14.3	5.53	--
	All zones	19.5	6,363.3	0.2	4/	5/	4.49	--
				25.5	2.8	23.9	2.27	--
Kenai	1-100	40.4	4,211.4	43.2	3.2	76.2	1.30	--
	101-200	14.7	5,133.1	52.6	1.0	23.8	5.08	--
	201-400	3.0	414.4	4.2	4/	5/	12.87	--
	All zones	16.5	9,785.9	39.0	4.2	35.9	2.32	--
Total	1-100	41.0	14,450.6	57.8	9.4	80.3	1.54	--
	101-200	11.5	9,997.4	40.0	2.3	19.7	4.35	--
	201-400	1.8	556.6	2.2	4/	5/	7.61	--
	All zones	16.4	25,004.6	100.0	11.7	100.0	2.14	--

&/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



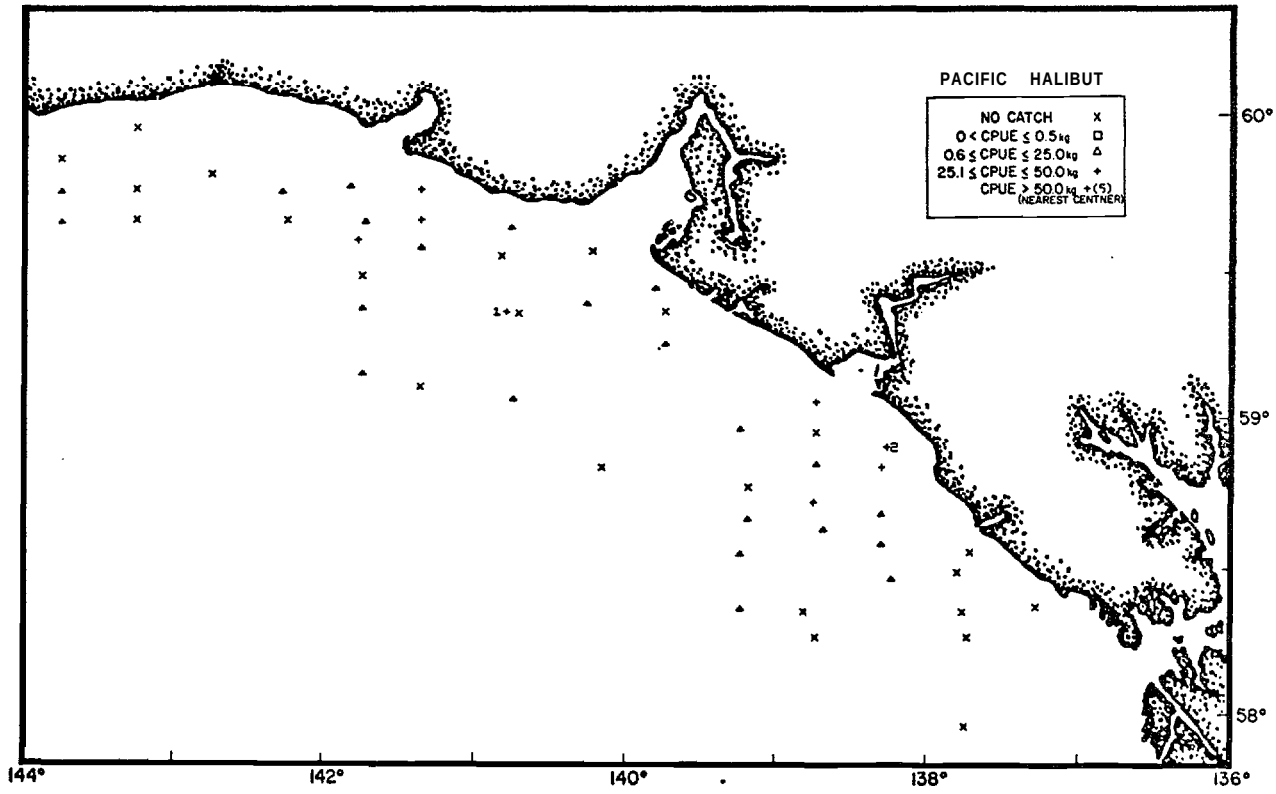
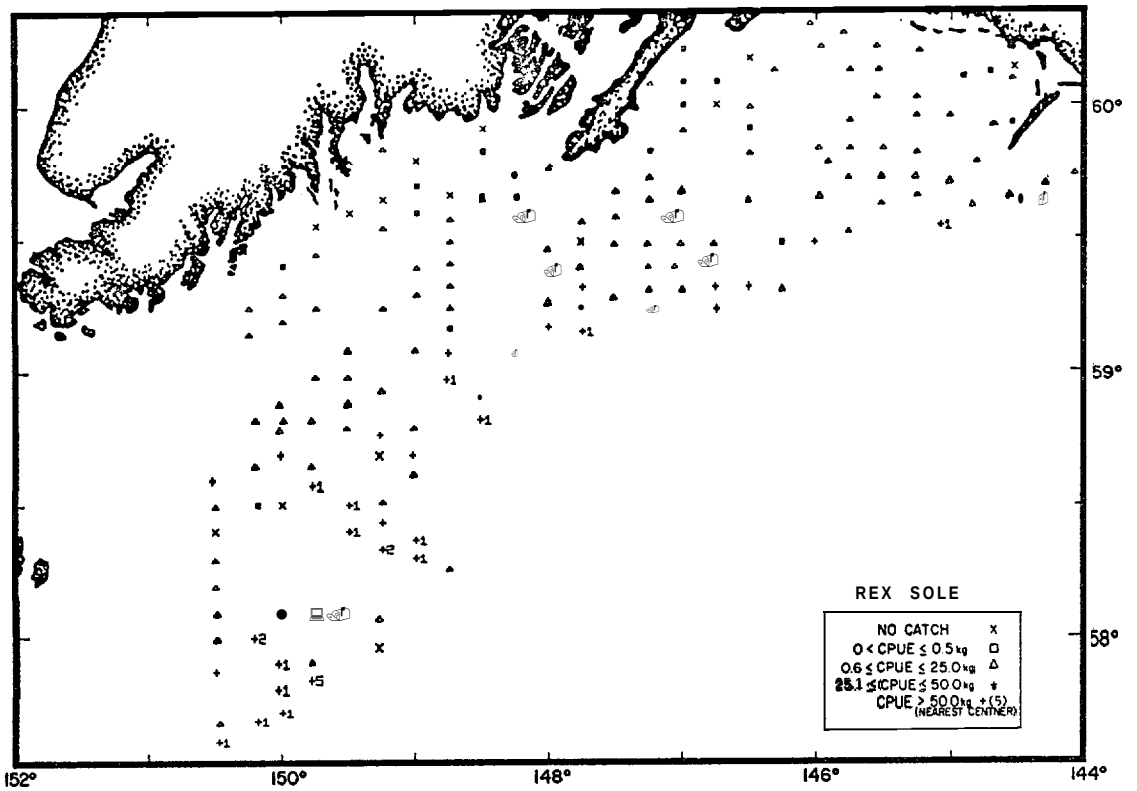


Figure XI-326.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-66.--Estimated biomass and population size of rex sole (Glyptocephalus zachirus) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Mean size per individual[2/] Length (cm)
Fairweather	l-100	5.7	243.2	7.4	0.8	6.2	0.30	--
	101-200	6.4	1,249.2	37.9	5.3	41.1	0.24	--
	201-400	50.3	1,802.5	54.7	6.8	52.7	0.27	--
	All zones	12.1	3,294.9	14.9	12.9	11.6	0.26	--
Yakutat	l-100	4.7	348.5	12.7	2.9	19.5	0.12	--
	101-200	4.8	839.7	30.6	4.8	32.2	0.18	--
	201-400	19.0	1,554.2	56.7	7.2	48.3	0.22	--
	All zones	8.3	2,742.4	12.4	14.9	13.3	0.18	--
Prince William	l-100	6.2	812.0	28.1	10.9	46.0	0.07	--
	101-200	9.4	1,407.8	48.8	9.3	39.2	0.15	--
	201-400	15.3	666.8	23.1	3.5	14.8	0.19	--
	All zones	8.9	2,886.6	13.0	23.7	21.3	0.12	--
Kenai'	l-100	3.8	394.3	3.0	2.3	3.8	0.17	--
	101-200	23.6	8,208.7	62.0	39.5	65.8	0.21	--
	201-400	34.1	4,642.6	35.0	18.2	30.4	0.26	36.1
	All zones	22.5	13,245.6	59.7	60.0	53.8	0.22	--
Total	l-100	5.1	1,798.0	8.1	16.9	15.2	0.11	--
	101-200	13.5	11,705.4	52.8	58.9	52.8	0.20	--
	201-400	29.1	8,666.1	39.1	35.7	32.0	0.24	--
	All zones	14.6	22,169.5	100.0	111.5	100.0	0.20	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



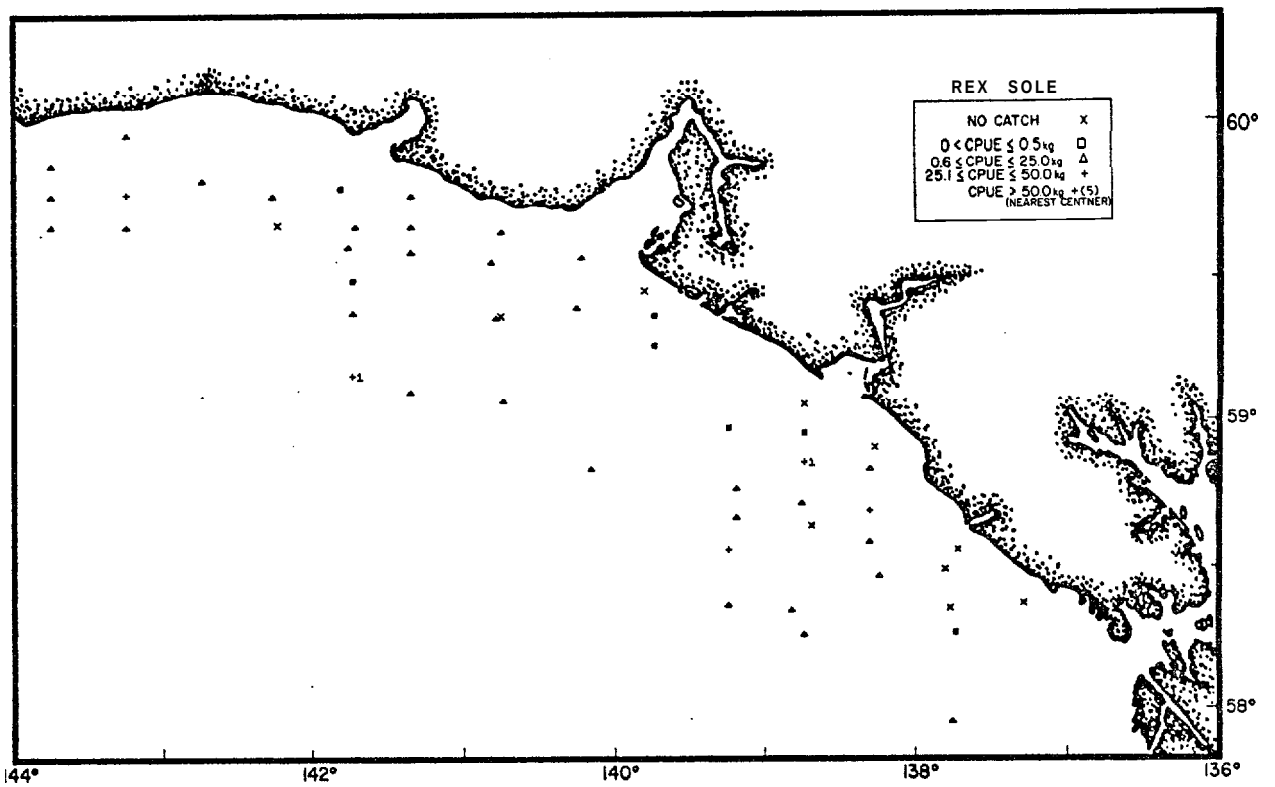
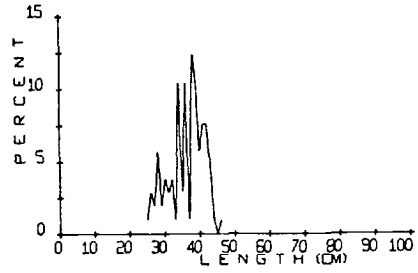


Figure X1-327.--Distribution of standardized catch rates in kg/hr of rex sole in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

DEPTH ZONE (M)

201 - 400



KENAI

Figure X1-328.--Percentage length frequencies of rex sole from the Gulf of Alaska (Cruise 628).

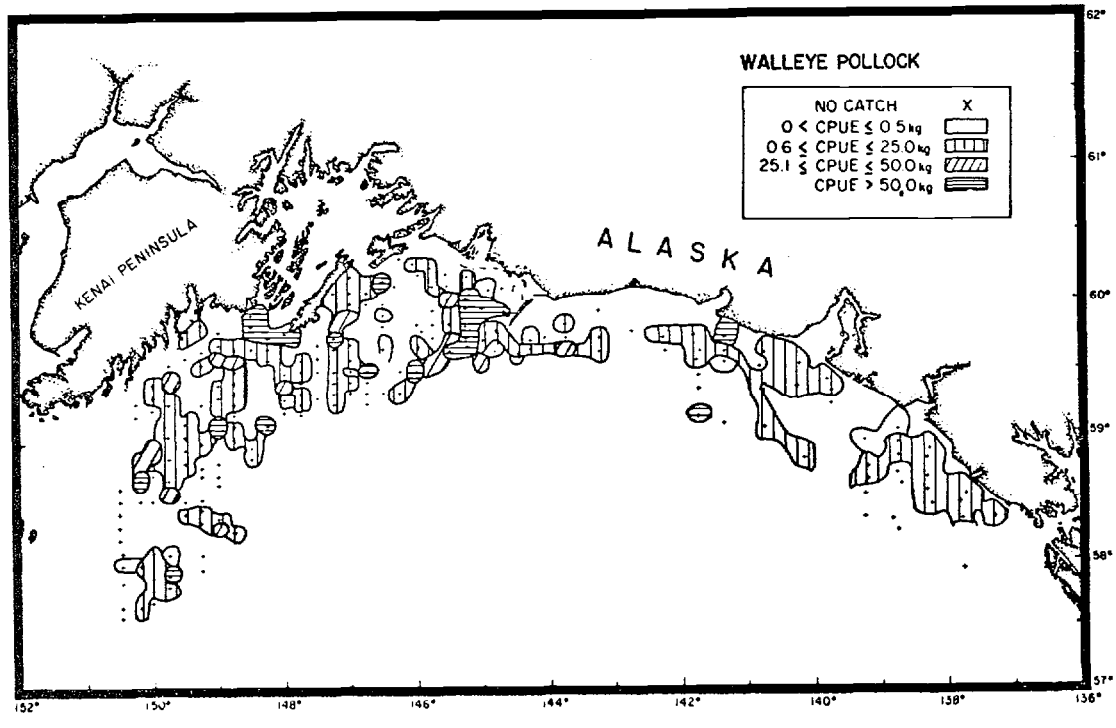
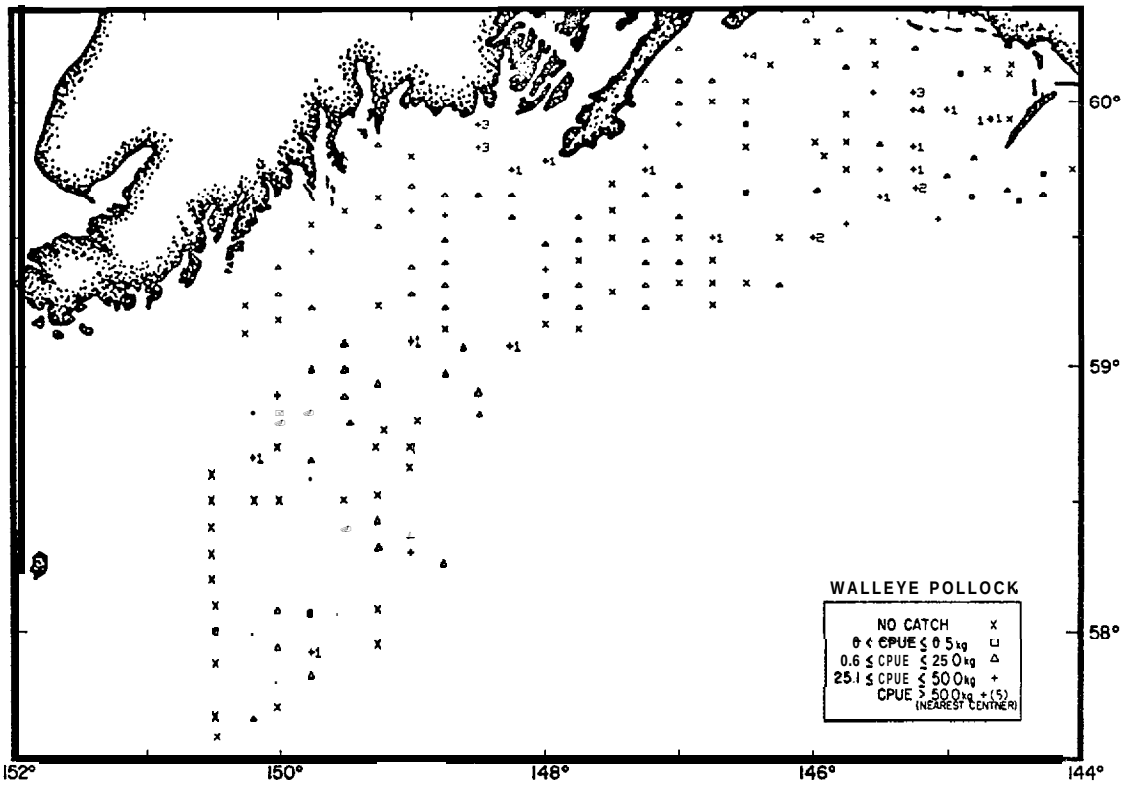


Figure XI-329.--Distribution of apparent relative abundance of walleye pollock in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-67.--Estimated biomass and population size of pollock (Theragra chalcogramma) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	3.4	146.0	15.7	0.6	28.6	0.25	--
	101-200	2.6	504.7	54.1	1.1	52.4	0.48	--
	201-400	7.9	281.8	30.2	0.4	19.0	0.64	--
	All zones	3.4.	932.5	4.3	2.1	4.5	0.44	--
Yakutat	l-100	12.7	938.8	29.3	2.3	33.3	0.40	--
	101-200	5.7	995.0	31.1	2.1	30.5	0.47	--
	201-400	15.5	2,167.7	39.6	2.5	36.2	0.50	--
	All zones	9.7	3,201.5	14.8	6.9	15.0	0.46	--
Prince William	l-100	0.9	129.8	1.6	0.3	2.4	0.38	--
	101-200	49.1	7,376.8	87.8	11.2	89.6	0.66	--
	201-400	20.5	893.2	10.6	1.0	8.0	0.87	--
	All zones	25.8'	8,399.8	38.8	12.5	27.1	0.67	--
Kenai	l-100	0	0	0	0	0	--	--
	101-200	22.0	7,655.4	84.1	21.6	87.8	0.35	--
	201-400	10.7	1,451.5	15.9	3.0	12.2	0.48	--
	All zones	15.5	9,106.9	42.1	24.6	53.4	0.37	--
Total	l-100	3.4	1,214.6	5.6	3.2	6.9	0.38	--
	101-200	19.1	16,531.9	76.4	36.0	78.1	0.46	--
	201-400	13.1	3,894.2	18.0	6.9	15.0	0.56	--
	All zones	14.3	21,640.7	100.0	46.1	100.0	0.47	--

&/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



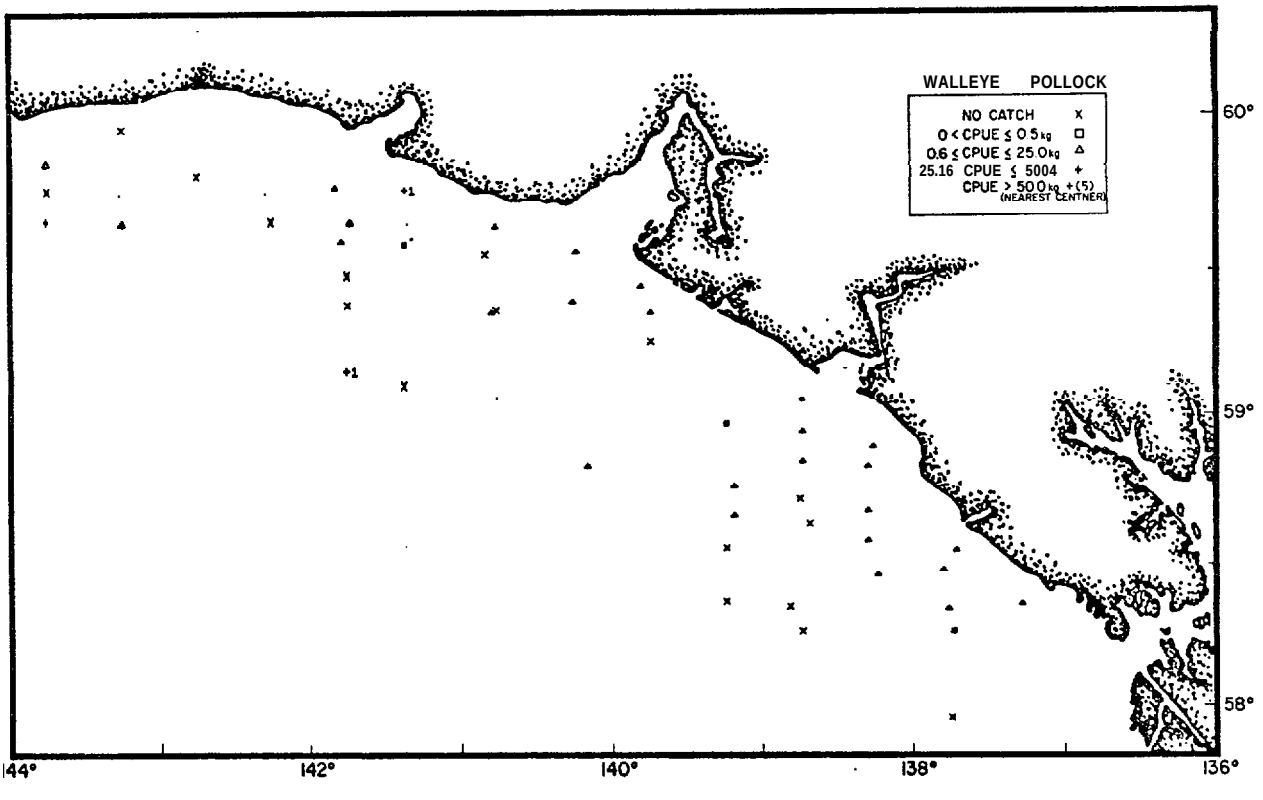


Figure X1-330.--Distribution of standardized catch rates in kg/hr of walleye pollock in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Biomass. --Of the nearly 22 thousand mt, of estimated apparent pollock biomass, 76% occurred in the outer shelf, 18% in the upper slope and 6% in the inner shelf. The Prince William and Kenai regions contributed 39% and 42% respectively, while the Yakutat and Fairweather regions accounted for 15% and 4%. The combined estimate from the Prince William and Kenai outer shelf depth zones represents nearly 70% of the total. biomass. The pollock biomass should be considered a minimum estimate since this is a semi-pelagic species and some unknown portion of the population may have occupied the water column above the sampling gear.

Size composition.--Pollock length frequencies were not taken during this survey.

SKATES (RAJIDAE)

Distribution and abundance.--During these surveys, skates were not identified to individual species. Skates were not taken on the inner shelf of the Fairweather and Kenai regions but appeared in significant concentrations within the remaining regions-depth zones (Table X1-68). Apparent relative abundance increased slightly with increasing depth, and averaged 13 kg/hr over the entire survey (Figure X1-331). The Fairweather region had the highest mean CPUE, a result of large catches in the upper slope (73 kg/hr).

Biomass. -The total apparent skate biomass has been estimated at nearly 25 thousand mt of which 61% occurred in the outer shelf, 24% in the upper slope and 15% in the inner shelf. The Fairweather region made the largest contribution to the biomass (35%) followed by Prince William (27%), Kenai (20%) and Yakutat (17%).

PACIFIC COD

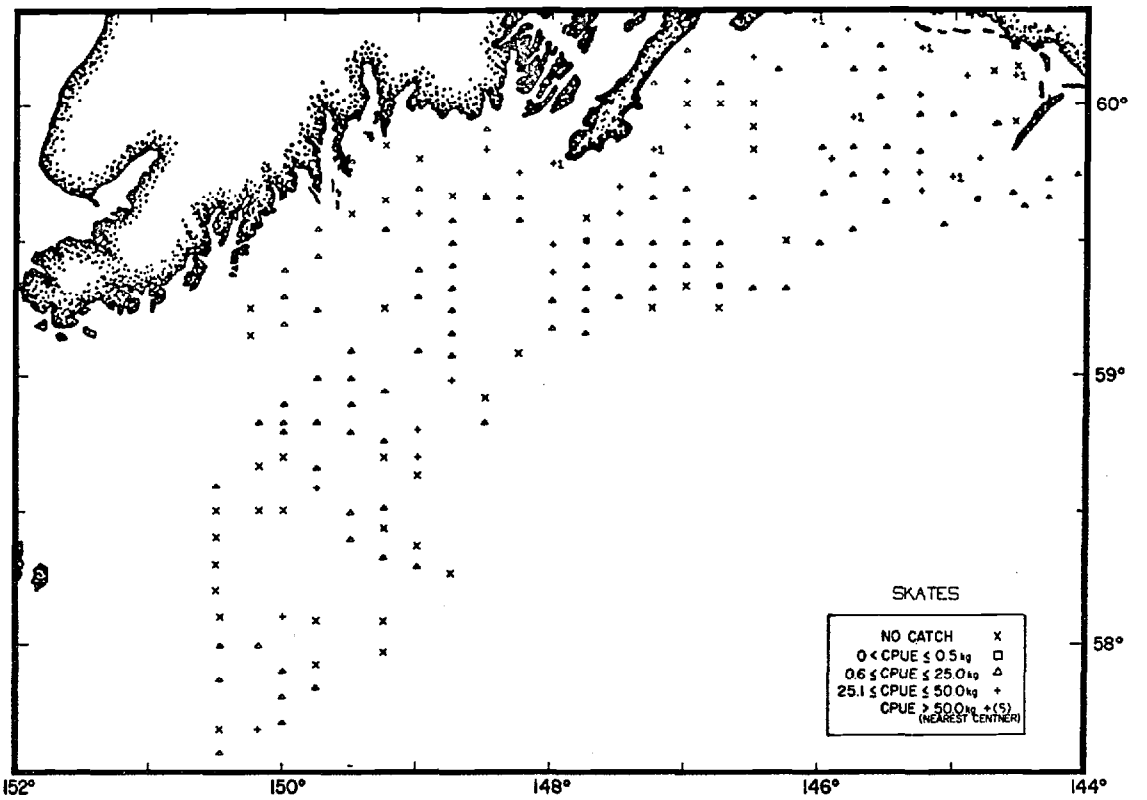
Distribution and abundance.--The highest concentrations of Pacific cod occurred in the Fairweather inner shelf and the Kenai inner and outer shelves (Table X1-69). Apparent relative abundance in the remaining region-depth zones was below the survey average (12 kg/hr) (Figure X1-332). Mean CPUE's were inversely related to bottom depth with values ranging from 3-21 kg/hr *in* the upper slope and inner shelf, respectively.

Biomass. --Of. the estimated 18 thousand mt of apparent biomass, over 95% was concentrated on the continental shelf with the inner shelf accounting for 42% and the outer shelf 53%. The Kenai region contributed nearly 70% to the total biomass with the outer and inner shelves of this region accounting for 24 and 45% respectively. The Fairweather region made the remaining substantial contribution (17%) where 14% of the total Pacific cod biomass occurred in the inner shelf. Although Pacific cod are mainly demersal, unknown portions of the population may have occupied the water column above the sampling gear resulting in a low biomass estimate.

Table XI-68.--Estimated biomass and population size of skates (Rajidae) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated popular&on ($X 10^6$)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	0	0	0	0	0	--	--
	101-200	31.4	6,095.2	70.1	3.2	68.1	1.89	--
	201-400	72.7	2,605.2	29.9	1.5	31.9	1.73	--
	All zones	31.9	8,700.4	35.3	4.7	37.3	1.85	--
Yakutat	l-100	3.8	281.4	6.7	0.1	4.3	1.91	--
	101-200	16.6	2,891.7	68.7	1.4	60.9	2.01	--
	201-400	12.7	1,039.4	24.6	0.8	34.8	1.39	--
	All zones	12.8	4,212.5	17.1	2.3	18.2	1.83	--
Prince William	l-100	25.2	3,321.6	49.6	0.7	31.8	4.78	--
	101-200	17.7	2,665.4	39.8	1.1	50.0	2.32	--
	201-400	16.4	713.7	10.6	0.4	18.2	1.71	--
	All zones	20.6	6,700.7	27.2	2.2	17.5	3.05	--
Kenai	l-100	0	0	0	0	0	--	--
	101-200	9.6	3,355.9	67.0	2.5	73.5	1.32	--
	201-400	12.2	1,654.8	33.0	0.9	26.5	1.91	--
	All zones	8.5	5,010.7	20.4	3.4	27.0	1.47	--
Total	1-100	10.2	3,603.0	14.6	0.8	6.3	4.50	--
	101-200	13.4	15,008.2	61.0	8.2	65.1	1.83	--
	201-400	14.7	6,013.1	24.4	3.6	28.6	1.67	--
	All zones	12.9	24,624.3	100.0	12.6	100.0	1.95	--

&/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 $X 10^6$ individuals.
5/ Less than 0.1 percent.



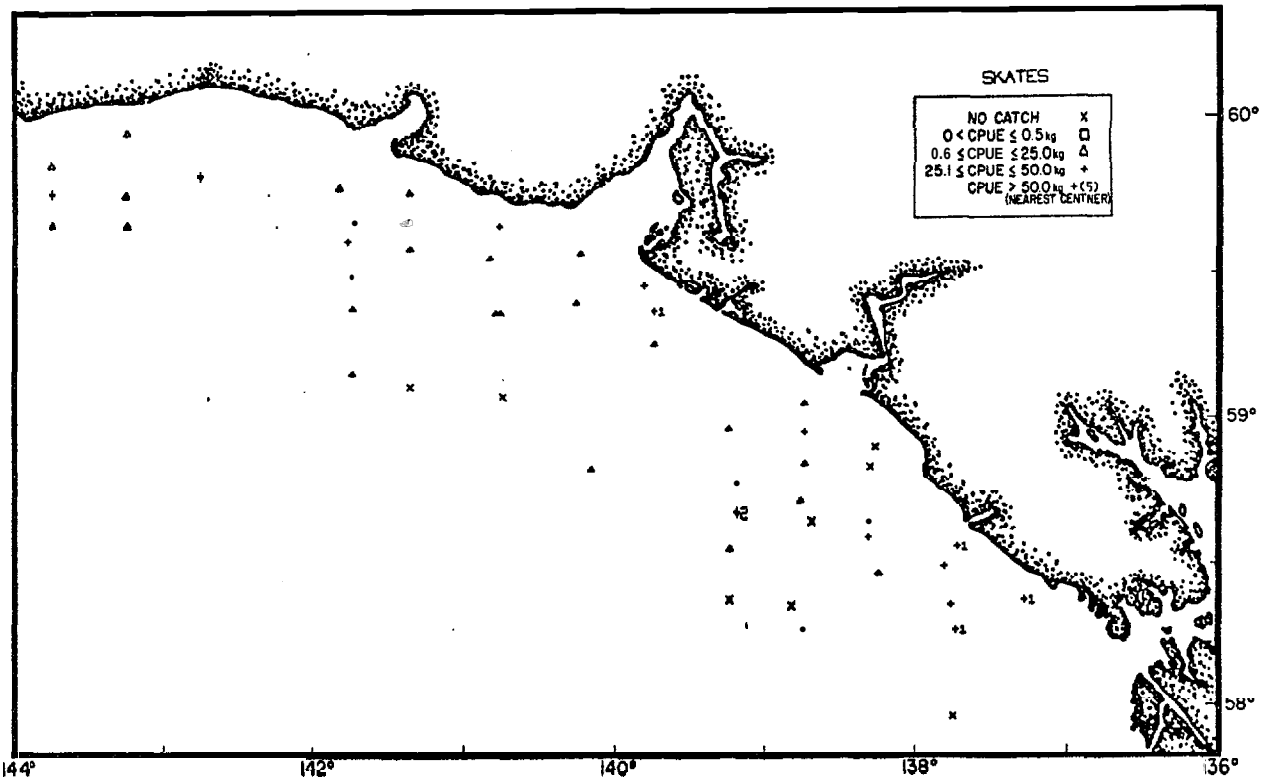
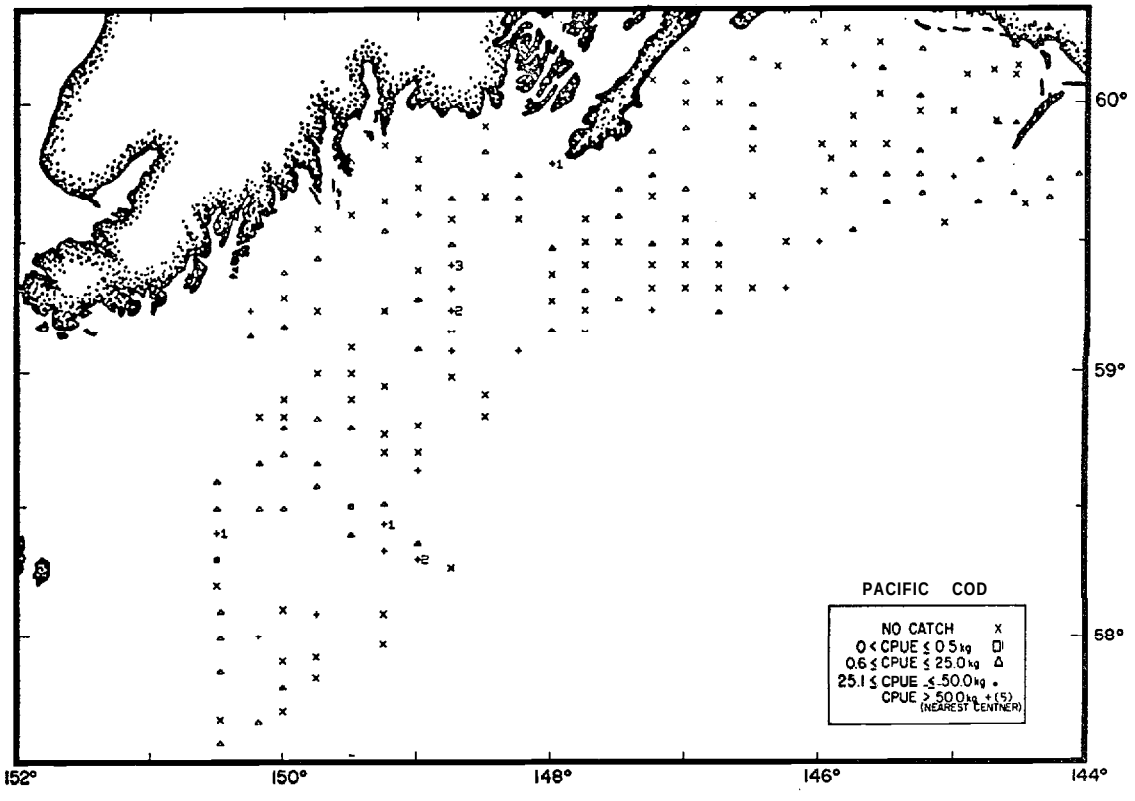


Figure X1-331.--Distribution of standardized catch rates in kg/hr of skates in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-69.--Estimated biomass and population size of Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (x 106)	Proportion of total estimated population	Mean size per individual[2] Weight (kg)	Length (cm)
F&weather	l-100	59.3	2,544.2	85.2	0.6	75.0	4.24	--
	101-200	0.9	176.2	5.9	0.1	12.5	2.38	--
	201-400	7.4	265.6	8.9	0.1	12.5	2.78	--
	All zones	10.9	2,986.0	16.7	0.8	4.7	3.73	--
Yakutat	l-100	5.9	437.6	40.6	0.4	36.4	1.14	--
	101-200	2.7	468.1	43.4	0.4	36.4	1.13	--
	201-400	2.1	172.6	16.0	0.3	27.2	0.60	--
	All zones	3.3	1,078.3	6.1	1.1	6.5	0.98	--
Prince William	l-100	2.3	305.0	23.1	0.2	25.0	1.39	--
	101-200	5.4	804.6	61.0	0.5	62.5	1.62	--
	201-400	4.8	209.7	15.9	0.1	12.5	2.73	--
	All zones	4.1	1,319.3	7.4	0.8	4.8	1.65	--
Kenai	l-100	40.7	4,248.2	34.2	4.9	34.5	0.86	--
	101-200	22.9	7,971.3	64.1	9.2	64.8	0.87	42.5
	201-400	1.6	216.5	1.7	0.1	0.7	2.14	--
	All zones	21.1	12,436.0	69.8	14.2	84.0	0.88	--
Total	l-100	21.3	7,535.0	42.3	6.1	36.1	1.24	--
	101-200	10.9	9,420.2	52.9	10.2	60.4	0.92	--
	201-400	2.9	864.4	4.8	0.6	3.5	1.44	--
	All zones	11.7	17,819.6	100.0	16.9	100.0	1.05	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hi.
4/ Less than 0.1 X 10 individuals.
5/ Less than 0.1 percent.



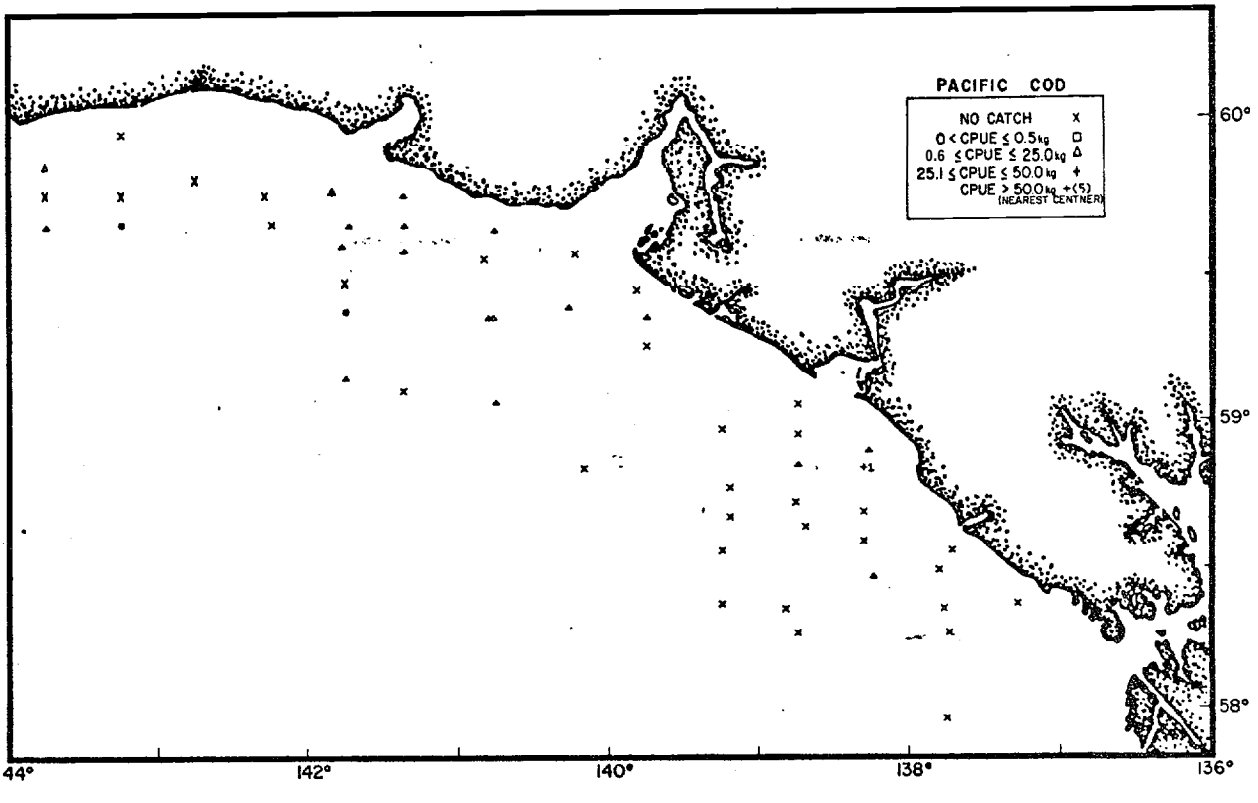


Figure X1-332.--Distribution of standardized catch rates in kg/hr of Pacific cod in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise $28).

Size composition.--Random length frequencies were taken in the Kenai outer shelf where Pacific cod ranged from 33-83 cm and averaged 42.5 cm (Figure X1-333).

SCALLOPS

Distribution and abundance.--Scallops had a relatively restricted geographic and bathymetric distribution with most concentrations occurring in shallow waters of the eastern Gulf regions (Table X1-70). Highest catch rates were in the Fairweather-inner shelf (205 kg/hr) and Yakutat-inner and outer shelf (47 and 22 kg/hr) (Figure X1-334). Scallops were not taken from the Kenai region, the Fairweather-outer shelf, and the upper slope depth zone of all regions.

Biomass,--Of the nearly 16 thousand mt of estimated apparent biomass, 74% occurred in the inner shelf and 26% in the outer shelf. Fifty-three percent of the biomass was contained in the Fairweather-inner shelf while the combined Yakutat-inner and outer shelf accounted for 44%. The biomass estimate for scallops should be considered minimal as the otter trawl is an inefficient gear for harvesting scallops.

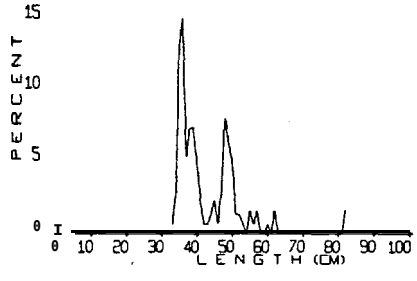
Size composition.--No length frequency data were collected for this species group.

COTTIDS

Distribution and abundance.--During the early Gulf of Alaska surveys, cottids were not identified to species but rather placed in the family grouping Cottidae. The density distribution of cottids was greatest on

DEPTH ZONE (M)

101 - 200



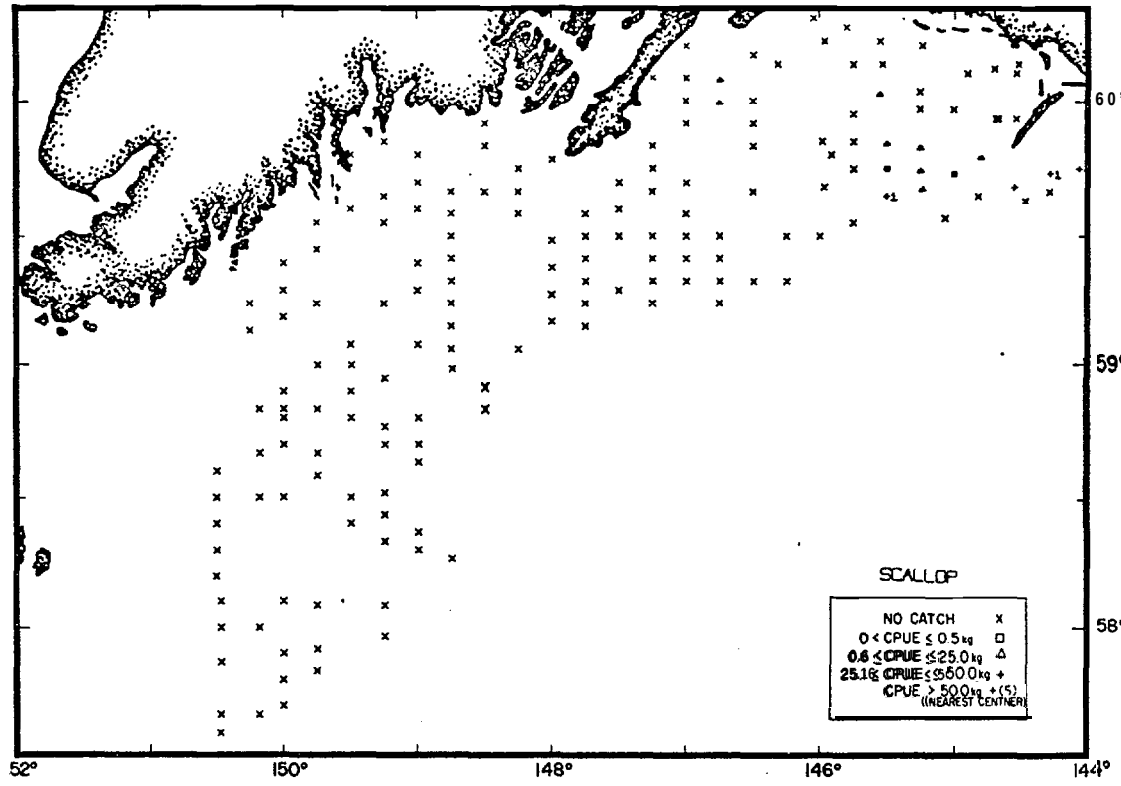
KENAI

Figure XI-333.--Percentage length frequencies of Pacific cod from the Gulf of Alaska (Cruise 628).

Table XI-70.--Estimated biomass and population size of scallops (Pectinidae) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	204.8	8,787.3	100.0	33.5	100.0	0.26	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	32.2	8,787.3	52.7	33.5	56.0	0.26	--
Yakutat	l-100	47.4	3,501.3	47.3	12.6	51.4	0.28	--
	101-200	22.4	47.3	52.7	11.9	48.6	0.33	--
	201-400	0	0	0	0	0	--	--
	All zones	22.4	7,400.6	44.4	24.5	41.0	0.30	--
Prince William	l-100	0.1	9.9	2.1	0.1	5.6	0.11	a-
	101-200	3.2	473.9	97.9	1.7	94.4	0.28	--
	201-400	0	0	0'	0	0	--	--
	All zones	1.5	483.8	2.9	1.8	3.0	0.27	--
Kenai	l-100	0	0	0	0	0		--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	0	--	--
Total	l-100	34.9	12,298.5	73.8	46.2	77.3	0.27	--
	101-200	5.1	4,373.2	26.2	13.6	22.7	0.32	--
	201-400	0	0	0	0	0	--	--
	All zones	11.2	16,671.7	100.0	59.8	100.0	0.28	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



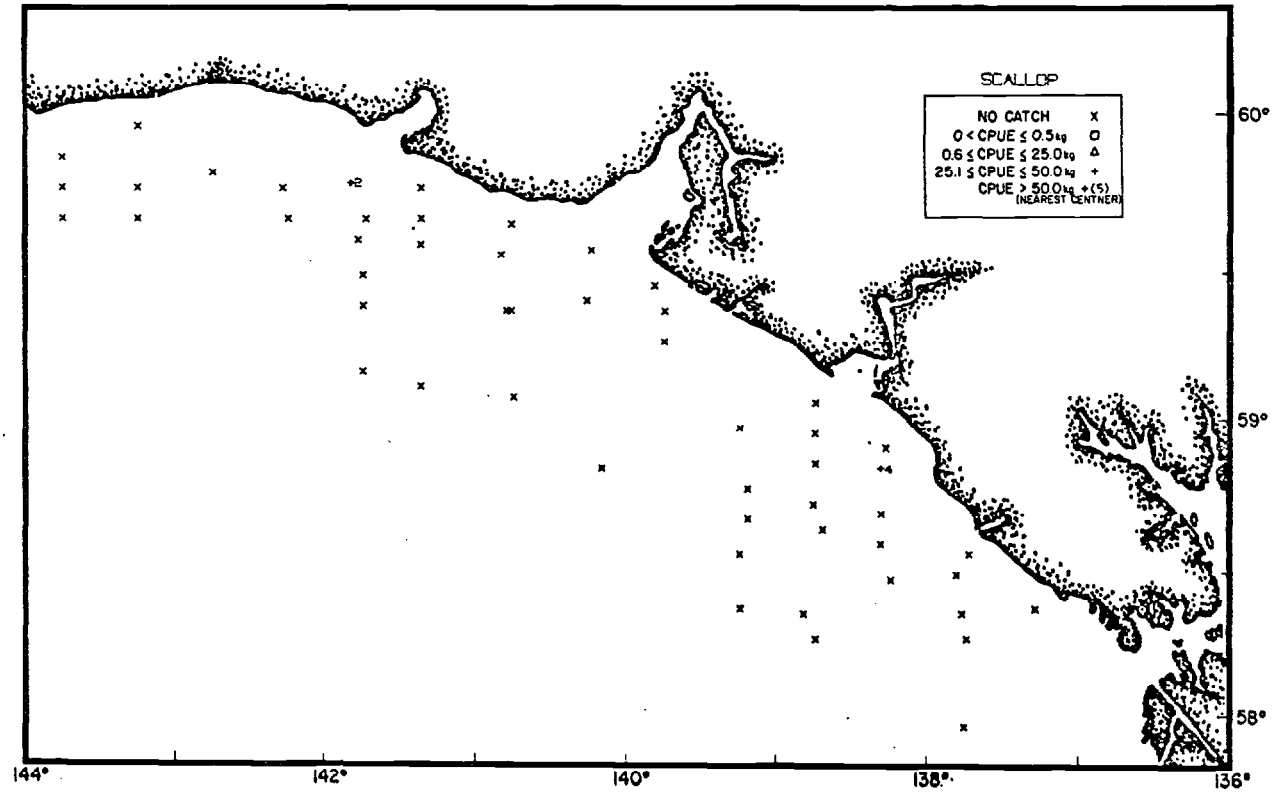
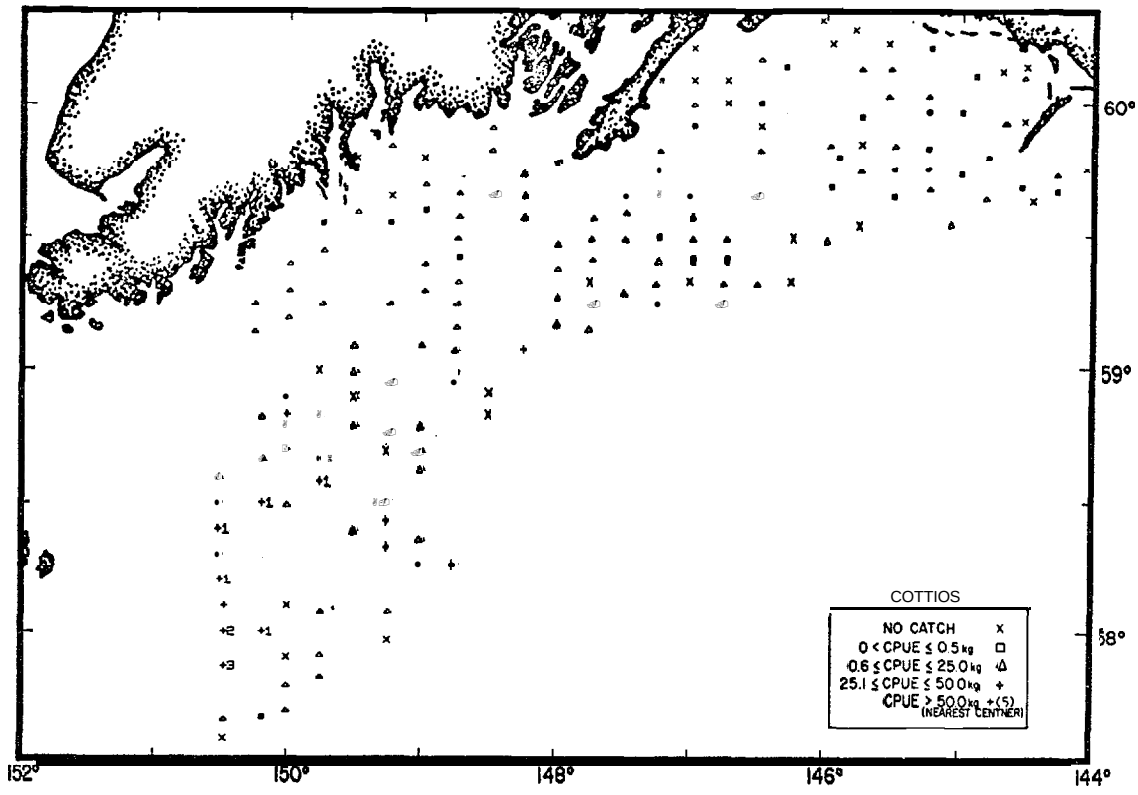


Figure XI-334.--Distribution of standardized catch rates in kg/hr of scallop in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



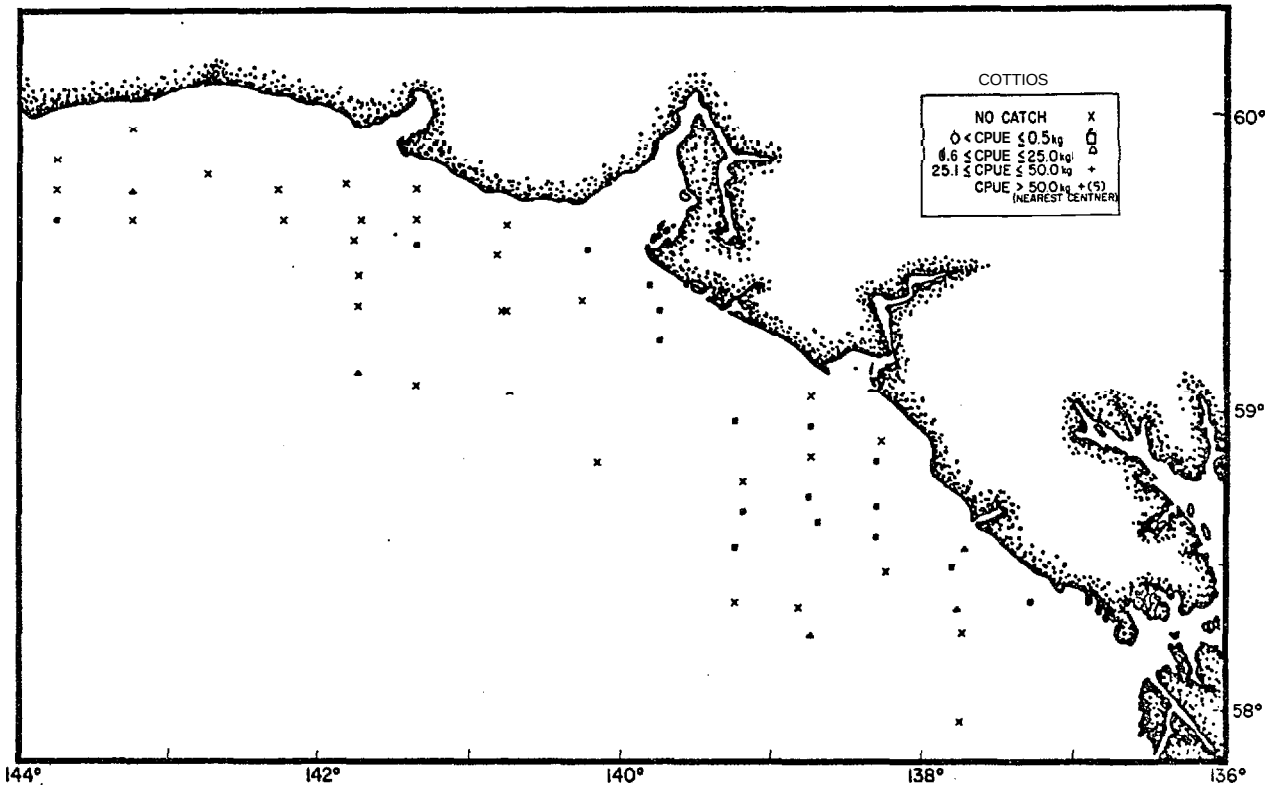
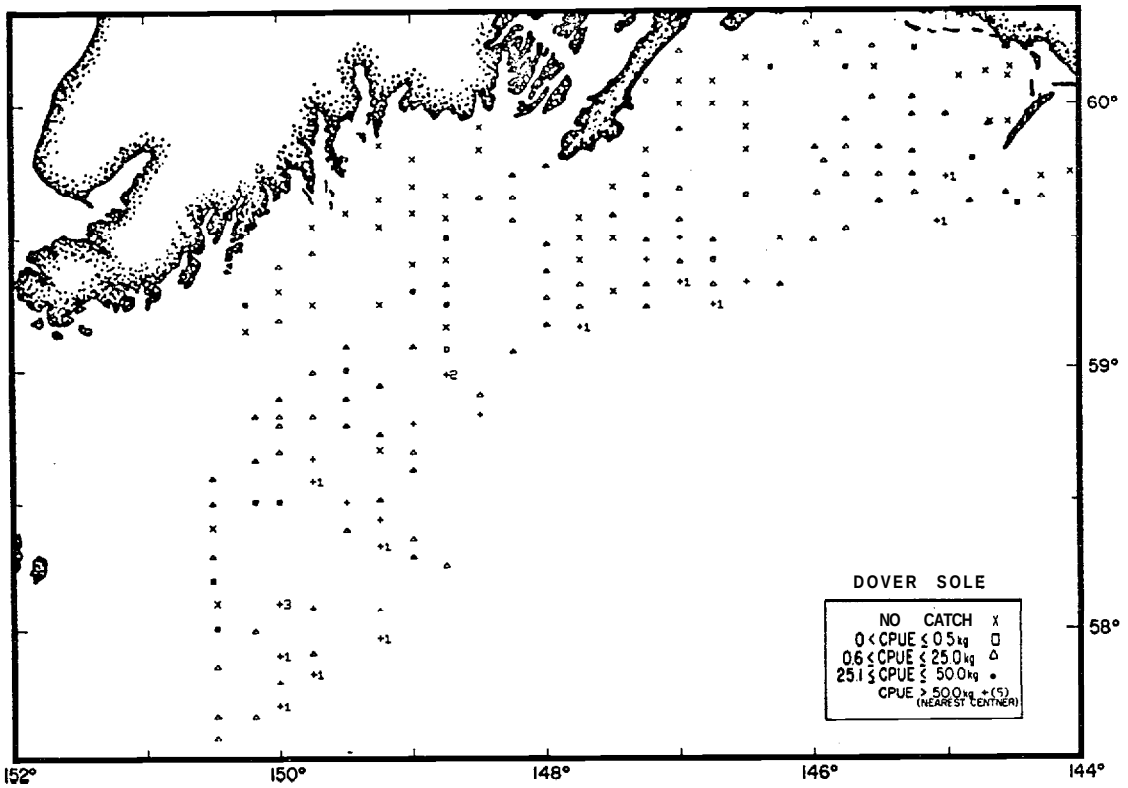


Figure X1-335.--Distribution of standardized catch rates in **kg/hr** of cottids in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).



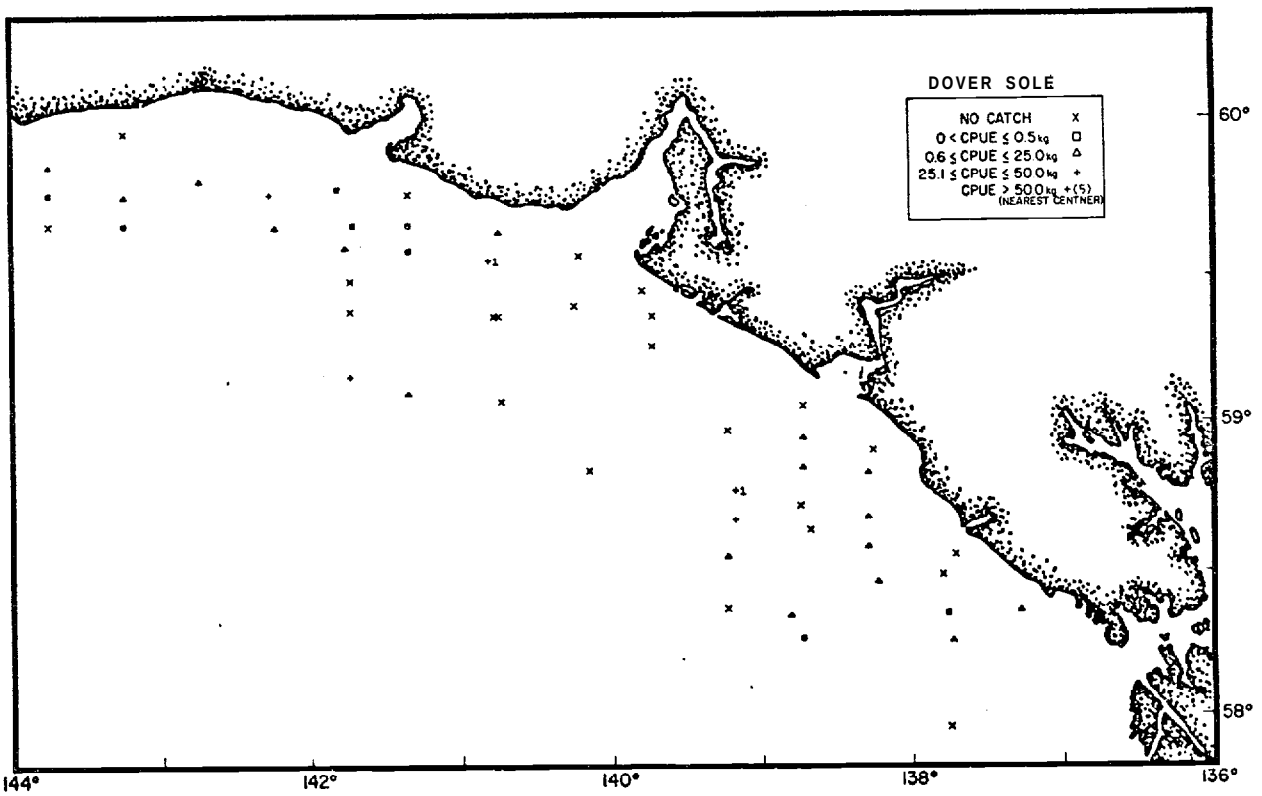


Figure X1-336.--Distribution of standardized catch rates in kg/hr of Dover sole in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

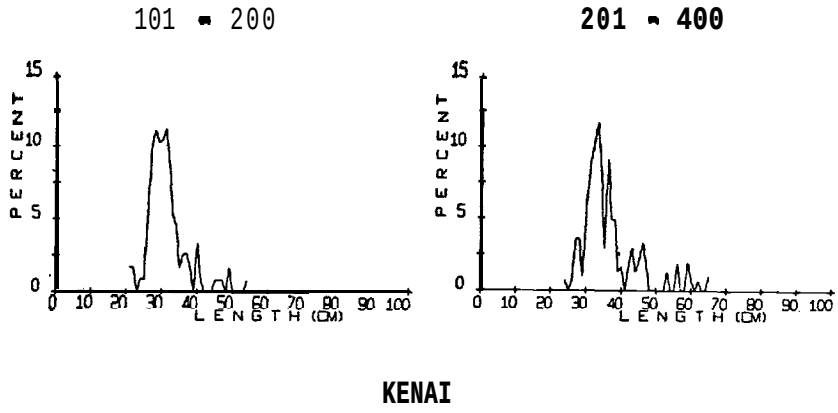


Figure X1-337.--Percentage length frequencies of Dover sole from the Gulf of Alaska (Cruise 628).

the continental shelf of the westernmost regions covered during the survey (Table XI-71 and Figure X1-335). The Kenai region accumulated the highest mean catch rate, a result of relatively high concentrations in the inner and outer shelf. While apparent abundance was below the survey average of IO kg/hr in the remaining regions.

Biomass. --Of the estimated 14 thousand mt of cottids, almost 96% were concentrated on the continental shelf. Sixty percent of the apparent biomass came from the outer shelf, 36% from the inner shelf, and only 5% from the upper slope.' The Kenai region contained 93% of the estimated biomass with estimates declining rapidly to the east.

Size composition.--No length frequency data were collected for this species group.

DOVER SOLE

Distribution and abundance.--Dover sole appeared in all regions sampled with mean catch rates increasing with bottom depth (Table X1-72). Catch rates increased from 1 kg/hr in the inner shelf to 28 kg/hr in the upper slope and averaged 9 kg/hr over the survey area (Figure X1-336). Mean CPUE's did not vary greatly between regions with Fairweather having the lowest apparent relative abundance and Kenai the highest.

Table XI-71.--Estimated biomass and population size of cdttids (Cottidae) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0.2	9.7	12.6	41	5/	0.23	--
	101-200	0.3	64.8	83.9	0.7	100.0	0.09	--
	201-400	0.1	2.7	3.5	4/	5/	0.06	--
	All zones	0.3	77.2	0.5	0.7	1.1	0.11	
Yakutat	l-100	0			0	0	--	--
	101-200	0.3	530.4	340.1	0.4	50.0	0.13	--
	201-400	1.3	103.3	65.9	0.4	50.0	0.24	
	All zones	0.5	156.7	1.1	0.8	1.3	0.20	--
Prince William	l-100	0.2	29.0	3.5	0.3	9.1	0.10	--
	101-200	4.7	709.0	84.7	2.8	84.9	0.25	
	201-400	2.3	99.2	11.8	0.2	6.0	0.80	--
	All zones	2.6	837.2	5.8	3.3	5.3	0.25	--
Kenai	l-100	48.9	5,099.9	38.1	18.0	31.5	0.28	--
	101-200	22.5	7.826.2	58.5	38.0	66.4	0.21	--
	201-400	3.3	-447.5	3.4	1.2	2.1	0.39	--
	All zones	22.7	13,373.6	92.6	57.2	92.3	0.23	
Total	l-100	14.6	5,138.6	35.6	18.3	29.5	0.28	--
	101-200	10.0	8,653.4	59.9	41.9	67.6	0.21	
	201-400	2.2	652.7	4.5	1.8	2.9	0.36	
	All zones	9.5	14,444.7	100.0	62.0	100.0	0.23	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Table XI-72.--Estimated biomass and population size of Dover sole (Microstomus pacificus) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (x 10^6)	Proportion of total estimated population	Mean size per individual/ Weight (kg)	Length (cm)
Fairweather	l-100	5.7	243.2	13.6	1.5	36.6	0.17	--
	101-200	0.7	139.7	7.8	0.4	9.8	0.37	--
	201-400	39.4	1,411.2	78.6	2.2	53.6	0.64	--
	All zones	6.6	1,794.1	13.3	4.1	11.6	0.44	--
Yakutat	l-100	0.1	6.0	0.2	4/	5/	0.14	--
	101-200	2.2	390.8	16.1	l-I-2	2z.o	0.32	--
	201-400	24.8	2,032.4	83.7	3.8	76.0	0.54	--
	All zones	7.3	2,429.2	18.1	5.0	14.2	0.49	--
Prince William	l-100	0.8						--
	101-200	7.9	1,185.0 106.7	53.2 4.7	4.00	57.1 8.6	0.17 0.29	--
	201-400	21.6	937.2	42.1	2.4	34.3	0.38	--
	All zones	6.9	2,228.9	16.6	7.0	19.9	0.32	--
Kenai	l-100	0.8	86.8	1.2	0.5	2.6	0.19	--
	101-200	8.5	2,952.0	42.3	9.9	51.8	0.30	31.3
	201-400	29.0	3,939.3	56.5	8.7	45.6	0.45	36.4
	All zones	11.9	6,978.1	52.0	19.1	54.3	0.37	--
Total	l-100	1.2	442.7	3.3	2.6	7.4	0.17	--
	101-200	5.4	4,667.5	34.8	15.5	44.0	0.30	--
	201-400	28.0	8,320.1	61.9	17.1	48.6	0.49	--
	All zones	8.9	13,430.3	100.0	35.2	100.0	0.38	--

&/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Biomass. -The apparent biomass of Dover sole was estimated at 13 thousand mt of which 62% occurred in the upper slope and 35% in the outer shelf. The Kenai region made the largest contribution to the biomass (52%) with the remaining being relatively evenly distributed between the Fairweather (13%), Yakutat (18%) and Prince William (17%) regions. The biomass estimate for Dover sole may be low as the bathymetric range or this species was not adequately sampled due to the limtations of the sampling gear and the rugged topography associated with the upper slope.

Size composition.--Length frequency data are available for the Kenai region. In the outer shelf, Dover sole, sexes combined, averaged 31.3 cm which increased to 36.4 cm in the upper slope (Figure X1-337).

DUNGENESS CRAB

Distribution and abundance.--Dungeness crab appeared within a very restricted distribution (Table X1-73). Highest relative apparent abundance occurred in the inner shelf of the Prince William (69 kg/hr), Yakutat (19 kg/hr) and Fairweather regions (22 kg/hr) with only trace amounts appearing in the Prince William region. (Figure X1-338). Over the survey area, Dungeness crab had mean CPUE of 33 kg/hr in the inner shelf and averaged 8 kg/hr over all depths. No catches containing this species occurred in the Kenai region.

Biomass .--Of the 11 thousand mt of Dungeness crab, nearly 100% came from the inner shelf depth zone. Nearly 80% of this apparent biomass was contained in the Prince William region followed by Yakutat (12%) and Fairweather (8%). The biomass estimate of Dungeness crab should be considered minimal as this species occurs in highest abundance where sampling was not adequately conducted during this survey.

Size composition.--No length frequency data were collected for this species.

SABLEFISH

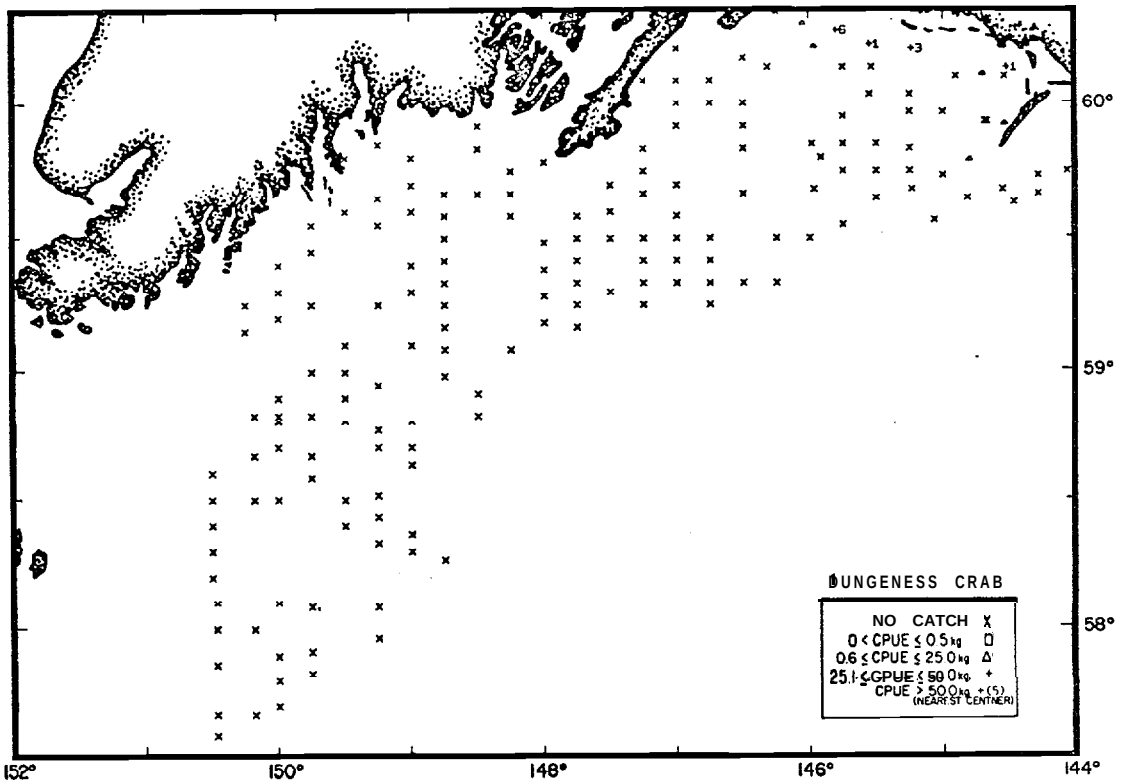
Distribution and abundance. --Except for the Kenai inner shelf, sablefish were taken throughout the survey area (Table X1-74). Relative apparent abundance averaged 7 kg/hr over the survey area and increased with increasing water depth from 1 kg/hr in the inner shelf to 21 kg/hr in the upper slope. (Figure X1-339). Mean CPUE's were above the survey average in the Fairweather, 10 kg/hr, and Kenai, 7 kg/hr, regions.

Biomass. --Nearly 97% of the estimated 10 thousand mt of sablefish apparent biomass was contained in the outer shelf (34%) and upper slope (63%) depth zones. The Kenai region contained the largest portion of the estimate (40%) followed by Fairweather (28%), Prince William (19%) and Yakutat (13%). The biomass estimate for sablefish should be considered low for the bathymetric range of this species extends beyond the depths covered during the survey.

Table XI-73.--Estimated biomass and population size of Dungeness crab (*Cancer magister*) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Mean size per individual[2/] Length (cm)
Fairweather	l-100	21.6	928.2	100.0	1.1	100.0	0.82	--
	101-200	0	0	0	0	0		--
	201-400	0	0	0	0	0	--	--
	All zones	3.4	928.2	8.1	1.1	7.2	0.82	--
Yakutat	l-100	18.7	1,384.9	100.0	1.8	100.0	0.76	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	4.2	1,384.9	12.2	1.8	11.9	0.76	--
Prince William	l-100	69.4	9,153.4	99.9	12.3	100.0	0.74	--
	101-200	3/	6.5	0.1	4/	5/	0.52	--
	201-400	0	0	0	0	0	--	--
	All zones	28.1	9,159.9	79.8	12.3	80.9	0.74	--
Kenai	l-100	0	0	0	0	0		--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	0	--	--
Total	l-100	32.5	11,466.5	99.9	15.2	100.0	0.75	--
	101-200	3/	6.5	0.1	41	5/	0.52	--
	201-400	0	0	0	0	0	--	--
	All zones	7.6	11,473.0	100.0	15.2	100.0	0.75	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



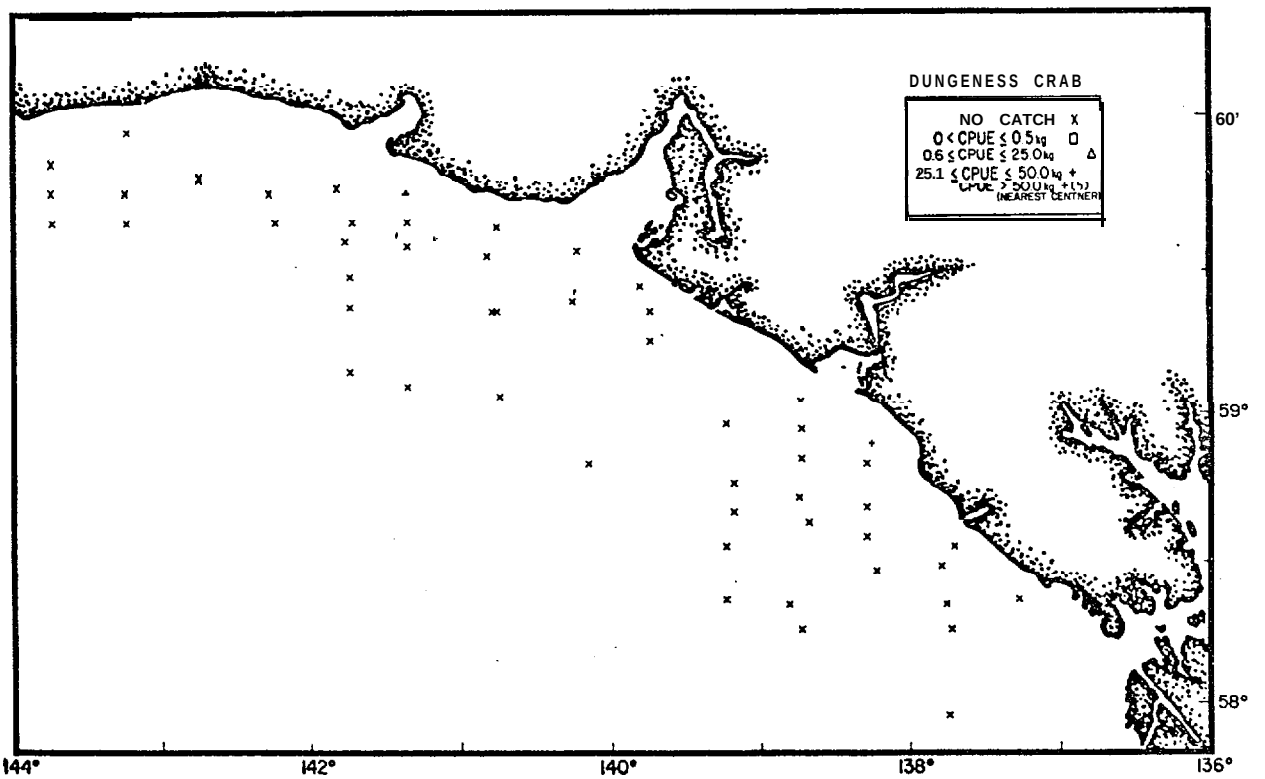
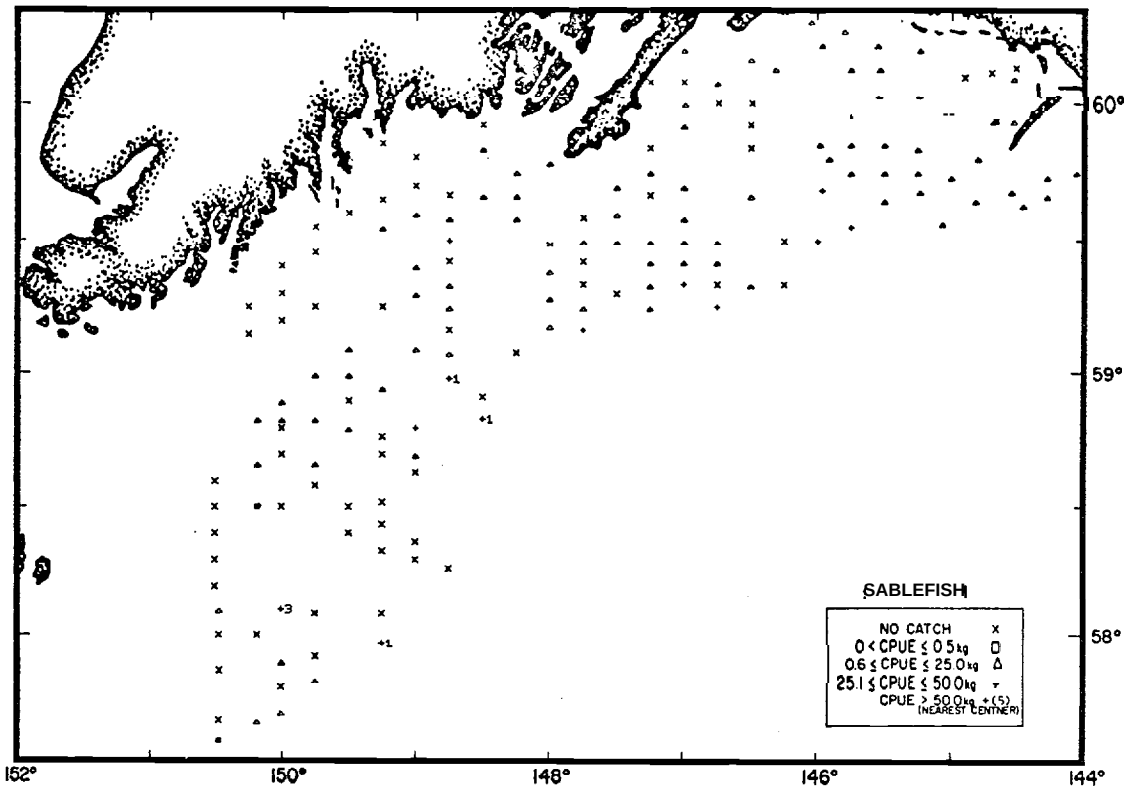


Figure X1-338.--Distribution of standardized catch rates in kg/hr of Dungeness crab in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-74.--Estimated biomass and population size of sablefish (*Anoplopoma fimbria*) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	l-100	0.7	29.2	1.1	0.1	4.4	0.34	--
	101-200	4.5	872.7	31.7	0.7	30.4	1.33	--
	201-400	51.6	1,850.2	67.2	1.5	65.2	1.25	--
	All zones	10.1	2,752.1	28.0	2.3	23.5	1.20	--
Yakutat	l-100	0.7	53.6	4.4	0.2	14.3	0.33	--
	101-200	3.3	574.0	46.7	0.7	50.0	0.75	--
	201-400	7.3	600.1	48.9	0.5	35.7	1.30	--
	All zones	3.7	1,227.7	12.5	1.4	14.3	0.88	--
Prince William	l-100	1.8	241.6	12.8	0.9	37.5	0.27	--
	101-200	7.5	1,130.2	59.7	1.2	50.0	0.97	--
	201-400	12.0	520.3	27.5	0.3	12.5	1.83	--
	All zones	5.8	1,892.1	19.3	2.4	24.5	0.79	--
Kenai	l-100	0	0	0	0	0	--	--
	101-200	2.1	743.7	18.8	1.5	40.5	0.51	45.3
	201-400	23.6	3,206.1	81.2	2.2	59.5	1.44	56.7
	All zones	6.7	3,949.8	40.2	3.7	37.7	1.07	--
Total	l-100	0.9	324.4	3.3	1.2	12.3	0.27	--
	101-200	3.8	3,320.6	33.8	4.1	41.8	0.81	--
	201-400	20.8	6,176.6	62.9	4.5	45.9	1.37	--
	All zones	6.5	9,821.7	100.0	9.8	100.0	1.00	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



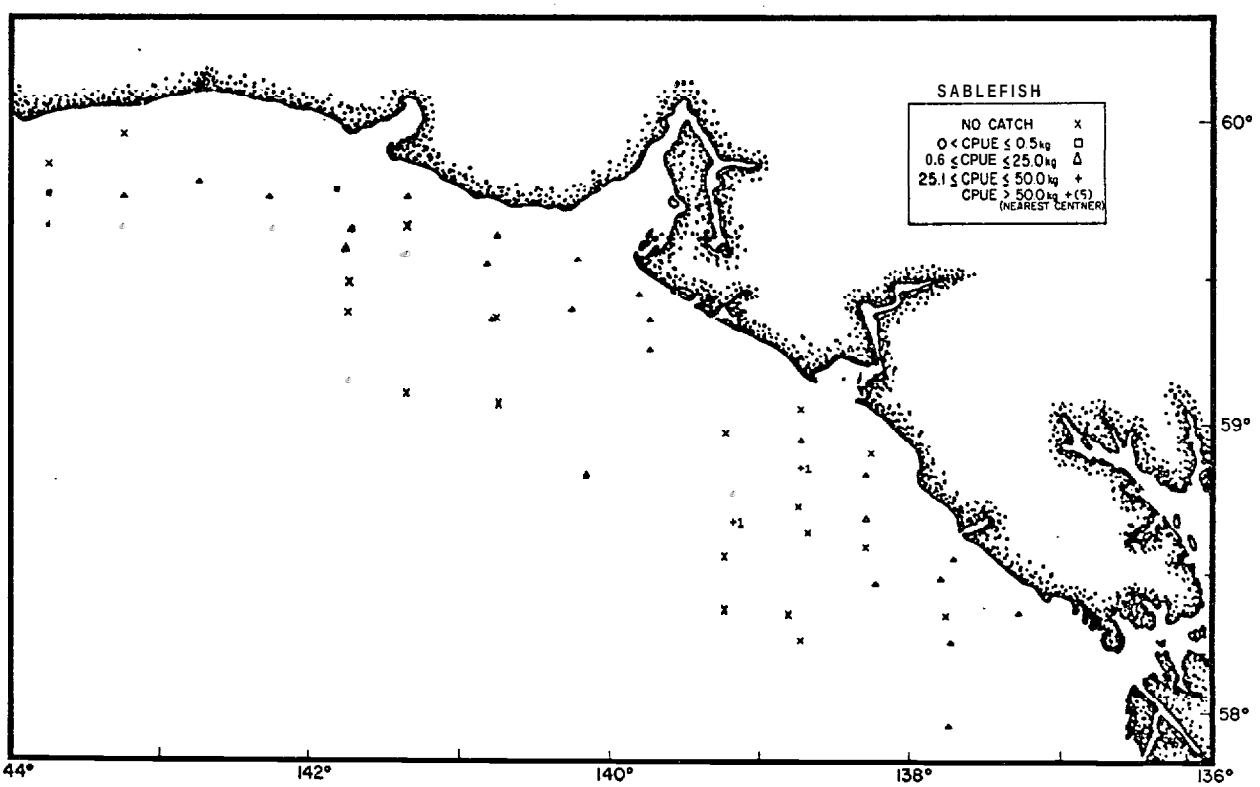


Figure XI-339.--Distribution of standardized catch rates in kg/hr of sablefish in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Size composition.-Length frequency data are available from the Kenai region where sablefish, sexes combined, averaged 45.3 cm on the outer shelf and 56.7 cm on the upper slope (Figure X1-340).

ROCK SOLE

Distribution and abundance .-High concentrations of rock sole were associated with shallow waters of the westernmost regions of the survey area (Table XI-75 and Figure X1-341). The Kenai inner shelf had the highest mean CPUE (76 kg/hr) but values fell to below the survey average (6 kg/hr) in the remaining regions (Figure X1-342).

Biomass .--Of the 9 thousand mt of estimated apparent biomass, nearly 90% occurred in the inner shelf depth zone with the greates contribution occuring in the Kenai inner shelf *(84%).* The biomass estimate for rock sole should be considered minimal as this species is most abundant during summer months in shallow untrawlable areas.

Size composition.--Length frequency data are available from the Kenai outer shelf where rock sole ranged in size from 19-37 cm and averaged *27.5* cm (Figure X1-343).

SHORTSPINE THORNYHEAD

Distribution and abundance.--Shortspine thornyheads were not taken in the inner shelf depth zone, appeared in small concentrations in the outer shelf and were most abundant in the upper slope (Table XI-76 and Figures *x1-344-345).* This species appeared in all regions with Yakutat having the highest apparent relative abundance followed by Prince William, Fairweather and Kenai. The mean CPUE over the entire survey area was 4 kg/hr.

Biomass. --Nearly 85% of the estimated 6 thousand mt of apparent biomass came from the upper slope depth zone while the contribution from the outer shelf was 15%. Yakutat made the largest regional contribution (44%) followed by Prince William (23%), Kenai (21%), and Fairweather (12%). Biomass estimate of this species should be considered minimal as the survey covered only a portion of its bathymetric range which includes the steep, rugged bottom of the continental slope.

Size composition. --Length frequencies were not taken for this species.

OTHER SPECIES

Over the survey area, several species were captured at mean CPUE's of less than 1 kg/hr yet had relatively high mean catch rates within restricted distributions (Table X1-77). Examples from the Fairweather inner shelf were the starry flounder (471 kg/hr), butter sole (251 kg/hr) and English sole (83 kg/hr), while in the Fairweather upper slope, English sole (83 kg/hr) and spiny dogfish (36 kg/hr) were relatively abundant. Other species were butter sole from the Yakutat inner shelf (18 kg/hr), starry flounder from the Prince William inner shelf (20 kg/hr) and ronquils from *the* Kenai outer shelf (22 kg/hr).

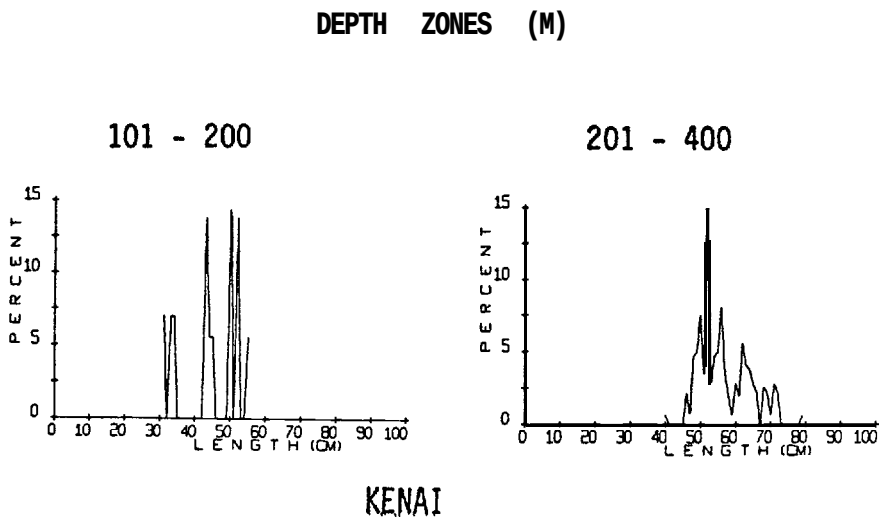


Figure X1-340.--Percentage length frequencies of sablefish from the Gulf of Alaska (Cruise 628).

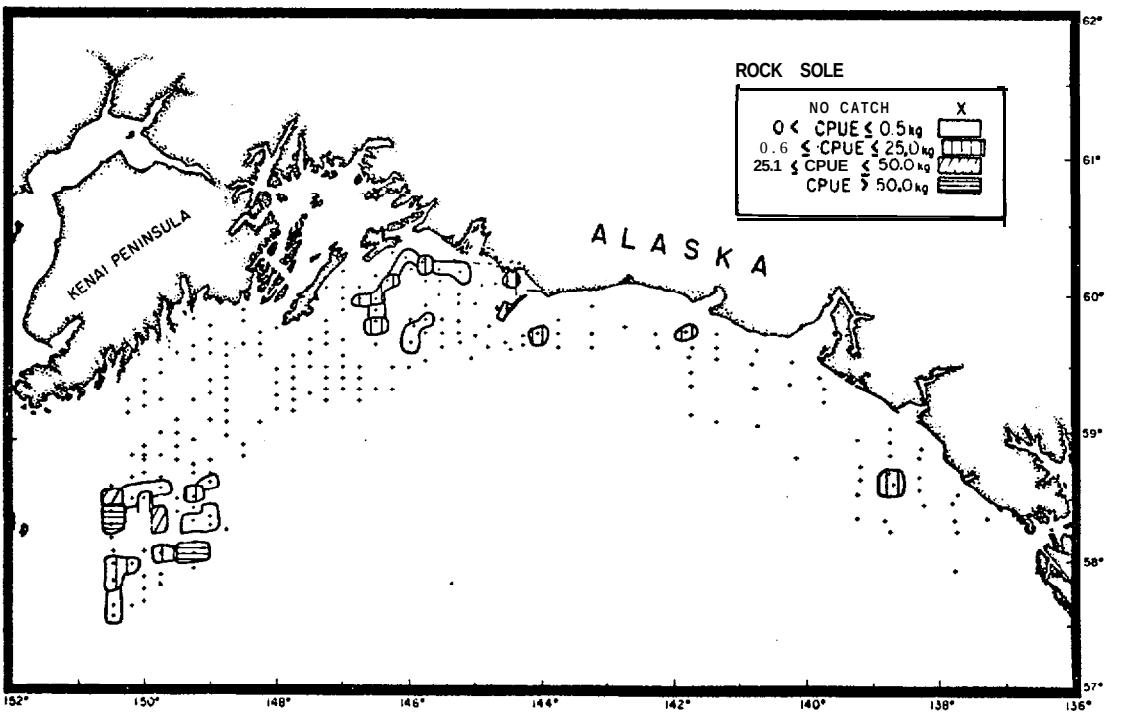
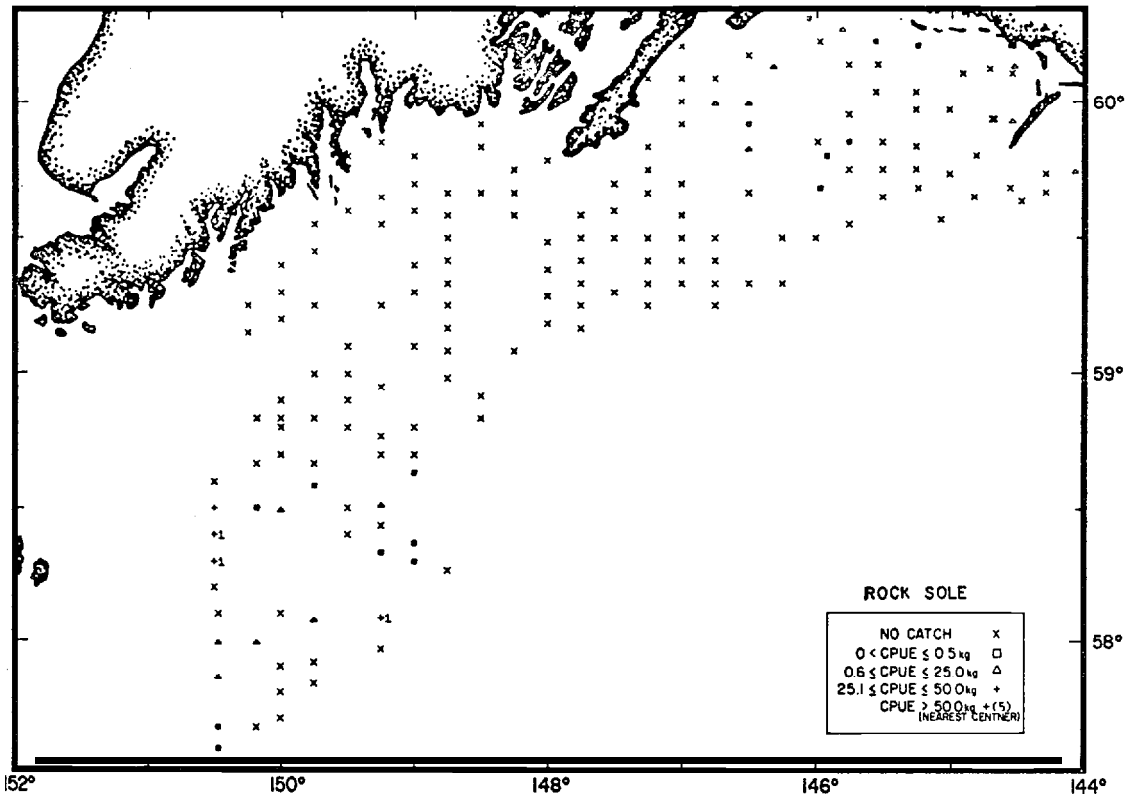


Figure XI-341.--Distribution of apparent relative abundance of rock sole in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-75.--Estimated biomass and population size of rock sole (Lepidopsetta bilineata) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual[2/] Weight (kg)	Length (cm)
Fairweather	1-100	0	0	0	0	0	--	--
	101-200	1.0	186.3	100.0	0.2	100.0	0.88	--
	201-400	0	0	0	0	0	--	--
	All zones	0.7	186.3	2.0	0.2	0.4	0.88	--
Yakutat	1-100	0.9	63.9	89.8	0.2	100.0	0.42	--
	101-200	3/	7.3	10.2	4/	5/	0.50	--
	201-400	0	0	0	0	0	--	--
	All zones	0.3	71.2	0.8	0.2	0.5	0.43	--
Prince William	1-100	3.3	433.0	99.7	1.3	100.0	0.34	--
	101-200	3/	1.3	0.3	4/	5/	0.20	--
	201-400	0	0	0	0	0	--	--
	All zones	1.4	434.3	4.7	1.3	2.8	0.33	--
Kenai	1-100	74.3	7,755.0	91.2	42.1	94.4	0.18	--
	101-200	2.2	749.3	8.8	2.5	5.6	0.30	27.5
	201-400	0	0	0	0	0	--	--
	All zones	14.5	8,504.3	92.5	44.6	96.3	0.19	--
Total	1-100	23.4	8,251.9	89.7	43.6	94.2	0.19	--
	101-200	1.1	944.2	10.3	2.7	5.8	0.35	--
	201-400	0	0	0	0	0	--	--
	All zones	6.1	9,196.1	100.0	46.3	100.0	0.20	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



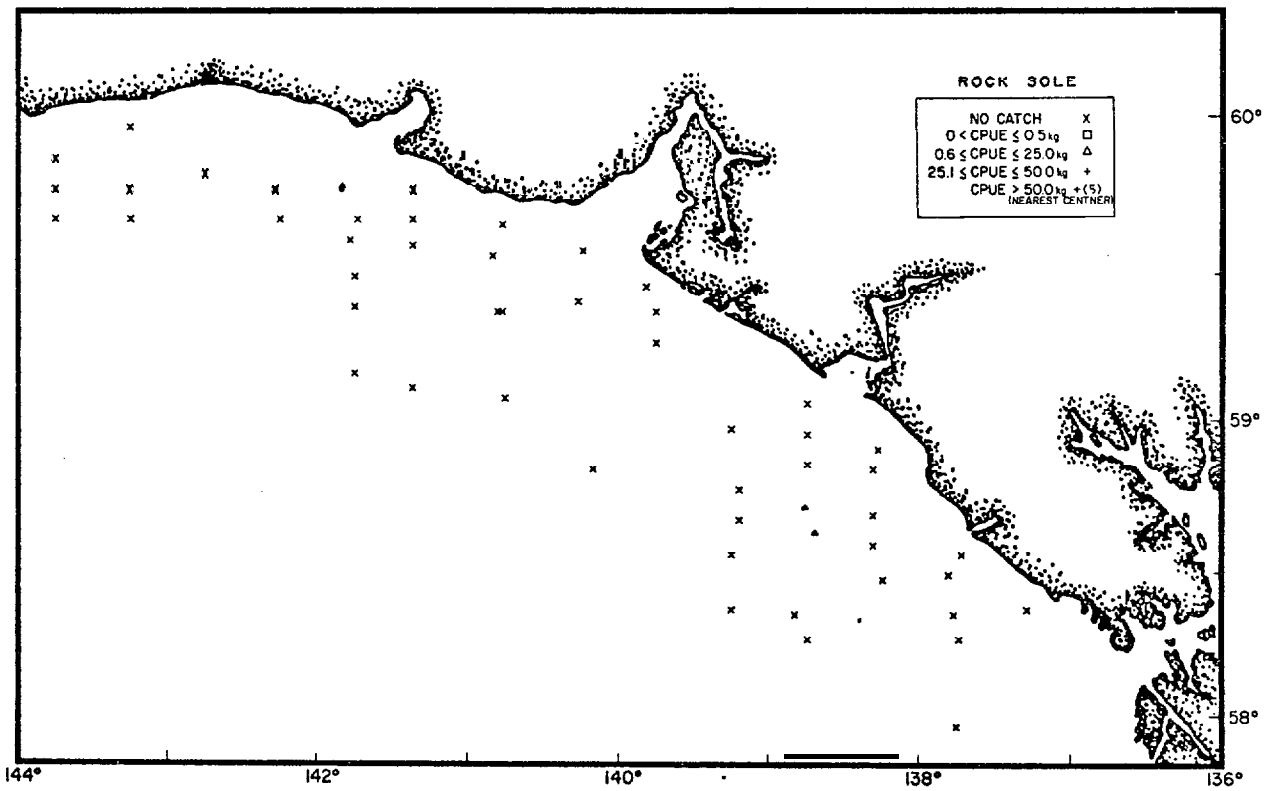
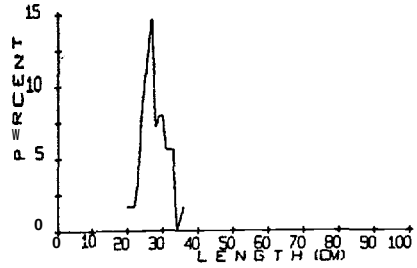


Figure X1-342.--Distribution of standardized catch rates in kg/hr of rock sole in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

DEPTH ZONES (M)

101 - 200



KENAI

Figure XI-343.--Percentage length frequencies of rock sole from the Gulf of Alaska (Cruise 628).

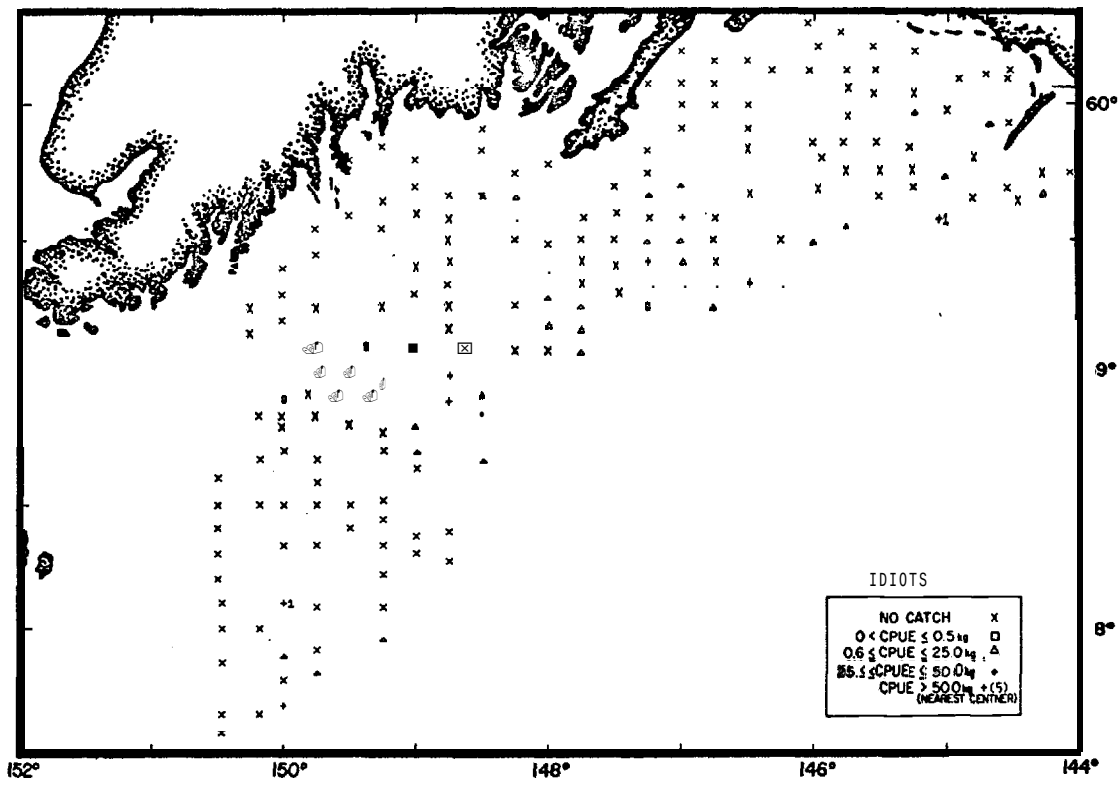


Figure X1-344.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table XI-76.--Estimated biomass and population size of shortspine thornyhead (Sebastolobus alascanus) in the Gulf of Alaska during June-August 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	1-100	0	0	0	0		--	--
	101-200	0.2	46.2	6.2	0.3	130.6	0.18	--
	201-400	19.5	698.6	93.8	1.9	86.4	0.36	--
	All zones	2.7	744.8	11.9	2.2	11.2	0.34	--
Yakutat	1-100	0	0	0	0	0		--
	101-200	0.9	148.3	5.3	0.5	5.3	0.29	--
	201-400	32.1	2,628.2	94.7	8.9	94.7	0.29	--
	All zones	8.4	2,776.5	44.4	9.4	48.0	0.30	--
Prince William	1-100	0	0	0	0		--	--
	101-200	3.5	529.1	37.6	1.5	308.5	0.34	--
	201-400	20.2	877.3	62.4	2.4	61.5	0.36	--
	All zones	4.3	1,406.4	22.5	3.9	19.9	0.35	--
Kenai	1-100	0	0	0	0	0	--	--
	101-200	0.5	186.0	14.1	0.5	12.2	0.36	37.4
	201-400	8.4	1,136.8	85.9	3.6	87.8	0.31	--
	All zones	2.2	1,322.8	21.2	4.1	20.9	0.32	--
Total	1-100	0	0	0	0	0	--	--
	101-200	1.0	909.6	14.6	2.8	14.3	0.32	--
	201-400	18.0	5,340.9	85.4	16.8	85.7	0.32	--
	All zones	4.1	6,250.5	100.0	19.6	100.0	0.32	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

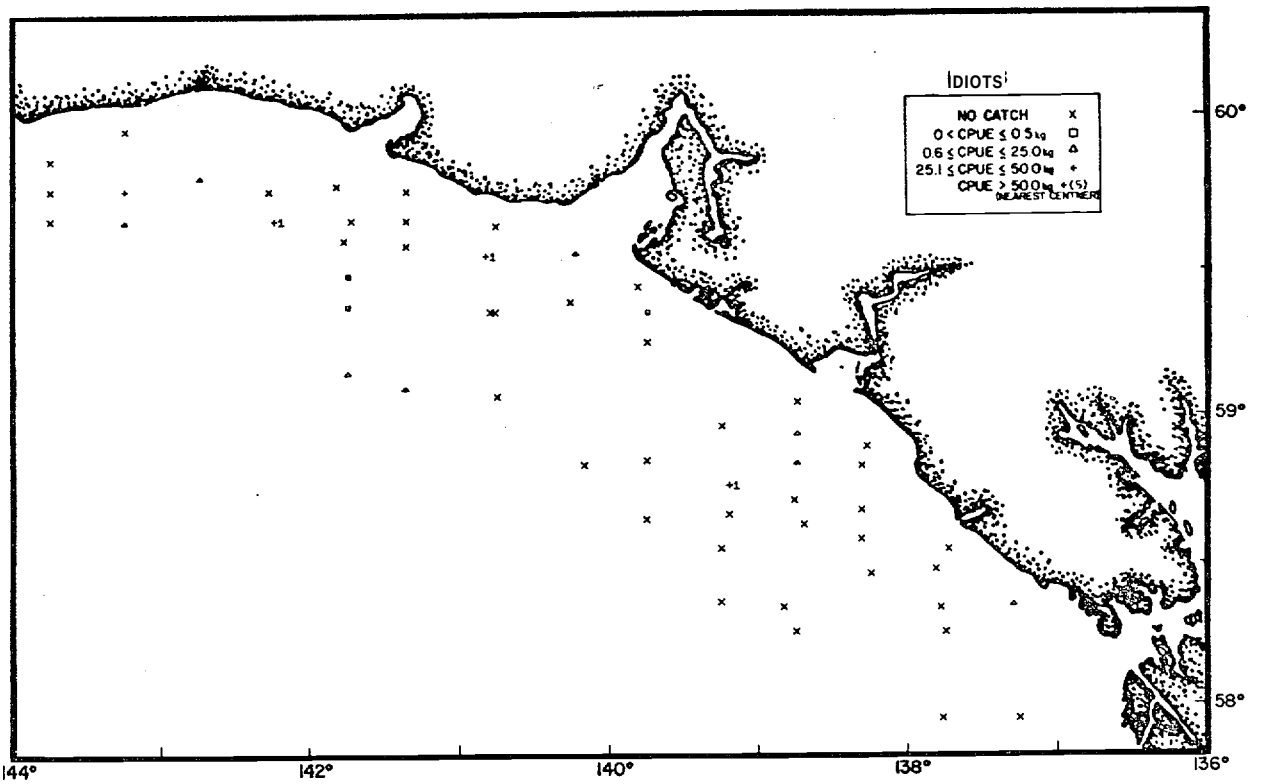


Figure X1-345.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the eastern Gulf of Alaska, June-Aug. 1962 (Cruise 628).

Table X1-77.--Species of fish which occurred at mean CPUE's greater than 10 kg/hr in restricted distribution (Cruise 628).

Region	Species	DEPTH ZONES (M) 0 - 100	101 - 200	201 - 400
Fairweather	Starry flounder	471	--	--
	Butter sole	251	--	--
	English sole	83	--	46
	Spiny dogfish	--	--	36
Yakutat	Butter sole	18	--	--
Prince William	Starry flounder	20	--	--
Kenai	Ronquils	--	22	--

Cruise 629, chartered Fishing vessels Arthur H., *St.* Michael and Western Flyer (September-November 1962).

During the 1962 resource assessment survey 114 stations were successfully sampled (Table X1-78). Sampling densities ranged from one station per 475 km^2 in the Prince William region, to one station per 1,316 km2 in the Yakutat region, and averaged one station per 741 km^2 over all regions. By depth zones, the highest densities occurred in the upper slope and outer shelf, with one station per 711 and 730 km^2 respectively, while the inner shelf had a density of one station per 1,173 km^2. Sampling did not occur on the Kenai inner shelf. Station numbers and positions for all successful tows are presented in Figure X1-346. Fish and commercially important invertebrate species taken during the survey are listed in Table V-3-4.

TOTAL BIOMASS

The total apparent biomass during the survey period has been estimated at 356 thousand mt, of which 16% occurred in the inner shelf, 58% in the outer shelf, and 26% in the upper slope (Table X1-79). The combined Fairweather and Kenai regions accounted for 71% of the total biomass. The Fairweather region contributed 39% the Kenai region 32% while the Prince William and Yakutat regions followed with 18 and 12% respectively. The mean biomass density over the four regions comprising the survey area was 4.2 mt/km^2. The Fairweather region had the highest density (8.4 mt/km^2), followed by Kenai, Prince William and Yakutat, (Figure X1-347). Biomass densities exceeded the average in all three depth zones of the Fairweather region as well as the Kenai and Prince William upper slope. Over all regions, densities increased with depth and ranged from 3.7 mt/km^2 on the inner shelf to 5.3 mt/km^2 in the upper slope. The total catch encountered at each successful sampling station is plotted in Figure X1-348.

RELATIVE IMPORTANCE OF SPECIES GROUPS

The proportion which the combined fish species contributed to the total apparent biomass increased with depth and averaged 88% over all regions. BY species groups, the flatfishes represented the greatest portion of the total biomass (53%), followed by roundfishes (14%), invertebrates (12%), rockfishes (11%) and elasmobranchs (10%) (Table X1-80).

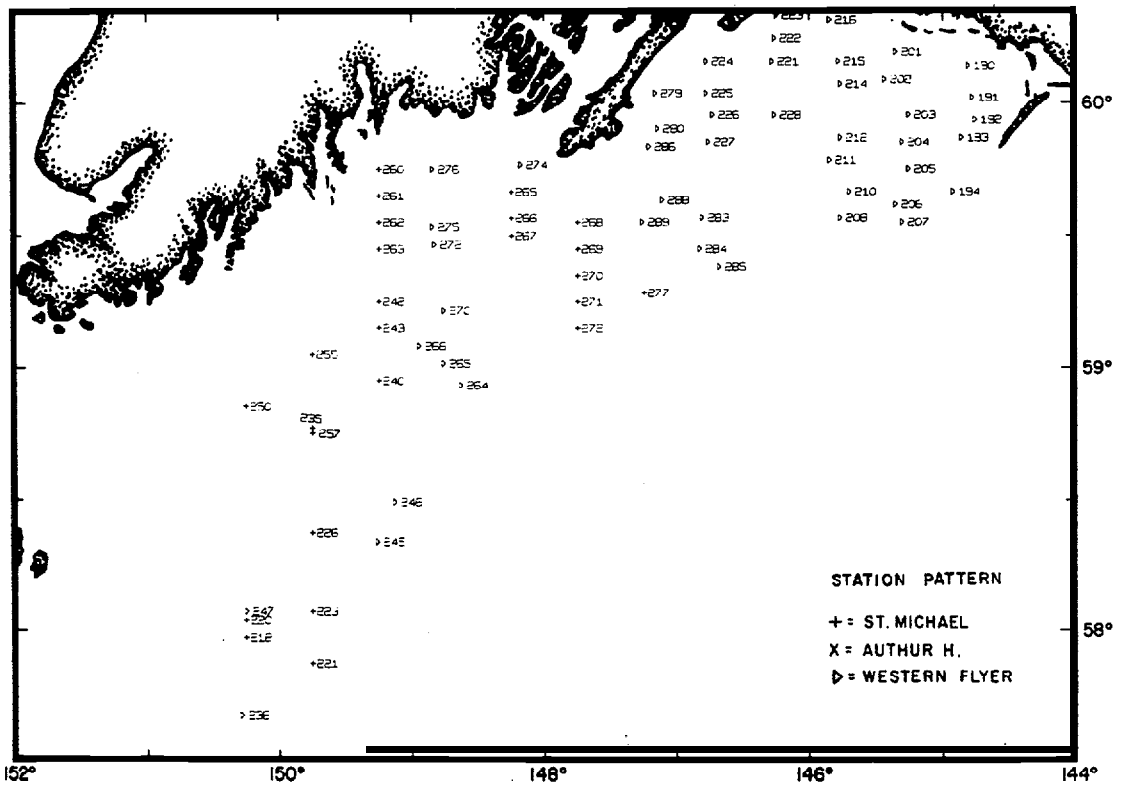
The combined flatfish species had an estimated total apparent biomass of 190 thousand mt, with 61% occurring on the outer shelf, 23% on the upper slope, and 16% on the inner shelf (Table X1-81). The Fairweather region contained the largest percentage of the total flatfish biomass (49%), followed by Kenai (27%), Prince William (16%) and Yakutat (9%).

Mean CPUE's for the flatfish group increased with depth, ranging from 87 kg/hr on the inner shelf to 148 kg/hr on the upper slope and averaging 125 kg/hr over the entire *survey area* (Figure X1-349). The Fairweather region had the highest mean CPUE of 337 kg/hr, with catch rates exceeding the survey average in each depth zone. Mean CPUE's fell below the survey average in the Prince William and Kenai regions and were lowest in Yakutat. The distribution of the standardized mean flatfish catch rates are plotted in Figure XI-350 for all stations successfully sampled.

Table XI-78.--Number of stations successfully trawled and sampling densities[1] by regions and depth zones in the Gulf of Alaska during September-November 1962 (Cruise 629).

Regions	DEPTH ZONES (M) 0-100 No. of stations	0-100 Area (km2)	0-100 Sampling density	101-200 No. of stations	101-200 Area (km2)	101-200 Sampling density	201-400 No. of stations	201-400 Area (km2)	201-400 Sampling density	0-400 No. of stations	0-400 Area (km2)	0-400 Sampling density
Fairweather	3	2,566	513	8	11,617	581	4	2,144	1,072	15	16,327	605
Yakutat		4,418	1,473	24	10,430	1,304		4,894	1,224	41	19,742	1,316
Prince William	10	7,885	789		8,990	375	7	2,600	371		19,475	475
Kenai	0	--	--	19	20,829	1,096	12	8,139	678	31	28,968	934
Total	18	14,869	826	71	51,866	731	25	17,777	711	114	84,512	741

1/ Sampling density = $\frac{\text{No. of km}^2}{\text{No. of stations}}$



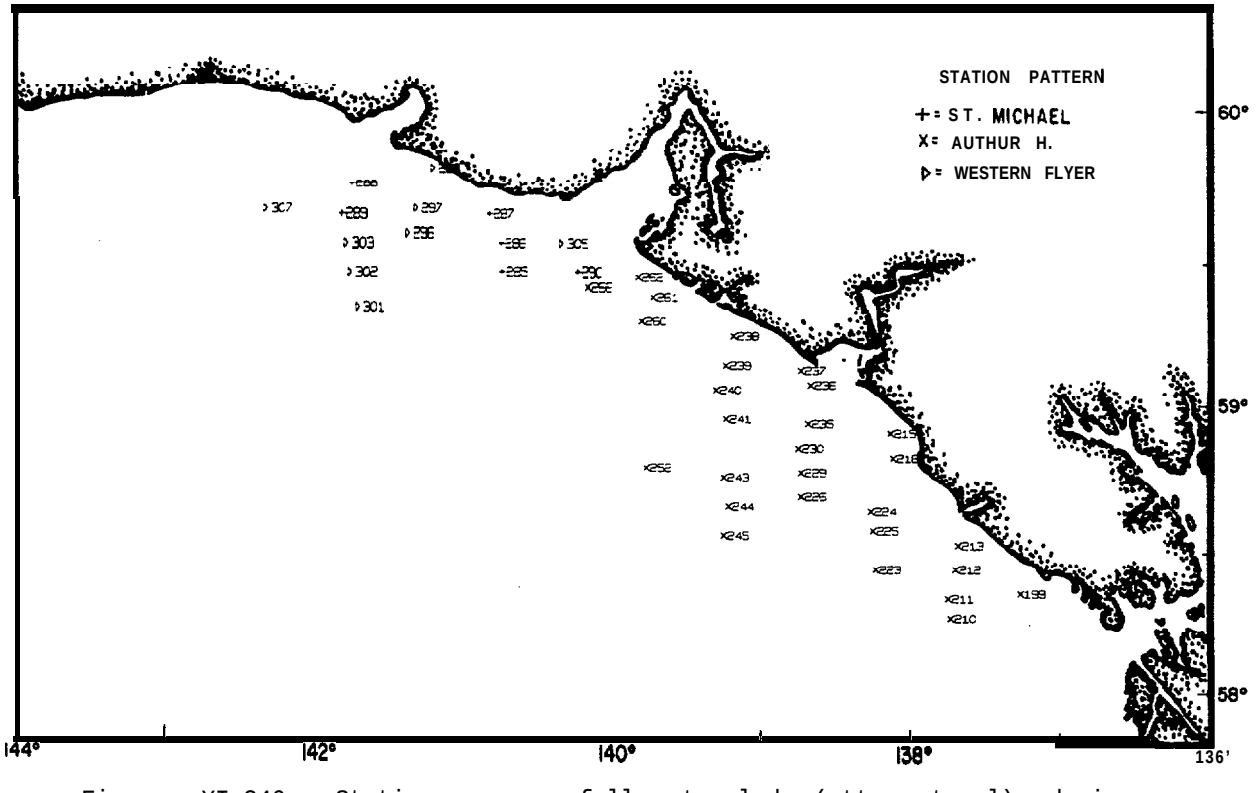


Figure XI-346.--Stations successfully trawled (otter trawl) during Cruise 629, Sept.-Nov. 1962,

Table XI-79.--Estimated biomass in metric tons of all species combined during the September-November 1962 resource assessment survey in the Gulf of Alaska (Cruise 629).

Regions	DEPTH ZONES (M)			
	O-100	101-200	201-400	O-400
Fairweather				
mt x 10^3	21.9	88.5	26.9	137.3
mt/km^2	8.5	7.6	12.6	8.4
% biomass in depth zone	39.4	42.8	28.8	38.6
% regional biomass	15.9	64.4	19.6	99.9
Yakutat				
mt x 10^3	5.4	25.3	10.7	41.4
mt/km^2	1.2	2.4	2.2	2.1
% biomass in depth zone	9.7	12.2	11.5	11.6
% of regional biomass	13.0	61.0	25.9	99.9
Prince William				
mt x 10^3	28.3	25.1	11.7	65.1
mt/km^2	3.6	2.8	4.5	3.3
% biomass in depth zone	50.9	12.1	12.6	18.3
% regional biomass	43.5	38.5	18:0	100: 0
Kenai				
mt x 10^3	--	68.1	44.1	112.2
mt/km^2	--	3.3	5.4	3.9
% biomass in depth zone	--	32.9	47.2	31.5
% regional biomass	--	60.7	39.3	100.0
Total				
mt x 10^3	55.6	207.0	93.4	356.0
mt/km^2	3.7	4.0	5.3	4.2
% biomass in depth zone	100.0	100.0	100.1	100.0
% total biomass	15.6	58.1	26.3	100.0

The roundfish group had the second highest apparent biomass of 48 thousand mt. As with the flatfish group, the outer shelf contained the greatest proportion of the estimated biomass (63%). The upper slope followed with 35% while the inner shelf contained 2% (Table XI-82). The roundfishes contribution to the total biomass increased with depth and ranged from 2% in the inner shelf to 18% in the upper slope. The Kenai region contained 50% of the total roundfish biomass, even though no sampling occurred on the inner shelf. Contributions by the other regions were significantly lower and ranged from 26% in the Fairweather region to 10% in the Yakutat region. Mean CPUE's for the roundfish group increased with depth, ranging from 3 kg/hr on the inner shelf to 56 kg/hr on the upper slope and averaging 34 kg/hr over the entire survey area (Figure X1-351). Highest apparent relative abundance occurred in the Fairweather region (45 kg/hr) followed closely by Kenai (41 kg/hr) with Prince William and Yakutat having significantly lower values. The distribution of the standardized catch rates are plotted for each successful station in Figure XI-352.

The invertebrates had the third highest estimated apparent biomass of 43 thousand mt, of which 59% occurred in the outer shelf, 26% in the inner shelf and 15% on the upper slope (Table X1-83). Invertebrates represented nearly 21% of the total biomass in the inner shelf, and 12% in the outer shelf, but only 7% in the upper slope. The total invertebrate biomass was relatively evenly divided between Fairweather (32%), Prince William (33%) and Kenai (26%) while the Yakutat region represented only 8%. The mean CPUE for the invertebrate group was 29 kg/hr, with catch rates decreasing

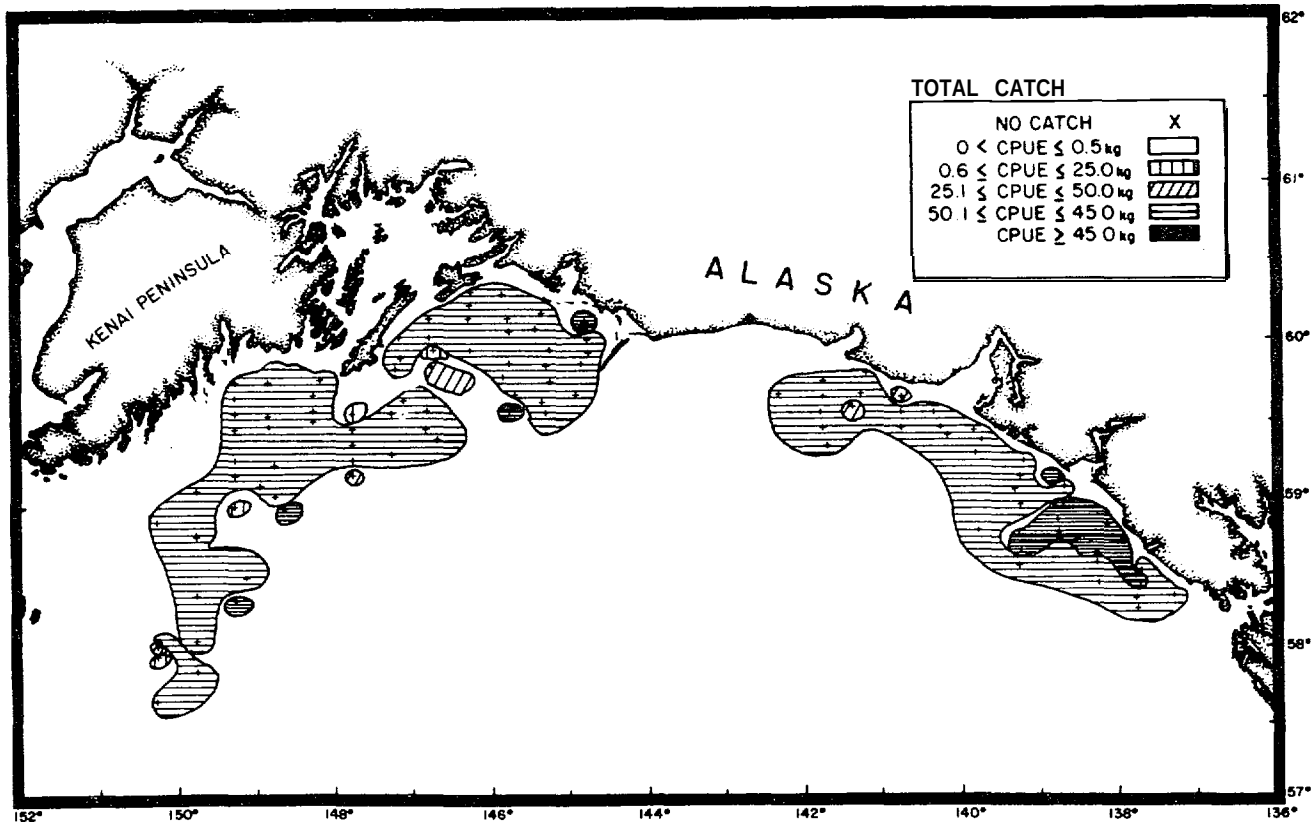
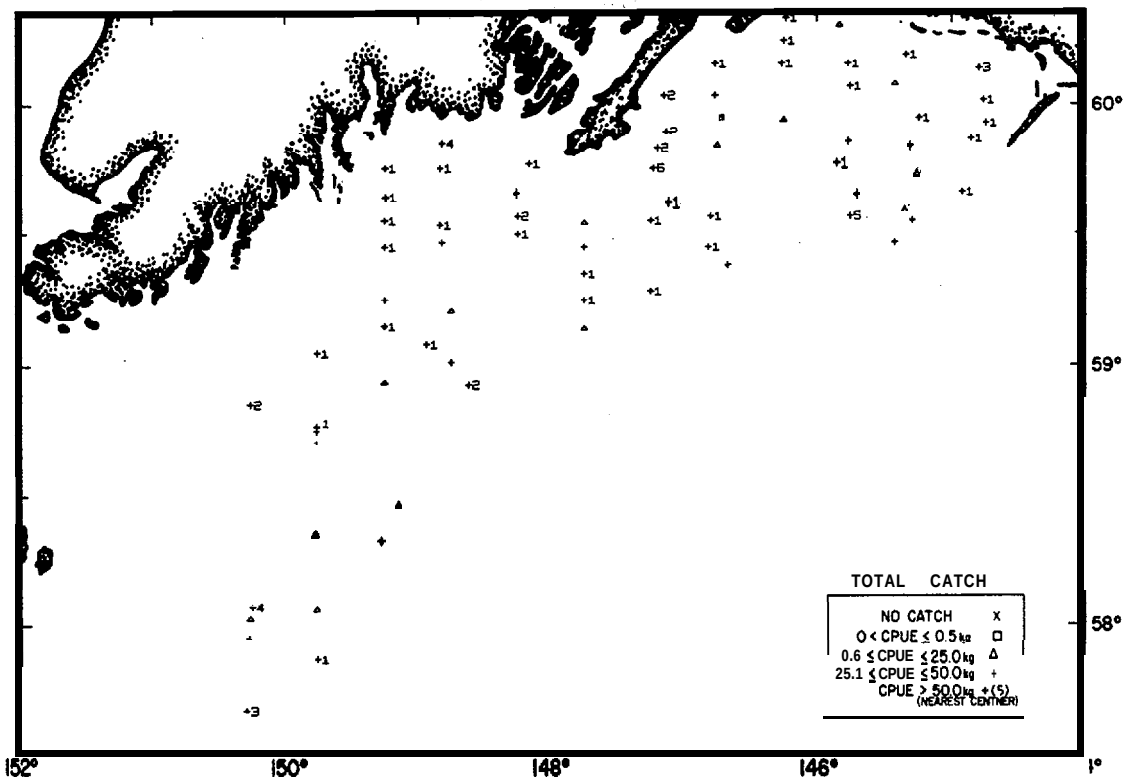


Figure XI-347.--Distribution of apparent relative abundance of all species combined in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



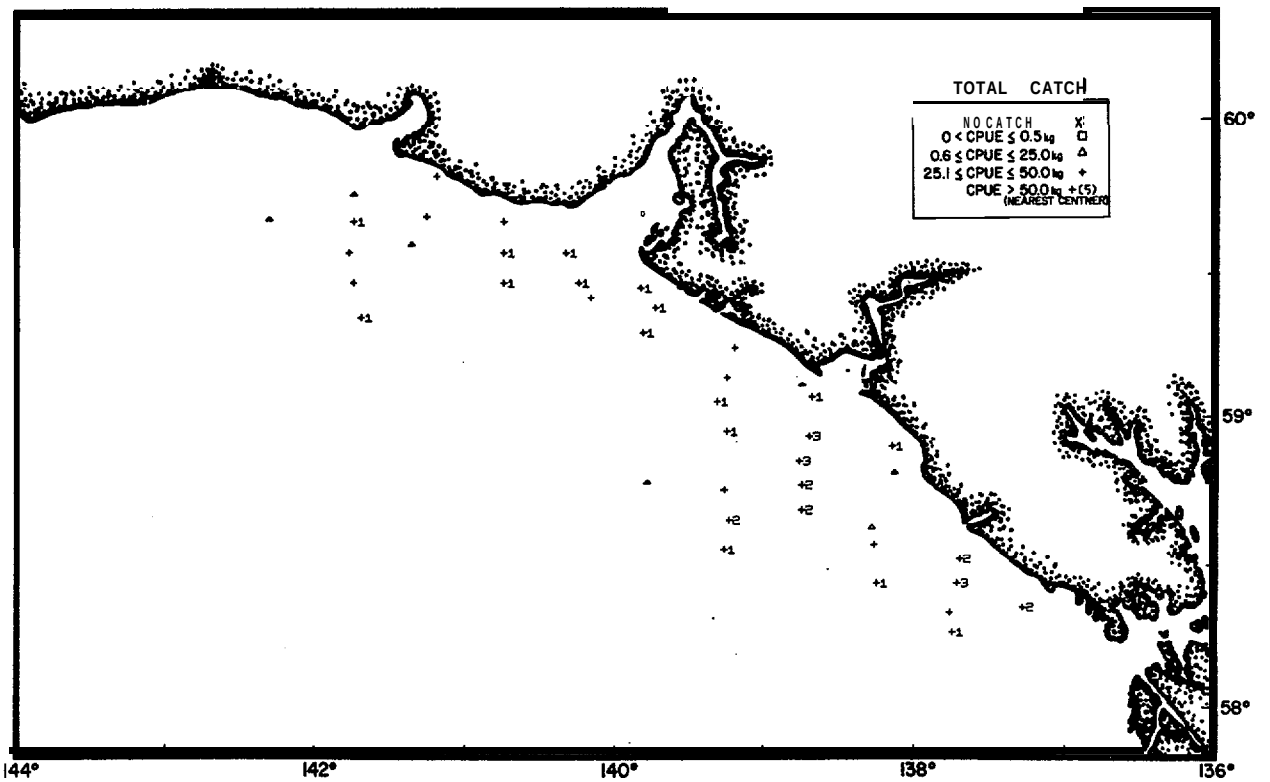


Figure X1-348.--Distribution of standardized catch rates in kg/hr of all species combined in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-80.--Relative importance of species groups based on the rank order of their total biomass (Cruise 629).

Species Group	DEPTH ZONES (M) 0-100	101-200	201-400	o- 400
Flatfish				
mt x 10^3	30.8	114.7	44.0	189.5
mt/km^2	2.1	2.2	2.5	2.2
% biomass in depth zone	55.5	55.4	47.0	53.2
% flatfish biomass	16.3	60.5	23:0	100.0
Roundfish				
mt x 10^3	1.0	30.2	16.8	48.0
mt/km^2	0.1	0.6	1.0	0.6
% biomass in depth zone	1.8	14.6	18.0	13.5
% roundfish biomass	2.1	62.9	35:o	100.0
Invertebrates				
mt x 103	11.4	25.5	6.4	43.3
mt/km^2	0.8	0.5	0.4	0.5
% biomass in depth zone	20.5	12.3	6.8	12.2
% invertebrate biomass	26.3	58.9	14.8	100: 0
Rockfishes				
mtx 10^3	0.1	19.6	20.2	39.9
mt/km^2	1/	0.4	1.1	0.5
% biomass in depth zone	0.2	9.5	21.6	11.2
% rockfish biomass	0.3	49.1	50.6	100.0
Elasmobranchs				
mt x 10^3	12.2	16.9	6.2	35.3
mt/km^2	0.8	0.3	0.4	0.4
% biomass in depth zone	22.0	8.2	6.6	9.9
% rockfish biomass	34.6	47.9	17.6	100.1
Total				
mt x 10^3	55.5	206.9	93.6	356.0
mt/km^2	3.7	4.0	5.3	4.2
% biomass in depth zone	100.0	100.0	100.0	100.0
% total biomass	15.6	58.1	26.3	100.0

1/ Less than 0.1 mt/km^2.

Table XI-81.--Estimated biomass and population size of flatfishes in the Gulf of Alaska during September-Novemb
1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size individua Weight (kg)
Fairweather	l-100	397.8	17062.5	18.5	39.7	22.9	0.43
	101-200	301.9	58637.2	63.7	105.6	60.9	0.56
	201-400	455.2	16314.6	17.7	28.1	16.2	0.58
	All zones	337.1	92014.3	48.6	173.4	42.3	0.53
Yakutat	l-100	33.3	2461.9	14.6	6.0	21.4	0.41
	101-200	64.7	11290.6	67.1	16.4	58.6	0.69
	201-400	37.7	3084.3	18.3	5.6	20.0	0.55
	All zones	51.0	16836.8	8.9	28.0	6.8	0.60
Prince William	l-100	85.3	11240.0	37.6	23.0	35.0	0.49
	101-200	91.8	13794.8	46.1	32.8	49.9	0.42
	201-400	112.2	4879.1	16.3	10.0	15.2	0.49
	All zones	91.9	29913.9	15.8	65.8	16.1	0.45
Kenai	l-100	--	--	--	--	--	--
	101-200	89.1	31036.0	61.2	81.3	57.1	0.38
	201-400	144.7	19686.2	38.8	61.1	42.9	0.32
	All zones	86.2	50722.2	26.8	142.4	34.8	0.36
Total	l-100	87.2	30764.4	16.2	68.7	16.8	0.45
	101-200	132.3	114758.6	60.6	236.1	57.6	0.49
	201-400	147.9	43964.2	23.2	104.8	25.6	0.42
	All zones	124.9	189487.2	100.0	409.6	100.0	0.46

1/ Mean catch per unit effort, in kilograms per hour trawled,
2/ Where data are available,
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals,
5/ Less than 0.1 percent,

with increasing depth (Figure X1-353,). Regions where the relative apparent abundance was higher than the survey average included Fairweather and Prince William. The distribution of the standardized catch rates are plotted in Figure X1-354.

The fourth most important species group contributing to the total apparent biomass were the rockfishes. This group was primarily restricted to the outer shelf and upper slope depth zones which together contained over 99% of the total rockfish biomass (40 thousand mt) (Table X1-84). The highest mean CPUE (68 kg/hr) occurred in the upper slope depth zone with values rapidly decreasing in the outer and inner shelf (Figure X1-355). Within regions, particularly high mean CPUE's occurred in the Fairweather and Kenai upper slope depth zones. The distribution of the standardized catch rates for the successful stations are plotted in figure X1-356.

The elasmobranchs made the smallest contribution to the total biomass (10%), but appeared in each region-depth zone sampled (Table X1-85). This group had a total apparent biomass of 35 thousand mt of which 48% occurred on the outer shelf, 35% on the inner shelf, and 20% on the upper slope. Elasmobranchs were most abundant in the three easternmost regions which contained over 90% of the estimated biomass (Figure X1-357) Standardized catch rates for all successfully sampled stations are plotted for this group in Figure X1-358.

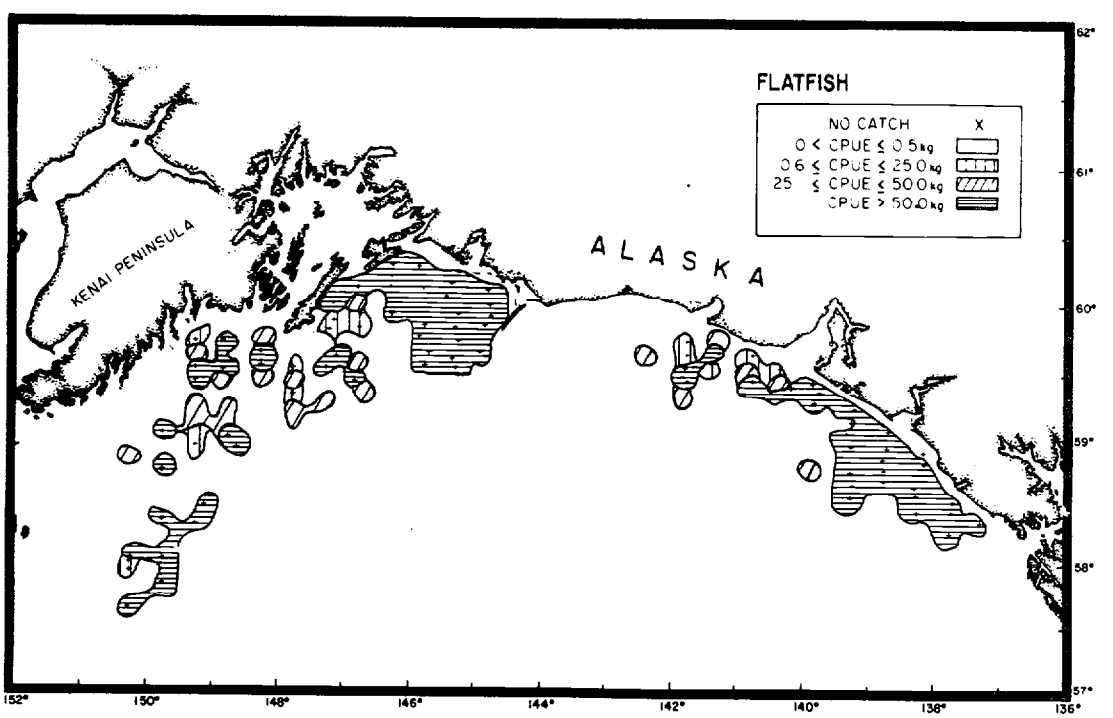
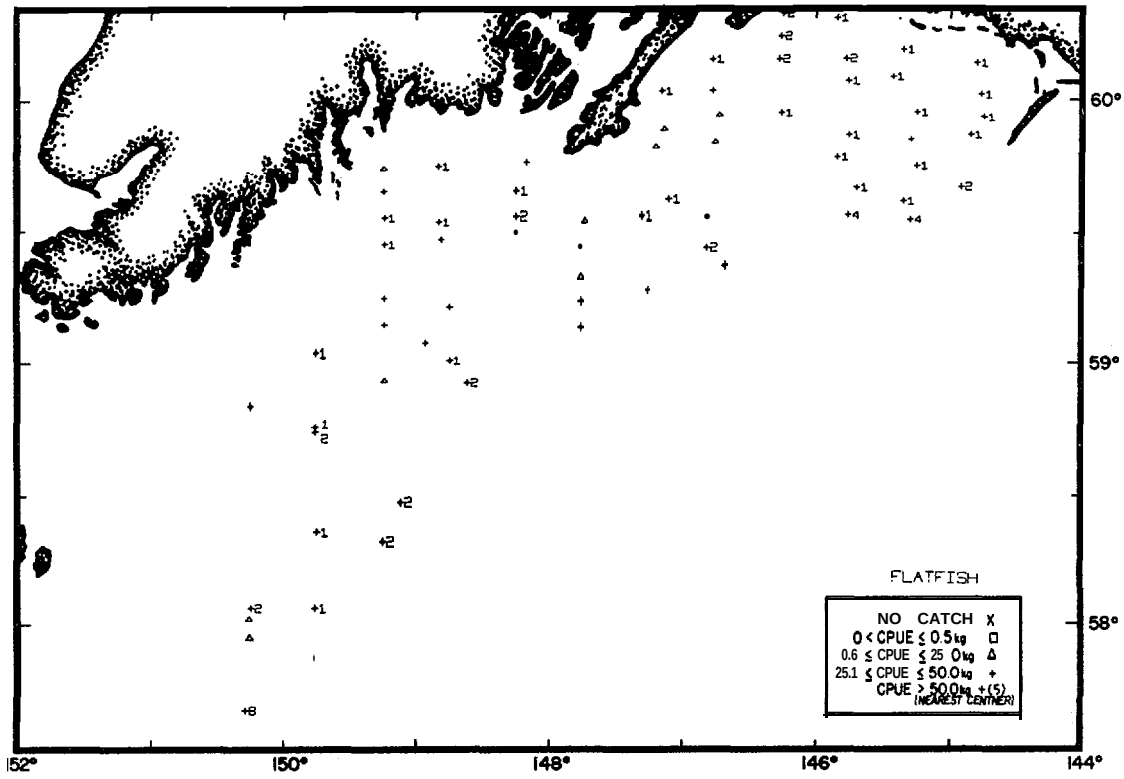


Figure X1-349.--Distribution of apparent relative abundance of **flatfish** in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



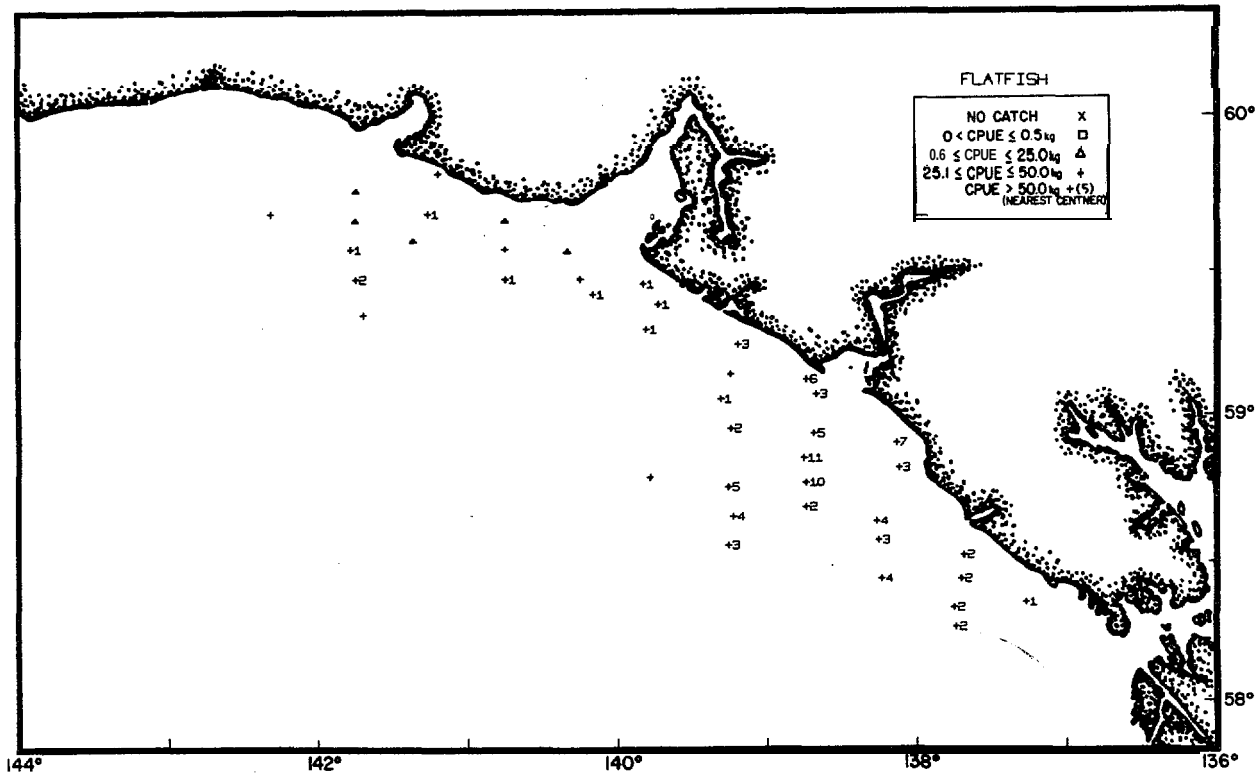


Figure X1-350.--Distribution of standardized catch rates in **kg/hr** of **flatfish** in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-82.--Estimated biomass and population size of roundfishes in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	1-100	6.3	271.2	2.2	0.4	2.5	0.77	--
	101-200	47.8	9289.0	74.9	13.4	83.2	0.70	--
	201-400	79.4	2885.2	23.0	2.3	14.3	1.21	--
	All zones	49.4	12465.4	100.0	16.1	100.0	0.77	--
Yakutat	1-100	2.6	190.8	4.1	1.1	17.7	0.17	--
	101-200	18.2	3179.1	68.2	3.6	58.1	0.87	--
	201-400	15.8	1292.8	27.7	1.5	24.2	0.86	--
	All zones	14.1	4662.7	9.7	6.2	6.4	0.74	--
Prince William	1-100	4.4	574.7	8.4	2.8	25.7	0.20	--
	101-200	16.5	2486.0	36.5	5.1	46.8	0.49	--
	201-400	86.2	3747.2	55.0	3.0	27.5	1.23	--
	All zones	20.9	6807.9	14.2	10.9	11.3	0.62	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	43.9	15283.6	63.3	49.3	78.0	0.31	--
	201-400	65.3	8882.0	36.8	13.9	22.0	0.64	--
	All zones	41.1	24165.6	50.3	63.2	65.6	0.38	--
Total	1-100	3.0	1036.7	2.2	4.3	4.5	0.23	--
	101-200	34.9	30237.7	62.9	71.4	74.1	0.42	--
	201-400	56.4	16767.2	34.9	20.7	21.5	0.81	--
	All zones	33.8	48041.6	100.0	96.4	100.0	0.50	--

L/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

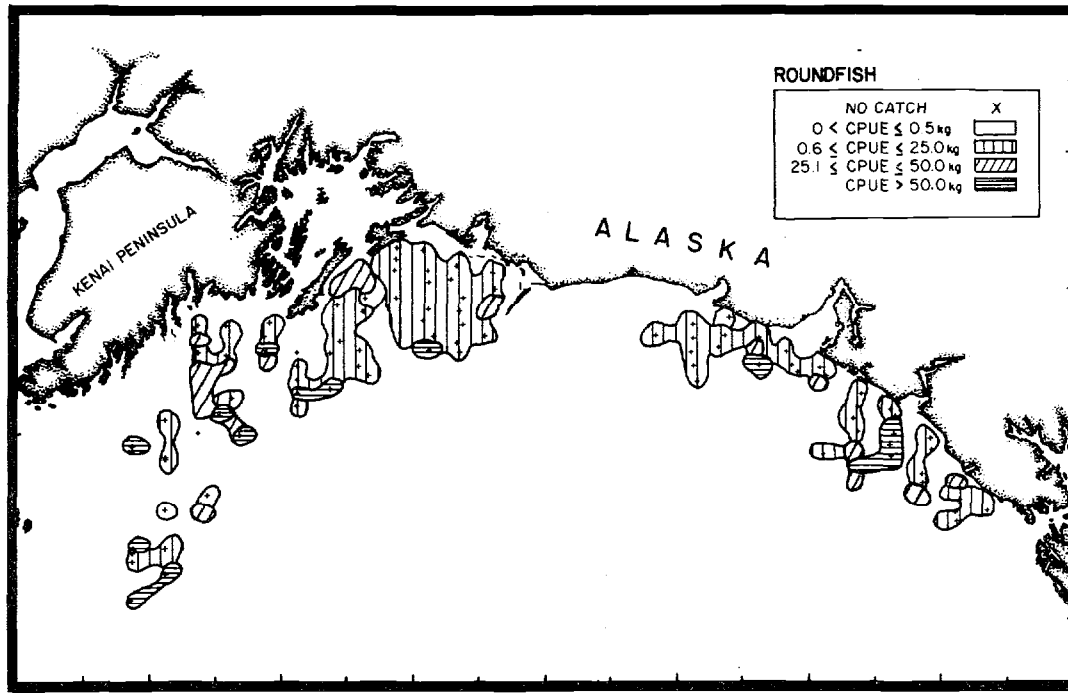


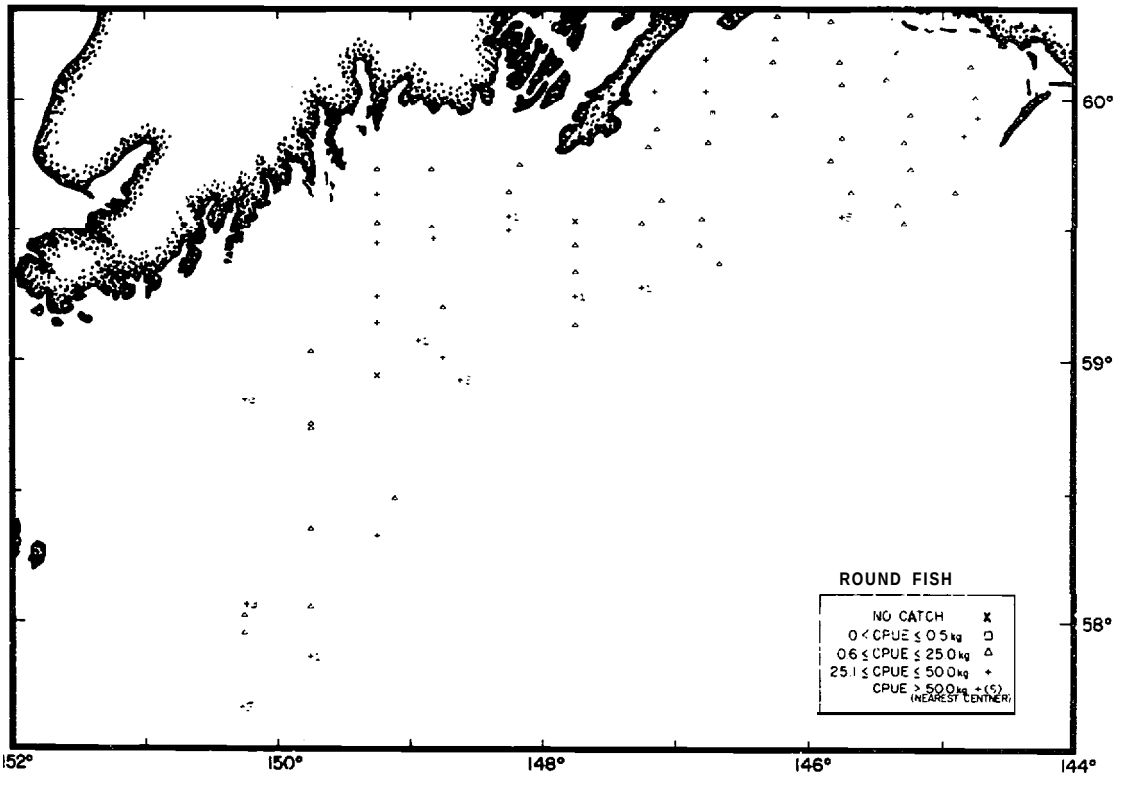
Figure XI-331 .--Distribution of apparent relative abundance of roundfish in the eastern Gulf of Alaska, Sept.-W. 1962 (Cruise 629).

DISTRIBUTION, RELATIVE APPARENT ABUNDANCE, BIOMASS ESTIMATES, AND SIZE COMPOSITION FEATURES OF PRINCIPAL SPECIES OF FISH AND INVERTEBRATES

TURBOT

Distribution and Abundance-Turbot occured in each region-depth zone sampled and had the highest apparent relative abundance (66 kg/hr) of any species encountered in the survey area. Mean CPUE's increased with depth from 14 kg/hr on the inner shelf, to 88 kg/hr on the upper slope (Table X1-86). The Fairweather region had the highest relative apparent abundance (218 kg/hr), while the three remaining regions were below the survey average (Figure X1-359). Within the Fairweather region, particularly high mean catch rates occurred on the upper slope (349 kg/hr) and outer shelf (234 kg/hr) which contributed significantly to the total apparent abundance of this species (Figure X1-360).

Biomass--The apparent biomass of turbot was estimated at 100 thousand mt, of which 69% occurred on the outer shelf, 26% on the upper slope, and only 5% on the inner shelf. The Fair-weather region accounted for nearly 60% of the turbot biomass, with the outer shelf and upper slope depth zones making the largest contribution to the regional total (98%) and the survey total (58%).



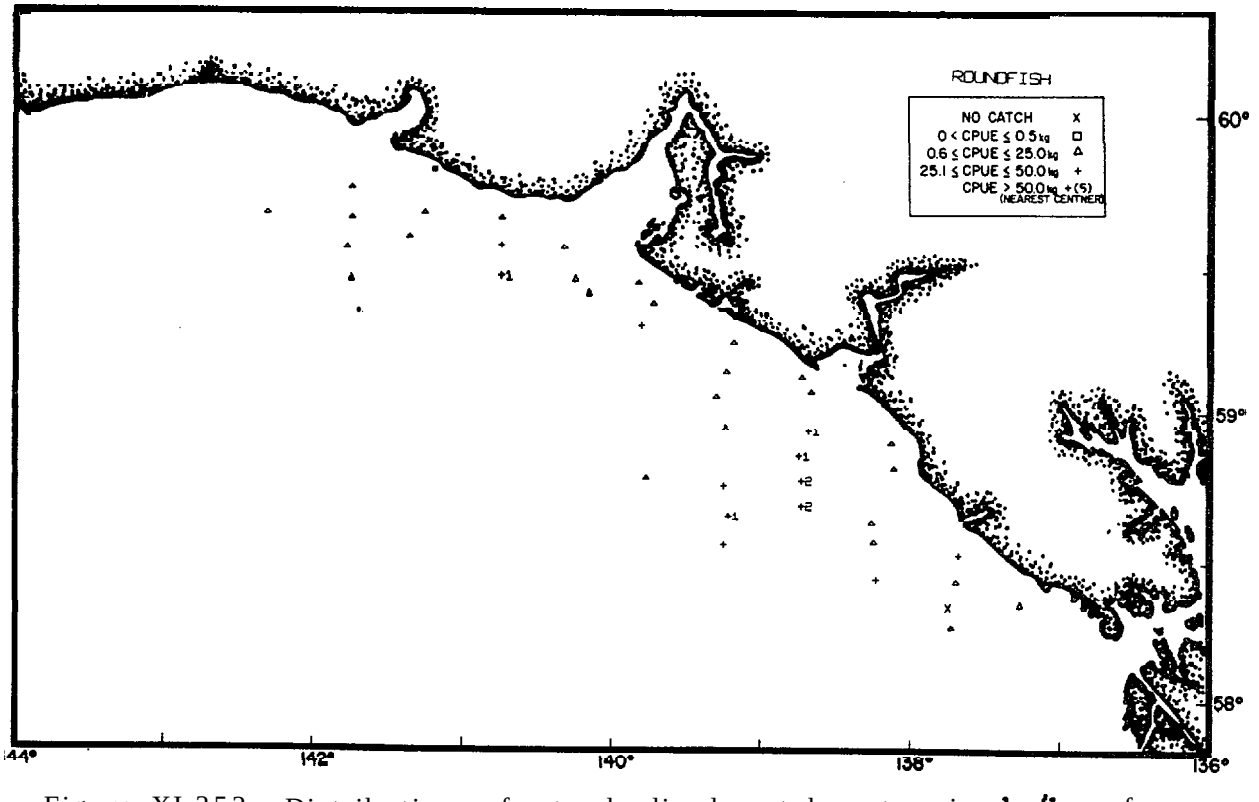


Figure XI-352 .--Distribution of standardized catch rates in **kg/hr** of roundfish in the **eastern** Gulf of Alaska, **Sept.-Nov.** 1962 (Cruise 629).

Table XI-83.--Estimated biomass of invertebrates in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	66.0	2828.1	20.6				
	101-200	53.7	10427.0,	76.1				
	201-400	12.7	454.4	3.3				
	All zones	50.3	13709.5	31.5				
Yakutat	l-100	7.0	519.0	13.3				
	101-200	13.0	2259.5	58.0				
	201-400	13.6	1116.6	28.7				
	All zones	11.8	3895.1	9.0				
Prince William	l-100	61.5	8106.0	56.2				
	101-200	31.6	4748.6	33.9				
	201-400	35.9	1560.0	10.8				
	All zones	44.3	14414.6	33.3				
Kenai	l-100	--	--	--				
	101-200	23.2	8074.8	71.3				
	201-400	23.8	3245.1	28.7				
	All zones	19.2	11319.9	26.1				
Total	l-100	32.5	11453.1	26.4				
	101-200	29.4	25509.9	58.9				
	201-400	21.4	6376.1	14.7				
	All zones	28.6	43339.1	100.0				

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Size composition--Random length frequencies were taken in the Kenai region. In the outer shelf, turbot sexes combined, ranged from 22-62 cm, and averaged 33.0 cm., while in the upper slope they ranged from 19-49 cm, and averaged 34.5 cm (Figure X1-361).

TANNER CRAB

Distribution and Abundance--Tanner crabs were taken in each region-depth zone sampled during the survey. Mean CPUE's were highest on the outer shelf and upper slope and averaged 21 kg/hr over all depth zones (Figure X1-362) The Fairweather region had the highest apparent relative abundance (36 kg/hr), followed by Prince William, Kenai, and Yakutat (Table X1-87, Figure X1-363).

Biomass-Of the total estimated biomass of 32 thousand mt, 33% was contained in the Kenai region, 31% in Fairweather, 29% in Prince William and 8% in Yakutat. By depth zones, 70% came from the outer shelf, 20% from the upper slope and 10% from the inner shelf. The Tanner crab biomass estimate should be considered minimal due to the inability of the otter trawl to capture larger male crabs when towed at speeds utilized during this survey.

Size composition--Size composition data were not taken for this species.

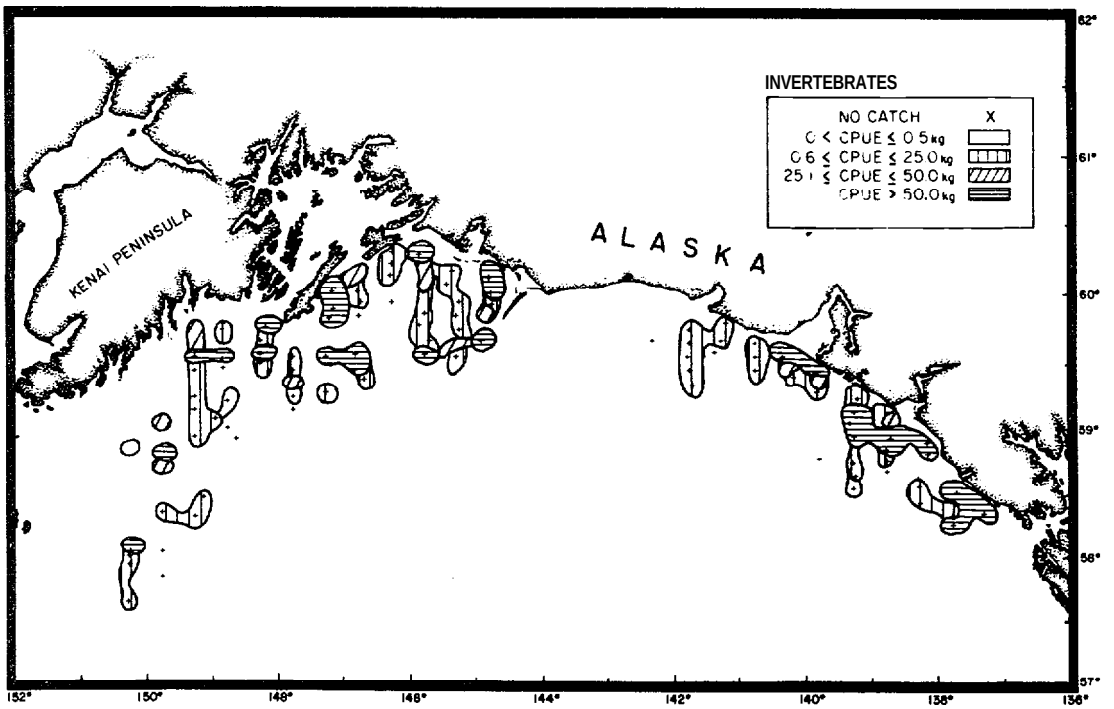
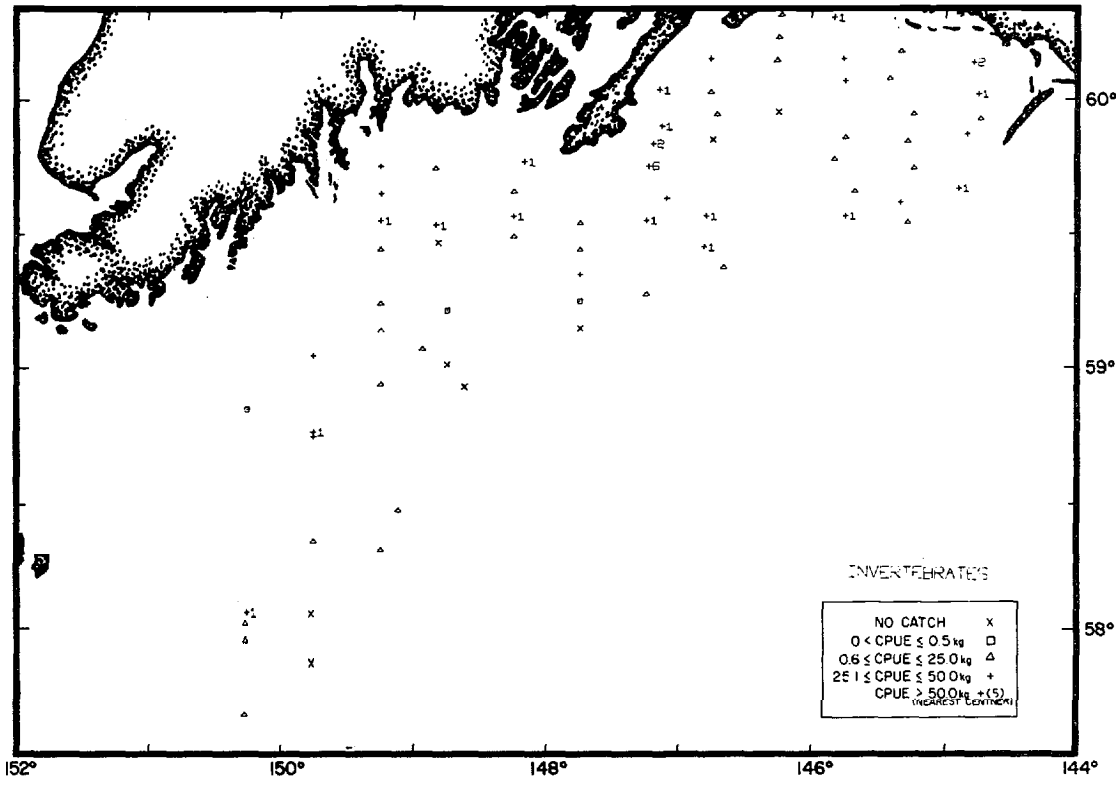


Figure XI-353.--Distribution of apparent relative abundance of invertebrates in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



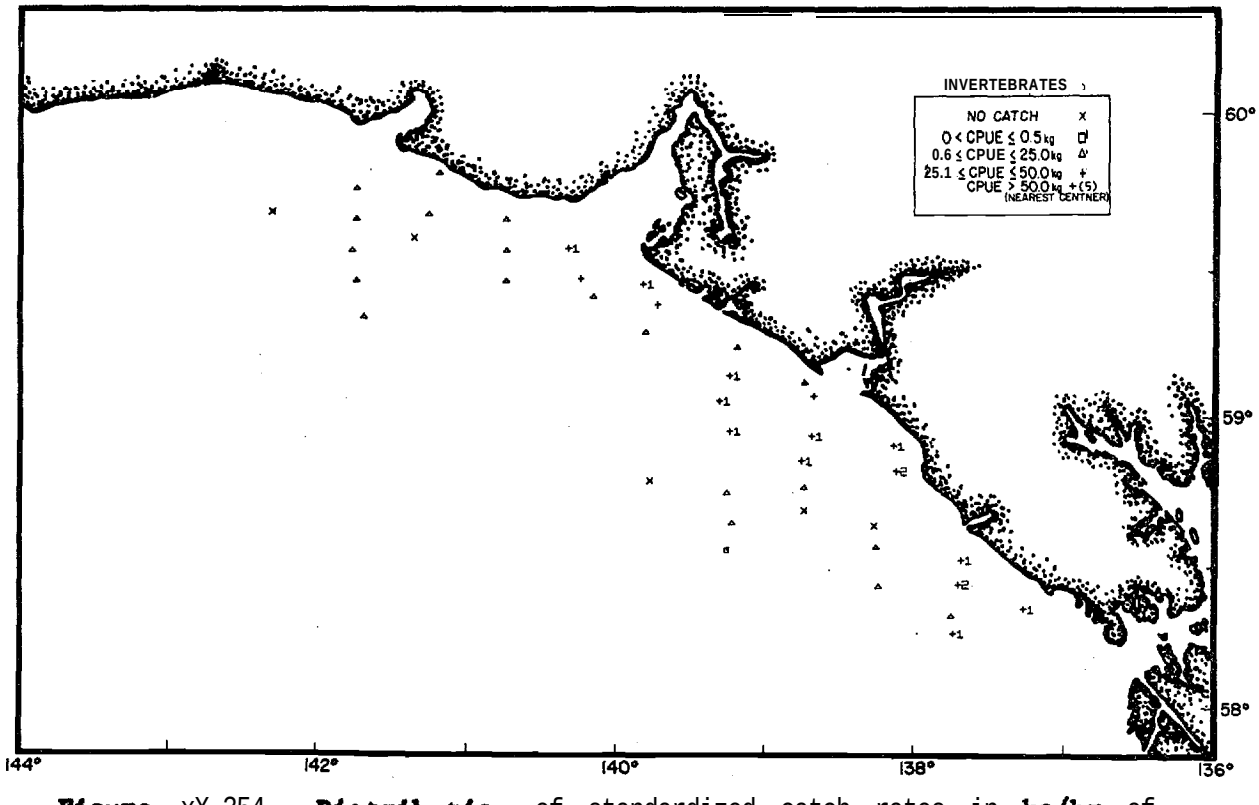


Figure xX-354.--**Distribution** of standardized catch rates in **kg/hr** of invertebrates in **the eastern** Gulf of Alaska, Sept.-Nov. 1962 **(Cruise** 629).

Table XI-84.--Estimated biomass and population size of rockfishes in the Gulf of Alaska during September-Novemb 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr).	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size individu Weight (kg)
Fairweather	l-100	0	0	0	0	0	--
	101-200	11.8	2292.1	28.2	4.8	24.6	0.48
	201-400	162.8	5836.0	71.8	14.7	75.4	0.40
	All zones	29.8	8128.1	20.4	19.5	24.8	0.42
Yakutat	l-100	0.4	29.0	0.4	0.1	0.6	0.39
	101-200	26.9	4690.0	62.1	10.3	62.1	0.46
	201-400	34.7	2835.7	37.5	6.2	37.4	0.46
	All zones	22.9	7554.7	18.9	16.6	21.1	0.46
Prince William	l-100	0.6	85.4	4.8	0.1	2.0	0.73
	101-200	7.2	1083.0	61.1	3.8	77.6	0.28
	201-400	14.0	605.5	34.1	1.0	20.4	0.58
	All zones	5.4	1773.9	4.4	4.9	6.2	0.36
Kenai	l-100	--	--	--			--
	101-200	32.9	11488.0	51.2	17.6	46.8	0.65
	201-400	80.6	10966.1	48.8	20.0	53.2	0.55
	All zones	38.1	22454.1	56.3	37.6	47.9	0.60
Total	l-100	0.3	114.4	0.3	0.2	0.3	0.57
	101-200	22.5	19553.1	49.0	36.5	46.4	0.54
	201-400	68.1	20243.3	50.7	41.9	53.3	0.48
	All zones	26.3	39910.8	100.0	78.6	100.0	0.51

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

FLATHEAD SOLE

Distribution and Abundance-Flathead sole were taken from each region-depth zone sampled in the survey area, Apparent relative abundance increased with depth and averaged 20 kg/hr over the survey area (Table X1-88). Mean catch rates varied from 4 kg/hr on the inner shelf to 34 kg/hr on the upper 'slope. The Fairweather and Kenai regions had the highest abundance (32 and 25 kg/hr), with mean catches falling below the survey average in the remaining regions (Figure X1-364). Within regions, particularly high CPUE's occurred in the Fairweather (78 kg/hr) and Kenai (43 kg/hr) upper slope depth zones, (Figure X1-365).

Biomass--Nearly all of the estimated flathead sole apparent biomass of 30 thousand mt was divided between the upper slope (34%) and outer shelf (62%) depth zones. The Kenai region contained the greatest percentage of the biomass (49%), followed by Fair-weather (28%), Prince William (20%), and Yakutat (4%).

Size composition-Random length frequencies were taken in the Kenai - outer shelf where flathead sole, sexes combined, ranged in size from 21 - 38 cm and averaged 26.7 cm. (Figure X1-366).

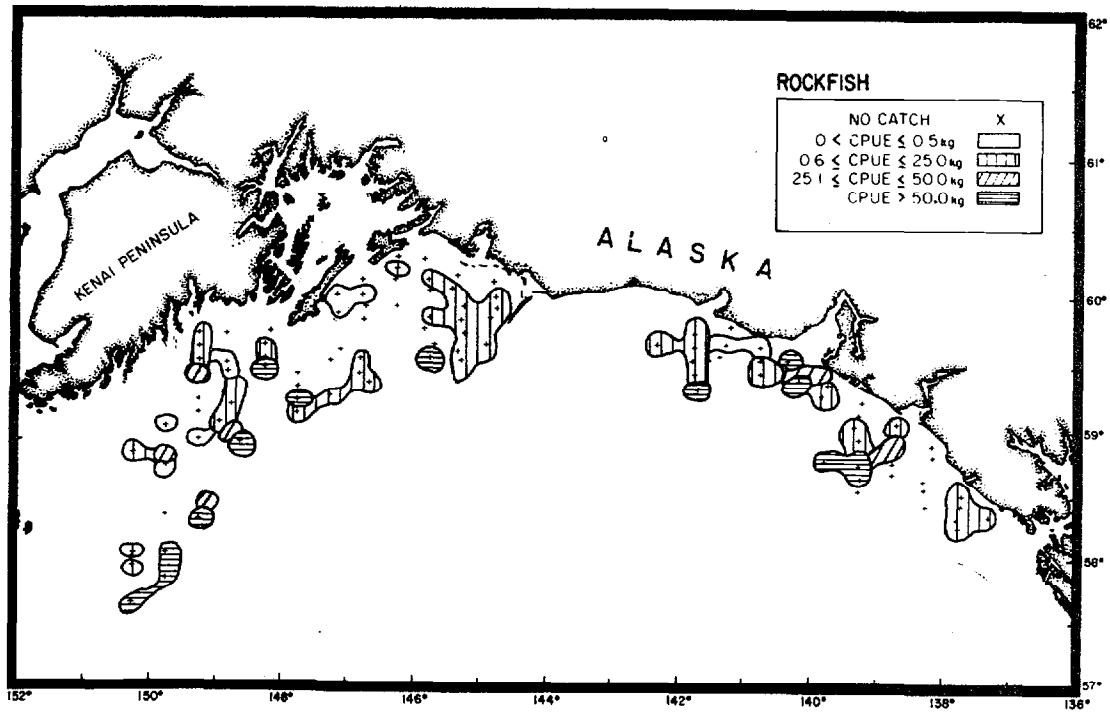
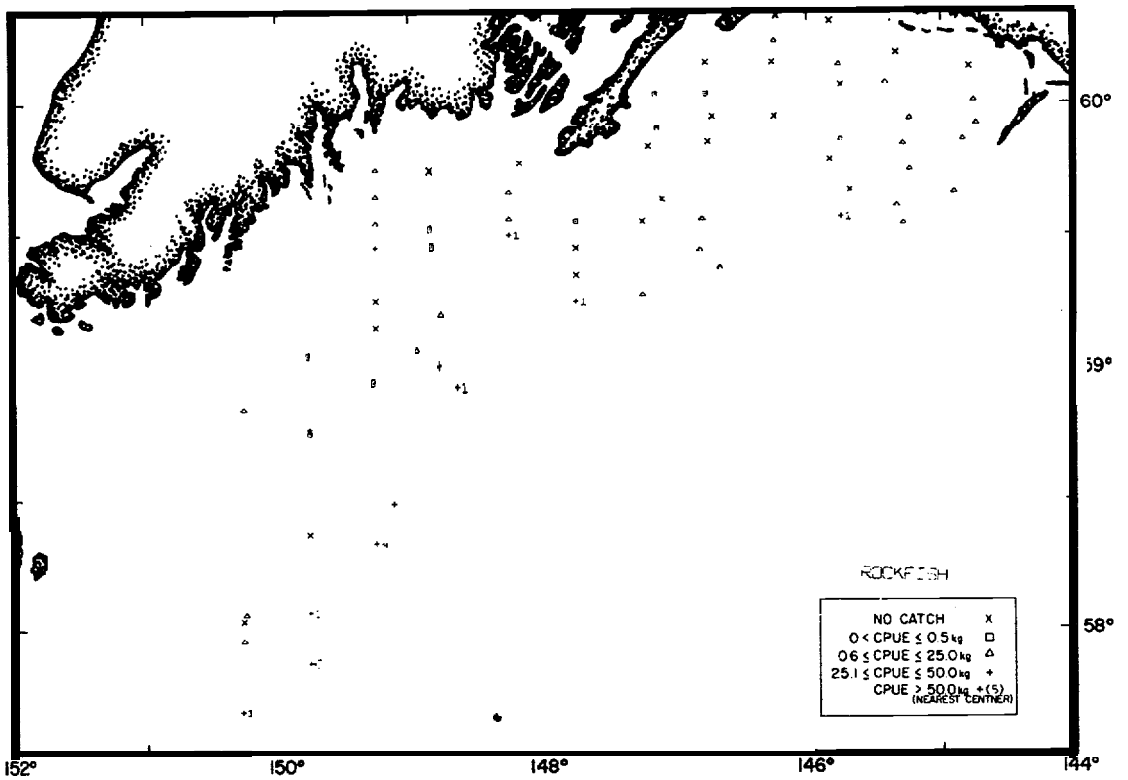


Figure XI-355.--Distribution of apparent relative abundance of rockfish in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



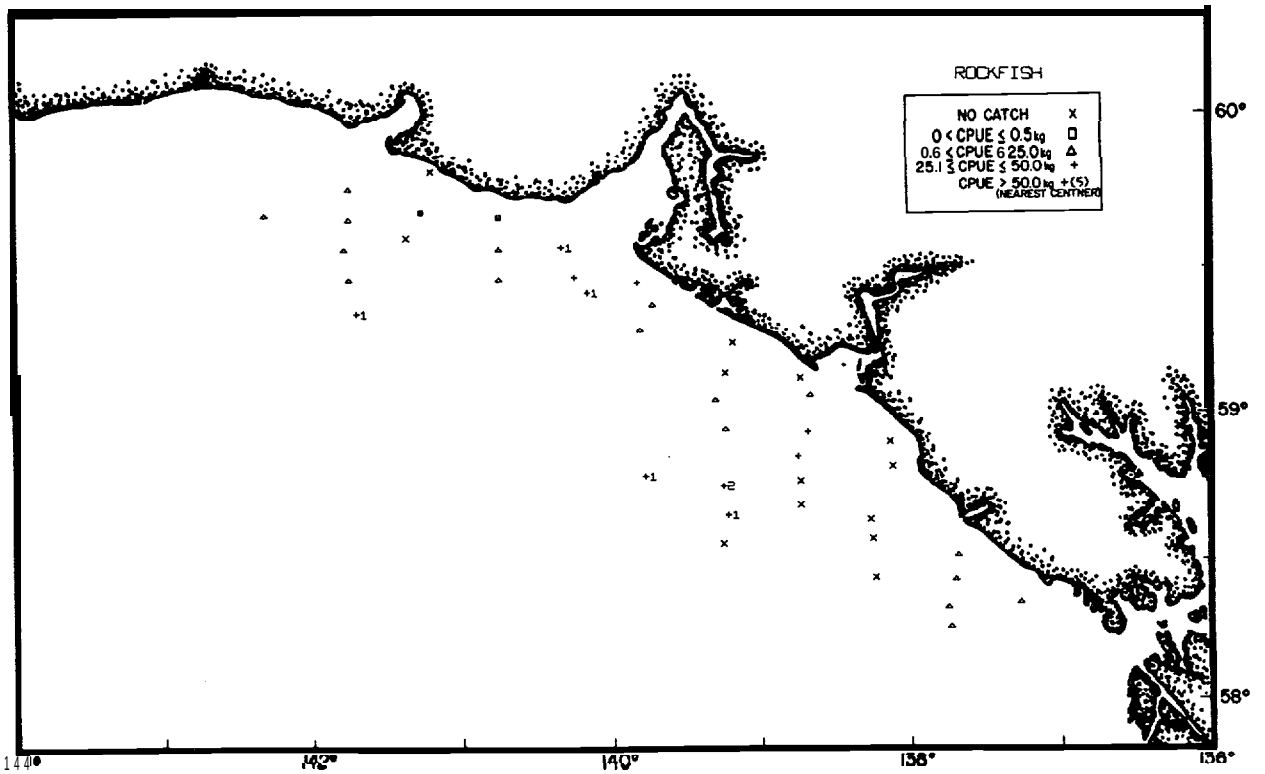


Figure XI-356.--Distribution of standardized catch rates **in kg/hr** of **rockfish** in the eastern Gulf of Alaska, **Sept.-Nov.** 1962 (Cruise 629).

Table XI-85.--Estimated biomass and population size of elasmobranchs in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total. estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	40.1	1719.3	15.5	0.8	11.8	2.15	--
	101-200	40.4	7852.6	70.9	4.8	70.6	1.63	--
	201-400	42.1	1509.2	13.6	1.2	17.7	1.25	--
	All zones	40.6	11081.1	31.4	6.8	41.2	1.63	--
Yakutat	l-100	29.8	2202.6	25.9	0.6	17.1	3.50	--
	101-200	22.2	3871.3	45.6	1.7	48.6	2.31	--
	201-400	29.5	2417.5	28.5	1.2	34.3	2.01	--
	All zones	25.7	8491.4	24.1	3.5	21.2	2.42	--
Prince William	l-100	62.9	8296.2	67.9	1.7	48.6	4.81	--
	101-200	19.8	2973.5	24.3	1.3	37.1	2.36	--
	201-400		947.8	7.8	0.5	14.3	1.82	--
	All zones	37.5	12217.5	3 4	3.5	21.2	3.49	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	6.2	2170.7	61.7	1.6	59.3	1.40	--
	201-400	9.9	1345.6	38.3	1.1	40.7	1.20	--
	All zones	6.0	3516.3	10.0	2.7	16.4	1.30	--
Total	l-100	34.6	12218.1	34.6	3.1	18.8	3.94	--
	101-200	19.4	16868.1	47.8	9.4	57.0	1.79	--
	201-400	20.9	6220.1	17.6	4.0	24.2	1.56	--
	All zones	23.3	35306.3	100.0	16.5	100.0	2.14	--

L/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available,
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals,
5/ Less than 0.1 percent.

PACIFIC OCEAN PERCH

Distribution and Abundance--Pacific ocean perch were widely distributed throughout the survey area, but were primarily taken in the outer shelf and upper slope depth zones (Table X1-89). The upper slope had the highest apparent abundance (53 kg/hr), followed by the outer and inner shelf (Figure X1-367). Mean CPUE's by regions ranged from 4 kg/hr in Prince William, to 37 kg/hr in Kenai and averaged 19 kg/hr over the entire survey area (Figure X1-368).

Biomass --The estimated apparent biomass of 29 thousand mt was relatively evenly divided between the outer shelf (46%) and upper slope (53%) depth zones. The Kenai region contained the largest percentage of the biomass (74%), while the next highest contribution came from the Fairweather region (17%). The biomass estimate for this species should be considered low, as this species is semi-pelagic and an unknown portion of the total population are distributed among hard-rocky areas, inaccessable to standard bottom trawls used during these surveys.

Size composition—Length frequency data are available from the Kenai outer shelf where Pacific ocean perch ranged in size from 31-41 cm and averaged 37.1 cm (Figure X1-369).

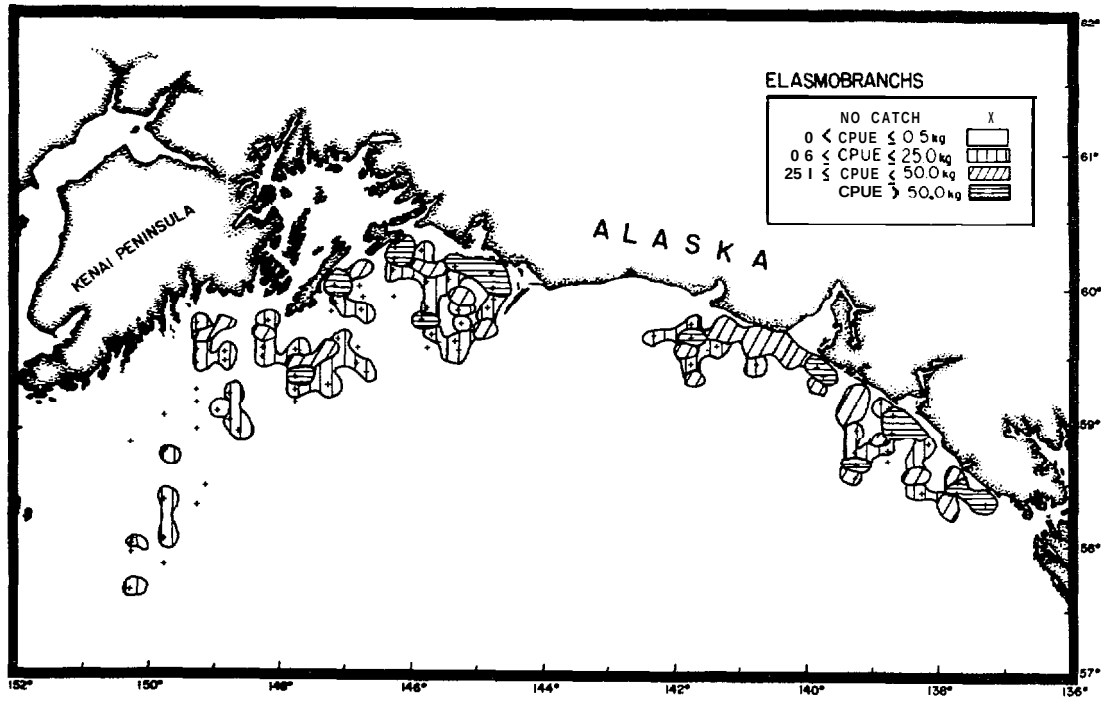
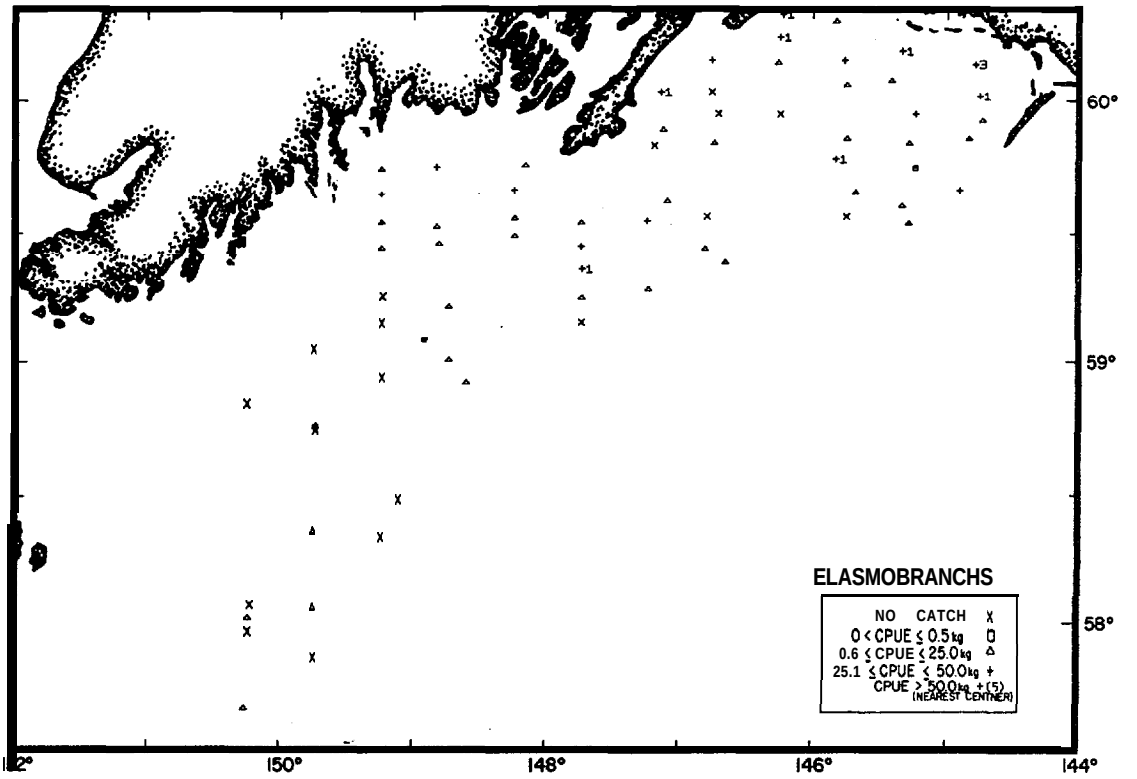


Figure XI-357 .--Distribution of apparent relative abundance of elasmobranchs in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).



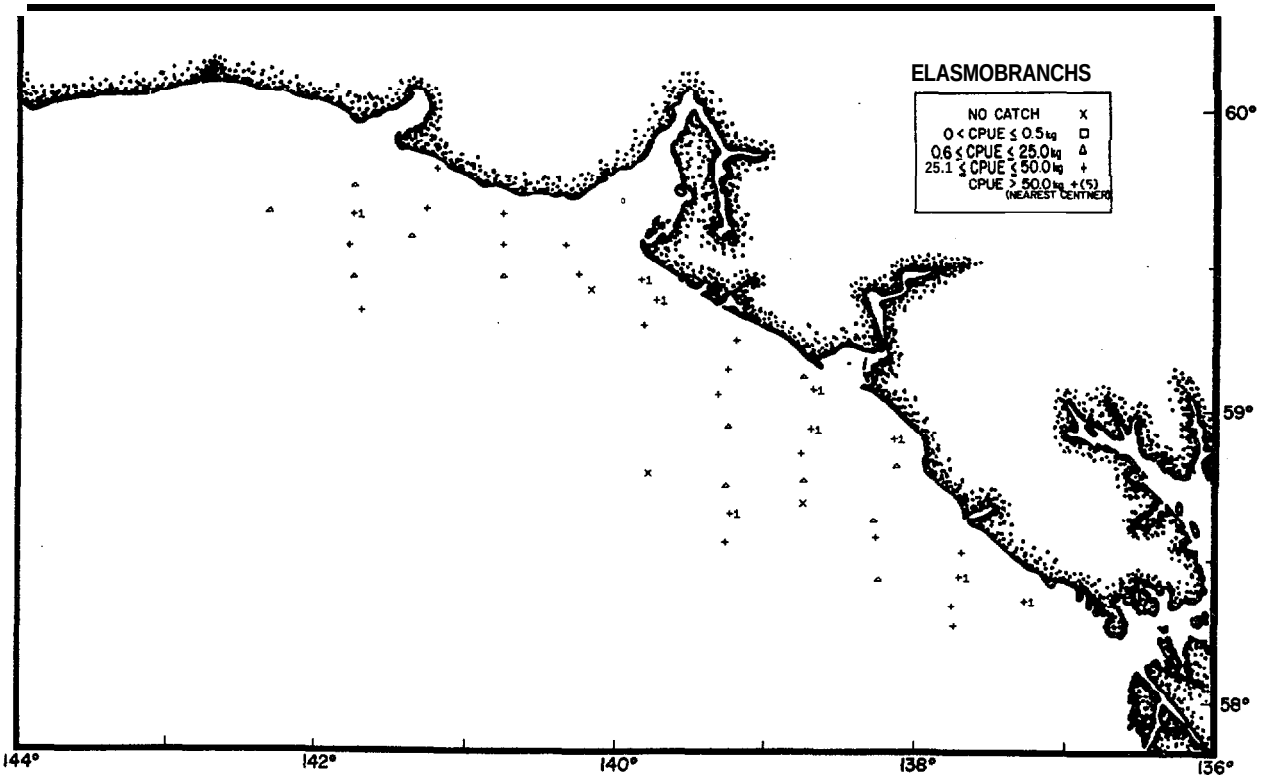


Figure XI-358.--Distribution of standardized catch rates In **kg/hr** of **elasmobranchs** in the eastern Gulf of Alaska, Sept.-&v. 1962 **(Cruise** 629).

Table XI-86.--Estimated biomass and population size of turbot (Atheresthes stomias) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm
Fairweather	l-100	33.5	1436.0	2.4	2.4	2.5	0.60	--
	101-200	234.3	45506.9	76.5	77.4	79.1	0.59	--
	201-400	349.4	12523.1	21.1	18.0	18.4	0.70	--
	All zones	217.8	59466.0	59.6	97.8	53.3	0.61	--
Yakutat	l-100	2.7	201.0	2.8	0.5	3.5	0.41	--
	101-200	31.5	5491.1	77.6	11.4	79.7	0.48	--
	201-400	16.9	1383.4	19.6	2.4	16.8	0.58	--
	All zones	21.4	7075.5	7.1	14.3	7.8	0.50	--
Prince William	l-100	26.1	3437.5	23.4	7.4	25.8	0.46	--
	101-200	56.8	8539.5	58.1	17.7	61.7	0.48	--
	201-400	62.7	2726.8	18.5	3.6	12.5	0.75	--
	All zones	45.2	14703.8	14.7	28.7	15.6	0.51	--
Kenai	l-100	--	--		--	--		--
	101-200	26.5	9226.5	49.7	24.2	56.7	0.38	33.0
	201-400	68.5	9328.4	50.3	18.5	43.3	0.50	34.5
	All zones	31.5	18554.9	18.6	42.7	23.3	0.43	33.7
Total	l-100	14.4	5074.5	5.1	10.3	5.6	0.49	--
	101-200	79.3	68764.0	68.9	130.7	71.2	0.53	--
	201-400	87.7	25961.7	26.0	42.5	23.2	0.61	--
	All zones	65.8	99800.2	100.0	183.5	100.0	0.54	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

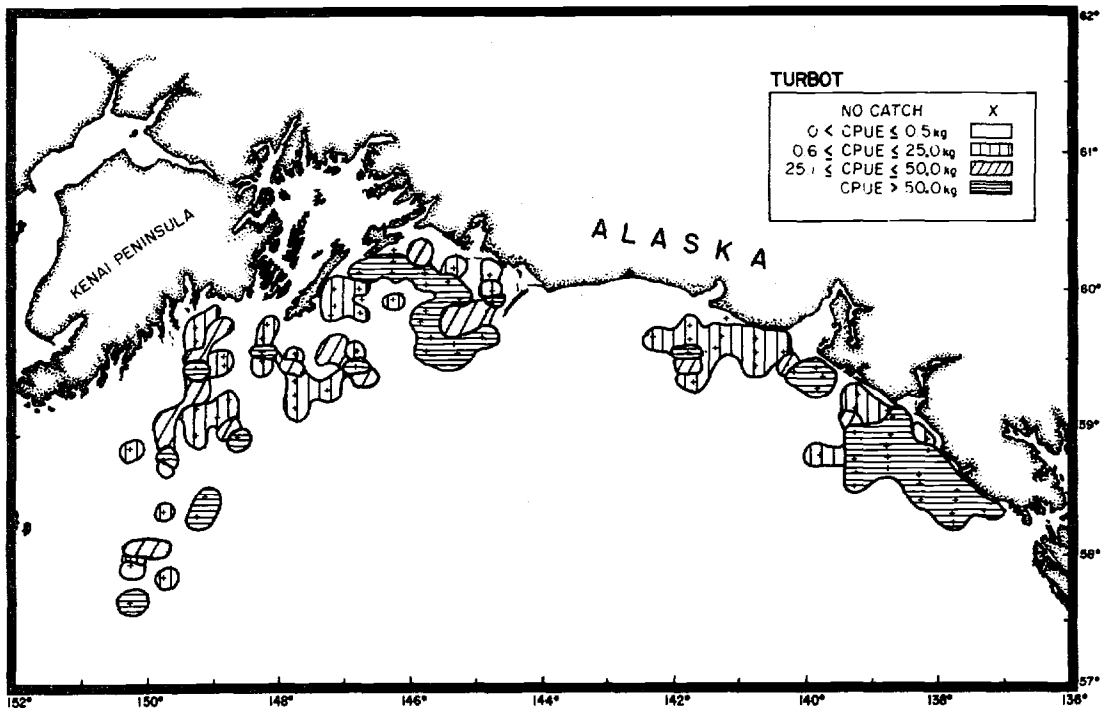


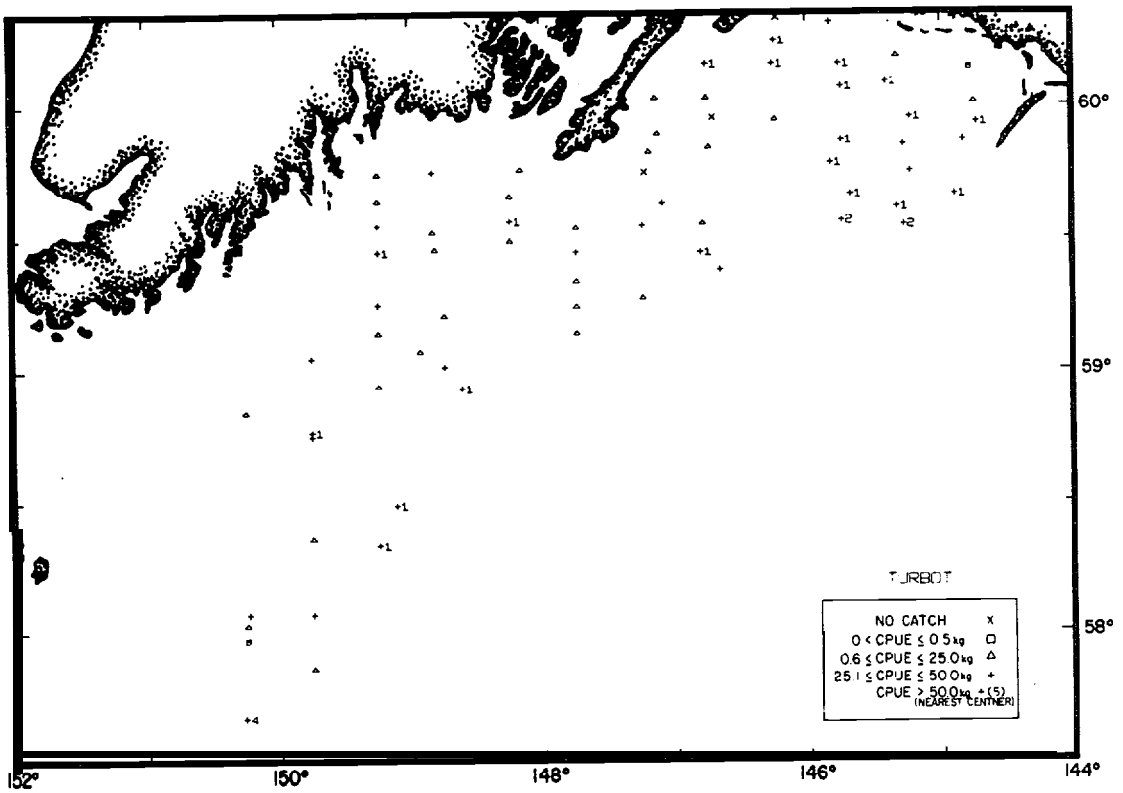
Figure XI-359.--Distribution of apparent relative abundance of turbot in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

SKATES

Distribution and Abundance--During the 1962 survey, skates were not identified to species but were combined into a general classification. Skates were taken in each region-depth zone sampled, and averaged 18 kg/hr over the survey area (Table X1-90). Highest apparent abundance occurred in the inner shelf depth zone (28 kg/hr), decreasing in the upper slope and outer shelf. With the exception of the Kenai area, (5 kg/hr) mean CPUE's varied little between (18-32 kg/hr) regions (Figure X1-370).

Biomass --The skate apparent biomass for the survey area has been estimated at 27 thousand mt, of which 46% occurred in the outer shelf, 36% in the inner shelf, and 18% in the upper slope. With the exception of the Kenai region which made the smallest contribution, the biomass was divided relatively evenly between Prince William (38%), Yakutat (26%) and Fairweather (25%).

Size Composition--Size composition data were not taken for this group.



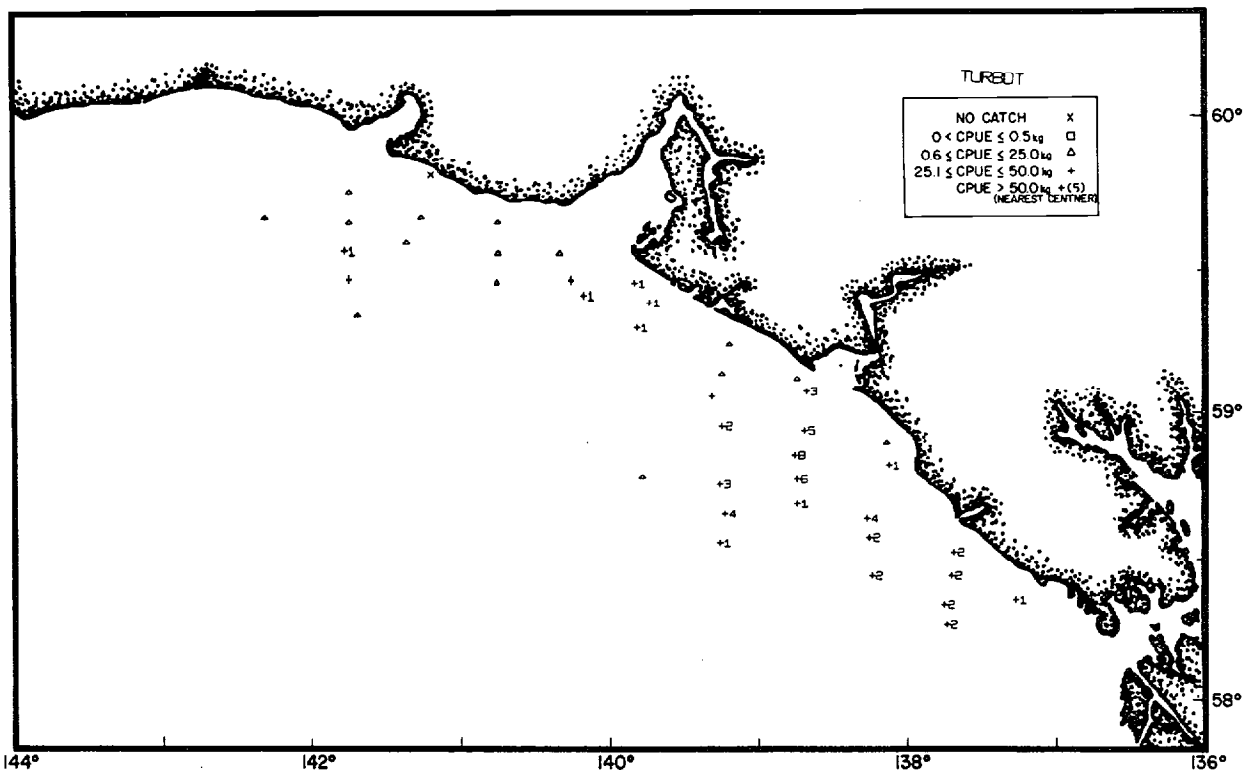


Figure X1-360.--Distribution of standardized catch rates in kg/hr of turbot in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

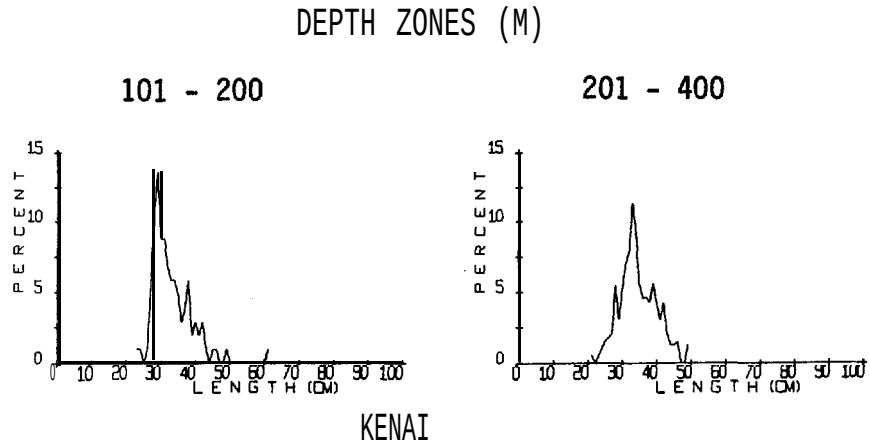


Figure XI-361.--Percentage length **frequencies of** turbot **from the** Gulf **of Alaska (Cruise** 629).

PACIFIC **HALIBUT**

Distribution and Abundance-With the exception of the Fairweatherupper slope, Pacific halibut were taken throughout the ***survey area.*** Apparent relative abundance varied little between regions with Yakutat having the largest concentrations **(20 kg/hr),** and Prince William the lowest (10 **kg/hr)(Table** X1-91). Mean **CPUE's** were highest on the outer shelf depth zone (20 **kg/hr),** while lower values occurred on the inner shelf and the upper slope (Figure X1-371).

Biomass-The apparent biomass of Pacific'halibut has been estimated at 23 thousand mt, of which 75% occurred on the outer shelf, 17% on the inner shelf, and 8% on the upper slope. The Kenai region made the largest contribution to the total biomass with **41%,** while proportions in the remaining regions ranged from 15% (Fairweather) to 29% (Yakutat). The biomass estimate for Pacific halibut should be considered low as the larger specimens of this species are apparently able to escape an otter trawl when towed at the speeds used during these surveys.

Size composition--Size composition data are available through the International Pacific Halibut Commission.

WALLEYE **POLLOCK**

Distribution and Abundance--With the exception of the Yakutat-inner shelf, pollock were encountered in each region-depth zone sampled (Table X1-92). Relative apparent abundance increased with depth with the highest mean **CPUE** occurring on the upper slope (32 kg/hr), followed by the outer and inner shelf and averaged 14 **kg/hr** over the entire survey area (Figure X1-372). The Fairweather, Kenai, and Prince William regions had relatively similar **CPUE's** which ranged from 12-19 **kg/hr** while the Yakutat region was lowest with 4 kg/hr. (Figure X1-373).

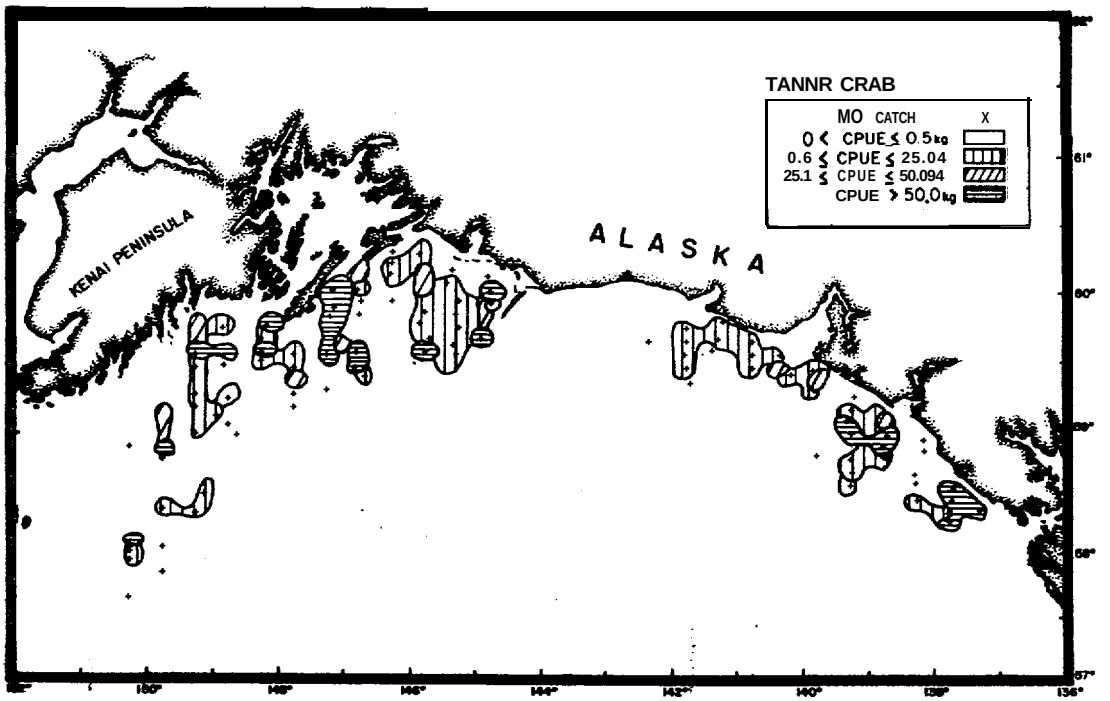


Figure X1-362.--Distribution of apparent relative abundance of Tanner **crab in the eastern** Gulf of Alaska, **Sept.-Nov.** 1962 **(Cruise** 629).

Biomass-The apparent pollock biomass of 20 thousand mt was fairly evenly divided between the outer shelf **(54%)**, and upper slope (46%) depth zones. The Kenai region accounted for the major portion of the biomass **(49%)**, while the remainder was divided between Fairweather **(26%)**, Prince William **(19%)**, and Yakutat (7%). The estimated pollock biomass should be considered a minimum since this is a semi-pelagic species and some unknown portion of the population may have occupied the water column above the sampling gear.

Size **composition**--Size composition data are not available for the species.

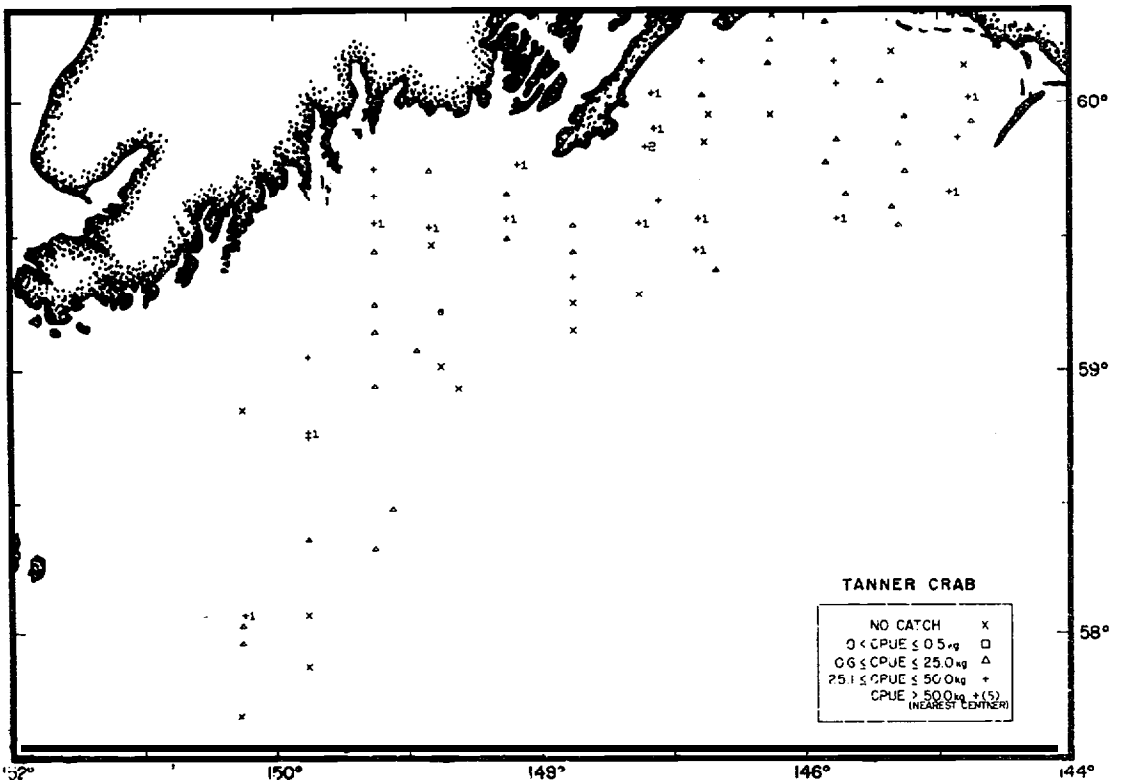
REX SOLE

Distribution and Abundance-Rex sole had a relatively wide distribution throughout the survey area, but were not highly abundant in any region or depth zone (Table X1-93). Mean **CPUEs** increased with depth, the highest abundance occurring on the upper slope and decreasing in the outer and inner shelf depth zones respectively. The Fairweather region had the highest apparent relative abundance followed by Kenai, Prince William and Yakutat (Figure X1-374).

Table XI-87.--Estimated biomass and population size of Tanner crab (*Chionoecetes sp.*) in the Gulf of Alaska duri
September-November 1962.

Region	Depth zone (m)	CPUE[1/] (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total 'estimated population	Mean size individu Weight (kg)
Fairweather	l-100	0.7	31.1	0.3	0.1	0.4	0.60
	101-200	47.4	9215.0	95.0	22.6	93.0	0.41
	201-400	12.7	454.4	4.7	1.6	6.6	0.30
	All zones	35.5	9700.5	30.7	24.3	29.9	0.40
Yakutat	l-100	2.0	144.1	6.1	0.3	2.0	0.56
	101-200	6.8	1179.7	49.8	10.2	69.4	0.12
	201-400	12.8	1044.0	44.1	4.2	28.6	0.25
	All zones	7.2	2367.8	7.5	14.7	18.1	0.16
Prince William	l-100	23.1	3041.5	33.7	6.2	28.7	0.49
	101-200	29.4	4419.9	49.1	12.7	58.8	0.35
	201-400	35.6	1547.7	17.2	2.7	12.5	0.57
	All zones	27.7	9009.1	28.5	21.6	26.5	0.42
Kenai	l-100	--	--	--	--	--	--
	101-200	21.0	7327.5	69.4	14.4	69.2	0.51
	201-400	23.7	3230.0	30.6	6.4	30.8	0.50
	All zones	17.9	10557.5	33.4	20.8	25.6	0.51
Total	l-100	9.1	3216.7	10.2	6.6	8.1	0.49
	101-200	25.5	22142.1	70.0	59.9	73.6	0.37
	201-400	21.1	6276.1	19.8	14.9	18.3	0.42
	All zones	20.8	31634.9	100.0	81.4	100.0	0.39

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



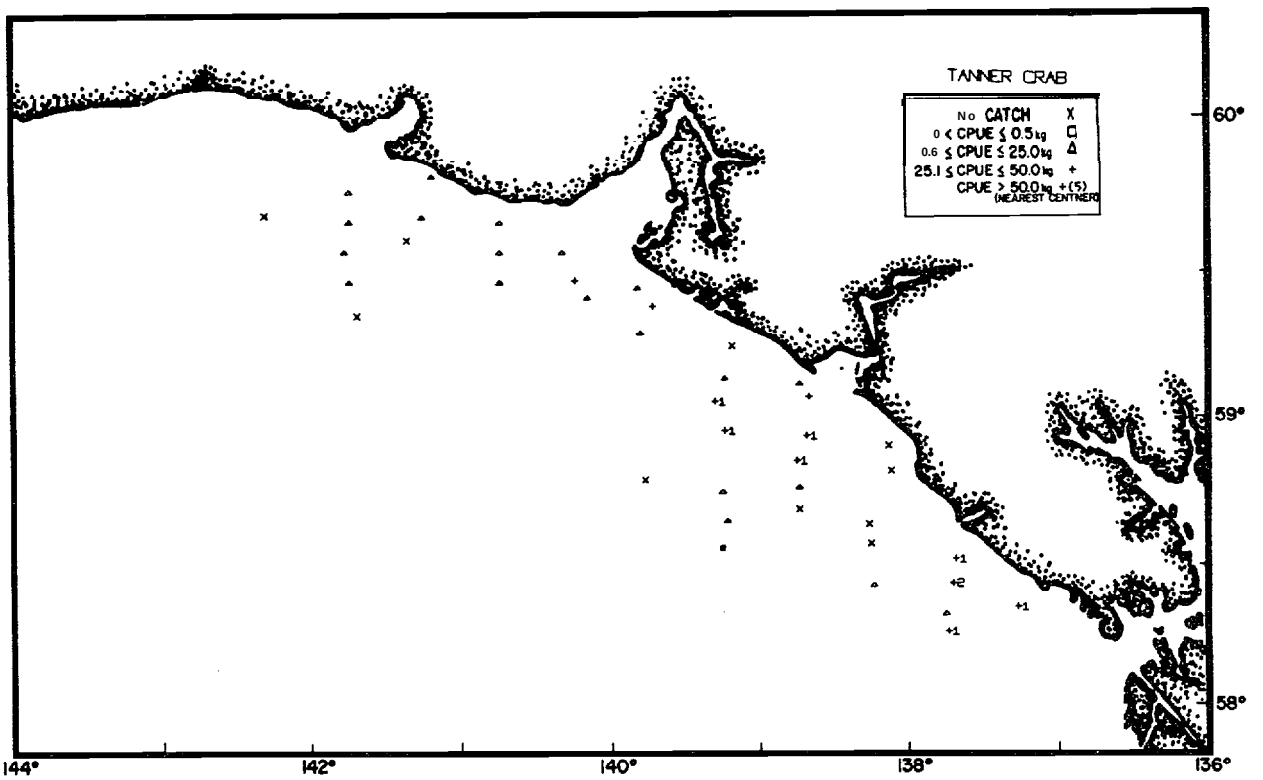


Figure X1-363.--Distribution of standardized catch rates in kg/hr of Tanner crab in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-88.--Estimated biomass and population size of flathead sole (Hippoglossoides elassodon) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total 'estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fair-weather	l-100	4.6	195.4	2.3	0.9	4.0	0.23	--
	101-200	28.9	5608.6	65.3	14.6	64.9	0.38	
	201-400	77.6	2780.2	32.4	7.0	31.1	0.40	--
	All zones	31.5	8584.2	28.2	22.5	22.0	0.38	--
Yakutat	l-100	0.1	8.9	0.8	4/	5/	0.18	--
	101-200	3.6	620.0	56.1	1.9	54.3	0.32	--
	201-400	5.8	475.9	43.1	1.6	45.7	0.30	--
	All zones	-3.4	1104.8	3.6	3.5	3.4	0.31	--
Prince William	l-100	8.1	1065.4	17.9	3.9	21.7	0.27	--
	101-200	25.1	3768.2	63.3	11.2	62.2	0.34	--
	201-400	25.7	1117.4	18.8	2.9	16.1	0.39	--
	All zones	18.3	5951.0	19.6	18.0	17.6	0.33	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	25.6	8928.7	60.5	32.5	55.6	0.27	26.7
	201-400	42.9	5834.8	39.5	26.0	44.4	0.23	
	All zones	25.1	14763.5	48.6	58.5	57.1	0.25	--
Total	l-100	3.6	1269.7	4.2	4.8	4.7	0.26	--
	101-200	21.8	18925.5	62.3	60.2	58.7	0.31	--
	201-400	34.4	10208.3	33.6	37.5	36.6	0.27	--
	All zones	20.1	30403.5	100.0	102.5	100.0	0.30	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

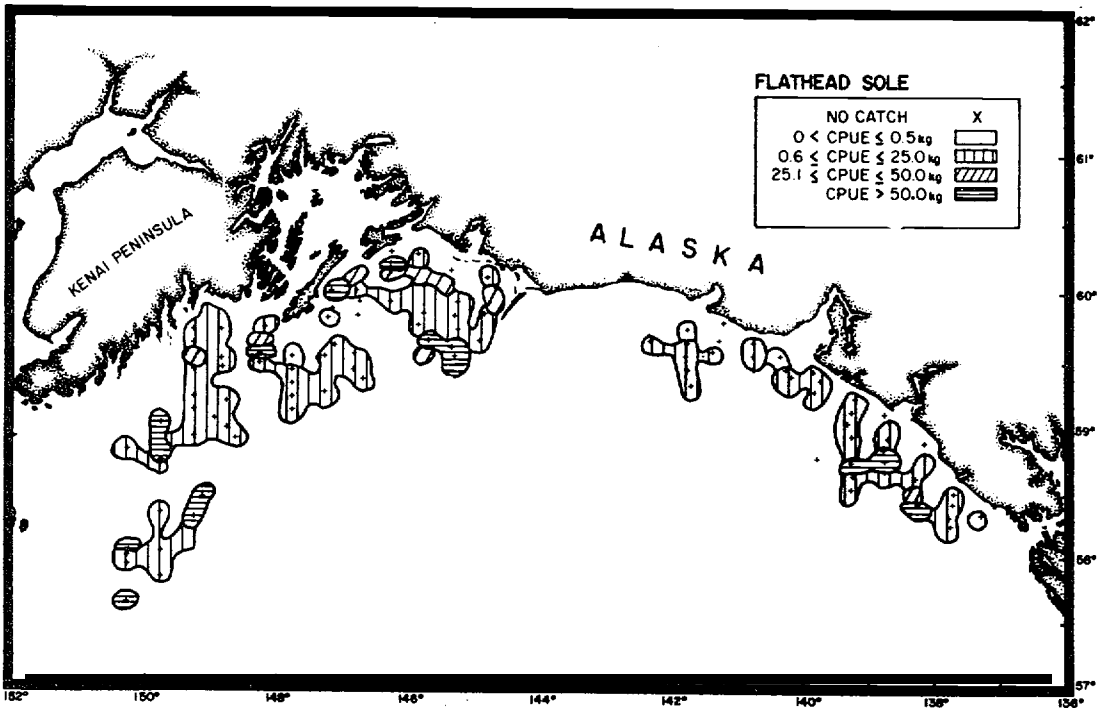


Figure XI-364.-Distribution of apparent relative abundance of **flathead sole** in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

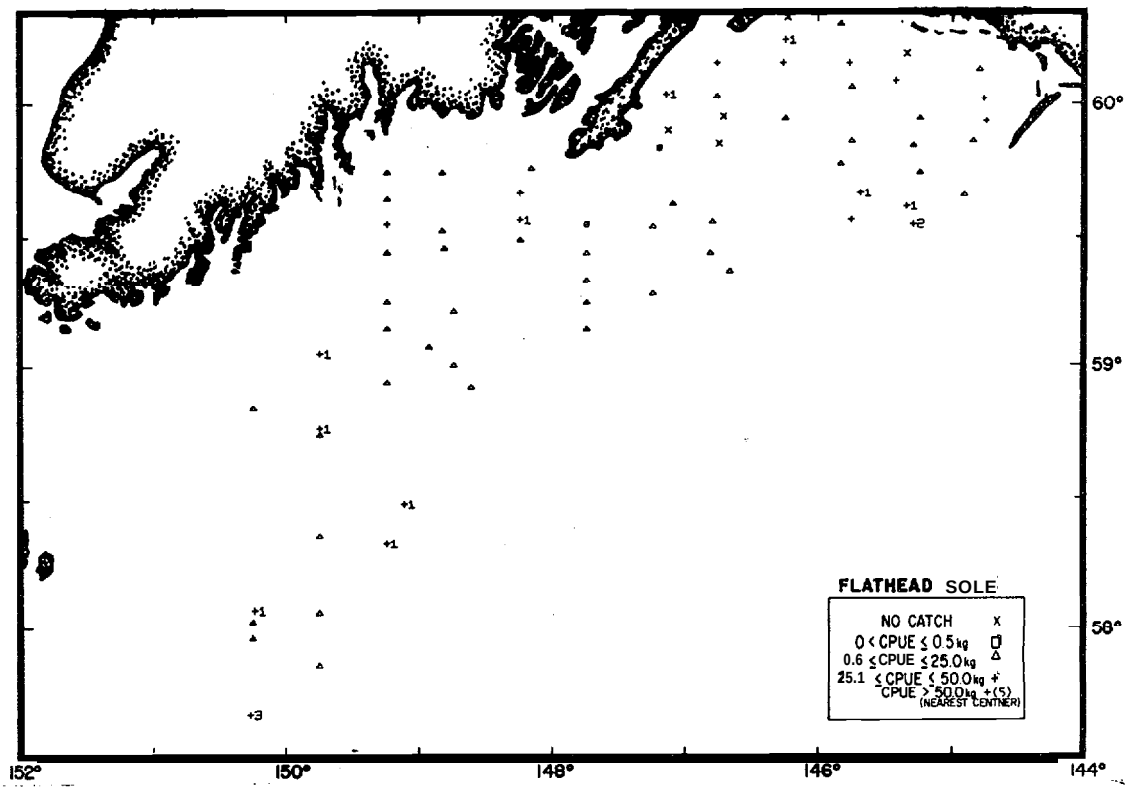
Biomass-Rex sole had an estimated apparent biomass of 12 thousand mt, of which 58% occurred in the outer slope, 28% in the upper slope, and 14% in the inner shelf. Together the Kenai and Fairweather regions accounted for 84% of the biomass with 67% of the Fairweather contribution coming from the outer shelf. The biomass in the Kenai region was divided relatively evenly between the outer shelf (57%) and upper slope (43%).

Size composition-Random length frequency data are available from the Kenai upper slope where rex sole, sexes combined, ranged in size from 20-42 cm averaging 30.7 cm (Figure X1-375).

PACIFIC COD

Distribution and Abundance--Pacific cod appeared regularly throughout the survey area, but in relatively low concentration (Table X1-94). By depths, the highest relative apparent abundance was in the upper slope depth zone (12 kg/hr), followed by the outer shelf and the inner shelf and averaged 6 kg/hr over the survey area. Mean CPUE's ranged from 3 to 9 kg/hr being highest in the Kenai and Yakutat regions. The distribution of the standardized catch rates are presented in figure X1-376.

Biomass-- The estimated apparent biomass of Pacific cod in the survey area was 10 thousand mt of which the largest contributors, Kenai (50%) and Yakutat (30%), together accounted for 80% of the total biomass. By depth zones, 59% of the biomass came from the outer shelf, 37% from the upper slope and 4% from the inner shelf. Although Pacific cod are mainly demersal, unknown portions of the population may have occupied the water column above the sampling gear thus resulting in a low biomass estimate.



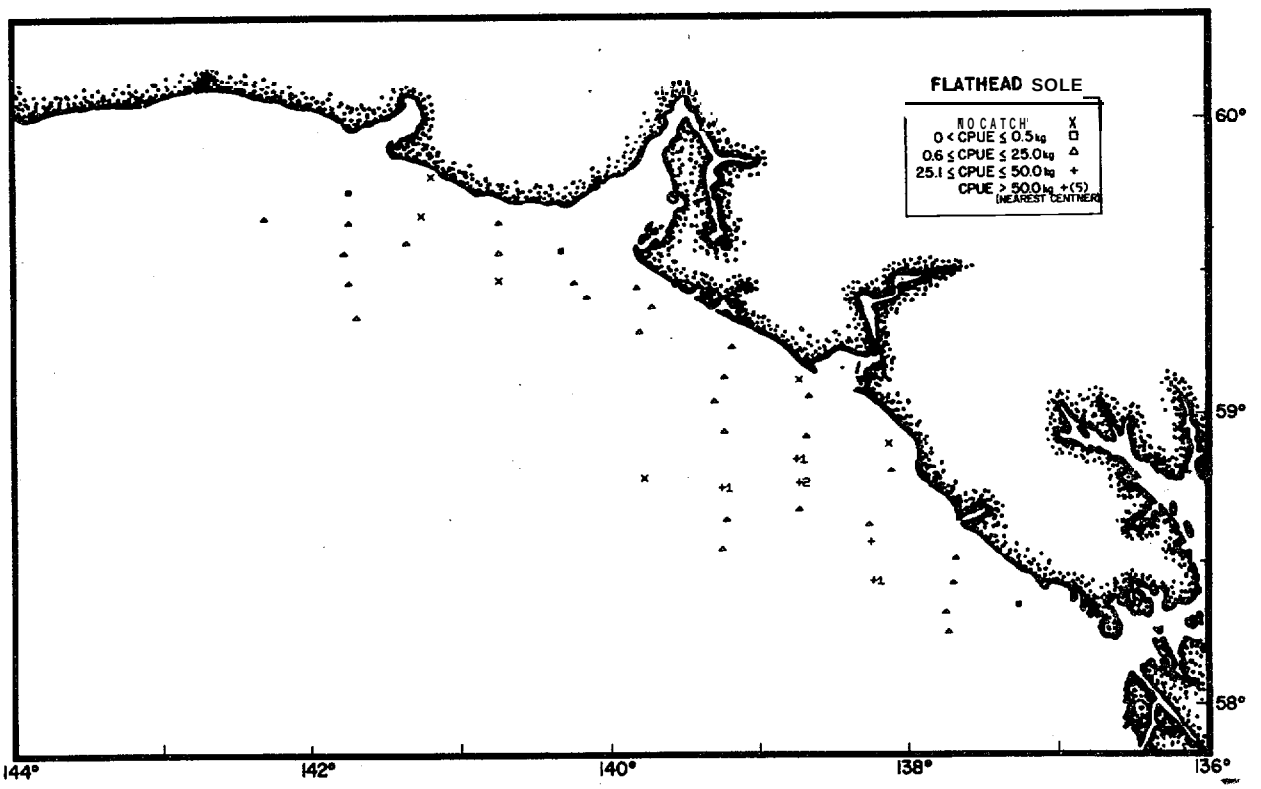
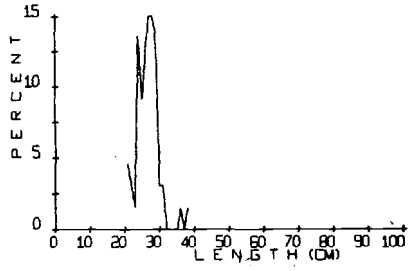


Figure X1-365.--Distribution of standardized catch rates in kg/hr of **flathead** sole in the' eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

DEPTH ZONES (M)

101 - 200



KENAI

Figure X1-366.--Percentage length frequency of **flathead** sole from the Gulf of Alaska (Cruise 629).

Size composition-Size composition data are not available for this species.

SABLEFISH

Distribution and Abundance--The distribution of sablefish catch rates shows that highest concentrations occurred at the deeper stations (Table X1-95). The upper slope depth zone had the largest mean **CPUE (11 kg/hr),** with lower values occurring in the outer and inner shelf. The Fairweather region had the highest sablefish catch rate (22 **kg/hr),** while values in the three remaining areas ranged from 0.2 **kg/hr (Yakutat)** to 3 **kg/hr** (Kenai and Prince William) (Figures X1-377-378).

Biomass--Of the estimated 8 thousand mt of sablefish, 60% occurred in the outer shelf depth zone. The upper slope contained 37% of the estimated standing stock, while the inner shelf accounted for only 3%. Together, the Fair-weather (69%) and Kenai (19%) region accounted for nearly 90% of the total biomass. The biomass estimate of sablefish should be considered minimal as this species occurs at greater depths than those sampled during this survey.

Size Composition-Size composition data are not available for this species.

Table XI-89.--Estimated biomass and population size of Pacific ocean perch (*Sebastes alutus*) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual. 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0	0	0	0	0	--	--
	101-200	4.3	829.5	20.4	1.6	17.6	0.51	--
	201-400	90.5	3244.4	79.6	7.5	82.4	0.43	--
	All zones	14.9	4073.9	16.9	9.1	17.2	0.45	--
Yakutat	l-100	0.2	14.5	0.7	4/	5/	0.59	--
	101-200	2.5	436.1	20.7	1.1	26.8	0.41	--
	201-400	20.2	1654.6	78.6	3.0	73.2	0.55	--
	All zones	6.4	2105.2	7.2	4.1	7.8	0.51	--
Prince William	l-100	0.6	85.4	5.8	0.1	2.3	0.73	--
	101-200	6.6	994.0	68.3	3.6	83.7	0.28	--
	201-400	8.6	375.2	25.8	0.6	14.0	0.58	--
	All zones	4.4	1454.6	5.0	4.3	8.1	0.33	--
Kenai	l-100	--	--	--		--	--	--
	101-200	32.6	11343.8	52.2	17.2	48.7	0.66	37.1
	201-400	76.5	10410.0	47.8	18.1	51.3	0.57	--
	All zones	37.0	21753.8	74.0	35.3	66.9	0.62	--
Total	l-100	0.3	99.9	0.3	0.1	0.2	--	--
	101-200	15.7	13603.4	46.3	23.5	44.5	0.58	--
	201-400	52.8	15684.2	53.4	29.2	55.3	0.54	--
	All zones	19.4	29387.5	100.0	52.8	100.0	0.57	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

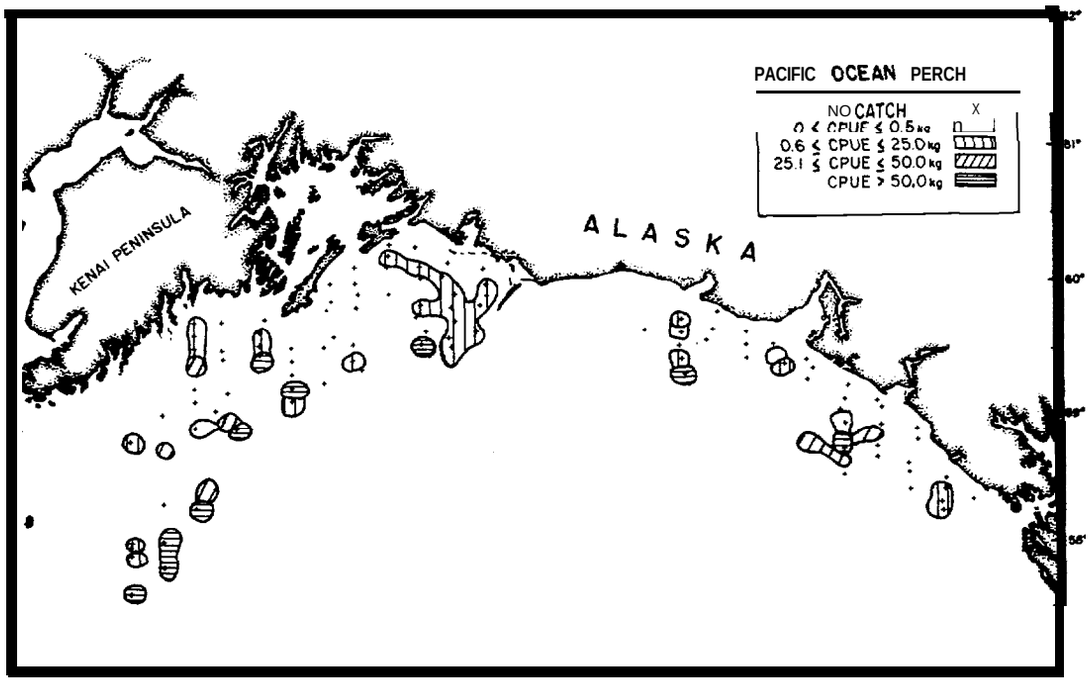


Figure X1-367.--Distribution of apparent relative abundance of Pacific ocean perch in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

SHORTSPINE THORNYHEAD

Distribution and Abundance--The CPUE of the shortspine thornyhead over the survey area averaged 5 kg/hr with apparent relative abundance increasing with depth (Table XI-96). Only trace amounts were encountered on the inner shelf, however, catch rates increased in the outer shelf (4 kg/hr), and upper slope (13 kg/hr). By geographic regions, mean CPUE's generally increased from west to east. Kenai and Prince William had the lowest' apparent abundance while Yakutat and Fairweather had significantly higher values (Figure X1-379).

Biomass--The standing stock estimate of the shortspine thornyhead (7 thousand mt) was fairly evenly divided between the outer shelf (48%) and upper slope (52%) depth zones. The two easternmost regions, Fairweather and Yakutat, accounted for 88% of the total estimated standing stock. Biomass estimates for this species should be considered minimal as the survey covered only a portion of its bathymetric range which includes the steep, rugged bottom of the continental slope.

Size composition--Size composition data are not available for this species.

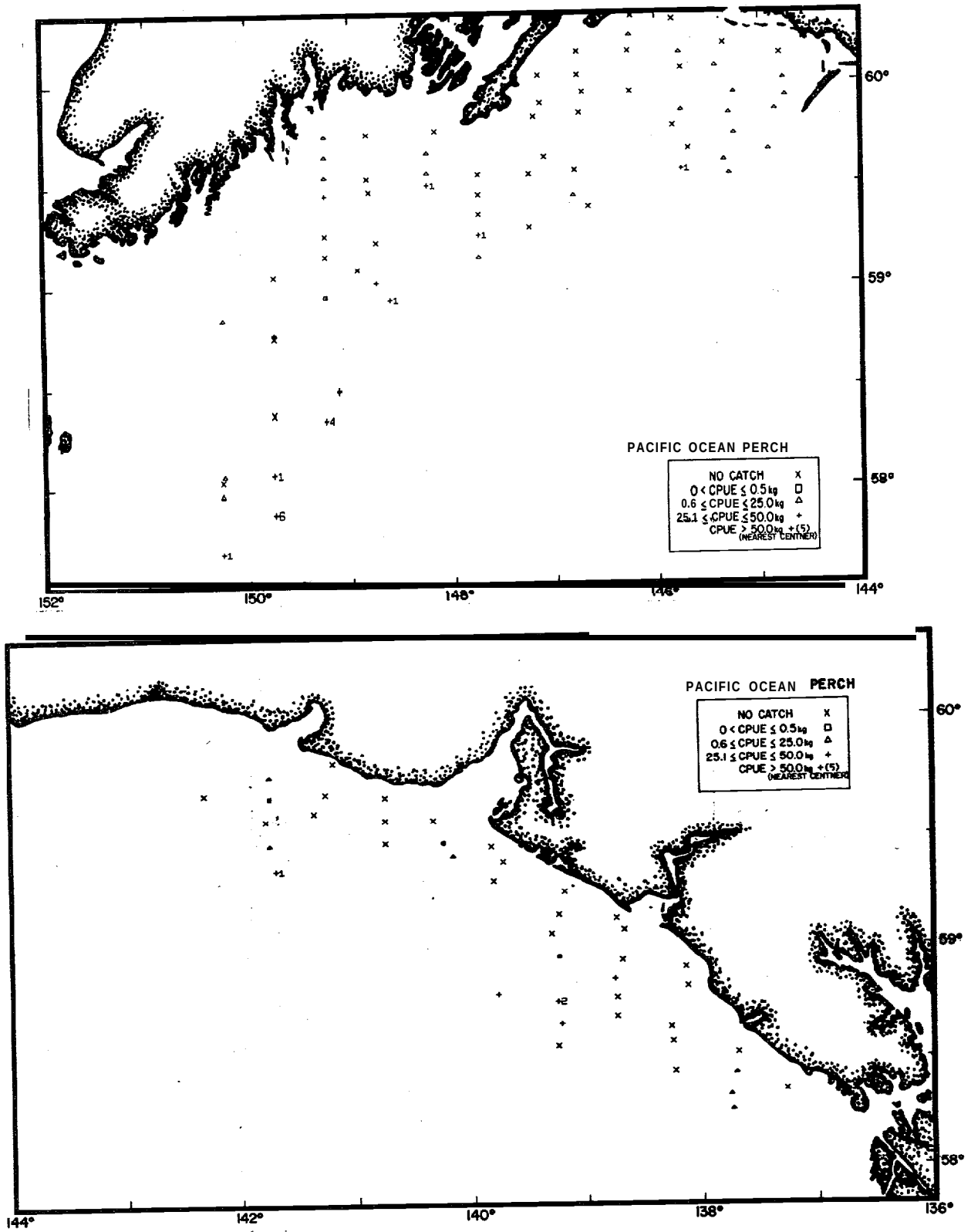
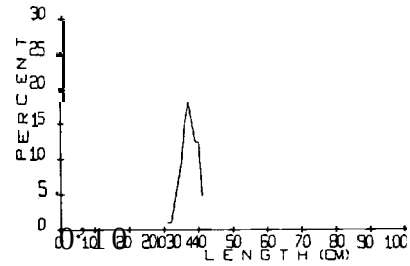


Figure XI-368.--Distribution of standardized catch rates in kg/hr of Pacific ocean perch in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

DEPTH ZONES (M)

101 - 200



KENAI

Figure X1-369.--Percentage length frequencies of Pacific ocean perch from the Gulf of Alaska (Cruise 629).

COTTIDS

Distribution and Abundance-The cottid group had an apparent relative abundance of 5 kg/hr (Table X1-97). Catch rates were highest in the outer shelf depth zone but decreased in the upper slope and inner shelf. By geographic regions, concentrations of cottids increased from east to west, ranging from 0.4 kg/hr in the Fairweather region to 10 kg/hr in the Kenai region (Figure X1-380).

Biomass--Of the estimated apparent biomass of cottids, 7 thousand mt, nearly 95% was contained in the outer shelf depth zone and 88% in the Kenai region.

Size composition-Size composition data are not available for this species.

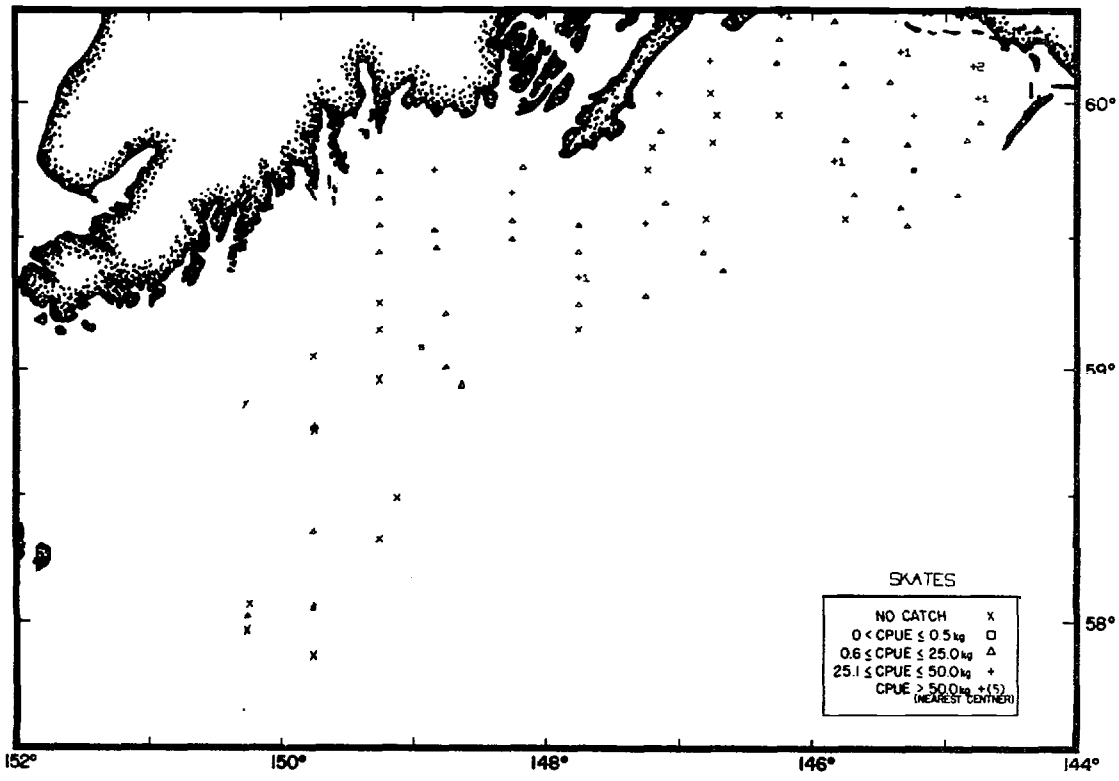
DUNGENESS CRAB

Distribution and Abundance--Dungeness crab appeared in three of the four regions comprising the survey area, but had a low overall apparent relative abundance (4 kg/hr) (Table X1-98). This species was not taken in the upper slope depth zone, only trace amounts appeared in the outer shelf and highest abundance occurred in the inner shelf depth zone (16 kg/hr), particularly in the Fairweather and Prince William regions (Figure X1-381).

Table XI-90.--Estimated biomass and population size of skates (Rajidae) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total 'estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	14.3	612.5	8.8	0.3	6.5	2.10	--
	101-200	27.9	5414.4	78.1	3.5	76.1	1.54	--
	201-400	25.3	906.8	13.1	0.8	17.4	1.08	--
	All zones	25.4	6933.7	25.2	4.6	37.4	1.49	--
Yakutat	l-100	25.3	1866.7	25.9	0.5	17.2	3.76	--
	101-200	18.5	3233.5	44.9	1.4	48.3	2.35	--
	201-400	25.6	2097.4	29.1	1.0	34.5	2.10	--
	All zones	21.8	7297.6	26.2	2.9	23.6	2.51	--
Prince William	l-100	55.4	7303.4	69.7	1.0	41.7	7.28	--
	101-200	16.1	2413.2	23.0	1.0	41.7	2.50	--
	201-400	17.5	763.0	7.3	0.4	16.7	1.82	--
	All zones	32.2	10479.6	38.1	2.4	19.5	4.37	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	4.7	1634.4	56.9	1.3	54.2	1.22	--
	201-400	9.1,	1240.1	43.1	1.1	45.8	1.14	
	All zones	4.9	2874.5	10.5	2.4	19.5	1.18	--
	l-100	27.7	9782:6	35.6	1.8	14.6	5.43	
	101-200	14.6	12695.5	46.2	7.2	58.5	1.76	--
	201-400	16.8	5007.3	18.2	3.3	26.8	1.52	--
Total	All zones	18.1	2	100.0	12.3	99.9	2.23	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



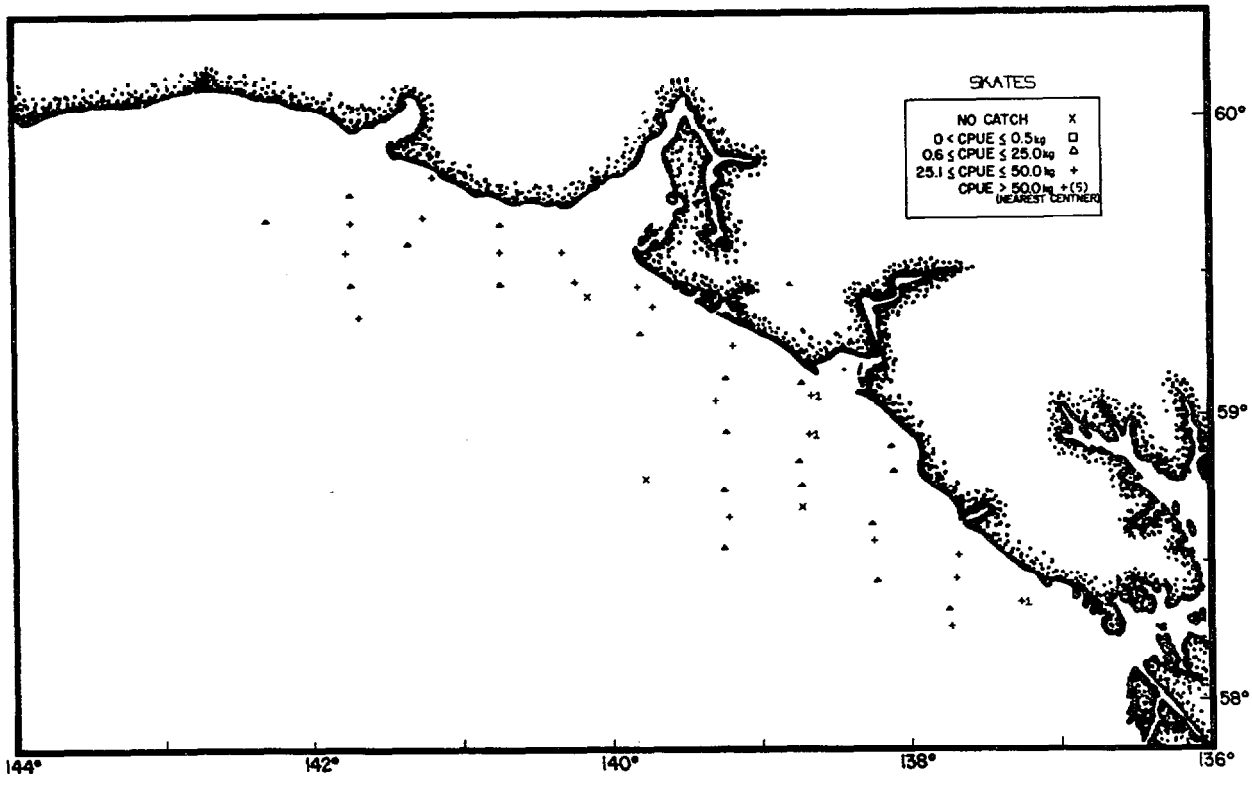
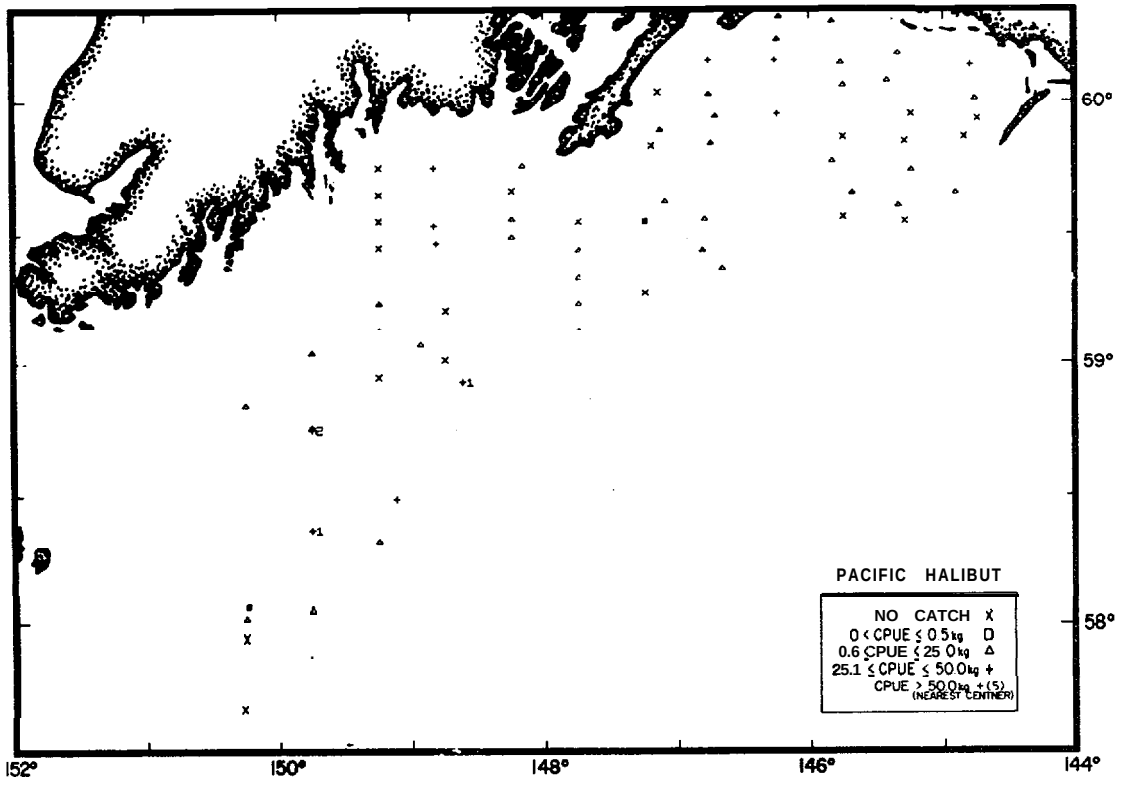


Figure XI-370.--Distribution of standardized catch rates in **kg/hr** of skates in the eastern Gulf of Alaska, **Sept.-Nov.** 1962 (Cruise 629).

Table X1-91.--Estimated biomass and population size of Pacific halibut (Hippoglossus stenolepsis) in the Gulf of Alaska during September-November, 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size individu Weight (kg) I
Fairweather	l-100	16.4	702.4	20.3	0.3	21.4	2.73
	101-200	14.2	2761.6	79.7	1.1	78.6	[illegible]
	201-400	0	0	0	0	0	--
	All zones	12.7	3464.0	15.3	1.4	18.0	2.63
Yakutat	l-100	10.7	793.0	12.1	0.4	19.1	1.89
	101-200	27.5	4795.0	73.1	1.4	66.7	3.55
	201-400	11.9	975.8	14.9	0.3	14.3	3.75
	All zones	19.9	6563.8	28.9	2.1	26.9	3.23
Prince William	l-100	17.9	2357.3	69.6	1.7	81.0	1.41
	101-200	6.0	907.0	26.8	0.4	19.1	2.43
	201-400	2.9	124.8	3.7	4/	5/	5.02
	All zones	10.4	3389.1	14.9	2.1	26.9	1.61
Kenai	l-100	--	--	--	--	--	--
	101-200	24.3	-8467.8	91.0	2.1	95.5	4.05
	201-400	6.1	834.4	9.0	0.1	4.6	7.88
	Al.1 zones	15.8	9302.2	40.9	2.2	28.2	4.23
Total	l-100	10.9	3852.7	17.0	2.4	30.8	1.61
	101-200	19.5	16931.4	74.5	5.0	64.1	3.39
	201-400	6.5	1935.0	8.5	0.4	5.1	4.84
	All zones	15.0	22719.1	100.0	7.8	100.0	2.91

1/ Mean catch per unit effort, in kilograms per hour trawled;
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



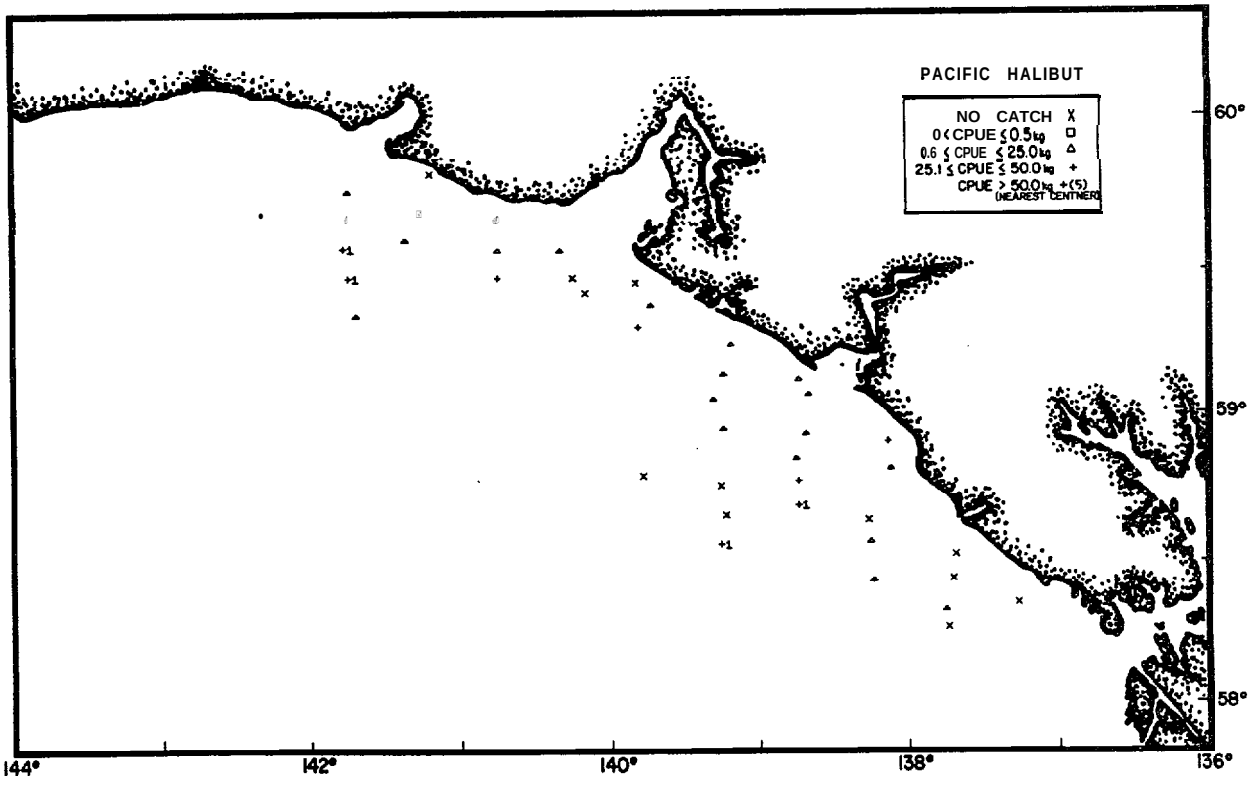


Figure XI-371.--Distribution of standardized catch rates in kg/hr of Pacific halibut in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-92.--Estimated biomass and population size of pollock (Theragra chalcogramma) in the Gulf of Alaska dur
September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr).	Estimated biomass (mt)	Proportion of total estimated hiomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size individua Weight (kg) I
Fairweather	l-100	0.6	24.9	0.5	4/	5/	0.58
	101-200	22.4	4347.4	82.8	7.0	81.4	0.62
	201-400	24.4	875.5	16.7	1.6	18.6	0.56
	All zones	19.2	5247.8	25.6	8.6	20.8	0.61
Yakutat	l-100	0	0	0	0	0	--
	101-200	3.7	650.7	47.1	1.0	58.8	0.66
	201-400	8.9	730.6	52.9	0.7	41.2	0.98
	All zones	4.2	1381.3	6.8	1.7	4.1	0.80
Prince William	l-100	0.3	36.9	0.9	0.2	4.6	0.24
	101-200	5.9	889.0	22.7	1.8	40.9	0.49.
	201-400	68.7	2985.0	76.3	2.4	54.6	1.25
	All zones	12.0	3910.9	19.1	4.4	10.6	0.89
Kenai	l-100	--	--	--	--	--	--
	101-200	14.7	5103.6	51.4	15.9	59.6	0.32
	201-400	35.5	4830.1	48.6	10.8	40.5	0.45
	All zones	16.9	9933.7	48.5	26.7	64.5	0.37
Total	l-100	0.2	61.8	0.3	0.2	0.5	0.31
	101-200	12.7	10990.7	53.7	25.7	62.1	0.43
	201-400	31.7	9421.2	46.0	15.5	37.4	0.61
	All zones	13.5	20473.7	100.0	41.4	100.0	0.49

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals,
5/ Less than 0.1 percent,

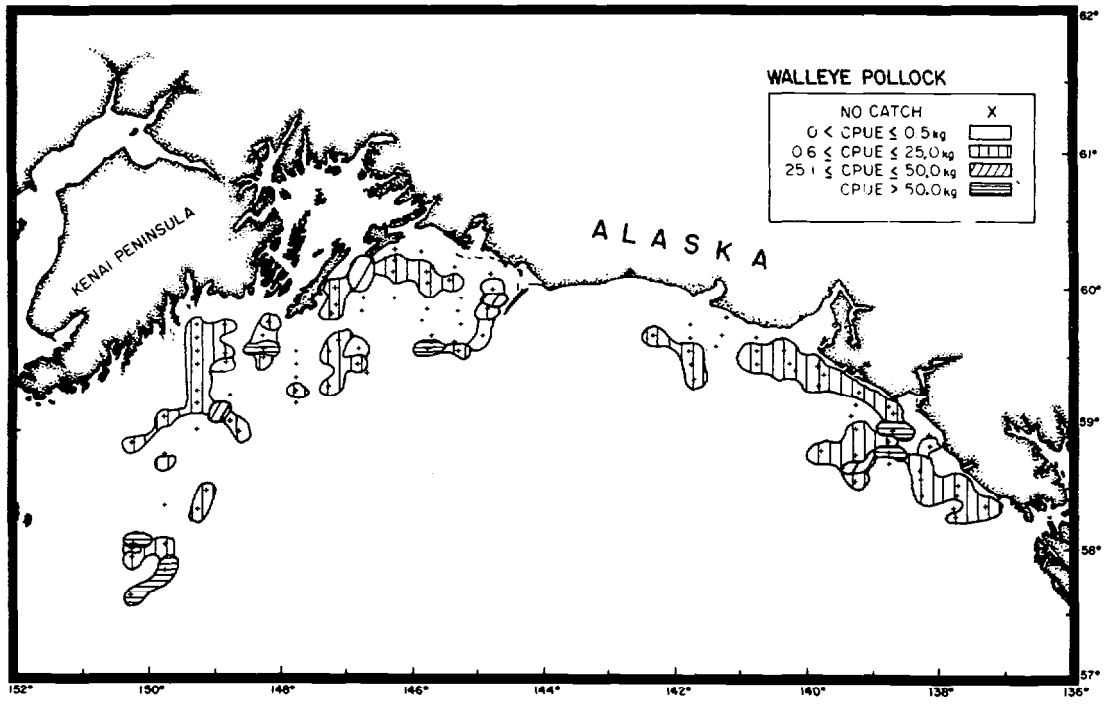


Figure X1-372.--Distribution of apparent relative abundance of walleye pollock in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

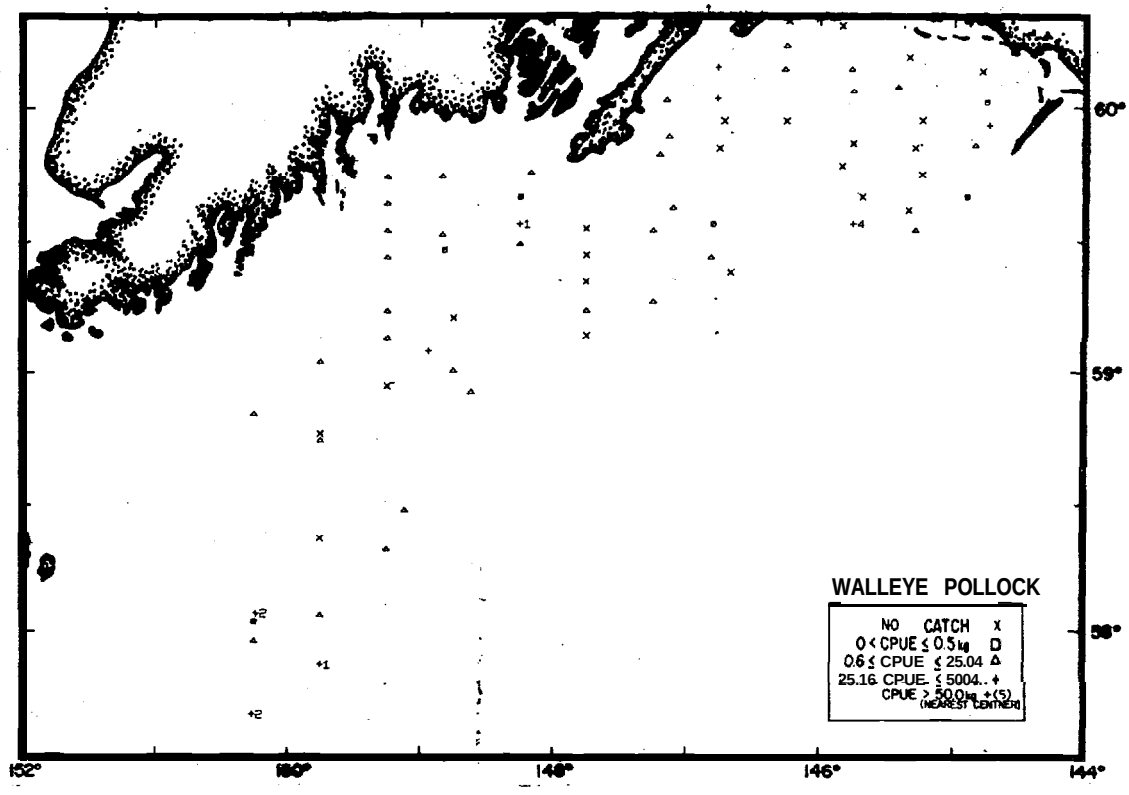
Biomass--Of the nearly 6 thousand mt of standing stock, 99% occurred in the inner shelf depth zone while, the Prince William (79%) and Fairweather (18%) regions together accounted for 98% of the total biomass. The biomass estimate for Dungeness crab should be considered minimal as most of the population occurs in water depths shallower than were adequately sampled during this survey.

Size composition--Size composition data were not taken for this species,

DOVER SOLE

Distribution and Abundance--The CPLJE for Dover sole over the survey area averaged 3 kg/hr with the apparent relative abundance increasing with depth from less than 1 kg/hr in the inner shelf to 8 kg/hr in the upper slope (Table X1-99). Highest mean CPUE's occurred in the Fairweather and Kenai regions (Figure X1-382).

Biomass--Of the nearly 5 thousand mt apparent biomass, 50% occurred in the outer shelf and 48% in the upper slope. Eighty-six percent of the total biomass occurred in the combined Fairweather (47%) and Kenai regions (39%), while Prince William (14%) and Yakutat (1%) contributed considerably lesser portions. The biomass estimate for Dover sole should be considered low as the bathymetric range of the species, which extends to approximately 600 fathoms, was not adequately sampled during this survey.



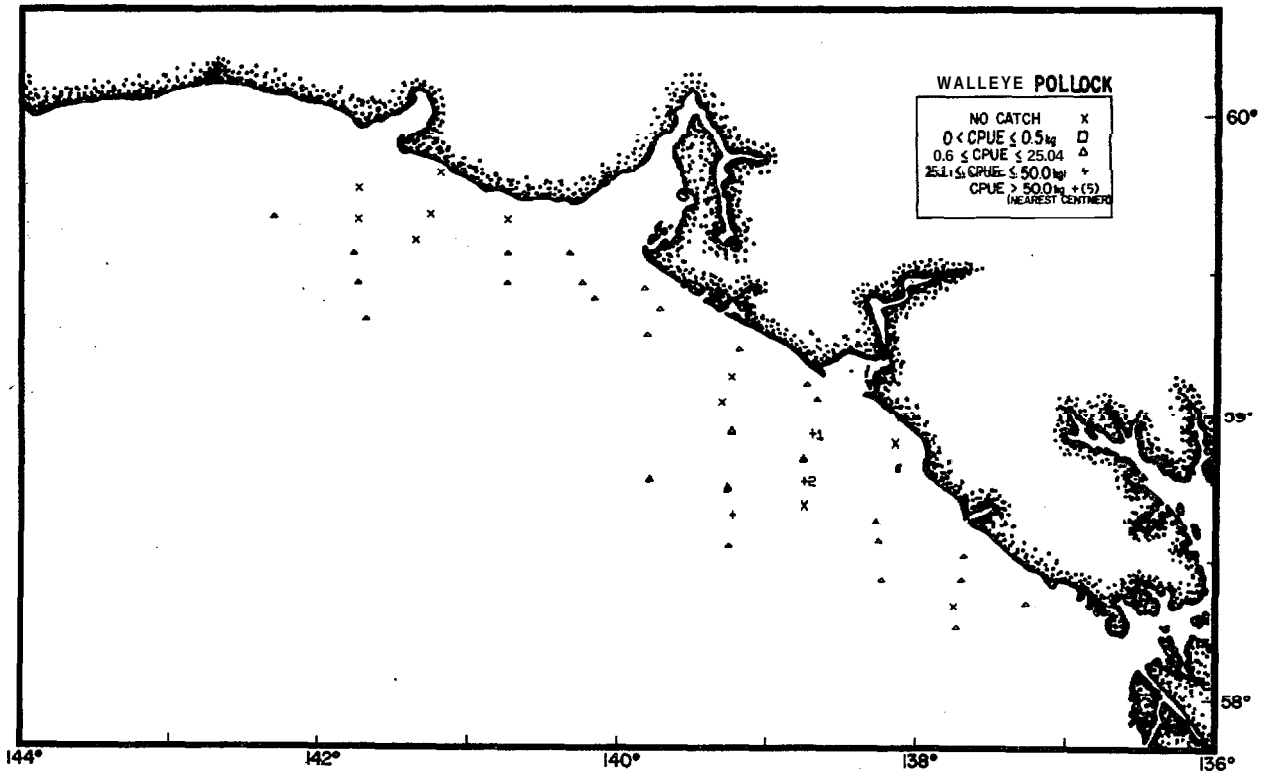


Figure M-373.--Distribuiton of standardized catch rates in **kg/hr** of walleye **pollock** in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-93.--Estimated biomass and population size of rex sole (Glyptocephalus zachirus) in the Gulf of Alaska dur
September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (x 106)	Proportion of total estimated population	Mean size individual Weight (kg)	Mean size individual Length (cm)
Fairweather	l-100	25.6	1097.4	25.5	5.5	33.5	0.20	--
	101-200	14.9	2898.4	67.3	9.4	57.3	0.31	--
	201-400	8.7	313.0	7.3	1.5	9.2	0.21	--
	All zones	15.8	4308.8	35.6	16.4	27.3	0.26	--
Yakutat	l-100	1.2	89.3	14.0	0.7	19.4	0.12	--
	101-200	1.8	315.4	49.6	1.6	44.4	0.20	--
	201-400	2.8	231.2	36.4	1.3	36.1	0.17	--
	All zones	1.9	635.9	5.3	3.6	6.0	0.17	--
Prince William	l-100	3.7	484.5	36.5	2.8	35.4	0.17	--
	101-200	3.0	448.1	33.7	3.0	38.0	0.15	--
	201-400	9.1	396.0	29.8	2.1	26.6	0.19	--
	All zones	4.1	1328.6	11.0	7.9	13.1	0.17	--
Kenai	1-100	--	--	--		--	--	--
	101-200	9.6	3326.3	56.9	19.0	59.0	0.18	--
	201-400	18.5	2520.3	43.1	13.2	51.0	0.19	30.
	All zones	10.0	5846.6	48.2	32.2	53.6	0.18	--
Total	l-100	4.7	1671.2	13.8	9.0	15,0	0.19	--
	101-200	8.1	6988.2	57.7	33.0	54.9	0.21	--
	201-400	11.6	3460.5	28.6	18.1	30,1	0.19	--
	All zones	8.0	12119.9	100.0	60.1	100.0	0.20	--

1/ Mean catch per unit effort, in kilograms per hour trawled,
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

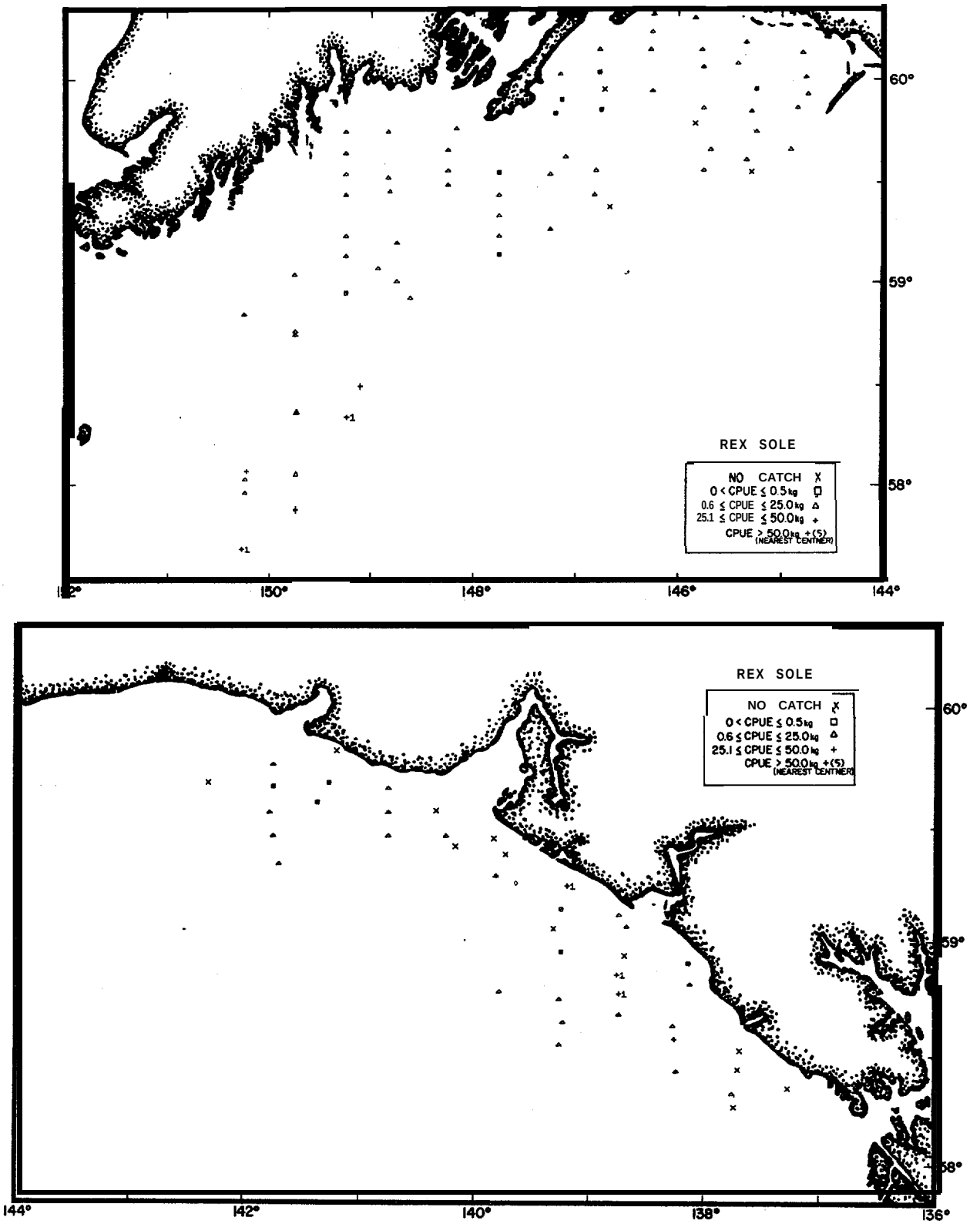


Figure XI-374.--Distribution of standardized catch rates in kg/hr of rex sole in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

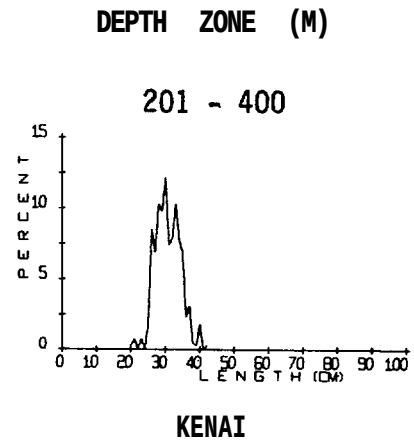


Figure X1-375.-Percentage length frequencies of rex sole from the Gulf of Alaska (Cruise 629).

Size composition-On the Kenai upper slope where random length frequency data are available, Dover sole, sexes combined, ranged in size from 27-41 cm and averaged 30.4 cm (Figure XI-383).

SCALLOPS

Distribution and Abundance--Scallops had a relatively limited distribution, appearing mainly in the inner shelf depth zone of the eastern regions which resulted in an overall mean CPUE of only 2 kg/hr (Table X1-100). The highest mean CPUE occurred in the Fair-weather region (10 kg/hr) (Figure XI-384).

Biomass--Of the 3,600 mt of apparent biomass of scallops, 58% occurred in the inner shelf, 41% in the outer shelf and only 1% in the upper slope. The Fair-weather region accounted for 80% of the total biomass, and the Yakutat region 12%. The biomass estimate for scallops should be considered minimal as the otter trawls used in these surveys are not an efficient gear for harvesting scallops.

Table XI-94.--Estimated biomass and population size of Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska duri
September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total 'estimated population	Mean size pe individual? Weight (kg)	Leng (cm
Fairweather	l-100	2.6	112.9	16.3	0.1	33.3	1.88	--
	101-200	3.0	579.1	83.7	0.2	66.7	2.45	--
	201-400	0	0	0	0	0	--	--
	All zones	2.5	692.0	7.2	0.3	2.9	2.31	--
Yakutat	1-100	1.8	134.0	4.6	0.2	6.5	0.60	--
	101-200	12.6	2205.1	76.3	2.2	71.0	1.00	--
	201-400	6.8	552.8	19.1	0.7	22.6	0.82	--
	All zones	8.7	2891.9	29.9	3.1	30.1	3 x -	--
Prince William	l-100	1.1	138.7	11.0	0.8	34.8	0.18	--
	101-200	6.3	948.5	75.1	1.4	60.9	0.68	--
	201-400	4.0	175.6	13.9	0.1	4.4	1.28	--
	All zones	3.9	1262.8	13.1	2.3	22.3	0.55	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	5.7	1993.3	41.3	2.6	56.5	0.78	--
	201-400	20.8	2833.4	58.7	2.0	43.5	1.41	--
	All zones	8.2	4826.7	49.9	4.6	44.7	1.05	--
Total	l-100	1.1	385.6	4.0	1.1	10.7	0.35	--
	101-200	6.6	5726.0	59.2	6.4	62.1	0.89	--
	201-400	12.0	3561.8	36.8	2.8	27.2	1.27	--
	All zones	6.4	9673.4	100.0	10.3	100.0	0.94	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals,
5/ Less than 0.1 percent.

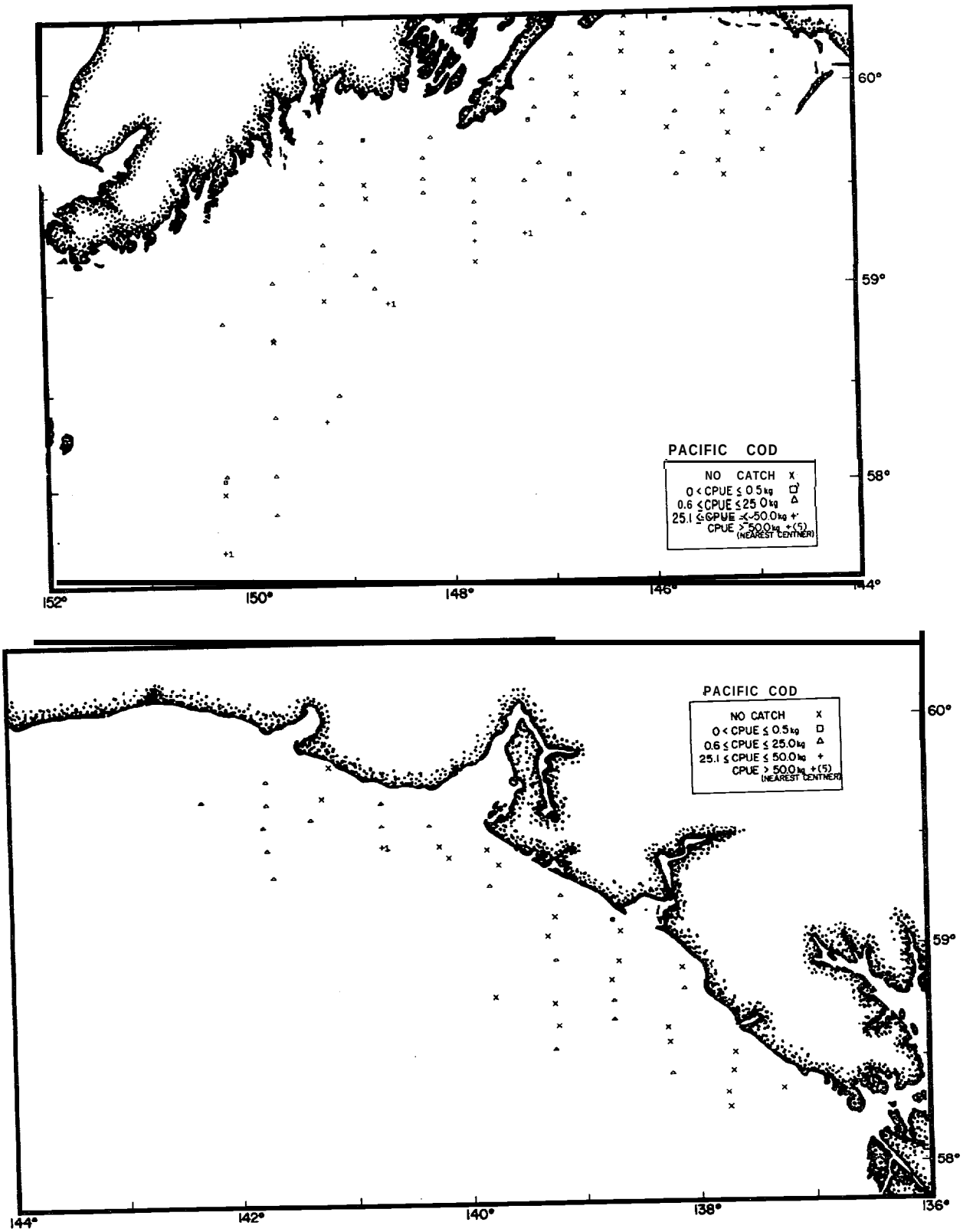


Figure X1-376.--Distribution of standardized catch rates in **kg/hr** of Pacific cod in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-95.--Estimated biomass and population size of sablefish (*Anoplopoma fimbria*) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0.6	25.3	0.4	0.1	1.7	0.42	--
	101-200	21.4	4156.3	70.8	4.9	84.5	0.85	--
	201-400	47.0	1685.2	28.7	0.8	13.8	2.24	--
	All zones	21.5	5866.8	69.4	5.8	67.4	-m	--
Yakutat	l-100	0	0	0	0	0	--	--
	101-200	0.3	58.3	100.0	0.1	100.0	~~0.45~~	--
	201-400	0	0	0	0	0	--	--
	All zones	0.2	58.3	0.7	0.1	1.2	0.45	--
Prince William	l-100	1.8	234.0	25.4	0.6	56.2	0.36	--
	101-200	1.8	264.6	28.7	0.4	30.8	0.61	--
	201-400	9.8	424.0	46.0	0.3	23.1	1.42	--
	All zones	2.9	922.6	10.9	1.3	15.1	0.71	--
Kenai	l-100	--	--		--	--	--	--
	101-200	1.7	585.8	36.5	0.8	57.1	0.71	48.2
	201-400	7.5	1017.9	63.5	0.6	42.9	1.59	--
	All zones	2.7	1603.7	19.0	1.4	16.3	-1.15	--
Total	l-100	0.7	259.3	3.1	0.7	8.1	0.37	--
	101-200	5.8	5065.0	59.9	6.2	72.1	0.82	--
	201-400	10.5	3127.1	37.0	1.7	19.8	0.16	--
	All zones	5.6	8451.4	100.0	8.6	100.0	0.98	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

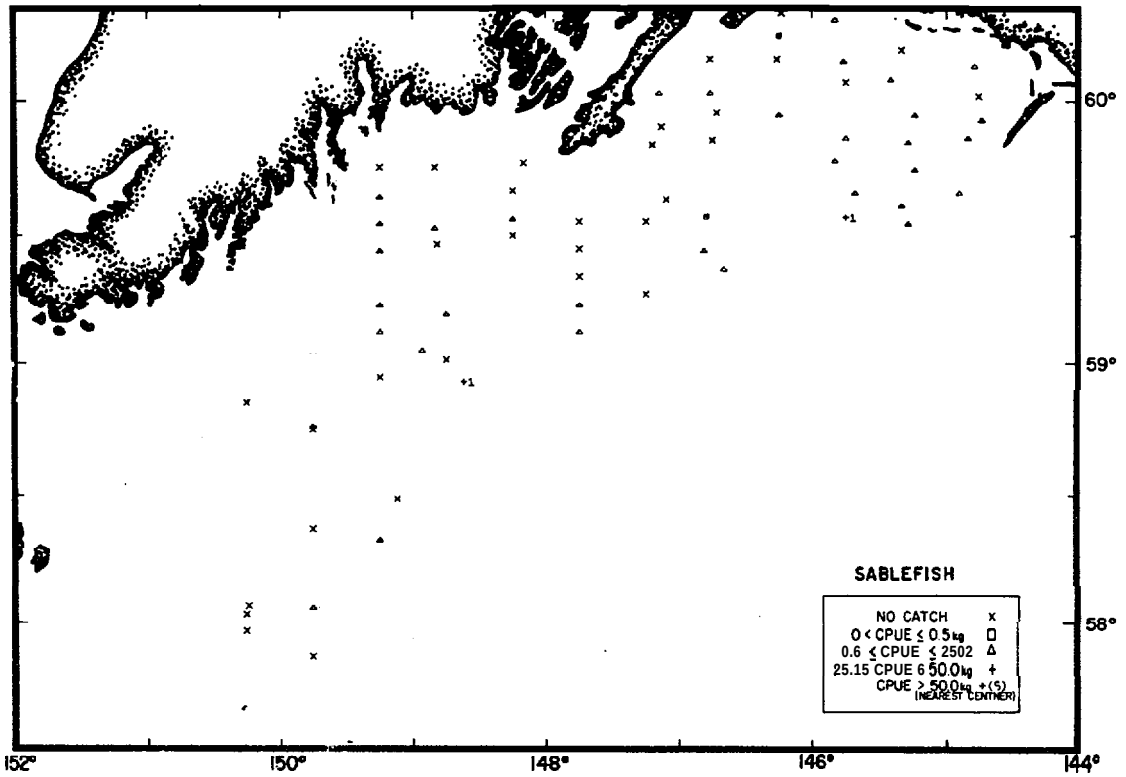


Figure XI-377.--Distribution of standardized catch rates in **kg/hr** of **sablefish** in the eastern Gulf of Alaska, Sept.-Nov.. 1962 (Cruise 629).

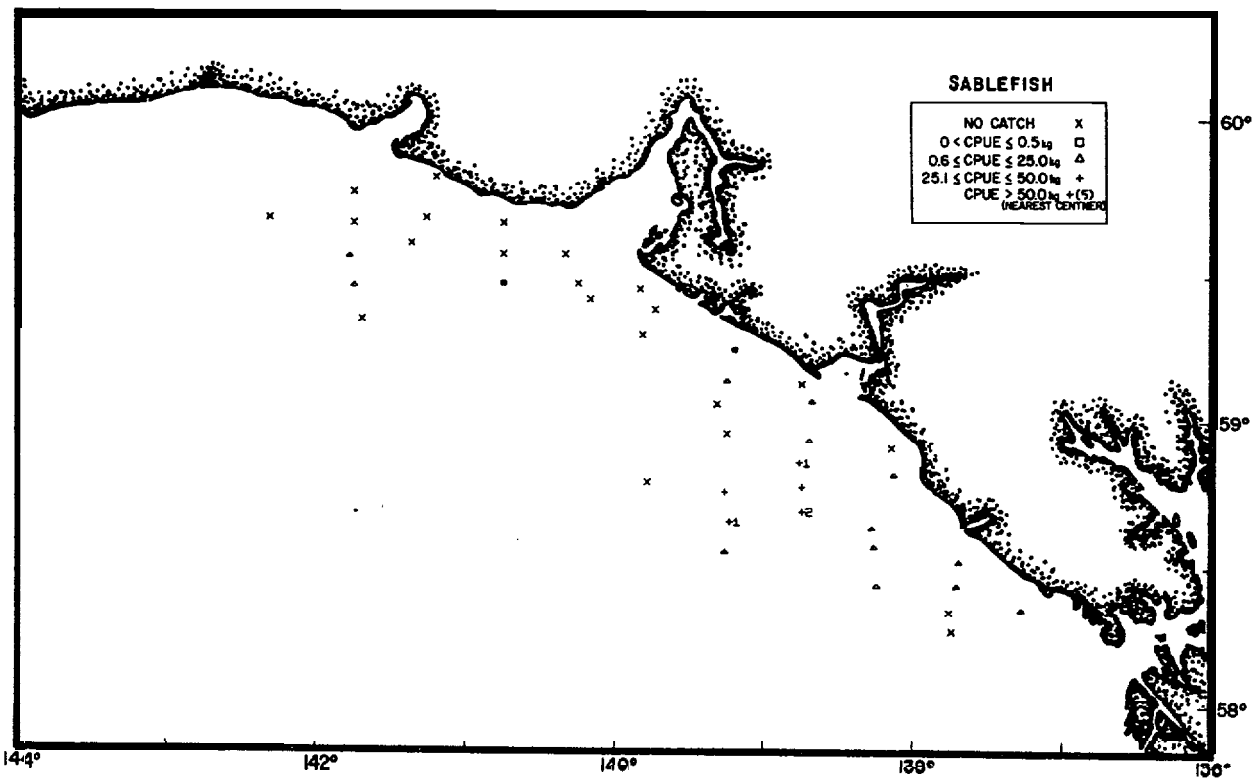
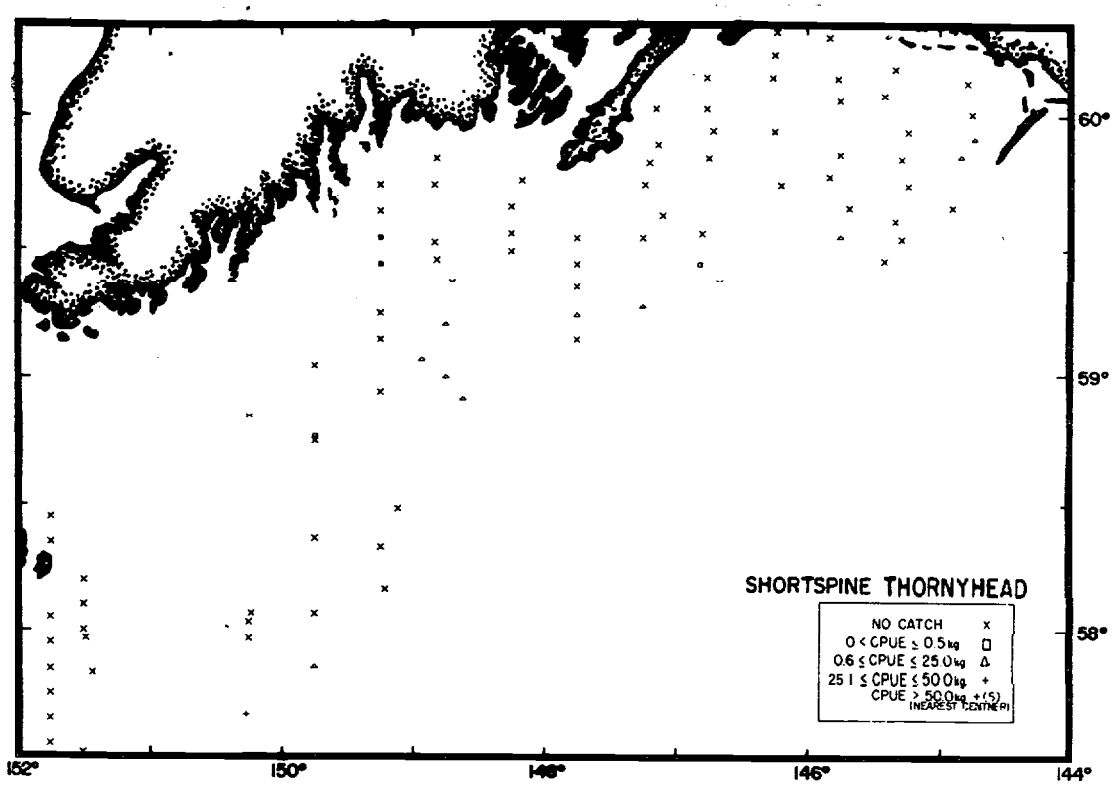


Figure X1-378.--Distribution of standardized catch rates in **kg/hr** of **sablefish** in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-96.--Estimated biomass and population size of shortspine thornyhead (Sebastolobus alascanus) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total 'estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fair-weather	l-100	0	0	0	0	0	--	--
	101-200	6.2	1209.1	36.4	2.5	27.5	0.48	--
	201-400	58.9	2112.8	63.6	6.6	72.5	0.32	--
	All zones	12.1	3321.9	46.5	9.1	43.3	0.37	--
Yakutat	1-100	0.1	7.8	0.2	4/	5/	0.32	--
	101-200	11.7	2032.1	68.4	6.8	70.8	0.29	--
	201-400	11.4	932.0	31.4	2.8	29.2	0.34	--
	All zones	9.0	2971.9	41.6	9.6	45.7	0.31	--
Prince William	l-100	0	0	0	0	0	--	--
	101-200	0.3	52.6	22.4	0.1	25.0	0.42	--
	201-400	4.2	182.3	77.6	0.3	75.0	0.60	--
	All zones	0.7	234.9	3.3	0.4	1.9	0.59	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	0.3	118.6	19.4	0.2	10.5	0.76	--
	201-400	3.6	492.4	80.6	1.7	89.5	0.29	--
	All zones	1.0	611.0	8.6	1.9	9.1	0.32	--
Total	l-100	3/	7.8	0.1	4/	5/	--	--
	101-200	3.9	3412.4	47.8	9.6	45.7	0.36	--
	201-400	12.5	3719.5	52.1	11.4	54.3	0.33	--
	All zones	4.7	7139.7	100.0	21.0	100.0	0.34	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.



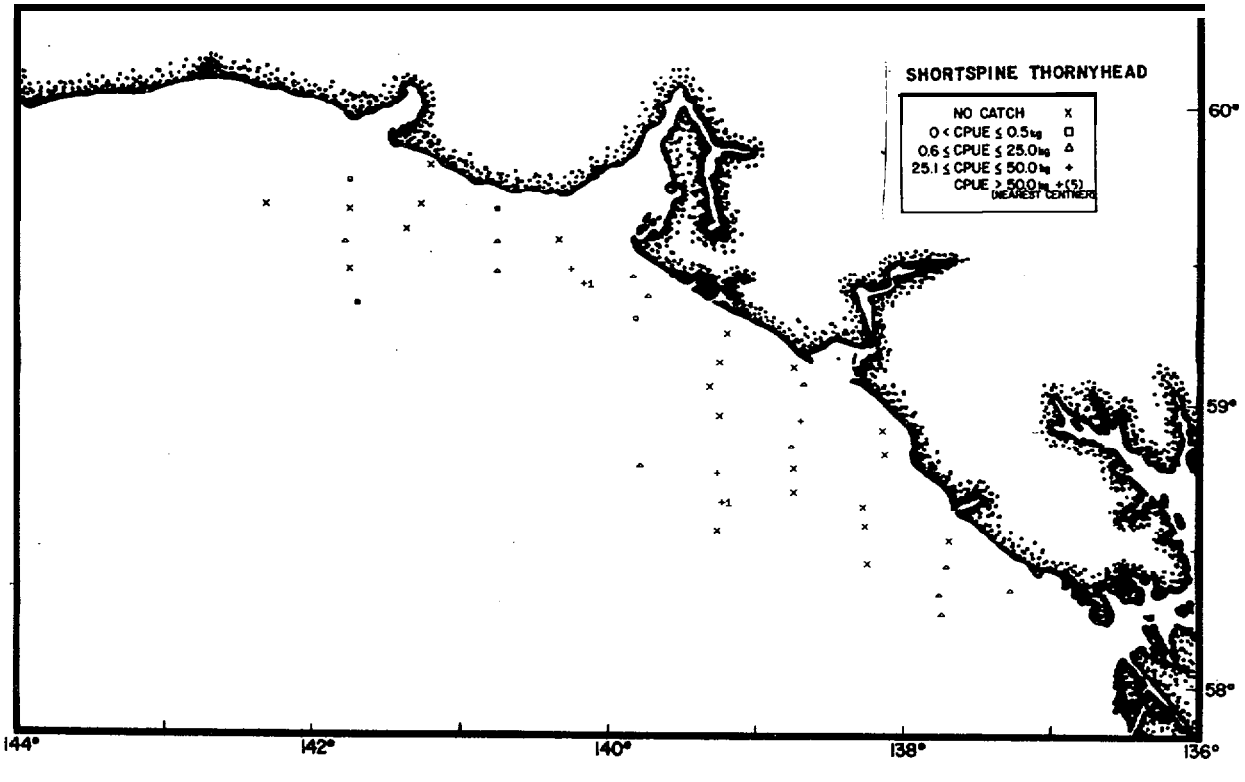
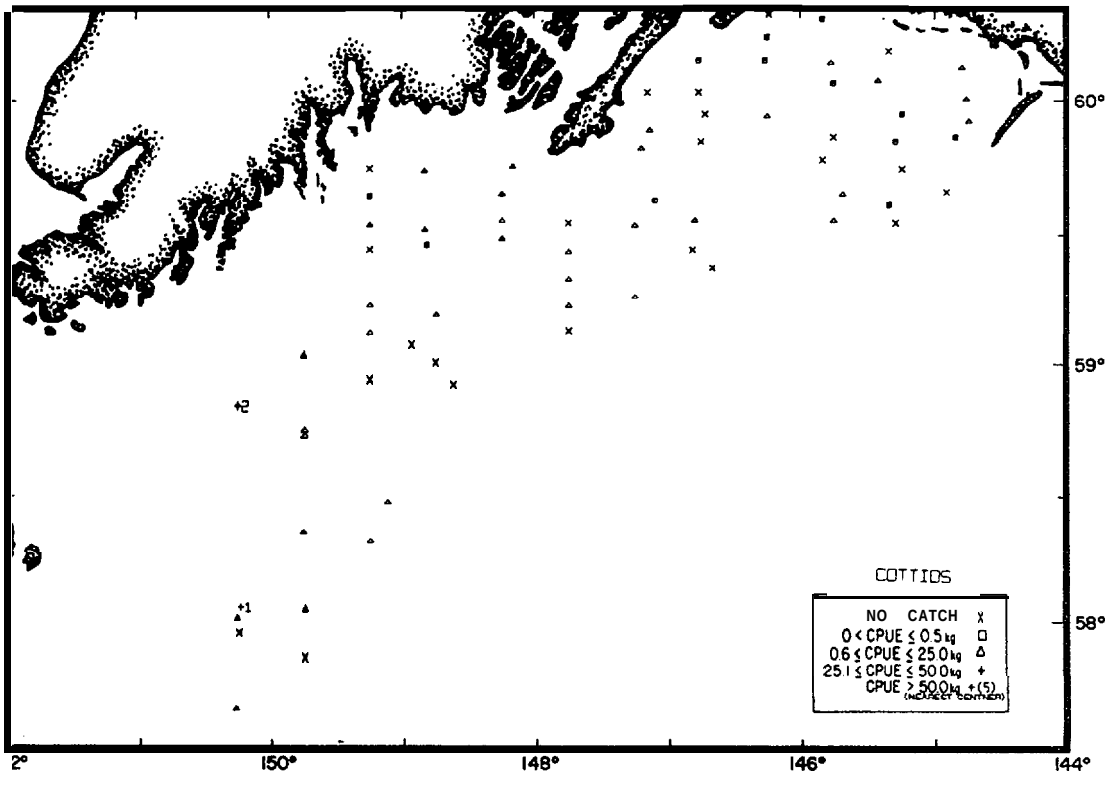


Figure XI-379.--Distribution of standardized catch rates in kg/hr of shortspine thornyhead in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-97.--Estimated biomass and population size of cottids (Cottidae) in the Gulf of Alaska during Septembe November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	proportion of total estimated biomass	Estimated population (x 106)	Proportion of total 'estimated population	Mean siz individu Weight (kg)
Fairweather	l-100	0.1	2.7	2.8	4/	5/	0.16
	101-200	0.5	94.0	97.2	0.7	100	0.13
	201-400	0	0	0	0	0	--
	All zones	0.4	96.7	1.4	0.7	3.2	0.14
Yakutat	l-100	0.1	5.6	2.2	4/	5/	0.11
	101-200	1.4	249.2	97.8	0.1	100	1.91
	201-400	0	0	0	0	0	--
	All zones	0.8	254.8	3.8	0.1	0.5	1.42
Prince William	l-100	0.4	46.4	10.5	0.4	25.5	0.13
	101-200	1.8	277.5	62.8	1.1	64.7	0.25
	201-400	2.7	117.7	26.7	0.2	il.8	0.56
	All zones	1.4	441.6	6.6	1.7.	7.8	0.26
Kenai	l-100	--	--	--	--	--	--
	101-200	16.5	5756.7	96.7	18.9	97.9	0.30
	201-400	1.4	193.8	3.3	0.4	2.1	0.51
	All zones	10.1	5950.5	88.2	19.3	88.5	0.31
Total	l-100	0.2	54.7	0.8	0.4	1.8	0.14
	101-200	7.3	6377.4	94.6	20.8	95.4	0.31
	201-400	1.0	311.5	4.6	0.6	2.75	0.52
	All zones	4.5	6743.6	100.0	21.8	100.0	0.31

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10 individuals.
5/ Less than 0.1 percent.



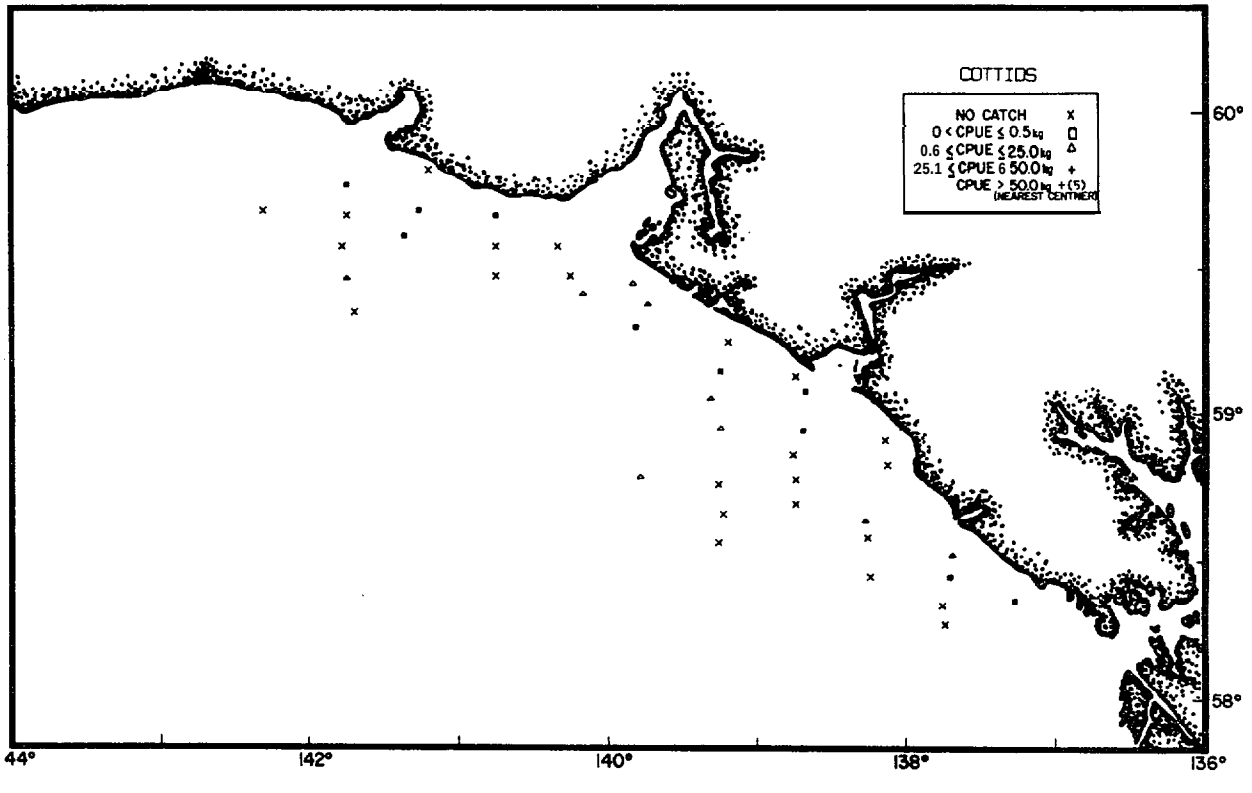
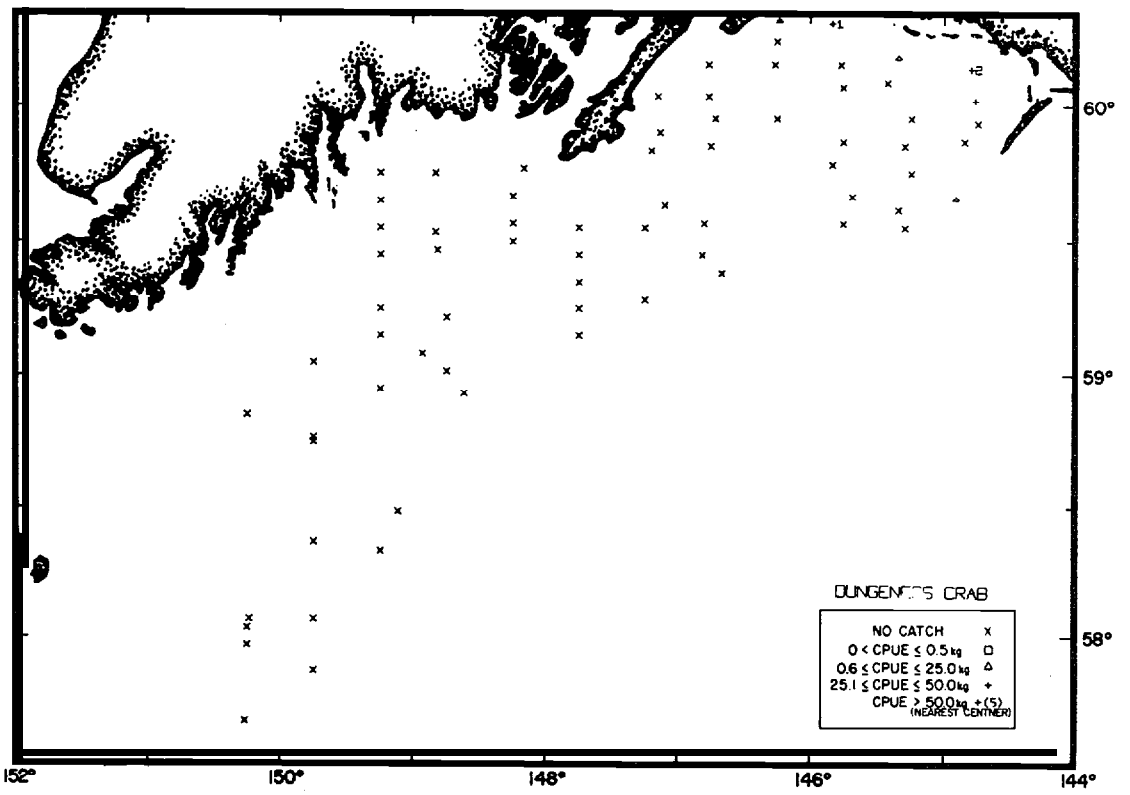


Figure XI-380.--Distribution of standardized catch rates in kg/hr of cottids in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-98.--Estimated biomass and population size of Dungeness crab (Cancer magister) in the Gulf of Alaska du September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr).	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total 'estimated population	Mean size individua Weight I (kg)
Fairweather	l-100	23.9	1023.9	94.7	0.6	85.7	1.68
	101-200	0.3	57.3	5.3	0.1	14.3	0.98
	201-400	0	0	0	0	0	--
	All zones	4 .	1081.2	19.0	0.7	8.8	1.54
Yakutat	l-100	1.3	95.7	100	0.1	100	0.91
	101-200	0	0	0	0	0	--
	201-400	0	0	0	0	0	--
	All zones	0.3	95.7	1.7	0.1	1.3	0.91
Prince William	l-100	34.3	4520.6	100	7.2	100	0.63
	101-200	0	0	0	0	0	--
	201-400	0	0	0	0	0	--
	All zones	13.9	4520.6	79.3	7.2	90.0	0.63
Kenai	l-100	--	--	--	--	--	--
	101-200	0	0	0	0	0	--
	201-400	0	0	0	0	0	--
	All zones	0	0	0	0	-ii-	--
Total	l-100	15.6	5640.2	99.0	7.9	98.8	0.71
	101-200	0.1	57.3	1.0	0.1	1.3	0.57
	201-400	0	0	0	0	0	--
	All zones	3.8	5697.5	100.0	8.0	100	-0.71

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available,
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



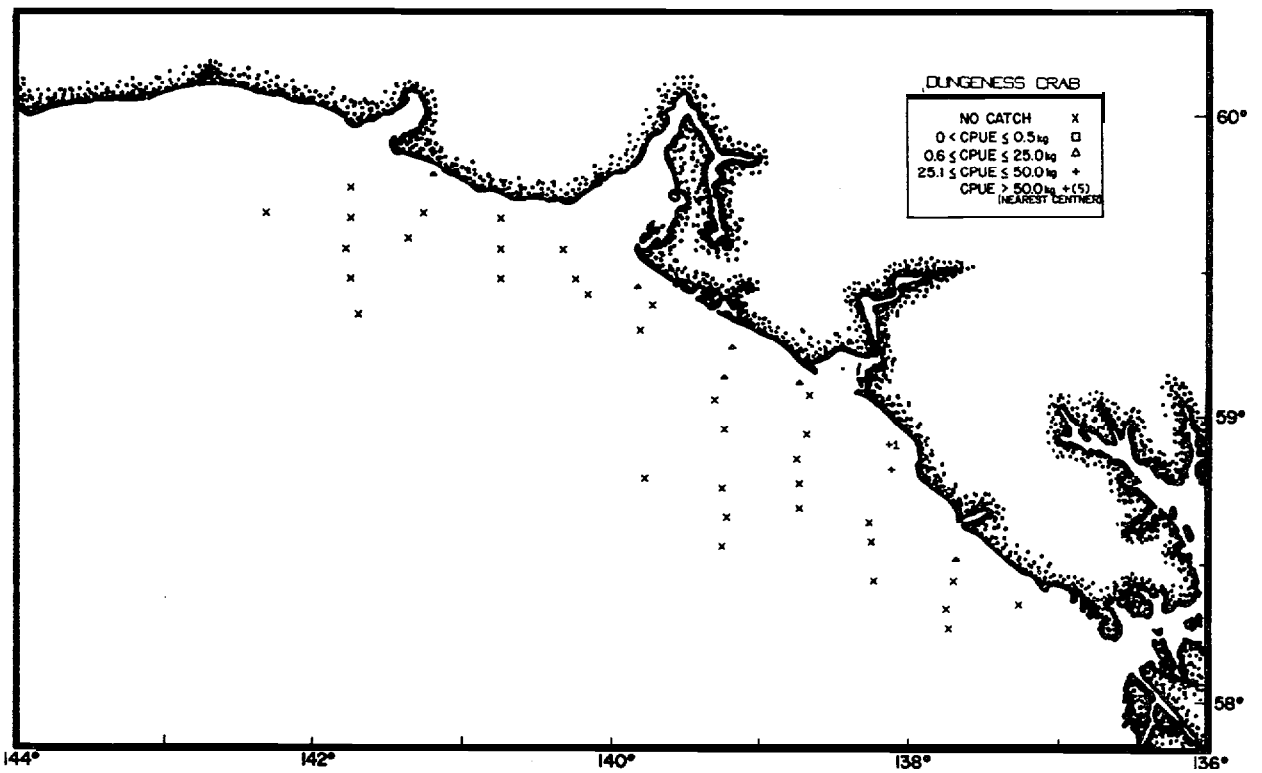
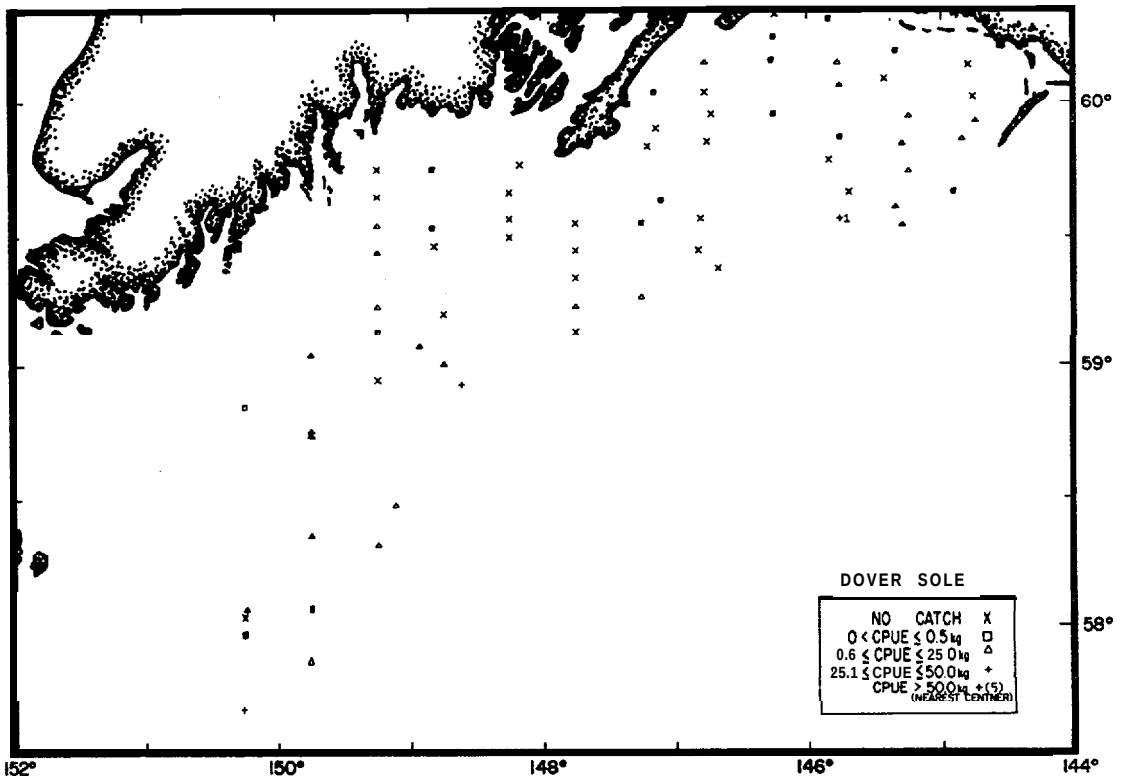


Figure XI-381.--Distribution of standardized catch rates in kg/hr of dungeness crab in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-99.--Estimated biomass and population size of Dover sole (Microstomus pacificus) in the Gulf of Alaska du: September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total 'estimated population	Mean size p individual; Weight (kg)	Len (c
Fairweather	l-100	1.7	71.2	3.1	0.3	6.8	0.22	--
	101-200	7.9	1524.8	66.9	2.6	59.1	0.60	--
	201-400	19.1	684.5	30.0	1.5	34.1	0.45	--
	All zones	8.4	2280.5	47.1	4.4	36.1	0.52	--
Yakutat	l-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	0.2	17.9	100	4/	100.0	0.36	--
	All zones	3/	17.9	0.4	4/	5/	0.36	
Prince William	l-100	0.2	24.7	3.8	0.2	9.5	0.15	
	101-200	0.7	112.5	17.3	0.5	23.8	0.21	
	201-400	11.8	514.3	78.9	1.4	66.7	0.37	
	All zones	2.0	651.5	13.5	2.1	17.2	0.31	
Kenai	l-100	--	--	--	--	--	--	
	101-200	2.2	766.9	40.5	2.5	43.9	0.30	
	201-400	8.3	1127.2	59.5	3.2	56.1	0.35	30
	All zones	3.2	1894.1	39.1	5.7	46.7	0.33	
Total	l-100	0.3	95.9	2.0	0.5	4.1	0.19	
	101-200	2.8	2404.2	49.6	5.6	45.9	0.43	
	201-400	7.9	2343.9	48.4	6.1	50.0	0.38	
	All zones	3.2	4844.0	100.0	12.2	100.0	0.40	

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



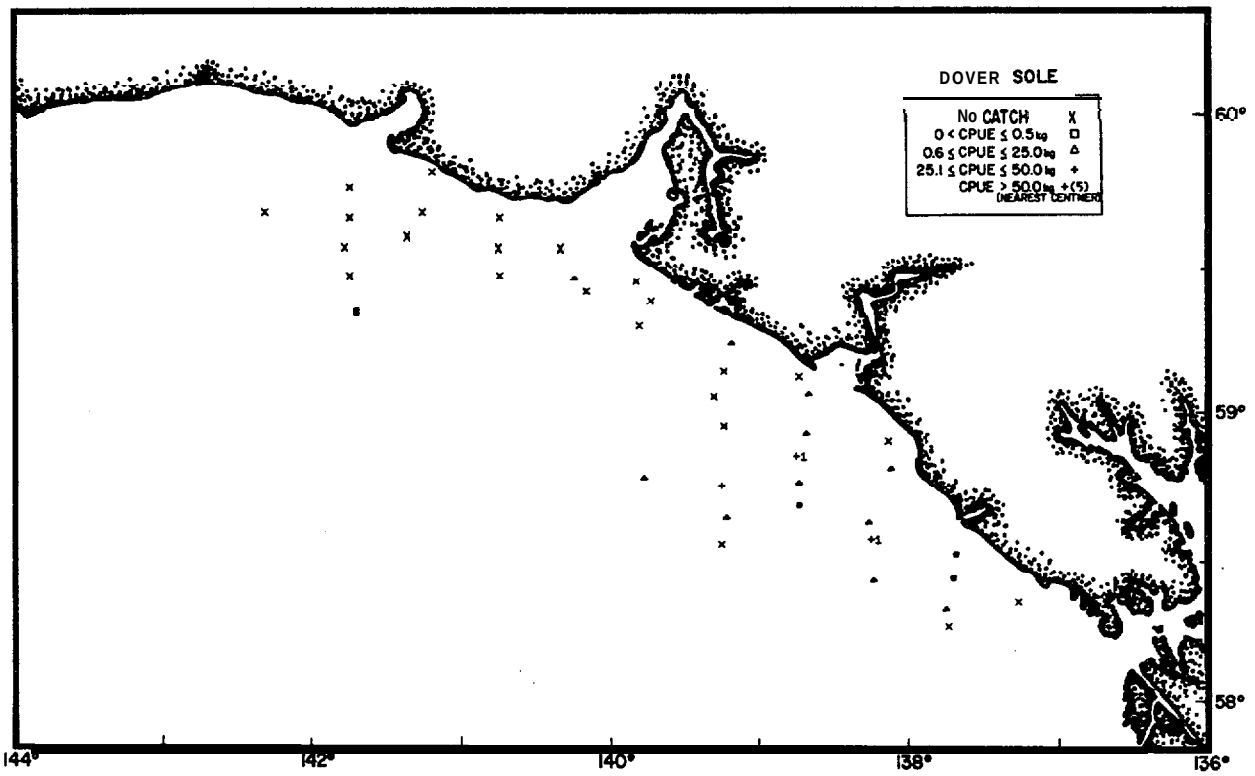


Figure XI-382.--Distribution of standardized catch rates in kg/hr of Dover sole in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

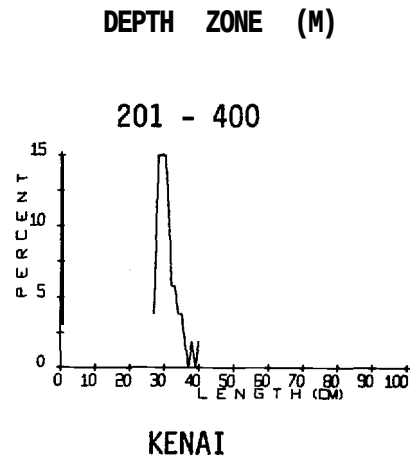


Figure XI-383.-Percentage length frequencies of Dover sole from the Gulf of Alaska (Cruise 629).

Size composition--No size composition data were taken for this species.

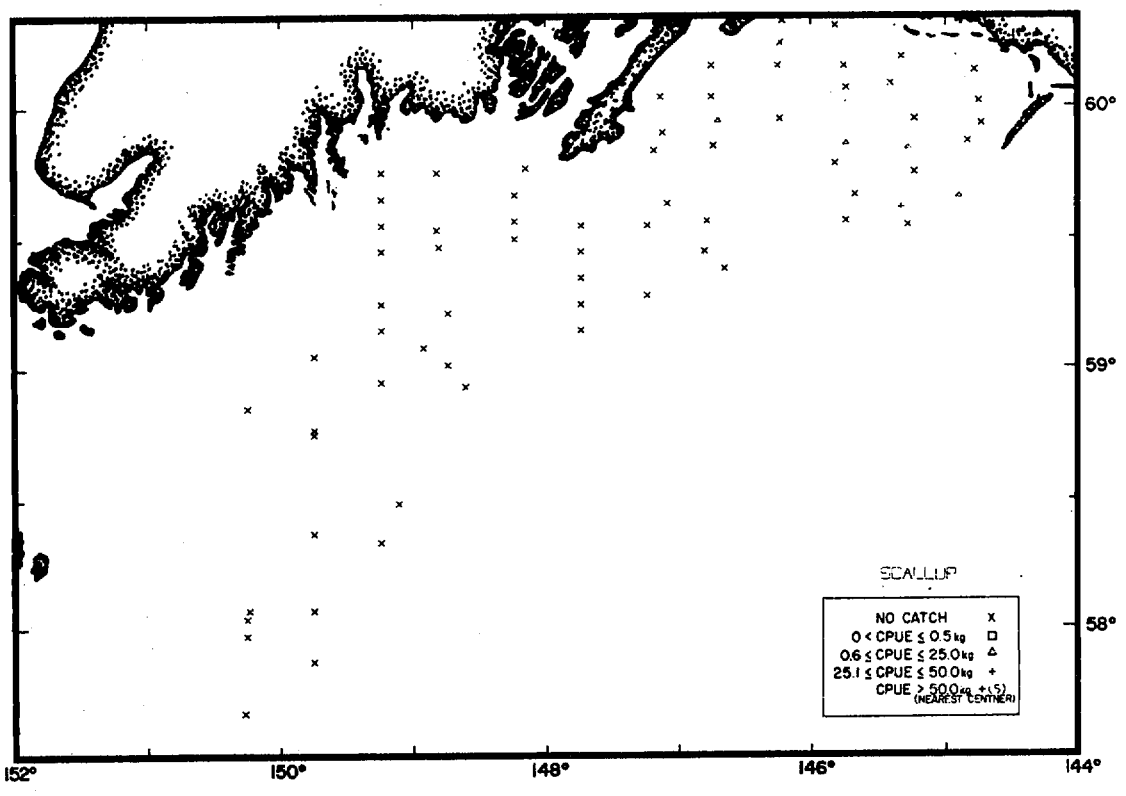
OTHER SPECIES

Several species which had low overall mean catch rates, produced relatively high levels of abundance within restricted distributions (Table x1-101). In the Fairweather region butter sole, starry flounder and English sole averaged over 10 kg/hr in the inner shelf and spiny dogfish in all three depth zones. The mean CPUE for starry flounder, also exceeded the 10 kg/hr catch rate in the Prince William region.

Table XI-100.--Estimated biomass and population size of scallops (Pectinidae) in the Gulf of Alaska during September-November 1962.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	41.3	1773.0	62.0	6.8	66.7	0.26	--
	101-200	5.6	1088.1	38.0	3.4	33.3	0.32	--
	201-400	0	0	0	0	0	--	--
	All zones	10.5	2861.1	79.7	10.2	75.6	0.28	--
Yakutat	l-100	3.8	279.2	67.2	1.2	66.7	0.23	--
	101-200	0.6	98.9	23.8	0.4	22.2	0.23	--
	201-400	0.4	37.1	8.9	0.2	11.1	0.23	--
	All zones	1.3	415.2	11.6	1.8	13.3	0.23	--
Prince William	l-100	0.2	32.0	10.2	0.3	20.0	0.11	--
	101-200	1.9	282.7	89.8	1.2	80.0	0.23	--
	201-400	0		0	0	0	--	--
	All zones	1.0	3140.7	5/	1.5	11.1	0.21	--
Kenai	l- 100	--	--	--	--	--	--	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	0	--	--
Total	l-100	5.9	2084.2	58.0	8.3	61.5	0.25	--
	101-200	1.7	1469.7	40.9	5.0	37.0	0.29	--
	201-400	0.1	37.1	1.0	0.2	1.5	0.19	--
	All zones	2.4	3591.0	99.8	13.5	100	0.27	--

L/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.



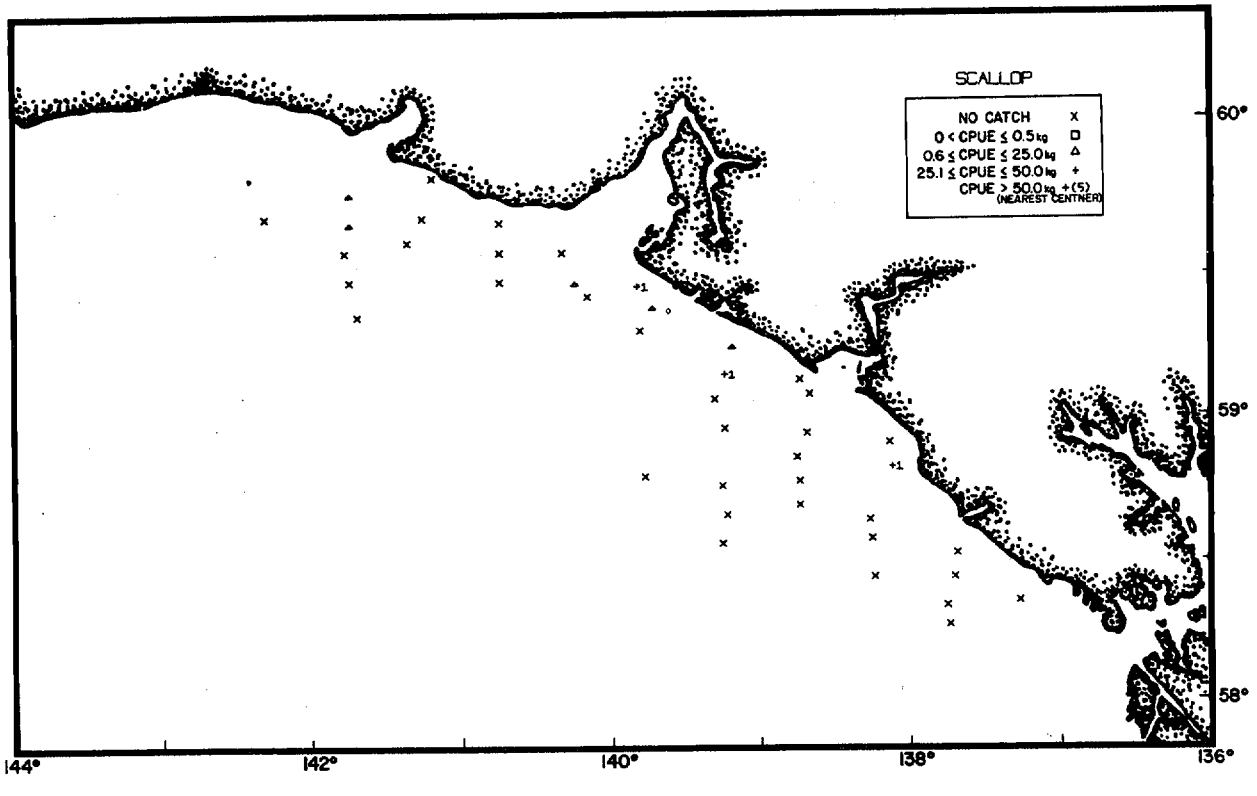


Figure XI-384.--Distribution of standardized catch rates in kg/hr of scallop in the eastern Gulf of Alaska, Sept.-Nov. 1962 (Cruise 629).

Table XI-101 .--Species of fish and invertebrates which occurred at mean CPUE's greater than 10 kg/hr in restricted distributions (Cruise 629).

Region	Species	DEPTH ZONES (M) 0 - 100	101 - 200	201 - 400
Fairweather	Butter sole	165	--	--
	Starry flounder	123	a-	--
	English sole	26	--	--
	Spiny dogfish	26	13	17
Prince William	Starry flounder	15	--	--

Cruises 733, 734, 744, 751, 753 and 762, R/V John N. Cobb and Chartered Fishing Vessel North Pacific (April-October 1973-76)

During the Gulf of Alaska surveys completed between 1973-1976, 310 stations were successfully sampled (Table X1-102). Sampling densities ranged from one station per 270 km2 in the Prince William region to one station per 902 km2 in the Sanak region, and averaged one station per 663 km2 over all regions. Sampling did not occur in the Shumagin region and the Kenai inner shelf. By depth zones, the highest sampling density occurred in the outer shelf, with one station per 559 km2. Lower densities of one station per 623 km^2, and one station per 1006 km^2 occurred in the upper slope and inner shelf. Station numbers and positions of the successful tows are presented for each cruise in Figures X1-385-389. Fish and important invertebrate species encountered during these surveys listed in Tables V-3 and V-4.

TOTAL BIOMASS

The total apparent biomass available between April and October of the 1973-76 survey period has been estimated at 1,922 thousand metric tons, of which 24% was located on the inner shelf, 57% on the outer shelf and 19% on the upper slope (Table XI-103 and Figures X1-390-391). Three western regions accounted for 64% of the total apparent biomass in the Gulf of Alaska. Sanak and Kodiak each contributed 24% while the Chirikof region accounted for 16%.

The biomass density over the Gulf of Alaska averaged 10.9 mt/km^2, and ranged. from 5.4 and 5.7 mt/km^2 in the Fairweather and Shelikof regions to 18.4 and 18.6 mt/km^2 in the Sanak and Kodiak regions. Within regions, Sanak and Kodiak exceeded 20 mt/km^2 in the outer shelf and upper slope depth zones, while the highest density of 28.3 mt/km^2 occurred in the Prince William upper slope. Over the entire Gulf of Alaska, the outer shelf depth zone had the greatest biomass density (12.6 mt/km^2) followed by the inner shelf and upper slope. The standardized total catch rate encountered at each successful station is plotted by individual cruises in Figures X1-392-396.

RELATIVE IMPORTANCE OF SPECIES GROUPS

The combined fish species accounted for 86% of the total biomass in the Gulf of Alaska. This contribution was greatest in the outer shelf and upper slope depth zones, where the total fish accounted for 88 and 86% of the total biomass, while the inner shelf contribution was lower, 80%. By species groups, the roundfishes represented the greatest portion of the total biomass (49%), followed by flatfishes (33%), and invertebrates (15%) while the rockfishes and elasmobranchs each contributed less than 2% (Table XI-104).

Table XI-102.--Number of stations successfully trawled and sampling densities[1/] of regions and depth zones in the Gulf of Alaska during April-October 1973-76 (Cruises 733, 734, 744, 751, 753, and 762).

	DEPTH ZONES (M)											
	O-100			101-200			201-400			O-400		
Region	No. of stations	Area (km2)	Sampling density	No. of stations	Area (km2)	Sampling density	No. of stations	Area (km2)	Sampling density	No. of stations	Area (km2)	Sampling density
Fairweather	16	2,566	642	16	11,617	726	2	2,144	1,072	22	16,327	742
Yakutat	17	4,418 7,885	464 276	31	10,430	336	12	4,894	408	59		
Prince William				50	8,990	180	5	2,600	520	72	19,742 19,475	335 270
Kenai	0	--	--	25	19,183	767	8	7,927	991	33		
Kodiak	3	10,924	1,821	15	9,415	628	10	4,253	425	31	27,110 24,592	822 793
Shelikof	8	9,439 497	1,180 166	9	3,132	348	7	7,999	1,143	19		
Chirikof				19	12,749	671	19	10,585	557	46	32,773 11,628	612 712
Shumagin	0	--		0	--	--	0	--	--	0	--	--
Sanak	8	12,773		14	11,607	829	6	888	148	28	25,268	902
Total	62	48,502	782	179	87,123	487	69	41,290	598	310	176,915	571

1/ Sampling density = $\frac{\text{No. of km2}}{\text{No. of stations}}$

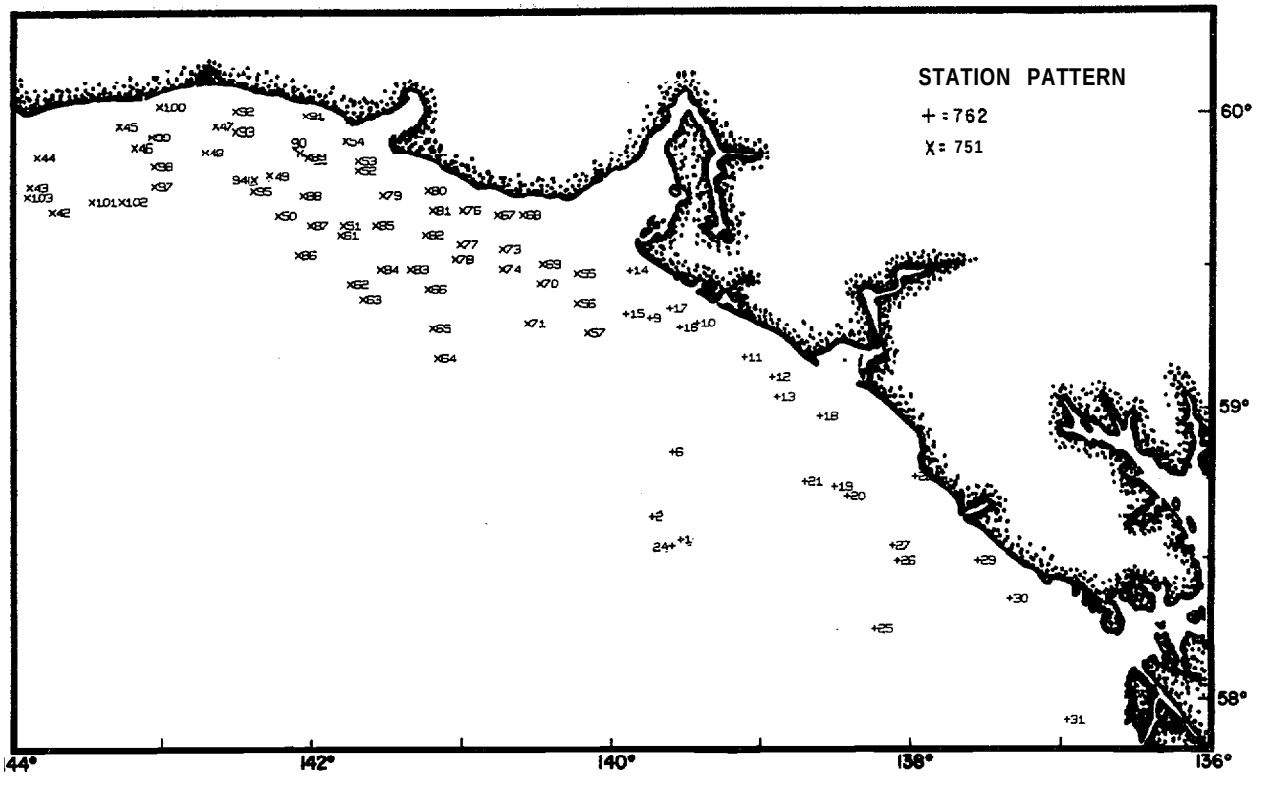


Figure XI-385.--Stations successfully trawled (otter trawl) during Cruises 751 and 762, May-Aug. 1975 and Apr. 1976.

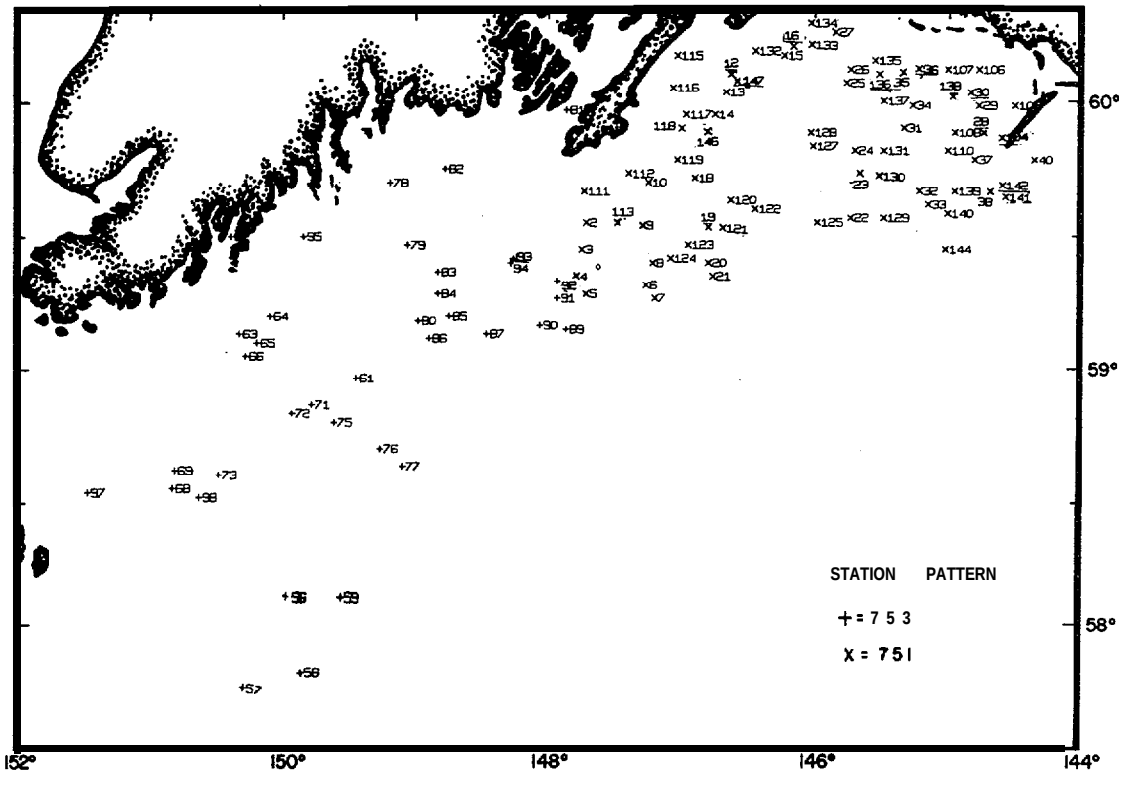


Figure XI-386.--Stations successfully trawled (otter trawl) during Cruises 751 and 753, May-Aug. 1975.

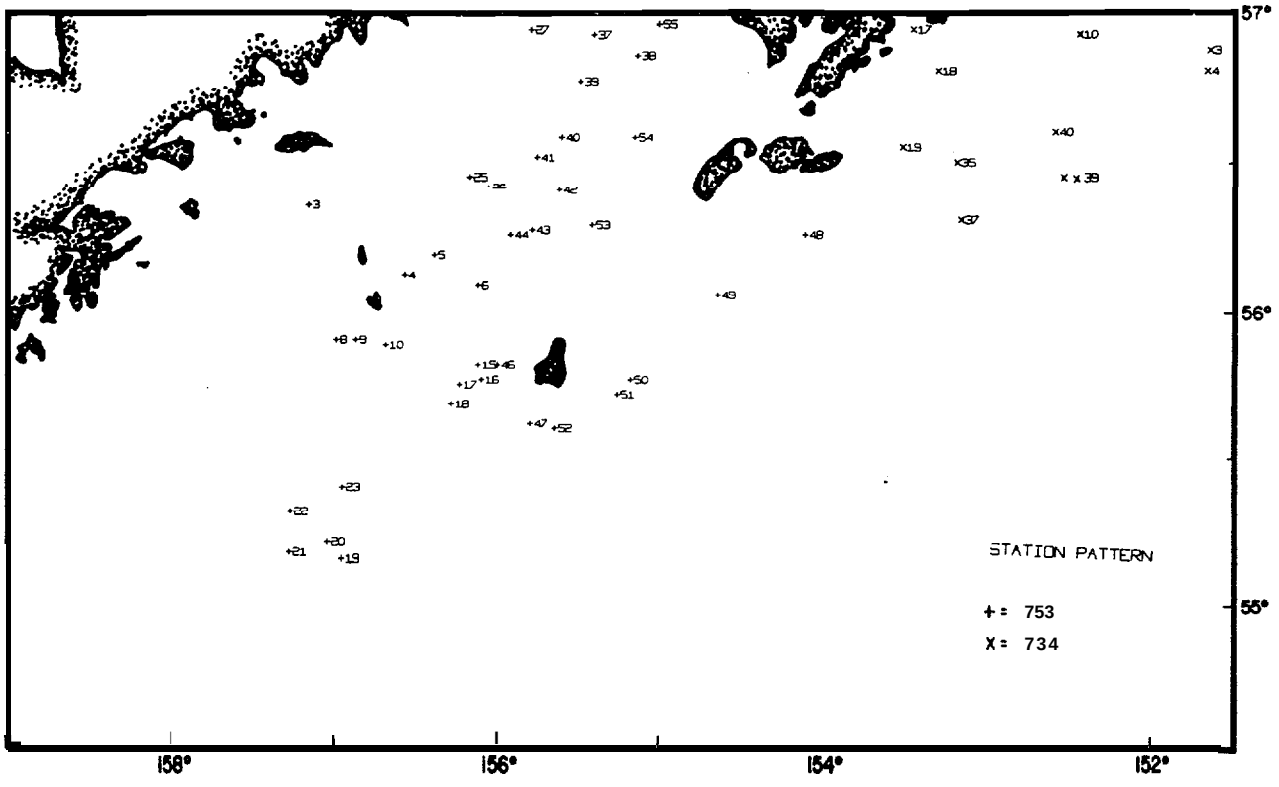


Figure XI-387.--Stations successfully trawled (otter trawl) during Cruises 734 and 753, Aug.-Oct. 1973 and Jun. -Aug. 1975.

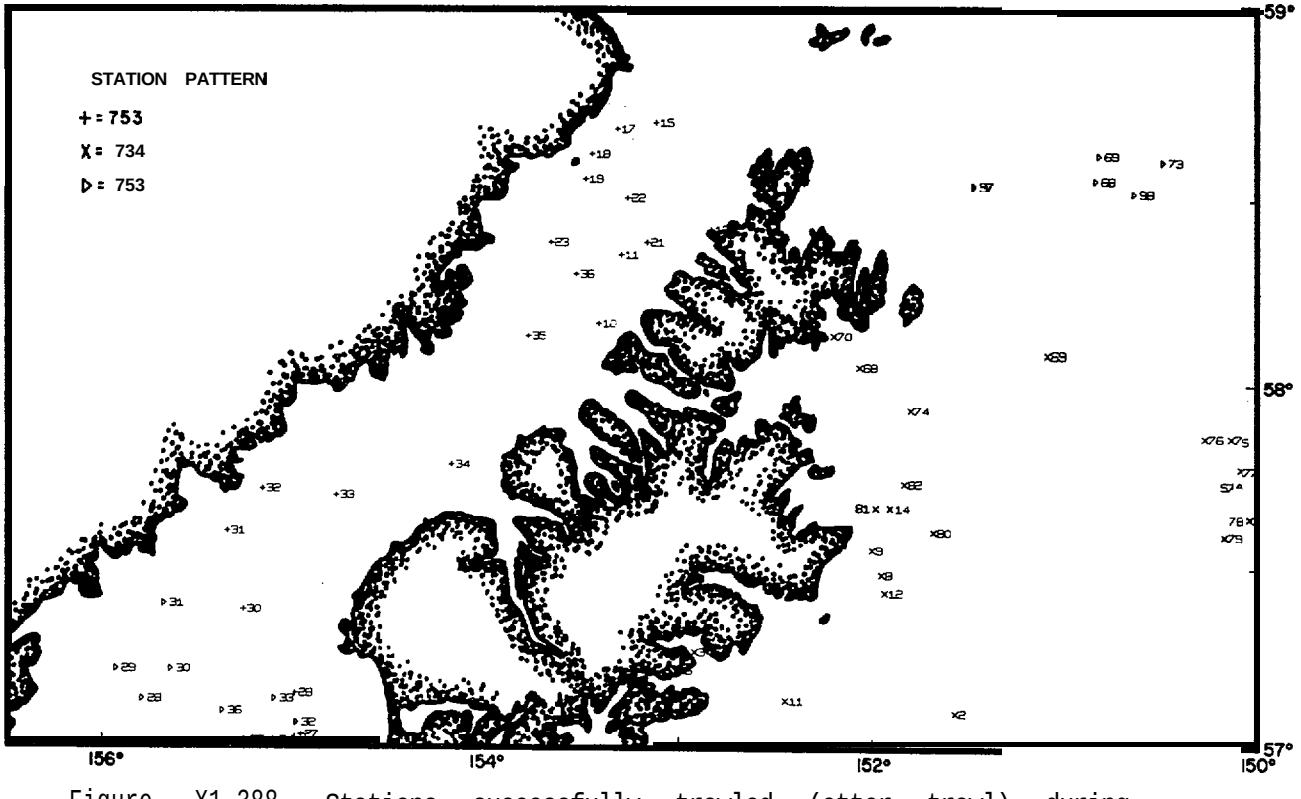


Figure X1-388.--Stations successfully trawled (otter trawl) during Cruises 733, 734, and 753, May-June 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975.

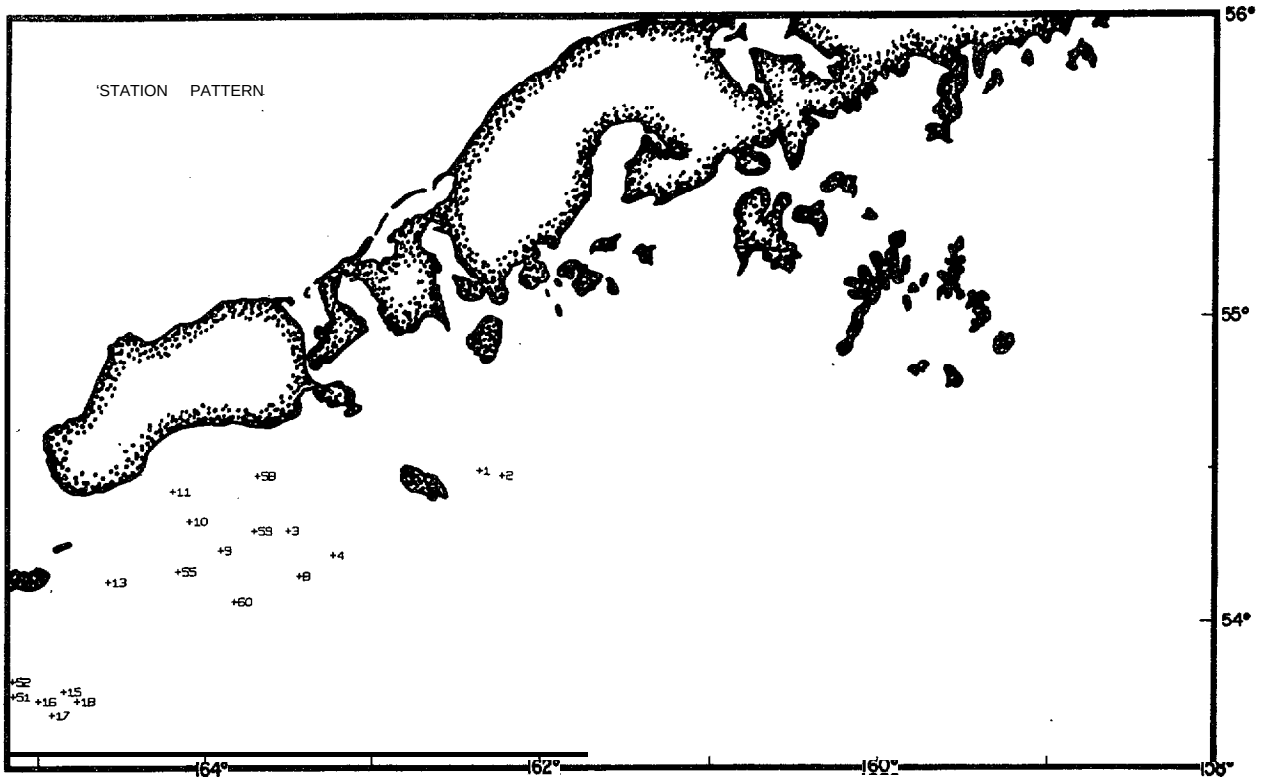


Figure XI-389.--Stations successfully trawled (otter trawl) during Cruise 744, Jul.-Aug. 1974.

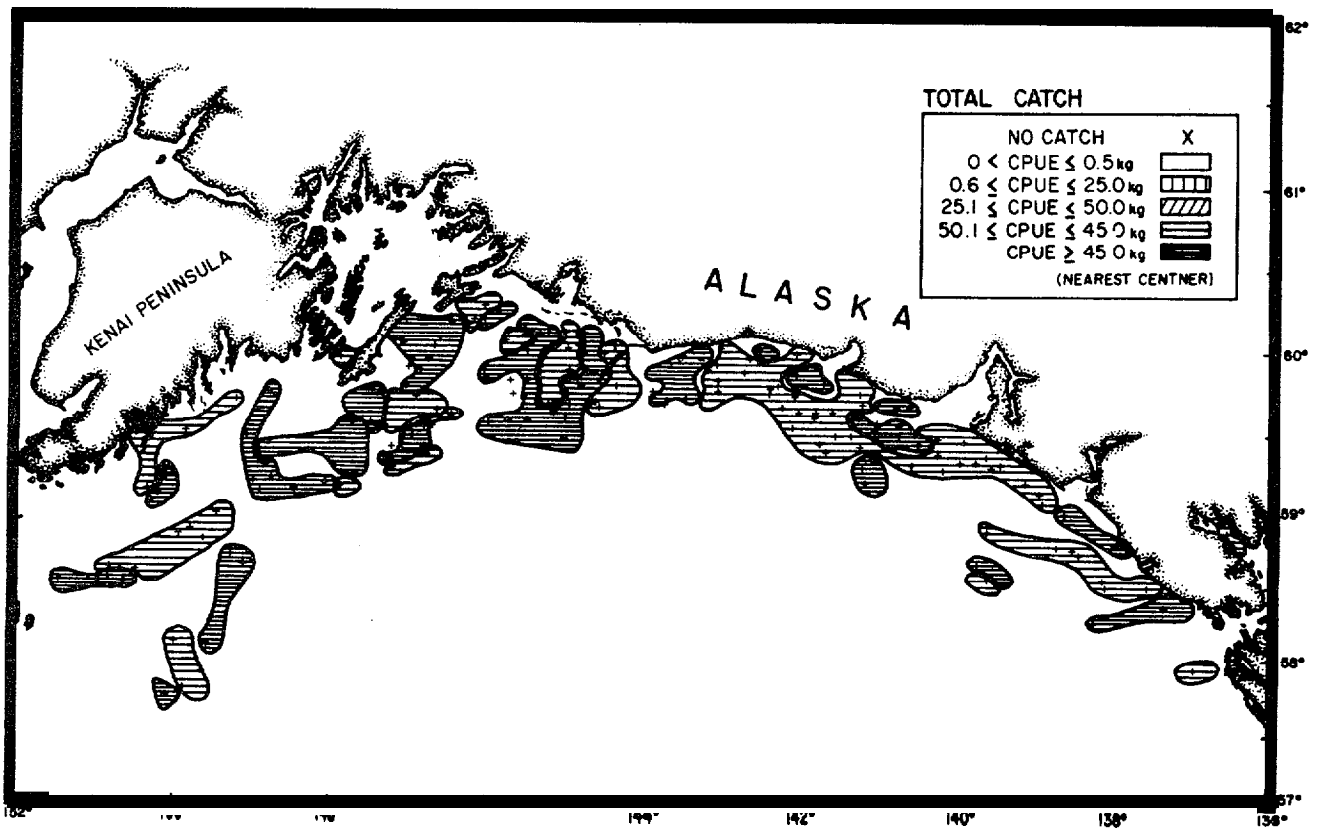


Figure XI-390.--Distribution cf apparent relative abundance of all species combined in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, Apr.. 1976 (Cruises 751-753 and 762).

Table XI-103 .--Estimated biomass in metric tons of all species combined during April-October 1973-76 resource assessment surveys in the Gulf of Alaska (Cruises 733, 734, 744, 751, 753, and 762). '

Region	DEPTH ZONES (M) 0-100	101-200	201-400	0-400
Fairweather				
mtx 10^3	9.5	61.9	lfi.8	88.2
mt/km^2	3.7	5.3	7.8	5.4
% biomass in depth zone	2.0	5.6	4.7	4.6
% regional biomass	10.8	70.2	19.0	100.0
Yakutat				
mt x 10^3	59.6	51.7	42.1	147.4
mt/km^2	12.1	4.9	8.8	7.5
% biomass in depth zone	11.5	4.7	11.7	7.7
% regional biomass	36.4	35.1	28.6	100: 1
Prince William				
mt x 103	59.5	70.6	73.5	203.6
mt/km^2	7.6	7.9	28.3	10.5
% biomass in depth zone	12.8	6.4	20.6	10.6
% regional biomass	29.2	34.7	36.1	100.0
Kenai				
mt x 10^3	--	157.5	24.1	181.6
mt/km^2	--	8.2	3.0	6.7
% biomass in depth zone	--	14.3	6.7	9.5
% regional biomass	--	86.7	13.3	100.0
Kodiak				
mt x 103	164.0	206.6	87.2	457.8
mt/km^2	15.0	21.9	20.5	18.6
% biomass in depth zone	35.3	18.8	24.3	23.8
% regional biomass	35.8	45.1	19.1	100.0
Shelikof				
mt x 103	3.2	24.6	37.9	65.7
mt/km^2	6.4	7.9	4.7	5.7
% biomass in depth zone	0.7	2.2	10.6	3.4
% regional biomass	4.8	37.5	57.7	100.0
Chirikof				
mt x 10^3	27.9	232.9	51.2	312.0
mt/km^2	3.0	18.3	4.8	9.5
% biomass in depth zone	6.0	21.2	14.3	16.2
% regional biomass	8.9	74.6	16.4	99.9
Shumagin				
mt x 10^3	--	--	--	--
mt/km^2	--	--	--	--
% biomass in depth zone	--	--	--	--
% regional biomass	--	--	--	--
Sanak				
mt x 10^3	146.9	293.8	25.4	466.1
mt/km^2	11.5	25.3	28.6	18.4
% biomass in depth zone	31.6	26.7	7.1	24.3
% regional biomass	31.5	63.0	5.5	100.0
Total				
mt x 10^3	464.6	1,099.6	358.2	,922.4
mt/km^2	9.6	12.6	8.7	10.9
% biomass in depth zone	100.0	99.9	100.0	100.1
% regional biomass	24.2	57.2	18.7	100.1

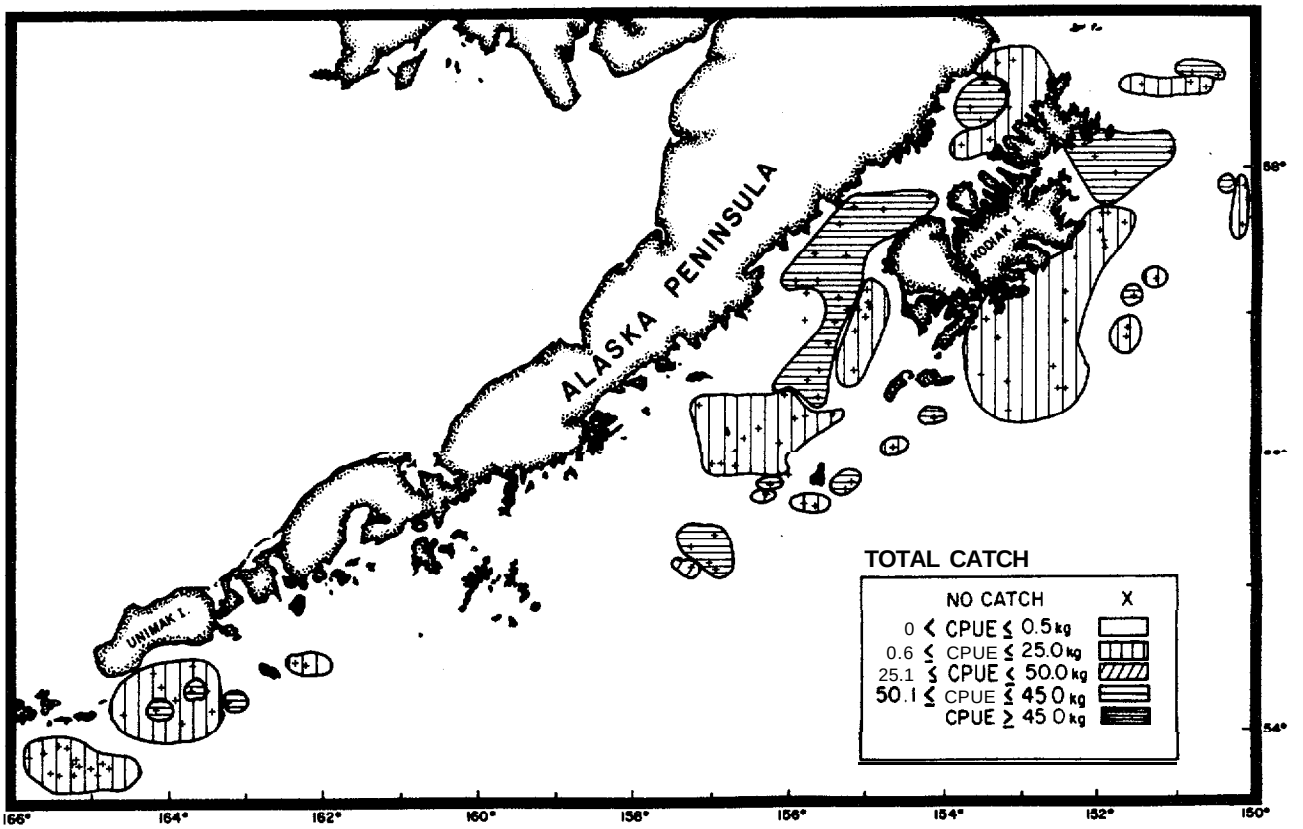


Figure XI-391.--Distribution of apparent relative abundance of all species combined in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

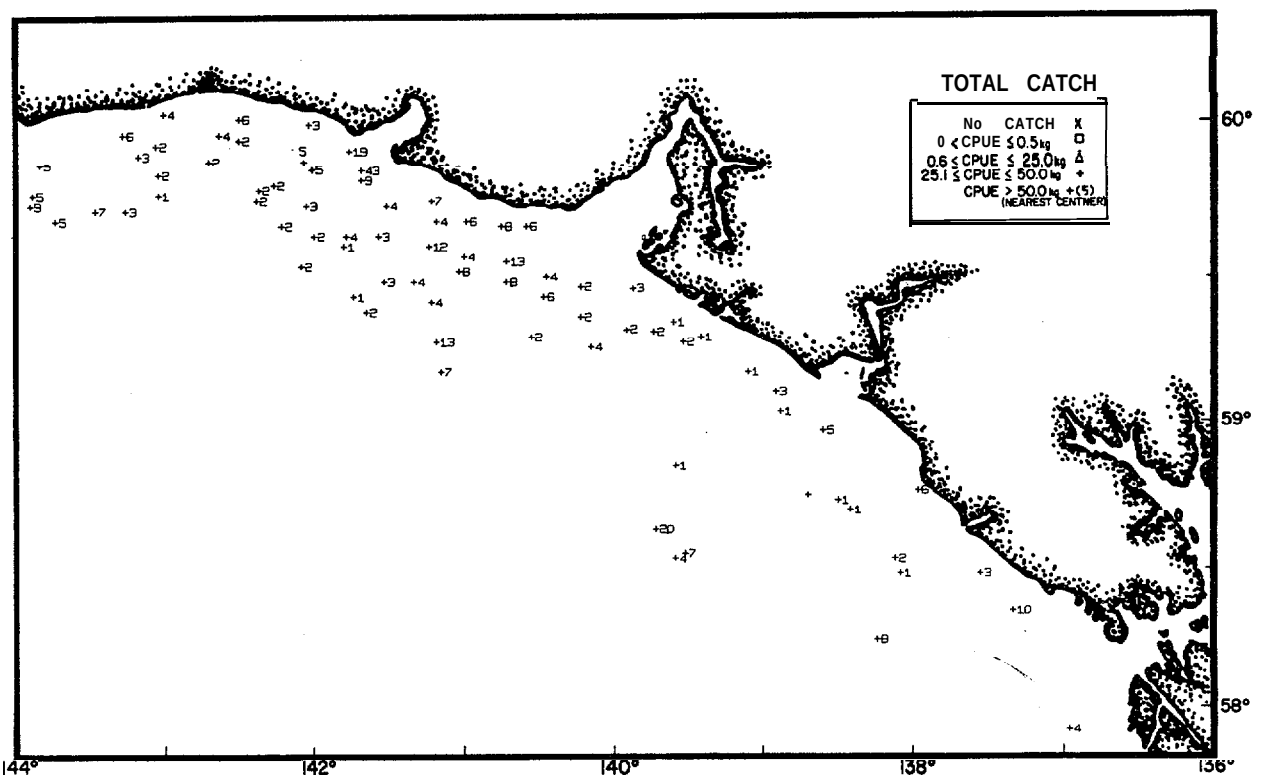


Figure XI-392.--Distribution of standardized catch rates in kilograms/hour of all species combined in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 762).

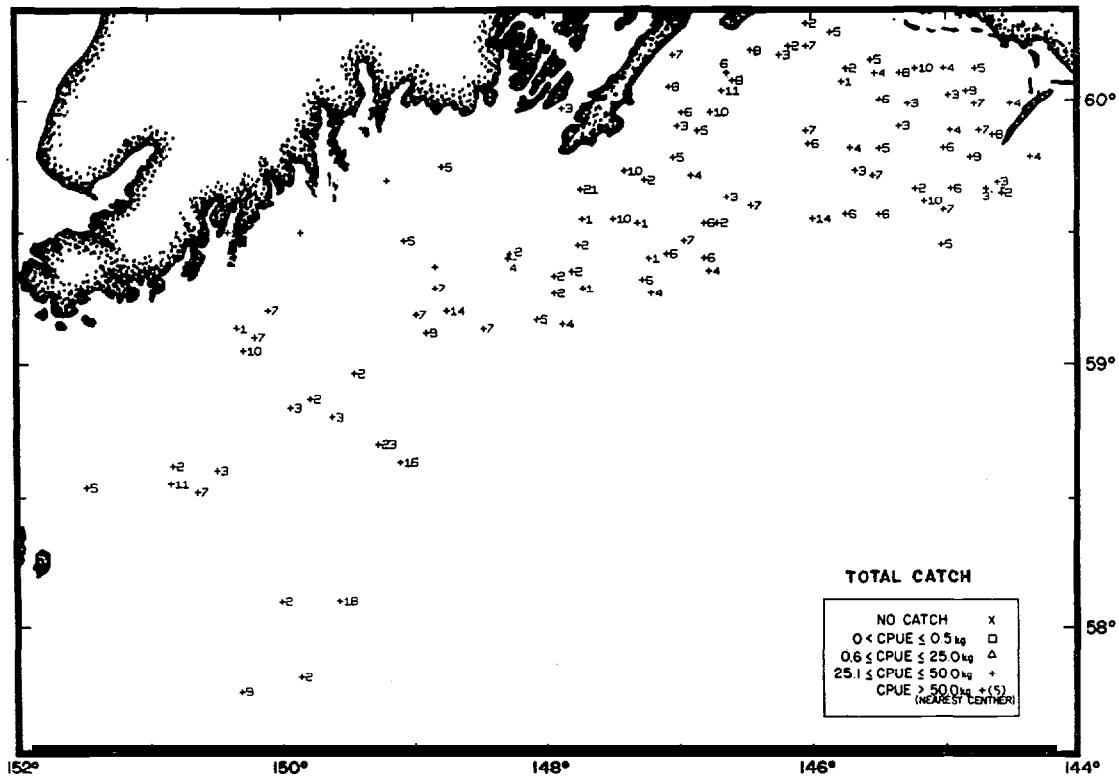


Figure x1-393.--Distribution of standardized catch rates in kilograms/ hour of all species combined in the eastern Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 751 and 753).

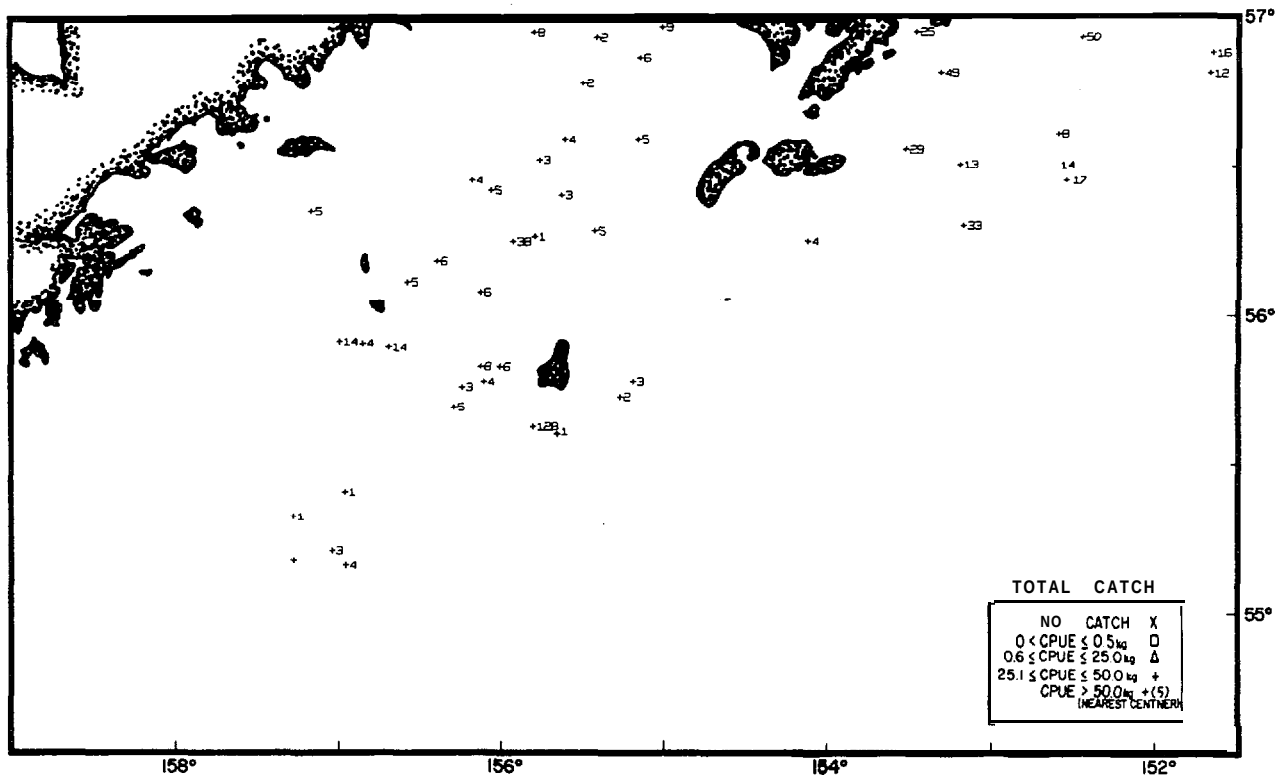


Figure XI-394.--Distribution of standardized catch rates in kilograms/ hour of all species combined in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.--Aug. 1975 (Cruises 734 and 753).

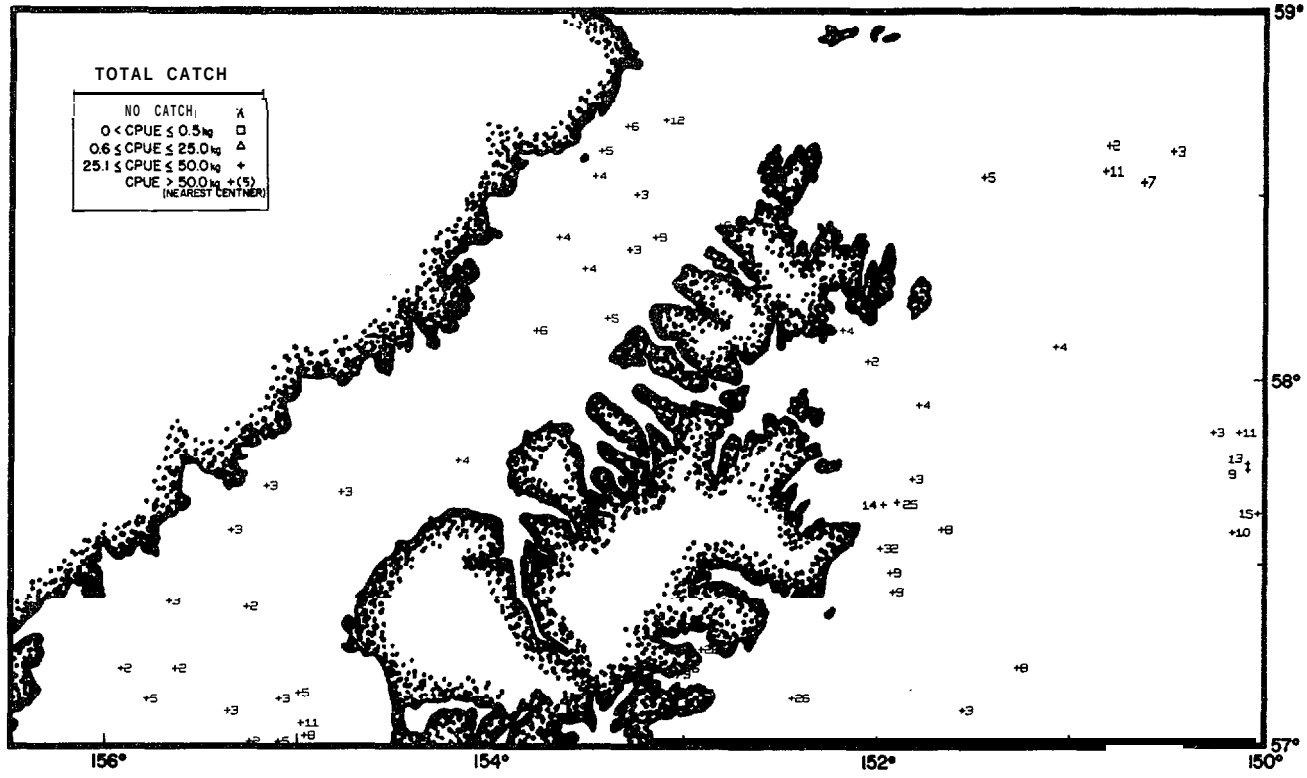


Figure XI-395.—Distribution of standardized catch *sates in kilograms/* hour of all species combined in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

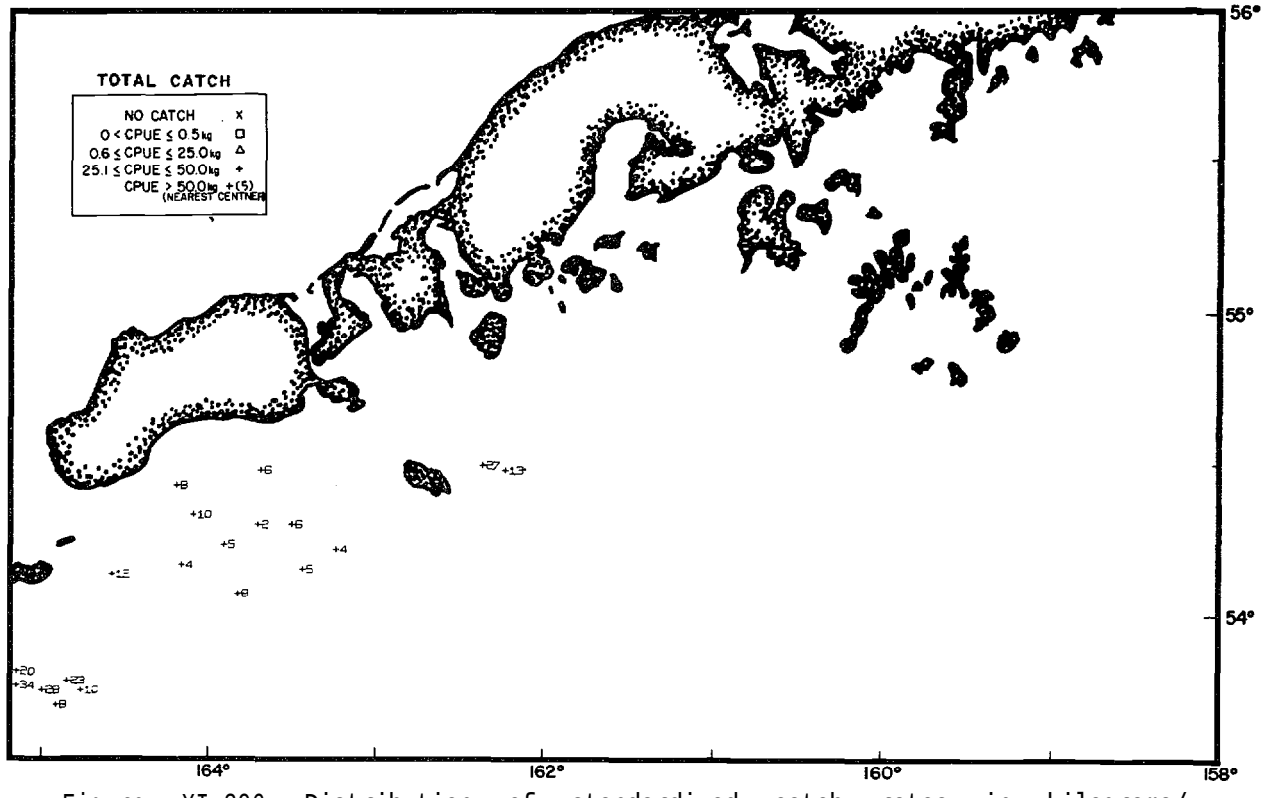


Figure XI-396 .-Distribution of standardized catch rates in kilograms/ hour of all species combined in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Of the total estimated relative apparent roundfish biomass of 946 thousand mt., nearly 73% occurred in the outer shelf depth zone, while the inner shelf contained 18%, and the upper slope 9% (Table X1-105). The roundfish group was the greatest contributor to the total biomass of all species in the outer shelf depth zones, 63%, and were second to the flatfish group in the inner shelf and upper slope with 37 and 23%. Mean CPUE's for the roundfish group ranged from 150 kg/hr in the upper slope to 599 kg/hr in the outer shelf, and averaged 408 kg/hr over the entire Gulf of Alaska. Apparent relative abundance increased from east to west, with the exception of the Shelikof region (Figures X1-397-398). The Sanak region had the highest mean CPUE of 845 kg/hr, with the largest values occurring in the outer shelf and upper slope. Other regions with above average levels of abundance were Kodiak and Chirikof. Standardized roundfish catch rates are plotted in Figures X1-399-403 for all stations successfully sampled.

The flatfish group had the second highest apparent biomass of 641 thousand mt, 38% occurring in the outer shelf, 32% in the upper slope and 30% in the inner shelf (Table X1-106). The flatfish were the greatest contributors to the total biomass in the upper slope (57%) and inner shelf (42%), and were second to the roundfish group in the outer shelf (22%). Mean CPUE's for the flatfish group ranged from 207 kg/hr in the outer shelf depth zone to 293 kg/hr in the inner shelf, and averaged 246 kg/hr over the entire Gulf. Regions with above average levels of relative apparent abundance were Kodiak, Sanak and Yakutat (Figures X1-404-405). Particularly high flatfish mean CPUE's occurred in the Kodiak and Sanak upper slope depth zones (757 and 722 kg/hr), and the Yakutat and Kodiak inner shelves (497 and 483 kg/hr). Standardized flatfish catch rates for all successful stations for this group are plotted in Figures X1-406-410.

Invertebrates, the third most important species group, had an estimated apparent biomass of 278 thousand mt, of which 50% occurred in the outer shelf, 33% in the inner shelf and 18% in the upper slope (Table X1-107). Invertebrates contributed 20% to the total biomass in the inner shelf, 14% in the upper slope and 13% in the outer shelf. The mean CPUE for invertebrates in the Gulf of Alaska was 117 kg/hr, with values ranging from 89 kg/hr in the upper slope to 138 kg/hr in the inner shelf. The Kodiak region had the highest apparent relative abundance (216 kg/hr) with above average mean catch rates in the Prince William, Fairweather and Shelikof regions (Figures X1-411-412). Invertebrates had relatively high mean CPUE's in the Shelikof inner shelf (327 kg/hr), Prince William inner shelf and upper slope (244 and 279 kg/hr), Kodiak inner and outer shelves (213 and 285 kg/hr), and the Sanak upper slope (282 kg/hr). Standardized catch rates are plotted for this group in Figures X1-413-417.

Table XI-104.--Relative importance of species groups based on the rank order of their total biomass (Cruises 733, 734, 744, 751, 753, 762).

Soeci es	DEPTH ZONES (M) 0-100	101-200	201-400	O-400
Roundfish				
mt x 103	172.5	692.2	81.6	946.3
mt/km^2	3.6	7.9	2.0	5.3
% biomass in depth zone	37.1	62.9	22.8	49.2
% roundfish biomass	18.2	73.2	8.6	100.0
Flatfish				
mt x 10^3	193.6	241.4	205.7	640.7
mt/km^2	4.0	2.8	5.0	3.6
% biomass in depth zone	41.7	22.0	5715	33.3
% flatfish biomass	30.2	37.7	32.1	100.0
Invertebrates				
mt x 103	90.9	137.5	49.4	277.8
mt/km2	1.9	1.6	1.2	1.6
% biomass in depth zone	19.6	12.5	13.8	14.5
% invertebrate biomass	32.7	49.5	17.8	100.0
Rockfish				
mt x 103	0.4	13.9	14.6	28.9
mt/km^2	1/	0.2	0.4	0.2
% biomass in depth zone	6.1	1.3	4.1	1.5
% rockfish biomass	1.4	48.1	50.5	100.0
Elasmobranchs				
mt x 103	7.2	14.8	6.3	28.3
mt/km^2	0.1	0.2	0.2	0.2
% biomass in depth zone	1.6	1.3	1.8	1.5
% elasmobranch biomass	25.4	52.3	22.3	100.0
Total				
mt x 103	464.6	1099.8	357.6	1922.0
mt/km^2	9.6	12.7	8.8	10.9
% biomass in depth zone	100.1	100.0	100.0	100.1
% total biomass	24.2	57.2	18.6	100.0

1/ Less than 0.1 mt/km^2.

Table XI-105.--Estimated biomass and population size of roundfishes in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10⁶)	Proportion of tot31 estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	25.1	902.4	16.2	9.6	26.0	0.09	--
	101-200	23.4	3,814.5	68.6	26.0	70.3	0.15	--
	201-400	28.2	846.7	15.2	1.4	3.8	0.63	--
	All zones	24.3	5,563.6	0 . 6	37.0	--	0.15	--
Yskutat	1-100	249.6	15,459.5	57.1	154.0	87.1	0.10	--
	101-200	52.5	7.677.4	28.4	20.3	11.5	0.38	--
	201-400	57.2	3,928.6	14.5	2.5	1.4	1.59	--
	All zones	97.8	27,065.5	-z-7-	176.8	--	0.15	--
Prince William	1-100	132.4	14,638.5	29.5	74.0	42.6	0.20	--
	101-200	247.1	31.152.0	62.8	85.3	49.1	0.37	--
	201-400	104.5	3,811.2	7.7	14.4	8.3	0.16	--
	All zones	181.6	49,601.7	5.2	173.7	--	0.29	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	313.7	76,182.1	90.9	145.7	98.8	.52	--
	201-400	76.3	7,656.1	9.1	1.8	1.2	4.27	--
	All zones	244.3	83,838.2	8 . 9	147.5	--	0.57	--
Kodiak	1-100	450.0	64,448.0	27.6	--	--	--	--
	101-200	1,088.2	134,313.0	57.5	--	--	--	--
	201-400	624.5	34.820.5	14.9	--	--	--	--
	All zones	724.4	233,581.5	24.7	--	--	--	--
Shelikof	1-100	75.9	491.8	2.5	--		--	--
	101-200	261.7	10,679.8	54.9		--	--	--
	201-400	79.4	8.275.7	42.6	--	--	--	--
	All zones	128.3	19,447.3	2.1	--	--	--	--
Chirikof	1-100	83.5	9,981.6	4.4	17.3	6.9	0.58	--
	101-200	1.270.2	205,001.0	90.3	218.6	87.5	0.94	--
	201-400	8 9 . 7	12,019.4	5.3	13.9	5.6	0.86	--
	All zones	560.b	227,002.0	24.0	249.8	--	0.91	--
Shumagin	1-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	1-100	370.5	66,559.2	22.2	--	--	--	--
	101-200	1.366.0	223.347.0	74.4	--		--	--
	201-400	921.1	10.260.5	3.4	--	--	--	--
	All zones	844.6	300,166.7	31.1	--	--		--
Total	1-100	261.5	172.481.0	18.2	--	--	--	--
	101-200	599.3	692,166.8	73.2	--	--		--
	201-400	149.8	81,618.7	8.6	--	--	--	--
	All zones	408.0	946,266.5	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.

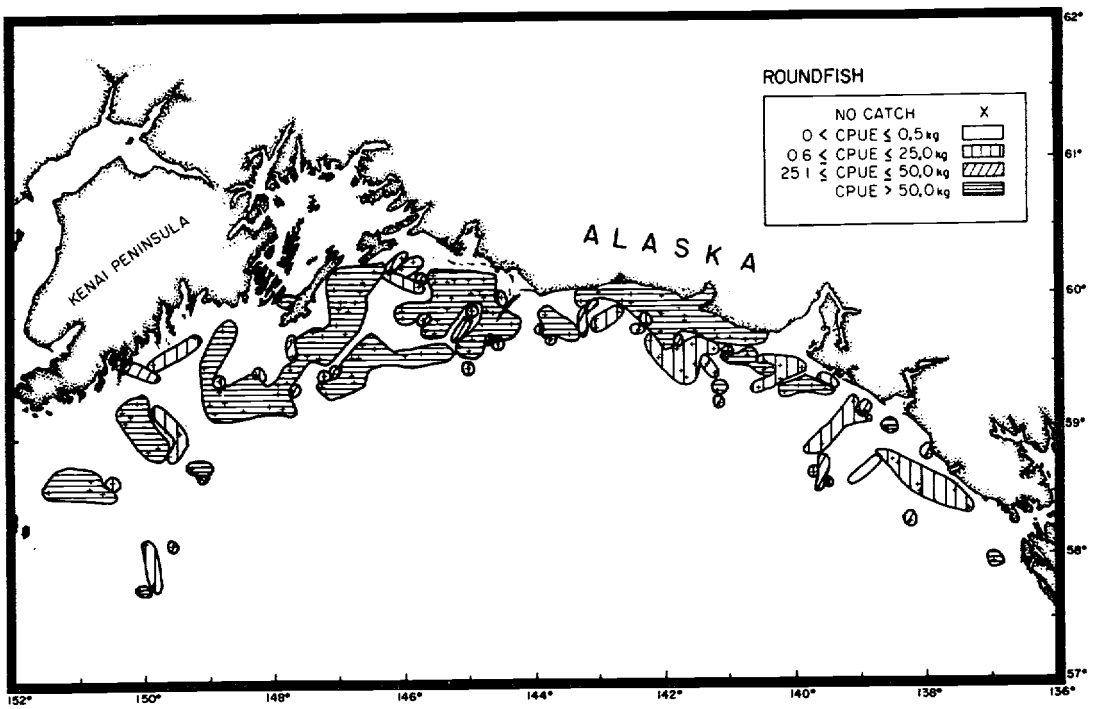


Figure XI-397. -Distribution of apparent relative abundance of roundfish in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

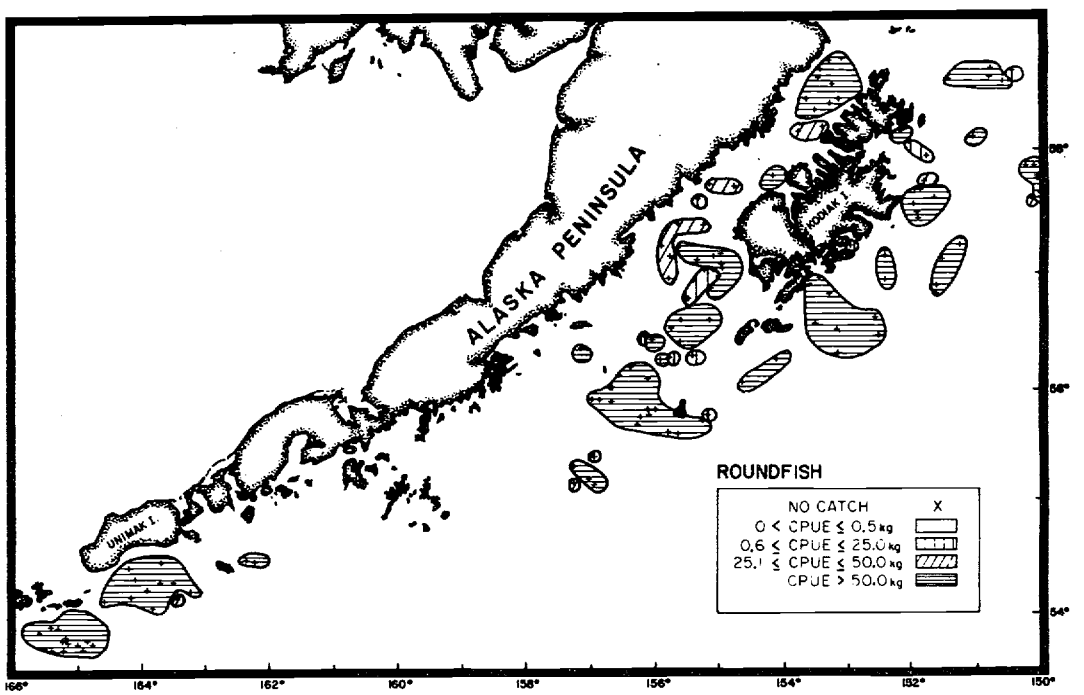


Figure XI-398. -Distribution of apparent relative abundance of roundfish in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

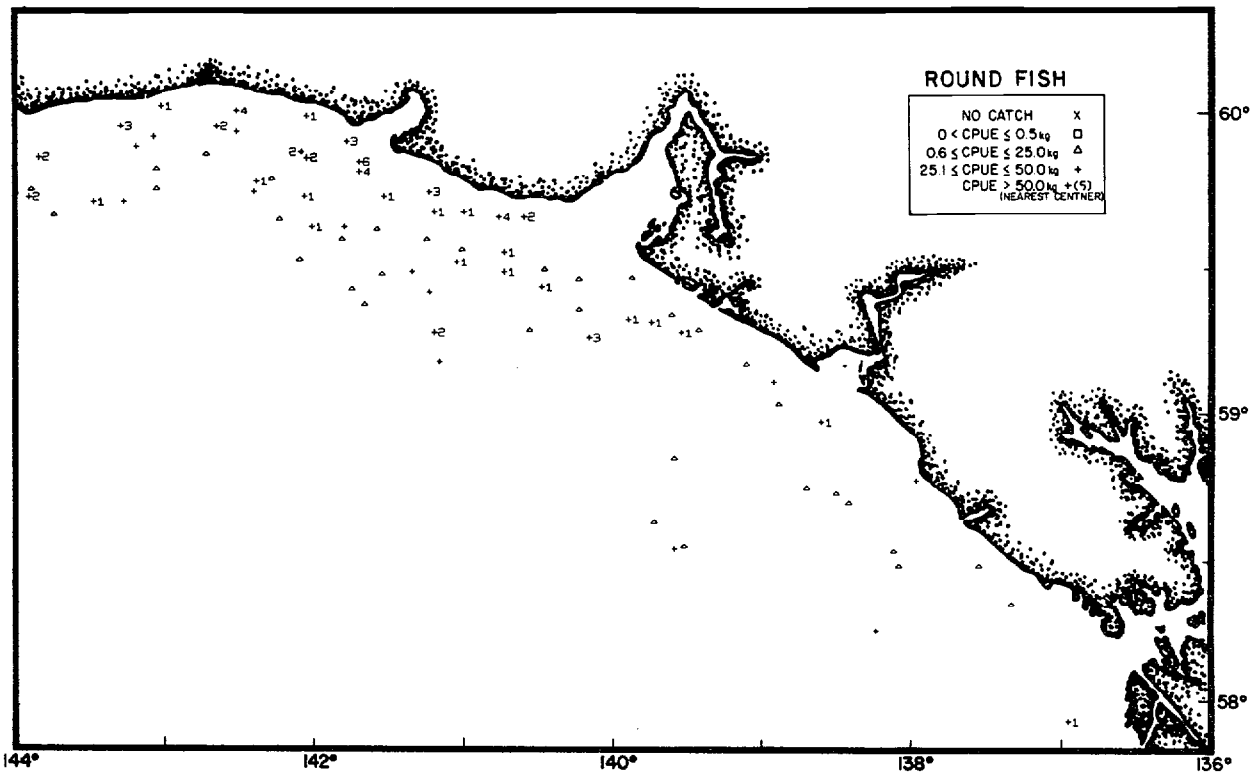


Figure XI-399.-Distribution of standardized catch rates in kilograms/ hour of roundfish in the eastern Gulf of Alaska, May-Aug, 1975, and Apr. 1976 **(Cruises** 751 and **762).**

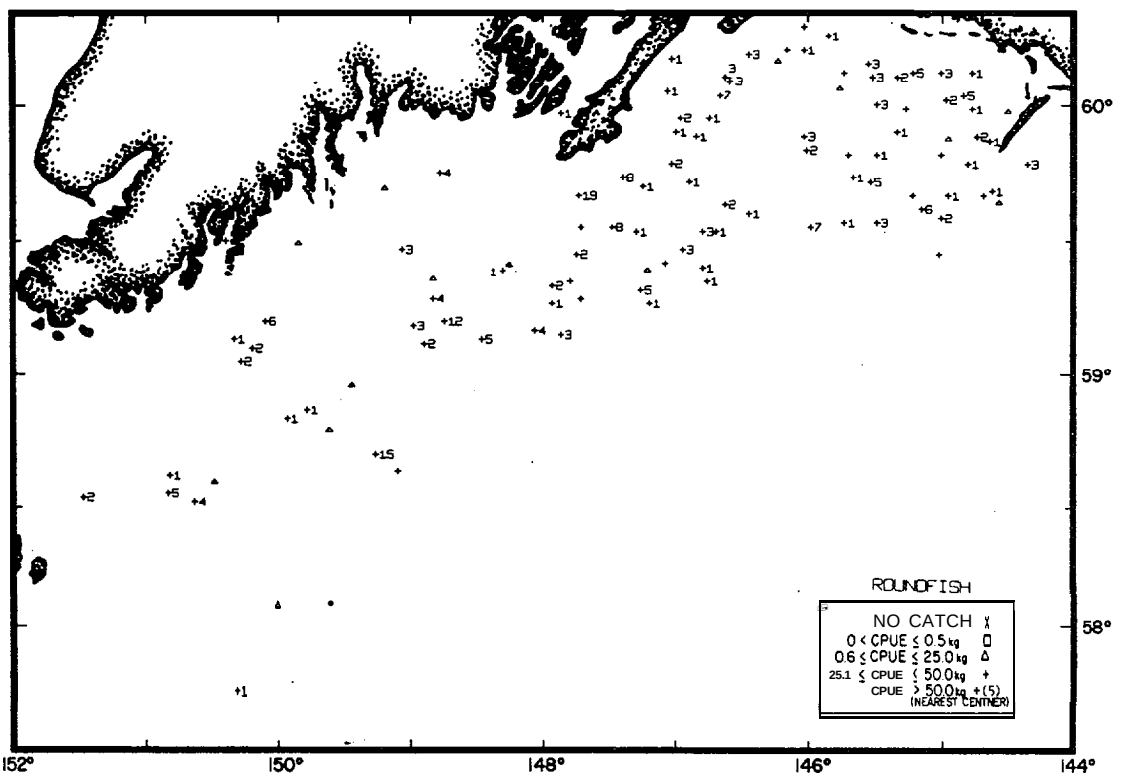


Figure XI-400.--Distribution of standardized catch rates in kilograms,' hour of roundfish in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

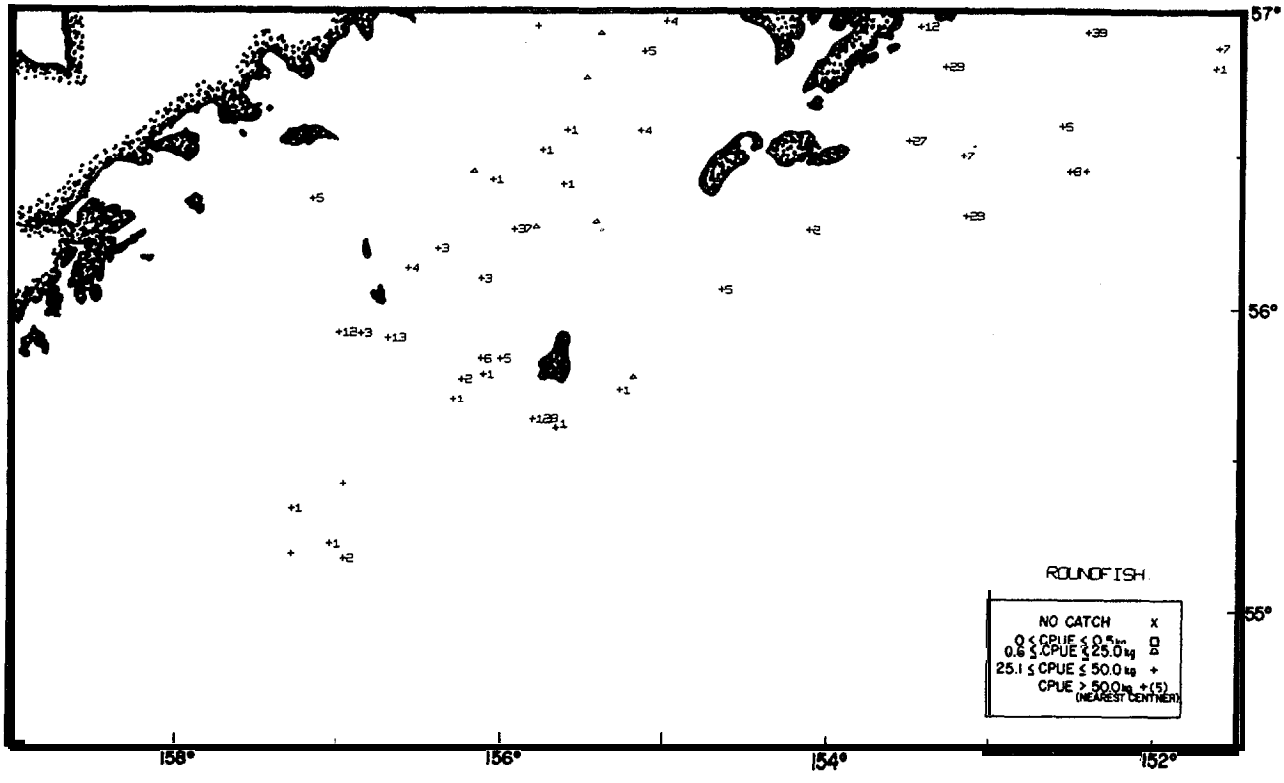


Figure XI-401.--Distribution of standardized catch rates in kilograms/hour of roundfish in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975, Cruises 734 and 753).

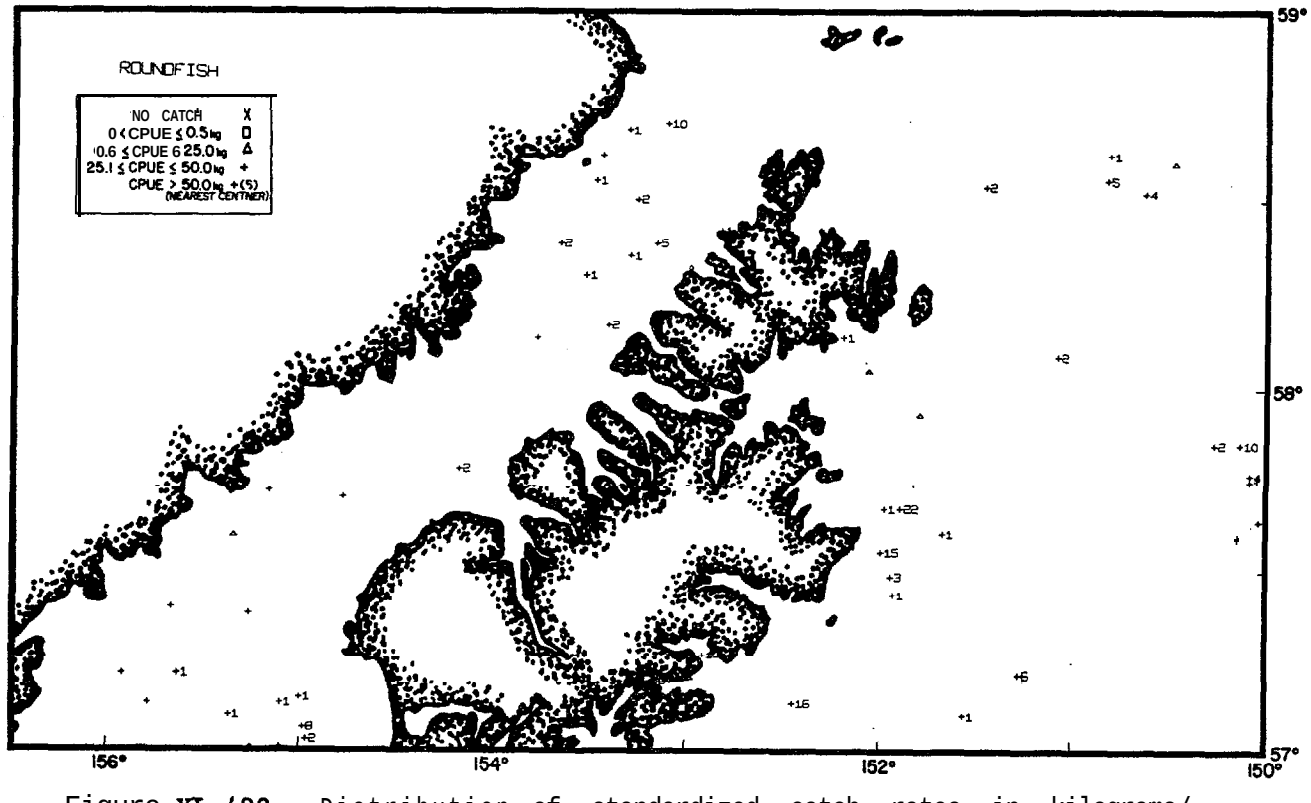


Figure XI-402.--Distribution of standardized catch rates in kilograms/hour of roundfish in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

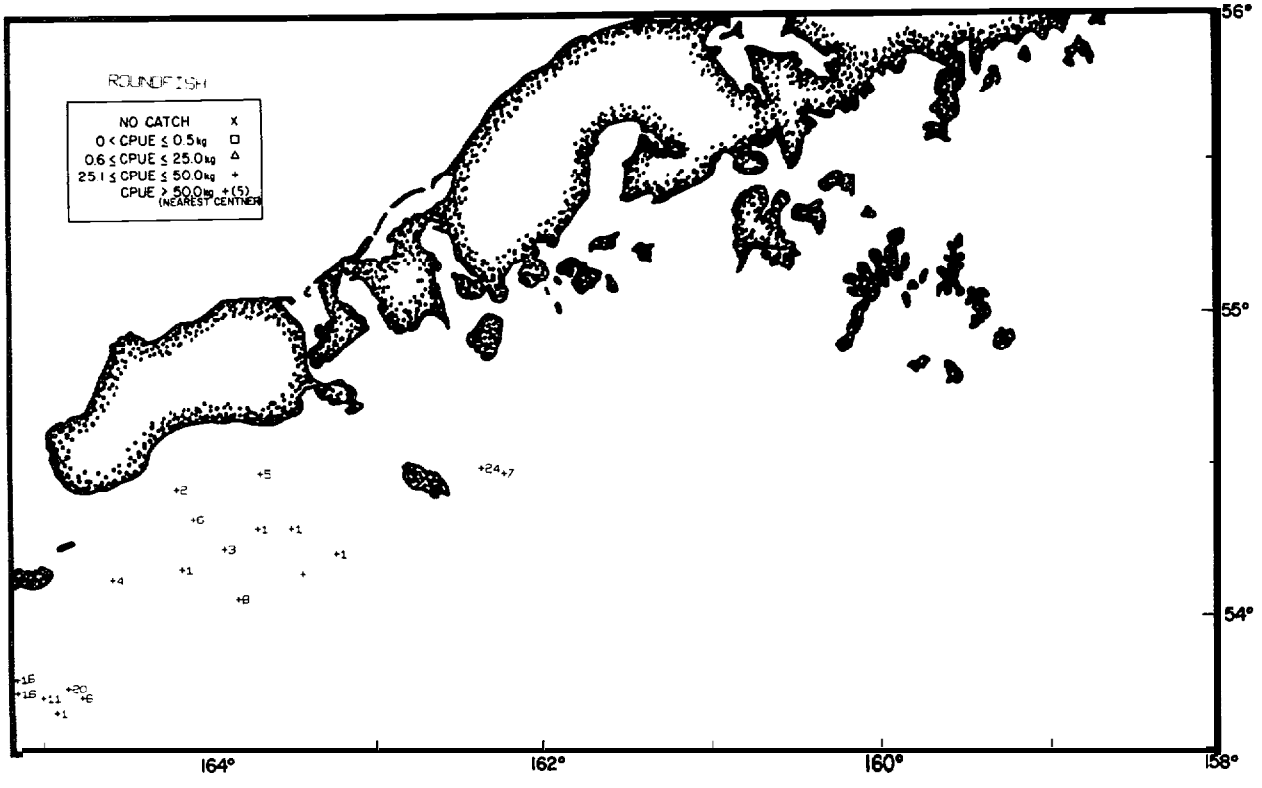


Figure X1-403. --Distribution of standardized catch rates in kilograms/hour of roundfish in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

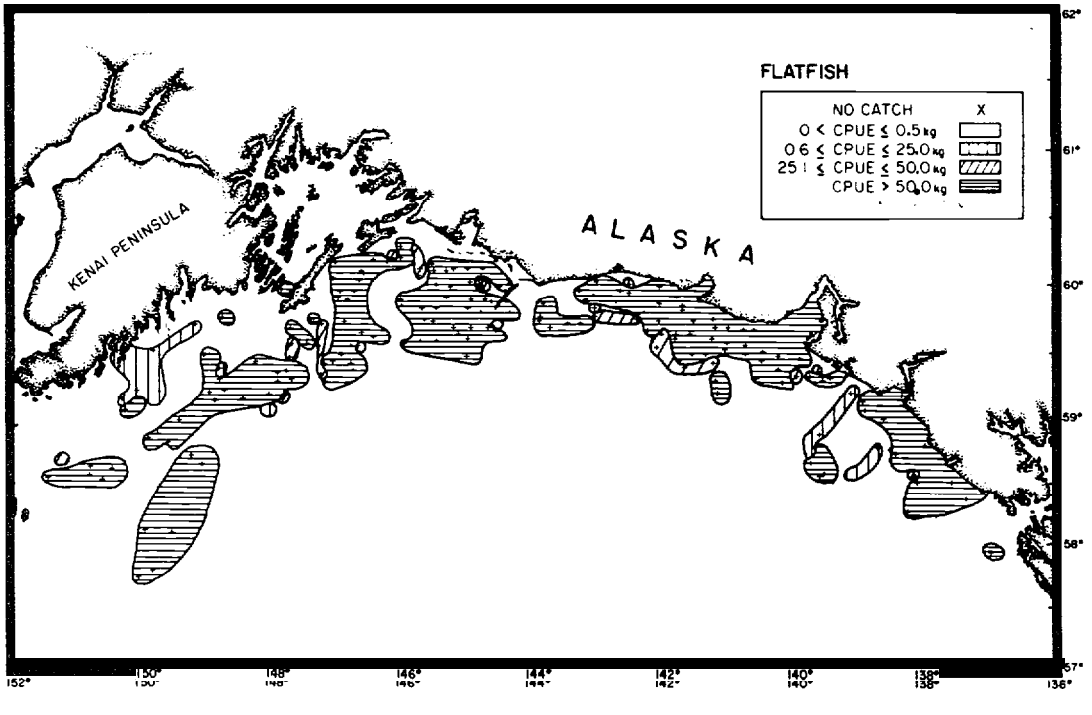


Figure XI-404. --Distribution of apparent relative abundance of flatfish in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

Table XI-106.--Estimated biomass and population size of flatfishes in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	164.0	5,898.9	14.8	27.3	25.0	0.22	--
	101-200	127.9	20.826.3	52.2	hl.0	55.8	0.34	--
	201-400	438.5	13,180.5	33.0	21.0	19.2	0.63	--
	All zones	174.4	39.905.7	6.2	109.3	--	0.36	--
Yakutat	l-100	497.0	30.787.4	36.7	64.0	34.4	0.48	--
	101-200	209.2	30,589.8	36.4	80.6	43.3	0.38	--
	201-400	329.4	22.608.9	26.9	41.4	22.3	0.55	--
	All zones	303.4	83,986.1	13.1	186.0	--	0.45	--
Prince William	l-100	123.8	13.685.6	15.4	76.2	51.5	0.18	--
	101-200	140.6	17,725.0	19.9	54.5	36.8	0.33	--
	201-400	158.1	57.637.7	65.7	17.3	11.7	0.33	--
	All zones	136.1	89.048.3	13.9	148.0	--	0.25	--
Kenai	I-100		--	--	--	--	--	--
	101-200	249.2	60,516.5	82.2	71.2	82.4	0.85	--
	201-400	130.7	13,111.3	17.8	15.2	17.6	0.86	--
	All zones	214.6	73.627.8	11.5	86.4	--	0.85	--
Kodiak	l-100	482.6	69,107.7	46.7	--	--	--	--
	101-200	297.2	36.682.9	24.8	--	--	--	--
	201-400	757.3	42,220.4	28.5	--	--	--	--
	All zones	459.1	148,011.0	23.0	--	--	--	--
Shelikof	l-100	85.1	551.3	2.3	--	--	--	--
	101-200	221.2	9,028.2	38.0	--	--	--	--
	201-400	135.9	14.167.0	59.7	--	--		--
	All zones	156.7	23,746.5	3.7		--	--	--
Chirikof	l-100	73.4	8,774.2	15.2	34.4	21.6	0.26	--
	101-200	93.5	15,090.5	26.2	64.5	40.5	0.23	--
	201-400	251.8	33,741.6	58.6	60.4	37.9	0.56	--
	All zones	130.6	57,606.3	9.0	159.3	--	0.36	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--		--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	360.5	64,770.4	51.9	--	--	--	--
	101-200	312.1	50,955.5	40.9	--	--	--	--
	201-400	721.8	9,019.8	7.2		--	--	--
	All zones	350.9	124,745.7	19.4	--	--	--	--
Total	l-100	292.9	193.575.5	30.2	--	--	--	--
	101-200	206.9	241,414.7	37.7	--	--	--	--
	201-400	281.3	205,687.2	32.1	--	--	--	--
	All zones	246.2	640,677.4	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

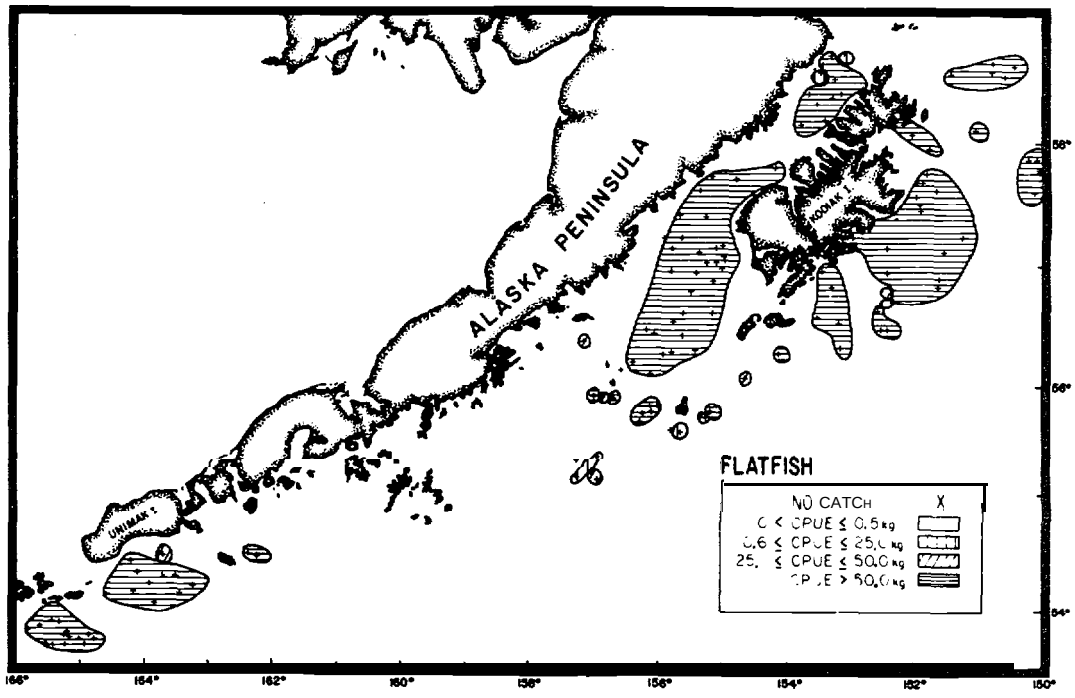


Figure XI-405.-Distribution of apparent relative abundance of flatfish in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

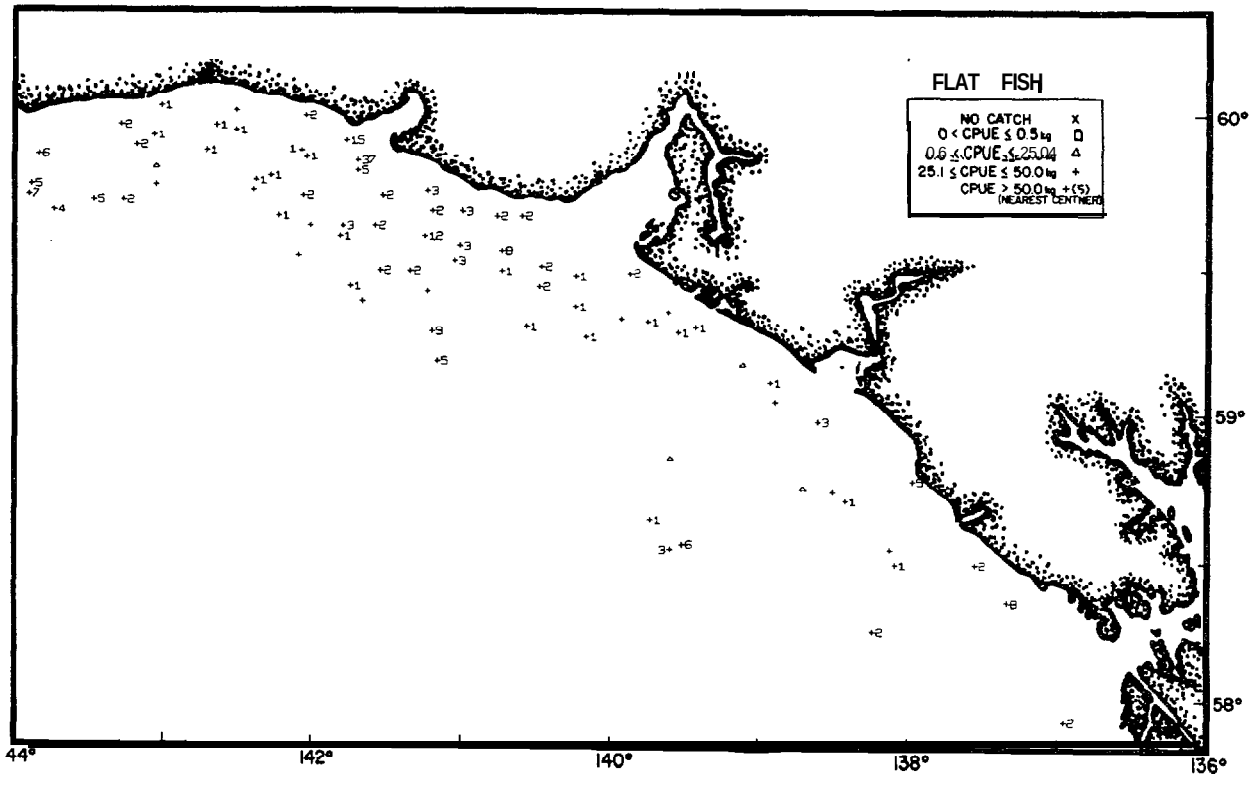


Figure XI-406.--Distribution of standardized catch rates in kilograms/hour of flatfish in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

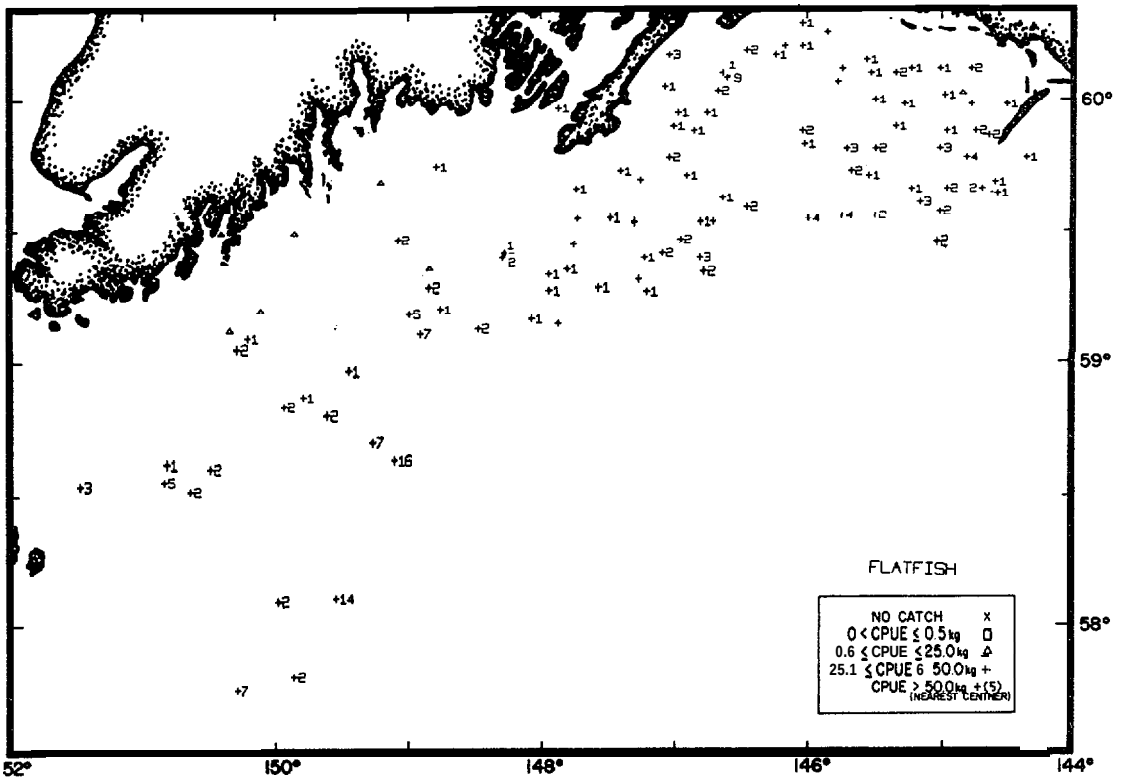


Figure XI-407.--Distribution of standardized catch rates in-kilograms/ hour of **flatfish** in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

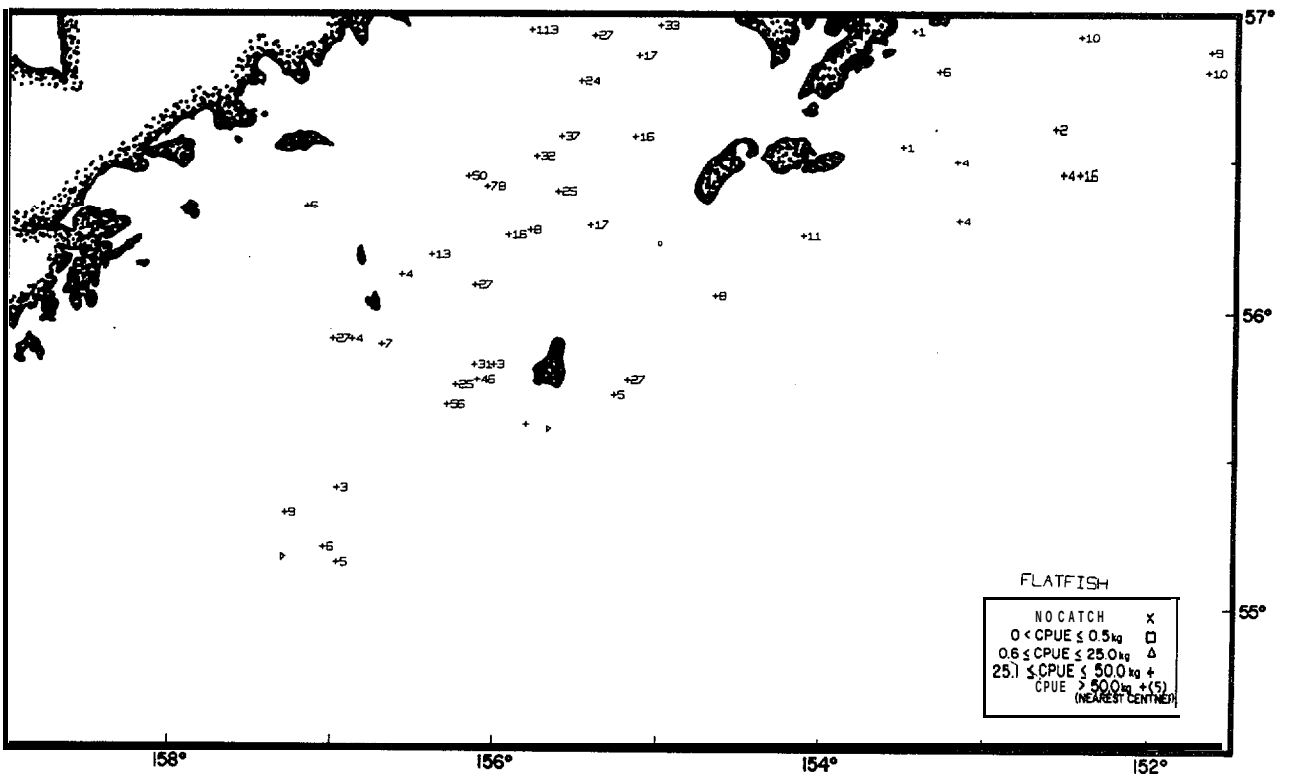


Figure XI-408.-Distribution of standardized catch rates in kilograms/ hour of **flatfish** in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

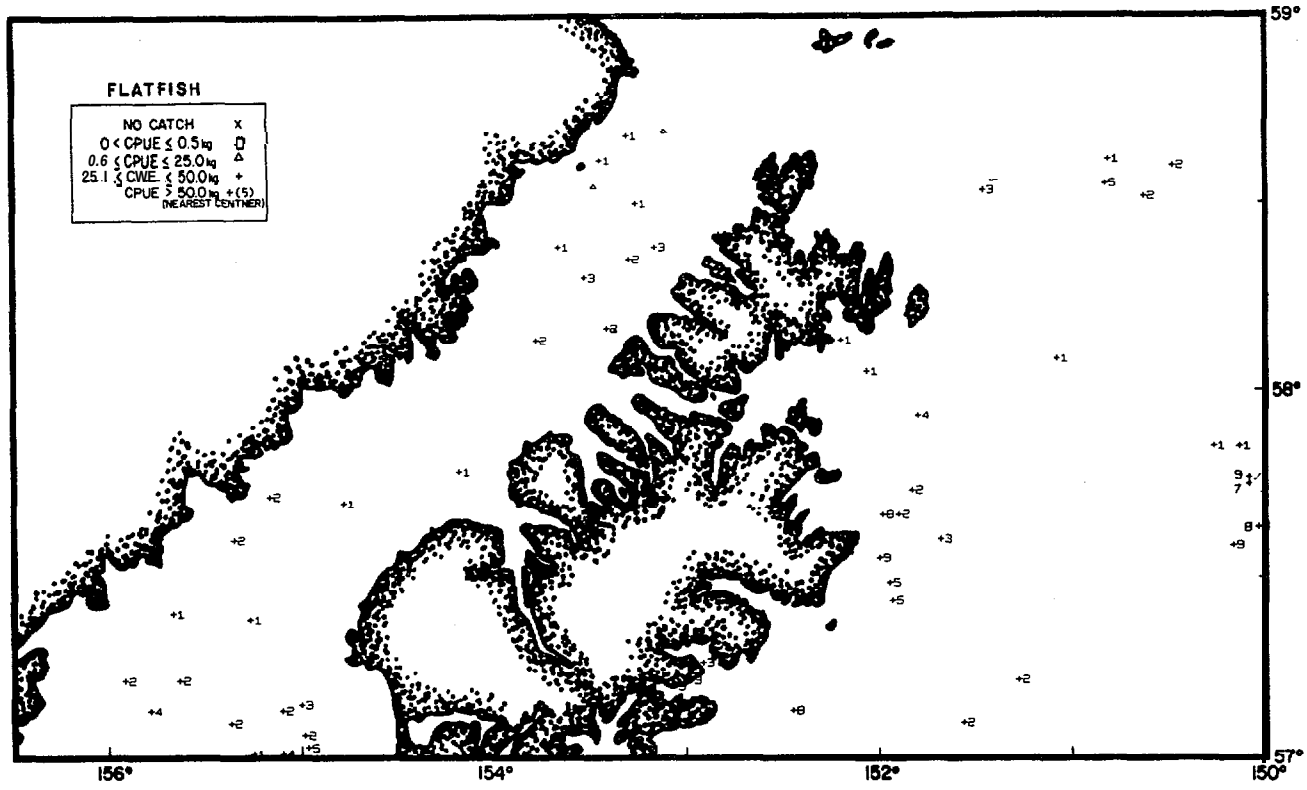


Figure XI-409.--Distribution of standardized catch rates in kilograms/hour of **flatfish** in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruise 733, 734, and 753).

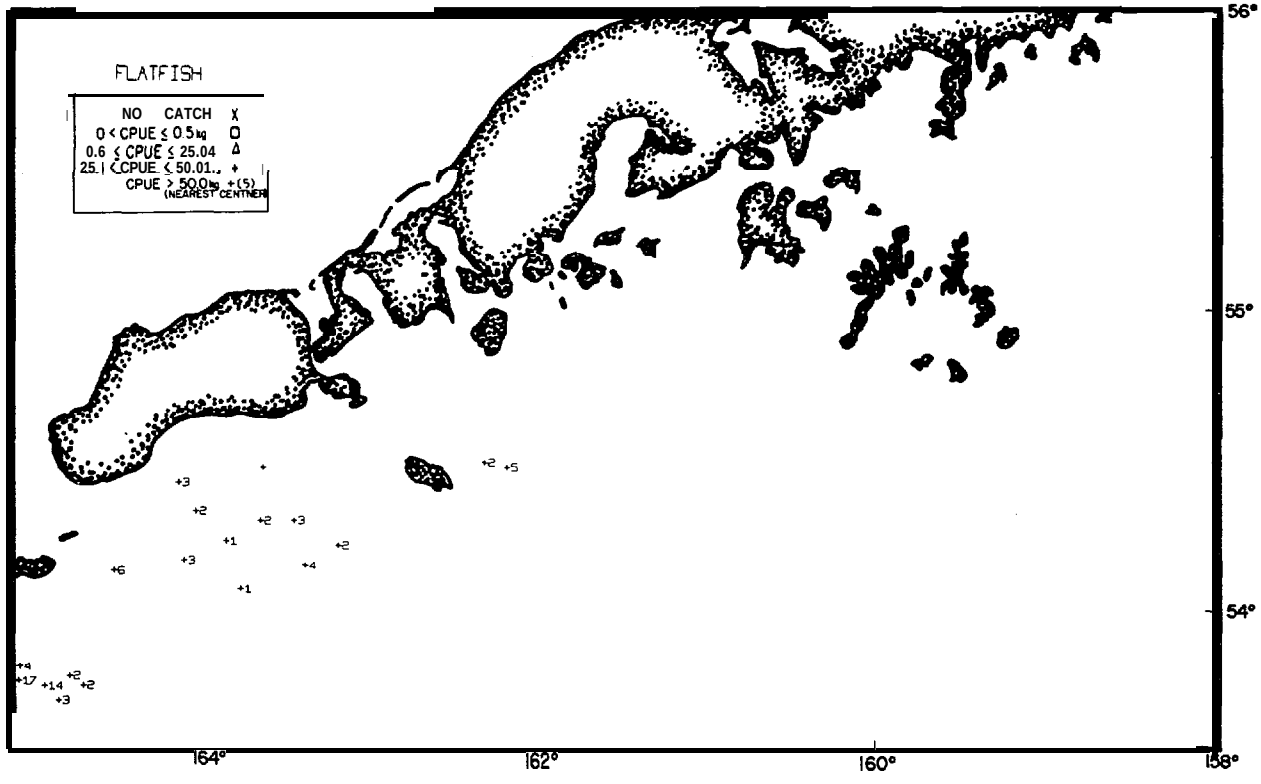


Figure XI-410.--Distribution of standardized catch rates in kilograms/hour of **flatfish** in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Table XI-107.--Estimated biomass and population size of invertebrates in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10⁶)	Proportion of total estimated population	Mean size per individual Weight (kg)	Mean size per individual Length 2/ (cm)
Fairweather	1-100	62.0	2,231.5	6.7				
	101-200	189.4	30,848.3	92.5				
	201-400	9.5	284.9	0.9				
	All zones	145.8	33,364.7	12.0				
Pakutat	1-100	73.5	4,552.6	21.5				
	101-200	45.8	6,702.0	31.6				
	201-400	145.1	9,957.0	46.9				
	All zones	76.6	21,211.6	7.6				
Prince William	1-100	243.8	26,958.0	49.4				
	101-200	138.2	17,416.0	31.9				
	201-400	278.9	10.167.6	18.6				
	All zones	159.7	54,541.6	19.6				
Kenai	1-100	--	--	--				
	101-200	72.7	17,663.4	86.8				
	201-400	26.8	2,690.1	13.2				
	All zones	59.3	20,353.5	7.3				
Kodiak	1-100	212.5	30,435.4	43.7				
	101-200	284.8	35,146.7	50.4				
	201-400	73.5	4.097.5	5.9				
	All zones	216.1	69,679.6	25.1				
Shelikof	1-100	326.9	2,118.7	9.8				
	101-200	117.1	4,778.0	22.1				
	201-400	140.9	14,684.4	68.0				
	All zones	142.4	21,581.1	7.8				
Chirikof	1-100	76.1	9,099.4	41.8				
	101-200	53.7	8,665.0	39.8				
	201-400	30.0	4,025.7	18.5				
	All zones	54.1	21,790.1	7.8				
Shumagin	1-100	--	--	--				
	101-200	--	--	--				
	201-400	--	--	--				
	All zones	--	--	--				
Sanak	1-100	86.5	15.545.7	44.0				
	101-200	99.6	16.255.5	46.0				
	201-400	281.5	3,518.2	10.0				
	All zones	99.4	35,319.4	12.7				
Total	1-100	138.4	90.941.3	32.7				
	101-200	117.2	137,474.9	49.5				
	201-400	89.1	49,425.4	17.8				
	All zones	116.7	277,841.6	100.0				

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

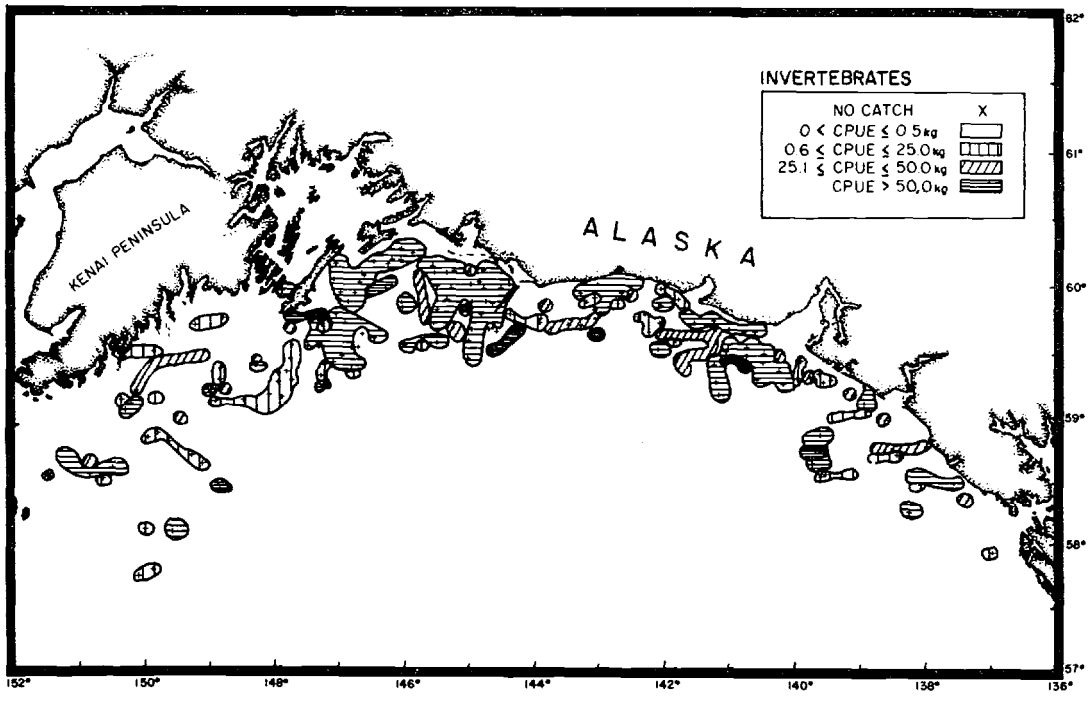


Figure XI-411. -Distribution of apparent relative abundance of invertebrates in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruise 751, 753, and 762).

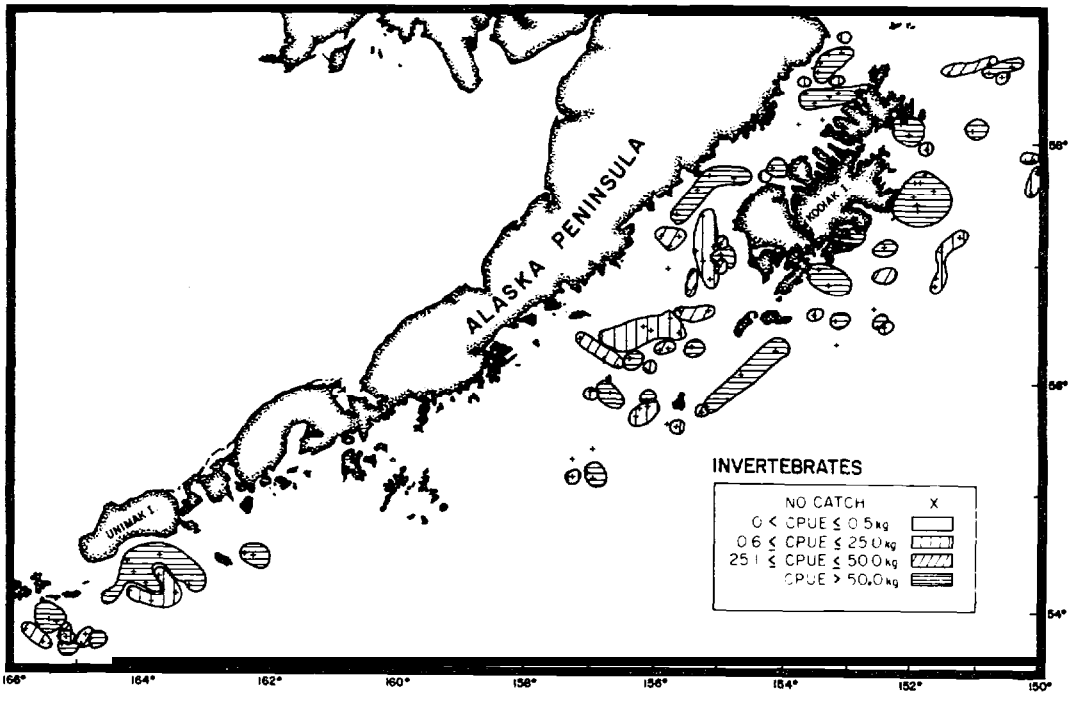


Figure XI-412.--Distribution of apparent relative abundance of invertebrates in the western Gulf of Alaska; May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

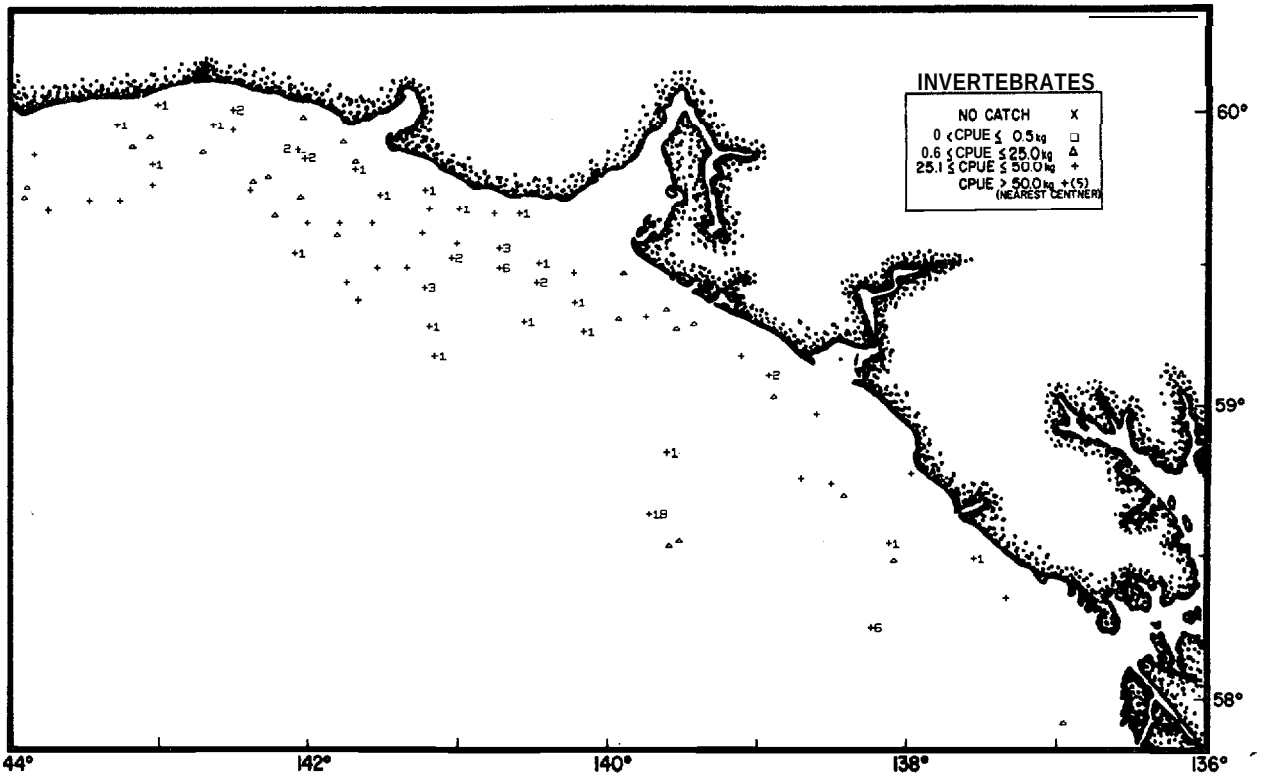


Figure Xi-413.--Distribution of standardized catch rates in kilograms/ hour of invertebrates in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

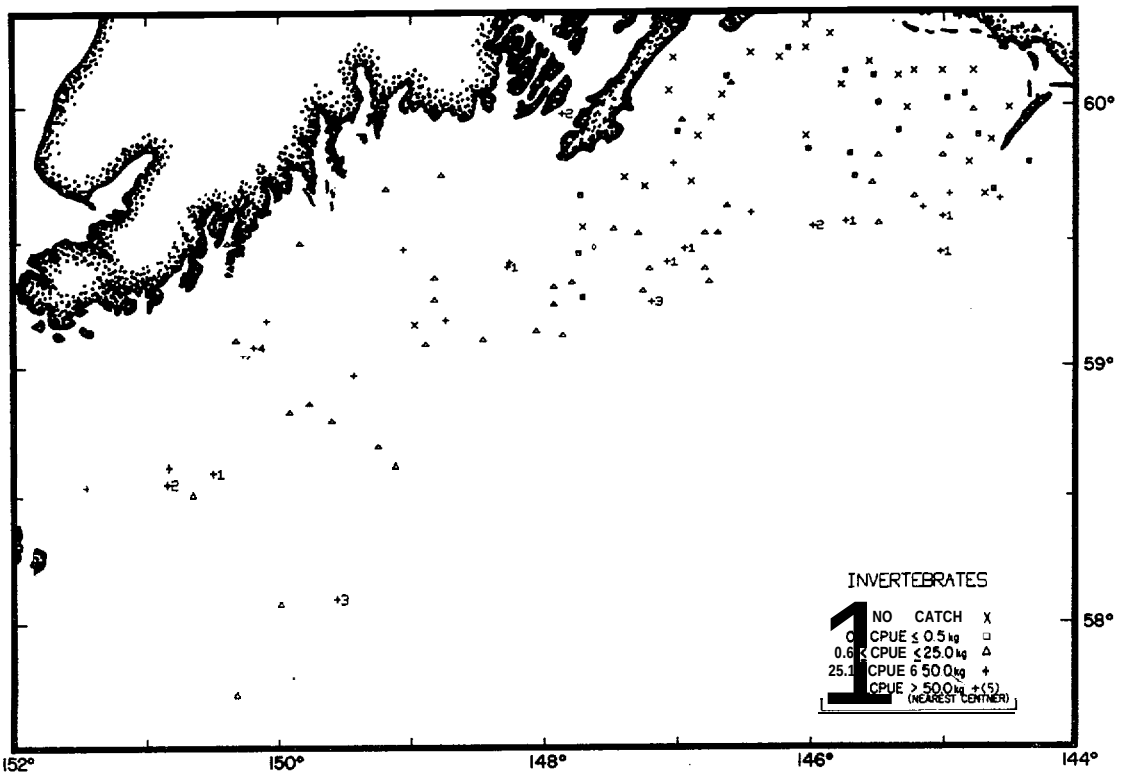


Figure XI-414.--Distribution of standardized catch rates in kilograms/ hour of invertebrates in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

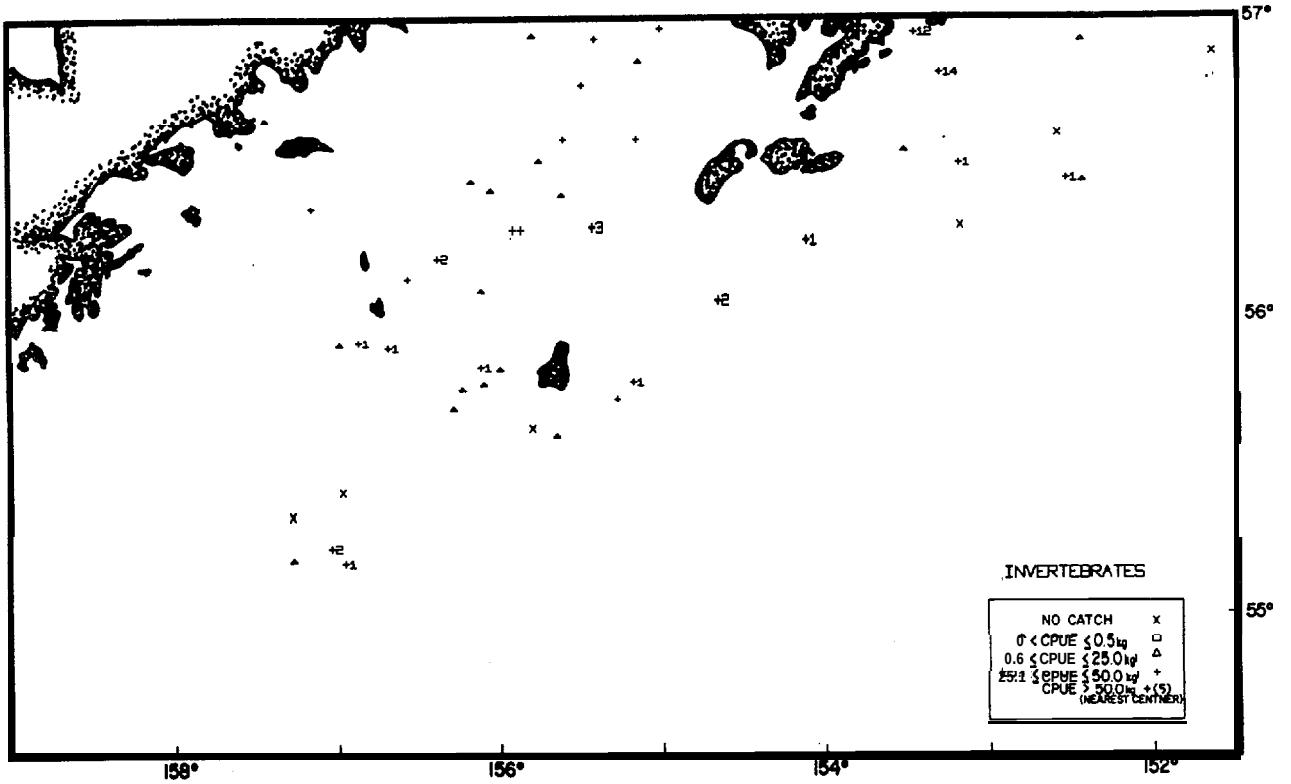


Figure XI-415.--Distribution of standardized catch rates in kilograms/hour of invertebrates in the western Gulf of Alaska, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 734 and 753).

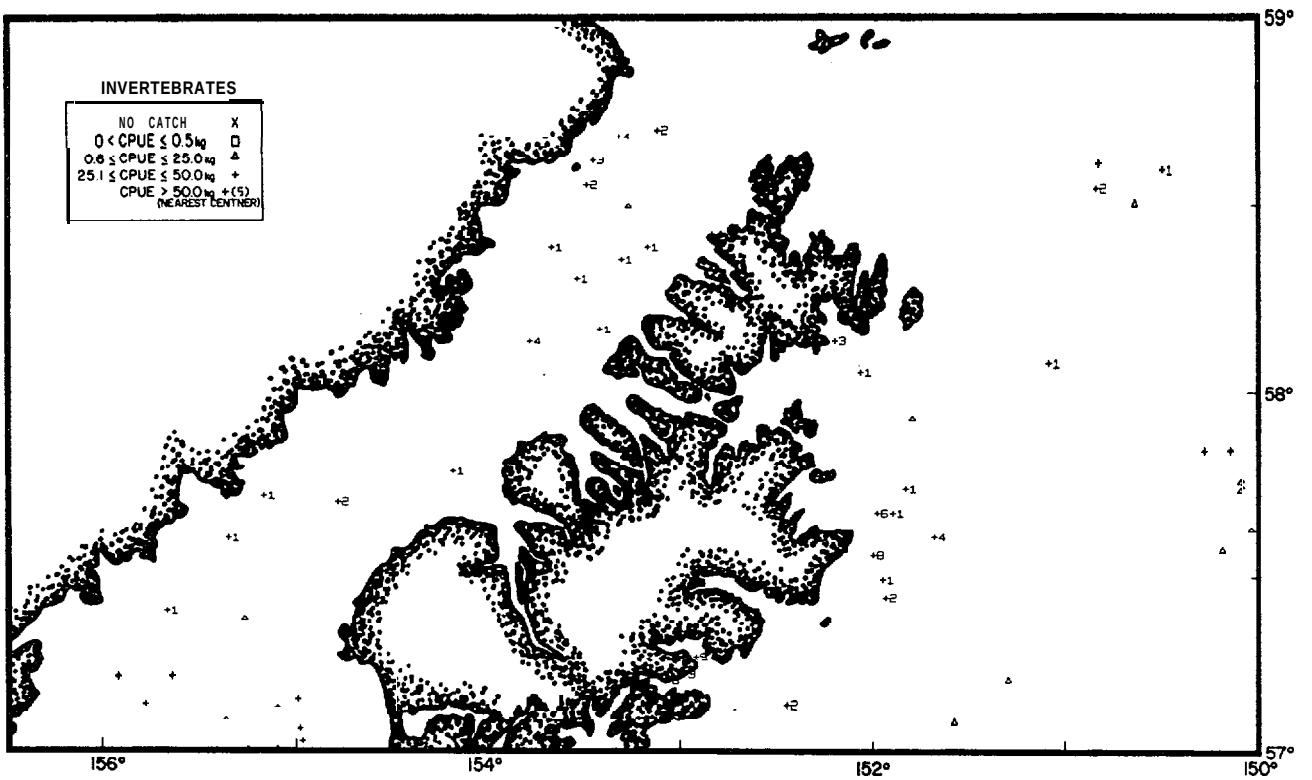


Figure XI-416.--Distribution of standardized catch rates in kilograms/hour of invertebrates in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

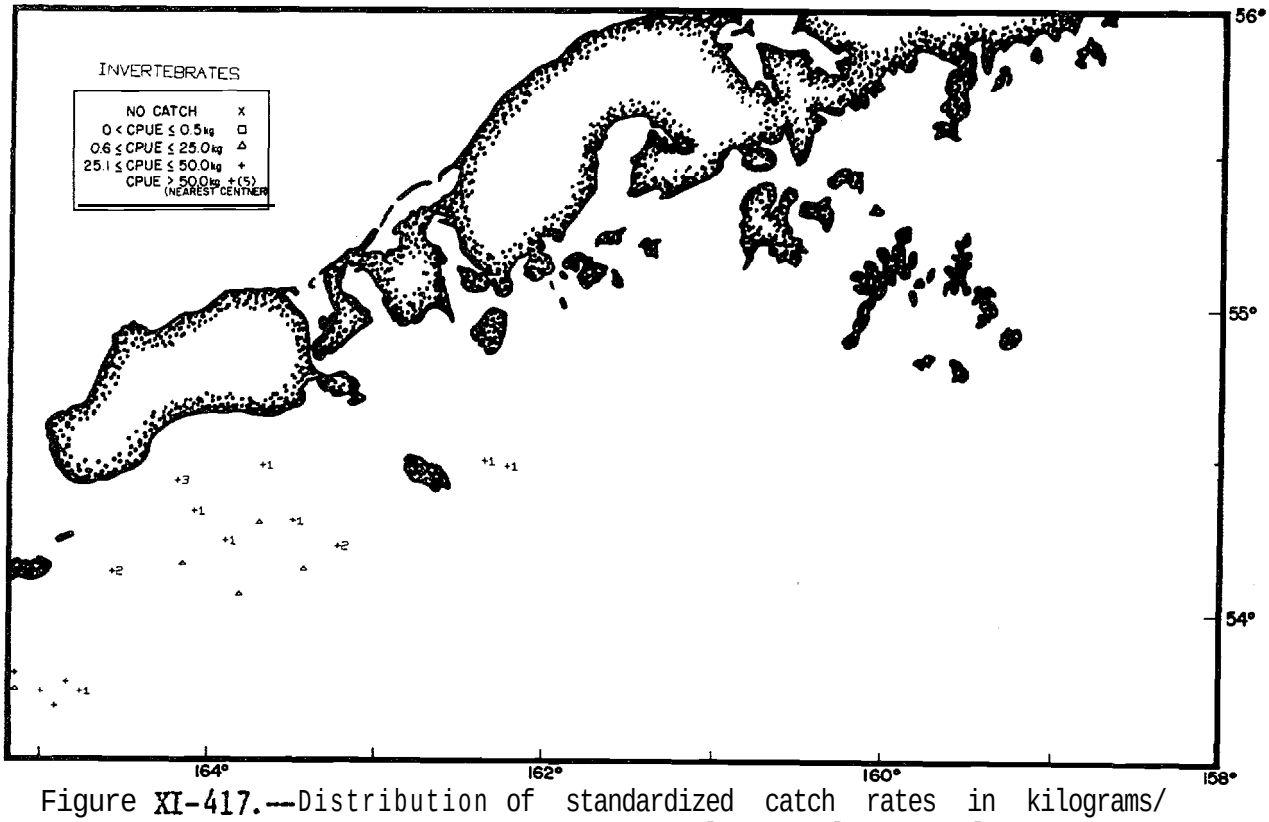


Figure XI-417.—Distribution of standardized catch rates in kilograms/hour of invertebrates in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 7441.

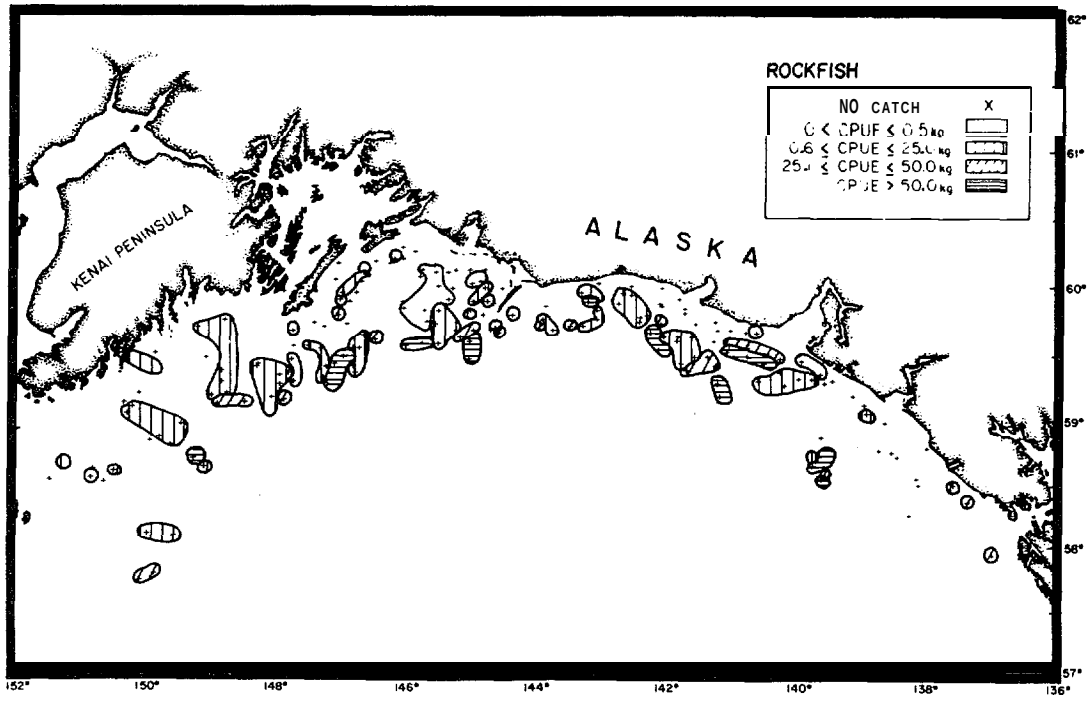


Figure x1-418.--Distribution of apparent relative abundance of rockfish in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976.

The rockfish group had an estimated apparent biomass of 29 thousand mt, which represents less than 2% of the total biomass in the Gulf of Alaska (Table X1-108). Nearly 100% of the rockfish biomass occurred at depths greater than 100 meters. The upper slope contained 51%, the outer shelf 48%, while the inner shelf estimate was approximately 1%. Mean CPUE's for the rockfish group ranged from 0.6 kg/hr in the inner shelf depth zone to 29 kg/hr in the upper slope, and averaged 13 kg/hr over the entire Gulf. Yakutat had the highest relative apparent abundance (24 kg/hr), which resulted from relatively high mean catch rates in the outer shelf and upper slope (Figures X1-418-419). Particularly high CPUE's also occurred in the Sanak and Kodiak upper slope depth zones. Standardized catch rates for all successful stations for this group are plotted in Figures x1-420-424.

The elasmobranch group had an estimated biomass of 28 thousand mt which represents less than 2% of the total estimated biomass in the Gulf of Alaska (Table X1-109). The greatest percentage of the elasmobranch biomass (52%) occurred in the outer shelf, while the remainder was evenly divided between the inner shelf (25%) and upper slope (22%). Mean CPUE's were almost identical (11-12 kg/hr) in all depth zones. Apparent relative abundance was highest in the three easternmost regions with the highest CPUE of 33 kg/hr occurring in the Yakutat area (Figures X1-425-426). Standardized catch rates for all successful stations for this group are plotted in Figures X1-427-431.

DISTRIBUTION, RELATIVE APPARENT ABUNDANCE, BIOMASS ESTIMATES, AND SIZE COMPOSITION FEATURES OF PRINCIPAL SPECIES OF FISH AND INVERTEBRATES

WALLEYE POLLOCK

Distribution and abundance--Walleye pollock were taken in each region and depth zone sampled and averaged 321 kg/hr, the highest relative apparent abundance of any species encountered in the Gulf of Alaska (Figures X1-432-433). By depth zones, the highest mean CPUE of 529 kg/hr occurred in the outer shelf followed by the inner shelf and the upper slope. Mean CPUE's were significantly above average in three western Gulf regions with Sanak having the highest mean CPUE followed by Chirikof and Kodiak. The lowest relative apparent abundance occurred in the Fairweather region. The distribution of the standardized catch rates for the successful stations is shown in Figures X1-434-438.

Biomass--The total biomass of walleye pollock has been estimated at 739 thousand mt of which 83% was located in the outer shelf depth zone (Table x1-110). The remaining biomass was relatively evenly divided between the inner shelf and upper slope. The western Gulf regions contained 84% of the apparent pollock biomass with Sanak making the largest contribution (33%) followed by Chirikof (28%) and Kodiak (21%). The combined Kodiak and Sanak outer shelf depth zones accounted for 42% of the estimated biomass for this species. The pollock biomass estimate should be considered minimal since this is a semi-pelagic species and some unknown portion of the population may have occupied the water column above the sampling gear, thus being unavailable to the trawl.

Table XI-108.--Estimated biomass and population size of rockfishes in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	0.3	12.2	0.4	4/	5/	0.34	--
	101-200	7.4	1,200.7	38.6	0.5	6.4	2.36	--
	201-400	63.1	1,895.2	61.0	7.3	93.6	0.26	--
	All zones	13.6	3,108.1	10.8	7.8	--	0.40	--
Yakutat	l-100	0.1	7.7	0.1	4/	5/	0.31	--
	101-200	18.9	1,292.5	59.0	7.0	35.9	0.39	--
	201-400	57.7	2,281.6	40.9	12.5	64.1	0.32	--
	All zones	24.3	5,581.8	19.3	19.5	--	0.34	--
Prince William	l-100	3.1	340.5	9.1	1.7	13.1	0.20	--
	101-200	17.3	2,185.6	58.4	7.3	56.2	0.30	--
	201-400	33.4	1.217.0	32.5	4.0	30.8	0.30	--
	All zones	13.7	3.743.1	13.0	13.0	--	0.29	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	11.8	2,862.4	90.2	2.1	63.6	1.35	--
	201-400	3.1	312.9	9.9	1.2	36.4	0.26	--
	All zones	9.3	3.175.3	11.0	3.3	--	0.96	--
Kodiak	l-100	0.2	21.7	0.3	--		--	
	101-200	2.6	320.2	5.0	--	--	--	--
	201-400	108.8	6.066.1	94.7	--	--	--	--
	All zones	19.9	6,408.0	22.2	--	--	--	
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	2.5	102.8	48.7	--	--		--
	201-400	1.0	108.1	51.3	--	--	--	--
	All zones	1.4	210.9	0.7	0.3	--		--
Chirikof	l-100	3/	4.1	0.1	4/	5/	0.14	--
	101-200	24.1	3.897.1	91.8	9.2	95.6	0.42	
	201-400	2.6	345.5	8.1	0.3	4.4	1.03	--
	All zones	10.8	4,246.7	14.7	9.6	--	0.44	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	193.2	2,414.6	100.0	--	--	--	--
	All zones	6.8	2.414.6	a.4	--	--	--	--
Total	l-100	0.6	386.2	1.3	--	--	--	--
	101-200	11.5	13.861.3	48.0	--	--	--	--
	201-400	29.0	14,641.0	50.7	--	--	--	--
	All zones	12.7	28,888.5	100.1	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 x 106 individuals.
5/ Less than 0.1 percent.

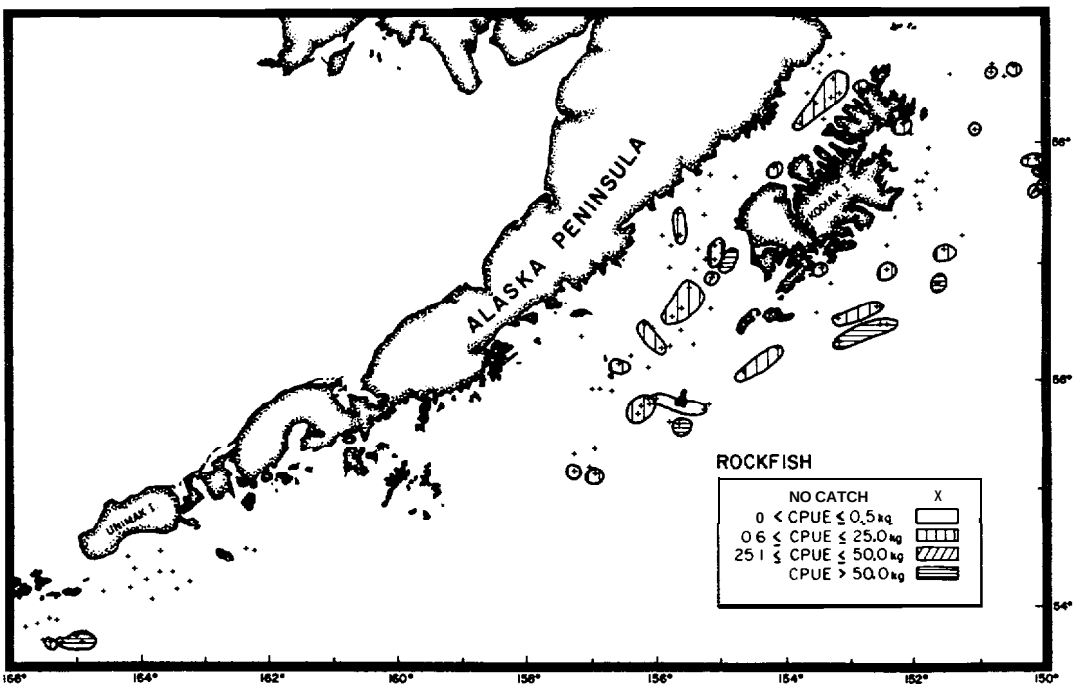


Figure X1-419.-Distribution of apparent relative abundance of rockfish in the western Gulf of Alaska, May-Jul. 1973, Aug.-&t. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

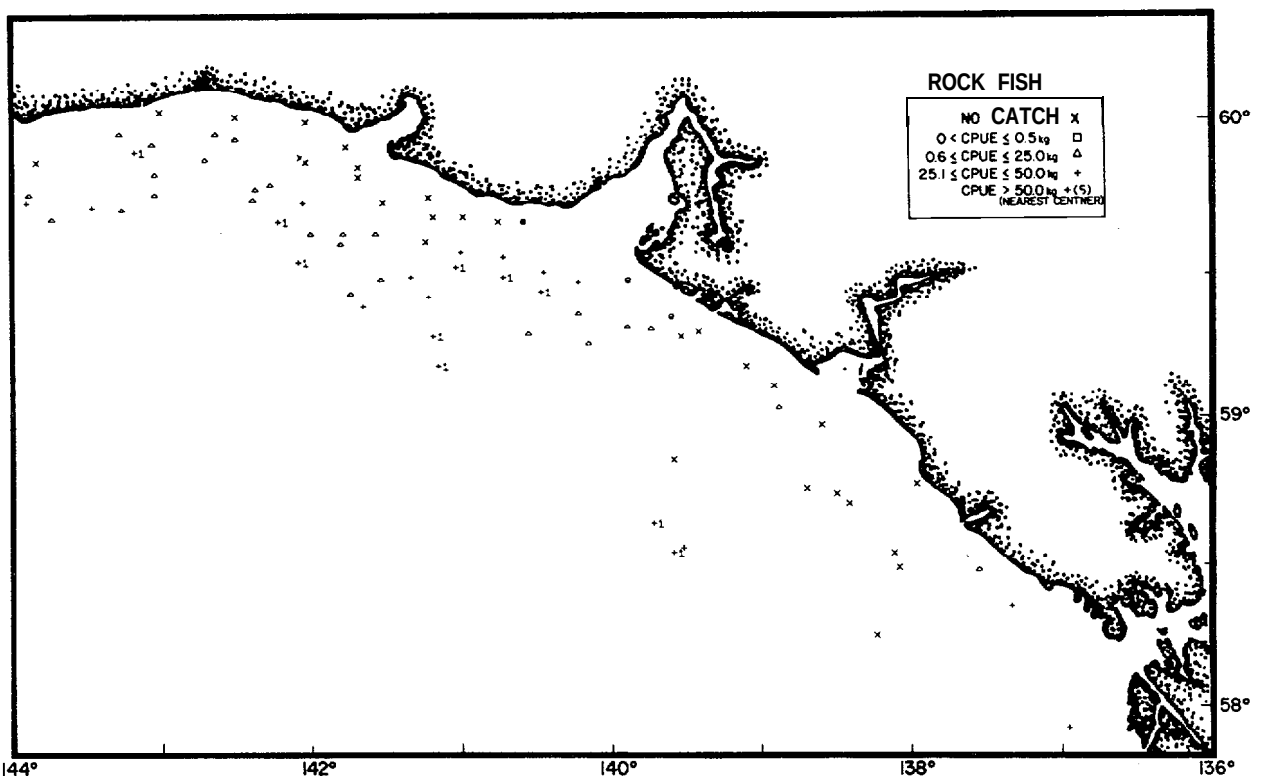


Figure XI-420.-Distribution of standardized catch rates in kilograms/hour of rockfish in the eastern Gulf of Alaska, May-Aug.'1975 and Apr. 1976 (Cruises 751 and 762).

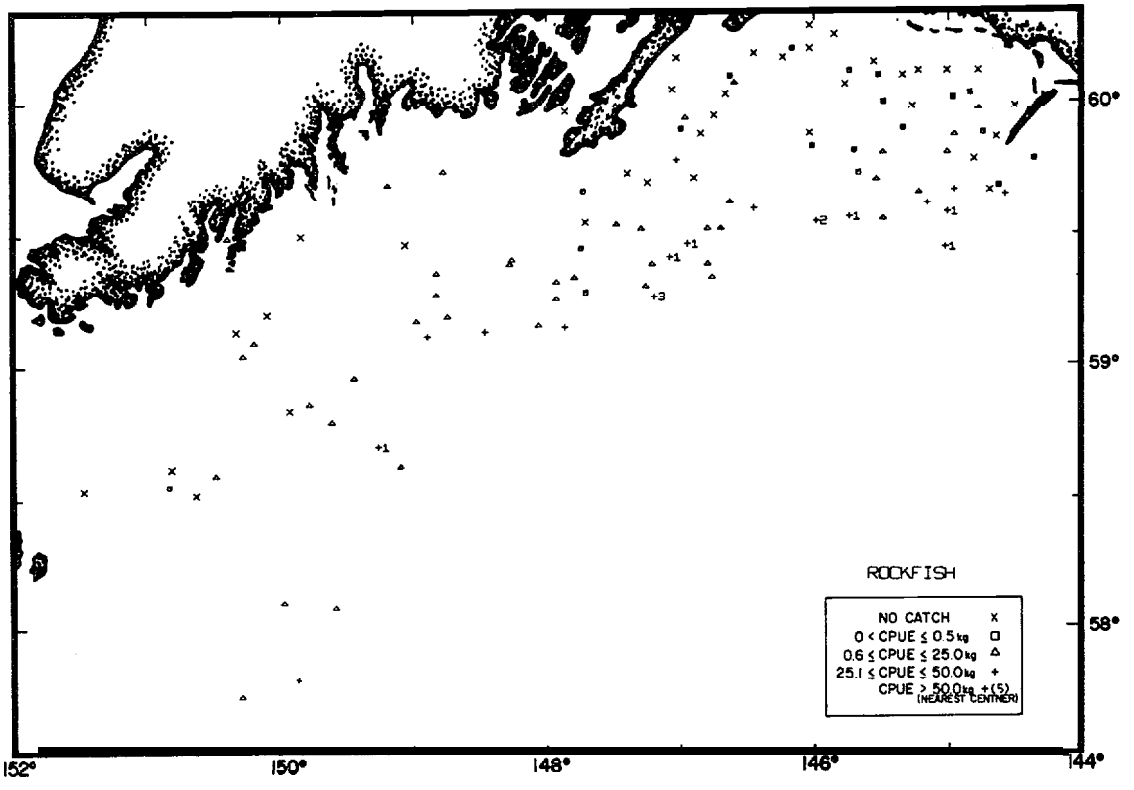


Figure XI--421. --Distribution of standardized catch rates in kilograms/ hour of rockfish in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

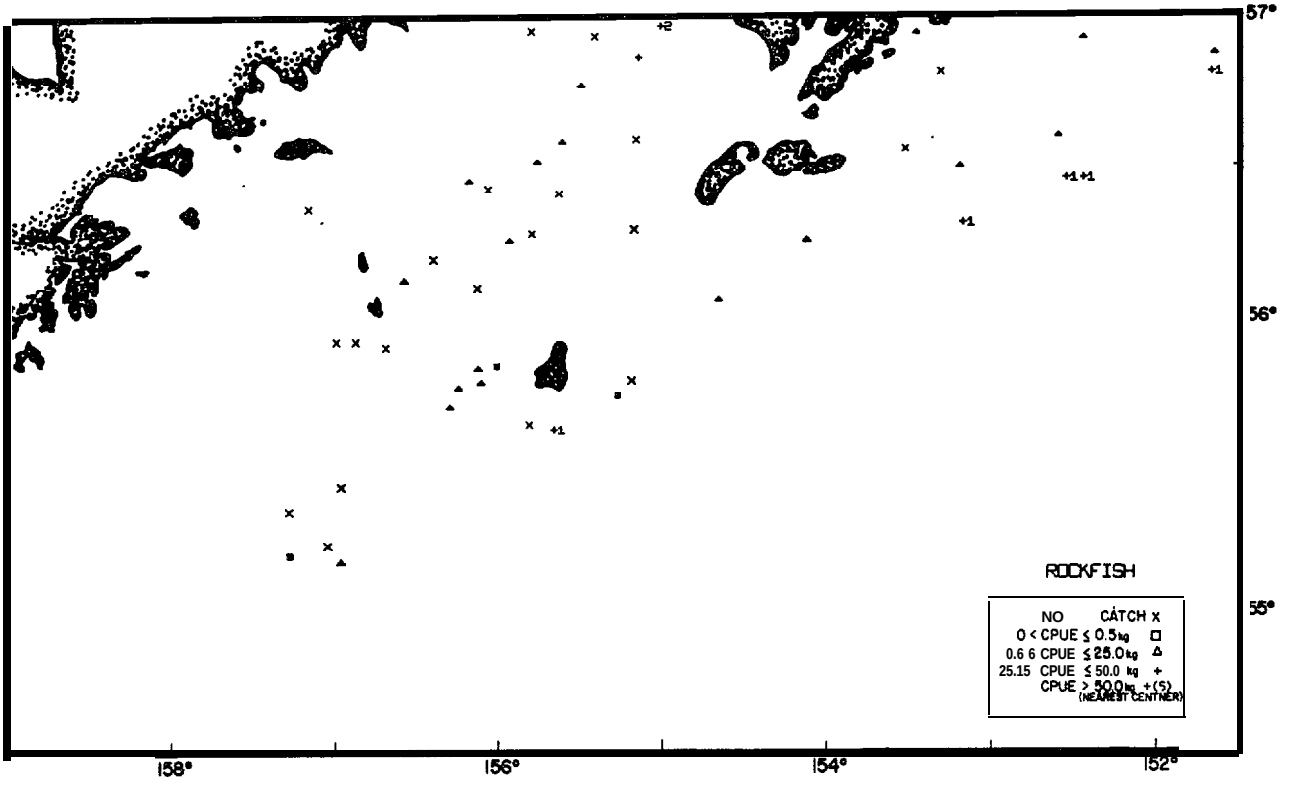


Figure XI-422.--Distribution of standardized catch rates in kilograms/ hour of rockfish in the western Gulf of Alaska, Aug.-Oct. 1973 and Jm.-Aug. 1975 (Cruises 734 and 753).

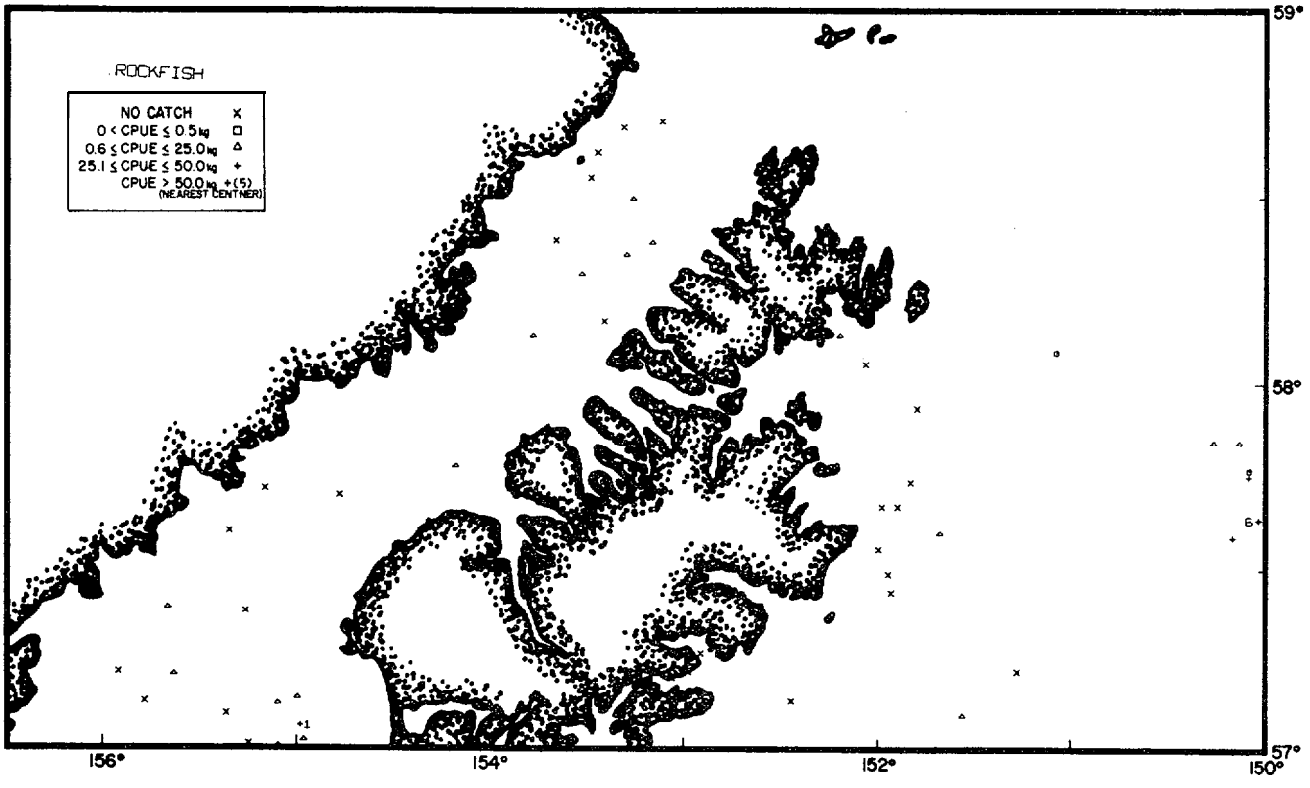


Figure XI-423.--Distribution of standardized catch rates in kilograms/hour of rockfish in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

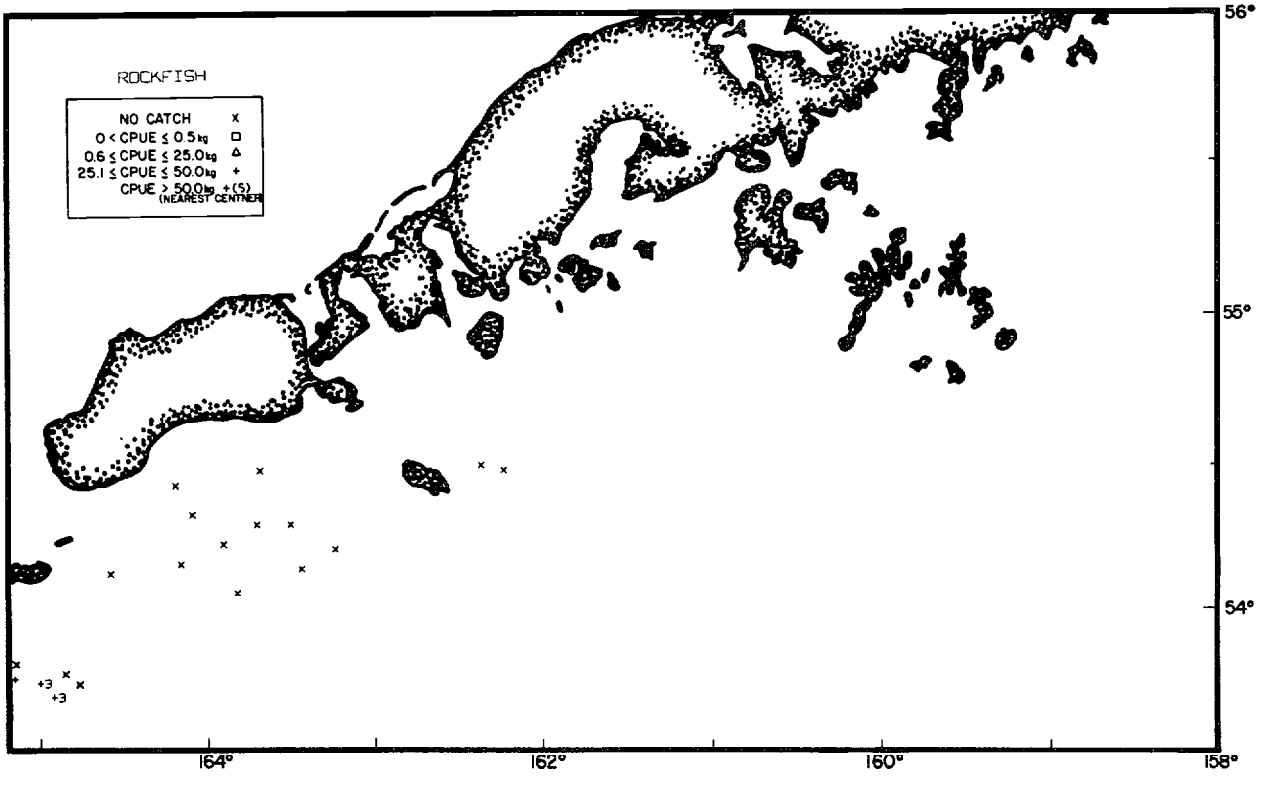


Figure XI-424.--Distribution of standardized catch rates in kilograms/hour of rockfish in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Table XI-109.--Estimated biomass and population size of Elasmobranchs In the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (x 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	12.7	456.9	7.3	0.3	8.8	1.81	--
	101-200	32.3	5.255.3	83.5	2.5	73.5	2.13	--
	201-400	19.3	579.5	9.2	0.6	17.7	1.01	--
	All zones	27.5	6.291.7	22.2	3.4		1.91	--
Yakutat	l-100	45.4	2,813.3	31.1	1.4	28.0	1.94	--
	101-200	23.7	3,459.7	38.2	2.2	44.0	1.55	--
	201-400	40.7	2,795.2	30.8	1.4	28.0	1.99	--
	All zones	2.8	9,068.2	31.9	5.0		1.79	--
Prince William	l-100	35.4	31911.5	58.7	0.7	41.2	5.87	--
	101-200	16.6	2,098.3	31.5	0.7	41.2	2.89	--
	201-400	17.8	649.9	9.8	0.3	17.7	2.35	--
	All zones	24.4	6,659.7	23.4	1.7	--	3.99	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	1.2	290.8	47.3	0.3	42.9	1.00	--
	201-400	3.2	324.3	52.7	0.4	57.1	0.92	--
	All zones	1.8	615.1	2.2	0.7		0.96	--
Kodiak.	l-100	0	0	0	0	0	--	--
	101-290	1.5	179.2	95.4	--	--	--	--
	201-400	0.2	8.6	4.6	--	--	--	--
	All zones	0.6	187.8	0.7	--	--	--	--
Shelikof	l-100	1.2	7.8	1.1	--	--	--	--
	101-200	0.5	20.6	2.8	--	--	--	--
	201-400	6.7	702.5	96.1	--	--	--	--
	All zones	4.8	730.9	2.6	--	--	--	
Chirikof	l-100	0	0	0	0	0	--	
	101-200	1.7	269.7	20.4	4/	5/	15.88	--
	201-400	7.8	1.049.3	79.6	8.2	100.0	5.31	--
	All zones	3.2	1,319.0	4.7	0.2	--	6.15	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	0	0	0	0	0	--	--
	101-200	19.9	3,247.9	94.2	1.9	95.0	1.74	--
	201-400	15.9	198.4	5.8	0.1	5.0	2.76	--
	All zones	9.7	3,446.3	12.1	2.0		1.78	
Total	I-100	10.5	7,189.5	25.4	--		--	--
	101-200	12.2	14,821.5	52.3	--	--	--	--
	201-400	11.2	307.7	22.3	--		--	--
	All zones	11.5	28,318.7	100.0	--	--	--	--

1/ Mean catch per unit effort. in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 x 10^6 individuals.
5/ Less than 0.1 percent.

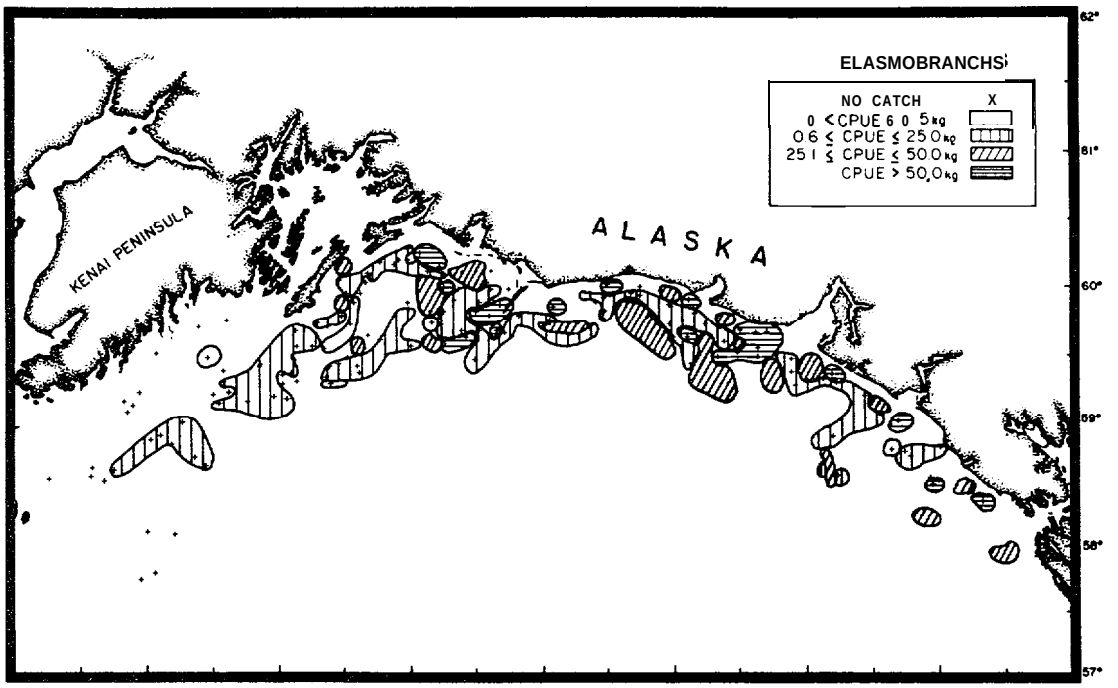


Figure X1-425.--Distribution of apparent relative abundance of elasmobranchs in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

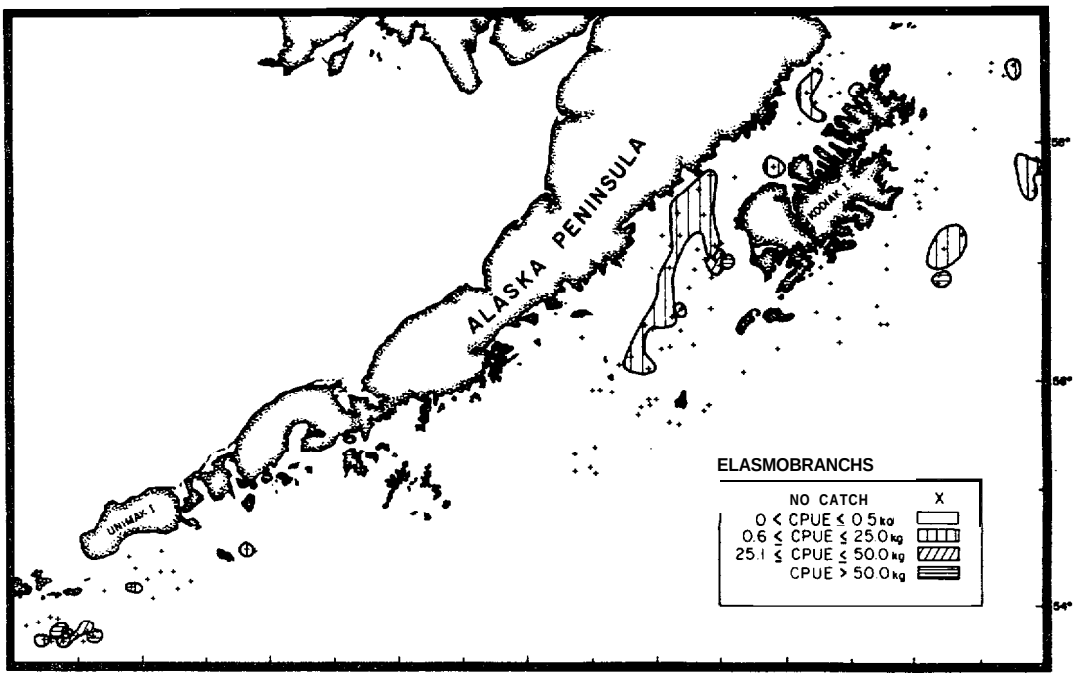


Figure XI-426.--Distribution of apparent relative abundance of elasmobranchs in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

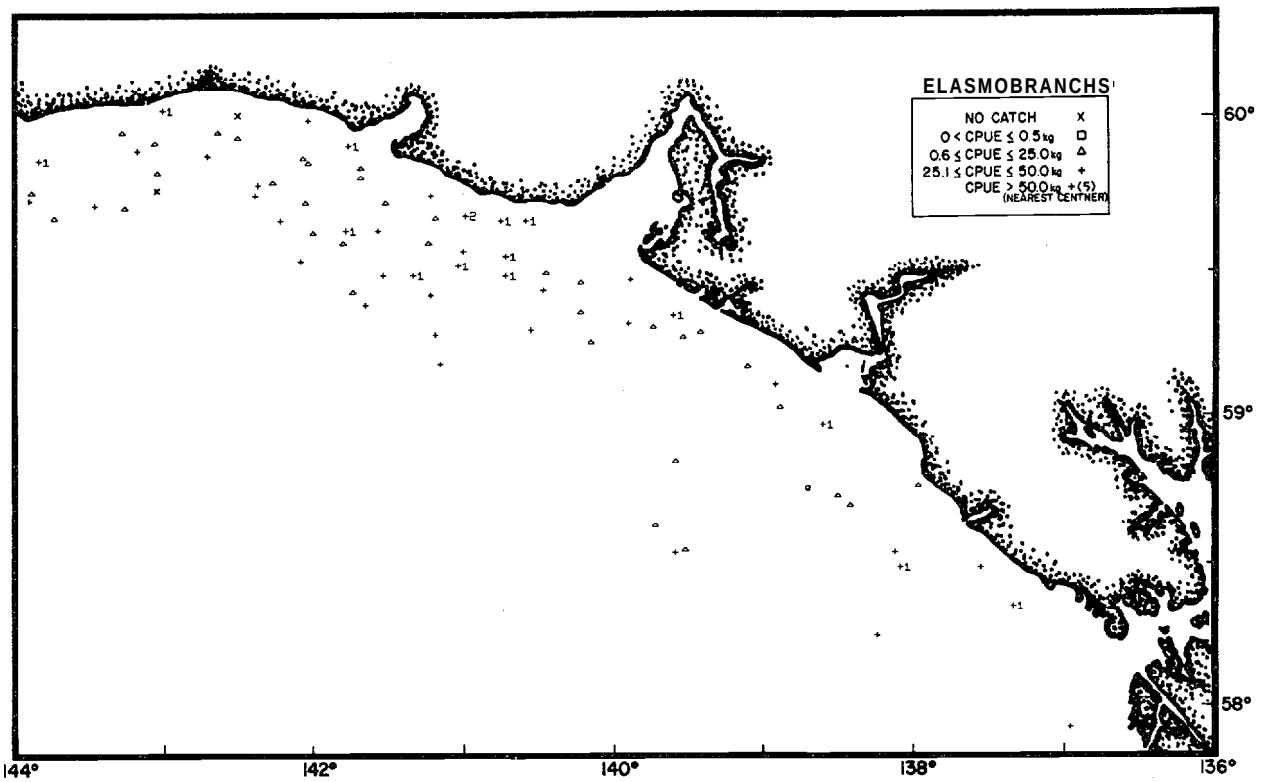


Figure XI-427.--Distribution of standardized catch rates in kilograms/ hour of elasmobranchs'in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

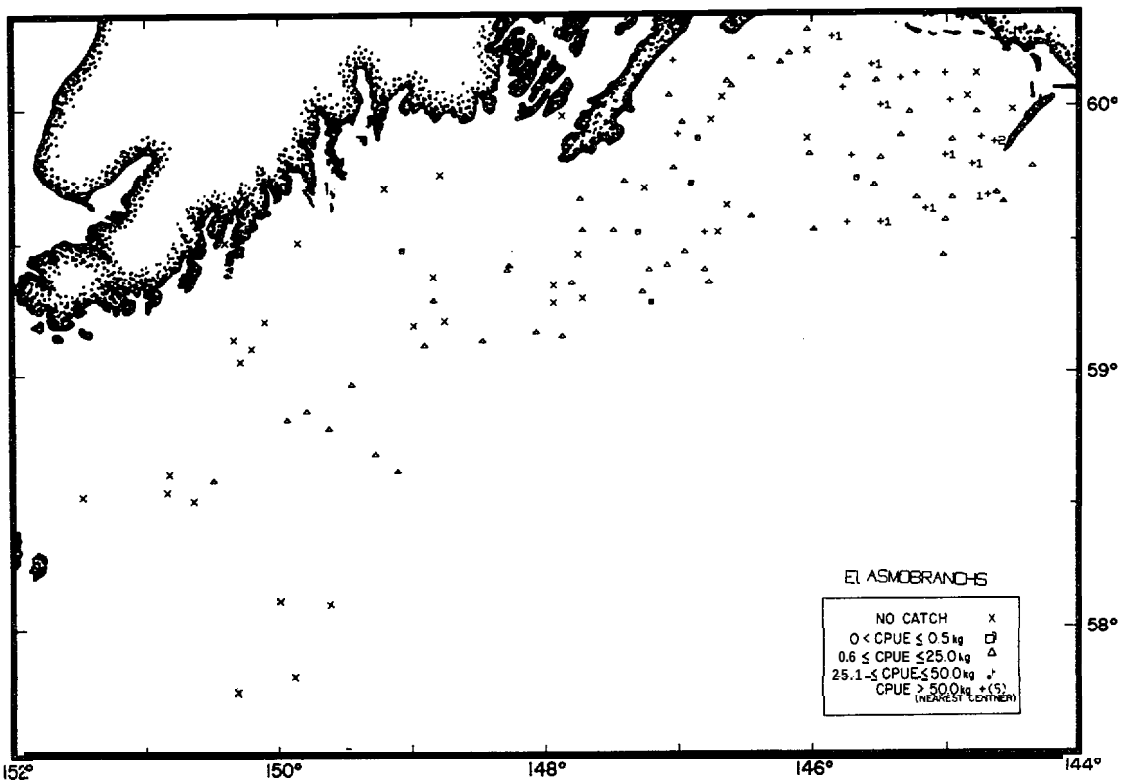


Figure XI-428.-Distribution of standardized catch rates in kilograms/ hour of elasmobranchs in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

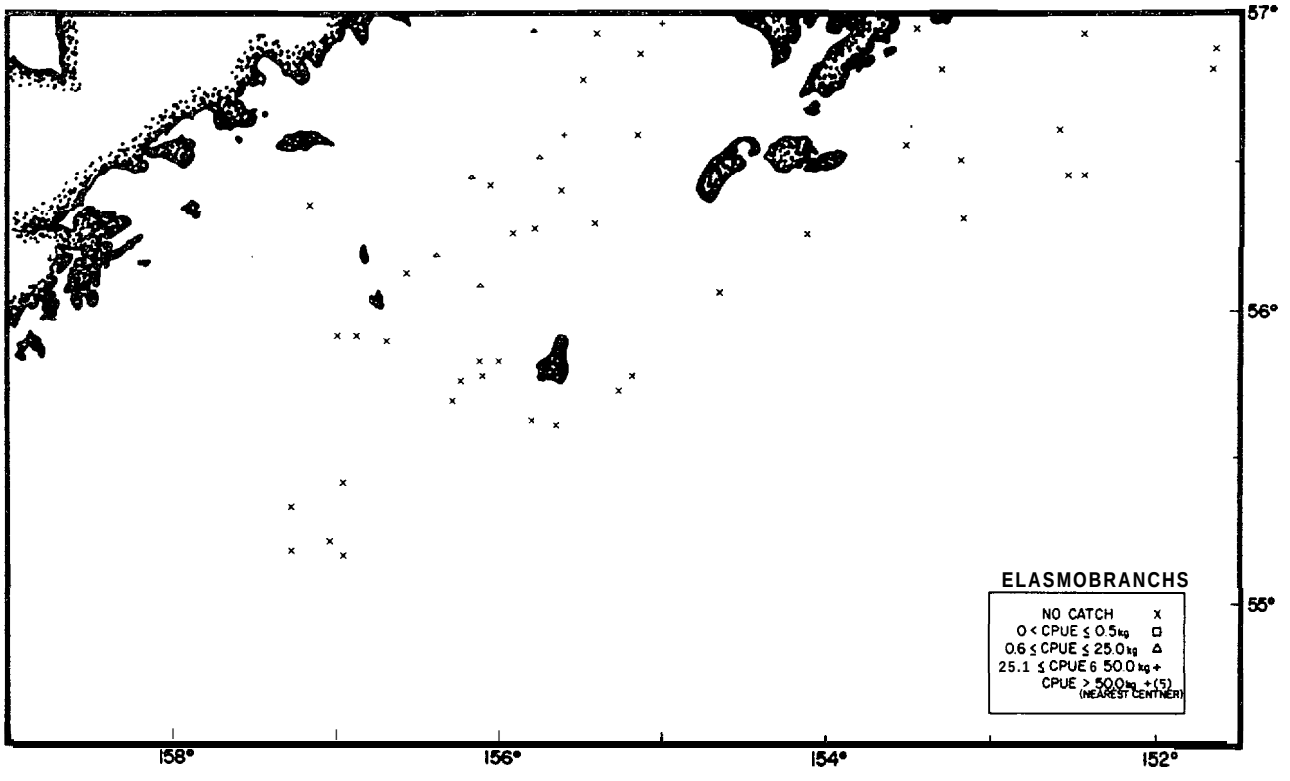


Figure XI-429 .--Distribution of standardized catch rates in kilograms/ hour of elasmobranchs in the western Gulf of Alaska, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 734 and 753).

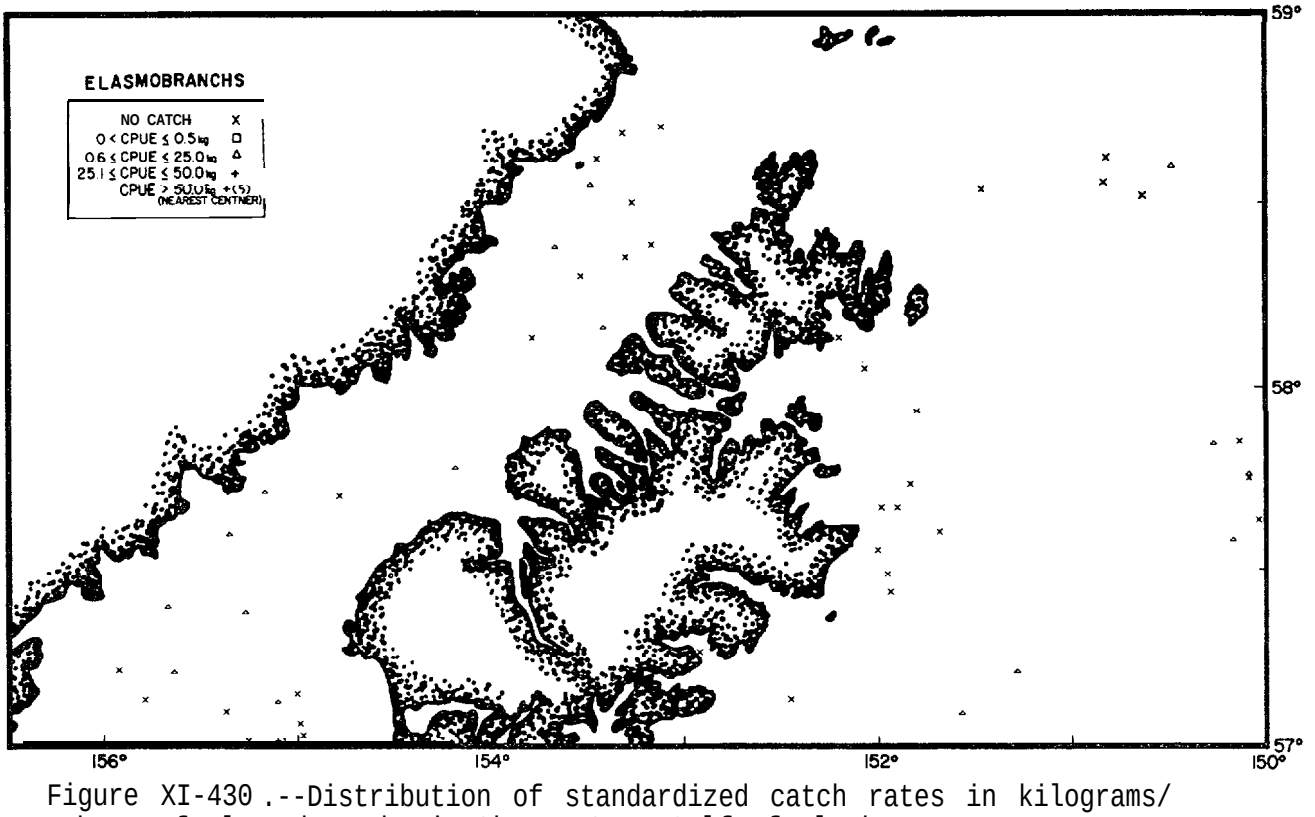


Figure XI-430 .--Distribution of standardized catch rates in kilograms/ hour of elasmobranchs in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

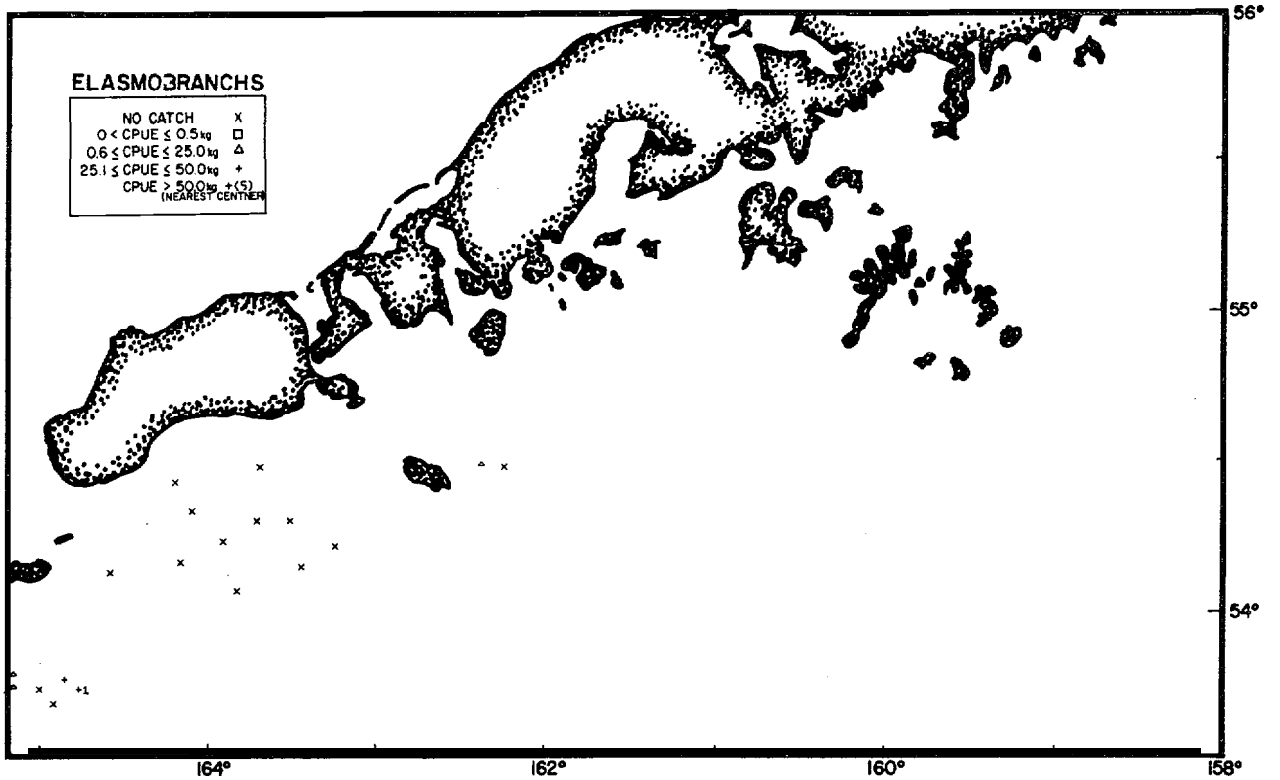


Figure XI-431.-Distribution of standardized catch rates in kilograms/ hour of elasmobranchs in the western Gulf of Alaska-, Jul.-Aug. 1974 (Cruise 744).

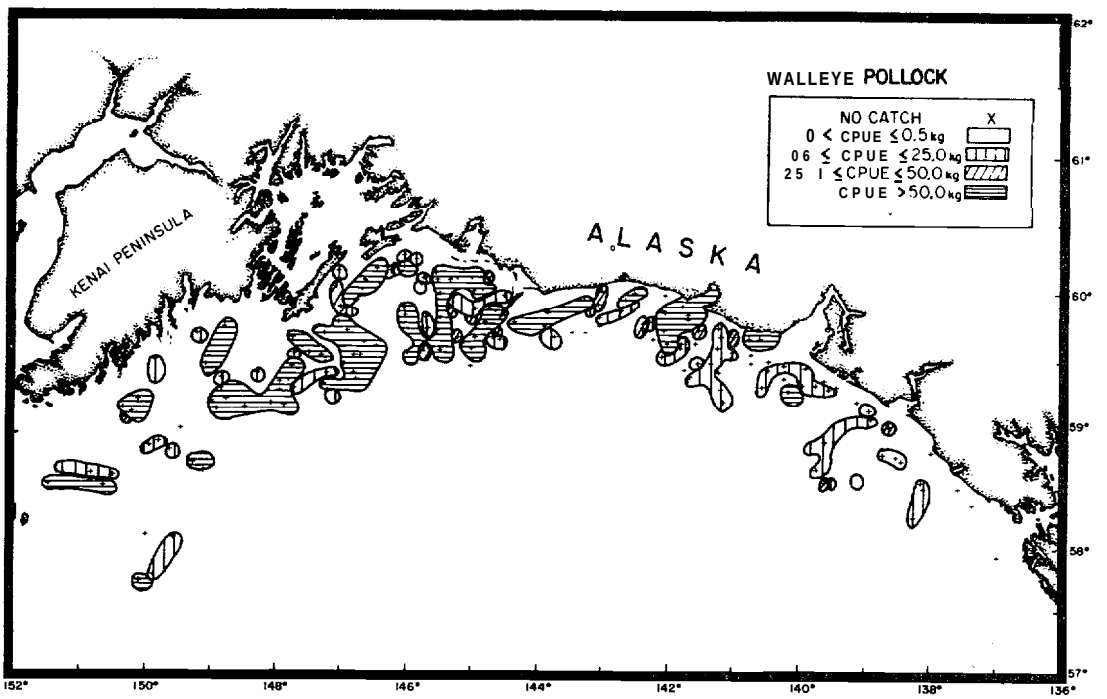


Figure XI-432.--Distribution of apparent relative abundance of walleye pdllock in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

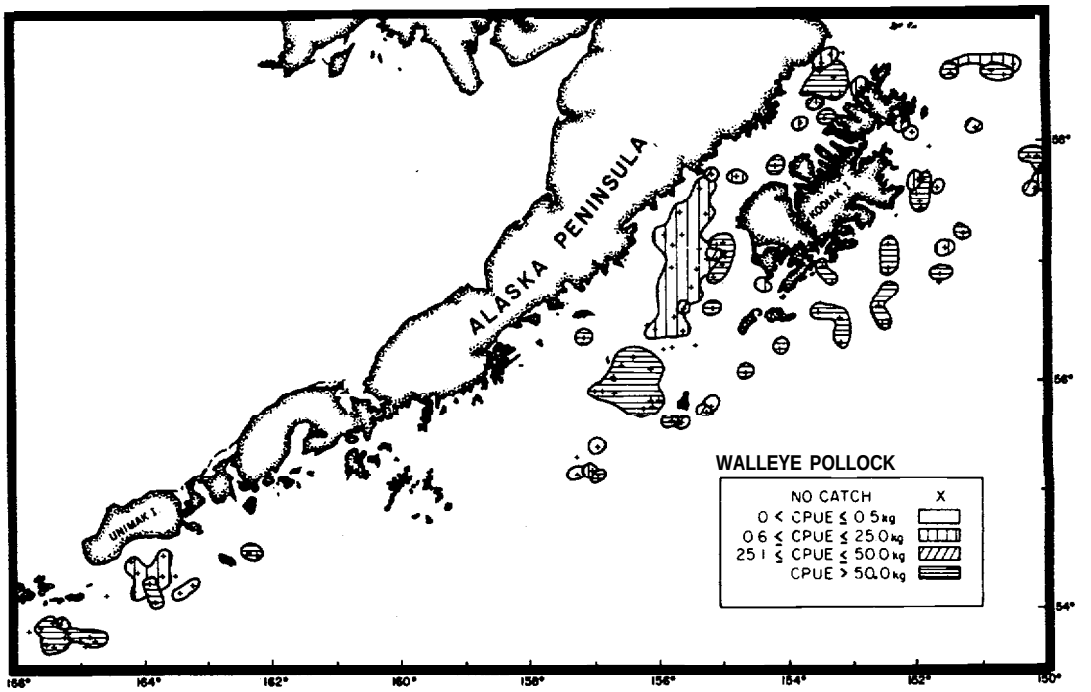


Figure XI-433.--Distribution of apparent relative abundance of walleye pollock .in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

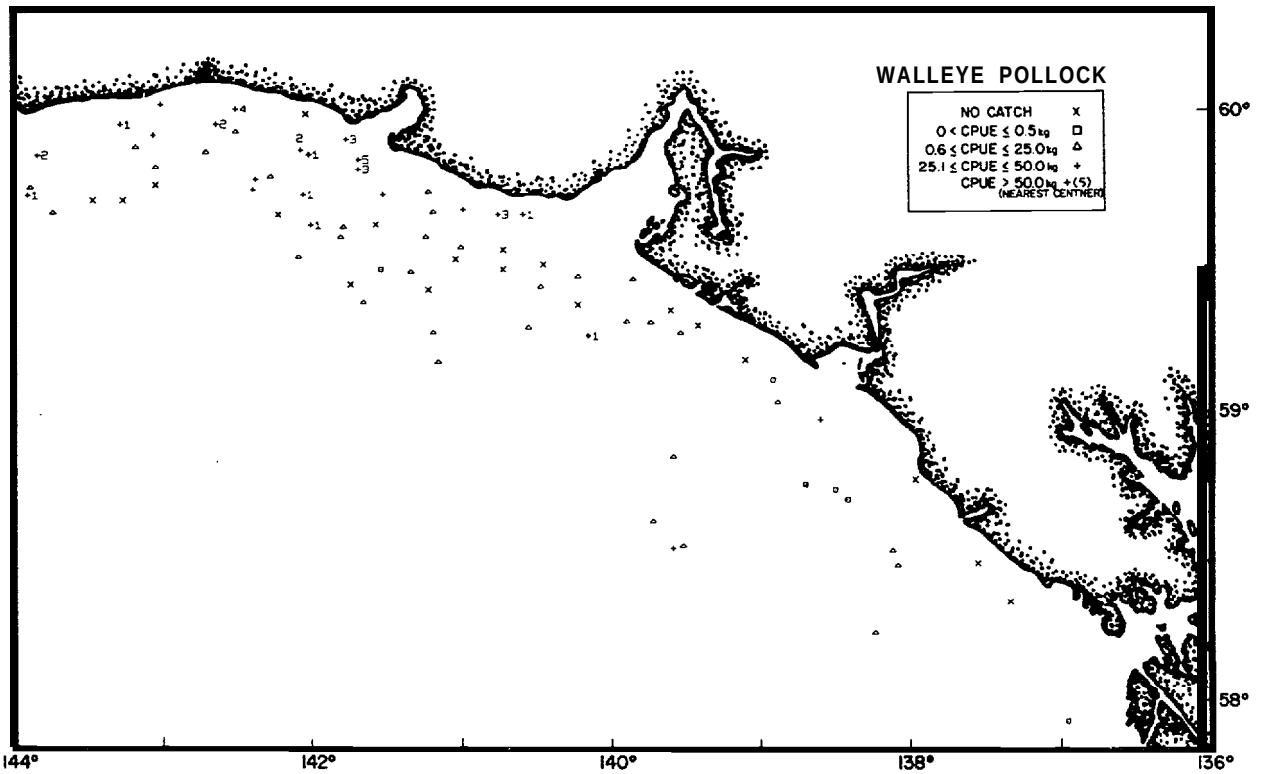


Figure n-434.--Distribution of standardized catch rates in kilograms/ hour of walleye pollock in the eastern Gulf of Alaska, May-Aug. 1975, Apr. 1976 (Cruises 751 and 762).

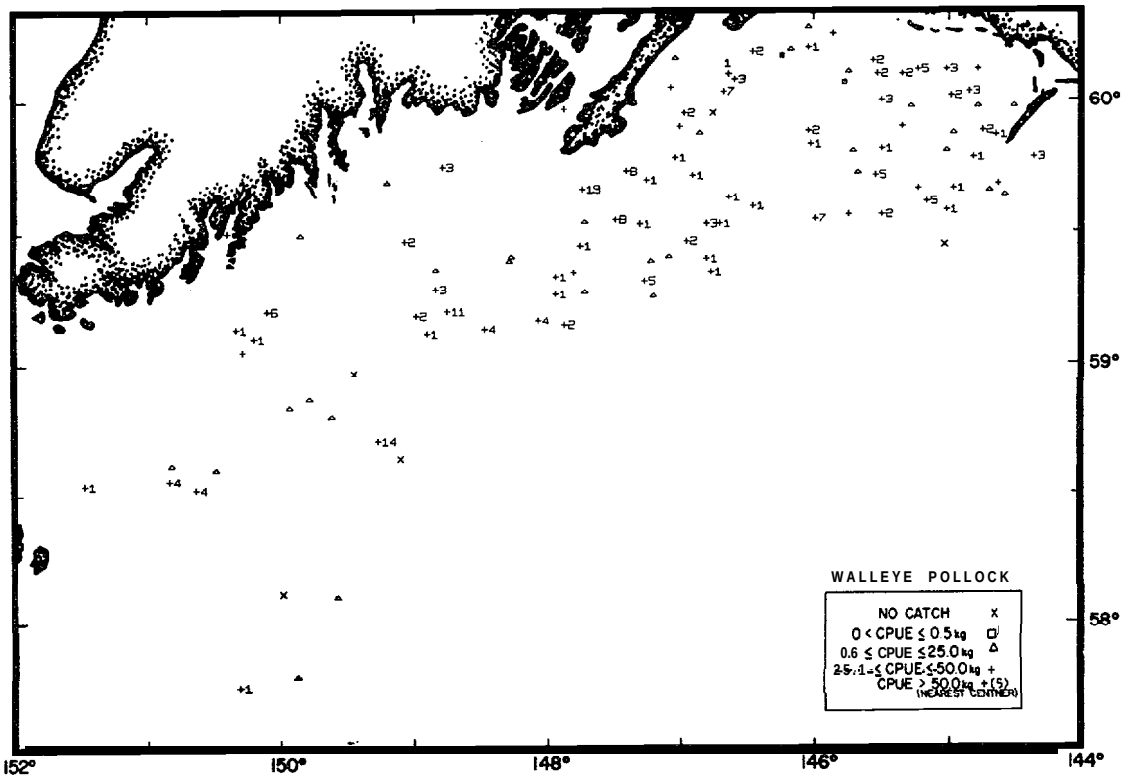


Figure XI-435.--Distribution of standardized catch rates in kilograms/hour of walleye pollock in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

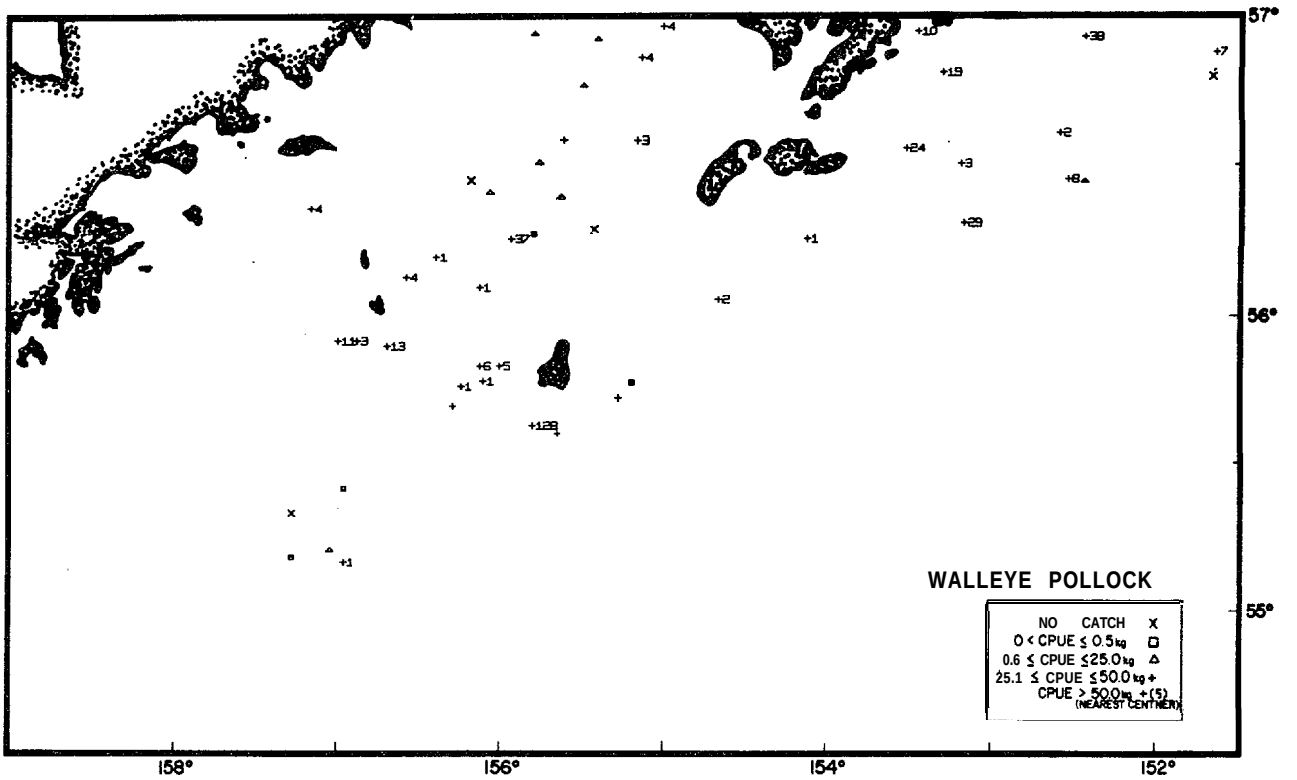


Figure XI-436.--Distribution of standardized catch rates in kilograms/hour of walleye pollock in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

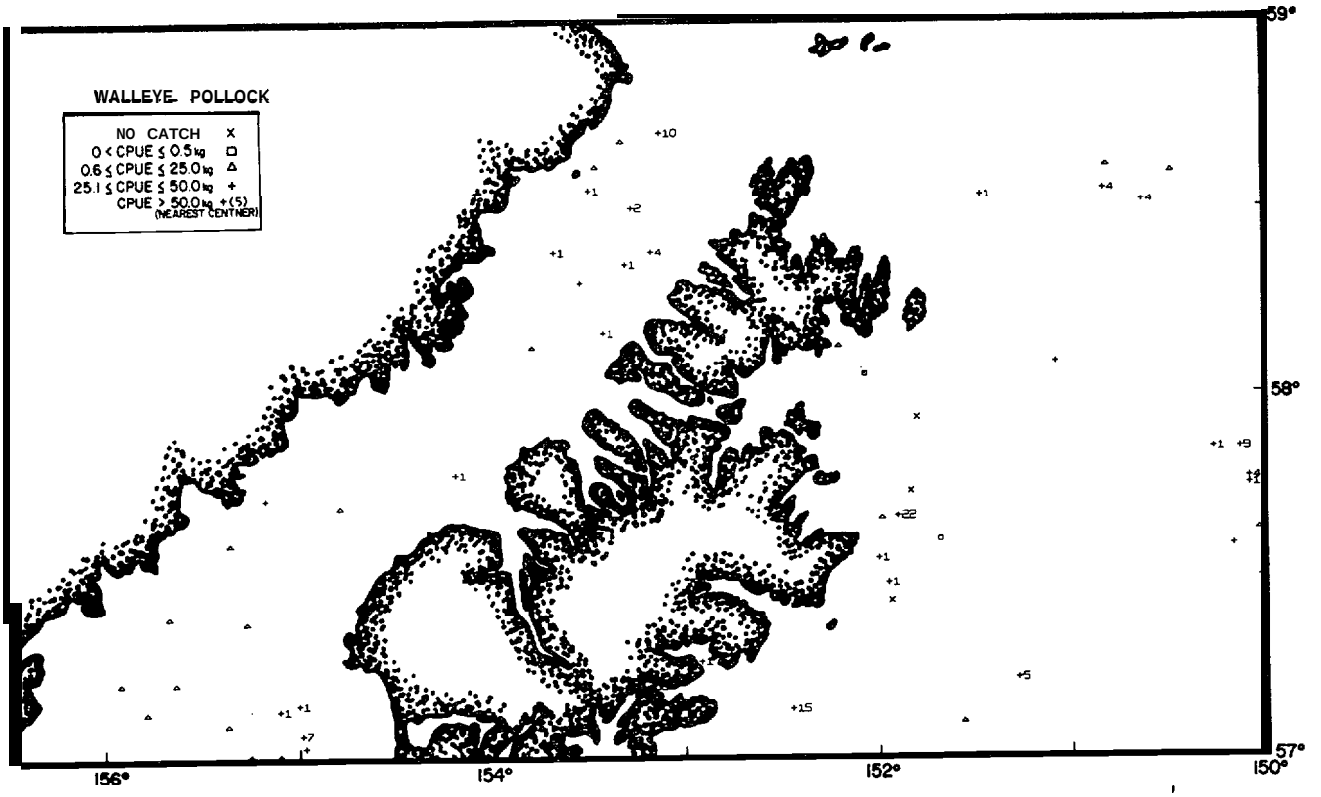


Figure XI-437.--Distribution of standardized catch rates in kilograms/ hour of walleye pollock in the western Gulf of Alaska, May-Jun., 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

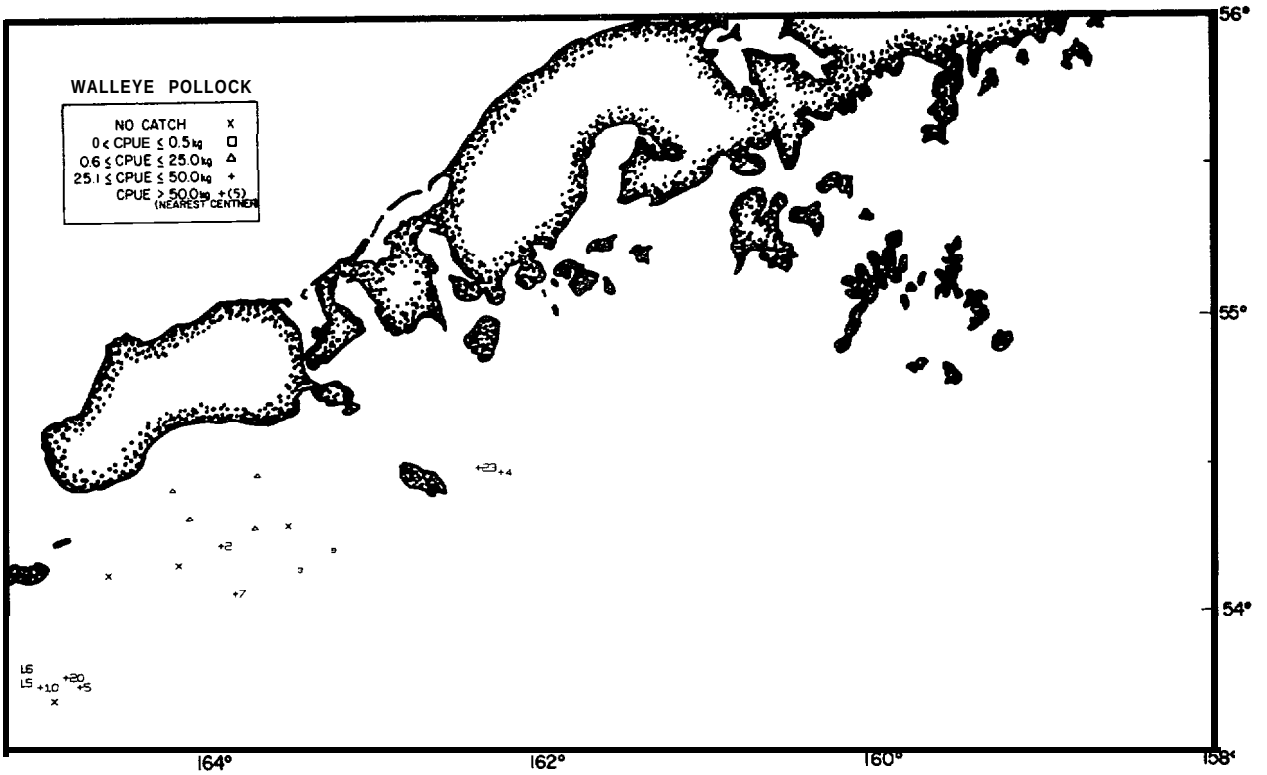


Figure XI-438.--Distribution of standardized catch rates in kilograms/ hour of walleye pollock in the western Gulf of Alaska, Jul. -Aug. 1974 (Cruise 744).

Table XI-110.--Estimated biomass and population size of walleye pollock (*Theragra chalcogramma*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	0.6	21.2	1.7	1.4	5.2	0.02	--
	101-200	4.1	665.0	53.9	24.4	90.0	0.03	12.0
	201-400	18.2	546.7	44.3	1.3	4.8	0.43	40.4
	All zones	5.4	1.232.9	0.2	27.1	—	0.05	—
Yakutat	l-100	169.1	10,474.4	70.9	137.3	92.2	0.08	16.3
	101-200	28.9	4,234.0	28.7	11.6	7.8	0.36	34.4
	201-400	0.9	62.3	0.4	0.1	0.1	0.49	—
	All zones	53.3	14.770.7	2.0	149.0	—	0.10	--
Prince William	l-100	93.3	10,314.0	26.5	46.9	36.7	0.22	35.5
	101-200	211.4	26,652.4	68.6	76.3	59.8	0.35	32.6
	201-400	52.3	1,904.9	4.9	4.5	3.5	0.42	36.0
	All zones	142.3	38,871.3	5.3	127.7	--	0.30	--
Kenai	l-100	--	--	—	—	--	--	—
	101-200	255.1	61,945.0	93.5	174.1	72.2	0.36	35.8
	201-400	42.8	4,290.0	6.5	14.7	7.8	0.29	33.1
	All zones	193.0	66,235.0	9.0	188.8	--	0.35	—
Kodiak	l-100	85.4	12,233.9	7.8	49.3	11.9	0.25	31.5
	101-200	913.4	112,732.0	71.9	306.7	74.2	0.37	35.9
	201-400	571.2	31,847.9	20.3	57.2	13.8	0.56	42.2
	All zones	485.3	156,813.8	21.2	413.2	--	0.38	
Shelikof	l-100	40.5	262.6	1.9	3.7	5.4	0.07	14.9
	101-200	210.2	8,577.0	61.7	44.8	65.8	0.19	27.9
	201-400	48.5	5,052.4	36.4	19.6	28.8	0.26	30.2
	All zones	91.7	13,892.0	1.9	68.1	--	0.20	
Chirikof	I-100	39.9	4,775.3	2.3	9.8	1.1	0.49	35.6
	101-200	1,212.1	195,625.0	95.9	856.5	98.1	0.23	30.3'
	201-400	26.8	3,595.7	1.8	6.4	0.8	0.56	41.7
	All zones	525.8	203,996.0	27.6	872.7	—	0.23	--
Shumagin	l-100	--	—		--	--	—	—
	101-200	--	—	--	--	—	—	--
	201-400	--	--	--	--	--	--	—
	All zones			—		—	—	
Sanak	l-100	193.3	34,722.1	14.3		—	—	—
	101-200	1.222.6	199,615.0	82.0	706.2	—	0.30	31.5
	201-400	731.8	9,144.5	3.8	--	—	—	—
	All zones	695.1	243,481.6	32.9	--	--	--	--
Total	l-100	108.9	72,803.5	9.9		--	--	--
	101-200	528.7	610,045.4	82.5	2,200.6	--	0.26	--
	201-400	103.4	56,444.4	7.6	--	--	—	--
	All zones	320.5	739,293.3	100.0	--	—	—	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Size composition--Length-frequency distributions for pollock may include juvenile fish for which sex was not always determined. The inclusion of these unsexed fish in the calculation of mean size for sexes combined caused, in several cases, the mean lengths to be considerably less than those for individual sexes. (Table X1-111).

Female pollock were generally larger than males throughout the Gulf of Alaska. The range of mean sizes for females was 29.2-47.8 cm, while males varied from 28.3-48.2 cm with the largest fish generally occupying the upper slope waters of the western Gulf. Length-frequency distributions are available for all regions sampled and are presented in Figure X1-439. Unless otherwise noted as random length-frequencies, all distribution plots for this species are representative of the population occupying the respective region-depth zone.

Length-weight relationship-The coefficients which set the regression lines derived from 881 length weight observations in the Yakutat and Prince William regions are summarized in Table XI-112 by sexes and depth zones. Data points representing all length-weight observations are presented graphically by region-depth zones in Figure X1-440.

Table XI-111 .--Mean lengths (cm) of walleye pollock by regions and depth zones (Cruises 733, 734, 744, 751, 753 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fair-weather	--	--	--	--	--	12.0	--	--	--
Yakutat	34.1	37.5	16.3 1/	322	36.1	34.4	--	--	--
Prince William	37.7	44.7	33.5 1/	32.5	33.1	32.6	35.7	36.5	36.0
Kenai	--	--	--	34.9	36.5	35.8	33.1	33.9	33.4
Kodiak	30.6	32.3	31.5	35.5	36.7	35.9	41.7	42.7	42.2
Shelikof	--	--	14.9 1/	28.3	29.2	27.9 1/	33.3	33.7	30.2 1/
Chirikof	29.8	39.5	35.6	30.1	30.6	30.3	39.4	42.8	41.7
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	--	34.5	23.7	31.5	--	--	--

1/ Size composition of this species was often determined using unsexed samples with the sex of smaller specimens rarely being determined.

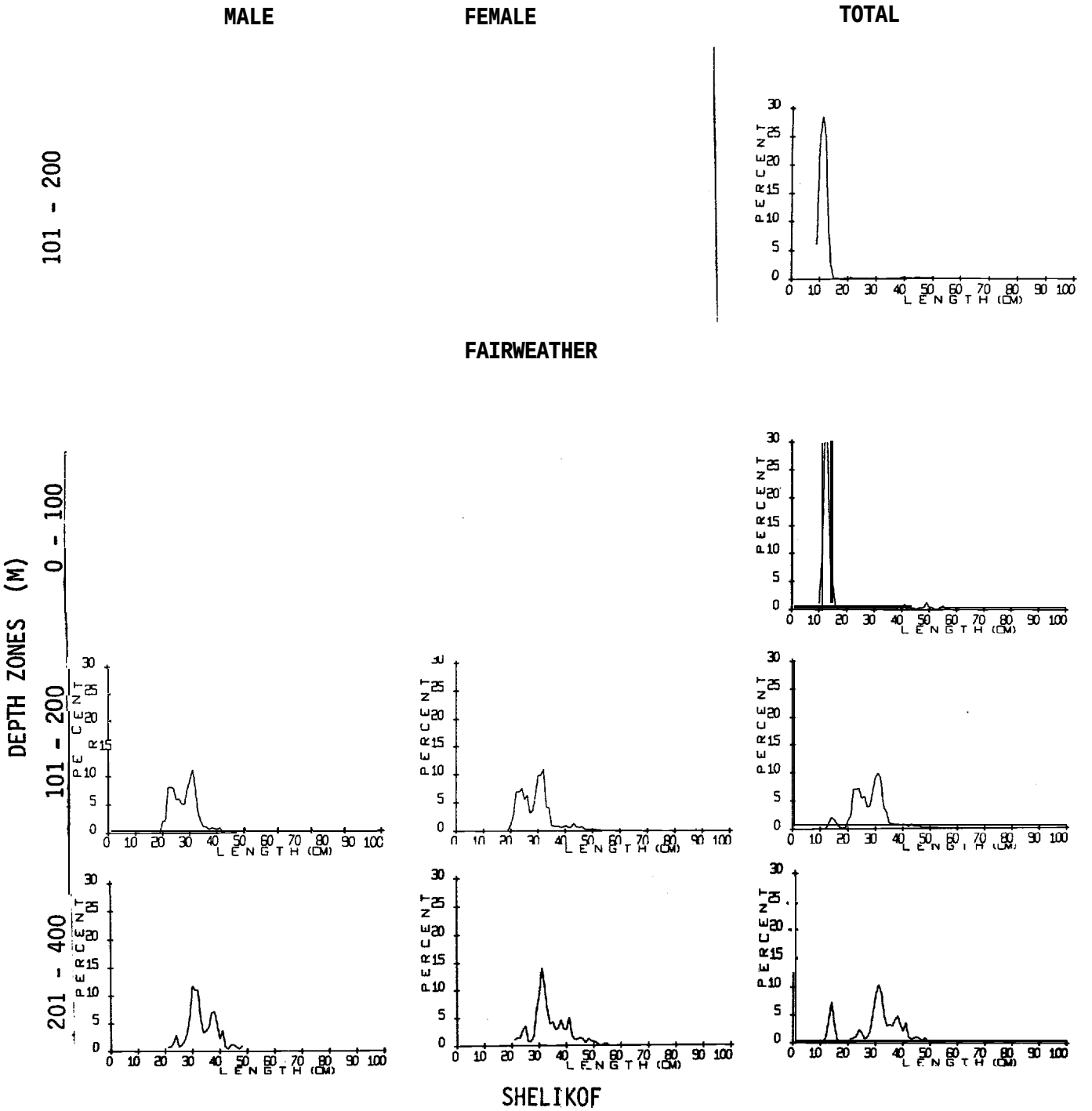


Figure XI-439.--Length frequency **distributions of walleye** pollock **in the** Gulf **of Alaska** by **region-depth zones, 1973-1976.**

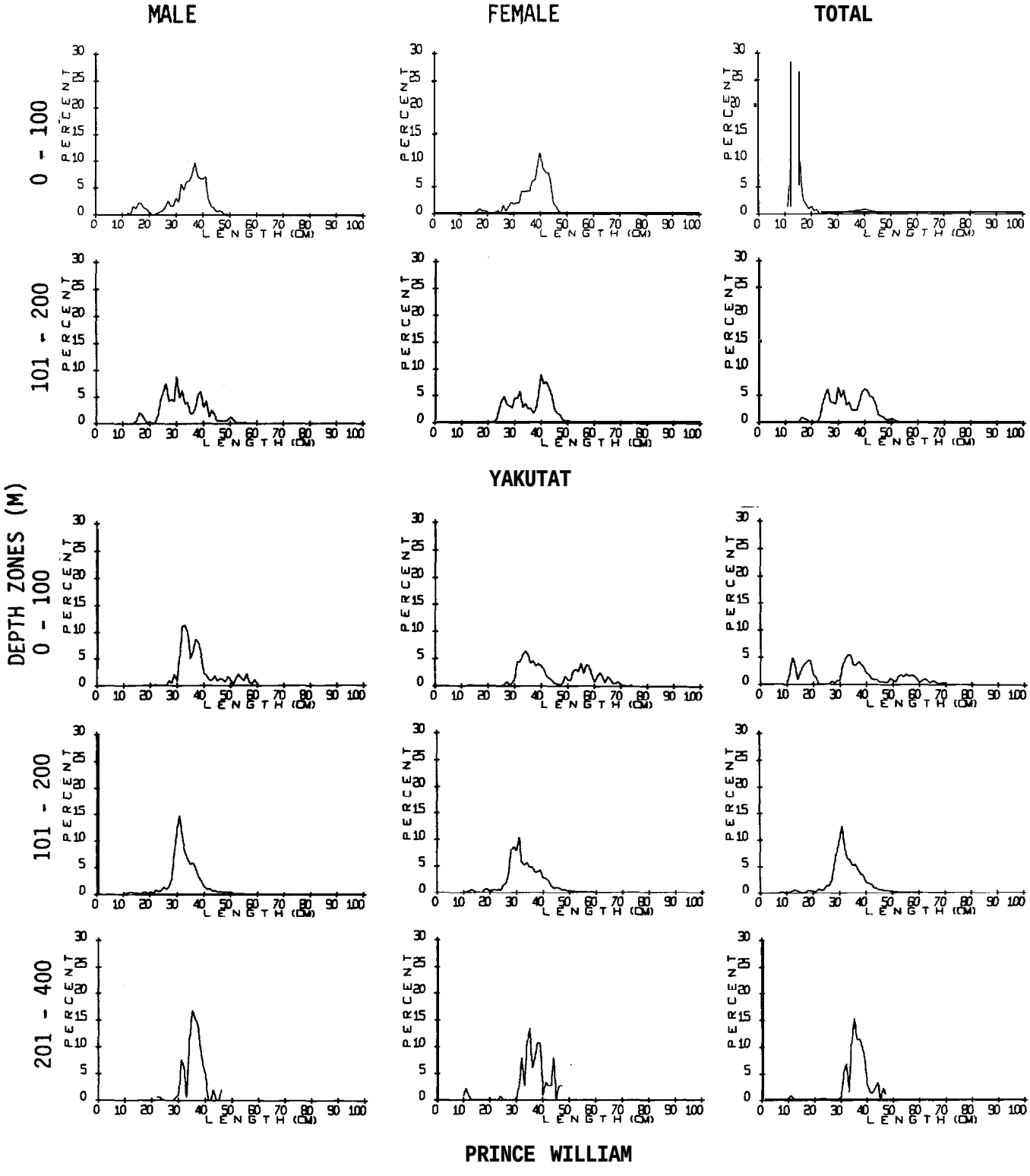


Figure XI-439 (continued).--Length frequency distributions of walleye pollock in the Gulf of Alaska by region-depth zones, 1973-1976.

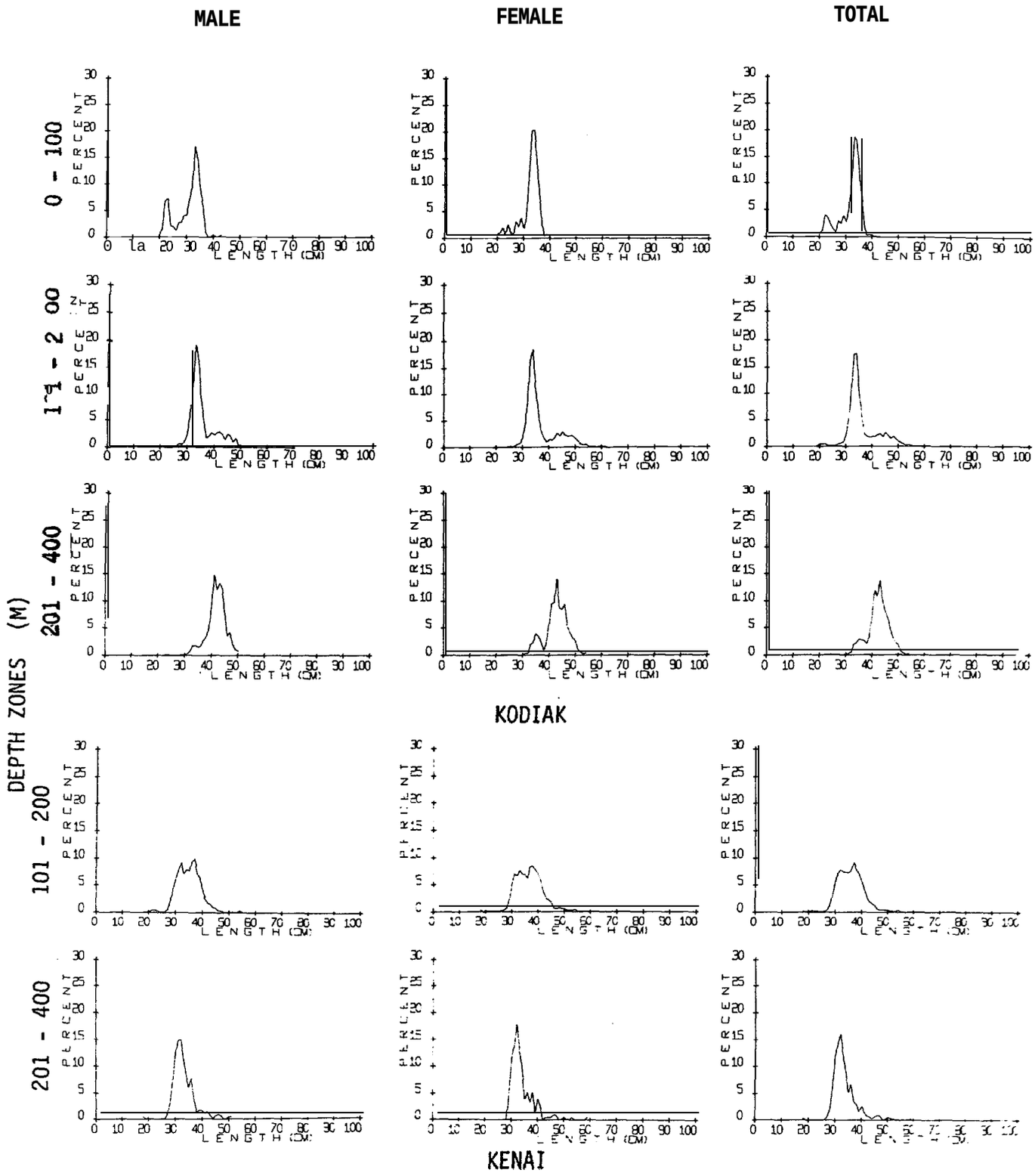


Figure XI-439 (continued).--Length frequency distributions of walleye pollock in the Gulf of Alaska by region-depth zones, 1973-1976.

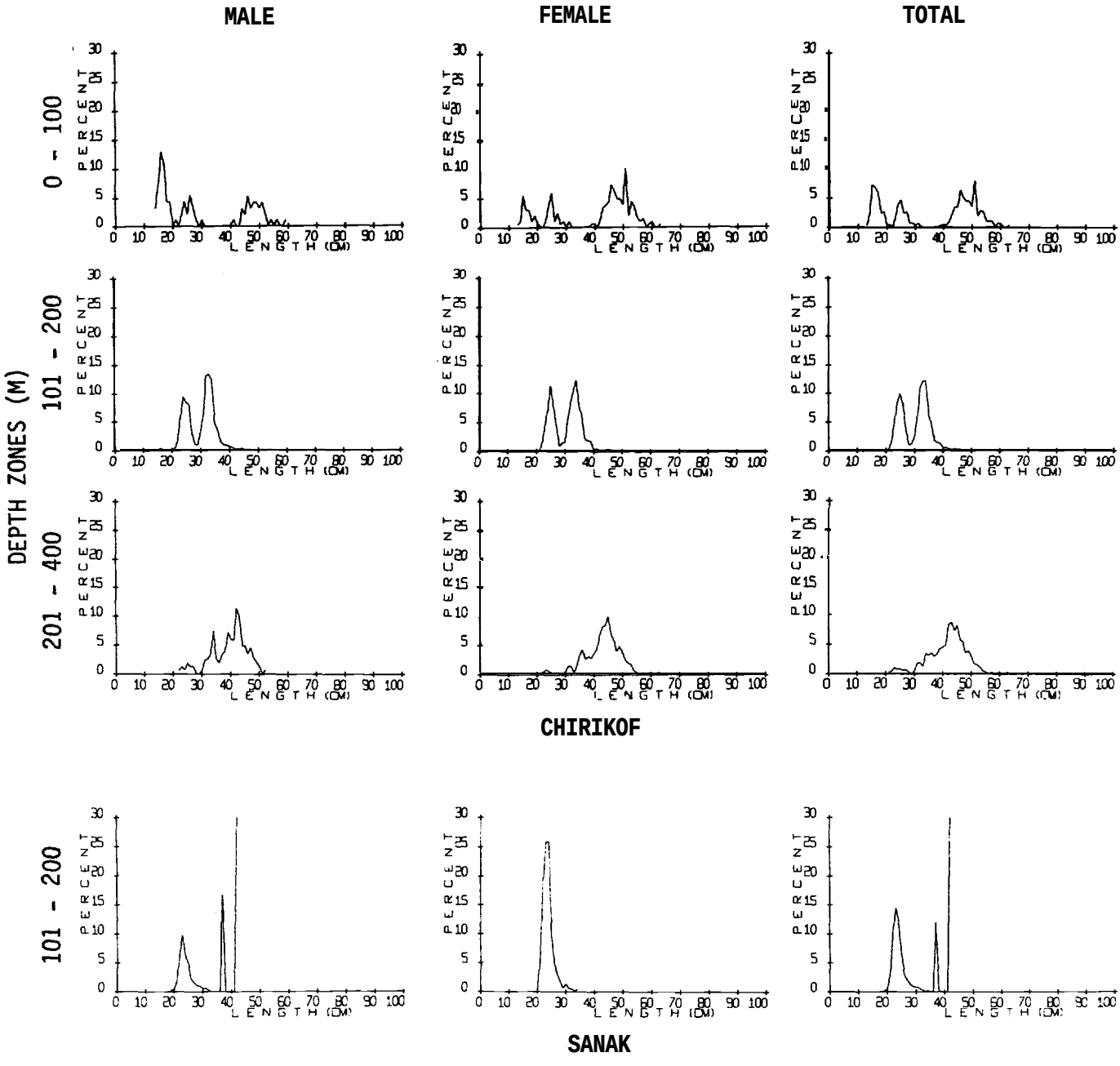


Figure XI-439 (continued).--Length frequency distributions of **walleye pollock** in the Gulf of Alaska by region-depth zones, **1973-1976.**

Table XI-112.--Parameters for the length-weight relationship-(weight (g) = a · length^b) for walleye pollock (Cruise 751).

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Sample Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	61	28-41	0.016136	2.756664	38	38-60	0.008751	2.955079
	101-200	163	23-50	0.011378	2.887332	130	21-58	0.007360	2.976247
	201-400	--		-_	--	32	22-41	0.032566	2.584934
Females	0-100	69	24-48	0.006271	3.032323	110	44-74	0.003107	3.214590
	101-200	181	23-68	0.015560	2.803517	85	26-60	0.003700	3.146924
	201-400	--	--	--	--	12	10-41	0.100003	2.304855

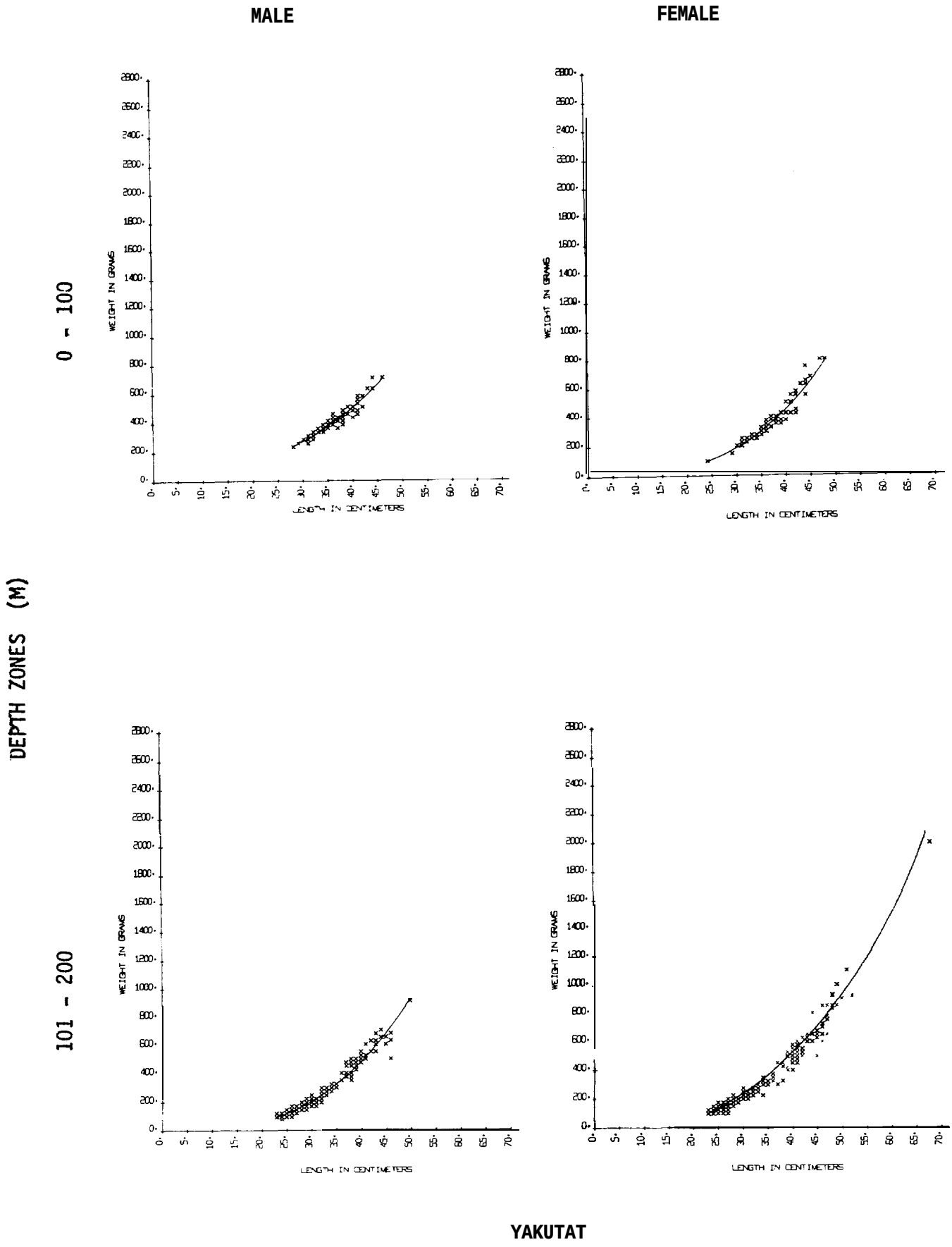


Figure XI-440.--Weight at **length** observations for **walleye pollock** in **the Gulf** of Alaska by **regions** ad **depth zones, May-Aug. 1975 (Cruise 751).**

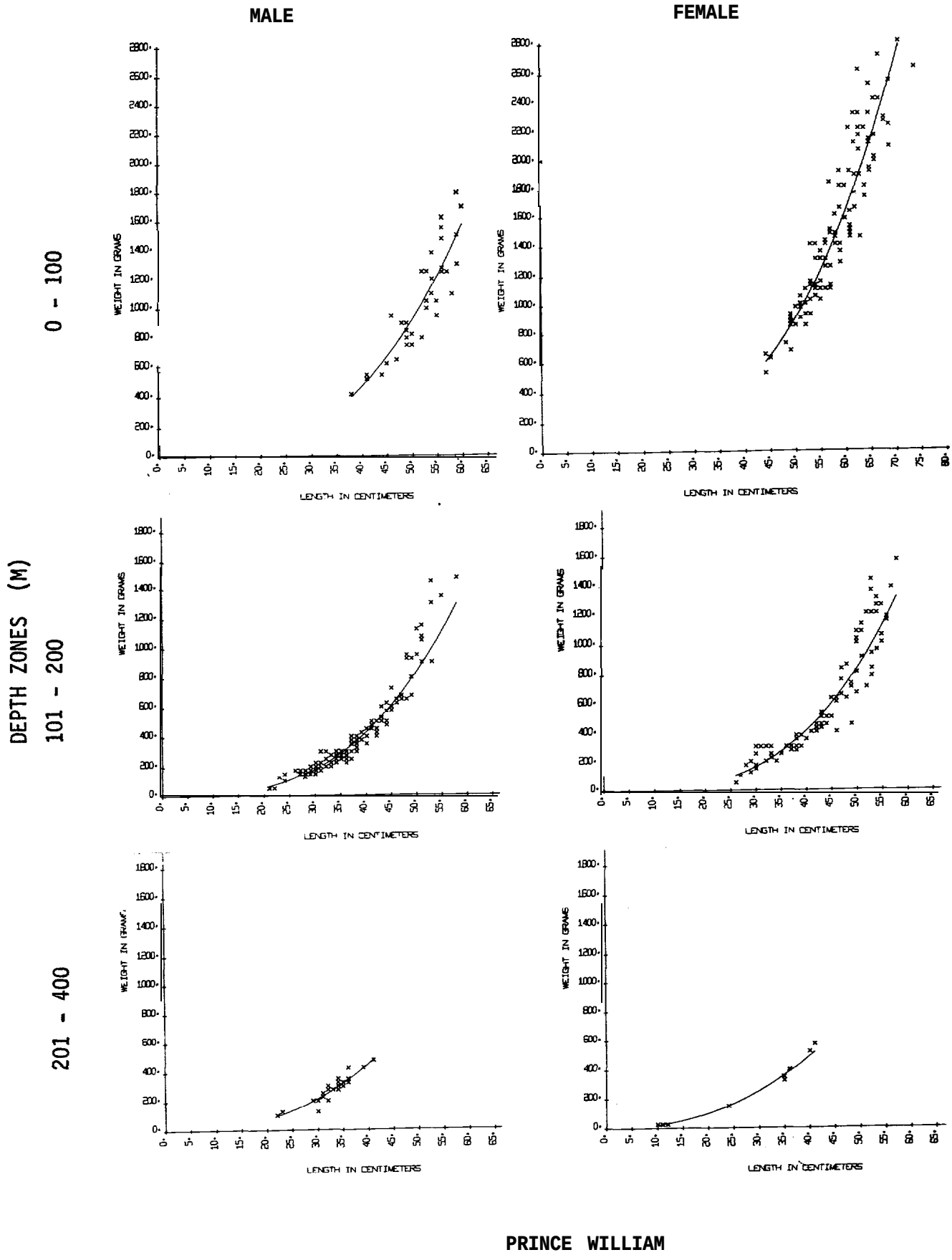


Figure XI-440 (continued).--Weight at length observations for walleye pollock in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).

Age-length relationship--Age and length data collected from the Yakutat and Prince William regions are presented in Table X1-113. These data are summarized in Figure XI-441 by plots of mean lengths-at-age by sexes and regions. In general, for each sex, differences in the mean values by depths and regions were relatively small up to approximately five years in males and six years for female.

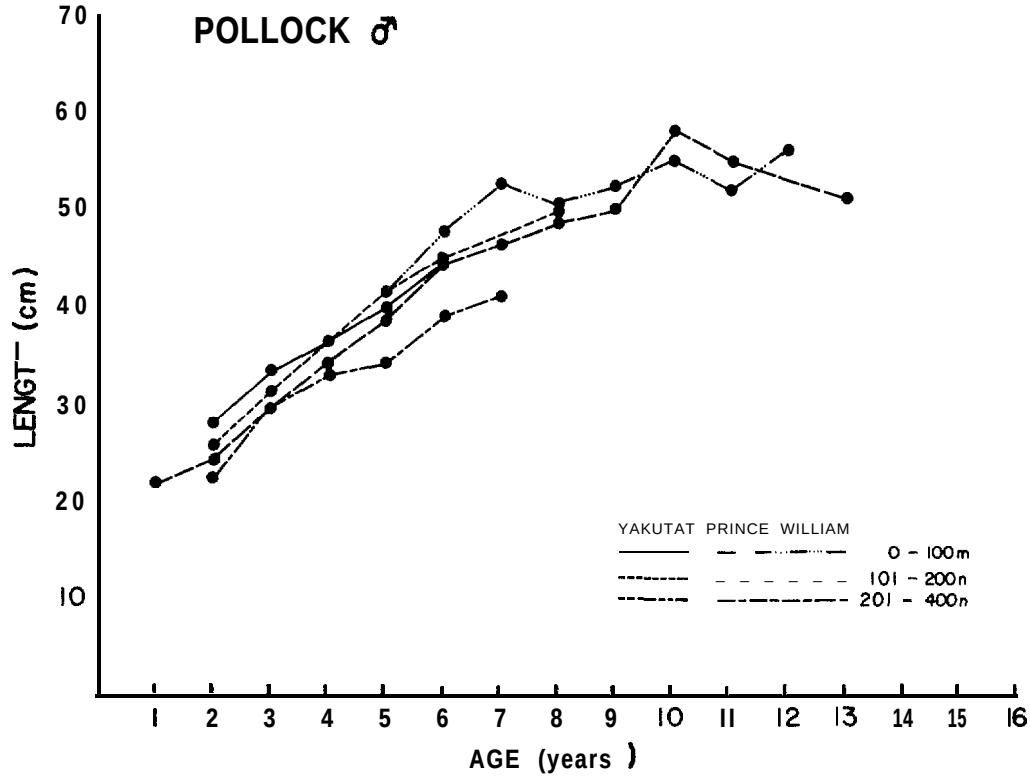
TURBOT

Distribution and abundance--Turbot were taken in each region-depth zone sampled and averaged 83 kg/hr over the entire Gulf of Alaska. Mean CPUE's increased with bottom depth, ranging from 43 kg/hr in the inner shelf to 119 kg/hr in the upper slope. The relative apparent abundance of turbot was greatest in the Yakutat region and was above average in the Kenai and Sanak regions (Figures X1-442-443). The distribution of the standardized catch rates for the successful stations is shown in Figures X1-444-448.

Biomass--The total biomass of turbot has been estimated at 191 thousand mt of which 52% was located in the outer shelf, 34% in the upper slope and 14% in the inner shelf (Table X1-114). Regions which accounted for relatively high portions of the total biomass were Kenai (20%), Sanak (19%). Yakutat (18%) and Chirikof (16%). The total turbot biomass was relatively evenly divided between the eastern (56%) and western (44%) Gulf regions.

Table XI-113.--Summary of age-length data collected for walleye pollock (Cruise 751).

	REGIONS					
	Yakutat			Prince William		
Sex	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	95	161	--	33	133	30
Range in age (years)	2-6	2-8	--	5-12	1-13	2-7
Range in length (cm)	26-47	23-50	--	38-59	21-59	22-41
Females						
Number of readable otoliths	141	162	--	92	153	7
Range in age (years)	2-6	2-12	--	15-13	2-13	2-5
Range in length (cm)	24-53	23-68	--	44-69	26-71	24-41



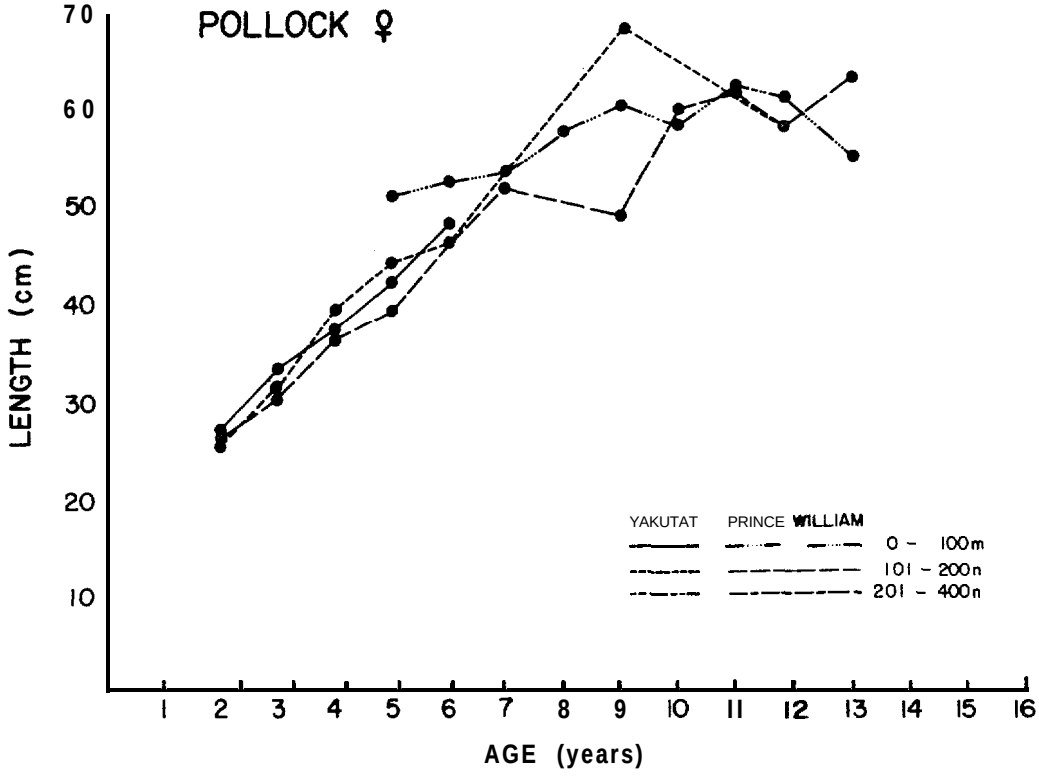


Figure XI-441.--Mean lengths at age for walleye pollock by sex and region-depth zones in the Gulf of Alaska, May-Aug. 1975 (Cruise 751).

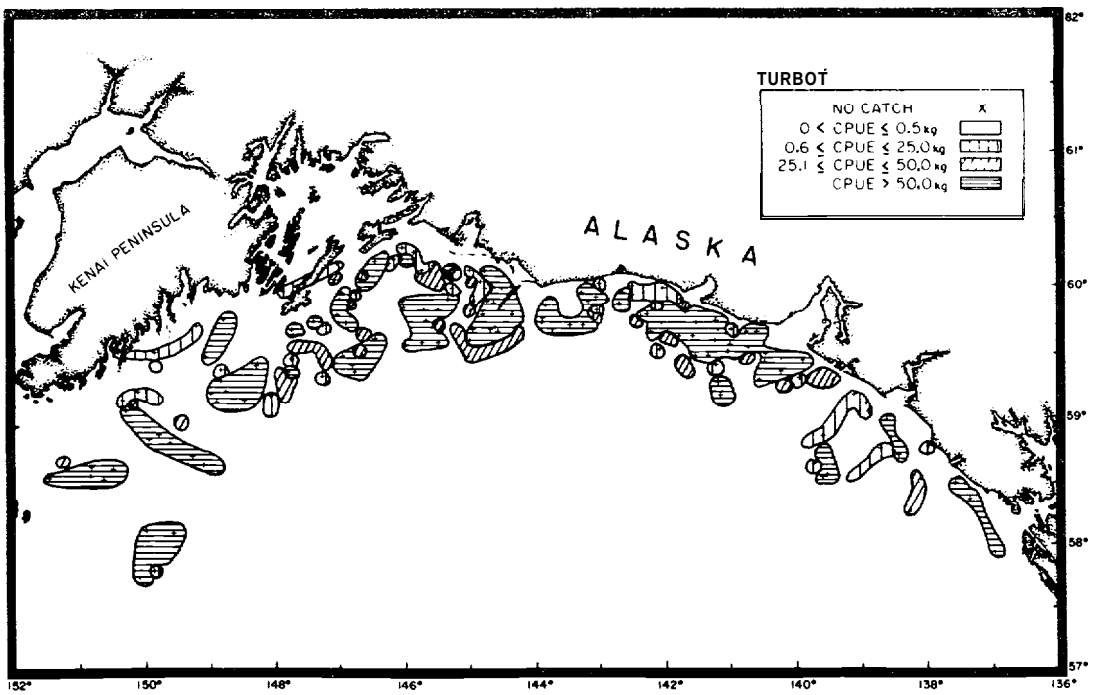


Figure XI-448.--Distribution of apparent **relative** a**bundance** of **turbot in the eastern Gulf** of **Alaska, May-Aug.** 1975, **Jun.-Aug.** 1975, **and** Apr. 1976 (Cruises 751, 753, and 762).

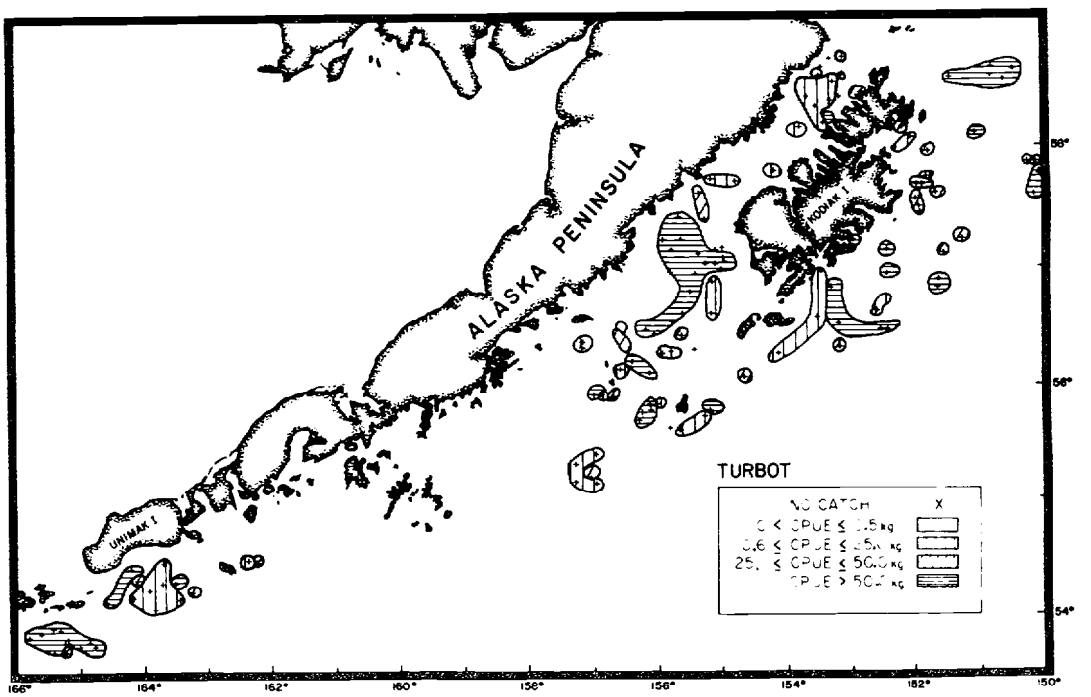


Figure XI-449.--Distribution of apparent relative abundance of turbot in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

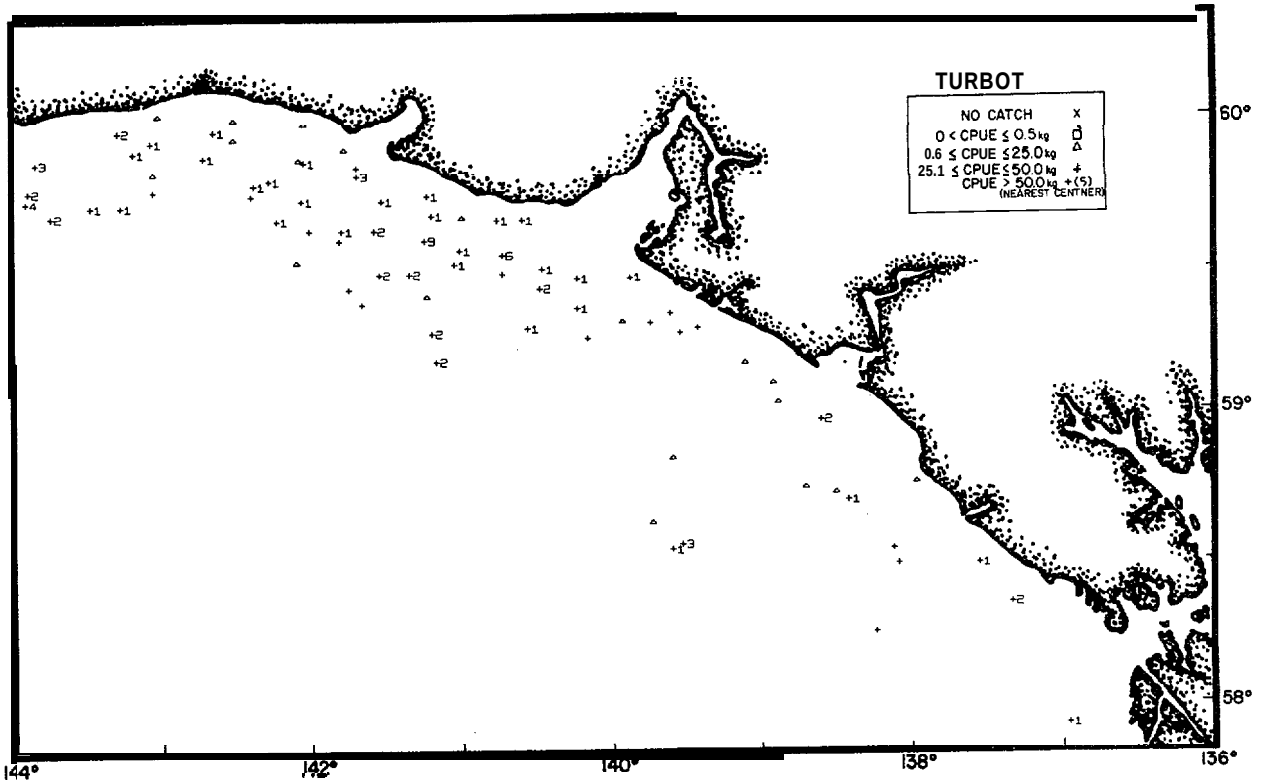


Figure XI-448.—Distribution of standardized catch rates in kilograms/hour of turbot in the eastern Gulf of Alaska, May-Aug. 1975, and Apr. 1976 (Cruises 751 and 762).

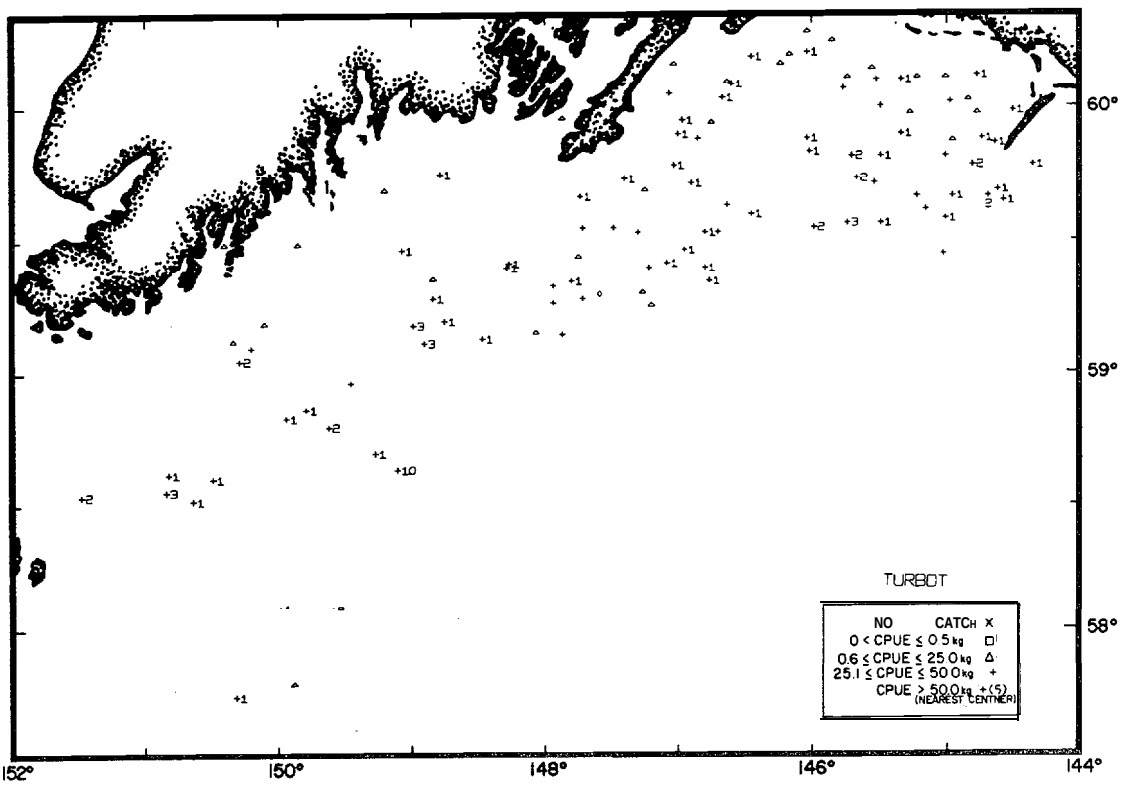


Figure xX-443.—Distribution of standardized catch rates in kilograms/hour of turbot in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

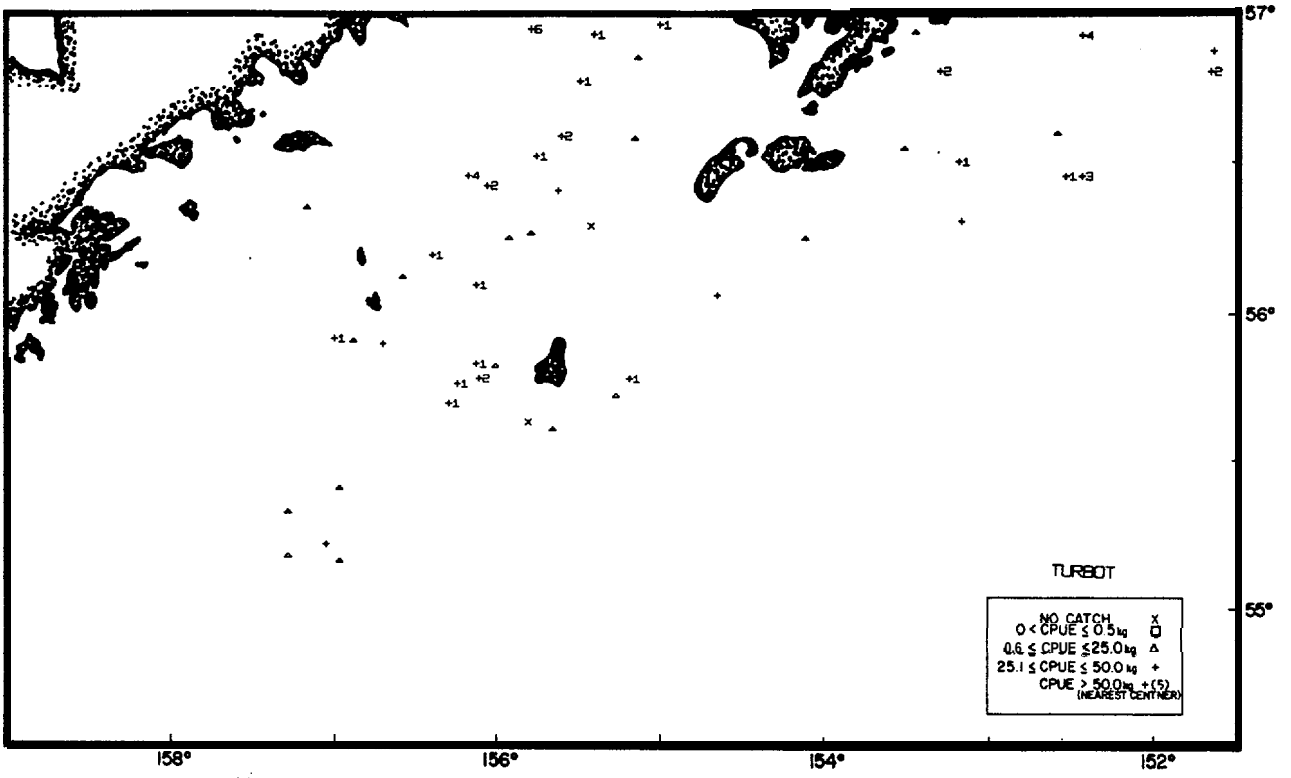


Figure XI-446.--Distribution of standardized catch rates in kilograms/hour of turbot in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

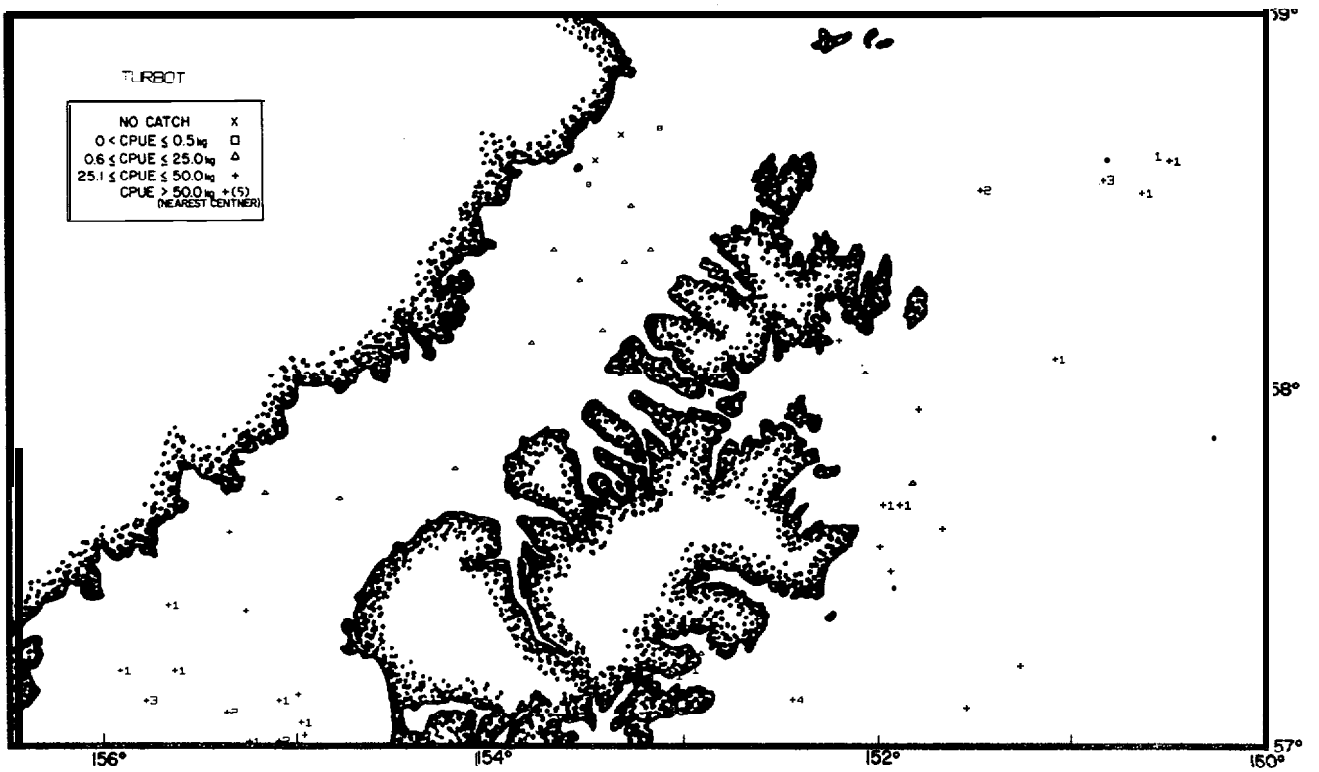


Figure XI-447.--Distribution of standardized catch rates in kilograms/hour of turbot in the western Gulf of Alaska, May-Jun. 1973; Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

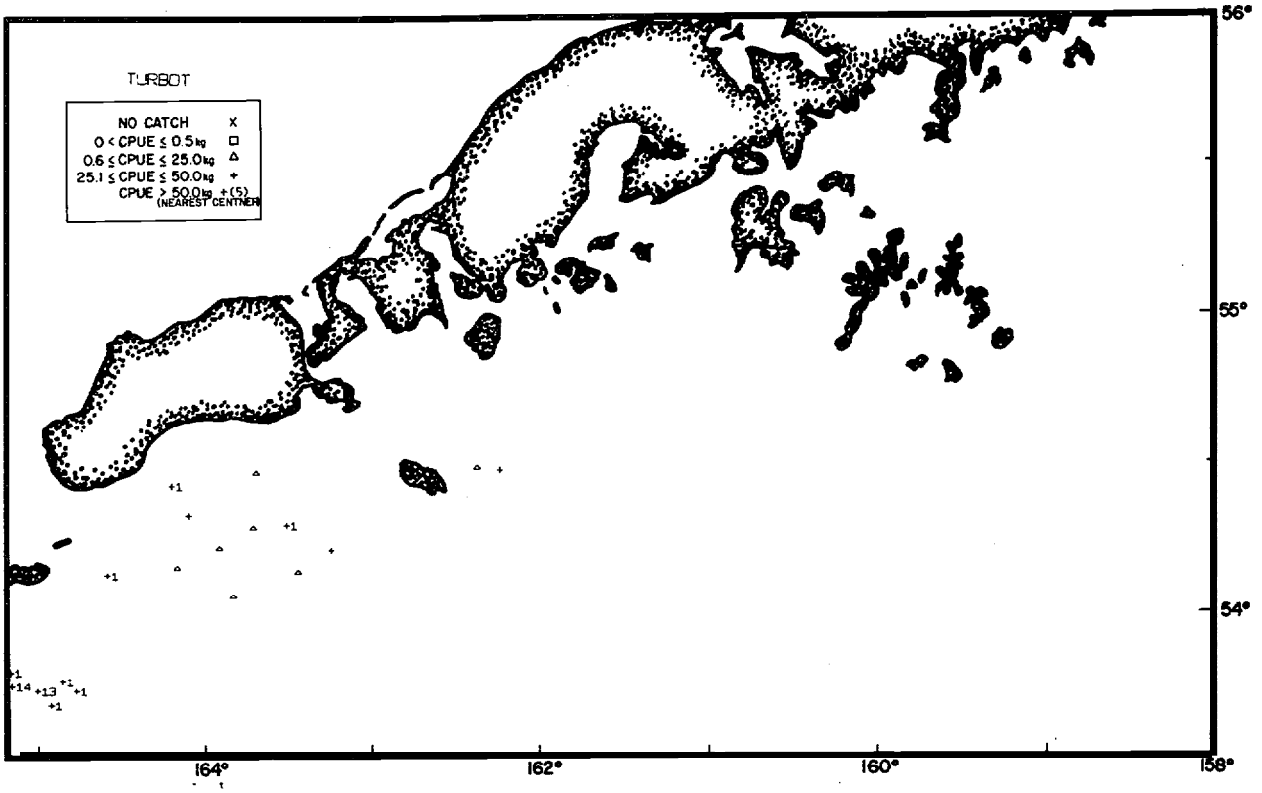


Figure XI-450.—Distribution of standardized catch rates in kilograms/hour of turbot in the western Gulf of Alaska, July-Aug. 1974 (Cruise 744).

Size composition--Mean sizes of arrowtooth flounder are presented in Table XI-115. Sexed data are available from the Fairweather. Yakutat. Prince William and Chirikof regions while unsexed observations were'used to calculate mean lengths in the Kenai, Kodiak, Shelikof and Sanak regions. Female turbot were generally larger than males with both sexes increasing in length with increasing depth. Mean lengths, sexes combined, ranged from 14.6 cm in the Kodiak inner shelf to 50.9 cm in the Yakutat upper slope. (Figure X1-449).

Length-weight relationship-The coefficients of regression derived from 1,442 length-weight observations in the Yakutat and Prince William regions are presented in Table XI-116 by sexes and depth zones. Data points representing each observation and the resulting regression line are presented in Figure X1-450.

Age-length relationship--Age and length data collected for turbot from the Yakutat and Prince William regions (Cruise 751) are presented in Table X1-117.

These data are summarized in Figure XI-451 by plots of mean lengths-at-age by sexes and regions. In general, differences in the mean values by depths and regions were negligable for males throughout their age range while relatively large deviations in the mean values for females occurred only after eight years of age.

Table XI-114.--Estimated biomass and population size of turbot (*Atheresthes stomias*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	12.9	465.1	2.65	1.5	3.4	0.30	28.9
	101-200	63.2	10,298.1	58.7	33.4	76.4	0.31	31.2
	201-400	226.1	6,796.8	38.7	8.8	20.1	0.77	39.2
	All zones	7h.7	17,560.0	9 . 2	43.7	—	0.40	—
Yakutat	1-100	55.8	3,456.9	9.9	11.6	15.0	0.30	30.2
	101-200	144.1	21.082.2	60.2	57.3	74.1	0.37	32.6
	201-400	152.7	10,476.6	29.9	8.4	10.9	1.25	50.9
	All zones	126.5	35,015.7	18.3	77.3	—	0.45	—
Prince William	1-100	55.7	6,154.6	31.4	39.6	58.9	0.16	26.3
	101-200	i2.6	9.149.9	55.5	26.5	39.2	0.35	31.0
	201-400	32.1	1,169.1	7.1	1.5	2.2	0.77	41.5
	All zones	60.4	16,473.6	8.6	67.6	--	0.24	—
Kenai	1-100	—	—	--	—	--	—	—
	101-200	127.3	30,924.0	80.8	58.5	87.8	0.53	36.8
	201-400	73.1	7,339.7	19.2	8.2	12.3	0.90	45.5
	All zones	111.5	38.263.7	20.0	66.7	—	0.57	--
Kodiak	1-100	34.9	2,182.9	14.6	—	--	--	--
	101-200	93.2	5,493.8	36.8	26.6	--	0.21	24.2
	201-400	129.8	7,238.1	48.5	10.2	--	0.71	39.6
	All zones	73.6	14,914.8	7.8	—	—	--	--
Shelikof	1-100	0.1	0.6	51	—	—	--	—
	101-200	10.1	411.4	12.4	—	--	--	—
	201-400	28.0	2,917.9	87.6	6.2	—	0.47	35.8
	All zones	22.0	3,329.9	1.7	—	—	—	—
Chirikof	1-100	13,3	1,585.5	5.2	16.1	21.0	0.09	21.5
	101-200	39,2	6,326.9	20.8	26.2	34.2	0.24	26.0
	201-400	168,0	22,514.9	74.0	34.4	44.9	0.66	39.5
	All zones	66.4	30,427.3	15.9	76.7	—	0.33	--
Shumagin	1-100	--	--	—	--	—	--	--
	101-200	—	—	—	--	--	—	
	201-400	—		--	—	--	—	
	All zones	—	—	—	--	--	—	—
Sanak	1-100	68.8	12,367,3	34.9	67.1	55.4	0.18	26.5
	101-200	100.9	16.472.4	46.5	46.2	38.2	0.36	33.1
	201-400	530.0	6,622.2	18.7	7.8	6.4	0.84	45.1
	All zones	99.7	35,461-P	18.5	121.1	--	0.29	--
Total	1-100	43.4	26,212.9	13.7	—	—	--	--
	101-200	90.9	100.158.7	52.3	--	—	--	--
	201-400	119.1	65,075,3	34.0	85.5	—	0.76	—
	All zones	82.8	191.446.9	100.0	--	—	--	—

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 x 106 individuals.
5/ Less than 0.1 percent.

Table XI-115.--Mean lengths (cm) of turbot by regions and depth zones (Cruises 733, 734, 744, 751, 753, and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	25.0	32.5	28.9	28.9	32.9	31.2	36.3	41.1	39.2
Yakutat	26.5	33.9	30.2	31.7	33.3	32.6	40.2	53.8	50.9
Prince William	25.8	27.5	26.3	29.2	32.2	31.0	32.0	44.6	41.5
Kenai	--	--	--	--	--	36.8	--	--	45.5
Kodiak	--	--	14.6[1/]	--	--	24.2	--	--	39.6
Shelikof	--	--	--	--	--	--	--	--	35.8
Chirikof	22.3	21.4	21.7	23.9	26.4	26.0	36.6	41.2	39.5
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	26.5	--	--	33.1	--	--	45.1

[1/] The limited number of length-frequency samples taken from this region-depth zone probably do not represent the size composition adequately.

PACIFIC COD

Distribution and abundance-Pacific cod were widely distributed throughout the Gulf of Alaska. With the exception of the Fairweather upper shelf, this species was taken in each region-depth zone sampled and averaged 48 kg/hr over the entire survey area. By depth zones, the highest apparent relative abundance occurred in the inner shelf followed by the outer shelf and the upper slope. Particularly high mean CPUE's were recorded in the Sanak --inner shelf (102 kg/hr) and the Kodiak inner and outer shelf (197 and 96 kg/hr). The distribution of the standardized catch rates for the successful stations is shown in Figures X1-452-456.

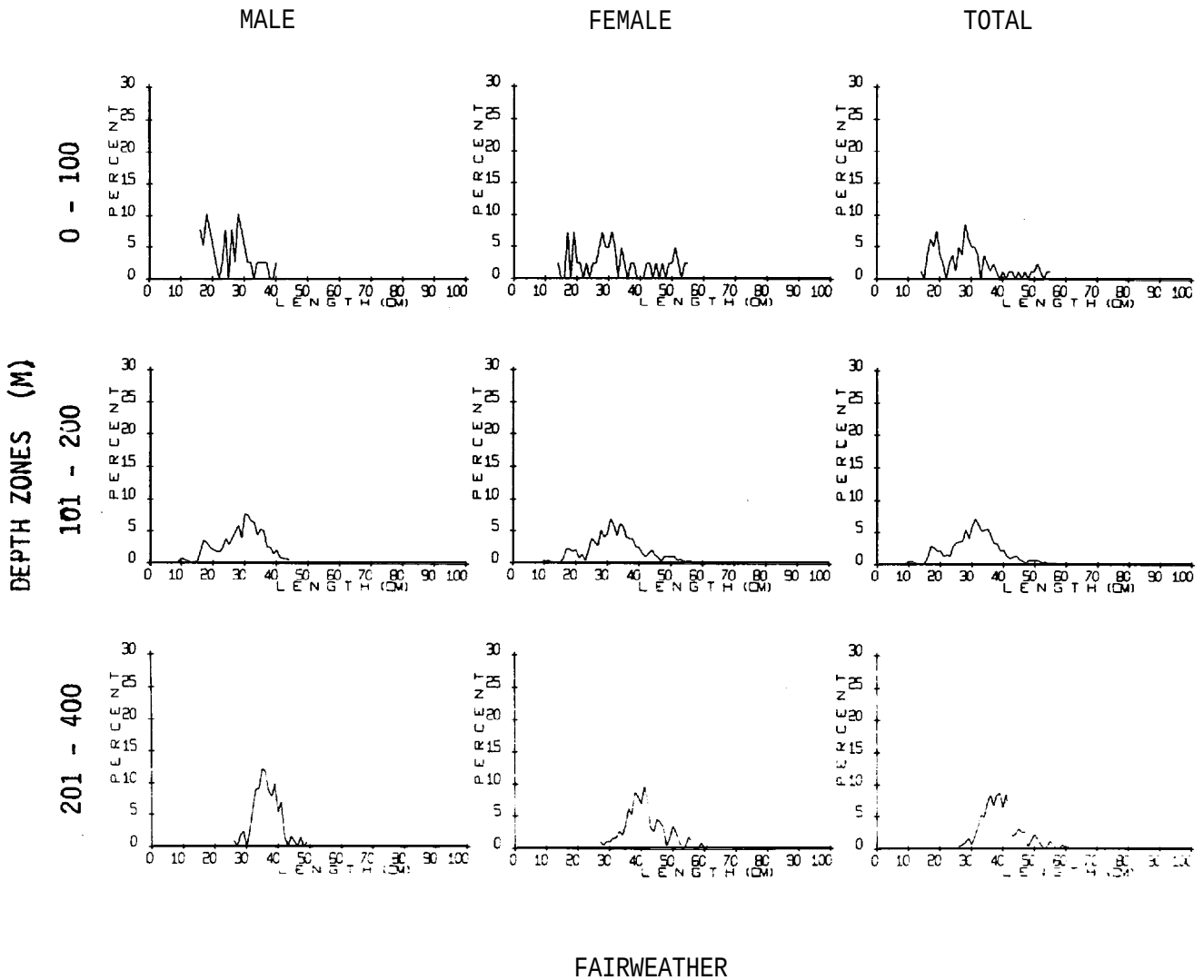


Figure XX-449.--Length frequency distributions of turbot in the Gulf of Alaska by region-depth zones, 1973-1976.

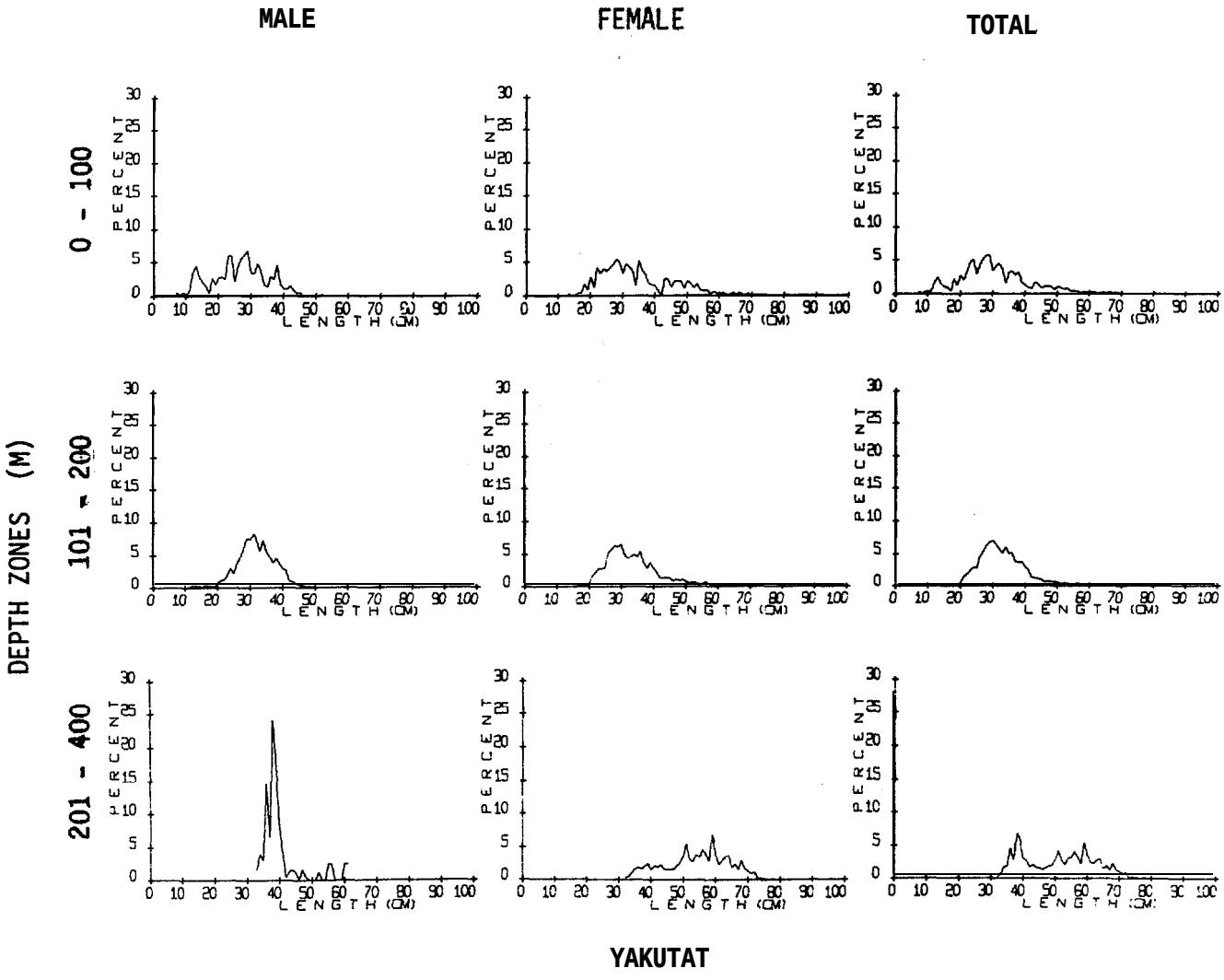


Figure XI-449 (continued) .--Length frequency distributions of turbot in the Gulf of Alaska by region-depth zones, 1973-1976.

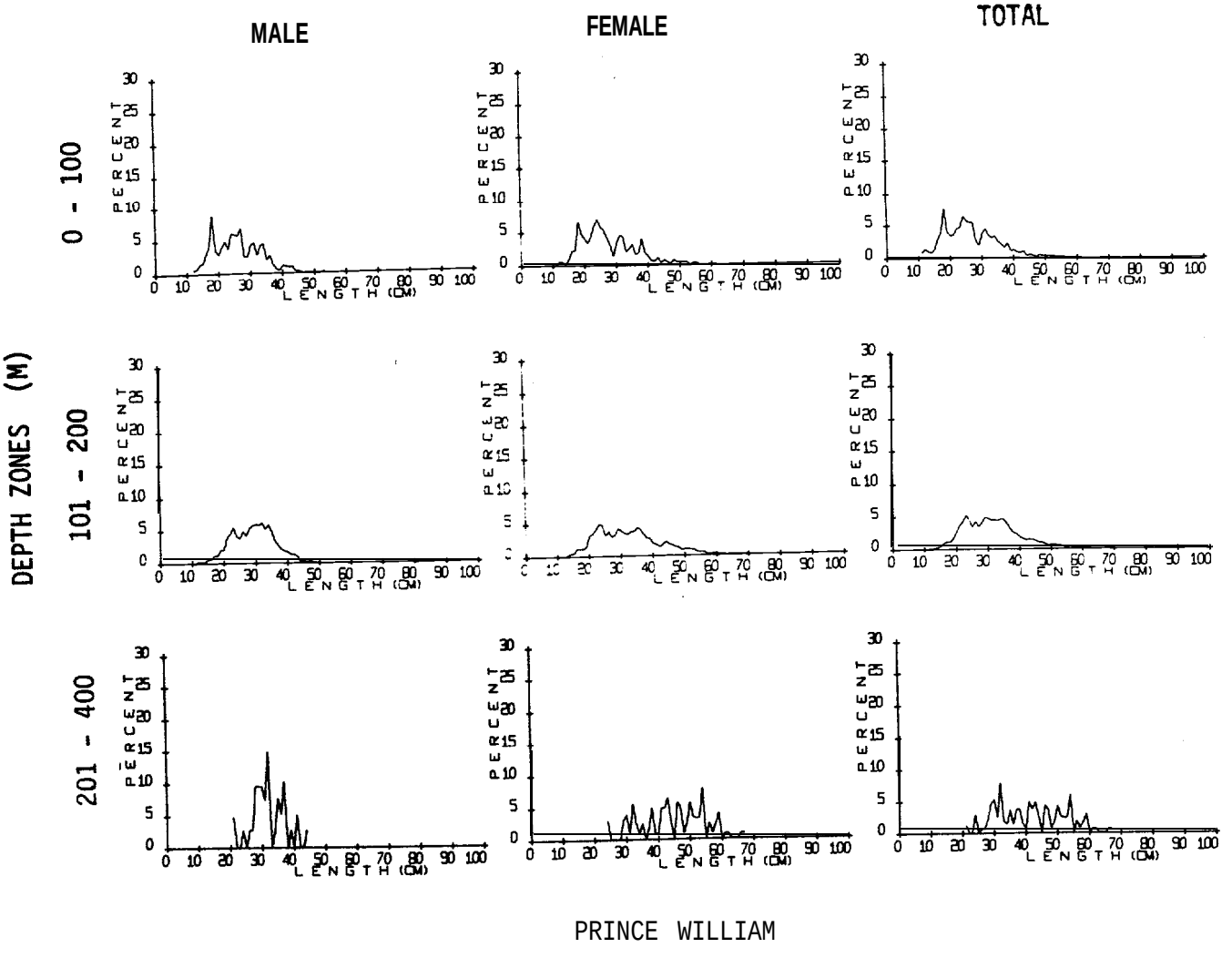


Figure XI-449 (continued). --Length frequency distributions of turbot in the Gulf of Alaska by region-depth zones, 1973-1976.

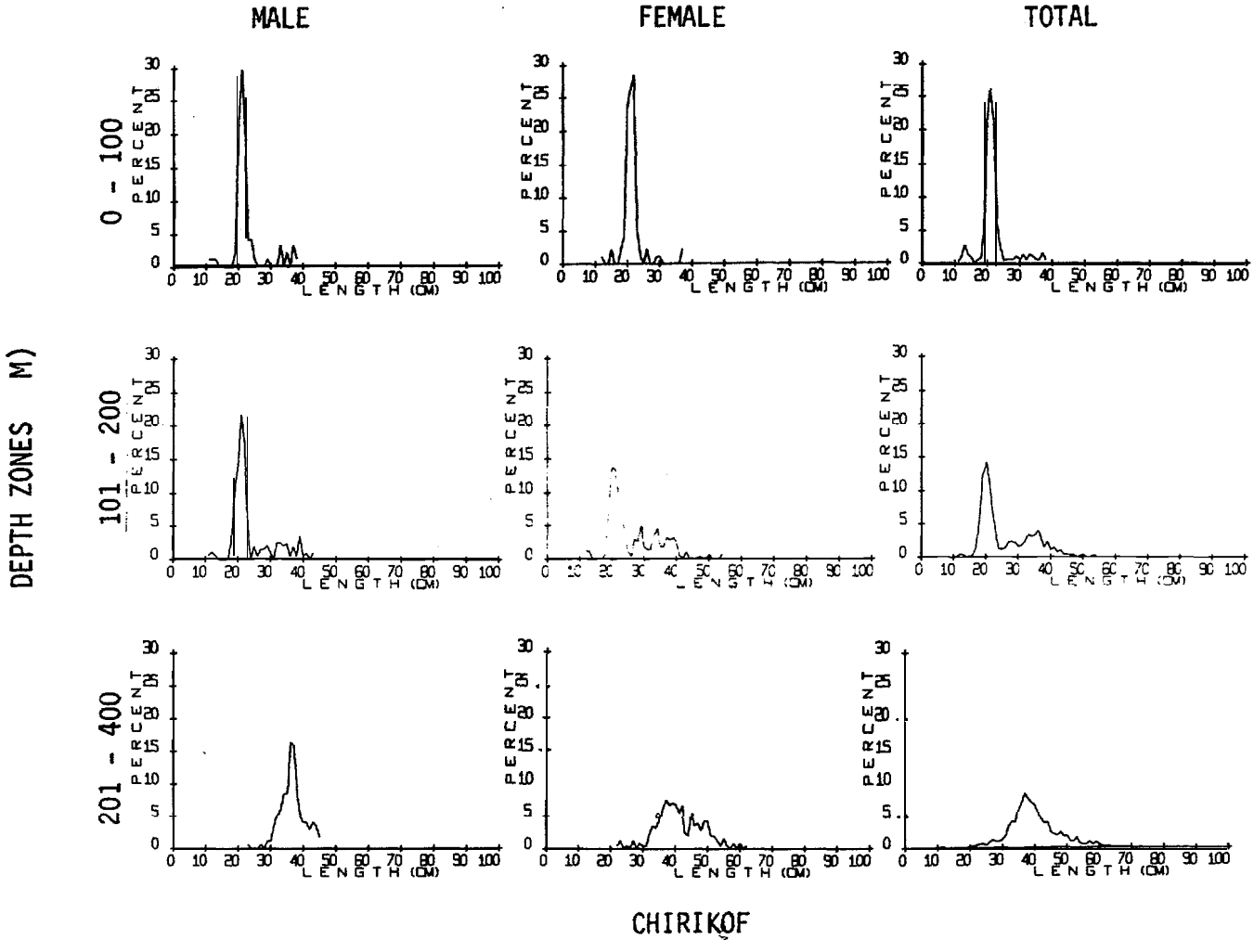


Figure XI-449 (continued) .-Length frequency distributions of turbot in the Gulf of **Alaska** by region-depth zones, 1973-1976.

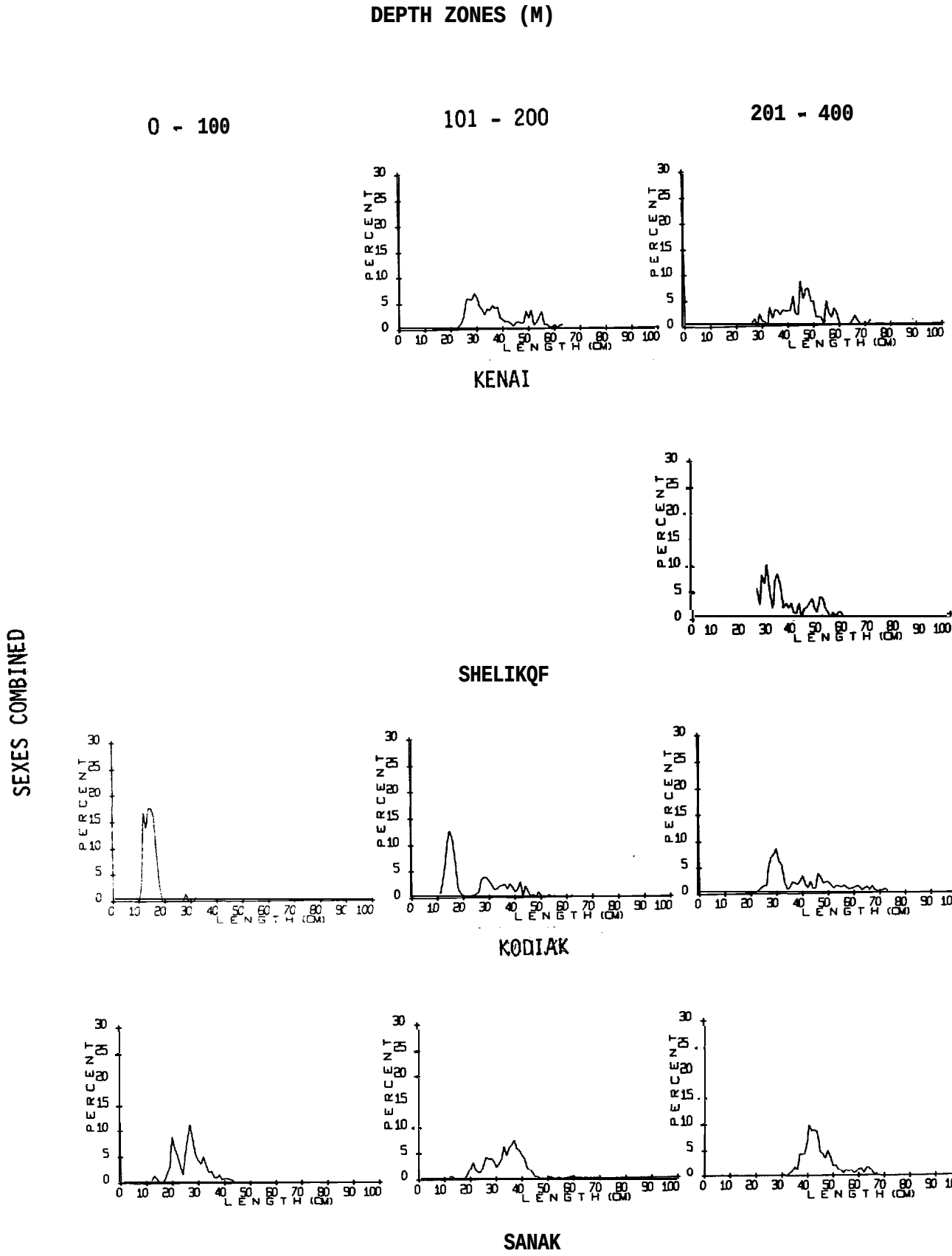


Figure XI-449 (continued).--Length frequency distributions of turbot in the Gulf of Alaska by region-depth zones, 1973-1976.

Table XI-116.--Parameters for the length-weight relationship (weight (g) = a .length^{b}) for turbot (Cruise 751).

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Snmple Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	183	18-57	0.004981	3.143462	49	13-38	0.201772	2.138611
	101-200	201	19-45	0.005512	3.101883	131	16-48	0.019233	2.755996
	201-400	25	33-47	0.014643	2.820948	23	21-42	0.002901	3.294699
Females	0-100	94	18-58	0.002955	3.289175	42	13-43	0.277278	2.026585
	101-200	340	17-68	0.004144	3.192835	202	16-64	0.009735	2.970779
	201-400	120	30-77	0.001988	3.382702	32	24-67	0.001622	3.451475

Table XI-117.--Summary of age-length data collected for turbot (Cruise 751).

	REGIONS					
	Yakutat			Prince William		
Sex	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	63	206	72	43	115	31
Range in age (years)	3-6	3-9	4-9	2-6	2-11	3-7
Range in length (cm)	20-36	20-45	25-48	20-38	20-50	21-41
Females						
Number of readable otoliths	88	293	142	32	190	48
Range in age (years)	3-9	3-16	3-19	2-5	3-14	4-14
Range in length (cm)	20-58	20-69	24-78	21-39	20-64	24-67

Biomass--The total biomass of Pacific cod was estimated at 113 thousand mt (Table X1-118). Although Pacific cod are mainly demersal, portions of the population probably occupied the water column above the sampling gear and the biomass estimate should be considered a minimum for the survey area. Over the Gulf of Alaska, the major portion of the biomass was located on the continental shelf with the inner shelf containing 47% and the outer shelf 42%. Thirty-six percent of the total biomass was located in the Kodiak region while Sanak accounted for 29%. The western Gulf regions accounted for 77% of the total estimated biomass.

Size composition--Over all regions and depth zones where sexes were determined, females were always larger than males. The mean lengths of Pacific cod, sexes combined, did not appear to be related with bathymetric or geographic variations. Mean lengths ranged from 34.4 cm in the Kodiak inner shelf to 64.7 cm in the Fairweather inner shelf (Table XI-119 and Figure X1-457).

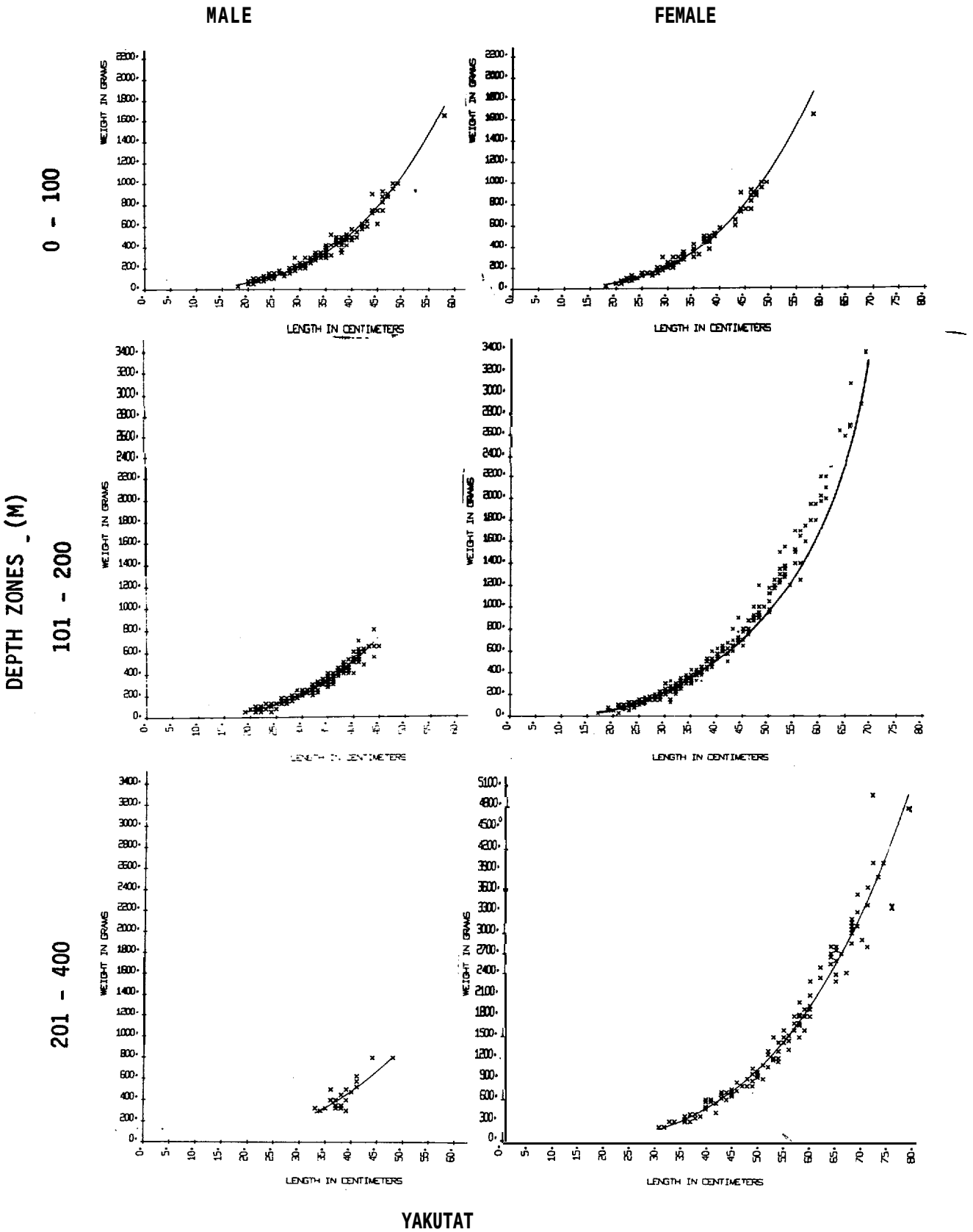


Figure XI-450.--Weight at length observations for turbot in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).

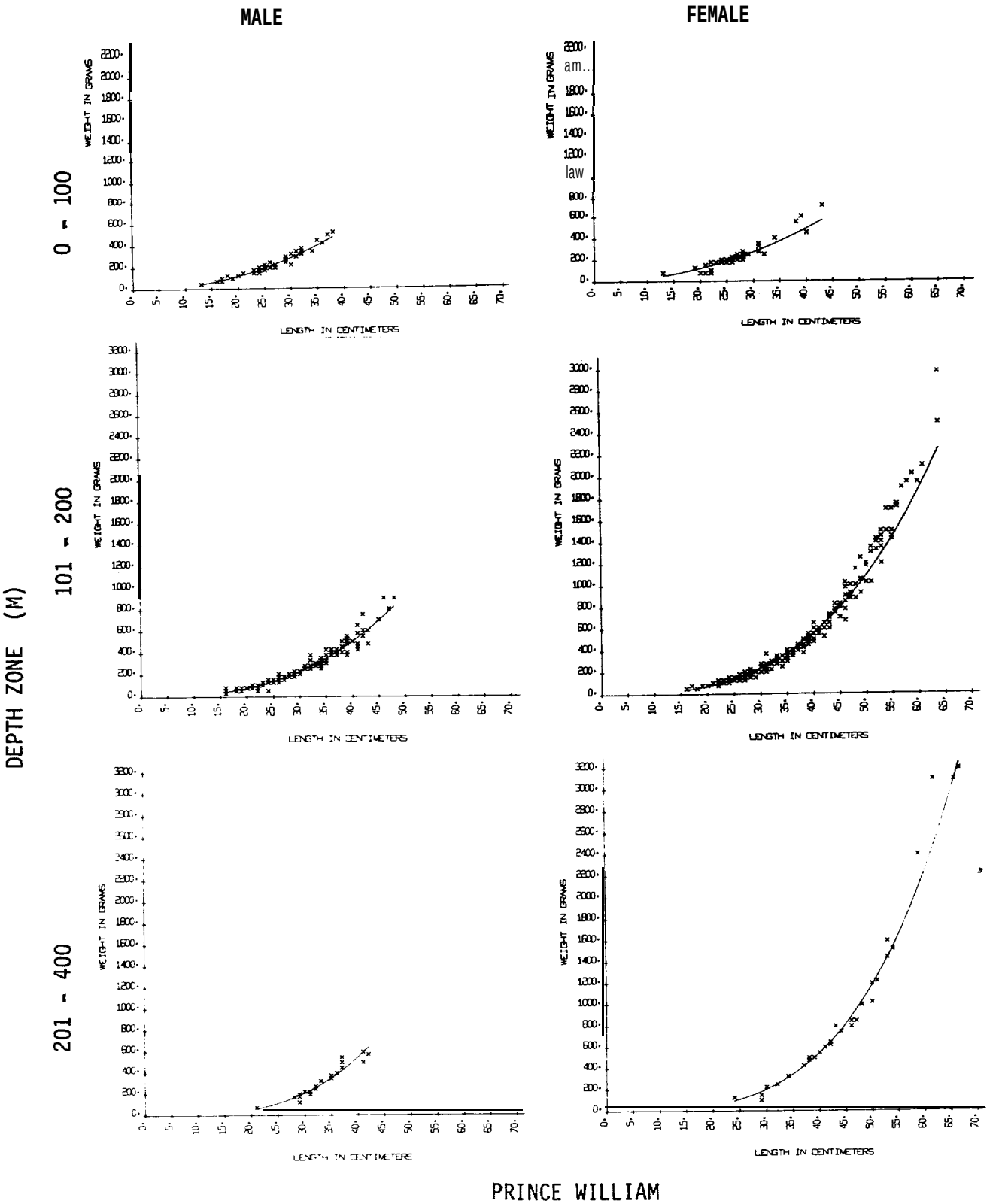
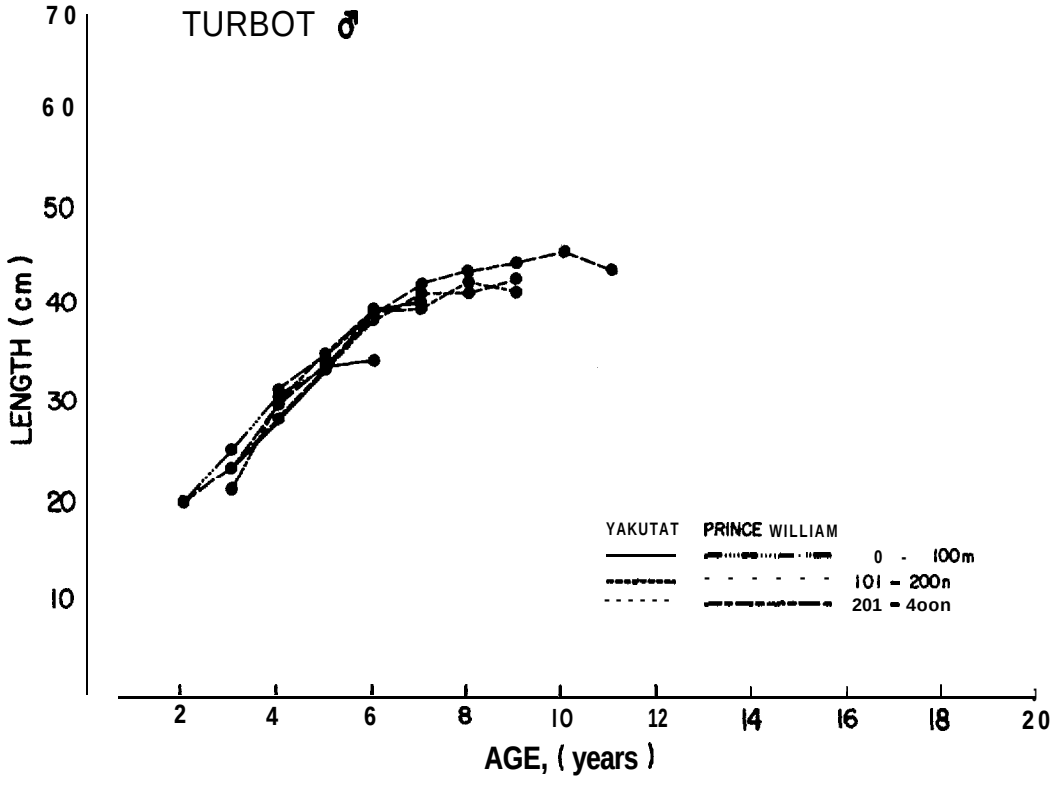


Figure XI-450 **(continued).**--Weight **at** length observations for turbot in the Gulf of Alaska by region-depth **zones,** 1973-1976.



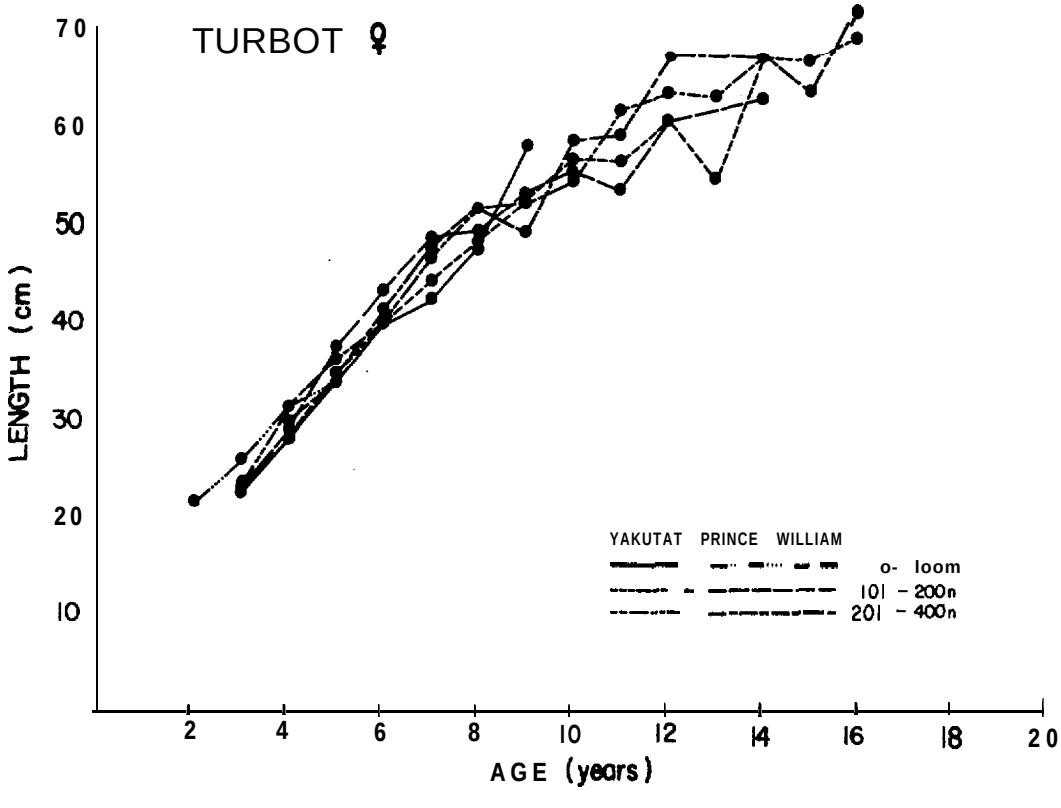


Figure XI-451.--Mean lengths at **age for turbot** by **sex** and **region-depth zones in** the Gulf of **Alaska, May-Aug.** 1975 **(Cruise** 751).

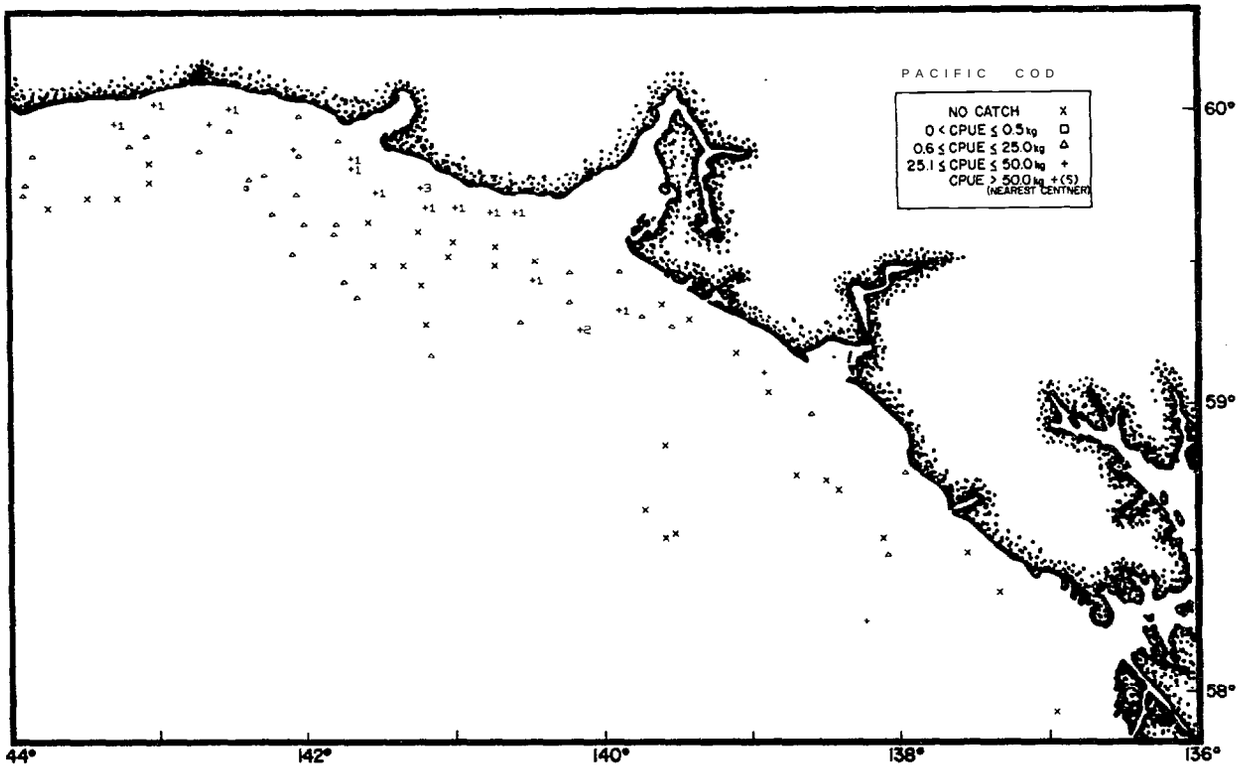


Figure XI-452.--Distribution *of* **standardized catch rates in kilograms/ hour** of **Pacific cod in the eastern Gulf** of **Alaska, May-Aug. 1975 and Apr.** 1976 **(Cruises** 751 and **762).**

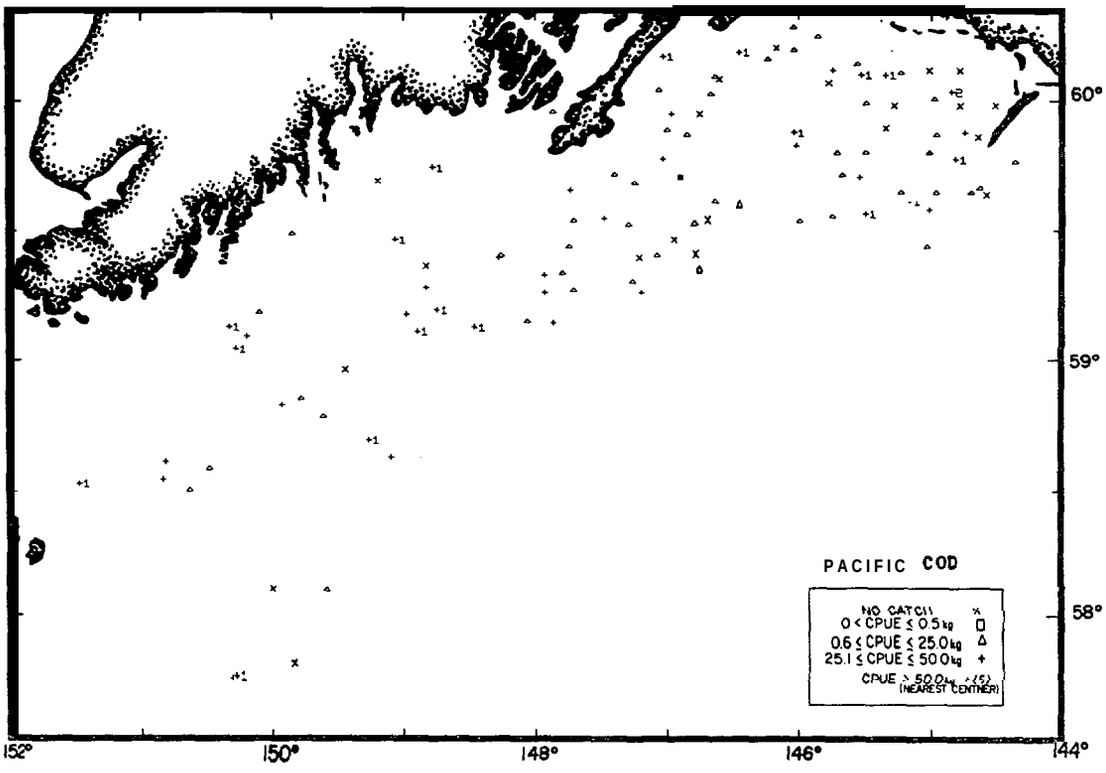


Figure XI-453.--Distribution of standardized catch rates in kilograms/ hour of Pacific cod in the eastern Gulf of Alaska, **May-Aug. 1975 (Cruises 751 and** 753).

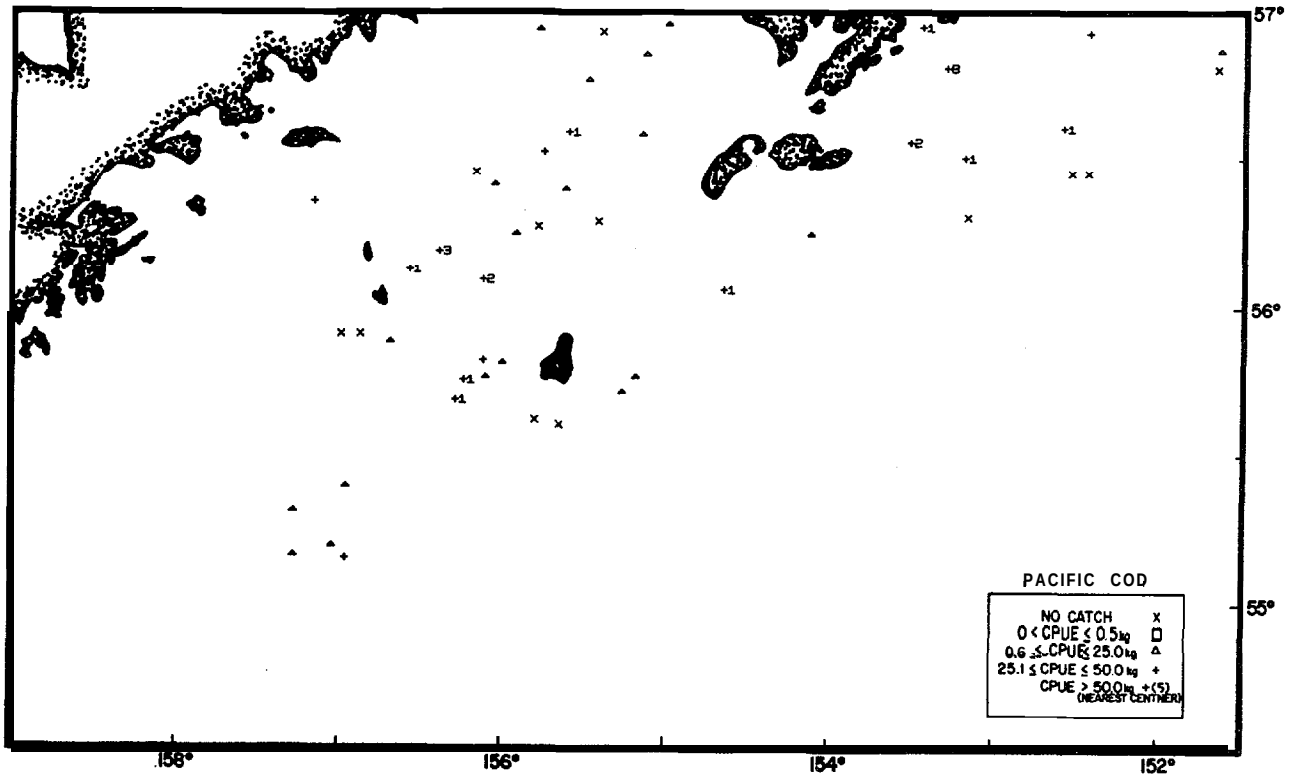


Figure XI-454.--Distribution of standardized catch rates in kilograms/hour of Pacific cod in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

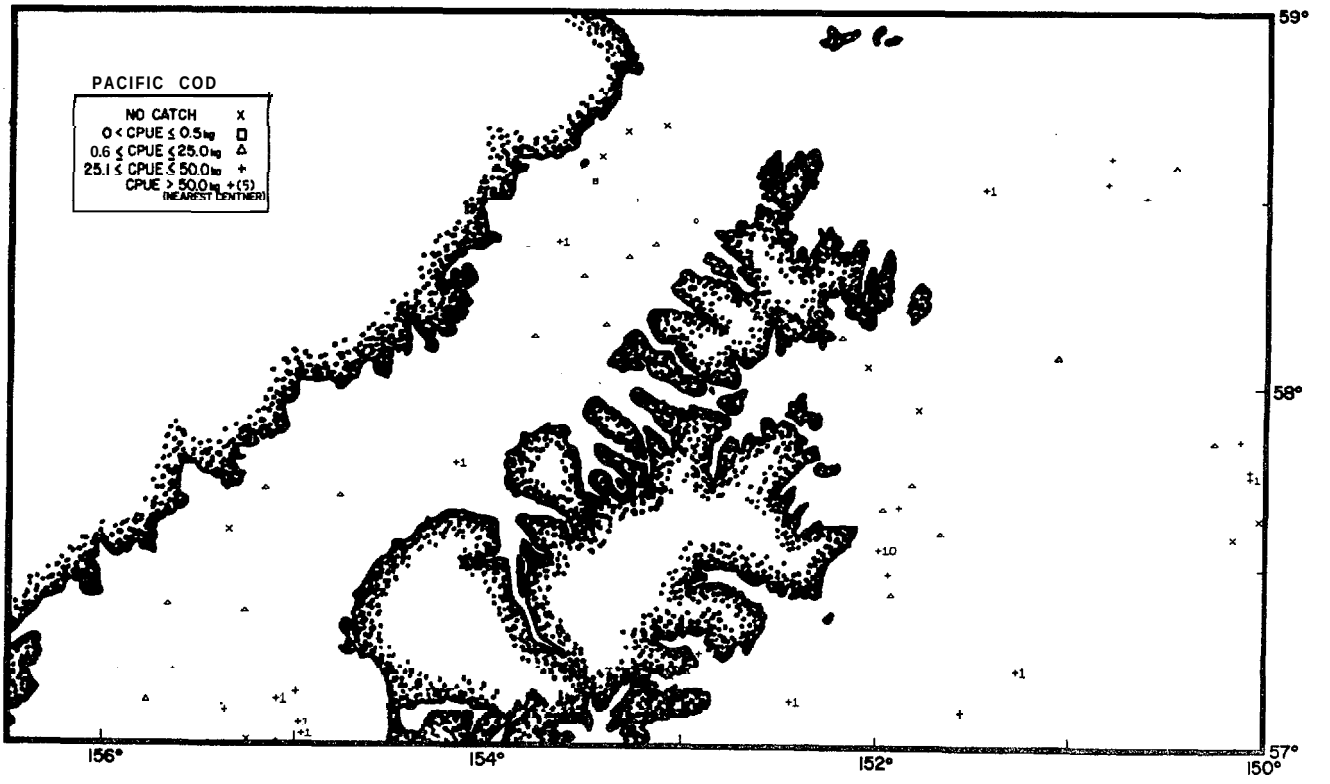


Figure XI-455.--Distribution of **standardized** catch **rates in kilograms/hour** of Pacific cod in the western Gulf of Alaska, **May-Jun.** 1973, **Aug.-Oct.** 1973, and Jun.-Aug. 1975 (Cruiser 733, 734, and 753).

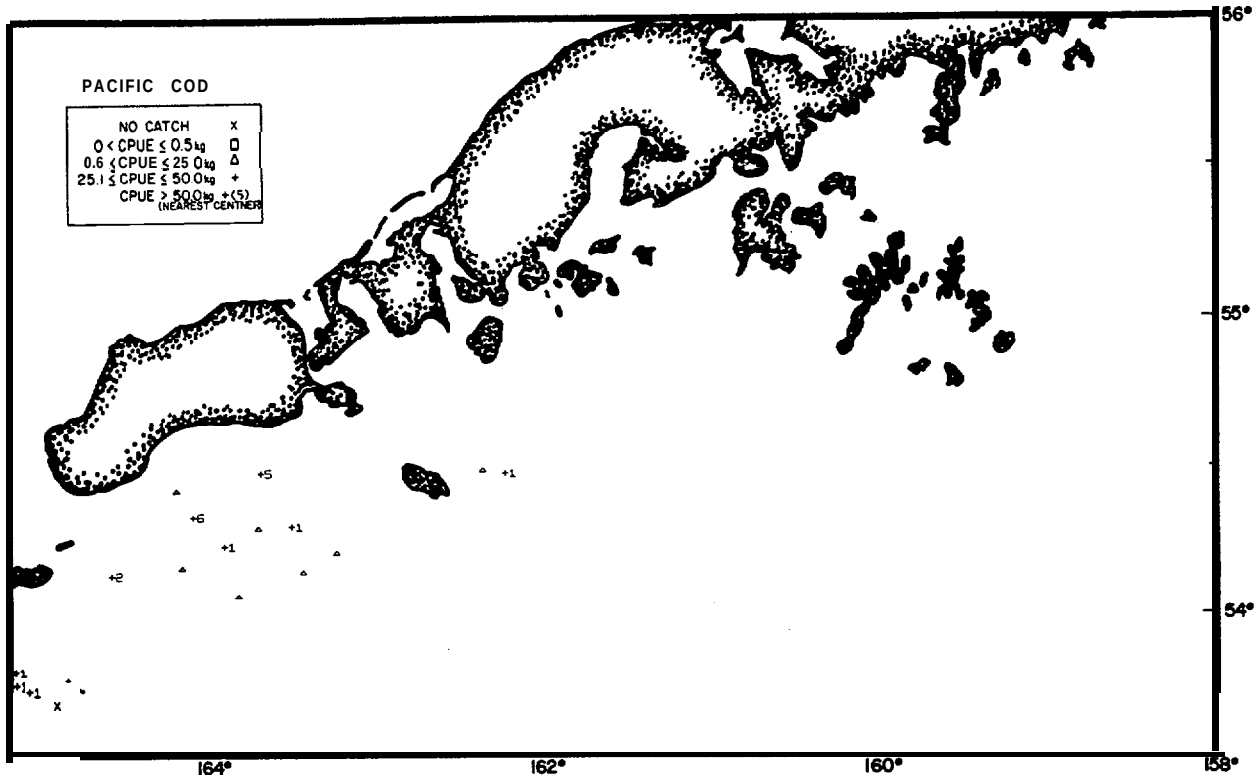


Figure XI-456.--Distribution of **standardized** catch **rates** in kilograms/ **hour of** Pacific cod **in** the **western** Gulf of **Alaska, Jul.-Aug.** 1974 **(Cruise** 744).

Length-weight relationship-Four hundred and ninety length-weight observations are available from the Yakutat and Prince William inner and outer shelf depth zones. The coefficients of regression are presented by sex and depth zones in Table XI-120 with the individual observations and resulting regression lines shown graphically in Figure X1-458.

Age-length relationship-Age and length data collected from the Yakutat and Prince William regions for Pacific cod are presented in Table X1-121.

The relatively narrow range of observed ages along with small sample sizes has resulted in little plottable data. Males ranged in age from l-5 years while females varied from 2-4 years.

ROCK SOLE

Distribution and abundance --Rock sole appeared in all regions sampled, but were **primarily** concentrated on the continental shelf in the western Gulf of Alaska. The relative apparent abundance of this species was inversely related to water depth, with the highest mean CPUE, 147 kg/hr, occurring in the inner shelf depth zone (Figures X1-459-460). Lesser values, well below the 47 **kg/hr** survey average, were recorded in the outer shelf and upper slope. In the Kodiak and Sanak regions, mean **CPUE's** were well above the Gulf of Alaska average with 173 and 147 **kg/hr** respectively. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-461-465.

Tohln XT-118.--Estimated biomass and population size of Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Pairweather	l-100	14.5	522.2	42.7	0.3	SO.0	2.23	64.7
	101-200	4.3	701.9	57.3	0.3	50.0	2.03	--
	201-400	0		0	0	0	--	--
	All zones	5.3	1,224.:	1.1	0.6	0.5	2.11	--
Yakutat	l-100	70.6	4,370.3	63.7	3.2	60.4	1.39	48.6
	101-200	16.6	2,427.8	35.4	2.1	39.6	1.17	46.1
	201-400	0.9	5 8 . 4	0.9	4/	5/	2.55	--
	All zones	24.8	6,856.5	6.1	J.3	4.0	1.31	--
Prince William	l-100	13.2	1,455.3	28.6	1.1	37.9	1.36	48.7
	101-200	25.2	3.173.9	62.4	1.6	55.2	2.01	53.1.
	201-400	12.5	456.4	9.0	0.2	6.9	2.61	60.5
	All zones	18.6	5,085.6	4.5	2.9	2.2	1.80	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	45.2	10.971.9	84.7	8.9	89.9	1.24	47.2
	201-400	19.7	1,980.0	15.3	1.0	10.1	1.98	55.5
	All zones	37.7	12,951.9	11.4	9.9	1 . 7	1.31	--
Kodiak	l-100	196.9	28,192.2	69.5	60.9	87.8	0.47	34.4
	101-200	96.3	11,891.2	29.3	8.0	11.5	1.48	49.2
	201-400	8. e	490.6	1.2	0.5	0.7	1.02	4 4 . 9
	All zones	125.8	40,574.0	35.8	69.4	52.8	0.59	--
Shelikof	l-100	0.2	1.0	5/	4/	5/	--	--
	101-200	31.9	1,299.9	46.9	2.0	6x.7	0.63	38.0
	201-400	14.1	1,4[illegible]	53.1	1.0	33.3	1.53	4Y.8
	All zones	18.3	2,773.4	2.5	3.0	2.3	--	--
Chirikof	l-100	5.3	636.9	5.6	0.6	8.8	1.12	53.5
	101-200	24.4	3,930.2	34.4	2.6	38.2	1.49	47.4
	201-400	51.1	6,852.4	60.0	3.6	52.9	1.88	52.3
	All zones	25.8	11,419.5	10.1	6.8	5.2	1.67	--
Shumagin	l-100	--	--	--	--	--		--
	101-200	--	--	--		--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	102.3	18.377.7	56.6	16.3	48.7	1.10	45.9
	101-200	82.7	13,499.5	41.6	16.9	50.5	0.80	41.7
	201-400	46.4	580.0	1.8	0.3	0.9	2.00	54.5
	All zones	91.3	32.457.2	28.6	33.5	25.5	1.00	--
Total	1-100	81.7	53,555.6	47.3	82.4	62.7	--	--
	101-200	41.2	47,896.3	42.3	42.4	32.3	1.48	--
	201-400	22.4	11,890.3	10.5	6.6	5.0	1.80	--
	All zones	47.6	113,342.2	100.0	131.4	100.0	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.

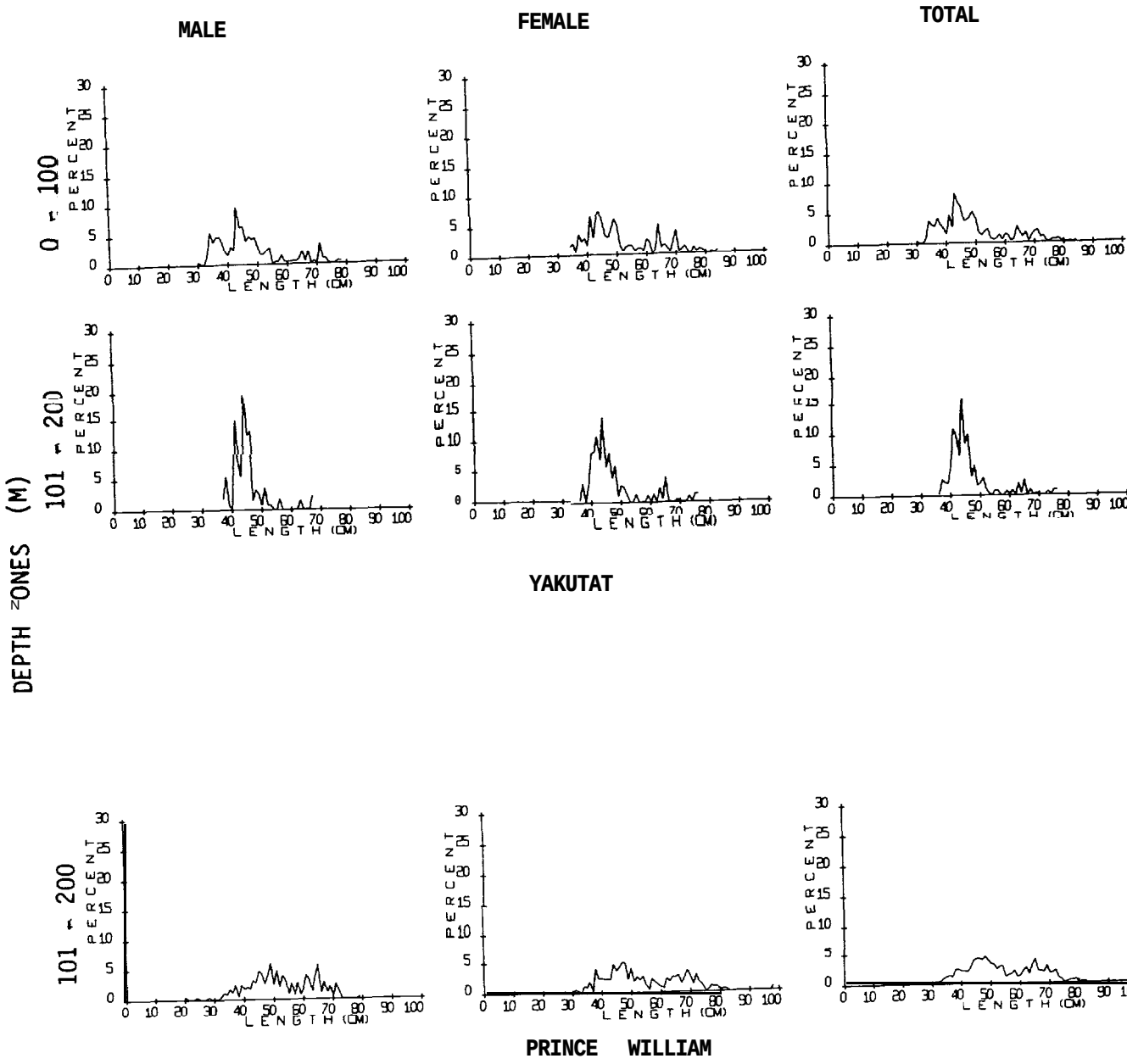


Figure XI-457.--Length frequency **distributions** of Pacific cod in **the** Gulf of **Alaska** by **region-depth** zones, 1973-1976.

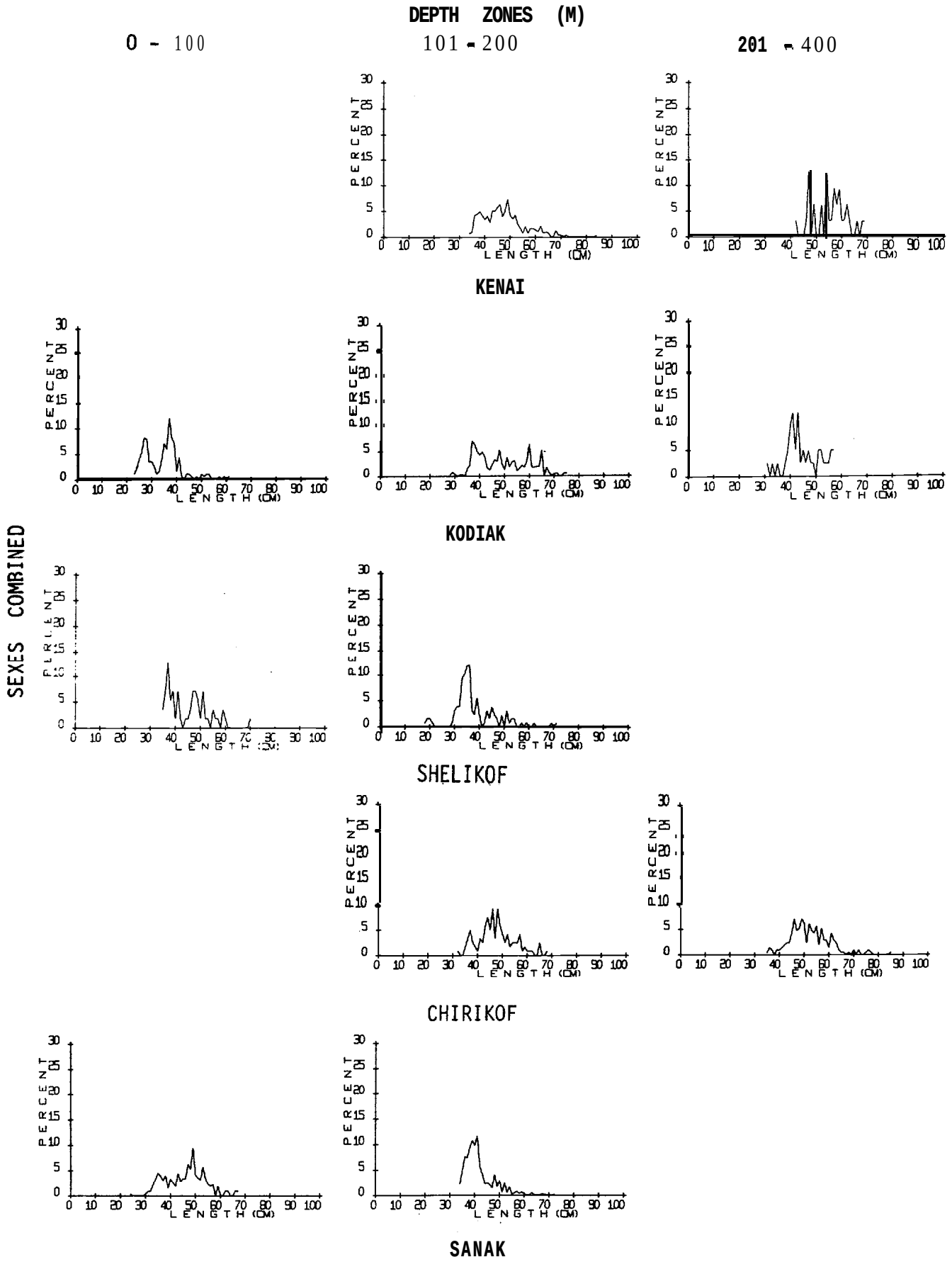


Figure XI-457 (continued).--Length frequency distributions of Pacific cod in the Gulf of Alaska by region-depth zones, 1973-1976.

Table XI-119.--Mean lengths (cm) of Pacific cod by regions and depth zones (Cruises 733, 734, 744, 751, 753 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	--	--	--	--	--	--	--	--	--
Yakutat	46.7	50.9	48.6	44.9	46.9	46.1	--	--	--
Prince William	--	--	--	52.5	53.7	53.1	--	--	--
Kenai	--	--	--	--	--	47.2	--	--	55.5
Kodiak	--	--	34.4	--	--	49.2	--	--	44.9
Shelikof	--	--	45.1	--	--	38.0	--	--	--
Chirikof	--	--	--	--	--	47.4	--	--	52.3
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	45.9	--	--	41.7	--	--	--

Biomass--The total apparent biomass of rock sole in the Gulf of Alaska has been estimated at 112 thousand mt with 86% of the total occurring in the inner shelf, 11% in the outer shelf and only 3% in the upper slope (Table x1-122). Two western Gulf regions, Kodiak and Sanak, accounted for over 96% of the total. Within these regions 44% of the total rock sole biomass occurred in the Kodiak-inner shelf while 40% was associated with the Sanak-inner shelf. The biomass estimate for rock sole is probably low as this species is abundant during summer months in shallow, untrawlable areas.

Size composition-Unsexed length frequency data are available from the Kodiak, Chirikof and Sanak regions. Mean lengths generally increased with depth but varied little between regions (Table XI-123 and Figure X1-466).

FLATHEAD SOLE

Distribution and abundance-Flathead sole were found in all areas and depth zones sampled in the Gulf of Alaska. By depth zones, apparent relative abundance was highest in the outer shelf and upper slope and averaged 44 kg/hr over the entire Gulf (Figures X1-467-468). Regions with above average mean CPUE's included Shelikof, Kodiak, Fairweather, Sanak and Kenai. Within regions, particularly high CPUE's occurred in the outer shelf depth zone of Shelikof and Kodiak and the Fairweather upper slope. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-469-473.

Table XI-120.--Parameters for the length-weight relationship (weight (g) = a · length^b) for Pacific cod (Cruise 751).

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Sample Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	61	34-77	0.004640	3.212017	17	34-73	0.022392	2.80392:
	101-200	38	37-56	0.003940	3.213627	100	33-72	0.003312	3.30353:
	201-400	--	--	--	--	--	--		--
Females	0-100	68	34-01	0.002646	3.350940	40	35-78	0.005628	3.170101
	101-200.	52	37-59	0.004918	'3.169297	114	31-78	0.009251	3.04686
	201-400	--	--	--	--		--		--

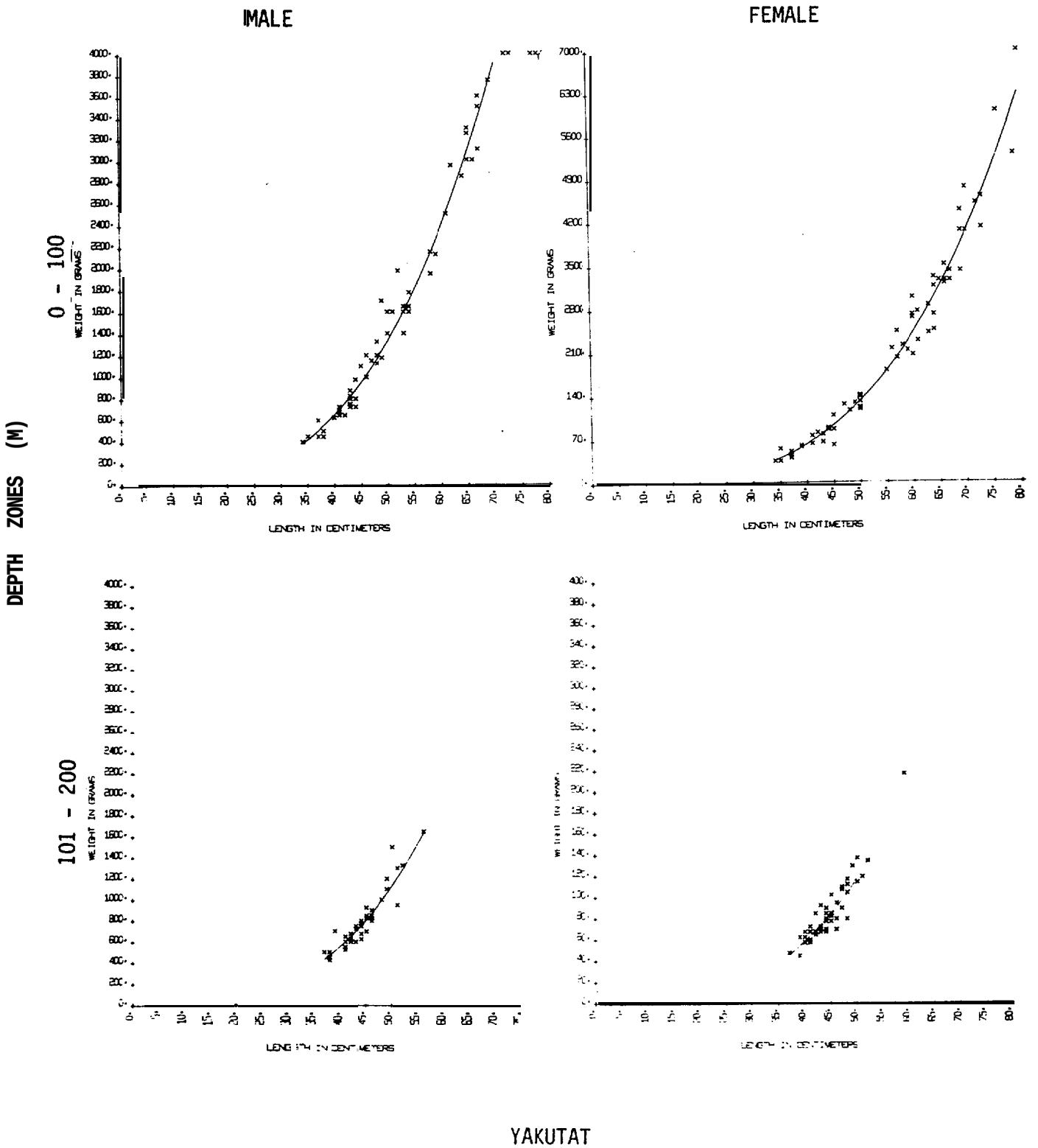


Figure XI-458.--Weight at length observations for Pacific cod in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).

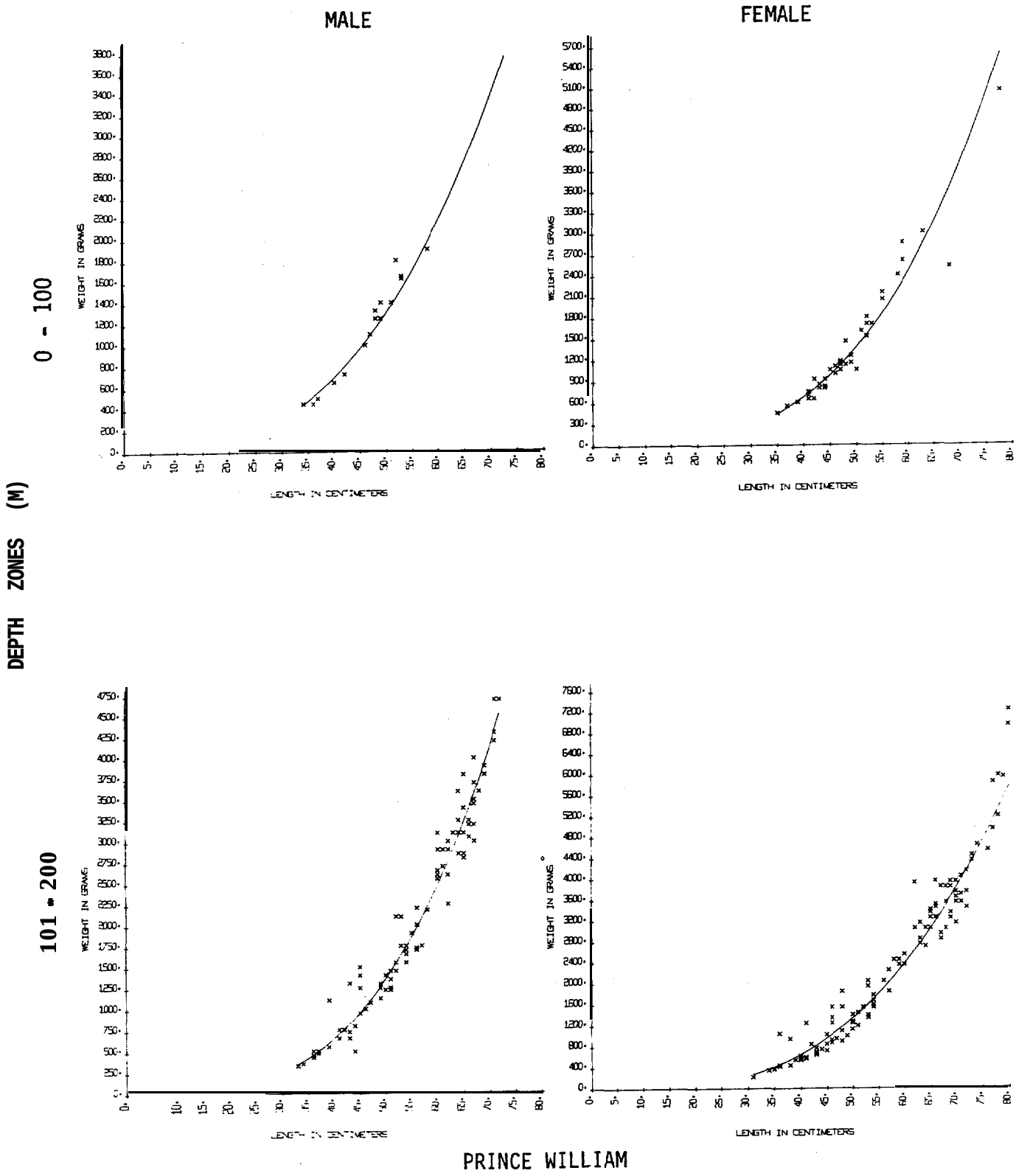


Figure XI-458 (continued).--Weight at length observations for Pacific cod in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).

Table X1-121.--Summary of age-length data collected for Pacific cod (Cruise 751).

Sex	REGIONS					
	Yakutat			Prince William		
	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	38	10	--	--	8	--
Range in age (years)	l-5	2	--	--	2-4	--
Range in length (cm)	37-77	38-54	--	--	37-69	--
Females						
Number of readable otoliths	30	28	--	--	25	--
Range in age (years)	2-4	2-3	--	--	l-4	--
Range in length (cm)	36-84	39-50	--	--	28-78	--

Biomass-The biomass of flathead sole in the Gulf of Alaska has been estimated at 104 thousand mt of which 69% was located in the outer shelf, 21% in the upper slope and 10% in the inner shelf (Table X1-124). Regions which contained the greatest portion of the biomass were Kodiak (18%), Sanak (16%), Kenai (15%) and Fairweather (11%). The eastern Gulf regions contributed 43% to the total flathead sole biomass while the western regions accounted for 57%.

Size composition-Length frequency data by sexes are available from the three easternmost Gulf regions while unsexed data are available from the remaining regions. Females were always larger than males with both sexes increasing in length with increasing depth (Figure X1-474). Largest mean lengths, sexes combined, generally occurred in the eastern Gulf regions with values ranging from 9.8 cm in the Kodiak inner shelf to 37.9 cm in the Prince William upper slope (Table X1-125).

Length-weight relationship--The coefficients of regression derived from 518 length weight observations obtained in the Yakutat and Prince William regions are presented in Table XI-126 by sexes and depth zones. Data points representing each observation and the resulting regression curves are presented in Figure X1-475.

Age-length relationship-Age and length data collected in the Yakutat and Prince William regions for flathead sole are presented in Table X1-127.

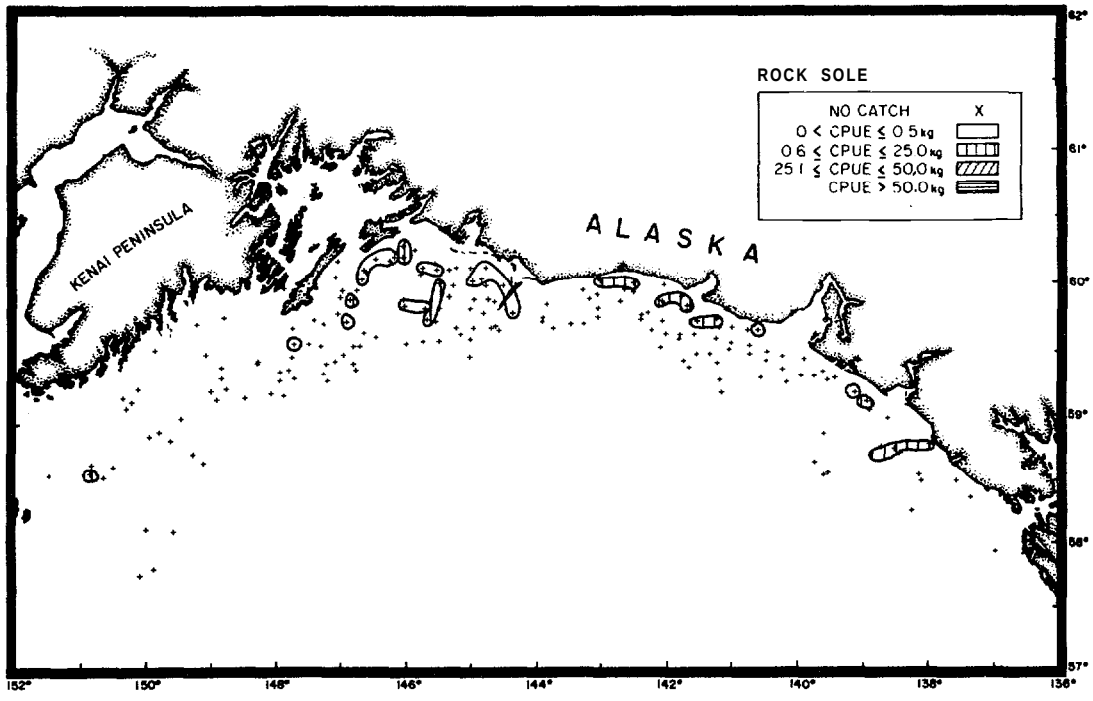


Figure X1-459. --Distribution of apparent relative abundance of rock sole in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

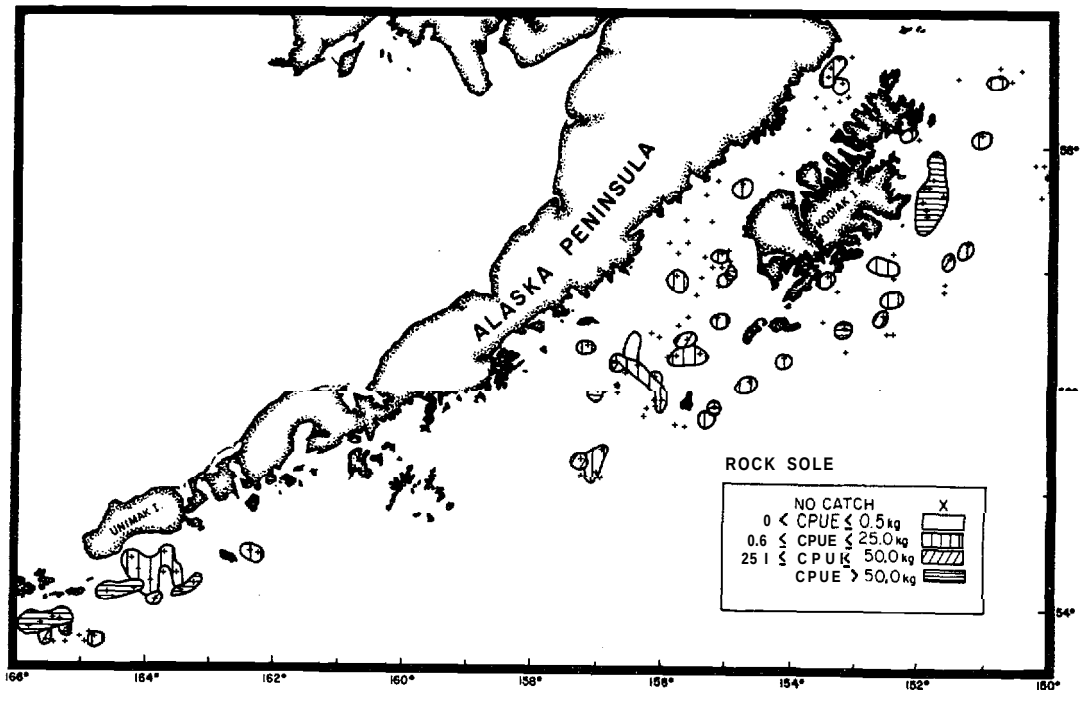


Figure X1-460. --Distribution of apparent relative abundance of rock role in the western Gulf of Alaska, May-July 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

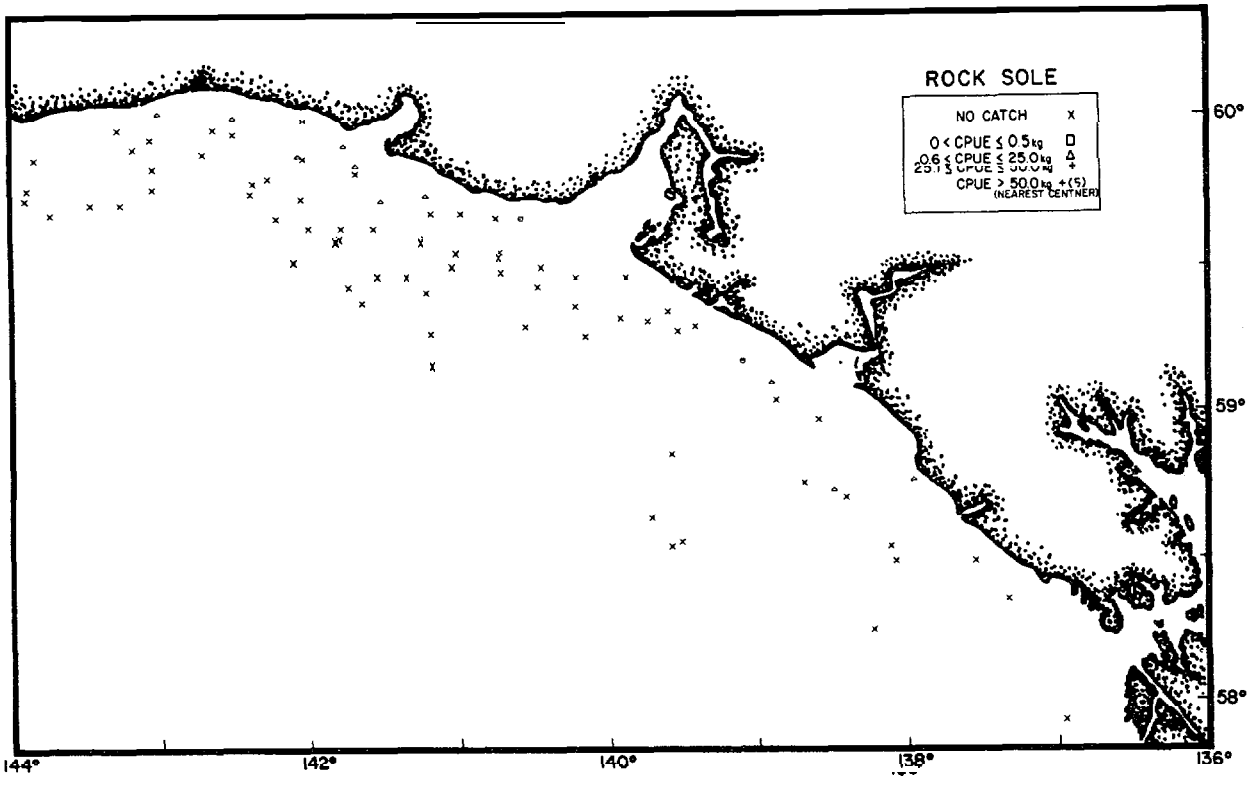


Figure XI-461.--Distribution of standardized catch **rates in** kilograms/ **hour** of rock sole **in** the eastern Gulf of Alaska, **May-Aug**. 1975 and **Apr.** 1976 (Cruises 751 and 762).

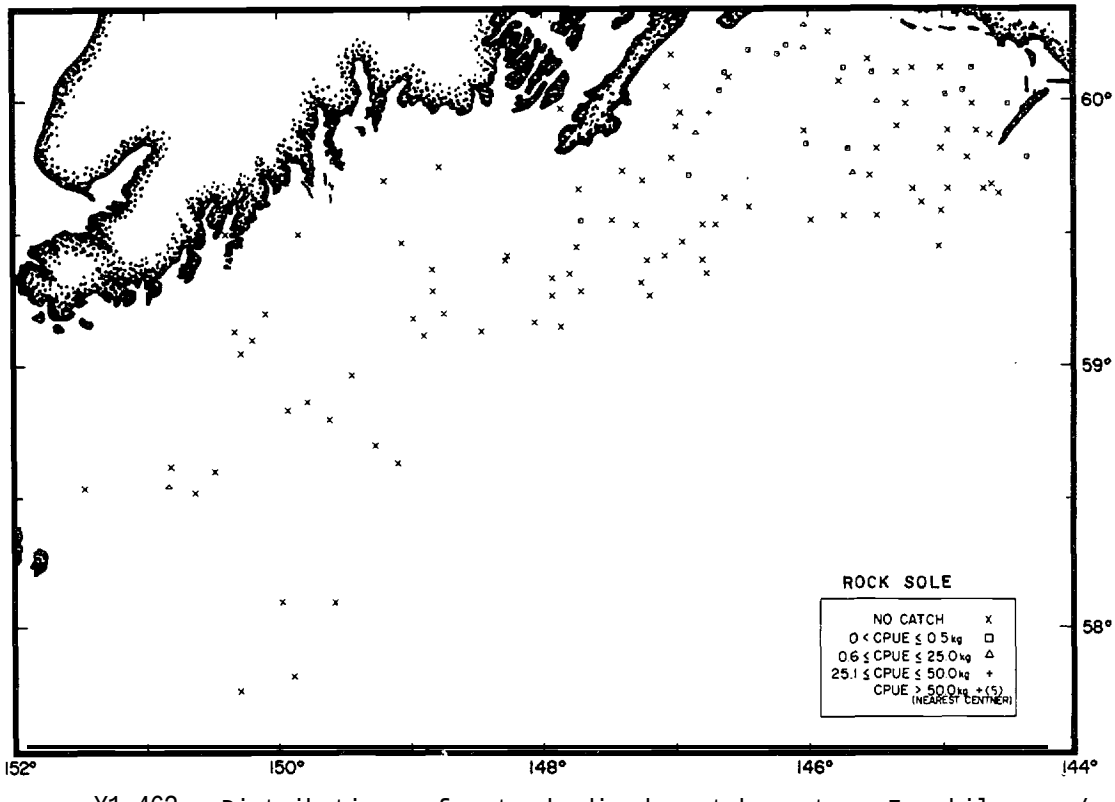


Figure X1-462.--Distribution of standardized catch rates In kilograms/ hour of rock sole in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

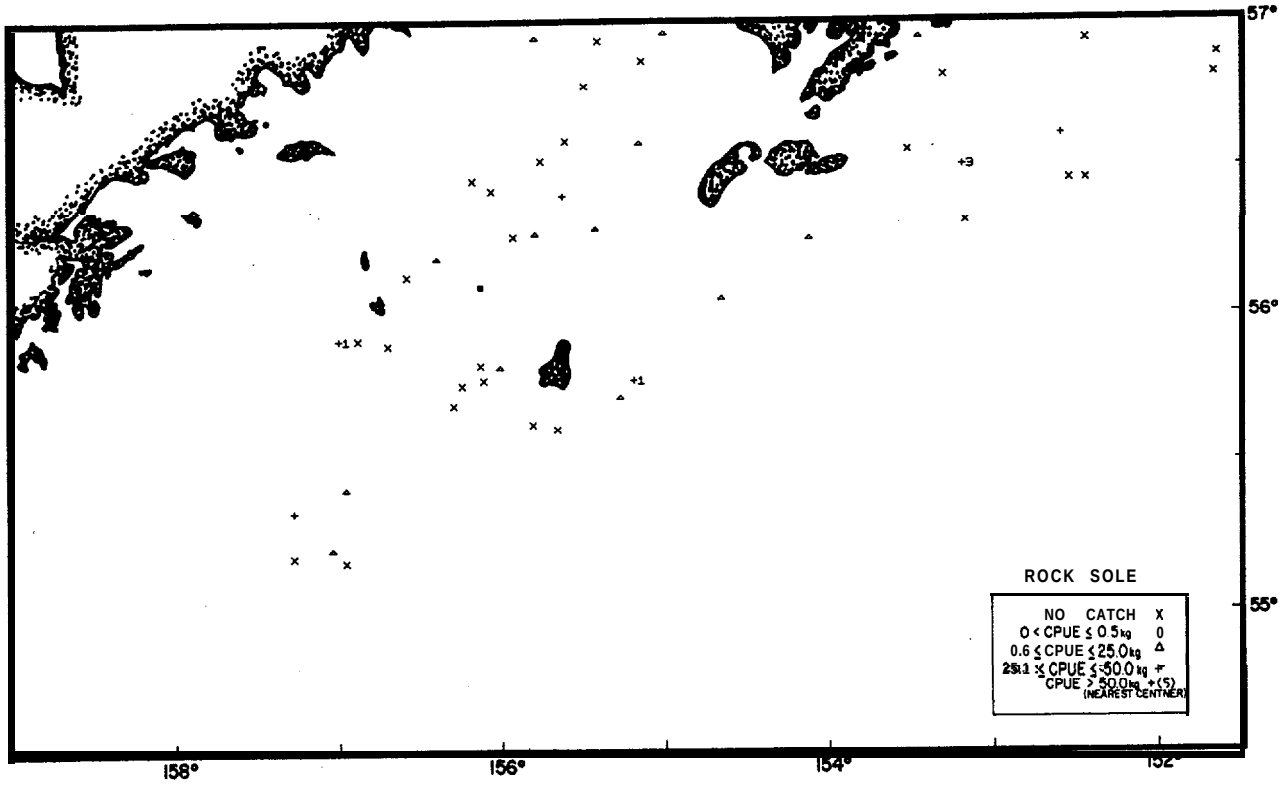
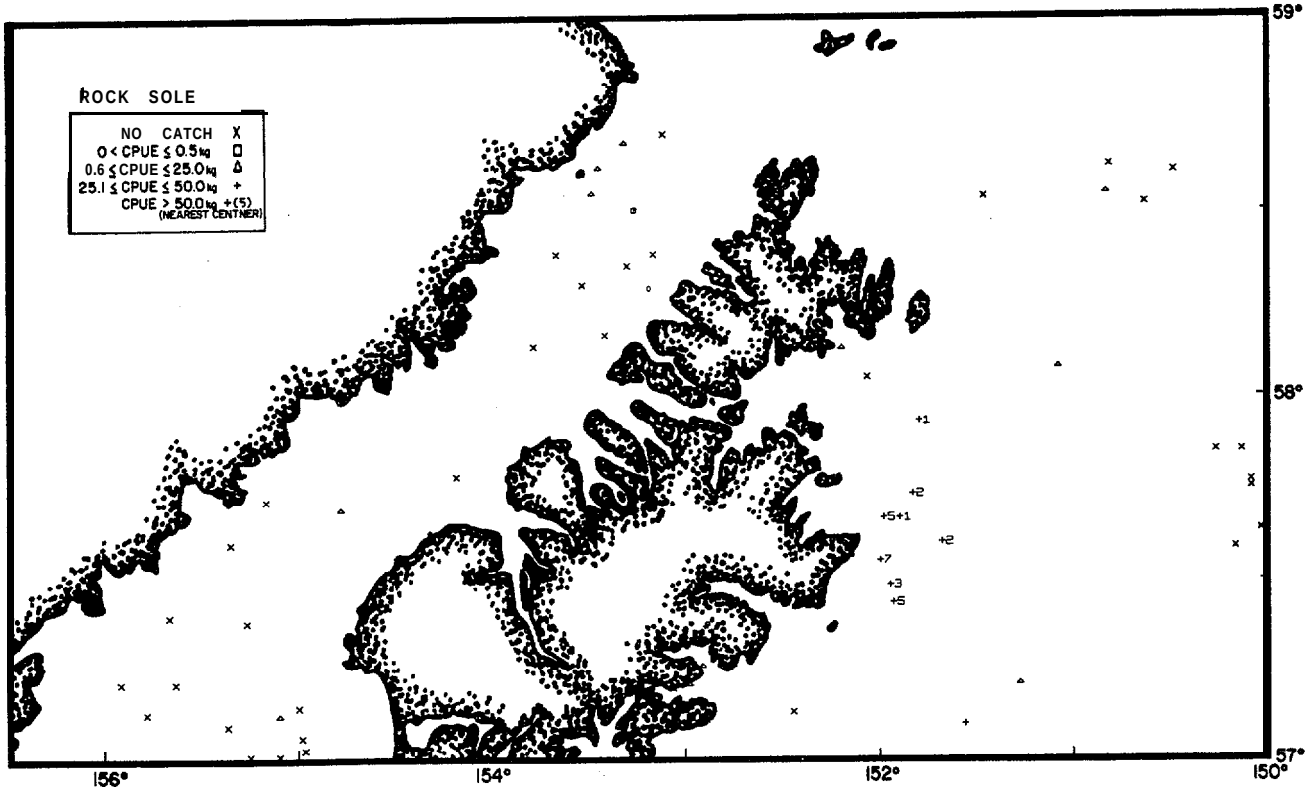


Figure XI-463.--Distribution of standardized catch **rates** in kilograms! hour of rock sole in the western Gulf of Alaska, **Aug.-Oct.** 1973 and **Jun.-hug. 1975 (Cruises 734** and 753).



Figures x1-464.--Distribution of standardized catch rates in **kilograms/** hour of rock sole in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

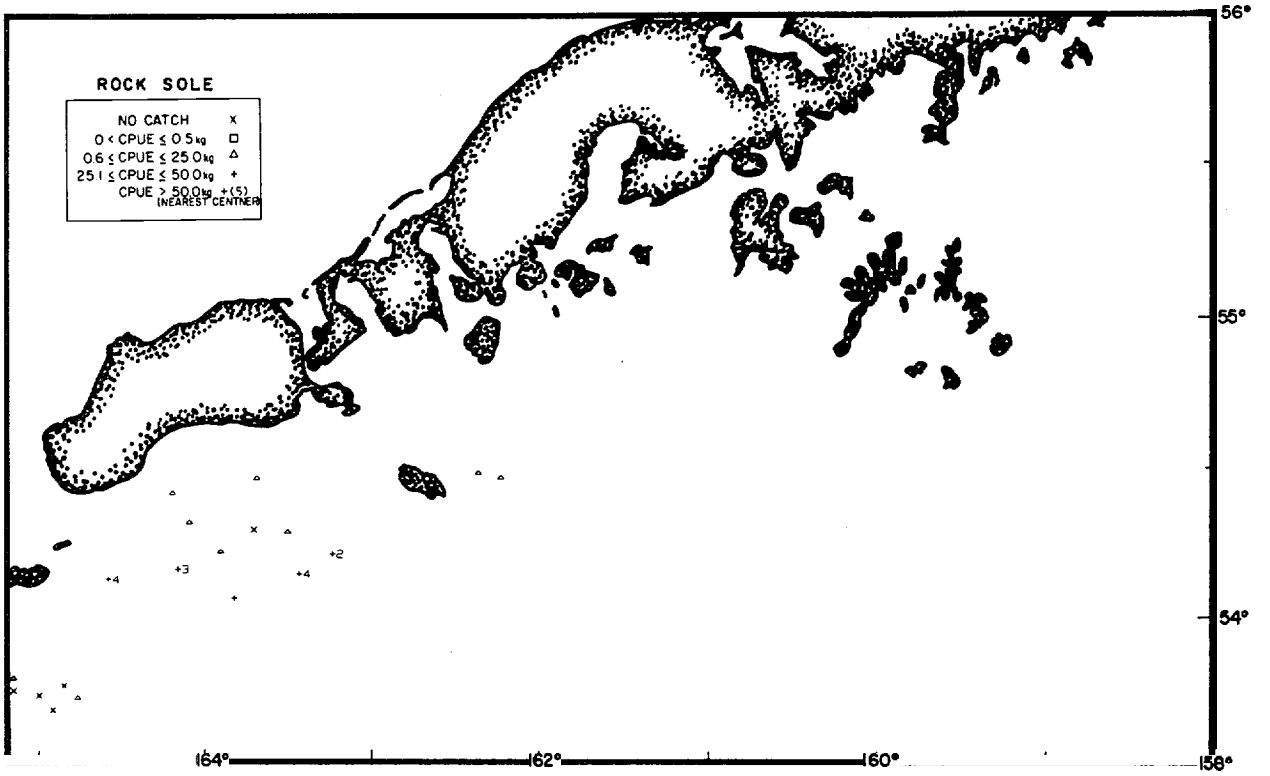


Figure XI-465.-Distribution of standardized catch rates in kilograms/hour of rock sole in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

These data are summarized in Figure XI-476 by plots of mean lengths-at-age by sexes and regions. In general, mean length-at-age values were highest for females in all depth zones of both regions. Females ranged in age from 4-19 years while males varied from 4-22 years. In general, in each sex, differences in the mean values between regions and depths were relatively small,

TANNER CRAB

Distribution and abundance--Tanner crabs occurred in all regions-depth zones, and with the exception of the Fairweather and Sanak upper slope averaged 37 kg/hr over the entire Gulf of Alaska. The relative apparent abundance of this species varied little between the three depth zones (Figures X1-477-478). The Prince William region had the highest mean CPUE (127 kg/hr) with catch rates exceeding 100 kg/hr in each depth zone (Figures X1-479-483). Other regions which exceeded the Gulf of Alaska average were Shelikof and Kodiak. The lowest regional CPUE's occurred in the Fairweather, Kenai and Yakutat areas.

Biomass--The biomass of Tanner crab has been estimated at 88 thousand mt of which, 48% was located in the outer shelf, 27% in the upper slope and 30% in the inner shelf (Table X1-128). The Prince William region contained 39% of the estimated biomass with Kodiak and Shelikof making significant contributions of 21 and 16%. The western Gulf regions accounted for 55% of the estimated biomass while the combined eastern regions followed with 45%. Biomass estimates for Tanner crab should be considered minimal as otter trawls fished at the towing speeds used during these surveys do not adequately sample the larger male crabs.

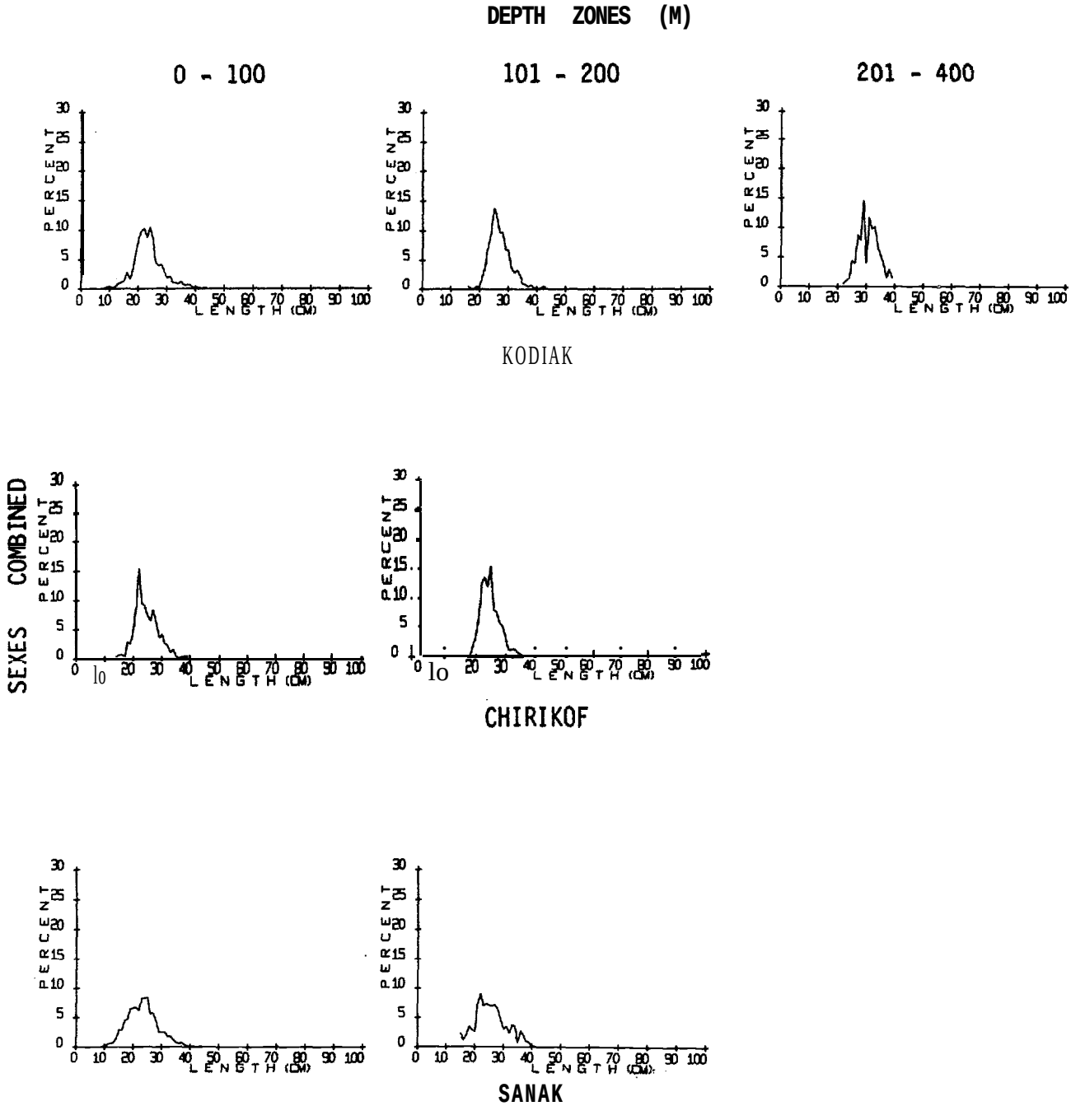


Figure XI-466 .--Length frequency **distributions** of **rock** sole **in** the **Gulf** of **Alaska** by **region-depth** zones, 1973-1976.

Table XI-122.--Estimated biomass and population size of rock sole (*Lepidopsetta bilineata*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	I-100	1.4	48.9	60.2	0.2	100.0	0.30	--
	101-200	0.2	32.3	39.8	4/	5/	1.59	--
	201-400	0	0	0	-0	0	--	--
	All zones	0.4	81.2	0.1	6.2	--	0.45	--
Yakutat	l-100	3.3	201.6	100.0	592.3	100.0	0.34	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0.7	201.6	0.2	592.3	--	0.34	--
Prince William	l-100	2.1	300.8	95.6	1.2	92.3	0.25	--
	101-200	0.1	13.9	4.4	0.1	7.7	0.27	--
	201-400.	0	0	0	0	0	--	--
	All zones	1.1	314.7	0.3	1.3	--	0.25	--
Kenai	l-loo	--	--	--	--			--
	101-200	0.1	17.6	100.0	4/	100.0	0.45	--
	201-400	0	0	0	0	0	--	--
	All zones	0.1	17.6	5/	4/	--	--	--
Kodiak	1-100	345.3	49,455.5	88.7	279.5	93.0	0.18	23.3
	101-200	29.2	3.598.0	6.5	14.0	4.7	0.26	26.9
	201-400	48.4	2,701.0	4.8	7.2	2.4	p.38	30.7
	All zones	172.9	55,754.5	49.7	300.7	--	0.19	--
Shelfkof	l-100	2.4	15.7	33.1	4/	--	0.53	--
	101-200	0.1	2.1	4.4	--	--	--	--
	201-400	0.3	29.7	62.5	0.3	--	0.09	--
	All zones	0.3	47.5	5/	--	--	--	--
Chirikof	l-100	15.6	1,870.0	52.3	9.6	53.9	0.20	24.5
	101-200	10.4	1,677.7	46.9	8.1	45.5	0.21	24.7
	201-400	0.2	28 2	0.8	0.1	0.6	0.40	--
	All zones	9 . 2	3.57579	3.2	17.8	--	0.20	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--		--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	248.6	44.660.8	85.7	251.6	88.9	0.18	23.2
	101-200	45.6	7,448.0	14.3	31.3	11.1	0.24	25.7
	201-400	0.2	4/	0	4/	5/	--	--
	All zones	146.6	52,108.8	46.5	282.9	--	--	--
Total	l-100	147.2	96,553.3	86.1	--	--		--
	101-200	10.8	12.789.6	11.4	--	--	--	--
	201-400	5.1	2,758.9	2.5	--	--	--	--
	All zone?)	46.9	112.101.8	100.0	--	--	--	--

1/ Mean catch par unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Table XI-123.--Mean lengths (cm) of rock sole by regions and depth zones (Cruises 734, 753 and 744).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fair-weather	--	--	--	--	--	--	--	--	--
Yakutat	--	--	--	--	--	--	--	--	--
Prince William	--	--	--	--	--	--	--	--	--
Kenai	--	--	--	--	--	--	--	--	--
Kodiak	--	--	23.3	--	--	26.9	--	--	30.7
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	24.5	--	--	24.7	--	--	--
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	23.2	--	--	25.7	--	--	--

Size composition-Length-frequency data are available from the Yakutat and Prince William regions. Males were generally larger than females, however, mean lengths never exceeded 100 mm for either sex (Table XI-129 and Figure X1-484).

COTTIDS

Distribution and abundance--In many Gulf of Alaska trawl surveys, sculpins were placed in a common "cottid" group and not identified to individual species. Representing approximately 25 species encountered during the survey, (Table V-3), the cottids were found in all regions and depth zones with the exception of the Fairweather inner shelf. Apparent relative abundance was inversely proportional to bottom depth with the inner shelf having the highest mean CPUE (49 kg/hr) followed by the outer shelf (14 kg/hr) and upper slope (5 kg/hr). The overall mean CPUE for cottids in the Gulf of Alaska averaged 22 kg/hr with the highest average catch rates occurring in the western Gulf. Kodiak and Sanak had the highest mean catch rates with 70 and 51 kg/hr, while the highest CPUE in an eastern region was 4 kg/hr which occurred in Prince William and Kenai. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-485-489.

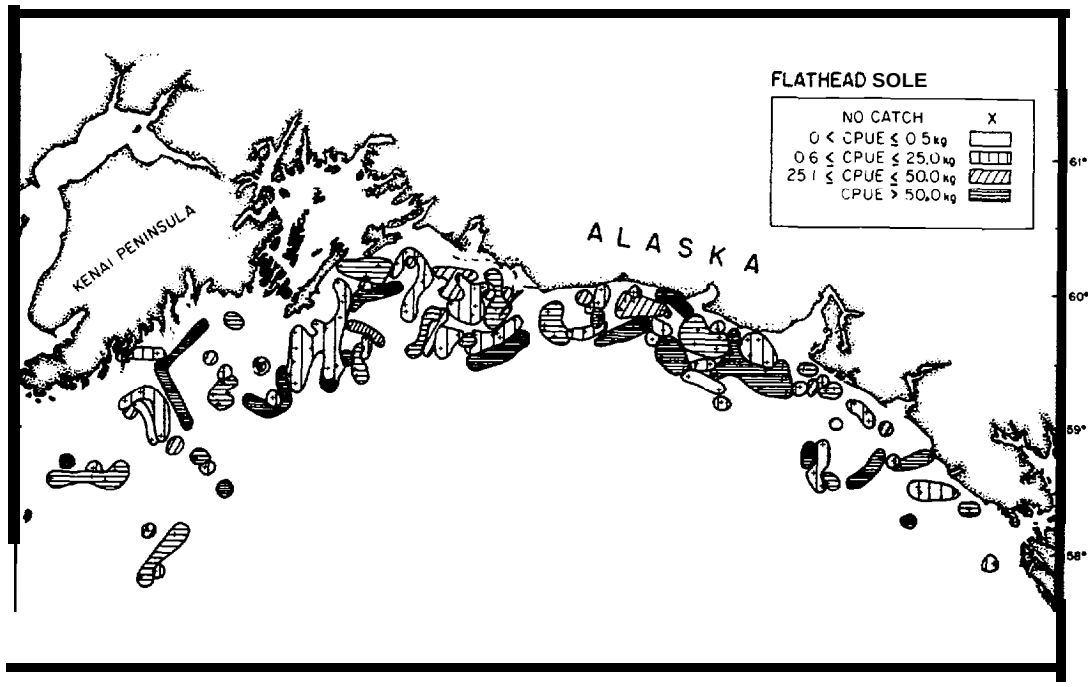


Figure X1-467.--**Distribution** of **apparent relative** abundance of **flathead sole in** the eastern Gulf of **Alaska, May-Aug.** 1975, **Jun.-Aug. 1975, and** Apr. 1976 (Cruises 751, 753, **and** 762).

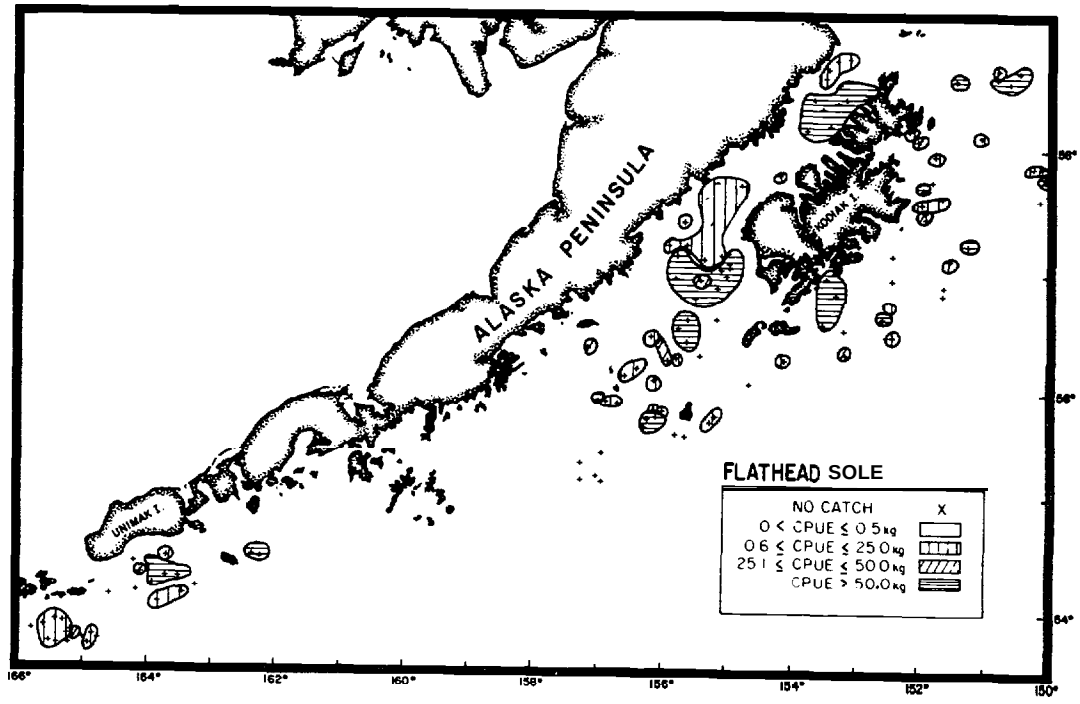


Figure XI-468 .--Distribution of apparent relative abundance of **flathead** sole in the western Gulf of Alaska, May-Jul. 1973, **Aug.-Oct.** 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 744, and 753).

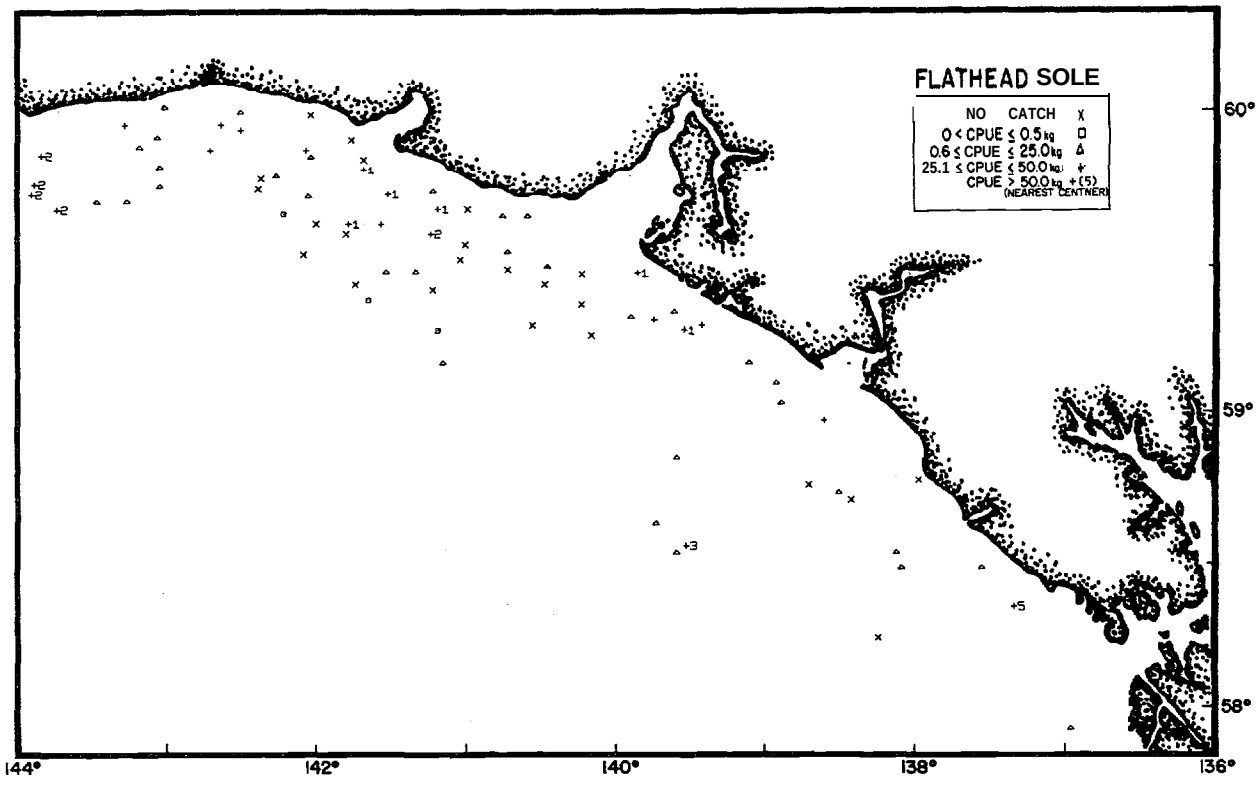


Figure X2-469.—**Distribution** of **standardized catch** rates **in** kilograms/ **hour** of **flathead** sole **in** the eastern Gulf **of** Alaska, May-Aug. 1975 **and** Apr. 1976 (Cruises 751 **and** 762).

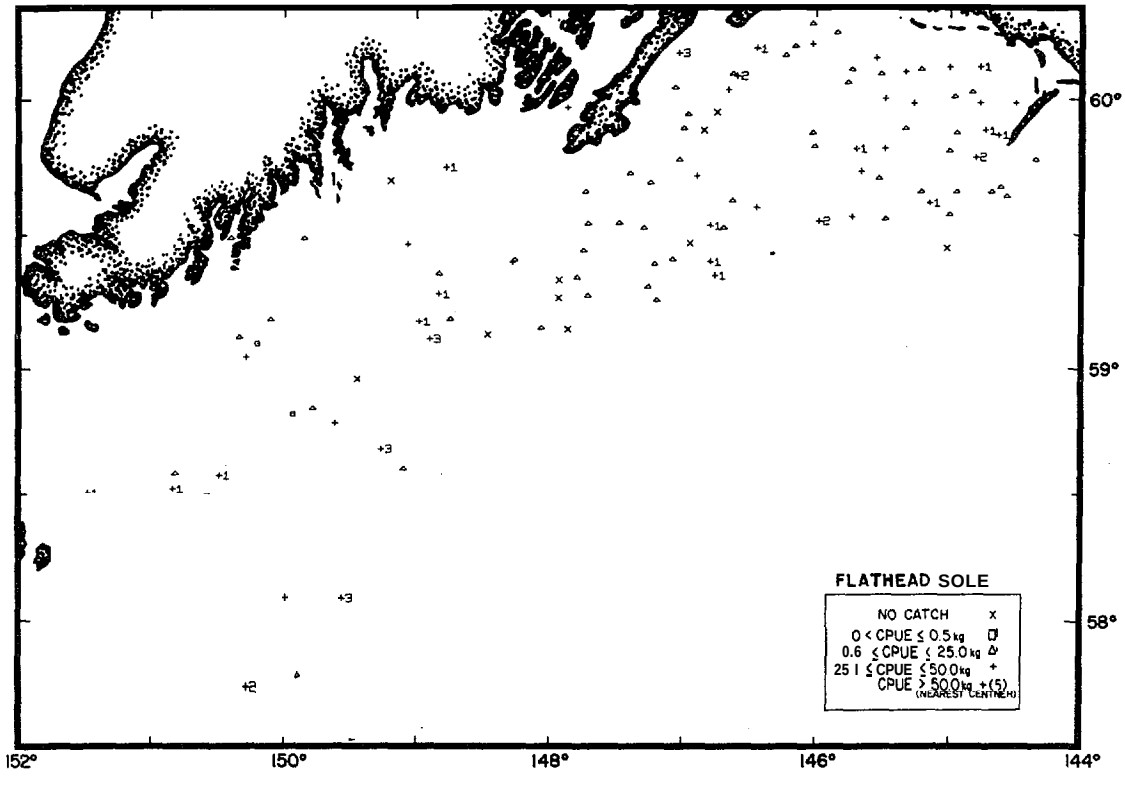


Figure X1-470.--Distribution of standardized catch rates in kilograms/ hour or tlathead sole in the eastern Gulf of Alaska, **May-Aug.** 1975 **(Cruises** 751 and 753).

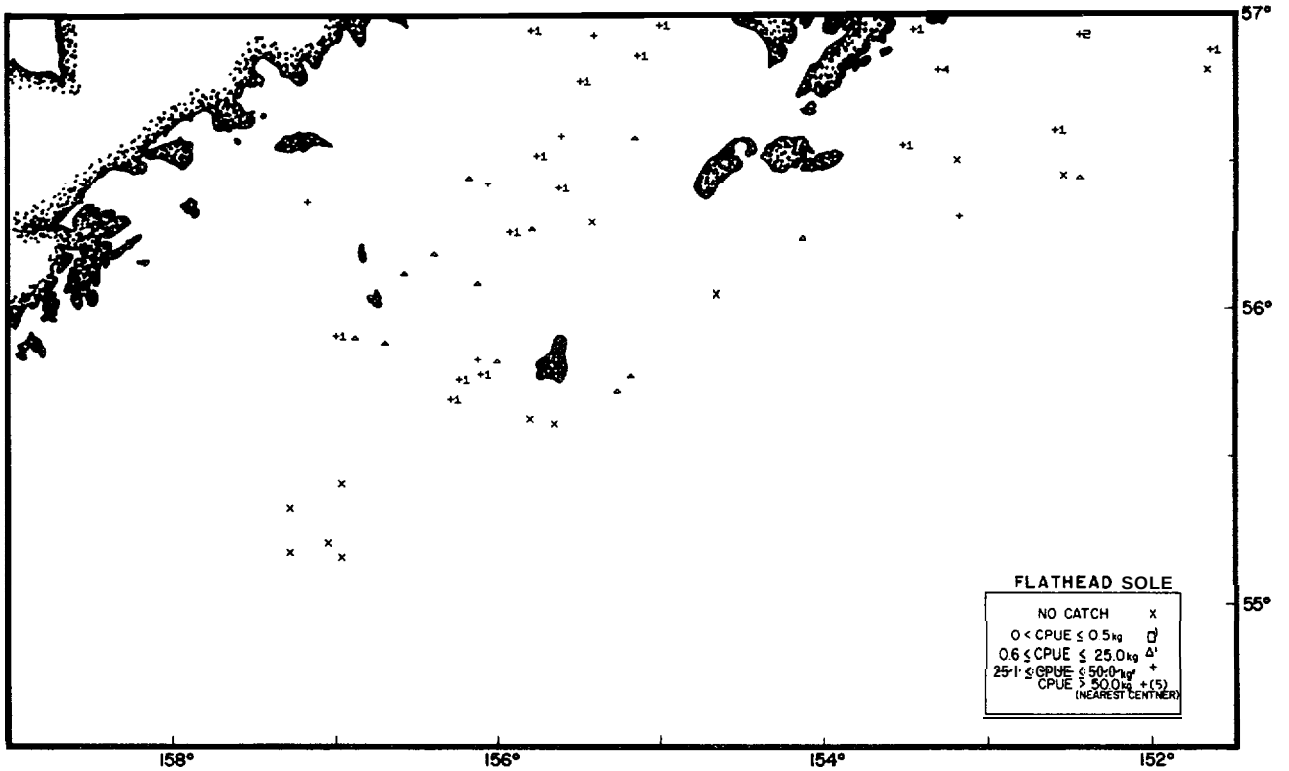


Figure XI-471.--Distribution of standardized catch rate8 in kilograms/ **hour** of **flathead sole** in the **western** Gulf of Alaska, Aug-Oct. 1973 **and Jun.-Aug.** 1975 **(Cruises** 734 and 753).

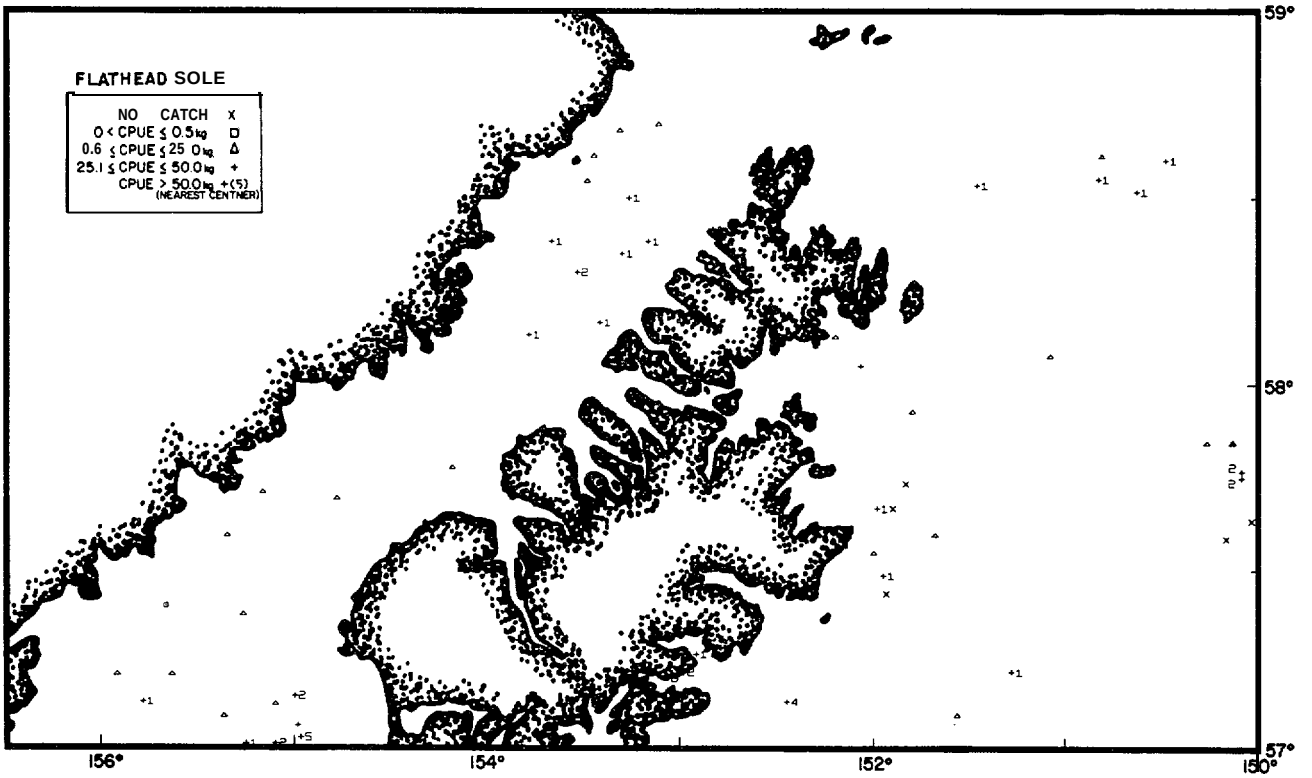


Figure X1-472.-Distribution of standardized catch rates in kilograms/ hour of **flathead sole** in the western Gulf of **Alaska, May-Jun.** 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

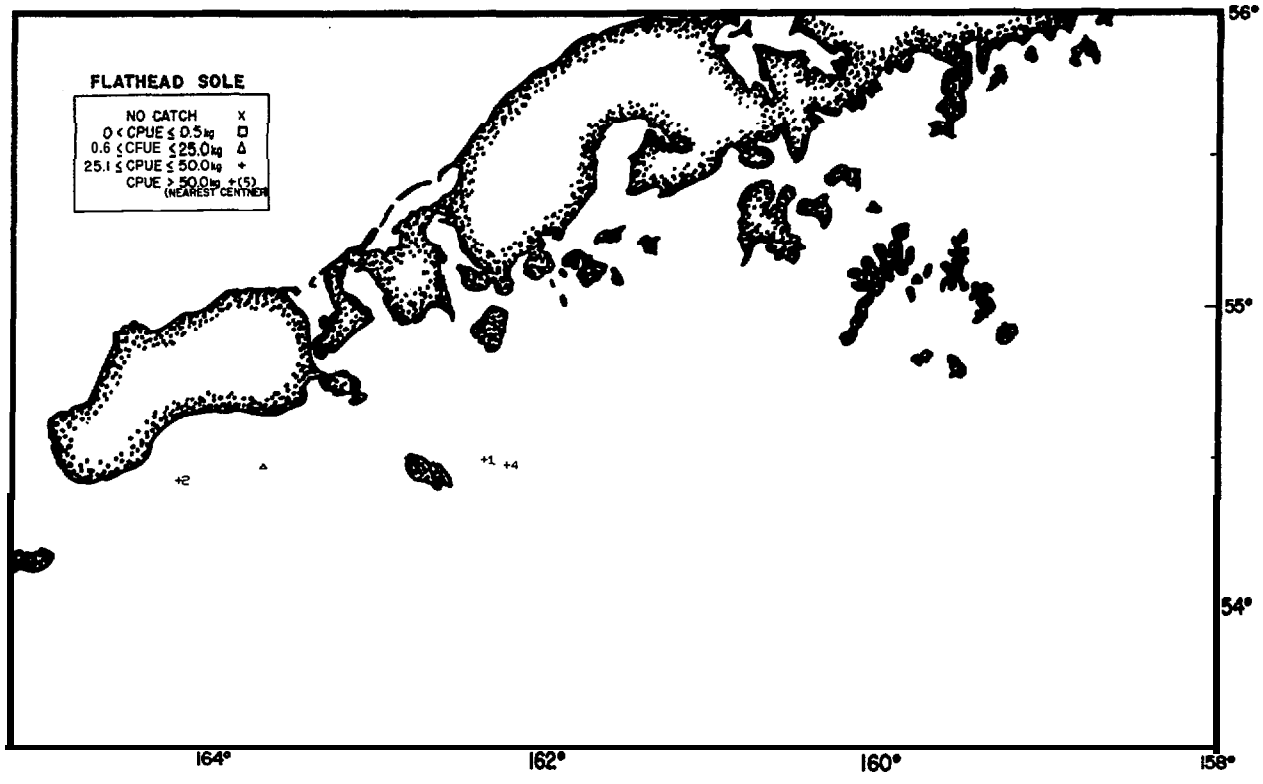


Figure XI-473.—Distribution of **standardized** catch **rates in kilograms/ hour** of **flathead sole in the western** Gulf of **Alaska, Jul.-Aug. 1974 (Cruise** 744).

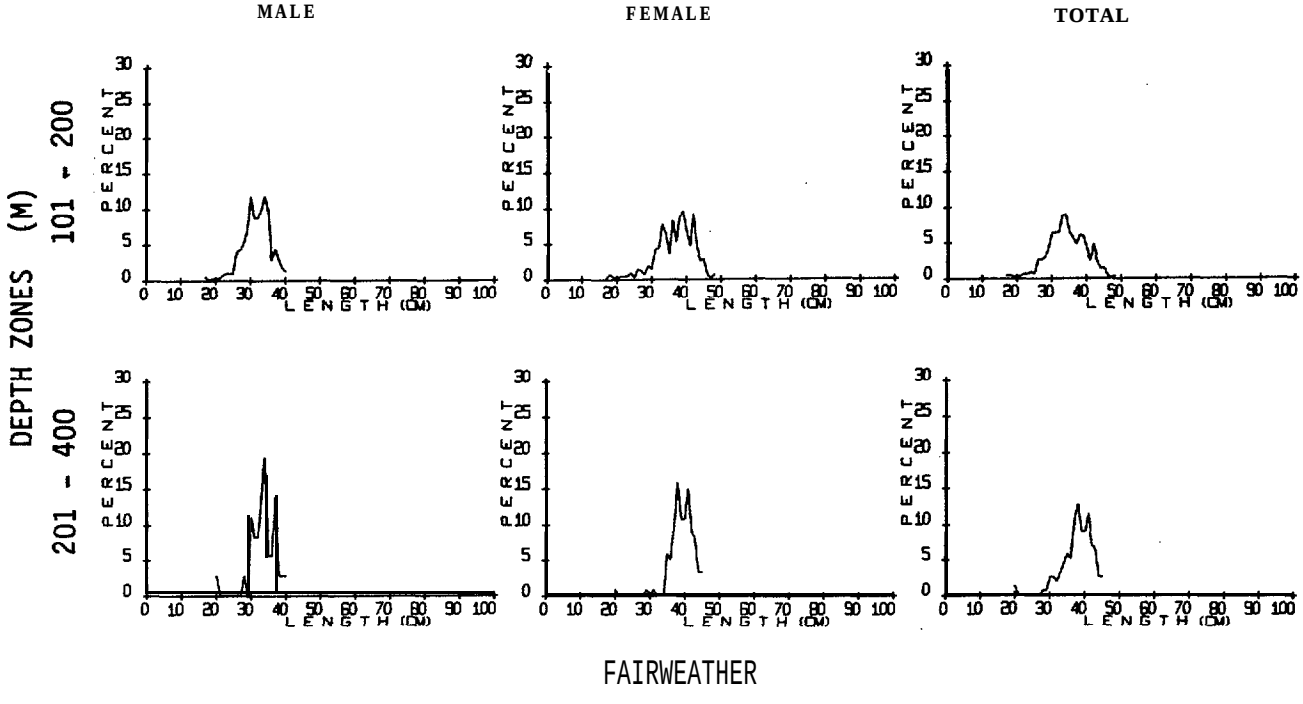


Figure XI-474.—Length frequency distributions of **flathead** sole in the **Gulf** of **Alaska** by **region-depth** tones, **1973-1976.**

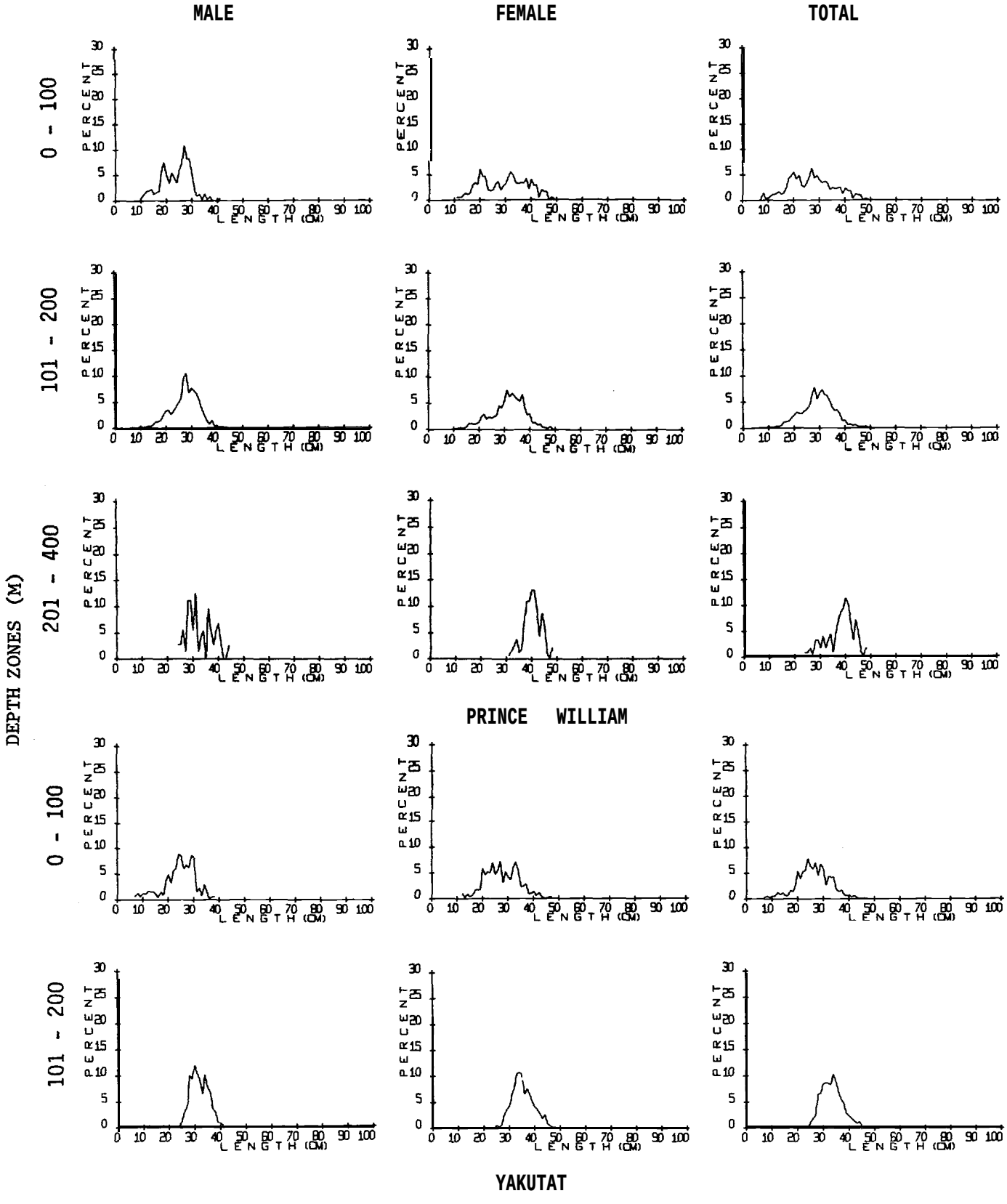


Figure XI-474 (continued).--Length frequency distribution8 of **flathead** sole **in** the Gulf of Alaska by region-depth tones, 1973-1976.

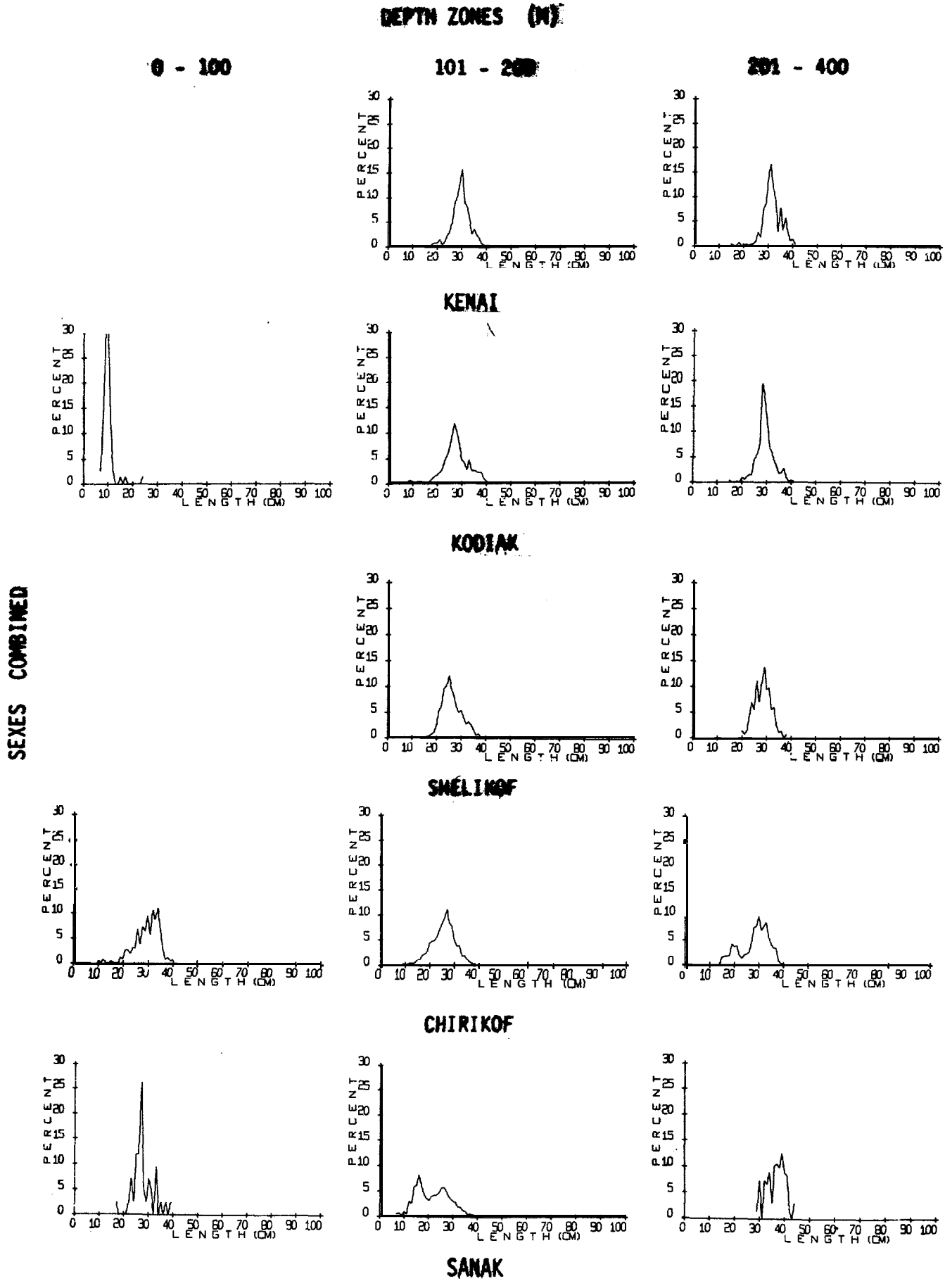


Figure XI-474 (continued).--Length frequency distributions of flathead sole in the Gulf of Alaska by region-depth zones, 1973-1976.

Table Xl-124 .--Estimated biomass and population size of flathesd sole (*Hippoglossoides elassodon*) in the Cult of Alaska during April-October 1973-76.

Region	Depth tone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	1.1	40.8	0.4	0.2	0.9	0,19	--
	101-200	44.6	7,264.1	62.9	17.3	77.9	0.42	34.2
	201-400	141.1	4.240.3	36.7	4.7	21.2	0,89	37.9
	All zones	50.4	11,545.2	11.1	22.2	--	0.52	--
Yakutat	1-100	25.8	1.597.2	19.5	7.8	32.4	0.21	26.1
	101-200	44.6	6,524.4	79.8	16.2	67.2	0.40	33.1
	201-400	0.8	51.9	0.6	0.1	0,4	0.35	--
	All zones	29.5	8,173.5	7.9	24.1	--	0.34	--
Prince William	1-100	28.7	3.170.1	34.3	18.5	52.3	0.17	26.8
	101-200	31.4	3,953.6	42.8	13.5	38.1	0.29	29.2
	201-400	57.8	2,106.7	22.8	3.4	9.6	0.63	37.9
	All zones	33.8	9,230.4	8 . 9	35.4	--	0.26	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	54.8	13,300.2	86.1	54.2	88.6	0.25	29.4
	201-400	21.3	2.141.6	13.9	7.0	11.4	0.30	31.6
	All zones	45.0	15,441.8	14.9	61.2	--	0.25	--
Kodiak	1-100	14.1	2,013.7	10.6	--	--	--	--
	101-200	114.2	14,093.3	74.5	17.6	--	0.21	27.5
	201-400	50.4	2.812.~	14.9	12.0	--	0.23	29.2
	All zones	58.7	18,919.3	18.3	--	--	--	--
Shelikof	1-100	5.1	33.3	0.3	4/	5/	--	--
	101-200	149.9	6.117.0	60.6	36.3	66.1	0.17	26.1
	201-400	31.8	3,944.7	39.1	18.6	33.9	0.21	28.3
	All zones	66.6	10.095.0	9.7	54.9	--	--	--
Chirikof	1-100	15.8	1,883.5	13.5	7.8	12.7	0.24	29.7
	101-200	34.4	5,548.6	39.7	31.0	50.4	0.18	25.6
	201-400	48.8	6,535.7	46.8	22.7	36.9	0.29	28.4
	All zones	32.6	13,967.8	13.5	61.5	--	0.23	--
Shumagin	1-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	1-100	7.9	1.426.2	8.8	--	--	--	--
	101-200	89.3	14,578.6	89.5	126.2	--	0.12	21.8
	201-400	22.2	277.7	1.7	0.6	--	0.48	36.5
	All zones	45.8	16,282.5	15.7	--	--	--	--
Total	1-100	15.4	10.164.8	9.0	--	--	--	--
	101-200	61.2	71.379.8	68.9	362.3	--	0.20	--
	201-400	40.7	22.110.9	21.3	69.1	--	0.32	
	All zones	43.7	103.655.5	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms Per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Table X1-125,--Mean lengths (cm) of flathead sole by regions and depth zones (Cruises 733, 734, 744, 751, 753 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	--	--	--	31.6	36.6	34.2	33.4	39.3	27.9[1/]
Yakutat	24.4	27.6	26.1	31.5	35.1	33.1	--	--	--
Prince William	23.8	29.5	26.8	27.4	31.4	29.2	32.6	40.0	37.9
Kenai	--	--	--	--	--	29.4	--	--	31.6
Kodiak	--	--	9.8[1/]	--	--	27.5	--	--	29.2
Shelikof	--	--	--	--	--	26.1	--	--	28.3
Chirikof	--	--	29.7	--	--	25.6	--	--	28.4
Shumagin	--	--	--	--	--		--	--	--
Sanak	--	--	27.7[1/]	--	--	21.8	--	--	36.5

[1/] The limited number of length-frequency samples taken from this region-depth zone probably do not represent the size composition adequately.

Biomass--The biomass of cottids in the Gulf of Alaska has been estimated at 51 thousand mt of which 63% occurred in the inner shelf, 32% in the outer shelf and 5% in the upper slope (Table X1-130). The two western Gulf regions of Kodiak and Sanak accounted for 79% of the total biomass while the combined eastern regions represented only 7%.

Size composition-No length-frequency data are available for this group.

REX SOLE

Distribution and abundance--With the exception of the Shelikof inner shelf, rex sole was taken throughout all regions and depth zones sampled. By depths, the apparent relative abundance of this species was highest in the upper slope (40 kg/hr) but decreased to below the Survey average in the outer and inner shelf. Regional CPUE's ranged from 13 to 24 kg/hr in the eastern Gulf, 0.1 to 46 kg/hr in the western Gulf and averaged 20 kg/hr over all regions. The distribution of the standardized catch rates for the successful stations are presented in Figures X1-490-494.

Table XI-126.--Parameters for the length-weight relationship (weight (g) = a * lengthb) for flathead sole (Cruise 751)

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Sample Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	--	--	--	--	--	--	--	[illegible]
	101-200	148	12-40	0.003786	3.265029	68	15-40	0.003439	3.276:
	201-400	--	--	--		55	24-39	0.006236	3.0941
Females	0-100	--	--	--	--	--	--		--
	101-200	139	22-47	0.006949	3.089048	98	15-48	0.002442	3.3669
	201-400	--	--	--	--	10	30-42	0.066091	2,433;

Table XI-127,--Summary of age-length data collected for flathead sole (Cruise 751).

	REGIONS					
	Yakutat			Prince William		
Sex	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	51	119	--	--	84	52
Range in age (years)	4-18	5-22	a-	--	4-19	5-20
Range in length (cm)	20-38	24-40	--	--	20-41	23-40
Females						
Number of readable otoliths	53	135	--	--	99	17
Range in age (years)	4-16	4-18	--	--	4-19	6-14
Range in length (cm)	20-42	21-47	--	--	20-48	29-42

Biomass--The total estimated biomass for rex sole in the Gulf of Alaska has been estimated at 47 thousand mt of which 47% occurred in the upper slope and outer shelf depth zones (Table X1-131). Kodiak and Sanak accounted for nearly 57% of the total biomass with 83% of the Kodiak contribution occurring in the upper slope and 84% of the Sanak contribution coming from the outer shelf. The eastern Gulf regions contributed 39% to the total biomass while the western regions accounted for 61%. The mean CPUE for rex sole averaged 20 kg/hr for the entire Gulf of Alaska and was highest in the Kodiak (46 kg/hr), Sanak (34 kg/hr) and Yakutat regions (24 kg/hr).

Size composition--Length frequency data by sexes are available from the three easternmost regions; while unsexed data are available from the Kenai, Kodiak, Chirikof and Sanak regions (Figure X1-495). Females were always larger than males with both sexes generally increasing in length with increasing depth (Table XI-132). Largest mean lengths occurred in the easternmost and westernmost regions of the survey area. In the eastern Gulf rex sole, sexes combined, ranged from 22.4-32.0 cm while mean lengths varied from 19.6-37.2 cm in the western regions.

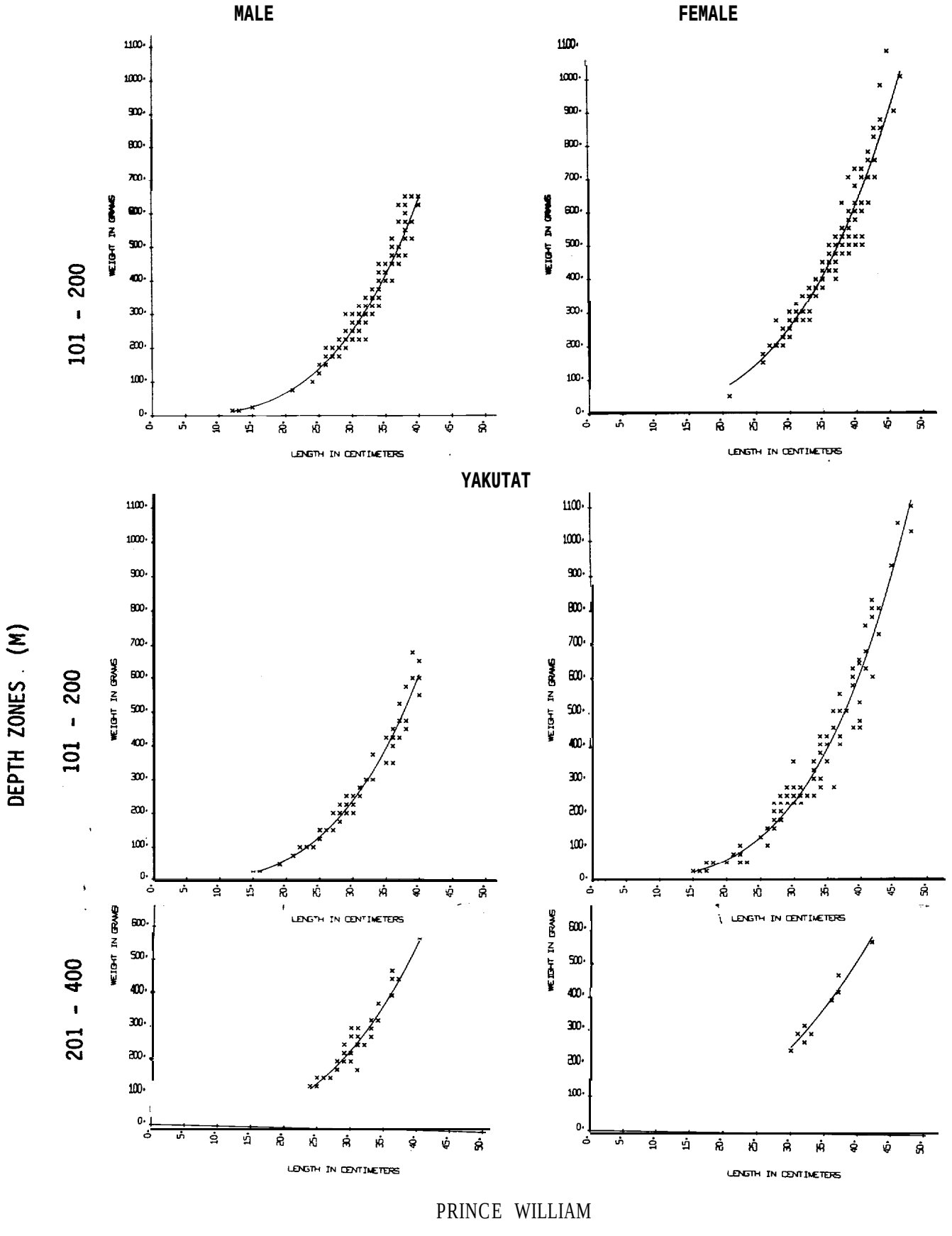
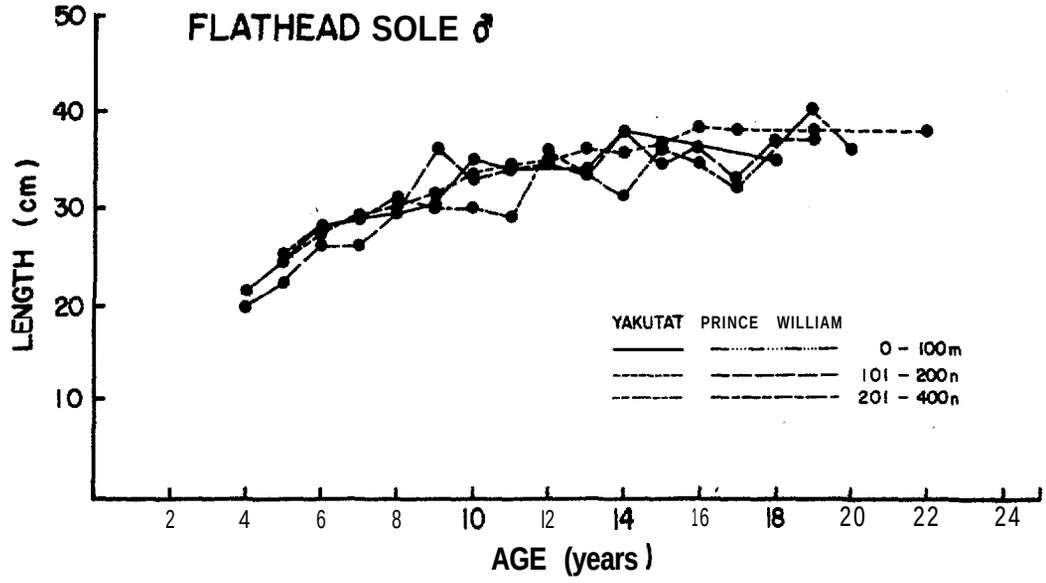


Figure XI-475.—Weight at length observations for flathead sole in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).



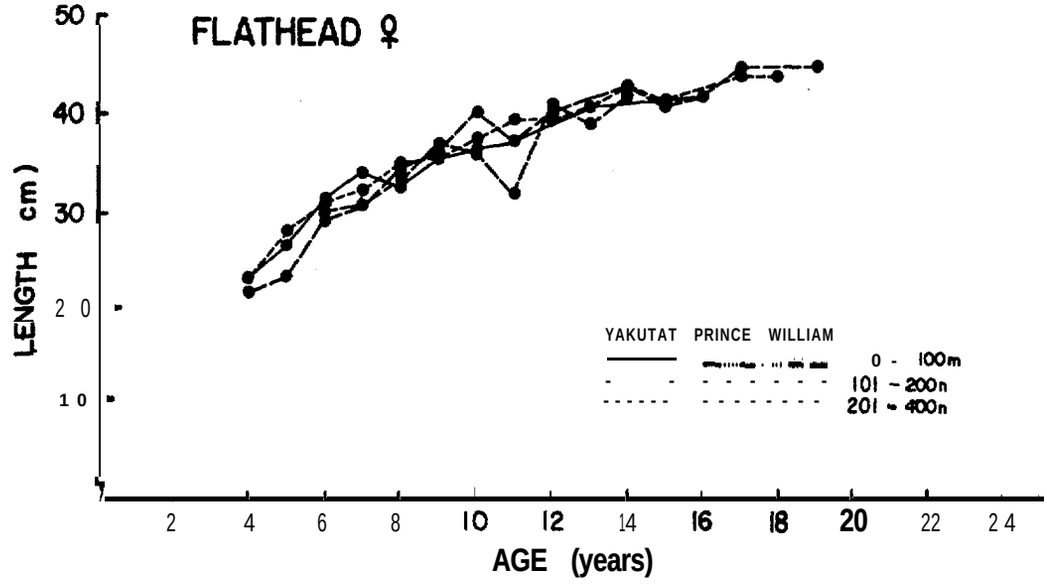


Figure XI-476.—Mean lengths at age *for* **flathead sole** by **sex and region-**depth **zones in** the Gulf **of Alaska, May-Aug.** 1975 **(Cruise** 731.)

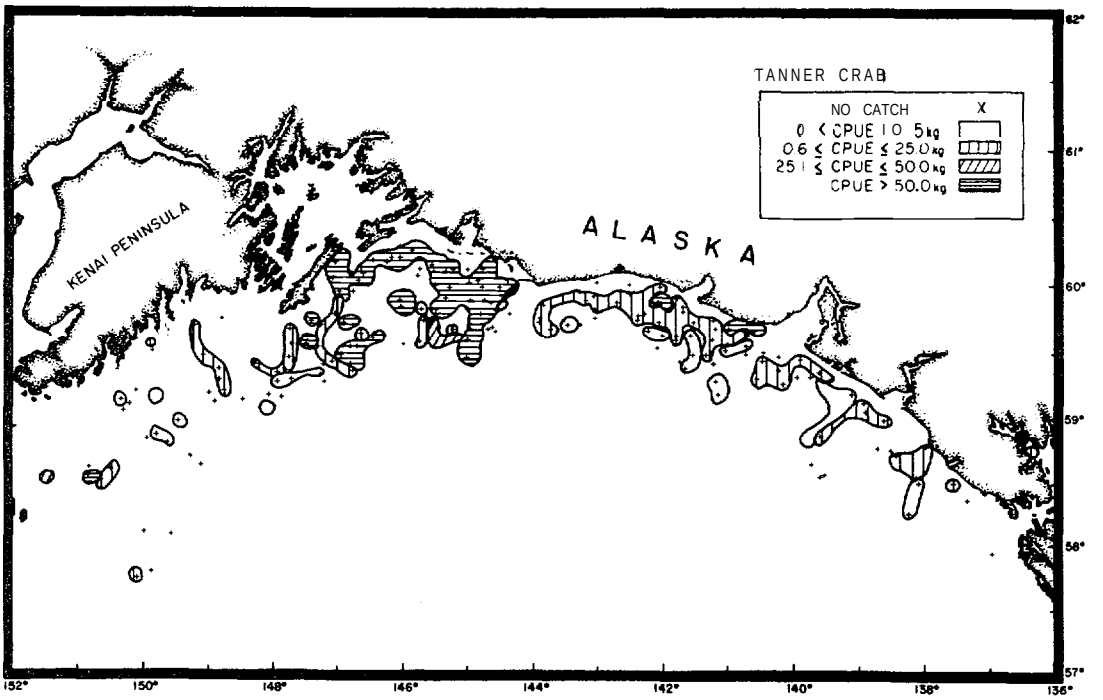


Figure XI-477.—Distribution of apparent relative abundance of Tanner crab in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apt. 1976 (Cruises 751, 753, and 762).

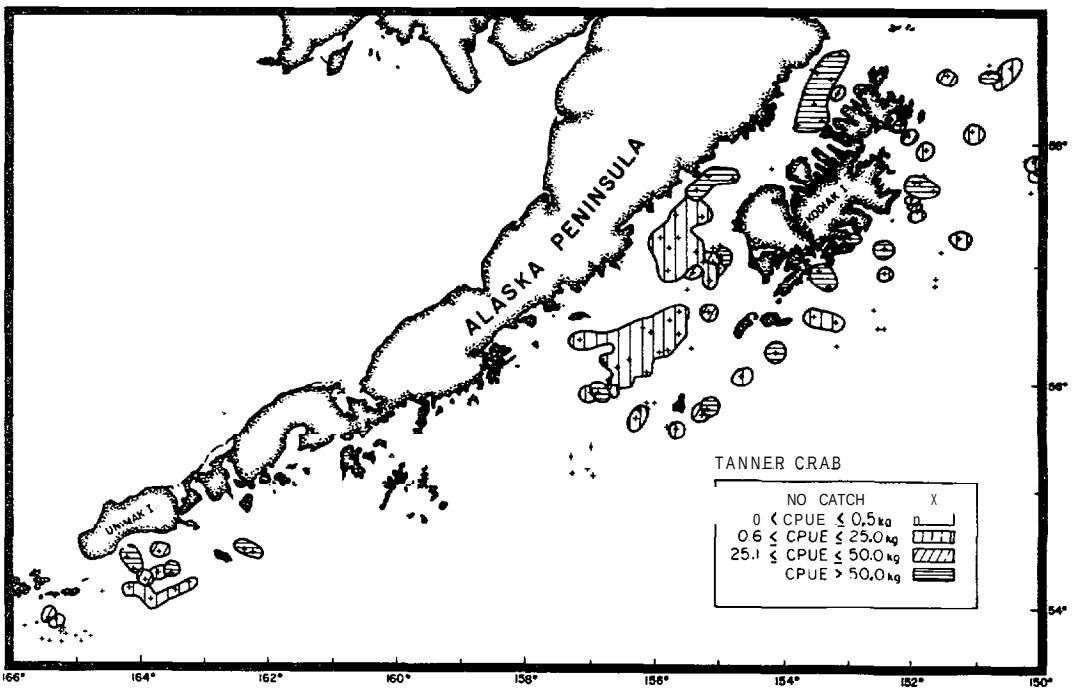


Figure XI-478.—Distribution of apparent relative abundance of Tanner crab ill the western Gulf of Alaska, May-Jul. 1973, Aug-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734,714,and 753).

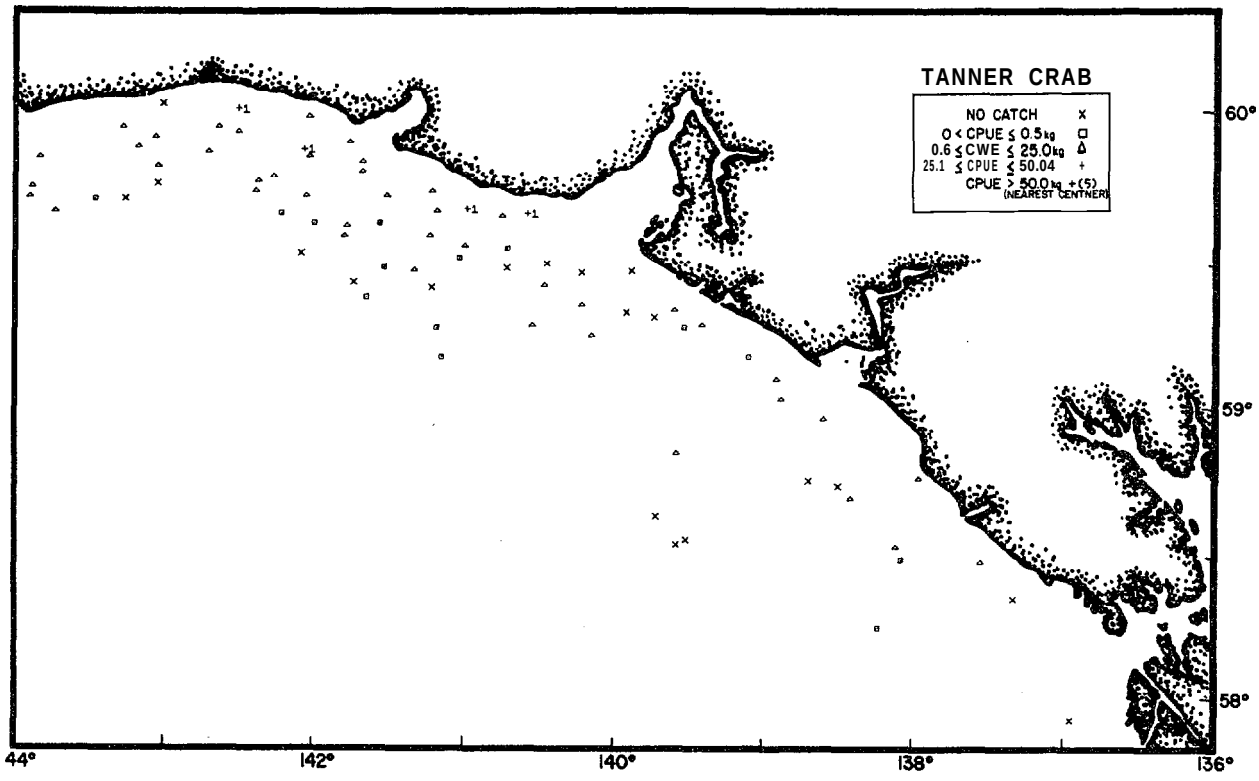


Figure XI-479.--Distribution of standardized catch rates in kilograms/hour of Tanner crab in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

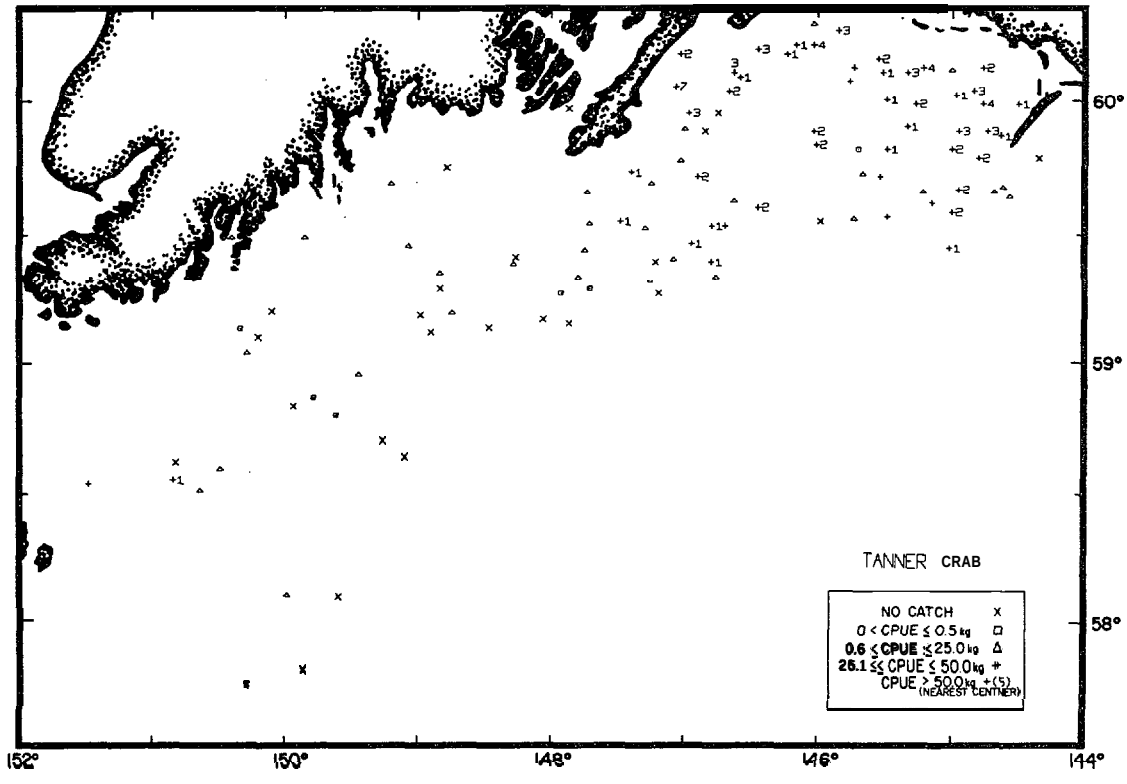


Figure XI-480.--Distribution of standardized **catch rates in kilograms/hour** of Tanner crab **in** the **eastern Gulf** of **Alaska,** May-Aug. **1975 (Cruises 751 and** 753).

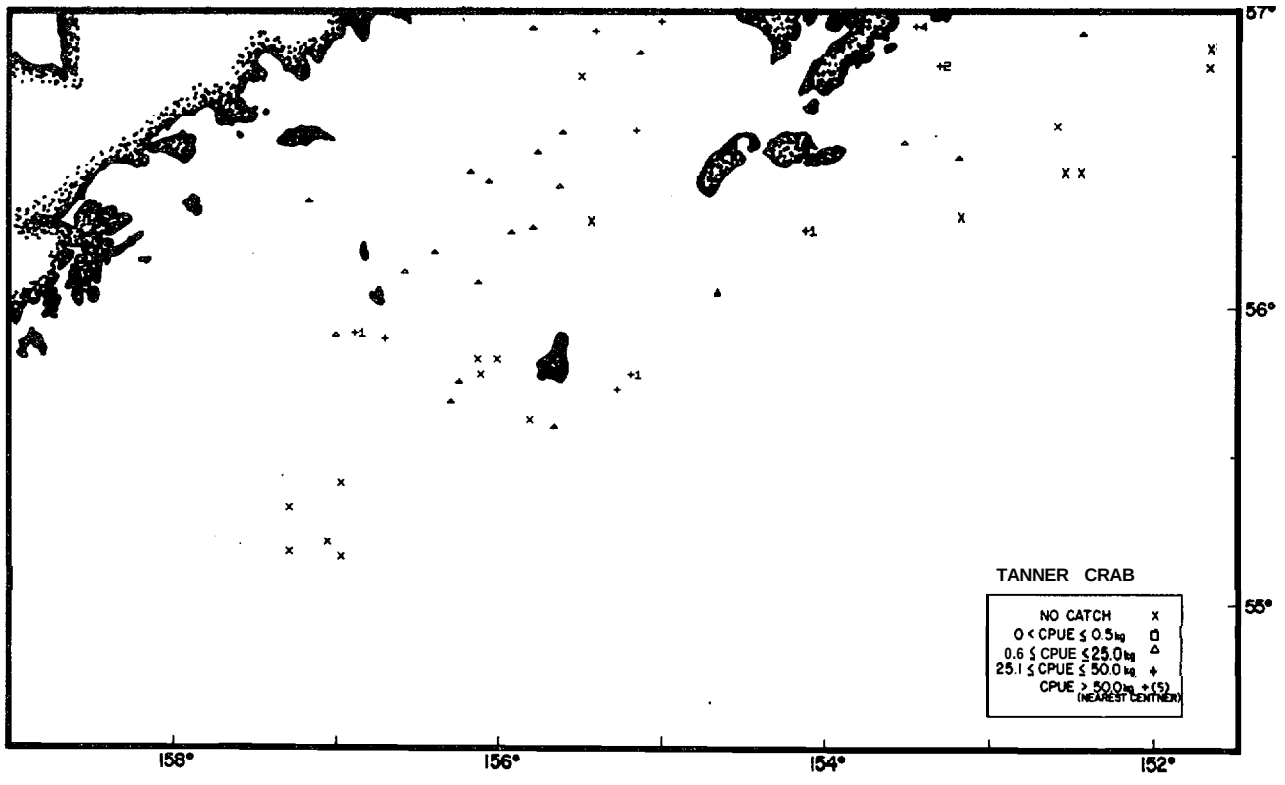


Figure XI-481.—Distribution of **standardized catch rates in kilograms/ hour of Tanner** crab **in the western Gulf of Alaska, Aug.-Oct.** 1973 ad **Jun.-Aug.** 1975 **(Cruises 734 and** 733).

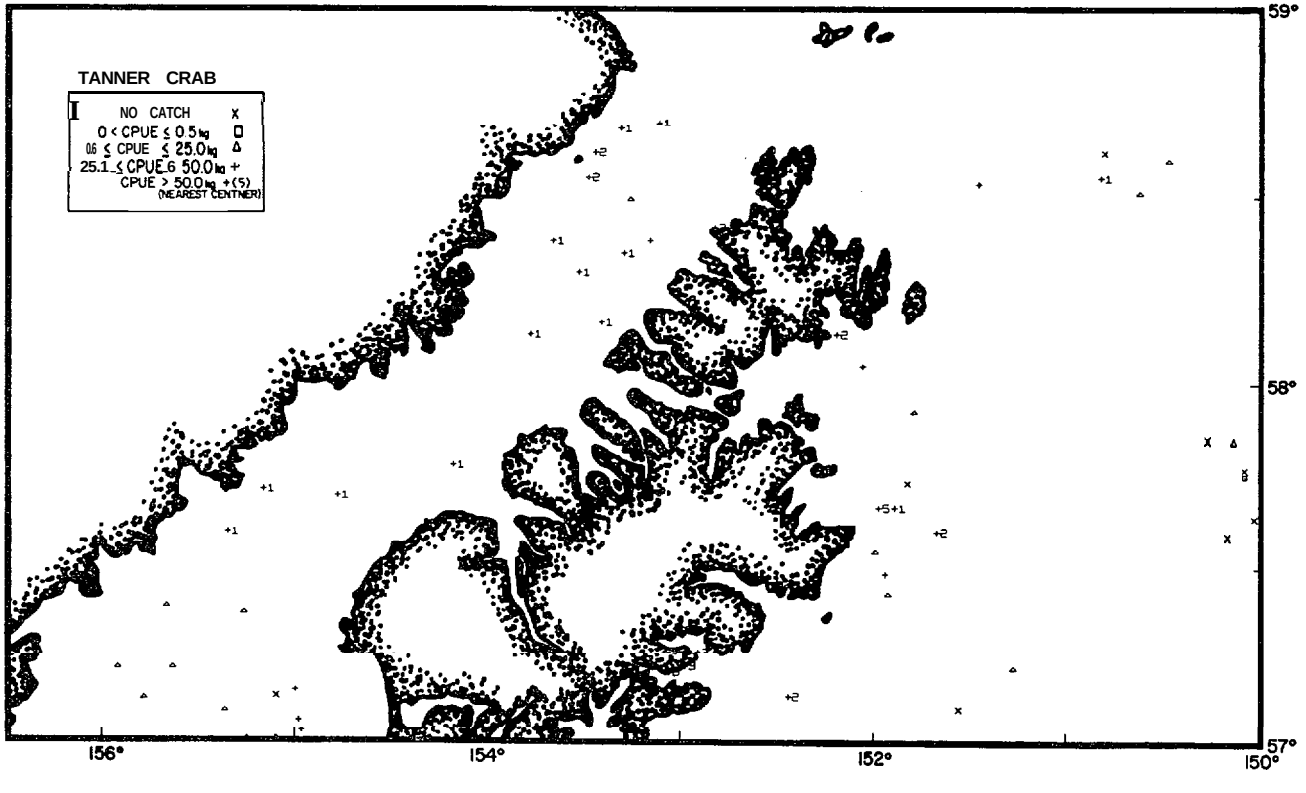


Figure XI-482.—Distribution of standardized catch rates in kilograms/ hour of Tanner crab **in** the western **Gulf of Alaska, Hay-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises** 733, 734, and **753).**

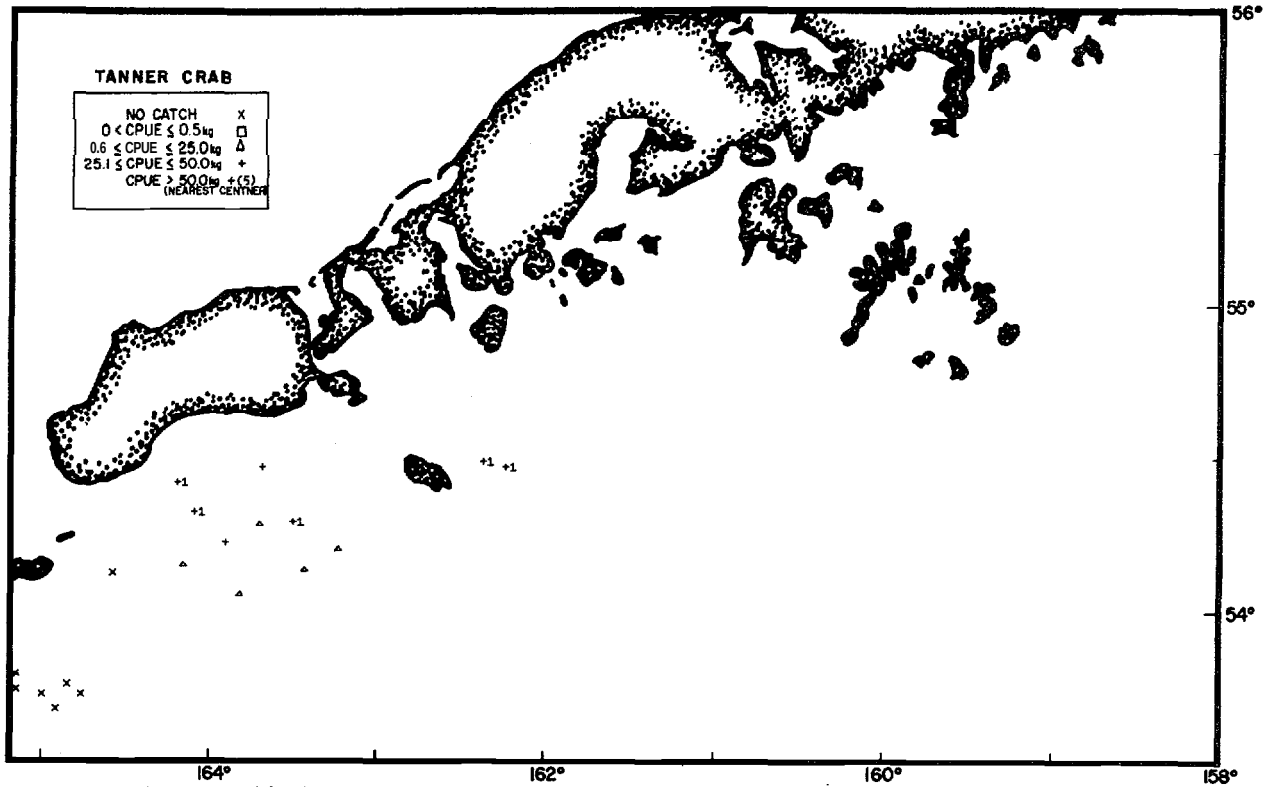


Figure XI-483.--Distribution of standardized catch rates in kilograms/hour or Tanner crab in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Length-weight relationship--Six hundred and sixty length-weight observations are available from the Yakutat and Prince William outer shelf and upper slope depth zones. The coefficients of regression are presented by sexes and depth zones in Table XI-133 while the individual observations and resulting regression lines are shown graphically in Figure X1-496.

Ape-length relationship-Age and length data collected from the Yakutat and Prince William regions are presented in Table X1-134.

These data are summarized in Figure XI-497 by plots of mean lengths-at-age by sexes and regions. In general, both sexes had similar mean length-at-age values through approximately eleven years with relatively small variations occurring between regions and depths for each sex.

DOVER SOLE

Distribution and abundance--The apparent relative abundance of Dover sole increased with depth in all regions except Kenai where the highest mean CPUE occurred in the outer shelf. Over all regions, the upper slope averaged 52 kg/hr, the outer shelf 14 kg/hr and the inner shelf had a mean catch rate of less than 1 kg/hr. The Kodiak region had the highest mean CPUE (64 kg/hr) due mainly to a 302 kg/hr contribution from the upper slope. Other regions with an apparent abundance greater than the Gulf of Alaska average (19 kg/hr) were Kenai and Yakutat. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-498-502.

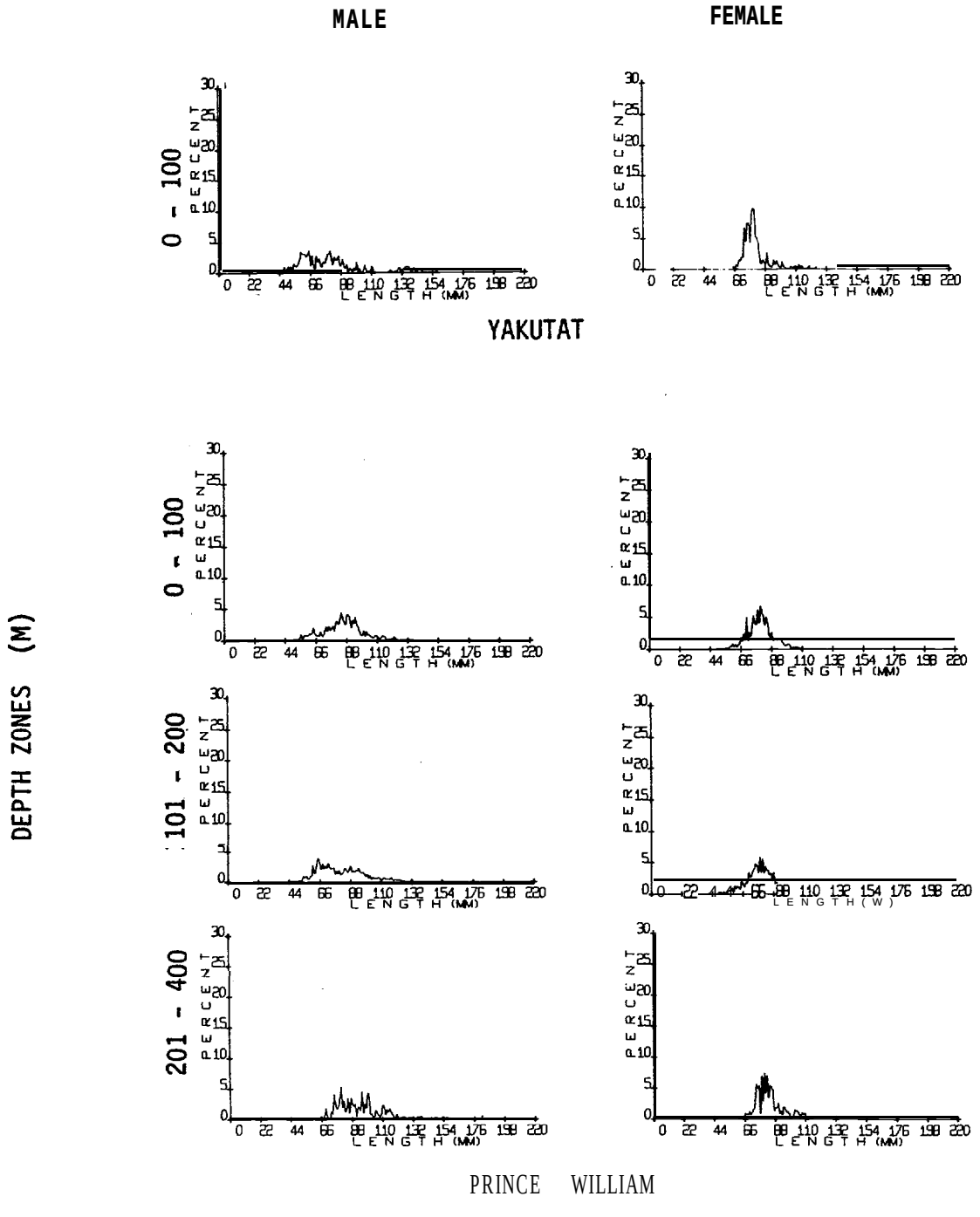


Figure XI-484.—Length frequency distributions *of* **Tanner** crab **in** the **Gulf** of **Alaska** by **region-depth** zones, 1973-1976.

Table XI-128.--Estimated biomass and population size of Tanner crab (Chionoecetes bairdi) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size par individual 2/ Weight (kg)	Length (mm)
Fairweather	l-100	2.0	73.4	7.3	0.2	8.0	0.36	--
	101-200	5.7	934.7	92.7	2.3	72.0	0.40	--
	201-400	0	0	0	0	0	--	--
	All zones	4.4	1,008.1	1.1	2.5	0.7	0.40	--
Yakutat	l-100	24.0	1,487.6	73.8	8.8	74.0	0.17	--
	101-200	5.2	756.3	32.4	2.5	21.0	0.30	--
	201-400	1.3	87.9	3.8	0.6	5.0	0.16	
	All zones	a.4	2,331.9	2.7	11.9	3.2	0.20	
Prince William	l-100	121.3	13,415.2	36.6	83.2	42.3	0.16	--
	101-200	106.4	13,414.7	38.7	78.7	40.0	0.17	--
	201-400	215.1	7,839.7	22.6	34.9	17.7	0.22	--
	All zones	126.9	34,669.6	39.4	196.0	52.1	0.18	
Kenai	l-100	--	--		--	--	--	--
	101-200	5.8	1,397.7	73.8	4.7	82.5	0.30	
	201-400	4.9	496.1	26.2	1.0	17.5	0.52	--
	All zones	5.5	1,893.8	2.2	5.7	1.5	0.35	--
Kodiak	l-100	35.0	2,143.6	11.4	6.7	14.5	0.32	--
	101-200	110.9	13,682.7	73.0	37.1	80.1	0.37	
	201-400	52.3	2,918.5	15.6	2.5	5.4	1.15	--
	All zones	58.2	18,744.8	21.3	46.3	12.3	0.41	
Shelikof	l-100	150.9	970.0	6.9	2.4	2.9	0.41	
	101-200	57.2	2,334-S	16.5	10.2	12.3	0.23	--
	201-400	103.7	10,807.3	76.5	70.3	84.8	0.15	--
	All zones	93.2	14,119.8	16.0	82.9	21.9	0.17	--
Chirikof	I-100	9.1	1,084.1	16.6	0.6	5.6	1.81	--
	101-200	26.0	4.192.2	64.3	7.8	72.2	0.54	--
	201-400	9.3	1,247.6	19.1	2.4	22.2	0.51	--
	All zones	16.2	6,523.9	7.4	10.8	2.9	0.60	--
Shumagin	l-100	--	--	--	--	--	--	
	101-200	--	--	--	--	--	--	
	201-400	--	--	--	--	--	--	
	All zones	--	--	--	--	--	--	
Sanak	l-100	20.4	3.667.4	41.9	11.7	55.7	0.31	--
	101-200	31.2	5,088.8	58.1	9.3	44.3	0.55	--
	201-400	0	0	0	0	0	--	--
	All zones	24.6	8.756.2	9.9	21.0	5.6	0.42	
Total	l-100	34.1	22,849.3	30.0	113.6	30.1	0.20	--
	101-200	35.6	41.801.6	47.5	152.7	40.4	0.27	
	201-400	42.4	23.397.1	26.6	111.7	29.6	0.21	--
	All zones	36.9	88,048.0	100.0	377.9	100.1	0.23	--

1/ Mean catch per unit effort, in kilograms par hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 x 10^6 individuals.
5/ Less than 0.1 percent.

Table X1-129.--Mean lengths (mm) of Tanner crab by regions and depth zones (Cruise 751).

	0 - 100			101 - 200			201 - 400		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	--	a-	--	--	--	--	--	--	--
Yakutat	78.9	80.4	--	--	--	--	--	--	--
Prince William	85.6	79.7	--	81.9	77.8	--	95.9	83.7	--
Kenai	--	--	--	a-	--	--	--	--	--
Kodiak	--	--	--	--	--	--	--	--	--
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	--	--	--	--	--	--	--
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	--	--	--	--	--	--	--

Biomass--Sixty-four percent of the estimated 45 thousand mt of Dover sole occurred in the upper slope depth zone (Table X1-135). The outer shelf contributed 36% while the inner shelf represented less than 1%. Forty-five percent of the estimated biomass was contained in the Kodiak region, while Kenai and Yakutat contributed 24 and 17% respectively. The biomass estimate for Dover sole is most probably low as the bathymetric range of this species, which extends to approximately 600 fathoms, was not adequately sampled during these surveys.

Size composition--In the three easternmost regions where sexed length measurements were taken, females were generally larger than males with both sexes increasing in length with depth (Table X1-136). Mean lengths, sexes combined, ranged from 30.0 cm in the Prince William inner shelf to 41.1 cm in the Sanak upper slope (Figure X1-503).

Length-weight relationship-The coefficients which fit the regression lines derived from 325 length-weight observations in the Yakutat and Prince William regions are summarized in Table XI-137 by sexes and depth zones. Data points representing all length weight observations are presented graphically by area-depth intervals in Figure X1-504.

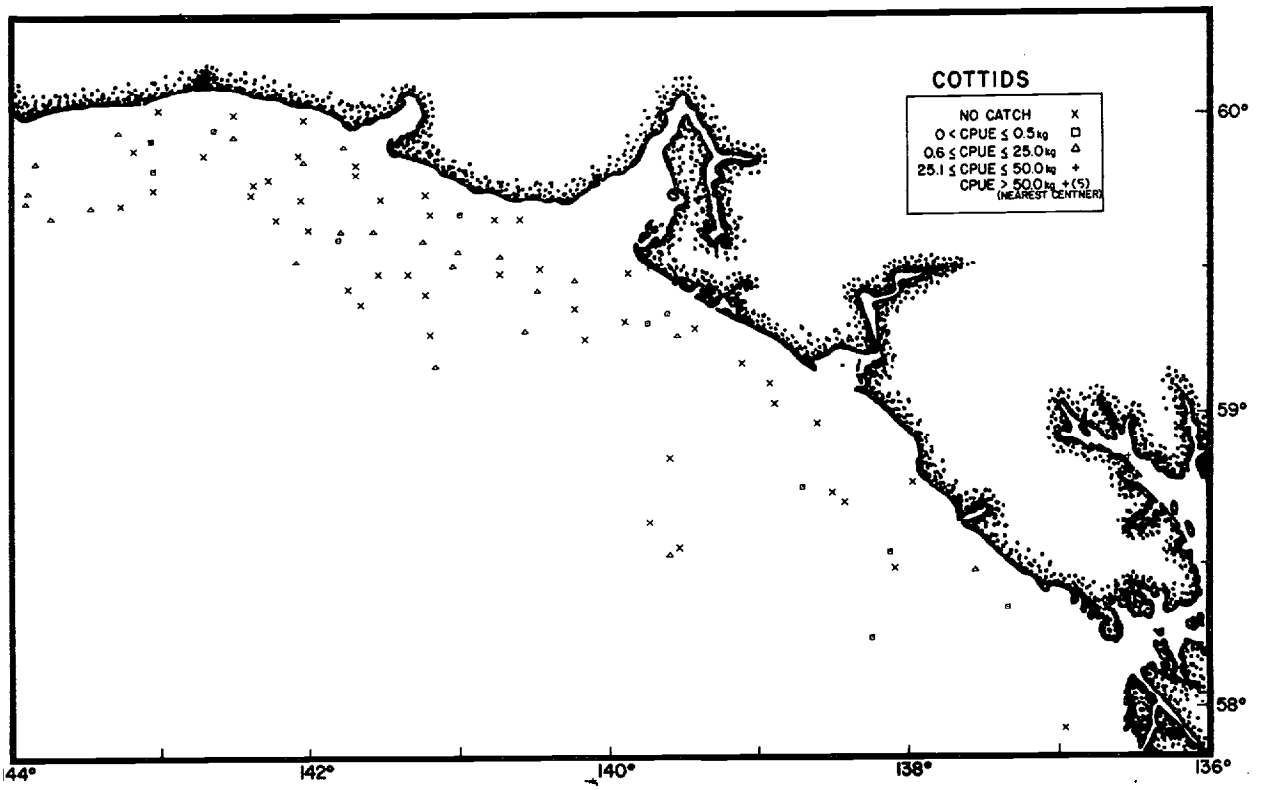


Figure XI-485.--Distribution of standardized catch rates in kilograms/hour of cottids in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

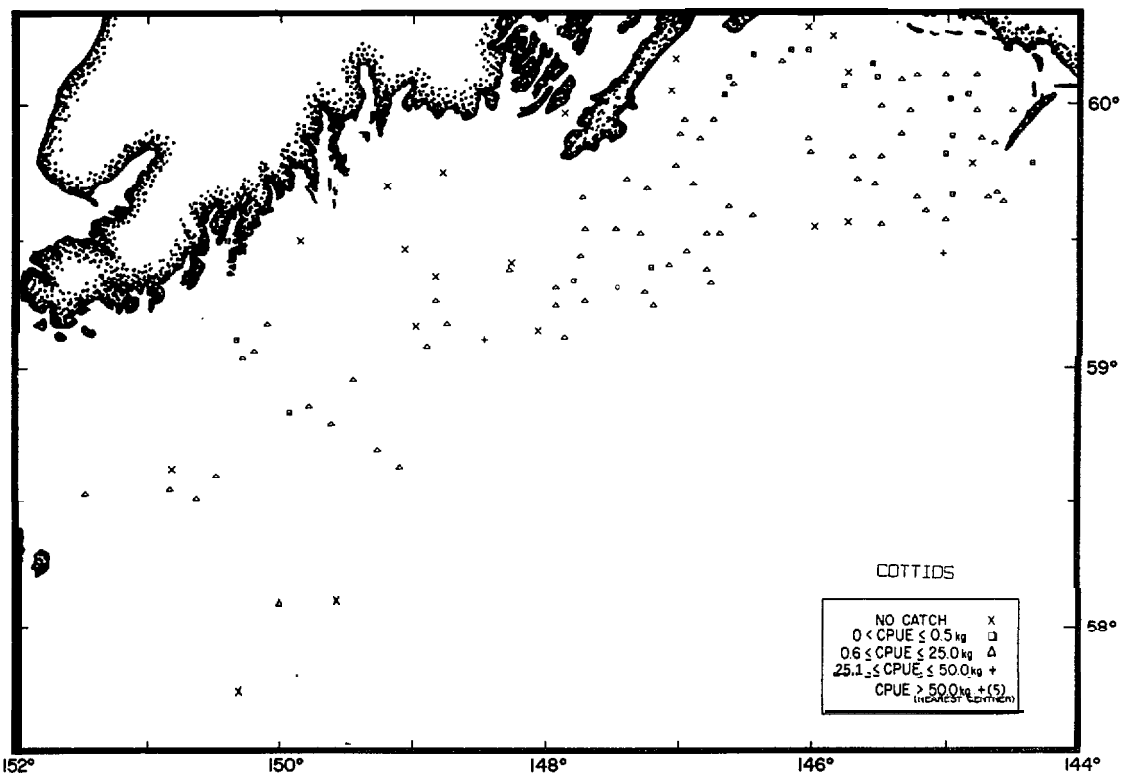


Figure X1-486.--Distribution of **standardized catch rates in kilograms/hour** of **cottids** in the eastern **Gulf of** Alaska, **May-Aug.** 1975 **(Cruises** 751 ● Bd **753).**

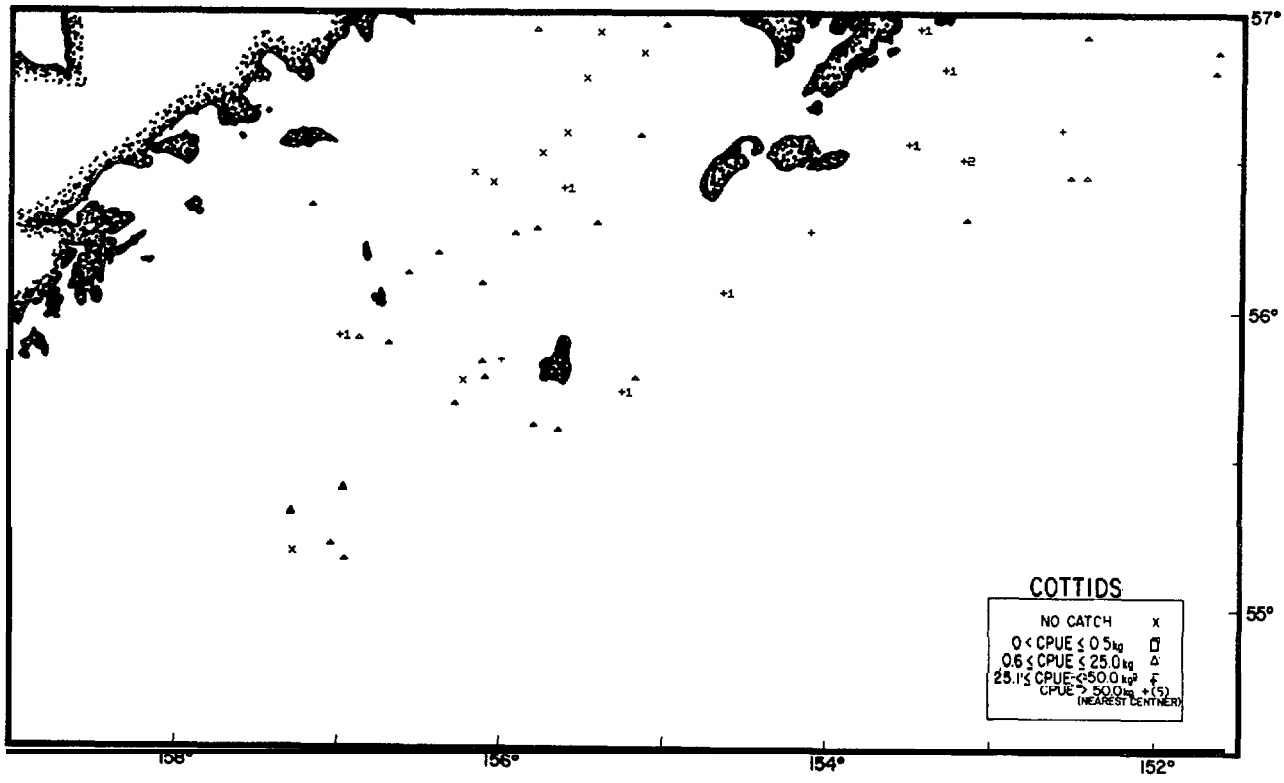


Figure XI-487.--Distribution of standardized catch rates in kilograms/ hour of cottids in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

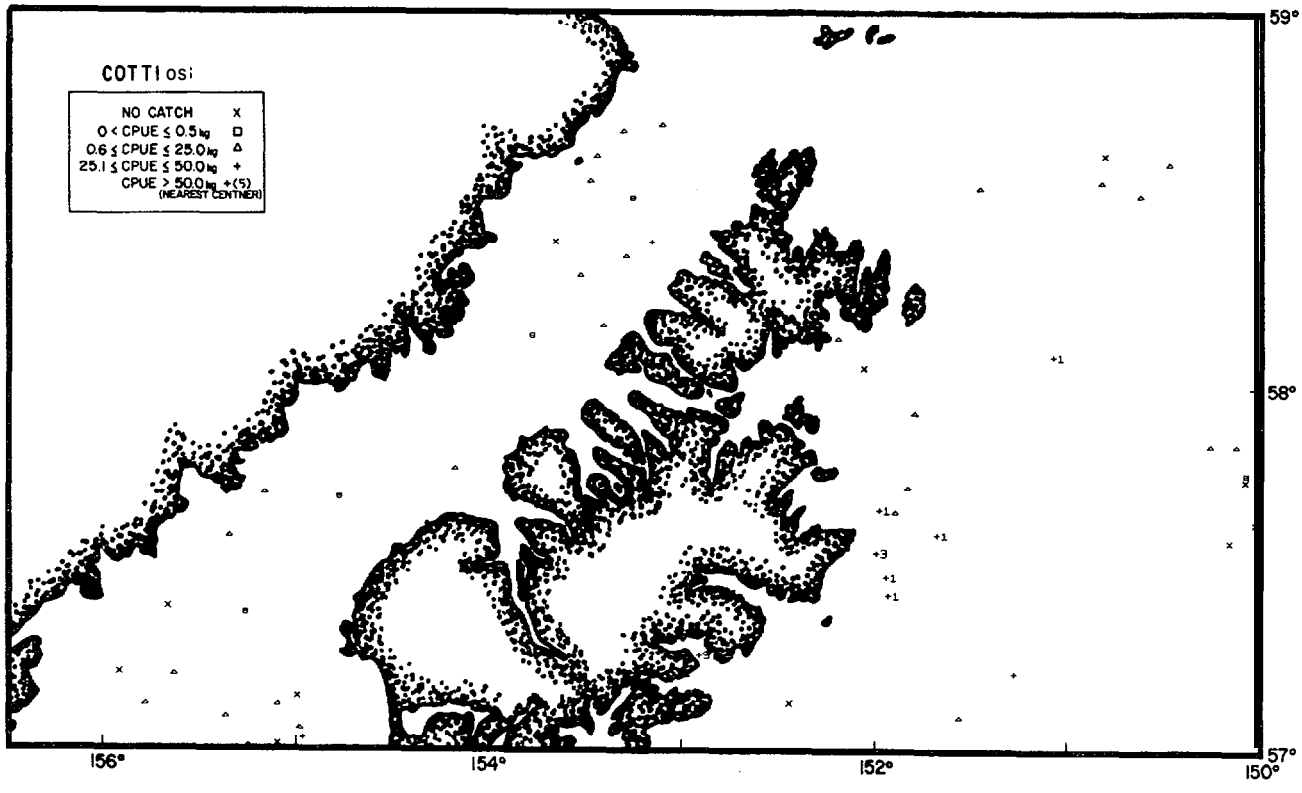


Figure XI-488.--[illegible] tmdardlred catch **rates in kilograms/ hour** of **cottids** in the western Gulf of Alaska, Hay-Jun. 1973 **and Jun.-Aug. 1975 (Cruises** 733, 734, and 753).

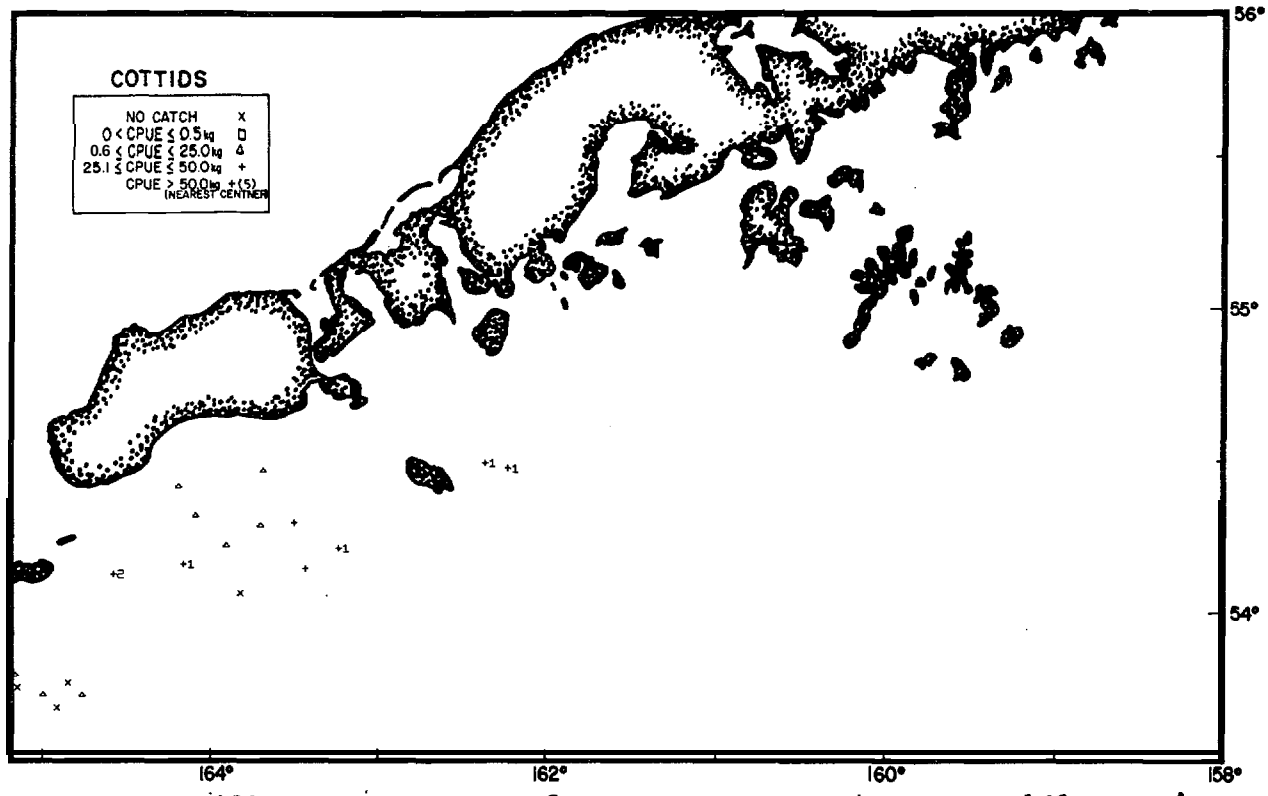


Figure XI-489.--Distribution of **standardized** catch **rates in kilograms/** hour ot **cottids in the western Gulf** of **Alaska, Jul.-Aug.** 1974 **(Cruise 744).**

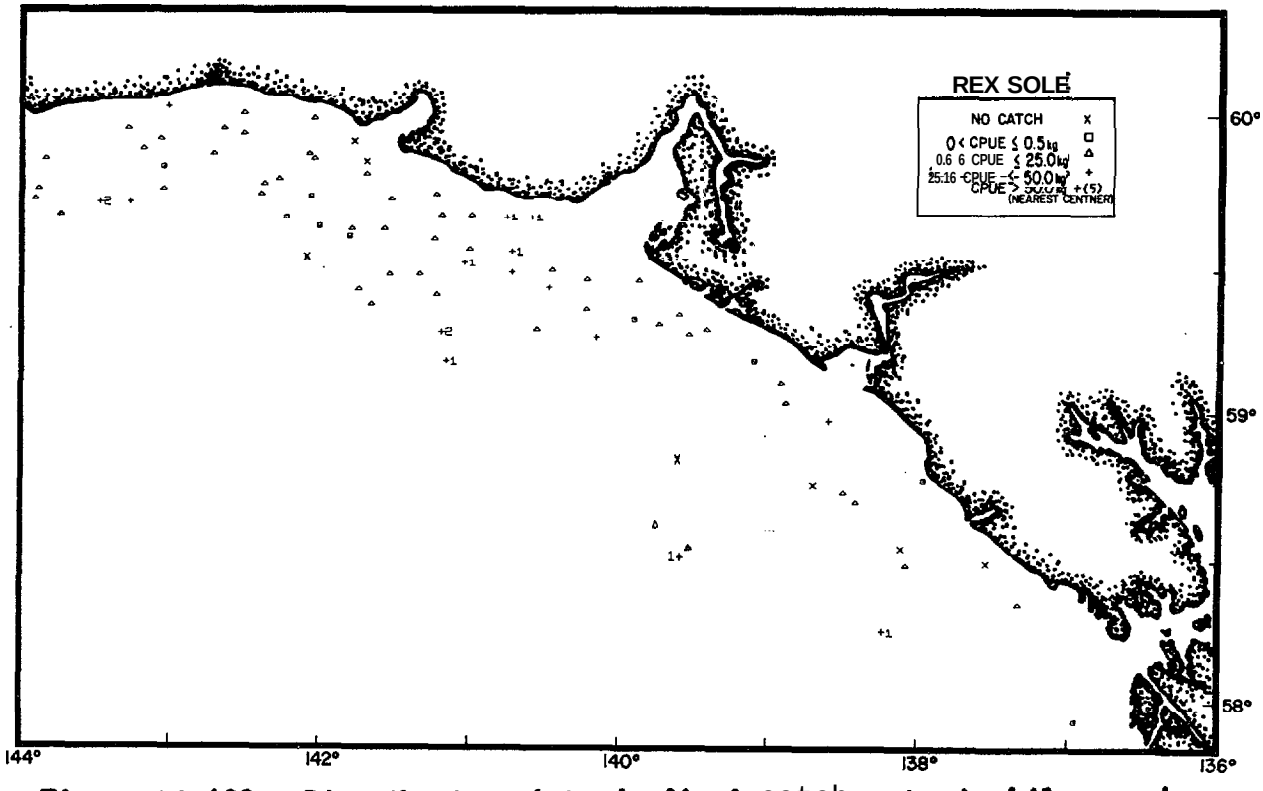


Figure XI-490.--Distribution *of* **standardized** catch **rates in kilograms/** hour of **rex** sole **in the eastern Gulf** of **Alaska, May-Aug.** 1975 **and Apr.** 1976 (Cruises 751 **and** 762).

Table XI-130.--Estimated biomass and population size of Cottids in the Gulf of Alaska during April-October, 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size par individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0	0	0	0	0	--	
	101-200	0.6	102.5	34.1	1.8	94.7	--	--
	201-400	6.6	197.7	65.9	0.1	5.3	--	--
	All zones	1.3	300.2	0.6	1.9	--	--	--
Yakutat	i-100	0.3	17.8	3.7	4/	51	0.31	--
	101-200	1.5	212.8	44.5	0.2	66.7	1.22	--
	201-400	3.6	247.5	51.8	0.1	33.3	1.80	--
	All zones	1.7	478.1	0.9	0.3	--	1.30	--
Prince William	l-100	4.3	475.1	39.1	3.4	68.0	0.14	--
	101-200	3.2	407.2	33.5	1.3	26.0	0.31	--
	201-400	9.1	332.0	27.3	0.3	6.0	1.11	--
	All zones	4.4	1.214.3	2.4	5.0	--	0.24	--
Kenai	l-100	--	--	--		--	--	--
	101-200	5.6	1,366.0	91.2	2.2	81.5	0.62	
	201-400	1.3	132.0	8.8	0.5	18.5	0.21	--
	All zones	4.3	1,498.0	3.0	2.7	--	0.56	
Kodiak	l-100	115.3	16.512.5	73.6	--	--	--	--
	101-200	42.2	5.206.6	23.2	--	--	--	--
	201-400	13.0	724.8	3.2		--	--	--
	All zones	69.6	22.443.9	44.1	--	--	--	--
Shelikof	l-100	5.1	33.3	3.0	--	--	--	--
	101-200	10.5	429.5	38.8		--	--	
	201-400	6.2	644.4	58.2	--	--	--	--
	All tones	7.3	1,107.2	2.2	--	--	--	--
Chirikof	l-100	16.2	1,937.8	32.8	1.2	28.6	1.66	--
	101-200	22.2	3.583.4	60.6	2.5	59.5	1.43	--
	201-400	2.9	393.5	6.6	0.5	11.9	0.73	--
	All zones	15.1	5,914.7	11.6	4.2	--	1.40	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--		--
Sanak	l-100	72.7	13,060.0	72.6	0.7	38.9	--	--
	101-200	30.1	4,908.9	27.3	1.0	55.6	--	--
	201-400	0.9	11.3	0.1	0.1	5.6	--	--
	All zones	50.6	17,980.2	35.3	1.8	--	--	--
Total	l-100	49.0	32,036.5	62.9	--	--	--	--
	101-200	14.0	16.216.9	31.8	--	--	--	--
	201-400	4.9	2,683.2	5.3	--	--	--	--
	All zones	21.6	50,936.6	100.1	--		--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.

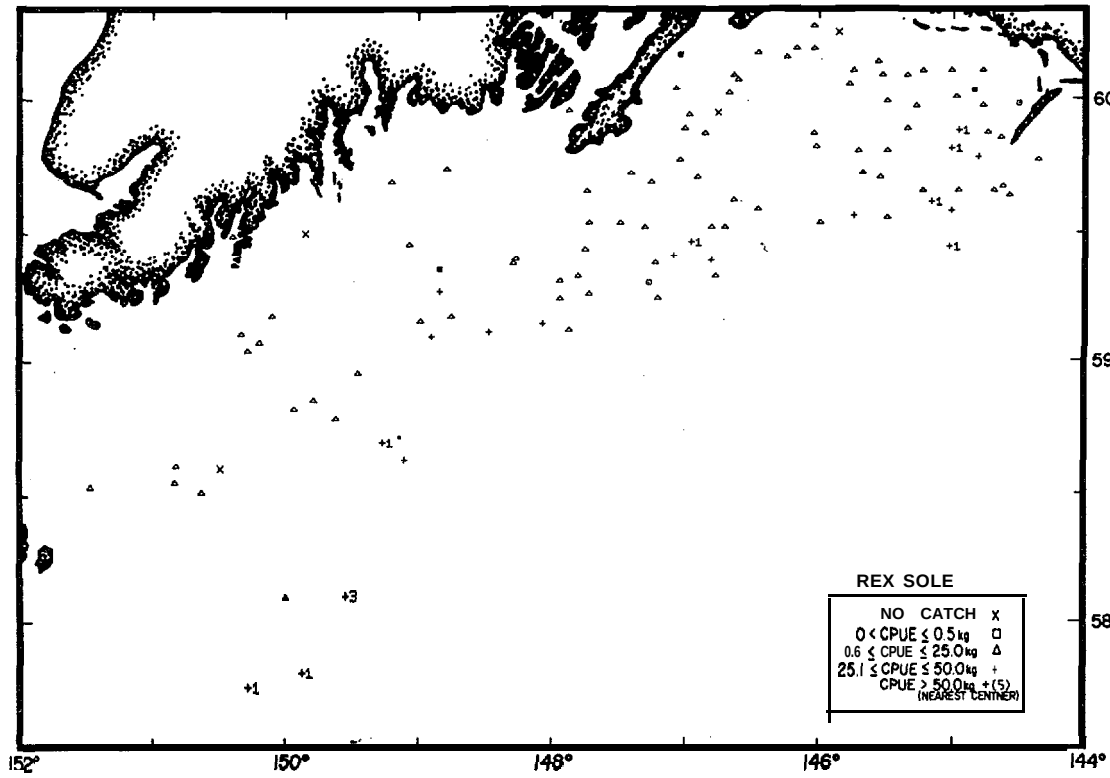


Figure XI-491.--Distribution of standardised catch rates in kilograms/ hour of rex sole in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

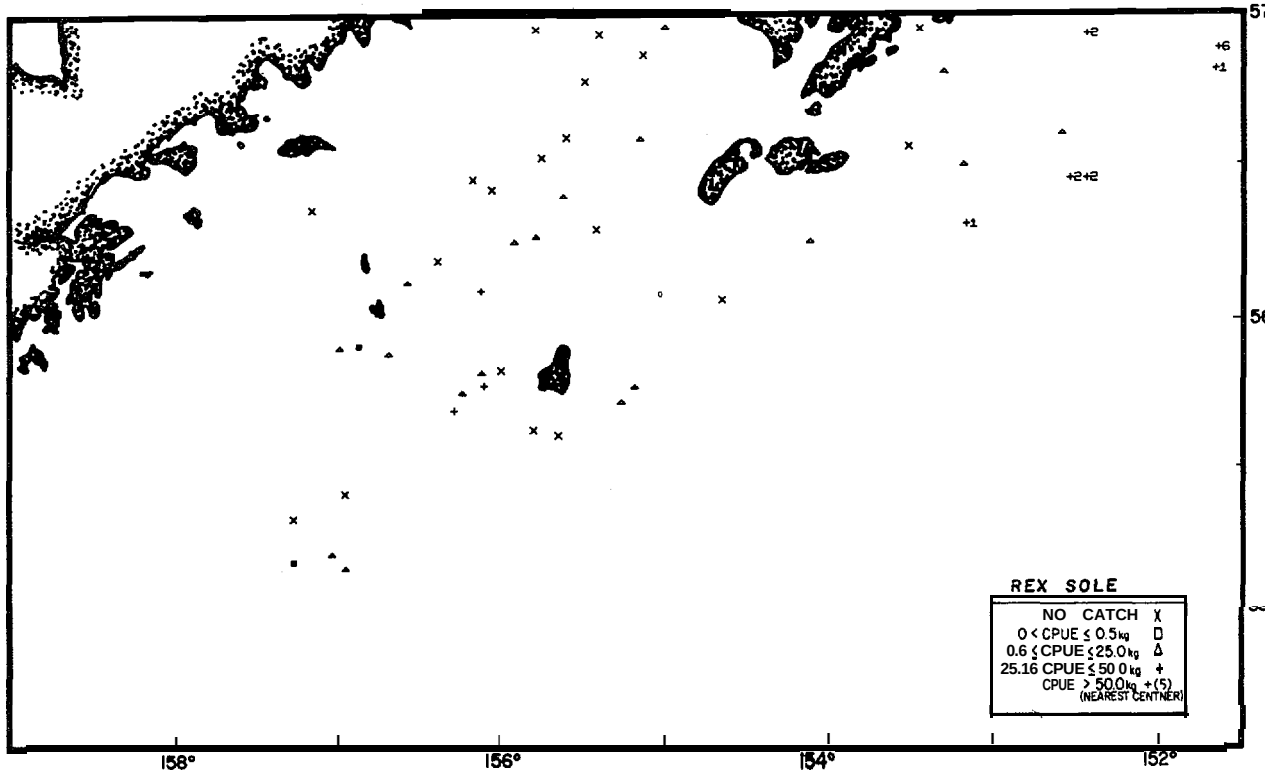


Figure XI-492.--Distribution of standardized catch rates in **kilograms/ hour** of **rex** sole **in** the **western** Gulf of Alaska, **Aug-Oct.** 1973 and **Jun.-Aug.** 1975 (Cruises 734 ad 753).

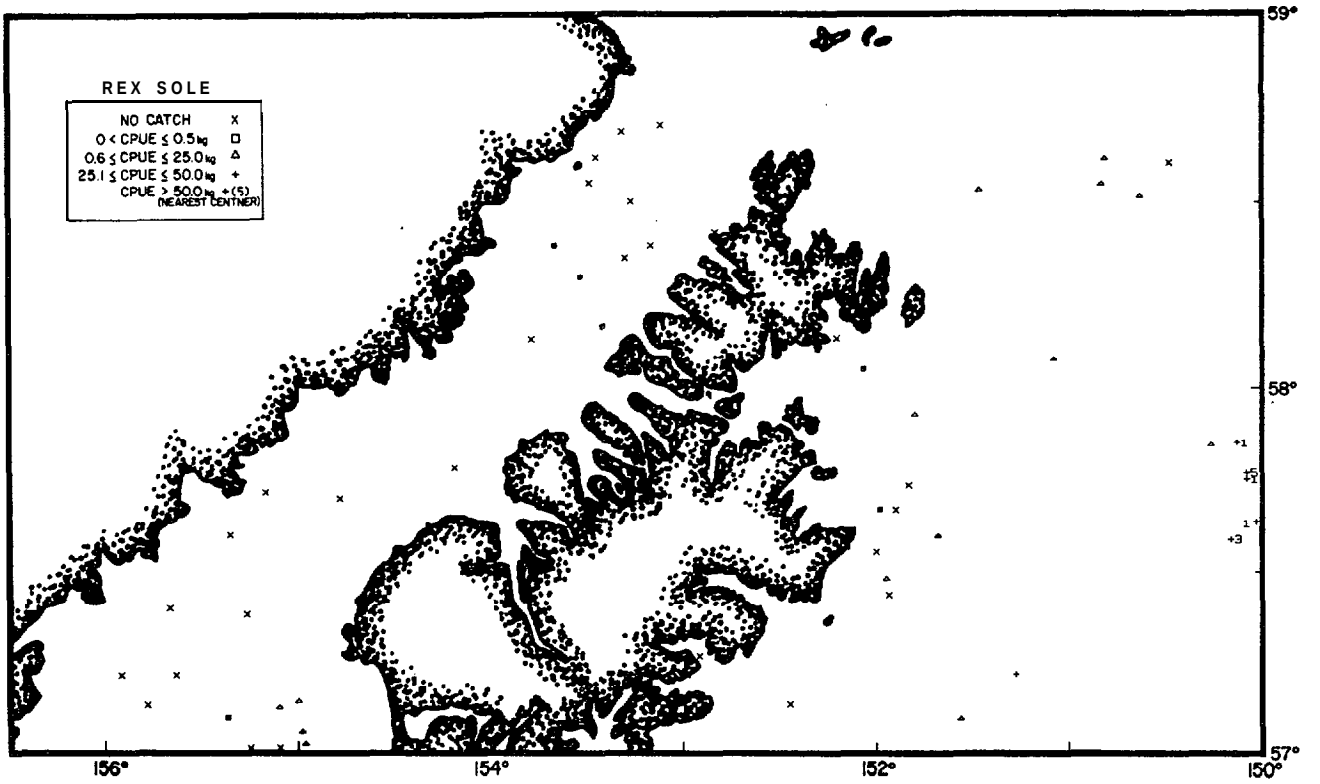


Figure XI-493.—Distribution of standardized catch rates in kilograms/hour of rex sole in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1973 (Cruises 733, 734, and 753).

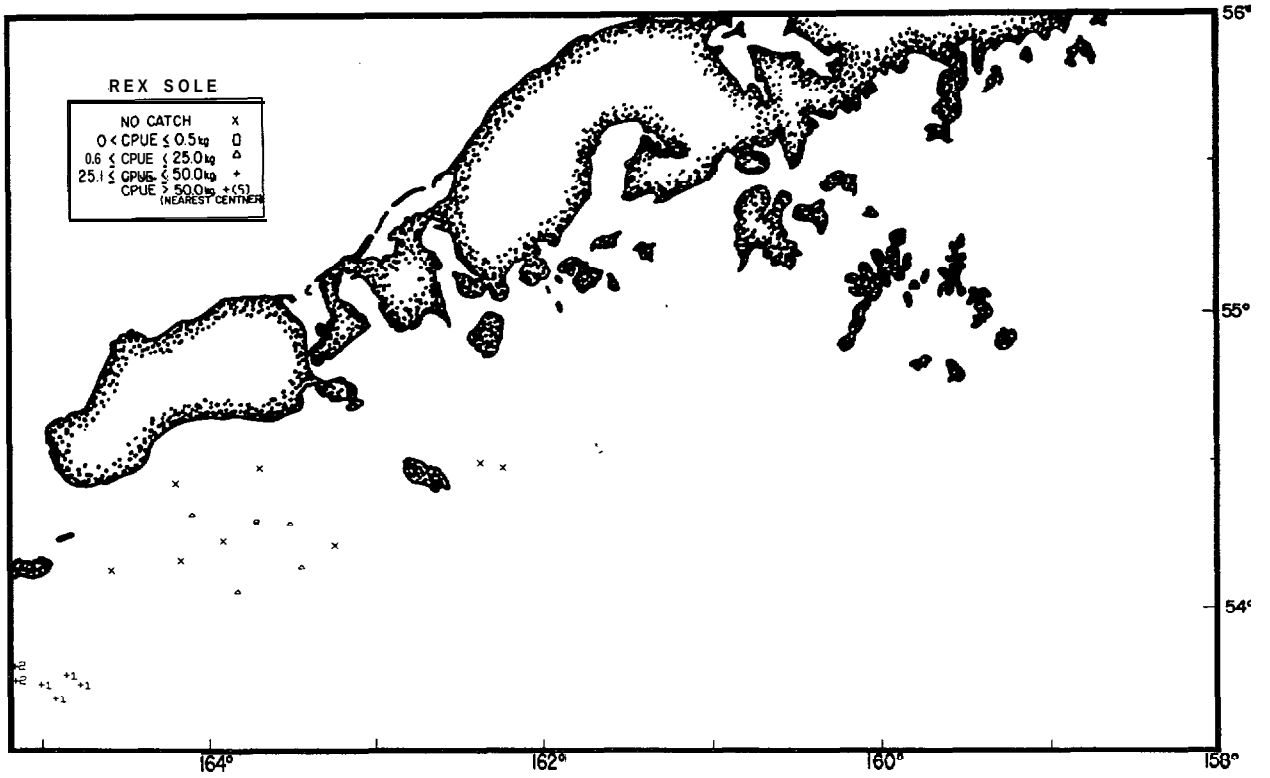


Figure XI-494.—Distribution of standardized catch rates in kilograms/hour of rex sole in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Table XI-131.--Estimated biomass and population size of rex sole (*Glyptocephalus zachirus*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Mean size per individual 2/ Length (cm)
Fairweather	l-100	2.8	99.5	3.0	0.8	5.2	0.13	28.0
	101-200	12.9	2,096.6	63.8	10.0	64.5	0.21	31.2
	201-400	36.3	1,091.0	33.2	4.7	30.3	0.23	32.0
	All zones	14.4	3,287-l	7.0	15.5	--	0.21	--
Yakutat	l-100	16.8	1,043.1	15.5	6.5	19.6	0.16	28.1
	101-200	7.1	1,032.4	15.3	5.5	16.6	0.19	28.3
	201-400	68.0	4,664.4	69.2	21.1	63.8	0.22	31.6
	All zones	24.4	6.739.9	14.3	33.1		0.20	--
Prince William	l-100	5.9	648.2	18.4	12.5	37.7	0.05	22.4
	101-200	12.2	1,531.9	43.4	11.1	33.4	0.14	28.0
	201-400'	37.0	1,350.3	38.3	9.6	28.9	0.14	27.4
	All zones	13.0	3 .	7.5	33.2	--	0.11	--
Kenai	l-100	--		--	--	--	--	
	101-200	17.2	4.169.3	83.4	25.8	--	0.16	29.6
	201-400	8.3	830.7	16.6	--	--	--	--
	All zones	14.6	5,000.0	10.6	--		--	--
Kodiak	l-100	"2.7	389.8	. 2.7	--	--	--	--
	101-200	16.8	2.068.5	14.1	--	--	--	--
	201-400	218.9	12,206.0	83.2	60.1	--	0.20	31.8
	All zones	45.5	14.664.3	31.1	--	--	--	--
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	0.3	11.1	62.0	--	--	--	--
	201-400	0.1	6.8	38.0	--	--	--	
	All zones	0.1	17.9	5/	--	--	--	
Chirikof	l-100	1.6	196.5	10.3	--	--	--	
	101-200	6.9	1,126.7	59.0	5.0	--	0.23	31-b
	201-400	4.4	585.4	30.7	1.4	--	0.41	33.2
	All zones	4.6	1,908.6	4.1	--	--	--	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	1.6	285.2	2.4	--	--	--	--
	101-200	61.7	10,065.4	84.3	30.1	--	0.33	37.2
	201-400	127.6	1,594.6	13.4	5.5	--	0.29	35.6
	All zones	33.6	11.945.2	25.4	--	--	--	--
Total	l-100	4.0	2 ,662.3	5.7	--	--	--	--
	101-200	18.7	22,101.9	46.9	--	--	--	--
	201-400	40.3	22,329.2	47.4	--	--	--	--
	All zones	19.7	47,093.4	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Loss than 0.1 kg/hr.
4/ Less than 0.1 X 106 Individuals.
5/ Less than 0.1 percent.

Table X1-132.--Mean lengths (cm) of rex sole by regions and depth zones (Cruises 734, 744, 751, 753 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	--	--	--	29.9	32.7	31.2	31.2	35.6	32.0
Yakutat	25.9	29.8	28.1	26.5	29.6	28.3	30.7	32.7	31.6
Prince William	23.9	24.6	22.4	25.1	27.1	26.0	26.5	29.0	27.3
Kenai	--	--	--	--	--	29.6	--	--	3 1 &
Kodiak	--	--	19.6 1/	--	--	28.6 1/	--	--	31.8
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	--	--	--	31.8	--	--	33.2
Shumagin	a-	--	--	--	--	--	--	--	--
Sanak	--	--	--	--	--	37.2	--	--	35.6

1/ The limited number of length-frequency samples taken from this region-depth zone probably do not represent the size composition adequately.

Age-length relationship-Age and length data collected from the Yakutat and Prince William regions are presented in Table X1-138.

These data are summarized in Figure XI-505 by plots of mean lengths-at-age by sexes and regions. Mean length-at-age values were similar for both sexes up to approximately six years. Females continued to show gradual growth through fourteen years while no male specimens had an estimated age greater than 10 years.

KING CRAB

Distribution and abundance-King crab had an apparent relative abundance of 19 kg/hr but were primarily taken in the western Gulf of Alaska (Figures X1-506-507). The Kodiak region had the highest mean CPUE (68 kg/hr), followed by Sanak, Chirikof, Kenai and Shelikof. The Fairweather region had an abundance of less than 1 kg/hr while no specimens were taken in the Yakutat and Prince William regions. Mean CPUE's were highest in the outer and inner shelves, respectively, but decreased rapidly in the upper slope. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-508-512.

Table X1-133.--Parameters for the length-weight relationship (weight (g) = a • length^b) for rex sole (Cruise 751).

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Sample Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	--	--	--	--	--	--	--	
	101-200	91	11-34	0.112836	2.073052	158	11-37	0.010487	2.825047
	201-400	24	20-38	0.001200	3.514319	58	8-38	0.008558	2.898465
Females	0-100	--	--	--	--	--	--	--	
	101-200.	68	18-38	0.003186	3.194584	67	14-43	0.005966	3.014629
	201-400	35	26-41	0.000079	4.252458	159	12-44	0.000399	3.790268

Table X1-134.--Summary of age-length data collected for rex sole (Cruise 751).

Sex	REGIONS					
	Yakutat			Prince William		
	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	--	63	68	--	71	71
Range in age (years)	--	3-9	4-11	--	3-11	3-15
Range in length (cm)	--	20-34	21-38	--	20-37	20-39
Females						
Number of readable otoliths	--	67	64	--	90	86
Range in age (years)	--	4-15	5-17	--	3-15	3-14
Range in length (cm)	--	20-38	21-41	--	20-45	20-42

Biomass--The biomass of king crab was estimated at 44 thousand mt of which 93% occurred in the western Gulf of Alaska (Table X1-139). The Kodiak region contributed nearly 50% to the total while Sanak accounted for 28% and Chirikof 14%. Sixty-two percent of the total biomass occurred in the outer shelf, 34% in the inner shelf and 4% came from the upper slope depth zone. Biomass estimates for king crab should be considered minimal due to the inability of the otter trawl to adequately sample the larger male crab when towed at speeds utilized during this survey.

Size composition--No length-frequency data are available for this species.

PACIFIC HALIBUT

Distribution and abundance--Pacific halibut were widely distributed throughout the Gulf of Alaska, appearing in all regions-depth zones with the exception of the Fairweather and Prince William upper slopes. Relative apparent abundance was highest in the Shelikof and Kodiak regions respectively, with mean CPUE's in the remaining regions falling below the 18 kg/hr survey average. Pacific halibut demonstrated a bimodal density distribution by depth zones. The inner shelf and upper slope had mean CPU-E'S of 29 and 23 kg/hr while the outer shelf followed with 10 kg/hr. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-513-517.

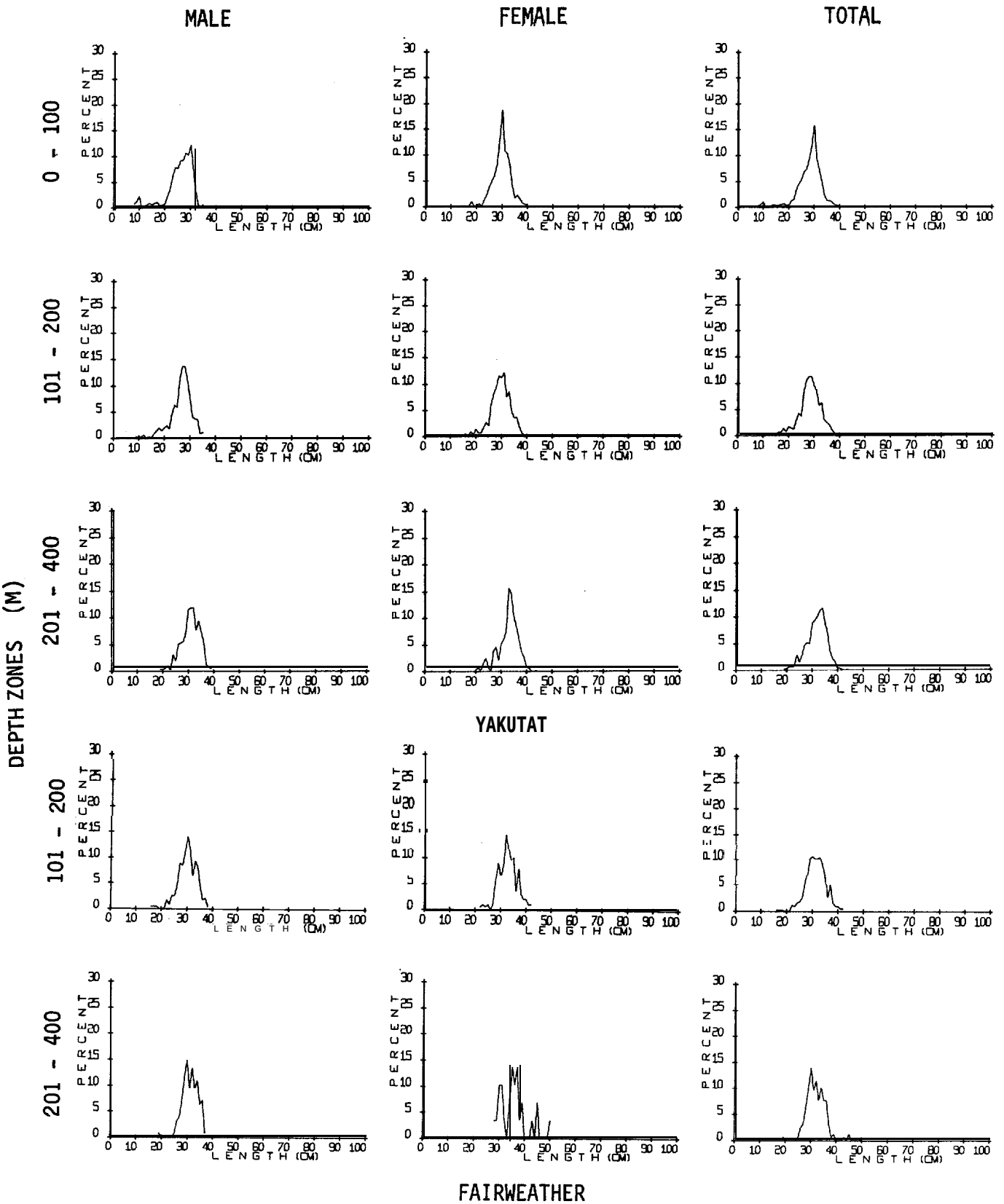


Figure XX-495.—**Length frequency distributions** of **rex** role **in** the **Gulf** of **Alaska** by **region-depth zones, 1973-1976.**

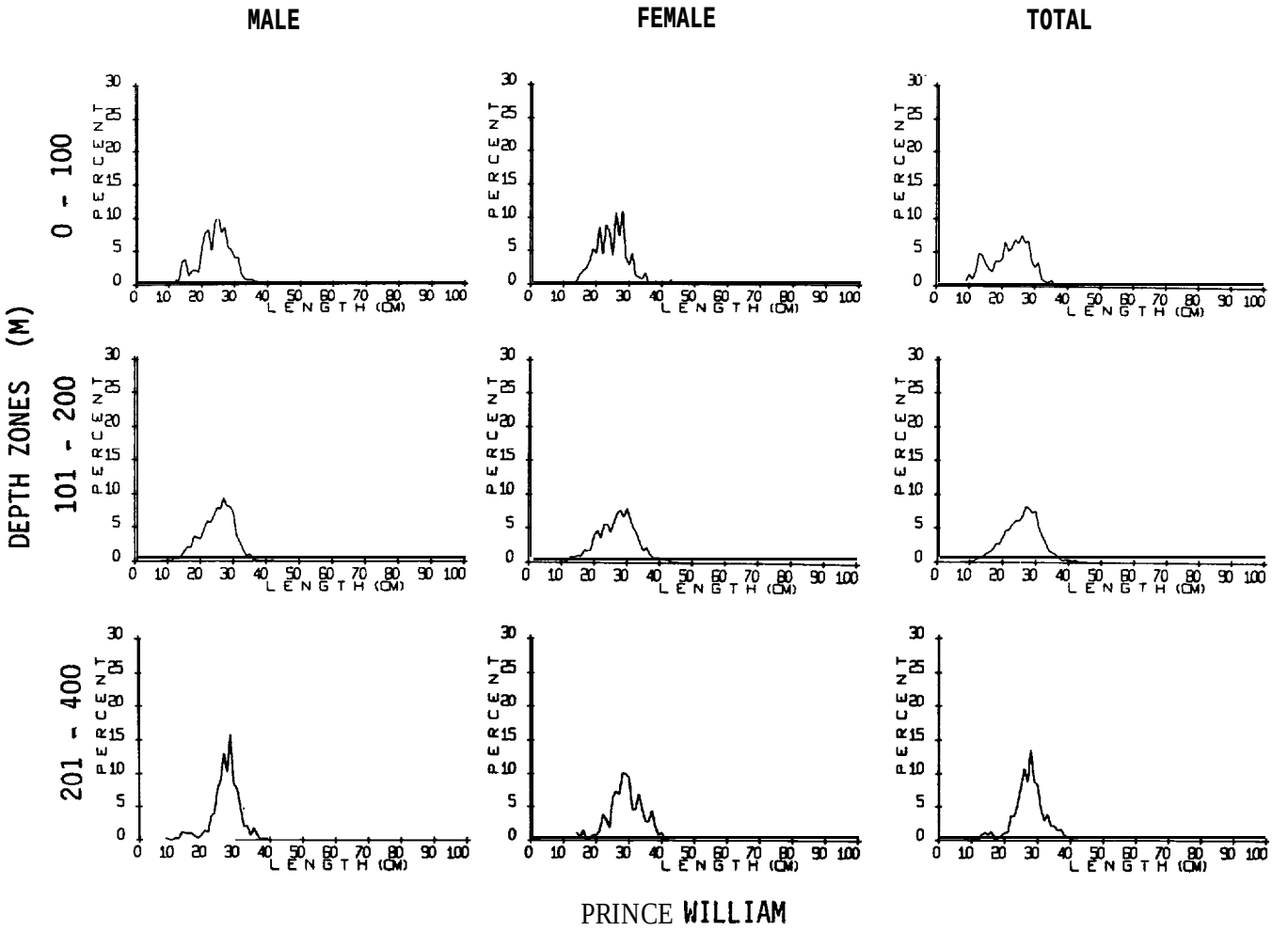


Figure XI-495 **(continued).--Length** frequency **distributions of rex** sole in the Gulf of **Alaska** by region-depth zones, **1973-1976.**

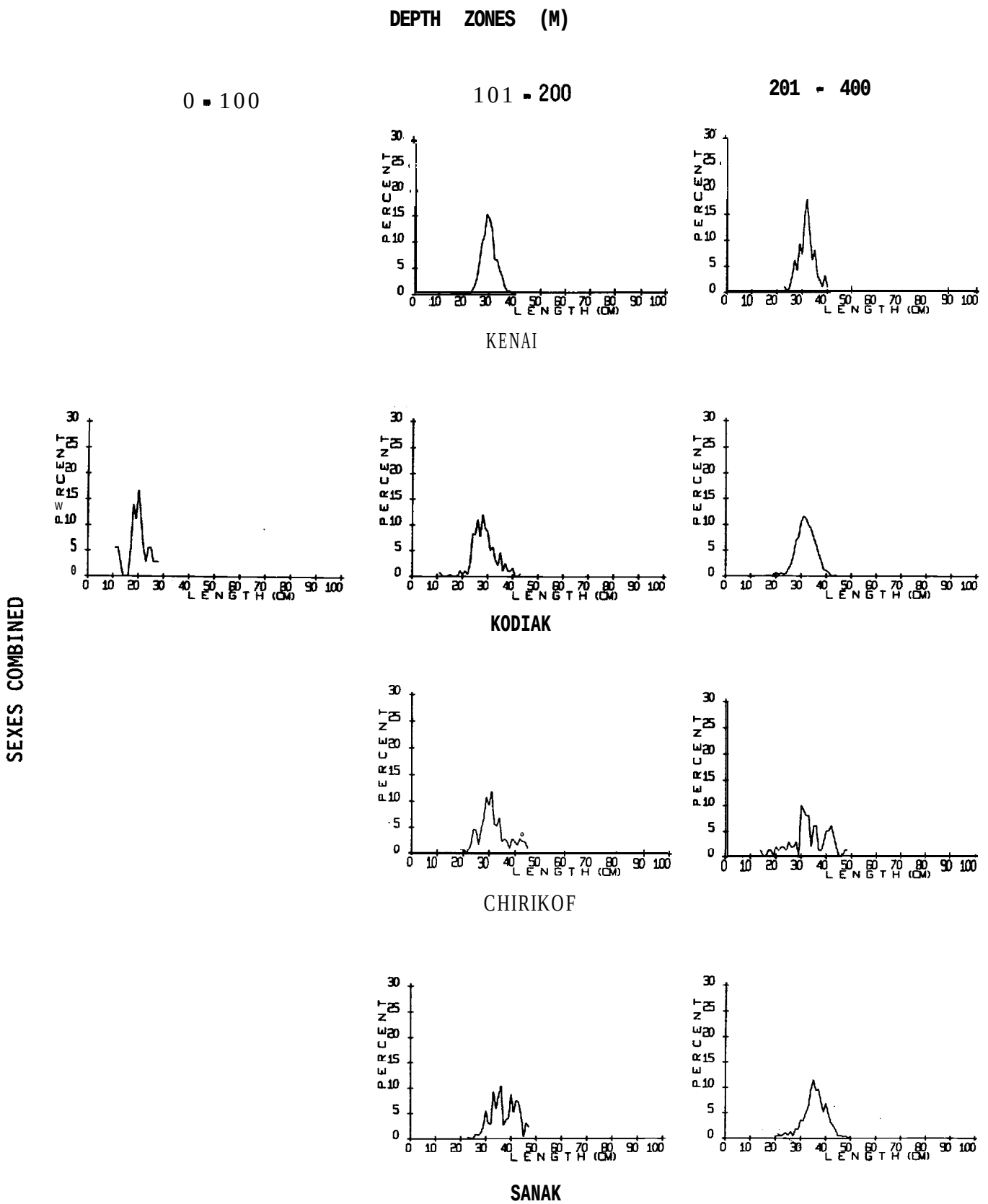


Figure XI-495 (continued).--Length frequency distributions of rex sole in the Gulf of Alaska by region-depth zones, 1973-1976.

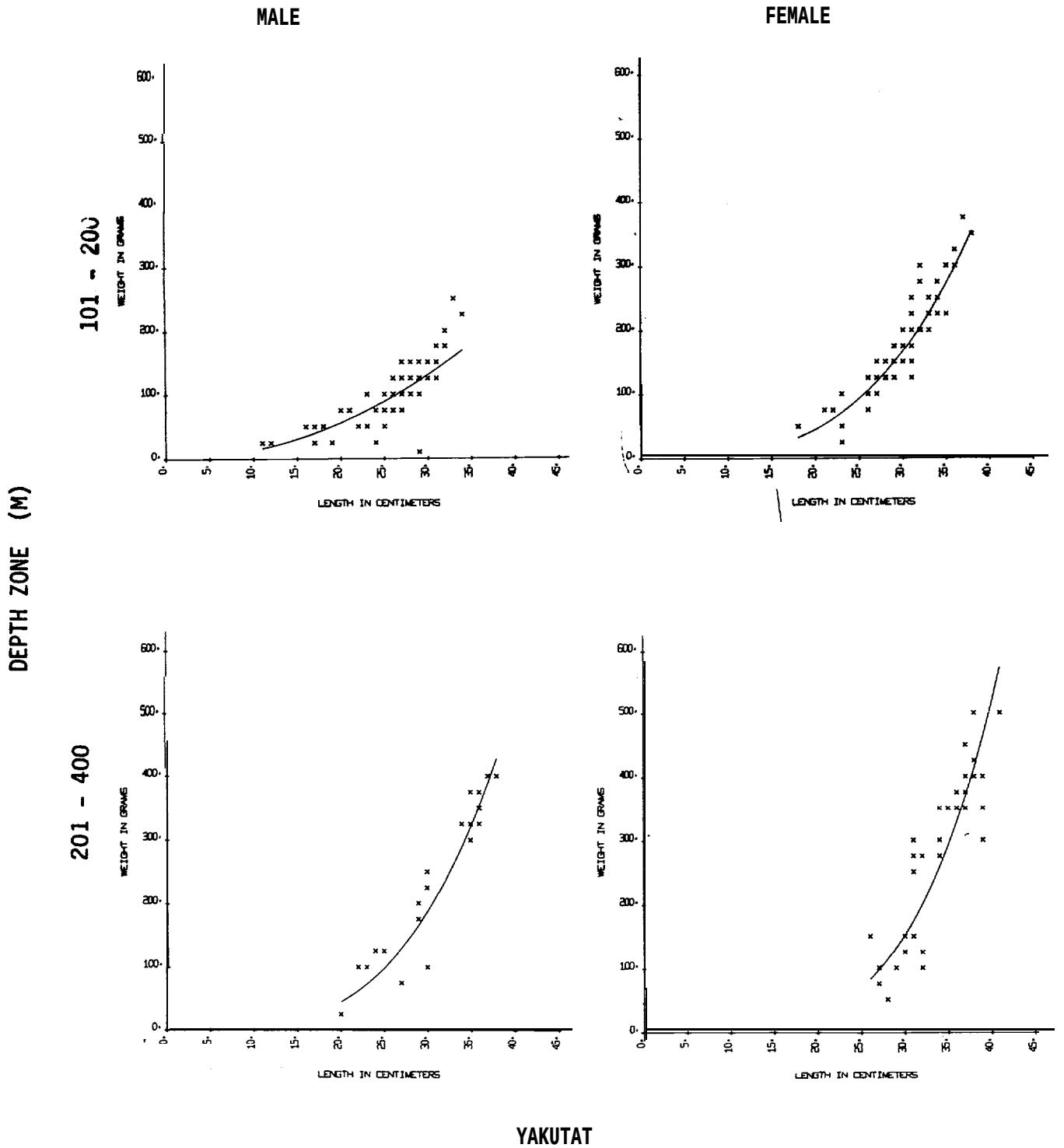


Figure XI-496.--Weight at **length observations** for **rex sole in the** Gulf of **Alaska** by **regions and** depth zones, **May-Aug. 1975 (Cruise** 751).

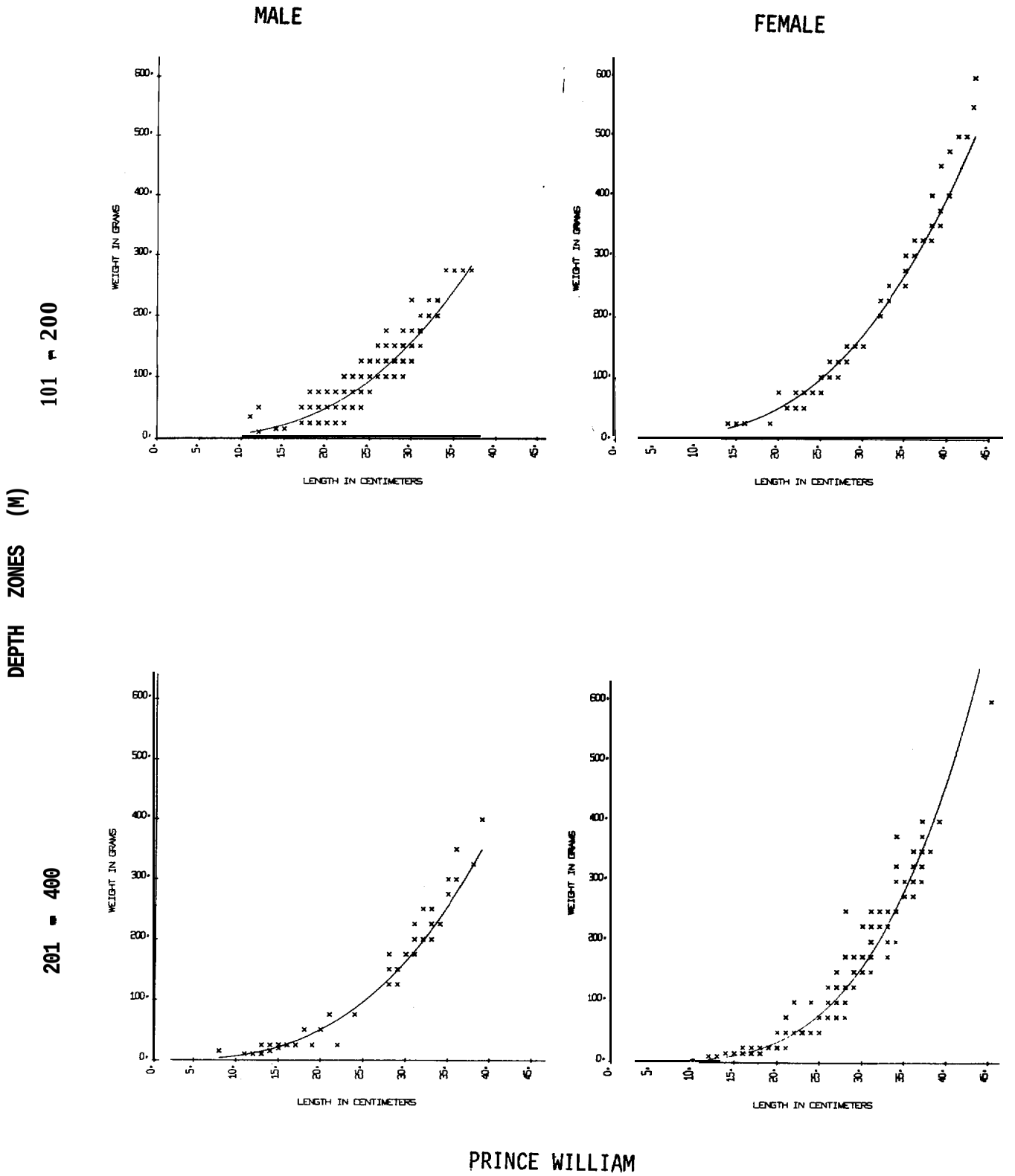
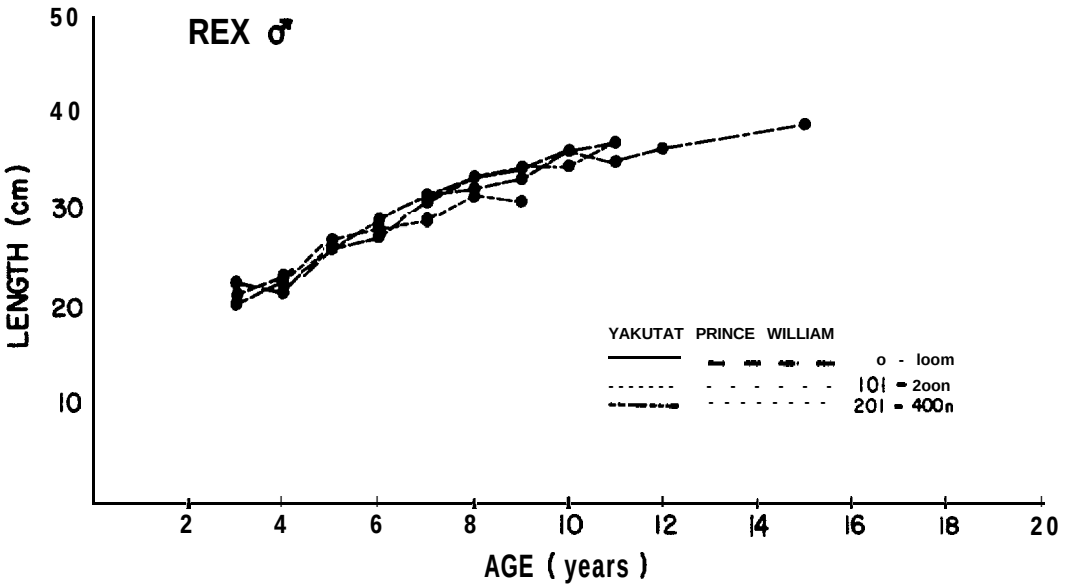


Figure XI-496 (continued).--Weight at length observations for rex sole in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).



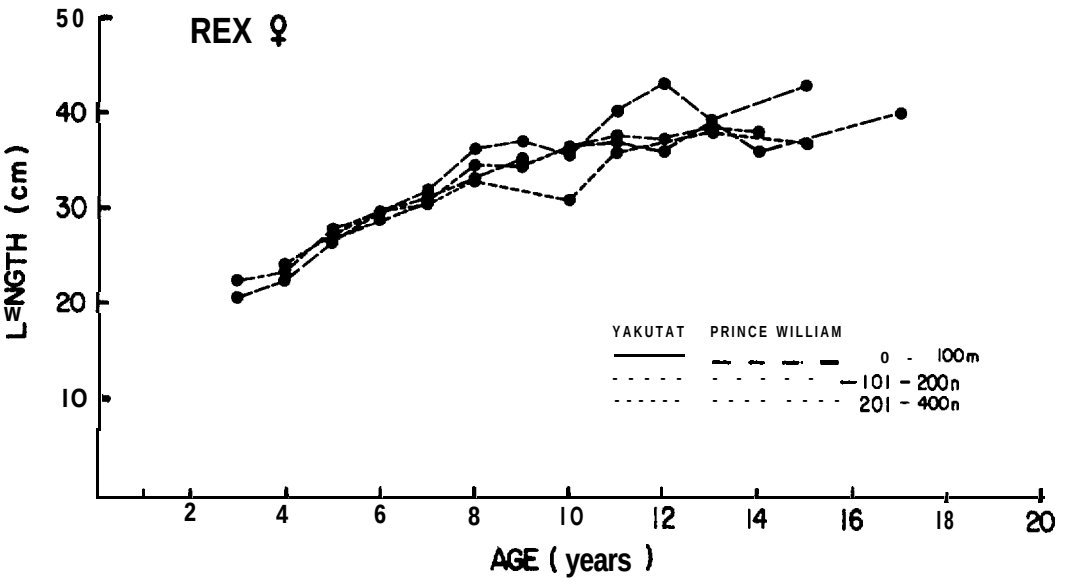


Figure xs-497.—Mean lengths at ● ge for **rex sole by sex and region-depth zones in the** Gulf of Alaska, **May-Aug.** 1975 **(Cruise 751).**

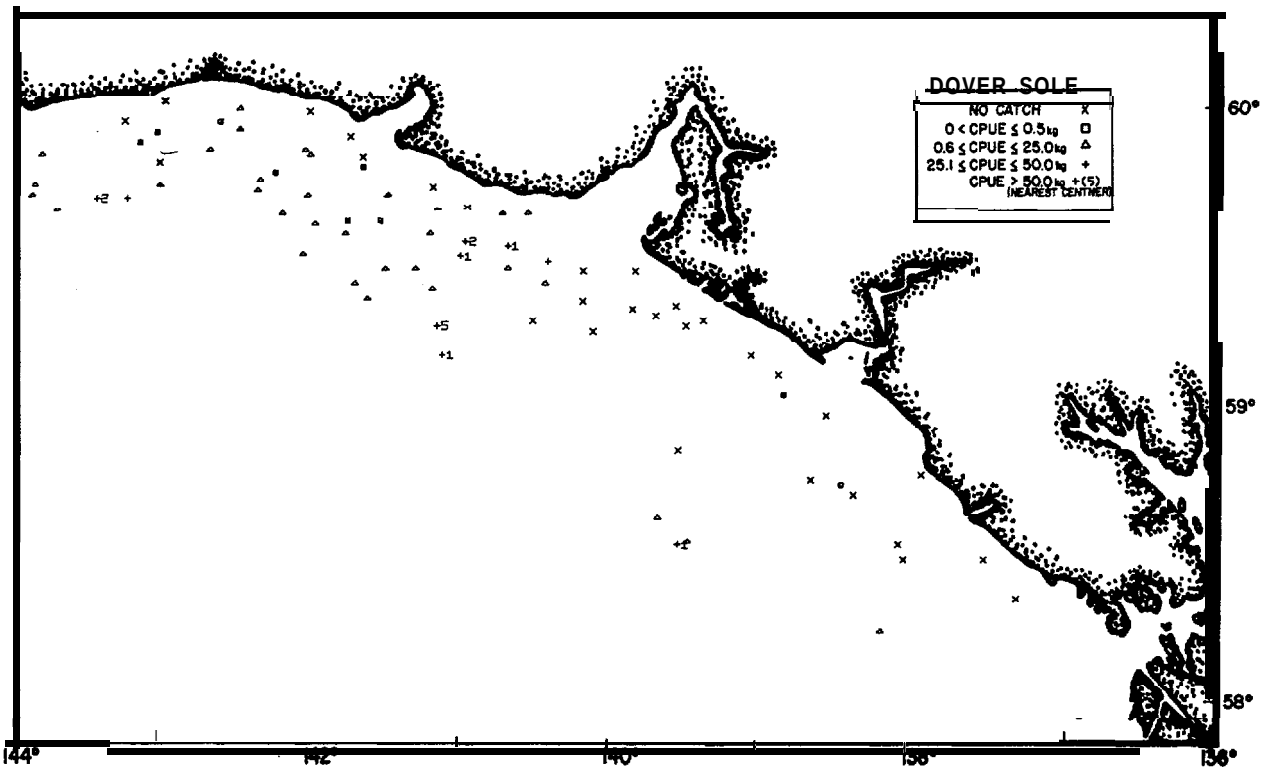


Figure XI-498.--Distribution of standardized catch rates in kilograms/hour of Dover sole in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

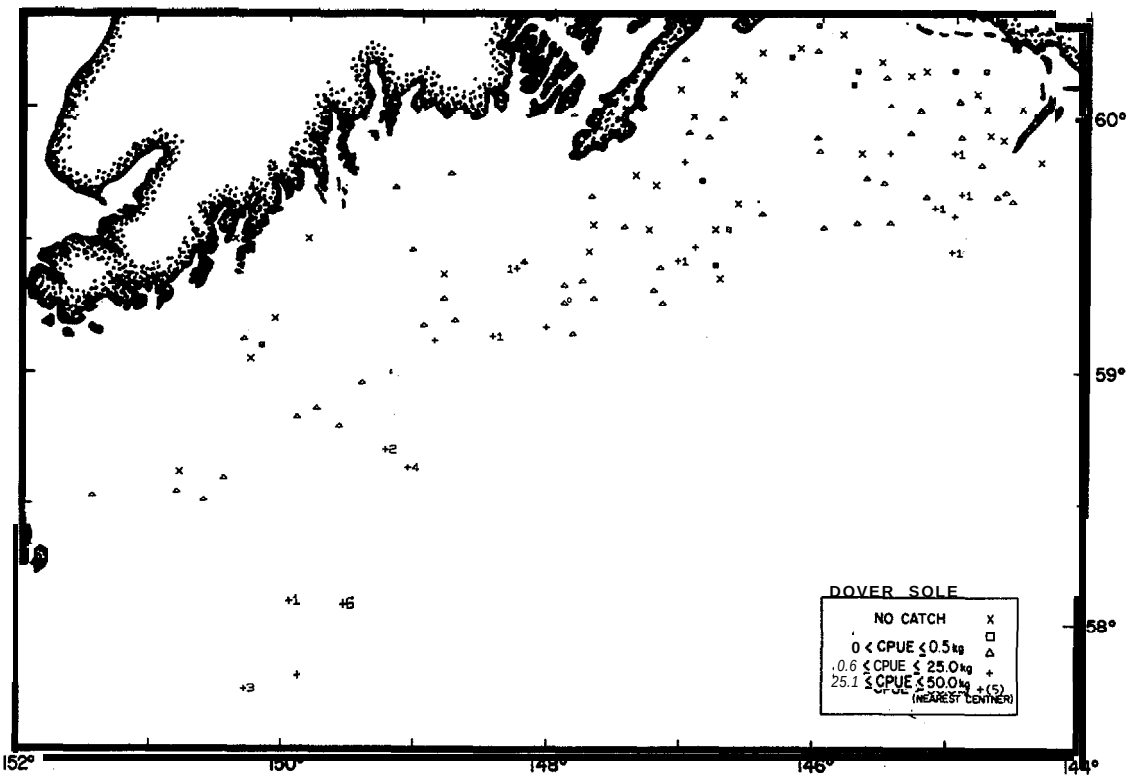


Figure X1-499.--Distribution of standardized catch *rates* in kilograms/hour of Dover sole in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

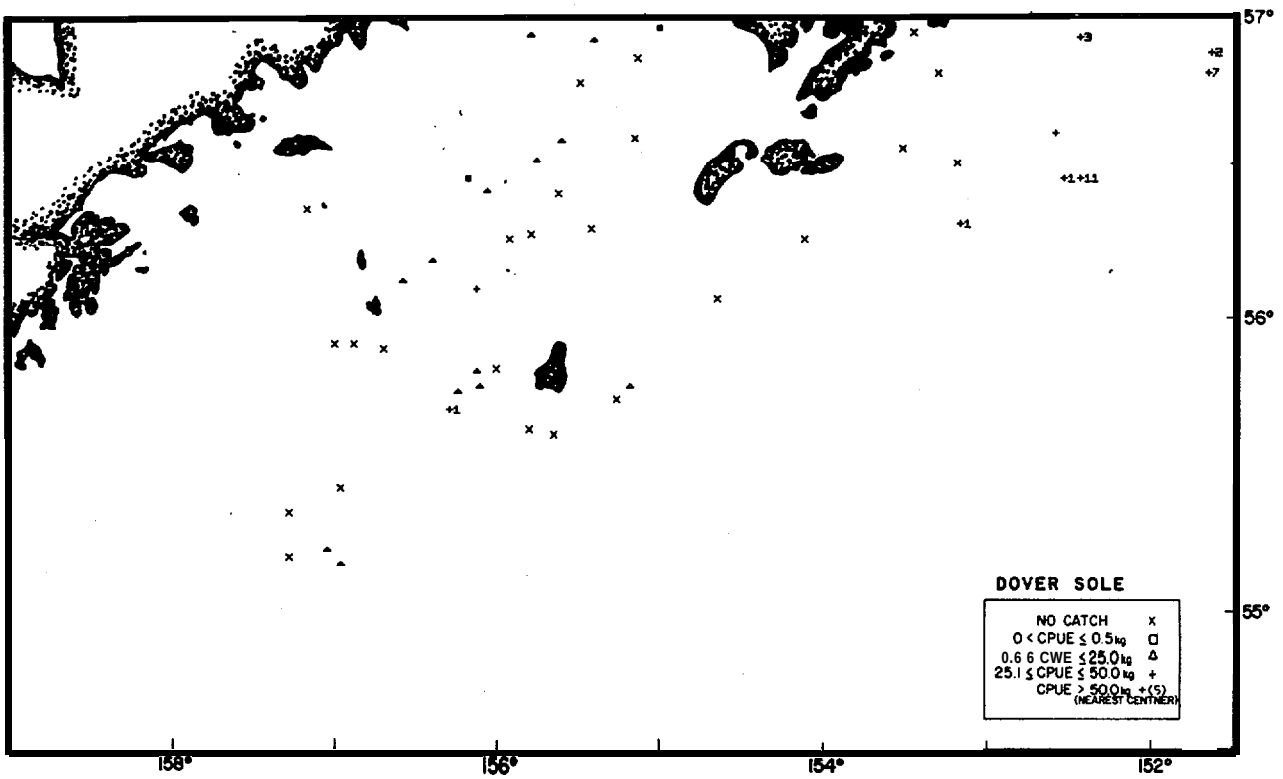


Figure X1-500.--Distribution of standardized catch rates in kilograms/hour of Dover sole in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jul.-Aug. 1975 (Cruises 733, 734, and 753).

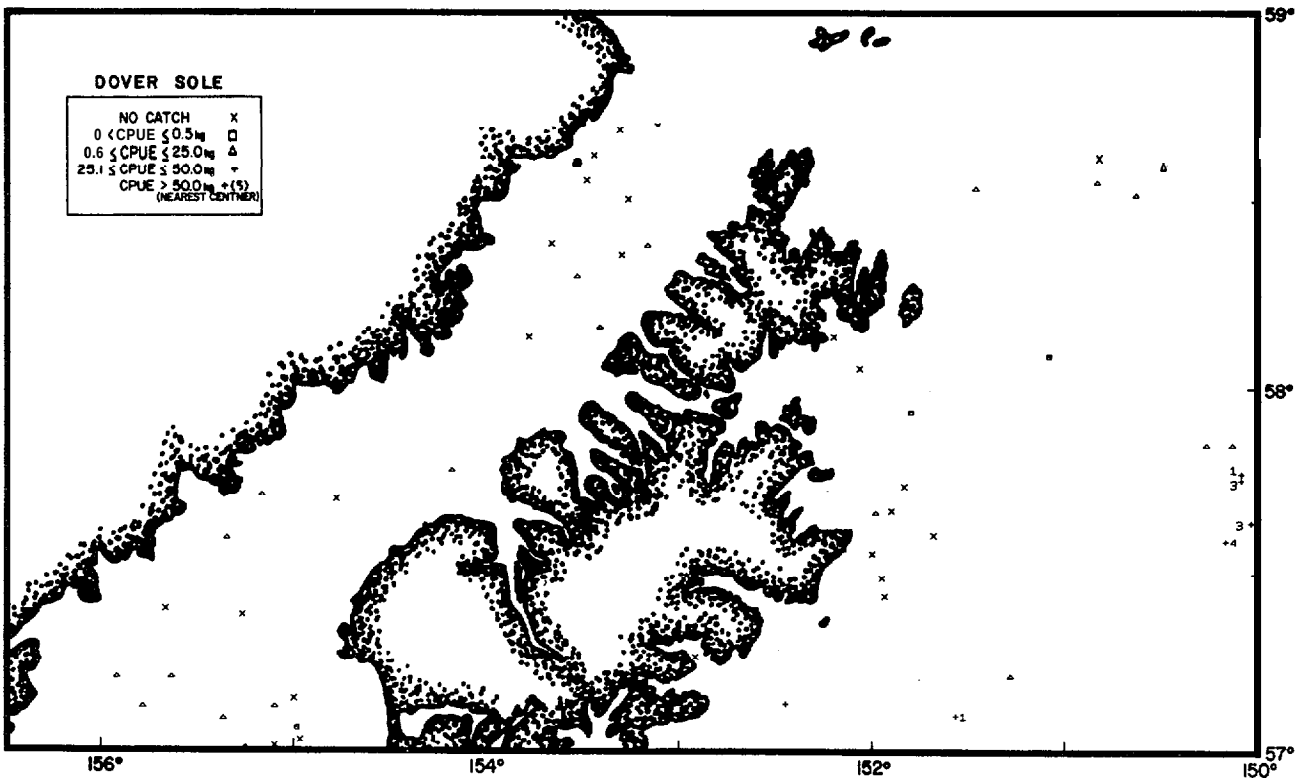


Figure XI-501.--Distribution of standardized catch rates in kilograms/hour of Dover sole in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct., 1973, and Jul.-Aug. 1975 (Cruises 733, 734, and 753).

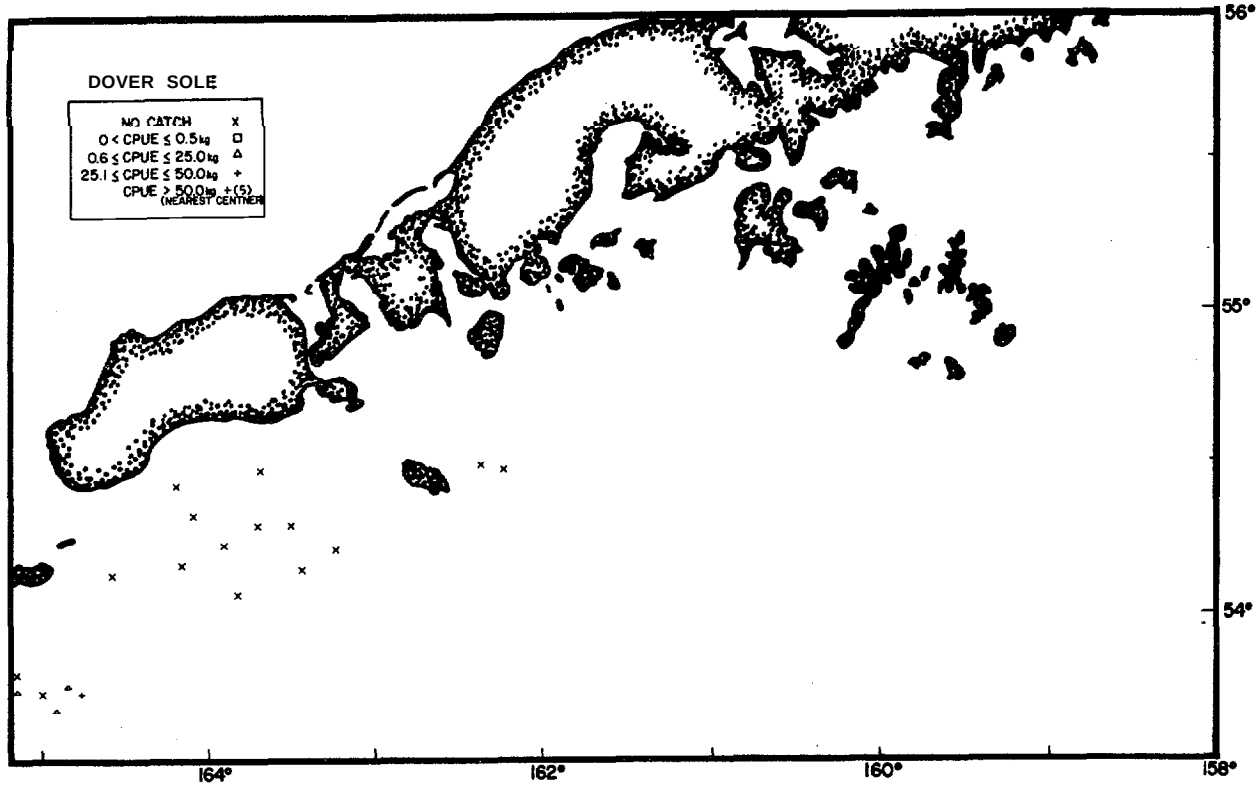


Figure XX-502.—Distribution of tududSs**ed catch rates in kilograms/ hour of Dover** mole **in the western Gulf** of **Alaska, Jul.-Aug.** 1974 **(Cruise 744).**

Biomass--The biomass of Pacific halibut has been estimated at 43 thousand mt of which 44 percent occurred in the inner shelf, 29% in the upper slope and 27% in the outer shelf (Table X1-140). The combined Kodiak and Shelikof regions contained 44% of the biomass while the proportion contributed by the remaining regions ranged from 4 to 13%. Biomass estimates for Pacific halibut should be considered minimal as large halibut appear to be able to escape the trawl gear when towed at speeds utilized during the survey.

The combined eastern Gulf regions contained 33% of the estimated biomass while the western regions accounted for 67%.

Size composition--Length-frequency information collected for this species is limited due to efforts to return to the sea any halibut caught as quickly as possible. The Fairweather, Yakutat and Prince William were the only regions where the samples were adequate to construct length-frequency distributions (Figure X1-517). Pacific halibut, sexes combined, ranged in length from 44.1 cm in the Fairweather upper slope to 72.6 cm in the Yakutat outer shelf (Table X1-141).

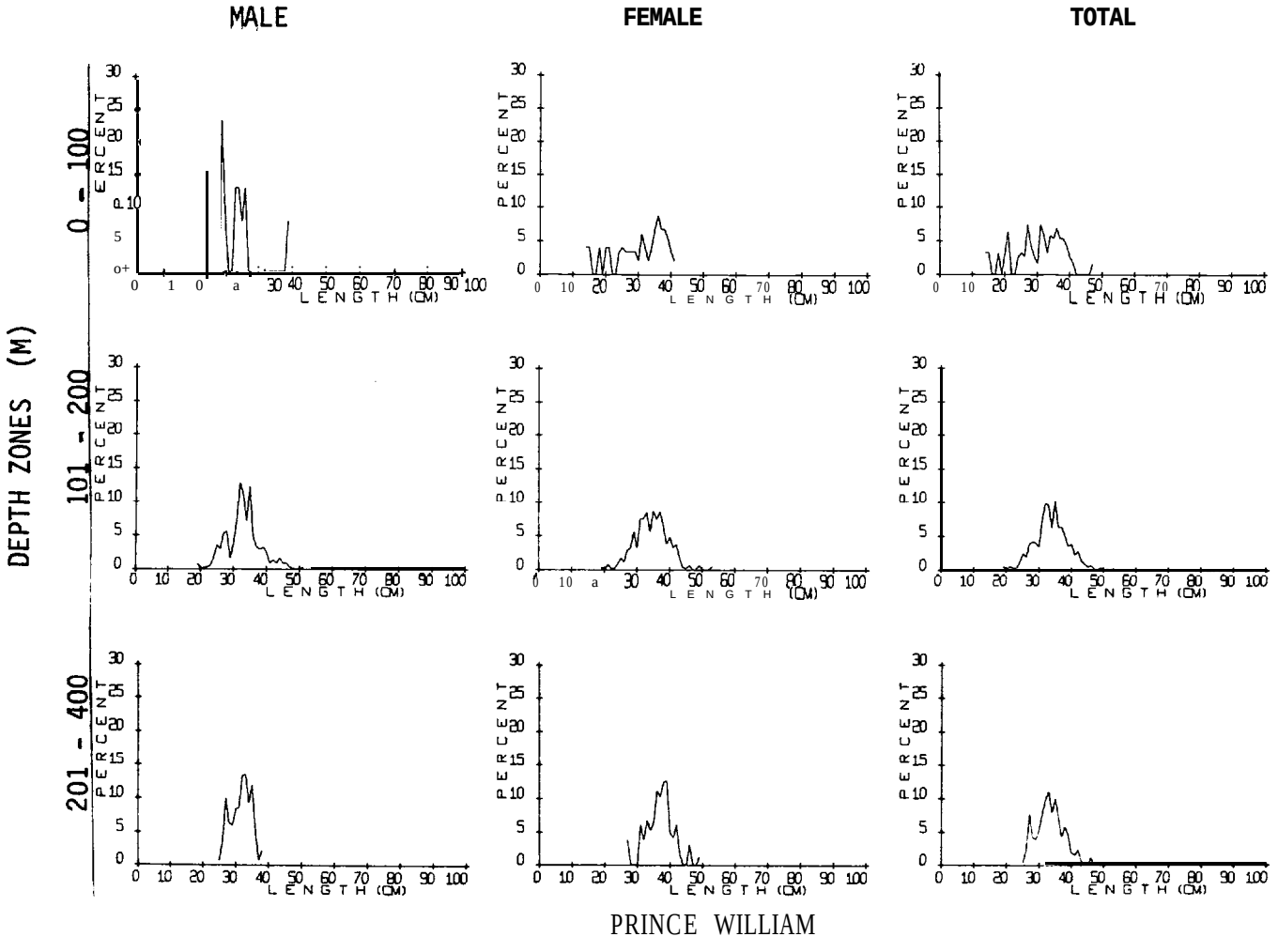


Figure XI-503.**--Length** frequency **distributions** of **Dover sole from the Gulf** of **Alaska** by region-depth **zones,** 1973-1976.

SEXES COMBINED

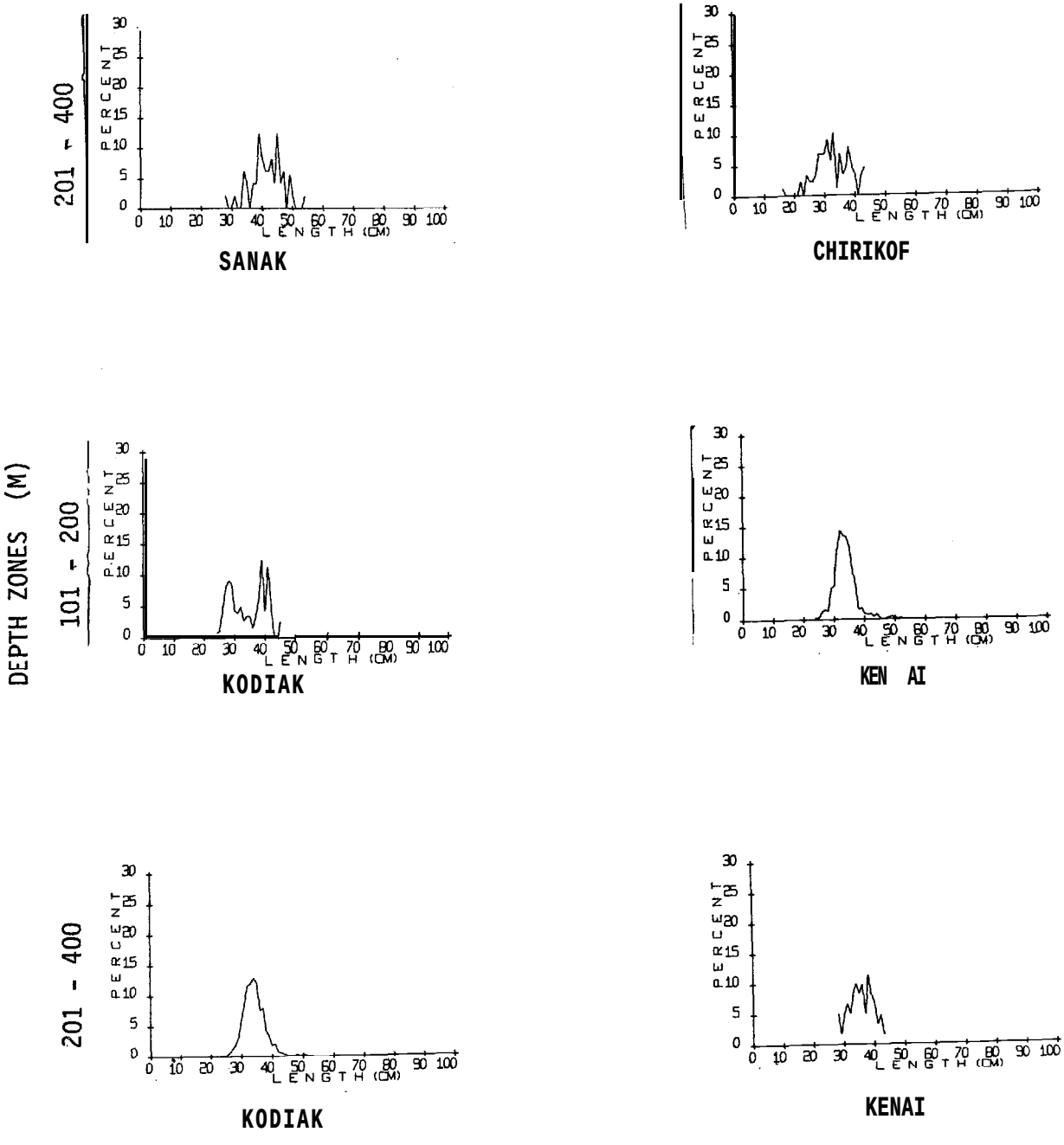


Figure XI-503 (continued).--Length frequency distributions of Dover sole from the Gulf of Alaska by region-depth zones, 1973-1976.

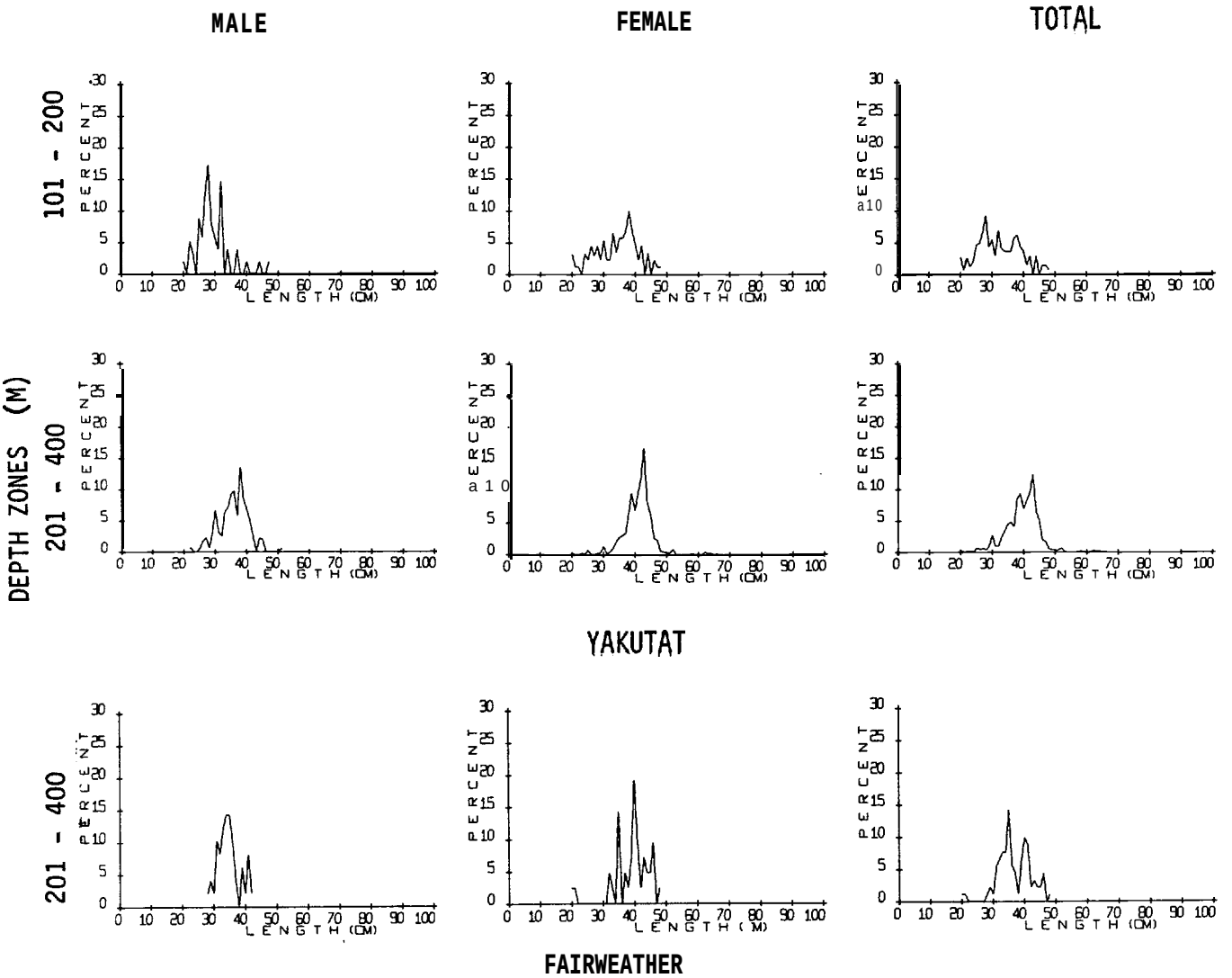


Figure XI-503 (continued).--Length frequency distributions of Dover sole from the Gulf of Alaska by region-depth zones, 1973-1976.

Table XI-135.--Estimated biomass and population size of Dover sole (Microstomus pacificus) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0.1	2.4	0.2	41	5/	0.14	--
	101-200	0.3	41.6	4.1	0.1	3.6	0.40	--
	201-400	31.8	954.4	95.6	2.7	96.4	0.35	36.6
	All zones	4.4	998.4	2.2	2.8	--	0.35	--
Yakutat	l-100	1.5	95.2	1.2	0.3	2.4	0.30	--
	101-200	2.7	398.1	5.1	1.1	8.8	0.37	32.3
	201-400	106.7	7,320.8	93.7	11.1	88.8	0.66	39.6
	All zones	28.2	7,&14.$	17.3	12.5	--	0.63	--
Prince William	l-100	1.9	209.9	8.1	0.9	13.9	0.22	30.0
	101-200	9.8	1.229.9	47.7	2.8	43.1	0.44	33.8
	201-400	31.2	1,137.7	44.1	2.8	43.1	0.41	33.5
	All zones	9.5	2,577.5	5.7	6.5	--	0.40	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	41.0	9,951.4	91.3	28.3	92.8	0.35	33.5
	201-400	9.4	-944.5	8.7	2.2	7.3	0.43	35.4
	All zones	31.8	10.895.9	24.1	30.5	--	0.36	--
Kodiak	l-100	3/	2.2	5/	4/	5/	--	--
	101-200	29.3	3,613.7	17.7	8.9	16.5	0.40	34.2,
	201-400	301.9	16,833.1	82.3	45.2	83.6	0.37	34.0
	All zones	63.5	20.449.0	45.3	54.1	--	--	--
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	0.2	8.2	3.5	4/	5/	--	--
	201-400	2.2	229.7	96.6	0.8	100.0	0.28	--
	All zones	1.6	237.9	0.5	0.8	--	--	--
Chirikof	l-100	0.2	27.1	2.2	0.1	4.0	0.23	--
	101-200	1.4	229.6	18.6	0.6	24.0	0.40	--
	201-400	7.3	980.8	79.3	1.8	72.0	0.54	32.9
	All zones	2.6	1,237.5	2.7	2.5	--	0.49	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	0	0	0	0	0	--	--
	101-200	3.4	550.1	57.0	--	--	--	--
	201-400	'32.2	402.4	42.3	0.6	--	0.72	41.1
	All zones	2.7	952.5	2.1	--	--	--	--
Total	l-100	0.5	336.6	0.8	1.3	--	0.31	--
	101-200	14.2	16.022.6	35.5	--	--	--	--
	201-400	52.1	28.803.4	63.8	67.2	--	0.43	--
	All zones	19.3	45,162.7	100.1	--	--	--	--

1/ Mean catch per unit effort, in kilogram per hour travled.
2/ Wbcre data are available.
3/ Lens than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

Table X1-136,--Mean lengths (cm) of Dover sole by regions and depth zones (Cruise 734 744, 751, 753 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	a-	--	--	--	--	--	34.6	39.0	36.6
Yakutat	--	--	--	29.2	34.2	32.3	35.8	41.0	39.6
Prince William	30.2	30.0	30.0	32.9	34.4	33.8	31.5	36.9	33.5
Kenai	--	--	--	--	--	33.5	--	--	35.4
Kodiak	--	--	--	--	--	34.2	--	--	34.0
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	--	--	--	--	--	--	32.7
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	--	--	--	a-	--	--	41.5

SKATES

Distribution and abundance—Due to problems associated with identification of the skate specie5 encountered in the Gulf of Alaska (Table V-3), these species have been combined into a general classification. Skates were found throughout the Gulf of Alaska with the exception of the Kodiak, Shelikof, Chirikof, and Sanak inner depth zones. Apparent relative abundance was highest in the eastern Gulf regions and averaged 11 kg/hr over all regions. The Yakutat region had the highest density distribution followed by Fairweather and Prince William. Mean CPUE's in the remaining regions were below the survey average in this group. Relative apparent abundance was evenly distributed between the three depth zones ranging from 11 kg/hr in the inner shelf to 12 kg/hr in the upper slope and outer shelf. The distribution of the standardized catch rates for the successful stations are presented in Figures X1-518-523.

Biomass-The skate biomass in the Gulf of Alaska has been estimated at 27 thousand mt of which 52% occurred in the outer shelf, 25% in the inner shelf and 23% in the upper slope (Table X1-142). The Yakutat region made the largest contribution to the total biomass (31%), followed by Prince William (24%) and Fairweather (22%). When combined these three easternmost Gulf regions accounted for 77% of the total skate biomass.

Table XI-137 .--Parameters for the length-weight relationship (weight (g) = a . length^{b}) for Dover sole (Cruise 751).

		YAKUTAT				PRINCE WILLIAM			
	Depth	Sample Size	Range in Length (cm)	Parameters (a)	(b)	Sample Size	Range in Length (cm)	Parameters (a)	(b)
Males	0-100	--	cc	--		3	32-34	0.041083	2.581121
	101-200	32	18-37	'0.000796	3.694699	69	24-37	0.000575	3.786216
	201-400	--	- -	--	--	--	--	--	--
Females	0-100	--	--	--	--	15	24-40	0.015220	2.887672
	101-200.	71	22-47	0.001305	3.544710	135	26-52	0.003337	3.277051
	201-400	--	--	--	--		--		

Table XI-138.--Summary of age-length data collected for Dover sole (Cruise 751).

	REGIONS					
	Yakutat			Prince William		
Sex	DEPTH ZONES (M)					
Males	0-100	101-200	201-400	0-100	101-200	201-400
Number of readable otoliths	--	26	55	3	21	45
Range in age (years)	--	3-8	3-10	6	4-10	4-10
Range in length (cm)	--	25-37	25-44	31-34	27-37	23-37
Females						
Number of readable otoliths	--	43	68	12	60	68
Range in age (years)	--	3-14	3-13	3-10	4-14	4-14
Range in length (cm)	--	24-42	25-52	24-40	26-51	23-53

SHORTSPINE THORNYHEAD

Distribution and abundance--Occurrence of the shortspine thornyhead was generally confined to the upper slope depth zones where catch rates averaged 18 kg/hr. Highest relative apparent abundance occurred in the upper slope of the Sanak (77 kg/hr), Fairweather (62 kg/hr), Yakutat (48 kg/hr) and Prince William (30 kg/hr) regions with substantially lower rates occurring in the remaining areas. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-524-528.

Biomass--Of the nearly 11 thousand mt of apparent biomass, 80% occurred in the upper slope, 18% in the outer shelf and 3% in the inner shelf (Table x1-143). The Yakutat region made the largest contribution to the total biomass (42%) followed by Fairweather (19%) and Prince William (18%). The remaining regions accounted for only 21% of the total biomass. The biomass estimate for this species should be considered minimal because the survey covered only a portion of its bathymetric range which includes the steep, rugged bottom of the lower slope.

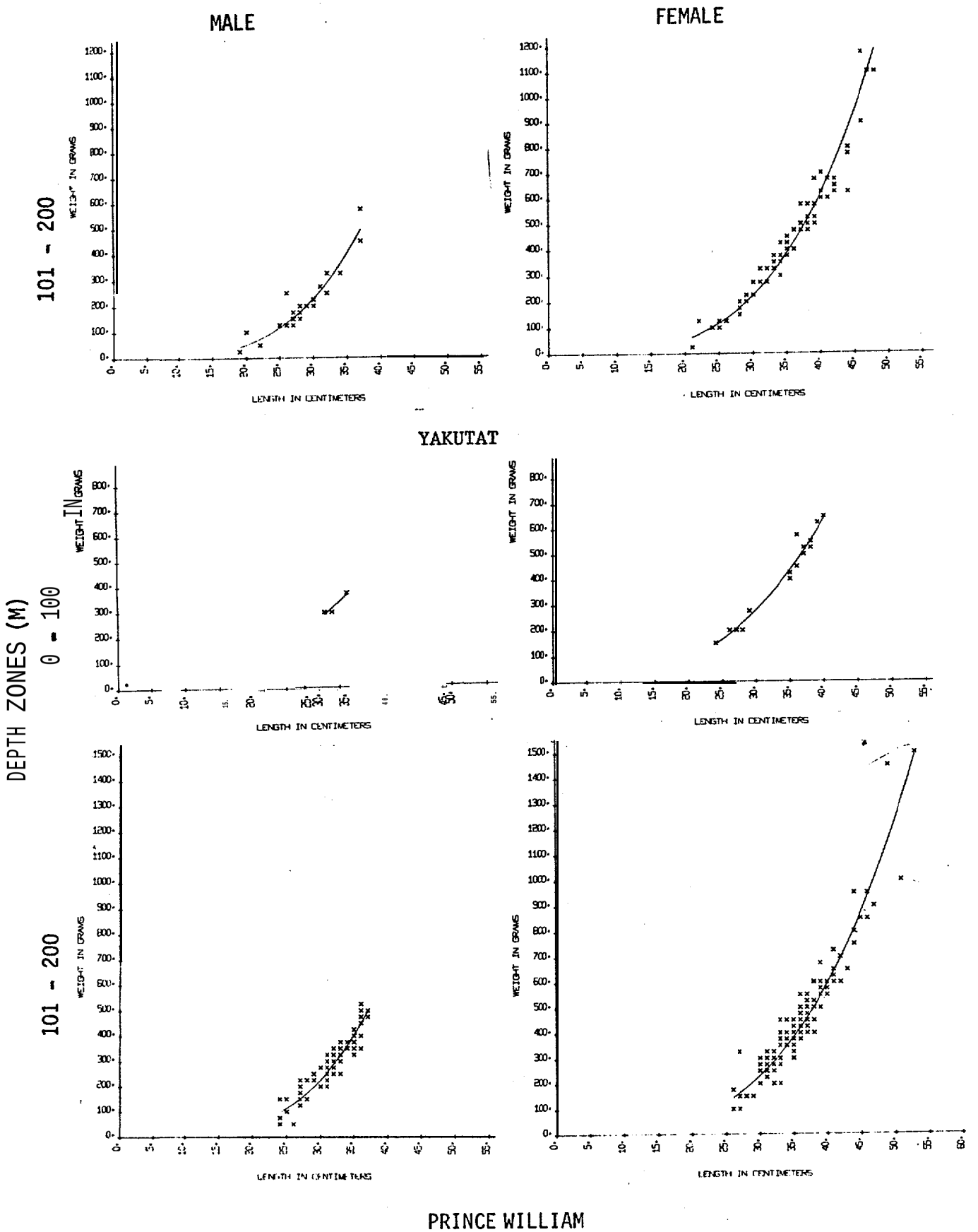
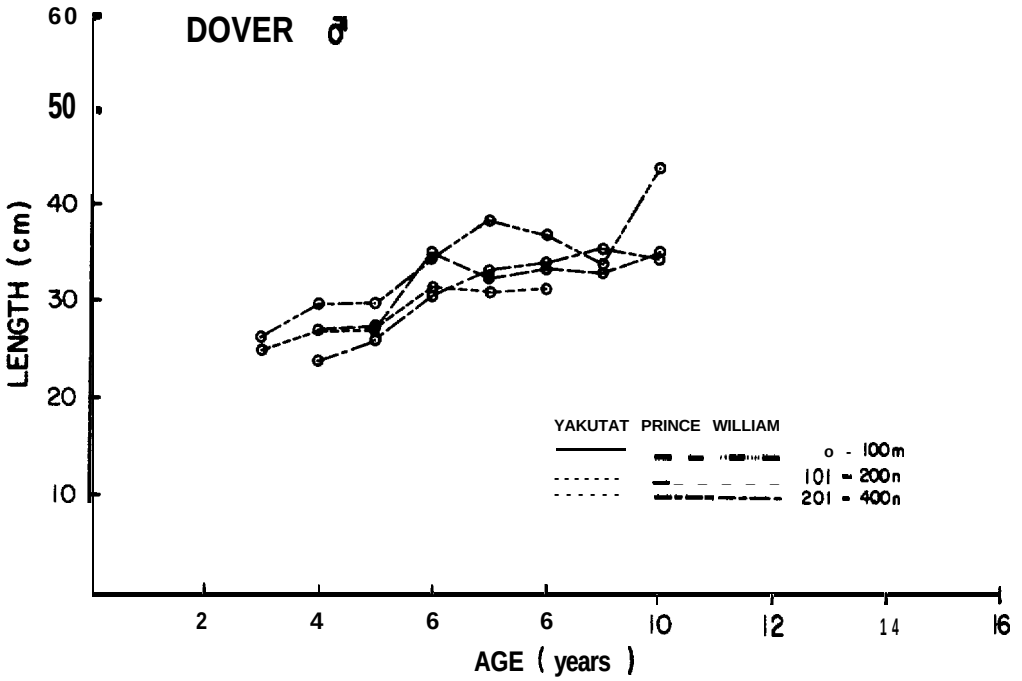


Figure XI-504.--Weight at length observations for Dover sole in the Gulf of Alaska by regions and depth zones, May-Aug. 1975 (Cruise 751).



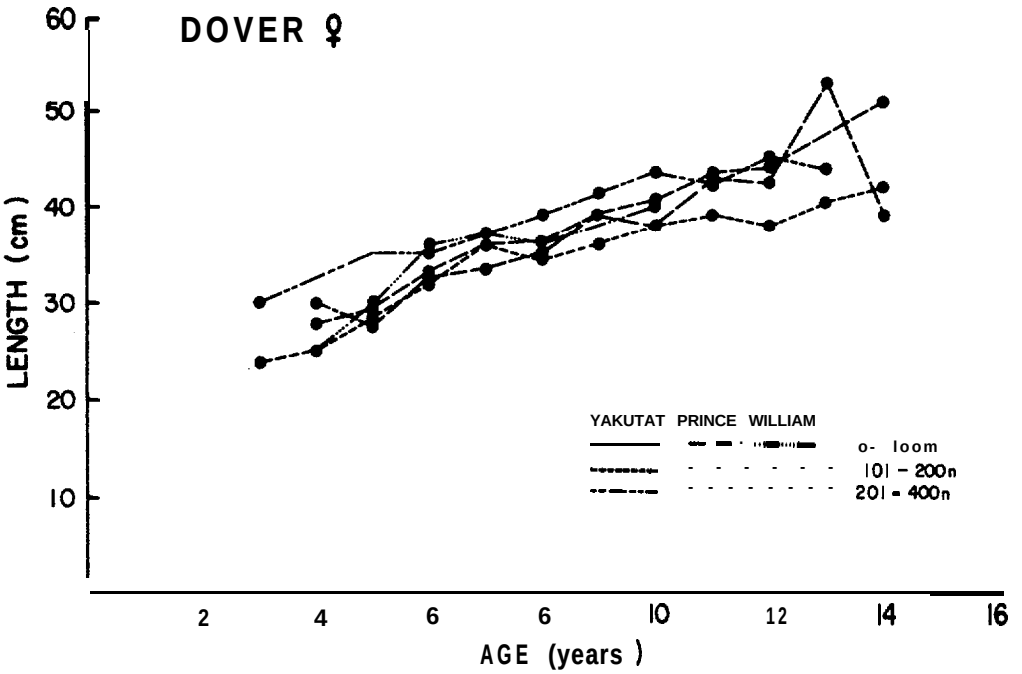


Figure XI-505.—Mean lengths at age for Dover **sole by** 80x **and region-depth zones in the Gulf of Alaska, May-Aug. 1975 (Cruise** 751).

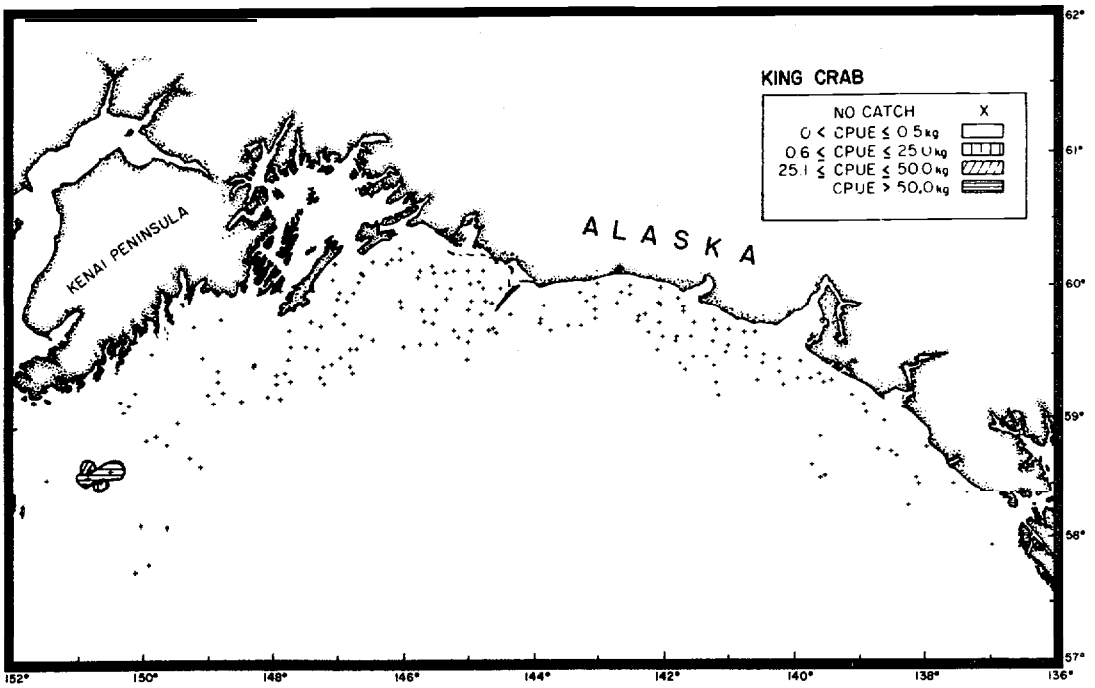


Figure X1-506.--Distribution of apparent relative abundance of king crab in the eastern Gulf of Alaska, May-Aug. 1975, Jun.-Aug. 1975, and Apr. 1976 (Cruises 751, 753, and 762).

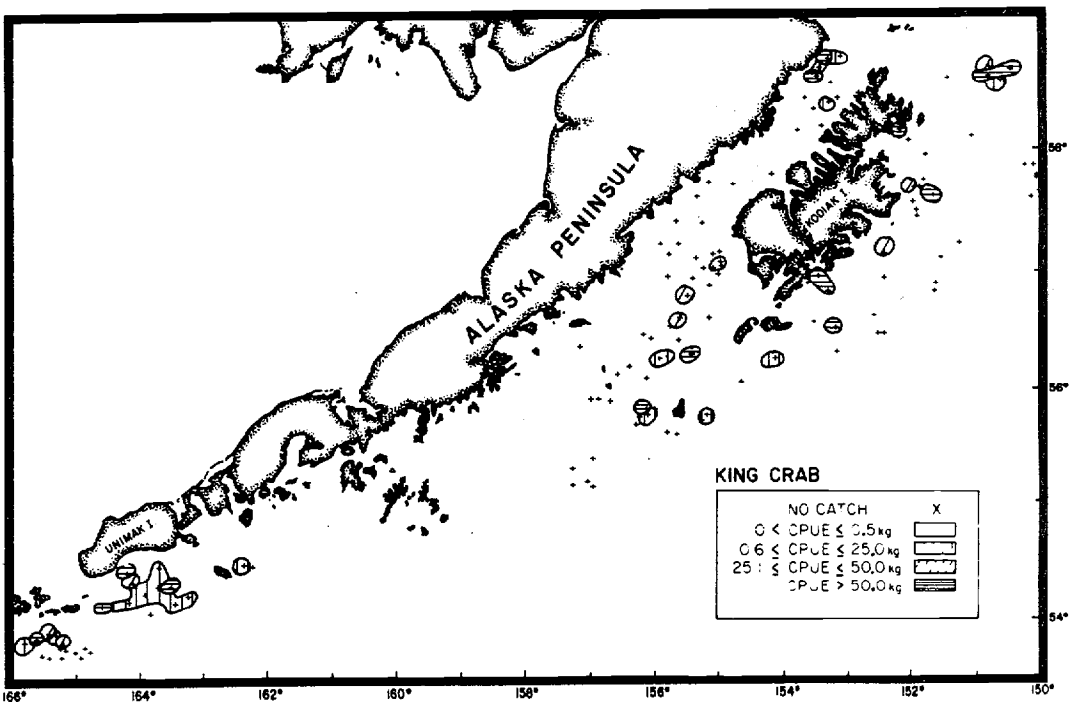


Figure XI-507.--Distribution of apparent relative abundance of king crab in the western Gulf of Alaska, May-Jul. 1973, Aug.-Oct. 1973, Jul.-Aug. 1974, and Jun.-Aug. 1975 (Cruises 733, 734, 753, and 744)

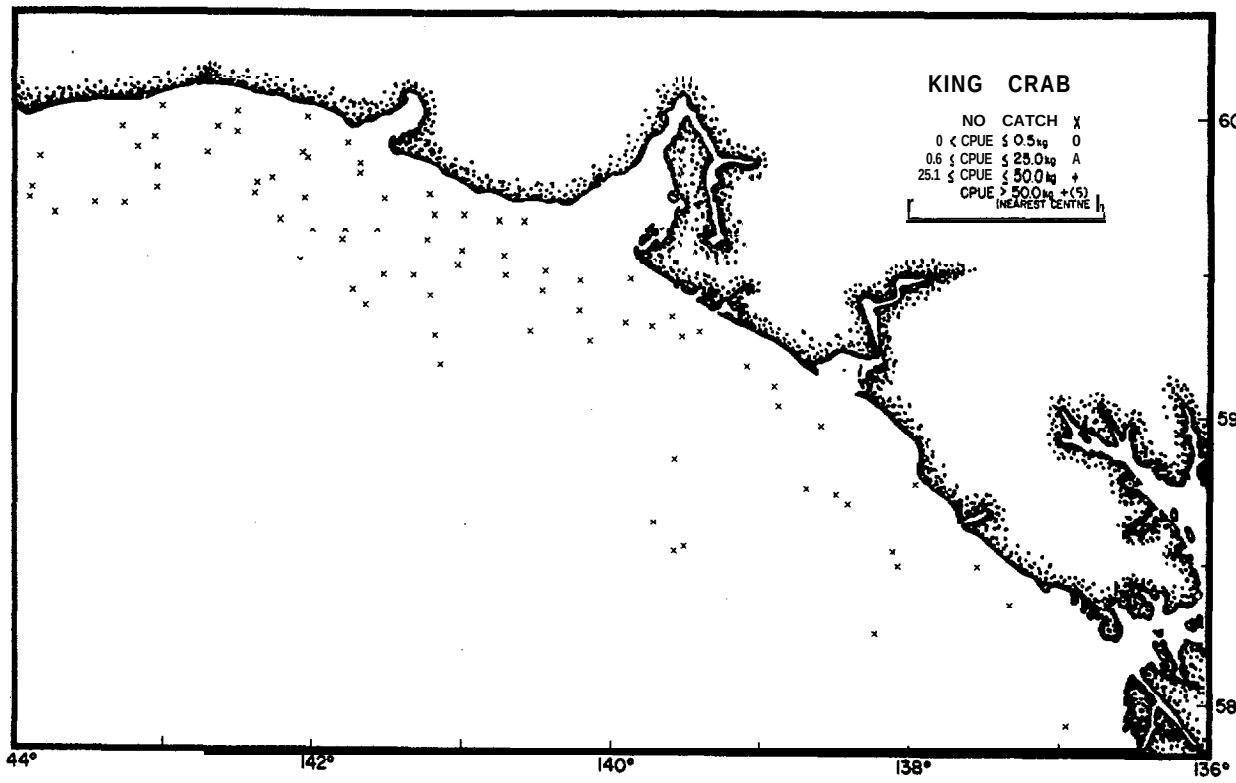


Figure XI-SOS. --Distribution of standardized catch rates in kilograms/ hour of **king** crab in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

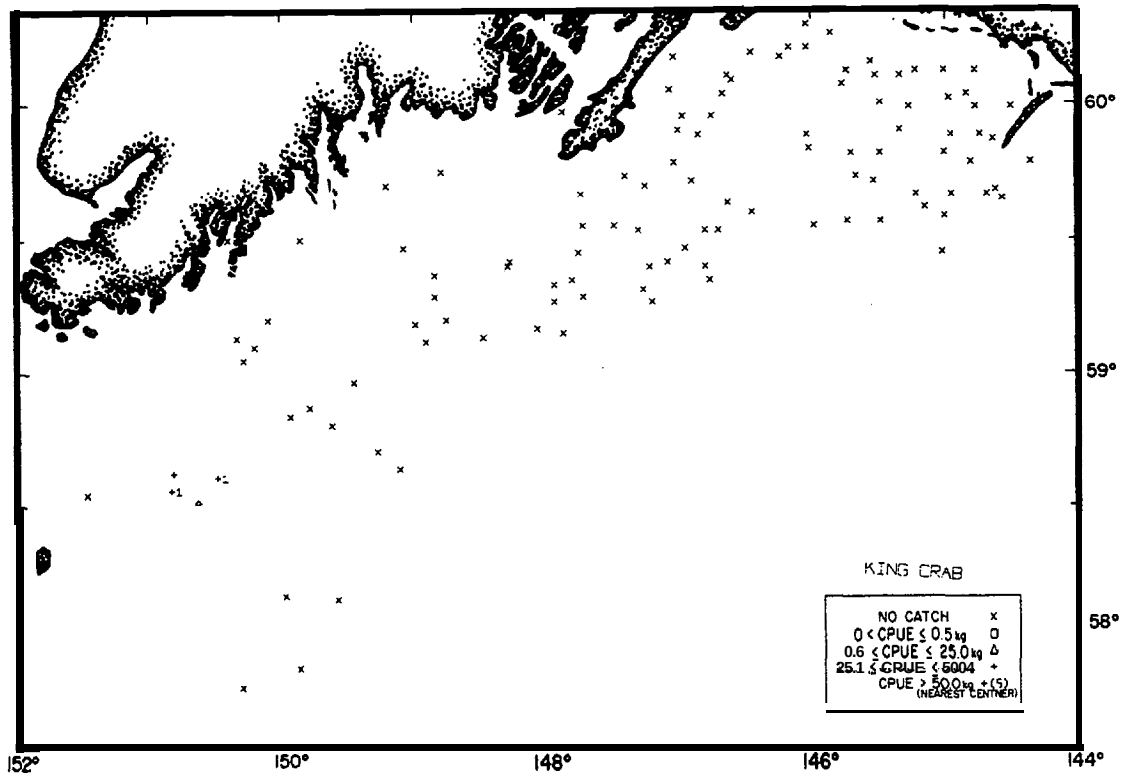


Figure XI-509. --Distribution of standardized catch rates **in** kilograms/ hour of king crab in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 **and** 753).

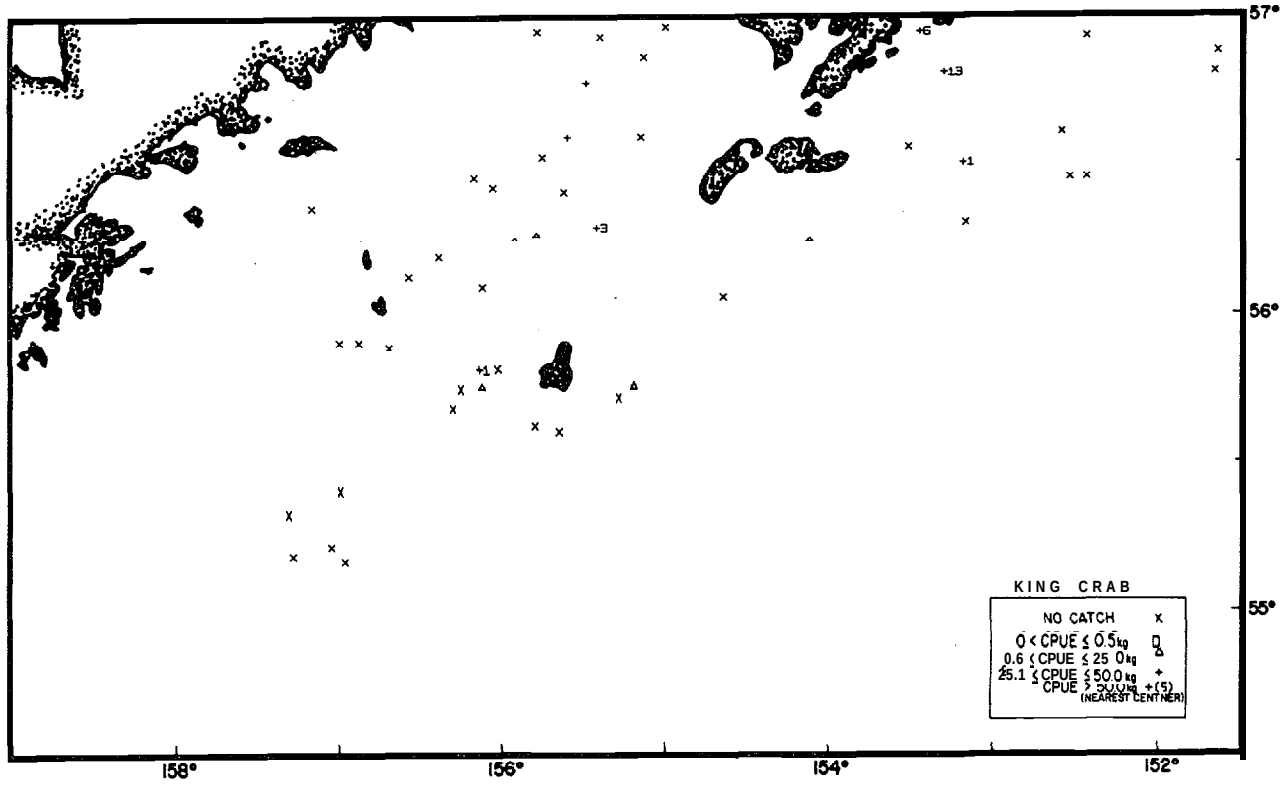


Figure X1-510. --Distribution of standardized catch rates in kilograms/ **hour** of king crab in the western Gulf of Alaska, **Aug.-Oct.** 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

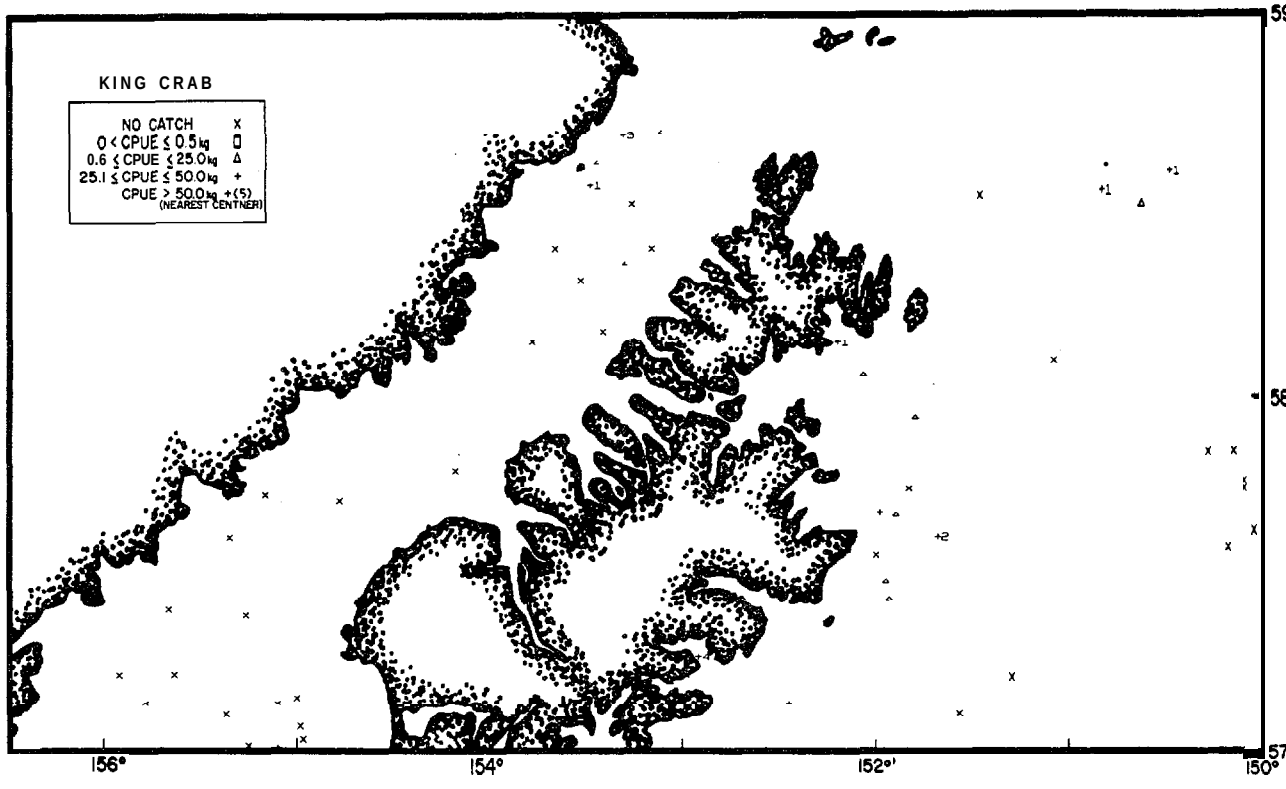


Figure XI-511 .--Distribution of standardized catch rates In kilograms/ hour of king crab in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

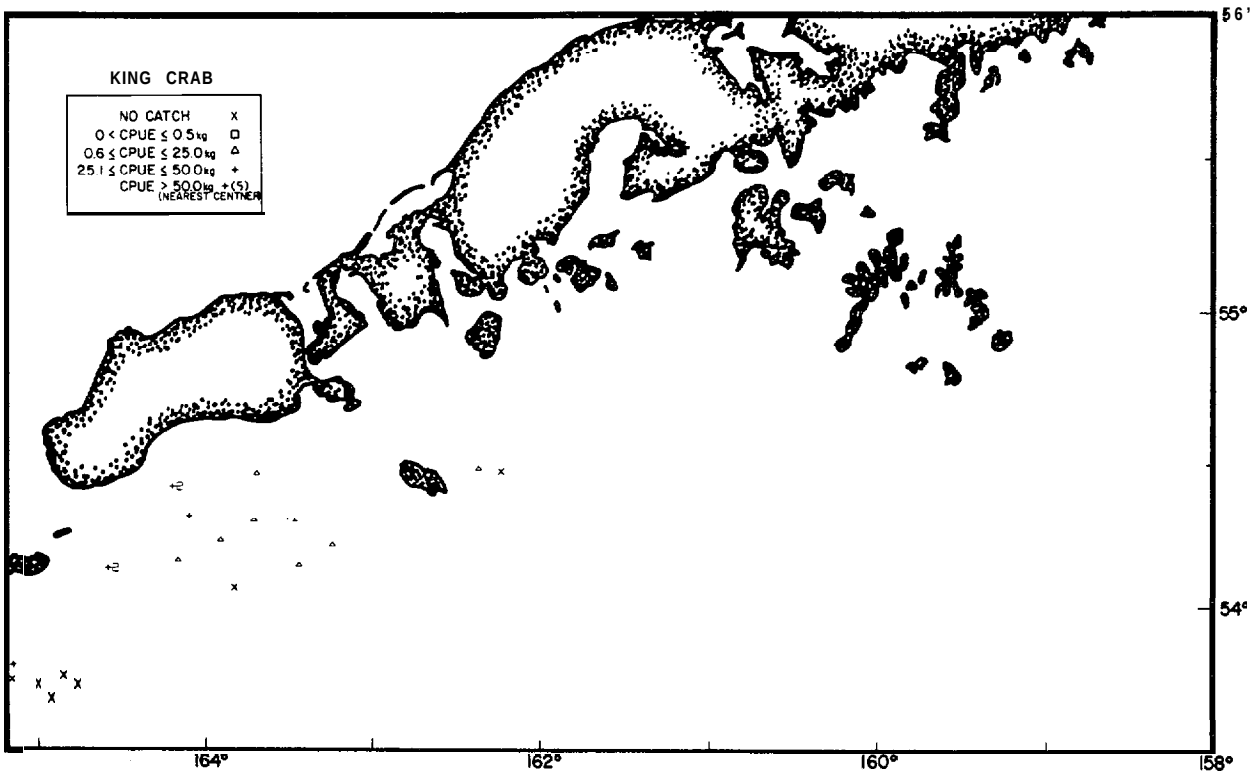


Figure XI-512.--Distribution of standardized catch rates in kilograms/hour of king crab in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

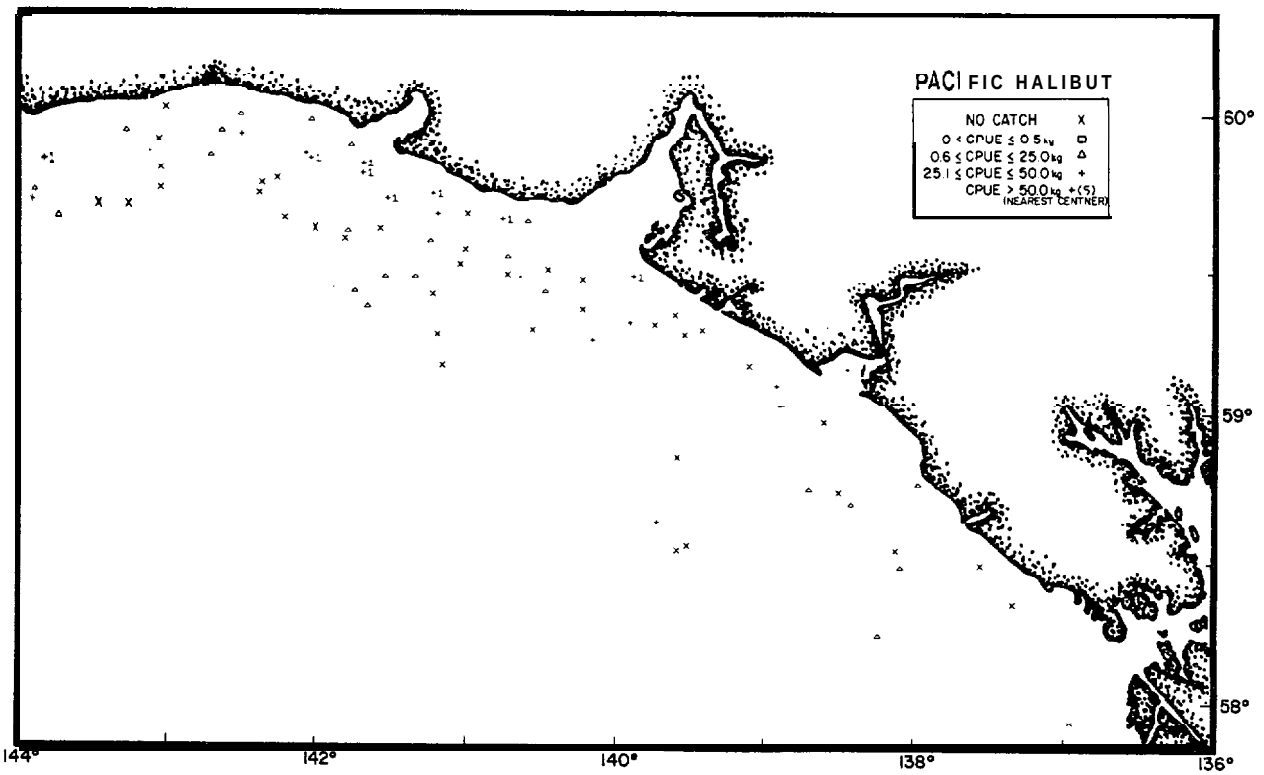


Figure XI-513.--Distribution of standardized catch rates in kilograms/hour of Pacific halibut in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

Table XI-139.--Estimated biomass and population site of king crab (*Paralithodes camtschatica*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 106)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	0	0	0	0	0	--	--
	101-200	1.1	175.5	100.0	0.1	100.0	1.44	--
	201-400	0	0	0	0	0	--	--
	All zones	0.8	175.5	0.4	0.4	0.1	1.44	--
Yakutat	l-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0		0	--	--
	All zones	0	0	0	3	0	--	--
Prince William	l-100			0	0	0	--	--
	101-200	8	8	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	0	--	--
Xenai	l-100	--	--	--	--	--	--	--
	101-200	7.1	1,727.3	59.6	0.4	57.1	3.87	--
	201-400	11.7	1,172.1	40.4	0.3	42.9	4.67	--
	All zones	8.5	2,899.4	6.6	0.7	3.5	4.16	--
Kodiak	l-100	25.9	3,702.7	16.8	1.2	11.4	2.98	--
	101-200	146.4	18,064.5	82.0	9.2	87.6	1.97	--
	201-400	4.6	258.0	1.2	0.1	1.0	3.30	--
	All zones	68.3	22.025.2	49.8	10.5	52.2	2.10	--
Shelikof	l-100	107.4	695.8	86.2	0.3	100.0	2.04	--
	101-200	2.7	111.1	13.8	4/	5/	3.06	--
	201-400	0	0	0	-0	0	--	--
	All zones	5.3	806.9	1.8	0.3	1.5	2.14	--
Chirikof	l-100	38.0	4,539.5	75.0	1.6	69.6	2.81	--
	101-200	6.5	1,055.8	17.4	0.5	21.7	1.96	--
	201-400	3.4	460.7	7.6	0.2	8.7	2.04	--
	All zones	15.4	6,056.0	13.7	2.3	11.4	2.55	--
Shumagin	l-100	--	--	--	--	--	--	
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	33.9	6,092.0	49.8	3.3	53.2	1.83	--
	101-200	37.6	6,141.7	50.2	2.9	46.7	2.15	--
	201-400	0	0	0	0	0	--	
	All zones	34.4	12,238.7	27.7	6.2	30.9	1.98	--
Total	l-100	23.3	15,030.0	34.0	6.4	31.8	2.35	--
	101-200	23.6	27,280.9	61.7	13.1	65.2	2.08	--
	201-400	3.6	1,890.8	4.3	0.6	3.0	3.15	--
	All zones	18.9	44,201.7	100.0	20.1	loo.0	-2-m	--

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Were data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

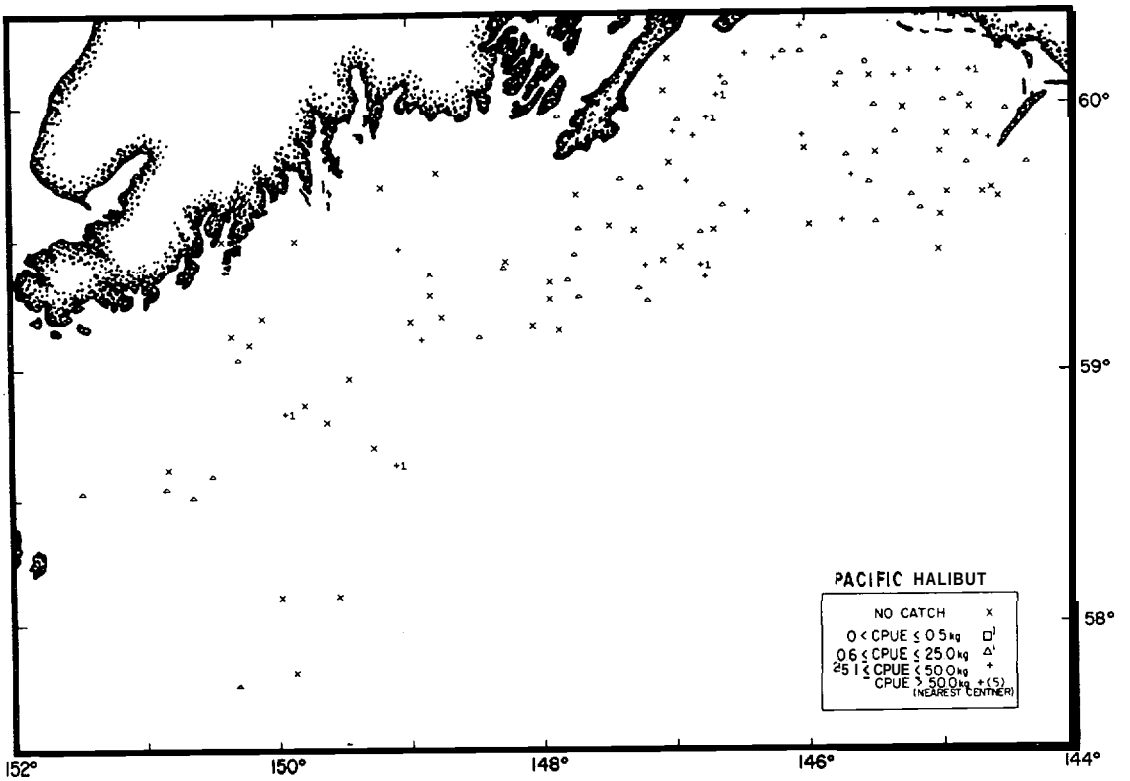


Figure n-514.--Distribution of **standardized** catch rates in kilograms/ hour of Pacific halibut in the eastern Gulf of Alaska, May-Aug. **1975** (Cruises 751 and 753).

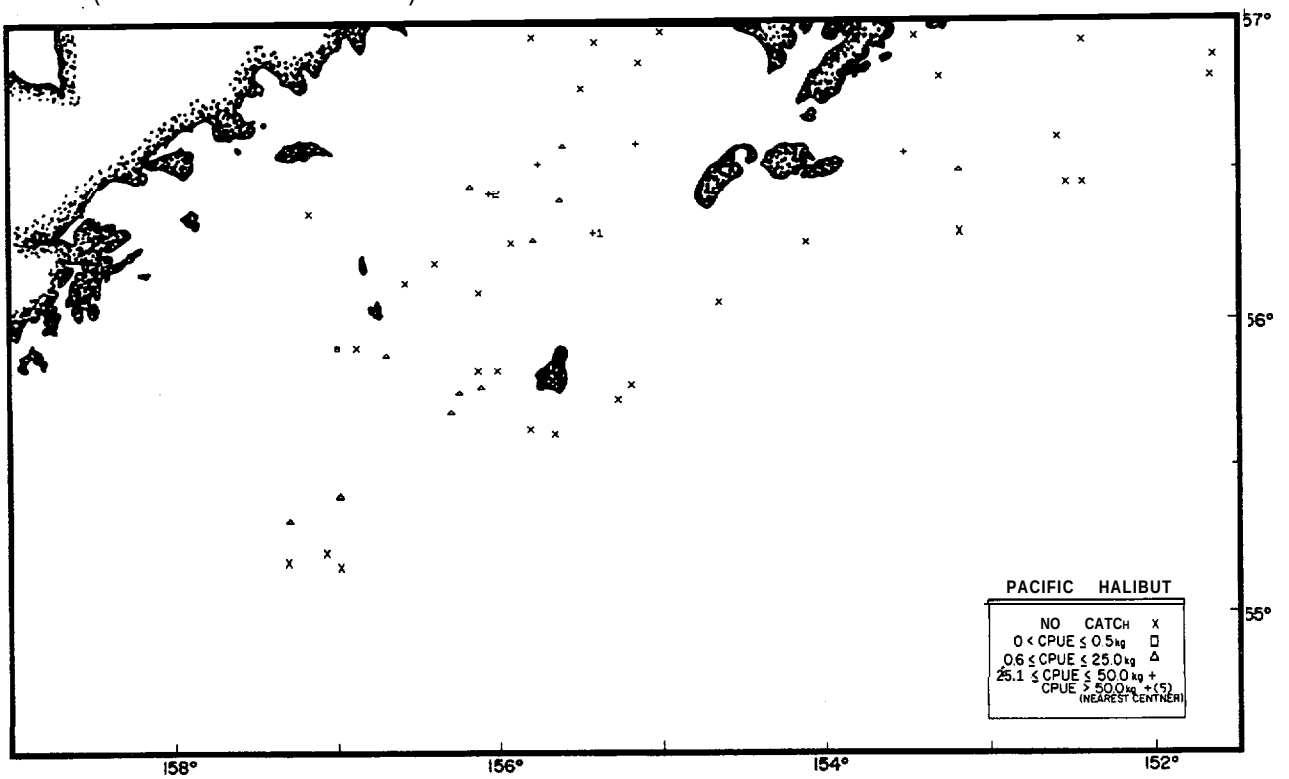


Figure X1-515.--Distribution of standardized catch rates in kilograms/ hour of Pacific halibut in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises **734** and 753).

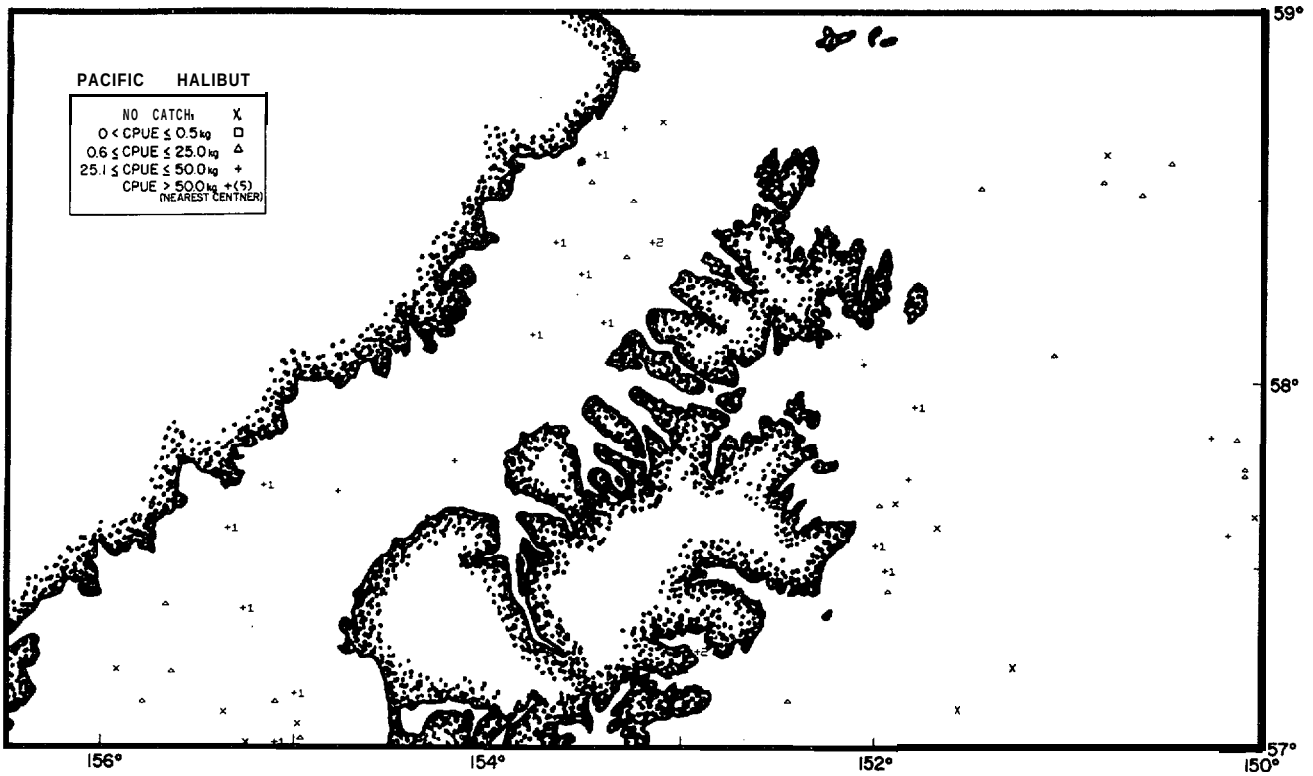


Figure X1-516.--Distribution of standardized catch rates in kilograms/hour of Pacific halibut in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

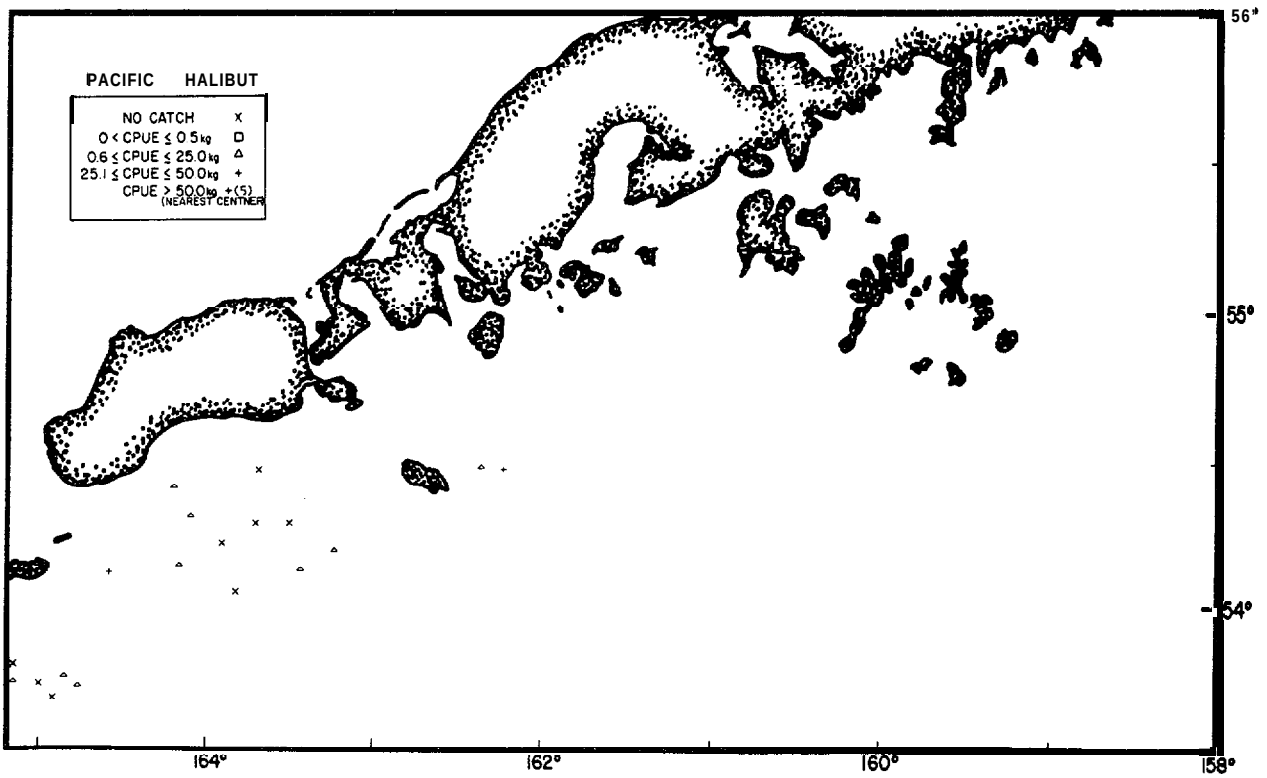


Figure XI-517.--Distribution of standardized catch rates in kilograms/hour of Pacific halibut in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Table XI-140.--Estimated biomass and population size of Pacific halibut (*Hippoglossus stenolepis*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10°)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	18.h	669.0	44.5	0.4	66.7	1.86	44.1
	101-200	5.1	835.9	55.6	0.2	33.3	4.56	65.4
	201-400	0	0	0	0	0	--	--
	All tones	6.6	1,504.9	3.5	0.6	3.3	2.77	--
Yakutat	1-100	37.5	2,321.2	59.8	0.9	75.0	2.61	54.5
	101-200	10.6	1.543.2	39.8	0.3	25.0	5.39	72.6
	201-400	0.2	14.3	0.4	4/	5/	2.49	--
	All zones	14.0	3,878.7	9.1	1.2	6.5	3.28	--
Prince William	1-100	25.8	2,854.5	60.8	2.0	80.0	1.44	47.1
	101-230	14.6	1,837.8	39.2	0.5	20.0	3.75	59.2
	201-400	0	0	0	0	0	--	--
	All zones	17.2	4,692.3	11.0	2.5	13.6	1.90	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	8.7	2,123.9	53.4	0.3	75.0	6.52	--
	201-400	18.5	1,854.8	46.6	0.1	25.0	18.48'	--
	All zones	11.6	3,978.7	9.4	0.4	2.2	9.34	--
Kodiak	1-100	52.6	7,535.3	82.8	1.5	60.0	5.17	--
	101-200	9.7	1,194.3	13.1	0.7	28.0	1.67	--
	201-400	6.7	374.3	4.1	0.3	12.0	1.34	--
	All zones	28.2	9.103.9	21.4	2.5	13.6	3.71	--
Shelikof	1-100	45.7	296.0	3.1	0.1	3.5	4.28	
	101-200	59.2	2,414.7	25.0	0.5	17.2	5.22	--
	201-400	66.7	6,957.2	72.0	2.3	79.3	2.99	--
	All zones	63.8	9,667.9	22.7	2.9	15.8	4.16	--
Chirikof	1-100	19.8	2,371.4	42.7	1.4	82.4	1.68	--
	101-200	0.5	88.6	1.6	0.1	5.9	1.74	--
	201-400	23.1	3,096.7	55.7	0.2	11.8	13.72	--
	All zones	12.6	5,556.7	13.1	1.7	9.2	3.29	--
Shumagin	1-100	--	--	--		--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--		--
	All zones	--	--	--	--	--	--	--
Sanak	1-100	14.5	2,607.9	63.0	5.5	83.3	0.48	--
	101-200	9.3	1,512.9	36.5	1.1	16.7	1.42	--
	201-400	1.5	18.9	0.5	4/	5/	4.54	--
	All zones	11.7	4,139.7	9.7	6.6	35.9	0.48	--
Total	I-100	28.4	18.655.3	43.9	11.8	64.1	1.58	--
	101-200	9.9	11.551.3	27.2	3.7	20.1	3.12	--
	201-400	23.1	12,316.2	29.0	2.9	15.8	4.25	--
	All zones	18.0	42,522.8	100.1	18.4	100.0	2.31	--

1/ Mean catch per unit effort, in kilogram per hour trawled.
2/ Where data are available.
3/ Less than 3.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.

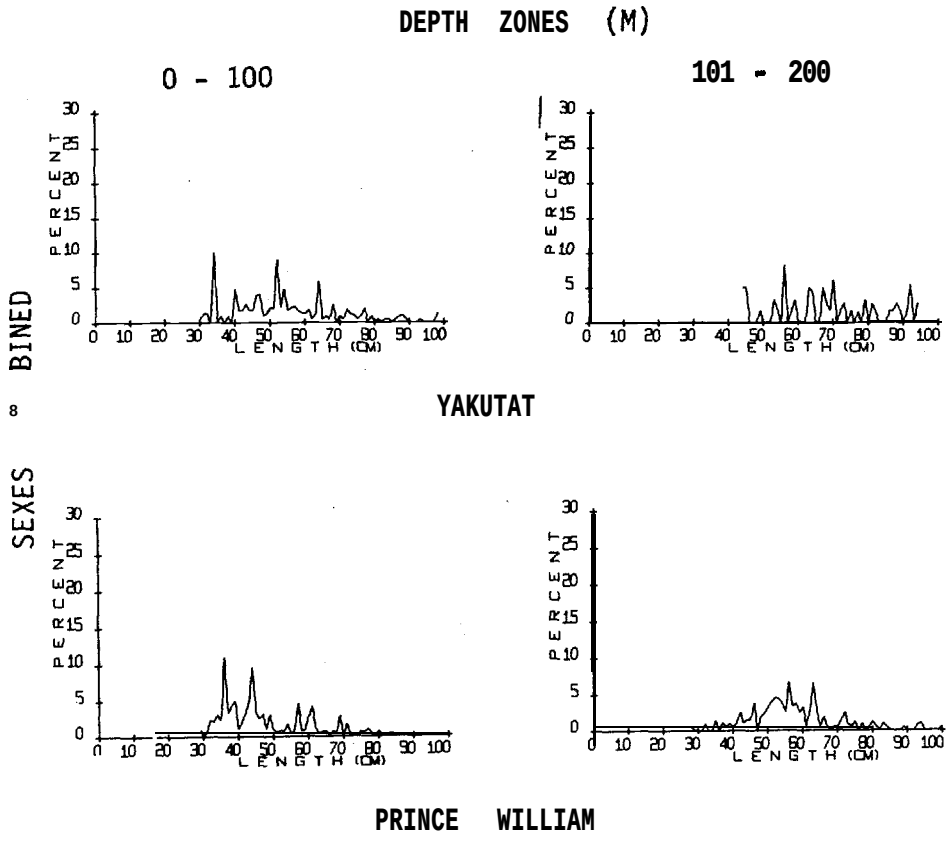


Figure **XI-518.—Length** frequency distributions of Pacific halibut in the Gulf of **Alaska** by region-depth zones, 1973-1976.

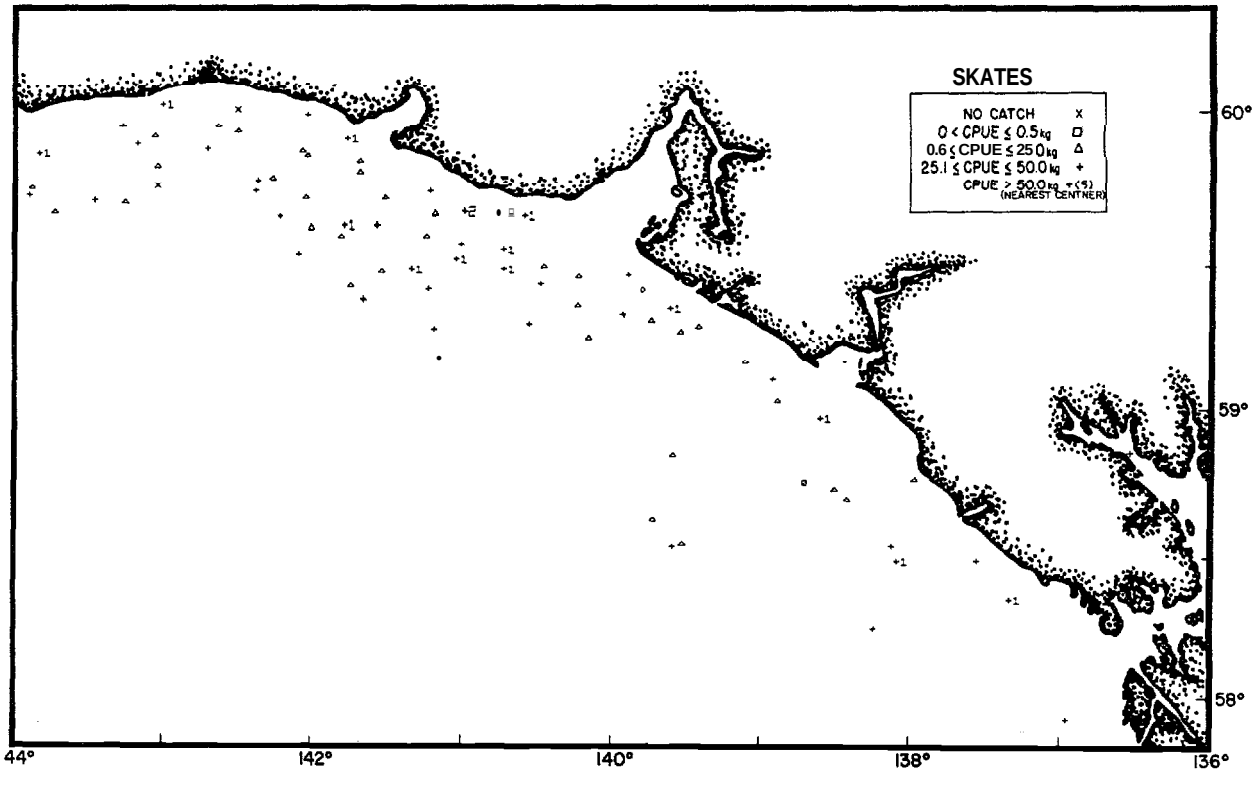


Figure X1-519. --Distribution of standardized catch rates in kilograms/. hour of skates in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

Table X1-141, --Mean lengths (cm) Pacific halibut by regions and depth zones (Cruises 751 and 762).

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fair-weather	--	--	--	--	--	--	--	--	--
Yakutat	--	--	54.5	--	--	72.6	--	--	--
Prince William	--	--	47.1	--	--	59.2	--	--	--
Kenai	--	--	--	--	--	--	--	--	--
Kodiak	--	--	--	--	--	--	--	--	--
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	--	--	--	--	--	--	--
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	--	--	--	--	--	--	--

Size composition-Length frequency data are available only from the Yakutat upper slope and Prince William outer shelf where mean lengths, sexes combined, were 26.1 and 34.0 cm respectively (Table XI-144 and Figure X1-528).

SABLEFISH

Distribution and abundance-While sablefish were taken at most depths throughout the survey area (Shelikof region excepted), highest concentrations occurred in the upper slope area of the eastern Gulf. The Yakutat-upper slope had the highest mean catch rate (51 kg/hr) followed by the upper slope of the Kodiak (19 kg/hr), Prince William (13 kg/hr) and Kenai (12 kg/hr) regions. The distribution of the standardized catch rates for the successful stations is presented in Figures X1-530-534.

Biomass--The apparent biomass of sablefish has been estimated at 10 thousand mt, of which 74% was contained in the upper slope, 24% in the outer shelf and 2% in the inner shelf (Table X1-145). The Yakutat region accounted for 37% of the sablefish biomass followed by Kenai (22%) and Kodiak (17%). Because the bathymetric range of this species, which extends to the lower slope, was not adequatly sampled, the biomass estimates should be considered minimal.

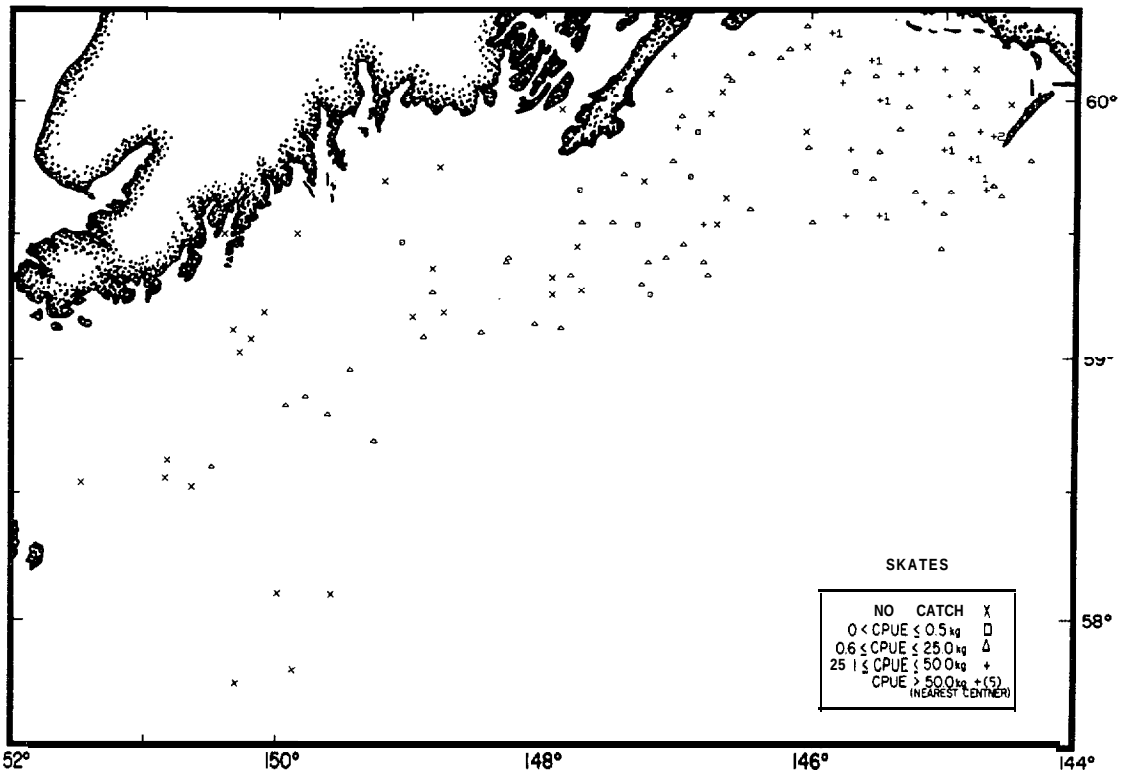


Figure x1-520. --Distribution of standardized catch rates in kilograms/ hour of skates in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

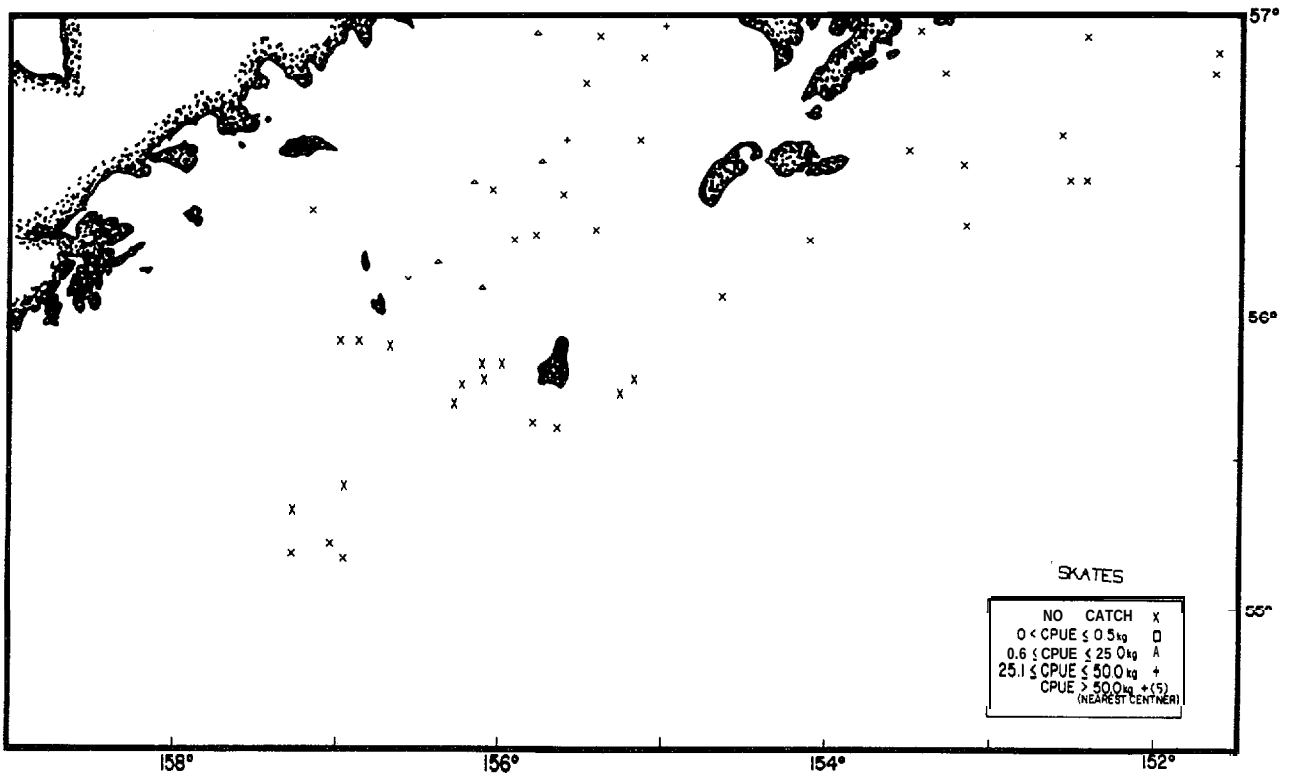


Figure XI-521 .--Distribution of standardized catch rates in kilograms/ hour of skates in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

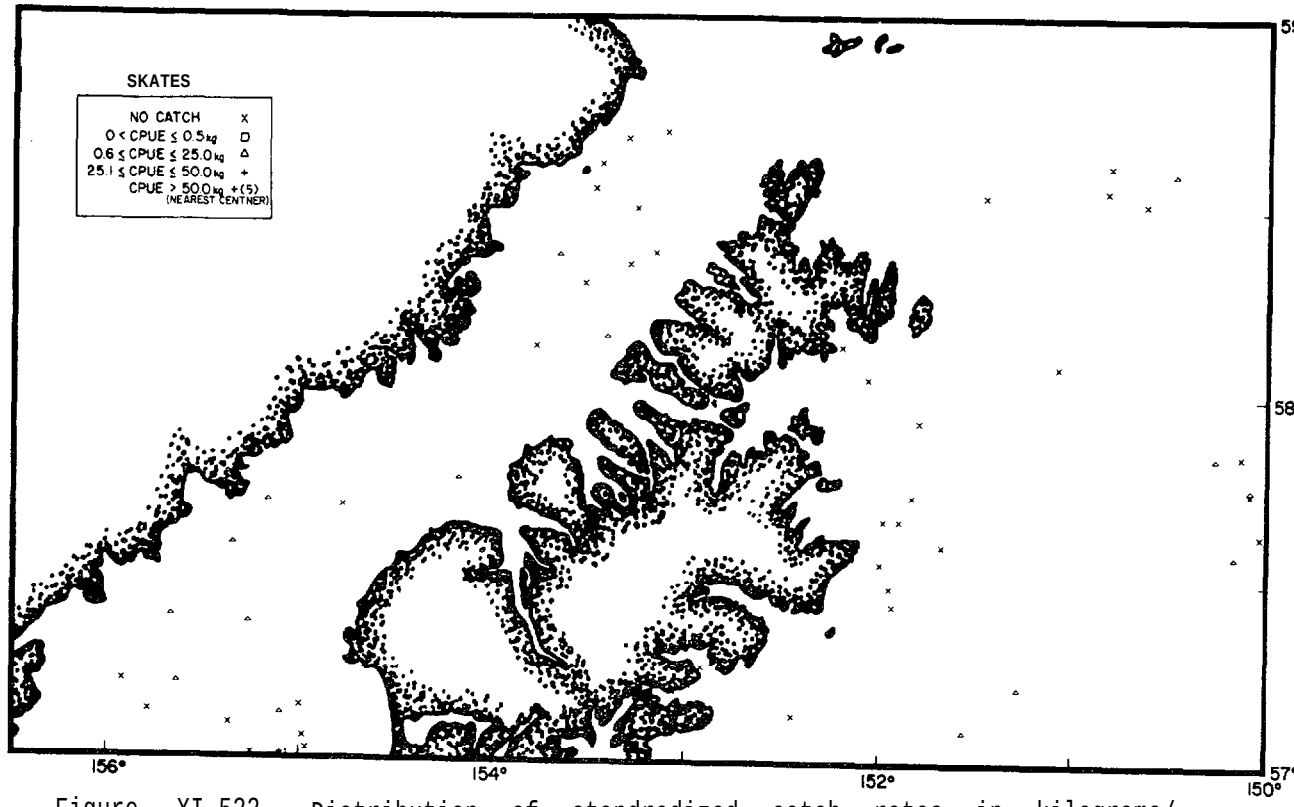


Figure XI-522.--Distribution of standradized catch rates in kilograms/hour of skates in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

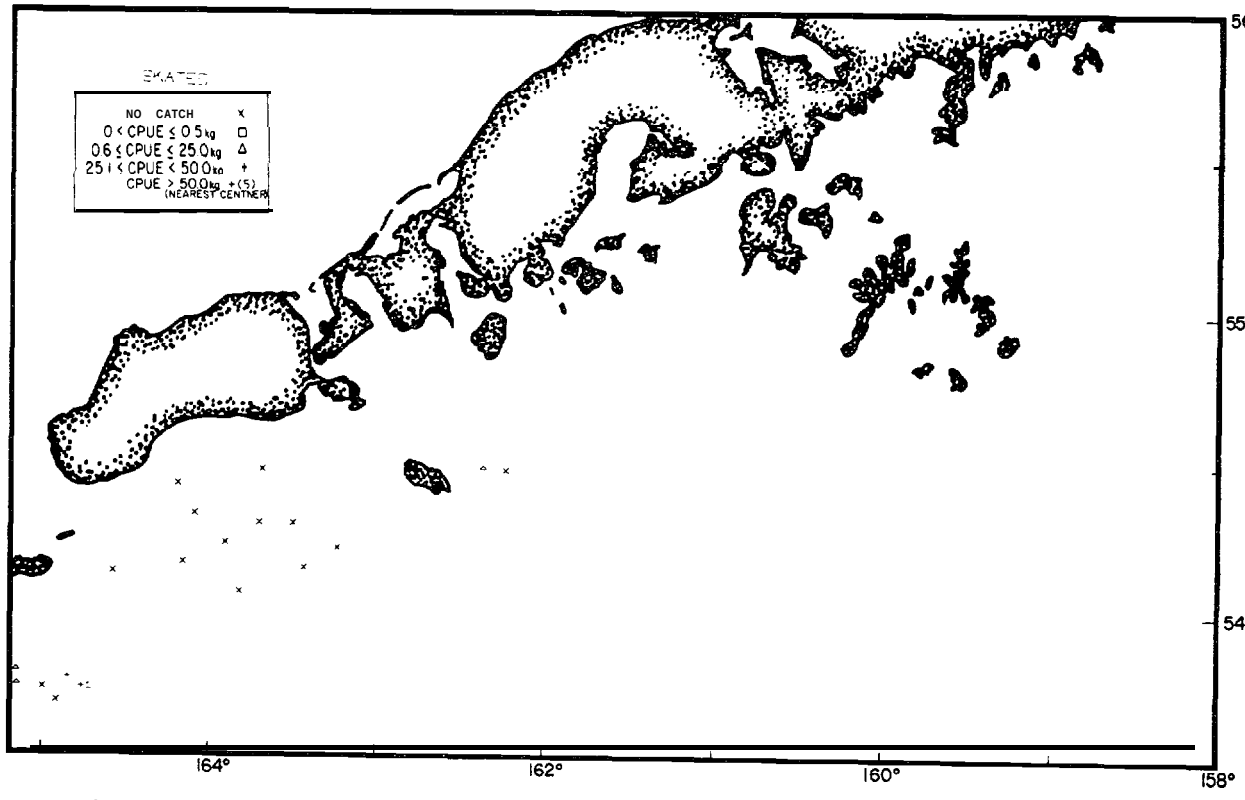


Figure XI-523.--Distribution of standardized catch rates in kilograms/hour of skates in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

Table X1-142.--Estimated biomass and population size of skates in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated population (X 10^6)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	l-100	12.7	456.9	7.6	0.3	9.4	1.81	--
	101-200	30.5	4,969.0	82.7	2.3	71.9	2.16	--
	201-400	19.3	579.5	9.7	0.6	18.8	1.01	--
	All zones	26.2	6.005.4	21.9	3.2	--	1.92	--
Yakutat	l-100	42.6	2,642.1	30.61	1.4	29.2	1.94	--
	101-200	22.5	3,286.9	38.1	2.1	43.8	1.53	--
	201-400	39.4	2,701.9	31.3	1.3	27.1	2.00	--
	All zones	31.2	8,630.9	31.4	4.8	--	1.78	--
Prince William	l-100	35.4	3.872.3	59.3	0.7	41.2	5.92	--
	101-200	16.6	2,033.6	31.11	0.7	41.2	2.93	--
	201-400	17.8	630.0	9.6	0.3	17.7	2.40	--
	All zones	24.4	6,535.9	23.8	1.7	--	4.06	--
Kenai	l-100	--	--	--	--	--	--	--
	101-200	1.2	290.8	47.3	0.3	42.9	1.00	--
	201-400	3.2	324.3	52.7	0.4	57.1	0.92	--
	All zones	1.8	615.1	2.2	0.7	--	0.96	
Kodiak	l-100	0	0	0	0	0	--	
	101-200	1.5	179.2	95.4	--	--	--	--
	201-400	0.2	8.6	4.6	--	--	--	
	All zones	0.6	187.8	0.7	--	--	--	--
Shelikof	l-100	0	0	0	0	0	--	--
	101-200	0.5	20.6	2.9	4/	5/	2.27	--
	201-400	6.7	702.5	97.2	0.5	100.0	1.47	
	All zones	4.7	723.1	2.6	0.5	--	1.49	
Chirikof	l-100	0	0	0	0	0	--	--
	101-200	1.7	269.7	20.4	4/	5/	15.88	--
	201-400	7.8	1,049.3	79.6	0.2	100.0	5.31	--
	All zones	1.2	1,319.0	4 . 8	0.2	--	6.15	--
Shumagin	l-100		--		--	--	--	
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	0	0	0	0	0	--	--
	101-200	19.9	3,247.9	94.2	1.9	95.0	1.71	--
	201-400	15.9	198.4	5.8	0.1	5.0	1.98	--
	All zones	9 . 7	3.446.3	12.6	2.0	cc	1.72	--
Total	l-100	10.5	6,971.3	25.4	--	--	--	--
	101-200	12.3	14,297.7	52.1	--	--	--	--
	201-400	11.5	6,194.5	22.5	--	--	c-	--
	All zones	11.2	27.463.5	100.0	--	--	--	

1/ Mean catch per unit effort, in kilograms per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 10^6 individuals.
5/ Less than 0.1 percent.

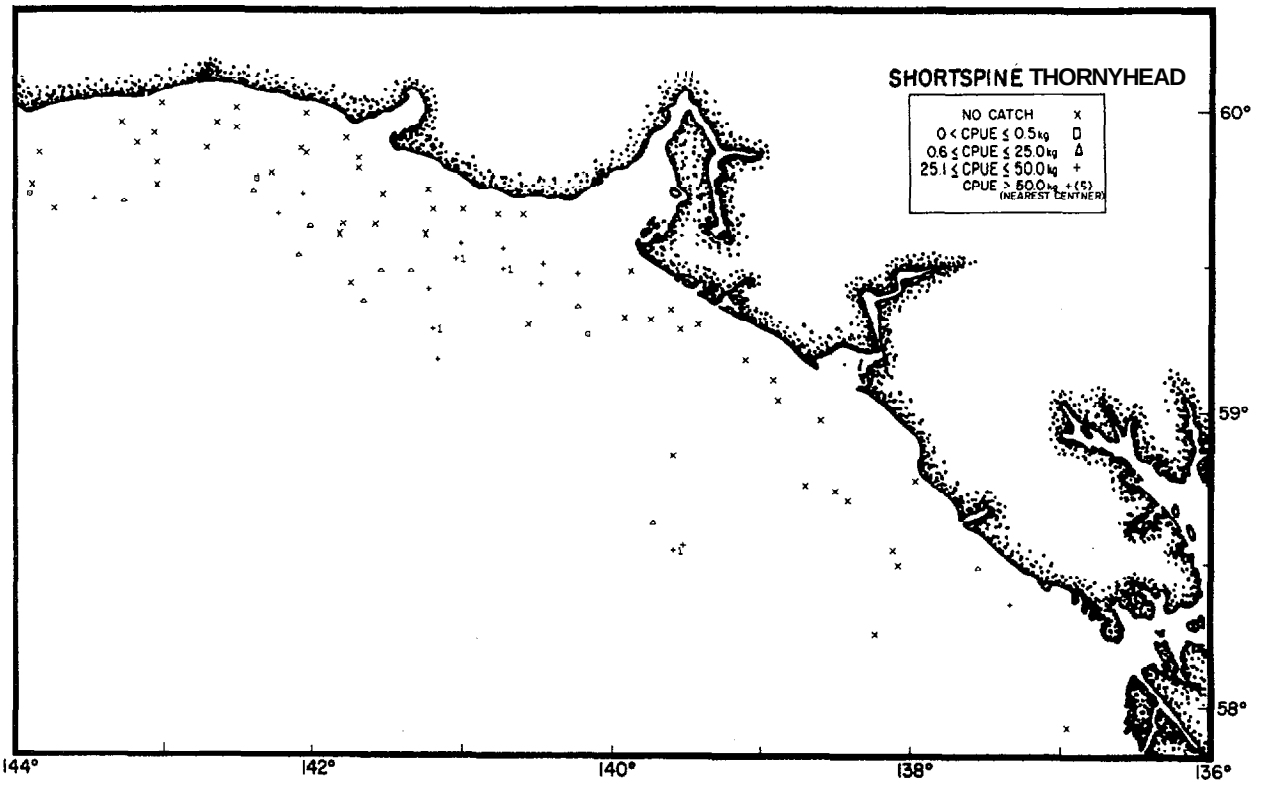


Figure XI-524.--Distribution of standardized catch rates in kilograms/hour of shortspine thornyhead in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

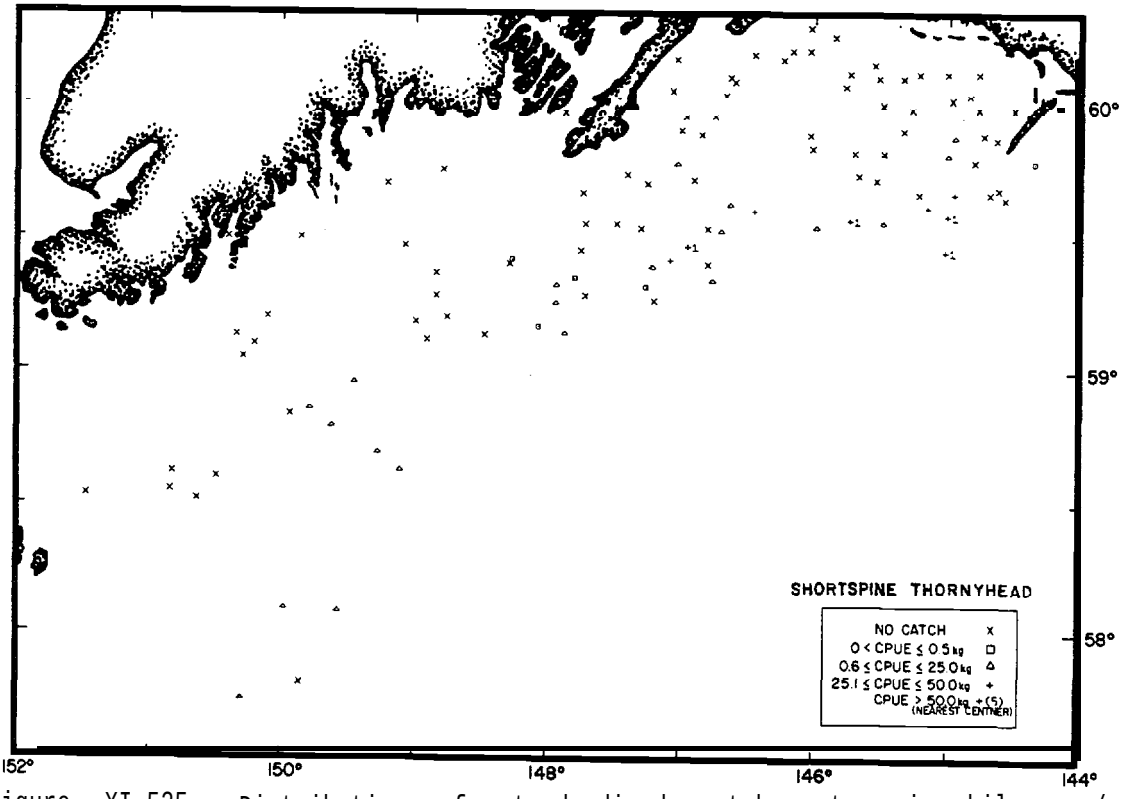


Figure XI-525.--Distribution of standardized catch rates in kilograms/hour of shortspine thornyhead In the eastern Gulf of Alaska,. May-Aug. 1975 (Cruises 751 and 753).

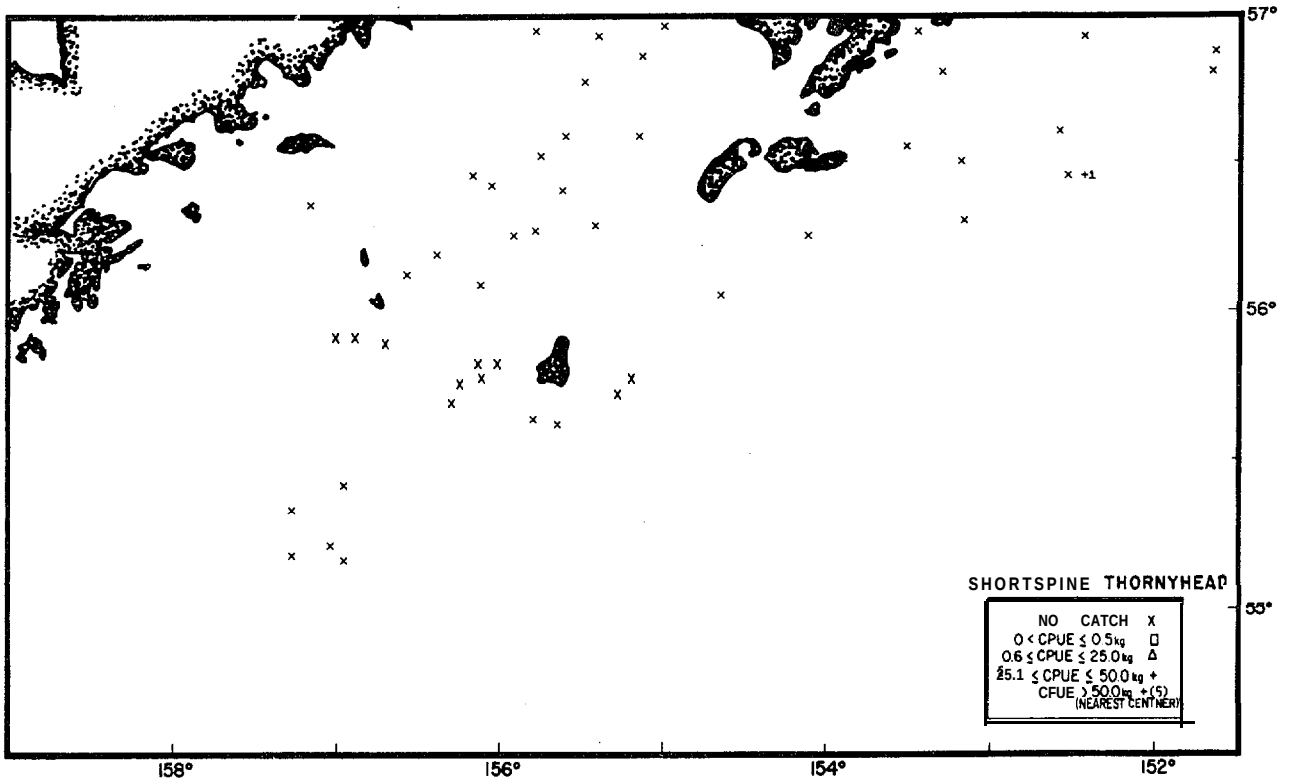


Figure X1-526. --Distribution of standardized catch rates in kilograms/hour of shortspine thornyhead in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

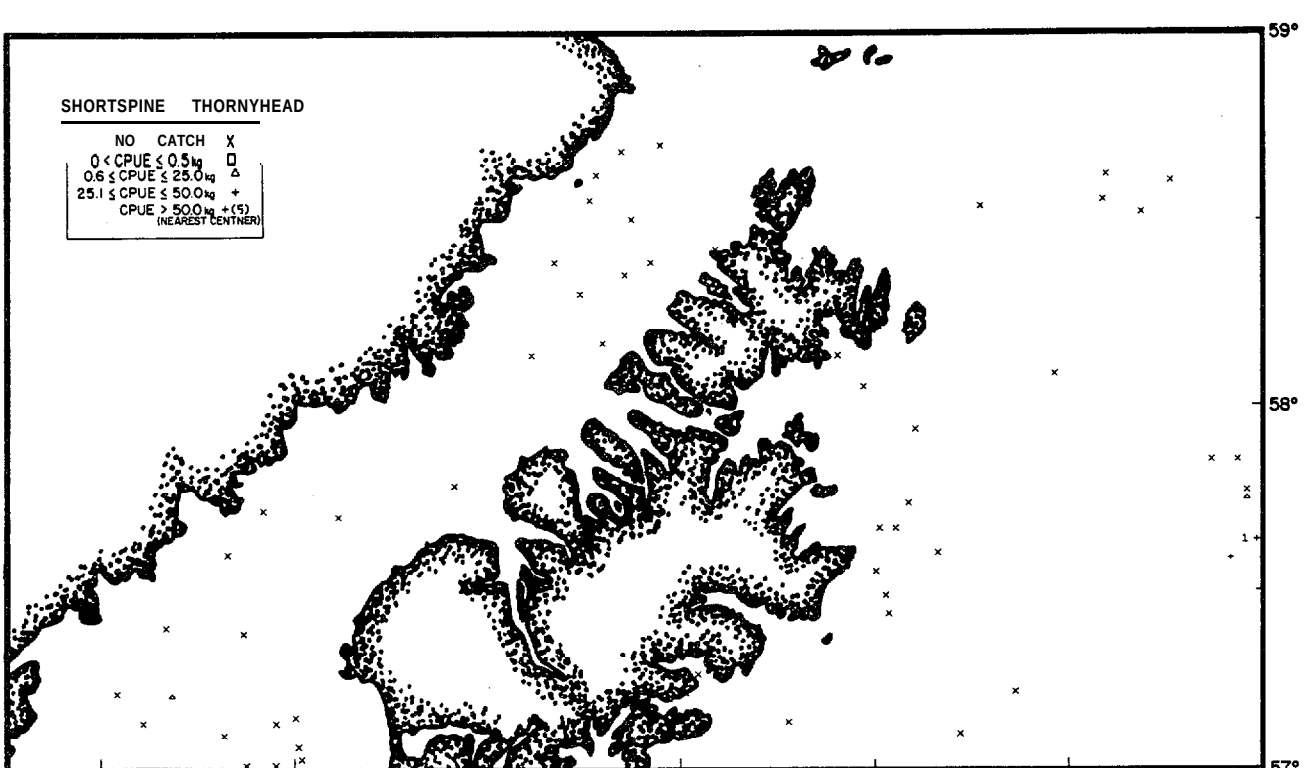


Figure X1-527. --Distribution of standardized catch rates in kilograms/hour of shortsplne thornyhead in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug. 1975 (Cruises 733, 734, and 753).

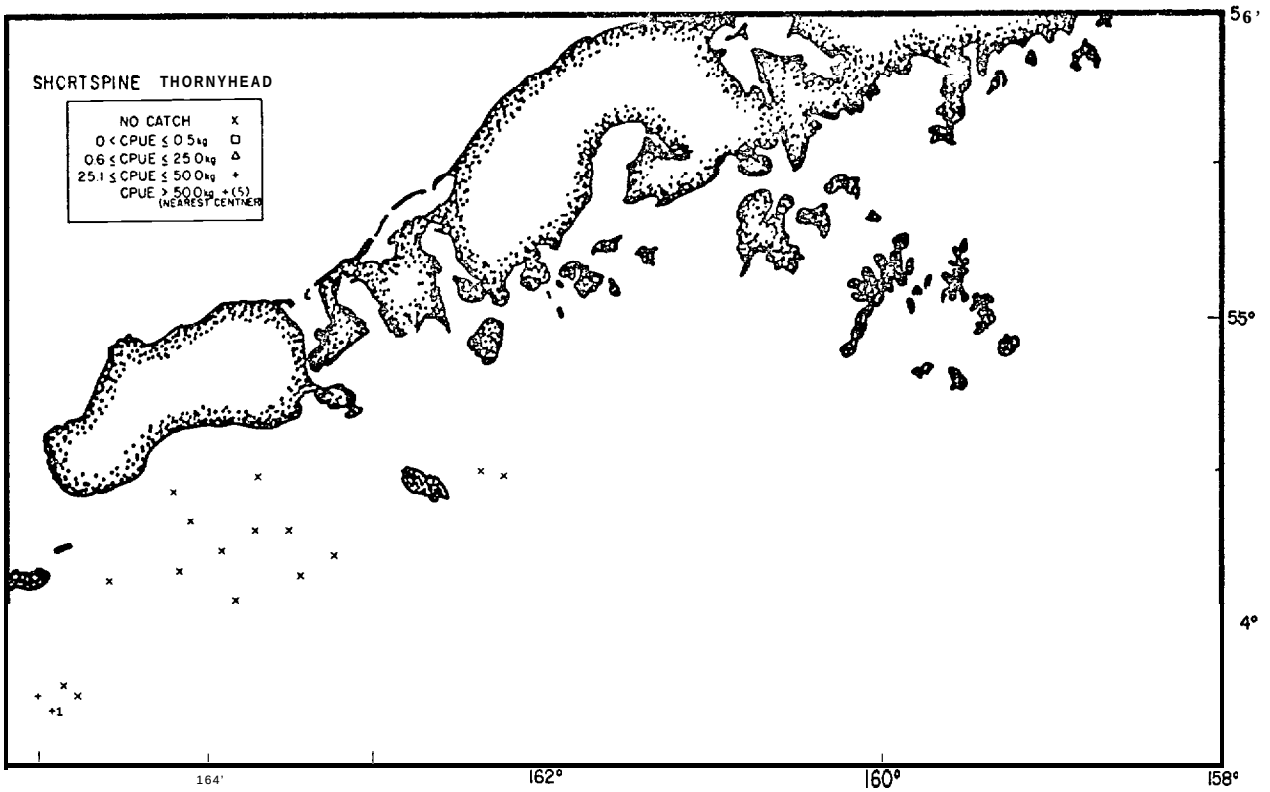


Figure X1-528.--Distribution of standardized catch rates in kilograms/hour of shortspine thornyhead in the western Gulf of Alaska, Jul.-Aug. 1974 (Cruise 744).

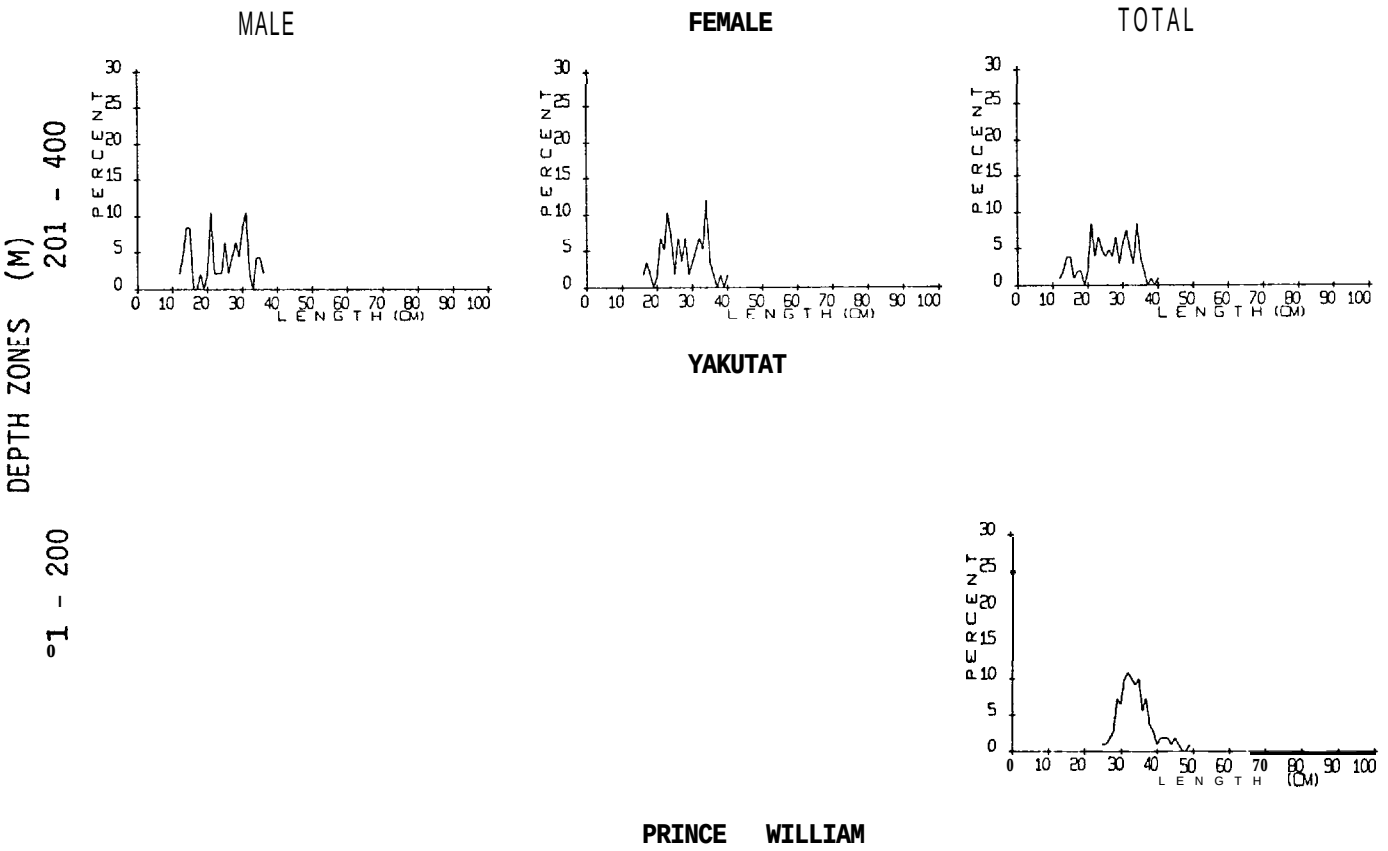


Figure X1-529.--Length frequency distributions of shortspine thornyhead in the Gulf of Alaska by region-depth zones, 1973-1976.

Table XI-143.--Estimated biomass and population size of shortspine thornyhead (*Sebastolobus alascanus*) in the Gulf of Alaska during April-October 1973-76.

Region	Depth zone (m)	CPUE 1/ (kg/hr)	Estimated biomass (mt)	Proportion of total estimated biomass	Estimated popular jon (X 10⁶)	Proportion of total estimated population	Mean size per individual 2/ Weight (kg)	Length (cm)
Fairweather	1-100	0	0	0	0	0	--	--
	101-200	2.4	397.1	17.5	0.4	5.2	0.91	--
	201-400	62.1	1.867.9	82.5	7.3	94.8	0.26	--
	All zones	9.9	2,265.0	19.0	7.7	--	0.29	--
Yakutat	I-100	3/	1.2	5/	4/	5/	0.16	--
	101-200	3.6	528.6	13.9	2.1	15.6	0.25	--
	201-400	47.6	3,268.7	86.1	11.4	04.4	0.29	26.1
	All zones	x - 7	3.798.5	41.6	13.5	--	0.28	--
Prince William	I-100	2.9	324.5	15.4	1.6	22.5	0.20	--
	101-200	5.4	677.1	32.1	1.6	22.5	0.42	34.0
	201-400	30.4	1,107.9	52.5	3.9	54.9	0.29	--
	All zones	7 . 7	2,190.5	17.7	7.1	--	0.30	--
Kenai	1-100	--	--	--	--	--	--	--
	101-200	1.1	275.8	53.6	1.0	41.7	0.28	--
	201-400	2.4	239.0	46.4	1.4	58.3	0.16	--
	All zones	1.5	514.8	4.3	2 . 4	--	0.21	--
Kodiak	l-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	19.4	1,082.4	100.0	--	--	--	--
	All zones	3.4	1,082.4	9.1	--	--	--	--
Shelikof	i-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	0	0	0	0	0	--	--
	All zones	0	0	0	0	0		--
Chirikof	l-100	0	0	0	0	0	--	--
	101-200	0	0	0	0	0	--	--
	201-400	3/	6.4	100.0	--	--	0.45	--
	All zones	3/	6 . 4	0.1	--	--	0.45	--
Shumagin	l-100	--	--	--	--	--	--	--
	101-200	--	--	--	--	--	--	--
	201-400	--	--	--	--	--	--	--
	All zones	--	--	--	--	--	--	--
Sanak	l-100	0	0	0	0	0	--	--
	101-200	0		0	0	0		--
	201-400	77.4	967.40	100.0	--	--	--	--
	All zones	2.7	967.4	8.1	--	--	--	--
Total	l-100	0.5	325.7	3.0	--	--	--	--
	101-200	1.1	1,878.6	17.5	--	--	--	--
	201-400	17.8	8,539.7	79.5	--	--	--	--
	All zones	4 . 3	10,744.0	100.0	--	--	--	--

1/ Mean catch per unit effort, in kilogram per hour trawled.
2/ Where data are available.
3/ Less than 0.1 kg/hr.
4/ Less than 0.1 X 106 individuals.
5/ Less than 0.1 percent.

Table XI-144.--Mean lengths (cm) of shortspine thornyhead by regions and depth zones (Cruise 751)

	0-100 m			101-200 m			201-400 m		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Fairweather	--	--	--	--	--	--	--	--	--
Yakutat	--	--	--	--	--	--	24.3	27.5	26.1
Prince William	--	--	--	--	--	34.0	--	--	--
Kenai	--	--	--	--	--	--	--	--	--
Kodiak	--	--	a-	--	--	--	--	--	--
Shelikof	--	--	--	--	--	--	--	--	--
Chirikof	--	--	--	--	--	--	--	--	--
Shumagin	--	--	--	--	--	--	--	--	--
Sanak	--	--	--	--	--	--	--	--	--

Size composition-Sablefish were often measured, tagged, and released alive so that the portion measured by sex groups was relatively small. Length data are available from the Yakutat and Prince William regions where sablefish ranged from 48.5-60.1 cm (Table XI-146 and Figure X1-535).

PACIFIC OCEAN PERCH

Distribution and abundance-Pacific ocean perch appeared in each region where sampling occurred but were generally restricted to the outer shelf and upper slope depth zones. Mean catch rates varied little between regions (2-8 kg/hr) with highest relative abundance occurring in Chirikof and Shelikof and lowest in the Fairweather and Sanak regions. By depth zones, apparent relative abundance was highest in the outer shelf (6 kg/hr) followed by the upper slope and inner shelf (Figures X1-536-537). The distribution of the standardized catch rates for the successful stations is presented in Figures X1-538-542.

Biomass--The apparent biomass of Pacific ocean perch has been estimated at 9 thousand mt, of which 78% was contained on the outer shelf and 22% on the upper slope (Table X1-147). The Chirikof region made the largest contribution to the total biomass (34%) while the remaining regions accounted for 2-16% of the balance. The biomass estimates should be considered minimal as this species is semi-pelagic and is known to be abundant in hard-rocky areas which could not be adequately sampled with the trawl gear utilized in these surveys.

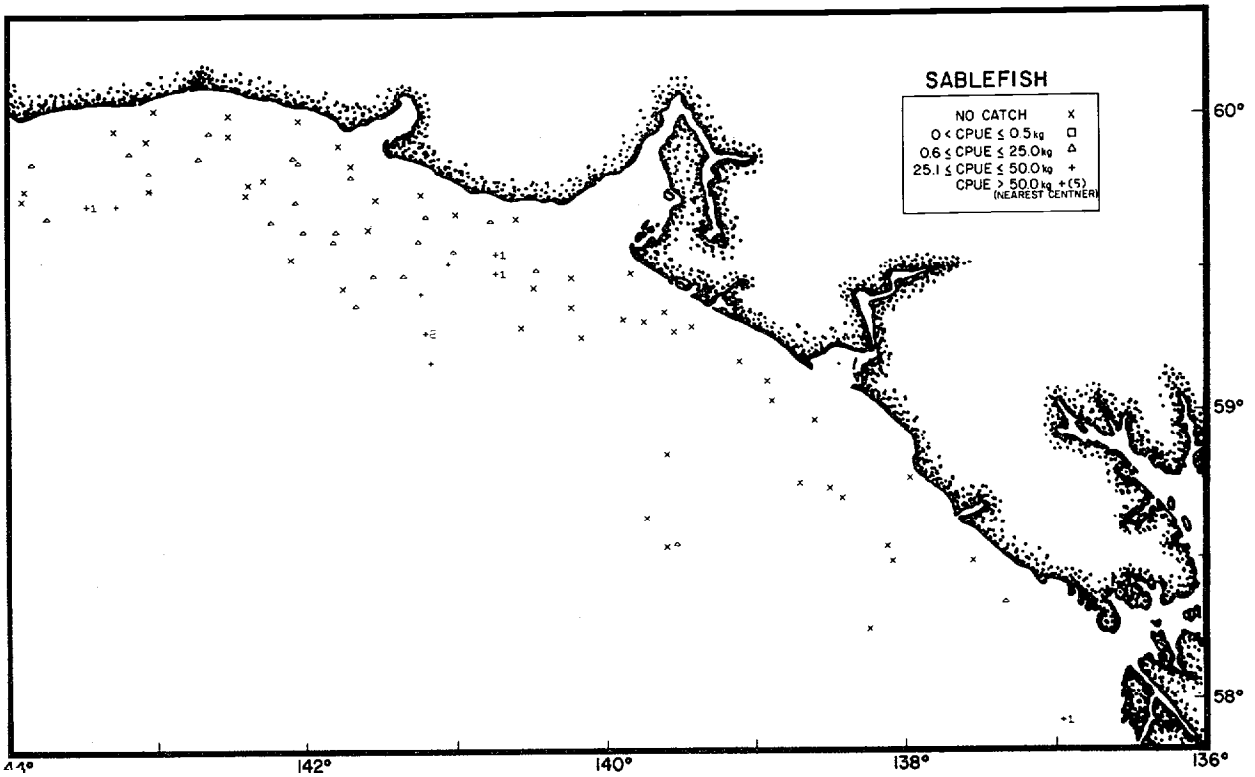


Figure X1-530.--Distribution of standardized catch rates in kilograms/hour of sablefish in the eastern Gulf of Alaska, May-Aug. 1975 and Apr. 1976 (Cruises 751 and 762).

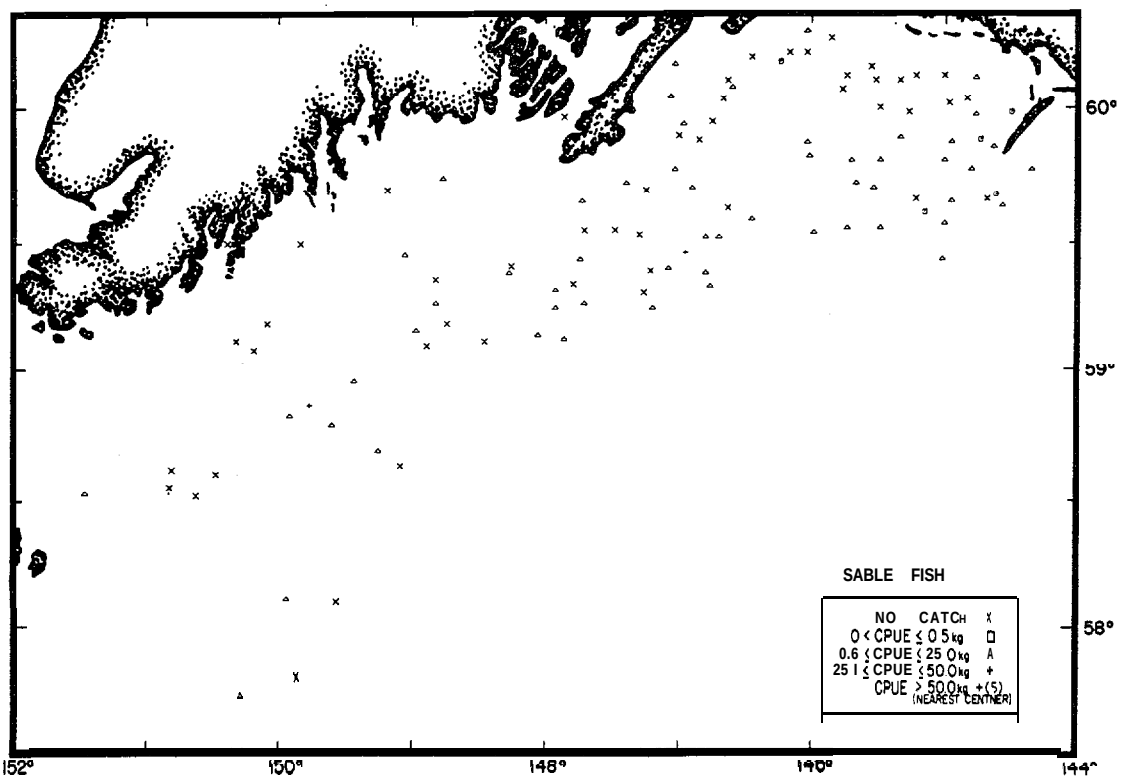


Figure X1-531.--Distribution of standardized catch rates in kilograms/hour of sablefish in the eastern Gulf of Alaska, May-Aug. 1975 (Cruises 751 and 753).

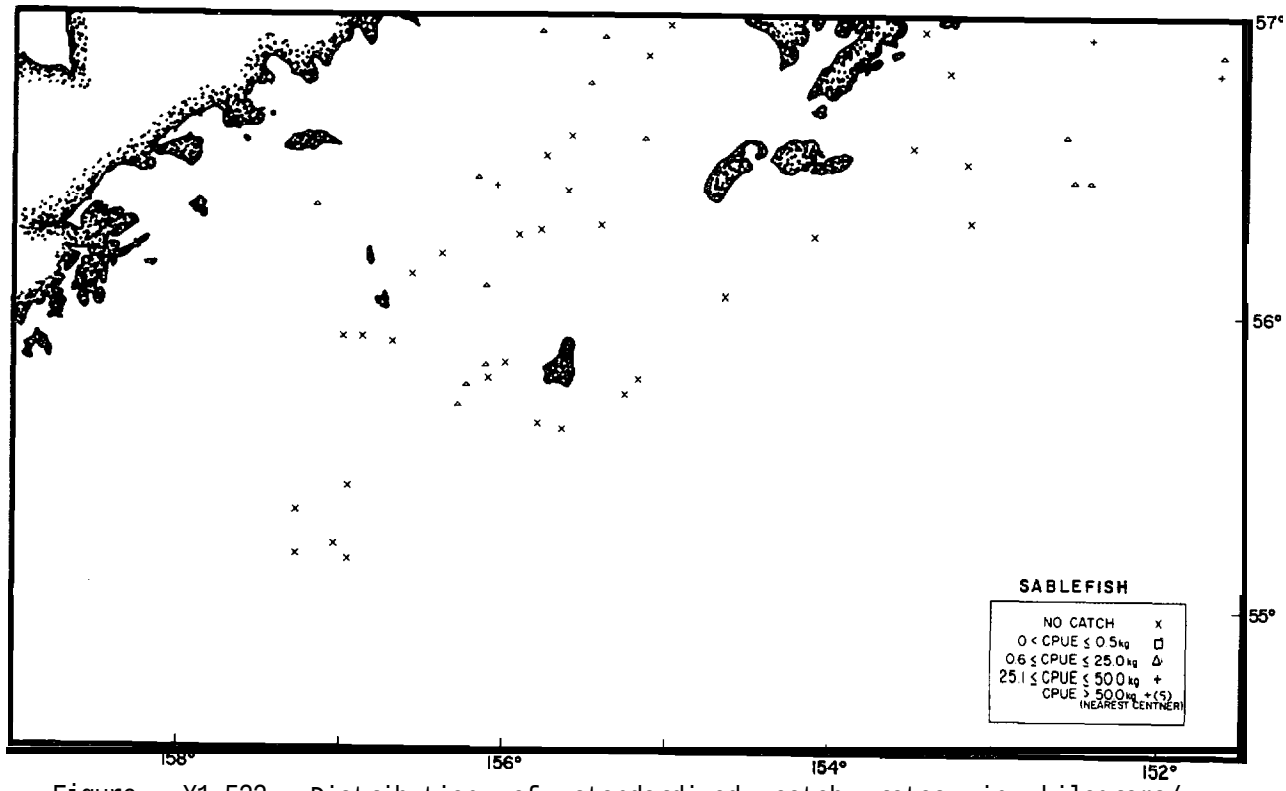


Figure X1-532.--Distribution of standardized catch rates in kilograms/ hour of sablefish in the western Gulf of Alaska, Aug.-Oct. 1973 and Jun.-Aug. 1975 (Cruises 734 and 753).

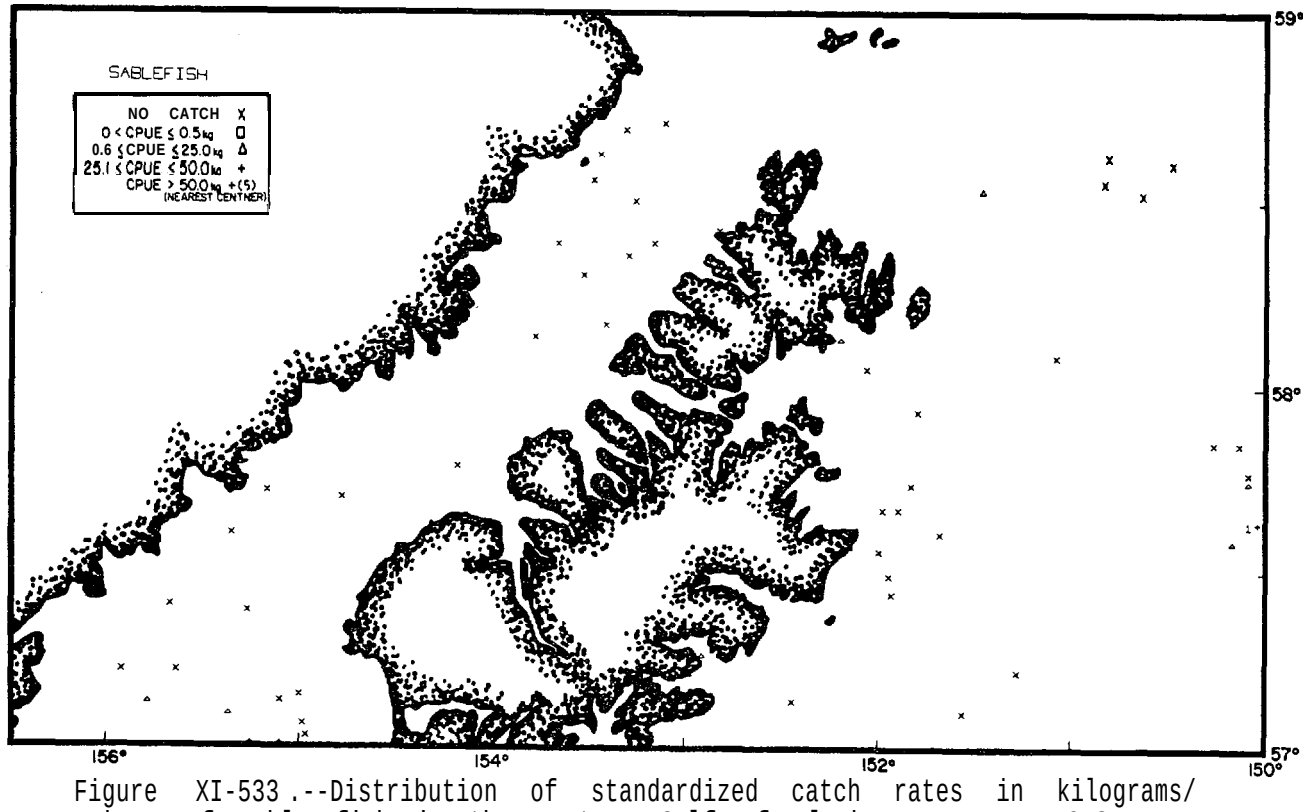


Figure XI-533.--Distribution of standardized catch rates in kilograms/ hour of sable fish in the western Gulf of Alaska, May-Jun. 1973, Aug.-Oct. 1973, and Jun.-Aug 1975 (Cruises 733, 734, and 753).