



**Northwest and
Alaska
Fisheries Center**

**National Marine
Fisheries Service**

U.S. DEPARTMENT OF COMMERCE

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**Groundfish Surveys Conducted
by the
Northwest and Alaska
Fisheries Center
in 1983**

April 1984

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Northwest and Alaska Fisheries Center in 1983

Summarized

by

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INTRODUCTION

The Resource Assessment and Conservation Engineering (RACE) Division of the Northwest and Alaska Fisheries Center (NWAFC) conducted 12 resource assessment surveys during 1983. The primary objectives of these surveys were to assess the current biological condition of important crab and groundfish species for management purposes and to conduct special scientific studies. Over 1,500 sampling sites were utilized from off southern California to St. Matthew Island in the Bering Sea (Fig. 1).

Descriptions of each survey including purpose, area, vessels used, timing, and sampling information are summarized by geographical area for the Bering Sea-Aleutian Islands region, Gulf of Alaska, and the west coast of Canada and the United States in Tables 1-3. Additional survey information is presented under these regional headings.

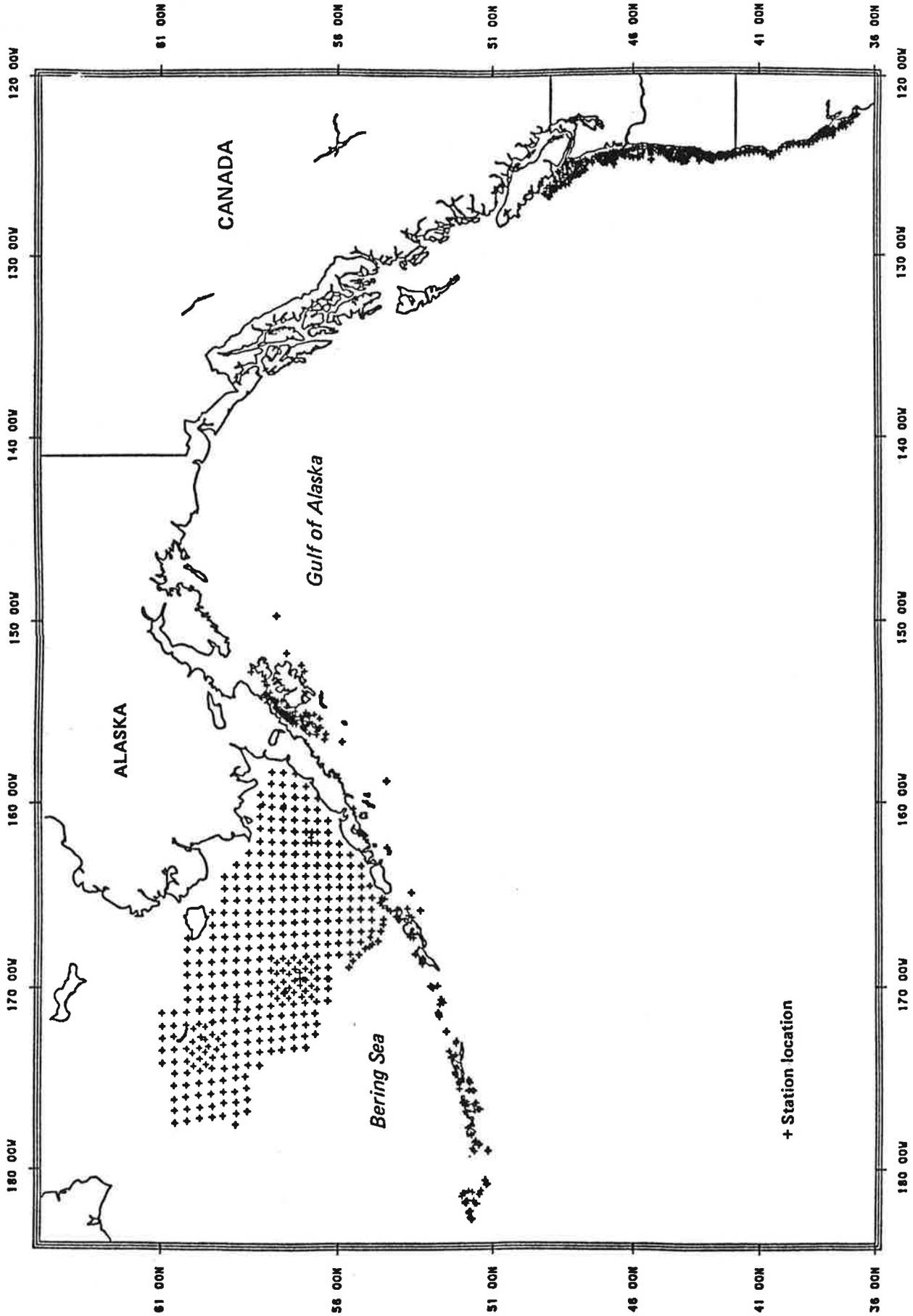


Figure 1. Distribution of sampling effort by major Northwest and Alaska Fisheries Center surveys during 1983.

Table 1. Groundfish research surveys conducted by the Northwest and Alaska Fisheries Service in the Bering Sea/Aleutian Islands region in 1983.

Survey	Primary purpose	Area	Vessels	Survey period	Sampling information		
					Sampling design	Gear types	Total hauls
A. Eastern Bering Sea winter crab-groundfish survey	Special study of distribution and biology of crab-groundfish populations in winter	Outer Bristol Bay, Pribilof Islands, and Unimak Pass area	<u>Miller Freeman*</u>	Feb. 10-28	Standard 37 x 37 km grid and trawl, CSTD, XBT opportunist	83-112 eastern trawl, CSTD, XBT	62
B. Eastern Bering Sea crab-groundfish survey	Continuing annual survey to assess condition of crab-groundfish for scientific and management purposes	Eastern Bering Sea continental shelf waters from Unimak Pass to St. Matthew Is.	<u>Chapman*</u> <u>Alaska**</u>	June 3-Aug. 13 June 3-Aug. 13	Standard 37 x 37 km grid	83-112 eastern trawl, CSTD, XBT	380
C. Aleutian Islands crab-groundfish survey	Second survey since 1980 to assess current condition of fisheries resources	Along Aleutian Islands chain from 170° E to 165° W	<u>Miller Freeman*</u> <u>Chapman*</u>	July 18-Aug. 16 Aug. 16-Sept. 15	Stratified random 50-900 m	90/105' Noreastern trawl, XBT	162

* NOAA vessel

** Chartered vessel

CSTD = conductivity-salinity-temperature-depth

XBT = expendable bathythermograms

Table 2. Groundfish research surveys conducted by the Northwest and Alaska Fisheries Center in the Gulf of Alaska during 1983.

Survey	Primary purpose	Area	Vessels	Survey period	Sampling information		
					Sampling design	Gear types	Total hauls
A. Shelikof Strait bottom trawl survey	Special study of demersal component of spawning pollock aggregations	Shelikof Strait between approximately 56°30' N to 58°30' N	<u>Chapman*</u>	Mar. 3-20	Random; based on 9 x 9 km grid	83-112 eastern trawl, XBT	52
B. Shelikof Strait and western Gulf of Alaska echo integrator-mid-water trawl survey	Special pelagic study of spawning pollock	Shelikof Strait and waters from Unalaska Is. to Portlock Bank	<u>Miller Freeman*</u> <u>Chapman*</u>	Mar. 2-Apr. 14 Mar. 23-Apr. 10	Hydroacoustic tracklines spaced 19-28 km apart	Diamond-100 trawl, 83-112 eastern trawl, echo sounder/integrator system, XBT	59
C. Ichthyoplankton survey of pollock larvae	To collect data on walleye pollock and sablefish larval distribution	Dixon Entrance to Shumagin Islands	<u>Chapman*</u>	May 11-31	Grid sampling and opportunistic	Newton, bongo, and Tucker trawls, CTD, XBT	74
D. Project SeaSub	To observe fishing gear characteristics and collect biological specimens	Sitka	<u>Mermaid II**</u> <u>Aloha**</u>	July 24-Aug. 16	55-223 m	Hallbut longline and various accessory gear	52 dives
E. Comparative studies of bottom trawls	Special study to compare efficiencies of standard sampling trawls	Gulf of Alaska east of Kodiak Is.	<u>Miller Freeman*</u>	Sept. 26-Oct. 7	Randomly selected sites	83-112 eastern trawl, 90-105 Noreastern trawl	127

* NOAA vessels

** Chartered vessel

XBT = expendable bathythermograms

CTD = conductivity-temperature-depth

Table 3. Groundfish research surveys conducted by the Northwest and Alaska Fisheries Center along the Pacific West Coast during 1983.

Survey	Primary purpose	Area	Vessels	Survey period	Sampling information	
					Sampling design	Gear types
A. West coast survey	Triennial survey to assess current condition of groundfish resources	Coastal waters from British Columbia-California	<u>Nordfjord**</u> <u>Warrior II**</u>	July 7-Oct. 30	Stratified-Random 55-366 m	90/105' Noreastern, XBT 596
B. Echo integrator-midwater trawl survey	Pelagic survey of Pacific whiting and shortbelly rockfish in conjunction with West Coast survey	Washington-California	<u>Gold'N Sun**</u>	Aug. 4-Sept. 22	Tracklines approximately 9 km apart; sampling on target sign	Echo integrator-dual beam system, Norsnet trawl, Diamond trawl, XBT 38
C. Sablefish index survey	Continuing survey to obtain indices of sablefish abundance	Washington-Oregon	<u>John N Cobb*</u>	Oct. 12-Nov. 22	Established sites 275-823 m	Conical and rectangular sablefish traps 400 trap lifts
D. Ichthyoplankton-hydrography survey	Special survey to determine geographic distribution of eggs and larvae	Washington-Northern California	<u>Miller Freeman*</u>	Nov. 10-Dec. 3	Grid system	Bongo and neuston trawls, Shipke sampler, beam trawl, rock dredge, CTD, XBT 113

* NOAA vessel

** Chartered vessel

CTD = conductivity-temperature-depth

XBT = bathythermograph

BERING SEA-ALEUTIAN ISLANDS REGION

Three bottom trawl surveys to assess the biological condition of demersal fish and shellfish stocks were conducted in the eastern Bering Sea and Aleutian Islands area during 1983.

A. Eastern Bering Sea Winter Crab-groundfish Survey

The NOAA research vessel Miller Freeman conducted a winter trawl survey of crab-groundfish resources in the southeastern Bering Sea during February 10-28, 1983. The primary objective of this study was to collect catch and biological data on principal species of crab and groundfish. Secondary objectives were to: (1) assess the current reproductive status of the Bristol Bay red king crab, Paralithodes camtschatica, stock; (2) collect reproductive and other organs of various crab species for pathological and parasite studies; (3) tag Pacific halibut, Hippoglossus stenolepis; (4) collect stomach samples from Pacific cod, Gadus macrocephalus, and other species for food habit analysis; and (5) collect oceanographic data using conductivity-temperature-depth (CTD) equipment.

A total of 62 sampling sites were utilized (Fig. 2). Catch information, including species composition, weights and number by species, and other biological information collected on species of interest were recorded from each trawl haul. Approximately 3,400 fish were measured for size composition. Whole specimens, fish stomachs, and tissue samples of fish and crab were preserved for subsequent laboratory analysis. In addition, nearly 350 Pacific halibut were tagged for studies of movements, and a total of 47 CTD casts were completed.

The study area was restricted by pack ice which covered the major portion of the Bering Sea. Bottom temperatures were typically coldest (-1.5°C to 0°C) near the ice edge in the northern portion of outer Bristol Bay but

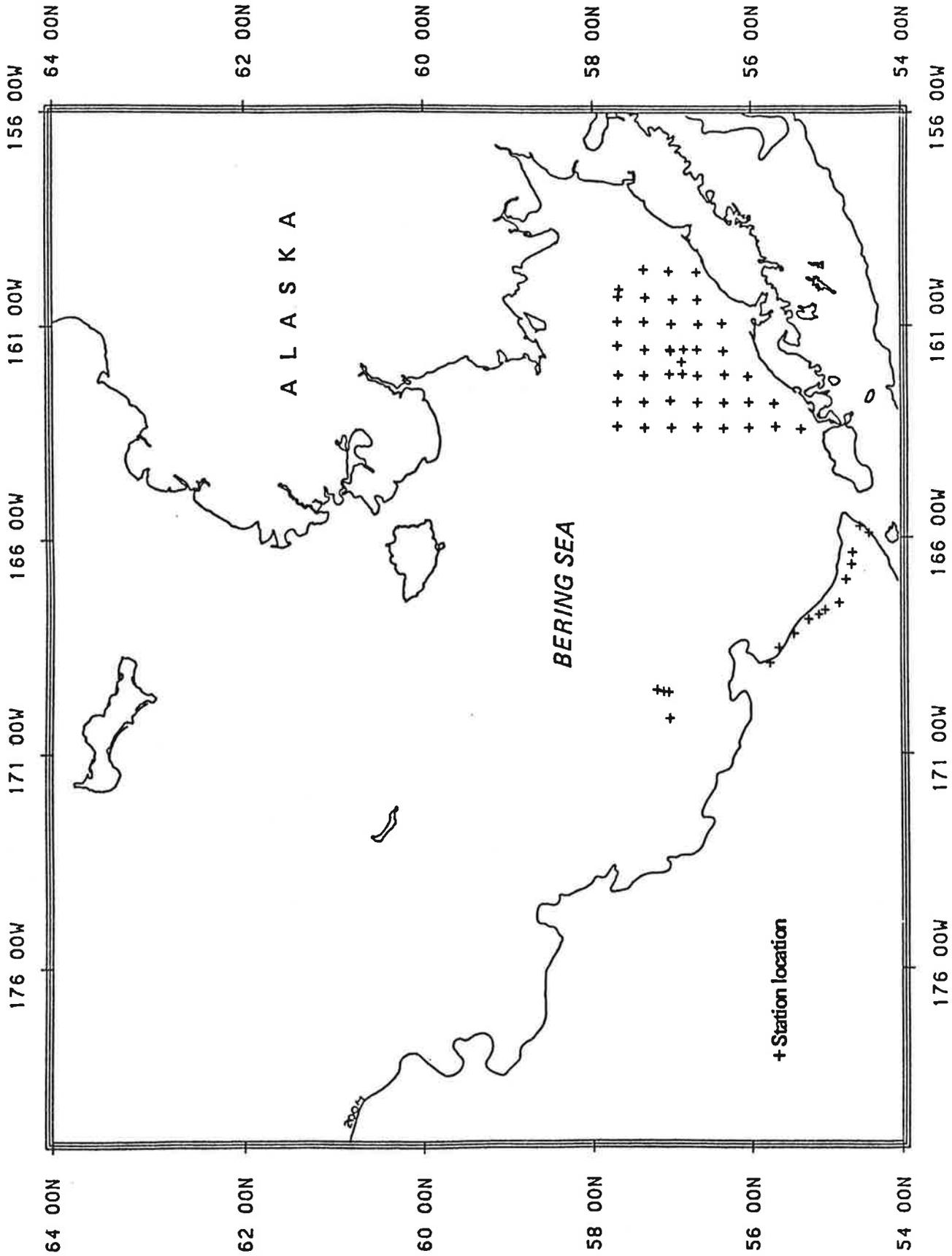


Figure 2. Distribution of stations sampled during the 1983 eastern Bering Sea winter crab-groundfish survey.

increased to about 2°C in the southwestern region of the study area. Catch rates generally increased with the increase in temperature although the highest catch rate (1,188 kg/ha trawled) was located in the central portion of outer Bristol Bay in relatively cold waters of 0° to 1°C.

Biological data, including size, tissue, and clutch samples, were collected from approximately 720 female red king crab of which about 42% were mature. Only about 5% of the females sampled in the mature size group were barren. No large concentrations of adult female red king crab (greater than 120 mm center length) were encountered. Biological data were also recorded for blue, Paralithodes platypus, and golden king, P. brevipes, crab from the Pribilof Islands area and continental slope.

Yellowfin sole, Limanda aspera, rock sole, Lepidopsetta bilineata, and Pacific cod were predominant species encountered throughout the survey area, comprising approximately 77% of the total fish catch. Walleye pollock, Theragra chalcogramma, and Pacific halibut were primarily restricted to warmer waters of the southwest region of the survey area where bottom temperatures approached 2°C.

B. Eastern Bering Sea Crab-Groundfish Survey

The eastern Bering Sea crab-groundfish survey was conducted from June 3 to August 13, 1983. The primary objectives of this survey were to assess the distribution, abundance, and current biological condition of commercially important fish and shellfish resources of the region. This was a continuation of the annual series of eastern Bering Sea crab-groundfish assessment surveys.

The survey was a cooperative U.S.-U.S.S.R. effort conducted by two U.S. vessels, the NOAA research vessel Chapman and chartered vessel Alaska, and the U.S.S.R. research vessel Milogradovo. The U.S. vessels sampled

continental shelf waters north from Unimak Pass, along the 200-meter depth contour to approximately 61°N, and east to the Alaska mainland. The Milogradovo generally sampled the same area as the U.S. vessels. Catch and haul data collected by U.S. and U.S.S.R. vessels in the overlapping sampling areas will be used to establish relative fishing powers between vessels for the standardization of a common data base.

The Chapman and Alaska conducted 359 demersal trawl hauls (Fig. 3). The two vessels sampled alternate rows of designated stations throughout most of the survey to examine differences in relative fishing powers of the two vessels through comparisons of catch rates.

Upon completion of the survey, the Chapman and Alaska conducted an additional 21 side-by-side comparative trawl hauls. The primary purpose of this experiment was to re-examine the effect of gear rigging modifications to the standard sampling net, the 83-112 eastern trawl, made during the previous 1982 eastern Bering Sea survey. These modifications appear to have improved the fishing efficiency of the 83-112 for bottom tending species such as flatfish and produced substantially higher catch rates for these species than the previously rigged trawls. However, these experiments were restricted by bad weather and the limited number of comparisons prevented meaningful results.

Seawater temperature profiles were collected at each standard station occupied by the Alaska using expendable bathythermograph (XBT) probes. Additional hydrographic data were collected aboard the Chapman with a conductivity-salinity-temperature-depth (CSTD) sonde-reader/recorder.

The catch at each survey station was sorted, weighed, and enumerated by species. Approximately 180,000 length measurements were taken by sex/centimeter categories from the major fish species encountered and nearly 6,000 age

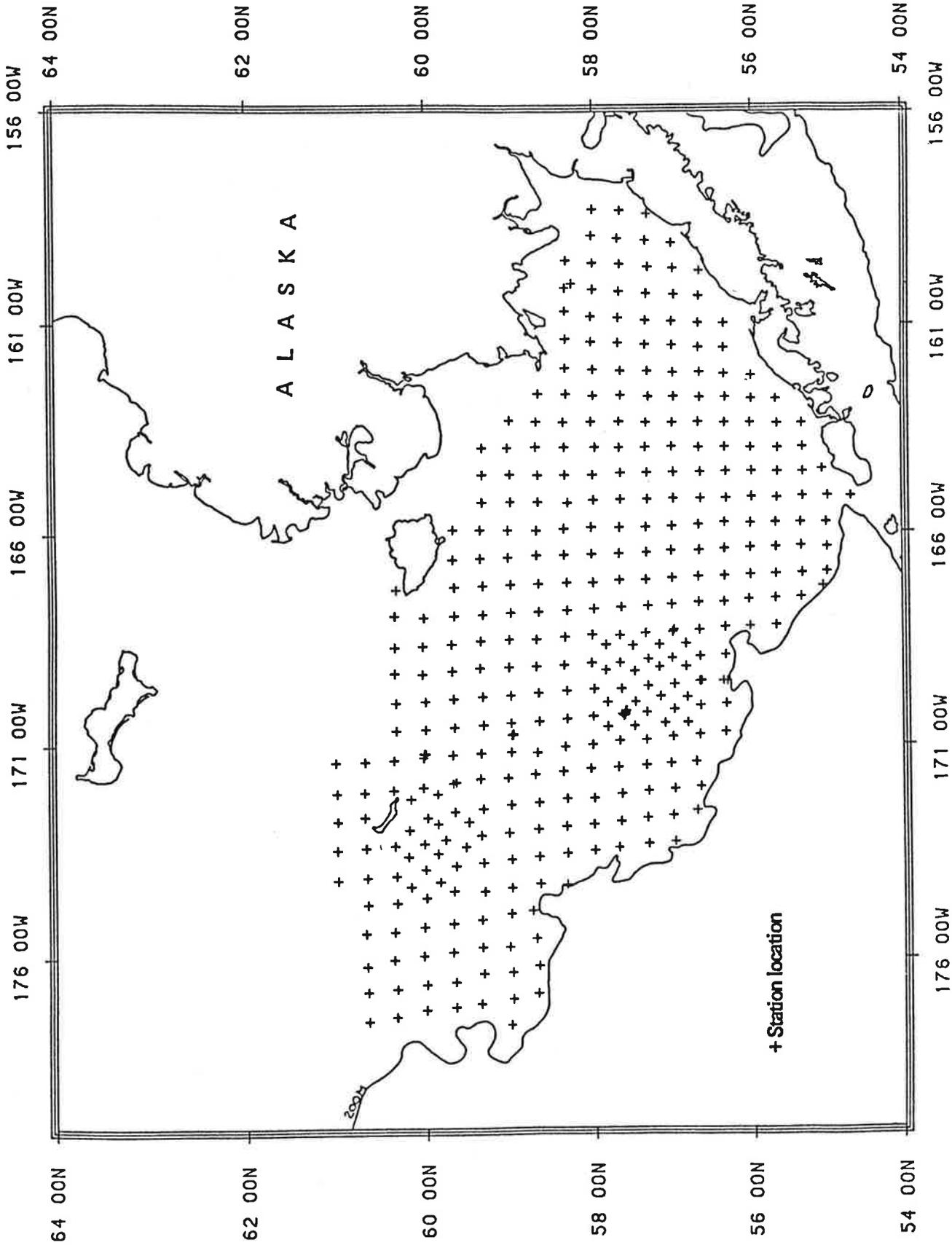


Figure 3. Distribution of stations sampled during the 1983 eastern Bering Sea crab-groundfish survey.

structure samples were collected. Length/width measurements, shell condition, clutch size, and egg condition were recorded from selected crab species. As during previous surveys, walleye pollock (133.0 kg/ha trawled), yellowfin sole (86.5 kg/ha), and Pacific cod (24.8 kg/ha) were the most abundant fish species encountered.

The biomass for all fish species combined was estimated at about 13.9 million t in 1983. Biomass estimates for the major fish taxa taken during the 1983 survey are summarized in Table 4. Estimates of apparent biomass from comparable areas surveyed in 1975 and 1979-82 are also shown for comparative purposes.

Biomass has generally increased for the gadids and pleuronectids since 1975, with the exception of Greenland turbot, Reinhardtius hippoglossoides. The significant increase in flatfish abundance between 1981 and 1982 may at least be partially attributed to modifications made to the sampling gear during 1982 resulting in better bottom tending characteristics than during previous surveys. However, the flounder population continued to increase between the 1982 and 1983 surveys, when sampling equipment was kept constant. This is largely due to the recruitment of relatively strong year classes to a number of flounder populations. Total fish biomass increased by about 4.4 million t (47%) from 1982 to 1983. The major portion of this increase is attributed to a 127% increase in the apparent abundance of walleye pollock. This may be the result of increased vulnerability to the sampling gear due to atypical environmental conditions, immigration, or a range of factors rather than a real increase in the demersal portion of the population.

Surface and bottom temperature profiles were recorded at 334 stations. Temperature data were summarized by oceanographic domain: inner shelf (<50 m),

Table 4.--Biomass estimates of demersal fish taken during comprehensive trawl surveys of the eastern Bering Sea in 1975 and 1979-83.

Species	Year					
	1975	1979	1980	1981	1982	1983
Walleye pollock	2,426,400	2,876,500	1,508,600	2,543,600	2,666,600	6,050,600
Pacific cod	64,500	734,600	907,300	840,100	1,013,900	1,126,400
Yellowfin sole	1,038,600	1,907,700	1,913,000	2,065,100	3,322,500	3,951,500
Rock sole	170,300	182,800	283,000	287,400	597,100	869,700
Flathead sole	113,000	101,800	128,400	155,200	204,300	279,200
Alaska plaice	127,300	283,000	348,800	438,300	654,100	745,400
Greenland turbot	126,700	143,300	172,200	87,400	37,700	35,100
Arrowtooth flounder	28,000	42,000	47,800	50,200	70,000	149,300
Pacific halibut	30,600	64,200	43,200	46,500	70,500	90,100
Sculpins	122,500	269,200	281,000	284,400	291,300	277,000
Eelpouts	98,600	360,800	371,500	147,400	118,500	68,600
Poachers	12,800	28,200	17,300	11,200	13,800	13,800
Skates	42,000	74,000	114,900	239,000	167,900	188,200
Other fish	133,700	193,700	117,500	97,500	193,000	14,300
TOTAL	4,535,000	7,261,800	6,254,500	7,293,300	9,421,200	13,859,200

middle shelf (50-100 m), and outer shelf (>100 m) for 1983 compared to survey findings from the relatively "cold year" of 1982 and the "warm year" of 1979 (Table 5). Although the mean bottom temperature during 1983 (3.11°C) was higher than the "cold year" of 1982 (2.21°C) it was lower than in 1979 (4.73°C). Mean surface temperature for the 1983 survey (8.59°C) was 0.20°C higher than the "warm year" of 1979 (8.39°C) and 2.87°C greater than the "cold year" of 1982.

Table 5. Eastern Bering Sea crab-groundfish survey temperature data collected during 1979, 1982, and 1983.

Depth	Mean bottom temperature in °C			Mean surface temperature in °C		
	1979	1982	1983	1979	1982	1983
<50 m	7.90	2.32	4.94	9.15	3.95	7.59
50-100 m	4.03	1.68	2.25	8.37	5.69	8.75
>100 m	3.46	3.15	3.06	7.94	7.15	9.07
TOTAL AREA	4.73	2.21	3.11	8.39	5.72	8.59

C. Aleutian Islands Crab-Groundfish Survey

The Aleutian Islands crab-groundfish survey was conducted during July-November, 1983. The principal objective of this study was to provide a quantitative assessment of the condition of fisheries resources in the waters contiguous to the Aleutian Islands. The study area included continental shelf and upper slope waters from 170°E to 170°W south of the islands and 170°E to 165°W north of the islands, including Bowers Bank. A similar comprehensive demersal trawl survey was conducted along the Aleutian Island chain in 1980.

The 1983 study was a cooperative U.S.-Japan research effort with fishing operations conducted aboard the NOAA research vessels Miller Freeman and Chapman and the Japanese Fisheries Agency research vessel Daito maru No. 38.

U.S. vessels operated from July through August while the Japanese vessel participated from July through November.

Sampling locations were established on a stratified random basis at depths ranging from 50 to 900 meters. Station densities were greatest in regions where high concentrations of important commercial species were encountered during the 1980 survey.

A total of 162 trawl hauls were conducted by the Miller Freeman and Chapman (Fig. 4). Trawl catches were sorted by species, weighed, and enumerated at each station site. Approximately 24,000 length frequencies were recorded from the predominant fish species. An additional 8,140 age structures were collected with about 2,700 length-weight relationships determined for major fish taxa. Maturity data were also collected from several fish species. Pacific cod; Atka mackerel, Pleurogrammus monopterygius; Pacific halibut; and sablefish, Anoplopoma fimbria, were tagged and released to provide subsequent information on stock movements.

GULF OF ALASKA

The largest known spawning concentration of walleye pollock in the Gulf of Alaska occurs during mid-February-March in Shelikof Strait. Since pollock are of considerable economic importance and comprise a primary component of the biological community, several surveys were conducted to obtain data on these spawning aggregates.

Pollock Surveys

A. Shelikof Strait Bottom Trawl Survey

The NOAA research vessel Chapman conducted a 17-day bottom trawl survey of Shelikof Strait during March 3 to March 20, 1983. The primary objective of

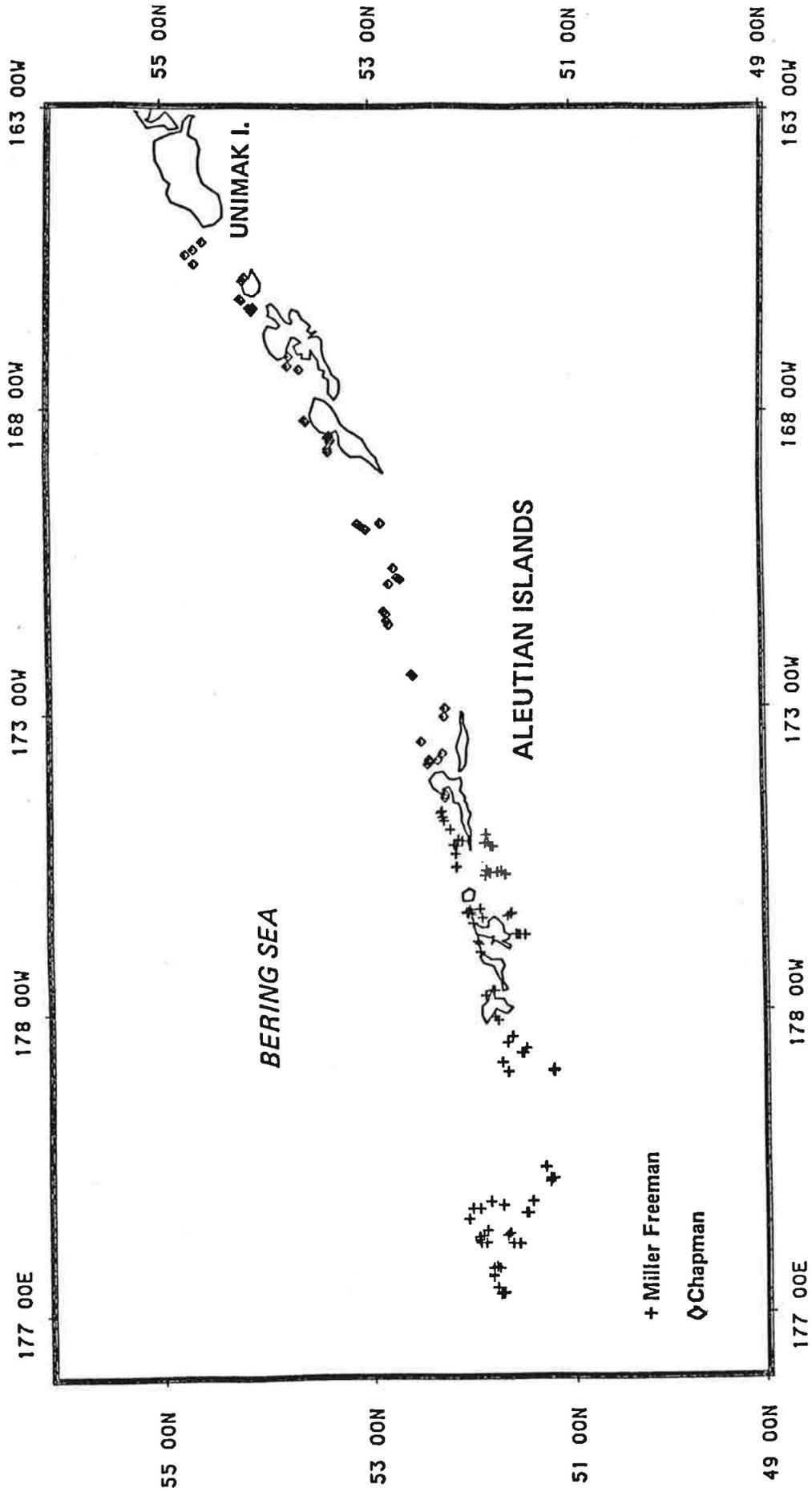


Figure 4. Distribution of stations sampled during the 1983 Aleutian Islands crab-groundfish survey.

this study was to obtain biological data to determine the age specific distribution of the bottom and near bottom component of the spawning walleye pollock aggregation. Sampling locations were randomly selected based on a 5x5 nmi grid system delineated for the survey region.

A total of 52 bottom trawls were completed (Fig. 5). Basic haul and catch data were recorded at each sampling site. Approximately 14,200 length frequencies, 5,300 maturity observations, and 2,300 otoliths were collected during the survey. In addition to pollock, biological data were also collected for arrowtooth flounder, Atheresthes stomias; flathead sole, Hippoglossoides elassodon; Pacific halibut; and Pacific cod. Sea water temperature profiles were collected using bucket thermometers and XBTs.

Walleye pollock constituted about 83% of the overall catch with catch per unit of effort values ranging from 544 kg/h to about 30,391 kg/h and averaging 5,964 kg/h trawled. Arrowtooth flounder, Pacific halibut, sablefish, and Pacific cod made up an additional 11.1% of the catch. Approximately 92% of the pollock sampled were in a prespawning or spawning condition. Few pollock less than 35 cm or over 50 cm in length were observed. Males averaged 40.9 cm in length compared to 42.8 cm for females.

B. Shelikof Strait and Western Gulf of Alaska Echo Integrator-Midwater Trawl Survey

An echo integrator-midwater trawl survey of spawning walleye pollock concentrations in the western Gulf of Alaska was completed in mid-April of 1983. Primary objectives of this survey were to: (1) collect echo integration data necessary to determine the distribution and biomass of the off bottom component of pollock aggregations; (2) collect data on biological composition

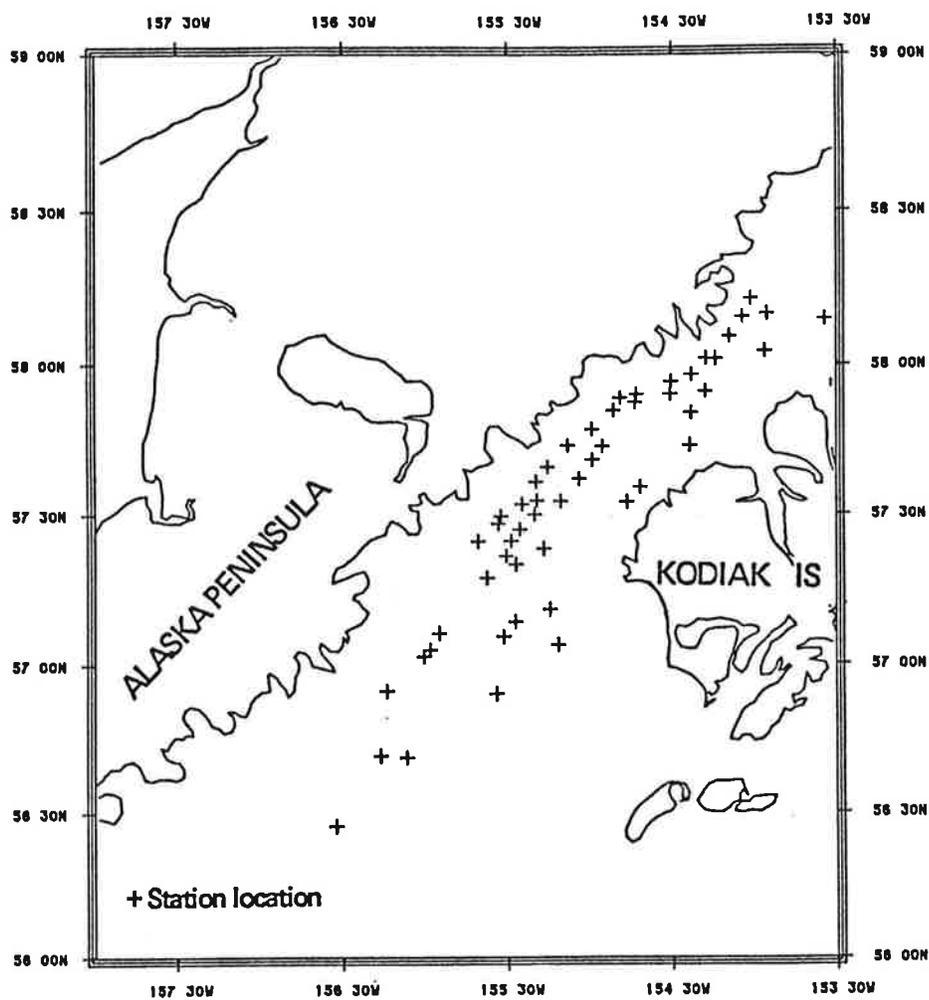


Figure 5. Distribution of stations sampled during the 1983 Shelikof Strait bottom trawl survey.

(sex, size, age, and maturity); and (3) collect data on the timing of peak spawning of the Shelikof Strait concentration.

Survey operations were conducted aboard the Miller Freeman from March 2 to April 14 and the Chapman from March 23 to April 10. The sampling area included Shelikof Strait and both outer shelf and upper slope waters (50-200 fathoms) from Unalaska Island to Portlock Bank on the east side of Kodiak Island.

The two survey vessels ran a total of 5,832 trackline miles and conducted 59 trawl hauls (Fig. 6). Relatively little sign of pollock was observed outside Shelikof Strait with the exception of two localized concentrations in small areas in the Shumagin Island-Sanak Islands region.

The major concentrations were primarily distributed between 56°40'N and 58°00'N through mid-March. By April, pollock were found in low levels of abundance throughout the strait with dense concentrations restricted to the north end of Katmai Bay. Most fish were in a prespawning condition through late March and by mid-April a high proportion of the spawning aggregation were spent.

C. Ichthyoplankton Survey of Pollock Larvae

On May 31, the NOAA research vessel Chapman completed a walleye pollock larvae survey in the northern Gulf of Alaska between southwestern Kodiak Island and the Shumagin Islands. The major objective of this survey was to define the distribution of larval walleye pollock by grid sampling with bongo and neuston tows and describe associated oceanographic features with CTDs. A secondary objective was to examine distribution of sablefish larvae in the Gulf of Alaska between Dixon Entrance and Kodiak Island along the 500-1000 m depth contour.

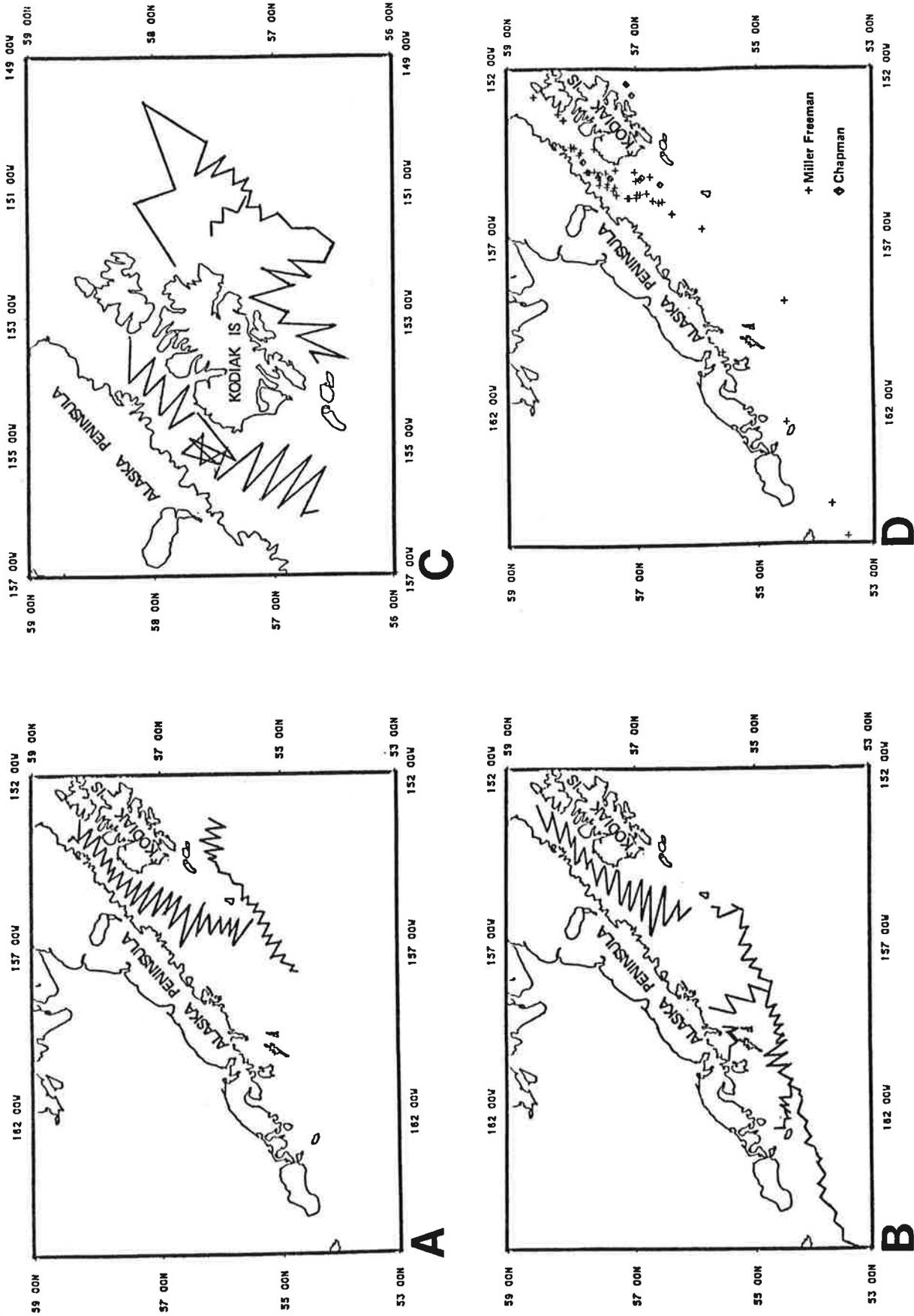


Figure 6. Area surveyed during the 1983 Shelikof Strait and western Gulf of Alaska echo integrator survey:
 A. acoustic trackline surveyed by the Miller Freeman during March 3-19, B. acoustic trackline surveyed by the Miller Freeman during March 25-April 13, C. acoustic trackline surveyed by the Chapman during March 24-April 10, D. total trawls completed by the Miller Freeman and Chapman.

A total of 63 stations were sampled in lower Shelikof Strait and west to approximately 158°45'W on the continental shelf. At each station a 10 minute neuston tow, a bongo tow, and an XBT cast were completed. CTD casts were also conducted at 15 sampling sites. Pollock larvae were encountered at most stations with greatest concentrations located in the southern portion of Shelikof Strait. One 48-hour station was occupied to study vertical diurnal distribution of larvae and their feeding habits. Sablefish larvae were collected from 11 neuston trawls made between Dixon entrance and Kodiak Island.

Other Surveys

A. Project Sea Sub

A total of 52 research dives were conducted near Sitka, Alaska from July 24 through August 16, 1983. Operations were completed aboard the chartered submersible Mermaid II launched from the support vessel Aloha. Specific objectives of this study were to: (1) assess factors associated with halibut longline bait loss; (2) compare the effectiveness of conventional hooks with recently introduced circle hooks; (3) determine whether a hook flotation device functioned at depth; (4) observe and photograph distribution and abundance of juvenile rockfish, Sebastes species; and (5) collect rockfish specimens for species identification.

B. Comparative Studies of Bottom Trawls

Bottom trawling experiments to compare efficiencies and evaluate selection characteristics of two demersal trawls were conducted aboard the Miller Freeman from September 26 to October 7, 1983. Trawling operations were completed in Gulf of Alaska waters east of Kodiak Island.

The 83/112' eastern trawl and the Noreastern trawl with roller gear have been standard sampling gear during previous groundfish assessment surveys in the Gulf of Alaska. This study focused on specific attributes of each net and subsequent gear modifications to develop a single standard sampling trawl.

A total of 127 stations were sampled during the survey. Standard haul and catch data were recorded at each trawling location. Data collected will be used to determine relative fishing powers between trawls and the effect of gear modification on bottom catches.

PACIFIC WEST COAST

A. West Coast Groundfish Survey

The chartered fishing vessels Nordfjord and Warrior II conducted an 80-day bottom trawl survey of groundfish resources off the west coast of Canada and the United States from July 7 to October 30, 1983. This research effort was part of a series of intensive regional surveys designed to comprehensively examine the condition of groundfish stocks in the Bering Sea, Gulf of Alaska, and off the United States and Canada on a triennial rotating basis. Final analysis of the 1983 survey data will be compared to the results of similar surveys conducted in 1977 and 1980 to define trends in population characteristics. A hydroacoustic midwater trawl survey was coordinated in conjunction with this survey to provide estimates of the off bottom portion of the Pacific whiting, Merluccius productus, stock.

The study area extended from Monterey Bay, California north to Estevan Point on Vancouver Island, British Columbia. Primary objectives were to:

- (1) assess the distribution and abundance of Pacific whiting and shelf

rockfish (particularly Sebastes flavidus and S. pinniger in the International North Pacific Fisheries Commission (INPFC) Columbia area and U.S. portion of the INPFC Vancouver area); (2) determine the biological characteristics of Pacific whiting and shelf rockfish resources; (3) collect sea temperature data; and 4) collect tissue samples for Pacific whiting parasite studies and a variety of biological samples for special investigations.

Station sites were randomly established on tracklines running perpendicular to the 55 m (30 fathom) depth contour. Sampling densities were increased in areas where significant abundance of whiting and selected rockfish species have been previously documented. Standard haul and catch data were recorded at each successfully occupied station. Biological data were collected from predominant fish species encountered.

A total of 596 demersal hauls were conducted, as shown in Figure 7. Surface water temperature was recorded at most stations while bottom temperatures were collected at 92 sampling sites. Approximately 84,000 length measurements were obtained from 34 fish species with almost 16,000 age structures collected from Pacific whiting, sablefish, and various rockfish species. Nearly 2,200 sablefish were tagged and released during the survey. Tissue, stomach, and bone samples from several fish taxa were preserved for analysis to be conducted by the NWAFC, Oregon State University, and for cooperative U.S.-Canada studies.

Dominant fish species caught by INPFC areas are shown in Table 6 ranked in order of relative abundance (kg/km). Pacific whiting, the most abundant species encountered in the overall survey region, were predominant in the Eureka and Columbia areas. In the Monterey and Vancouver areas, whiting ranked third and ninth, respectively. Other major species caught in the Monterey region were stripetail rockfish, Sebastes saxicola; bocaccio,

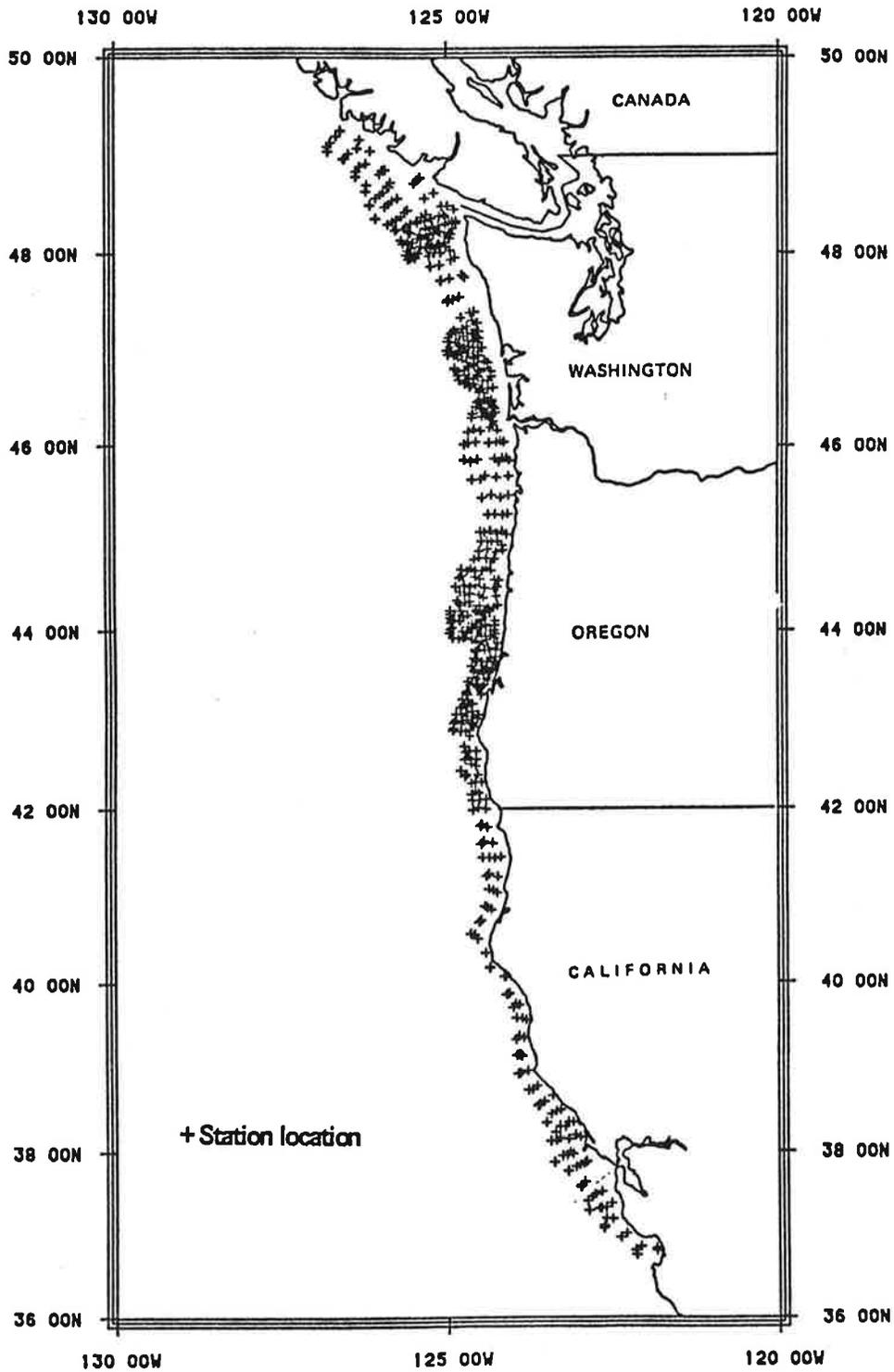


Figure 7. Distribution of stations sampled during the 1983 west coast groundfish survey.

Table 6. The 20 most abundant species by INPFC area ranked in order of CPUE (kg/km).

Monterey		Eureka		Columbia	
Species	Mean CPUE	Species	Mean CPUE	Species	Mean CPUE
Stripetail rockfish	30.47	Pacific whiting	57.08	Pacific whiting	24.61
Bocaccio	23.62	Spiny dogfish	34.62	Dover sole	16.85
Pacific whiting	20.59	Dover sole	14.71	Sablefish	14.82
Chilipepper	15.75	Sablefish	10.20	Darkblotched rockfish	7.26
Dover sole	14.96	Rex sole	4.25	Arrowtooth flounder	6.76
Spiny dogfish	13.25	Darkblotched rockfish	3.64	Rex sole	5.77
Splitnose rockfish	10.75	Splitnose rockfish	2.83	Sharpchin rockfish	5.26
Sablefish	9.25	Shortspine thornyhead	2.69	Pacific ocean perch	4.80
Shortbelly rockfish	8.60	Lingcod	2.25	Lingcod	2.79
Canary rockfish	5.92	Stripetail rockfish	2.10	Canary rockfish	2.72
Rex sole	3.50	Sea urchin	1.98	Yellowtail rockfish	2.71
Darkblotched rockfish	3.29	Pacific ocean perch	1.63	Splitnose rockfish	2.58
English sole	3.09	English sole	1.35	Shortspine thornyhead	2.44
Sea urchin	3.03	Yellowtail rockfish	1.26	Slender sole	2.06
Pacific herring	2.53	Bocaccio	1.22	Sea urchin	2.02
Sharpchin rockfish	2.03	Sharpchin rockfish	1.22	Pacific sanddab	2.02
White croaker	1.94	Canary rockfish	0.90	English sole	1.82
Pacific sanddab	1.93	Greenstriped rockfish	0.83	Redstripe rockfish	1.50
Yellowtail rockfish	1.25	Arrowtooth flounder	0.65	Pacific herring	1.50
Lingcod	1.22	Redbanded rockfish	0.60	Jack mackerel	1.47

Vancouver		All areas combined		
Species	Mean CPUE	Species	Mean CPUE	Percentage of total catch
Spiny dogfish	53.10	Pacific whiting	35.96	23.0
Redstripe rockfish	22.23	Spiny dogfish	23.47	15.0
Yellowtail rockfish	16.29	Sablefish	9.08	5.8
Canary rockfish	15.91	Yellowtail rockfish	8.16	5.2
Arrowtooth flounder	13.17	Dover sole	7.32	4.7
Silvergray rockfish	12.78	Canary rockfish	6.50	4.2
Pacific ocean perch	10.96	Sharpchin rockfish	5.57	3.6
Sharpchin rockfish	10.12	Redstripe rockfish	5.50	3.5
Pacific whiting	9.59	Lingcod	3.94	2.5
Sablefish	8.21	Arrowtooth flounder	3.67	2.3
Lingcod	7.76	Darkblotched rockfish	3.48	2.2
Dover sole	6.48	Rex sole	3.37	2.2
Pacific cod	3.05	Pacific ocean perch	2.92	1.9
Bocaccio	2.67	Bocaccio	2.88	1.8
Widow rockfish	2.51	Stripetail rockfish	2.82	1.8
Rex sole	2.05	Pacific sanddab	2.50	1.6
Pacific herring	2.01	Jack mackerel	2.20	1.4
Redbanded rockfish	1.81	Silvergray rockfish	1.93	1.2
Greenstriped rockfish	1.62	Splitnose rockfish	1.85	1.2
Walleye pollock	1.60	English sole	1.85	1.2

S. paucispinis; chilipepper, S. goodei; splitnose rockfish, S. diploproa; and Dover sole, Microstomus pacificus. In the Eureka area dogfish, Squalus acanthias; sablefish; and rex sole, Glyptocephalus zachirus, were also relatively abundant. In the Columbia area, whiting was followed in abundance by sablefish, rex sole, Dover sole, arrowtooth flounder, and darkblotched rockfish, Sebastes crameri. Dominant species caught in the Vancouver area were dogfish; redstripe rockfish, S. proriger; yellowtail rockfish; canary rockfish, and arrowtooth flounder.

B. Echo Integrator-Midwater Trawl Survey

The chartered vessel Gold'N Sun conducted an echo integrator-midwater trawl survey of Pacific whiting from August 4 to September 22, 1983. The principal purpose of this survey was to collect data on the abundance and biological condition of the off bottom component of Pacific whiting and shortbelly rockfish resources along the west coast of the United States and Canada.

Other objectives were to: (1) estimate the biomass of shortbelly rockfish off California in the area between 36°58' and 37°25'N; (2) in cooperation with Canadian research vessels, compare NWAFC and Pacific Biological Station acoustic survey population estimation methods; (3) collect measurements of the acoustic target strength of Pacific whiting using a dual beam transducer; and (4) obtain data on the biological composition of yellowtail rockfish in midwater trawl catches for comparison with bottom trawl samples.

The survey area extended over the same region sampled during the west coast groundfish survey from central California to Vancouver Island, British Columbia. The Gold'N Sun surveyed along zig-zag track lines between the 30 and 250 fathom depth contours with an average distance between adjacent transects of 5 nmi.

Thirty-eight trawl hauls were completed (Fig. 8) to identify selected echo sign and to obtain biological data on target species including sex, length, weight, maturity, and otoliths. Several days of echo-integrator comparative studies between the Gold'N Sun and the Canadian research vessel G. B. Reed were completed near Vancouver Island. Overall, age 3 fish of the 1980 year class predominated the Pacific whiting catch although fish age 6 were also abundant in the Vancouver Island INPFC area.

C. Sablefish Index Survey

On November 22, 1983 the NOAA research vessel John N. Cobb concluded a 42-day survey to obtain indices of sablefish abundance off Washington and Oregon at depths ranging from 150 to 450 fathoms.

The primary objective of the survey was to collect standardized catch per unit of effort (CPUE) data at selected index sites as an indicator of population trends. Biological data including maturity, length, and age composition were obtained to determine biological characteristics of the population. Catch rates from two different trap types, conical and rectangular, were compared to establish the feasibility of converting to the conical trap as the standard sampling unit.

Four index sites previously established off Cape Johnson and Willapa Bay, Washington, and Cape Lookout and Cape Arago, Oregon were sampled (Fig. 9). A 10-trap groundline was set along the 150, 225, 300, 375, and 450 fathom isobaths at all four locations. Two sets (20 trap lifts) were made at each depth. Trap fishing was limited to 24 hours + 1 hour by using magnesium alloy, timed-release devices to close tunnel entrances. A perforated plastic bait jar containing two pounds of chopped herring was hung in each trap.

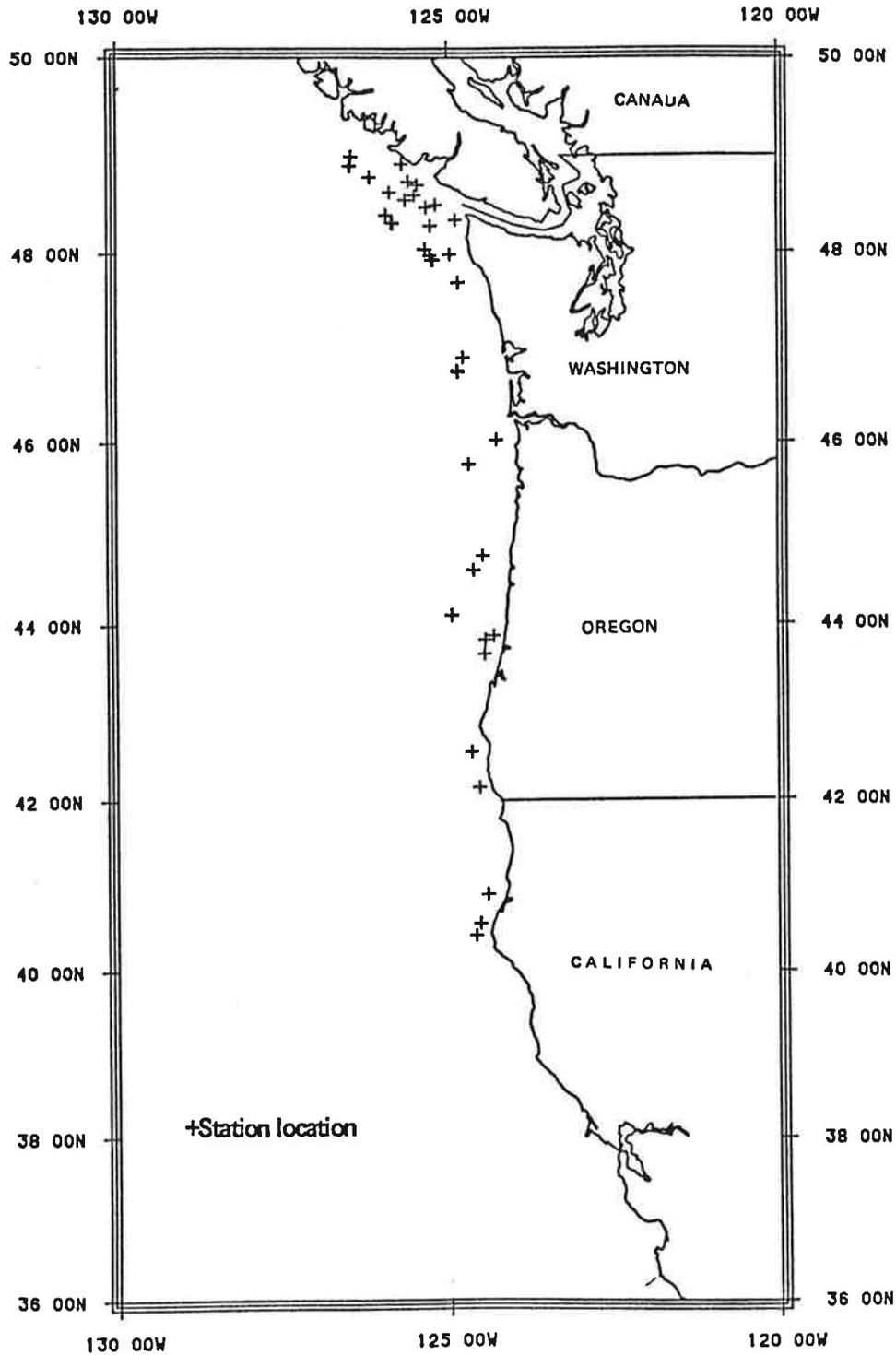


Figure 8. Distribution of stations sampled during the 1983 west coast echo integrator-midwater trawl survey.

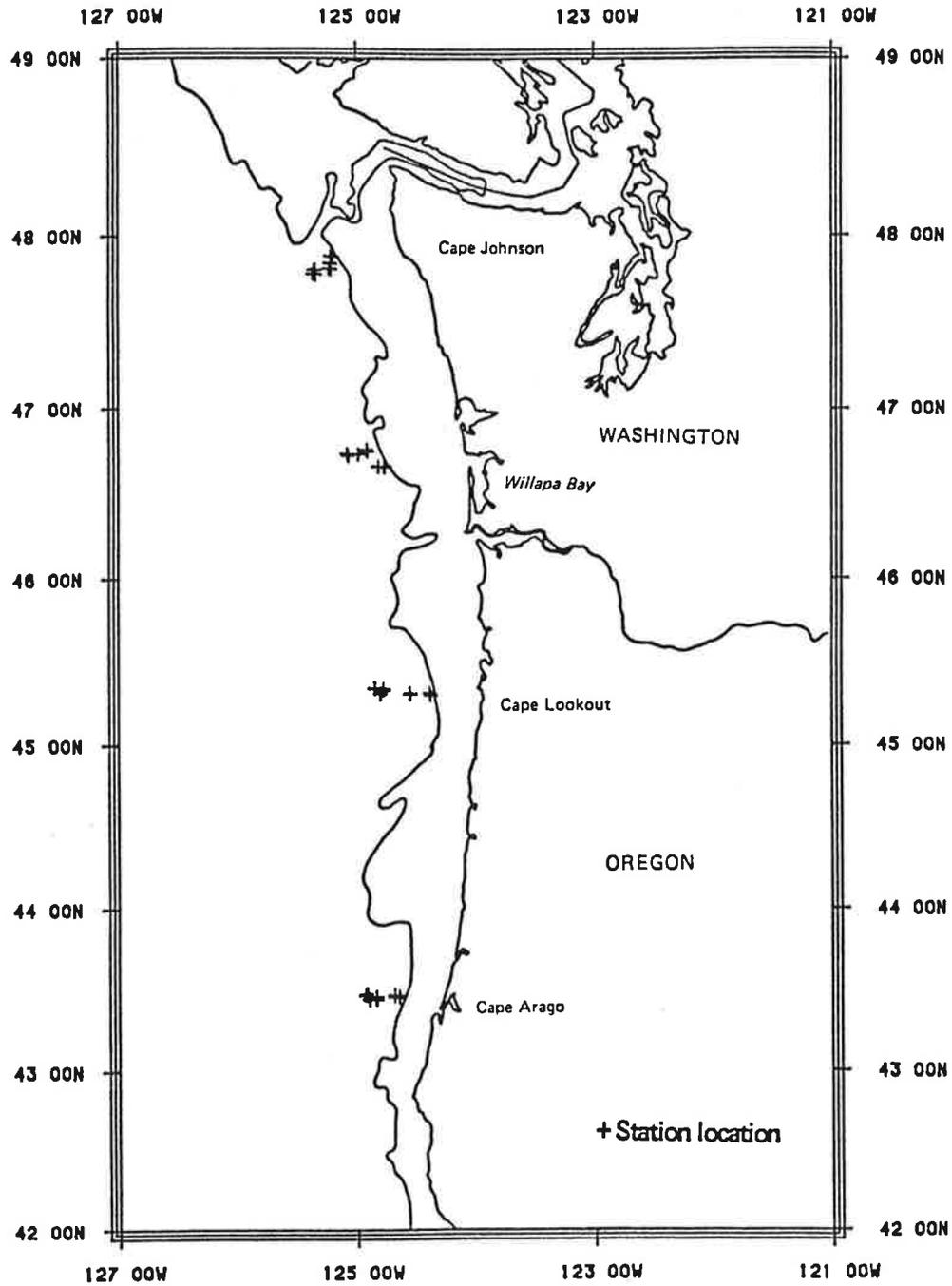


Figure 9. Distribution of sites sampled during the 1983 west coast sablefish index survey.

Two sets (100 trap lifts with 50 lifts of each trap type) were made at each of the four index sites for a total of 400 trap lifts. Conical traps captured 15.6% more sablefish than rectangular traps for all sites combined, and mean lengths were nearly identical at 53.7 and 53.4 cm, respectively.

Highest catches were made at the Willapa Bay site, followed by Cape Lookout and Cape Arago, with the lowest catches at Cape Johnson. Highest catch rates by depth generally occurred at 300 fathoms, followed by 225 fathoms and 375 fathoms, with much lower catch rates generally occurring at 450 fathoms and 150 fathoms.

Four new sites were scheduled for sampling to improve the sensitivity of the survey, but prolonged adverse weather precluded occupation of those sites. They will be included in future surveys.

D. Ichthyoplankton-Hydrography Survey.

An ichthyoplankton-hydrography survey of the Pacific west coast was carried out by the Miller Freeman from November 10 to December 3, 1983. The survey area included Pacific waters from northern California to Washington. Primary objectives were to: (1) to determine the seasonal-geographic distribution of fish eggs and larvae; (2) sample inshore stations for Dungeness crab, Cancer magister, and flatfish; and (3) collect salinity data in a line of stations along latitude 47°N.

Ichthyoplankton sampling was conducted at 113 of the planned 125-station grids. At each station, a standard bongo tow, a 10-minute Sameoto neuston tow, and either a CTD cast or XBT trace were taken.^{1/} In the neuston tows, Pacific saury, Cololabis saira, and lanternfish, myctophids, were the

^{1/} Reference to trade names in tables and text does not imply endorsement by the National Marine Fisheries Service, NOAA.

only fish taken in abundance. The bongo tows also showed a significant number of myctophids in the catches. Some flatfish and rockfish larvae were also noted. The plankton volumes of both the neuston and bongo tows were generally small.

The nearshore benthic crab study conducted off the coast of northern Oregon and Washington consisted of a survey of bottom topography using the ship's echo sounder, a Shipek sampler to sample bottom sediment, and either a 15-minute beam trawl tow or a 10-minute rock dredge tow. Twenty stations were sampled, 18 with the beam trawl and 2 with the rock dredge where bottom characteristics warranted its use.

All crabs collected were measured, sexed, and weighed. Shell and egg conditions from mature females were assessed and recorded. All fish were identified, counted, and weighed, and lengths were taken for flatfish.

