

**REPORT OF THE  
INTERNATIONAL PACIFIC HALIBUT COMMISSION**

APPOINTED UNDER THE CONVENTION BETWEEN CANADA AND THE  
UNITED STATES OF AMERICA FOR THE PRESERVATION OF THE  
NORTHERN PACIFIC HALIBUT FISHERY

**NUMBER 49**

**REGULATION AND INVESTIGATION  
OF THE PACIFIC HALIBUT FISHERY  
IN 1968**

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**1969**

## FOREWORD

The terms of the 1953 Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea provide that the International Pacific Halibut Commission shall publish a report of its activities and investigations from time to time.

The present report, the forty-ninth published by the Commission, is the twenty-second of a series of annual reports that was begun in 1947 to provide a summary of the Commission's activities and results of its investigations during the year.

Those desiring additional background information on the Commission's activities are referred to earlier reports.

REGULATION AND INVESTIGATION OF THE PACIFIC  
HALIBUT FISHERY IN 1968

By

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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## INTRODUCTION

The commercial halibut fishery, eighty years old in 1968, had its inception off Cape Flattery on the northwest coast of Washington Territory in 1888 and when the first carlot of halibut was shipped to Atlantic coast markets from Tacoma. The initial 25 years of the fishery was a period of unconcerned expansion limited only by market demand. When extension to new and more distant fishing grounds failed to sustain the total catch the industry became concerned about the possibility of overfishing. The existence of overfishing was confirmed by investigations conducted by the Province of British Columbia during the beginning of World War I.

International control was recommended by the industry as early as 1915. These efforts finally came to fruition with the signing of the first Halibut Convention in 1923 between Canada and United States. This Convention established a closed winter period to protect the halibut during the spawning season and provided for the creation of the International Fisheries Commission to investigate the fishery and propose further measures for its preservation.

Investigations demonstrated that the closed season alone was ineffective in halting the decline in the resource. A new Convention was signed in 1930 broadening the regulatory authority of the Commission.

The Conventions of 1937 and 1953 further extended the authority of the Commission to meet the changing needs of management for the rebuilt stocks.

The 1953 Convention changed the name of the Commission to the International Pacific Halibut Commission. It also specifically provided that all regulations be based on the results of scientific investigations and that the Commission be charged with the responsibility of developing and maintaining halibut stocks at levels which would permit the maximum sustainable yields.

The annual catch reached a maximum of 68 million pounds in 1915 as the primeval accumulations were successively subjected to uncontrolled exploitation. Thereafter catches declined to a low of 44 million pounds by 1931 despite continued expansion of the fishery throughout the range of the species and despite a constant increase in fishing effort.

After 1931 catches were gradually increased under regulation but catch increments were held below what growth and recruitment were adding to the stocks. Thus stocks were rebuilt and by the early 1960's had largely attained their levels of maximum sustainable yield.

Since the early 1960's there has been an increase in both foreign trawling and blackcod setline fishing over much of the range of the species as well as in the domestic trawl fishery off British Columbia. The losses and removals of halibut by such fishing have diminished the share of the North American setline halibut fleets in the increased productivity of the rebuilt stocks.

## CONDITION OF THE RESOURCE, 1968

Catches in 1968 were considerably below the prescribed catch limits in Areas 2 and 3A and continued at a low level in Bering Sea. With the reduced state of the stocks on some sections of the coast and with prices even lower than in 1967 the number of vessels engaged in halibut fishing was further reduced in 1968.

It is also evident that losses other than the removals by the North American setline fleet and natural mortality are affecting the resource and reducing the yields available to Canadian and United States setline fishermen.

South of Cape Spencer in Area 2 the decline in the stocks appears to have been stemmed. However, the catch per unit effort has not responded proportionately to the sharp reductions that have been made in the removals during the past several years, particularly south of Dixon Entrance.

West of Cape Spencer, in Area 3A, there has been no further decline in the stocks but as in Area 2, the response to reduced removals in recent years has been below what should be expected, particularly east of Kodiak Island. Here also, there are indications that losses are occurring from foreign fishing particularly in the latter region.

In Area 3B, the stock condition is satisfactory as indicated by a continued improvement in the catch per unit effort and in the age structure of the halibut population.

The 1968 Bering Sea catch by Canada and United States was slightly over 1 million pounds lower than in 1967 with most of the reduction due to poor catches from the important Polaris ground in Area 4A. Fishing on the latter ground was hampered by many Japanese and Russian trawlers in the area. There were also strong indications that the stocks had been reduced because of such fishing. Catches from other areas in Bering Sea were of about the same magnitude as in 1967 with the condition and composition of stocks continuing to be satisfactory.

### ACTIVITIES OF THE COMMISSION

During 1968 the Commission continued its program of statistical and biological observations which provide the basis for the regulation of the fishery according to scientific principles as required by the 1953 Convention.

The Commission held its Forty-fourth Annual Meeting in Seattle, Washington from January 23 to 26, 1968. It examined the results of scientific investigations and the effects of the 1967 halibut regulations on the stocks, dealt with administrative and budgetary matters, conferred with industry representatives regarding the management of the resource and adopted regulations for the halibut fishery in 1968.

On the morning of January 23 the Commission met in closed session to approve the provisional agenda and to discuss the program for the following sessions. During the afternoon the Commission met in joint session with representatives of all segments of the halibut industry and other interested persons. The Commission staff reviewed results of scientific investigations in 1967, reviewed the status of the stocks and of the fishery, and presented their proposals for regulation of the fishery in 1968.

The Commission met in two sessions on January 24 to approve research plans for 1968 and to consider various administrative and fiscal matters including a budget for 1969/70. The Commission met in joint session with representatives of the dealers and the Conference Board consisting of delegates from vessel owners and union organizations on the morning of January 25 for further discussion of regulatory and other proposals by the industry.

Regulatory proposals by the staff and industry were further examined by the Commission and regulations for 1968 were adopted at the sixth session held on the

afternoon of January 25. The seventh session was held on the morning of January 26 for selection of future meeting dates, election of officers and preparation of a News Release on the 1968 regulations.

During the 1968 fishing season the Commission kept a detailed and current account of the landings of halibut from each area. Announcements were made from time to time on the cumulative catches from each regulatory area. Due to stock conditions and reduced fleet activity in the fishery all areas closed on dates provided in the regulations rather than by attainment of catch limits.

The Commission held a Special Meeting in Seattle, Washington on September 17 to review with the staff and representatives of the industry the results of the 1968 fishery in Bering Sea. Proposals recommended by both the staff and industry were examined and the Commission then transmitted to the governments of Canada and the United States regulatory changes it had under consideration for Bering Sea in 1969.

On invitation several members of the Commission staff attended, as consultants, meetings of the Biology and Research Committee and the Gulf of Alaska Groundfish Committee of the International North Pacific Fisheries Commission in connection with the Fifteenth Annual meeting of that Commission. In addition the staff prepared a number of Technical Reports at the request of the Canadian and United States sections of the International North Pacific Commission.

In addition to the above mentioned Technical Reports the Annual Report for 1967 and two scientific reports were published by the Commission in 1968. Titles for the publications prepared in 1968 are given at the end of this report.

During 1968 further progress was made on the construction of facilities to accommodate the offices and laboratory of the Commission on the University of Washington campus. The new accommodations are being constructed by the University of Washington under a \$500,000 grant made for this purpose by the United States. Official dedication of the building will be at the time of the Commission's 1969 Annual Meeting.

### REGULATION IN 1968

The Pacific Halibut Fishery Regulations adopted by the Commission for 1968 were approved by the Governor General of Canada on March 7 and by the President of the United States of America on March 11, at which time they became effective. As in previous years, these regulations also implemented on behalf of Canada and the United States the conservation measures recommended by the International North Pacific Fisheries Commission for eastern Bering Sea.

#### Regulatory Areas

The regulatory areas in 1968, shown in Figure 1, were the same as in 1967 and are as follows: Area 2—the convention waters south of Cape Spencer, Alaska; Area 3A—the waters off Alaska between Cape Spencer and Kupreanof Point near the Shumagin Islands; Area 3B—the waters south of the Alaska Peninsula and the Aleutian Islands between Kupreanof Point and the meridian of 175° W.; Area 3C—the waters south of the Aleutian Islands and west of 175° W.; Area 4A—the waters encompassing the 100-fathom edge lying east of 170° W. and south of a line between Cape Sarichef and Cape Navarin; Area 4B—the waters along the Bering Sea side of

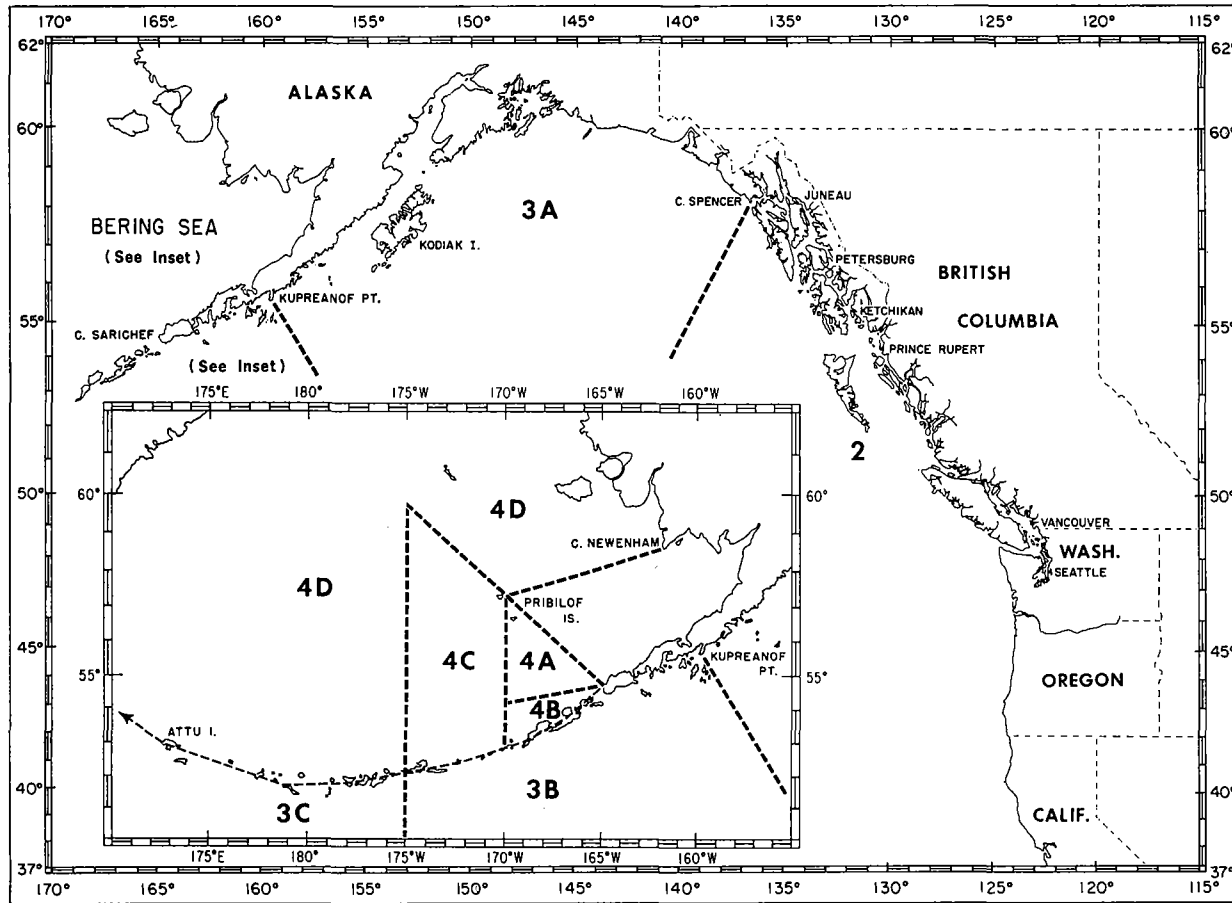


Figure 1. Pacific Coast of North America showing the 1968 regulatory areas as defined by the International Pacific Halibut Commission.



the Aleutian Islands east of the meridian of 170° W.; Area 4C — the waters in the region south of a line between Cape Sarichef and Cape Navarin between 170° W. and 175° W.; Area 4D — all of the waters lying north of the Aleutian Islands and west of 175° W. and those waters lying east of 175° W. and north of a line between the Pribilof Islands and Cape Newenham.

#### Catch Limits

The catch limit in 1968 in Area 3A was 32,000,000 pounds, which was a 1,000,000 pound reduction from the allowable removals in 1967. The Area 2 and Area 3B catch limits of 23,000,000 and 3,500,000 pounds respectively were unchanged from 1967. Removals from all other regulatory areas were effectively controlled by providing stated time periods for fishing in each area.

#### Length of Seasons

The 1968 fishing season in both Areas 2 and 3A opened on May 4 and closed on the statutory closing date of October 15 without the attainment of the catch limit in either area.

There were two fishing seasons in Area 3B in 1968. The first season of four days opened on April 14 and closed on April 18. This short season was established to test the early availability of halibut in the area at a time when adequate fishing power was in the same general region. The second season of 195 days opened on May 4 and closed on November 15 as provided in the regulations. It was also the date at which time the catch limit for the area was taken.

Area 4A, the edge grounds between Unimak Pass and the Pribilof Islands, opened on April 3 and closed on April 17 for a 14-day fishing period, the same length of season as in 1967. It was felt continuation of a 14-day season would not jeopardize continuation of the rehabilitation process. There had been some indications that the area was continuing to show some recovery from the overfishing by the North American and Japanese fleets in 1963 and 1964.

Area 4B, the Fox Islands grounds, was opened on September 1 and closed September 10 providing for 9 days of fishing, the same length of season as in 1967.

Area 4C, the edge grounds between the meridians of 170° W. and 175° W. was opened on March 29 and closed on April 22 providing for a 24-day fishing period. This length of season was regarded as a prudent one and would prevent any possible overfishing such as occurred in 1963 in Area 4A, then referred to as the Triangle.

Area 3C, south of the Aleutian Islands and west of the meridian of 175° W. and Area 4D, in western and northeastern Bering Sea were opened March 29 and closed November 15 after 231 days. These long seasons are designed to permit some exploration in those regions by setline gear. They presently produce only limited quantities of halibut.

## STATISTICS OF THE FISHERY

#### Catches by Sections of the Coast and Regulatory Areas

Canadian and United States catches of halibut in thousands of pounds for the years 1964 to 1968 are shown in Table 1. Estimates of the poundage taken in contravention of the regulations are included in the totals for each section of the coast. All 1968 figures are preliminary. No estimates of catches made in the North Pacific Ocean and Bering Sea by other than North American vessels are included.

Table 1. United States and Canadian Catches by Regulatory Areas 1964-1968\*  
in Thousands of Pounds

		1964	1965	1966	1967	1968
Area 2**	U.S.	8,315	12,200	12,054	10,142	6,003
	Canada	11,437	12,350	11,522	9,877	10,381
	Total	19,752	24,550	23,576	20,019	16,384
Area 3A	U.S.	15,082	16,146	16,939	18,004	11,949
	Canada	18,052	17,551	17,487	12,944	15,170
	Total	33,134	33,697	34,426	30,948	27,119
Area 3B	U.S.	1,909	1,395	809	513	703
	Canada	2,843	2,496	2,277	1,644	2,835
	Total	4,752	3,891	3,086	2,157	3,538
Area 3C	U.S.	1	—	—	2	—
	Canada	—	—	48	—	—
	Total	1	—	48	2	—
Area 3 Total	U.S.	16,992	17,541	17,748	18,519	12,652
	Canada	20,895	20,047	19,812	14,588	18,005
	Total	37,887	37,588	37,560	33,107	30,657
BERING SEA***						
Area 4A	U.S.	875	331	—	558	167
	Canada	643	178	219	739	348
	Total	1,518	509	219	1,297	515
Area 4B	U.S.	24	—	138	14	—
	Canada	343	42	94	—	—
	Total	367	42	232	14	—
Area 4C	U.S.	141	258	—	220	167
	Canada	219	163	312	222	201
	Total	360	421	312	442	368
Area 4D	U.S.	29	154	419	495	321
	Canada	51	207	13	147	127
	Total	80	361	432	642	448
Area 4E	U.S.	3	2	(	Closed Area	)
	Canada	—	—	(	do	)
	Total	3	2	(	do	)
Bering Sea Total	U.S.	1,072	745	557	1,287	655
	Canada	1,256	590	638	1,108	676
	Total	2,328	1,335	1,195	2,395	1,331
Total All Areas	U.S.	26,379	30,486	30,359	29,948	19,310
	Canada	33,588	32,987	31,972	25,573	29,062
	Total	59,967	63,473	62,331	55,521	48,372

\* 1968 figures are preliminary.

\*\* Area 1 incorporated with Area 2 in 1967. Annual catches therefrom, which averaged 146,000 pounds from 1964 to 1966, are included in Area 2.

\*\*\*Not including catches by Japan.

## SOUTH OF CAPE SPENCER

The 1968 Area 2 catch of 16.4 million pounds represents the lowest total catch taken from the region since records of the fishery were first available in 1910 and was 6.6 million pounds below the 23 million pound catch limit. Substantial losses have been accruing to the stocks from the incidental capture of halibut by both foreign and domestic trawlers in Area 2 particularly on grounds south of Dixon Entrance. Under such stock conditions and with prices even lower than in 1967 the fishery became less attractive to the setline halibut fleet. Also the increased trawling activity has at times forced setline vessels to fish other than their usual and accustomed grounds.

## WEST OF CAPE SPENCER

The 1968 Area 3A catch of 27.1 million pounds was 4.9 million pounds below the 32 million pound catch limit and the lowest total removal from Area 3A since 1953. Increasing activity of foreign trawl fisheries by Japan and the U.S.S.R. particularly between Kodiak Island and Cape Spencer coupled with some reduced entry into the halibut fishery are the primary factors accounting for the large catch deficit occurring in 1968. The decline in Area 3A removals experienced during the last three years has been from grounds off Kodiak Island and eastward, whereas the level of removals west of Kodiak Island, a region of lesser foreign trawling has shown some increase during the same period.

In Area 3B, the 1968 catch was slightly over the 3.5 million pound catch limit prescribed for the area. A continued improvement in fishing conditions in this western area attracted a number of setline vessels even though grounds closer to port to the eastward remained open to October 15.

## BERING SEA

The 1968 Area 4A catch of 515,000 pounds was much below the 1967 catch of 1.3 million pounds. Poor fishing coupled with the presence of a large fleet of Japanese and Russian trawlers severely restricted the normal fishing activities of a somewhat reduced North American setline fleet.

No vessels fished during the short 9-day fall season in Area 4B in 1968. The short period of fishing held little attraction due to the extended seasons in all areas to the eastward.

The 1968 catch in Area 4C of 368,000 pounds continues the close control of the past several years on removals from these grounds.

The 1968 catch of 448,000 pounds in Area 4D was taken primarily from the northeastern flats. Relatively few vessels venture into this more remote area due to the proportionately greater expenses and somewhat greater risks involved in fishing such distant and relatively unexplored grounds.

**Catch Per Unit of Fishing Effort**

In Area 2, the catch per unit effort showed a moderate increase over 1967. This resulted from an improving trend from grounds off southeastern Alaska which more than offset a further decline in the catch per unit effort from grounds off the British Columbia coast. This latter portion of Area 2 has become a region of particular concern as continuing and sharp reductions in setline removals have had but little effect in raising the level of the catch per unit effort. It is becoming increasingly

apparent that factors other than the North American setline removals are of primary importance in the lack of proportionate response to the sharp reduction made in catches by the Canadian and United States setline fleet.

In Area 3A, the catch per unit effort was unchanged from 1967. This was expected on those grounds west of Kodiak Island, but for Kodiak Island and eastward some improvement had been anticipated in response to reduced removals in 1967.

In Area 3B, there was continued improvement in the trend in the catch per unit effort that started in 1966. While part of the increase was due to excellent fishing during the first fishing season of four days in April, the summer and fall fishery was also on an improving trend.

On the Polaris ground, in Area 4A, the catch per unit effort was substantially below 1967 levels. The North American fleet was hampered from operating effectively by the presence of a very large foreign trawl fleet and in addition there were strong indications that losses were occurring to the stocks from such fishing.

On the Misty Moon grounds in the northern part of Area 4A and in Area 4C where there is relatively little trawling, the catch per unit effort was equal to or improved over last year.

The catch per unit effort on the northeastern flats in Area 4D was below the 1967 level as relatively small local populations of halibut discovered in previous years have been reduced in size by the removals of the setline fleet.

#### Landings by Ports

The distribution of halibut landings by ports or sections of the coast from all areas is shown in Table 2 with comparable data for 1966 and 1967. The distribution of landings is similar to that observed in 1967, with relatively heavy landings in the southern ports and reduced landings in the northern ports, particularly in central Alaska which was down almost 45 percent from 1967. This is a normal pattern under conditions of low prices as the fleet tends to land as much fish as possible at the distant but higher priced railhead ports in an effort to maximize earnings. Landings rose in Prince Rupert with the resolution of labor problems that disrupted this port in 1967, but were still substantially lower than those reported in 1966 and earlier years.

Table 2. United States and Canadian Landings by Regions and Ports 1966-1968\*  
in Thousands of Pounds

Region or Port	1966			1967			1968		
	U.S.	Canada	Total	U.S.	Canada	Total	U.S.	Canada	Total
California and Oregon	149	—	149	135	—	135	135	—	135
Seattle, Washington	3,775	452	4,227	8,013	163	8,176	8,142	490	8,632
Bellingham, Washington	1,053	2,585	3,638	1,187	900	2,087	752	3,098	3,850
Other Washington	304	—	304	196	—	196	215	—	215
Vancouver, British Columbia	—	4,067	4,067	—	7,048	7,048	—	7,141	7,141
Vancouver Island	—	1,298	1,298	—	1,070	1,070	—	1,090	1,090
Prince Rupert, British Columbia	595	17,854	18,449	332	9,506	9,838	104	13,204	13,308
Other British Columbia	—	1,263	1,263	—	1,359	1,359	—	484	484
Ketchikan, Alaska	8,112	234	8,346	6,883	851	7,734	3,088	218	3,306
Other Southeastern Alaska	10,014	594	10,608	8,785	768	9,553	5,102	385	5,487
Central Alaska	6,357	3,625	9,982	4,417	3,908	8,325	1,772	2,952	4,724
Totals	30,359	31,972	62,331	29,948	25,573	55,521	19,310	29,062	48,372

\*1968 Data are preliminary.

## COMPOSITION OF THE CATCHES

Sampling of the landings for age and size composition data was continued at Seattle, Vancouver, Ketchikan, Petersburg and Prince Rupert. These ports receive more than 70 percent of the Pacific halibut catch and all major fishing grounds are proportionately represented in their landings.

Over 61,000 measurements and otoliths for size and age data were collected from 290 commercial trips, including three setline trips sampled at sea by Commission observers. Also included were measurements at sea by Commission observers of the inadvertently-caught halibut by nine commercial otter trawlers, which are prohibited from retaining such halibut.

The three vessels chartered by the Commission in 1968 contributed over 23,000 additional measurements, 2,500 accompanied by age and sex information, increasing the number of measured fish to almost 85,000.

The number of samples secured in 1968, and the number of fish measured and otolithed compares favorably to the level in 1967. Due to reduced funds limiting the number of temporary aides available as observers on vessels fishing commercially, sampling at sea was reduced.

A summary of the sampling activity is contained in Table 3.

## Size and Age Composition

Improvement in the size and age compositions of the halibut population in Area 2, as in the case of the catch per unit effort, has not been commensurate with the sharp reductions made in the removals in recent years.

Table 3. Summary of Catch Sampling in 1968 Showing Number of Trips and Total Fish Measured According to Area of Origin of the Catches

Area of Origin of Catches	Number of Samples Secured			Number of Fish Measured
	Port Sampling	Sea Sampling	Total	
South of Cape Spencer				
Cape Flattery to Cape Scott .....	3	0	3	702
Queen Charlotte Sound .....	18	7	25	5,275
Hecate Strait .....	44	2	46	7,853
Dixon Entrance and West Coast Queen Charlotte Islands .....	14	0	14	3,104
Southeastern Alaska .....	56	0	56	10,604
Measured fish from chartered vessels .....				12,122
	135	9	144	39,660
West of Cape Spencer				
Cape Spencer to Cape Cleare .....	27	1	28	5,745
Cook Inlet - Shelikof Strait .....	8	0	8	2,172
Portlock - Albatross Banks .....	44	0	44	9,884
Trinity Islands - Chirikof Island .....	34	1	35	8,171
Shumagin Islands and West .....	15	1	16	3,842
Bering Sea .....	15	0	15	4,016
Measured fish from chartered vessels .....				11,127
	143	3	146	44,957
Totals Pacific Coast .....	278	12	290	84,617
(1967 Totals) .....	(274)	(18)	(292)	(94,056)

The lack of improvement is most noticeable in the region south of Dixon Entrance which is the locale of the domestic trawl fishery of Canada and United States as well as of an expanding foreign fishery. In this region young year classes of halibut, which are most vulnerable to trawling, have declined prematurely. The 1961 class, which was recruited in some strength in 1966 and 1967, and other classes of young, which had been observed to be abundant in recruitment studies as one and two year olds, were not present in the expected numbers in the 1968 commercial catch. Also since older fish continue to fail to show improved abundance despite the reduced level of catch, it appears that the presence of trawl operations on the known halibut grounds south of Dixon Entrance may be affecting the availability to setline gear of the entire fishable stock of halibut, both young and old.

On the other hand, off southeastern Alaska where there is less trawling and where such trawling is not concentrated as heavily upon grounds known to be inhabited by young halibut as is the case in the region south of Dixon Entrance, young year classes have entered the setline fishery in relatively normal numbers and variations in the abundance of fully-recruited age groups appear to be more readily attributable to changes in the setline fishery.

In Area 3A, the decline in the stock composition which began in the early 1960's, appears to have levelled off. The modal age groups, 11 to 15 years of age, which contribute a major portion of the weight to the catches in Area 3A, have displayed a stable level of abundance for several years while older fish have shown some improvement on all sections except on the important Portlock-Albatross grounds. Recruitment of young fish aged 10 and younger, has been relatively stable in all sections of Area 3A.

In Area 3B older fish, aged 11 and older, were also more abundant in the catches in 1968, terminating a long-term decline paralleling that described for Area 3A. In the region, the Shumagin Islands and westward, however, a concurrent long-term decline in entry of young continues.

In southeastern Bering Sea the condition of the halibut population continued to show minor improvement except on the important Polaris ground section of Area 4A which deteriorated further in 1968 despite the stringent restrictions upon the setline fishery.

Here as in other regions where large trawl fisheries have been operative, there is evidence of loss to the stocks beyond that which can be accounted for by the North American setline catch. Young halibut, notably those of the 1958, 1959 and 1961 year classes, which had shown some potential strength in 1965 through 1967, declined prematurely and precipitously in 1968. Furthermore small halibut of all ages were also lacking in the catches.

Catches from further west along the edge on the Misty Moon ground and in Area 4C continued to contain good proportions of older fish while displaying satisfactory supplies of younger groups as well.

It is evident that replenishment of stock on the depleted sections on the edge cannot be expected in the near future from redistribution of older fish from elsewhere along the edge and furthermore that recruitment from young classes on these grounds is being jeopardized by the massive trawl operations in the respective regions.

It would appear that conditions on the various grounds in Bering Sea remain

sufficiently diverse, to continue to require individual management to facilitate recovery of the depleted sections and in order to maximize the potential halibut yield in the region as a whole.

### TAGGING EXPERIMENTS

Scientific management of the halibut resource requires information on the fishing and natural mortality rates of the various stock components. Such information is obtainable from suitably designed tagging experiments and, in conjunction with recruitment and growth data, aids in determining the size and productivity of the stocks. Tagging also provides information on the interchange or migration of halibut between grounds and permits the stocks to be defined.

The Commission has tagged over 170,000 halibut since 1925 including the 12,903 tagged halibut released during 1968. Of this year's total 12,239 were released from three chartered otter trawl vessels: the *Karen T*, the *St. Michael* and the *Harmony*. These vessels operated between Cape Flattery on the northwest coast of Washington State and the northeastern flats of Bering Sea. The remaining 664 tagged halibut were released off the northern British Columbia coast from commercial trawlers by Commission personnel. A summary of 1968 releases is shown in the following table.

Vessel	Region of Tagging	Number Tagged
HARMONY	Bering Sea Flats	316
HARMONY	Chirikof and Unimak Islands	43
KAREN T	LaPerouse Bank	2,797
KAREN T	Cape Scott	1,421
KAREN T	Goose Islands (June)	535
KAREN T	Horseshoe	1,132
KAREN T	Ramsey Island	1,432
KAREN T	Goose Islands (July - August)	2,160
ST. MICHAEL	Southeastern Alaska to Chirikof Island	2,403
*Other	Cape Scott to Dixon Entrance	664
Total		12,903

\*The United States commercial trawlers, MORNING STAR, NEW WASHINGTON and WESTNESS, and the Canadian commercial trawler, WHITE SWAN.

The chartered trawler *Karen T* made four cruises during a 75-day charter period between late May and mid-August. The first cruise was to LaPerouse Bank; the second to Cape Scott and Goose Islands grounds; the third to Horseshoe and Ramsey Island grounds; and the fourth a return to Goose Islands grounds.

The catch statistics collected provide further understanding of the relationship of halibut between various grounds and with other species of bottom fish taken concurrently. Data upon the distribution, stock size, age composition and mortality rates of the halibut for these areas were secured. The availability of halibut to various sizes of codend meshes of bottom trawl gear in these areas was also studied.

Tagging from the chartered trawlers *St. Michael* and *Harmony* operating in the Gulf of Alaska and Bering Sea respectively is described in the section of this report dealing with recruitment studies.

In 1968 there were 2,121 recovered tags reported including 71 recovered but unreported in previous years. This total represents the largest number of tags received

in a single season. The primary reason for the increase was the return of nearly 1,200 tags from the trawl fishery. Most of these trawl recoveries were from the many releases made in 1968 off the British Columbia coast by the chartered tagging vessel *Karen T.* Canadian and United States vessels reported recoveries of six tags released by Japanese research vessels. These were forwarded to the Fisheries Agency of Japan through the International North Pacific Fisheries Commission. In turn, thirty-eight tags released by the Halibut Commission were recovered by Japanese vessels and returned by the Fisheries Agency of Japan. Forty-eight tags were received from the Soviet Union in 1968, the first since 1960 and included recoveries by Soviet vessels at various times during the past seven years.

In 1966 a program of premium rewards of \$100.00 each was initiated for the return of tags bearing pre-selected numbers. The recovery of eight premium tags was expected in 1968 based upon the expected recovery rates and the number of preselected tags. During the year six such tags were recovered and \$100.00 rewards were paid to the finders, four from Canada and two from the United States. Three of the respective tags were recovered in each of Areas 2 and 3A. During the three years of the program a total of 27 premium awards have been paid.

Analyses in 1966 and 1967 suggested that the program had resulted in increased returns and the 1968 results further support this conclusion. In 1966 the recoveries from all past experiments exceeded the expected number based on recoveries and fishing effort in past years. In 1967 and 1968 the number of returns has remained at the elevated level of 1966 returns, and exceeds the expected number as based on returns from earlier years.

Preliminary estimates suggest that over 1,000 additional tags were returned during the three-year test period as a result of the premium reward program. Cost calculations have shown that the premium rewards have resulted in an improved cost/benefit ratio for the tagging program.

### RECRUITMENT STUDIES

Reduced useable funds in 1968 brought about further reduction in charter time available for recruitment studies and monitoring the effect of foreign trawl fishing on the halibut stocks. Vessel operations for recruitment studies were reduced to 155 days in 1968 from 200 days in 1967.

The otter trawl vessel *Harmony* operated from mid-May to July 10 in eastern Bering Sea and thereafter until early August in the Gulf of Alaska in the vicinity of Unimak and Chirikof Islands for a total charter period of 85 days. The otter trawler *St. Michael* operated from June 27 to September 4 on both inshore and offshore locations in the Gulf of Alaska from Shelikof Bay to Chirikof Island for a total charter period of 70 days. Both vessels joined in replicate sampling and parallel fishing on some stations off Chirikof Island to measure variability in fishing effectiveness between vessels.

In 1968 approximately 2,100 halibut below 65 centimeters and 700 over that length were tagged and released during the operations. Tagging of all viable halibut in excess of those required for age composition purposes has been a function of the recruitment studies for the past several years. Many of the small trawl-caught



individuals tagged in past years are now of a size available to the commercial setline and trawl fisheries operating over the entire length of the coast. Recapture of these fish should indicate the relationships existing between the young found in the nursery areas and their contribution as adults in the commercial fisheries.

#### Inshore Areas

Sampling of selected inshore locations around the perimeter of the Gulf of Alaska that have proven to be good indicator areas for juvenile halibut was continued in 1968, using as in past years, a small-fish trawl of 1¼-inch codend mesh. In addition, promising locations for the capture of young halibut were found in the Bering Sea. This was the first year that significant numbers of one-year-old halibut were taken north of the Alaska Peninsula.

Sixty-nine hauls of 15 minutes duration were made on the inshore areas at depths varying from 7 to 27 fathoms and 4,469 halibut less than 65 cm. in length were caught.

The 1966 year class was abundant in the 1967 survey and, in 1968, was caught in above average numbers as two-year-olds in the Gulf of Alaska on the inshore grounds of Cape St. Elias and Kodiak Island.

The following table summarizes the catch by age and fishing grounds.

Number of Halibut Less than 65 Centimeters in Length from  
Inshore Areas in 1968 by Age and Locality

Age: Year-Class:	0 1968	1 1967	2 1966	3 1965	4 1964	5 1963	6 1962	7 1961	8 1960	9 1959	Total	Number Hauls
Shelikof Bay	26	109	139	72	307	199	34	35	2	—	923	25
Icy Strait	—	—	1	5	13	22	15	2	9	3	70	3
Cape St. Elias	28	23	95	141	9	6	2	1	—	—	305	10
Kodiak Island	—	586	740	28	16	3	1	—	—	—	1,374	18
Unimak Island	—	782	386	90	11	4	3	—	—	—	1,276	9
Bering Sea	—	301	135	66	14	3	2	—	—	—	521	4
Total	54	1,801	1,496	402	370	237	57	38	11	3	4,469	69

#### Offshore Areas

Recruitment studies on offshore grounds are directed primarily to ascertaining the direct effect that the growing foreign trawl fishery may have upon the smaller sizes of halibut which are vulnerable to trawling on the offshore banks.

The 1968 monitoring of the stocks of juvenile halibut in the Bering Sea was directed to selected stations, mainly on the southeastern flats, known to regularly produce significant catches. Some limited exploratory work was carried out in the vicinity of St. Matthew Island between June 21 and 26. Here fourteen hauls resulted in a catch of only five halibut, all less than 65 cm. in length. Bottom water temperatures found here were colder, near 0° C., than those found on the southeastern flats.

In previous surveys large numbers of juvenile halibut were present on the flats of southeastern Bering Sea, but the current juvenile population is apparently at a greatly reduced level. A representative group of 34 stations sampled each year at about the same time of year has manifested a sharply declining catch rate of fish less

than 65 cm. in length, per hour in the years 1966, 1967 and 1968 respectively. The juvenile halibut on the offshore grounds of the Gulf of Alaska have not shown the decrease observed in southeastern Bering Sea.

The offshore stations were sampled by 60-minute hauls with a 3½-inch mesh trawl net that has been standard for all offshore surveys including the extended trawl survey by the Commission from 1961 to 1963. This type of net also approximates what is generally used in the commercial trawl fisheries for demersal fisheries both by foreign and domestic trawl vessels. This year 182 hauls were made at offshore stations at depths of 11 to 124 fathoms and 6,578 halibut were caught, of which 5,908 or 90 percent were below 65 centimeters in length.

During late May prior to the beginning of the offshore survey, 25 plankton hauls at below-surface depths of about 5 fathoms were made on four traverse lines crossing the Alaska Stream between Kodiak and the Shumagin Islands. This reconnaissance was preliminary to a possible investigation of the relationship that may exist between the positions and strengths of the Alaska Stream and the influx of halibut larvae into the eastern Bering Sea from spawning in the Gulf of Alaska. Examination of the samples showed an absence of halibut eggs and larvae at that particular time of the year.

The 1964 year class which made an impressive appearance as three-year-olds in the catches on the Chirikof Island grounds last year continued to be prominent as four-year-olds in the same region as well as showing increased importance at Cape Chiniak. The increased availability of this year class at Cape Chiniak in 1968 as compared to 1967 is further confirmation of the apparent west-to-east movement of juvenile halibut which had earlier been indicated by the returns of tagged juveniles.

Although the above named grounds apparently have an above-average supply of the 1964 year class, in general the offshore grounds in 1968 did not indicate any great variation from the average number of pre-recruits encountered in previous surveys. The following table summarizes the age composition on the offshore areas sampled.

Number of Halibut Less than 65 Centimeters in Length from  
Offshore Areas in 1968 by Age and Locality

Age:	0	1	2	3	4	5	6	7	8	9	Total	Number
Year-Class:	1968	1967	1966	1965	1964	1963	1962	1961	1960	1959		Hauls
Cape St. Elias	—	—	12	38	95	176	105	50	21	4	501	32
Cape Chiniak	—	—	85	197	752	351	207	86	12	—	1,690	37
Chirikof Island	—	92	1,452	383	552	187	184	89	5	—	2,944	36
Unimak Island	—	—	3	38	42	19	11	—	—	—	113	5
S.E. Bering Sea	—	—	39	279	64	105	11	9	—	—	507	46
N.E. Bering Sea	—	—	4	81	23	23	7	14	1	—	153	26
Total	—	92	1,595	1,016	1,528	861	525	248	39	4	5,908	182

**PUBLICATIONS AND MANUSCRIPT REPORTS PREPARED DURING 1968****Published Reports:**

Report No. 46: Regulation and Investigation of the Pacific Halibut Fishery in 1967.

Report No. 47: A Simulation of Management Strategies in the Pacific Halibut Fishery – G. Morris Southward.

Report No. 48: The Halibut Fishery South of Willapa Bay, Washington – F. Heward Bell and E. A. Best.

**Manuscript Reports:**

1. Additional Information on Distribution of Juvenile Halibut on the Bering Sea 'Flats' Particularly With Respect to Seasonal and Annual Variation in Movement – E. A. Best.
2. Size Composition of Halibut Taken by Japanese Trawlers and Seiners – Gordon J. Peltonen.
3. The Distribution of the Japanese Groundfish Fleets in Relation to Halibut Nursery Areas in Eastern Bering Sea – E. A. Best.
4. Tagging and Stock Assessment Investigations in Eastern and Western Bering Sea in 1967 – Ian R. McGregor.
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6. Results of Halibut Tagging Experiments Conducted Since 1956, Exclusive of Those in Bering Sea – Richard J. Myhre.
7. Recent Changes in the Halibut Fishery and the Condition of the Stocks by Regulatory Areas – William H. Hardman.
8. The Effects of Bottomfish Trawling on Halibut. National Fisherman Yearbook, 1969 – F. Heward Bell.
9. The Pacific Halibut (*Hippoglossus*) Fishery. The Future of the Fishing Industry of the United States. University of Washington – Publications in Fisheries – New Series, Volume IV, 1968, p. 272-273 – F. Heward Bell.