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INTERNATIONAL PACIFIC HALIBUT COMMISSION

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REGULATION AND INVESTIGATION OF THE PACIFIC HALIBUT FISHERY IN 1965

COMMISSIONERS:

HAROLD E. CROWTHER
MARTIN K. ERIKSEN
L. ADOLPH MATHISEN
(From May 1965)
FRANCIS W. MILLERD
HAAKON M. SELVAR
WILLIAM M. SPRULES

SEATTLE, WASHINGTON

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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 fortieth published by the Commission, is the nineteenth 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 1965

By

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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INTRODUCTION

Commercial halibut fishing commenced off Vancouver Island and Cape Flattery in 1888. Unrestricted fishing during the subsequent 25 years reduced the halibut stocks on the grounds off British Columbia and Southeastern Alaska to low levels. When expansion of the fishery to grounds in the Gulf of Alaska by 1913 and further westward in subsequent years failed to sustain the total catch, concern was felt about overfishing.

The fishing industry advocated international control of the fishery as early as 1915, but it was not until after World War I that a convention was consumated on March 2, 1923 between the Dominion of Canada and the United States of America. This Convention, which was ratified on October 21, 1924, established a three-month winter closed season from November 16 to February 15 during the spawning season. It provided for the appointment of the International Fisheries Commission to investigate the fishery and to recommend measures for its preservation.

After intensive scientific investigations had shown that the stocks of halibut were in an overfished, low-yielding state and that the statutory three-month winter closed season alone was not effective in stopping intensification of the fishery and further decline, the Commission recommended additional remedial measures to the two Governments.

A new convention was signed in 1930 and ratified in 1931. It empowered the Commission to change or suspend the closed season; to divide the convention waters into areas and to limit the catch of halibut to be taken from each during its fishing season; to regulate the licensing and departure of vessels for purposes of the convention; to collect statistics; to fix the type of gear to be used; to close grounds found to be populated by small immature halibut; and to conduct such investigations as were necessary into the life history of the halibut. Enforcement of any regulations was the responsibility of the individual governments.

A third convention was signed and ratified in 1937 extending the previous regulatory authority of the Commission. It provided for control of the capture of halibut caught incidentally to fishing for other species in areas closed to halibut fishing and for prohibiting the departure of vessels to any area when the number which had already departed would suffice to take the catch limit assigned to that area.

The present convention signed and ratified in 1953 changed the name of the Commission to the International Pacific Halibut Commission and also increased the number of members from two to three from each country. It specifically charged the Commission with the responsibility of developing the stocks of halibut of the Northern Pacific Ocean and Bering Sea to levels which will permit the maximum sustained yield and for maintaining the stocks at those levels. It further required that regulations be based upon the results of investigations.

The annual catch of halibut, which without regulation had declined to about 44 million pounds by 1931, responded to management and was steadily increased to provide a record catch of 75 million pounds by 1962. Such high catch levels tested the upper limits of the estimated sustainable yields and the intensive fishing rates involved in taking the large catches caused the catch per unit effort to decline in some areas. Fishing intensities have been reduced in some areas in order to return the stocks to their respective optimum levels.

CONDITION OF THE RESOURCE, 1965

South of Cape Spencer in Area 2 the removals were reduced by catch regulation to an average of 22.6 million pounds in 1963-1964 and 24.4 million pounds in 1965 to offset the effect of earlier high removals. Due to the reduction the decline in catch per unit effort lessened by 1963 and a rising trend, which began in 1964, continued into 1965.

In the Gulf of Alaska catches have been held at approximately 38 million pounds annually during the past four years. The 1965 catches from Areas 3A and 3B South were 33.8 and 3.9 million pounds respectively. A gradual decline in catch per unit effort has occurred suggesting that removals are slightly too high to maintain the optimum stock size.

In Bering Sea between Unimak Pass and the Pribilof Islands (Area 3B North Triangle) there was a sharp reduction in 1964 from the excessive three-nation catch permitted in 1963. In 1965 the catch per unit effort increased and further improvement is expected in 1966 due to the still lower catch of 0.6 million pounds in 1965.

From the remainder of eastern Bering Sea a further catch of 0.4 million pounds was taken in 1965 chiefly from the edge from 170° to 175° W., and the catch per unit effort was about the same in 1965 as in 1964.

The 1965 Pacific Coast production was 63.5 million pounds and can be expected to continue at about a 65-million-pound level, although ultimately a sustainable yield of approximately 70 million pounds is indicated under present environmental conditions.

With North American halibut production and imports at moderate levels and generally favorable economic conditions, halibut prices reached a record level in 1965 yielding a near record total value of catch of approximately 20.1 million dollars to the Canadian and United States fleets.

ACTIVITIES OF THE COMMISSION

During 1965 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.

Canadian members in 1965 were: Dr. William M. Sprules, Ottawa, Ontario, Chairman; Mr. Martin K. Eriksen, Prince Rupert, British Columbia; and Mr. Francis W. Millerd, Vancouver, British Columbia. United States members were: Mr. Harold E. Crowther, Washington, D.C., Vice Chairman; Mr. Haakon M. Selvar, Bainbridge Island, Washington; and Mr. L. Adolph Mathisen, Petersburg, Alaska, from May 8, 1965. Under the Rules of the Commission, the Chairmanship and Vice Chairmanship alternate between the two countries in successive years.

The Commission held its regular annual meeting in Vancouver, British Columbia, from January 19 to 21, 1965. During the sessions it examined the results of its investigations and the effects of regulation on the fishery during 1964, dealt with administrative and budgetary matters, conferred with industry representatives regarding the management of the resource and adopted regulations for the 1965 fishery.

The morning of January 19 the Commission met in closed session to approve the provisional agenda and review the program for the public session to follow. During the latter part of the morning and afternoon the Commission met in joint session with representatives of all segments of the halibut industry and other interested persons.

A review of the results of scientific investigations during the previous year and the staff proposals for regulation of the fishery in 1965 were presented.

January 20 was devoted to discussion with the staff on administration, budget, and research plans for 1965. A joint meeting between the Conference Board consisting of delegates from vessel owners and union organizations, representatives of the dealers, and the Commission was held the morning of January 21 for discussion of regulatory and other proposals of the staff and industry.

The closing session was held the afternoon and evening of January 21 at which time the regulatory proposals recommended by the staff and industry were examined in detail and the 1965 regulations were adopted. A press release listing the important features of the regulations being recommended to the two governments for the 1965 fishing season was released immediately for the information of the industry and public.

During the fishing season the Commission determined the dates on which it deemed the catch limits of various regulatory areas would be attained, announced those dates in advance and the areas were closed accordingly.

A Special Meeting of the Commission was held in Seattle, Washington, on November 2, 1965 to review the results of the 1965 spring halibut fishery in Bering Sea and to develop proposals for the regulation of that fishery in 1966. The condition of the halibut stocks in the area, as indicated by the Commission's investigations, were reviewed with representatives of all segments of the United States and Canadian halibut industry concerned with the halibut fishery in Bering Sea.

Subsequently, the Governments of Canada and the United States were advised that the Commission had under consideration the following proposals for regulation of the halibut fishery in Bering Sea in 1966. To facilitate the interpretation of the proposals by the United States and Canadian National Sections of the International North Pacific Fisheries Commission they were phrased in the terms used by that Commission in their definition of conservation measures for the halibut of eastern Bering Sea.

1. That all vessels employing any type of trawl net gear shall return to the sea immediately any halibut captured in Bering Sea.
2. That no halibut of length less than 66 centimeters (26 inches) as measured from the tip of the lower jaw to the extreme end of the middle of the tail, or halibut which, with the head off and entrails removed, is less than 2.25 kilograms (5 lbs.) in weight may be retained in Bering Sea at any time by any fishing vessel.
3. That in any area or areas in Bering Sea found to be populated by small immature halibut, measures be taken to avoid as far as possible the capture of such halibut by any gear.
4. That Bering Sea be divided into the following conservation areas, with the indicated period of retention of halibut. All times mentioned in the proposals herein shall be local standard time.
   A. An area bounded by a line connecting Cape Navarin and the northern tip of Cape Sarichef on Unimak Island; the meridian of 170 degrees west longitude; and a line connecting said northern tip of Cape Sarichef with a point on the meridian of 170 degrees west longitude at 54° 00′ 00″ north latitude; the retention of halibut by vessels fishing with long-line gear within this area shall be permitted during a period beginning

at 1500 hours on April 6, 1966 and terminating at 1800 hours on April 15, 1966.

B. An area bounded by the Aleutian Islands; the meridian of 170 degrees west longitude; and a line connecting the northern tip of Cape Sarichef on Unimak Island and a point on the meridian of 170 degrees west longitude at 54° 00′ 00″ north latitude; retention of halibut by vessels fishing with longline gear shall be permitted therein during a period beginning at 1500 hours on September 1, 1966 and terminating at 1800 hours on September 10, 1966.

C. An area bounded by the Aleutian Islands; the meridians of 175 degrees west longitude and 170 degrees west longitude; and a line connecting a point on the meridian of 170 degrees west longitude at approximately 57° 15′ 00″ north latitude and a point on the meridian of 175 degrees west longitude at approximately 59° 42′ 00″ north latitude (which line is a segment of that line connecting Cape Sarichef and Cape Navarin); retention of halibut by vessels fishing with longline gear shall be permitted therein during the period beginning at 1500 hours on March 25, 1966 and terminating at 1800 hours on April 15, 1966.

D. All other areas in Bering Sea shall open for the retention of halibut by vessels fishing with longline gear during the period from 1500 hours on March 25, 1966 until 1800 hours on November 15, 1966.

Proposals 1 to 3 were directed to maximizing the physical yield of halibut from Bering Sea, the primary objective of both the Halibut and the North Pacific Fisheries Conventions. Size limits, the avoidance of nursery areas, and prohibiting the retention of halibut caught by trawl gear tend to minimize the taking of halibut below their optimum harvesting size. Such measures on other parts of the Pacific Coast have alleviated some of the destructive effects of trawling upon the halibut stocks and have neither impaired the effectiveness nor productivity of important trawl fisheries for the other demersal species.

Proposal 4 would divide the former Area 3B North Triangle into two sections, A and B. Section A encompasses the edge grounds between Unimak Pass and the Pribilof Islands and section B the grounds along the north shores of the Fox Islands.

In section A, with indications of a favorable stock reaction already evident from the lower removals of 1964 and with further improvement expected in 1966 due to the still lower 1965 catch, two days could be added to the fishing period which had been drastically reduced to 7 days in 1965 without jeopardizing the rehabilitation process. This relaxation would provide the fleets with enough time to fish over a wider area and assure a better evaluation of the condition of the resource on the edge. The sequence of the opening dates on the edge in section A and that west of 170° west longitude would also assure a feasible operation for the North American setline fleets as well as permit a conservative cropping of the stocks on these two grounds.

In section B, including the Fox Islands grounds, fishing has usually been conducted in the late summer and early fall, the time of highest availability of halibut in that region. Early closure of the original Area 3B North Triangle largely precludes such fishing. The proposed 9-day fishing period in the fall should thus provide more adequate utilization.

Section C of Proposal 4 defines the grounds in Bering Sea between 170° and 175° west longitude and would restrict fishing in that area to 21 days. In 1965

this area was fished almost exclusively by United States and Canadian vessels. Such restraint is required to prevent any repetition of the overfishing that occurred in 1963 on the edge east of that area in Area 3B North Triangle.

Section D of Proposal 4, covering the remainder of Bering Sea, would provide for setline halibut fishing from March 25 to November 15 in 1966 to permit some exploration of the resource by North American setline gear. Despite the protracted open period, the available fishing power, economic considerations and the fleet logistics would limit such setline fishing to very moderate levels.

During 1965, in addition to the Annual Report, several manuscript reports dealing with analyses of scientific data were prepared; three of such were published. Also, various technical papers were prepared to provide the Governments of Canada and the United States with background information, chiefly with respect to matters under consideration by the International North Pacific Fisheries Commission. A listing of these is given at the end of this report.

REGULATION IN 1965

The Pacific Halibut Fishery Regulations adopted by the Commission for 1965 were approved by the Governor General of Canada in Council on March 5 and by the President of the United States of America on March 23 at which time they became effective. As in the previous two 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.

The more significant changes in the regulations in 1965 included a drastic reduction in the fishery in Area 3B North Triangle from a three-nation catch limit of 6,393,340 pounds in 1964 to a prescribed 7-day fishing period commencing on April 4; the division of Area 3B North into two regions – Area 3B Northeast (east of 175° west longitude not including Area 3B North Triangle) and Area 3B Northwest (west of 175° west longitude); and a reduction in the catch limit in Area 2 from 25,000,000 pounds in 1964 to 23,000,000 pounds in 1965.

Regulatory Areas

The regulatory areas in 1965, shown in Figure 1, were as follows: Area 1 – the convention waters south of Willapa Bay, Washington; Area 2 – the waters off northern Washington, British Columbia and Southeastern Alaska between Willapa Bay and Cape Spencer, Alaska; Area 3A – the waters off Alaska between Cape Spencer and Kupreanof Point near the Shumagin Islands; Area 3B South – the waters south of the Alaska Peninsula and the Aleutian Islands west of Kupreanof Point; Area 3B North Triangle – the waters encompassed by a line from the Pribilof Islands to Unimak Pass, the Aleutian Islands and the meridian of 170° west longitude; Area 3B Northeast – the waters of Bering Sea east of the 175° west longitude, not including those in Area 3B North Triangle; and Area 3B Northwest – the waters of Bering Sea west of 175° west longitude.

The above divisions of the convention waters define regulatory or management units and do not necessarily define biologically separate populations. By applying differential opening dates to the areas it is possible to provide for an amount of fishing appropriate to the productivity of the various grounds.

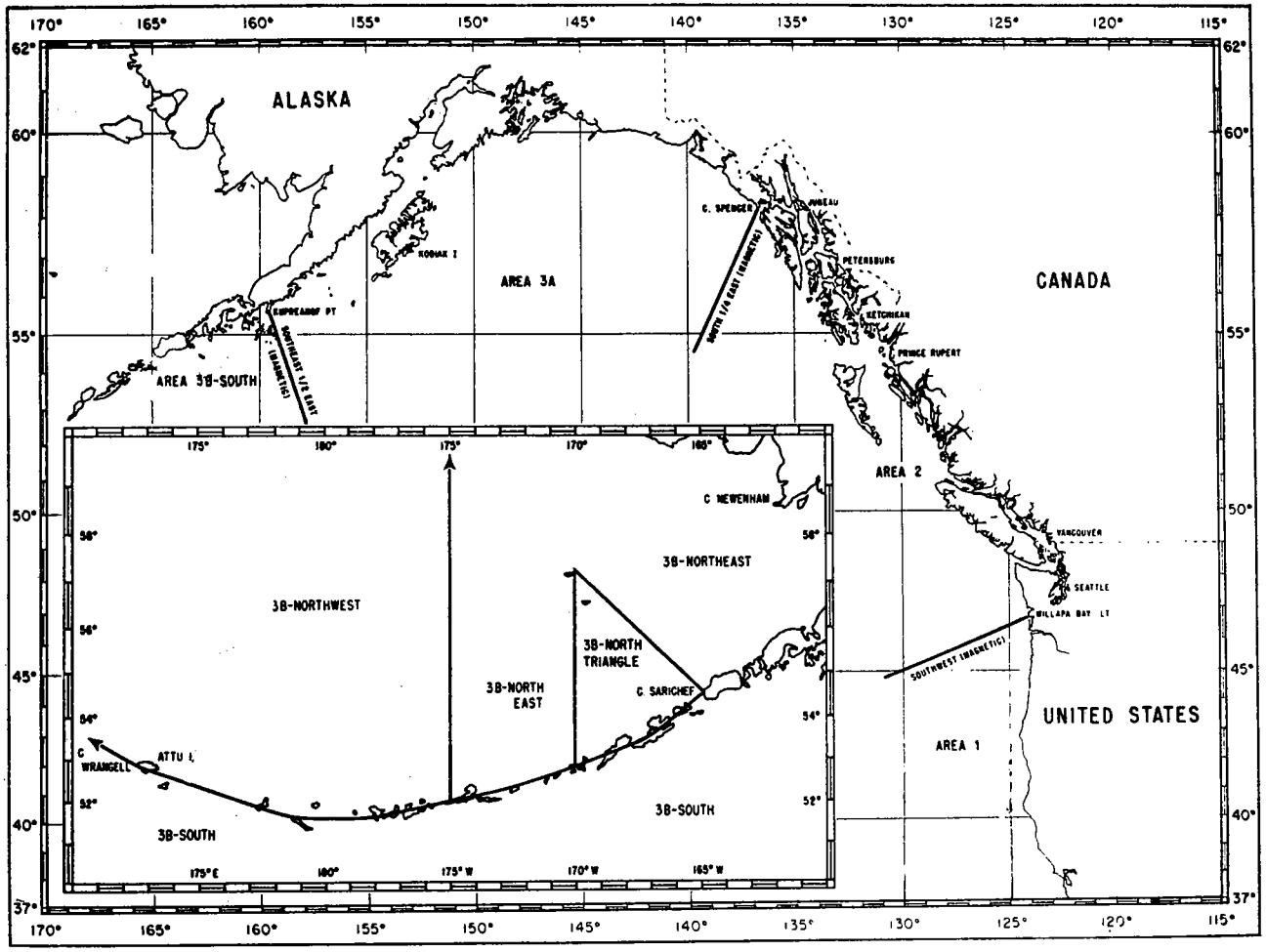

Figure 1. Pacific Coast of North America showing regulatory areas defined by the International Pacific Halibut Commission in 1965.

Catch Limits

The catch limits in 1965 were 23,000,000, 34,000,000 and 4,000,000 pounds for Areas 2, 3A and 3B South respectively. There was no catch limit for Area 1 or for either of the three regulatory areas in Bering Sea.

Regulation in Bering Sea east of 175° west longitude followed the conservation measures recommended by the three-nation International North Pacific Fisheries Commission in November 1964. They conformed in general with the proposed regulations considered by this Commission in October 1964.

Area 3B North Triangle, which had been subjected to excessive removals by the Canadian, Japanese and United States fleets in 1963, was opened to halibut fishing for a seven-day period without catch limit. While the restriction was slightly less drastic than the five-day period under consideration by the Halibut Commission the difference was not sufficient to jeopardize the rehabilitation process.

The newly created Area 3B Northeast was opened for an 87-day period from March 25 to June 20 without catch limit as recommended by the International North Pacific Fisheries Commission. This period was shorter than the March 25 to October 15 period under consideration by the Halibut Commission in October 1964. The earlier date of closure restricted the fishing period to a time when the Canadian and United States fleets were engaged in fishing on the more accessible grounds in the Gulf of Alaska and exploratory commercial setlining on the northeastern flats of Bering Sea was largely precluded.

Area 3B Northwest, west of 175° west longitude, outside the region covered by the conservation measures of the International North Pacific Fisheries Commission, was opened March 25 and closed November 15 without catch limit. This conformed in general with the period under consideration by the Halibut Commission in October 1964 except that a closing date of October 15 had been proposed.

Lengths of Seasons

Areas 1 and 2, which opened on May 1, were closed on September 15 by reason of attainment of the catch limit in Area 2. As this closing date coincided with the statutory closing date of Area 2, closure was regarded as having taken place in accord with the latter provision which involved less administrative detail than required under the catch-limit provision of the regulations. The fishing season of 137 days was the same length as in 1964.

The Area 3A season also commenced May 1 and was terminated on August 26 for a total of 117 fishing days, seven days longer than in 1964. Area 3B South opened on April 12 and was terminated September 30, providing for a 171-day fishing season, 21 days shorter than in 1964. Both Area 3A and Area 3B South were closed by reason of attainment of their respective catch limits.

The 7-day fishing season in Area 3B North Triangle commenced April 4 and terminated April 11. Areas 3B Northeast and 3B Northwest opened March 25 and closed June 20 and November 15 respectively. The fishing season totaled 87 days in Area 3B Northeast and 235 days in Area 3B Northwest. The opening and closing dates of all areas without catch limit are announced in the regulations published prior to the fishing season.

STATISTICS OF THE FISHERY

Landings by Regulatory Areas

Canadian and United States landings of halibut in thousands of pounds by regulatory areas for the years 1960 to 1965 are shown in the following table. Estimates of the poundage taken in contravention of the regulations are included in the totals for each section of the coast. All 1965 figures in the report are preliminary.

United States and Canadian Catches by Regulatory Areas in Thousands of Pounds

		1960	1961	1962	1963	1964	1965
Area 1	U.S.	309	270	312	205	142	142
	Can.	----	----	----	----	----	----
	Total	309	270	312	205	142	142
Area 2	U.S.	16,723	15,756	14,480	11,689	8,173	11,971
	Can.	15,086	13,093	14,183	14,462	11,437	12,403
	Total	31,809	28,849	28,663	26,151	19,610	24,374
Area 3A	U.S.	17,423	20,479	19,956	17,221	15,082	16,136
	Can.	12,535	13,422	14,652	15,752	18,052	17,631
	Total	29,958	33,901	34,608	32,973	33,134	33,767
Area 3B South	U.S.	1,587	1,520	1,879	1,823	1,910	1,383
	Can.	2,651	1,024	2,335	2,135	2,843	2,512
	Total	4,238	2,544	4,214	3,958	4,753	3,895
Area 3B North Triangle	U.S.	2,170	2,037	3,434	3,242	899	333
	Can.	3,308	1,927	3,369	4,024	986	219
	Total	5,478	3,964	6,803	7,266	1,885	552
Area 3B North*	U.S.	138	3	385	110	173	410*
	Can.	33	----	134	760	270	370
	Total	171	3	519	870	443	780
Total All Areas	U.S.	38,350	40,065	40,446	34,290	26,379	30,375
	Can.	33,613	29,466	34,673	37,133	33,588	33,135
	Total	71,963	69,531	75,119	71,423	59,967	63,510

* Area 3B North was divided in 1965 into Area 3B Northwest and Area 3B Northeast, and 338,000 and 442,000 pounds were taken from the two areas respectively.

Area 1

In Area 1, the total 1965 catch of 142,000 pounds is indicative of the sparsity of the halibut population at this southern extremity of the range of the species. Much of the halibut is taken incidentally while fishing for other species. Tagging and other studies indicate that the halibut in the region are biologically inseparable from those on the grounds to the north. It has been identified as a separate area for enforcement reasons which are largely no longer applicable.

Area 2

In Area 2, the total 1965 catch was 24.4 million pounds. This represents an increased removal from the area of over 4 million pounds above the 1964 total. Several factors contributed to the larger production, foremost of which was the general stock improvement as evidenced by the increased catch per unit effort. Record ex-vessel halibut prices that prevailed throughout the season and the below-average salmon season in

Southeastern Alaska not only attracted a larger fleet to halibut fishing but resulted in some salmon vessels remaining in the halibut fishery for a longer period. Also, some vessels in Southeastern Alaska actually left the salmon fishery early to return to halibut fishing due to below-normal fishing in the former fishery. Included in the above 24.4 million pounds were 0.4 million pounds most of which was caught incidentally while fishing for other species in Area 2 after the closure of that area.

The excess taken over the 23-million-pound catch limit was above normal, largely because of the unexpected good fishing encountered at the end of the season as well as the re-entry of vessels from the salmon fishery to halibut fishing after announcement of the September 15 closing date. A range of management error is expected in administering catch limits in the Pacific halibut fishery. Catch deficits or excesses usually balance one another over a period of years and since the trip is the operational unit of the North American fleet it is necessary to determine and announce the date of attainment of catch limits considerably in advance of the event.

Area 3A

In Area 3A the 1965 total catch was 33.8 million pounds. The deficit below the 34-million-pound catch limit represents only a fraction of one day's fishing by the fleet operating in the area. Announcement of closure of the season in this area was made on August 6, twenty days in advance of actual closure on August 26, 1965.

Area 3B South

In Area 3B South the 1965 total catch was 3.9 million pounds, close to the 4-million-pound catch limit. Announcement of closure of the season in this area was made on September 9, twenty-one days in advance of actual closure on September 30, 1965.

Area 3B North Triangle

In Area 3B North Triangle the 1965 total catch was only 552,000 pounds, all of which was taken by the United States and Canadian fleets. The Japanese did not participate in halibut fishing in the area in 1965.

The catch was not only lower than expected, it was taken largely from the more accessible Polaris ground due probably to the drastic reduction in the season to seven days of fishing. The lower-than-expected removal resulted chiefly from the premature departure of the fleet from the area in order to be in a favorable position to fish on the opening date in Area 3B South. Of the 27 vessels that started to fish in the Triangle only three remained to the seventh and last day of the season despite the fact that the catch per unit effort was not unduly low even by the time of their departure. Furthermore, early departure cannot necessarily be attributed to the bad storm on the third day which resulted in the tragic loss of the Canadian vessel *Sea Ranger,* as the exodus did not get fully underway until the second day following the storm, nor did the catch per unit effort decline on the day following the storm.

Area 3B Northeast

In Area 3B Northeast the 1965 total catch was 442,000 pounds, all of which was taken during March and April on the edge grounds, except for 24,000 pounds landed in September by the Commission's chartered tagging vessel, which fished in the vicinity of Nunivak, St. Matthew and the Pribilof Islands. Although the season remained open through June 20, the North American fleet operated in the more accessible grounds in Area 3A which opened on May 1st.

Area 3B Northwest

In Area 3B Northwest the 1965 total catch was 338,000 pounds. Of this total, slightly under 100,000 pounds were taken along the Aleutian Chain and Bowers Bank, with the remainder being taken from the edge grounds west of 175° west longitude.

Landings by Ports

The distribution of halibut landings in thousands of pounds from all areas is shown in the following table according to regions and ports or groups of ports for 1965 with comparable data for 1963 and 1964.

United States and Canadian Landings by Regions and Ports in Thousands of Pounds

	1963			1964			1965		
	U.S.	Canada	Total	U.S.	Canada	Total	U.S.	Canada	Total
California and Oregon	228	----	228	133	----	133	143	----	143
Seattle	10,596	1,376	11,972	7,938	1,226	9,164	5,926	155	6,081
Bellingham	769	2,916	3,685	982	1,588	2,570	767	1,473	2,240
Other Washington	226	----	226	215	----	215	275	----	275
Vancouver, B.C.	----	5,783	5,783	----	5,739	5,739	----	4,050	4,050
Vancouver Island	----	1,557	1,557	----	833	833	----	1,013	1,013
Prince Rupert	733	17,248	17,981	562	18,275	18,837	566	19,872	20,438
Other B.C.	----	1,222	1,222	----	856	856	----	860	860
Ketchikan	6,838	1,170	8,008	6,123	929	7,052	8,188	601	8,789
Other S.E. Alaska	8,960	651	9,611	7,095	498	7,593	9,657	467	10,124
Central Alaska	5,940	5,210	11,150	3,331	3,644	6,975	4,853	4,644	9,497
TOTALS	34,290	37,133	71,423	26,379	33,588	59,967	30,375	33,135	63,510

The most noticeable feature in the distribution of landings is the downward trend in the major southern ports of Seattle, Bellingham and Vancouver and the substantial upward trend of landings in all Alaskan ports and Prince Rupert.

Since most of the vessels are independently owned and noncaptive to any port, the distribution of landings by the larger units of the fleet is chiefly a function of port price differentials which change according to the general price level. The current high prices tend to result in landings in ports closer to the grounds.

The increased landings in Southeastern Alaska also reflect an increase in the number of vessels fishing for halibut in the area from the sharp reduction that occurred in 1964, and the greater relative attractiveness of halibut prices and fishing compared to those in the salmon fishery in 1965.

Catch Per Unit of Fishing Effort

In Area 2 there was a noticeable improvement in the catch per unit effort in 1965 extending beyond the slight increase that occurred in 1964.

North of Dixon Entrance in Southeastern Alaska the improvement in catch per unit effort was greatest due to the sharp reduction in removals that had occurred in the region during the past several years. South of Dixon Entrance all of the grounds in Hecate Strait and Queen Charlotte Sound exhibited moderate increases in the catch per unit effort. The only decline was off the northwest coast of Queen Charlotte

Islands which probably resulted from the increased removals from this area during the past five years.

In Area 3A the catch per unit effort continued the slow but steady decline of the past five years. While the stock size is not yet below what may be regarded as the optimum under present environmental conditions, the removal level should be lowered to stop the decline. The decline in Area 3A is most noticeable on the grounds between Kodiak and Shumagin Islands where there has been a sharp increase in the removals during the past six years.

In Area 3B South the catch per unit effort has continued to decline and is below what is regarded as the optimum level. Present removals from the area, particularly during the spring fishery, appear to be in excess of the optimum.

In Bering Sea in Area 3B North Triangle, which underwent a disastrous decline in catch per unit effort in 1964 as a result of an excessive catch permitted in 1963, the catch per unit effort increased from 95 pounds to 128 pounds due to the greatly reduced removals of 1964. Further improvement is expected in 1966 due to the still greater reduction in removals in 1965.

On the edge grounds in Area 3B Northeast between 170° and 175° west longitude the catch per unit effort was about the same as in 1964 but lower than in 1963.

The catch per unit effort on the various grounds within Bering Sea as a whole, not including Area 3B North Triangle, can probably be expected to be sensitive to any substantial changes in effort and catch during succeeding years as the stocks of adult halibut appear to be limited in size.

COMPOSITION OF THE CATCHES

Studies of the size and age composition of the stocks on the major fishing grounds provide information regarding the number of spawners and recruits and their rates of growth and mortality for the evaluation of the effects of current regulation and fishing upon the population.

The investigations are based upon measurements and age readings obtained from representative samples of otoliths collected from the commercial catches at the time of landing. These market samples are supplemented by samples taken at sea on commercial vessels and on vessels chartered for tagging and recruitment studies where data regarding sex and maturity can be obtained before the fish are eviscerated.

In 1965 landings were sampled regularly at Seattle, Vancouver, Prince Rupert, Petersburg and Ketchikan and intermittently at Sand Point. Over 56,000 otoliths were collected for length and age data from 251 commercial trips, including 12 trawlers and 9 setline vessels sampled at sea. An additional 14,000 measurements, 5,000 of which are identified by sex, were taken during chartered vessel operations. More than 35,000 otoliths were read during the year.

The number of commercial trips sampled at sea or in port is shown by area of origin in the following table.

Considerably fewer commercial trips were sampled in 1965 than 1964's record 313 trips, chiefly because of a shift in landing on the part of the fleet to ports where sampling could not be maintained on a continuing basis. Nevertheless, as seen from Figure 2, all major sections of the coast are well represented in the sampling.

Summary of Catch Sampling in 1965 Showing Number of Trips According to Area of Origin

Area of Origin	Number of Trips		
	In Port	At Sea	Total
Cape Flattery - Cape Scott	4	3	7
Queen Charlotte Sound	25	7	32
Hecate Strait	23	3	26
North and West Coast Queen Charlotte Islands	17	----	17
Southeastern Alaska	48	----	48
Totals South of Cape Spencer	117	13	130
Cape Spencer - Cape Cleare	32	----	32
Portlock - Albatross Banks	36	2	38
Cook Inlet - Shelikof Strait	6	----	6
Trinity Islands - Chirikof Island	19	1	20
Shumagin Islands and Westward	10	2	12
Bering Sea	10	3	13
Totals West of Cape Spencer	113	8	121
Totals Pacific Coast	230	21	251

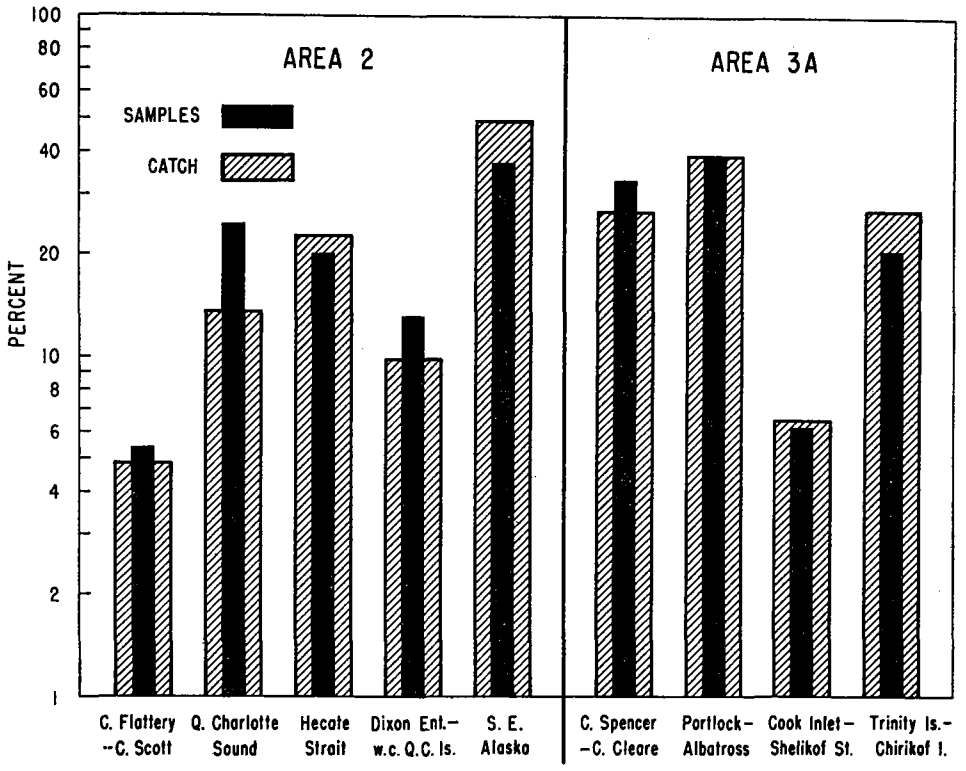

Figure 2. Percentage distribution of the total catch and market samples in Areas 2 and 3A in 1965 by sections of each area.

In Area 2 off British Columbia, although there was an increase in older and larger fish on some grounds in 1965, the catches continued to be particularly dependent upon the younger year classes.

In Southeastern Alaska, both on the inside and outside grounds, the abundance of all major year classes is being sustained. In this region the 1955 and 1957 classes, which are declining prematurely in parts of Hecate Strait, continue to show recruitment into the catches.

In the Masset region, an accumulation of large old fish has been largely reduced since that formerly-closed nursery area was opened to fishing in 1958 although there are indications of considerable rejection of small halibut at sea. The composition of the landings from that ground is now similar to those from nearby northern Hecate Strait.

Average weight by age data in Area 2 indicates that a considerable increase in rate of growth has occurred since about 1955 similar to that observed for west of Cape Spencer since about 1930. The age of entry into the commercial setline fishery on some grounds in Area 2 has declined to as young as three years while the number of years during which they remain in the chicken (5-10 pound) trade category is also reduced. By six years of age most have entered the medium (10-60 pound) trade category. Nevertheless, if there has been no compensatory change in natural mortality, any fishing which concentrates unduly upon the young age groups of the population will preclude maximizing the potential yield from even these fast-growing year classes.

West of Cape Spencer, both in Areas 3A and 3B South, the older fish have declined and the catches are dependent to a greater extent than heretofore upon fish 12 years of age and younger. To realize the full potential of several apparently strong year classes, notably those of 1955 and 1957, removals should be held at moderate levels.

In Area 3B North Triangle in Bering Sea, despite the excessive and premature removals taken from the younger year classes in 1963 by the large amount of lightweight gear used by the Japanese fleet in that year, most age groups showed improvement in 1965. Their abundance and relative representation in the catches in 1964 and 1965 are relatable to the amount and type of setline gear that was fished in the area in 1963 and 1964.

To credit the year-to-year changes in composition to variations in availability would require that such variation was largely restricted to specific year classes and particularly to those that had been intensively fished by the large volume of lightweight gear which had been used in 1963.

The continued importance of the 1955 year class as ten-year-olds in the 1965 catch is simply a further reflection of the abundance which it has shown in all areas along the coast. A large component of that class due to be recruited into the setline fishery in 1965 was apparently of individuals small enough to have escaped the heavy fishing of 1963. Thus, as with the overall population, the reaction of the 1955 (and the less important 1956) year classes in 1964 and 1965 is largely attributable to the amount and the character of setline fishing in the region.

The 1958 year class, which was prominent as five-year-olds in catches of the Commission's chartered trawler on the southeastern flats in Bering Sea in 1963, made its first significant appearance in the setline fishery in Area 3B North Triangle as seven-year-olds in 1965, and in even greater numbers than did the 1955 year class

at the same age. It was also prominent in 1965 setline catches on the northeastern flats, particularly off Nunivak Island.

On the edge west of the Pribilof Islands, although the abundance and the average age have declined, catches in the early spring continue to contain greater proportions of older fish than those from Area 3B North Triangle. On the other hand, small accumulations of old fish continue to be found. One catch in October from west of 175° west longitude was predominantly of very slow-growing fish over 18 years of age.

Along the Aleutian Chain exploratory commercial fishing experienced variable fishing success. One catch from Bowers Bank contained a high proportion of old fish of the largest average weight by age yet encountered in Bering Sea.

TAGGING EXPERIMENTS

Tagging experiments provide information required for the scientific management of the halibut fishery including data on the relationships between the stocks on the various fishing grounds as well as estimates of both fishing and natural mortality rates for determining the extent to which each stock is being utilized.

Tagging operations scheduled for 1965 involved the chartering of three setline vessels, one combination setline-trawler and one trawler, although the primary function of the latter two vessels was recruitment studies, tagging being secondary. However, failure to obtain a requested increase in appropriations for the 1965-1966 fiscal year necessitated foregoing chartering of one of the three setline vessels for work in Bering Sea and required the reduction of the projected charter period for a second setline vessel. The latter action involved postponement of tagging off the coasts of Oregon and northern California. Also the scheduled operations of the third setline vessel in Area 3B South were shortened to permit one trip into Bering Sea.

Despite the program modifications a total of 8,309 halibut were tagged in 1965 between Cape Scott on Vancouver Island and St. Matthew Island in Bering Sea. A summary of tagging from vessels chartered by the Commission is shown in the following table.

Chartered Vessel	Operation	Region of Tagging	Number Tagged
CHRISTIAN S	Summer Setline-Grid	Hecate Strait - Dixon Entrance	1034
CHELSEA	Summer Setline-Grid	Shumagin Islands to Umnak Is.	1689
CHELSEA	Summer Setline	Bering Sea	1115
TORDENSKJOLD	Trawl and Setline-Grid	Bering Sea	1095
DON EDWARDS	Recruitment Studies	Hecate Strait to Chirikof Island	3376
TOTAL			8309

An additional 276 halibut were tagged between Cape Flattery and mid-Hecate Strait by Commission personnel from the catches of halibut taken incidentally to commercial trawling by the United States and Canadian otter trawlers *Morning Star, Renown,* and *Sea Prince.*

The chartered setliner *Chelsea* completed the third phase of a program of tagging experiments commenced off Cape Cleare in 1963 in which fishing was conducted on a predetermined grid of stations. The 1965 operations included the grounds from Shumagin Islands and westward to Cape Sagak on Umnak Island. A total of 185

stations were occupied on four trips during a 77-day charter period extending from late May to the early part of August. Such systematic fishing and tagging on all the fishable bottom in a given area provides a better representation of the total population of halibut by the tagged members. Recoveries from such "grid tagging" experiments should provide more reliable estimates of mortality and utilization rates than has been possible from the more conventional method of tagging only on the traditional commercial concentrations of halibut in an area.

Due to the urgent need for information on the interrelationships between the halibut found in the summer on the northeastern Bering Sea "flats" with those concentrated on the edge grounds in the spring, the *Chelsea* was diverted from completion of the grid program to make one trip of 23 days during the latter part of August to grounds near Nunivak, St. Matthew and Pribilof Islands in Bering Sea.

The chartered setliner *Christian S* operated 74 days from the middle of May to the end of July initiating a grid tagging program in Area 2 similar to that being carried out west of Cape Spencer. Fishing was conducted at 152 stations between the northern end of Vancouver Island to the middle of Hecate Strait. The program should provide more precise data concerning the distribution, population size, age composition and mortality rates of the halibut in the region than is obtained from conventional tagging, as well as some evaluation of the possible effect that the United States and Canadian trawl fishery may be having upon the halibut population.

The chartered trawler *Tordenskjold,* using both trawl and longline gear, fished on a predetermined grid primarily on the large expanse of flats in southeastern Bering Sea. On five trips from June to the middle of September, 102 stations were fished with trawl gear and 41 with setline gear. The primary objective was to ascertain the stock size and age composition of a very large population of young halibut from one to four years old that inhabit this region. All viable halibut were tagged to provide information on the relationship between these young halibut and the adult populations in other areas of Bering Sea and the Gulf of Alaska and possibly in Area 2. Preliminary results of these operations are discussed in the section on recruitment studies in this report.

A total of 665 recovered tags were reported during 1965, including 16 taken in previous years. Japanese vessels reported 7 of the recoveries. United States and Canadian vessels reported recoveries of an additional 16 tags released by Japanese research vessels, which were forwarded to the Fisheries Agency of Japan.

The first year's returns from 1963-1964 winter tagging south of the Alaska Peninsula in Area 3B South and the western section of Area 3A again demonstrated the interrelationships between the two areas as shown by recoveries from previous non-winter tagging experiments in those areas. There was a substantial interchange indicated between Areas 3B South and 3A.

RECRUITMENT STUDIES

Annual investigations of the distribution and abundance of subcommercial sizes of halibut, which were started in 1955, were continued in 1965. The original objective of the investigations was to determine the relationships that may exist between abundance of young, environmental conditions, size of spawning stock, and subsequent recruitment to the commercial fishery. During the past three years with the advent of an increasingly large foreign trawl fishery in the Gulf of Alaska, the scope of the investigations has been broadened.

Sampling that had been largely confined to certain inshore grounds was extended to include some offshore banks to provide some indication of the possible impact that foreign trawling might be having upon the stocks of the young halibut in the Gulf of Alaska.

During 1965 the monitoring of the stocks of young halibut was extended into Bering Sea to reinitiate a program commenced in that area in 1963.

Two commercial otter trawl vessels were used to carry out these surveys. The *Don Edwards* was chartered for 65 days from July 1 through September 3 to conduct the survey in Southeastern Alaska and in the Gulf of Alaska, and the *Tordenskjold* was chartered for 105 days, May 28 through September 9, to work in Bering Sea.

Inshore Areas—Southeastern Alaska and Gulf of Alaska

Certain inshore areas between Dixon Entrance and the southwest end of Kodiak Island have consistently provided good samples of young halibut that can be effectively caught with a standard small-fish trawl (57-foot groundline 2-seam type trawl of 1¼-inch mesh). The 1965 survey caught 3,170 sublegal halibut in 60 hauls of 15-minute duration in depths varying from 8 to 38 fathoms. The number of hauls and age composition of the halibut is summarized according to locality in the following table.

Number of Halibut Less than 66 Centimeters in Length Taken from Inshore Areas in 1965 According to Locality and Age

Age:	0	1	2	3	4	5	6	7	8	9	10		Number
Year Class:	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	Totals	Hauls
Dixon Entrance	....	22	10	13	50	56	21	16	13	....	....	201	7
Shelikof Bay	1	348	76	60	174	51	7	3	4	....	....	724	24
Icy Strait	....	....	10	16	83	33	3	....	2	....	....	147	11
Cape St. Elias	....	386	309	140	117	14	13	2	4	....	1	986	12
Kodiak Island	....	689	319	73	25	6	....	....	....	....	....	1112	14
Totals	1	1445	724	302	449	160	44	21	23	....	1	3170	68

One-year-old halibut dominated the catches in all inshore areas. However, the 1961 year class, which is now four years old, continued to show up exceptionally strong as it has in the past four annual surveys. The faster-growing individuals of this year class have already entered the catch of the Canadian and United States setline fishery and should make a significant contribution to that fishery in the next few years. On the other hand, the first appearance of the 1965 year class, as fish of the year, was very weak. Only one individual of this group was taken in 24 hauls at Shelikof Bay and none in 12 hauls at Cape St. Elias and 14 hauls at Kodiak Island.

By comparison, the 1961 year class produced nearly 4,500 fish of the year during the 1961 survey from these same grounds in about the same number of hauls.

However, any conclusions about the relative strength of the 1965 year class should not be entertained until its abundance as one- or two-year-olds has been established.

To evaluate the subsequent contribution of the young fish on the inshore grounds to the commercial setline fishery for the adults and to ascertain their relationships, tagging is made an integral part of the program. Nearly 1,100 individuals, chiefly two-year-olds, were tagged with vinyl spaghetti tags attached through the opercle.

Offshore Areas—Gulf of Alaska

Recruitment studies on offshore areas in the Gulf of Alaska are directed primarily to ascertaining the effect that the growing foreign trawl fishery in that area may have upon the stocks of halibut. Prior to the expansion of foreign trawling from Bering Sea into the Gulf of Alaska and with the aid of special funds made available by the two governments, a comprehensive survey of the availability of halibut and other demersal species to trawl gear was conducted from May 1961 to April 1963. Approximately 1,560 stations were occupied on a predetermined pattern over the 65,000 square miles of shelf area between Unimak Pass and Cape Spencer, Alaska. This survey revealed a widespread distribution of young halibut over the entire shelf area. It also indicated that the impact of trawling in this region would probably be greatest upon the younger ages.

As a result of these findings an increasing share of recruitment studies during the past four years was directed to the annual monitoring of some selected stations occupied during the two-year trawl survey. With increased funds that will be available in 1966 it will be possible to expand the present sampling program to a magnitude that will provide more reliable results.

Limited sampling at selected stations in four general offshore locations involved 56 one-hour hauls with a standard commercial otter trawl net (94-foot groundrope 2-seam type trawl of 3½-inch mesh) between Hecate Strait and Chirikof Island from waters down to 100 fathoms in depth. The four-year-old fish were the predominant group in the catches from these offshore stations.

Tagging of sublegal fish caught in the offshore areas resulted in nearly 1,500 halibut being released.

The number of hauls made and age composition of halibut from the offshore sampling is summarized in the following table by sections of the coast.

Number of Halibut Less than 66 Centimeters in Length Taken from Offshore Areas in 1965 According to Locality and Age

Age:	0	1	2	3	4	5	6	7	8	9	10		Number
Year Class:	1965	1964	1963	1962	1961	1960	1959	1958	1957	1956	1955	Totals	Hauls
Hecate Strait	----	----	----	----	8	29	27	7	5	----	----	76	19
Cape St. Elias	----	----	----	1	10	10	4	1	----	----	----	26	4
Kodiak Island	----	----	30	258	673	306	56	14	----	----	----	1337	28
Trinity Islands	----	----	11	27	36	5	2	----	----	----	----	81	2
Chirikof Island	----	21	145	598	308	138	55	27	3	----	----	1295	22
Totals	----	21	186	884	1035	488	144	49	8	----	----	2815	75

The 19 hauls listed above in Hecate Strait were made in connection with studies of the size and age composition of halibut taken by trawl gear in that region.

Bering Sea—Inshore and Offshore Grounds

To ascertain the distribution and abundance of young halibut on the shallow southeastern flats of Bering Sea, the Commission conducted a preliminary trawl and setline survey of the region in 1963. The findings confirmed and expanded earlier information on the availability of young halibut in the region that had been collected by the United States Bureau of Commercial Fisheries in conjunction with the king crab investigations in the area from 1956 to 1960.

In 1965 an expanded survey was conducted by the Commission to initiate a systematic annual sampling of the very large population of young halibut now known to be in the region. The same region has been the locale of a massive foreign trawl fishery for fishmeal for the past several years. Young halibut are particularly vulnerable to trawl fishing and it is necessary to obtain adequate information on the cumulative effect of such a trawl fishery on the young halibut.

A predetermined grid of stations was established and at each station that it was possible to occupy, a small-fish 1¼-inch mesh trawl was towed for 15 minutes, and the commercial-sized 3½-inch mesh trawl was towed for one hour. At alternate stations 8 skates of commercial setline gear were fished. During the latter part of the operations period, the frequency of setline stations was reduced to gain increased coverage of the area by trawling.

In all, 206 trawl hauls were made in depths of 8 to 60 fathoms, (104 with the 1¼-inch net and 102 with the 3½-inch net. These hauls caught 1,872 sublegal halibut, of which the four-year-old fish (1961 year class) predominated in the catch. Setline catches, which are always low on the flats, rarely included any halibut below 66 centimeters.

To obtain information as to the ultimate dispersion of this large concentration of juvenile halibut, 870 sublegal halibut were tagged during the survey. Much valuable information was accumulated on areas of scarcity as well as of abundance of halibut, on the general ecology of the area, and on the seasonal changes in the distribution of the young halibut in southeastern Bering Sea.

The age composition of the small trawl-caught halibut from eastern Bering Sea is summarized below.

Number of Halibut Less than 66 Centimeters in Length Taken from Bering Sea in 1965 by Age

Mesh Size (Inches)	Number Hauls	Age: Year Class:	0 1965	1 1964	2 1963	3 1962	4 1961	5 1960	6 1959	7 1958	8 1957	Totals
1¼	104		....	....	126	111	111	18	5	8	.	379
3½	102		....	....	109	247	799	134	68	127	9	1493
Totals	206		....	....	235	358	910	152	73	135	9	1872

PUBLICATIONS AND MANUSCRIPT REPORTS PREPARED DURING 1965

Published Reports:

Report No. 37: Sampling the Commercial Catch and Use of Calculated Lengths in Stock Composition Studies of Pacific Halibut – by William H. Hardman and G. Morris Southward.

Report No. 38: Regulation and Investigation of the Pacific Halibut Fishery in 1964.

Report No. 39: Utilization of Pacific Halibut Stocks: Study of Bertalanffy's Growth Equation – by G. Morris Southward and Douglas G. Chapman.

Manuscript Reports:

Summary of Field Activities Conducted During 1965.

Summary of Bering Sea Halibut Tagging and Recovery Since September 1964.

Preliminary Results of Tagging Conducted in Bering Sea and Between Shumagin Islands and Unimak Pass in the Winter of 1963-1964.

Size and Age Composition of the Japanese and North American Halibut Catches in Southeastern Bering Sea in 1963 and 1964.

Preliminary Observations of the Distribution, Magnitude and Age Composition of the stocks of Young Halibut in Southeastern Bering Sea.