

**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 33

**REGULATION AND INVESTIGATION
OF THE PACIFIC HALIBUT
FISHERY IN 1962**

COMMISSIONERS:

WILLIAM A. BATES

HAROLD E. CROWTHER

HAROLD S. HELLAND

MATTIAS MADSEN

RICHARD NELSON

WILLIAM M. SPRULES

SEATTLE, WASHINGTON

1963



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 thirty-third published by the Commission, is the sixteenth in a series of annual reports that was begun in 1947. In addition to providing the usual summary of the Commission's activities and of results of its investigations during the year, this report also includes numerous short explanations to aid in the understanding of some of the methods and procedures used by the Commission.



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HALIBUT FISHERY IN 1962
by
INTERNATIONAL PACIFIC HALIBUT COMMISSION

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INTRODUCTION

In the nearly 40 years that have elapsed since the International Pacific Halibut Commission was established, the Pacific halibut fishery has changed from a declining and overfished resource to one that in 1962 produced an all-time high yield of 75,119,000 pounds with stock levels at or near their optimum.

Under the first treaty, which was signed March 2, 1923 and ratified May 31, 1924, the responsibilities of the Commission, then named the International Fisheries Commission, were largely restricted to investigation of the condition of the fishery for the purpose of recommending measures for its rehabilitation. At that time regulation was confined to a winter closed season aimed at reducing fishing intensity on spawning concentrations of halibut. It was subsequently shown that the winter closed season alone was of limited effectiveness in reducing fishing mortality.

Successive treaties of 1930, 1937 and 1953 provided for more flexible and effective regulatory measures, chief of which were the division of the coast into areas; control of the amount of fishing by the setting of an annual catch limit or by adjusting the length of the closed season in any area; and the placing of limits on the size of fish to be retained by the fishery. The current 1953 treaty specifically charges the Commission with developing the stocks of Pacific halibut to levels which will permit maximum sustained yield and with maintaining the stocks at those levels.

During the 31 years of management there has been progressive improvement of the stocks and an increase in annual yield. The annual catch, which had declined to 44,000,000 pounds by 1931, the year before regulation, has averaged about 72,000,000 pounds during each of the past four years. The record 1962 catch was worth nearly \$22,500,000 to the fishermen, also a record in value.

The year 1962 witnessed many other records for the 75-year history of the Pacific halibut fishery. The largest single fare of halibut since the days when large steamers were used in the fishery was landed by an eight-man Canadian vessel, a catch that totalled 177,000 pounds. The season's catch of 850,000 pounds for the same vessel was the largest for a single vessel in the past 45 years.

Several ports had record receipts of halibut. Nearly 11,000,000 pounds were landed in Ketchikan, a record in its 52-year history as a halibut landing center. The ports of Bellingham in Washington and Kodiak in Alaska, both with new modern freezing facilities, came into prominence as landing points for both United States and Canadian vessels.

The noteworthy event of the year was attainment of a total catch that was close to the maximum sustainable yield. It was the culmination of over three decades of scientific management and placed the Pacific halibut fishery in a unique position among the marine fisheries of the world.

ACTIVITIES OF THE COMMISSION

During 1962 the Commission continued the regulation of the fishery and the program of statistical and biological observations upon which the 1953 treaty requires that regulation be based.

Members of the Commission from the United States in 1962 were: Mr. Harold E. Crowther, Washington, D.C., Chairman; Mr. Mattias Madsen, Seattle, Washington; and Mr. William A. Bates, Ketchikan, Alaska. Canadian members were: Dr. William M. Sprules, Ottawa, Ontario, Vice-Chairman; Mr. Harold S. Helland, Prince Rupert, British Columbia; and Mr. Richard Nelson, Vancouver, British Columbia.

Membership on the Commission is appointive and without monetary compensation. Liaison with the two governments is furthered by representation on the Commission from the respective federal fisheries departments in Ottawa and in Washington, D.C. The Rules of the Commission require that the chairmanship and vice-chairmanship alternate between the two countries in successive years.

The Commission held its regular annual meeting from February 13 to 16, 1962 in Seattle, Washington where it maintains a permanent office and laboratory. Continuing its long-established practice of consulting with the industry on all regulatory matters that may directly or indirectly affect its economy, the Commission held a joint open meeting on February 13. The scientific staff reviewed the status of the stocks and of the fishery and presented the results of scientific investigations in 1961. Staff proposals regarding the regulation of the fishery in 1962 were explained and discussed with the Commission and the assembled representatives of all branches of the industry.

On February 14 the Commission dealt with budgetary and other administrative matters in closed meetings with the staff. The following day the Commission met jointly with the Conference Board, consisting of representatives of the fishermen and vessel owners, and with spokesmen for dealers from all sections of the coast to hear and discuss their respective views regarding regulations in 1962. The basic features of the industry proposals usually parallel those indicated by the scientific investigations of the Commission. Differences that did occur were usually only in the means whereby the common objectives could be attained.

During the sixth and last session of the meetings on February 16, the Commission considered all the proposals made by the staff and the industry and unanimously adopted regulations for 1962. A summary of the regulations being recommended to the two governments for their approval, as required under the Convention, was immediately released for the information of the industry and the public.

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

Two reports were published by the Commission during the year, the annual report, *The Investigation and Utilization of the Pacific Halibut Fishery in 1961*, and a scientific report, *Utilization of Pacific Halibut Stocks: Estimation of Maximum Sustainable Yield, 1960*, by Douglas G. Chapman, Richard J. Myhre and G. Morris Southward. In addition, numerous technical memoranda were prepared for the United States and Canada for their use in connection with the International North Pacific Fisheries Convention. The latter dealt mainly with the distribution of halibut in Areas 3A and 3B South and with the results of the trawl survey conducted in 1961 and 1962 on the continental shelf between Unimak Pass and Kodiak Island.

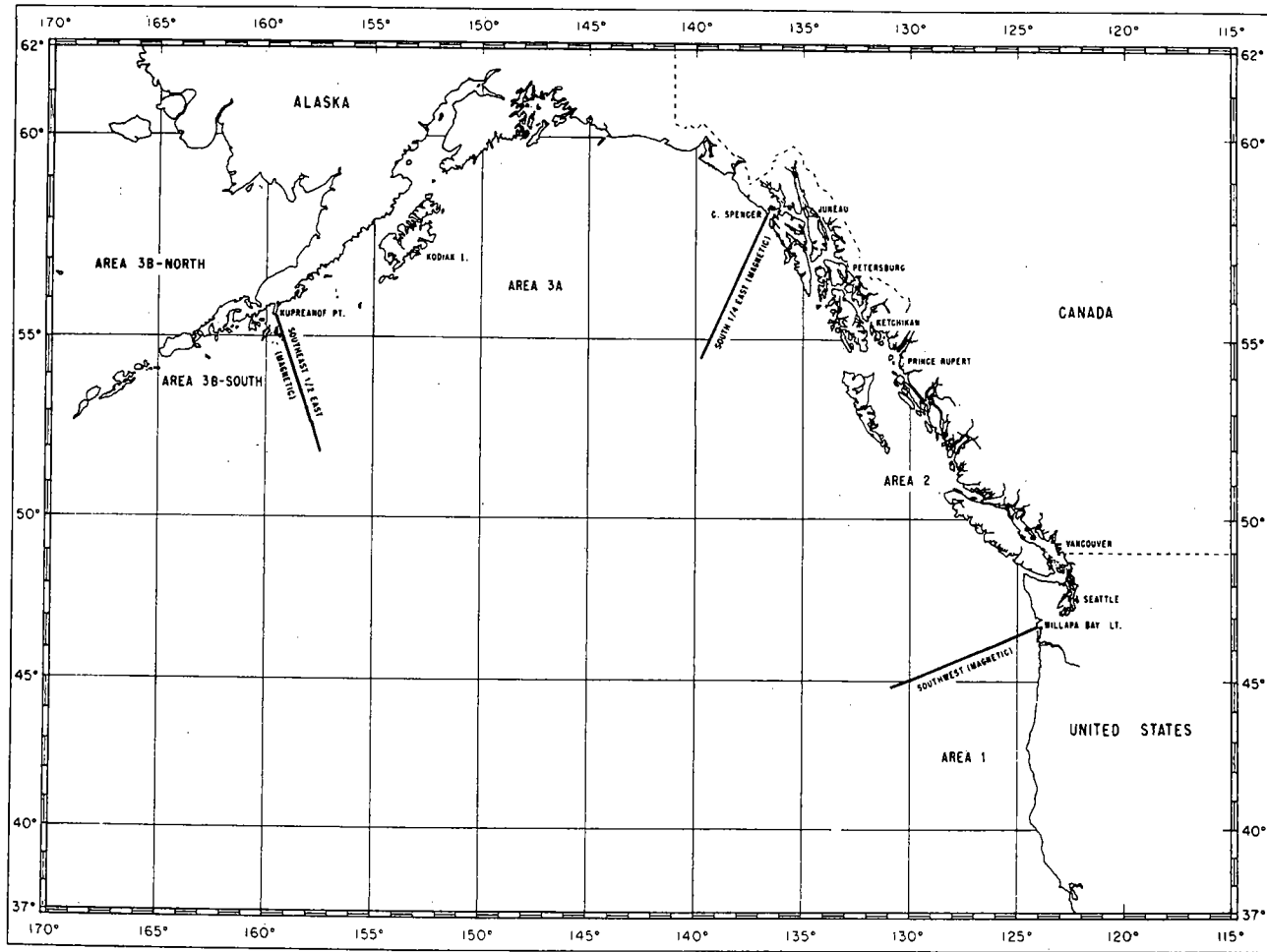


Figure 1. Pacific Coast of North America showing regulatory areas defined by the International Pacific Halibut Commission in 1962.

THE REGULATIONS IN 1962

The Pacific Halibut Fishery Regulations for 1962 adopted by the Commission were approved by the Governor General of Canada on March 15 and by the President of the United States on March 27 and became effective on the latter date.

The regulatory areas in 1962, 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, Alaska; Area 3B South—the waters south of the Alaska Peninsula and the Aleutian Islands between Kupreanof Point and Cape Sagak, Umnak Island; and Area 3B North—the waters of Bering Sea and along the Aleutian Islands west of Cape Sagak.

The dividing lines between the above sections of the convention waters except that at Cape Spencer are not biological. They are designed to provide practical management divisions that may be opened or closed to fishing at different times in order to secure the amount of fishing appropriate to the productivity of the various grounds and with recognition of the seasonal differences in availability of halibut. The foregoing method is necessary because in the United States and Canada the principle of free entry precludes control of the fishing intensity in an area by restricting the number of licenses or by allotting of catch quotas to individual vessels.

Tagging and other scientific studies have shown that the halibut in Areas 3A, 3B South and in Area 3B North appear to be part of a continuous population with movements that extend throughout the entire region, and in addition but to a much lesser extent into areas south of Cape Spencer. Similarly, the present or past divisions of the grounds south of Cape Spencer into Areas 1A or 1B and Area 2 or subdivisions thereof (2A, 2B or 2C) were for distributing fishing over the commercial range of the species or for enforcement purposes.

Several significant changes were made in the 1962 Pacific Halibut Fishery Regulations from those of 1961. Former Areas 1A and 1B were combined as Area 1, as in the years prior to 1946. Increased effectiveness of enforcement made their separation no longer necessary. Also, to facilitate air patrol in all areas, opening and closing dates were changed from 6:00 a.m. to 6:00 p.m. Pacific Standard Time.

Enforcement was further strengthened by requiring vessels departing from either Area 3B North or Area 3B South into Area 3A with any halibut on board when Area 3A was closed to have their gear-hauling gurdy or their gear-setting chute, or both, sealed by an enforcement officer at Sand Point, Alaska. It was also required that the seal or seals be broken only by an enforcement officer at the port of sale prior to unloading. This reduced the ability of vessels to fish illegally during the 3 to 4-day transit through the closed Area 3A. The measure alleviated a condition that sea patrol alone had been incapable of adequately controlling. The administrative cost of such sealing and unsealing of the deck equipment is negligible compared to the cost of sea patrol.

Catch limits in 1962 from Areas 2 and 3A were 28,000,000 and 33,000,000 pounds respectively, the same amounts as in 1961. In Areas 3B South and 3B North the catch was controlled by adjusting the timing and length of season in each area for a fleet whose magnitude was predictable. This method of control has provided a catch in Area 3B South that has averaged 3,900,000 pounds annually during the 5-year period since 1958, which combined with the average annual catch permitted in Area 3A in the same period closely approximates the maximum sustainable yield indicated for the two regions in Commission Report No. 31 (1962). In Area 3B North the method has resulted in a trend of increasing removals from southeastern Bering Sea which was desired to test the productivity of that region.

In addition to controlling the fishing mortality rate by limiting removals with catch limits or time periods of fishing, other regulatory measures have been utilized to maximize the yield, such as prohibition of the retention of halibut less than 26 inches. Even with the death of some rejected undersized individuals the size limit results in a net gain in yield because it encourages the avoidance of concentrations of small halibut by the fleets. The use of dory gear and nets of any kind for the taking of halibut is also prohibited since there is a demonstrated tendency for these gears to catch an undue proportion of small halibut below their optimum harvesting size.

The fishing season in Area 3B North was opened on March 28 and terminated on October 15. Area 3B South opened on April 19 and closed September 30. All other areas were opened on May 9. The opening dates of all areas and closing dates of those areas without catch limits are promulgated in the published regulations in advance of the fishing season. The season in Areas 1 and 2 terminated on September 8 following advance announcement on August 30, which provided the customary notice period of approximately eight days. The season in Area 3A terminated on August 11 with announcement on July 25 to provide the customary 18 days' notice of closure.

The length of notice of closure in each area is designed to permit the vessels to adjust their operations for optimal use of the time remaining in the season as United States and Canadian halibut vessels outfit and operate on a trip basis. The length of notice takes into consideration the fact that the average duration of a trip in different sections of Area 2 ranges from 10 to 14 days between departure and return to port. On grounds west of Cape Spencer the average duration is from 20 to 24 days, depending upon the section fished and port of landing.

STATISTICS OF THE FISHERY

Landings by Regulatory Areas

Catches of halibut during the years 1951 to 1962 are shown in thousands of pounds for groups of regulatory areas in the following table with comparable landings for 1931, the year immediately preceding the commencement of regulation by the Commission. Since Areas 3A, 3B South and 3B North are management

areas only and not indicative of stock separations, the landings from these areas are combined in the table. Poundage taken in contravention of the regulations is included in the totals. With the present effectiveness of enforcement, which under the Convention is the responsibility of the individual governments, the illegally-caught poundage is judged to be at nearly the minimum that can be expected of any fishery situation. Such effective enforcement has not always prevailed in the fishery and constant vigilance is required to maintain it.

Area 1

The total catch for Area 1 in 1962 was 312,000 pounds. As stated previously, the area is not separable from Area 2 on biological grounds. Also, it was previously divided into Areas 1A and 1B for enforcement reasons which no longer prevail. Fishing in the region has been subject to the same size limits and gear restrictions as in other areas. The fishing grounds in the region encompass the southern limits of the commercial concentrations of halibut, and in recent years much of the halibut catch has been caught incidentally while fishing for other species.

Area 2

The total catch in 1962 from Area 2 was 28,393,000 pounds, approximately one-half million pounds less than was taken in 1961. The average catch in 1961 and 1962 was nearly two and one-half million pounds below the average of the period 1957 to 1960. The reduction was justified by some deterioration in the condition of the stocks that had resulted from holding removals at elevated levels to test the productivity of the stocks.

Included in the production from Area 2 in 1962 are 192,000 pounds of halibut caught incidentally to other setline fishing, chiefly for blackcod, after the area was closed to halibut fishing. The remaining 201,000 pounds over the 28,000,000 pound catch limit is but a small excess in view of the fact that closing dates in catch limit areas are predicted and announced in advance.

Area 3A

In Area 3A during the single season from May 9 to August 11 the catch amounted to 34.7 million pounds. The excess over the 33,000,000 pound catch limit resulted largely from the fact that there was more doubling-up of landings in central Alaska on the next to the last trip of the season than was anticipated when announcing the date of closure.

Area 3B South

In Area 3B South a total of 4.1 million pounds was taken compared to 2.5 million pounds in 1961. This increase in catch was as planned when the opening and closing dates for the area were established in the regulations. The seasonal distribution of the catches were also close to what was expected. Although there was some fishing in the region in June and July, most of the production was taken when Area 3A was closed. Nearly a million pounds were taken in the months of April and May and about 2.7 million pounds were taken in August and September.

The foregoing catch of 4.1 million pounds in Area 3B South when combined with the 34.7 million pound catch in Area 3A provides a total removal of 38.8 million pounds from both areas. This amount is very close to the 38.0 million

pounds which was the best estimate of present maximum sustainable yield from the foregoing two areas combined as determined by the use of yield models (Chapman, et al, 1962) and by empirical methods.

Area 3B North

A total of 7.3 million pounds was taken in 1962 from Area 3B North, exceeding the previous record of 5.7 million pounds in 1960. The size, timing and distribution of the catch in this region are also close to what was expected when setting the opening and closing dates for the area in the regulations. About 5.2 million pounds of the total was taken in March and April, prior to the opening of Area 3A, and about one million pounds was taken from August to October after the closure of the latter area. Some fishing was conducted in the region in May, June and July, providing a catch of approximately one million pounds for the three summer months. Due to the longer season of fishing provided in 1962, which extended to October 15, and the scarcity of fish in October on the Unimak Pass to Pribilof Islands edge grounds fished in the spring, a number of vessels extended their fishing activities over a broader area, including the edge west of the Pribilof Islands as far as 178° W. longitude, and the grounds along the Aleutian Chain as far westward as Adak Island.

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

Year	Area 1* U.S.	Area 2			Areas 3A, 3B North and 3B South			All Areas		
		U.S.	Canada	Total	U.S.	Canada	Total	U.S.	Canada	Total
1931	923	14,609	7,018	21,627	20,907	765	21,672	36,439	7,783	44,222
1951	319	14,392	16,216	30,608	20,618	4,829	25,447	35,329	21,045	56,374
1952	526	13,655	17,193	30,848	23,868	7,586	31,454	38,049	24,779	62,828
1953	383	14,832	18,175	33,007	19,447	7,678	27,125	34,662	25,853	60,515
1954	715	19,125	17,574	36,699	23,841	9,952	33,793	43,681	27,526	71,207
1955	612	15,717	13,027	28,744	20,595	9,120	29,715	36,924	22,147	59,071
1956	594	20,301	15,121	35,422	21,014	10,476	31,490	41,909	25,597	67,506
1957	446	16,261	14,365	30,626	19,934	10,389	30,323	36,641	24,754	61,395
1958	357	15,505	15,053	30,558	20,433	13,865	34,298	36,295	28,918	65,213
1959	236	16,575	14,229	30,804	24,010	16,665	40,675	40,821	30,894	71,715
1960	309	16,723	15,086	31,809	21,318	18,527	39,845	38,350	33,613	71,963
1961	270	15,756	13,093	28,849	24,039	16,373	40,412	40,065	29,466	69,531
1962	312	14,480	14,183	28,663	25,654	20,490	46,144	40,446	34,673	75,119

* Catches from Area 1 are shown separately only to indicate the relatively small production from these grounds at the southern limit of the range of the species.

During 1962, 75 vessels, 35 Canadian and 40 United States, with 537 men, fished in the Bering Sea. Their catches in that area represent over 25 percent of their total season's production in 1962. The landings from Area 3B South and Area 3B North for the years 1956 to 1962 are shown below.

	1956	1957	1958	1959	1960	1961	1962
Area 3B South	612	1352	2387	6321	4323	2482	4139
Area 3B North	267	47	2180	4113	5688	3919	7289

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 1962 with comparable data for 1960 and 1961.

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

Ports	1960			1961			1962		
	U.S.	Canada	Total	U.S.	Canada	Total	U.S.	Canada	Total
California and Oregon	420	—	420	371	—	371	392	—	392
Seattle	15,849	2,444	18,293	12,671	420	13,091	10,089	877	10,966
Bellingham	205	937	1,142	1,554	1,493	3,047	2,065	3,256	5,321
Other Wash.	520	—	520	339	—	339	236	—	236
Vancouver, B.C.	—	8,495	8,495	—	6,782	6,782	—	4,527	4,527
Vancouver I.	—	2,160	2,160	—	1,085	1,085	—	1,774	1,774
Prince Rupert	1,063	14,670	15,733	1,755	15,160	16,915	644	17,142	17,786
Other B.C.	—	1,663	1,663	—	1,887	1,887	—	1,374	1,374
Ketchikan	6,102	161	6,263	9,337	161	9,498	10,101	705	10,806
Other	—	—	—	—	—	—	—	—	—
S.E. Alaska	9,749	559	10,308	11,031	674	11,705	11,638	895	12,533
Central Alaska	4,442	2,524	6,966	3,007	1,804	4,811	5,281	4,123	9,404
TOTALS	38,350	33,613	71,963	40,065	29,466	69,531	40,446	34,673	75,119

Landings in California and Oregon in 1962 continued at the low levels which might be expected from grounds at the southern limit of the range of the species. A decline in landings in Seattle which began in 1960, continued in 1961 and 1962. This was due chiefly to a shift of landings to other ports, particularly Bellingham, Washington and Ketchikan, Alaska where there were improvements in unloading and other facilities or very active markets.

Landings in Vancouver were much lower than in 1960 and 1961. Landings in Prince Rupert in 1962 continued the upward trend noted in the landings for several years.

Southeastern Alaska landings were again higher than in the previous three years. Landings in central Alaska by both United States and Canadian vessels showed a very marked increase in 1962. This was due largely to improved facilities and an increased number of buyers in the Kodiak Island area and to a greater number of landings at Sand Point from the larger United States and Canadian fleets fishing in Bering Sea.

Catch Per Unit Fishing Effort

All halibut vessels of five net tons or over are required to keep records showing the date, the fishing location, the amount of gear fished and the estimated catch of halibut in pounds for each fishing operation. These records are collected and analyzed to determine the average catch per standardized unit of fishing effort in the various areas and subsections thereof and in the different seasons. The resultant returns per unit effort are then compared with those of earlier years to ascertain whether changes in relative abundance have occurred and to measure the magnitude of such changes.

In Area 2 the catch per unit effort, that had declined slightly in most sections of the area in 1961, declined further in 1962 in all portions of the area. While the levels of catch per unit effort on most grounds in 1961 were close to the long-term trends of slowly-rising values, the 1962 averages were consistently below such trends on all grounds. Though this is cause for concern, it will take one or more years of such consistent decline to confirm such a reversal of trend. In the meantime, the permitted annual catches from Area 2 must be held at conservative levels and a critical appraisal of the strength and availability of entering year classes and of any changes in the growth rate must be continued.

In both Area 3A and Area 3B South the catch per unit effort declined in 1962. Between Cape St. Elias and Trinity Islands the decline from 1961 was 14 percent, between Trinity Islands and Shumagin Islands it was 12 percent, and in

Area 3B South, Shumagin Islands and west, it was 8 percent. The general decline may be a temporary change in availability or the result of increases in annual catches that have recently been permitted in the two areas. Furthermore, the effect of the removals from southeastern Bering Sea, which have averaged about 5 million pounds annually for the past four years, cannot be ruled out as a possible contributing factor. The estimate of present maximum sustainable yield of halibut for Areas 3B South and 3A of 38 million pounds (Chapman, et al, 1962) was predicated upon a continuation of the previous normal volume of emigration from Bering Sea. A reduction in emigration from Bering Sea due to increased removals in southeastern Bering Sea cannot but reduce the abundance in Areas 3A and 3B South.

Despite the above decline on grounds west of Cape Spencer, catches must be maintained at current levels for the present to test the estimate of maximum sustainable yield. However, in the event the declining trend in catch per unit effort persists in Areas 3A and 3B South and removals in eastern Bering Sea are not reduced it may be necessary to make some reduction in the permitted catches in Areas 3A and 3B South.

In Area 3B North, the Bering Sea, the overall catch per unit effort in the southeastern section of the region was about the same in 1962 as in 1961. Due to some changes in the geographical and seasonal distribution of fishing within eastern Bering Sea, which brought into production apparently unfished accumulations beyond the Pribilof Islands, the trend in the catch per unit effort should be more correctly portrayed by the year-to-year changes that have occurred on the longer-fished Clipper and Polaris grounds in the region. Also, a more reliable comparison can be made by using only the data from the first month of fishing each year when about 75 percent of the season's production is taken.

Since 1959 there has been a sharp decline (about 60 percent) in the catch per unit effort on the Clipper grounds. On the Polaris grounds a considerable decline also occurred from 1958 to 1961. In 1962 there was some recovery on the Polaris grounds, above the 1961 level, but the catch was heavily dependent upon a single group, the 1951 year class. Such dependence on a single year class does not augur well for the future.

The changes that have occurred in the catch per unit effort in southeastern Bering Sea coincide in time and magnitude with the changes that have taken place in the volume and distribution of Canadian and United States setline fishing in the region with due recognition given to the normal variability in such catch statistics and in the relative strength of year classes. The same relative changes in catch per unit effort in response to similar intensities of fishing have occurred many times elsewhere on the Pacific coast during the past 50 years.

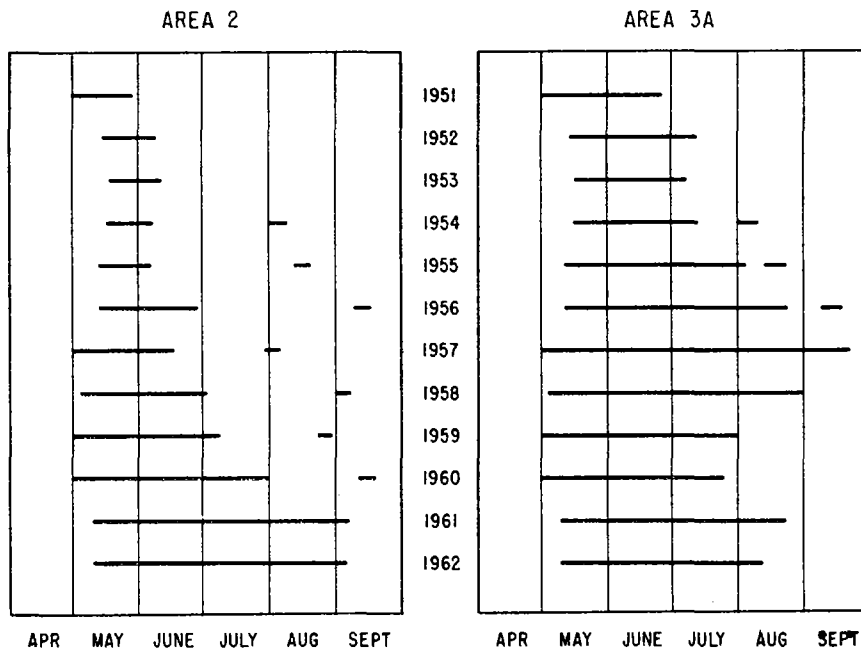
The growth, magnitude and location of Japanese and Russian fishing in Bering Sea during the past 10 years are out of phase with the changes in the catch per unit effort of United States and Canadian setline vessels. There is no present evidence that any significant portion of the change in catch per unit effort of adult halibut to date is attributable to such foreign fishing in Bering Sea. The effect of such fishing upon the small halibut known to inhabit the region of intensive trawl fishing and upon their future recruitment into the fishable stock still remains to be seen.

LENGTH OF THE FISHING SEASONS

The lengths of the seasons in Areas 2 and 3A for recent years are indicated by the respective lines in the following chart. The single 1962 season in Area 2 encompassed the period of the year previously covered by the first "catch-limit" season and the second "non-catch-limit" season, the latter being indicated by the short lines to the right.

For the third year since regulation began, the length of the season in Area 3A was shorter than the season in Area 2. The increase in the length of the season attained in 1961 over 1960, obtained by delaying the opening date, was largely offset in 1962 by the increase in the size of the fleet. In all areas the length of the fishing period is affected by the date of opening of the season and by the voluntary between-trip lay-in program, jointly carried out by the vessel owners and fishermen, during which all vessels remain in port for eight days between landing and subsequent departure. A moderately delayed opening date reduces the proportion of the catch that may be taken before the first week of July. At that time vessels of the salmon fleet usually terminate their pre-salmon-season halibut fishing activities. Due to the greatly reduced fleet remaining, the season is prolonged considerably, even though only a relatively small proportion of the catch limit may remain to be taken.

The present season in Area 2, continuous from May to September, encompasses the period of greatest availability on the more important producing grounds in Area 2. Historically, before regulation tended to shorten the fishing season, most of the catch from Area 2 was taken in this period of the year. From a stock utilization and management standpoint a single long season throughout the summer and autumn months provides a better distribution of fishing than was accomplished by the multiple seasons that were in effect in Area 2 from 1954 to 1960. It is also more satisfactory for the fleets and the industry.



INCIDENTAL CAPTURE OF HALIBUT

With the lengthening of the seasons in Areas 2 and 3A, the period during which retention of halibut caught incidentally while fishing with setline gear for other species is permitted in an area closed to halibut fishing has been shortened and the amount of halibut involved has been sharply reduced. The annual landings of such incidentally-caught halibut in pounds by United States and Canadian vessels from 1953 to date have been as follows:

1953	603,000	1958	413,000
1954	761,000	1959	517,000
1955	1,136,000	1960	514,000
1956	756,000	1961	307,000
1957	786,000	1962	192,000

The regulations provide that halibut may be retained by the setline vessels only to the extent of one pound of halibut for each seven pounds of salable fish, actually utilized, of other species not including salmon or tuna. This proportion was first determined as a result of comprehensive study made at a time when there was no restriction upon retention. Repeated re-examinations have indicated that the same ratio continues to be a satisfactory average value of the relative amounts of halibut which are in fact inadvertently taken by the average vessel over the present range of the United States and Canadian blackcod fishery. The same ratio must be applied over a fairly wide area, even though the permitted ratio may be high for some vessels and some grounds and low for others. To vary the ratio from one fishing ground to an adjacent one would result in intolerable enforcement conditions. In instances where the permitted ratio may be too high for a particular local ground it can lead to some purposeful catching of halibut. The overall amount of halibut involved in such a practice is very small in the Canadian and United States setline fishery for blackcod.

The conservation, management and enforcement aspects of the retention of incidentally-caught halibut by various types of gear have been examined at length in International Pacific Halibut Commission Report No. 23, 1956.

In the setline blackcod fishery and in salmon trolling, the size composition of the incidentally-caught halibut is approximately the same as when setline fishing for halibut. Consequently their retention does not increase the taking of small halibut prior to their optimum harvesting age, and thus defeat the objective of the halibut convention, namely the attainment of the maximum sustainable yield. The commercial trawl fishery catches a higher proportion of small undersized halibut than do the setline or troll fisheries. Accordingly, the taking of small halibut has been reduced by prohibiting their retention by trawl gear.

It is also evident that the amount of halibut involved in the setline blackcod fishery as prosecuted by the Canadian and United States fleet has represented a very small and relatively inconsequential proportion of the total catch of halibut. During the past 26 years of record it has not exceeded 2.0 percent of the total Pacific coast halibut production. The proportion in the past five years has been 0.6 percent and was only 0.2 percent of the 1962 catch. Consequently, management of the halibut fishery and control of the annual removals are not significantly affected by the magnitude or timing of the fishery for blackcod. In the trawl and troll fisheries incidentally-caught halibut would represent a very large and variable proportion of the annual halibut catch, and would result in an unmanageable situation.

Also the logistics and length of season of the United States and Canadian setline blackcod fishery make it susceptible to surveillance for reasons enumerated in the above mentioned report. Accordingly, control of the retention of halibut caught incidentally by the setline blackcod fishery in an area closed to halibut fishing can be made satisfactorily effective. While the retention of incidentally-caught halibut by troll gear in areas closed to halibut fishing does not appear to be biologically undesirable, to control such retention would require an expanded and very costly enforcement organization.

It was concluded in the above report that of troll, trawl and setline gear only the latter reasonably met the requirements of conservation, management and enforcement to qualify it for the retention of incidentally-caught halibut in an area closed to halibut fishing.

The qualifications for the retention of incidentally-caught halibut by the setline fishery in a closed area have been subjected to review each year, and these later studies have continued to support the earlier conclusions. Notwithstanding, the annual regulations of the Commission from 1936 to those of March 21, 1963 have, as a precautionary measure, included a cancellation provision that could be implemented at any time within a year. On two occasions only substantial improvement in enforcement conditions in two different ports forestalled prohibition by the Commission of all retention of halibut caught incidentally in an area closed to halibut fishing, including those caught by setline gear.

COMPOSITION OF THE CATCHES

Management of the halibut stocks requires continuous evaluation of the effects of current regulation and fishing upon the population and determination of the stock levels necessary for maximum sustainable yield. Studies of the composition of the stocks on different grounds provide information regarding the numbers of spawners and recruits and their rates of growth and mortality, which is essential in this research.

Data for the above studies are obtained mainly from representative samples of lengths taken from the landed commercial catches and from corresponding samples of otoliths whose concentric annual rings are used to determine the age of the fish. Market samples are supplemented with observations obtained at sea where the sex and stage of maturity can be determined. Identification of sex is not possible from the landed catches as the reproductive organs are removed in the course of eviscerating the fish at sea and there are no observable secondary sexual characteristics.

In 1962 sampling was conducted on the landings at Seattle, Vancouver, Prince Rupert and Petersburg. Also sampling at sea, initiated on a broad scale in 1960, was again carried out with the cooperation of the crews of several Canadian and United States vessels who provided accommodations for a member of the staff. In addition to sampling setline catches at sea, trawl-caught halibut were measured by observers on Canadian and United States otter trawlers fishing off the British Columbia coast.

Approximately 104,000 halibut, including those sampled on tagging vessels, with a calculated weight of about 2.5 million pounds were measured during 1962. Of these, 33,000 individuals were sampled for otoliths. Also nearly 17,000 sex determinations were made at sea at the time the fish were being eviscerated. The young

Summary of Catch Sampling in 1962 showing Measurements, Otoliths
and Sex Data according to Area of Origin

Fishing Areas	Number of Trips			Number of Fish			
	Port Sampling	Sea Sampling	Total	Measurements Only	Measurements and Otoliths	Measurements, Otoliths and Sex	Total
Area 2							
Washington-Vancouver I.	1	—	1	514	140	248	902
Cape Scott-Goose Is.	11	2	13	7,314	1,540	1,405	10,259
Dixon Entrance	6	—	6	1,253	800	—	2,053
Hecate Strait	22	—	22	5,728	3,000	143	8,871
Southeastern Alaska	39	—	39	8,372	4,427	—	12,799
Total Area 2	79	2	81	23,181	9,907	1,796	34,884
Areas 3A and 3B							
Cape Spencer-Cape Cleare	24	—	24	5,446	3,244	—	8,690
Cook Inlet-Shelikof St.	2	1	3	1,201	280	142	1,623
Portlock-Albatross Banks	20	4	24	7,387	2,941	1,149	11,477
Trinity Is.-Chirikof I.	5	8	13	7,135	700	1,881	9,716
Shumagin Is. & West (3BS)	7	1	8	1,990	980	498	3,468
Bering Sea (3BN)	9	3	12	5,594	1,291	945	7,830
Total Areas 3A & 3B	67	17	84	28,753	9,436	4,615	42,804
Total Areas 2, 3A & 3B	146	19	165	51,934	19,343	6,411	77,688

halibut investigations supplied 6,100 measurements, 800 of which were accompanied by otoliths and 1,800 by sex determinations. The following table gives a breakdown of the numbers of measurements, otoliths and sex determinations secured from various grounds by sampling at the four landing ports and from sea sampling conducted by observers aboard both setline and trawl fishing vessels of Canada and the United States.

A new method of sampling, utilizing otolith measurements instead of total fish-length measurements, was also employed extensively in 1962 to further test its practicability and to solve problems involved in its application. Using this method, one person can obtain an adequate random sample of several hundred otoliths while at least three persons and considerable equipment with its attendant transportation problems are required to obtain an adequate sample of body-length measurements from the average halibut fare. The otoliths are subsequently measured and their lengths converted into size-composition data from which average weight by age can be computed in the same manner as when fish lengths are used. Over 10,000 otoliths were measured from 56 test samples. Results indicated that this method can be adopted as an acceptable, labor-saving and lower cost technique of sampling the landed catches for age composition data. It reduces the amount of handling of the several millions of pounds of halibut measured each year.

The parent-progeny relationship for halibut has been under continuing study. When the relationship is determined from year classes which have completed their major contribution to the fishery it appears that the number of progeny rises to a maximum at some stock level and remains at that level regardless of any further increase in the parent stock. However, presently-used techniques of estimating potential contributions of incompleting year classes leads to questionable results, probably due to selectivity of the fishery. An apparent recent decline in relative strengths of year classes contributing to the fishery cannot be accepted until the bias in estimating their incompleting contribution has been corrected.

In Area 2 the age composition of the catches from important fishing grounds in Hecate Strait shows that the high availability of the younger classes, which have sustained the fishery in recent years, has been drastically diminished. The 1951 year class, which alone made up 25 percent of the catch from Goose Islands grounds in 1961, has now passed from prominence on all Hecate Strait grounds. The 1954 year class, which entered the fishery strongly at a young age several years ago, declined markedly as age 8 fish in 1962, apparently having passed the peak of its availability earlier than previous strong year classes possibly due to the higher intensity of fishing upon it.

On grounds both inside and outside the Alexander Archipelago of Southeastern Alaska, the availability of the 1951 and 1954 year classes was similarly low. Also, the abundance of fish of age 12 and older continued the downward trend which has been observed since sampling was begun in Petersburg in 1958.

Some late-summer Area 2 catches contained a moderate showing of the newly-entering 1956 to 1958 year classes, particularly on the Horseshoe grounds in Hecate Strait where six-year-olds accounted for 20 percent of the catch. However, there is no indication from age composition data that increased catches can be expected in Area 2 from these newly-entering classes in the immediate future.

In Area 3A the availability of most age groups on the representative Portlock-Albatross grounds declined, continuing a trend of several years, although the 1951 year class remained strong. The 1954 year class, which has been so prominent on grounds in Area 2, has not yet made an appearance of any strength on these western grounds.

In the Shumagin Islands section of Area 3B South, a trend of declining abundance of most age groups that has been noted for several years continued in 1962, again with the exception of the 1951 year class.

In Bering Sea most of the United States and Canadian catches in recent years have been taken in April and from the edge grounds in the southeastern section between Unimak Pass and the Pribilof Islands. In 1962 fishing was extended beyond the Pribilof Islands to grounds as far west as 178° W. longitude, within 240 miles of Cape Navarin on the Asiatic Coast. This exploratory extension of fishing by the United States and Canadian vessels revealed some accumulations of old slow-growing halibut similar to those found on the Polaris ground in 1956. About 25 percent of the catches from newly-discovered accumulations consisted of fish 20 years of age and older. A moderate fishery was conducted thereon throughout the summer and especially in September and October after Areas 3A and 3B South were closed. The availability in both summer and autumn on these grounds was similar to that in the first few years of fishing on the Polaris and Clipper grounds prior to the development of the heavy spring fishery of the past four years.

In contrast, recently the fishery on the Polaris and Clipper grounds has been confined to an early spring operation only, partly because of reduced availability of halibut there in the summer and the timing of the opening of seasons elsewhere, but also because of the removal of the accumulation from these grounds by the fishery over the past few years.

The age composition of the spring samples from the Polaris and Clipper grounds has been progressively altered to one of younger fish by the fishery since 1958. A single group, again the 1951 year class as in Area 3A, made up 35 percent of the weight of the southeastern Bering Sea catches in 1962. This along with a decline in fish over 11 years old represents a radical change in the population on these grounds since their discovery in 1956 (IPHC, 1957) and reflects the high rate of the exploitation to which they have been subjected since 1958.

A levelling off of the decline in abundance of fish over age 11 observed in 1962, suggests that the composition may be stabilizing at the present level of fishing. However, the dependence upon such young fish augurs poorly for the future stability of the fishery in the area and emphasizes the continuing need for controlled exploitation. The need for prudent restraint is furthered by the fact that extensive removals in eastern Bering Sea cannot but affect the availability of fish in Areas 3A and 3B South and to some lesser degree in Area 2 due to the high emigration rate out of eastern Bering Sea indicated by tagging experiments.

TAGGING EXPERIMENTS

Tagging experiments play an important role in the Commission's regulatory program. They provide information regarding the relationships between the stocks upon the various fishing grounds and their availability and utilization. Tagging

also provides measures of both fishing and natural mortality rates which are required for scientific management of the stocks.

During 1962 a total of 5,733 halibut were tagged and released on grounds between Capt Scott and Unimak Pass. Most of these fish were obtained from the catches of the three vessels operated by the Commission during a trawl-survey in the Gulf of Alaska and from catches taken during the Commission's small-halibut investigations. The remainder were tagged by Commission observers placed aboard commercial trawlers to tag and sample for size and age composition data the halibut taken incidentally to such fishing operations, and from two U.S. Bureau of Commercial Fisheries vessels engaged in trawl-survey operations similar to those conducted by the Commission. A summary of tagging in 1962 is given in the following table.

Vessel Name	Agency	Region of Tagging	Number Tagged
ARTHUR H.	IPHC Charter	Cape Scott-Goose Is., Unimak Pass-Cape Spencer	2163
MORNING STAR	IPHC Charter	Cape Flattery-Goose Is., Unimak Pass-Cape Chiniak	892
ST. MICHAEL	IPHC Charter	Unimak Pass-Cape St. Elias	731
WESTERN FLYER	IPHC Charter	Portlock Bank-Cape St. Elias	694
GAIL BERNICE	IPHC Observer	Goose Islands-Horseshoe	63
UNIMAK	IPHC Observer	Cape Scott	164
KODIAK	IPHC Observer	Cape Flattery-Nootka Sd.	117
JOHN N. COBB	U.S. BCF	Marmot Flats-Cape St. Elias	292
YAQUINA	U.S. BCF Charter	Marmot Flats-Portlock Bank	173
ASTRONAUT	IPHC Charter	Alitak Bay-Kayak Is.	427
TOTAL			5716

A total of 772 tagged halibut were returned in 1962 compared to 1094 recovered in the previous year. This decline in numbers of recoveries largely reflects the reduction in the number of tagged fish in the population owing to mortalities during the past year. About two-thirds of the recoveries were from fish tagged in Area 2 in 1960. Three of this year's recoveries were tagged in Hecate Strait in 1951, and had been at liberty for a period of 11 years. Also recovered were 33 tags released during the trawl survey between Kodiak Island and Unimak Pass in 1961-1962. The recoveries during 1961 and 1962 from experiments in 1959, 1960 and 1961 are summarized in the following table.

Recoveries in 1962 also included ten fish that were captured by Japanese trawlers fishing in Bering Sea. One of these fish had been released on the Bering Sea edge in 1956, while nine had been released in 1959. Tagging information on these recoveries was forwarded to the Japanese Fisheries Agency. In addition to the foregoing, seven tags that had been released by Japan during experimental fishing operations between Kodiak Island and Dixon Entrance in 1962 were recovered by Canadian and United States halibut vessels and forwarded to the Japanese Fishery Agency.

Analyses of recoveries from the 1956 experiment on the edge in southeastern Bering Sea have provided new estimates of the rate of fishing in that region as well as some refinements of estimates made previously. A summary of these indicates that the fishery on the edge generated an annual fishing mortality rate in 1960 and in 1961 of 0.46 and 0.35 respectively. On the same basis, it is estimated that the annual fishing mortality rate on the edge in 1962 was approximately 0.55.

Summary of 1961 and 1962 Tag Recoveries from
1959 to 1961 Tagging Experiments

Year and Location	Month	Number Tagged	Number of Recoveries by Season					
			1961*			1962		
			Regular	Other**	Total	Regular	Other**	Total
SOUTH OF CAPE SPENCER								
1960 Experiments								
Goose Is.	April	2,289	193	30	223	87	14	101
Goose Is.	August	1,012	158	28	186	46	30	76
Masset	May	175	11	6	17	6	—	6
Masset	August	132	3	1	4	4	—	4
Freeman Pass	May-June	147	16	4	20	8	1	9
Northern Hecate Strait	May-July	351	21	8	29	30	2	32
Dixon Entrance	May	107	10	1	11	5	—	5
Cape Bartolome	May	33	1	—	1	4	—	4
Timbered I.	May	316	15	7	22	13	—	13
Timbered I.	July	1,787	124	4	128	108	1	109
Coronation I.	May-July	426	21	3	24	23	—	23
Cape Ommaney	June	315	23	1	24	16	—	16
Point Amelia	July	1,098	59	4	63	42	1	43
West Coast Graham I.	August	700	29	2	31	33	7	40
Two Peaks	August	168	30	5	35	19	3	22
Cape Scott	August	16	—	—	—	1	—	1
Bowie Seamount	August	23	—	—	—	1	—	1
Butler Cove	May-July	265	20	1	21	9	3	12
WEST OF CAPE SPENCER								
1959 Experiments								
Bering Sea edge	May	1,270	11	3(2)	14	14	3(1)	17
Bering Sea edge	June	365	2	1(1)	3	3	2(2)	5
Bering Sea edge	July	82	2	—	2	—	2(2)	2
Aleutian Islands	June	87	1	1	2	2	—	2
Makushin Bay	August	389	1	—	1	6	—	6
Slime Bank	June-July	1,907	8	1(1)	9	15	7(7)	22
Slime Bank	July	963	1	—	1	6	1(1)	7
1961 Experiments								
Shumagin Is.-Trinity I.	May-Nov.	1,923	—	—	—	5	—	5
Trinity I.-Marmot I.	May-Nov.	1,477	—	—	—	9	1	10
Marmot I.-Middleton I.***	Sept.-Oct.	226	—	—	—	2	—	2
Middleton I.-Cape Spencer***	June-Sept.	601	—	—	—	4	1	5
Trinity Island	August	743	—	—	—	—	2	2
Patton Bay	August	170	—	—	—	—	1	1

* Zero-year recoveries are not comparable and are omitted.

** Includes recoveries by out-of-season setline, trawl and unknown gear.

*** Tagging done by U.S. Bureau of Commercial Fisheries.

Numbers in parentheses indicate number of recoveries by foreign vessels.

These rates apply directly to the fish that were tagged in 1956, which were generally of large size and of old age. How well these results apply to the smaller and younger fish now inhabiting the edge during the intensive spring fishery remains to be established by more recent experiments.

The high total disappearance rate indicated for halibut on the edge in Bering Sea is a consequence of both a high rate of fishing mortality and a high emigration rate. The latter has been estimated to be 0.37 from tagging data on the basis of year-to-year declines in the number of recoveries on the Bering Sea edge. Although this estimate seems high, it is supported by the large number of recoveries that are taken on grounds outside Bering Sea, even as far away as the coast of Oregon. Obviously these recoveries represent only a fraction of the total number of migrants. The latter has been estimated to be 31.4 percent of the number originally tagged on the basis of chances of recapture on the various sections of the coast.

To estimate the intensity of the Pacific halibut fishery, fishing mortality rates have been computed from 24 major tagging experiments conducted over the range of the fishery between 1925 and 1956. These estimates of intensity parallel the levels of observed gear densities on the same fishing grounds which tend to support their validity. The fishing mortality rates indicate that in recent years the most intensive fishing is done in Dixon Entrance and on Goose Islands grounds as well as on other grounds in Area 2. These estimates by themselves do not indicate when grounds are overfished or underfished. However, overfishing did occur in Area 2 in the late 1920's when fishing was not much more intensive than that presently extant in much of the area.

In connection with these studies, it has been found that the percentage recovery of tags does not increase as rapidly as the total mortality rate. Although such has been suspected in the past, it does indicate that a significant loss of recaptured tags may occur due to nonreporting and confirms the often-stated belief that estimates of fishing mortality from tagging have been and are too low. Evaluation studies of the loss due to nonreporting are under way.

STUDIES OF HALIBUT BELOW COMMERCIAL SIZE

The objectives of studies of halibut during the years prior to recruitment into the fishery are to determine where and how the young live, their relationship to other species, the changes in their numbers from year to year, and ultimately, the factors responsible for observed year-to-year variations in the number of recruits entering the setline fishery including those from possible mortalities occasioned by the entry of foreign trawling into the Gulf of Alaska.

Sampling in 1962 was conducted largely on those inshore and offshore regions where year-to-year concentrations had been consistently found previously. The trawler *ASTRONAUT* was chartered for a 60-day period commencing July 29 and terminating on September 26. One hundred twenty four hauls, usually of 15 minutes duration, with an "eastern" otter trawl having a 1¼-inch mesh codend and a 60-foot groundrope were completed in depths from 6 to 75 fathoms.

Over 400 one-year-old halibut were tagged with plastic dart tags off Kodiak Island and Cape St. Elias. During the sampling four tags were recovered in Alitak Bay from 1961 tagging. One of these had been released during the 1961-1962 trawl survey near Alitak; the other three during the 1961 small halibut investigations in Alitak Bay.

Fishing was conducted during the summer of 1962 at some of the offshore trawl-survey stations of 1961-1962 in the vicinity of Kodiak Island and off Chirikof Island to secure samples of older halibut of pre-commercial size and to observe what changes had occurred in the abundance of young halibut of the size that were taken at the same locations during the 1961-1962 trawl survey investigations.

During the period of the charter a total of 9,495 small halibut were caught, ranging from 2 to 25 inches in length and from less than one to ten years of age. Over 6,100 length measurements were taken, 1,800 sex identifications were made and 810 otoliths, required for determining the ages of the young fish, were collected. The number of halibut captured according to locality and age were as follows:

Captures of Halibut of Sub-commercial Size, 1962
According to Locality and Age

Locality	Age										Total	
	0	1	2	3	4	5	6	7	8	9		10
Area 2												
Dixon Entrance	—	—	—	1	1	—	—	—	—	—	—	2
Cape Addington	—	—	—	—	—	6	6	2	1	—	—	15
Shelikof Bay	29	449	11	18	10	16	1	—	—	—	—	534
Icy Strait	—	—	1	2	5	12	3	4	—	—	—	27
Area 3A												
Cape St. Elias	2,179	555	70	20	16	2	—	—	—	—	—	2,842
Prince William Snd. ...	158	97	11	—	—	—	—	—	—	—	—	266
Kodiak Island	71	3,616	393	99	88	29	4	1	—	—	—	4,301
Trinity Islands	652	277	20	8	6	4	3	—	—	—	—	970
Chirikof Island	—	6	178	126	104	88	16	16	2	1	1	538
Total	3,089	5,000	684	274	230	157	33	23	3	1	1	9,495

Catches taken off Chirikof Island by the ASTRONAUT in 1962 were lower than those taken at identical stations during the trawl investigations in 1961. They were similar to those obtained in 1962 by the chartered vessel ARTHUR H., which revisited some of the stations that it had sampled in 1961 while engaged in the trawl survey.

Sampling to date on the grounds in Hecate Strait and offshore of Kodiak Island has not produced any halibut less than one year of age (zeros). Halibut less than one year of age, which have been taken in Areas 2 and 3A, have been in close proximity to the beaches. The distribution of the different ages by depth in 1962 was similar to previous years, the one-year-olds and younger were the groups most abundant in depths of less than 20 fathoms. Halibut two years old and older appear to be widely dispersed. They were present both in the shallow bays, in depths of less than 20 fathoms, and on the grounds inhabited by fish of commercial size and age and within the range of the commercial fishery.

Although few two- and three-year-old fish were captured, the differences between the abundance of one-, two- and three-year-old fish from various sections of Areas 3 and 2 are sufficiently consistent to be indicative of the strength of year classes. This is demonstrated by the catches of the numerically dominant 1954 year class as one-year-olds in the small fish catches, and in its subsequent strong entry into the commercial fishery in Area 2 in 1958.

As in other years, the one-year-old and older halibut taken in Area 2 were consistently larger at the same age than those from Area 3A. The females are also consistently larger than males of the same age in both areas, even when as small as 8 inches in length.

TRAWL SURVEY

At the request of the Governments of Canada and the United States, the Commission planned and on May 1, 1961 began a comprehensive twelve-month investigation of the distribution and availability of halibut and of other associated bottom or demersal species off the southern coast of central and western Alaska using bottom otter trawl gear. The purpose of the survey was to estimate the potentialities of the region for bottom trawling and the effect that such a fishery might have upon the supply of adult and juvenile halibut.

The 1961 survey area extended from the northeastern end of Kodiak Island to Unimak Pass, a distance of 550 miles along the coast, and included about 40,000 square miles of shelf area. The third and winter round of sampling was conducted from January to April 1962 in the foregoing region. At the further request of the two governments, the survey was extended commencing May 1, 1962 to the grounds between Kodiak Island and Cape Spencer, a distance of 480 miles along the coast and covering about 25,000 square miles of shelf area.

From the various United States and Canadian vessels tendered, the M/V's WESTERN FLYER, ARTHUR H. and ST. MICHAEL, with net tonnages of 63, 59 and 73 respectively, were chartered. The vessels were equipped with standard Pacific coast bottom trawls with codends of 3.5 inch stretched mesh. Each was manned by a captain and crew of three fishermen. Three biological aides of the Commission were assigned to each vessel to process the catches and record the pertinent data.

The pattern of sampling stations on parallel north-south lines 15 minutes of longitude apart was the same as in 1961. Along these lines the stations were located six minutes of latitude apart from shore to the 100-fathom line, with two additional stations, one at 140 fathoms and one at 250 fathoms. The latter depth is approximately the maximum to which most Pacific coast trawlers of the United States and Canada can effectively operate due to the capacity of their cable drums.

Provision was again made for sampling the region during three periods of the year to obtain information about the seasonal distribution and availability of halibut and other species to a trawling operation. Two of these periods of sampling, from May to August and from August to December, were completed in 1962.

It was found that fishing could be conducted effectively at about 42 percent of the stations established in the 1962 survey region, which was similar to the 45 percent that prevailed in the region west of Kodiak Island.

Halibut were again caught throughout the area of the survey. Young halibut of ages two to four years had a widespread dispersion over the entire continental shelf out to depths of 100 fathoms. They were taken at about 75 percent of the trawlable stations and represented approximately 5 percent of the total weight of fish taken. In the region west of Kodiak Island the percentages had been 80 and 6 respectively during the survey of the preceding year. Again there was a tendency for the abundance to be greatest at depths from 20 to 60 fathoms and to decrease at greater depths. Also, the catch per unit effort of fish other than halibut increased at the greater depths and over much of the area was greatest in waters near 100 fathoms.

About 70 percent of all halibut by numbers taken during the survey between Kodiak Island and Cape Spencer were less than 26 inches long, the minimum legal size in the setline fishery for halibut. About 85 percent of all halibut by numbers taken during the survey between Kodiak Island and Unimak Pass were less than 26 inches. There are definite trends of increase in average age and average length of the young halibut from Unimak Pass eastward to Cape Spencer. Of most frequent occurrence in the 1962 survey were halibut between 18 and 26 inches long, and from four to six years of age.

Concentrations of commercially-important crustacea as well as those of flounders and roundfishes were discovered. However, the extremely rough rocky bottom prevailing in large sections of the survey area prevented a detailed appraisal of their concentrations.

Despite inclement weather, attempts were made in December to fish comparatively with trawl and setline gear on the spawning concentrations of halibut on the Yakutat and "W" grounds. The results were inconclusive. However, the differences between the sizes of halibut taken by the two gears paralleled those observed on other grounds and at other seasons.

In July, while enroute to the survey area west of Cape Spencer, the ARTHUR H. made a number of test hauls in Hecate Strait, the region where Canadian and United States commercial trawlers from time to time inadvertently catch large quantities of halibut. The catches of halibut that were taken by the ARTHUR H. demonstrated that the trawls and method of fishing used in the trawl survey were capable of catching halibut of commercial size in large quantities where concentrations occurred.

In September, prior to beginning the second round of sampling, the three chartered vessels together made a series of coordinated and parallel hauls to study the effect of different sizes of mesh in the codends upon the catch of halibut and to compare the fishing effectiveness of the three vessels. The catches of parallel hauls by the three vessels indicated that the three vessels were comparable as to their fishing effectiveness. Comparison of the halibut catches using codend meshes varying from 3½ inches to 9 inches showed that the mesh sizes generally used in commercial fishing are most efficient in catching small halibut that should not be caught and are inefficient for catching larger halibut of which many should be caught. The latter observations lend support to the policy followed by the Commission over the past 20 years of endeavoring to minimize the catching of halibut by trawl gear by prohibiting the retention of such catches.