# 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

# ANNUAL REPORT
# 1969

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SEATTLE, WASHINGTON
1970

## FOREWORD

The International Pacific Halibut Commission, established in 1923 by the Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea, is required to publish from time to time reports of its activities and investigations.

This report is the 23rd of a series of annual reports begun in 1947 which, prior to this issue, have been included in the single numerical series of reports of this Commission. This report for 1969 will begin a new series to be specifically designated as ANNUAL REPORTS which will be identified by the year only and not otherwise numbered.

A new series of TECHNICAL REPORTS was begun in 1969 which will include subject matter of general interest such as data reports of field investigations, preliminary analyses of research findings, and studies on techniques or methodology. Technical Reports Numbers 1 - 5 were published in 1969.

The SCIENTIFIC REPORTS, of which three were published in 1969, will be continued as a separate series and will continue the numbering of the original series of Commission reports.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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# INTERNATIONAL PACIFIC HALIBUT COMMISSION

## ANNUAL REPORT 1969

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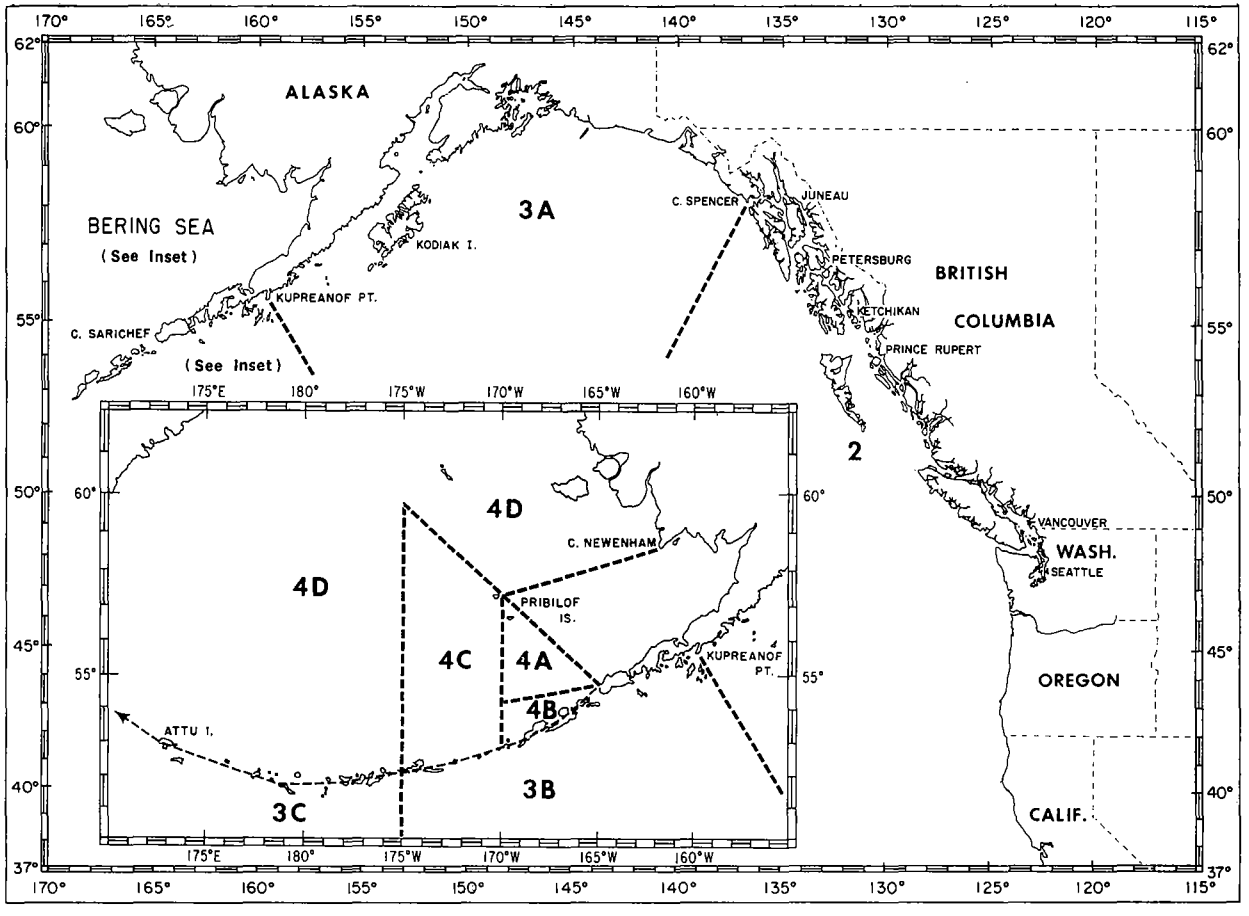



Figure 1. Pacific Coast of North America showing the 1969 regulatory areas as defined by the International Pacific Halibut Commission.

## INTRODUCTION

Explorers in the Pacific Northwest found the halibut *(Hippoglossus hippoglossus stenolepis)* an important item in the diet and economy of the natives on the outer coasts of what is now Washington State and British Columbia. In addition to its subsistence value it was, along with salmon, a major item of trade between the Indians and the settlers. There were several attempts in the 1870's to ship fresh halibut in "pounded" ice on steamers from Puget Sound and Victoria to San Francisco, but the commercial fishery is regarded to have commenced in Washington Territory in 1888. This was signaled by the shipment to Atlantic Coast markets of the first carload of halibut from Tacoma on the newly completed transcontinental railroad. Parallel developments followed soon after in British Columbia.

The first 25 years of the fishery was a period of uncontrolled expansion, limited only by market demands. By 1915, when the total catch began to decline despite extension of the fishery to encompass the commercial range of the halibut, the industry became concerned about the possibility of overfishing.

Recommendations by the industry in Canada and the United States for international control culminated in the signing of the first Halibut Convention in 1923 between the two countries. This Convention, besides being the first treaty signed by Canada alone, unaccompanied by any plenipotentiary from Great Britain, was also the first effective international agreement providing for joint management of a marine fishery.

The 1923 Convention established a closed winter period to protect halibut during the spawning season, and provided for the creation of the International Fisheries Commission to investigate the fishery and to propose further measures for its preservation. The Conventions of 1930, 1937 and 1953 further extended the authority of the Commission to meet changing needs of management.

The sole function of the Commission since its inception has been to maximize the yield of halibut on behalf of Canada and the United States and this responsibility was specifically stated in the 1953 Convention. That Convention also changed the name of the Commission to the International Pacific Halibut Commission and increased the membership from four to six members – three from each country.

Annual catches, which had declined to a low of 44 million pounds by 1931, were gradually increased by regulations restricting removals to a level below what growth and recruitment were adding to the stocks. Thus stocks were rebuilt and by the early 1960's had largely attained levels of maximum sustainable yield.

Since the early 1960's there has been an increase in foreign trawling and blackcod *(Anoplopoma fimbria)* setline fishing over much of the range of the halibut, as well as an increase in the domestic trawl fishery off British Columbia. The inadvertent loss among halibut subjected to such fishing diminishes the share of the increased productivity of the rebuilt stocks available to the North American setline halibut fleets.

Coupled with such losses of adults, there has been a massive destruction of young halibut in eastern Bering Sea that appear to be a major source of recruits to the fishery in the Gulf of Alaska and even as distant as the coasts of British Columbia.

These developments, stemming largely from the large foreign fishery off the

coast of North America, are of grave concern to the Canadian and United States halibut fleets and currently constitute a major problem of the Commission in its management of the resource.

## NEW OFFICES AND LABORATORY

New quarters of the International Pacific Halibut Commission were completed at the University of Washington in December 1968 and dedicated on the 28th of January 1969 during the Forty-fifth Annual Meeting.

Except for a period between 1931 and 1936, the headquarters of the Commission have been at the University of Washington, Seattle, Washington. First invited to the University in 1924 by President Henry Suzzallo, acting on behalf of the Board of Regents, the Commission has enjoyed a long and mutually valuable association with the University.

The quarters of the Commission were located in temporary wooden buildings built during World War I as an infirmary for the University Reserve Officer Training Corps; the buildings also served as offices, classrooms and laboratories for the then School of Fisheries, until the latter moved in November 1950 to new quarters.

In token recognition, the Halibut Commission at the outset made a small contribution annually for the purchase of scientific equipment for the School of Fisheries. Later, by agreement, a fixed but still nominal monthly contribution was made to the University.

The early presence of the Halibut Commission at the University and the subsequent locating of other fishery research groups, both State and Federal, at the University contributed to the College of Fisheries becoming a major center for fisheries research and instruction. Lacking a special fisheries library, the faculty and students of the College were granted unrestricted use of the large and valuable collection of the Commission and the assistance of its librarian for over two decades, 1925 to 1950. Also, members of the professional staff of the Commission from time to time conducted scheduled seminar courses for the College.

In turn, the Commission and its staff enjoyed many benefits from its presence at the University, including the convenient employment of student assistants, participation in graduate seminars and advanced academic training, as well as providing staff and faculty privileges for the respective Commission employees.

In 1963 attention of the United States Department of State was drawn to the fact that the University of Washington was engaged in expanding its facilities for its marine sciences and that an opportunity existed whereby the Commission might be afforded more satisfactory quarters. Being the host country for the Halibut Commission, the United States could thus reciprocate for the provisions made by the Government of Canada for housing joint fisheries commissions headquartered in Canada.

To this end, through the special efforts of members of the United States Senate and the United States House of Representatives from Washington, and by amendment of the 1937 Northern Pacific Halibut Act, the required authorization and appropriation Acts were expedited by the 89th Congress, 1st Session, and signed by the President of the United States, Lyndon B. Johnson, in January 1966. A grant of $500,000, without regard to the cost-sharing provisions of the Convention, was made to the University of Washington to construct facilities for office and other necessary space involving 12,000 square feet. The Grant Contract with the Uni-

versity authorities included provision for all utilities and maintenance of the quarters.

The dedication program was held in the University of Washington Health Sciences Auditorium, January 28, 1969, with F. Heward Bell, Director of Investigations, introducing the participants.

The Reverend Dr. O. L. Haavik, Pastor Emeritus of the American Lutheran Church, gave the Invocation. Dr. Haavik was for many years Pastor of the Ballard Lutheran Church and had initiated the Fishermen's Festival in 1929, which is held annually at the outset of the halibut fishing season.

William C. Herrington, formerly Special Assistant for Fisheries to the Under-Secretary of State (retired) and a former Halibut Commission employee, in the absence of Donald J. McKernan, Special Assistant for Fisheries and Wildlife to the Secretary of State, made the presentation of the building with Dr. Charles E. Odegaard, President of the University of Washington, responding on behalf of the Board of Regents.

Following the major address by the Honorable Thomas J. Pelly, United States Congressman, acknowledgements were expressed on behalf of Canada by W. R. Hourston, Director Pacific Region, Department of Fisheries, and on behalf of the halibut industry by Harold E. Lokken, Commissioner, Pacific Marine Fisheries Commission and manager of the Seattle Fishing Vessel Owners' Association. In the absence of Chairman Harold E. Crowther, the program was concluded with remarks by Francis W. Millerd, Vice-chairman of the International Pacific Halibut Commission.

Following the dedication the laboratory, office facilities and exhibits were open for inspection by invited guests, during which a buffet featuring halibut hors d'oeuvres was provided by the Halibut Fishermen's Wives' Association.

An evening reception and buffet was held by the International Pacific Halibut Commission, the Fishing Vessel Owners' Association of Seattle, the Halibut Association of North America, the Deep Sea Fishermen's Union of Seattle and the Northwest Fisheries Association.

Moving into new quarters, is an appropriate time to commemorate those persons who have held the position of Director of Investigations, for they have carried out the functions and duties of the Commission during the past 45 years under the four successive Conventions.

William Francis Thompson (1888-1965), the first incumbent, made major contributions to the modern theory of fishing and was the first to apply it to an exploited stock of fish. His 1914 studies for the Government of British Columbia, on the condition of the halibut stocks, laid a groundwork for the extensive investigations initiated by him in 1924 under the first Halibut Convention of 1923 between Canada and the United States. Under the authority of the succeeding Convention of 1930 and by the vigorous application of basic principles of population control, the previously over-exploited stocks of halibut were gradually rebuilt.

On September 30, 1940, he resigned to become Director of the International Pacific Salmon Fisheries Commission. In 1943, he returned to the University of Washington as the first Director of Fisheries Research Institute, retiring in 1958. He remained active in research until his death on November 7, 1965.

Henry Adam Dunlop (1898-1966) was employed on July 1, 1925 as Assistant Director and became Director of Investigations on October 1, 1940. During the period

to his retirement on July 8, 1963, the rehabilitation of the resource was continued and by the early 1960's the stocks generally had attained their optimum size. Mr. Dunlop passed away on May 3, 1966 in Vancouver, British Columbia, where he had lived prior to his 38 years of service with the Commission.

Frederick Heward Bell (1902- ) was employed by the Commission as a Biologist from July 1, 1925 to June 30, 1940, when he became Assistant Director of the International Pacific Salmon Fisheries Commission. He returned to the Halibut Commission as Assistant Director on December 1, 1941 and became Director of Investigations on July 9, 1963. Mr. Bell plans to retire on July 4, 1970 after serving the Halibut Commission over a 45-year period.

## ACTIVITIES OF THE COMMISSION

Following the dedication of the new offices on the morning of January 28, the Commission met during the afternoon in joint session with representatives of all segments of the halibut industry and other interested persons. The Commission staff reviewed results of scientific investigations in 1968, discussed the status of the stocks and of the fishery, and presented their proposals for regulation of the fishery in 1969.

On the morning of January 29, after a brief session to discuss various administrative matters, the Commission met with a delegation from the Trawl Halibut Committee, representing trawler organizations in British Columbia and the Pacific Coast States, to provide a hearing on proposals in their previously-submitted brief on the retention of halibut caught by trawl gear. During the afternoon the Commission approved research plans for 1969 and considered other administrative and fiscal matters, including budget proposals for 1969/70. The dates for the 1970 Annual Meeting, scheduled to take place at Prince Rupert, British Columbia, were also tentatively approved.

On the morning of January 30 the Commission met in joint session with representatives of the halibut dealers and the Conference Board, consisting of delegates from vessel owners and union organizations, for further discussion of regulatory and other proposals by the industry. Also on January 30, representatives of the Conference Board and the staff of the Commission held a joint seminar on the methods of calculation and standardization of the catch per skate, and its use as a measure of abundance.

During the afternoon of January 30, the Commission reviewed staff and pension matters and, after further examination of the regulatory proposals by the staff and industry, some of the regulatory changes for 1969 were adopted. During the final session, held on the morning of January 31, the regulations were finalized, officers for the next year were elected, and a news release on the 1969 regulations was prepared.

During 1969 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.

During the fishing season the Commission maintained a detailed and current account of the landings of halibut from each area. Announcements were made from time to time on the cumulative catches from each regulatory area. Due to the return of vessels to the fishery, (brought about by improved market conditions), catch limits were attained in all areas so regulated prior to the statutory closing dates, and such

areas were closed to fishing when it was deemed such limits would be attained.

The Commission held a Special Meeting in Seattle, Washington on September 18 to review, with the staff and representatives of the industry, the results of the 1969 fishery in Bering Sea. Proposals recommended by both the staff and industry were examined and the Commission then transmitted to the Governments of Canada and the United States the regulatory changes it had under consideration for Bering Sea in 1970.

Several members of the Commission staff attended meetings of the Biology and Research Committee and the Gulf of Alaska Groundfish Committee of the International North Pacific Fisheries Commission as invited consultants, in connection with the Sixteenth Annual Meeting of that Commission, held in Vancouver, British Columbia, Canada, during part of October and November 1969. The staff prepared a number of manuscript and technical reports at the request of the Canadian and United States sections of the International North Pacific Fisheries Commission.

In addition to the above mentioned manuscript reports, the annual report for 1968, three scientific reports, and five technical reports initating a new series were published by the Commission in 1969. Titles for the publications prepared in 1969 are given at the end of this report.

## CONDITION OF THE RESOURCE, 1969

Catches by setline vessels of Canada and United States in 1969 from all regulatory areas totaled 58.3 million pounds, as compared to 48.8 million pounds in 1968. The 1969 catch is close to the maximum that can be expected from the resource under present growth and recruitment conditions and in view of the estimated losses arising from other fisheries both foreign and domestic. With the record high prices paid for halibut in 1969, a number of vessels returned to the fishery after having engaged in other pursuits because of the low prices in 1967 and 1968.

In Area 2 the catch per unit effort was about the same as in 1968 and failed to show improvement despite the low removals in 1968. There continues to be some deficiency of younger fish, although over the longer term they manifest a generally level trend.

In Area 3A the halibut population has reacted in a more predictable manner and tended to reflect the changing levels of the North American setline fishery on the various sections of the area, although there appear to be some losses due to other causes. The decline in the abundance of older fish since the late 1950's has leveled off and the strong showing of younger fish during the past 12 years is being well sustained.

In Area 3B removals are being held at a level that appears to be about the maximum that the region can sustain. The age composition on those grounds is similar to that which prevails in the western portion of Area 3A.

In Bering Sea the halibut on the important Polaris grounds in Area 4A are showing the effects of the intensive foreign trawl fishery upon both the young and adult halibut. They again failed to respond to the stringent restrictions placed upon the North American setline fishery in the area. In Areas 4C and 4D, where trawling is not as intensive, the halibut stock, though not large, appears to be in a satisfactory condition.

The 1969 halibut catch, though much lower than the record catch of 75.1 million pounds in 1962, was worth $22.3 million to the fishermen, which is a record high, slightly exceeding that of $22.2 million in 1962. With the recovery in halibut prices after Canada and United States ruled against the use of the name halibut to describe the genus *Reinhardtius,* Pacific halibut *(Hippoglossus)* again became second only to the Atlantic cod as the most valuable foodfish species in Canada. In the United States it also recovered its hitherto high value as a foodfish.

## REGULATION IN 1969

The Pacific Halibut Fishery Regulations, which were adopted by the Commission for 1969, were approved by the President of the United States of America on March 20 and by the Governor-General of Canada on March 31, at which time they became effective. As in previous years, these regulations also implemented, on behalf of the United States and Canada, the conservation measures recommended by the International North Pacific Fisheries Commission for eastern Bering Sea.

### Regulatory Areas

The regulatory areas in 1969, shown in Figure 1, were the same as in 1968 and are as follows: Area 2 – the convention waters south of Cape Spencer, Alaska; Area 3A – the waters off Alaska between Cape Spencer and Kupreanof Point near the Shumagin Islands; Area 3B – the waters south of the Alaska Peninsula and the Aleutian Islands between Kupreanof Point and the meridian of 175°W.; Area 3C – the waters south of the Aleutian Islands and west of 175°W.; Area 4A – the waters in Bering Sea encompassing the 100-fathom edge lying east of 170°W. and south of a line between Cape Sarichef and Cape Navarin; Area 4B – the waters along the Bering Sea side of the Aleutian Islands east of the meridian of 170°W.; Area 4C – the waters in the Bering Sea south of a line between Cape Sarichef and Cape Navarin between 170°W. and 175°W.; Area 4D – all of the waters lying north of the Aleutian Islands and west of 175°W. and those waters lying east of 175°W. and north of a line between the Pribilof Islands and Cape Newenham.

### Catch Limits

The catch limit in Area 2 in 1969 was 21,000,000 pounds and in Area 3A was 31,000,000 pounds. These catch limits are 2,000,000 and 1,000,000 pounds lower for Areas 2 and 3A respectively than were allowed in 1968. The catch limit of 3,500,000 pounds in Area 3B remained unchanged from the previous year. Removals from all other regulatory areas were controlled by providing stated time periods of fishing in each area.

### Length of Seasons

The hours of opening and closing in Areas 2, 3A and 3B were changed in 1969 from the 1800 hours Pacific Standard Time opening and closing time that has prevailed since 1962. The hour of opening was changed to 1500 hours to allow the setline fleets three additional daylight hours to set their gear at the opening of the season. A change in the closing time to 0600 hours was to provide enforcement agencies a maximum number of daylight hours for surveillance of the fishing grounds at the close of the halibut fishing seasons.

The fishing seasons in Area 2 and 3A were opened for halibut fishing on May 7 and closed on September 21 and 22 respectively, at which time the catch limits for the two areas were deemed to have been taken. This provided fishing periods of 137 and 138 days, as compared to a fishing period of 164 days in each area in 1968.

As in 1968, Area 3B again had two fishing seasons. The first fishing period opened on April 12 and closed on April 18. The second fishing period of 171 days opened on May 7 and closed on October 25, at which time the catch limit was deemed to have been taken. The total 177-day fishing season in 1969 was 22 days shorter than the 199-day fishing season in 1968.

The fishing season in Area 4A extended from April 3 to April 15, a total of 12 days. This was a reduction of 2 days compared to the 1968 fishing season and was necessitated by the further deterioration of the stocks on grounds that have recently been subjected to an intensive foreign trawl fishery.

There were two 12-day fishing seasons in Area 4B. The first fishing period coincided with the fishing season in Area 4A and was initiated to test the availability of halibut in the area early in the year. The second fishing period between September 1 to September 13 continued the previously-established fall fishery in the area.

The fishing seasons in Areas 3C, 4C and 4D were the same as in 1967 and 1968. All areas opened on March 29, with Area 4C closing on April 22 after a 24-day fishing period, and Areas 3C and 4D closing on November 15 after a 231-day fishing period. The latter two areas produce only limited quantities of halibut at present, and the prolonged seasons are designed to permit additional exploration of the region by the setline halibut fleets of Canada and the United States.

## STATISTICS OF THE FISHERY

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

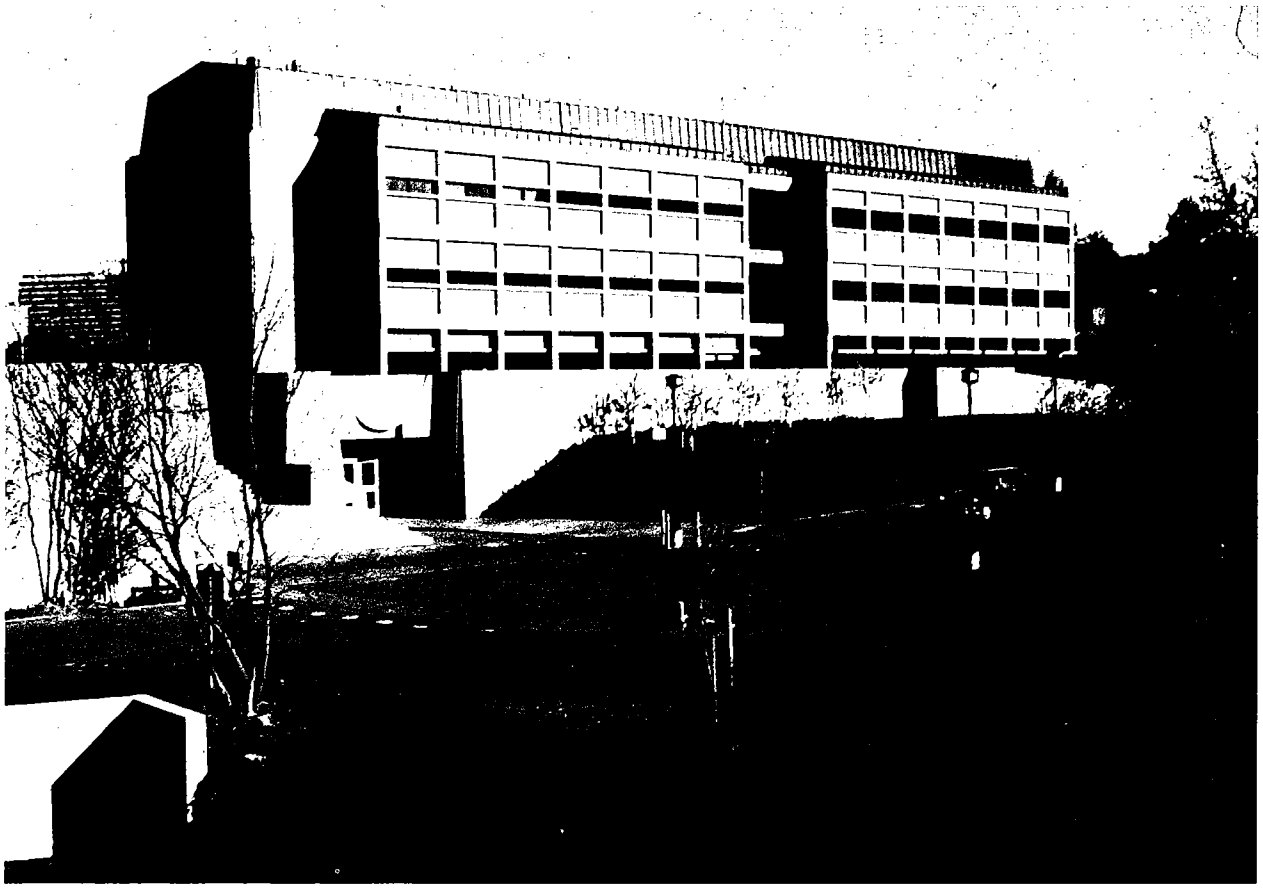
Canadian and United States catches of halibut in thousands of pounds for the years 1965 to 1969 are shown in Table 1. Estimates of the poundage taken in contravention of the regulations are included in the total for each section of the coast. All figures are eviscerated, heads-off weights and all 1969 data are preliminary. These totals do not include catches by other than North American vessels nor any estimates of losses arising from the inadvertent capture of halibut by other fisheries, both foreign and domestic.

#### South of Cape Spencer

The 1969 catch in Area 2 was 22.6 million pounds, which was 6.0 million pounds more than was taken from the area in 1968. The recovery in prices over the low levels of 1967 and 1968 resulted in an 18 percent increase in the number of setline vessels fishing in Area 2 and a rise in the landings by small boats primarily fishing for salmon. The excess over the 21.0-million-pound catch limit largely arose from the shift of some of the vessels from Area 3A to Area 2 after the determination of the closing date, and an abnormally high re-entry into the halibut fishery of salmon seiners late in the season.

#### West of Cape Spencer

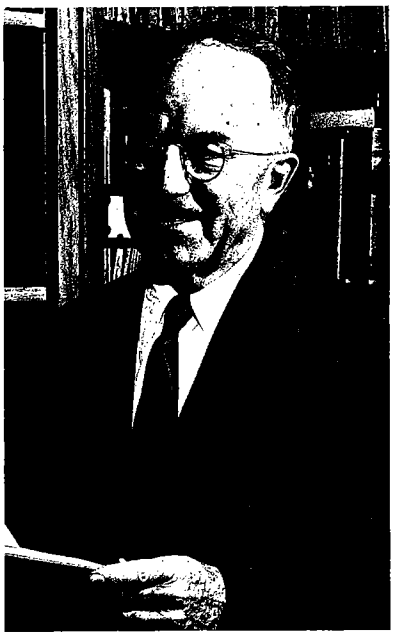
The 1969 catch in Area 3A was 30.3 million pounds, an increase of 3.1 million pounds from 1968. The two percent deficit from the 31-million-pound catch limit



Marine Sciences Building No. 2. The offices and laboratory of the Halibut Commission are located in the upper two levels of the wing to the right.

Fisheries Hall No. 2. The former quarters of the Halibut Commission.

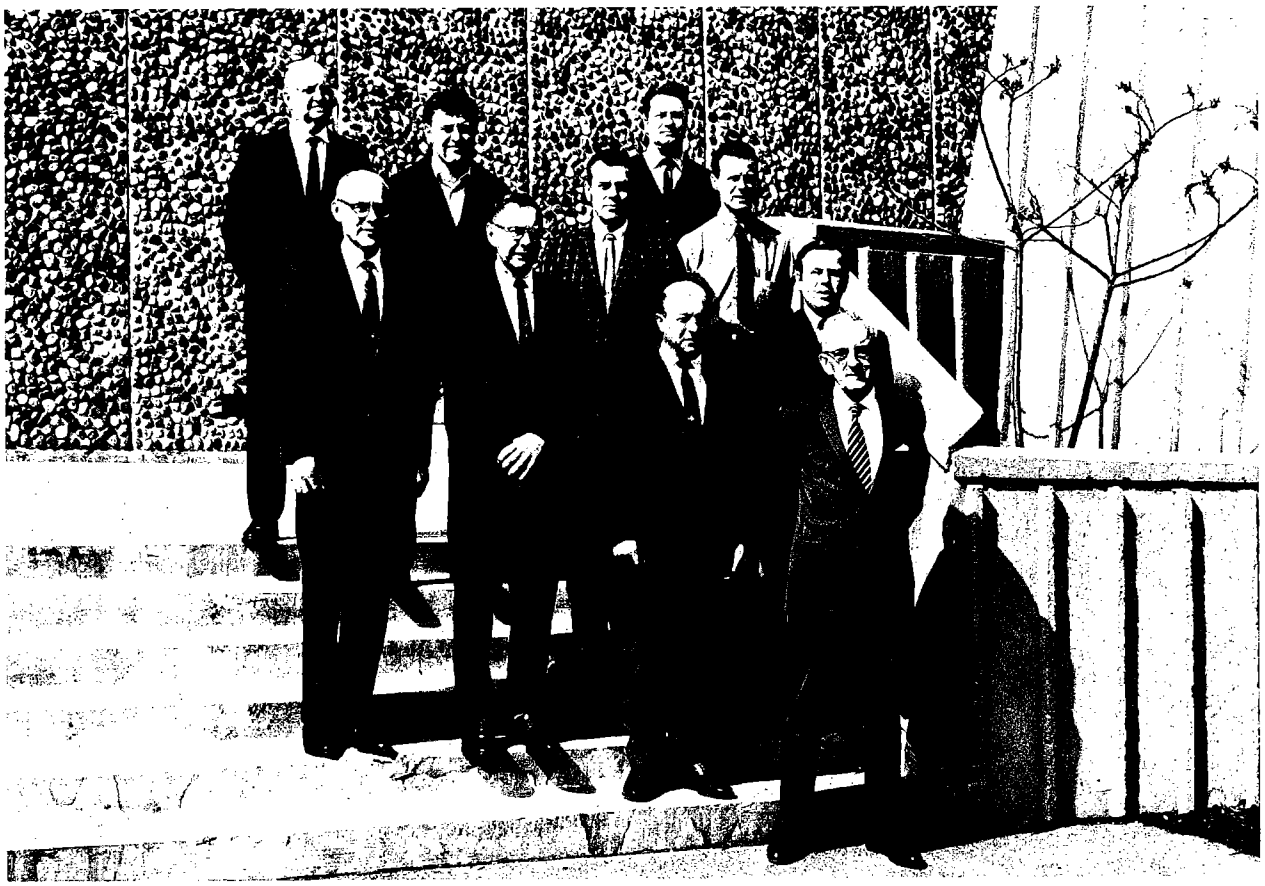
DIRECTORS OF INVESTIGATIONS



William F. Thompson

F. Heward Bell

Henry A. Dunlop



Halibut Commission staff 1970. Olaf E. Eriksen, Stephen H. Hoag, Kenneth W. Exelby, Richard J. Myhre, Edgar A. Best, Gordon J. Peltonen, Ian R. McGregor, William H. Hardman, Gilbert St-Pierre, F. Heward Bell.

**Table 1. United States and Canadian Catches by Regulatory Areas 1965-1969* in Thousands of Pounds**

| | | 1965 | 1966 | 1967 | 1968 | 1969 |
|---|---|---|---|---|---|---|
| Area 2 | U.S. | 12,200 | 12,054 | 10,142 | 5,971 | 9,537 |
| | Can. | 12,350 | 11,522 | 9,877 | 10,666 | 13,055 |
| | Total | 24,550 | 23,576 | 20,019 | 16,637 | 22,592 |
| Area 3A | U.S. | 16,146 | 16,939 | 18,004 | 12,042 | 13,919 |
| | Can. | 17,551 | 17,487 | 12,944 | 15,173 | 16,409 |
| | Total | 33,697 | 34,426 | 30,948 | 27,215 | 30,328 |
| Area 3B | U.S. | 1,395 | 809 | 513 | 705 | 1,067 |
| | Can. | 2,496 | 2,277 | 1,644 | 2,962 | 3,064 |
| | Total | 3,891 | 3,086 | 2,157 | 3,667 | 4,131 |
| Area 3C | U.S. | — | — | 2 | — | 47 |
| | Can. | — | 48 | — | — | — |
| | Total | — | 48 | 2 | — | 47 |
| Area 3 Total | U.S. | 17,541 | 17,748 | 18,519 | 12,747 | 15,033 |
| | Can. | 20,047 | 19,812 | 14,588 | 18,135 | 19,473 |
| | Total | 37,588 | 37,560 | 33,107 | 30,882 | 34,506 |
| BERING SEA** | | | | | | |
| Area 4A | U.S. | 331 | — | 558 | 165 | 21 |
| | Can. | 178 | 219 | 739 | 343 | 212 |
| | Total | 509 | 219 | 1,297 | 508 | 233 |
| Area 4B | U.S. | — | 138 | 14 | — | 35 |
| | Can. | 42 | 94 | — | — | 225 |
| | Total | 42 | 232 | 14 | — | 260 |
| Area 4C | U.S. | 258 | — | 220 | 167 | 166 |
| | Can. | 163 | 312 | 222 | 201 | 56 |
| | Total | 421 | 312 | 442 | 368 | 222 |
| Area 4D | U.S. | 154 | 419 | 495 | 321 | 342 |
| | Can. | 207 | 13 | 147 | 124 | 174 |
| | Total | 361 | 432 | 642 | 445 | 516 |
| Area 4E | U.S. | 2 | — | — | — | — |
| | Can. | — | — | — | — | — |
| | Total | 2 | — | — | — | — |
| Bering Sea Total | U.S. | 745 | 557 | 1,287 | 653 | 564 |
| | Can. | 590 | 638 | 1,108 | 668 | 667 |
| | Total | 1,335 | 1,195 | 2,395 | 1,321 | 1,231 |
| Total All Areas | U.S. | 30,486 | 30,359 | 29,948 | 19,371 | 25,134 |
| | Can. | 32,987 | 31,972 | 25,573 | 29,469 | 33,195 |
| | Total | 63,473 | 62,331 | 55,521 | 48,840 | 58,329 |

* 1969 figures are preliminary.

**Not including catches by Japan.

was due to an above normal shift of vessels out of Area 3A and into Area 3B and, to a lesser extent, into Area 2 after the date of closure of Area 3A had been announced. Production from the eastern portions of Area 3A was substantially higher than in 1968 and was somewhat reduced west of Kodiak Island.

The 1969 catch for the two fishing seasons in Area 3B was 4.1 million pounds, of which 0.4 million was taken during the short first season in April. The excess taken over the 3.5-million-pound catch limit was primarily due to a large proportion of the vessels fishing in the region at the time of announcement of closure selling their fares in the western ports and remaining in the fishery for another trip until closure of the area.

The combined catch of 34.4 million pounds from Areas 3A and 3B is close to the 34.0 million pounds which models indicate to be the best estimate of the present sustainable yield from west of Cape Spencer, not including Bering Sea.

### Bering Sea

The total North American catch in Bering Sea in 1969 was 1.2 million pounds compared to 1.3 million pounds in 1968. The Area 4A catch in 1969 was 233,000 pounds compared to the 508,000 pound catch in 1968. The reduction was due to the continuing deterioration of the stocks in those portions of the area that are being subjected to a very intensive fishery by the Japanese and Russian trawl fleets. Area 4A generally has become unattractive to the North American setline fleet.

In Area 4B the 1969 catch was 260,000 pounds, of which 120,000 pounds were taken in April and 140,000 pounds were taken in September. This is regarded as a satisfactory total removal from the area.

In Area 4C, the 1969 catch was 222,000 pounds. While below the level of removals of the past few years, fishing was successful and the stocks have responded favorably to the restrictions placed upon the setline fishery during the past several years.

The 1969 catch in Area 4D was 516,000 pounds. The catch was about equally divided between grounds on the northeastern flats and the "edge" grounds west of 175°W. longitude. The high prices paid for halibut in 1969 attracted several vessels which would not have fished this remote region under less favorable price levels.

#### Catch Per Unit of Fishing Effort

In Area 2 the catch per unit effort showed no major changes from that observed in 1968. Similarly, the catch per unit effort on the individual grounds, both north and south of Dixon Entrance, showed little change since 1968. While there has been a slight but steady upward trend in catch per unit effort for several years, the substantial reductions in landings by the setline halibut fleet, particularly in 1967 and 1968, should have resulted in a much stronger response. This gives further support to the probability of losses accruing to the Area 2 halibut stocks from other than setline removals by Canadian and United States vessels, as well as some possible decline in recruitment.

In Area 3A the catch per unit effort in 1969 in the eastern portion of the region between Cape Spencer and Cape St. Elias showed a substantial improvement over 1968, whereas there was a significant decline in Area 3A west of Kodiak Island.

These changes appear to be associated in part with the magnitude of the setline removals in each region. However in the central portion of Area 3A between Cape St. Elias and Trinity Islands, where there had also been a substantial reduction in the catch for the last three years, there has been no improvement in the catch per unit effort, suggesting that there have been losses in recent years due to causes other than the removals by the Canadian and United States setline fleets.

In Area 3B the 1969 catch per unit effort was well below that observed in 1968. This was due in large part to a substantial reduction during the first fishing season in April. The late summer and fall catch per unit effort was also lower in about the same degree as on the adjacent western portion of Area 3A.

A further stock deterioration was in evidence on the Polaris grounds in Area 4A. However on the Misty Moon and Area 4C grounds to the northwest, where the major portion of the North American Bering Sea setline catch is now taken, the level of the catch per unit effort remains satisfactory.

The 1969 catch per unit effort in both of the two fishing seasons in Area 4B were also at satisfactory levels with the setline fleets fishing on some small accumulations of halibut that had been only lightly harvested in the past few years.

In Area 4C and the eastern portion of Area 4D conditions were similar to those observed in 1968. A satisfactory catch per unit effort was evident in the fall fishery in the western portion of Area 4D by the few boats which ventured into the region.

**Landings by Ports**

The distribution of landings by ports or sections of the coast from all regulatory areas is shown in Table 2, along with comparable data for 1967 and 1968. Landings were down moderately in all the major southern ports, but were substantially higher at Prince Rupert and most Alaskan ports. The heavier landings in Southeastern Alaska were in part due to recovery in the size of the local Area 2 fleet and some increase in the average number of trips per vessel. Increased landings in central Alaska were primarily the result of a substantial increase in prices, particularly at Kodiak where halibut prices were generally comparable to those in Southeastern Alaska ports. Under such conditions there is less benefit to be derived from landing at ports more distant from the fishing grounds.

**Table 2. United States and Canadian Landings by Regions and Ports 1967-1969* in Thousands of Pounds**

| Region or Port | 1967 | | | 1968 | | | 1969 | | |
|---|---|---|---|---|---|---|---|---|---|
| | U.S. | Can. | Total | U.S. | Can. | Total | U.S. | Can. | Total |
| California and Oregon | 135 | — | 135 | 136 | — | 136 | 106 | — | 106 |
| Seattle, Washington | 8,013 | 163 | 8,176 | 8,224 | 481 | 8,705 | 6,906 | 239 | 7,145 |
| Bellingham, Washington | 1,187 | 900 | 2,087 | 769 | 3,085 | 3,854 | 646 | 1,942 | 2,588 |
| Other Washington | 196 | — | 196 | 131 | — | 131 | 145 | — | 145 |
| Vancouver, British Columbia | — | 7,048 | 7,048 | — | 7,315 | 7,315 | — | 5,414 | 5,414 |
| Vancouver Island | — | 1,070 | 1,070 | — | 1,248 | 1,248 | — | 1,202 | 1,202 |
| Prince Rupert, British Columbia | 332 | 9,506 | 9,838 | 104 | 13,223 | 13,327 | 513 | 19,061 | 19,574 |
| Other British Columbia | — | 1,359 | 1,359 | — | 601 | 601 | — | 829 | 829 |
| Ketchikan, Alaska | 6,883 | 851 | 7,734 | 3,113 | 212 | 3,325 | 3,128 | 141 | 3,269 |
| Other Southeastern Alaska | 8,785 | 768 | 9,553 | 5,115 | 383 | 5,498 | 9,050 | 691 | 9,741 |
| Central Alaska | 4,417 | 3,908 | 8,325 | 1,779 | 2,921 | 4,700 | 4,640 | 3,676 | 8,316 |
| Totals | 29,948 | 25,573 | 55,521 | 19,371 | 29,469 | 48,840 | 25,134 | 33,195 | 58,329 |

*1969 Data are preliminary.

## COMPOSITION OF THE CATCHES

Sampling of the landings for age and size composition data was continued at Seattle, Vancouver, Prince Rupert, Ketchikan and Petersburg. These five ports received 65 percent of the halibut catch in 1969 and the major fishing grounds are well represented in the landings.

Over 63,000 measurements were taken in sampling 296 commercial trips. Otoliths were taken for age and growth studies. Included were over 17,000 measurements made at sea by Commission personnel observing the inadvertently-caught halibut taken on 42 commercial trawler trips. Such vessels are prohibited from retaining halibut.

In addition, the two vessels chartered by the Commission in 1969 contributed over 19,000 measurements, 1,500 accompanied by sex and age data, increasing the number of fish measured in 1969 to over 82,000.

A summary of the sampling activity is shown in the following table.

**Summary of Catch Sampling in 1969 Showing Number of Trips and Total Fish Measured According to Area of Origin of the Catches**

| Area of Origin of Catches | Number of Samples Secured | | | Number of Fish Measured |
|---|---|---|---|---|
| | Port Sampling | Sea Sampling | Total | |
| South of Cape Spencer | | | | |
| Cape Flattery to Cape Scott | — | 7 | 7 | 1,039 |
| Queen Charlotte Sound | 28 | 11 | 39 | 10,797 |
| Hecate Strait | 37 | 24 | 61 | 16,590 |
| Dixon Entrance and West Coast Queen Charlotte Islands | 17 | — | 17 | 3,166 |
| Southeastern Alaska | 38 | — | 38 | 6,042 |
| Measured fish from chartered vessels | — | — | — | 7,655 |
| Total South of Cape Spencer | 120 | 42 | 162 | 45,289 |
| West of Cape Spencer | | | | |
| Cape Spencer to Cape Cleare | 37 | — | 37 | 6,644 |
| Cook Inlet to Shelikof Strait | 8 | — | 8 | 1,867 |
| Portlock - Albatross Banks | 40 | — | 40 | 7,594 |
| Trinity Islands - Chirikof Island | 27 | — | 27 | 4,661 |
| Shumagin Islands and West | 12 | — | 12 | 2,519 |
| Bering Sea | 10 | — | 10 | 2,386 |
| Measured fish from chartered vessels | — | — | — | 11,482 |
| Total West of Cape Spencer | 134 | — | 134 | 37,153 |
| Totals Pacific Coast | 254 | 42 | 296 | 82,442 |
| (1968 Totals) | (278) | (12) | (290) | (84,617) |

### Size and Age Composition

In Area 2 there has been some increase in the abundance of older fish on some grounds, although the improvement is not as great as had been expected in view of the reduced catches of recent years.

However, catches from some important grounds south of Dixon Entrance (such as the Horseshoe and in lower Hecate Strait) were dominated by young halibut with 4- and 5-year-olds accounting for as high as 40 percent of the number of fish in the landings. The lack of any substantial increase in the overall catch per unit effort appears to be due to a reduced entry, or to a lack of sustained availability of such young

classes. For example, although the 1961 year class, which appeared very abundant as 1- and 2-year-olds in recruitment surveys, did enter into the setline fishery in some strength as 5- and 6-year-olds in 1966 and 1967, it did not appear in 1969 in the numbers one would have expected. Furthermore, the 1961 class failed to show expected continued recruitment as 7-year-olds in 1968 and actually decreased in availability in 1969 on some sections of Hecate Strait.

In view of the reduced setline catches in recent years, the limited response of such initially strong classes suggests that some losses are occurring to them prior to their full entry into the setline fishery. Both strong and weak year classes are vulnerable to the expanding foreign and domestic trawl fisheries. Furthermore, since tagging of both adults and juvenile halibut has shown emigration from Bering Sea to the British Columbia coast, the well-being of the halibut population may also be affected by the heavy losses of young halibut from trawling in waters as distant as eastern Bering Sea.

In Area 2 north of Dixon Entrance, as on grounds to the south, there has been some increase in the relative abundance of older fish but the younger groups continue to be below normal. These grounds have been fished at a moderately high intensity by the North American setline fleet and much of the current stock condition can be attributed to the removals by that fleet. While there are no indications from studies of the very young in the Gulf of Alaska and adjacent waters that there has been any recent cycle of weak year classes and although there has been relatively little trawling in the region, the continuing below-normal entry of young halibut into the setline fishery may also result from the reduced supplies of such young fish elsewhere, some of which are known to migrate to Southeastern Alaska from as far as eastern Bering Sea.

In Area 3A, the decline in stock composition which was quite sharp during the early 1960's appeared to level off after 1965. An improving trend has continued into 1969 on most sections of the area. Abundance of young fish, below age 11, has fluctuated about a more-or-less level trend over the past 12 years, although it has been below average west of Kodiak Island during the past two years. Older fish, while below the average over the same long term, lately show an upward trend, a probable consequence of reduced removals during recent years. Changes in condition of the resource generally on each section of Area 3A appear to be chiefly a reflection of the levels of North American setline catches, although other causes cannot be ruled out.

Area 3B, the Shumagin Islands and westward to 170°W. longitude, appears to follow similar trends of stock structure as do grounds in the western portion of Area 3A. A long-term decline in older fish during the past 12 years has leveled off but fish less than 11 years old continue slightly below average. The low catch per unit effort in the early season in 1969, mentioned earlier, appeared to be due to a generally reduced level of availability of all year classes, compared to that in 1968, but especially of the prominent 1955 and 1958 classes.

In southeastern Bering Sea, despite stringent restrictions upon the setline fishery in Area 4A, the condition of the resource has continued to deteriorate. This is particularly true on the important Polaris ground where foreign trawling has been most intensive.

Catches from other grounds further west along the edge, notably the Misty Moon ground in Area 4A and grounds in 4C where there is very much less trawling,

contain moderate proportions of older fish and although the populations are not large, they seem to have responded to the restriction on the setline fishery. It has become increasingly evident from results of tagging and age studies that replenishment of the stock of older fish on the depleted grounds in Area 4A cannot be expected from any rapid redistribution from less depleted areas. Furthermore, there are developing indications of a major reduction in the level of recruitment on all grounds in eastern Bering Sea which may have serious consequences within the next few years.

Thus, with both the adult and juvenile halibut population subject to massive trawl operations, the possibility of rebuilding the resource in Area 4A and maximizing the yield in eastern Bering Sea becomes increasingly remote.

## TAGGING EXPERIMENTS

In 1969 the Commission chartered the otter trawlers *Tonquin* and *Sea Prince*. The former was engaged in recruitment studies, and the latter investigated the effects of trawling with respect of halibut. During both operations a number of halibut were tagged. Releases from the *Tonquin* were primarily under 65 centimeters in length and recoveries from them will provide information on the source of recruits to the commercial fishery. Recoveries from tagging during the charter of the *Sea Prince* should provide information on the viability of trawl-caught halibut.

Three commercial otter trawlers, the *Arthur H*, the *Don Edwards*, and the *Karen T*, were also chartered for brief periods during commercial trips for mesh selection studies and tagged fish were released throughout these trips to provide further data on viability. In addition, tagged fish were released from 15 commercial otter trawlers by Commission personnel placed on board to observe the incidental catches of halibut.

The following table summarizes the tagged fish releases in 1969.

| Vessel | Region of Tagging | Number Tagged |
|---|---|---|
| TONQUIN | Bering Sea Flats | 277 |
| TONQUIN | Southeastern Alaska to Chirikof Island | 2624 |
| SEA PRINCE | Goose Islands | 475 |
| SEA PRINCE | Rose Spit | 236 |
| SEA PRINCE | Horseshoe | 283 |
| *Others | Washington Coast to Dixon Entrance | 3171 |
| Total | | 7066 |

*The United States commercial trawlers ARTHUR H, CAPE FLATTERY, DON EDWARDS, KAREN T, WINDJAMMER, and ZAREMBO II, and the Canadian commercial trawlers JO MARC, MERMAID II, MISS BARBI, MISS TERRI, RENOWN, VICTOR F, WESTERN MAID, WHITE SWAN, and ZENARDI.

Due primarily to the large number of tags released off the British Columbia Coast in 1968 from the chartered trawler *Karen T*, 1969 produced 2398 recovered tags, the largest number ever reported in a single year. This total includes 63 tags recovered but unreported in previous years. Six tags released by Japanese research vessels and recovered by North American vessels were forwarded to the Fisheries Agency of Japan through the International North Pacific Fisheries Commission. Fifty-six tags released by the Halibut Commission and recovered by Japanese vessels

were returned to the Commission through the same channels by the Fisheries Agency of Japan.

During the 1969 season 138 longline and 31 trawl recoveries have been returned from the 3584 tagged fish released near St. Matthew Island in Bering Sea in 1967. Of the longline returns 124 were caught in Bering Sea, 1 in Area 3B, 6 in Area 3A and 7 in Area 2. All of the trawl recoveries received in 1969 were caught in 1968 in Bering Sea, thirty by Japanese vessels and one by a Russian vessel. The distribution of recoveries throughout the range of the fishery is similar to that observed from tagging releases on other grounds in Bering Sea.

The program of premium rewards of $100.00 each for the return of tags bearing preselected numbers instituted to stimulate return of recovered tags was continued in 1969; four such tags were received. Three of these were recovered from Area 2 and one from Area 3A. Three premium rewards were paid to finders in Canada and one in the United States. Since the inception of the program in 1966, 31 premium tags have been received and rewards paid. Preliminary analyses have shown that the premium rewards have been successful in terms of the cost/benefit ratio.

## RECRUITMENT STUDIES

Annual investigations of the distribution and abundance of subcommercial sizes of halibut, which were commenced in 1955, were continued in 1969. 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. Monitoring the effect of foreign trawl fishing on the halibut stocks has in recent years become a major objective of the investigations.

Experience gained from the extensive operations during the past several years permitted some reduction in the extent of the sampling in southeastern Bering Sea in 1969. This made it possible to conduct both the Bering Sea operations and those in the Gulf of Alaska with a single vessel and still maintain the required magnitude and timing of the sampling on each ground.

The commercial otter trawl vessel *Tonquin* was chartered for a total period of 110 days. Operations were conducted in Bering Sea from June 1 to 25, and thereafter in the Gulf of Alaska, beginning in the vicinity of Unimak Island and proceeding in an easterly direction to be completed at Shelikof Bay in Southeastern Alaska on September 3.

Tagging of the viable halibut not required for biological analysis has always been a part of the recruitment investigation. Of 2,901 halibut tagged and released during the 1969 investigations, 2,438 were below 65 centimeters while 463 exceeded that length. As these tagged juvenile halibut reach a size to be readily taken by setline gear, their recovery could supply important information about the source of recruits for the established Canadian and United States setline fisheries.

During 1969 two additional recoveries of tagged juvenile halibut released in Bering Sea were made in the Gulf of Alaska. A halibut 51 cm. in length when released off Cape Mordvinof, Unimak Island on 8 July 1961 was returned from Uyak Bay, Kodiak Island on 18 June 1969. A 64 cm. halibut, released by the Fisheries Agency of Japan on the Misty Moon ground of Bering Sea on 17 June 1963, was

recovered by a North American setline vessel in Frederick Sound, Southeastern Alaska, on 20 August 1968 at a size of 107 cm. This extensive movement is similar to that of another juvenile released in Bering Sea by the Commission and recovered at Port Camden in Southeastern Alaska in 1967.

Several additional recoveries of halibut released in the Gulf of Alaska were made in locations which added further evidence of a west-to-east movement of small halibut on all grounds investigated.

#### Inshore Areas

Representative inshore locations around the perimeter of the Gulf of Alaska and the Bering Sea have provided catches for appraising the abundance of the very young halibut. During the 1969 sampling, 69 hauls of 15 minutes duration were completed at depths ranging from 5 to 30 fathoms; 5,913 halibut were caught, or which 5,893 were less than 65 centimeters in length.

The inshore stations in the Gulf of Alaska produced above-average catches of one-year-olds (1968 year class) at Cape St. Elias and Kodiak Island. However, the catch of three-year-olds (1966 year class) at Shelikof Bay, which has been used as an indicator of recruitment to Area 2, was only 1/6 of the average catch for the past 13 years. Whether the mortality rate in the next few years will be above or below average could determine the level of entry of that year class (1966) into the setline fishery in 1971 and 1972.

Inshore stations were sampled for the second year in Bering Sea and two-year-old halibut (1967 year class) were found to be more abundant than other classes. The catch of one-year-old halibut in 1969 (1968 year class) was considerably lower than that of the one-year-olds in 1968 (1967 year class). To date no fish-of-the-year have been caught on the inshore stations in Bering Sea in any year. As yet there is an insufficient series of samples to determine what should be considered as the average stock condition for these grounds.

The following table summarizes the catch by age and grounds.

**Number of Halibut Less than 65 Centimeters in Length from Inshore Areas in 1969 by Age and Locality**

| Area | Age: | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | Number |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year Class: | 1969 | 1968 | 1967 | 1966 | 1965 | 1964 | 1963 | 1962 | 1961 | Total | Hauls |
| Shelikof Bay | | 25 | 60 | 21 | 10 | 10 | 19 | 2 | — | — | 147 | 25 |
| Cape St. Elias | | 3 | 599 | 235 | 139 | 48 | 40 | 27 | 3 | 6 | 1,100 | 10 |
| Kodiak Island | | — | 2,654 | 456 | 19 | 2 | 4 | 3 | — | — | 3,138 | 12 |
| Unimak Island | | — | 165 | 508 | 66 | 14 | 1 | — | — | — | 754 | 10 |
| Bering Sea | | — | 40 | 638 | 71 | 5 | — | — | — | — | 754 | 12 |
| Total | | 28 | 3,518 | 1,858 | 305 | 79 | 64 | 32 | 3 | 6 | 5,893 | 69 |

#### Offshore Areas

Recruitment studies on the offshore grounds are directed primarily to determining the direct effect that the foreign trawl fishery may have upon the vulnerable young halibut. The offshore stations were sampled with 60-minute hauls with the Commission's standard net at selected stations. During the 1969 survey 182 stations were occupied at depth of 11 to 94 fathoms; 5,717 halibut were caught, of which 5,256, or 92 percent, were below 65 centimeters in length.

In previous surveys large numbers of juvenile halibut have been found on the flats of southeastern Bering Sea. A representative group of 34 stations in the area, which are sampled annually at about the same time of year, has shown a declining catch rate of young halibut for the past several years and this trend continued in 1969. The 1969 catches indicated that the number of halibut present on the flats of southeastern Bering Sea was the lowest since the surveys began in 1963.

In the Gulf of Alaska study areas, no trend of increasing or decreasing numbers of juveniles is apparent on any of the grounds. In contrast to what was found on the inshore stations of the eastern Gulf of Alaska, the three-year-olds (1966 year class) appeared in strength on the western grounds. The following table summarizes the age composition of the offshore areas sampled.

**Number of Halibut Less than 65 Centimeters in Length from Offshore Areas in 1969 by Age and Locality**

| Area | Age: 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | Number |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year Class: 1969 | 1968 | 1967 | 1966 | 1965 | 1964 | 1963 | 1962 | 1961 | Total | Hauls |
| Cape St. Elias | — | 2 | 30 | 232 | 131 | 203 | 101 | 21 | 12 | 732 | 43 |
| Cape Chiniak | — | — | 6 | 210 | 64 | 153 | 61 | 13 | 3 | 510 | 25 |
| Chirikof Island | — | 10 | 570 | 1,267 | 413 | 311 | 182 | 85 | 7 | 2,845 | 36 |
| Unimak Island | — | — | 112 | 231 | 157 | 80 | 85 | 13 | 6 | 684 | 28 |
| Bering Sea | — | — | 74 | 157 | 193 | 20 | 30 | 9 | 2 | 485 | 50 |
| Total | — | 12 | 792 | 2,097 | 958 | 767 | 459 | 141 | 30 | 5,256 | 182 |

## TRAWL INVESTIGATIONS

Investigations of the interaction between trawling and the stocks of adult halibut were further expanded in 1969 to supplement the large body of information on the inadvertent taking of halibut by trawl gear that the Commission has collected since 1946 throughout the range of the halibut fishery. During the past 8 years observers have been placed on Canadian and United States commercial trawlers to secure information on numbers, size composition and viability of halibut taken inadvertently while trawling for other demersal species off the coast of British Columbia. The operations on 38 different trawlers have been observed during 130 trips since 1962. A summary of the sampling from 1962 to 1969 by sections of the Pacific Coast south of Dixon Entrance is given below. In addition to the observations on commercial trawlers in 1969 similar data were secured for hauls on chartered vessels and these are included in the following table.

| | South Cape Flattery | | West Coast Vancouver Is. | | Queen Charlotte Sound | | Hecate Strait | | Total All Areas | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | No. Hauls | No. Halibut | No. Hauls | No. Halibut | No. Hauls | No. Halibut | No. Hauls | No. Halibut | No. Hauls | No. Halibut |
| 1962 | 19 | 63 | 142 | 682 | 124 | 2,468 | 19 | 1,732 | 304 | 4,945 |
| 1963 | 18 | 17 | 15 | 41 | 84 | 319 | — | — | 117 | 377 |
| 1964 | 120 | 199 | 82 | 229 | 133 | 1,294 | 37 | 588 | 372 | 2,310 |
| 1965 | 5 | — | 50 | 20 | 143 | 2,489 | 78 | 1,708 | 279 | 4,217 |
| 1966 | — | — | 136 | 1,945 | 170 | 1,393 | 8 | 18 | 314 | 3,356 |
| 1967 | — | — | 230 | 6,462 | 122 | 3,026 | 13 | 68 | 365 | 9,556 |
| 1968 | — | — | 33 | 67 | 152 | 2,721 | 55 | 356 | 240 | 3,144 |
| 1969 | 42 | 229 | 129 | 1,819 | 315 | 10,494 | 563 | 19,911 | 1,049 | 32,453 |
| Totals 1962-1969 | 204 | 508 | 817 | 11,265 | 1,243 | 24,204 | 773 | 24,381 | 3,037 | 60,358 |

The halibut content of the trawl catches off the British Columbia coast vary according to the season and the commercial species sought at the time. The largest catches of halibut occurred during the period from June to August, inclusive, and also when species other than Pacific Ocean perch were the target of the operation. Estimates of the catch of halibut per hour of trawling and the proportion of halibut in the catch were applied to the total effort and total demersal fish catch off the coast of British Columbia to obtain acceptable estimates from which to calculate the probable losses of adult halibut in the domestic trawl fishery.

Information on the size composition of trawl-caught halibut was obtained from the observer program and indicates that commercial trawl gear, as commonly used, retains smaller halibut on the average than does setline gear.

In addition to the observer program, the selection characteristics of trawl gear with respect to halibut were further examined on chartered vessels. The trawlers *Arthur H, Don Edwards* and *Karen T* were chartered on a day-by-day basis during their regular commercial operations and the *Sea Prince* was chartered for a period of 35 days in the months of August and September 1969. A selection curve was obtained for 12-inch codends, which extends the results reported upon by the Commission in 1969. The effects of mesh size in the codend on the size composition of halibut caught is significant; but such variables as haul speed and length of haul were found to have little effect on the selection curve on the grounds fished.

Wide variations exist in the extent and character of the interaction that occurs between trawling and the stocks of halibut over the 3,000-mile halibut fishery from California to Cape Navarin on the coast of Asia. There is variation between grounds, from season to season and from year to year. Also, conditions in the domestic trawl fishery, conducted almost exclusively off British Columbia and chiefly for foodfish, differ radically from what prevails in foreign mothership trawl fishing in Bering Sea and in the Gulf of Alaska, where the catch may be used for foodfish, minced fish, or reduction purposes.

Since conclusions from such studies could have profound implications with respect to interests of Canada and the United States in the halibut fishery, studies must be thorough and comprehensive and provide data having a high degree of confidence.

## PUBLICATIONS AND MANUSCRIPT REPORTS PREPARED DURING 1969

### Published Reports

**Publications by International Pacific Halibut Commission**

Report No. 49: Regulation and Investigation of the Pacific Halibut Fishery in 1968.

Report No. 50: Agreements, Conventions and Treaties Between Canada and the United States of America with Respect to the Pacific Halibut Fishery – F. Heward Bell.

Report No. 51: Gear Selection and Pacific Halibut – Richard J. Myhre.

Report No. 52: Viability of Tagged Pacific Halibut – Gordon J. Peltonen.

Technical Report No. 1: Recruitment Investigations: Trawl Catch Records, Bering Sea, 1967 – E. A. Best.

Technical Report No. 2: Recruitment Investigations: Trawl Catch Records, Gulf of Alaska, 1967 – E. A. Best.

Technical Report No. 3: Recruitment Investigations: Trawl Catch Records, Eastern Bering Sea, 1968 and 1969 – E. A. Best.

Technical Report No. 4: Relationship of Halibut Stocks in Bering Sea as Indicated by Age and Size Composition – William H. Hardman.

Technical Report No. 5: Recruitment Investigations: Trawl Catch Records, Gulf of Alaska, 1968 and 1969 – E. A. Best.

**Publications in Other Journals**

Regulation and its effect upon the North American halibut fleet.
National Fisherman Yearbook, 1970 – F. Heward Bell.

Will Pacific halibut become an incidental trawl fish?
Western Fisheries, Vol. 77, No. 6 – R. J. Myhre.

Trawling: Growing threat to the halibut resource.
Western Fisheries, Vol. 77, No. 6 – E. A. Best.

Range extension of the flag rockfish *(Sebastodes rubrivinctus)* to Aleutian Islands.
Journal, Fisheries Research Board of Canada Vol. 26, No. 7 – E. A. Best.

Serum transferrin systems and the hemoglobins of the Pacific halibut.
Journal, Fisheries Research Board of Canada, Vol. 26, No. 9 – H. Tsuyuki, E. Roberts and E. A. Best.

**Manuscript Reports**

1. Catch and effort statistics for the North American setline halibut fishery in Bering Sea in 1967, 1968 and 1969.
2. Size and age composition of North American setline halibut catches in Bering Sea in 1969.
3. Size composition studies of halibut taken in the North American halibut fishery in 1968.
4. North American catch of halibut in thousands of net weight pounds and fishing effort in thousands of skates in 1968 by month and by IPHC 60-mile statistical areas and INPFC sub-areas from the Washington Coast to and including the Aleutian Islands.
5. International Pacific Halibut Commission field activities in 1969 and plans for 1970.
6. Abundance of young halibut and trawl catch records for 1963, 1965 and 1966 in eastern Bering Sea – F. Heward Bell and E. A. Best.