

INTERNATIONAL PACIFIC HALIBUT COMMISSION

**ESTABLISHED BY A CONVENTION BETWEEN
CANADA AND THE UNITED STATES OF AMERICA**

ANNUAL REPORT 1977

COMMISSIONERS

NEILS M. EVENS

WILLIAM S. GILBERT

CLIFFORD R. LEVELTON

FRANCIS W. MILLERD

ROBERT W. SCHONING

PETER C. WALLIN

DIRECTOR

BERNARD E. SKUD

SEATTLE, WASHINGTON

1978

Preface

The International Pacific Halibut Commission (IPHC) was established in 1923 by a Convention between Canada and the United States for the preservation of the halibut (*Hippoglossus stenolepis*) fishery of the North Pacific Ocean and the Bering Sea. The Convention was the first international agreement providing for joint management of a marine resource. The Conventions of 1930 and 1937 extended the Commission's authority and the 1953 Treaty specified that the halibut stocks be developed and maintained at levels that permit the maximum sustained yield.

Three Commissioners are appointed by the Governor General of Canada and three by the President of the United States. The Commissioners appoint the Director who supervises the scientific and administrative staff. The scientific staff collects and analyzes statistical and biological data needed to manage the halibut fishery. The headquarters and laboratory are located on the campus of the University of Washington in Seattle, Washington. Each country provides one-half of the Commission's annual appropriation.

The Commissioners meet annually to review the regulatory proposals made by the scientific staff and the Conference Board which represents vessel owners and fishermen. The regulatory alternatives are discussed with the Advisory Group composed of fishermen, vessel owners, and processors. The regulatory measures are submitted to the two governments for approval. Citizens of each nation are required to observe the regulations that are adopted.

The International Pacific Halibut Commission has three publications: Annual Reports, Scientific Reports, and Technical Reports. Until 1969, only one series was published. The numbering of the original series has been continued with the Scientific Reports.

Cover: Halibut vessel displaying "tub gear."

INTERNATIONAL PACIFIC HALIBUT COMMISSION
P.O. BOX 5009, UNIVERSITY STATION
SEATTLE, WASHINGTON 98105, U.S.A.

International Pacific Halibut Commission

ANNUAL REPORT 1977

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Activities of the Commission

The Fifty-Third Annual Meeting of the Commission was held in Vancouver, British Columbia, January 25-28, 1977. Mr. Clifford R. Levelton presided as Chairman and Mr. Robert W. Schoning was Vice Chairman. The Commission staff reviewed the 1976 fishery, presented results of scientific investigations and recommended regulations for the halibut fishery in 1977. The staff also summarized results of a questionnaire distributed to vessel captains to obtain their views and recommendations for halibut regulations during 1977. The Conference Board, representing vessel owners and fishermen, met with the Commission to present and discuss their regulatory proposals. Recommendations were also received from the Makah Indian Tribe. The Commission reviewed all proposals with the Advisory Group before regulations for the 1977 halibut season were adopted and sent to the Canadian and United States Governments for approval.

The Commission considered administrative and fiscal matters, approved research plans for 1977, and adopted the budget for fiscal year 1979-1980. Mr. Schoning was elected Chairman for 1977 and Mr. Levelton was elected Vice Chairman. A news release, issued at the close of the meeting, expressed concern for the low stock abundance and summarized regulations recommended to both governments for the 1977 fishing season.

Letters were sent to the governments expressing deep concern for the present low abundance of the halibut stocks and the continuing decline in recruitment of young halibut. The Commission urged a reduction in the incidental catch of halibut by foreign and domestic fisheries and the development of gear which would protect the halibut resource while effectively catching other species.

The Commission met again in Vancouver, British Columbia, on September 13, 1977 to review the 1977 fishing season and to discuss industry reactions to the split fishing season. Regulations for the 1978 Bering Sea fishery were not considered at this meeting because approval by the International North Pacific Fisheries Commission (INPFC) is no longer required under extended jurisdiction. Mr. Levelton presented a brief review of progress in the Canada-United States negotiations and discussed the future prospects for the Commission under extended jurisdiction. At the close of the meeting, the Commission sent a letter to both governments conveying the concern within the halibut industry that an accord had not yet been reached and urging that industry representatives have an opportunity to present their views to their respective governments. The Commission also urged that both countries adopt measures aimed at rebuilding the halibut stocks as part of their management plans under their new fisheries jurisdictions.

Reports published by the Commission during 1977 are listed at the end of this report. In addition, several documents were prepared at the request of the Canadian and United States Governments and the North Pacific Fishery Management Council.

Expenditures during the 1976-1977 fiscal year (April-March) were \$762,000. The Commission expenses were shared equally by both governments as required under the Halibut Convention.



FRANCIS W. MILLERD
Canadian Commissioner, 1964-1977

The Commissioners and staff gratefully acknowledge the contributions of Mr. Millerd during his 14-year tenure, the third longest of all Commissioners.

Director's Report

My secondment to the Commission from the U.S. Federal Government is limited to 8 years and will be completed in August of 1978. I am taking the liberty in this, my last report, to express my appreciation to the staff and Commissioners, fishermen, industry representatives and officials of other agencies who have provided assistance to our research efforts and who have been so cooperative, particularly in providing needed data for our assessment of stock condition and management of the fishery.

It also seems fitting to provide my prognosis of the abundance of halibut in the coming years.¹ As indicated later in this report, the condition of the stock is still critical, but several indices of stock condition have improved. The CPUE in the halibut fishery increased during 1977 and, more importantly, has been relatively stable for the past 3 years, indicating that the decline in abundance since 1960 has been halted. This goal has been achieved largely by reducing the catch quotas by one-half since 1970 and lowering fishing effort (mortality) to a level consistent with the existing stock size.

Another encouraging index is the 5-year increase in the abundance of juveniles in the Bering Sea. This increase coincided with restrictions imposed on Japanese and Soviet trawlers. (In 1972, IPHC proposed that particular areas be closed to fishing when the incidental catch of halibut was high and Canada and the United States successfully negotiated these terms.) In the Gulf of Alaska, where the restrictions on foreign trawling came later, the increase in juvenile abundance is more recent, but encouraging nonetheless.

We do not and cannot expect to eliminate all the "losses" of halibut due to incidental catches in other fisheries, but the major component of this incidental mortality, foreign trawling has been substantially reduced and the recruitment to the longline fishery has been enhanced. This reduction has been achieved without unduly restricting either the operation or the production of fisheries for other species which should be rationally exploited.

If the new management regimes introduced by both Canada and the United States since the extension of their fishing zones can monitor and control the incidental catch by foreign and domestic fisheries, a gradual recovery of the halibut stocks is anticipated. The North American longline fleet cannot expect to attain the former peak production of 70 million pounds because of present-day losses to trawl and pot fisheries. However, in future years, an annual sustained yield of 40 million pounds is probable, providing restraint is exercised and catch quotas are not raised too soon. Conversely, it will be important not to unnecessarily limit the fishery as conditions do improve. Our studies on CPUE, cohort analysis, and juvenile halibut will contribute to a reliable assessment from which the future course of the fishery can be decided.

¹After this report went to press, three manuscripts concerning stock assessment were completed. These papers provide new insights for future management and will be published in 1978 as Scientific Reports, Nos. 64, 65, and 66.

The Fishery

REGULATIONS FOR 1977

Regulatory Proposals

Regulatory proposals for 1977 were submitted by fishermen, vessel owners, processors, government agencies, and the Commission's scientific staff. A summary of all proposals was distributed to all interested groups prior to the Annual Meeting. The staff recommended a catch limit of 10 million pounds for each of Areas 2 and 3, 5 million pounds less than the combined catch limit in 1976; that Areas 2 and 3 open on May 16, predicated upon a continuation of the fleet voluntary lay-up program; that the fishing season be limited to 3 1/2 months in each area; that only the 24-inch head-off measurement be used as the size limit in 1977; and that the sport fishery regulations and gear restrictions remain the same as in 1976. The staff also proposed that the waters in Area 3, west of 175° West longitude, be open from April 1 to November 15, the same season as in the Bering Sea, to permit vessels to fish on both sides of the western Aleutian Islands. Further, the staff proposed that the governments study time-depth closures for foreign and domestic trawlers and that federal, state and provincial agencies provide the Commission with updated information on all licenses issued to vessels landing halibut.

At the Annual Meeting, the Conference Board announced that the fleet's voluntary lay-up program would be discontinued in 1977. The staff then recommended and the Commission agreed that the fishing season in Areas 2 and 3 should be divided into a succession of open and closed periods to spread fishing mortality between early and late components of the stock.

The Conference Board proposed that a catch limit of 13 million pounds be set in each of Areas 2 and 3 and that the following fishing periods be set in lieu of the lay-up program: May 8 to May 27, June 11 to July 1, July 16 to August 12, and August 27 to September 16. The Conference Board appointed a Lay-Up Review Committee to work with the Commission to see if the lay-up rules could be incorporated into the Commission's regulations for 1978. The Conference Board recommended that all periods closed to halibut fishing be diligently enforced and that the governments study and institute time-depth closures for foreign and domestic trawlers. The Conference Board also proposed that a special season be allowed in Area 3 west of the Shumagin Islands beginning 10 days after the final closure in Area 3 with a 1 million pound catch limit and an October 1 statutory closing date. In addition, the Conference Board proposed that the size limits, gear restrictions, and sport fishery regulations remain the same as in 1976.

Before the Annual Meeting, IPHC circulated a questionnaire to solicit regulatory proposals from vessel captains, some of whom are not members of a vessel owner or union organization. The questionnaire was intended to supplement information received from the Conference Board, unions, vessel owners, and other

organizations. Over 700 questionnaires were mailed and 191 or 27% were returned. Although recommendations for the catch limit varied from 6 to 20 million pounds, the average was 13 million pounds in each area; the average opening date was May 8. In response to specific questions, 72% reported no change in the percentage of undersized fish, 31% reported using a longer soak now than they did in earlier years, 62% favored limited entry for the halibut fishery, and 95% thought IPHC should continue to manage the halibut fishery.

All regulatory alternatives were discussed with the Advisory Group, consisting of representatives of fishermen, vessel owners, and processors. Members of the Advisory Group in 1977 were: Robert Alverson, James Ferguson, Jack Knutsen (Seattle, Wa.); Don Reinhardt (Bellingham, Wa.); William Anderson, George Dodman, Ben Karasosky, John Radosevic, R. S. Rogers, and Donald Russell (Vancouver, B.C.); Sid Dickens (Prince Rupert, B.C.); Albert Davis (Kake, Alaska); Chris Christensen and Tom Thompson (Petersburg, Alaska).

The regulations adopted by the Commission and approved by the United States Secretary of State on March 22, 1977 and by the Governor General of Canada on April 1, 1977 are listed at the end of this section. As in previous years, approval of the regulations also implemented the conservation measures adopted by INPFC for the halibut fishery in the Bering Sea.

Regulations for the 1977 Bering Sea fishery were considered at the Commission's September 1976 meeting. The staff proposed that the regulations set for the spring fishery be the same as in 1976, i.e., the waters east of 175° W longitude (Areas 4A, 4B, 4C, and 4D-East) would be open from April 1 to April 19. For the fall fishery east of 175° W, the staff recommended opening the season 10 days after the quota was reached in Area 3 for a period of 20 days. The waters west of 175° W longitude (Area 4D-West) would open on April 1 and close on November 15. The staff also recommended that the U.S. National Marine Fisheries Service deputize a person at Sand Point, Alaska to supervise clearances of vessels entering and leaving the Bering Sea fishery. Halibut fishermen concurred with the staff's proposals but urged that Canada and the United States intensify trawl research to determine whether modifications of fishing areas could reduce the incidental catch of halibut without seriously affecting trawling efficiency.

Regulatory Areas

The regulatory areas in 1977 are shown in Figure 1:

Area 2 - South and east of Cape Spencer, Alaska.

Area 3 - North and west of Area 2, excluding the Bering Sea:

3A: Cape Spencer to Kupreanof Point.

3B: Kupreanof Point to the meridian of 175° W.

3C: West of 175° W.

Area 4 - The Bering Sea:

4A, 4B, 4C and 4D-East: East of 175° W except Area 4E.

4D-West: West of 175° W.

4E: The southeastern flats.

Catch Limits and Length of Seasons

The 1977 catch limit in Area 2 was 11 million pounds, 2 million pounds less than in 1976. In Area 3, the catch limit also was 11 million pounds, down 1 million from 1976. Special seasons were established in Areas 3B and 3C, and the

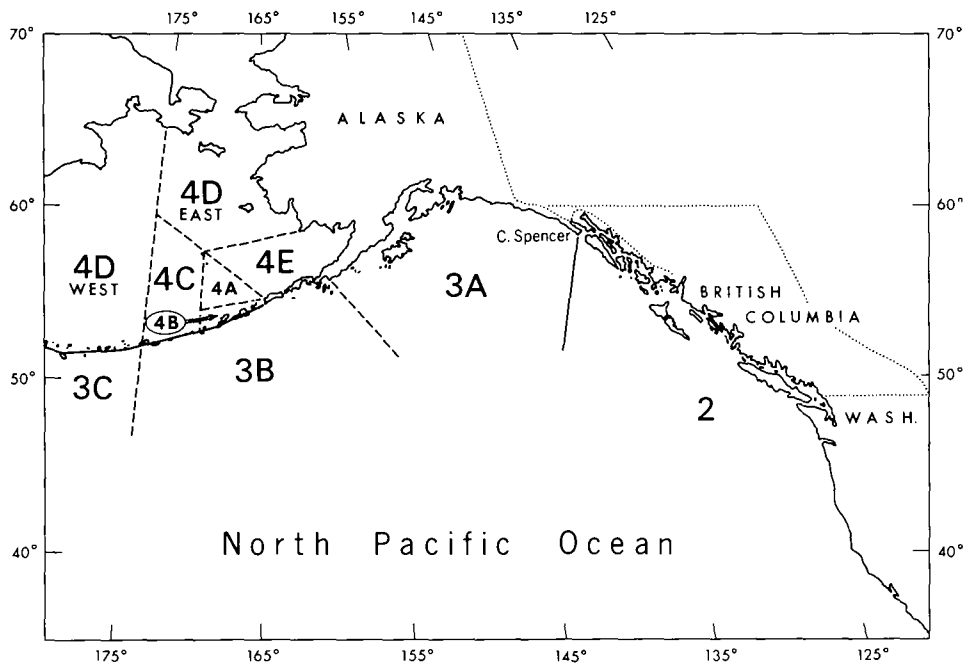


Figure 1. Regulatory areas for the Pacific halibut fishery, 1977.

catch from these areas was not included in the Area 3 catch limit when Area 3A was closed. Area 4 was managed by restricting the length of the fishing seasons without assigning catch limits. Area 4E, designated as a halibut nursery area since 1967, again was closed to all halibut fishing.

The opening and closing dates and length of fishing seasons for 1976 and 1977 are given in Table 1. The fishing seasons in Areas 2, 3A and 3B consisted of fishing periods of specified lengths in 1977, except that the closing date of July 30 in Areas 3A and 3B resulted from attainment of the Area 3 catch limit. The fishing seasons began at 1500 hours in Areas 2, 3A and 3B and at 1800 hours in Areas 3C and 4; all areas closed at 0600 hours. The hours were Pacific Standard Time.

Split Fishing Season

The adoption of a split fishing season for 1977 was a radical departure from past practices. The traditional fishing season in the major areas consisted of an opening date and a closure when the catch limit for the area was taken. In the 1950's when stock abundance was high, the fishing seasons became short and intense. The fleet established a voluntary lay-up program to provide rest periods between fishing trips, to extend the fishing season, and to obtain a more orderly distribution of landings. Support for the voluntary program was strong among the full-time halibut fishermen, but during the 1970's many new and part-time fishermen, who either were unaware of the objective of the plan or disagreed with the rules, did not follow the lay-up system. As the number of non-participants increased, support for the program weakened and the Lay-Up Committee decided to abandon the lay-up system for 1977.

The fishermen urged IPHC to adopt the lay-up principles in its own regulations, but this posed insurmountable enforcement problems. IPHC had the

option of either letting the season run its natural course and be over within a short period, which was biologically undesirable, or splitting the season so that fishing could be extended over a longer period of time. The Commission decided that the fishing season should be divided and sought the advice of the Advisory Group regarding the timing of the open and closed periods. The fishermen regarded the split season as a temporary measure and appointed a committee to review different regulatory options for 1978. The Lay-Up Review Committee met in March and again in October to discuss the lay-up program. However, many fishermen reported that the split season worked better than they had anticipated and, with relatively minor adjustments would be an acceptable arrangement for future fishing seasons. Some of the more serious problems raised by the split season in 1977 were: the open periods sometimes coincided with unfavorable weather or tides; the concentration of vessels and gear increased on the grounds; and the concentration of landings at the end of each fishing period, particularly when occurring on weekends, sometimes caused congestion at the landing docks.

Table 1. Opening and closing dates by area, 1976-1977.

Area	1976			1977		
	Opening	Closing	Fishing Days	Opening	Closing	Fishing Days
2	May 8	Sept. 8	123	May 10	May 29	19
				June 16	July 4	18
				July 20	Aug. 7	18
				Aug. 23	Sept. 10	18
3A, 3B*	May 8	Aug. 12	96	May 10	May 29	19
				June 16	July 4	18
				July 20	July 30	10
3B*				Sept. 15	Oct. 3	18
3C*	May 8	Aug. 12	96	Apr. 1	Nov. 15	227
4A, B, C, D-East	Apr. 1	Apr. 19	17	Apr. 1	Apr. 21	19
	Sept. 15	Sept. 30	14	Aug. 9	Aug. 29	19
4D-West	Apr. 1	Nov. 15	227	Apr. 1	Nov. 15	227

*In 1976, Areas 3A, 3B, and 3C were managed as a single area.

Other Regulations

The regulation requiring vessels to have their licenses validated at Sand Point, Alaska before and after fishing in Areas 3C and 4 was modified to allow the vessels to notify the Commission representative at Sand Point, or the Commission headquarters in Seattle, Washington by wire or telephone. Vessels are no longer required to stop at Sand Point.

The regulations on vessel licensing were clarified by specifically stating that halibut licenses need not be renewed unless a vessel is sold, transferred, renamed or redocumented.

All other regulations pertaining to licensing, gear restriction, size limits, and the sport fishery remained unchanged from 1976.

STATISTICS OF THE FISHERY

A compilation of historical statistics was published in 1977 as Technical Report Number 14, "The Pacific Halibut Fishery: Catch, Effort and CPUE, 1929-1975". The report summarizes catch and effort data by statistical area, region, regulatory area, and country; data on catch also are given by port and country. Appendix tables in the 1976 Annual Report updated those statistics to 1976, but some of the values were in error. Appendix Tables 1-5 of this year's Annual Report are in the same format as Technical Report Number 14 and include the correct statistics for 1976 as well as those for 1977.

Catch by Regulatory Area

The total commercial catch in 1977 was 21.9 million pounds, 5.6 million less than in 1976. The decline reflects the lower catch limits and a reduction in fishing effort in Area 2. The catches by Canada and the United States declined by 3.2 and 2.4 million pounds, respectively. Catches are shown by country and regulatory area for 1973 through 1977 in Table 2.

In Area 2, the catch was 8.8 million pounds, 4.2 million pounds less than in 1976 and nearly 2.2 million pounds less than the 1977 catch limit of 11 million pounds. The largest reduction occurred in southeastern Alaska where the catch dropped by 2.3 million pounds in 1977. The catch limit was not attained because of the low abundance of halibut and a substantial reduction in fishing effort in late July and August when an unusually large number of vessels switched from the halibut to the salmon fishery.

Table 2. Catch by regulatory area, 1973-1977.

Regulatory Area	1973	1974	1975	1976	1977
Catch in Thousands of Pounds					
Area 2					
Canada	7,364	4,973	7,369	7,400	5,707
United States	<u>5,565</u>	<u>5,771</u>	<u>6,461</u>	<u>5,648</u>	<u>3,113</u>
Total	12,929	10,744	13,830	13,048	8,820
Area 3					
Canada	6,990	2,227	3,819	4,534	2,921
United States	<u>11,535</u>	<u>7,898</u>	<u>9,442</u>	<u>9,430</u>	<u>9,446</u>
Total	18,525	10,125	13,261	13,964	12,367
Bering Sea					
Canada	96	168	169	62	139
United States	<u>190</u>	<u>269</u>	<u>356</u>	<u>461</u>	<u>542</u>
Total	286	437	525	523	681
All Areas					
Canada	14,450	7,368	11,357	11,996	8,767
United States	<u>17,290</u>	<u>13,938</u>	<u>16,259</u>	<u>15,539</u>	<u>13,101</u>
Total	31,740	21,306	27,616	27,535	21,868

In Area 3, the 1977 catch was 12.4 million pounds, nearly 1.6 million pounds less than in 1976. The catch during the regular fishing season which closed on July 30 was 11.1 million, 0.1 million pounds over the catch limit. An additional 0.8 million pounds were caught during the special season in Area 3B in late September and 0.4 million pounds were taken in Area 3C during extended fishing periods in the spring and late fall. The catch declined in most regions of Area 3 with the sharpest drop occurring in the Yakutat region where the catch was 1.6 million pounds less than in 1976. The catch from the Shumagin and Aleutian regions increased 1.0 million pounds, due largely to the special seasons there.

In Area 4 (the Bering Sea) the total catch was 681,000 pounds, up 158,000 pounds from 1976. The fall fishing season in the eastern Bering Sea opened on August 9, more than 5 weeks earlier than in the past several years. Because Area 3 was closed, fishing effort in the Bering Sea increased and this accounted for the increased catch. United States and Canadian vessels caught 135,000 and 31,000 pounds, respectively, during the spring season and 407,000 and 108,000 pounds during the summer and fall. Most of the catch, 90%, was taken from grounds near the Aleutian Islands in Areas 4B, 4C, and 4D-West and 10% from grounds along the "100 fathom edge" northwest of Unimak Pass.

The landed value of the 1977 catch was \$29 million, and fishermen received an average price of \$1.31 per pound. There was little difference in the price for medium and large halibut.

Landings by Port

Kodiak, Alaska was the leading halibut port on the Pacific coast in 1977 with landings of 4,665,000 pounds. Prince Rupert, British Columbia, which had held this distinction since 1961, had landings of 3,581,000 pounds. Of the major ports, only Kodiak and Bellingham, Washington showed slight increases in landings. The largest decreases (over 40%) occurred in Prince Rupert and in Pelican, Alaska. Details of the landings by port for 1977 are given in Appendix II, Table 5.

Number of Vessels

Table 3 shows the number of vessels, the number of trips, and the catch by vessel category in 1977. Licensed vessels are those 5 net tons or larger that fish with setline gear. Unlicensed vessels are setliners less than 5 net tons and trollers and handliners. The number of licensed vessels in Areas 2 and 3 increased 62% from 743 in 1976 to 1,204 in 1977. Many of these vessels, particularly those in the Canadian fleet, had participated in the 1976 fishery but had not been licensed. The Canadian Department of Environment increased its enforcement effort in 1977 and informed many of the smaller vessels, particularly those landing at remote ports, that licenses were required. The number of unlicensed setliners landing halibut declined more than 20% primarily because of this change in the licensing status. The number of trollers landing halibut declined about 30%. Halibut caught during an open fishing period must be landed before a vessel can fish for other species when the area is closed to halibut fishing, and many trollers chose not to retain halibut rather than interrupt their salmon fishing.

Licensed vessels caught 90% of the catch in 1977, an 8% increase over 1976. Licensed vessels took 82% of the catch in Area 2 and 95% of the catch in Areas 3 and 4.

Table 3. Number of vessels, number of trips and catch by licensed and unlicensed vessels in Areas 2 and 3, 1977.

Vessel Category	Canada			United States			Total		
	No. of Vessels	No. of Trips	Catch 000's Pounds	No. of Vessels	No. of Trips	Catch 000's Pounds	No. of Vessels	No. of Trips	Catch 000's Pounds
AREA 2									
Unlicensed									
Trollers	735	1,750	158	933	1,630	88	1,668	3,380	246
Setliners	144	434	214	364	1,194	624	508	1,628	838
Other**	-	-	398	-	-	2	-	-	400
Total	879	2,184	770	1,297	2,824	714	2,176	5,008	1,484
Licensed									
5-19 tons***	618	1,816	2,792	158	674	1,136	776	2,490	3,928
20-39 tons	38	103	1,401	45	144	524	83	247	1,925
40-59 tons	2	8	19	4	7	61	6	15	80
60+ tons	3	6	136	2	5	132	5	11	268
Total	661	1,933	4,348	209	830	1,853	870	2,763	6,201
All Vessels	1,540	4,117	5,118	1,506	3,654	2,567	3,046	7,771	7,685
AREA 3*									
Unlicensed									
Trollers				70	190	16	70	190	16
Setliners		None		378	1,138	746	378	1,138	746
Other***				-	-	17	-	-	17
Total				448	1,328	779	448	1,328	779
Licensed									
5-19 tons***	2	7	83	181	635	1,833	183	642	1,916
20-39 tons	15	45	1,336	86	320	4,333	101	365	5,669
40-59 tons	6	13	355	23	87	2,976	29	100	3,331
60+ tons	13	33	1,875	8	28	613	21	61	2,488
Total	36	98	3,649	298	1,070	9,755	334	1,168	13,404
All Vessels	36	98	3,649	746	2,398	10,534	782	2,496	14,183
Grand Total	1,576	4,215	8,767	2,252	6,052	13,101	3,828	10,267	21,868

*Includes vessels that fished in both Areas 2 and 3, and those that fished in Area 4.

**Deliveries of unknown origin.

***Includes small vessels of unknown tonnage.

Sport Fishery

The Alaska Department of Fish and Game estimated that 14,700 halibut were caught by sport fishermen in 1977, 4,500 less than in 1976. The catch in Cook Inlet was 11,000 fish, 3,000 more than in 1976, while the catch in southeastern Alaska decreased from 7,700 to 1,100 fish.

Canadian sport fishermen caught 917 halibut with an average weight of about 25 pounds according to a preliminary tally of fishery officer reports. Most of this catch was from the west coast of Vancouver Island and from the vicinity of Prince Rupert.

The Washington Department of Fisheries reports that sport fishermen caught 1,076 halibut in 1977. This is well above the 1976 catch of 576 fish. Most of the catch (85%) was taken in the Strait of Juan de Fuca. Most of the fish were under 35 pounds, but several over 100 pounds were reported.

ASSESSMENT OF STOCKS

In general, the results of the stock assessment studies were encouraging: catch per unit effort (CPUE) increased, the incidental catch declined, and abundance of juveniles improved. However, the condition of the resource remains critical. The assessment of halibut stocks in 1977 was based on several analyses. Trends in catch, effort, and CPUE continued to be a major part of the assessment, but data from age composition and tagging studies as well as results from IPHC surveys and incidental catch records also were used. More detailed results from these analyses are given later in this report under "Scientific Investigations".

Abundance of Adult Halibut

CPUE in the setline fishery is used as an indicator of abundance of adult halibut. CPUE is expressed as the average catch per standard skate and is estimated from catch and effort data recorded in the fishermen's log books. IPHC regulations require that the captains of all licensed setline vessels maintain log records showing daily fishing location, amount of gear fished, and estimated catch. These records must be made available to representatives of the Commission upon request, and usually are obtained at the time of landing in the major ports, or are requested by mail at the completion of the fishing season. All records are used in assigning the location of the catch, but only fixed-hook setline gear is used for computing CPUE and fishing effort. In 1977, CPUE was based on data representing 26% of the catch in Area 2 and 57% of the catch in Area 3.

CPUE in Area 2 shows a general decline in abundance since the early 1960's (Figure 2). The 1977 CPUE was 54 pounds, up 6 pounds from 1976, but still below that in 1975. CPUE in southeastern Alaska was only 45 pounds, the lowest on the coast. In Area 3, CPUE declined sharply from 1960 to 1973, but has been relatively stable since then. CPUE in 1977 was 65 pounds, up 4 pounds from the previous year. In recent years, CPUE has been higher in the western part of Area 3 than in the eastern part.

Analysis of catch and age data, using a method called cohort analysis, provides an estimate of the number of fish at each age in the stock since 1935. The results show that the abundance of adults has declined sharply in both Areas 2 and 3; abundance in the early 1970's was about 5 million fish in each area compared to over 10 million fish in the early 1950's. Estimates in terms of weight still are preliminary, but suggest a biomass of about 100 million pounds in each area during the early 1970's, compared with over 200 million pounds in the 1950's. Estimates since the early 1970's were excluded because each year class must be observed in the fishery for several years before the estimates are considered reliable.

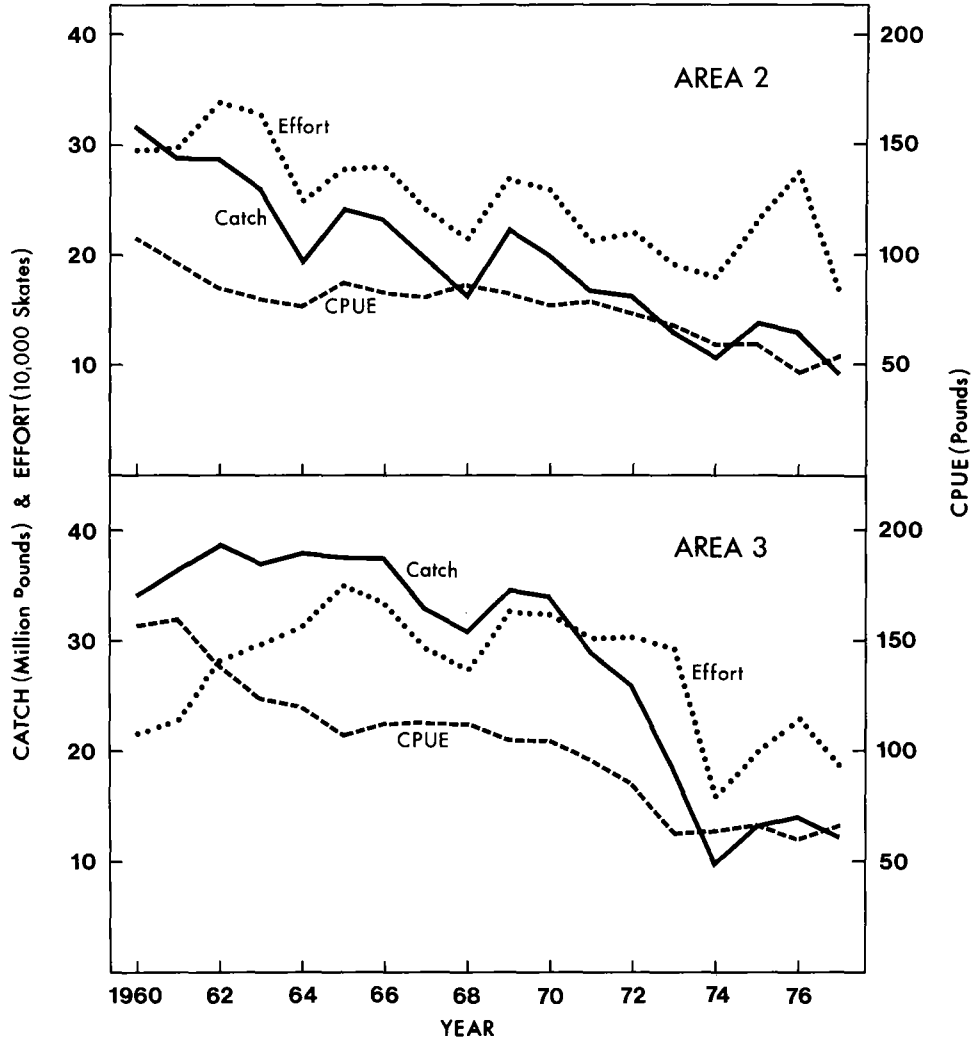


Figure 2. Catch, effort, and catch per unit effort (CPUE) in Regulatory Areas 2 and 3, 1960-1977.

Abundance of Young Halibut

Results from cohort analysis indicate a long-term decline in year class size since the 1940's. The abundance of 3-year-olds was used to indicate year class strength before entry into the trawl or setline fisheries. After increasing during the 1930's, abundance peaked in the early 1940's at over 10 million fish in each of Areas 2 and 3. Abundance then declined to about 5 million fish in the late 1940's. Several relatively strong year classes appeared during the 1950's and early 1960's, but these were generally smaller than year classes of the late 1930's and early 1940's. Abundance has continued to decline and was estimated to be less than 3 million fish in 1970-1971.

Data from IPHC surveys of juvenile halibut in the eastern Bering Sea and the Gulf of Alaska provide a more current indication of trends in abundance. Figure 3 shows the CPUE of juvenile halibut since 1963. After declining during the 1960's, abundance in the Bering Sea has increased since 1972. In the Gulf of

Alaska, abundance continued to decline during the 1970's although an increase did occur in 1977. The recent increase in both areas is encouraging, but will not improve conditions in the setline fishery for several years, and the abundance is still well below that in the 1960's.

Fishing Mortality

The substantially lower catch limits in recent years have successfully reduced fishing mortality by the setline fishery. Fishing effort, expressed as the number of standard skates fished, is an indicator of setline mortality and suggests that mortality in 1977 was nearly as low as at any time in the history of the fishery. In Area 2, effort generally has been declining since the early 1960's and after increasing briefly in 1975-1976, dropped again in 1977 (Figure 2). In Area 3, effort increased during the early 1960's, remained high through 1973, and then decreased sharply in 1974. After increasing in 1975-1976, effort declined in 1977.

Cohort analysis and tagging data provide estimates of the rate of fishing mortality. Annual mortality by setlines generally increases with age and ranges from less than 0.1 at 8 years of age to 0.2 at 15 years of age. The average mortality for 8- to 15-year-olds in 1977 probably was about 0.10 in Area 2 and 0.15 in Area 3, well below that estimated in most earlier years.

The incidental catch of halibut by foreign and domestic trawlers also causes mortality, and estimates of their catch have been included in recent analyses. The results show that fishing mortality by trawls is relatively low, usually less than 0.05. A notable exception occurred in Area 3 where trawl mortality on 4-year-olds

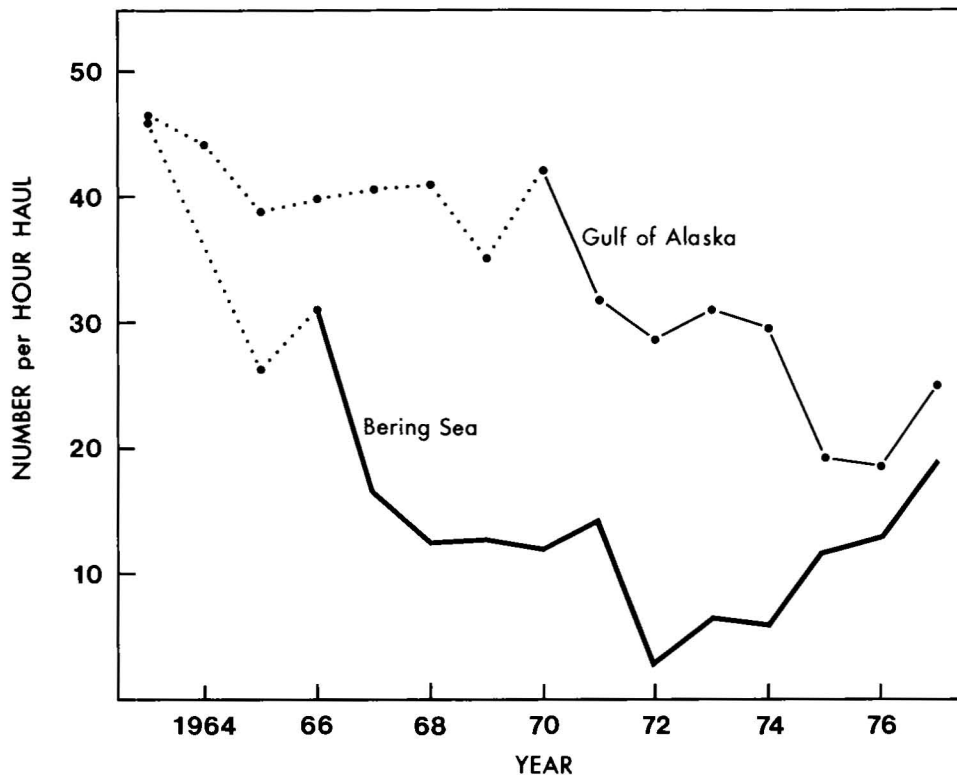


Figure 3. Index of abundance of juvenile halibut in the Gulf of Alaska and the south-eastern Bering Sea. Dotted lines indicate meager data.

exceeded 0.1 during the late 1960's and early 1970's. Although trawl mortality is relatively low overall, it does represent a high percentage of total fishing mortality on fish less than 8 years of age. The recent reduction in the incidental catch has reduced mortality by trawls and is expected to improve future recruitment of young halibut into the setline fishery.

Equilibrium Yield

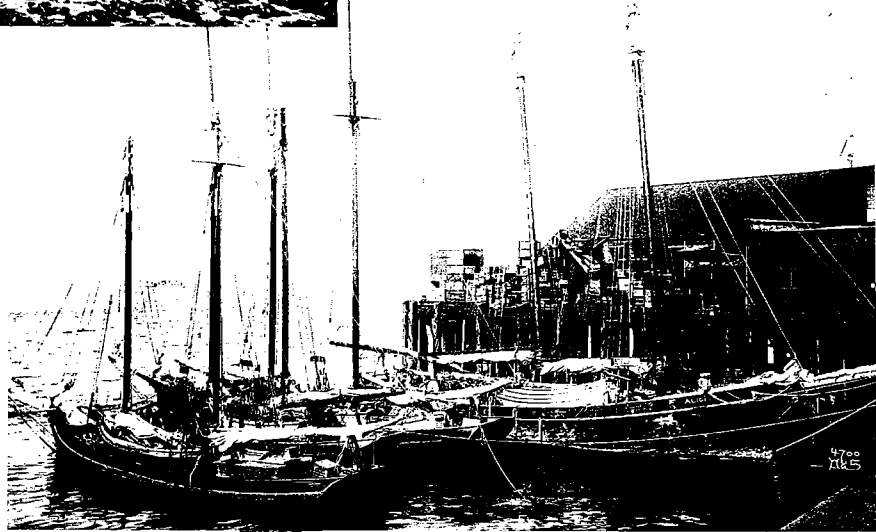
The equilibrium yield is the yield that can be taken without changing the stock size from one year to the next. If the catch is held below the equilibrium yield, a subsequent increase in stocks should occur. Based on trends in the setline fishery, the equilibrium yield has averaged about 10 million pounds in Area 2 and 12 million pounds in Area 3 over the past 5 years. The estimates are variable and the loss from incidental catches was treated as part of the natural mortality. The equilibrium yield will vary with changes in year class strength, growth, and survival, but because halibut are a long-lived species, the year-to-year changes are usually small.

Halibut Through

*Indian Canoes
(Late 1800's)*

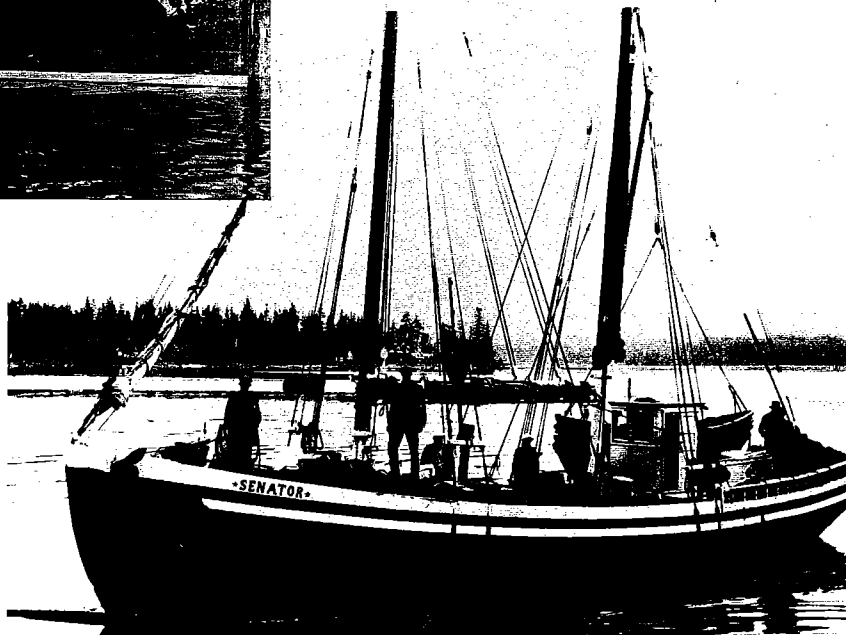


*Sailing Schooners
With Dories
(Early 1900's)*



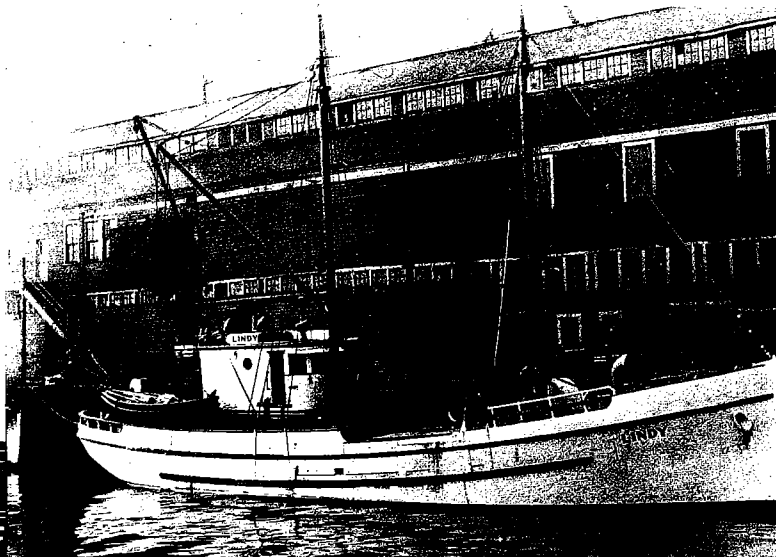
*Steamer With Dories
(Early 1900's)*

*"Gas-Boat" Schooner
With Dories (1910's)*

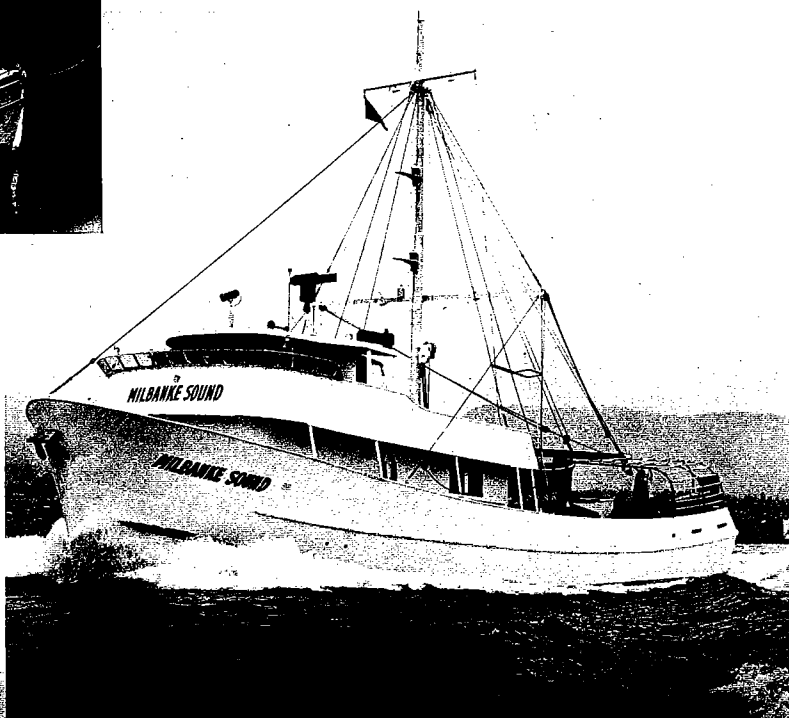


Boats the Years

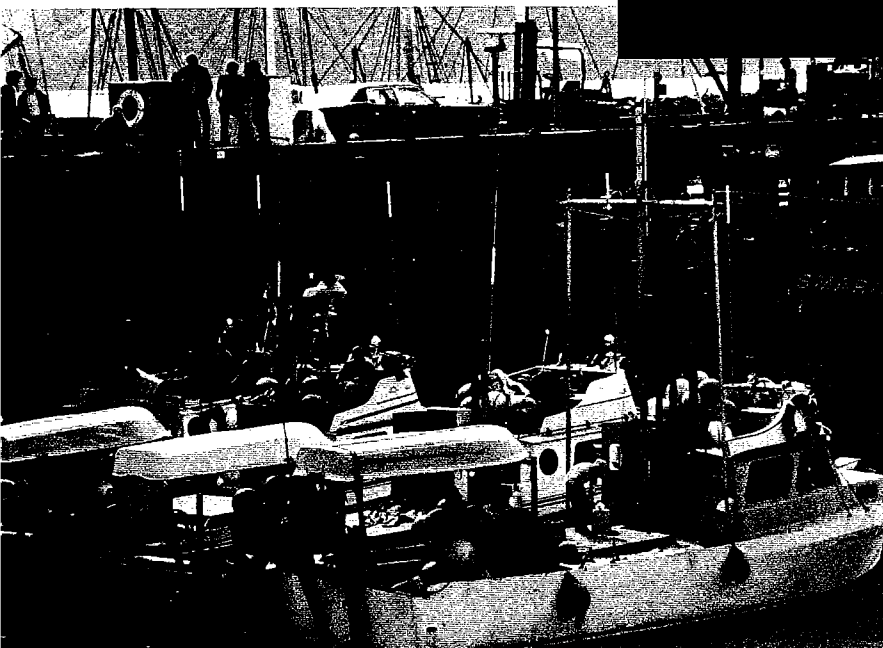
*Diesel Schooner
Longliner
(1920's To Date)*



*Small Seine-Type Longliner
(1920's To Date)*



*Modern Seine-Type
Longliner (1950's To Date)*



*Drum Boats With
Snap-On Gear
(1960's To Date)*

Scientific Investigations

INTERMINGLING OF STOCKS

The pending renegotiation of the Halibut Treaty between Canada and the United States and the review of management alternatives for the halibut fishery prompted a reanalysis of data regarding the interrelationships of halibut stocks. IPHC's early publications (1930's to 1950's) stressed the thesis that the stocks in regulatory Area 2 and Area 3 were separate and independent. This conclusion initially was based on the results of tagging experiments and catch statistics but later was supported by interpretations of data on egg and larval drift, anatomical differences, and growth rate. By the late 1950's, IPHC regularly reported on tagging studies that showed a "close relationship" among stocks in the several regulatory areas; however, that rate of exchange between Area 2 and Area 3 was not greatly different from that shown in the early tagging experiments.

Reexamination of the data on the distribution of eggs and early stages of larvae affirmed the original conclusion that there is little or no drift of these stages from Area 3 to Area 2; but contrary to the conclusion that stocks in Area 2 and Area 3 were separate and independent, evidence indicates that eggs and larvae from British Columbia drift northward and could be carried to Cape Spencer and beyond (Figure 1). The distribution and abundance of larvae in southeastern Alaska and the lack of late stage larvae south of Cape Ommaney also supported this conclusion. There is the possibility that an eddy in the northern Gulf of Alaska could carry postlarvae to southeastern Alaska.

Tagging of juvenile halibut showed extensive movements from Area 3 to Area 2 and 30% of all recoveries from juveniles released in the western Gulf of Alaska were taken in British Columbia. The abundance of juveniles, 2 to 4 years old, was highest on the northern and western areas of the Gulf of Alaska, but their abundance declined with age; whereas in southern areas of southeastern Alaska and British Columbia, the peak abundance of juveniles generally occurred at an older age and often increased from ages 4 to 6, indicating extensive movements of juvenile halibut from Area 3 to Area 2.

Results of tagging experiments with adult halibut indicated that interpretations of the extent of interchange between regulatory areas and between countries must consider the season of release and of recovery as well as the size of the fish. The movements of halibut tagged in the summer and recovered in the winter or vice versa generally are more extensive than those from summer to summer and the predominant direction of movement changes seasonally.

The major conclusions reached from this study were (1) that the stocks from Area 2 and Area 3 intermingle in varying degrees at all stages of their life history and (2) that juvenile halibut account for most of the compensatory movement, i.e., counterbalancing the drift of eggs and larvae. Based on the findings of this study, a conceptual model was formulated, describing the migratory circuits of

several stocks. Some of the adult movements do not conform to this general description and at least a part of the compensatory emigration apparently is executed by adult halibut rather than juveniles. Whether these adult movements are related to spawning activities or are size or sex specific is not known. Thus, winter tagging experiments indicate that most of the halibut that spawn near Yakutat are fish that have summer feeding areas in the northern Gulf of Alaska. However, some halibut are from summer feeding grounds to the south. Summer taggings at Yakutat show a pronounced southerly movement but, until an adjustment can be made for fishing effort, the significance of this movement cannot be evaluated. Although a precise quantification of the interchange between stocks is not feasible at present, collectively these findings indicate that transboundary movements of stock are substantial and extensive.

At present, the longline fishery only operates during the summer and the gear is selective for adult halibut which, as shown by tagging studies, generally return to the same grounds each summer. Providing that the fishery continues to operate in the summer, it is not unreasonable to assume that the exploitation of the adult stocks in Area 2 and Area 3 can be managed separately because intermingling is not extensive at that time. Further, because different vessels fish in each area, maintenance of separate regulatory areas for the longline fishery still may be the most practical approach for the optimum use of the resource.

TAGGING

In 1977, 178 tags were returned to IPHC, 44 of which were from fish recaptured in previous years. The Fisheries Agency of Japan returned 3 tags through the International North Pacific Fisheries Commission. One tagged fish released by the Fisheries Agency of Japan was recaptured by a North American fisherman and the tag was forwarded to Japan through INPFC.

Premium rewards of \$100.00 were paid for nine tags, including two recaptured in previous years, and \$2.00 was paid for each of the other returns. Two of the premium tags were recovered in the Bering Sea, one in Area 3 and six in Area 2, one of which was recovered off Oregon. Six were paid to fishermen and three were paid to plant workers.

For many years, the standard reward for the return of tags has been \$2.00. In 1978, the Commission will raise the cash reward to \$5.00. If a fish bears two tags, this will result in a \$10.00 reward. (See inside back cover.) In addition, the premium \$100.00 reward program will be continued.

In 1977, 1,471 tagged halibut were released from five chartered vessels. During the juvenile survey, 205 fish were released from the M/V TORDENSKJOLD, all but one on the index stations in the southeastern Bering Sea. These fish were captured by trawl gear and most were below the minimum size limit. During the stock assessment survey, 1,010 tagged fish were released from the M/V POLARIS and M/V RESOLUTE near the east end of Kodiak Island, and 256 were released from the M/V CHELSEA and M/V EVENING STAR in Hecate Strait - Queen Charlotte Sound.

The 204 releases in the Bering Sea are part of a cooperative program with the U.S.S.R. to investigate the relationship between stocks in the western and eastern Bering Sea. Three recoveries have been received from the 1975 U.S.S.R.-IPHC cooperative tagging program off Kamchatka in the western Bering Sea.

Two of these were recaptured in 1976 in the western Bering Sea by Japanese fishermen. The third was recaptured in 1977 by a North American vessel fishing near the Shumagin Islands in the Gulf of Alaska, about 1,000 miles from the release area. Earlier tagging experiments also showed that halibut migrate between Soviet and Alaska waters, but none from as far west in the Bering Sea. Fourteen tags have been recovered from the 1976 releases in the eastern Bering Sea. Thirteen of these were recovered near the release sites and one was recovered near Cape Fairweather in the eastern Gulf of Alaska, over 1,000 miles from the release site.

Through the years the Commission has recovered tags from six fish which have migrated more than 2,000 miles. All of these fish moved from the Bering Sea or the Aleutian Islands to Cape Flattery, Washington or further south, essentially from one end of the species range to the other. One fish was recaptured after only two years and the other five were taken five or six years after tagging.

The Commission released 1,529 tagged halibut near the Aleutian Islands between 1964 and 1967. Twenty-five of these fish have been recovered: 7 from the release area and 18 from the Gulf of Alaska. The geographical distribution of these recoveries is shown in Figure 4. The southernmost recovery is one of the six long-distance migrants discussed in the preceding paragraph. Of the 18 migrants, 10 were recovered in Area 2 including 6 from the British Columbia coast or further south. These results indicate that halibut in the Aleutians are a component of stocks in Areas 2 and 3.

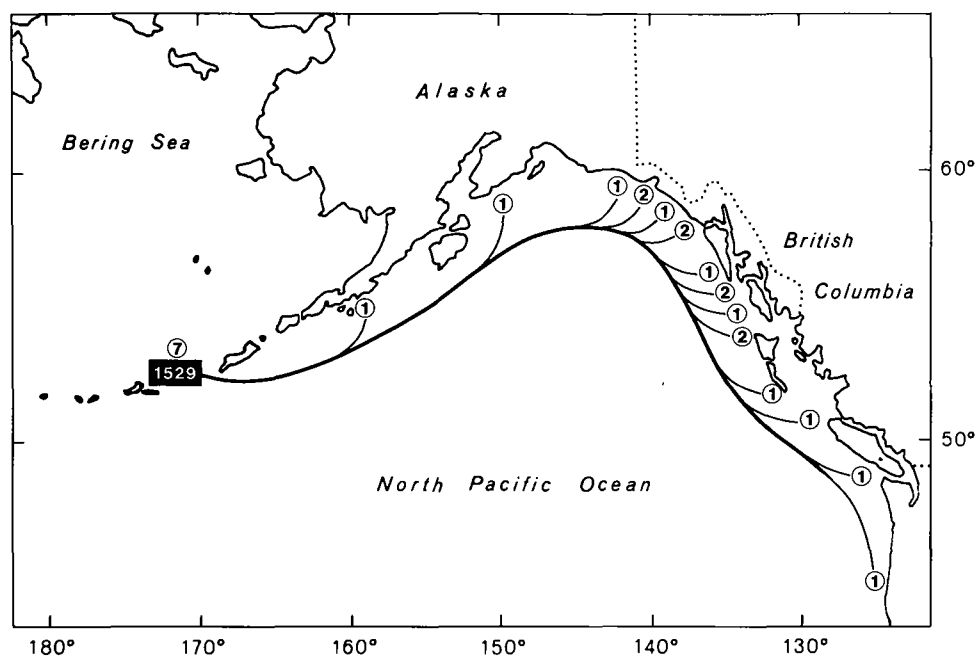


Figure 4. Distribution of recoveries from 1,529 halibut tagged in the Aleutian Islands, 1964-1967.

BAIT

Since 1957, IPHC has collected information from fishermen's log books on the type and quantity of bait used in the fishery. An examination of data from 1972 to 1976 indicates that the type of bait differs between the Canadian and U.S. fleet,

between regulatory areas, and with the type of gear. Canadian fishermen tend to use more salmon, fresh herring, and frozen cod, but less frozen herring than U.S. fishermen. Fishermen in Area 2 use more herring; whereas salmon, octopus, and cod are used more frequently in Area 3. Also, conventional longline vessels generally use more salmon and octopus and less herring than vessels using snap-on gear.

All types of bait produced good catches at times, and it was difficult to separate the effect of bait from other factors such as the experience of the fishermen. Also, the effect of bait may vary with particular fishing conditions. At a given location or time of year, one type of bait may be superior; whereas another type may be more effective under different circumstances. Many fishermen consider the quality (e.g. freshness) of the bait to be more important than the type, and some place importance on providing a variety of bait on the hooks. The results from this study showed that the average CPUE was highest when salmon was used, followed closely by octopus and fresh herring; frozen herring and frozen cod produced a notably lower CPUE. Gurdy bait, fish caught incidentally on the grounds, was not included in this analysis.

SUBLEGAL HALIBUT

The North American halibut fishery discards halibut below the legal size limit (32 inches), but some of these fish die from injuries received during capture. The rate of mortality varies with conditions but probably averages about 50%. To estimate the magnitude of the discards, data on the number of sublegal halibut were collected from fishermen's log books in 1976 and 1977. IPHC stock assessment cruises provided data on the size of these small fish. The results indicate that sublegal halibut were 7.6% (by weight) of the catch in 1976 and 6.2% of the catch in 1977; the average weight of fish was 6.9 pounds and 7.2 pounds, respectively. Assuming that the log data are representative of the entire fleet, the total catch of undersized fish was about 2.2 million pounds (320,000 fish) in 1976 and 1.4 million pounds (195,000 fish) in 1977.

The incidence and average size of these fish were higher in Area 2 than in Area 3. In Area 2, undersized fish were 10.8% of the catch in 1976 and 8.3% of the catch in 1977, compared to 4.5% and 4.6% in Area 3. The lowest incidence occurred in the far western part of Area 3. Estimates of the catch and size of sublegal fish will be useful in assessing recruitment to the setline fishery as well as the effect of the minimum size limit.

STOCK ASSESSMENT SURVEY

During August-September 1976, preliminary sampling was conducted to test the experimental design for a stock assessment survey with setline gear. Results indicated that the design was satisfactory and a full-scale survey was conducted in August 1977. Essentially the survey entails fishing about 100 stations on a 6 x 24 mile grid in each of two areas: Hecate Strait-Queen Charlotte Sound in Area 2 and Portlock-Albatross grounds in Area 3. The survey provides an index of abundance for Areas 2 and 3 as well as information on age and sex. The setliners M/V POLARIS and M/V RESOLUTE fished in Area 3, and the M/V EVENING STAR and M/V CHELSEA fished in Area 2 in the 1977 survey.

In Area 2, the average CPUE in 1977 was 16.4 pounds per skate, less than a third of the CPUE reported by this year's commercial fishery and about one-half of that recorded in last year's preliminary survey (28.9 pounds). In Area 3, the average CPUE in 1977 was 78.6 pounds per skate, approximately 20% higher than the CPUE in the commercial fishery and 63% higher than in last year's survey (48.1 pounds). These results suggest that halibut stocks have decreased in Area 2 and increased in Area 3. However, the large change in CPUE between 1976 and 1977 and the difference in CPUE recorded in the survey from that reported by the fishery suggest that changes in the availability of fish also may affect the results. This was particularly true in Area 3 where the survey CPUE was higher than that in the fishery. The opposite pattern was expected because fishermen try to maximize their catch; whereas the survey was designed to uniformly sample the entire area.

Approximately 2,300 fish were caught during the 1977 survey, of which nearly 1,300 were tagged. Recoveries from these tags will provide estimates of mortality and growth as well as information on migration. All of the fish were measured and fish that were unsuitable for tagging were used to determine age and sex. The average weight of fish was 24 pounds in Area 2 and 31 pounds in Area 3. The ratio of males to females was about even in both areas, but as usual, the percentage of males declined with size. The sex composition of halibut in the 1976 survey was similar to that in 1977 in Area 3, but 60% of the fish were females in Area 2.

JUVENILE HALIBUT

The Seattle-based trawler M/V TORDENSKJOLD was chartered from May 23 to August 21 to survey juvenile halibut populations in the southeastern Bering Sea and the Gulf of Alaska. Juvenile halibut are defined as fish less than 65 cm (26 inches) and most are below 7 years of age. The survey is conducted annually with trawl gear and is designed to measure changes in abundance. The survey is designed to maintain comparability in the fishing gear, timing, and location of fishing, but fewer stations were fished during the early 1960's when the surveys began and extra stations occasionally have been added. Variations in the sampling design have been relatively minor in the Bering Sea, and a standard index of abundance was developed several years ago and presented in previous Annual Reports. The analysis of the survey data in the Gulf of Alaska has been more complicated because of changes in the stations fished and the widely separated sampling locations. Fishing locations, however, have been relatively consistent since 1970 and a standard index of abundance was developed in 1977 (Figure 5).

At the 34 index stations in the southeastern Bering Sea, the abundance index (number per hour trawled) in 1977 was 18.9, nearly 50% higher than the 12.9 recorded in 1976. Abundance has increased steadily since 1972 and is now higher than in any year since 1966 (Figure 3). The increase coincides with a reduction in the incidental catch of juvenile halibut by foreign trawlers, but changes in abundance also may be related to environmental factors such as water temperature. In 1977, bottom temperatures averaged 3.2°C, more than 2° above the average for 1971-1976. Halibut were caught at all index stations, and the abundance of all ages, except 3-year-olds, was equal to or greater than that in 1976. The 1973 year class appears to be large and as 4-year-olds, was more abundant than any previous

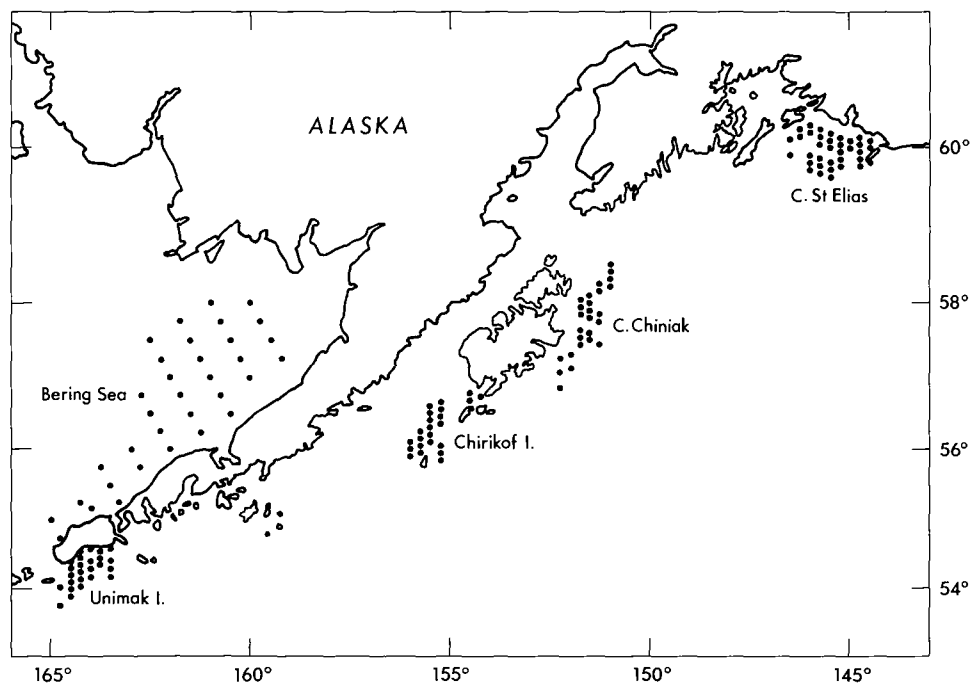


Figure 5. Sampling locations for juvenile halibut in the Bering Sea and the Gulf of Alaska.

year class surveyed. The 1974 year class also appears strong and, along with the 1973 year class, should start to improve conditions in the setline fishery in about 5 years.

In the Gulf of Alaska, the index of abundance is based on 110 offshore stations in four regions (Figure 5): 25 stations in Unimak Bight, 23 stations near Chirikof Island, 26 stations near Cape Chiniak, and 36 stations near Cape St. Elias. The index increased from 18.6 in 1976 to 23.7 in 1977 but is well below the estimated abundance in the 1960's (Figure 3). Most juveniles caught at offshore stations are 3-to 6-year-olds. Although the overall index declined from 1975 to 1976, abundance has been increasing since 1974 near Cape Chiniak and since 1975 near Cape St. Elias. Recent analyses on the distribution and movements of juveniles show that the changes in abundance cannot be expected to occur uniformly in all areas at the same time. Juveniles move eastward across the Gulf of Alaska and the youngest ages are most abundant in the western part. Consequently, changes in abundance should be apparent first in the western regions and latterly in the eastern regions.

IPHC also samples at shallow inshore stations in the Gulf of Alaska and the eastern Bering Sea to obtain information on juvenile halibut younger than 3 years of age. Data from these stations are too variable to provide a meaningful index of abundance, but are useful in determining growth and age. In 1977, 27 stations were fished at 5 locations in the Gulf of Alaska where 3,013 fish were caught in 43 hauls, and 5 stations were fished in the southeastern Bering Sea where 340 were caught in 10 hauls. Halibut caught at inshore stations usually are 1- to 3-year-

olds, but a large number of fish-of-the-year (0 year) were taken in the eastern Gulf of Alaska in 1977. This may indicate a strong year class or an increase in availability, perhaps due to the warmer water in 1977.

A study of the feeding habits of young halibut was initiated in 1976 and continued in 1977. The results were very similar in both years with Tanner crab, *Chionocetes bairdi*; hermit crab, family *Paguridae*; sand lance, *Ammodytes hexapterus*; and walleye pollock, *Theragra chalcogramma* being important segments of the diet. Of special note this year was the large numbers of zero-age rock sole, *Lepidopsetta bilineata*, consumed by young halibut in some areas.

The cooperative study on the migration and distribution of Bering Sea halibut with the Soviet research laboratory at Vladivostok was continued in 1977 and 204 juvenile halibut were tagged at the index stations in the eastern Bering Sea.

INCIDENTAL CATCH OF HALIBUT

Observer programs to collect data on the catch of foreign vessels were expanded in 1977 to meet the needs of extended jurisdiction. IPHC again participated in the programs and placed observers on one Japanese and one Soviet trawler in February and March. However, the programs are no longer coordinated through the International North Pacific Fisheries Commission and part of the emphasis is on enforcement of Canadian and United States regulations. Therefore, IPHC no longer will participate on a regular basis.

Data from 1977 are still preliminary, but indicate a continued decline in the incidental catch of halibut. In the eastern Bering Sea, the incidental catch in 1977 is estimated to be about 3 million pounds, down substantially from the 15 million pounds estimated in 1971. In the northeast Pacific, the incidental catch by foreign trawlers was about 6 million pounds, well below the 15 million pound peak in 1965. An additional incidental catch of about 3 million pounds may occur in the U.S. shrimp and crab fisheries, and a similar catch was estimated for Canadian and U.S. trawl fisheries off British Columbia. The total incidental catch in the northeast Pacific was about 12 million pounds, nearly half of that in earlier years.

The recent decline in the incidental catch can be attributed to several factors. Fishing effort by foreign vessels was reduced in the Bering Sea and certain grounds have been closed to trawling when halibut were most vulnerable. Different species are being sought and observers report that some vessels are using off-bottom trawls and catching almost no halibut. The recent reduction in incidental catch will improve the survival of young halibut and, in time, increase the abundance of older halibut available to the setline fishery.

U.S. observers were aboard Japanese setline vessels fishing for blackcod for the first time in 1977. During September-October 1977, observers were aboard 6 vessels that fished in several areas of the Gulf of Alaska. Only one halibut was observed, an indication that the incidental catch is low during these months and that halibut can be avoided by the blackcod fishery. Recently, observers also were aboard Japanese setline vessels fishing for Pacific cod. Results are still preliminary, but suggest that the incidence of halibut may be substantially higher than in the blackcod fishery.

CATCH SAMPLING

IPHC has sampled landings to obtain data on age and size composition since 1935. In the early years, sampling was conducted only in Seattle and Vancouver as most catches were landed in these ports; sampling was extended to Prince Rupert in 1949 and to Petersburg in 1958. When the pattern of landings shifted to the westward ports, samplers were placed in Kodiak and Seward. During the 1977 fishing season, samplers were stationed at Seattle, Vancouver, Prince Rupert, Petersburg, Sitka-Juneau, Pelican, Seward, and Kodiak.

An attempt is made to sample every third landing over 5,000 pounds and every tenth landing between 1,000 and 5,000 pounds from setline vessels. Landings by troll and handline vessels also are sampled occasionally, but these data are not used to estimate the annual age or size composition of the catch. The samples consist of otoliths from all fish in systematically selected cargo slings that are used to unload the catch. The objective is to collect 200 otoliths from each landing that is sampled. The number and frequency of the slings selected for sampling depend on the size of the catch and the size of the fish. Samples generally are proportional to landings, and catches from most major fishing banks are represented. In 1977, samples represented about 8% of the catch although the percentage varied with region:

Region Fished	Charlotte	S.E. Alaska	Yakutat	Kodiak	Chirikof	Shumagin Aleutian	Bering Sea
Percent Sampled	6.1	12.0	9.2	7.3	3.1	6.0	9.2

Landings from the Vancouver and Columbia regions were very small (0.5 million pounds) and were not sampled. Southeastern Alaska was the most heavily sampled region.

Landings from over 250 setline vessels were sampled in 1977. Nearly 35,000 otoliths were measured of which 11,000 were used for age determination. Additionally, 1,028 halibut from 116 troller landings were sampled. IPHC also measured nearly 10,000 halibut and collected 1,886 otoliths from vessels chartered for the annual stock assessment and the juvenile halibut surveys. About 250 otoliths and fish length measurements were obtained from miscellaneous sources such as observers aboard foreign trawlers and tagged halibut.

The age composition of halibut in the 1977 setline landings and the mean age since 1973 are summarized by region in Table 4. Mean age increased in 1973 following the increase in minimum legal size in that year, particularly in the inshore portions of the Charlotte and S.E. Alaska regions. Mean age in the Charlotte (Inside) region, continued to increase until 1975 but declined sharply in 1976; a slight increase occurred in 1977. Elsewhere in Area 2, mean age has remained stable or declined moderately since 1973. In Area 3, mean age was affected only slightly by the change in minimum size and has remained relatively stable in most regions. Data from the Aleutian and Bering Sea regions are highly variable, but show a higher mean age than in other regions; this coupled with the low abundance, suggests that recruitment of young halibut to the fishery has been severely reduced.

Table 4. Age composition in 1977 and mean age by region, 1973-1977.

Region	Age (1977)				Year				
	<9	9-11	12-14	>14	1973	1974	1975	1976	1977
	Percent				Mean Age				
Willapa Bay and South Washington-Vancouver Is.	-	-	-	-	-	-	-	-	-
Charlotte (Inside)	31.9	36.0	23.1	9.0	9.9	10.8	11.0	9.9	10.4
Charlotte (Outside)	17.2	41.3	25.8	15.7	13.6	12.1	11.4	11.6	11.4
S.E. Alaska (Inside)	14.5	44.6	23.9	17.0	11.4	11.6	11.5	11.5	11.5
S.E. Alaska (Outside)	11.7	38.0	29.0	21.3	12.9	12.7	12.5	12.6	12.0
Cape Spencer-St. Elias	7.7	34.8	35.3	22.2	12.3	12.3	12.1	12.2	12.3
Portlock-Albatross Banks	12.0	49.9	25.0	13.1	11.5	11.6	11.1	11.0	11.2
Chirikof-Semedi Islands	22.5	47.3	20.0	10.2	10.5	11.1	10.9	10.4	10.6
Shumagin Is.-Davidson Bank	15.2	43.0	29.0	12.8	11.5	12.1	11.4	11.0	11.3
Aleutian Islands	2.9	24.7	38.7	33.7	-	16.7	-	17.8	13.7
Bering Sea - 4A	3.3	35.4	30.8	30.5	-	-	-	11.7	13.0
Bering Sea - 4B	13.1	27.4	20.9	38.6	10.8	11.3	13.6	13.0	13.2
Bering Sea - 4C	5.5	35.5	35.6	23.4	-	-	-	-	12.4
Bering Sea - 4D-W	2.0	21.1	26.9	50.0	-	-	14.6	-	15.1

APPENDIX

The following tables for 1976 and 1977 are provided as a supplement to Technical Report No. 14, "The Pacific Halibut Fishery: Catch, Effort and CPUE, 1929-1975." Appendix tables in the 1976 Annual Report updated these statistics to 1976, but some of the values were in error. The tables in this year's Annual Report include the correct statistics for 1976. A detailed explanation of the tables, the methods of compilation, and definitions of the statistical subdivisions are included in Technical Report Number 14 which is available on request. The poundage in these tables is dressed weight (head-off, eviscerated). Copies of the tables in metric units and round (live) weight are available on request.

Appendix I

- Table 1. Catch, CPUE and effort by statistical area and country, 1976.
- Table 2. Catch, CPUE and effort by region and country, 1976.
- Table 3. Catch, CPUE and effort by regulatory area, 1976.
- Table 4. Catch in thousands of pounds by regulatory area and country, 1976.
- Table 5. Landings in thousands of pounds by port and country, 1976.

Appendix II

- Table 1. Catch, CPUE and effort by statistical area and country, 1977.
- Table 2. Catch, CPUE and effort by region and country, 1977.
- Table 3. Catch, CPUE and effort by regulatory area, 1977.
- Table 4. Catch in thousands of pounds by regulatory area and country, 1977.
- Table 5. Landings in thousands of pounds by port and country, 1977.

TABLE 1. CATCH, CPUE AND EFFORT BY STATISTICAL AREA AND COUNTRY, 1976.

1976	CANADA			UNITED STATES			TOTAL			LOGS %
	STAT. AREA	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	
00-03	-	-	-	48	28.9*	17	48	28.9	17	-
04	-	-	-	5	28.9*	2	5	28.9	2	-
05	5	26.5*	2	180	26.5	68	185	26.4	70	6
06	222	32.9*	67	20	32.9	6	242	33.2	73	3
07	57	17.4*	33	17	17.4	10	74	17.2	43	-
08	101	162.4*	6	31	162.3	2	132	165.0	8	2
09 -0	35	55.3*	6	4	55.6*	1	39	55.7	7	-
09 -I	392	45.4	86	57	70.0	8	449	47.8	94	22
10 -0	-	-	-	-	-	-	-	-	-	-
10 -I	1002	50.3	199	331	102.4	32	1333	57.7	231	19
11 -0	106	64.8	16	-	-	-	106	64.8	16	27
11 -I	1086	56.0	194	10	111.1	1	1096	56.2	195	38
12 -0	90	54.2	17	-	-	-	90	54.2	17	23
12 -I	1082	56.2	192	-	-	-	1082	56.2	192	44
13 -0	436	53.5	81	-	-	-	436	53.5	81	26
13 -I	2046	55.7	367	4	55.6*	1	2050	55.7	368	25
14 -0	80	38.4	21	199	31.9	62	279	33.6	83	12
14 -I	144	55.5	26	552	29.5	187	696	32.7	213	18
15 -0	240	49.1	49	585	44.5	132	825	45.6	181	32
15 -I	-	-	-	328	41.5	79	328	41.5	79	14
16 -0	222	47.3	47	368	40.0	92	590	42.4	139	38
16 -I	-	-	-	1156	41.4	279	1156	41.4	279	37
17 -0	38	28.3	13	446	28.9	154	484	29.0	167	5
17 -I	-	-	-	169	36.6	46	169	36.6	46	53
18S-0	16	16.9	9	80	38.9	21	96	32.0	30	11
18S-I	-	-	-	1058	60.5	175	1058	60.5	175	7
18W	67	62.1	11	404	56.1	72	471	56.7	83	33
19	282	50.7	56	443	57.5	77	725	54.5	133	66
20	559	68.1	82	654	46.8	140	1213	54.6	222	53
21	276	61.0	45	152	43.6	35	428	53.5	80	56
22	496	80.5	62	248	71.3	35	744	76.7	97	68
23	284	67.0	42	407	46.5	88	691	53.2	130	49
24	236	67.9	35	604	50.8	119	840	54.5	154	55
25	393	82.0	48	1344	58.4	230	1737	62.5	278	61
26	90	42.3	21	1722	62.1	277	1812	60.8	298	41
27	90	51.8	17	1157	49.9	232	1247	50.1	249	25
28	423	66.4	64	713	80.2	89	1136	74.2	153	56
29	515	73.9	70	634	64.6	98	1149	68.4	168	76
30	233	63.8	37	421	56.0	75	654	58.4	112	63
31	186	68.9	27	149	48.8	31	335	57.8	58	73
32	190	78.4	24	218	68.3	32	408	72.9	56	68
33	26	51.7	5	48	46.9	10	74	49.3	15	69
34	70	64.8	11	37	56.6	7	107	59.4	18	73
35	26	28.3	9	2	41.7	0	28	31.1	9	11
36	-	-	-	36	63.4*	6	36	63.4	6	-
37	-	-	-	18	101.1	2	18	101.1	2	83
38	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	-	-	-	-	-	-
40	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	-	-	-	-	-	-
42+	92	122.3	8	19	118.0	2	111	111.0	10	100
4A	-	-	-	34	136.5	2	34	136.5	2	94
4B	-	-	-	189	79.1	24	189	79.1	24	72
4C	2	44.4	0	41	89.3	5	43	86.0	5	95
4DE	-	-	-	-	-	-	-	-	-	-
4DW	60	84.0	7	191	70.6	27	251	73.8	34	94
4E	-	-	-	6	60.6	1	6	60.6	1	100

* NO LOG DATA, CPUE INTERPOLATED.

TABLE 2. CATCH, CPUE AND EFFORT BY REGION AND COUNTRY, 1976.

1976 REGION	CANADA			UNITED STATES			TOTAL			LOGS %
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	
COLUMBIA	-	-	-	48	32.6*	15	48	32.6	15	-
VANCOUVER	385	32.6*	118	253	32.6	78	638	32.6	196	4
CHARLOTTE	6275	55.0	1141	406	94.4	43	6681	56.4	1184	29
CHAR-O	667	55.4	120	4	55.6*	1	671	55.5	121	25
CHAR-I	5608	54.9	1021	402	96.1	42	6010	56.5	1063	29
SE ALASKA	740	47.1	157	4941	41.5	1190	5681	42.2	1347	23
SE AK-O	596	45.4	131	1678	40.4	415	2274	41.6	546	25
SE AK-I	144	55.5	26	3263	42.1	775	3407	42.5	801	23
YAKUTAT	1964	65.9	298	2308	53.3	433	4272	58.4	731	55
KODIAK	1232	66.7	185	5540	59.4	933	6772	60.6	1118	47
CHIRIKOF	934	70.1	133	1204	60.0	201	2138	64.0	334	72
SHUMAGIN	312	70.4	44	359	63.6	56	671	67.1	100	63
ALEUTIAN	92	122.3	8	19	118.0	2	111	111.0	10	100
BERING SEA	62	81.7	8	461	78.1	59	523	78.1	67	88
TOTAL	11996	57.3	2092	15539	51.6	3010	27535	54.0	5102	51

* NO LOG DATA, CPUE INTERPOLATED.

TABLE 3. CATCH, CPUE AND EFFORT BY REGULATORY AREA, 1976.

YEAR	AREA 2				AREA 3				AREA 4			
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %
1976	13048	47.6	2742	25	13964	60.9	2293	55	523	78.1	67	88

TABLE 4. CATCH IN THOUSANDS OF POUNDS BY REGULATORY AREA AND COUNTRY, 1976.

YEAR	AREA 2			AREA 3			AREA 4			ALL AREAS		
	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL
1976	7400	5648	13048	4534	9430	13964	62	461	523	11996	15539	27535

TABLE 5. LANDINGS IN THOUSANDS OF POUNDS BY PORT AND COUNTRY, 1976.

PORT	1976		
	CAN.	U.S.	TOTAL
CAL AND ORE	-	48	48
SEATTLE	-	381	381
BELLINGHAM	137	251	388
MISC WASH	-	278	278
VANCOUVER	2157	-	2157
MISC SO BC	277	-	277
NAMU	577	-	577
PR RUPERT	6120	6	6126
MISC NO BC	377	-	377
KETCHIKAN	18	326	344
WRANGELL	21	518	539
PETERSBURG	84	2090	2174
JUNEAU	-	674	674
SITKA	-	590	590
PELICAN	630	1064	1694
MISC SE AK	30	1492	1522
KODIAK	992	3422	4414
P WILLIAMS	-	330	330
SEWARD	573	2845	3418
MISC CEN AK	3	1224	1227

TABLE 1. CATCH, CPUE AND EFFORT BY STATISTICAL AREA AND COUNTRY, 1977.

1977 STAT. AREA	CANADA			UNITED STATES			TOTAL			LOGS %
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	
00-03	-	-	-	56	58.8*	10	56	58.8	10	-
04	-	-	-	16	58.8*	3	16	58.8	3	-
05	7	58.8*	1	128	58.8*	22	135	58.7	23	-
06	142	58.8*	24	4	58.8*	1	146	58.4	25	-
07	43	58.8*	7	2	58.8*	0	45	64.3	7	-
08	153	58.8*	26	19	58.8*	3	172	59.3	29	-
09 -0	48	68.0	7	-	-	-	48	68.0	7	54
09 -I	177	43.5	41	8	33.8	2	185	43.0	43	10
10 -0	-	-	-	-	-	-	-	-	-	-
10 -I	949	73.2	130	217	85.5	25	1166	75.2	155	29
11 -0	84	56.9	15	-	-	-	84	56.9	15	23
11 -I	960	58.4	164	1	58.8*	0	961	58.6	164	19
12 -0	104	51.9	20	-	-	-	104	51.9	20	9
12 -I	783	66.8	117	1	66.7*	0	784	67.0	117	40
13 -0	380	60.3	63	-	-	-	380	60.3	63	29
13 -I	1171	52.5	223	1	52.6*	0	1172	52.6	223	25
14 -0	126	64.2	20	107	45.9	23	233	54.2	43	40
14 -I	152	74.3	20	246	58.8	42	398	64.2	62	30
15 -0	350	70.3	50	247	44.9	55	597	56.9	105	48
15 -I	-	-	-	267	40.5	66	267	40.5	66	22
16 -0	63	43.2	15	288	66.0	44	351	59.5	59	15
16 -I	-	-	-	569	42.7	133	569	42.7	133	48
17 -0	7	25.9*	3	311	26.0	120	318	25.9	123	2
17 -I	-	-	-	120	20.2	59	120	20.2	59	20
18S-0	8	19.0*	4	66	19.0	35	74	19.0	39	1
18S-I	-	-	-	439	26.4	166	439	26.4	166	8
18W	74	61.7	12	177	42.1	42	251	46.5	54	49
19	142	50.5	28	446	54.7	81	588	53.9	109	57
20	312	44.8	70	355	52.2	68	667	48.3	138	41
21	188	81.4	23	138	53.6	26	326	66.5	49	46
22	152	66.1	23	223	58.7	38	375	61.5	61	69
23	261	52.7	50	166	44.8	37	427	49.1	87	59
24	182	48.5	37	557	49.4	113	739	49.3	150	27
25	231	85.3	27	1287	64.5	200	1518	66.9	227	62
26	113	90.6	12	1839	68.1	270	1952	69.2	282	52
27	39	59.1	7	847	62.6	135	886	62.4	142	45
28	301	76.7	39	611	57.4	106	912	62.9	145	52
29	432	85.3	51	701	67.8	103	1133	73.6	154	73
30	194	69.4	28	292	60.8	48	486	63.9	76	58
31	96	79.3	12	203	74.0	27	299	76.7	39	66
32	130	85.4	15	429	68.4	63	559	71.7	78	47
33	7	88.6*	1	573	89.0	64	580	89.2	65	87
34	20	57.1*	4	112	57.2	20	132	55.0	24	77
35	20	92.2	2	10	29.9	3	30	60.0	5	83
36	-	-	-	17	37.7	5	17	37.7	5	41
37	-	-	-	41	46.1	9	41	46.1	9	66
38	-	-	-	46	76.3	6	46	76.3	6	96
39	-	-	-	2	40.8	0	2	40.8	0	50
40	-	-	-	-	-	-	-	-	-	-
41	-	-	-	12	43.3	3	12	43.3	3	92
42+	27	106.3	3	362	102.6	35	389	102.4	38	94
4A	-	-	-	20	71.7	3	20	71.7	3	95
4B	29	109.0	3	241	60.1	40	270	62.8	43	54
4C	-	-	-	129	91.1	14	129	91.1	14	89
4DE	-	-	-	5	31.8	2	5	31.8	2	100
4DW	110	85.4	13	147	73.1	20	257	77.9	33	75
4E	-	-	-	-	-	-	-	-	-	-

* NO LOG DATA, CPUE INTERPOLATED.

TABLE 2. CATCH, CPUE AND EFFORT BY REGION AND COUNTRY, 1977.

1977 REGION	CANADA			UNITED STATES			TOTAL			LOGS %
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	
COLUMBIA	-	-	-	56	82.8*	7	56	82.8	7	-
VANCOUVER	345	60.4	57	169	60.4*	28	514	60.5	85	-
CHARLOTTE	4656	60.9	765	228	81.4	28	4884	61.6	793	27
CHAR-O	616	60.4	102	-	-	-	616	60.4	102	27
CHAR-I	4040	60.9	663	228	82.8	28	4268	61.8	691	27
SE ALASKA	706	69.9	101	2660	41.4	643	3366	45.2	744	28
SE AK-O	554	68.0	81	1019	49.1	208	1573	54.4	289	28
SE AK-I	152	74.3	20	1641	37.7	435	1793	39.4	455	28
YAKUTAT	1129	55.4	204	1505	52.7	286	2634	53.8	490	53
KODIAK	866	78.0	111	5141	63.3	812	6007	65.1	923	51
CHIRIKOF	722	79.9	90	1196	67.1	178	1918	71.6	268	68
SHUMAGIN	177	86.6	20	1228	74.8	164	1405	76.4	184	69
ALEUTIAN	27	106.3	3	376	97.6	39	403	96.0	42	95
BERING SEA	139	89.4	16	542	68.8	79	681	71.7	95	70
TOTAL	8767	64.1	1367	13101	57.9	2264	21868	60.2	3631	53

* NO LOG DATA, CPUE INTERPOLATED.

TABLE 3. CATCH, CPUE AND EFFORT BY REGULATORY AREA, 1977.

YEAR	AREA 2				AREA 3				AREA 4			
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %
1977	8820	54.1	1629	26	12367	64.9	1907	57	681	71.7	95	70

TABLE 4. CATCH IN THOUSANDS OF POUNDS BY REGULATORY AREA AND COUNTRY, 1977.

YEAR	AREA 2		AREA 3		AREA 4		ALL AREAS					
	CAN.	U.S. TOTAL	CAN.	U.S. TOTAL	CAN.	U.S. TOTAL	CAN.	U.S. TOTAL				
1977	5707	3113	8820	2921	9446	12367	139	542	681	8767	13101	21868

TABLE 5. LANDINGS IN THOUSANDS OF POUNDS BY PORT AND COUNTRY, 1977.

PORT	1977		TOTAL
	CAN.	U.S.	
CAL AND ORE	-	77	77
SEATTLE	-	213	213
BELLINGHAM	370	364	734
MISC WASH	-	273	273
VANCOUVER	1877	-	1877
MISC SO BC	211	-	211
NAMU	305	-	305
PR RUPERT	3576	5	3581
MISC NO BC	322	-	322
KETCHIKAN	-	143	143
WRANGELL	-	281	281
PETERSBURG	313	1565	1878
JUNEAU	-	277	277
SITKA	-	649	649
PELICAN	478	485	963
MISC SE AK	157	722	879
KODIAK	571	4094	4665
P WILLIAMS	-	-	-
SEWARD	587	2562	3149
MISC CEN AK	-	1391	1391

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