INTERNATIONAL PACIFIC HALIBUT COMMISSION

Established by a Convention Between

Canada and the United States of America

ANNUAL REPORT

1981

SEATTLE, WASHINGTON

1982

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 Commission's authority was expanded by several subsequent conventions, the most recent being signed in 1953 and amended by the protocol of 1979.

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. The commissioners meet annually to review all regulatory proposals, including those made by the scientific staff and the Conference Board, which represents vessel owners and fishermen. Regulatory alternatives are discussed with the Advisory Group, composed of fishermen, vessel owners, and processors. The measures recommended by the Commissioners 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 (U.S. ISSN 0074-7238), Scientific Reports (U.S. ISSN 0074-7246), and Technical Reports (U.S. ISSN 0579-3920). Until 1969, only one series was published. The numbering of the original series has been continued with the Scientific Reports.

Unless otherwise indicated, all weights in this report are dressed weight (eviscerated, head-off).

Cover: Otolith from a halibut in its ninth year. The IPHC collects thousands of otoliths each year to provide information on size and age composition of the landings, growth rates, and strengths of year classes contributing to the fishery.

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

International Pacific Halibut Commission

ANNUAL REPORT 1981

Contents

Activities of the Commission

The 57th Annual Meeting of the Commission was held in Vancouver, British Columbia, on February 3-5, 1981. Mr. Michael Hunter presided as Chairman, with Mr. Robert W. Schoning, Vice Chairman. The Commission staff presented a review of the 1980 halibut fishery, highlights of scientific investigations, and regulatory proposals for the 1981 halibut fishery. The Conference Board, representing vessel owners and fishermen, presented and discussed its regulatory proposals with the Commission. The Commission reviewed all proposals with the Advisory Group, consisting of fishermen, vessel owners, and processors before adopting regulations for the 1981 halibut fishery, which were then sent to the Canadian and United States governments for approval.

In other sessions, the Commission considered administrative and fiscal matters, approved research plans for 1981, and adopted the budget for fiscal year 1983-1984. Mr. Schoning was elected Chairman for 1981 and Mr. Hunter was elected Vice Chairman. A news release was issued at the close of the meeting summarizing the regulations being presented to the governments for approval, and reiterating the Commission's concern over the wastage of halibut caused by the incidental catch in fisheries seeking other species.

The Commission also sent letters to the governments drawing attention to the continuing high level of incidental catch of halibut, and urging the governments to develop and implement methods to reduce the incidental catch to permit more effective use of the halibut resource. The letters briefly described cooperative research conducted by the Commission and the Alaska Department of Fish and Game under sponsorship and funding by the North Pacific Fishery Management Council. This research showed that side-entry crab pots have a higher incidence of halibut than top-entry crab pots when fished under the same conditions.

The Commission held a telephone conference on June 29, 1981, during which it decided that the quotas in Areas 2C and 3A had been taken during the first fishing period, and that those areas should remain closed for the remainder of 1981. The Commission also decided that the opening date for Area 4 should be July 10, 1981, ten days after the announcement of closure of Area 3A. During telephone conferences on July 2 and July 6, 1981, the Commission decided to recommend an increase in the catch limit for Area 3 to 15 million pounds, thereby allowing additional fishing time in Area 3. This allowed a short fishery in Area 3B during August 25-28, which provided a catch sufficient for stock assessment purposes. The staff assured the Commission that the catch would still be below the equilibrium yield in Area 3, even with the additional fishing time.

A list of reports published by the Commission staff during 1981 is appended to this annual report. Additionally, several documents were prepared at the request of the governments.

Expenditures during the 1980-1981 fiscal year (April through March) were $1,300,000 (U.S.). The Commission expenses were shared equally by both governments as required by the Halibut Convention.

JOHN A. O'CONNOR
Canadian Commissioner, 1978-1980

Director's Report

The International Pacific Halibut Commission spends a large proportion of its annual budget conducting research in support of its management requirements. Not all our research activities are well publicized, yet are of considerable interest to members of the halibut fishing community. I would like to take this opportunity, therefore, to briefly outline the Commission's research program.

During the past 50 years the Commission has collected annual catch statistics and biological information on the landed halibut. The data are obtained from our port sampling and logbook programs. Gordon Peltonen and Ken Exelby compile the catch statistics and Ed Best's group is responsible for aging and assembling the age structure files. This information provides the Commission with an excellent data base of catch-per-effort information and catch-by-age data. These data sets are unique in world fisheries because of their accuracy and consistency over the past 50 years and are used as input to a number of mathematical population models. Consequently, we have established a large program of population dynamics research. Dr. Richard Deriso and Dr. Terrence Quinn II were added to our staff several years ago to work with Steve Hoag on this program. The results they have produced have added to our knowledge of the dynamics of halibut populations and allow us to manage the resource through the use of quotas on a sound scientific basis.

In the past several years we have increased our tagging program many fold, particularly on juvenile halibut as part of a transboundary study. Simultaneously, we began an extensive analysis of the 35,000 tag returns to date on adult halibut movements. The tag returns have been meticulously compiled by Ian McGregor and the analysis is being conducted by Dr. Deriso. Preliminary results have been presented and confirm the substantial migrations of halibut in an easterly and southerly direction. This analysis is of particular importance in allocating fairly the harvest between U.S. and Canadian fishermen.

Independent stock assessment is conducted each year on both juvenile and adult halibut. Bill Hardman and Gilbert St-Pierre are responsible for the large juvenile survey program. Cyreis Schmitt is presently analyzing the 20 years of juvenile data to determine the most efficient method for predicting future recruits to the fishery.

Steve Hoag and Gregg Williams supervise an annual setline adult assessment survey throughout the Gulf of Alaska. The purpose of this survey is to collect biological data in a consistent manner, independent of the fishery. Sex, age, length, and weight data are collected and an independent estimate of catch-per-effort is obtained. These data are routinely incorporated into our annual stock assessment analysis.

Estimates of the incidental catch of halibut in other fisheries are derived by Gregg Williams and Cyreis Schmitt. The incidental loss is a very large portion of the total halibut removals each year and must be accounted for in computing annual surplus production.

In addition to the major activities, many smaller but equally important research projects are in progress.

Cal Blood and Ed Best are involved in a project to tag and inject halibut with oxytetracycline for the purpose of validating our aging technique. Dick Myhre is

developing new weight-length relationships for halibut. I am working on two projects; one is an analysis of changes in growth over time and the other is the development of a statistical method for estimating sex ratio of the catch from otoliths collected from field sampling.

The research conducted by the staff is directed toward increasing our knowledge of this important species so that the Commission can provide the opportunity for maximum removals from the stocks by fishermen of both countries.

Cooperation with the fishing industry has been outstanding. Special thanks are extended to all those fishermen who have returned tags, assisted in our surveys, and been patient and cooperative in allowing our staff to copy their logbooks.

Regulations for 1981

REGULATORY PROPOSALS

Late in 1980 the Commission solicited regulatory proposals for the 1981 halibut fishery from fishermen and vessel owner groups, from government agencies involved with the halibut fishery, and from any others having an interest in the halibut fishery. A summary of the proposals received, including those of the Commission scientific staff, was distributed to all interested groups prior to the 1981 Annual Meeting.

The staff recommended dividing Area 2 into three subareas. All waters off the coasts of Washington, Oregon, and California would become Area 2A with a proposed catch limit of 0.2 million pounds. All waters off British Columbia would become Area 2B with a proposed catch limit of 5.4 million pounds, and all waters off southeastern Alaska would become Area 2C with a proposed catch limit of 3.4 million pounds. The staff recommended that Area 3 be divided into two subareas. The waters from Cape Spencer, Alaska, to Cape Trinity at the south end of Kodiak Island would become Area 3A with a catch limit of 12 million pounds. The waters from Cape Trinity to 170° W longitude would become Area 3B with a catch limit of 2 million pounds. The staff recommended that Pacific waters west of 170° W longitude and all of the Bering Sea again be designated Area 4 with a proposed catch limit of 1 million pounds, the same as in 1980.

The staff proposed a sequence of fishing periods for Areas 2A, 2B, 3A, 3B, and 4 as follows: June 5 to June 19, July 4 to July 18, August 2 to August 16, and August 31 to September 14. The staff proposed an additional open period for Area 2B from May 7 to May 21. For Area 2C the staff proposed fishing periods from June 9 to June 16, July 7 to July 14, August 5 to August 12, and September 2 to September 9. The schedule of fishing periods was selected to provide openings of adequate length that coincided with favorable tides and avoided landings on weekends and holidays. The staff proposed that vessels fishing in Area 4 must clear with U.S. Customs or federal fishery officers at Dutch Harbor, Alaska, before fishing in Area 4, and again when leaving Area 4. All other regulations, such as the nursery area, size limits, gear restrictions, opening and closing hours, and sport fishing regulations would remain the same as in 1980.

The Makah Indian Tribe requested changes in the regulations that would exempt tribal members from complying with some current Pacific Halibut Fishery Regulations.

The National Marine Fisheries Service in Juneau proposed that the halibut sport fishery regulations be modified to allow the use of two hooks on sport gear. This change was recommended because part of the sport catch of halibut in Alaska is taken incidentally by salmon fishermen who typically use two hooks on their gear.

The Conference Board met during the first two days of the annual meeting. They supported creation of Areas 2A, 2B, and 2C, and the catch limits for each area as recommended by the staff. Representatives from southeastern Alaska contended that the catch limits for the subareas in Area 2 should be based on the productivity of the respective subareas. The Conference Board supported the staff proposal for subdividing Area 3 into Areas 3A and 3B, although central Alaska representatives favored a shift in the proposed boundary line between Areas 3A and 3B to permit more small-boat fishing in Shelikof Strait. The Conference Board proposed moving the eastern boundary of Area 4 to the

vicinity of Scotch Cap on Unimak Island to provide for additional fishing on the Pacific side of the Fox Islands group in the eastern Aleutian Islands, and at the same time increasing the Area 4 quota to 1.25 million pounds. The Conference Board generally supported the fishing seasons proposed by the staff, except that the representatives from southeastern Alaska opposed having Area 2B open before Area 2C. The Conference Board proposed that Area 3B re-open on August 18 to allow more fishing in Area 3B during the latter part of the summer. The Board also proposed that Area 4 close when the Area 3A quota was taken and re-open ten days thereafter and remain open until the Area 4 quota was taken. The Bering Sea representatives favored a continuous opening during the summer to take full advantage of favorable weather. The Conference Board proposed that other regulations, such as the nursery area, size limits, gear restrictions, opening and closing hours, and sport fishery regulations, remain the same as in 1980.

All regulatory proposals were discussed with the Advisory Group. Members of the Advisory Group in 1981 were Ira Koker (Newport, Oregon); Robert Alverson, Jay Brevik, James Ferguson, Brian Kelly, and Eugene Rutherford (Seattle, Washington); Alf Larsen, R. T. Merino, and Tony Peterson (Vancouver, British Columbia); Sid Dickens and Stan Hewitt (Prince Rupert, British Columbia); Tom Thompson (Sitka, Alaska); Charles Christiansen (Petersburg, Alaska); Albert Davis (Kake, Alaska); Marvin Bellamy (Homer, Alaska); and Don Baker (Kodiak, Alaska).

The regulations recommended by the Commission were approved by the United States Secretary of State on March 10, 1981, and by the Governor General of Canada by Order in Council July 9, 1981, and became officially effective on the latter date. On July 9, 1981, the Commission recommmended that the Area 3 catch limit be increased from 13 million pounds to 15 million pounds to permit some additional fishing in Area 3B for stock assessment purposes. This change was approved by the United States Secretary of State on July 21, 1981, and by the Governor General of Canada by Order in Council on August 24, 1981.

REGULATORY AREAS

Regulatory areas for the 1981 halibut fishery are shown in Figure 1. Area 2 was divided into three subareas and Area 3 was divided into two subareas. The boundary lines separating Areas 2 and 3 and separating Areas 3 and 4 remained the same as in 1980. The nursery area in the eastern Bering Sea was the same as in 1980 and was again closed to all halibut fishing. Following is a description of the regulatory areas for the halibut fishery in 1981:

Area 2A – All waters off the coasts of California, Oregon, and Washington
Area 2B – All waters off the coast of British Columbia
Area 2C – All waters off the coast of Alaska, south and east of Cape Spencer, Alaska
Area 3A – Cape Spencer, Alaska, to Cape Trinity, Kodiak Island
Area 3B – Cape Trinity to 170° W longitude
Area 4 – Bering Sea, and Gulf of Alaska west of 170° W longitude

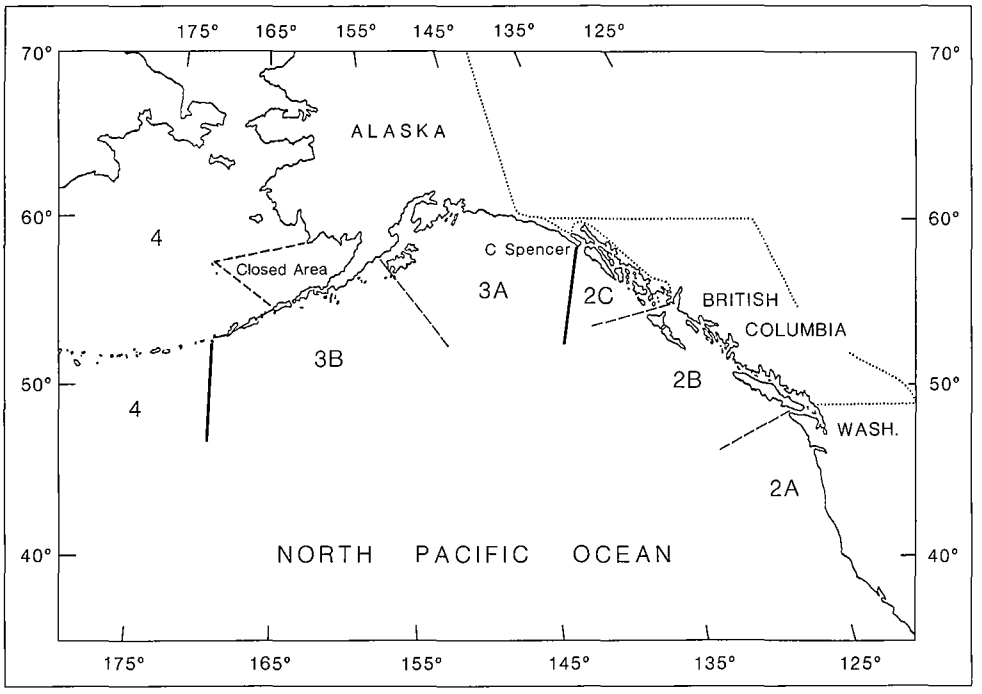


Figure 1. Regulatory areas for the Pacific halibut fishery, 1981.

CATCH LIMITS AND LENGTHS OF SEASONS

The 1981 catch limit in Area 2 was 9 million pounds, 300,000 pounds less than the catch limit in 1980. The catch limits for the subareas were 200,000 pounds in Area 2A, 5.4 million pounds in Area 2B, and 3.4 million pounds in Area 2C. In Area 3 the catch limit was 13 million pounds, 11 million pounds in Area 3A and 2 million pounds in Area 3B. When the Area 3 catch limit was exceeded during the first fishing period in Area 3, the catch limit was raised to 15 million pounds to allow some additional fishing in Area 3B. In Area 4 the catch limit was 1 million pounds, the same as in 1980. Opening and closing dates and lengths of fishing periods for 1980 and 1981 are given in Table 1. Fishing seasons in all areas in 1981 consisted of a series of fishing periods, each of specified length. When the catch limit for each area was reached, the area was closed and subsequent fishing periods were dropped. The fishing periods in all areas began at 1500 hours and ended at 0600 hours, Pacific Standard Time.

Table 1. Opening and closing dates by area, 1980-1981

	1980			1981		
Area*	Opening Date	Closing Date	Fishing Days	Opening Date	Closing Date	Fishing Days
2A	May 20	May 30	10	June 7	June 21	14
				July 7	July 21	14
				Aug. 6	Aug. 20	14
				Sept. 5	Sept. 19	14
2B	May 20	June 3	14	May 7	May 22	15
	July 15	July 29	14	June 7	June 22	15
	Aug. 12	Aug. 26	14	July 7	July 22	15
	Sept. 9	Sept. 23	14	Aug. 6	Aug. 19	13
	Oct. 27	Nov. 5	9			
2C	May 20	May 30	10	June 7	June 14	7
3A	May 19	June 4	16	June 7	June 20	13
	July 15	July 19	4			
3B	May 19	June 4	16	June 7	June 20	13
	July 15	July 19	4	Aug. 25	Aug. 28	3
4	Apr. 10	Apr. 30	19	June 7	June 22	15
	July 29	Aug. 23	25	July 10	Aug. 6	27

*In 1980, Areas 2A and 2C were designated Area 2-U.S. waters; Area 2B was designated Area 2-Canadian waters; and Areas 3A and 3B were designated Area 3.

OTHER REGULATIONS

A new regulation adopted for 1981 required that vessels participating in the Area 4 fishery clear with a U.S. Customs or federal fishery officer at Dutch Harbor, Alaska, prior to any fishing in Area 4 and again upon leaving Area 4. This regulation did not apply to fishermen resident in Area 4 and who unload all of their catches at ports within that area, and was designed to reduce illegal fishing in Area 3 during the Area 4 open season. The sport fishery regulation was modified to permit the use of two hooks on gear used to catch halibut. This change was justified because some sport-caught halibut are taken incidentally to the sport fishery for salmon which occasionally uses two hooks per bait. The 1980 regulations allowed only one hook on sport gear for catching halibut.

All other regulations pertaining to minimim size limits, licensing, gear restrictions, and the sport fishery, remained unchanged.

The Fishery

COMMERCIAL FISHERY

A compilation of historical statistics published in 1977 as Technical Report No. 14, "The Pacific Halibut Fishery: Catch, Effort and CPUE, 1929-1975" summarizes catch and effort data by statistical area, region, regulatory area, and country. Data are also given by port and country. Appendix tables in this Annual Report and the Annual Reports for 1977, 1979, and 1980 are in the same format and update those statistics to 1981.

Catch by Regulatory Area

The 1981 commercial catch was 25.7 million pounds, nearly 3.9 million more than was caught in 1980. The Canadian fleet took 22% of the catch and the United States fleet took 78%. Canadian landings were down sharply from a 35% share of the catch in 1980 due to the termination of their fishing privileges in United States waters which ended following the 1980 halibut season.

Catch by country and regulatory area for 1977 through 1981 is shown in Table 2. The catches for all years are shown by regulatory area as defined in the 1981 Pacific Halibut Fishery Regulations, to facilitate comparison of similar geographic areas. The actual boundaries for regulatory areas in years prior to 1981 can be found in previous annual reports published by the Commission. It should be noted that Canadian catches from the waters of Dixon Entrance are included in Area 2B whereas United States catches from the same region are included in Area 2C. This division of the catch is necessary because of an unresolved boundary dispute between the two countries in this region.

The Area 2A catch in 1981 was 200,000 pounds, the same as the catch limit, and 180,000 pounds more than the 1980 catch. In years prior to 1981, all United States waters in Area 2 were treated as a single regulatory area and the rapid attainment of the catch limit in southeastern Alaska waters resulted in little fishing off the California, Oregon, and Washington coasts. In 1981, this region was designated Area 2A with a separate catch limit, thus permitting better utilization of the resource.

The catch in Area 2B, the waters off British Columbia, was 5.6 million pounds, the same as in 1980, and slightly greater than the 5.4 million pound catch limit. Increased effort, particularly during the first and second fishing periods, resulted in a shorter fishing season in spite of a slight decrease in the CPUE.

In Area 2C, the waters off southeastern Alaska, the 1981 catch was 4.0 million pounds, 600,000 pounds more than the 3.4 million pound catch limit. A near doubling of the CPUE in this area, plus exceptionally favorable weather, resulted in the fleet exceeding the catch limit during the first fishing period despite a 3-day shorter season than in 1980.

In Area 3A, the regular season catch was 14.0 million pounds, exceeding the 11.0 million pound catch limit by 3.0 million pounds and the overall Area 3 catch limit of 13.0

Table 2. Catch by country and regulatory area*, 1977-1981 (in thousands of pounds).

Regulatory Area	1977	1978	1979	1980	1981
Area 2A					
U.S.	200	94	46	22	202
Canada	7	3	—	—	—
Total	207	97	46	22	202
Area 2B					
U.S.	253	243	—	—	—
Canada	5,174	4,364	4,857	5,650	5,654
Total	5,427	4,607	4,857	5,650	5,654
Area 2C					
U.S.	2,660	3,409	4,366	3,238	4,010
Canada	526	907	164	—	—
Total	3,186	4,316	4,530	3,238	4,010
AREA 2					
U.S.	3,113	3,746	4,412	3,260	4,212
Canada	5,707	5,274	5,021	5,650	5,654
TOTAL	8,820	9,020	9,433	8,910	9,866
Area 3A					
U.S.	6,646	7,488	9,714	10,014	14,225
Canada	1,995	2,807	1,621	1,952	—
Total	8,641	10,295	11,335	11,966	14,225
Area 3B					
U.S.	2,424	950	373	277	456
Canada	899	377	17	—	—
Total	3,323	1,327	390	277	456
AREA 3					
U.S.	9,070	8,438	10,087	10,291	14,681
Canada	2,894	3,184	1,638	1,952	—
TOTAL	11,964	11,622	11,725	12,243	14,681
AREA 4					
U.S.	918	1,199	1,369	713	1,185
Canada	166	147	—	—	—
TOTAL	1,084	1,346	1,369	713	1,185
ALL AREAS					
U.S.	13,101	13,383	15,868	14,264	20,078
Canada	8,767	8,605	6,659	7,602	5,654
TOTAL	21,868	21,988	22,527	21,866	25,732

*Regulatory Areas defined in 1981 Pacific Halibut Fishery Regulations

million pounds by 1.0 million pounds during the first scheduled fishing period. A June opening date, exceptionally good weather, and a 19% improvement in CPUE from 1980 all contributed to the catch overage. Landings by IPHC research vessels during fall and winter tagging charters added an additional 220,000 pounds to the Area 3A total catch.

In Area 3B, the catch during the first fishing period was 100,000 pounds out of a scheduled catch limit of 2.0 million pounds. Because the total Area 3 catch limit was exceeded, Area 3B was declared closed; however, the Commission decided to schedule a short 3-day season in late August to provide some assessment of the stocks in the area and an additional 360,000 pounds were landed.

The Area 4 catch was 1.2 million pounds, slightly exceeding the 1.0 million pound catch limit for the area. Only 25,000 pounds were taken during the first fishing period by a few fishermen residing within the area. A new system of clearing vessels into and out of Area 4 at Dutch Harbor aided the Commission in setting the date when the catch limit was attained.

Number of Vessels

Table 3 shows the number of vessels, the number of trips, and the catch by vessel category in 1981. Vessels five net tons or larger that fish with setline gear are required to be licensed by the Commission. Smaller vessels, or those not using setline gear, do not need a Commission license.

There was little change in the number of Canadian vessels landing halibut in 1981 compared to 1980, reflecting the stabilizing of the fleet due to the Canadian limited entry program. The United States fleet, however, continued to grow with the licensed setline fleet increasing by 20%, and unlicensed setliners increasing by 10% from the previous year. Much of the increase in fleet size over the past few years has been stimulated by rumors of impending limited entry for the halibut fishery, with many new fishermen hoping to stake a claim to a portion of the halibut resource. The number of trollers landing halibut also increased by 57% in 1981, as the excellent fishing weather and improved halibut abundance increased their fishing success.

Landings by Port

Landings in all Alaska and Washington ports generally increased in 1981, reflecting the large increase in catches by United States vessels. The largest increases occurred in central Alaska where landings doubled from those of 1981 as a result of the intense Area 3A fishery. Canadian landings were down in all British Columbia ports, and particularly in Bellingham, Washington, which had received several of the 1980 Canadian Area 3A landings. Kodiak was the leading halibut port in 1981, with nearly double the landings it had the previous year, followed by Seward, Prince Rupert, Sitka, and Seattle.

Value of the 1981 Catch

The total ex-vessel value of the 1981 catch was $26.2 million (U.S.) compared to $22.0 million for 1980 (Table 4). The fishermen received an average price of $1.02 (U.S.)

Table 3. Number of vessels, number of trips, and catch by licensed and unlicensed vessels in Areas 2 and 3, 1981.

Vessel Category	Canada			United States			Total		
	No. of Vsls.	No. of Trips	Catch 000's Lbs.	No. of Vsls.	No. of Trips	Catch 000's Lbs.	No. of Vsls.	No. of Trips	Catch 000's Lbs.
AREA 2									
Unlicensed									
Trollers	14	15	10	566	826	104	580	841	114
Setliners	9	12	45	636	1,515	999	645	1,527	1,044
Other**	—	—	—	—	—	2	—	—	2
Total	23	27	55	1,202	2,341	1,105	1,225	2,368	1,160
Licensed									
5-19 tons***	287	959	3,669	324	597	1,538	611	1,556	5,207
20-39 tons	37	105	1,221	62	89	631	99	194	1,852
40-59 tons	9	25	379	2	3	54	11	28	433
60+ tons	4	12	330	—	—	—	4	12	330
Total	337	1,101	5,599	388	689	2,223	725	1,790	7,822
All Vessels	360	1,128	5,654	1,590	3,030	3,328	1,950	4,158	8,982
AREA 3*									
Unlicensed									
Trollers	—	—	—	51	82	24	51	82	24
Setliners	—	—	—	832	2,203	1,313	832	2,203	1,313
Other**	—	—	—	—	—	—	—	—	—
Total	—	—	—	883	2,285	1,337	883	2,285	1,337
Licensed									
5-19 tons***	—	—	—	464	1,000	3,833	464	1,000	3,833
20-39 tons	—	—	—	196	338	6,223	196	338	6,223
40-59 tons	—	—	—	58	118	4,178	58	118	4,178
60+ tons	—	—	—	19	23	1,179	19	23	1,179
Total	—	—	—	737	1,479	15,413	737	1,479	15,413
All Vessels	—	—	—	1,620	3,764	16,750	1,620	3,784	16,750
Grand Total	360	1,128	5,654	3,210	6,794	20,078	3,570	7,922	25,732

*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 unkown tonnage.

per pound, an increase of $0.03 per pound over the price received in 1980. This is substantially lower than the record value set in 1979, when the catch was worth $48 million at an average price of $2.13 per pound. The calculated average price (U.S. dollars) paid during the 1981 season was $1.17 in Washington and Oregon, $1.16 in southern British Columbia, $1.04 in northern British Columbia, $0.96 in southern Alaska, and $0.97 in central Alaska.

The Canadian catch totalled 5.7 million pounds with a landed value of $6.2 million (U.S.) for an average price of $1.09 per pound. The Canadian catch included 500,000 pounds landed in Washington ports with a value of $0.6 million at an average price of $1.18 per pound. The U.S. catch totalled 20.1 million pounds with a landed value of $20.0 million at an average price of $0.99 per pound.

Fish destined for the fresh market continued to receive a higher price. For example, most of the 2.1 million pounds of fish landed in May from Canada's first fishing season was sold on the fresh market and received an average price of $1.27 (U.S.) per pound. Market demands in 1981 generated a higher price for large-sized fish. The difference in price was greater in southeastern Alaska where fish 60 pounds and greater sold at an average of $0.22 per pound more than those less than 60 pounds; the smallest difference ($0.02) was in British Columbia. Large fish landed in central Alaska received an average of $0.19 more and those in the Washington-Oregon region received $0.07 more.

Table 4. Landings and value by region of the coast.

Region	Landings (Thousands of pounds)	Value (Millions of U.S. dollars)
Washington-Oregon	3,633	4.2
British Columbia	5,163	5.6
Southeastern Alaska	7,926	7.6
Central Alaska	9,010	8.7
Total	25,732	26.2

SPORT FISHERY

The Commission relies on state and provincial agencies for estimates of the annual sport fishery harvest. Estimates from the respective agencies are shown in Table 5. The 1981 catch is not available from British Columbia and is estimated from the previous four years.

Sport fishing for halibut is becoming increasingly popular, particularly in Alaska where halibut stocks are rebuilding. Other factors include the reduced opportunity for salmon sports fishing in some regions, and the publicity given large trophy catches of halibut. Although the Kenai Peninsula and southeastern Alaska constitute the majority of the landings, a significant improvement has occurred in Kodiak where landings have increased an average of 64.3% during the last five years. British Columbia and Washington harvests remain relatively stable. Coastwide, the sport catch in 1981 was 2.5 times greater than five years ago. Sport landings are expected to continue to increase in the future. The Commission intends to closely monitor this rapidly increasing fishery during the next few years.

Table 5. Catch by sport fishermen (thousands of pounds).

Area	1977	1978	1979	1980	1981	
Alaska						
Southeastern	110	115	246	467	411	
Prince William Sound	23	18	32	59	47	
Kenai	285	257	315	404	517	
Kodiak	19	32	57	69	129	
Total	437	422	650	999	1,104	
British Columbia	17	9	18	11	12	*
Washington	17	10	19	22	20	
TOTAL	471	441	687	1,032	1,136	

*Estimated from the 1977-80 catches.

INCIDENTAL CATCH OF HALIBUT

Halibut are caught in many fisheries other than the commercial setline, troll, and sport fisheries. Although regulations require that incidentally-caught halibut be returned to the sea, many of the released fish die from injuries received during capture. Nearly all halibut caught in foreign trawls and domestic crab pots, and about half of those caught by domestic trawls and foreign setlines, do not survive. In recent years, the incidental catch has nearly equalled the commercial catch and, therefore, the impact of incidental catches on the halibut resource is significant.

Estimates of the incidental catch are not precise and may change as additional information becomes available. Incidental catches by foreign trawls, foreign setlines, and domestic trawls are estimated from data collected by observers who sample the catch at sea. Incidental catches by domestic shrimp trawls and crab pots are based on data collected during research cruises.

In 1980, the most recent year for which data are available, the estimated total incidental catch was 20.4 million pounds, comparable to the commercial catch of 21.8 million pounds. Incidental catches have risen nearly 50% since 1978 and are again at the high levels of the late 1960's and early 1970's. Increases in 1980 occurred primarily in the foreign trawl and crab pot fisheries in Area 4 and in the foreign setline fishery in Area 3. The incidental catch of halibut by regulatory area and fishery is presented in Table 6.

Table 6. Estimated incidental catch of halibut by regulatory area and fishery, 1980 (in million of pounds).

Fishery	Area 2	Area 3	Area 4	Total
Foreign Trawl	0.2	3.2	7.0	10.4
Foreign Setline	Trace	1.9	0.1	2.0
Domestic Fish Trawl	2.7	0.1	0.5	3.3
Domestic Shrimp Trawl	Trace	0.1	Trace	0.1
Domestic Crab Pot	0.3	3.1	1.2	4.6
Total	3.2	8.4	8.8	20.4

In September 1981, the North Pacific Fishery Management Council approved Amendment #3 to the Bering Sea Groundfish Plan, which calls for a systematic reduction in the rate of incidental catch of salmon, halibut, and crab by foreign trawlers over a 5-year period. In the case of halibut, the incidental catch per unit of groundfish is scheduled to be reduced 10% per year beginning in 1982. The reduction schedule is subject to annual review and can be modified under changing conditions. However, the amendment still must be reviewed and approved by the Secretary of Commerce and, if approved, would not be in effect until 1983. This amendment would be a significant step towards controlling the incidental catch of halibut and increasing production in the Canadian and United States setline fishery. A significant number of juvenile halibut move from the Bering Sea into the Gulf of Alaska and beyond, hence, this amendment would affect halibut on a coastwide basis.

Population Assessment

In general, stock assessment results indicate that halibut abundance and productivity are increasing in most areas. Young halibut are also becoming more abundant, indicating that halibut stocks should continue to improve during the 1980's. Unfortunately, incidental catches in other fisheries continue at a high level and they substantially reduce the yield available to the halibut fishery.

Assessment of halibut stocks in 1981 relied on several sources of data. The commercial fishery continued to be the primary source of stock assessment data, providing estimates of catch-per-unit-effort (CPUE) and age composition. Additional data were obtained from two surveys: one to assess juvenile abundance, the other to assess adults. Two analytical techniques were used to estimate biomass: cohort analysis was applied to age composition data, and a new technique, called delay-difference analysis, was applied to CPUE data. The estimates of biomass were then used to predict the annual surplus production (previously called equilibrium yield).

TRENDS IN ABUNDANCE

Table 7 summarizes estimates of CPUE and biomass by area from 1975 through 1981. These estimates provide an indication of the abundance of adult halibut in each area. Differences among estimates may result from factors such as the area where data are collected and assumptions used in the analytical techniques. For example, cohort analysis provides a consistently lower estimate of biomass than does the delay-difference approach. The reasons for the difference include slightly different age spans used in the two approaches and the way gear selectivity by age is treated.

In Area 2, the various estimates do not show a consistent trend. CPUE from the commercial fishery and cohort analysis suggest an increase in Area 2 abundance, whereas the survey CPUE and delay-difference analysis indicate that abundance is stable or declining. One reason for these differences is that conditions varied considerably among subareas within Area 2. In Area 2B, CPUE from the commercial fishery and the survey both indicate that abundance is stable or declining. On the other hand, CPUE in Area 2C has increased dramatically since the late 1970's. For example, the 1981 commercial CPUE was 185 pounds per skate in Area 2C compared to 64 pounds in Area 2B. The reason for the different conditions within Area 2 is unclear at this time, and changes either in the environment or stock productivity could be responsible. Because of the uncertainty in the estimates of abundance in Area 2, additional studies are scheduled for 1982 to help resolve the differences.

In Area 3, all evidence suggests an increasing trend in abundance. CPUE in the survey was the highest ever recorded, and the commercial CPUE was the highest since the early 1960's. Biomass estimates also show that abundance in Area 3 is increasing, although not as rapidly as indicated by CPUE. The dramatic increase in CPUE appears to be partly the result of improved availability, i.e., greater vulnerability of the fish to the fishery, although factors affecting availability are not fully understood.

Table 7. CPUE and biomass estimates for Areas 2, 3, and 4, 1975 to 1981.

	1975	1976	1977	1978	1979	1980	1981
Area 2			**CPUE (pounds per skate)**				
Survey	—	29	16	22	—	32	20
Commercial	60	48	54	59	61	70	87
			Biomass (millions of pounds)				
Cohort	70	72	76	79	83	85	85
Delay-difference	173	170	166	164	165	163	160
Area 3			**CPUE (pounds per skate)**				
Survey	—	48	79	37	58	99	167
Commercial	66	61	64	74	82	121	140
			Biomass (millions of pounds)				
Cohort	85	91	102	114	124	133	142
Delay-difference	208	214	223	236	246	255	266
Area 4			**CPUE (pounds per skate)**				
Commercial	96	84	80	76	66	56	100
			Biomass (millions of pounds)				
Cohort	15	16	17	18	20	21	22
Delay-difference	37	37	37	38	39	40	41

Data from Area 4 are meager because of the limited fishery and, hence, CPUE and biomass estimates may not reflect true changes in abundance. CPUE declined from 1975 to 1980 but increased sharply in 1981. Biomass estimates show a steady gain since 1975.

SURPLUS PRODUCTION

Annual surplus production is defined as the catch that can be taken in a given year without changing biomass. The estimated surplus for 1982 was 64 million pounds under 1981 conditions (Figure 2). This surplus is almost as high as earlier estimates of maximum sustainable yield, suggesting that halibut stocks are in fair condition. Unfortunately, a loss in production occurs from mortality of incidentally caught halibut in the trawl and pot fisheries and, therefore, only part of the estimated surplus is available to the setline fishery. We estimate an annual loss of about 28 million pounds due to incidental catches: 20 million pounds of actual incidental catch plus 8 million pounds of lost growth potential. Subtracting 28 million pounds leaves 36 million pounds of surplus production for the setline fishery. However, halibut stocks are still below optimal levels and the staff recommends leaving 25% or 9 million pounds of the available surplus for continued rebuilding of the resource. This leaves 27 million pounds for setline harvest and is the basis for the catch limits recommended by the staff for the 1982 fishing season.

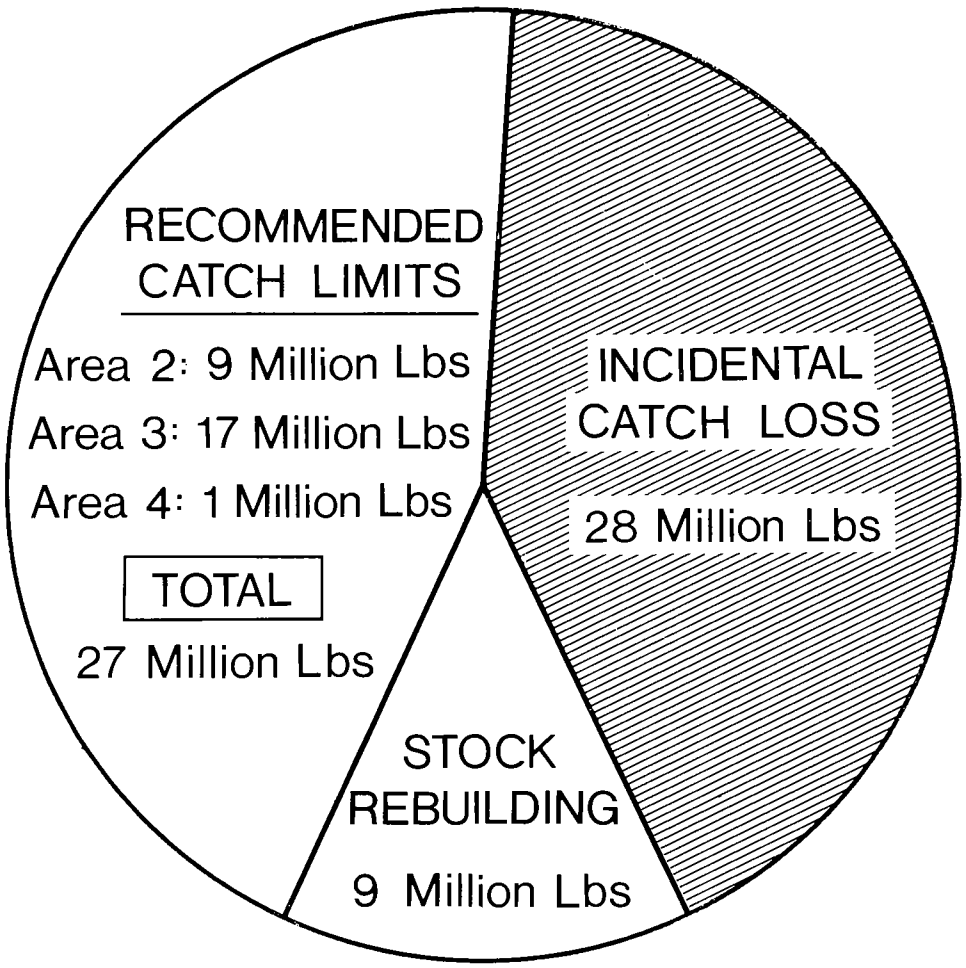


Figure 2. Recommended allocation of 1982 surplus production with allowance for expected incidental catch loss based on 1981 conditions.

FUTURE PRODUCTIVITY

A change in the incidental catch or other factors would obviously alter the amount available for the halibut fishery, but there is no reason to expect any substantial change in the near future. Incidental catches have been increasing in recent years, but this trend may be reversed when amendments to the U.S. management plans for groundfish in the Bering Sea and Gulf of Alaska become effective. These amendments will restrict foreign trawling in the eastern part of the Gulf of Alaska and systematically reduce incidental catches of halibut by 50% over a 5-year period in the Bering Sea. The restriction in the eastern Gulf of Alaska should be in effect in 1982 and might save between 1 and 2 million pounds of halibut if effort is not shifted to other areas. The restriction in the Bering Sea

will not be in effect until at least 1983. Although these are reasons to believe that incidental catches can be reduced, it is not possible at this time to predict the magnitude of future incidental catches.

IPHC juvenile surveys suggest that the abundance of young halibut is increasing. In Area 3, CPUE of juveniles increased in 1981 and was the highest recorded in three of the four regions. In the Bering Sea, CPUE declined slightly in 1981 but was still well above the average of recent years. Halibut caught in the juvenile surveys are primarily 2- to 5-year-olds and those that survive will contribute heavily to the fishery in the late 1980's.

In conclusion, the abundance of halibut appears to be increasing. Evidence of more juveniles suggests that stocks should continue to improve and that the yield available to the fishery will increase during the 1980's. However, the rebuilding process will be slow and incidental catches in other fisheries will have a major impact on the rate of rebuilding and the yield that will be available to the halibut fishery.

Scientific Investigations

POPULATION DYNAMICS STUDIES

Research in 1981 concentrated on standardizing methods of determining abundance and key population parameters of Pacific halibut. The methodology is based on the concept of a single population. The distribution of the population is considered to be variable from year to year, reflecting migration patterns and changes in availability. As a result of this concept, the initial focus of our population studies is the estimation of abundance and annual surplus production from the total population, which is not influenced by distributional changes.

Two methods were used to estimate total population biomass. The first method, based on cohort analysis, uses age composition data. The second method, delay-difference analysis, uses catch-effort data in a model of the population. The investigations of these methods is to be published in a volume of proceedings from a special symposium concerning groundfish research held by the International North Pacific Fisheries Commission in October 1981. Both procedures have the capacity for forecasting trends in population abundance.

Biomass estimates are used to calculate the annual surplus production available to the commercial fishery. Because halibut taken in incidental fisheries are part of the overall production, the total annual surplus production (including incidental catch losses) was also calculated.

Partitioning total population estimates into subarea estimates is the second major focus of the population studies, requiring information about habitat occupied by the population, migration estimates, and catch-per-unit-effort data. A new method which does not require information about fishing effort was constructed to estimate migration. Migration estimates were used in a generalization of cohort analysis for migratory populations, which led to estimates of relative abundance by subarea.

These investigations led to the results which have increased our understanding of the dynamics of the Pacific halibut population. In hindsight, the major events in the Pacific halibut fishery are as follows (see Figure 3): Before 1925 the fishery was unregulated and the population declined substantially. The fishery was regulated after 1925 with the imposition of a winter closure and by 1932 catch limits were implemented. Between 1935 and 1950, survival of the young was high, and the population increased because catch was below surplus production. Survival of the young since 1950 has been fairly constant, although lower than pre-1950 levels. Incidental catches became a major source of halibut mortality in the 1960's and 1970's, accounting for 50% of total removals (adjusted for growth and mortality). The total removals by incidental and commercial fisheries greatly exceeded surplus production and the population declined rapidly. Because incidental catches are mainly of small, young fish, the commercial fishery is forced to take what is left over after the incidental removal. Commercial catch restrictions and some restrictions on foreign fishing in the late 1970's have brought total removals below total surplus production causing stock biomass to once again increase.

Another important aspect investigated in 1981 is catchability, the probability that a fish will be caught by a fixed unit of gear. Analyses indicate substantial variability in

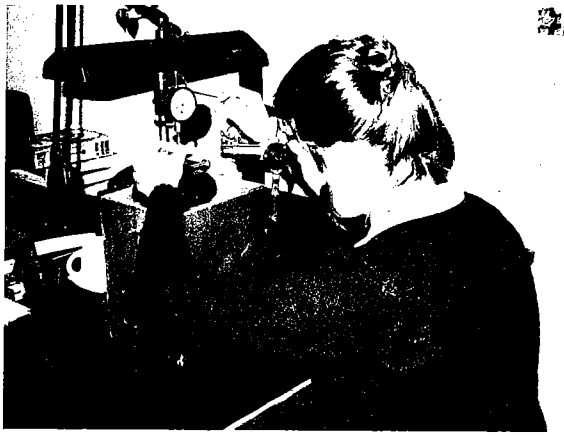
The sling, the sampling unit

SAMPLING OF THE COMMERCIAL CATCH

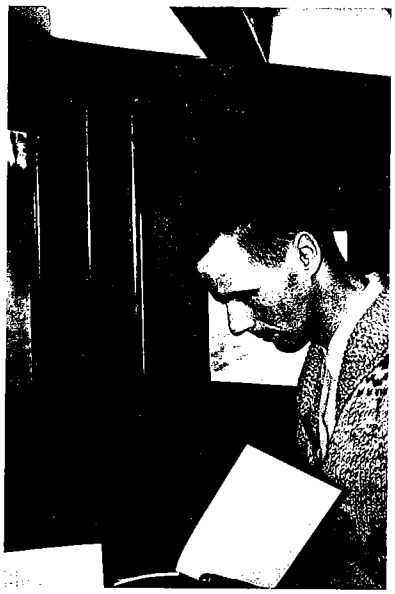
Locating the otolith

The otolith, the information bone

Removing otoliths from selected slingloads of halibut



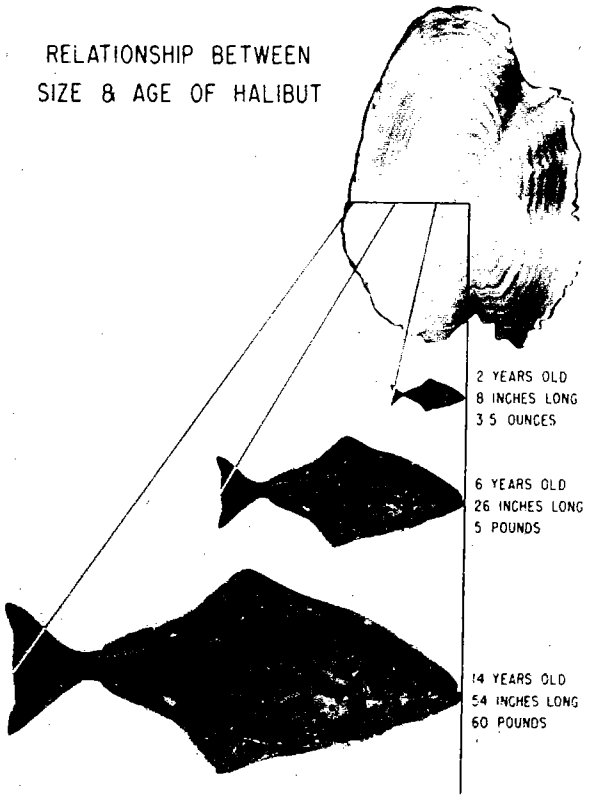
Measuring otolith length



Copying logs for location and CPUE information

Weighing the otolith

Reading the age



Age and length (by region) the basic result

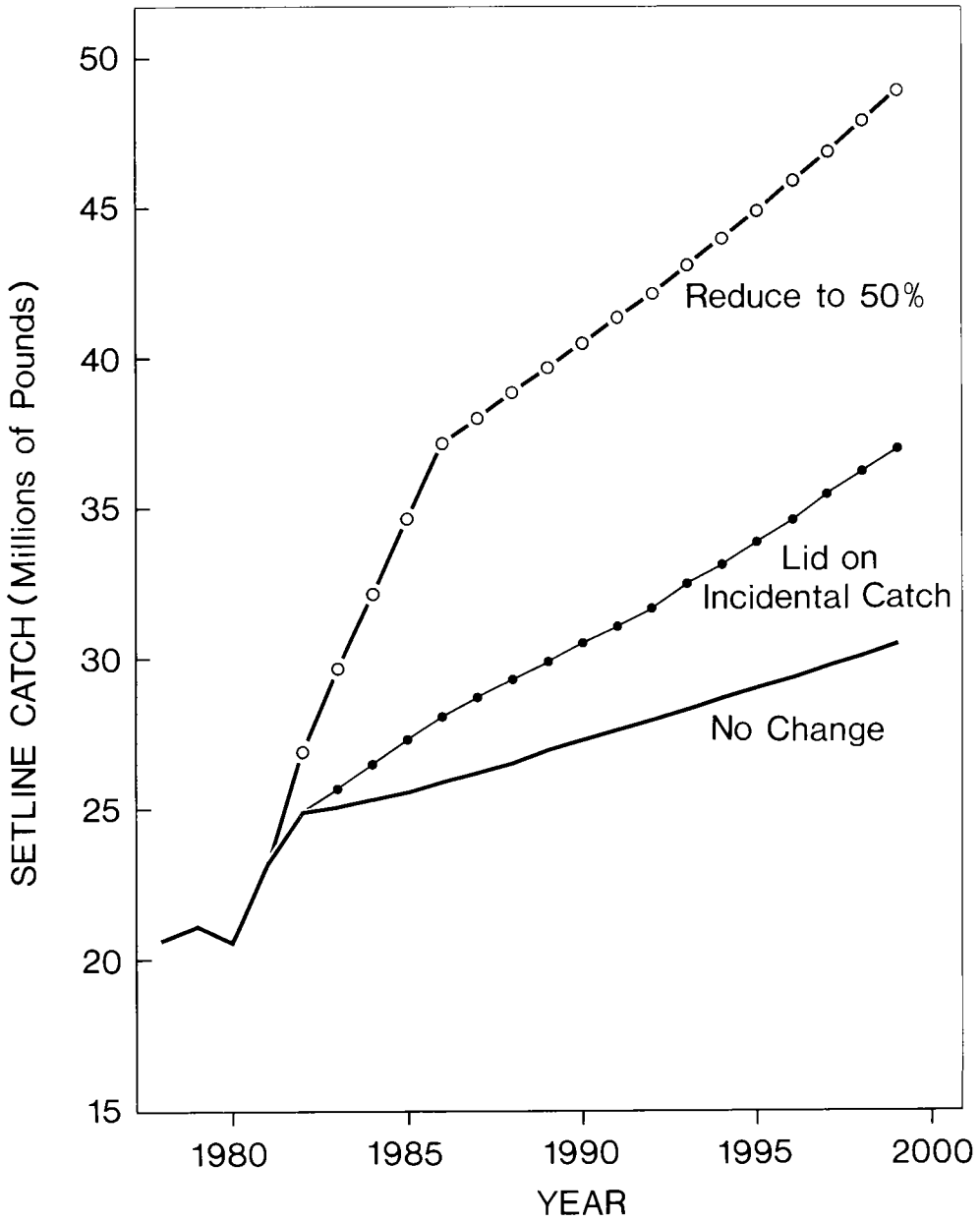


Figure 4. Forecasts of setline catches in the northeast Pacific (set at 75% of commercial annual surplus production) for three scenarios where (1) there is no change in the percent of each year-class taken by incidental catch, (2) a lid is placed on incidental catch so that it does not exceed the 1979-1981 average, and (3) incidental catch is reduced 10% each year for the next five years and thereafter remains at 50% of the 1979-1981 average.

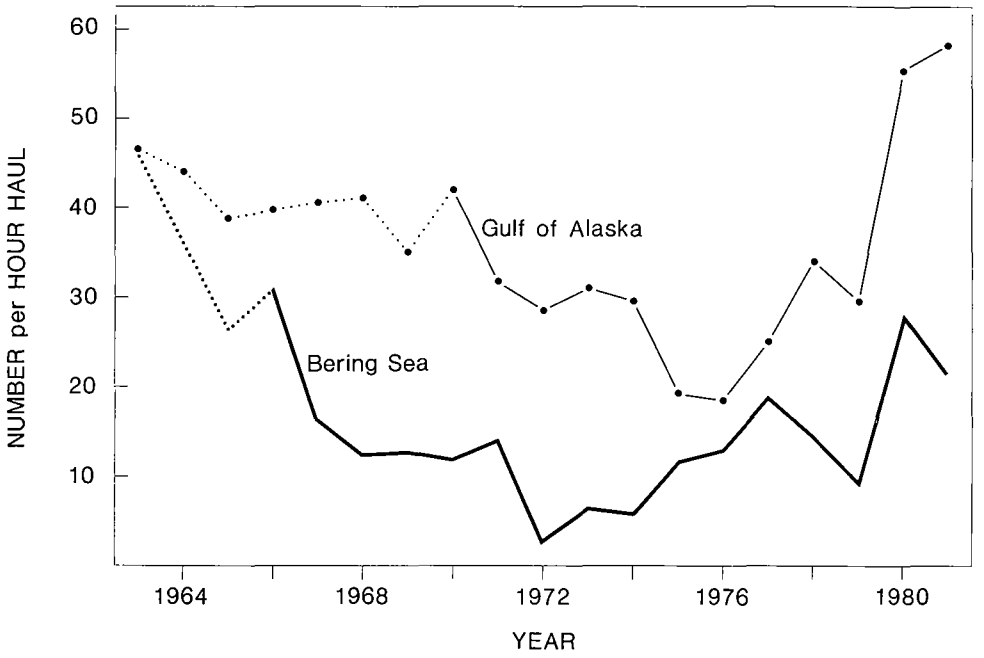


Figure 5. Catch per unit effort of juvenile halibut in the Gulf of Alaska and the Bering Sea, 1963-1981.

index area depending on the continuing availability of juveniles. The low CPUE in 1979 was attributed to the apparent weakness of the 1976 year-class and to a wide dispersion of juveniles, making them less available in the index area. In 1980 and 1981, juveniles were highly available both within and outside the index area. Catches with the smaller mesh net also improved in 1981 compared to the two previous years: 382 in 1981, 266 in 1980, and 177 in 1979. Four and 5-year-olds were the dominant age groups in the catches with the 90-mm mesh; catches with the 32-mm mesh were primarily of 2-, 3-, and 4-year-olds.

The Gulf of Alaska assessment index is based on 110 offshore stations in four locations: 25 off Unimak Island, 23 near Chirikof Island, 26 off Cape Chiniak, and 36 near Cape St. Elias. The average CPUE in the Gulf of Alaska has been increasing steadily during the past five years, and in 1981 was 58.1 juveniles per one-haul, slightly higher than in 1980 and the highest recorded for the region. The increase in CPUE was most pronounced west of Kodiak. In the Gulf of Alaska, as in the Bering Sea, the catches with the 90-mm gear were primarily 4- and 5-year-olds, but the 3-year-olds were also strong. Catches of juveniles with the small 32-mm net in the Gulf of Alaska continued to be low in 1981, totalling 1,422 compared to 1,357 in 1980, 1,545 in 1979, and 4,442 in 1978. These catches are primarily of 1- to 4-year-olds, with the 1979 year class (2-year-olds) especially prominent at 42% of the catch.

ADULT HALIBUT SURVEY

Since 1976, IPHC has acquired population assessment information independent of the commercial fishery through its own setline survey. The survey entails fishing a

Tag recoveries in 1981 totalled 277 and came from the releases from 1969 to date. Seven premium tags were received and the finders were awarded $100.00 each in addition to the basic $5.00 reward.

The chartered vessels M/V PACIFIC HARVESTER and M/V HOPE BAY collectively released over 30,000 tagged halibut less than 65 cm in length in 1980. These fish were all released west of Cape Spencer in Area 3A. Eight of these fish, still less than 65 cm long, were recovered along the British Columbia coast in 1981. This is a small percentage recovery (0.027%), but it indicates that small halibut make substantial migrations. Two of the eight were released near the west side of Kodiak Island. The chances of recovering such small fish by setline are not great; of the eight recovered, four were taken by trollers, three by trawlers, and only one by setline gear.

INCIDENTAL CATCHES IN SHRIMP TRAWLS

As in previous years, IPHC conducted studies to improve estimates of the incidental catch of halibut; in 1981, emphasis was placed on the shrimp trawl fisheries off Alaska. An IPHC observer monitored the incidence of halibut during a commercial trip on July 27-28 in Kachemak Bay, near Homer, Alaska, and also during a shrimp survey in Yakutat Bay conducted by the Alaska Department of Fish and Game on August 25-27. The results of these observations corroborate estimates from previous research surveys and suggest that incidental catches from the shrimp trawl fishery have a relatively minor impact on the halibut resource.

In Kachemak Bay, the incidence of halibut averaged 2.3 fish per metric ton of shrimp, nearly identical to previous IPHC estimates for the Gulf of Alaska. During 16 hours of fishing, 56 halibut were caught. They ranged in length from 25 to 104 cm, averaging about 50 cm. Average weight was 4.3 pounds. Also, most halibut were dead from injuries or suffication during capture. These results indicate that the incidental catch of halibut in the Kachemak Bay shrimp fishery probably averages less than 30,000 pounds annually.

The incidence of halibut in research catches in Yakutat Bay was about half that observed in Kachemak Bay. During 12 hours of fishing, 21 halibut, averaging 7.0 pounds, were caught. These data suggest that the annual incidental catch of halibut in Yakutat Bay probably has been under 10,000 pounds in recent years.

CATCH SAMPLING

IPHC sampled the commercial halibut landings at representative ports from Seattle, Washington, to Kodiak, Alaska, in 1981. The longest series of data has been collected at Seattle where sampling has been conducted annually since 1935. Seattle and Vancouver, British Columbia, were important landing ports during the early days of the fishery and IPHC management. By the 1970's, increased landings at northern ports relegated Seattle and Vancouver to relatively minor status as halibut landing ports. Characteristics of the 1981 fishing season permitted vessels to run south and benefit from higher prices, and Seattle and Vancouver regained some of their importance as halibut landing ports.

Nearly 21,000 otoliths were collected from the commercial landings and these were weighed to determine the size of fish in the landings. Over 8,200 of these were then randomly selected for age determination.

A sub-sample of 700 otoliths was selected from each month-region for age analysis in 1980. Analysis of the 1980 age compositions determined that 600 otoliths would provide an adequate estimate. Consequently, the sub-samples selected for aging were reduced to 600 otoliths in 1981.

Although the sampling varied among regions, an overall rate of 2.5% was achieved for the season. A summary of the sampling by region is presented in Table 8. Lightly fished regions such as Columbia and Shumagin were not sampled. Other regions that had special one-time landings, such as Chirikof, Aleutian, and the Bering Sea were intentionally sampled at high rates to ensure enough otoliths for the age composition estimates.

Table 8. Commercial catch and percent sampled for size and age composition by region during 1981.

Region	Catch* (000's pounds)	Percent Sampled
Columbia	56	0.0
Vancouver	451	3.0
Charlotte-Outside	655	3.7
Charlotte-Inside	4,147	3.3
S.E. Alaska-Outside	1,160	1.0
S.E. Alaska-Inside	3,289	1.5
Yakutat	5,183	1.6
Kodiak	9,039	2.3
Chirikof	337	9.2
Shumagin	61	0.0
Aleutian	282	21.9
Bering Sea	905	7.2
TOTAL	25,605	2.5

*Does not include research catches.

The 1972 year-class has made an important early contribution to the fishery. It has been particularly noticeable in the southeast Alaska-Inside region (Figure 7). Although there also has been an increase in CPUE, the contribution of the year-class as 8-year-olds in 1980 and 9-year-olds in 1981 is clearly evident.

Catch, CPUE and average weight at each age of halibut in the setline landings in 1981 are summarized by region in Appendix III, Table 2. The average length and age of the fish in the landings and the number of halibut measured and aged are also reported.

Appendix I.

TABLE 1. CATCH, CPUE AND EFFORT BY STATISTICAL AREA AND COUNTRY, 1981.

1981	CANADA			UNITED STATES			TOTAL			
STAT. AREA	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %
00-03	-	-	-	52	40.6*	13	52	40.6	13	-
04	-	-	-	2	40.8*	0	2	40.8	0	-
05	-	-	-	148	40.6	36	148	40.6	36	12
06	137	40.6*	34	-	-	-	137	40.6	34	-
07	76	40.6*	19	-	-	-	76	40.6	19	-
08	102	40.6*	25	-	-	-	102	40.6	25	-
09 -O	86	71.5	12	-	-	-	86	71.5	12	21
09 -I	446	42.3	106	-	-	-	446	42.3	106	8
10 -O	37	53.9*	7	-	-	-	37	53.9	7	-
10 -I	772	86.8	89	-	-	-	772	86.8	89	38
11 -O	59	46.1	13	-	-	-	59	46.1	13	36
11 -I	961	57.9	166	-	-	-	961	57.9	166	42
12 -O	134	76.5	18	-	-	-	134	76.5	18	22
12 -I	731	71.5	102	-	-	-	731	71.5	102	28
13 -O	366	47.4	77	-	-	-	366	47.4	77	7
13 -I	1329	47.2	281	-	-	-	1329	47.2	281	15
14 -O	72	46.7	15	66	46.7*	14	138	47.6	29	14
14 -I	346	59.2	58	252	59.2*	43	598	59.2	101	27
15 -O	-	-	-	228	121.1	19	228	121.1	19	23
15 -I	-	-	-	378	271.0	14	378	271.0	14	8
16 -O	-	-	-	336	160.2	21	336	160.2	21	13
16 -I	-	-	-	850	129.9	65	850	129.9	65	18
17 -O	-	-	-	359	67.5	53	359	67.5	53	1
17 -I	-	-	-	188	126.4*	15	188	126.4	15	-
18S-O	-	-	-	129	341.3	4	129	341.3	4	46
18S-I	-	-	-	1224	133.2	92	1224	133.2	92	6
18W	-	-	-	580	76.8	76	580	76.8	76	11
19	-	-	-	784	108.5	72	784	108.5	72	22
20	-	-	-	975	127.1	77	975	127.1	77	43
21	-	-	-	622	109.8	57	622	109.8	57	25
22	-	-	-	918	126.4	73	918	126.4	73	42
23	-	-	-	1372	133.0	103	1372	133.0	103	31
24	-	-	-	1359	131.1	104	1359	131.1	104	37
25	-	-	-	3155	134.3	235	3155	134.3	235	49
26	-	-	-	2530	175.1	144	2530	175.1	144	37
27	-	-	-	1238	207.2	60	1238	207.2	60	10
28	-	-	-	692	278.8	25	692	278.8	25	25
29	-	-	-	333	216.9	15	333	216.9	15	28
30	-	-	-	-	-	-	-	-	-	-
31	-	-	-	50	159.2	3	50	159.2	3	64
32	-	-	-	56	40.0	14	56	40.0	14	2
33	-	-	-	12	93.8	1	12	93.8	1	100
34	-	-	-	-	-	-	-	-	-	-
35	-	-	-	3	44.8*	1	3	44.8	1	-
36	-	-	-	2	44.4*	0	2	44.4	0	-
37	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-
39	-	-	-	27	143.6	2	27	143.6	2	93
40	-	-	-	-	-	-	-	-	-	-
41	-	-	-	64	91.8	7	64	91.8	7	98
42+	-	-	-	149	104.8	14	149	104.8	14	73
4A	-	-	-	47	79.3	6	47	79.3	6	-
4B	-	-	-	460	147.7	31	460	147.7	31	1
4C	-	-	-	266	88.2	30	266	88.2	30	26
4DE	-	-	-	5	14.3	4	5	14.3	4	47
4DW	-	-	-	167	85.1	20	167	85.1	20	9
4E	-	-	-	-	-	-	-	-	-	-

* NO LOG DATA, CPUE INTERPOLATED.

Appendix I. (continued)

TABLE 2. CATCH, CPUE AND EFFORT BY REGION AND COUNTRY, 1981.

1981	CANADA			UNITED STATES			TOTAL			
REGION	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %
COLUMBIA	-	-	-	52	40.6*	13	52	40.6	13	-
VANCOUVER	315	40.6*	78	150	40.6	37	465	40.4	115	4
CHARLOTTE	4921	61.7	797	-	-	-	4921	61.7	797	25
CHAR-O	682	58.0	118	-	-	-	682	58.0	118	14
CHAR-I	4239	62.4	679	-	-	-	4239	62.4	679	27
SE ALASKA	418	57.3	73	4010	145.8	275	4428	127.2	348	14
SE AK-O	72	46.7	15	1118	168.0	67	1190	145.1	82	15
SE AK-I	346	59.2	58	2892	139.0	208	3238	121.7	266	13
YAKUTAT	-	-	-	5251	121.3	433	5251	121.3	433	31
KODIAK	-	-	-	8974	149.6	600	8974	149.6	600	36
CHIRIKOF	-	-	-	383	198.4	19	383	198.4	19	32
SHUMAGIN	-	-	-	73	86.9	8	73	86.9	8	18
ALEUTIAN	-	-	-	240	103.7	23	240	103.7	23	82
BERING SEA	-	-	-	945	104.6	90	945	104.6	90	39
TOTAL	5654	59.6	948	20078	134.0	1498	25732	105.2	2446	35

* NO LOG DATA, CPUE INTERPOLATED.

TABLE 3. CATCH, CPUE AND EFFORT BY REGULATORY AREA, 1981.

	AREA 2				AREA 3				AREA 4			
YEAR	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 %
1981	9866	77.5	1273	19	14681	138.5	1060	34	1185	104.9	113	48

TABLE 4. CATCH IN THOUSANDS OF POUNDS BY REGULATORY AREA AND COUNTRY, 1981.

	AREA 2			AREA 3			AREA 4			ALL AREAS		
YEAR	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL	CAN.	U.S.	TOTAL
1981	5654	4212	9866		14681	14681		1185	1185	5654	20078	25732

TABLE 5. LANDINGS IN THOUSANDS OF POUNDS BY PORT AND COUNTRY, 1981.

	1981		
PORT	CAN.	U.S.	TOTAL
CAL AND ORE	-	113	113
SEATTLE	307	1524	1831
BELLINGHAM	184	1253	1437
MISC WASH	-	252	252
VANCOUVER	1965	-	1965
MISC SO BC	672	-	672
NAMU	47	-	47
PR RUPERT	2307	-	2307
MISC NO BC	172	-	172
KETCHIKAN	-	156	156
WRANGELL	-	465	465
PETERSBURG	-	1407	1407
JUNEAU	-	751	751
SITKA	-	2117	2117
PELICAN	-	1107	1107
MISC SE AK	-	1923	1923
KODIAK	-	3446	3446
P WILLIAMS	-	-	-
SEWARD	-	2334	2334
MISC CEN AK	-	3230	3230

APPENDIX III. (continued)

TABLE 2. CATCH IN NUMBERS, CPUE IN NUMBER PER 10,000 SKATES, AND AVERAGE WEIGHT IN POUNDS (DRESSED, HEAD-OFF) AT AGE BY REGIONS, 1981.

	COLUMBIA*			VANCOUVER			CHARLOTTE OUTSIDE		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	0	0	0.0	0	0	0.0	0	0	0.0
5	4	31	6.3	31	27	6.3	0	0	0.0
6	61	476	12.5	542	473	12.7	205	174	10.9
7	111	867	11.9	970	847	11.9	912	776	12.7
8	373	2912	13.3	3354	2928	13.4	2661	2263	15.3
9	446	3482	14.5	3981	3476	14.4	3850	3274	18.7
10	292	2279	17.4	2615	2283	17.3	4083	3472	22.5
11	220	1717	24.7	1946	1699	24.7	3034	2580	25.9
12	184	1436	25.2	1668	1456	25.2	3317	2821	31.9
13	125	976	27.8	1121	979	27.7	1825	1552	31.9
14	151	1179	35.3	1364	1191	35.3	1658	1410	40.0
15	131	1023	30.3	1167	1019	29.8	1068	908	41.2
16	61	476	60.1	542	473	60.7	705	600	51.9
17	33	258	58.6	290	253	59.4	728	619	53.3
18	34	265	61.6	298	260	63.2	497	423	55.0
19	18	141	62.9	168	147	62.9	409	348	67.6
20	20	156	39.2	175	153	38.4	22	19	50.5
21+	8	62	110.3	76	66	110.3	524	446	97.4
TOT	2272	17736	22.9	20308	17730	22.9	25499	21685	29.6
	AV LEN 98.2, AV AGE 10.8			AV LEN 98.2, AV AGE 10.8			AV LEN 107.0, AV AGE 11.5		
	#OTO'S 593, #AGED 593			#OTO'S 593, #AGED 593			#OTO'S 831, #AGED 831		

	CHARLOTTE INSIDE			SE ALASKA OUTSIDE			SE ALASKA INSIDE		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	106	16	7.3	0	0	0.0	0	0	0.0
5	1942	286	8.0	0	0	0.0	0	0	0.0
6	7719	1136	9.3	96	117	14.6	999	375	10.3
7	15782	2323	11.5	675	823	11.2	3677	1380	11.2
8	28318	4169	13.8	2605	3178	14.4	14526	5450	13.2
9	35502	5226	17.8	5693	6945	17.4	21211	7959	17.8
10	27941	4113	21.8	4439	5415	23.1	15621	5861	22.8
11	23950	3526	25.1	5404	6593	30.1	13363	5014	30.5
12	13789	2030	30.0	4246	5180	36.2	9946	3732	37.3
13	10178	1498	36.4	2509	3061	52.0	5303	1990	37.4
14	8982	1322	42.0	1640	2001	56.9	4102	1539	48.7
15	4628	681	48.8	1351	1648	62.8	3064	1150	55.6
16	3866	569	53.3	2026	2472	64.3	1990	747	67.9
17	2704	398	48.8	965	1177	55.9	775	291	62.5
18	1992	293	74.2	289	353	60.3	2147	806	78.5
19	641	94	82.1	0	0	0.0	731	274	93.8
20	680	100	94.8	193	235	68.6	731	274	80.6
21+	905	133	105.2	289	353	103.4	1002	376	91.0
TOT	189624	27913	24.2	32424	39556	34.5	99189	37218	29.2
	AV LEN 99.9, AV AGE 10.2			AV LEN 112.0, AV AGE 11.5			AV LEN 105.8, AV AGE 10.8		
	#OTO'S 5678, #AGED 2404			#OTO'S 336, #AGED 336			#OTO'S 1706, #AGED 600		

(*) INDICATES EXTRAPOLATION FROM AN ADJACENT REGION

APPENDIX III. (continued)

TABLE 2. CATCH IN NUMBERS, CPUE IN NUMBER PER 10,000 SKATES, AND AVERAGE WEIGHT IN POUNDS (DRESSED, HEAD-OFF) AT AGE BY REGIONS, 1981.

	YAKUTAT			KODIAK			CHIRIKOF		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	0	0	0.0	0	0	0.0	0	0	0.0
5	535	124	7.1	0	0	0.0	12	62	6.3
6	2260	522	9.6	1747	291	14.2	89	461	11.5
7	4939	1141	14.5	6530	1089	13.7	315	1632	15.6
8	12794	2955	15.5	17788	2965	19.9	1356	7026	20.2
9	24689	5703	18.9	26282	4381	24.7	1491	7725	24.4
10	21793	5034	22.6	27071	4513	31.1	1475	7642	28.8
11	32087	7412	27.5	32443	5408	36.3	1054	5461	36.5
12	24569	5676	33.4	26311	4386	46.0	936	4850	47.4
13	15653	3616	35.6	26161	4361	52.0	872	4518	48.3
14	11666	2695	44.9	15138	2524	59.9	548	2839	56.5
15	6493	1500	49.8	10110	1685	66.1	466	2415	67.2
16	5142	1188	56.7	5615	936	60.0	340	1762	66.9
17	3646	842	50.3	4746	791	81.6	269	1394	70.4
18	2002	462	77.9	3575	596	96.3	127	658	80.5
19	1017	235	75.2	1234	206	98.5	192	995	87.4
20	1357	313	80.3	2054	342	95.8	59	306	104.2
21+	722	167	123.0	2890	482	108.8	94	487	95.2
TOT	171364	39586	30.6	209695	34957	42.8	9697	50244	39.5
	AV LEN 108.2, AV AGE 11.4			AV LEN 120.0, AV AGE 11.7			AV LEN 117.0, AV AGE 11.3		
	#OTO'S 2692, #AGED 601			#OTO'S 4787, #AGED 600			#OTO'S 783, #AGED 602		

	SHUMAGIN*			ALEUTIANS			BERING SEA		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	0	0	0.0	0	0	0.0	0	0	0.0
5	2	24	6.3	0	0	0.0	47	52	11.5
6	17	202	11.5	0	0	0.0	317	351	11.0
7	60	714	15.6	32	138	13.7	1243	1376	14.0
8	258	3071	20.2	310	1340	17.2	6055	6702	19.8
9	284	3381	24.4	414	1789	20.4	4647	5143	22.4
10	281	3345	28.8	545	2355	25.1	3620	4007	24.9
11	201	2393	36.5	789	3410	28.8	3713	4110	32.8
12	178	2119	47.4	639	2761	29.0	2654	2937	40.1
13	166	1976	48.3	527	2277	33.9	1481	1639	39.8
14	104	1238	56.5	254	1098	38.7	1505	1666	48.7
15	89	1060	67.2	273	1180	44.9	560	620	56.3
16	65	774	66.9	302	1305	48.0	367	406	62.3
17	51	607	70.4	320	1383	52.6	735	814	70.1
18	24	286	80.5	186	804	66.8	437	484	64.3
19	37	440	87.4	176	761	67.3	311	344	76.5
20	11	131	104.2	158	683	64.6	183	203	71.5
21+	18	214	96.4	653	2822	99.0	808	894	99.3
TOT	1848	22000	39.5	5578	24105	43.0	28684	31748	33.0
	AV LEN 117.0, AV AGE 11.3			AV LEN 118.8, AV AGE 14.0			AV LEN 110.3, AV AGE 10.9		
	#OTO'S 783, #AGED 602			#OTO'S 1437, #AGED 598			#OTO'S 1895, #AGED 1103		

(*) INDICATES EXTRAPOLATION FROM AN ADJACENT REGION

APPENDIX III. (continued)

TABLE 2. CATCH IN NUMBERS, CPUE IN NUMBER PER 10,000 SKATES, AND AVERAGE WEIGHT IN POUNDS (DRESSED, HEAD-OFF) AT AGE BY REGIONS, 1981.

	AREA 2A*			AREA 2B			AREA 2C		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	0	0	0.0	103	11	7.3	0	0	0.0
5	15	24	6.3	1922	206	8.0	0	0	0.0
6	236	382	12.5	8248	885	9.6	1094	398	10.7
7	431	697	11.9	17210	1847	11.6	4351	1585	11.2
8	1448	2341	13.3	33449	3590	13.9	17130	6240	13.4
9	1732	2800	14.5	42217	4531	17.5	26902	9799	17.7
10	1134	1833	17.4	33747	3622	21.6	20058	7306	22.8
11	854	1381	24.7	28184	3025	25.2	18765	6835	30.4
12	714	1154	25.2	18291	1963	29.9	14191	5169	37.0
13	485	784	27.8	12786	1372	35.0	7811	2845	42.1
14	586	947	35.3	11694	1255	40.9	5741	2091	51.0
15	508	821	30.3	6686	718	44.4	4414	1608	57.8
16	236	382	60.1	4981	535	53.9	4015	1462	66.1
17	128	207	58.6	3626	389	50.5	1739	633	58.8
18	132	213	61.6	2715	291	69.6	2436	887	76.3
19	69	112	62.9	1186	127	74.6	730	266	93.8
20	77	124	39.2	854	92	82.4	923	336	78.1
21+	31	50	110.3	1467	157	102.7	1290	470	93.8
TOT	8824	14267	22.9	229371	24619	24.6	131604	47936	30.5
	AV LEN 98.2, AV AGE 10.8			AV LEN 100.5, AV AGE 10.4			AV LEN 107.3, AV AGE 10.9		
	#OTO'S 593, #AGED 593			#OTO'S 7102, #AGED 3828			#OTO'S 2042, #AGED 936		

	AREA 2 TOTAL			AREA 3A			AREA 3B		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	106	8	7.3	0	0	0.0	0	0	0.0
5	2170	170	7.8	535	52	7.1	15	54	6.3
6	9696	762	9.5	4007	388	11.6	106	383	11.5
7	22668	1781	11.5	11469	1111	14.0	375	1354	15.6
8	51281	4029	13.6	30582	2961	18.1	1614	5827	20.2
9	70730	5557	17.7	50971	4935	21.9	1776	6412	24.4
10	54780	4304	22.1	48864	4731	27.3	1756	6339	28.8
11	48488	3810	27.2	64530	6248	31.9	1255	4531	36.5
12	32545	2557	33.0	50881	4927	39.9	1115	4025	47.4
13	20892	1641	37.7	41814	4049	45.8	1038	3747	48.3
14	17596	1383	44.1	26804	2595	53.4	653	2357	56.5
15	11529	906	50.4	16603	1608	59.7	555	2004	67.2
16	9264	728	58.5	10757	1042	58.4	405	1462	66.9
17	5653	444	52.4	8392	813	68.0	320	1155	70.4
18	5463	429	70.1	5577	540	89.7	151	545	80.5
19	1911	150	82.1	2251	218	88.0	229	827	87.4
20	1814	143	81.6	3411	330	89.7	71	256	104.2
21+	2730	214	98.3	3612	350	111.7	112	404	95.4
TOT	369316	29017	26.7	381059	36897	37.3	11545	41679	39.5
	AV LEN 103.0, AV AGE 10.6			AV LEN 114.7, AV AGE 11.5			AV LEN 117.0, AV AGE 11.3		
	#OTO'S 9144, #AGED 4764			#OTO'S 7479, #AGED 1201			#OTO'S 783, #AGED 602		

(*) INDICATES EXTRAPOLATION FROM AN ADJACENT REGION

APPENDIX III. (continued)

TABLE 2. CATCH IN NUMBERS, CPUE IN NUMBER PER 10,000 SKATES, AND AVERAGE WEIGHT IN POUNDS (DRESSED, HEAD-OFF) AT AGE BY REGIONS, 1981.

	AREA 3 TOTAL			AREA 4 TOTAL			ALL AREAS		
AGE	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT	CATCH	CPUE	AVE WT
1	0	0	0.0	0	0	0.0	0	0	0.0
2	0	0	0.0	0	0	0.0	0	0	0.0
3	0	0	0.0	0	0	0.0	0	0	0.0
4	0	0	0.0	0	0	0.0	106	4	7.3
5	549	52	7.1	47	41	11.5	2767	113	7.7
6	4113	388	11.6	317	279	11.0	14127	577	10.2
7	11844	1117	14.1	1275	1123	14.0	35787	1463	12.4
8	32196	3036	18.2	6365	5608	19.7	89841	3672	15.7
9	52747	4974	22.0	5061	4459	22.3	128538	5254	19.6
10	50620	4773	27.4	4165	3670	24.9	109565	4478	24.7
11	65784	6203	32.0	4503	3968	32.1	118775	4854	30.1
12	51995	4903	40.1	3293	2902	38.0	87834	3590	37.4
13	42852	4041	45.9	2008	1769	38.3	65752	2687	43.1
14	27456	2589	53.4	1759	1550	47.2	46811	1913	49.7
15	17158	1618	60.0	834	735	52.5	29521	1207	56.0
16	11162	1053	58.7	669	589	55.8	21094	862	58.5
17	8712	822	68.1	1055	930	64.8	15419	630	62.1
18	5728	540	89.4	623	549	65.0	11814	483	79.2
19	2480	234	87.9	487	429	73.2	4878	199	84.2
20	3482	328	90.0	341	300	68.4	5636	230	86.0
21+	3725	351	111.2	1460	1286	99.2	7916	324	104.5
TOT	392604	37022	37.4	34262	30189	34.6	796182	32541	32.3
	AV LEN 114.8, AV AGE 11.5			AV LEN 111.7, AV AGE 11.4			AV LEN 109.2, AV AGE 11.1		
	#OTO'S 8262, #AGED 1803			#OTO'S 3332, #AGED 1701			#OTO'S 20738, #AGED 8268		

(*) INDICATES EXTRAPOLATION FROM AN ADJACENT REGION

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