INTERNATIONAL PACIFIC HALIBUT COMMISSION

Annual Report
1989

Established by a Convention between
Canada and the United States of America

Seattle, Washington
1990

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 the 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 IPHC commissioners are appointed by the governor general of Canada and three by the president of the United States. Each country pays one-half of the Commission's annual expenses, as required by the Halibut Convention. The commissioners appoint the director who supervises the scientific and administrative staff. The scientific staff collects and analyzes the statistical and biological data needed to manage the halibut fishery. The IPHC headquarters and laboratory are located on the campus of the University of Washington in Seattle, Washington.

Cover: Canadian vessels tied up in Prince Rupert between halibut openings.

The Commission meets annually to review all regulatory proposals, including those made by the scientific staff and the Conference Board, which represents vessel owners and fishermen. The measures recommended by the Commission are submitted to the two governments for approval. Upon approval, the regulations are enforced by the appropriate agencies of both governments.

The International Pacific Halibut Commission publishes three serial publications: Annual Reports (U.S. ISSN 0074-7238), Scientific Reports—formerly known as Reports—(U.S. ISSN 0074-7246), and Technical Reports (U.S. ISSN 0579-3920). Until 1969, only the Report series was published; the numbering of that series has been continued with the Scientific Reports.

Unless otherwise indicated, all weights in this report are dressed weight (eviscerated, head-off). Round (live) weight may be calculated by multiplying the dressed weight by a factor of 1.33.

INTERNATIONAL PACIFIC HALIBUT COMMISSION
P.O. BOX 95009
SEATTLE, WASHINGTON 98145-2009 U.S.A.

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ACTIVITIES OF THE COMMISSION

In 1989, the Commission held several meetings, including its annual meeting in Vancouver, British Columbia, an interim meeting in Seattle, Washington, and several telephone conference calls throughout the summer. This section summarizes the activities of the Commission during these occasions.

ANNUAL MEETING

The 65th Annual Meeting of the Commission was held on January 23-27, 1989, with Mr. Dennis N. Brock presiding as chairman and Mr. James W. Brooks as vice chairman. The Commission staff reviewed the 1988 Pacific halibut fishery, summarized the results of the 1988 scientific investigations, and presented its regulatory proposals for the 1989 fishery. The Conference Board, representing vessel owners and fishermen, also presented its regulatory proposals to the Commission. In addition, the Commission received proposals from the U.S. Pacific and North Pacific Fishery Management Councils pertaining to allocating the halibut resource among fishing groups.

Also during the meeting, the Commission considered administrative and fiscal matters, approved research plans for 1989, and adopted the budget for fiscal year 1991-1992. The new U.S. government commissioner, Mr. Steven Pennoyer of Juneau, Alaska, was elected chairman for 1989 and Mr. Brock was elected vice chairman. After the meeting, the Commission issued a news release summarizing the regulations that were being recommended to the governments.

Following the meeting a letter was sent to each government expressing concern for increasing mortality of juvenile halibut in the groundfish fisheries in the Gulf of Alaska and Bering Sea. The letter noted that catch limits for the halibut fishery were reduced to compensate for bycatch mortality and solicited the cooperation of the governments in developing and implementing effective conservation measures.

In a separate letter, the Commission summarized its regulatory decisions and expressed concern for the problems created because of uncontrolled fishing effort in the United States. The Commission also expressed its appreciation to other government agencies that were involved in the development of the 1989 regulations.

Regulatory Proposals for 1989

The Commission received regulatory proposals for the 1989 halibut fishery from fishermen, vessel owners, processors, government agencies, and the Commission's scientific staff. A summary of all proposals and their sources was distributed to all interested groups prior to the annual meeting.

The Commission's staff recommended a total catch limit of 64.65 million pounds for 1989 compared to the 1988 total catch limit of 74.15 million pounds; both these limits include the Area 2A recreational fishery. The staff recommendations by regulatory area were as follows: Area 2A - 0.65 million pounds; Area 2B - 10.0 million pounds; Area 2C - 9.5 million pounds; Area 3A - 31.0 million pounds; Area 3B - 8.5 million pounds; Area 4A - 1.8 million pounds; Area 4B - 1.9 million pounds; Area 4C - 0.6 million pounds; Area 4D - 0.6 million pounds; and Area 4E - 0.1 million pounds.

Further, the staff developed two options for fishing periods in 1989. The

first option provided a series of short periods chosen to provide landings over an extended period while avoiding fishing on large tides, landings on weekends and holidays, and conflicts with other fisheries. The second option would allow fishing to occur for two weeks each month. This would require dividing the catch limit in each area into monthly catch limits and restricting each vessel's landings during the month.

The Conference Board met during the first three days of the annual meeting. The Board proposed the following catch limits for 1989: Area 2A - 0.75 million pounds; Area 2B - 12.0 million pounds; Area 2C - 9.5 million pounds; Area 3A - 31.0 million pounds; Area 3B - 8.5 million pounds; Area 4A - 1.9 million pounds; Area 4B - 2.0 million pounds; Area 4C - 0.7 million pounds; Area 4D - 0.7 million pounds; and Area 4E - 0.1 million pounds.

The Conference Board was opposed to the staff proposal for monthly catch limits and proposed a series of short fishing periods for each area.

The Conference Board also recommended that the prohibition of hook-strippers be continued, that trip limits not be used unless needed to avoid exceeding the catch limit, and that the possession limit in the recreational fishery in Alaska be increased to include a 2-day bag limit.

After discussing all proposals with the staff and other advisors, the Commission adopted the regulations which were recommended to the Canadian and United States governments. The regulations were approved by the United States Secretary of State and the Governor General of Canada and are summarized below and in later sections of this annual report.

Summary Of Major Regulatory Decisions

(1) Recommended catch limits for the 1989 fishery totaling 64.65 million pounds.

(2) Proposed fishing periods for the commercial fishery.

(3) Adopted allocation regulations for Area 2A that divided the catch among the commercial, treaty Indian, and recreational fisheries. These regulations were developed and recommended by the Pacific Fishery Management Council.

(4) Adopted allocation regulations for Areas 4C and 4E that included fishing periods and trip limits. These regulations were developed and recommended by the North Pacific Fishery Management Council.

(5) Agreed to continue a procedure for setting fishing period limits by vessel size class to be used for "cleanup" fishing periods. The procedure was developed by the Conference Board.

(6) Approved regulations for the recreational fishery.

INTERIM MEETING

The Commission met on November 21, 1989, in Seattle, Washington with Mr. Steven Pennoyer presiding as chairman. The staff reviewed the 1989 fishery and management actions taken during 1989.

The Commission reviewed 1989 management actions and proposed research programs for 1990. Particular attention was given to stock assessment results indicating a declining halibut resource and the effect of bycatch in the

Alaskan groundfish fisheries on the halibut fishery and resource. The Commission agreed to meet with the North Pacific Fishery Management Council in January, 1990 to discuss issues of mutual concern.

OTHER ACTIVITIES

A list of reports published by the Commission staff during 1989 appears later in this annual report. The staff also prepared various documents at the request of the governments. The staff assisted in the development of fishery management plans for the United States fishery management councils.

Expenditures during the 1988-1989 fiscal year (April, 1988 through March, 1989) were $1,547,889. The Commission expenses were shared equally by Canada and the United States as required by the Halibut Convention.

DIRECTOR'S REPORT

The year 1989 began with the Commission sharply reducing catch limits for the first time in a decade. Halibut stocks appear to have peaked in 1986 and by 1989, a decline in both juvenile and adult abundance was apparent in the staff's assessment of the resource. Part of the decline can be attributed to the rising bycatch in the domestic groundfish fishery, and another period of lower natural productivity. Periods of low productivity have occurred in the past and must be expected in the future. The Commission's management policy of only allowing a harvest of up to 35 percent of the adult exploitable biomass should prevent a collapse in stocks, but lower stock abundance and catch limits are probably inevitable over the next few years.

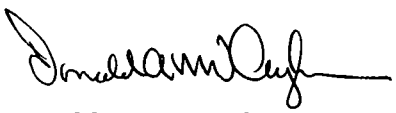
The bycatch of halibut in other groundfish fisheries remains a major problem. The bycatch by the present domestic fleet is now double what the foreign fleets were taking in the mid-1980s for the same quantity of groundfish. The Commission staff believes that the domestic fleet should be encouraged to fish as cleanly as the foreign fleets were able to. This can be accomplished if the current "olympic system" is replaced by a rational management scheme and if a reasonable set of incentive regulations are adopted.

Donald A. McCaughran
Director

Considerable staff effort in 1989 was devoted to developing methods of controlling bycatch by working with the U.S. National Marine Fisheries Service and the North Pacific Fishery Management Council to institute effective regulations. We believe progress was made, but further improvement must still occur before the Commission conservation and management goals can be attained.

In the spring of 1989, the Commission research efforts were diverted to assessing the effect of the EXXON VALDEZ oil spill. An April-May survey showed that adult halibut avoided any contamination but it remains to be seen if the spill will have a longer term effect on future halibut production.

A number of major research projects were initiated in 1989 that will serve to improve annual estimates of stock abundance and lead to a better determination of appropriate harvest levels. A goal of our stock assessment is to be able to separate the sexes in the analysis. The staff is convinced that the sex ratio of the catch, and perhaps age composition of the catch for each sex, can be determined from the length, weight, and age of otoliths collected in our port sampling program. We hope to be able to estimate the sex ratio of the catch in earlier years. This will enable us to analyze the effect of size limit changes and exploitation rates on sex composition. Plans were also laid for an ambitious research effort in 1990 including participating on the National Marine Fisheries Service triennial trawl survey in the Gulf of Alaska.



Donald A. McCaughran
Director

COMMISSION STAFF

This year we have included a photo of the commission staff. Many people only see the field personnel during the course of the year and may be surprised at our actual staff size.

Davis Freeman, University Photography

First Row — *(left to right)* Ken Exelby, Linda Shen, Don McCaughran, Steve Hoag, Heather Gilroy, Cal Blood

Second Row — *(left to right)* Gregg Williams, Ian McGregor, Tracee Geernaert, Chris Carr, Gerry Lariviere.

Third Row — *(left ro right)* Gilbert St-Pierre, Tom Henchman, Bob Trumble, Phil Neal, Kregg Foote, Joan Forsberg.

Fourth Row — *(left to right)* Bill Clark, Jan Flagg, Steve Kaimmer, Gordon Peltonen, Cynthia Doyer, Pat Sullivan, Bernard Vienneau.

Missing from the photo is Phyllis Severeid.

THE FISHERY

The Pacific halibut resource is harvested by commercial and recreational fisheries and is also taken incidentally in fisheries targeting on other species. The following sections present the results of the 1989 commercial and recreational fisheries. In addition, information of the incidental catch of halibut during 1978-1989 is provided.

COMMERCIAL FISHERY

Regulatory Areas for 1989

Regulatory areas for the 1989 commercial halibut fishery are shown in Figure 1. Boundary lines for the regulatory areas are the same as in 1988. The southeastern flats in Bering Sea remained closed in 1989 to all halibut fishing. A brief description of the regulatory areas for the 1989 halibut fishery is as follows:

Area 2A — all waters off California, Oregon, and Washington.
Area 2B — all waters off British Columbia.
Area 2C — all waters off Alaska, south and east of Cape Spencer.
Area 3A — all waters between Cape Spencer and Cape Trinity, Kodiak Island.
Area 3B — all waters between Cape Trinity and a line extending southeast from Cape Lutke, Unimak Island.

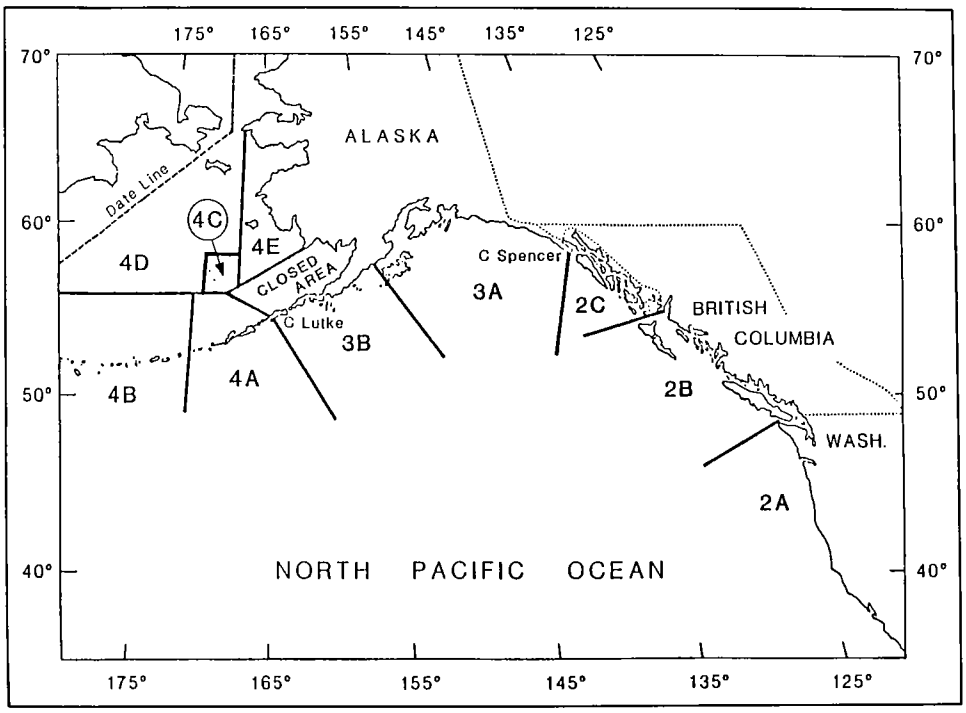


FIGURE 1.
Regulatory areas for the 1989 Pacific halibut fishery.

Area 4A — all waters west of Area 3B and of the Bering Sea closed area, south of 56°20′ N. and east of 172°00′ W.
Area 4B — all waters west of Area 4A and south of 56°20′ N.
Area 4C — all waters in the Bering Sea north of Area 4A and a line running from Cape Newenham to a point at latitude 56°20′N., longitude 168°30′ W., which are east of longitude 171°00′ W., south of latitude 58°00′ N., and west of longitude 168°00′ W.
Area 4D — all waters in the Bering Sea north of Areas 4A, 4B, and 4C, and west of longitude 168°00′ W.
Area 4E — all waters in the Bering Sea north of the closed area, east of Areas 4C and 4D, and south of 65°34′ N.

Other Regulations in 1989

The Commission continued a policy of flexibility in establishing and modifying regulations within the fishing season and specifically indicated that the June fishing period in Area 2B would be eliminated, if need be, to ensure fishing in September in that area.

The Commission adopted a catch sharing plan developed for Area 2A by the Pacific Fishery Management Council (PFMC). Area 2A was managed to provide a maximum total allowable catch for all user groups of 650,000 pounds. This catch limit was sub-divided as follows: to the non-Indian commercial fishery, 274,000 pounds; to the treaty Indian fishery, 152,000 pounds; and to the recreational fishery, 224,000 pounds.

The Commission established fishing period limits in Areas 4C and 4E where allocation regulations were recommended by the North Pacific Fishery

TABLE 1.
Commercial catch of Pacific halibut by regulatory area, 1985-1989, in thousands of pounds.

Regulatory Area	1985	1986	1987	1988	1989[1]
2A	493	581	592	486	472
2B	10,389	11,225	12,246	12,858	10,110
2C	9,207	10,611	10,685	11,369	9,550
3A	20,852	32,790	31,316	37,862	33,733
3B	10,888	8,831	7,758	7,082	7,827
4A	1,711	3,381	3,713	1,930	1,025
4B	1,236	261	1,501	1,593	2,653
4C	620	686	878	707	571
4D	681	1,223	703	453	674
4E	36	43	90	9	13
Total	56,113	69,632	69,482	74,349	66,628

[1]Preliminary.

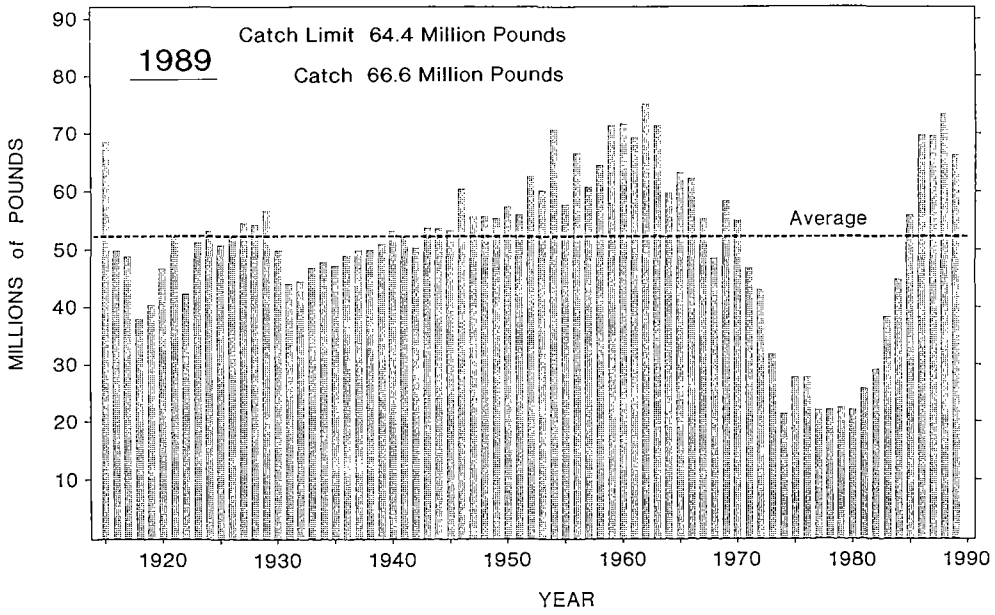


FIGURE 2.
Commercial catch of Pacific halibut, 1915-1989, in millions of pounds.

Management Council (NPFMC). Area 4C had a fishing period limit for all vessels of 10,000 pounds until 50 percent of the catch limit was taken, after which the fishing period limit was increased to 20,000 pounds. A fishing period limit of 6,000 pounds was in effect for fishing in Area 4E throughout the season.

Catch Limits, Commercial Catches, and Seasons

The commercial catch by regulatory area for 1985 through 1989 is shown in Table 1. A more detailed summary of the 1989 seasons and catches for each regulatory area is provided in Table 2.

The total 1989 commercial catch of halibut off the Pacific coast was 66.6 million pounds. Although this is the lowest catch of the last few years, the 1989 harvest was the fourth highest since 1963, and well above the 1915-1989 average catch of 52.2 million pounds (Figure 2). The 1989 commercial catch limit of 64.4 million pounds was exceeded by 2.2 million pounds, or 3.4 percent. The resource is currently even more productive than indicated by the commercial harvest: the recreational catch, bycatch, and wastage of 5.8, 13.6, and 3.4 million pounds, respectively, brings the total 1989 removals to over 89 million pounds.

The value of the commercial catch was $102 million (U.S.), the second highest value recorded in the history of the fishery. Fishermen received an average price of $1.53 per pound, with halibut over 60 pounds receiving a higher price than smaller halibut. A change from the normal trend of higher prices in the southern ports occurred during the May Area 2B opening when higher prices were paid in Prince Rupert than in Vancouver.

TABLE 2.
Summary of the 1989 commercial fishery catch of Pacific halibut in each regulatory area by fishing period. (Preliminary)

Area	Catch Limit (millions lbs.)	Opening Date		Closing Date		Fishing Days	Catch (000's lbs)
2A	0.274	June	27	June	29	2	330
	0.152[1]	Mar.	1	Oct.	13	226	142
						228	472
2B	10.0	Apr.	25	May	3	8	7,167
		Sept.	9	Sept.	12	3	2,943
						11	10,110
2C	9.5	May	15	May	16	1	3,489
		June	12	June	13	1	4,557
		Sept.	7	Sept.	8	1	1,504
						3	9,550
3A	31.0	May	15	May	16	1	6,527
		June	12	June	13	1	10,090
		Sept.	7	Sept.	8	1	9,392
		Oct.	10	Oct.	11	1	7,724
						4	33,733
3B	8.5	May	15	May	16	1	1,009
		June	12	June	13	1	2,733
		Sept.	7	Sept.	8	1	2,387
		Oct.	10	Oct.	11	1.25	1,698
						4.25	7,827
4A	1.8	May	15	May	16	1	13
		June	12	June	13	1	83
		Aug.	11	Aug.	12	1	852
		Sept.	7	Sept.	8	1	77
						4	1,025
4B	1.9	May	15	May	17	2	1
		May	27	May	28	1	2
		June	3	June	4	1	5
		June	12	June	14	2	8
		June	17	June	18	1	2
		June	24	June	25	1	4
		July	22	July	23	1	313
		July	29	July	30	1	408
		Aug.	9	Aug.	13	4	1,910
						14	2,653
4C	0.6	June	12	July	7	13[2]	571
4D	0.6	Aug.	8	Aug.	14	6	674
4E	0.1	May	26	Aug.	11	52[3]	5
		Aug.	12	Oct.	31	80	8
						132	13
Total	64.426						66,628

[1]Treaty Indian fishery: 142,000 pounds commercial, 10,000 pounds ceremonial and subsistence.
[2]13 1-day fishing periods.
[3]26 2-day fishing periods.

More halibut was landed in Kodiak than any other port; 16.5 million pounds. Homer has been the second highest port in the U.S since 1986, and accounted for almost 8.0 million pounds in 1989. Over 3 million pounds were landed in Vancouver, which makes it the top port in Canada; Prince Rupert accounted for 2.6 million pounds in 1989. Table 3 lists the landings in the major ports.

TABLE 3.
Commercial landings in 1989 of Pacific halibut by port and country, in thousands of pounds. (Preliminary)

Port	Canada	United States	Total
California & Oregon	—	749	749
Seattle	61	2,410	2,471
Bellingham/Blaine	1,865	778	2,643
Misc. Washington	—	755	755
Vancouver	3,243	—	3,243
Prince Rupert	2,513	62	2,575
Misc. B.C.	2,428	—	2,428
Ketchikan/Craig	—	1,766	1,766
Wrangell	—	617	617
Petersburg	—	2,815	2,815
Juneau	—	632	632
Sitka	—	3,857	3,857
Hoonah/Excursion Inlet/ Pelican/Yakutat	—	3,815	3,815
Misc. SE Alaska	—	568	568
Cordova	—	1,066	1,066
Seward	—	4,454	4,454
Homer	—	7,963	7,963
Kenai	—	1,052	1,052
Kodiak	—	16,482	16,482
Alitak/King Cove/ Sand Point	—	2,757	2,757
Misc. Central Alaska	—	1,229	1,229
Akutan/Dutch Harbor	—	2,338	2,338
Misc. Bering Sea	—	353	353
Total	10,110	56,518	66,628

IPHC issued more than 6,600 commercial licenses in 1989. The Canadian fleet has limited entry and only 435 vessels are allowed licenses. In the United States, where there is no license limitation, 6,263 licenses were issued. The size of both fleets was about the same as in 1988.

While most Canadian licenses are active, the number of licenses in the U.S. does not reflect the number of vessels landing halibut, as only 62 percent of the licensed U.S. boats reported halibut landings. Although the EXXON VALDEZ oil spill did not close the halibut fishery, some vessels were employed by the oil company during the halibut seasons on cleanup charters, probably

reducing the number of active licenses. The fleet size in the Alaska fishery increased from May to September, as the number of vessels participating in the oil cleanup decreased.

Fishing seasons in all areas consisted of a series of fishing periods, each of specific length. When further fishing would surpass the catch limit for an area, it was closed to commercial halibut fishing and subsequent fishing periods were canceled. Fishing periods in all regulatory areas began and ended at 1200 hours local time, with the exception of the Area 3B October 10th fishing period. This fishing period began at 9:00 a.m. and ended at 3:00 p.m. local time.

Regulatory Area Trends

A summary of the catch by regulatory area and fishing period is provided in Table 2 and highlights of the 1989 fishery by regulatory area are given below.

Area 2A had a catch sharing plan developed by the Pacific Fishery Management Council to allocate the 650,000 pound total catch limit among non-treaty commercial, recreational, and treaty Indian fisheries. The non-treaty commercial catch of 330,000 pounds exceeded the 274,000 pound catch limit in one 2-day fishing period. The catch represents a daily catch rate of 165,000 pounds. The Indian commercial catch of 142,000 pounds was reached October 13, with the remaining 10,000 pounds reserved for ceremonial and subsistence fishing.

In Area 2B, the 10.1 million pound catch exceeded the catch limit by 100,000 pounds. The number of fishing days has been declining steadily over the past few years and the 1989 catch was taken in 2 fishing periods with a total of 11 days of fishing. A scheduled June fishing period was canceled to allow for September fishing. The daily catch rate during the short three-day September season was nearly a million pounds a day.

The 9.5 million pound catch limit in Area 2C was attained in three days of fishing. The third fishing period, which occurred in September, required fishing period limits in an attempt to prevent exceeding the catch limit. The fishing period limits by vessel length categories (Table 4) were calculated from previous catches and adjusted by anticipated fleet size to obtain the 1.5 million pounds remaining in the catch limit.

TABLE 4.
Fishing period limits by vessel class for the Area 2C September opening in 1989.

Vessel Class		
Length (feet)	**Letter**	**Fishing Period Limit**
0-25	A	900 lbs.
26-30	B	1,200 lbs.
31-35	C	2,100 lbs.
36-40	D	2,900 lbs.
41-45	E	4,800 lbs.
46-50	F	6,100 lbs.
51-55	G	6,100 lbs.
56+	H	7,000 lbs.

The combined catch limit of Areas 3A and 3B of 39.5 million pounds was exceeded by two million pounds. Areas 3A and 3B are managed by the combined amount, but separate catch limits exist for each area to ensure a broad distribution of the catch. The catch of Area 3A exceeded the catch limit by three million pounds and the catch of Area 3B was under the catch limit by one million pounds. The Area 3A and 3B catches were taken in 4 and 4.25 days, respectively. The Area 3B season was lengthened by 6 hours for the October opening to encourage vessels to shift from Area 3A to Area 3B. This may have encouraged some boats to shift areas but the Area 3B catch still fell short of the catch limit, probably due to the poor weather conditions west of Kodiak.

Areas 4A and 4B were also managed with a combined catch limit, although catch limits are set for each area. In 1989, additional openings in June and July were scheduled in Area 4B at the request of the North Pacific Fishery Management Council to provide greater fishing opportunity for resident fishermen. As a result, the resident fishermen caught 25,000 more pounds in 1989 than in 1988. An unexpectedly large participation by non-resident vessels occurred during the July and August fishing periods causing the 1.9 million pound catch limit to be exceeded by 750,000 pounds. The combined Area 4A-4B catch limit of 3.7 million pounds was nearly met as the Area 4A harvest was under the 1.8 million pound catch limit by 775,000 pounds.

Area 4D had one six-day fishing period which overlapped with the August seasons in Areas 4A and 4B. The 600,000 pound catch limit was exceeded by 74,000 pounds as eleven vessels caught 674,000 pounds.

In Areas 4C and 4E, the Commission adopted allocation regulations recommended by the North Pacific Fishery Management Council. Area 4C had ten 1-day fishing periods with a 10,000 pound fishing period limit and a 20,000 pound limit on the last three fishing periods. Bad weather during the last three fishing periods lowered the catch by residents but had little effect on the larger non-resident vessels. The percentage of the catch caught by local residents declined from 70 percent in 1988 to 50 percent in 1989.

Area 4E had a 6,000 pound fishing period limit along with restricted fishing periods. Only 13,000 pounds of the 100,000 pound catch limit was taken, 5,000 pounds by the resident fishermen, and 8,000 pounds by non-resident vessels. The low catch by local fishermen was apparently the result of a local fuel shortage.

RECREATIONAL FISHERY

The catch in the 1989 recreational fishery was estimated at 5.8 million pounds, continuing a decade-long trend of increasing harvests. Most notable is the recreational fishery in Area 3, where the estimated harvest has increased dramatically since the early 1980s and was almost 4 million pounds in 1989 (Figure 3). The majority of the fish are harvested in lower Cook Inlet, with Homer the principal port of landing. Significant fisheries also occur at Deep Creek on the Kenai Peninsula, Seward, and Kodiak. The estimated catch for Area 2C was almost 1.2 million pounds in 1989. The trend in the Area 2C harvest has been consistently upward since the early 1980s, but at a slower rate than Area 3. Recreational fishing in Area 4 is minimal and confined

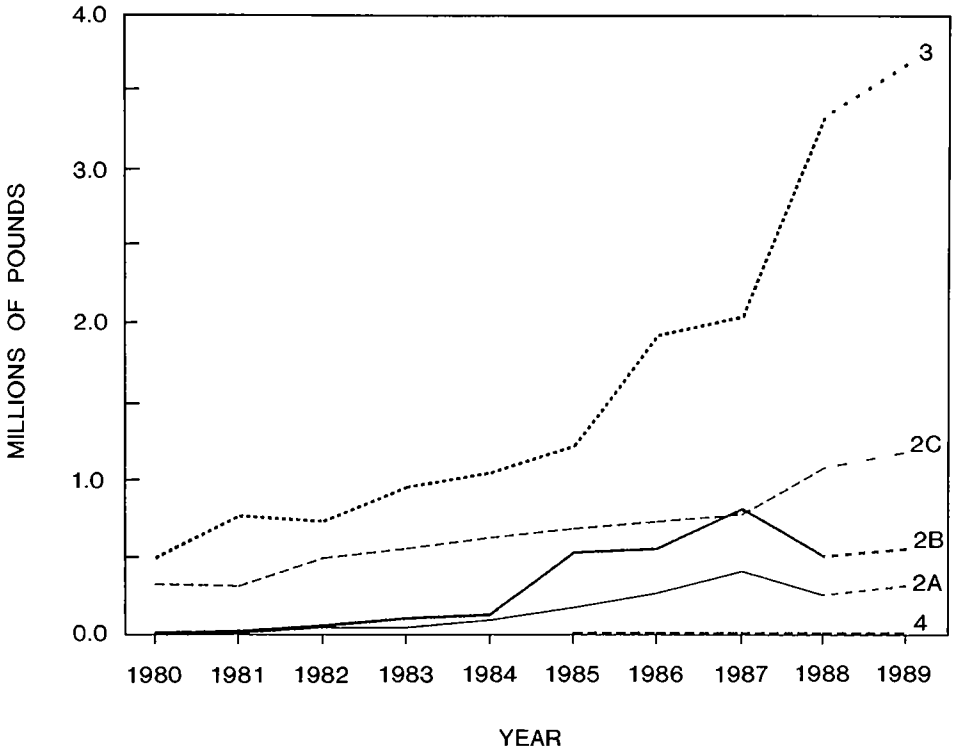


FIGURE 3.
Catch by recreational fishermen 1980-1989, in millions of pounds. 1989 catch figures are projections, except in Area 2A.

primarily to the naval station on Adak Island and a few communities on Bristol Bay.

The recreational catch in Area 2B was estimated at almost 0.6 million pounds in 1989, down from the peak of 0.8 million pounds in 1987. Some of the decrease in the harvest in Area 2B may be the result of new methods of estimation, but there is little doubt that harvest levels have increased above

TABLE 5.
1989 recreational fishery allocations and harvest estimates (pounds) by subarea within Regulatory Area 2A.

Sub-Area	Allocation	Estimated Harvest
Washington		
Puget Sound	78,000	41,000
North Coast	87,000	149,000
South Coast	2,000	5,000
Oregon-California	57,000	135,000
Total	224,000	330,000

the level of the early 1980s, particularly off Barkley Sound on the west coast of Vancouver Island and near Langara Island in Dixon Entrance.

In Area 2A the 1989 recreational harvest was estimated at 330,000 pounds (Table 5). The fishery in this area grew at a rapid pace from 1984 to 1987, but has since been controlled as part of the allocation regulations developed by the Pacific Fishery Management Council. In 1989, seasons were established to specifically limit the harvest in various subareas of Area 2A. In three of the four subareas, the catch allocation was exceeded. The total catch allocation of 224,000 pounds was exceeded by 47 percent. As seasons are compressed, daily fishing effort increases and this increase must be accounted for in controlling the harvest level. Popular fishing grounds in Area 2A include the Strait of Juan de Fuca and Swiftsure Bank in Washington and Heceta Bank and Stonewall Bank in Oregon.

Recreationally caught halibut tend to be smaller than those caught in the commercial fishery. Size varies with area, but averages less than 20 pounds.

INCIDENTAL CATCH AND MORTALITY

Pacific halibut are caught inadvertently in fisheries targeting on various groundfish and shellfish species, and estimates of this incidental catch indicate the removals reached 13.6 million pounds of mortality in 1989. The International Pacific Halibut Commission is supplied with estimates of the incidental catch in foreign and joint venture fisheries by the U.S. National Marine Fisheries Service through the Observer Program. Bycatch in the fully domestic U.S. fishery is estimated with statistical procedures or fixed rates that have been

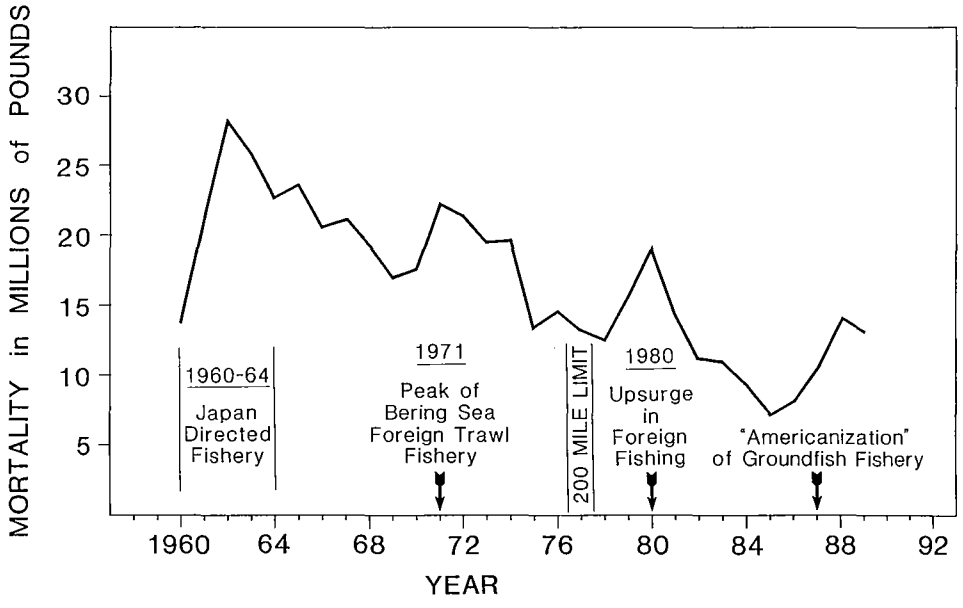


FIGURE 4.
Incidental mortality of Pacific halibut since 1960.

evaluated by IPHC staff. Estimates of bycatch in other fisheries are generated by IPHC staff from information collected on research surveys or through predictive models.

Current Estimates of Incidental Mortality

International Pacific Halibut Commission regulations allow retention of halibut only with hook and line gear and during open seasons. North Pacific Fishery Management Council (NPFMC) regulations require that all halibut caught as bycatch be returned to the sea in as good a condition as possible. Most halibut that are incidentally caught are injured to some degree during the capture process. However, not all fish which are returned to the sea die, so the incidental mortality is less than the actual catch.

Historically, halibut incidental mortality was relatively small until the 1960s, when it increased rapidly due to the sudden influx of foreign fishing vessels off the North American coast (Figure 4). Directed halibut harvest in the Bering Sea by Japan is included. The total incidental mortality peaked in 1962 at about 25 million pounds. Halibut bycatch declined during the 1960s, but increased to about 20 million pounds in the early 1970s. The bycatch dropped to a 13 million pound level during the late 1970s and early 1980s. By 1985, the incidental mortality declined to 7 million pounds, the lowest level in recent history. However, incidental mortality has increased since 1985 and was 13.6 million pounds in 1989. By area, the 1989 bycatch mortality is estimated at 2.0 million pounds in Area 2, 4.2 million pounds in Area 3, and 7.4 million pounds in Area 4 (Figure 5). Estimates of the incidental mortality for 1978-1989 are shown in Table 6.

The recent increase in incidental mortality occurred despite a reduction in foreign fishing off Alaska and is attributed to increased mortality by joint venture and fully domestic groundfish fisheries. The objectives of U.S. extended jurisdiction legislation included fully "Americanizing" the groundfish fisheries in U.S. waters. The North Pacific Fishery Management Council adopted policies and regulations that encouraged joint ventures between domestic catcher vessels and foreign processors when U.S. processing capacity was insufficient. As domestic processing increased, both through at-sea processing vessels and shore-side plants, harvest priorities shifted to fully domestic operations. As the mix of foreign, joint venture, and fully domestic fishing has changed over the past several years, so has the source of bycatch mortality.

The NMFS provides estimates of foreign and joint venture bycatch from a comprehensive observer program required by the Magnuson Fishery Conservation and Management Act. No such requirements have applied to the fully domestic fishery, and bycatch estimates are made indirectly rather than with complete observer coverage. Representatives of IPHC and NMFS developed a statistical method of estimating bycatch rates in the Bering Sea/Aleutian Islands for the fully domestic fishery using observer data from the 1986-1988 joint venture fisheries. The procedure calculated species-specific coefficients that, when multiplied by the catch of groundfish species, estimates the bycatch for that species. This procedure was used in 1989 for the Bering Sea fishery. Bycatches in the Gulf of Alaska groundfish fisheries are estimated from assumed rates for longline, bottom trawl, and groundfish pot gears.

Different fishing gear or techniques cause different mortality rates on the

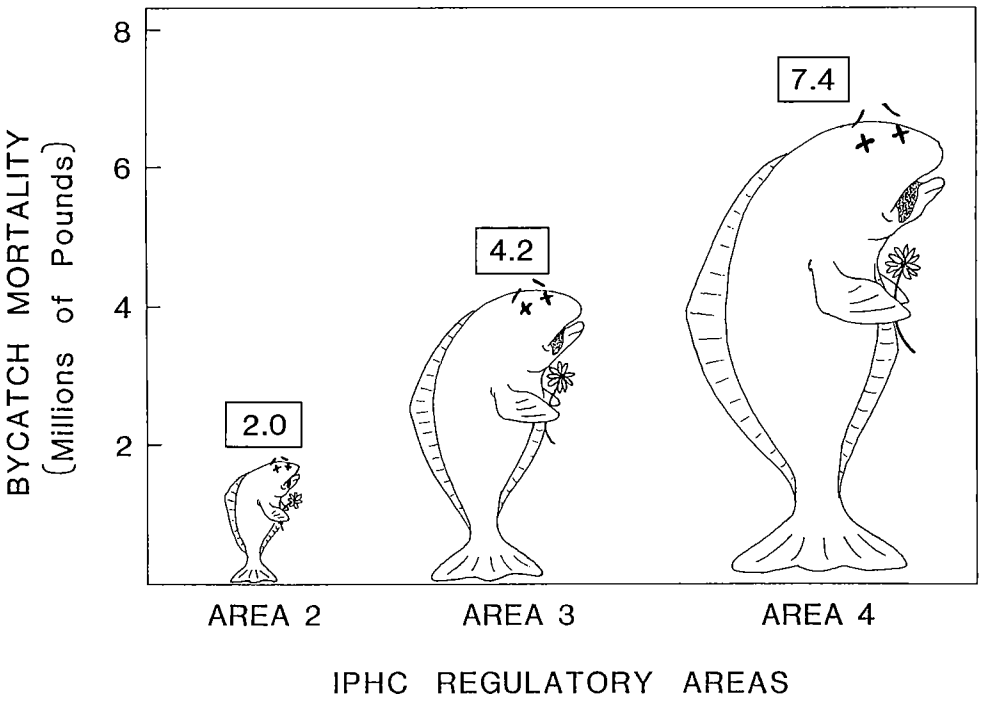


FIGURE 5.
1989 halibut bycatch mortality by IPHC regulatory area.

TABLE 6.
Estimated incidental mortality of Pacific halibut by IPHC regulatory area and year for 1978-1989. Estimates are in the thousands of pounds, net weight, and are preliminary for 1989.

	IPHC Regulatory Area					Coast-wide
Year	2A	2B	2C	3	4	Total
1978	2	1,471	377	4,895	5,023	11,768
1979	1	1,852	821	6,715	5,419	14,808
1980	1	1,372	520	7,099	9,235	18,227
1981	tr	1,188	507	6,282	6,408	14,385
1982	tr	867	302	5,972	4,756	11,898
1983	1	943	304	4,892	4,269	10,408
1984	tr	1,074	302	3,647	4,692	9,714
1985	tr	1,139	301	1,578	4,207	7,225
1986	1	1,161	303	1,246	5,576	8,287
1987	tr	1,649	303	3,113	5,738	10,803
1988	1	1,679	303	3,415	8,858	14,256
1989	1	1,650	303	4,230	7,425	13,609

discarded halibut. Such factors as time on deck before return to the sea, gaffing, hook stripping, and size of halibut have a major effect on the condition of the halibut before they are returned to the sea. The likelihood of a halibut being killed during incidental capture can be estimated by a condition factor, which is related to time on deck. Mortality in trawls with long tows, large catches, and slow sorting is usually very high, approaching 100 percent. Trawling operations that transfer the trawl codends to a mothership for processing also exhibit mortality rates close to 100 percent, as the sorting process is very slow and the catches are usually large. Mortality in short trawl tows with small catches and quick sorting has been estimated at 50 percent. Bycatch mortality associated with longline gear is believed to be about 13 percent, as the fish can usually be released with minimal damage to the jaw. However, the recent introduction of hook strippers into the longline fisheries for sablefish (*Anoplopoma fimbria*) and Pacific cod (*Gadus macrocephalus*) may result in a higher mortality rate for longline fisheries. Mortality in crab pots is believed to be nearly 100 percent.

A recent report by Alaska Department of Fish and Game (ADF&G) on the observer program in the Gulf of Alaska and NMFS observer reports from the Bering Sea provided data on condition of discarded halibut in longline, shore-based trawl, and factory trawl fisheries. Using survival rates estimated previously by IPHC for condition factor, bycatch mortalities for the various fisheries were calculated. These rates differed somewhat from the assumed rates presently being used. The IPHC staff will work closely with other scientists to re-evaluate the bycatch mortality rates for trawls and longlines, using new data that will be collected by observers on vessels fishing in Alaskan waters in 1990.

Halibut killed as bycatch are generally sublegal in size. In the past estimates of incidental mortality have been incorporated into the halibut population assessment models as "adult equivalents",—i.e., the number of pounds of adult halibut that are represented by the estimated mortality of sublegal (juvenile) fish. The conversion factor used to estimate adult equivalents was 1.58,—i.e., one pound of bycatch mortality equals 1.58 pounds of lost adult halibut yield. The adult equivalent value was then subtracted from the staff-recommended catch limit. A review of this methodology has been recently completed and shows that reductions to catch limits should equal the amount of bycatch without the expansion factor. This change is based on compensation to the adult part of the resource for lost reproductive value of the halibut killed as bycatch. Details of this new approach will be discussed in detail in a later section.

North Pacific Fishery Management Council Bycatch Management

After a long period of review, a temporary bycatch management plan for halibut and crab species in the Bering Sea/Aleutian Islands region submitted by the NPFMC was approved in August, 1989 by the Secretary of Commerce. This temporary plan expires at the end of 1990, so it will need to be renewed or replaced by January 1, 1991. Several alternatives for a halibut bycatch management plan for the Gulf of Alaska were proposed for implementation in 1990,

but the Council delayed decisions on the Gulf of Alaska plan so that Bering Sea and Gulf of Alaska plans could be developed together.

The IPHC staff submitted a proposed bycatch management plan specific for the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan but whose concepts would apply to the Gulf of Alaska Groundfish Fishery Management Plan. The IPHC staff considers that a successful plan must recognize three basic premises: 1) there must be an upper limit to bycatch mortality; 2) there must be incentives to fish cleanly in the groundfish fisheries to maximize groundfish harvest for a given amount of halibut bycatch; and 3) available data suggest that bycatch rates do not vary significantly by major management area in the Bering Sea.

The proposed plan called for a single upper limit on halibut bycatch mortality in Alaska waters, with an intent to fish as much as practicable below the upper limit. Increases in one area would be balanced by decreased mortality in the other. The Council would select the limit, but the IPHC recommended 10 million pounds, net weight (6,000 mt round weight). The 10 million pound limit represents the 10 year bycatch mortality average from 1978-1987; the five year average from 1983-1987 was only about 8 million pounds. Deviation from the long term averages should be based on objective criteria not yet developed. The IPHC proposal did not incorporate time-area closures in the Bering Sea for halibut bycatch management because analysis shows only minor differences in bycatch rates. At this time, benefits of time-area closures in the Gulf of Alaska have not been demonstrated.

The current groundfish fishery is a free-for-all race for fish under which fishermen work as hard and as fast as possible to catch the most groundfish. This system works to the disadvantage of both groundfish fishermen and halibut fishermen. The groundfish fishermen cannot slow down their operation to learn or apply techniques to reduce bycatch because other fishermen will take a higher share of the groundfish. Halibut fishermen then receive reduced quotas to compensate for the bycatch. Incentives to groundfish fishermen to fish cleanly are the best way to involve industry in solutions to bycatch problems.

The primary incentive is to provide more fish to groundfish fishermen who demonstrate low bycatch. Observer coverage is required for this to work. The NPFMC established mandatory observer coverage in the Bering Sea and Gulf of Alaska for 1990. Under this requirement, vessels 125 feet and longer will have 100 percent observer coverage, while smaller vessels over 60 feet in length will carry observers at a 30 percent rate. Funding for observers will be the responsibility of the individual vessel.

The IPHC staff has developed recommendations for controlling Pacific halibut bycatch that are designed to provide the maximum amount of groundfish for harvest and the least disruption to normal operations, while staying within a halibut bycatch mortality limit set by the Council. The basic premise is to provide incentives for reduced bycatch rates, with rewards of increased harvest for operations which are successful. Rewards may take the form of additional fishing time within a fishery/gear halibut bycatch allocation, or shift from one fishery/gear to another that can demonstrate lower bycatch and mortality rates. Alternatives for managing for lower bycatch without a requirement to close upon reaching a halibut bycatch limit are also provided, but these alternatives are much less efficient or desirable than the bycatch limit approach.

Cooperative Bycatch Reduction Research with Industry

The IPHC staff has met with longline and trawl groups to discuss cooperative efforts to reduce halibut bycatch rates and bycatch mortality rates. At the September 1989 NPFMC meeting, an industry workshop with IPHC and NPFMC staff was held to discuss causes of bycatch discard mortality, ways to reduce discard mortality, and results of calculating new discard mortality rates. In addition to a useful exchange of information, it was decided to convene a follow up meeting to discuss ways to reduce bycatch rates. The IPHC staff recently began discussions with bottom trawl groups to find ways to reduce halibut bycatch and discard mortality rates. We intend to examine ways to modify bottom trawls to reduce bycatch, to examine factory trawler design to reduce time on board before discard, and to provide results to the industry when available.

POPULATION ASSESSMENT

The Pacific halibut stock assessment for the 1990 fishery is based on an area by area catch-at-age analysis. It uses information compiled from catch, catch per unit effort (CPUE), and age composition and average weight to determine the exploitable biomass. Once the exploitable biomass has been estimated, then the constant exploitation yield (CEY) is determined as a fraction of this estimate. Based on an optimal exploitation rate of 0.35, this yield represents roughly a third of the exploitable biomass. The recommended allowable commercial catch is finally determined by accounting for the removals from other sources (recreational harvest, wastage, and bycatch). This procedure is outlined in Figure 6.

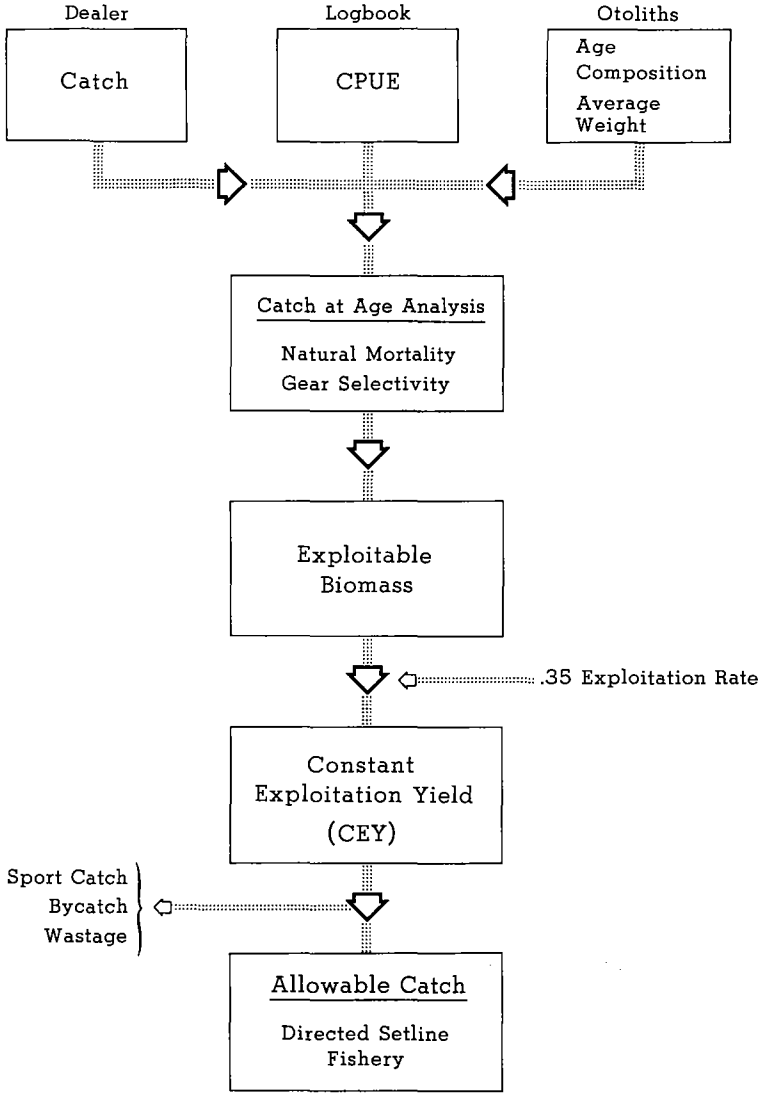


FIGURE 6.
IPHC stock assessment flow chart.

ASSESSMENT FOR 1990

Results from the stock assessment indicate that the total exploitable biomass of Pacific halibut available for 1990 is 232.9 million pounds. This represents a decline in biomass this year of 6 percent, a rate which is similar to the 5-6 percent decline observed in recent years. Figure 7 shows the trends in exploit-

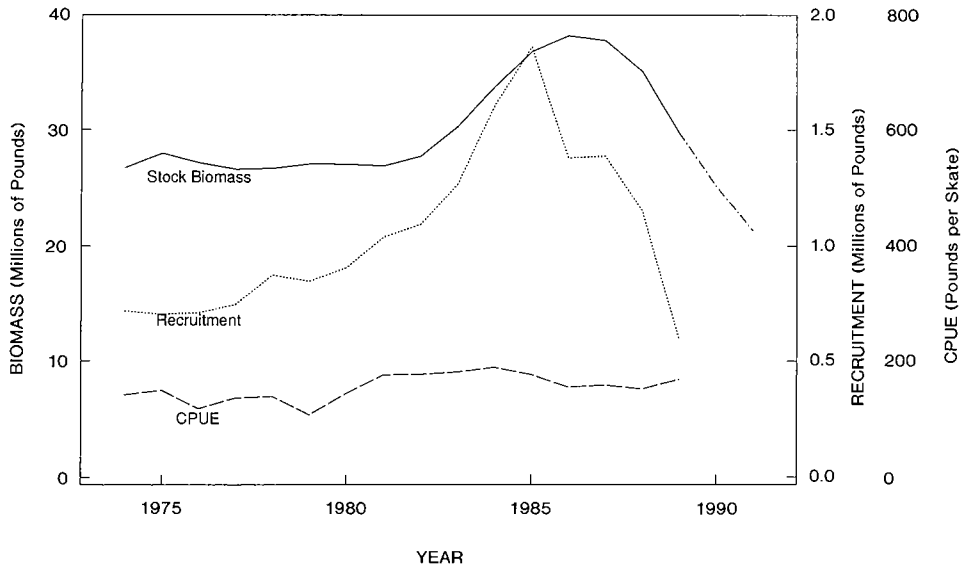


FIGURE 7.
Estimates of biomass, recruitment, and CPUE for the Pacific halibut resource during 1973-1989, with a biomass projection to 1992.

able biomass for the total stock along with estimates of recruitment (abundance of 8-year-olds) and CPUE. Declines in exploitable biomass range from highs of 15 percent per year in Areas 2B and 2C to little or no decline in Area 3A. These trends are consistent with the respectively higher and lower exploitation rates exhibited in these areas.

Recruitment has dropped off dramatically this year in all areas. This observation is consistent with cyclical patterns of recruitment that have occurred over the last 50 years. This year's 12-year-old age class continues to make up a large component of the catch. This class, which recruited as eight-year-olds in 1985, will continue to influence the catch for several more years. However, the lower recruitment shown in recent years combined with exploitation above the recommended 0.35 level indicates that the stock will continue its decline at a rate of about 5-15 percent per year over the next several years.

While the overall commercial CPUE appears to have increased slightly from last year, significant drops were noted in Areas 3A and 3B.

RECOMMENDED ALLOWABLE CATCH

The results from the stock assessment are used in determining the recommended allowable catch. The setline CEYs from the available 1990 stocks are shown in Table 7. The overall CEY is obtained by multiplying the area specific exploitable biomass by the constant exploitation yield ratio of 0.35. Once the exploitation rate is applied equally to all areas, the biomass removal from other sources is subtracted out to determine the allowable setline catch. The recommended setline allowable catch levels indicate the harvest that should be taken by the setline commercial fishery in order to maintain optimal yields and viability of the stock.

EFFECT OF BYCATCH

The impact of bycatch on the allowable setline catch was reviewed in 1989. Adjustments to the allowable catch for bycatch represent compensation to the stock for losses in the stock's reproductive potential due to losses from bycatch. New estimates of adult reproductive compensation have been developed that better reflect the impact to the fishery from bycatch. The result of this analysis is that the setline CEY in Table 7 is reduced by one pound for every pound of bycatch removed. This is in contrast to the 1.58 conversion used previously.

TABLE 7.
Pacific halibut yield assessment for 1990 in millions of pounds.

	IPHC Regulatory Area						
	2A[1]	**2B**	**2C**	**3**	**3B**	**4**	**Total**
Exploitable Biomass	1.48	29.74	32.85	132.80	23.08	12.91	232.86
Total CEY[2]	0.52[1]	10.41	11.50	46.48	8.08	4.52	81.53
Non-Setline Catches							
Sport	—[1]	0.56	1.18	3.67	0.00	0.02	5.43
Waste	0.01	0.34	0.35	2.06	0.38	0.23	3.37
Bycatch	0.09	1.74	1.92	7.77	1.35	0.75	13.61
TOTAL	0.10	2.64	3.45	13.50	1.73	1.00	22.41
Setline CEY[2]	0.42[1]	7.77	8.05	32.99	6.35	3.52	59.10

[1]Recreational catch included in setline calculations for Area 2A.
[2]Constant exploitation yield.

SCIENTIFIC INVESTIGATIONS

The IPHC staff conducts a sizable research program aimed at improving the information used by the Commission in making management decisions. Most important is work that serves to improve the annual stock assessment: better biological sampling data, better methods of stock size estimation, and better measures of the potential productivity of the halibut stock. Of almost equal importance in the last few years has been work on bycatch monitoring and management: better methods of estimating bycatch, better estimates of the mortality of discarded fish, and new ways to reduce bycatch rates. The following summary is organized by subject: stock assessment, bycatch management, tagging studies, biological sampling, surveys, and miscellaneous.

STOCK ASSESSMENT

Stock assessment procedures were reviewed in 1989 with the following results:

(1) The staff tested several methods of catch-at-age analysis on artificial data sets, where the true population size was known. All produced similar estimates. For this year's assessment the staff chose to use only one of the methods because it involves fewer assumptions than the others. The work of testing alternative methods will continue in 1990, and if a superior method is found it will be used for 1991.

(2) The estimates of historical recruitment that led to the 0.35 exploitation rate were revised to reflect new estimates of historical bycatch. This study is not yet complete, so the 0.35 rate was used again for 1990. It may be modified for 1991 on the basis of the final results of the study.

(3) The effect of bycatch on egg production was computed, and this factor, rather than the effect on setline yield, was used for scaling bycatch before subtracting it from the allowable catch. This new factor is 1.00, so for 1990 bycatch reduced catch limits on a pound-for-pound basis.

During 1990, the staff will continue tests of alternative stock size estimation procedures and complete the re-evaluation of the 0.35 exploitation rate. Once these studies are complete, the next major task will be to modify the population model so that abundance and catch are predicted for male and female halibut separately. This should provide more precise stock size estimates, and it may suggest a different management strategy that accounts for the higher fishing mortality experienced by females owing to their faster growth. The beginning of this work will have to await information on the sex composition of the catch, to be inferred from otoliths as described below.

Another study scheduled for 1990 is an analysis of the effect of season on halibut catch per effort. Earlier work showed no seasonal change in size composition, but there may be a change in catchability.

BYCATCH MANAGEMENT

During 1989, the Commission provided $60,000 to the Alaska Department of Fish and Game to support its voluntary observer program in the Gulf of Alaska. This program showed some very high bycatch rates in both trawl and longline fisheries, and was doubtless influential in securing approval of the mandatory National Marine Fisheries Service program that will begin in 1990. In addition, IPHC staff worked with the staff of NMFS and the North Pacific Fishery Man-

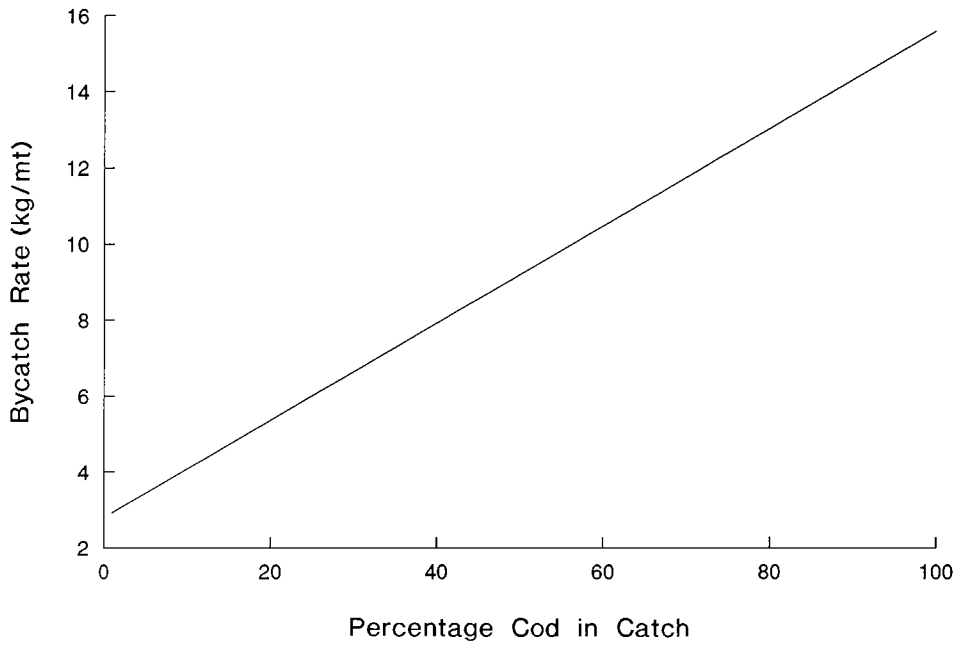


FIGURE 8.
Average relationship between the percentage of Pacific cod and the halibut bycatch rate in joint venture bottom trawl catches in the Bering Sea during 1986-1988.

agement Council on a number of issues relating to bycatch in the Alaska groundfish fisheries, including:

(1) Estimation of bycatch in the Bering Sea domestic trawl fisheries. Lacking observer data, NMFS was obliged to estimate the 1989 bycatch from the directed groundfish catch and historical bycatch rates in the joint venture fishery. IPHC and NMFS staff worked together to derive an effective predictor based on the species composition of the groundfish catch.

(2) Time-area differences in bycatch rates. To assess the usefulness of time-area closures in controlling halibut bycatch, Commission staff analyzed the large data set on joint venture bycatch rates in 1986-88. The study indicated that the species composition of the groundfish catch was most important in determining halibut bycatch rates, with cod and rock sole catches tending to have higher bycatch rates, and that once this effect was accounted for, time-area differences were minor (Figure 8).

(3) Estimation of discard mortality rates. With some new data in hand from the ADF&G observer program, IPHC staff re-estimated the mortality rate of halibut discarded in various fisheries, as follows: 65 percent for small-scale trawling (up from 50 percent), 85 percent for large-scale trawling with observer present (no previous estimate), 100 percent for large-scale trawling without an observer (as before), 13 percent for longlining with an observer present (no previous estimate), and 25 percent for longlining without an observer (as before). Confirmation of these rates awaits results from the mandatory observer

program for groundfish fishing in Alaskan waters.

In 1990, IPHC staff will continue to be active in monitoring bycatch within the NPFMC process on the basis of observer data supplied by the new NMFS program. Beyond simply monitoring bycatch, IPHC will support further analysis by ADF&G of seasonal and regional patterns in bycatch rates by. The staff is also promoting cooperative work by IPHC, NMFS, the trawl industry, and trawl manufacturers to design and test modifications of bottom trawls that will reduce halibut bycatch rates.

TAGGING STUDIES

In 1980-1981, the Commission tagged and released about 60,000 juvenile halibut in the central and western Gulf of Alaska in order to study their migration to other areas and eventual recruitment to the fishery. A contract analysis of recoveries of these fish has been completed, which indicates surprisingly low rates of migration—on the order of 5-10 percent from the western Gulf to each of Areas 2C and 2B. These estimates depend on a number of assumptions about the timing of migration and the rate of exploitation on each size group in each area. The analysis will be repeated in 1990 with assumptions that now appear to be more realistic.

In another contract study, survival rates of adult halibut were estimated on the basis of recoveries of adult fish tagged and released during IPHC setline surveys in 1979-1986. For fish over 100 cm, the estimates were in the neighborhood of 60-70 percent, which agrees very well with the survival rates estimated from commercial data by catch-at-age analysis in recent stock assessments.

Commission staff tagged and released about 2,000 halibut in the vicinity of Newport, Oregon in May. In addition to the standard external tag, each fish was injected with a coded wire microtag. Only 21 marked fish were found from the June commercial halibut fishery. On the other hand, 85 tags were returned voluntarily from recreational, trawl, sablefish longline, and salmon troll fisheries. The large difference in recovery rates among fisheries is inexplicable at this time. Further returns during the 1990 fisheries may provide some clues.

BIOLOGICAL SAMPLING

The annual stock assessment depends heavily on the age composition of the otolith sample collected during the season, so it is essential to collect a proper sample. For statistical reasons, a proper sample is one that includes random subsamples from as many landings as possible, with the size of each subsample proportional to the size of the landing. This objective has been met in a variety of ways over the years as the fishery has evolved and landing periods have shortened. In 1989, IPHC port samplers switched to a new procedure whereby a fixed percentage (usually 1-4 percent) of the fish from each trip are sampled. For example, if the sampling rate for a particular area is 2 percent and a trip of 25,000 pounds arrives, the sampler will take a random sample of 500 pounds of fish.

In addition to age composition data, the otolith sample provides an estimate of the weights of fish in the catch by way of a relationship between

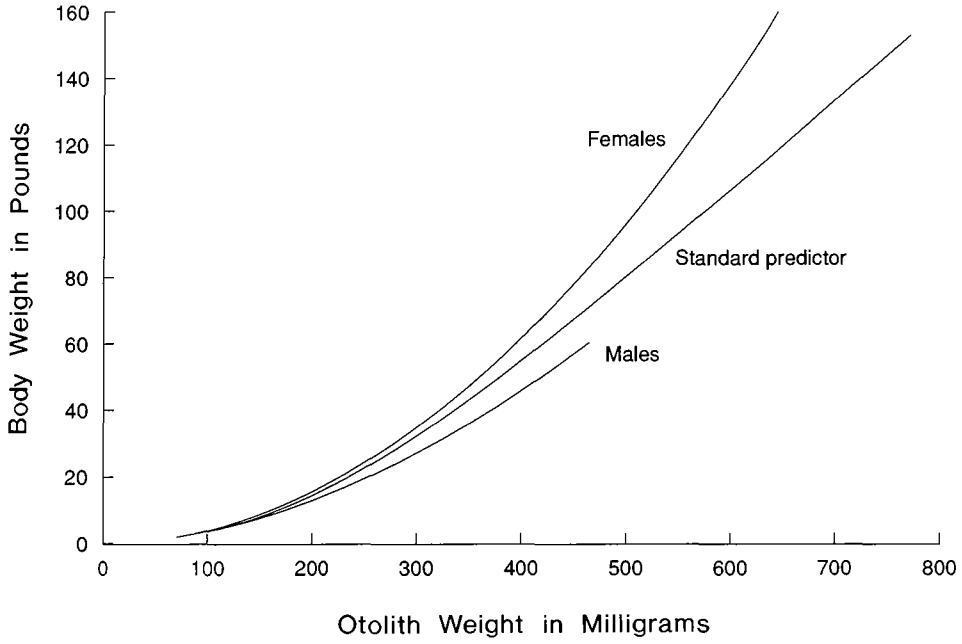


FIGURE 9.
Combined-sex otolith weight-body weight relationship for Pacific halibut using the standard predictor and separate plots of the relationship for male and female halibut.

otolith weight and fish weight. The estimated weights are then used to estimate the numbers of fish represented by the total catch in weight as reported on fish tickets. This procedure works well, but the predictive relationship is based on data from the 1960s and 1970s, and a comparison of actual and predicted fish weights from a cruise in 1988 indicated that it was out of adjustment by about 10 percent. In 1989 the staff conducted a series of cruises from British Columbia to the Aleutians in order to collect a reference data set and to investigate whether there is a difference between males and females in the relationship between otolith weight and body weight. Preliminary analysis indicates that there is a significant difference between the sexes, and that the observed error in predicted weights in 1988 was probably the result of a change in the sex ratio of the catch over the last two decades (Figure 9).

In view of this finding, it is now clear that the staff will need to determine the sex of each fish sampled for an otolith in the market sample and then apply a sex-specific predictor to the otolith weight to estimate the body weight. An important task for 1990 will therefore be to develop a routine method of determining the sex of halibut sampled for otoliths. An important benefit of this work will be the development of estimates of the sex composition of present and historical catches so that males and females can be distinguished in the population model used for the annual stock assessment, as previously explained.

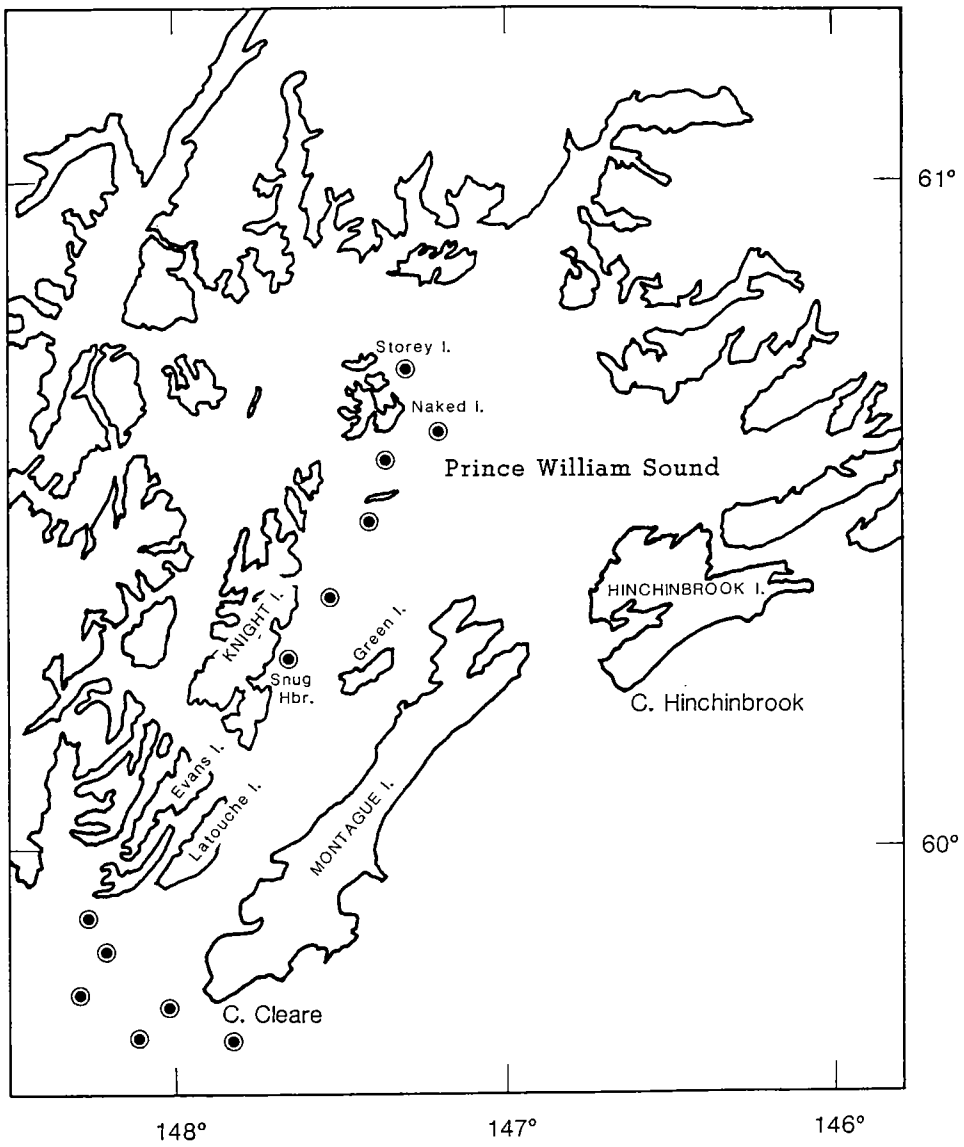


FIGURE 10.
Stations fished in Montague Strait and Prince William Sound, Alaska during April, 1989 following the EXXON VALDEZ oil spill. Additional areas were surveyed westward of Prince William Sound, but are not shown.

SURVEYS

In the wake of the EXXON VALDEZ spill in late March, 1989, the Commission chartered the Kodiak longliner ROYAL QUARRY to survey Prince William Sound and adjacent areas (Figure 10). The survey was done in late April and

early May. None of the 900 fish handled showed any trace of oil contamination.

During 1990, the major field activity of the staff will be collecting data on the age, sex, and size of halibut from the NMFS trawl survey in the Gulf of Alaska. The trawl data should provide a better description than longline data of the growth of halibut in the size range 30-120 cm, because longline gear is strongly selective for larger fish.

As an adjunct to the Gulf survey, the same survey vessel will be used for about three days to collect a sample of about 400 fish in Queen Charlotte Sound in Area 2B. It is especially important to get better growth data from Area 2B because some data suggest low growth rates among males in that area, and if that is true there may be a need to reconsider the size limit for Area 2B.

In addition to collecting growth data from the 1990 trawl survey, the staff will calculate a biomass estimate from recent Gulf of Alaska data for comparison with the estimate obtained by catch-at-age analysis. Because of differences in coverage and selectivity, this cannot be a straightforward comparison, but a large difference would nonetheless raise questions that should be pursued.

OTHER INVESTIGATIONS

In 1989, the Commission issued a voluntary catch record card for use by recreational anglers in Washington. During the season the proportion of the catch landed by record keepers was monitored by ramp samplers, and at the end of the season the total catch by record keepers was determined by contacting them. The total catch by all anglers could then be estimated by scaling up the record keepers' catch by the observed proportion. The procedure resulted in a very precise estimate.

The Commission is supporting a study of the chemical composition and microstructure of halibut otoliths at the University of Alaska. In addition to distinguishing fish from different nursery areas, this study may detect events in the early life history of halibut that affect year-class strength.

A hook timer is a device that records the time at which the hook gets its first strike. For the last two years the staff has been planning to conduct hook timer sets off British Columbia to investigate the degree to which dogfish reduce the effectiveness of longlines. The first trials were conducted in 1989, with promising results. Further work with an improved timer will be done in 1990.

PUBLICATIONS

The Commission publishes three serial publications — Annual Reports, Scientific Reports, and Technical Reports — and also prepares and distributes regulation pamphlets and information bulletins. Items produced during 1989 by the Commission and staff are shown below. A list of all Commission publications is shown on the following pages. Commission materials are available upon request free of charge.

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Williams, Gregg H., Cyreis C. Schmitt, Stephen H. Hoag, and Jerald D. Berger. 1989. Incidental catch and mortality of Pacific halibut, 1962-1986. International Pacific Halibut Commission, Technical Report No. 23. 94 p.

Williams, Gregg H., Loh-Lee Low, Jerald D. Berger, Dave Carlile, and Peter Craig. 1989. A review of Pacific halibut bycatch discard mortality rates. Unpublished manuscript. 33 p.

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