

**INTERNATIONAL PACIFIC HALIBUT COMMISSION**

**Established by a Convention Between  
Canada and the United States of America**

**ANNUAL REPORT  
1983**

**Commissioners**

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**Director**

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**SEATTLE, WASHINGTON**

**1984**

## Preface

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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. Each country pays one-half of the Commission's annual expenses, as required by the Halibut Convention.

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. Regulatory alternatives are discussed with the Advisory Group composed of fishermen, vessel owners, and processors. The measures recommended by the Commission are submitted to the two governments for approval. Upon approval, the regulations are enforced by appropriate agencies of both governments.

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 photo: Halibut schooner crossing the stormy Gulf of Alaska.

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**International Pacific Halibut Commission**  
**ANNUAL REPORT 1983**

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## Activities of the Commission

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The 59th Annual Meeting of the Commission was held in Vancouver, British Columbia, on February 1-3, 1983. Mr. Michael Hunter presided as Chairman, and Mr. Robert McVey served as Vice Chairman. The Commission staff presented a review of the 1982 halibut fishery, summarized the results of scientific investigations conducted during the year, gave a brief assessment of current stock condition, and presented regulatory proposals for the 1983 halibut fishery. The Conference Board, representing vessel owners and fishermen, presented and discussed its regulatory proposals with the Commission. Processors, representing the Halibut Association of North America, discussed their concerns and 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 1983 halibut fishery. The regulations were then sent to the Canadian and United States governments for approval. During other sessions, the Commission considered administrative and fiscal matters, approved research plans for 1983, and adopted the budget for fiscal year 1985-1986. Mr. McVey was elected Chairman for 1983, and Mr. Hunter was elected Vice Chairman. A news release was issued at the close of the meeting, summarizing the regulations the Commission had adopted and had submitted to the governments for approval. The news release also expressed the Commission's concern that the incidental catch of halibut accounted for nearly half of the total removals from the resource without significant benefit to the people of Canada and the United States.

Following the meeting, letters were sent to the governments describing the abnormal distribution of the halibut in Area 2, resulting in high concentrations of fish in southeastern Alaska, and relatively low concentrations south of Dixon Entrance. This imbalance created difficulty in achieving the 60:40 catch division between Canada and the United States established by the 1979 Protocol to the Convention. Although the Commission did not recommend a change in the division of the Area 2 catch for 1983, it stated its intention to review the situation in November when more complete data and analyses of the 1983 fishing season would be available. The letters also expressed concern about the Commission's ability to keep catches within the catch limits, and urged the U.S. government to take action to reduce fishing effort for halibut in U.S. waters. The Commission again urged the governments to develop regulations to reduce the economic loss due to the incidental catch of halibut by other fisheries. The governments were also informed of the Commission's concern that the incidental catch of halibut accounted for nearly half of the total removals from the resource without significant benefit to the people of Canada and the United States. The letters also mentioned a request from the Makah Indian Tribe of Washington state for special regulations to allow it to take fifty percent of the Area 2A quota, and the Commission's understanding that it lacked authority to allocate the halibut resource among different groups of nationals within either country. Finally, the letters mentioned a request from the Alaska Board of Fisheries for a year-round subsistence fishery for halibut in Alaska, and requested legal interpretations on how the 1980 Alaska National Interest Land Conservation Act provisions for subsistence fishery rights apply to the Commission's authority to regulate the resource.

A list of reports published by the Commission staff during 1983 is appended to this Annual Report. Several documents were also prepared at the request of the governments.

Expenditures during the 1983 fiscal year (April through March) were \$1,420,000 U.S.



William S. Gilbert  
United States Commissioner  
1972-1983



Gordon Jensen  
United States Commissioner  
1983

## Director's Report

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1983 could be called the year of the "circle" hook. Although there were many fishermen using the new hook in 1981 and 1982, the U.S. fleet in particular made a rapid conversion in 1983, followed by the Canadian fleet in 1984. No other single factor has had such a dramatic impact on the catch-per-unit-effort (CPUE) in the ninety year history of the halibut fishery.

A number of fishermen brought the increased capabilities of the new hook to the attention of the Commission staff in 1982. Research was initiated in 1983 to test the effectiveness of circle hooks against the standard "J" hook. The first research consisted of alternating the two hook types and observing their respective fishing properties from a submarine. This preliminary work gave rise to an experiment in the fall of 1983 in which skates containing each hook type were alternated. The experiment indicated that the "circle" hook skates greatly outfished the "J" hook skates, and also that the increase in CPUE varied with the density of halibut: the higher the density the larger the increase in CPUE with circle hooks. No difference in size distribution of halibut could be detected between the hook types.

The preliminary 1983 research was used to design a more thorough study for 1984. We will use two boats in our standardized adult assessment survey, one using eight skates of "circle" hooks and the other using eight skates of "J" hooks on each station. Over the range of densities of halibut covered by our stations from Kodiak to southern British Columbia, sufficient data will be obtained to build an appropriate mathematical model of the difference between the hook types.

We theorize that the "circle" hook outfishes the "J" hook by retaining halibut at a higher rate once they are hooked. The hooking rates are probably similar. The "circle" hook usually hooks the fish in the jaw, causing less damage. Halibut remain in much better physical condition when on the hook, which results in less "sand flea" damage and a higher survival of released undersized fish. There is no need to gaff small fish to bring them aboard, as they can be lifted with the gangion and released with very little injury. Although the benefits of using "circle" hooks are many, it has had the effect of increasing effective effort and further shortening the already too-short fishing seasons.

By the 1985 season, the conversion should be complete and will leave the Commission with the difficult task of standardizing the historic "J" hook CPUE record with the new "circle" hook CPUE. The previously discovered CPUE difference due to hook spacing may be quite different with "circle" hooks and will require new research on hook spacing effects. It is not clear at this time if we will ever be able to properly standardize the CPUE for both hook types and we may be left with an irreconcilable jump in the historic CPUE record.

If one examines the "circle" hook, the similarities to the ancient Makah Indian hook are obvious. Perhaps there is still much to learn from the old ways when fishing was a matter of survival.

## Regulations for 1983

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### REGULATORY PROPOSALS

The Commission received regulatory proposals for the 1983 halibut fishery from fishermen, vessel owners, processors, government agencies, the Makah Indian Tribe, and the Commission's scientific staff. A summary of all proposals and their source was distributed to all interested groups prior to the Annual Meeting.

The staff recommended that Area 4 be subdivided into three subareas to achieve a distribution of catch that more nearly corresponds to the productivity of the area. Other regulatory area boundaries would remain the same as in 1982. The staff recommended a total catch of 30.2 million pounds for 1983, which is 75% of the estimated annual surplus production. This catch would be allocated as follows: 9 million pounds to Area 2, 19 million pounds to Area 3, and 2.2 million pounds to Area 4. Within Area 2, the staff recommended 200,000 pounds for Area 2A, 5.4 million for Area 2B, and 3.4 million for Area 2C, which maintained the 60:40 division of the Area 2 catch between Canadian and U.S. waters. The Area 3 catch would be divided 14 million pounds to Area 3A, and 5 million to Area 3B. The Area 4 catch would be divided 1.2 million pounds to Area 4A, 0.8 million to Area 4B, and 0.2 million to Area 4C. In Area 2A, the staff proposed an opening on June 15 for 23 days and openings on July 14, August 13, and September 11 for 12 days each. In Area 2B, the staff proposed five 12-day openings starting on May 14, June 15, July 14, August 13, and September 11. For Area 2C, the staff recommended openings on June 16 and July 16 for 5 days each. For Areas 3A, 3B, and 4A, the staff recommended openings on June 15 and July 15 for 7 days each and on August 14 for 5 days. In addition, Area 3B would be opened again on September 13 for 5 days. For Areas 4B and 4C, the staff recommended an opening on June 13 for 14 days and an opening on July 15 until the catch limit was taken. This schedule of fishing periods was selected to provide openings of adequate length, to coincide with favorable tides, and to avoid landings on weekends and holidays. The staff recommended that the IPHC license be discontinued as it was no longer necessary, and that sport charter boats be required to maintain a logbook showing their daily halibut catch and to make those log records available to IPHC representatives on request. The staff proposed that other regulations, such as those for nursery areas, size limits, gear, and the sport fishery regulations remain the same as in 1982.

The Conference Board, made up of representatives of fishermen's and vessel owner's organizations, met during the first two days of the Annual Meeting. They concurred with the staff recommendation for subdividing Area 4, except that they proposed the line separating Areas 4A and 4B be located at 172° W. to avoid splitting a known fishing ground. The Conference Board could not agree on quotas for subareas in Area 2. United States representatives contended that quotas should be based on productivity of the resource in each subarea, whereas Canadian representatives felt the 60:40 division of the Area 2 catch should be maintained as established by the Protocol to allow adequate migration of halibut from Alaska to Areas 2B and 2A. In Area 3A, the Conference Board proposed a 16 million pound quota, while in Areas 3B, 4A, and 4B, the Conference Board concurred with the staff proposal. In Area 4C, the Conference Board unanimously proposed a 400,000 pound quota. The Conference Board recommended four fishing periods of 13 days each in Area 2A, starting on June 15, July 14, August 13, and September

11. In Area 2B, the Conference Board recommended a sequence of 14-day openings, starting on or about May 14, with closing dates on Sundays. In Area 2C, the Conference Board recommended two 6-day openings, starting on June 16 and July 15, and a third 6-day opening starting on August 14. The Conference Board recommended that Area 3B open concurrently with Area 3A, except that the third opening be from August 27 to September 3. The Board recommended that Areas 4A and 4B open and close concurrently with Area 3A or Area 3B, until the final closure of Area 3A. In Area 4C, the Conference Board proposed a sequence of 4-day open periods followed by a 1-day closed period, starting on June 15 and continuing until the quota is taken. If the quota has not been taken by September 12, Area 4C would be open until the quota was taken. The Board also recommended that vessels fishing in Area 4C be required to report to a government agent at Dutch Harbor, Alaska, prior to fishing in Area 4C and prior to unloading any halibut caught in Area 4C, unless the vessel is operated by residents of Area 4C. Finally, the Conference Board recommended that the North Pacific Fishery Management Council be requested to include the domestic trawl fishery under prohibited species regulations, and that the State of Alaska be asked to help finance an observer program on domestic crab and trawl vessels. The Makah Indian Tribe of Washington State renewed its request that a specific portion of the catch limit in Area 2A be allocated to the Makah Tribe. This provision would allow the Tribe to exercise its fishing rights guaranteed under their Treaty with the U.S. Government.

The Alaska Board of Fisheries requested that the Commission allow a year-round subsistence harvest of halibut in Alaska to satisfy the requirements of the Alaska National Interest Lands Conservation Act of 1980 with respect to subsistence use of fish and wildlife resources.

The National Marine Fisheries Service proposed that vessels be required to unload their catch within seven days of the season closure, that vessels be required to maintain accurate and current log records, that longline gear be required to have adequate vessel identification, and that hold inspections be required of vessels retrieving gear that could not be hauled before the end of a fishing period.

All regulatory proposals were discussed with the Advisory Group. Members of the Advisory Group in 1983 were Ron Hegge, Newport, Oregon; Robert Alverson, Arne Lee, Mark Lundsten, Bruce Mitchell, and Mark Sandvik, Seattle, Washington; Steve Joner, Neah Bay, Washington; Veryl Reimer, Bellingham, Washington; Tom Tournier, Jack Waterfield, Vancouver, British Columbia; Reg Paine, Victoria, British Columbia; Sid Dickens, Rick Dunn, Ray Krause, and Robert Strand, Prince Rupert, British Columbia; Sig Mathisen, Petersburg, Alaska; Marvin Bellamy, Homer, Alaska; Craig Priebe and Chip Threinen, Kodiak, Alaska; Flori Lekinof, Sr., and Perfenia Pletnikoff, Jr., the Pribilof Islands, Alaska.

The regulations recommended by the Commission were approved by the United States Secretary of State on March 16, 1983, and by the Governor General of Canada, by order in Council, on April 20, 1983, and became officially effective on the latter date.

## **REGULATORY AREAS**

Regulatory areas for the 1983 halibut fishery are shown in Figure 1. Boundary lines for the regulatory areas are the same as in 1982, except that Area 4 was divided into four subareas. The nursery area in the eastern Bering Sea was the same as in 1982, and was closed to all halibut fishing. Following is a brief description of the regulatory areas for the halibut



fishery in 1983:

- Area 2A — all waters off the coast 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, Alaska,
- Area 3B — Cape Trinity to a line extending southeast from Cape Lutke, Unimak Island,
- Area 4A — all waters west of Area 3B and of the Bering Sea closed area, south of 56°20' N. latitude, and east of 172° W. longitude,
- Area 4B — all waters west of Area 4A, and south of 56°20' N. latitude,
- Area 4C — all waters north of the closed area, and of Area 4A, and east of a line extending northwest from a point at 56°20' N. and 170°00' W.,
- Area 4D — all waters north of Areas 4A and 4B, and west of Area 4C.

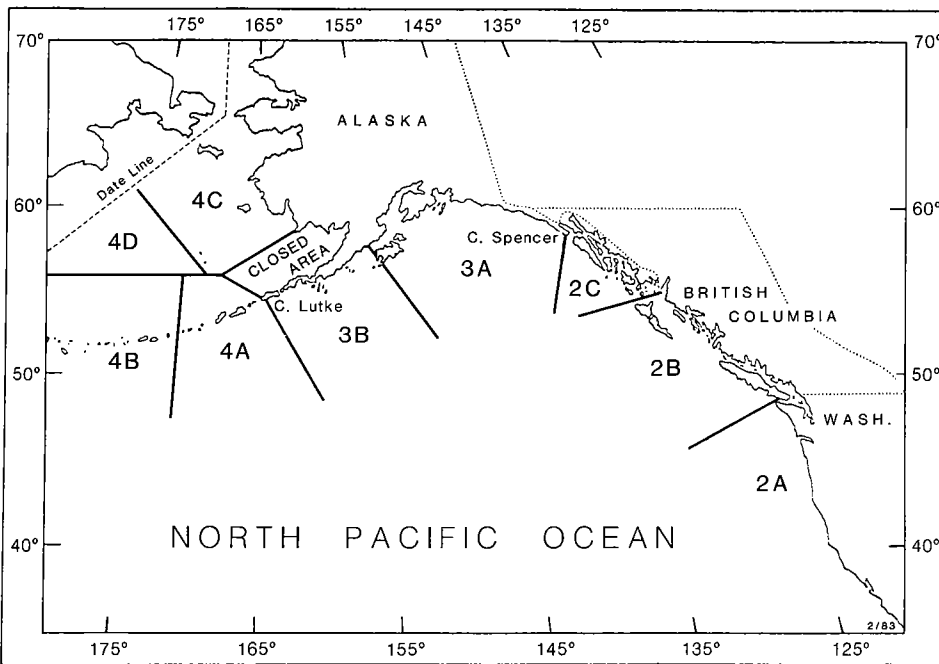


Figure 1. Regulatory areas, 1983.

### CATCH LIMITS AND LENGTHS OF SEASONS

The total catch limit for all areas in 1983 was 30.6 million pounds. This was 3.1 million pounds more than the 27.5 million pound catch limit in 1982. The 1983 catch limit in Area 2 was 9 million pounds, the same as in 1982. The limits for the subareas in Area 2 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 19 million pounds, 2 million pounds more than in 1982. Of this, 14 million pounds was allocated to Area 3A and 5 million pounds to Area 3B. In Area 4, the catch limit was 2.6 million pounds, 1.1 million pounds more than in 1982. Of

this, 1.2 million pounds was allocated to Area 4A, 800,000 pounds to area 4B, 400,000 pounds to Area 4C, and 200,000 pounds to Area 4D.

The opening and closing dates and lengths of the fishing periods for 1982 and 1983 are given in Table 1. Fishing seasons in all areas in 1983 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 voided. The fishing periods in all areas began at 1200 hours and ended at 1200 hours, Pacific Standard Time (PST).

**Table 1. Opening and closing dates by area, 1982-1983.**

Area	1982			1983		
	Opening Date	Closing Date	Fishing Days	Opening Date	Closing Date	Fishing Days
2A	May 12	May 24	12	June 15	June 28	13
	June 9	June 21	12	July 14	July 27	13
	July 7	July 19	12			
	Aug. 9	Aug. 22	13			
2B	May 12	May 24	12	May 3	May 15	12
	June 9	June 21	12	June 14	June 26	12
	July 7	July 19	12			
	Aug. 9	Aug. 22	13			
	Sept. 4	Sept. 16	12			
2C	May 12	May 17	5	June 17	June 22	5
3A	May 11	May 19	8	June 16	June 23	7
	June 9	June 12	3			
3B	May 11	May 19	8	June 16	June 23	7
	June 9	June 12	3	Aug. 27	Aug. 30	3
	Aug. 20	Aug. 27	7			
4A*				June 16	June 23	7
				July 15	July 23	8
4B*				June 16	June 23	7
				July 15	July 29	14
				Sept. 13	Sept. 21	8
4C*	May 11	May 19	8	June 16	June 20	4
	June 9	June 28	19	June 21	June 25	4
				June 26	June 30	4
				July 1	July 5	4
				July 6	July 10	4
				July 11	July 15	4
				July 16	July 20	4
				Aug. 25	Aug. 29	4
4D*				June 16	June 23	7
				July 15	July 29	14

\*In 1982 Areas 4A, 4B, 4C, and 4D were combined into Area 4.

## **OTHER REGULATIONS**

All other regulations pertaining to minimum size limits, licensing, gear restrictions, and the sport fishery remained unchanged. The regulation requiring that vessels participating in the Area 4 fishery report to U.S. Customs or fishery officers at Dutch Harbor, Alaska, prior to any fishing in Area 4, and again upon leaving Area 4, applied again in 1983. This regulation did not apply to fishermen resident in Area 4 and who unloaded all of their catches at ports within the area. In addition, vessels that fished in Area 4C were required to clear with U.S. Customs or fishery officers at Dutch Harbor, Alaska, prior to any fishing in Area 4C, and again before unloading any halibut caught in Area 4C. This regulation did not apply to fishermen residing in Area 4C, and who unloaded all of their catch at ports within Area 4C.

## The Fishery

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### 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 I, Tables 1-5 in this annual report and the annual reports since 1977 are in the same format and update those statistics through 1983. However, one departure from past practice was made in these tables. Catches landed by IPHC research vessels were formerly reported according to the flag of the chartered vessel. Beginning with 1983, catch by IPHC charter vessels will be reported in the national zone from which the catch was taken. The change will eliminate the erroneous impression that some vessels were fishing in the other country's waters. IPHC charter vessels are not operating as flag vessels, but as international vessels during the charter.

#### Catch by Regulatory Area

The total Pacific Coast commercial halibut catch in 1983 was 38.4 million pounds, 7.8 million pounds more than the combined catch limits of the nine regulatory areas managed by the Commission, and 9.4 million pounds more than was caught in 1982. The catch limits, which were 3.1 million pounds greater than in 1982, were attained in all but one regulatory area, and substantially exceeded in four of the areas. Canadian vessels took 14% of the catch, down from 19% in 1982, and United States vessels took 86%. The number of fishing days decreased in most areas as increased effort, more effective fishing gear, a mid-June opening date for most areas, and good fishing weather all contributed to the shortening of the seasons.

Catch by country and major regulatory area for 1979 through 1983 is shown in Table 2. The catches for all years are shown by regulatory area as defined in the 1983 Pacific Halibut Fishery Regulations to facilitate comparison of similar geographic regions, except that Areas 4A, 4B, 4C, and 4D established in 1983 are combined as Area 4. Previous annual reports of the Commission should be consulted for actual regulatory area boundaries in effect in any specific year. Canadian catches from the waters off 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.

In Area 2A, the waters off California, Oregon, and Washington, the catch in 1983 was 265,000 pounds, 54,000 pounds more than was taken in 1982 and 65,000 pounds greater than the catch limit. Catches of 111,000 and 154,000 pounds were caught in two 13-day fishing periods, whereas four fishing periods totalling 49 days were needed to take 211,000 pounds in 1982. Few large vessels fish this area, and most of the catch is taken by small local setliners and trollers.

In Area 2B, the waters off British Columbia, the 1983 catch was just slightly greater than the 5.4 million pound catch limit and 0.1 million pounds less than was taken in 1982. An 8% increase in the number of vessels fishing for halibut and a 29% improvement in CPUE in the Charlotte region, which encompasses the major fishing grounds in Area 2B,

**Table 2. Catch by country and regulatory area\*, 1979-1983 (in thousands of pounds).**

Regulatory Area	1979	1980	1981	1982	1983
<b>Area 2A</b>					
U.S.	46	22	202	211	265
Canada	—	—	—	—	—
Total	46	22	202	211	265
<b>Area 2B</b>					
U.S.	—	—	—	—	—
Canada	4,857	5,650	5,654	5,538	4,536
Total	4,857	5,650	5,654	5,538	5,436
<b>Area 2C</b>					
U.S.	4,366	3,238	4,010	3,500	6,398
Canada	164	—	—	—	—
Total	4,530	3,238	4,010	3,500	6,398
<b>Area 3A</b>					
U.S.	9,714	10,014	14,225	13,530	14,112
Canada	1,621	1,952	—	—	—
Total	11,335	11,966	14,225	13,530	14,112
<b>Area 3B</b>					
U.S.	369	277	451	4,800	7,751
Canada	17	—	—	—	—
Total	386	277	451	4,800	7,751
<b>Area 4</b>					
U.S.	1,373	713	1,190	1,429	4,422
Canada	—	—	—	—	—
Total	1,373	713	1,190	1,429	4,422
<b>ALL AREAS</b>					
U.S.	15,868	14,264	20,078	23,470	32,948
Canada	6,659	7,602	5,654	5,538	5,436
Total	22,527	21,866	25,732	29,008	38,384

\*Regulatory Areas defined in 1983 Pacific Halibut Fishery Regulations.

resulted in the attainment of the catch limit in two 12-day fishing periods. Five fishing periods totalling 61 days were needed to take the catch limit in 1982. This is the only area that had an early May fishing period, with approximately half the catch taken in May and the remainder taken in mid-June.

In Area 2C, the waters off southeastern Alaska, the 1983 catch was 6.4 million pounds, nearly double the 3.4 million pound catch limit. The total catch was taken in one 5-day fishing period and is 2.9 million pounds larger than the 1982 catch, also taken in five fishing days. Foremost among the factors contributing to the large catch overrun was a 36% increase in the number of vessels fishing in Area 2C. Other factors include increased availability of fish, more effective fishing gear due to an increased use of "circle" hooks, and excellent fishing weather.

In Area 3A, the waters between Cape Spencer and the west end of Kodiak Island, the 1983 catch was 14.1 million pounds, just slightly greater than the 14 million pound catch limit and 0.6 million pounds more than was caught in 1982. The total catch was taken in one 7-day fishing period, whereas two fishing periods of eight and three days respectively were fished in 1982. As in Area 2C, a major increase in fleet size of 20% and increased gear efficiency were the most important factors in the trend towards decreasing season length.

In Area 3B, the waters between Kodiak Island and Unimak Pass, the 1983 catch was 7.8 million pounds, 2.8 million pounds more than the catch limit and nearly 3.0 million pounds more than the 1982 catch. Three fishing periods totalling 18 days were allowed in 1982, but fishing time was reduced to two periods of seven and three days respectively in 1983. Slightly less than 1.4 million pounds were caught during the first fishing period, leaving 3.6 million pounds to be taken during a second fishing period. The Commission, anticipating a substantial increase in fishing effort for the second period, projected a daily catch rate of 1.2 million pounds, double the observed rate in the area in 1982. However, actual catch was nearly 6.4 million pounds, or over 2.1 million pounds per day. An 80% increase in the size of the fishing fleet from 236 to 424 vessels, more effective fishing gear, excellent weather, and an abundance of halibut all contributed to the large catch.

Area 4, which includes all waters in the Bering Sea and all Pacific waters west of Cape Lutke, was managed as four separate regulatory areas in 1983. Each area had its own season and catch limit in order to encourage fishing over a larger geographic area than was fished in 1982.

In Area 4A, the waters surrounding the Fox Islands, and waters along the 100 fathom edge south of latitude 56° 20' N., the 1983 catch was 2.5 million pounds. This was more than double the 1.2 million pound catch limit and over twice the catch that originated from the same geographic area in 1982. Local fishermen caught 19,000 pounds during a 7-day fishing period in June. The balance of the catch was taken during an 8-day period in July. The second fishing period, initially scheduled for 12 days, was shortened to eight days by Commission action when it became apparent that a much larger fleet was planning to fish the area than originally projected. A total of 63 licensed and 15 unlicensed vessels fished in 1983 compared to 35 licensed and 13 unlicensed vessels the previous year. For the second successive year, most of the catch, nearly 2.1 million pounds, was taken on grounds south of the Fox Islands.

Area 4B, the waters surrounding the Aleutian Islands west of 172° W. produced a catch of 1.3 million pounds, taken in two fishing periods of 14 and eight days respectively, which was 0.5 million pounds greater than the 0.8 million pound catch limit. Twelve vessels caught 200,000 pounds during a 14-day fishing period in July, mostly in the four days following the closure of Area 4A to the east. The balance of 1.1 million pounds was caught by 29 vessels that fished in the area in late September. No fishing was reported during a 7-day fishing period in mid-June.

In Area 4C, the Bering Sea flats, the catch of 430,000 pounds was slightly greater than the 400,000 pound catch limit. Eight 4-day fishing periods were allowed in the area, during

which four large vessels made six landings totalling 259,000 pounds and small vessels made 119 landings totalling 171,000 pounds. In 1982, a total of 251,000 pounds was taken from the same geographic area.

In Area 4D, the 100 fathom edge north of 56°20'N., the catch was 148,000 pounds taken by five vessels. This is slightly less than the 200,000 pound catch limit for the area.

### **Number of Vessels**

The number of vessels, the number of trips, and the catch by vessel category in 1983 are given in Table 3. Vessels five net tons or over that fish with setline gear were required to be licensed by the Commission. Smaller vessels, or those not using setline gear, did not require a Commission license.

The number of Canadian vessels landing halibut was slightly higher than in 1982, with 347 vessels reporting catches compared to 321 vessels the previous year. The Canadian fleet has tended to be relatively stable since the introduction of a license limitation program in 1979.

In contrast, the United States fleet continued the rapid and unchecked expansion it has undergone for several years. A proposed moratorium on the number of vessels that could fish for halibut was rejected by the United States Office of Budget and Management one day prior to the scheduled opening of the 1983 halibut season in United States waters. The number of licensed setliners increased over 28% from 1,125 vessels in 1982 to 1,445 vessels in 1983 and the number of unlicensed setliners increased from 1,468 vessels to 2,195 vessels, a nearly 50% increase during the same period. This uncontrolled entry of new vessels into the halibut fishery is the primary reason for the continued shortening of the fishing seasons in United States waters. The number of vessels reporting troll landings of halibut declined by 28 vessels.

### **Landings by Port**

Landings in central Alaskan ports showed the largest increase for any section of the coast. Slightly more than 10 million pounds were landed at Kodiak, the leading halibut port on the coast, up sharply from 1982 landings of over 6.2 million pounds. Seward had the second largest volume of halibut with 4.0 million pounds, followed by Sitka with 3.0 million pounds. Landings in Washington were lower than in 1982, but Oregon landings were up sharply because of deliveries of several trips of halibut caught in Alaskan waters. Canadian deliveries to United States ports were down slightly, but landings in British Columbia ports were higher than in 1982.

## **VALUE OF THE 1983 CATCH**

The total ex-vessel value of the 1983 catch was \$43.5 million (U.S.) compared to \$31.2 million for 1982. The fishermen received an average price of \$1.132 per pound, an overall increase of \$0.045 per pound over the price received in 1982. The 1983 landings ranked second in value to the \$48.0 million set in 1979 and fifth in price per pound compared to the \$2.134 per pound set in 1979. The average price per pound in U.S. dollars received by

**Table 3. Number of vessels, number of trips, and catch by licensed and unlicensed vessels in Areas 2 and 3, 1983.**

Vessel Category	Canada			United States			Total		
	No. of Vsls.	No. of Trips	Catch of 000's Lbs.	No. of Vsls.	No. of Trips	Catch of 000's Lbs.	No. of Vsls.	No. of Trips	Catch of 000's Lbs.
<b>AREA 2</b>									
Unlicensed									
Trollers	9	16	1	133	201	18	142	217	19
Setliners	6	11	19	907	2,030	1,809	913	2,041	1,828
Total	15	27	20	1,040	2,231	1,827	1,055	2,258	1,847
Licensed									
5-19 tons***	292	643	3,905	494	884	3,015	786	1,527	6,920
20-39 tons	30	63	1,062	88	118	1,126	118	181	2,188
40-59 tons	7	14	312	8	9	234	15	23	546
60+ tons	3	5	137	—	—	—	3	5	137
Total	332	725	5,416	590	1,011	4,375	922	1,736	9,791
All Vessels	347	752	5,436	1,630	3,242	6,202	1,977	3,994	11,638
<b>AREA 3*</b>									
Unlicensed									
Trollers	—	—	—	—	—	—	—	—	—
Setliners	—	—	—	1,288	3,262	1,966	1,288	3,262	1,966
Other**	—	—	—	—	—	4	—	—	4
Total	—	—	—	1,288	3,262	1,970	1,288	3,262	1,970
Licensed									
5-19 tons***	—	—	—	583	1,208	6,821	583	1,208	6,821
20-39 tons	—	—	—	189	369	8,277	189	369	8,277
40-59 tons	—	—	—	51	135	5,882	51	135	5,882
60+ tons	—	—	—	32	85	3,796	32	85	3,796
Total	—	—	—	855	1,797	24,776	855	1,797	24,776
All Vessels	—	—	—	2,143	5,059	26,746	2,143	5,059	26,746
Grand Total	347	752	5,436	3,773	8,301	32,948	4,120	9,053	38,384

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

\*\*Deliveries of unknown origin.

\*\*\*Includes small vessels of unknown tonnage.



fishermen in various regions of the coast for years 1980-1983 is given in Table 4. Annual landings, ex-vessel prices and value of the catch from 1929-1983 are given in Appendix II.

In 1983, the Canadian catch totalled 5.4 million pounds with a landed value of \$7.1 million (U.S.). This included 1.2 million pounds landed in Washington State ports with a landed value of \$1.7 million at an average price of \$1.427 per pound. The 1983 U.S. catch was 33.0 million pounds with a landed value of \$36.4 million at an average price of \$1.104 per pound, compared to 23.4 million pounds with a landed value of \$25.4 million at an average price of \$1.084 per pound in 1982.

As in the past, fish destined for the fresh market, especially those from the first landings in each period, received a higher price in Washington State and British Columbia.

**Table 4. Price per pound (U.S. dollars) by region, 1980-1983.**

Region	Price per Pound			
	1980	1981	1982	1983
Washington-Oregon	1.128	1.166	1.265	1.402
So. British Columbia	1.159	1.155	1.117	1.392
No. British Columbia	0.994	1.043	0.979	1.199
Southeastern Alaska	0.898	0.957	1.054	1.045
Central Alaska	0.896	0.968	1.060	1.088
Coastwide Average	0.991	1.019	1.087	1.132
Average Received by:				
Canadian Fishermen	1.079	1.108	1.105	1.317
United States Fishermen	0.944	0.944	1.084	1.104

## 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.

In response to the continued growth of the sport fishery, IPHC renewed efforts in 1983 to improve the collection of timely and meaningful data of sport caught halibut. Public meetings were held in Homer, Juneau, and Ketchikan during May with representatives of the sport charter boat industry to improve communications and implement a voluntary logbook program. IPHC has encouraged their participation in the program as an alternative to mandatory regulations.

Creel census data provided by the Alaska Department of Fish and Game and the Washington Department of Fisheries has improved the estimation of the average size of sport caught halibut. Based on this information, the estimates for the sport harvest of halibut over the past five years have been revised.

The sport harvest in Alaska continues to dominate Pacific Coast sport landings. Halibut sport fishing is aggressively promoted by Alaska tourism interests with several communities holding halibut derbies throughout the summer season. There is every reason to believe the sport harvest will continue to increase with the present improved stock condition and increased angler pressure.

Washington and British Columbia anglers significantly increased their sport harvest of halibut in 1983. Bottom fishing has become increasingly popular in recent years partly because of reduced opportunities for recreational salmon fishing.

**Table 5. Catch by sport fishermen (thousands of pounds), 1979-1983.**

Area	1979	1980	1981	1982	1983
Alaska:					
Southeastern	246	333	319	489	562
Prince William Sound	32	42	36	36	47
Kenai	315	404	517	521	1,067
Kodiak	32	45	84	122	145
Total	625	824	956	1,168	1,821
British Columbia*					
Washington	18	11	23	66	99
Total	10	20	18	43	49
Total	653	855	997	1,277	1,969

\*Increase between 1981 and 1982 is due to revised estimation procedures

## INCIDENTAL CATCH AND MORTALITY OF HALIBUT

Halibut are caught incidentally in fisheries other than the commercial and sport fisheries for halibut. Information on the magnitude of the incidental catch is lacking or meager for some fisheries, making it difficult to accurately assess the effect of incidental catches on the fishery. IPHC has conducted several studies to estimate incidental catch over the years, but does not have the resources to monitor these fisheries on an annual basis. Rather, IPHC relies largely on information collected by other agencies.

The most reliable information on incidental catch is from observer programs where biologists sample the catch at sea. Unfortunately, these programs are expensive and require cooperation from the fishing industry. Presently, only foreign and joint-venture fisheries off the U.S. are being extensively monitored by observers. Estimates of incidental catch by foreign and joint-venture fisheries off Alaska in 1982 are shown in Table 6. (Estimates for 1983 are still preliminary.) The estimated foreign trawl catch of halibut, 4.4 million pounds, was nearly 28% less than the 1981 estimated catch of 6.2 million pounds. The halibut catch by joint-venture fisheries increased 125% from 0.4 to 0.9 million pounds from 1981 to 1982. Also, the foreign setline fishery continued its increasing trend of recent years, rising 11% or 0.3 million pounds to a total of 2.7 million pounds in 1982. The annual incidental catch by foreign setlines is now over ten times that estimated for the early 1970's, primarily a result of an expanding fishery for Pacific cod. Preliminary estimates of the 1983 incidental catch indicate an increase in foreign catch to about 8 million pounds, with a continued increase in incidental catch by longlines. Estimates of incidental catch by joint-venture fisheries indicate little change between 1982 and 1983.

Regulations require that incidentally caught halibut be returned to the sea, but many of those released die from injuries received during capture and, hence, represent a loss in yield

**Table 6. Estimated incidental catch and mortality of halibut (millions of pounds) in foreign and joint-venture fisheries off Alaska in 1982 (U.S. National Marine Fisheries Service).**

	Setline		Trawl		Joint Venture	
	Catch	Mortality	Catch	Mortality	Catch	Mortality
Area 2C	0	0	0	0	0	0
Area 3	2.5	<1.3	1.9	1.0-1.9	Trace	Trace
Area 4	0.2	<0.1	2.5	1.3-2.5	0.9	0.5-0.9
<b>TOTAL</b>	2.7	<1.4	4.4	2.3-4.4	0.9	0.5-0.9

from the resource. Estimates of mortality are based primarily on observer reports and vary greatly depending on how quickly the halibut are released. On foreign and joint-venture trawlers where catches are large, the halibut often cannot be released immediately; mortality may approach 100% and is probably at least 50%. Mortality on halibut released from foreign setline vessels is probably less than 50%.

Observer programs are lacking or infrequently conducted in domestic fisheries for crab, shrimp, and groundfish. In past IPHC annual reports, detailed estimates of incidental catch from these fisheries have been provided based on survey data even though these estimates were not considered precise. To avoid any misconception only estimates of the general magnitude of the incidental catch for these fisheries are provided in this year's report. In 1982 the incidental halibut catch was probably about 2 million pounds in the British Columbia groundfish fishery, 4 million pounds in the crab fisheries off Alaska, and 0.5 million pounds in the domestic groundfish and shrimp fisheries off Alaska. Mortality has been estimated at about 50% in the British Columbia trawl fishery. Estimates of mortality are not available for the shrimp and crab fisheries, but are likely to be at least 50%.

Summing incidental catches from all known sources results in a total incidental catch of about 14.5 million pounds. Total mortality from incidental catches is probably between 6 and 12 million pounds. Based on earlier estimates, mortality from incidental catches peaked at about 20 million pounds during the 1960's and early 1970's and has since declined steadily. Mortality in 1982 was probably lower than at any time since the early 1960's.

# Population Assessment

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## EVALUATION OF POPULATION CONDITION

Quantitative evaluation of the condition of Pacific halibut stocks was improved in 1983. Formal methods of estimating population parameters such as halibut biomass and annual surplus production (ASP) have been applied to the total halibut population in the past several years. In 1983, studies focused on the estimation of population parameters for individual regulatory areas. Estimates of biomass and annual surplus production are presented in this section for Regulatory Areas 2 (as a whole), 3A, 3B, and 4.

Last year, an analytical method called CPUE-partitioning was developed for estimating halibut biomass for regulatory areas. With this method, biomass of total population was obtained from analysis of age-structured data from sampling commercial catches. Catch-effort information is used to stabilize the estimates, but the assumption of constant catchability over time is less important. Biomass and ASP for regulatory areas are obtained by partitioning total biomass and ASP with a combination of CPUE and relative habitat information. Recent estimates from the method of CPUE partitioning may not be very accurate because current investigations suggest that catchability may vary among areas.

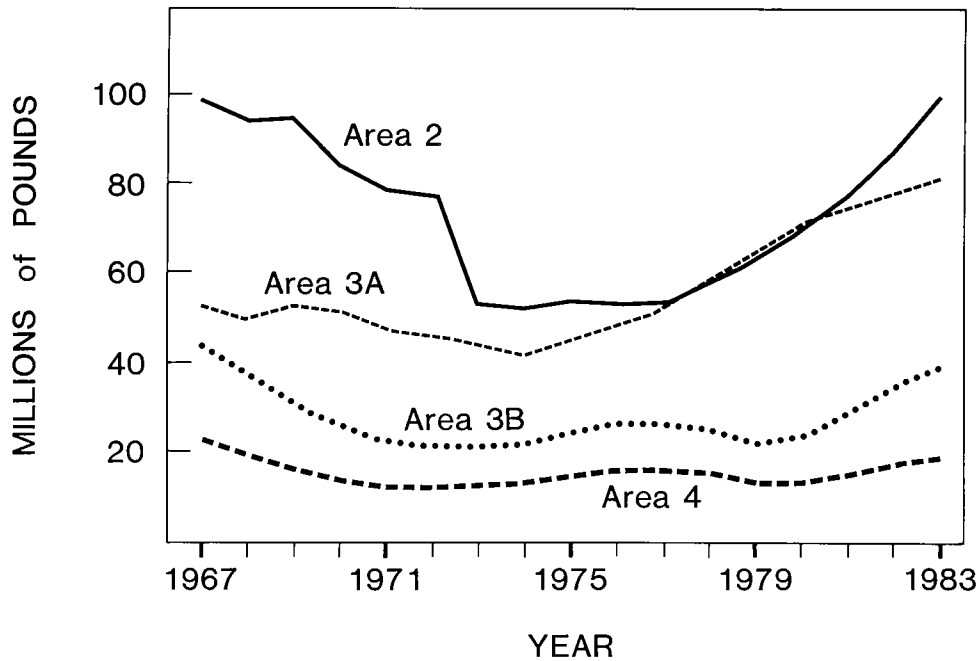
This year a new analytical method called migratory catch-age analysis was developed to reduce the impact of CPUE data on the estimates. This method uses catch-age data for individual regulatory areas rather than for the total population. Each regulatory area is analyzed separately but linked to other areas with migration rates and population abundance information. CPUE information is still needed to stabilize estimates, but is not used to partition biomass. A major assumption of this method is that estimates of migration rates are reliable. Annual surplus production is calculated as the sum of catch and change of biomass in each regulatory area, rather than partitioning total ASP with CPUE data.

Several sensitivity analyses of this new method indicate that regulatory estimates are not nearly as reliable as the total population estimate. Still, the regulatory area estimates from this method are similar to those from CPUE-partitioning over time periods when CPUE information was considered reliable. Further studies of this new method will be conducted to assure its reliability as a method of determining current surplus production.

Biomass estimates for each regulatory area between 1967 and 1983 from migratory catch-age analysis are shown in Figure 2. All areas exhibit a period of decline and then a period of increase between those years. The most recent estimates are the least reliable, which makes it difficult to make firm, quantitative statements about recent population increases. Area 3A begins to increase in 1974, followed by Area 2 in 1977, Area 3B in 1979, and Area 4 just recently. Thus, the population increase appears to have begun in the center of the halibut range and is expanding toward the edges of halibut distribution.

Annual surplus production is the excess of biomass above what is needed to replenish the population each year. If catch is held below the true surplus production, then the population will increase. A range of estimates from sensitivity analyses was used to arrive at an overall estimate of 1983 surplus production for each regulatory area. In addition, an approximate 95% confidence interval was calculated for each estimate. This means that 95 times out of 100, the confidence interval will contain the true surplus production.

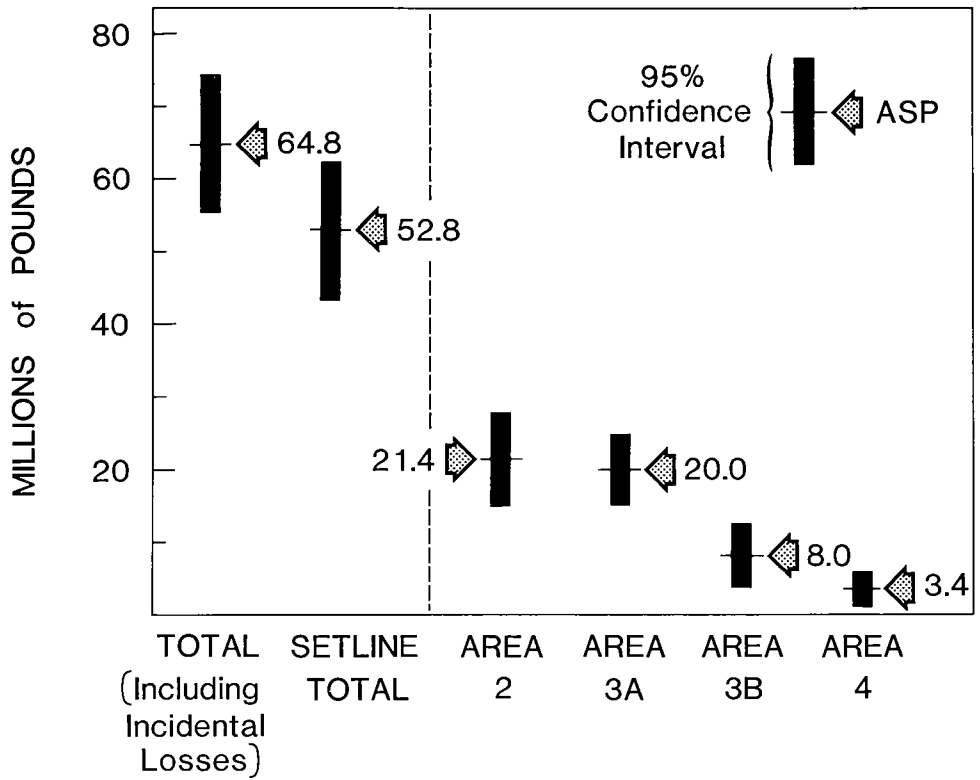
Estimates of 1983 surplus production, which include adjusted mortality from incidental catches, and the 95% confidence intervals for the total population are shown in



**Figure 2. Estimated biomass for Regulatory Areas 2, 3A, 3B, and 4, 1967-1983, from migratory catch-age analysis.**

Figure 3, with the total removals available to the commercial setline fishery, by regulatory areas. The estimated total surplus in 1983 is 64.8 million pounds. The 95% confidence interval for the true total surplus ranges from 55 million pounds to 74 million pounds. Mortality from incidental catches has to be subtracted from this total surplus to obtain the surplus available to the commercial setline fishery. Adjusted incidental mortality was assumed to be about 12 million pounds in 1983, which results in an estimated surplus available to the commercial setline fishery of 52.8 million pounds. This surplus is about 13 million pounds more than in 1982. The standard error of this surplus production estimate is about 5 million pounds, a relative error of about 10%. The resulting 95% confidence interval is 43-62 million pounds.

The breakdown of surplus production available to the commercial setline fishery by regulatory areas is relatively less certain than for all areas combined. In Area 2, estimated 1983 surplus production is 21.4 million pounds, up from 13 million pounds in 1982. The 95% confidence interval, 15-28 million pounds, is fairly wide, showing the uncertainty in the estimate. In Area 3A, estimated 1983 surplus production is 20 million pounds, up from 16 million pounds last year. The 95% confidence interval of 15-25 million pounds is also fairly wide. In Area 3B, estimated 1983 surplus production is 8 million pounds, about the same as last year, with a 95% confidence interval of 4-12 million pounds. In Area 4, estimated 1983 surplus production is 3.4 million pounds, about the same as last year, with a 95% confidence interval of 1-6 million pounds. Neither age structure nor CPUE information in Areas 3B and 4 is very reliable in the late 1970's because of a low level of fishing, so estimates of production from these areas are particularly sensitive to estimation error.



**Figure 3.** Estimates of 1983 total surplus production, including incidental losses; total surplus production available to commercial setline fishery; and surplus production by regulatory areas. The 95% confidence interval for each estimate is also shown.

## Scientific Investigations

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### RECENT PROBLEMS AFFECTING CPUE DATA

Until recently, fishing gear and conditions were relatively stable in the halibut fishery and CPUE was considered a reliable measure of fish density. However, several factors have altered the relationship between catch and fishing effort in recent years, and CPUE data may not provide an accurate assessment of the condition of the halibut resource. Factors affecting CPUE include the increasing use of snap gear, the high abundance of dogfish in some areas, the conversion to circle hooks, and short fishing seasons. IPHC conducted several studies in 1983 to evaluate the effect of these factors on CPUE and the results are reviewed here.

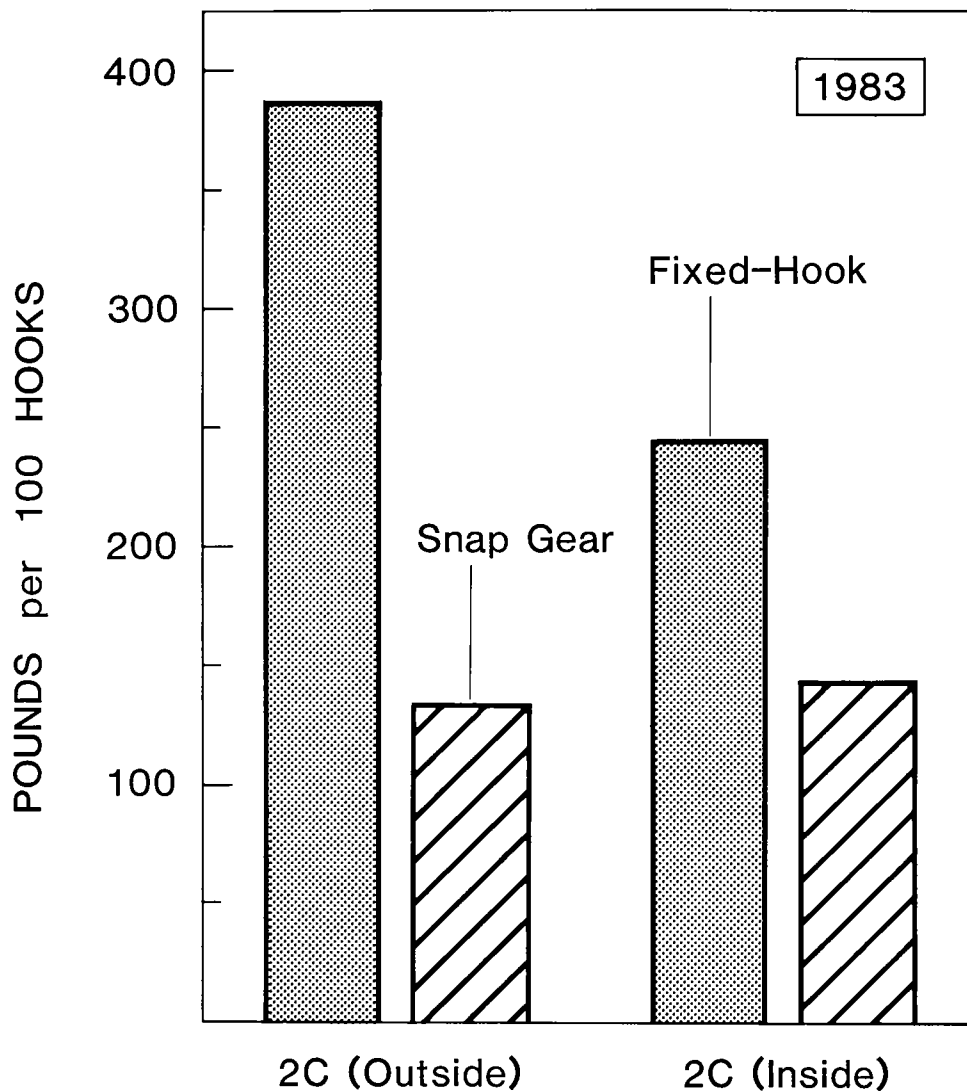
#### Snap gear

The number of vessels using conventional fixed-hook gear has declined as vessels switch to snap gear. This has reduced the amount of logbook data available to IPHC for estimating CPUE because no satisfactory method has been developed to standardize effort from snap gear vessels. Although the conversion to snap gear has been an ongoing process, the paucity of usable data became critical in Area 2C in 1983 when logs were obtained from only two vessels using fixed-hook gear in outside waters. Studies where the two gear types were fished comparatively indicate no significant difference in CPUE between snap and fixed gear, but data from the commercial fishery indicates a much higher CPUE for vessels using fixed-hook gear. The difference in the CPUE with gear type is illustrated in Figure 4. CPUE in outside waters was 387 pounds for fixed-hook gear compared to 134 pounds for snap gear. The difference was less pronounced in inside waters where the amount of logbook data for fixed-hook gear was greater.

The reason for the difference is not clear. Snap gear is used more frequently on smaller vessels which may tend to fish different grounds, closer inshore, due to their size limitations. However, as previously mentioned, our experiments indicate little difference in CPUE when the two gears are fished in a similar manner. Fishermen who use fixed-hook gear tend to have greater fishing experience, and this may account for their higher CPUE. Also, the number of hooks actually fished by snap gear may be overestimated in the log records; most snap vessels do not record the actual number of hooks fished but report the number of skates fished and the average hook spacing.

#### Dogfish

A study was conducted in 1982 to relate the CPUE of halibut in Hecate Strait (Area 2B) to factors such as dogfish abundance. The experimental design involved fishing both trawl and setline gear at several locations and then using the ratio of the setline to trawl catches as an indicator of setline efficiency, i.e., the trawl catch was used as an indicator of the actual halibut abundance. The results showed that the setline catch of halibut was reduced when dogfish were present in relatively high densities, but it was not possible to



**Figure 4.** A comparison of CPUE between fixed-hook and snap gear in Area 2C, 1983.

quantify the overall loss in the halibut catch or compare the efficiency of setlines in Area 2B with efficiency in other areas.

A second study was conducted in a similar manner during 1983 to determine if setline CPUE was less effective in catching halibut in Area 2B than in Area 3A. Area 2C was not chosen for comparison because the bottom is generally too rough for trawling. The results indicated setline gear caught fewer halibut relative to the trawl in Area 2B than in Area 3A, and the catchability of halibut in Area 3A was 1.48 times that in Area 2B for legal-sized fish. No difference in catchability was observed when stations with high dogfish abundance in Area 2B were excluded. Unfortunately, we do not know if the difference in catchability is a recent phenomenon or one that has occurred for some time.

### Circle hooks

Halibut fishermen have recently started converting to circle-shaped hooks from the traditional J-shaped hooks. The conversion began several years ago but became widespread in 1983. Based on logbook information collected for the first fishing period in 1983, about



20% of fishing effort involved some use of circle hooks in the U.S. fleet. However, most U.S. vessels probably were using at least some circle hooks by the end of the fishing season. Only a few vessels in Canada used circle hooks in 1983. Unfortunately, a precise estimate of total usage effort with circle hooks in 1983 is not available.

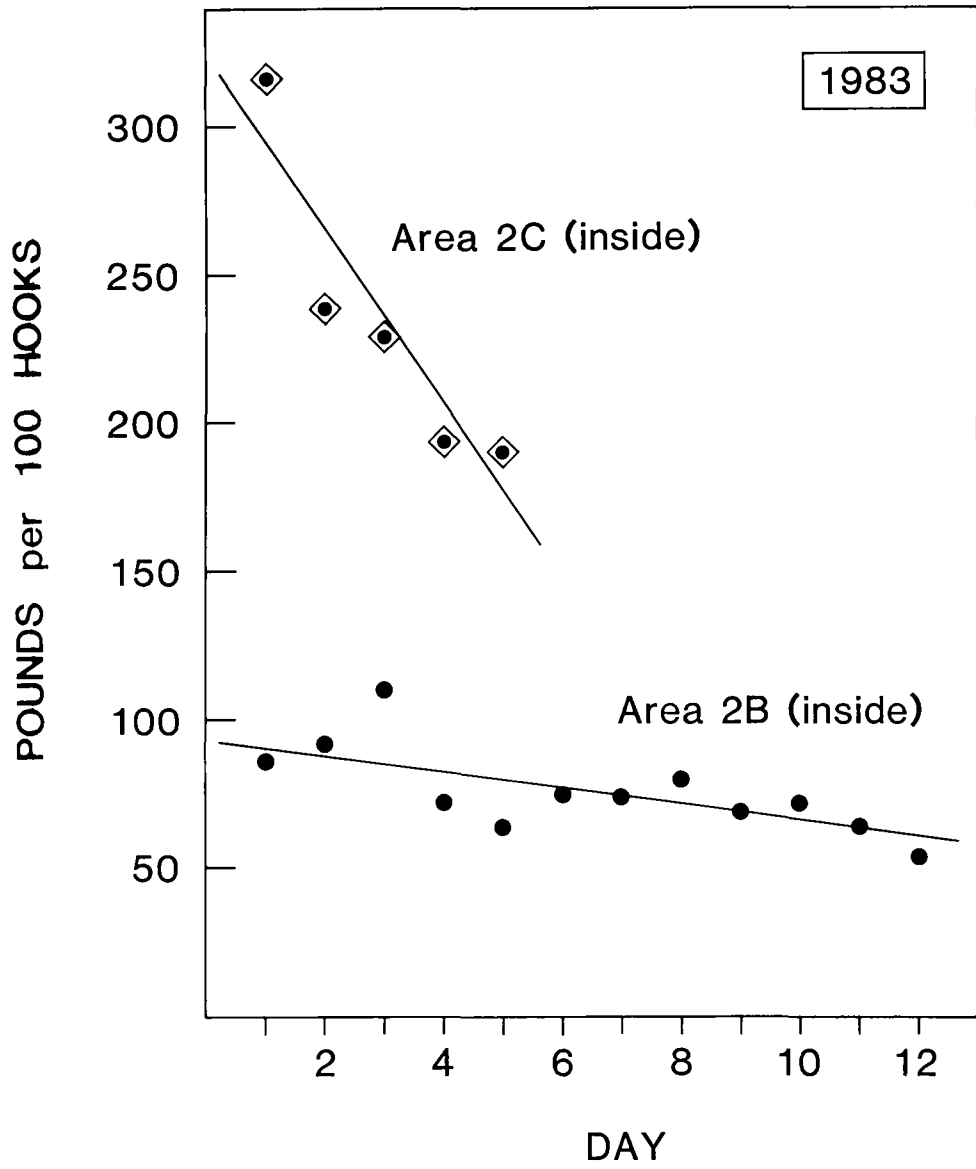
IPHC conducted several studies during 1983 to provide information on relative efficiency of circle hooks. The first occurred during July and August near Sitka, Alaska. The U.S. National Marine Fisheries Service played a key role in the study by providing a two-man submarine with a support vessel to observe the hooks along the bottom. Two experimental designs were used in the study. The first involved alternating hook-type within each skate fished, i.e., a circle hook followed by a traditional hook. The second design called for alternating hook-type on every other skate. The results clearly indicated that circle hooks out-fish traditional hooks: circle hooks caught 39% and 61% more poundage in the two experiments. Another study was conducted during October-November near Cape Clear in Area 3A and off the Queen Charlotte Islands in Area 2B. The CPUE of circle hooks was about 90% higher than the "J" hooks in Area 3A and about 75% higher in Area 2B. The results indicated that the relative efficiency of circle hooks may increase with fish density. No significant difference in the size composition of catch could be determined. Further investigations will be needed to precisely determine the efficiency of the circle hooks and to develop a CPUE correction factor.

## **Short Fishing Season**

Logbook data indicate that CPUE tends to decline during a fishing period. This probably is a result of local depletion on heavily frequented fishing grounds and competition among vessels. During closed periods, halibut apparently redistribute themselves over the grounds as CPUE often will again be high at the beginning of the next fishing period. Prospecting prior to the season may also contribute to the high CPUE at the start of the season, as will illegal fishing when the catch prior to the season may be claimed as part of the first day's catch. These "opening day" effects suggest that CPUE from short fishing periods cannot be compared directly with CPUE from long periods. Examples of the decline in CPUE during the season are shown in Figure 5. Both Areas 2B and 2C show a decline in CPUE during the fishing season, but the decline was much sharper in Area 2C where the fishing was more intense. If the season in Area 2C had been as long as the season in Area 2B, CPUE in Area 2C may have been much lower. On the other hand, CPUE in Area 2C probably would not have declined as sharply if the effective fishing effort was lower as in Area 2B.

## **Conclusion**

Results from recent studies indicate that a major adjustment is needed before recent CPUE data can be used for stock assessment purposes. Figure 6 illustrates the dramatic increase in CPUE that has occurred since the mid-1970's. Certainly, stocks have increased during this period, but not to the degree indicated by the rise in CPUE. IPHC will continue to conduct research on factors affecting CPUE and will attempt to standardize CPUE during 1984. In the meantime, assessment techniques using catch and age data (cohort analysis) can be used as an alternative.



**Figure 5.** Examples of the decline in CPUE during the fishing season, Areas 2B and 2C (inside waters), 1983.

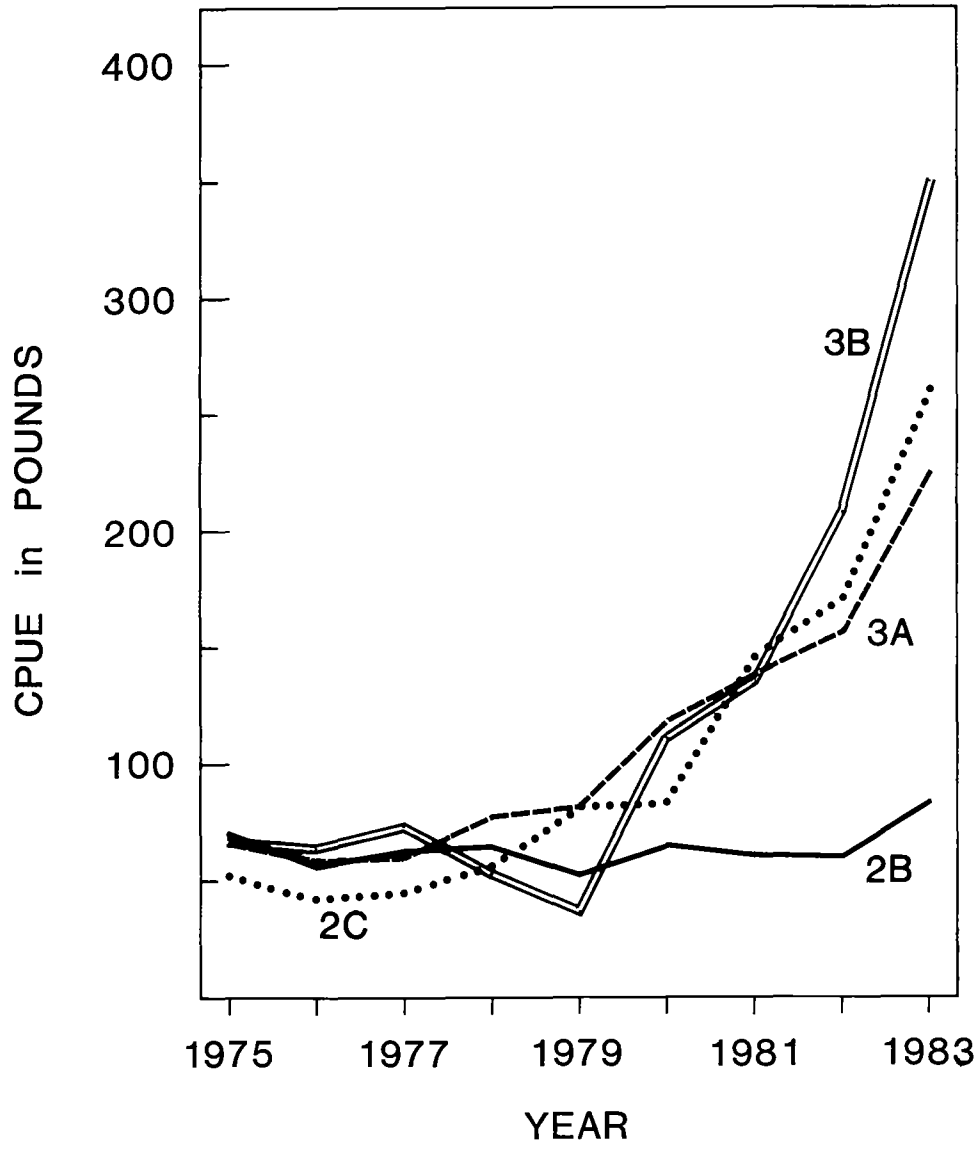


Figure 6. Unadjusted CPUE (lbs. per 100 hooks) by regulatory area, 1975-1983.

## JUVENILE HALIBUT SURVEY

A trawl survey to assess changes in abundance of juvenile halibut in southeastern Bering Sea and in the Gulf of Alaska has been conducted annually since 1963. The survey of the Bering Sea was deferred in 1983 to permit use of the chartered trawler for a comparative trawl-setline study in Hecate Strait in British Columbia and the Gulf of Alaska. However, the U.S. National Marine Fisheries Service conducted a groundfish survey later in the year in much of the area usually sampled by IPHC, and Commission personnel participated in that operation to collect halibut data.

A Canadian trawler, the PACIFIC HARVESTER, was chartered for 89 days in 1983. After completion of the trawl-setline comparison study, discussed earlier in this report, the trawler began the juvenile survey in the Gulf of Alaska.

The survey in the Gulf consists of 110 index stations fished each year with a 90 mm mesh net near Unimak Island (25 stations); Chirikof Island (23 stations); Cape Chiniak (26 stations); and Cape St. Elias (36 stations). In addition, 27 inshore stations are fished with a smaller 32 mm mesh net at Unimak Island, Trinity Islands, Alitak Bay, Kayak Island, and at Shelikof Bay. Lengths of all halibut were recorded and most viable halibut not needed for sex and age data were tagged. All hauls were subsampled to obtain an estimate of the number and weight of all species caught. In addition, the number and sex of all king crab caught were recorded and the carapace lengths of all male king crab were measured.

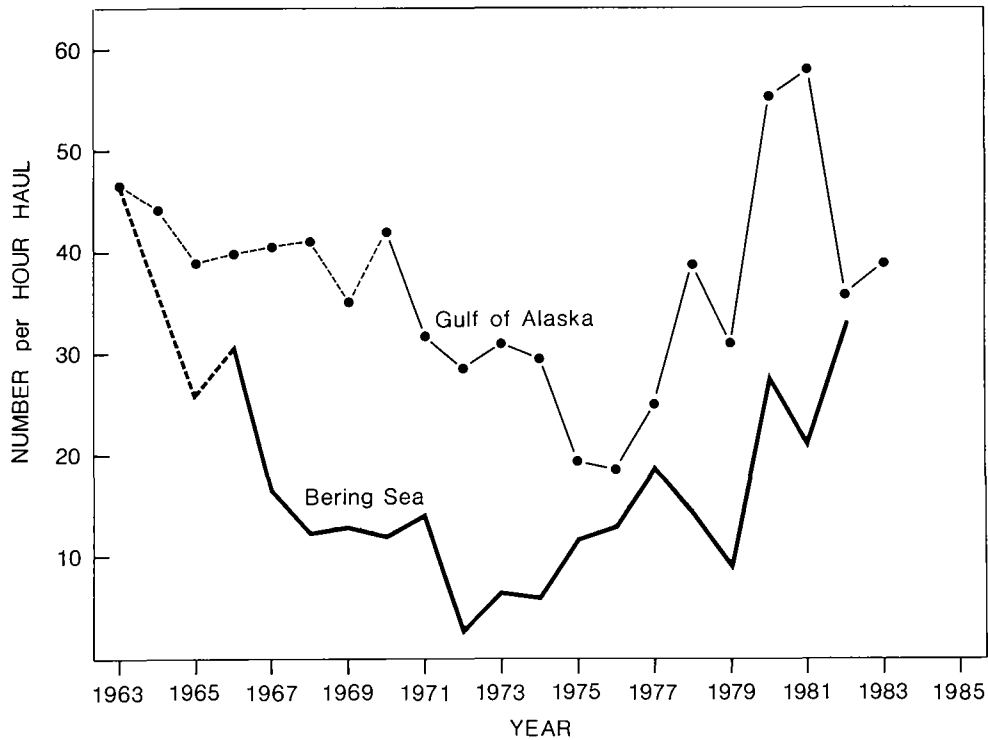
The CPUE of juvenile halibut was estimated as the number per one-hour haul with the 90 mm gear and the number per 15-minute haul with the 32 mm gear, and the results are given in Appendix III, Table I along with the average length at each age, for each index region in 1983. The CPUE for the Bering Sea index area and the average CPUE for the Gulf of Alaska are shown in Figure 7 for all years for which data are available.

Based on the catch at the 34 index stations fished each year, the mean CPUE in the Bering Sea has been increasing from a low level in the early 1970's. In 1982, the CPUE was 33.1, the highest recorded since the sampling began in the 1960's. Unfortunately, no comparable data were collected in 1983. The results of the NMFS survey in 1983 show a significant decline in juvenile abundance, but since that sampling was conducted later in the year than the previous surveys by IPHC, that conclusion must be interpreted with caution. However, the size compositions of the NMFS catches showed a continued decline in the percentage of smaller juveniles, which had also been observed in IPHC catches for several years.

The mean CPUE of the IPHC survey in the Gulf of Alaska in 1983 was 39.0, up slightly from 1982. The CPUE's in 1982 and 1983 were decidedly lower than the highs recorded in 1980-81, but still on the upward trend observed since the mid-1970's.

One-year-olds made a strong showing in catches with the 32 mm gear at Kayak Island and in Alitak Bay, and two-year-olds were strong in all sampling regions. Three-year-olds were especially prominent in catches with the 90 mm gear, particularly on the grounds around Kodiak Island where they accounted for over 50% of the catches.

Following the regular survey, exploratory hauls were made off southeastern Alaska. Few trawlable grounds exist in this region, and few juvenile halibut were caught. Live halibut were collected from grounds off northern Graham Island in British Columbia for transfer to the Seattle Aquarium. The results of this transfer are discussed in a later section of this report.



**Figure 7. Catch-per-unit-effort of juvenile halibut in the Gulf of Alaska and the Bering Sea. No comparable data for Bering Sea in 1983.**

### ADULT HALIBUT SURVEY

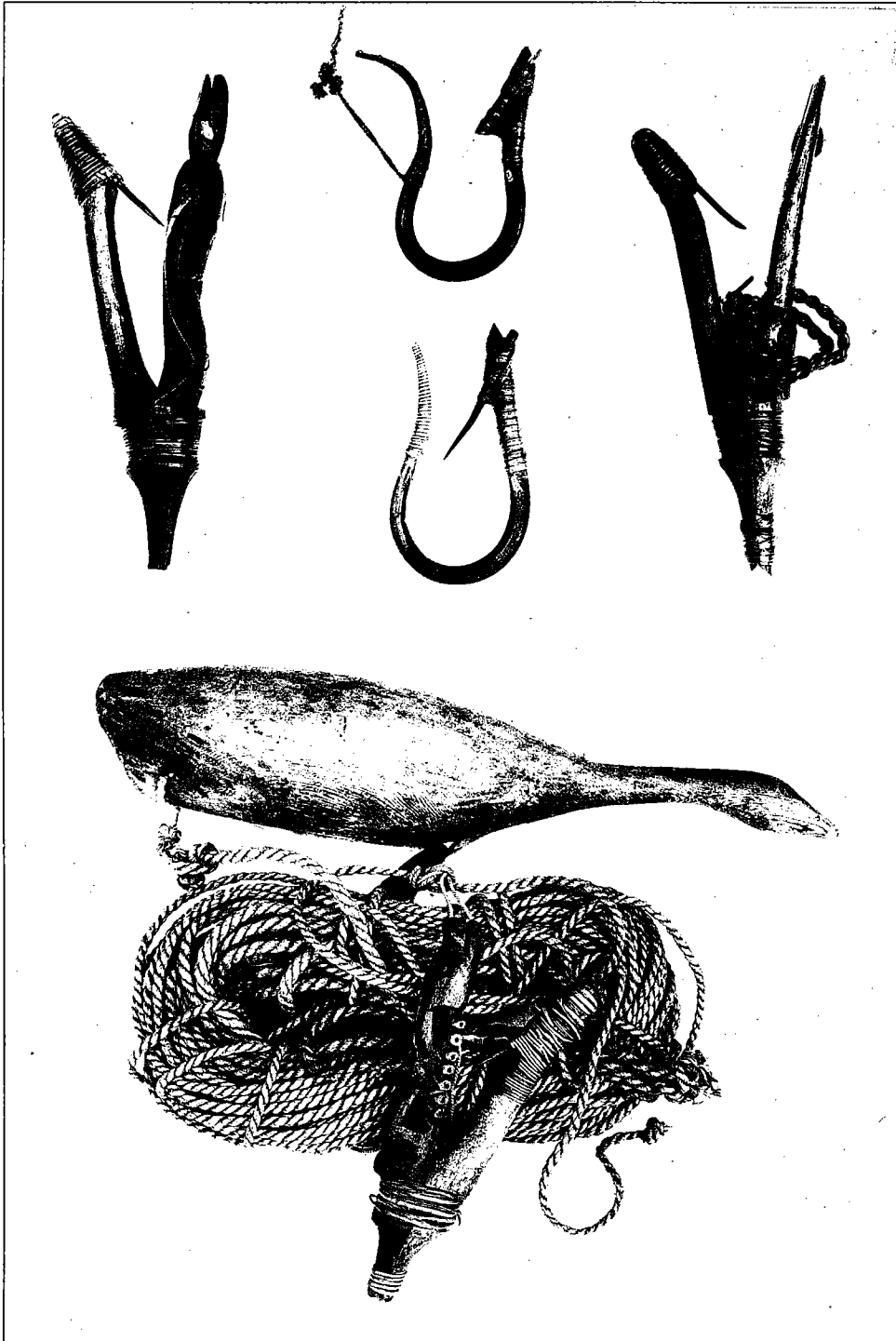
Since 1976, IPHC has acquired population assessment information on adult halibut independent of the commercial fishery through its own setline surveys. The catch of sublegal halibut on these surveys also provides a useful indicator of potential recruitment to the adult population. In 1983, surveys were conducted in the Charlotte region in Area 2B, in the southeastern Alaska region (Area 2C), and in the Kodiak region of Area 3A.

The 1983 surveys caught 7,132 halibut, of which 3,407 fish were used to estimate the size, sex, and age composition of the catches. The remaining 3,725 halibut without serious injuries were tagged and released. Recoveries of these tags will provide estimates of mortality and growth as well as information on migration.

To standardize the fishing operation the same grid of stations is fished each year, setting and hauling times follow a predetermined schedule, and baiting practices are the same in all areas. Vessels chartered were the EVENING STAR, Poulsbo, Washington, and the WINDWARD ISLE, Vancouver, B.C., for the Charlotte survey in British Columbia; the POLARIS, Seattle, for the southeastern Alaska survey; and the MASONIC, Seattle, for the Kodiak survey.

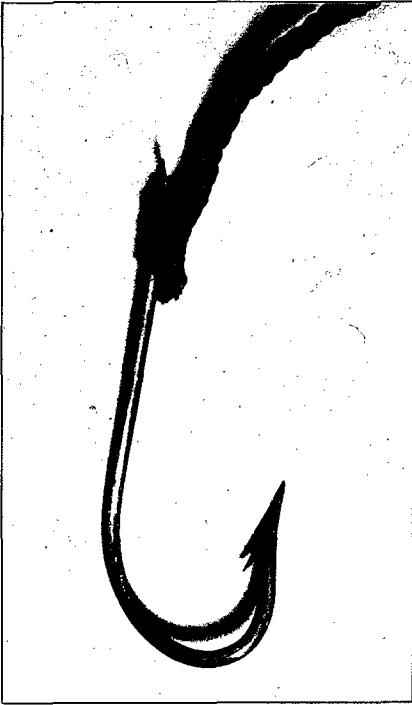
CPUE in the following discussion is expressed in pounds per skate for legal-sized halibut ( $\geq 81$  cm) and in number per skate for sublegal halibut. These reporting units are

## EVOLUTION OF THE

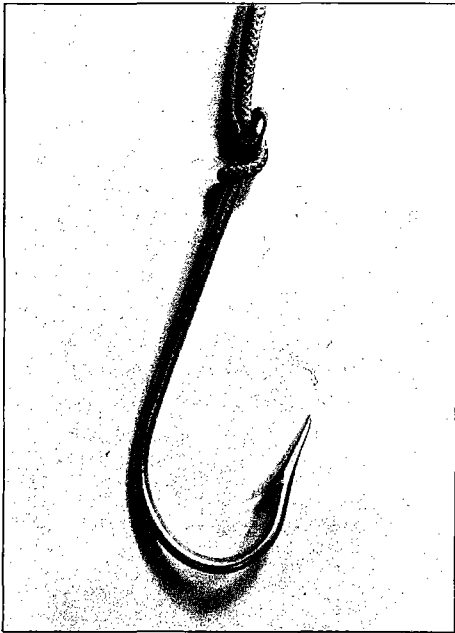


Early Indian hooks, float and line. The hooks were often ornately carved with good-luck symbols and were rigged to float just off the bottom.

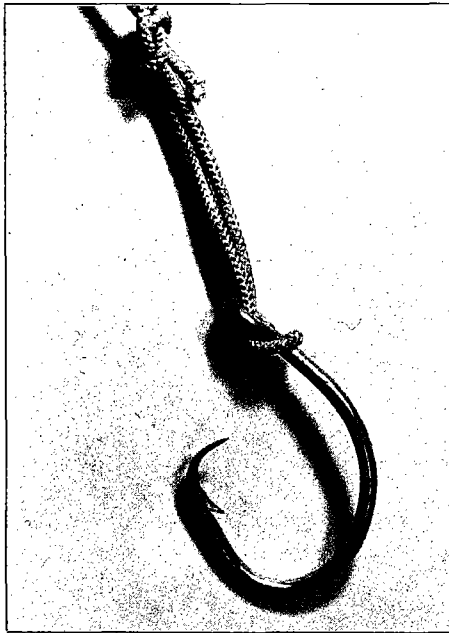
# HALIBUT HOOK



The flattened off-set hook (left), common in the fishery for over 60 years. Much of the fishermen's time running to the grounds was spent seizing the hooks to the gangions with ganging twine (above).



The eyed off-set hook replaced the ganged hook in the late 1960's.



The modern circle hook, introduced in 1982-3.

used because fishery statistics for adults usually are given in weight, whereas estimates of numerical abundance of sublegal halibut, because of their small size, may be more meaningful. For example, large changes in numerical abundance of juveniles can be masked by small changes in average weight. Survey CPUE may be a more reliable indicator of recent changes in stock condition because the comparability of commercial CPUE over time has been reduced by changes in the fishery, such as circle hooks, dogfish, and length of seasons.

In the Charlotte region, abundance of legal-sized halibut, as measured by survey CPUE, continued to fluctuate about its long-term average. In 1983, CPUE was 20.5 pounds per skate, slightly lower than the 23.2 pounds per skate caught during 1982 (Table 7). The highlight of the 1983 survey results is the increased abundance of sublegal halibut. A CPUE of 0.6 halibut per skate in 1983 is twice the 1982 value and is the highest catch in the history

**Table 7. Historical results from the adult halibut surveys.**

	Sublegals (<81 cm)					Legals (≥81 cm)				
	Lbs. Per Skate	No. Per Skate	Avg. Wgt.	Median Age	% Female	Lbs. Per Skate	No. Per Skate	Avg. Wgt.	Median Age	% Female
<b>Charlotte</b>										
1965-66	3.0	0.4	7.1	7.2	27	43.6	1.2	37.3	11.4	71
1976	2.1	0.3	7.8	8.0	11	26.8	0.8	34.7	10.3	79
1977	1.7	0.2	7.6	7.6	31	14.7	0.5	31.4	10.4	60
1978	1.7	0.2	7.3	6.7	29	20.7	0.6	35.0	11.3	57
1980	2.5	0.3	7.6	7.5	35	29.0	1.0	28.2	10.3	63
1981	1.8	0.3	7.3	7.1	30	18.2	0.6	30.1	10.5	67
1982	2.5	0.3	7.3	7.5	36	23.2	0.8	28.6	10.4	66
1983	4.3	0.6	6.8	7.3	36	20.5	0.8	26.5	10.2	70
Average	2.5	0.3	7.4	7.4	29	24.6	0.8	31.5	10.6	67
<b>Southeastern</b>										
1982	4.4	0.6	6.9	7.7	34	114.8	3.0	38.2	11.6	63
1983	4.4	0.6	7.1	7.9	33	139.0	3.7	37.9	11.7	63
Average	4.4	0.6	7.0	7.8	34	126.9	3.4	38.1	11.7	63
<b>Kodiak</b>										
1963	3.9	0.6	6.3	7.5	30	86.3	2.2	38.6	10.5	72
1977	5.5	1.0	5.7	7.0	30	73.0	1.5	47.3	10.2	70
1978	4.3	0.8	5.5	6.1	40	33.1	0.8	39.8	9.7	65
1979	6.0	1.0	6.0	6.7	36	52.0	1.4	36.8	9.9	65
1980	5.2	0.8	6.4	7.4	40	93.7	2.3	41.2	10.8	75
1981	6.8	1.1	6.2	6.9	37	160.4	3.5	45.4	11.3	71
1982	6.5	1.0	6.8	7.2	39	160.7	3.7	43.4	10.4	70
1983	5.7	0.9	6.3	7.0	47	143.7	3.2	45.4	11.2	72
Average	5.5	0.9	6.2	7.0	37	100.4	2.3	42.2	10.5	70
<b>Shumagin</b>										
1965	1.9	0.3	5.8	7.2	50	72.2	1.5	47.1	10.6	86
1982	7.5	1.3	5.9	7.1	43	144.7	3.1	46.4	10.1	84
Average	4.7	0.8	5.9	7.2	47	108.5	2.3	46.8	10.4	85



of the surveys in this region. Also, it equalled or exceeded the number of legal-sized halibut caught during several previous surveys. Females represented 70% of the legal-sized halibut caught during 1983, slightly higher than most years. Median age declined slightly in 1983.

Changes in survey results within the southeastern Alaska region should be assessed with caution because this region has been surveyed only during 1982 and 1983 and the 1983 survey included some areas not surveyed during 1982. The CPUE of legal-sized halibut was 139.0 pounds per skate, 21% higher than in 1982 (Table 7). The CPUE of sublegal fish was 0.6 halibut per skate, the same as in 1982. For both size groups, the proportion of females did not change. Thirty-three percent of sublegal and 63% of legal-sized halibut were females, nearly the same as in the Charlotte region. Median age was slightly higher in 1983.

Relative abundance of legal-sized halibut in the Kodiak region showed its first decline since 1978 (Table 7). CPUE in 1983 was 143.7 pounds per skate, 11% less than during 1982. The CPUE of sublegal halibut continued to fluctuate about its long-term average and was 0.9 halibut per skate in 1983, slightly lower than in 1982. The proportion of females in both size groups was higher in the Kodiak survey than in the Charlotte and southeastern Alaska surveys. The female proportion of adult halibut was 72%, nearly identical to previous years. The female proportion of sublegal halibut, 47%, was considerably higher than previous catches and may be related to the timing of the survey. The 1983 survey was conducted during May and June rather than in August as in most years. In 1980, the survey was conducted in June and again in August, and a similar difference in sex composition of sublegal halibut was observed between those surveys.

Species other than halibut affect the results of the surveys because they compete for baited hooks. On the Charlotte survey halibut comprised only 7% of the catch by number. Chief competitors were spiny dogfish (*Squalus acanthias*), skates (*Raja* spp.), sablefish (*Anoplopoma fimbria*), and rockfish (*Sebastes* spp.). On the southeastern Alaska survey halibut accounted for 49% of the catch. Rockfish, skates, and dogfish were also caught in significant numbers. Halibut represented 50% of the catch on the Kodiak survey, with starfish and Pacific cod (*Gadus macrocephalus*) making up a large portion of the remainder.

IPHC Technical Report No. 18 presented detailed results of these surveys through 1979. Appendix III, Tables 3 and 4, of this annual report update these results.

## COOPERATIVE GROUND FISH STUDIES

IPHC participated on a portion of the U.S. National Marine Fisheries Service groundfish survey in the Bering Sea in 1983. The NMFS survey consisted of a series of stations 20 miles apart covering the flats out to the 100 fathom edge, and extending from the Alaska Peninsula (Unimak Island-Bristol Bay) to St. Matthew Island (latitude 61° N). An 83/112' eastern trawl, a 3.5 mesh net similar to the 71/94' net used in IPHC juvenile surveys, was used as the sampling gear.

In 115 hauls sampled, 359 halibut were observed, of which 309 were tagged. The percent distribution by size is given in Table 8. Surface temperatures were mostly between 8°C and 10°C, whereas the bottom temperature varied from 0°C to 5°C. Halibut abundance varied according to bottom temperature, with few fish observed in waters less than 2°C. Large concentrations were found 40 miles south of Nunivak Island and around the Pribilof Islands.

**Table 8. Size Composition of halibut caught by NMFS Groundfish Survey in the Bering Sea in 1983.**

Size Range	Percent	
	Bering Sea	Aleutian Islands*
<40 cm	16.4	8.8
40-49 cm	51.5	9.1
50-64 cm	24.0	49.6
65-81 cm	5.6	14.7
>81 cm	2.5	17.8

\*net equipped with roller gear.

Commission personnel also participated in a NMFS groundfish survey along the eastern Aleutian Islands between Akutan and Atka Islands during the latter part of August. A sampling pattern of stratified random design on the continental shelf and upper slope from 50-900 m was used. Trawlable stations were sampled with a 90/105' (3.5" mesh) northeastern trawl with 14-inch roller gear. Surface temperature varied from 7°C to 10°C, with bottom temperatures ranging from 4°C to 7°C. A total of 63 tows were made during this survey with most of the halibut found in waters shallower than 182 meters. The size composition of these catches is also given in Table 8. Almost 18% of the halibut caught in the Aleutian area were of commercial size.

The larger size composition of the catch in the Aleutian area compared to that on the Bering Sea flats may be due to the use of roller gear as much as the difference in area or depths fished.

## TAGGING STUDIES

IPHC tagged 12,124 halibut in 1983 compared to 11,671 in 1982. Tagged fish were released from nine vessels involved in IPHC research projects (Table 9) and, although none of the projects was designed primarily as a tagging study, the releases and future returns will create a useful pool of data on fish movement, utilization, and growth rates. Three areas were fished by conventional setliners working on a predetermined grid of stations in a continuing summer adult survey. The Area 2B survey, which extends from Cape Scott to Dixon Entrance, was fished by the WINDWARD ISLE and EVENING STAR, fishing the southern and northern portions respectively. The POLARIS fished the entire Area 2C survey, which covers all of southeastern Alaska. The MASONIC fished the Area 3A survey, which extends from eastern Portlock Bank to the Trinity Islands, excluding Shelikof Strait. The VALOROUS duplicated the work of the MASONIC, but used snap-on gear for a comparison with fixed-hook gear. The WINDWARD ISLE was chartered again late in the year for an experiment comparing the relative effectiveness of "J" hooks and "circle" hooks. The first trip was in the central Gulf of Alaska and the second was in northern British Columbia. Trawl releases include those from the PACIFIC HARVESTER, which was chartered for the annual juvenile halibut survey and released tagged fish from Unimak Island in Alaska to near Cape Scott on the central British Columbia coast. Commission personnel released tagged fish from the CHAPMAN and MILLER FREEMAN, which

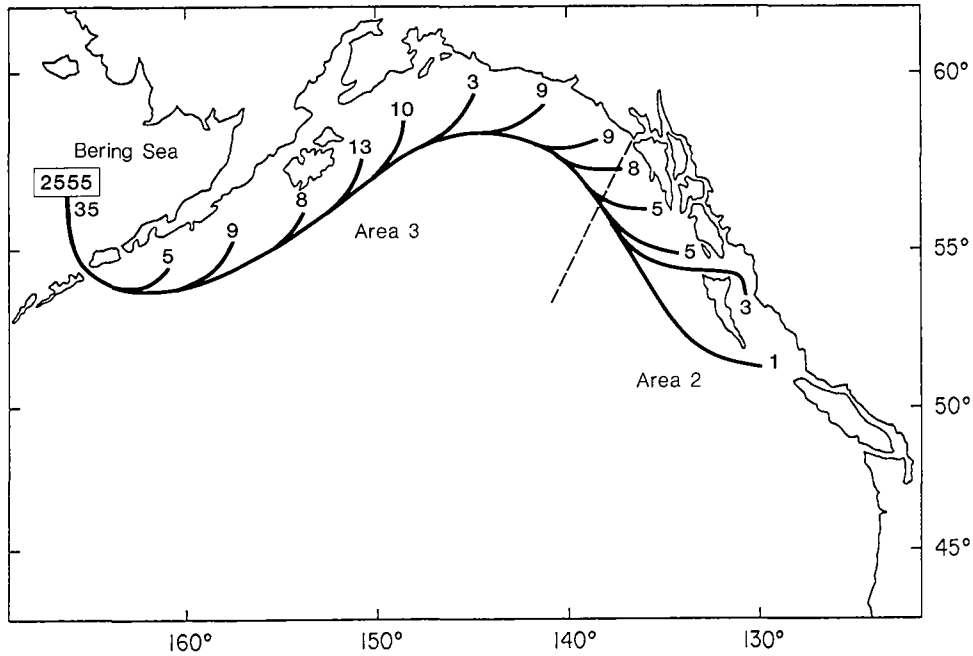
were conducting a survey for king crab in the Bering Sea area for the National Marine Fisheries Service. An IPHC staff member tagged halibut caught during a joint U.S.-Japan trawl gear investigation in the Bering Sea using the Japanese research vessel YAKUSHI MARU NO. 31.

**Table 9. Tag releases by month, vessel, and gear in 1983.**

Month	Vessel	Gear	No. Tagged
February	MILLER FREEMAN	Trawl	353
May - June	WINDWARD ISLE	Setline	287
May - June	EVENING STAR	Setline	221
May - June	POLARIS	Setline	1,707
May - June	MASONIC	Setline	1,520
May - June	VALOROUS	Setline	928
May - Aug.	PACIFIC HARVESTER	Trawl	5,631
July - Sept.	CHAPMAN	Trawl	649
Oct. - Nov.	WINDWARD ISLE	Setline	528
Nov. - Dec.	YAKUSHI MARU NO. 31	Trawl	300
Total			12,124

Tag recoveries totalled 645 in 1983, including two recaptured in earlier years but not reported until this year. Six premium tags were received and the finders were awarded \$100.00 each in addition to the basic \$5.00 reward.

During 1983, some earlier tagging experiments conducted in 1964, 1965, and 1967 around the Pribilof Islands were analyzed for migration patterns. In all, 1,740 halibut were tagged and released at St. Paul Island and 815 were released at St. George Island. Over the years, there are 123 returns from these tags. Of these, seven tags were recovered at the island where they were released: four at St. Paul and three at St. George. An additional 24 tags were recovered on the Bering Sea shelf edge, 22 south of the islands, and two to the west. All of the tags recovered close to the islands were recovered between May and September, whereas those recovered along the edge were recaptured between February and May. Another four tags were recovered within the Bering Sea, but the recovery location was not given. An additional 88 tags were recaptured in Areas 2 and 3 as shown in Figure 8. The relative number of recaptures taken at different locations is a function of both the number of tagged fish present at each location and the intensity of the fishery there. Nevertheless, these experiments show that Pribilof Island fish migrate to the edge of the continental shelf within the Bering Sea, particularly during the winter months, and a substantial number migrate into the Gulf of Alaska and further south. This migration pattern is similar to what has been observed in other Bering Sea tagging experiments.



**Figure 8. Recovery locations from 2,555 halibut tagged near the Pribilof Islands in 1964, 1965, and 1967.**

### **HALIBUT CAPTURED FOR THE SEATTLE AQUARIUM**

During the last cruise of the 1983 juvenile survey, 30 young halibut, averaging 75 cm in length, were retained live for the Seattle Aquarium. The fish, all in excellent condition, were caught off the northern coast of Graham Island in Dixon Entrance. After a stormy trip to Seattle, 29 surviving halibut were immediately transferred to the aquarium in tanks of well-oxygenated seawater. At the time of the transfer it was noted that the fish had suffered some abrasion injuries, possibly due to the motion of the vessel during the rough three-day voyage to Seattle. The wounds were concentrated on the ventral surfaces and on the tail fins, parts most likely to be in contact with the surfaces of the flooded holding tank where they were held. Eighteen of the least damaged fish were selected to go on display in the aquarium dome exhibit and the rest were released into Elliot Bay, Seattle's harbor. The retained fish were all given one of two treatments to prevent or eliminate infection of the injured areas by microorganisms. One group of 10 was treated with a "slime replacer", which recoats body surfaces denuded of natural slime with an artificial slime. This protects the abraded areas from infection, allowing the animal's natural immune system to overcome any microorganism already present. The other eight fish were treated with a topical bacteriocidal stain which kills any microorganisms already present, but does not prevent reinfection.

Presently, three young halibut are alive and healthy in the Seattle Aquarium display dome. The remainder died from a *Myxobacterium* infection, which gradually destroys the body tissues beginning with the fins (hence the common term for the disease "fin rot").

Although the three remaining fish still bear fin rot scars, all of their wounds have healed and they eat ravenously. Unfortunately, we do not know to which of the treatment groups the survivors belong.

Results of this study emphasized the importance of preventing physical injury to fish collected for live studies, particularly during transport. Although the fish were in excellent condition when caught, damage inflicted during the trip to Seattle proved fatal to 90% of them by increasing their vulnerability to infection. Transport containers with smooth liners would likely reduce the possibility of physical damage to the fish during extended moves. The addition of a small amount of an antibiotic agent or slime replacer to the water during transport as an additional precautionary measure may also be useful in preventing minor handling injuries from becoming a serious source of mortality.

## **BRISTOL BAY NEARSHORE JUVENILE HALIBUT STUDY**

During a NMFS survey of the distribution and abundance of juvenile king crab, juvenile halibut aged one to two years were captured at nearshore locations in the Bering Sea from the west end of Unimak Island to Kvichak Bay at the head of Bristol Bay.

The survey was conducted aboard the NOAA research vessel MILLER FREEMAN as part of a graduate study by a University of Washington student supported by IPHC funding. Sixty-six tows of ten minutes each were made between June 2 and June 17 with a try net that had a 17' opening and a 6 mm codend. The footrope was rigged with a tickler chain.

Forty halibut were caught, usually in depths less than 17 fathoms. In one area off Port Moller, the halibut were distributed heavily around five fathoms. In addition to the larger juveniles, one late stage post-larvae was taken, possibly in midwater as it appeared to be a pre-bottom stage, not completely metamorphosed. Because of the early timing of the survey, it appeared questionable whether the small halibut taken as far into Bristol Bay as Kvichak Bay could have migrated to that area seasonally, but may actually have overwintered there under the ice.

The study results indicate that in future studies of halibut nursery areas sampling should be conducted at least as shallow as five fathoms, perhaps necessitating use of a skiff and a smaller net than now used in the annual juvenile survey.

## **CRAB POT STUDIES**

Halibut are caught incidentally in crab pots and previous research has focused on finding pot designs that are effective in catching crab, but not halibut (see IPHC Technical Report No. 19). In June 1983, IPHC, in a cooperative study with the Alaska Department of Fish and Game, tested a device termed a "Tanner crab cone" that may reduce the incidental catch by side-entry crab pots. The Tanner crab cone was originally designed to reduce escapement by Tanner crab but may also reduce the catch of halibut.

Normally, halibut become trapped in side-entry pots when they enter through a tunnel and fall to the bottom of the pot. The cone fits between the tunnel openings inside the pot and may direct halibut through the pot and out the opposite tunnel. The cone is actually a vertical tunnel, similar to the tunnel of a top-entry pot, with side panels that extend to the top of the pot to prevent crab from escaping.

The experimental pots were fished near Frederick Sound during an assessment survey of king and Tanner crab stocks in southeastern Alaska. Side-entry crab pots, measuring seven by seven feet with 3.5 inch stretch mesh, were fished in strings and the cones were inserted in alternate pots within the string.

The experiment included 56 potlifts during nine fishing days, 28 with the cone and 28 without. Halibut catches declined from 2.1 halibut per pot when the cone was not used to less than one halibut per pot with the cone in place (Table 10). Halibut captured in pots with the cone were smaller and averaged 10.4 pounds. Halibut in pots without the cone averaged 16.1 pounds. Overall mortality was relatively low: 9% (eight fish) were dead when the pots were retrieved.

**Table 10. Catch results from 1983 crab pot modification experiment.**

	Halibut		Tanner Crab		King Crab	
	With Cone	Without Cone	With Cone	Without Cone	With Cone	Without Cone
No. of Individuals	26	60	226	151	60	28
No. per Potlift	0.9	2.1	8.1	5.4	0.4	1.0
Halibut Avg. Weight	10.4	16.1	—	—	—	—
Legal crab* Per Potlift	—	—	5.5	2.5	0.04	0.04

\*Legal Tanner crab defined as  $\geq 140$ mm. Legal red king crab defined as  $\geq 8$  mm.

Tanner crab (*Chionoecetes bairdi*) catches increased when the cones were used, averaging 50% higher for all sizes of crab and more than 100 percent higher for legal crab ( $\geq 140$  mm carapace width). In contrast, the catch of king crab (*Paralithodes camtschatica*) decreased with the use of the cone. Catches averaged 1.0 king crab in pots without the cone, but were less than half of that in pots with the cone. However, catches of all sizes of king crab were small and all king crab were caught in just eight potlifts (four of each type). Only one legal king crab ( $\geq 178$  mm carapace length) was captured by each pot-type.

The cones reduced the catch of halibut of all sizes and nearly eliminated the catch of halibut greater than 100 cm (20 pounds). These results are similar to the effect of Tanner boards on the catch of halibut by side-entry pots (IPHC Technical Report No. 19); i.e., Tanner boards almost eliminate the catch of halibut over 90 cm and provide further evidence that halibut catches by pots can be reduced without adversely affecting crab catches.

## CATCH SAMPLING

Halibut landings were sampled at ports from Newport, Oregon, to the Pribilof Islands, Alaska. Over 24,000 otoliths were collected from 268 separate deliveries for determination of the size composition of the landed fish. A sub-sample of over 9,600 otoliths was selected for age composition estimation. The sub-sample for aging consisted of 600 otoliths from each region of the coast for each fishing period.

The rush of landings following the brief fishing seasons in Areas 2C and 3A made it impossible to maintain the desired sampling rate of 1/6 of the fish delivered by 1/3 of the vessels, or 5.6%. The sampling rate declined to only 2.1% in 1983, down from 2.9% in 1982. Nevertheless, the data collected are adequate for age composition studies. A summary of the sampling by region is presented in Table 11.

Catch and CPUE in numbers of fish and average weight at each age of halibut in the 1983 setline landings are summarized by region in Appendix III, Table 2. The average length and age of fish in the landings, and numbers of halibut measured and aged are also reported.

The 1970 and 1972 year classes, important in the catch in 1982, apparently reached their peak abundance in the fishery and declined in importance this year. The 1973 year class, which made a significant contribution in Area 4 in 1982 was the largest single group in the landings from all regulatory areas as 10-year-olds. The 1975 year class also made an important contribution to the catch from Area 4 only as 8-year-olds.

**Table 11. Commercial catch and percent sampled for size and age composition by region during 1983.**

Region	Catch* (000's pounds)	Percent Sampled
Columbia	133	7.8
Vancouver	365	0.0
Charlotte-Outside	879	2.7
Charlotte-Inside	4,316	2.4
S.E. Alaska-Outside	2,322	1.5
S.E. Alaska-Inside	4,076	1.1
Yakutat	3,566	1.8
Kodiak	10,532	2.0
Chirikof	6,116	1.8
Shumagin	3,692	3.0
Aleutian	906	4.1
Bering Sea	1,459	3.8
<b>Total</b>	<b>38,362</b>	<b>2.1</b>

\*Does not include research catches.

## **HALIBUT FISHING FILM**

Color footage of surface and underwater scenes was taken during the submersible/hook comparison study off Sitka, Alaska, in July and August 1983. A preliminary 25-minute preview film was produced in cooperation with NMFS describing the submersible operation, some fishing scenes, and the reaction of fish while hooked on the gear. The film has been shown at several industry and scientific meetings and at the Halibut Commission Annual Meeting.

The film will be edited with the addition of scenic and other fishing scenes and provided with a sound track. The project is jointly sponsored by the Undersea Research Program Office of the National Oceanic and Atmospheric Administration and the International Pacific Halibut Commission.



## Appendices

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The tables in Appendix I provide statistics for 1983 and are a supplement to Technical Report No. 14, "The Pacific Halibut Fishery: Catch, Effort and CPUE, 1929-1975." Appendix tables in the 1977 Annual Report updated these statistics for 1976 and 1977, the 1979 Annual Report updated these statistics for 1978 and 1979, and the 1980, 1981, and 1982 Annual Reports did likewise. A detailed explanation of the tables, the methods of compilation, and definitions of the statistical subdivisions are included in Technical Report No. 14 which is available on request. The poundage in these tables is dressed weight (head-off, eviscerated). Copies of the tables in metric units and round (live) weight are available on request.

The tables in Appendix II and Appendix III provide data on ex-vessel price of halibut and on abundance and average size at each age by regions of sampling, respectively.

### Appendix I.

- Table 1. Catch, CPUE, and effort by statistical area and country, 1983.
- Table 2. Catch, CPUE, and effort by region and country, 1983.
- Table 3. Catch, CPUE, and effort by regulatory area, 1983.
- Table 4. Catch in thousands of pounds by regulatory area and country, 1983.
- Table 5. Landings in thousands of pounds by port and country, 1983.

### Appendix II.

- Annual landings, ex-vessel price, and value (U.S. dollars), 1929-1983.

### Appendix III.

- Table 1. Juvenile halibut CPUE and average length (cm) by age and sampling area, 1983.
- Table 2. Catch in numbers, CPUE in number per 10,000 skates, and average weight in pounds (dressed, head-off) at age by regions, 1983.
- Table 3. Adult survey catch per unit effort (number of fish per skate) and average weight (pounds, heads-off, eviscerated) of males and females by age, region and year.
- Table 4. Adult survey catch per unit effort (number of fish per skate) of males and females by 5 cm length interval, region and year.

APPENDIX I.

TABLE 1. CATCH, CPUE AND EFFORT BY STATISTICAL AREA AND COUNTRY, 1983.

1983	CANADA			UNITED STATES			TOTAL			LOGS
STAT. AREA	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	%
00-03	-	-	-	133	40.3	33	133	40.3	33	-
04	-	-	-	8	34.6	2	8	34.6	2	25
05	-	-	-	124	40.8	30	124	40.8	30	11
06	97	40.3*	24	-	-	-	97	40.3	24	-
07	110	40.3*	27	-	-	-	110	40.3	27	-
08	26	40.4*	6	-	-	-	26	40.4	6	-
09 -0	64	75.5	8	-	-	-	64	75.5	8	8
09 -I	453	87.4*	52	-	-	-	453	87.4	52	-
10 -0	28	95.2*	3	-	-	-	28	95.2	3	-
10 -I	774	122.9	63	-	-	-	774	122.9	63	8
11 -0	38	121.4	3	-	-	-	38	121.4	3	63
11 -I	806	77.9	104	-	-	-	806	77.9	104	31
12 -0	159	95.0*	17	-	-	-	159	95.0	17	-
12 -I	462	71.3	65	-	-	-	462	71.3	65	14
13 -0	590	96.4	61	-	-	-	590	96.4	61	23
13 -I	1829	86.4	212	-	-	-	1829	86.4	212	28
14 -0	-	-	-	230	297.5*	8	230	297.5	8	-
14 -I	-	-	-	316	217.2*	15	316	217.2	15	-
15 -0	-	-	-	318	371.9	9	318	371.9	9	28
15 -I	-	-	-	362	155.4	23	362	155.4	23	6
16 -0	-	-	-	947	297.6*	32	947	297.6	32	-
16 -I	-	-	-	1604	238.2	67	1604	238.2	67	19
17 -0	-	-	-	668	297.6*	22	668	297.6	22	-
17 -I	-	-	-	272	189.8	14	272	189.8	14	8
18S-0	-	-	-	159	212.6	7	159	212.6	7	26
18S-I	-	-	-	1522	223.1	68	1522	223.1	68	7
18W	-	-	-	382	144.1*	27	382	144.1	27	-
19	-	-	-	515	81.8	63	515	81.8	63	2
20	-	-	-	913	173.4	53	913	173.4	53	23
21	-	-	-	528	153.8	34	528	153.8	34	14
22	-	-	-	382	161.3	24	382	161.3	24	48
23	-	-	-	849	178.5	48	849	178.5	48	19
24	-	-	-	1344	185.1	73	1344	185.1	73	8
25	-	-	-	2339	257.9	91	2339	257.9	91	49
26	-	-	-	2703	211.1	128	2703	211.1	128	20
27	-	-	-	2240	198.8	113	2240	198.8	113	9
28	-	-	-	1917	246.5	78	1917	246.5	78	26
29	-	-	-	4129	271.1	152	4129	271.1	152	23
30	-	-	-	1436	409.6	35	1436	409.6	35	42
31	-	-	-	551	379.5	15	551	379.5	15	39
32	-	-	-	1225	392.4	31	1225	392.4	31	37
33	-	-	-	323	412.0	8	323	412.0	8	41
34	-	-	-	87	239.7	4	87	239.7	4	52
35	-	-	-	835	177.5	47	835	177.5	47	45
36	-	-	-	665	138.0	48	665	138.0	48	59
37	-	-	-	211	84.9	25	211	84.9	25	55
38	-	-	-	346	177.4	20	346	177.4	20	100
39	-	-	-	9	187.5	0	9	187.5	0	89
40	-	-	-	10	56.2	2	10	56.2	2	90
41	-	-	-	294	127.5	23	294	127.5	23	47
42+	-	-	-	593	180.0	33	593	180.0	33	86
4A	-	-	-	172	150.9	11	172	150.9	11	-
4B	-	-	-	389	120.7	32	389	120.7	32	51
4C	-	-	-	529	153.1	35	529	153.1	35	50
4DE	-	-	-	14	133.3*	1	14	133.3	1	-
4DW	-	-	-	355	129.2	27	355	129.2	27	24
4E	-	-	-	-	-	-	-	-	-	-

\* NO LOG DATA, CPUE INTERPOLATED.

APPENDIX I. (continued)

TABLE 2. CATCH, CPUE AND EFFORT BY REGION AND COUNTRY, 1983.

1983 REGION	CANADA			UNITED STATES			TOTAL			LOGS %
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	
COLUMBIA	-	-	-	133	39.9	33	133	39.9	33	-
VANCOUVER	233	39.9*	58	132	39.9	33	365	40.1	91	4
CHARLOTTE	5203	86.3	603	-	-	-	5203	86.3	603	20
CHAR-O	879	98.5	89	-	-	-	879	98.5	89	19
CHAR-I	4324	84.1	514	-	-	-	4324	84.1	514	20
SE ALASKA	-	-	-	6398	248.9	257	6398	248.9	257	9
SE AK-O	-	-	-	2322	300.9	77	2322	300.9	77	6
SE AK-I	-	-	-	4076	226.4	180	4076	226.4	180	11
YAKUTAT	-	-	-	3569	165.4	216	3569	165.4	216	18
KODIAK	-	-	-	10543	234.6	449	10543	234.6	449	24
CHIRIKOF	-	-	-	6116	318.6	192	6116	318.6	192	29
SHUMAGIN	-	-	-	3692	187.0	197	3692	187.0	197	51
ALEUTIAN	-	-	-	906	161.3	56	906	161.3	56	73
BERING SEA	-	-	-	1459	136.8	107	1459	136.8	107	-
TOTAL	5436	82.2	661	32948	213.9	1540	38384	174.4	2201	28

\* NO LOG DATA, CPUE INTERPOLATED.

TABLE 3. CATCH, CPUE AND EFFORT BY REGULATORY AREA, 1983.

YEAR	AREA 2				AREA 3				AREA 4			
	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %	CATCH 000 LBS	CPUE LBS	EFFORT 00 SKS	LOGS %
1983	12099	123.0	984	14	23920	226.9	1054	28	2365	145.1	163	38

TABLE 4. CATCH IN THOUSANDS OF POUNDS BY REGULATORY AREA AND COUNTRY, 1983.

YEAR	AREA 2			AREA 3			AREA 4			ALL AREAS		
	CAN.	U. S.	TOTAL	CAN.	U. S.	TOTAL	CAN.	U. S.	TOTAL	CAN.	U. S.	TOTAL
1983	5436	6663	12099			23920	23920			2365	2365	5436 32948 38384

TABLE 5. LANDINGS IN THOUSANDS OF POUNDS BY PORT AND COUNTRY, 1983.

PORT	CAN.	U. S.	TOTAL
CAL AND ORE	-	435	435
SEATTLE	55	1060	1115
BELLINGHAM	568	1003	1571
MISC WASH	535	412	947
VANCOUVER	1452	-	1452
MISC SD BC	561	-	561
NAMU	8	-	8
PR RUPERT	2137	-	2137
MISC NO BC	108	-	108
KETCHIKAN	4	353	357
WRANGELL	-	89	89
PETERSBURG	-	2184	2184
JUNEAU	-	496	496
SITKA	8	2990	2998
PELICAN	-	870	870
MISC SE AK	-	2142	2142
KODIAK	-	10098	10098
P WILLIAMS	-	-	-
SEWARD	-	3987	3987
MISC CEN AK	-	6829	6829

**APPENDIX II. Annual landings, ex-vessel price, and value (U.S. dollars), 1929-1983.**

Year	Catch (000's pounds)	Price (dollars/ pound)	Value (000's dollars)	Year	Catch (000's pounds)	Price (dollars/ pound)	Value (000's dollars)
1929	56,928	.12	6,831				
1930	49,492	.10	4,949	1960	71,605	.16	11,457
1931	44,220	.07	3,095	1961	69,274	.21	14,548
1932	44,454	.04	1,778	1962	74,862	.30	22,459
1933	46,795	.06	2,808	1963	71,237	.21	14,960
1934	47,546	.06	2,853	1964	59,784	.23	13,750
1935	47,343	.07	3,314	1965	63,176	.32	20,216
1936	48,923	.08	3,914	1966	62,016	.34	21,085
1937	49,539	.08	3,963	1967	55,222	.23	12,701
1938	49,553	.07	3,469	1968	48,594	.23	11,177
1939	50,903	.07	3,563	1969	58,275	.38	22,144
1940	53,381	.09	4,804	1970	54,938	.37	20,327
1941	52,231	.10	5,223	1971	46,654	.32	14,929
1942	50,388	.15	7,558	1972	42,884	.64	27,446
1943	53,699	.19	10,203	1973	31,740	.74	23,488
1944	53,435	.15	8,015	1974	21,306	.70	14,914
1945	53,395	.15	8,009	1975	27,616	.89	24,578
1946	60,266	.17	10,245	1976	27,535	1.26	34,694
1947	55,700	.17	9,469	1977	21,868	1.31	28,647
1948	55,564	.17	9,446	1978	21,988	1.70	37,380
1949	55,025	.17	9,354	1979	22,532	2.13	47,993
1950	57,234	.23	13,164	1980	21,866	.99	21,647
1951	56,045	.17	9,528	1981	25,732	1.02	26,247
1952	62,262	.19	11,830	1982	29,019	1.09	31,631
1953	59,837	.15	8,976	1983	38,384	1.13	43,374
1954	70,583	.17	11,999				
1955	57,521	.14	8,053				
1956	66,588	.22	14,649				
1957	60,854	.17	10,345				
1958	64,508	.21	13,547				
1959	71,204	.19	13,529				

**APPENDIX III. Table 1. Juvenile halibut CPUE and average length (cm) by age and by sampling area, 1983.**

AREA		AGE										Total	
		0	1	2	3	4	5	6	7	8	9		10
A. Using 32 mm mesh for 15-minute tow													
Shelikof Bay	CPUE	0.41	1.32	0.20	0.41	0.51	0.20	—	—	—	—	—	3.04
	Av. Lgth.	8.0	24.2	34.0	44.6	45.9	57.0	—	—	—	—	—	24.8
Kayak Island	CPUE	0.08	5.73	7.54	1.05	2.10	0.89	0.23	0.09	—	—	—	17.72
	Av. Lgth.	8.0	17.2	27.7	39.7	47.2	52.6	57.9	53.6	—	—	—	29.0
Trinity Islands	CPUE	—	1.40	2.35	4.93	0.42	0.20	—	—	—	—	—	9.30
	Av. Lgth.	—	13.1	26.5	34.2	45.9	57.0	—	—	—	—	—	30.1
Alitak Bay	CPUE	—	5.89	12.55	9.82	3.31	0.79	0.65	—	—	—	—	33.00
	Av. Lgth.	—	11.2	23.2	33.0	46.2	57.7	58.8	—	—	—	—	27.8
Unimak Bight	CPUE	—	0.20	8.62	6.63	4.02	0.88	0.64	—	—	—	—	21.00
	Av. Lgth.	—	10.0	22.6	34.2	40.2	46.5	51.3	—	—	—	—	31.4
Bering Sea		NO DATA											
B. Using 90-mm mesh for 60-minute tow													
Cape St. Elias	CPUE	—	0.06	0.74	1.88	3.92	4.53	3.51	0.63	0.42	—	0.25	15.94
	Av. Lgth.	—	23.7	29.6	36.4	43.4	51.6	54.4	61.3	60.5	—	63.0	48.1
Cape Chiniak	CPUE	—	—	1.18	20.09	9.13	2.54	0.93	0.36	0.11	—	0.19	34.53
	Av. Lgth.	—	—	28.1	35.2	42.4	52.6	56.8	60.8	51.0	—	63.3	39.2
Chirikof Island	CPUE	—	—	0.72	22.81	13.67	8.35	3.93	2.98	0.15	—	0.21	52.80
	Av. Lgth.	—	—	24.1	32.3	37.8	50.0	53.8	56.3	63.1	—	63.1	39.6
Unimak Island	CPUE	—	—	0.32	6.06	5.21	7.10	8.76	1.40	1.00	0.08	0.11	30.04
	Av. Lgth.	—	—	23.0	34.0	43.7	49.1	50.2	54.3	58.3	60.1	62.9	45.8

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, 1983.

AGE	COLUMBIA			VANCOUVER			CHARLOTTE OUTSIDE		
	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	0	0	0.0	0	0	0.0	0	0	0.0
6	0	0	0.0	207	226	9.9	568	636	9.9
7	26	78	9.4	1114	1218	12.4	2542	2848	12.5
8	423	1269	14.1	2187	2391	13.8	5364	6009	14.0
9	462	1386	15.5	2615	2859	16.3	6740	7550	16.5
10	372	1116	18.5	3246	3549	19.3	7331	8212	19.4
11	321	963	23.6	2251	2461	23.7	5268	5901	24.1
12	308	924	25.1	998	1091	28.4	2562	2870	28.3
13	282	846	38.5	859	939	32.5	1959	2194	33.0
14	231	693	40.9	605	661	36.9	1375	1540	38.6
15	103	309	43.5	346	378	43.6	731	819	42.6
16	321	963	60.7	294	321	41.6	744	833	43.3
17	180	540	57.0	131	143	65.6	308	345	62.2
18	218	654	63.0	139	152	49.5	340	381	53.5
19	90	270	57.0	36	39	92.2	100	112	85.6
20	64	192	58.2	28	31	46.8	68	76	46.7
21+	245	735	81.2	100	109	82.6	180	202	82.6
TOT	3642	10927	36.3	15154	16567	22.4	36179	40528	22.4
	AV LEN 112.8, AV AGE 13.1		AV LEN 98.2, AV AGE 10.4		AV LEN 98.4, AV AGE 10.3				
	#OTO'S 284, #AGED 284		#OTO'S 1061, #AGED 1061		#OTO'S 1061, #AGED 1061				
AGE	CHARLOTTE INSIDE			SE ALASKA OUTSIDE			SE ALASKA INSIDE		
	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	820	159	6.7	0	0	0.0	208	116	9.2
6	3862	751	10.0	545	706	13.5	607	337	9.0
7	16035	3118	12.7	2553	3309	14.6	4046	2248	13.4
8	24659	4795	14.9	3920	5080	16.4	8204	4557	14.8
9	26978	5246	18.0	5762	7468	20.5	19721	10955	20.1
10	29968	5828	22.1	9544	12369	23.5	26996	14996	23.8
11	19441	3781	27.7	9979	12933	28.0	21657	12030	28.1
12	16575	3223	30.4	9385	12163	34.3	15072	8372	34.7
13	8572	1667	37.2	6872	8906	43.8	9328	5182	43.4
14	6497	1263	40.9	5118	6633	48.3	7559	4199	50.6
15	5286	1028	43.1	3514	4554	52.6	4685	2602	53.9
16	2829	550	42.8	2013	2609	55.3	2549	1416	67.8
17	1141	222	64.1	2221	2878	63.7	2020	1122	81.8
18	1732	337	63.3	1329	1722	70.1	1570	872	97.3
19	912	177	70.1	415	538	80.3	463	257	119.1
20	611	119	85.1	586	759	90.8	726	403	111.4
21+	1271	247	75.5	764	990	88.7	570	317	116.6
TOT	167189	32512	24.7	64519	83617	35.5	125981	69982	32.4
	AV LEN 101.2, AV AGE 10.3		AV LEN 113.2, AV AGE 11.9		AV LEN 109.8, AV AGE 11.1				
	#OTO'S 4236, #AGED 1198		#OTO'S 966, #AGED 601		#OTO'S 1325, #AGED 601				

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, 1983.

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	0	0	0.0	0	0	0.0	0	0	0.0
6	0	0	0.0	2715	604	11.4	565	294	9.8
7	761	353	16.3	7338	1633	17.8	4967	2587	17.2
8	6470	2998	16.8	20494	4561	19.2	14865	7743	20.6
9	9456	4381	19.4	34491	7676	26.4	23392	12184	26.7
10	15990	7409	24.3	55017	12244	30.5	43602	22711	33.1
11	14036	6504	28.5	38455	8558	36.7	23244	12107	41.9
12	17162	7952	36.9	35980	8007	47.6	15367	8004	50.6
13	12409	5750	41.1	22184	4937	59.6	13065	4805	56.0
14	8501	3939	46.8	11816	2630	64.8	5386	2805	72.1
15	7476	3464	44.8	8163	1817	60.3	3759	1958	81.1
16	5384	2495	53.4	8468	1884	81.3	1442	751	90.9
17	2493	1155	46.4	4530	1008	75.3	2421	1261	94.9
18	1674	776	69.9	1789	398	69.2	839	437	107.4
19	1021	473	82.9	1555	346	103.2	464	242	109.9
20	994	461	72.9	342	76	133.4	75	39	125.0
21+	308	143	84.3	2286	509	124.1	519	270	121.2
TOT	104137	48252	35.3	255623	56887	41.1	153971	80197	40.3
AV LEN 113.6, AV AGE 12.1				AV LEN 118.5, AV AGE 11.2			AV LEN 118.9, AV AGE 10.7		
#OTO'S 1835, #AGED 601				#OTO'S 5237, #AGED 600			#OTO'S 2681, #AGED 992		
SHUMAGIN (3B)				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	0	0	0.0	0	0	0.0	0	0	0.0
6	296	150	12.8	0	0	0.0	171	162	9.1
7	1955	990	16.4	206	367	10.1	690	654	13.3
8	7819	3961	20.3	1161	2067	15.1	7709	7302	17.3
9	14920	7558	25.1	3159	5623	16.8	6100	5778	24.4
10	25376	12854	32.8	5626	10014	24.0	9696	9184	30.4
11	14885	7540	38.6	2088	3717	29.9	4959	4697	34.6
12	9506	4815	46.8	3633	6467	33.0	2941	2786	33.8
13	7953	4029	50.0	2800	4984	40.9	4144	3925	45.8
14	5752	2914	50.8	2082	3706	49.0	2791	2644	46.3
15	2246	1138	70.9	1374	2446	45.4	1527	1446	49.8
16	2127	1077	63.0	583	1038	48.8	875	829	54.6
17	513	260	103.1	162	288	81.9	500	474	58.6
18	485	246	85.2	122	217	62.5	273	259	58.3
19	288	146	71.9	356	634	80.3	267	253	67.3
20	83	42	152.5	161	287	81.6	297	281	95.9
21+	912	462	116.9	1230	2189	117.6	633	600	105.5
TOT	95117	48182	38.2	24746	44048	36.5	43576	41277	33.5
AV LEN 116.5, AV AGE 10.9				AV LEN 113.7, AV AGE 12.1			AV LEN 112.1, AV AGE 11.0		
#OTO'S 3010, #AGED 1332				#OTO'S 1028, #AGED 599			#OTO'S 1680, #AGED 1393		

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, 1983.

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	0	0	0.0	0	0	0.0
5	0	0	0.0	842	135	6.7	207	81	9.2
6	0	0	0.0	4577	731	10.0	1146	450	11.2
7	52	70	9.4	20525	3279	12.6	6562	2575	13.8
8	847	1138	14.1	32732	5230	14.6	12059	4732	15.3
9	925	1243	15.5	36082	5765	17.6	25345	9947	20.2
10	745	1001	18.5	42708	6824	21.3	36343	14263	23.8
11	643	864	23.6	27965	4468	26.5	31465	12349	28.0
12	617	829	25.1	20233	3233	30.1	24325	9546	34.5
13	565	759	38.5	11935	1907	35.8	16113	6323	43.5
14	463	622	40.9	8881	1419	39.5	12609	4948	49.7
15	206	277	43.5	6777	1083	43.4	8154	3200	53.3
16	643	864	60.7	3869	618	42.1	4537	1781	62.3
17	360	484	57.0	1638	262	65.5	4218	1655	72.3
18	436	587	63.0	2252	360	59.5	2883	1132	84.8
19	180	242	57.0	1040	166	73.2	873	343	100.8
20	128	172	58.2	722	115	80.1	1305	512	102.2
21+	491	659	81.2	1737	278	77.3	1327	521	100.6
TOT	7292	9799	36.3	224514	35871	24.2	189472	74358	33.5
AV LEN 112.8, AV AGE 13.1 #OTO'S 284, #AGED 284				AV LEN 100.4, AV AGE 10.3 #OTO'S 5297, #AGED 2259			AV LEN 111.0, AV AGE 11.4 #OTO'S 2291, #AGED 1202		
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	0	0	0.0	0	0	0.0	0	0	0.0
5	1028	104	7.2	0	0	0.0	0	0	0.0
6	5606	569	10.3	2715	408	11.4	861	221	10.8
7	26601	2699	12.9	8099	1218	17.7	6922	1778	17.0
8	44404	4506	14.8	26964	4054	18.6	22684	5825	20.5
9	61064	6196	18.7	43947	6607	24.9	38312	9839	26.1
10	78480	7964	22.4	71006	10675	29.1	68978	17714	33.0
11	59176	6005	27.3	52491	7891	34.5	38129	9792	40.6
12	44457	4511	32.5	53142	7989	44.2	24873	6388	49.2
13	28098	2851	40.3	34593	5201	53.0	21018	5398	53.8
14	21552	2187	45.5	20317	3054	57.3	11138	2860	61.1
15	14897	1512	48.9	15639	2351	52.9	6005	1542	77.3
16	8649	878	53.4	13852	2082	70.5	3569	917	74.3
17	6014	610	70.0	7024	1056	65.0	2933	753	96.3
18	5309	539	73.5	3463	521	69.5	1323	340	99.3
19	1979	201	84.7	2577	387	95.2	752	193	95.4
20	2080	211	93.4	1336	201	88.4	158	41	139.5
21+	3270	332	87.1	2595	390	119.3	1431	367	118.5
TOT	412664	41874	28.6	359760	54085	39.4	249088	63967	39.5
AV LEN 105.5, AV AGE 10.8 #OTO'S 7872, #AGED 3745				AV LEN 117.1, AV AGE 11.4 #OTO'S 7072, #AGED 1201			AV LEN 118.0, AV AGE 10.8 #OTO'S 5691, #AGED 2324		



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, 1983.

AGE	AREA 3 TOTAL			AREA 4 TOTAL			ALL AREAS		
	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	0	0	0.0	0	0	0.0	1028	47	7.2
6	3576	339	11.3	171	106	9.1	9353	425	10.6
7	15021	1424	17.4	896	554	12.6	42518	1931	14.5
8	49648	4708	19.5	8870	5484	17.0	102923	4674	17.3
9	82260	7800	25.5	9259	5724	21.8	152583	6930	22.5
10	139984	13274	31.0	15323	9473	28.1	233787	10618	27.9
11	90620	8593	37.1	7047	4357	33.2	156842	7123	33.2
12	78015	7398	45.8	6575	4065	33.3	129047	5861	40.6
13	55612	5273	53.3	6945	4294	43.9	90655	4117	48.5
14	31455	2983	58.6	4874	3013	47.5	57881	2629	52.8
15	21644	2052	59.6	2901	1794	47.8	39443	1791	54.7
16	17421	1652	71.3	1458	901	52.3	27528	1250	64.7
17	9957	944	74.3	662	409	64.3	16633	755	72.3
18	4786	454	77.8	395	244	59.6	10490	476	74.9
19	3329	316	95.2	624	386	74.7	5931	269	89.6
20	1494	142	93.8	459	284	90.8	4032	183	93.2
21+	4026	382	119.0	1865	1153	113.5	9160	416	106.5
TOT	608848	57734	37.5	68322	42239	34.6	1089834	49497	35.0
	AV LEN 117.5, AV AGE 11.2	AV LEN 113.7, AV AGE 11.4	AV LEN 112.8, AV AGE 11.1						
	#OTO'S 12763, #AGED 3525	#OTO'S 2708, #AGED 1992	#OTO'S 23343, #AGED 9262						

**APPENDIX III. (continued)**

TABLE 3 ADULT SURVEY CATCH PER UNIT EFFORT (NUMBER OF FISH PER SKATE) AND AVERAGE WEIGHT (POUNDS, HEADS-OFF, EVISCERATED) OF MALES AND FEMALES BY AGE, REGION AND YEAR.

REGION: YEAR:		CHARLOTTE 1980				KODIAK 1980				CHARLOTTE 1981			
AGE	MALES		FEMALES		MALES		FEMALES		MALES		FEMALES		
	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	
2	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	-	-	-	-	-	-	-	
4	-	-	.0084	5.4	.0039	5.7	.0118	2.1	-	-	-	-	
5	.0129	3.6	.0148	6.0	.0163	2.8	.0226	4.3	.0078	4.7	.0132	5.7	
6	.0111	8.5	.0495	10.6	.0548	5.0	.0725	5.6	.0179	4.9	.0200	7.6	
7	.0882	7.9	.0473	14.1	.1633	6.3	.1528	10.3	.0533	7.9	.0303	9.6	
8	.0757	9.9	.1169	14.1	.1809	10.3	.2578	16.0	.0642	9.9	.0594	13.8	
9	.0989	11.9	.1470	20.4	.1686	12.8	.2539	21.8	.0469	12.0	.0813	19.1	
10	.0635	15.3	.1166	25.6	.1498	18.1	.2625	33.7	.0444	14.1	.0630	24.6	
11	.0690	16.2	.0511	26.2	.1477	22.7	.2243	44.0	.0188	14.9	.0577	34.5	
12	.0312	17.1	.0668	36.6	.1041	26.6	.1769	52.4	.0225	19.1	.0243	38.9	
13	.0342	19.4	.0388	38.5	.0492	34.1	.1427	58.1	.0167	16.1	.0207	52.0	
14	.0320	24.8	.0135	62.0	.0362	31.1	.1220	68.8	.0257	22.5	.0232	56.8	
15	.0222	29.5	.0210	55.6	.0160	42.2	.0511	88.0	.0111	22.0	.0056	63.0	
16	.0257	26.3	.0161	84.4	.0117	57.3	.0448	79.5	.0115	24.7	.0102	85.3	
17	.0063	23.1	.0131	76.7	.0061	46.4	.0451	89.4	.0075	33.6	.0094	87.8	
18	.0112	34.7	.0083	95.7	.0048	37.6	.0206	86.3	.0021	42.0	.0129	81.4	
19	.0093	28.2	.0042	77.5	.0062	49.3	.0131	99.3	.0079	27.6	.0088	106.1	
20	.0026	45.3	-	-	.0016	95.8	.0110	147.2	.0020	20.9	.0016	191.1	
21	.0048	50.7	.0051	80.3	.0016	69.7	.0015	210.5	-	-	.0018	65.1	
22	-	-	.0099	106.9	-	-	.0030	156.6	.0018	63.6	.0016	158.8	
23	.0056	49.0	-	-	-	-	.0068	147.8	-	-	-	-	
24	-	-	.0023	93.9	.0020	77.7	.0015	188.0	-	-	-	-	
25+	-	-	.0056	101.1	-	-	.0015	194.3	-	-	.0016	93.9	
TOT	0.60		0.76		1.12		1.90		0.36		0.45		

REGION: YEAR:		KODIAK 1981				CHARLOTTE 1982				SOUTHEASTERN 1982			
AGE	MALES		FEMALES		MALES		FEMALES		MALES		FEMALES		
	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	
2	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	-	-	-	-	-	-	-	
4	.0329	2.1	.0365	3.0	-	-	.0061	4.2	.0109	6.4	.0038	2.8	
5	.0647	3.0	.0848	4.5	.0118	4.2	.0197	5.1	.0090	3.0	.0252	6.8	
6	.1092	4.6	.1150	6.7	.0333	5.9	.0230	7.9	.0468	5.5	.0691	6.3	
7	.1703	6.8	.1157	10.4	.0549	8.6	.0747	10.9	.0858	6.6	.1135	11.5	
8	.2775	10.7	.2499	16.3	.0789	10.1	.0672	17.4	.1098	9.0	.1874	14.7	
9	.2486	14.0	.3376	21.7	.0696	9.9	.0986	19.1	.2181	10.7	.2952	22.6	
10	.2165	19.1	.3141	30.9	.0819	14.2	.1159	24.4	.2078	16.7	.2540	27.6	
11	.2196	25.3	.2685	37.0	.0174	17.1	.0646	29.1	.2083	20.5	.2039	43.3	
12	.1422	29.4	.2989	48.6	.0325	18.5	.0521	40.7	.2046	18.9	.2038	43.6	
13	.1048	33.1	.2633	58.8	.0241	20.5	.0377	61.1	.1272	22.6	.2324	53.4	
14	.0560	33.9	.1659	67.4	.0200	19.2	.0244	48.3	.0542	21.3	.1372	62.8	
15	.0260	47.7	.1133	86.0	.0403	16.9	.0078	59.2	.0961	32.0	.0801	72.3	
16	.0240	63.3	.0799	103.4	.0206	20.1	.0135	69.7	.0574	36.8	.0755	80.4	
17	-	-	.0613	116.1	.0130	23.7	.0044	86.5	.0224	32.7	.0991	83.4	
18	.0101	66.5	.0419	118.8	.0081	20.9	.0018	132.9	.0357	44.9	.0336	95.1	
19	.0026	42.0	.0212	143.4	-	-	.0040	127.4	.0054	37.7	.0282	108.2	
20	.0019	88.3	.0194	143.1	-	-	.0194	48.9	.0093	22.5	.0129	106.4	
21	.0026	38.8	.0104	124.2	-	-	.0071	74.4	.0052	68.1	.0222	115.6	
22	.0020	69.7	.0096	160.5	.0023	56.6	-	-	.0100	38.2	.0069	107.2	
23	-	-	.0048	182.5	-	-	.0018	156.1	-	-	.0113	101.4	
24	-	-	-	-	-	-	-	-	.0050	72.8	-	-	
25+	-	-	.0017	128.1	-	-	-	-	-	-	.0079	102.8	
TOT	1.71		2.61		0.51		0.64		1.53		2.10		

APPENDIX III. (continued)

TABLE 3. ADULT SURVEY CATCH PER UNIT EFFORT (NUMBER OF FISH PER SKATE) AND AVERAGE WEIGHT (POUNDS, HEADS-OFF, EVISCERATED) OF MALES AND FEMALES BY AGE, REGION AND YEAR.

REGION:		KODIAK 1982				SHUMAGIN 1982				CHARLOTTE 1983			
YEAR:		MALES		FEMALES		MALES		FEMALES		MALES		FEMALES	
AGE	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	
2	-	-	-	-	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	-	-	-	-	-	-	-	
4	.0073	2.6	.0062	6.8	.0123	1.2	.0082	1.6	.0044	1.8	-	-	
5	.0362	3.6	.0589	4.9	.0319	2.4	.0951	3.5	.0097	3.3	.0279	6.3	
6	.0823	4.2	.1750	7.2	.1197	4.6	.1415	5.6	.0659	5.2	.0595	5.9	
7	.1150	8.2	.1924	12.6	.2159	6.1	.2847	10.8	.0972	6.0	.1176	8.8	
8	.2146	10.0	.2804	18.4	.1985	9.0	.3606	19.1	.1038	7.5	.1370	14.6	
9	.3999	13.1	.4955	27.1	.3026	10.9	.5459	32.1	.0900	9.9	.1154	16.2	
10	.2559	19.5	.4102	35.8	.1023	18.1	.5199	42.8	.0948	11.1	.0959	24.5	
11	.1599	24.2	.3881	51.3	.1050	19.5	.3707	50.0	.0460	11.0	.0728	31.1	
12	.1471	28.9	.3459	61.4	.0831	33.1	.3256	69.2	.0400	13.6	.0518	37.5	
13	.1057	29.3	.2603	68.6	.0592	21.9	.1822	72.5	.0251	15.5	.0372	47.4	
14	.0938	37.8	.1388	76.8	.0244	24.9	.0973	83.7	.0035	46.5	.0197	68.4	
15	.0400	38.5	.0873	87.7	.0057	33.8	.0710	97.6	.0134	18.6	.0073	43.6	
16	.0237	54.3	.0700	96.7	.0046	47.7	.0085	120.4	.0256	23.9	.0033	60.7	
17	.0029	26.8	.0220	96.8	.0100	49.5	.0152	143.3	-	-	.0082	69.7	
18	.0037	79.4	.0469	122.8	-	-	.0119	145.6	-	-	.0099	91.3	
19	.0086	59.5	.0392	107.3	-	-	.0171	157.7	.0055	31.1	.0049	121.1	
20	.0026	30.2	.0084	144.9	-	-	.0090	172.3	-	-	.0033	145.5	
21	-	-	.0106	137.4	-	-	.0115	187.3	.0035	35.7	-	-	
22	-	-	-	-	.0048	50.1	.0125	204.4	-	-	-	-	
23	.0030	101.8	.0075	175.3	-	-	.0092	173.7	-	-	-	-	
24	-	-	-	-	-	-	-	-	-	-	-	-	
25+	-	-	.0014	297.6	-	-	-	-	-	-	-	-	
TOT	1.70		3.05		1.28		3.10		0.63		0.77		

REGION:		SOUTHEASTERN 1983				KODIAK 1983			
YEAR:		MALES		FEMALES		MALES		FEMALES	
AGE	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	CPUE	AVG. WGT.	
2	-	-	-	-	-	-	-	-	
3	-	-	-	-	-	-	.0030	0.4	
4	.0022	2.5	-	-	.0071	1.5	.0234	1.5	
5	.0105	3.9	.0047	2.7	.0322	2.6	.0256	4.3	
6	.0349	4.3	.0375	5.8	.0751	4.1	.1928	7.5	
7	.0912	6.6	.1140	10.8	.1353	7.0	.2315	10.9	
8	.1289	9.0	.2006	13.9	.1466	9.5	.2417	16.2	
9	.1564	12.8	.2706	20.3	.2149	14.4	.2526	25.1	
10	.2925	16.8	.3590	26.1	.2752	19.3	.3113	33.5	
11	.2694	17.8	.3701	34.8	.2285	25.1	.2911	40.5	
12	.1956	23.0	.3015	42.3	.0942	32.3	.2474	54.1	
13	.1640	24.3	.2798	54.0	.0948	31.4	.3340	64.1	
14	.0929	25.3	.1706	57.2	.0502	35.5	.2171	77.1	
15	.0803	28.0	.1204	66.0	.0296	35.1	.1604	79.5	
16	.0513	38.0	.0773	83.2	.0296	34.7	.0781	79.9	
17	.0556	38.1	.0641	80.5	.0098	62.6	.0455	107.7	
18	.0461	37.7	.0664	88.9	-	-	.0311	124.1	
19	.0307	46.1	.0376	95.0	.0036	43.1	.0241	115.6	
20	.0128	49.4	.0353	96.0	.0032	52.7	.0189	131.2	
21	.0074	48.6	.0171	108.9	-	-	.0163	150.4	
22	.0049	53.3	.0087	137.0	.0037	99.8	.0040	189.9	
23	.0030	53.9	.0043	138.9	-	-	.0051	157.2	
24	.0070	78.8	.0052	82.3	-	-	-	-	
25+	.0023	63.6	.0096	118.3	-	-	.0015	257.2	
TOT	1.74		2.55		1.43		2.76		

APPENDIX III. (continued)

TABLE 4 ADULT SURVEY CATCH PER UNIT EFFORT (NUMBER OF FISH PER SKATE) OF MALES AND FEMALES BY 5 CM. LENGTH INTERVAL, REGION AND YEAR.

REGION: YEAR	CHARLOTTE 1980		KODIAK 1980		CHARLOTTE 1981		KODIAK 1981		CHARLOTTE 1982	
LENGTH INTERVAL	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE
30-34	-	-	-	-	-	-	0016	-	-	-
35-39	-	-	-	-	-	-	0008	0008	-	-
40-44	-	-	-	-	-	-	0042	0021	-	-
45-49	-	-	0066	0066	-	-	0281	0161	-	-
50-54	0045	-	0207	0103	-	0016	0472	0302	0018	0018
55-59	0102	0034	0376	0215	0066	-	0639	0450	0141	-
60-64	0108	0163	0640	0674	0085	0064	0963	0505	0086	0215
65-69	0452	0060	1051	0543	0259	0104	1162	0749	0285	0333
70-74	0479	0274	1292	0760	0543	0165	1309	0791	0713	0188
75-79	0737	0573	1060	0489	0578	0263	1665	0892	0825	0412
80-84	0783	0722	0739	0973	0327	0382	1422	0741	0674	0404
85-89	0647	0722	0673	0980	0475	0200	1123	0866	0493	0691
90-94	0686	0549	0780	0932	0312	0446	1082	1001	0660	0330
95-99	0654	0625	0834	0893	0268	0424	0839	1087	0369	0479
100-104	0359	0574	0833	0805	0263	0364	1359	1387	0437	0358
105-109	0241	0722	0589	1005	0163	0183	1023	1723	0179	0404
110-114	0247	0370	0619	1123	0103	0292	0807	1766	0069	0550
115-119	0238	0424	0576	0944	0058	0387	0887	1891	0082	0449
120-124	0085	0397	0253	1238	0064	0150	0888	1385	-	0336
125-129	0104	0182	0239	0912	0041	0223	0346	1485	0032	0321
130-134	0060	0211	0121	1089	-	0066	0268	1532	-	0194
135-139	-	0166	0095	1218	-	0099	0194	1432	0023	0136
140-144	0020	0176	0107	1162	0018	0146	0147	1069	-	0124
145-149	-	0181	0016	0767	-	0132	0098	1039	-	0071
150-154	-	0075	0020	0645	-	0099	0020	0659	-	0159
155-159	-	0045	0045	0383	-	0082	0038	0625	-	0088
160-164	-	0135	0016	0265	-	-	0016	0426	-	0071
165-169	-	0060	-	0236	-	0082	0016	0489	-	-
170-174	-	0045	-	0162	-	-	-	0663	-	0053
175-179	-	0060	-	0148	-	-	-	0395	-	0018
180-184	-	-	-	0074	-	0049	-	0189	-	-
185-189	-	0015	-	0059	-	0016	-	0110	-	0018
190-194	-	-	-	0015	-	0016	-	0158	-	-
195-199	-	-	-	0059	-	0016	-	0063	-	0018
200+	-	-	-	0059	-	-	-	0079	-	-
TOTAL	0.60	0.76	1.12	1.90	0.36	0.45	1.71	2.61	0.51	0.64

REGION: YEAR	SOUTHEASTERN 1982		KODIAK 1982		SHUMAGIN 1982		CHARLOTTE 1983		SOUTHEASTERN 1983	
LENGTH INTERVAL	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE	MALE CPUE	FEMALE CPUE
30-34	-	-	-	-	-	-	-	-	-	-
35-39	-	-	-	-	-	-	-	-	-	-
40-44	0019	-	0028	0028	0123	-	-	-	0006	0006
45-49	0038	-	0038	0019	0196	0245	0066	-	0012	0012
50-54	0038	0076	0213	0071	0147	0344	0111	0037	0065	0044
55-59	0259	0104	0497	0213	0858	0590	0316	0079	0397	0076
60-64	0527	0369	0560	0761	1564	0521	0669	0268	0371	0283
65-69	0520	0662	1000	0648	1467	1404	0663	0521	0683	0273
70-74	1111	0338	1381	1090	1395	1279	0913	0747	0996	0578
75-79	1289	0446	1789	0740	1455	0901	0984	0512	1396	0710
80-84	1495	0773	1633	0867	1070	0844	1069	0558	1182	0803
85-89	1643	1274	1507	1206	1159	0902	0436	0829	1622	1344
90-94	1449	1087	1291	1593	0698	1020	0333	0571	1805	1330
95-99	1923	1223	1369	1245	0363	1306	0278	0675	1811	1118
100-104	1087	1334	1260	1724	0509	1577	0124	0402	1749	1700
105-109	1077	1077	0884	1474	0288	1895	0143	0382	1240	1895
110-114	0839	0839	0953	1505	0286	1431	0110	0383	1124	1962
115-119	0633	1655	0785	1601	0397	1590	0035	0458	1078	1742
120-124	0326	1523	0543	1573	0256	1535	-	0230	0485	1875
125-129	0473	0899	0250	1625	0232	1854	0035	0244	0412	1670
130-134	0237	1136	0455	1932	0190	2141	-	0115	0359	1227
135-139	0049	1076	0150	2009	0145	1891	-	0197	0331	1267
140-144	0156	0988	0114	2002	-	1767	-	0115	0186	1303
145-149	0100	1101	0127	1719	-	1251	-	0082	0065	0928
150-154	-	0896	0074	1446	-	1251	-	0099	-	0871
155-159	-	0629	0060	1105	-	0981	-	0082	0025	0931
160-164	-	0343	0061	0578	-	0785	-	0049	-	0484
165-169	-	0419	-	0455	-	0417	-	-	-	0448
170-174	-	0343	-	0369	-	0245	-	0049	-	0242
175-179	-	0153	-	0341	-	0270	-	-	-	0169
180-184	-	0133	-	0227	-	0221	-	0033	-	0109
185-189	-	0057	-	0156	-	0196	-	-	-	0048
190-194	-	0057	-	0057	-	0098	-	-	-	0061
195-199	-	0019	-	0043	-	0049	-	-	-	-
200+	-	-	-	0028	-	0172	-	-	-	0036
TOTAL	1.53	2.10	1.70	3.05	1.28	3.10	0.63	0.77	1.74	2.55

APPENDIX III. (continued)

TABLE 4. ADULT SURVEY CATCH PER UNIT EFFORT (NUMBER OF FISH PER SKATE) OF MALES AND FEMALES BY 5 CM. LENGTH INTERVAL, REGION AND YEAR.

REGION:	KODIAK	
YEAR:	1983	
LENGTH INTERVAL	MALE CPUE	FEMALE CPUE
30-34	-	.0015
35-39	-	.0075
40-44	.0067	.0067
45-49	.0146	.0122
50-54	.0291	.0097
55-59	.0543	.0233
60-64	.0823	.0504
65-69	.0776	.0880
70-74	.1115	.1003
75-79	.0923	.1046
80-84	.1125	.1097
85-89	.0962	.1036
90-94	.0785	.1080
95-99	.0806	.0998
100-104	.1317	.0966
105-109	.0786	.1571
110-114	.1049	.1338
115-119	.1091	.1355
120-124	.0601	.1547
125-129	.0683	.1331
130-134	.0190	.1899
135-139	.0069	.1557
140-144	.0118	.1538
145-149	-	.1507
150-154	.0033	.1116
155-159	-	.1044
160-164	.0037	.0694
165-169	-	.0686
170-174	-	.0373
175-179	-	.0313
180-184	-	.0164
185-189	-	.0149
190-194	-	.0075
195-199	-	.0045
200+	-	.0060
TOTAL	1.43	2.76

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