

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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

ANNUAL REPORT 1974

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1975

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

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Preface

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

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

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

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Dedication



This Annual Report is dedicated to Mr. Harold E. Lokken in recognition of his long service and valuable contributions to the conservation of halibut. Mr. Lokken has been manager of the Seattle Fishing Vessel Owners Association since 1924. He has attended each annual meeting of the Commission since 1940 and for many years has been the spokesman for the Conference Board, which consists of halibut fishermen from both Canada and the United States. Mr. Lokken is widely recognized as an industry expert on fishery matters and is a member of several United States advisory groups, including the National Advisory Committee on Oceans and Atmosphere. He also serves as a Commissioner of the Pacific Marine Fisheries Commission and as an advisor to the U.S. Section of the International North Pacific Fisheries Commission.

Activities of the Commission

The Commission held its 50th Annual Meeting in Seattle, Washington, January 22-25, 1974; Mr. Robert W. Schoning presided as Chairman. Mr. Clifford R. Levelton, Ottawa, and Mr. Jack T. Prince, Prince Rupert, were welcomed as new Canadian Commissioners. The Commission staff reviewed the results of scientific investigations, the effects of the 1973 halibut regulations, and the condition of the halibut stocks. The Conference Board, whose members represent vessel owners and fishermen, met with the Commission to present and discuss their regulatory proposals. The Commission also considered a brief submitted by the International Trawlers Association. All proposals were reviewed with a newly created Advisory Group (see page 9). Regulations were adopted for the 1974 halibut season and submitted to the Canadian and United States Governments for approval. The Commission reviewed administrative and fiscal matters, approved the research plans for 1974 and the budget for fiscal year 1976. Mr. Levelton was elected Chairman and Mr. Schoning was elected Vice Chairman for 1974.

The Commission called a special meeting in Seattle on April 16 to discuss the implications of a sharp increase in U.S.S.R. trawling in the Gulf of Alaska during the early months of 1974. The Commission urged the governments to contact the Soviet Union to discuss measures to limit the incidental catch of halibut by their trawl fishery. Representatives from Canada, the United States, and the U.S.S.R. met in Halifax, Nova Scotia in June to discuss the halibut resource and measures required for its protection. Observers from Japan and consultants from IPHC attended the meeting.

The Commission met in Seattle, Washington on September 30 and October 1 to consider staff and industry proposals for the Bering Sea commercial fishery and the sport fishery regulations for 1975. The Commission recommended that its member governments urge Japan to expand the trawl restrictions adopted, as a domestic measure, for the Bering Sea in 1974. In particular, the Commission proposed that the time and area of the Bering Sea trawl closure be increased. Trawl restrictions were proposed for the Gulf of Alaska during the winter and spring, when the incidental catch of halibut is high. Regulations proposed by the Halibut Commission for the eastern Bering Sea were also proposed by the International North Pacific Fisheries Commission (INPFC). After discussions subsequent to INPFC's annual meeting in November, the proposal was approved by the member governments: Canada, Japan, and the United States. Japan agreed to restrict its trawl fishery to reduce the incidental catch of halibut (see page 19).

The Commission's publications during 1974 are listed at the end of this report. In addition, several special papers were prepared for the INPFC annual meeting at the request of the Canadian and United States national sections.

Expenditures during the 1973-1974 fiscal year (April-March) were \$587,000. In compliance with the Convention, expenses of the Commission were shared equally by both governments.

Director's Report

The stocks of halibut continued to decline in 1974, but the rate of decline was less than in previous years. Our analyses show that reduced recruitment is responsible for the current low stock size and yield in the fishery. Though the cause of this reduction is not fully understood, part is attributable to the incidental catch of juvenile halibut by trawlers. As a result of the reduced recruitment and continued removals of older fish by the setline fishery, spawning stocks are low and must be protected to insure future recruitment. The reduction in catch and effort over the past several years is expected to halt the decline in abundance by 1975, but a major increase in stock abundance will not occur until recruitment improves. Although restrictions on the North American halibut fleet have slowed the rate of decline, the expected benefits are being partially negated by the incidental catch by trawl fisheries. As explained in this report, Japan agreed to restrict trawling in the Bering Sea and the Gulf of Alaska. Although the Canadian and United States Governments have urged the Soviet Union to adopt similar measures, no agreement has been reached, but trilateral sessions to discuss protective measures for halibut are scheduled in 1975.

During the meetings with the U.S.S.R., the three nations decided that cooperative research should be undertaken to provide needed information on the halibut resource. In September 1974, the U.S. and the U.S.S.R. agreed on a joint research program placing a scientist from each country aboard several Soviet commercial fishing vessels in the eastern Bering Sea and the Gulf of Alaska to determine the species composition of the Soviet catch and to provide more precise estimates of the incidental catch of halibut. In addition, agreement was reached on a cooperative tagging program to determine the relationship of halibut in the eastern and western Bering Sea and between the Bering Sea and the North Pacific. The Canadian and U.S. Governments asked IPHC to represent them in this undertaking. Scientists from IPHC, U.S. National Marine Fisheries Service (NMFS), and U.S.S.R. Pacific Research Institute of Fisheries and Oceanography (TINRO) met in Seattle, Washington and Batumi, U.S.S.R. to formulate plans for this joint study, which will begin in 1975. The Soviets will supply the vessel, trawl gear, fishing crew, and scientists; IPHC will provide longline gear, tags, and expertise on the tagging and fishing methods.

The information gained from the observer program and the tagging study will be useful to the national governments in developing a means of managing the multi-species trawl fisheries. Additional areas of study are needed, such as gear modification to reduce the incidental catch, and should include domestic as well as foreign trawl fisheries. The basic premise of IPHC's proposal for trawl closures is that trawl fisheries need not be conducted on a year-round basis to achieve optimum harvest of the groundfish resource. With the proper scheduling of fishing operations, the productivity of the trawl fisheries can be maintained and the incidental catch of halibut can be substantially reduced.

The Fishery

REGULATIONS FOR 1974

Regulatory proposals for 1974 were submitted by fishermen, vessel owners, dealers, government agencies, and the Commission's scientific staff. Prior to the annual meeting, a summary of the proposals was distributed to the industry. Major changes proposed by the IPHC staff for 1974 were a 15 million pound reduction of the catch limit in Area 3 to assure a lower fishing effort in 1974 and to reverse the trend of recent years; a June 1 opening date in Areas 2 and 3, 22 days later than in 1973; and a statutory closing date of September 1, one month earlier than in 1973. These dates would limit the setline fishery to 3 months, an adequate period for taking the catch limit unless CPUE declined sharply, in which event additional fishing would be undesirable. The staff also proposed that an annual license be required for all vessels fishing for halibut and that the Halibut Convention and Enabling Acts be revised to provide more flexible guidelines for management of the fishery (neither was adopted). The staff also proposed, and the Commission approved, the elimination of license validation and clearance. These regulations required licensed vessels to report before the start of each fishing season and to submit a record of catch after each trip. In 1932, when these regulations were instituted, the system ensured the collection of reliable catch statistics. In time, federal and state agencies established their own statistical systems. This duplication continued for many years but has now been eliminated, removing an unnecessary burden on the fishermen. The change does not alter the requirement for IPHC's license (all vessels over 5 net tons) or the maintenance of a log book to provide data on effort, gear, and other information not otherwise available.

The Conference Board proposed an 8 million pound reduction in the quota for Area 3, contending that the Area 3 catch should not be reduced below 17 million pounds because foreign trawlers, not setliners, were the cause of the depleted stocks. The Board favored an opening date of May 10 because the availability of fish is generally higher in May than in June, and because many vessels change to the salmon fishery in mid-summer. The Conference Board also proposed: greater protection from all types of fishing detrimental to the halibut stocks, an annual license for all halibut vessels, a ban on the importation of halibut caught by methods prohibited by IPHC, and a reduction of the sport fish limit to one fish per day.

At the 1974 Annual Meeting, the Commission established an Advisory Group consisting of representatives of fishermen, vessel owners, and industry. Members of the 1974 Advisory Group were Fred Leland, Delta; Chris Christensen, Petersburg; S. W. Dickens, Prince Rupert; Harold E. Lokken and David G. Roy, Seattle; George Clovis, Seward; and Glenn R. McEachern, G. A. Dodman, and D. R. Russell, Vancouver. All regulatory alternatives were discussed with the Advisory Group before the Commission adopted the regulations for 1974. The regulations

were approved by the Governor General of Canada on February 26 and by the United States Secretary of State on March 11. As in previous years, these regulations also implemented the conservation measures adopted by the International North Pacific Fisheries Commission for the eastern Bering Sea on behalf of Canada and the United States.

During the past few years, several steps have been taken to simplify the regulations. Vessels no longer are required to clear for halibut fishing at the start of the season, the requirement that vessels have their licenses validated and file a statistical return at the end of each trip has been eliminated, and several regulatory areas in the Bering Sea now have been combined. The language of the regulations also has been changed for added clarity. Canada and the United States have reviewed the revisions to assure that they are legally sound. As a result of these changes, the 1974 regulations required only 5 pages of text compared with 11 pages in 1971.

Regulatory Areas

The regulatory areas in 1974 are depicted in Figure 1:

Area 2 — South of Cape Spencer, Alaska.

Area 3 — North and west of Area 2, excluding the Bering Sea.

Area 4 — The Bering Sea:

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

4D West—West of 175° W.

4E—The southeastern flats.

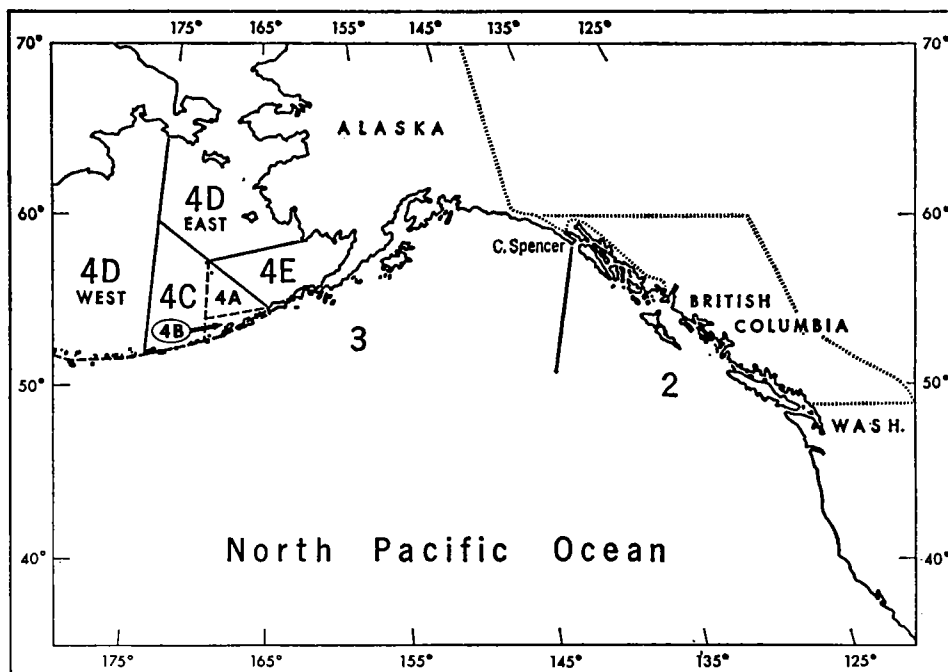


Figure 1. Regulatory areas for the Pacific halibut fishery, 1974.

Before 1974, Area 3 was partitioned into Areas 3A, 3B, and 3C. These areas were combined because the subdivision no longer served a useful purpose. Similarly, some of the areas within Area 4 have been managed as a unit in recent years. The identity of the smaller divisions was maintained, however, for statistical records. The establishment or consolidation of regulatory areas does not imply biological independence or uniformity of the fish within the area boundaries.

Catch Limits and Length of Seasons

The catch limit in Area 2 for 1974 was 13 million pounds, the same as in the previous year. The Area 3 quota was 12 million pounds, 13 million pounds less than in 1973 and the largest reduction ever made by the Commission for a single area. The reduction was necessitated by recent sharp declines in stock size as indicated by CPUE. Area 4 was managed by limiting the length of the fishing seasons without assigning catch limits. No fishing was permitted in Area 4E, which has been designated as a halibut nursery area since 1967.

The opening and closing dates and the number of fishing days in 1973 and 1974 are compared in Table 1. In 1974, Pacific Daylight Time was used for the opening and closing hours in Areas 2 and 3, and Pacific Standard Time was used in Area 4. The fishing seasons began at 1500 hours and ended at 0600 hours in Areas 2 and 3, and began at 1800 hours and ended at 0600 hours in Area 4.

Table 1. Opening and closing dates by area, 1973-1974.

Area	1973			1974		
	Opening	Closing	Fishing Days	Opening	Closing	Fishing Days
2	May 10	Aug. 13	95	May 17	Sept. 15	121
3A, B	May 10	Oct. 1	144	May 17	Sept. 15	121
3C	Apr. 1	Nov. 15	227	May 17	Sept. 15	121
4A, B, C	Apr. 1	Apr. 19	17	Apr. 1	Apr. 19	17
	Sept. 15	Sept. 30	14	Sept. 15	Sept. 30	14
4D East	Apr. 1	Nov. 15	227	Apr. 1	Apr. 19	17
				Sept. 15	Sept. 30	14
4D West	Apr. 1	Nov. 15	227	Apr. 1	Nov. 15	227

Size Limit

A minimum commercial size limit of 32 inches with head-on or 24 inches with head-off was adopted for Areas 2 and 3 in 1973 and continued in 1974, and was adopted in Area 4 (Bering Sea) in 1974. The minimum size was increased because of the present fast growth of young halibut, and the change is expected to increase the yield in future years. The size limit does not apply to the sport fishery for halibut.

Sport Fishery

Regulations for the sport fishery for halibut were first introduced in 1973. In 1974, the Commission reduced the daily catch limit from three fish to one fish. The season began on March 1 and lasted until October 31. Sport fishing gear was restricted to a hand-held rod or line. There was no possession limit. In the United States, state agencies have regulatory authority over the sport catch of marine

species; in Canada, the federal government has sole authority. IPHC solicited the views of the state and federal agencies prior to formulation of sport fishery regulations for halibut and encouraged the state agencies to adopt the IPHC regulations. Establishment of unified sport fish regulations for the entire coast was difficult because of geographic differences in stock conditions and socio-economic situations. Alaska and Oregon did not adopt the IPHC sport fishery regulations, and Washington adopted a three fish daily catch limit before IPHC reduced the limit to one fish. Although the objective of unified sport fish regulations was not achieved in 1974, IPHC and the state agencies are continuing to work toward this end.

Only Washington and Alaska conduct a marine sport fish census that regularly includes halibut. Because these records are incomplete and records from elsewhere are lacking, the coast-wide sport catch cannot be estimated reliably. An estimate has been attempted, nevertheless, so that the sport fishery can be placed in perspective as a user of the resource. Data provided by state agencies and the Canadian Department of the Environment were used to estimate the annual sport catch, which for the entire coast was 250,000 pounds.

STATISTICS OF THE FISHERY

The 1974 catch was 21.3 million pounds, 10.4 million less than in 1973. It was the lowest catch reported for any year since the turn of the century and 40% of the catch in 1970. Canadian fishermen landed only 35% of the 1974 catch, their lowest share since 1950. The total catch of halibut from 1970 to 1974 is given by country and regulatory area in Table 2.

In Area 2, the catch was 10.7 million pounds, 2.2 million pounds less than the 1973 catch and 2.3 million below the catch limit. The highest reduction in

Table 2. Catch of halibut in thousands of pounds (eviscerated, heads-off) by regulatory areas, 1970-1974.

Regulatory Area	1970	1971	1972	1973	1974
Area 2					
Canada	11,147	10,189	10,517	7,351	4,973
United States	8,738	6,584	5,765	5,565	5,771
Total	19,885	16,773	16,282	12,916	10,744
Area 3					
Canada	17,119	14,578	11,757	6,963	2,227
United States	16,800	14,437	14,112	11,536	7,898
Total	33,919	29,015	25,869	18,499	10,125
Area 4					
Canada	889	729	261	96	168
United States	245	137	606	189	269
Total	1,134	866	867	285	437
All Areas					
Canada	29,155	25,496	22,535	14,410	7,368
United States	25,783	21,158	20,483	17,290	13,938
Total	54,938	46,654	43,018	31,700	21,306

catch was in northern and central British Columbia and was largely caused by reduced fishing effort of Canadian vessels. Whereas the Canadian catch dropped 2.4 million pounds, the United States catch in this area was practically the same as in 1973.

The catch in Area 3 was 10.1 million pounds, 8.4 million pounds less than in 1973 and 1.9 million below the catch limit. IPHC had drastically reduced the catch limit because of stock conditions, but the principle reason for not meeting the quota was the sharp reduction in fleet size caused by the later opening date and prospects of greater earnings in other fisheries. The Canadian share of the catch in this area fell from 38% to 22%.

In Area 4 (Bering Sea), the total catch was 437,000 pounds: 2,000 pounds in Area 4A, 178,000 pounds in Area 4B, 2,000 pounds in Area 4C, and 255,000 pounds in Area 4D West. The catch in Area 4 has been less than a million pounds since 1970. The three United States vessels that participated in the spring fishery in the Bering Sea landed 137,000 pounds. Four United States and one Canadian vessel fished in the summer and fall, landing 300,000 pounds.

The value of the catch from all areas was \$15 million, compared with \$24 million and \$25 million in 1973 and 1972 respectively. The average prices paid to the fishermen for medium and large halibut were 70 and 72 cents per pound respectively, slightly lower than the record prices in 1973. Prices generally increased during the season and were about 12 cents a pound higher at Seattle and Vancouver than in Alaskan ports.

Landings by Ports

Prince Rupert continued to be the leading halibut port on the Pacific Coast with landings of 4.5 million pounds, followed by Kodiak and Petersburg with 3.7 and 3.0 million pounds respectively. Landings in Petersburg and Pelican were nearly the same as in 1973, but landings in all other major Pacific Coast ports declined. During the 1930's, Seattle received 40% of the total halibut landings. Since then, the number of vessels in the Seattle fleet has declined, and vessels are selling more of their catch in northern ports. In 1974, Seattle received only 2% of the total landings. See Table 3 for the distribution of landings by ports in 1973 and 1974.

Number of Vessels and Fishermen

The number of regular halibut vessels (licensed vessels that landed at least 10,000 pounds during the season) in 1974 declined from the preceding year by about 25% in Area 2 and by 35% in Area 3 (Table 4). The number of vessels and men declined more in the Canadian fleet than in the U.S. fleet, particularly in Area 2. The late opening of the fishing season and the generally poor prospect for catches discouraged some vessels from entering the fishery. Many regular vessels left the fishery by early July to fish for other species. Unlicensed vessels (most of which are under 5 net tons) produced over 30% of the Area 2 catch and 10% in Area 3. Many of these small vessels are salmon gillnetters and trollers that fish for halibut before the salmon season begins but also take halibut incidentally while fishing for salmon. The fleet of small vessels is concentrated in Area 2 (British Columbia and southeastern Alaska). Most of the small boats in Area 3 are salmon gillnetters and operate primarily in the vicinity of Seward and Kodiak.

Table 3. Halibut landings in thousands of pounds by port, 1973-1974.

Region or Port	1973			1974		
	Canada	U.S.	Total	Canada	U.S.	Total
CALIFORNIA AND OREGON	—	32	32	—	68	68
WASHINGTON						
Bellingham	1,238	186	1,424	80	241	321
Seattle	58	508	566	—	432	432
Neah Bay	—	97	97	—	231	231
Other	—	37	37	—	116	116
BRITISH COLUMBIA						
Prince Rupert	6,641	189	6,830	4,390	154	4,544
Vancouver	1,990	29	2,019	1,447	—	1,447
Vancouver Island	371	—	371	180	—	180
Namu	322	—	322	163	—	163
Other	302	—	302	180	—	180
SOUTHEASTERN ALASKA						
Petersburg	81	2,971	3,052	—	3,047	3,047
Ketchikan	2	706	708	—	465	465
Juneau	—	937	937	—	769	769
Pelican	393	657	1,050	143	878	1,021
Sitka	9	862	871	—	463	463
Metlakatla	—	174	174	—	372	372
Craig	—	159	159	—	168	168
Wrangell	—	399	399	—	397	397
Hoonah	—	141	141	—	171	171
Other	—	47	47	—	58	58
CENTRAL ALASKA						
Kodiak	1,825	4,767	6,592	541	3,201	3,742
Seward	1,121	2,850	3,971	244	1,686	1,930
Yakutat	57	171	228	—	155	155
Homer	—	394	394	—	431	431
Other	—	977	977	—	435	435
Total	14,410	17,290	31,700	7,368	13,938	21,306

Table 4. Number of regular vessels* and men by area and country.

Year	Area 2		Area 3		Areas 2 & 3**		Total	
	Vessels	Men	Vessels	Men	Vessels	Men	Vessels	Men
CANADA								
1972	109	370	41	296	15	96	165	762
1973	95	338	36	251	13	69	144	658
1974	48	198	23	149	5	30	76	377
UNITED STATES								
1972	110	343	88	380	19	75	217	798
1973	103	346	77	372	17	60	197	778
1974	101	361	50	255	3	12	154	628
CANADA AND UNITED STATES								
1972	219	713	129	676	34	171	382	1,560
1973	198	684	113	623	30	129	341	1,436
1974	149	559	73	404	8	42	230	1,005

* Licensed vessels that landed at least 10,000 pounds during the season.

** Vessels that fished both areas.

CONDITION OF THE RESOURCE

The detailed assessment of stock condition initiated in 1973 showed a long-term decline in recruitment in Area 2 and a marked increase in fishing mortality in Area 3. The study was continued during 1974 with special emphasis on refinement of statistics on fishing effort and age composition. These refinements did not change the general results, but a decline in recruitment in Area 3 was apparent. Reduced recruitment is a major cause of the present low stock size and yield in the fishery and, in part, is attributable to losses of juvenile halibut to foreign and domestic trawlers; other causes, including the effect of setline fishing, have contributed to the decline. The setline fishery has reduced spawning stocks and, as a result, may have reduced recruitment. The trawl closures adopted by Japan and the reductions of catch limits for the setline fishery should reduce the mortality of juvenile halibut and increase the spawning stock.

Age Composition

The age composition of halibut in the 1974 landings and mean ages since 1971 are summarized by region in Table 5. Mean age, in combination with CPUE and total mortality, is a useful indicator of stock condition. In recent years, CPUE has declined and total mortality has increased; a decline of mean age usually accompanies these conditions. The interpretation of the data on mean age is complicated by the increase in the size limit in 1973 (see page 26). Mean age increased noticeably in that year in Area 2, which historically has contained high proportions of young fish.

The comparison of CPUE in numbers of halibut at each age in 1973 and 1974 in Area 2 and Area 3 shows that most of the decline of CPUE was caused by a reduction in the number of young fish. The 1961 year class continued to be strong as 13-year-olds in 1974. Currently, the dominant age groups are from the 1961, 1963-1965 year classes in Area 2 and the 1961-1964 year classes in Area 3. No strong year classes are evident among young fish entering the fishery.

Table 5. Age composition of halibut in 1974 and mean age by region, 1970-1974.

Region	Age (1974)				Year			
	<9	9-11	12-14	>14	1971	1972	1973	1974
	Percent				Mean Age			
Willapa Bay and South	—	—	—	—	10.3	10.6	—	—
Washington-Vancouver Island	—	—	—	—	8.9	9.7	13.5	—
Hecate Strait	26	40	22	12	7.7	8.6	9.9	10.8
West Coast Queen Charlottes	15	38	22	25	9.0	10.6	13.6	12.1
Inside S.E. Alaska	13	42	29	16	10.7	10.3	11.4	11.6
Outside S.E. Alaska	9	30	32	29	12.3	11.3	12.9	12.7
Cape Spencer-St. Elias	8	32	38	22	11.4	12.3	12.3	12.3
Portlock-Albatross Banks	11	41	34	14	11.0	10.8	11.5	11.6
Chirikof-Semedi Islands	18	42	29	11	11.2	9.9	10.5	11.1
Shumagin Is.-Davidson Bank	10	37	34	19	11.3	11.1	11.5	12.1
Aleutian Islands	0	9	20	71	—	—	—	16.7
Bering Sea — 4A	—	—	—	—	10.4	11.0	—	—
Bering Sea — 4B	14	43	26	17	11.9	11.2	10.8	11.3
Bering Sea — 4C	—	—	—	—	12.8	—	—	—
Bering Sea — 4D	—	—	—	—	—	13.8	—	—

Catch Per Unit Effort (CPUE)

As explained in previous reports, a new measure of CPUE was adopted in 1972 to correct for the effects of hook-spacing on longline gear. Studies showed that the catch per hook increases with wider hook-spacing and that more of the vessels are using the wider-spaced gear. Before 1950, most of the fleet used 13-foot spacing between hooks; by 1960, most of the gear was rigged at 18-foot intervals; and, more recently, 21-foot gear has been the most common. In 1972, many vessels, particularly in Area 3, fished with 26-foot gear. A comparison of catch per hook (CPUE) of the different gear by area and year showed that each gear reflected a similar decline of stock abundance. To obtain a single measure of CPUE, gear with different hook-spacing has been equated with the catch per 100 hooks of 18-foot gear.

Although catch and effort decreased again in 1974, the CPUE in Area 2 dropped from 69 pounds in 1973 to 62 pounds, continuing the decline observed since 1953 (Figure 2). This CPUE indicates the lowest stock size in the area since 1942. CPUE in Area 3 declined from 68 pounds in 1973 to 65 pounds in 1974 (Figure 2). This CPUE is the lowest since 1930. Effort and catch decreased 43% and 52%, respectively, from 1973 to 1974 — a major objective of the 1974 regulations. The sharp reduction in fishing is expected to halt the stock decline, a change which should be apparent in the CPUE in 1975. Nevertheless, recent declines of CPUE in both Area 2 and Area 3 indicate that setline catch and effort must be held at low levels to allow the resource to recover. Assuming that growth and natural mortality have not changed recently, the decline in CPUE accompanied by the reduction in effort indicates that recruitment has declined.

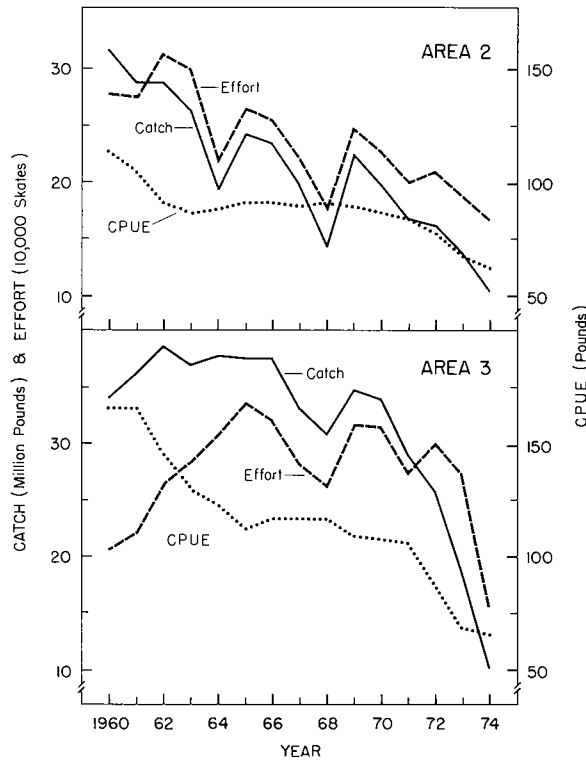


Figure 2. Setline catch, effort, and CPUE in Area 2 and Area 3.

Long Lining for Halibut

A coiled skate ready for baiting

Bringing a halibut aboard

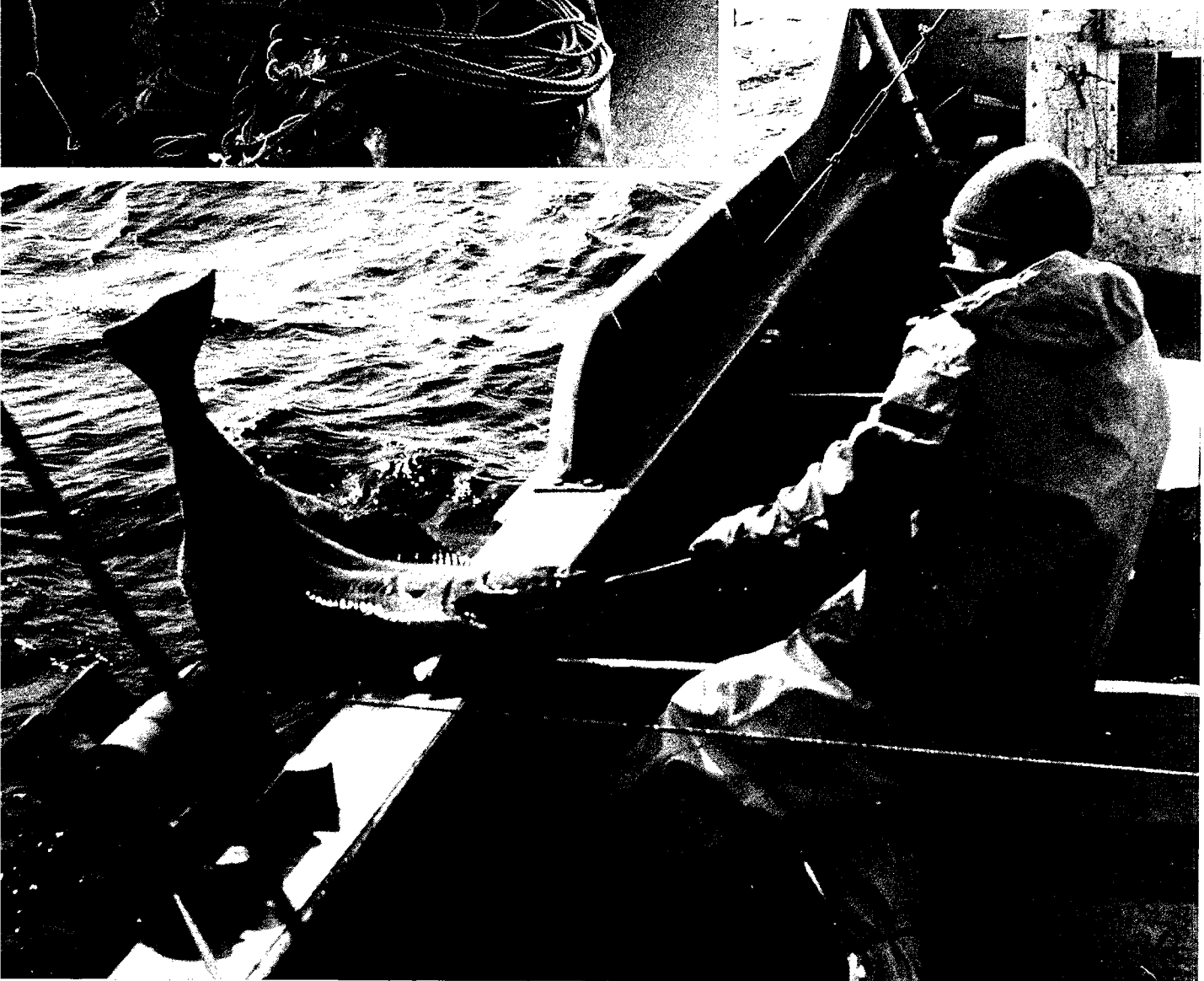




Long Lining for Halibut

Coiling a skate of gear

Halibut on the rail



Scientific Investigations

INCIDENTAL CATCH OF HALIBUT

In addition to the catch by North American halibut vessels, large quantities of halibut are caught incidentally by fisheries seeking other species of groundfish. Foreign trawlers take most of the incidental catch, but halibut are also taken in domestic trawls and crab pots. The Commission estimated that the incidental catch in recent years has been 15 to 20 million pounds. The magnitude of the incidental catch is of obvious importance to the management of the resource. Trawl restrictions adopted by Japan as a domestic measure are expected to reduce the incidental catch by Japanese vessels.

In 1973, IPHC proposed that foreign fishing be prohibited in particular areas in the Bering Sea. These closures were designed to reduce the incidental catch of halibut by closing areas when the percentage of halibut in the trawl catch was relatively high. Canada and the United States successfully negotiated with Japan to establish trawl closures in the eastern Bering Sea for 1974. Details of these closures were given in the 1973 Annual Report. In response to a proposal by IPHC in 1974, the trilateral negotiations continued and Japan agreed to expand the duration and area of the Bering Sea closures for 1975. Closures also were adopted in the Gulf of Alaska as a result of bilateral negotiations between Japan and the U.S. (Figure 3). In addition to protection for halibut, the closures were also

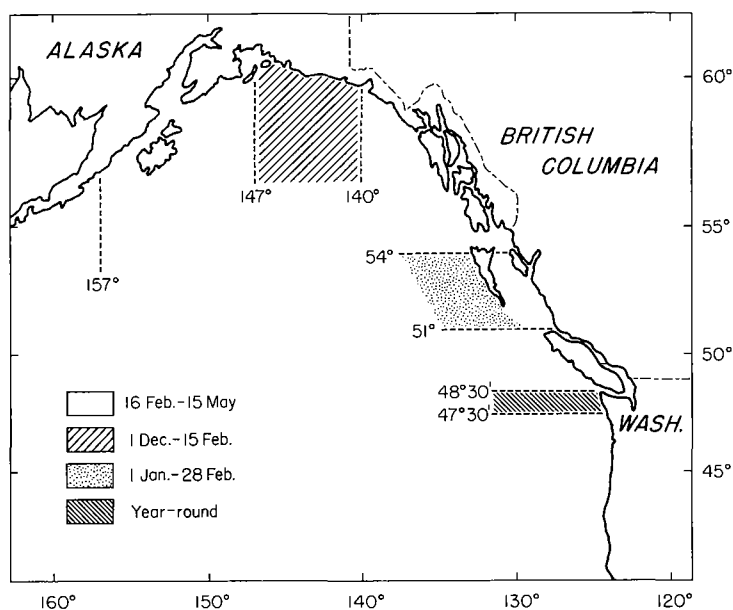


Figure 3. Japanese trawl closures in the Gulf of Alaska for 1975.

designed to protect other groundfish and crab resources in the Gulf. Canada and the U.S. discussed similar closures with the U.S.S.R. (see Activities of the Commission), but no agreements have been reached.

In Canada and the United States, proponents of extended jurisdiction over marine resources have been gaining support. IPHC recognizes that extended jurisdiction will not eliminate the incidental catch of halibut by foreign fisheries. If, however, the coastal nations can control the incidental catch by establishing closures similar to those adopted by Japan, it will be possible to protect halibut stocks while allowing other fisheries to operate profitably. IPHC relies on its member governments to negotiate with other nations to secure the needed protection.

Bering Sea Observer Program

An observer program to collect data on the incidental catch of halibut by Japanese trawlers was initiated in 1972 and continued through 1974. The program is coordinated by the U.S. National Marine Fisheries Service under the auspices of the International North Pacific Fisheries Commission. IPHC has participated in the program since its inception. The 1973 Annual Report described the program and gave preliminary results from data collected through 1973.

Data from the program have been used to estimate the incidental catch of halibut by Japan and to determine where and when the incidental catch occurred. The estimated incidental catch by Japanese trawlers increased from 6 million pounds (1,500,000 halibut) in 1968 to 14 million pounds in 1971, and declined to 10 million pounds in 1973, the latest year that Japanese catch data are available. About 90% of this catch occurred in Areas 4A, B, and E from December to May. Analyses show that the incidental catch was highest in the southeastern Bering Sea during the winter and spring. The incidence, expressed as the number of halibut per metric ton of groundfish, ranged from over 25 per m.t. in Area 4E during December and January to less than 0.2 per m.t. in most areas from June to November. This seasonal change conformed with the known distribution of halibut, which are widely dispersed over the eastern Bering Sea flats in the summer but are concentrated in deeper water during the winter. These data indicated that area and season closures to trawling could reduce the incidental catch substantially, yet allow a productive fishery for other groundfish. On this basis, IPHC proposed that areas and months with a high incidental catch be closed to trawling to protect halibut.

Survival of Trawl-Caught Halibut

IPHC regulations prohibit the retention of trawl-caught halibut by domestic trawlers, and INPFC regulations prohibit retention by Japanese trawlers in the Gulf of Alaska and the southeastern Bering Sea. In assessing the effect of trawling, it is essential to have reliable estimates of survival of the halibut that are released from the trawls. Observations on Japanese trawlers indicate that survival is low, due primarily to the time required to process the catch.

Most of the halibut caught by domestic trawlers are alive when released, but some die from undetected injuries. In 1969, the physical condition of over 2,000 halibut caught by domestic trawlers was judged on the basis of their external injuries and physical activity. Condition was positively correlated with length of fish and negatively correlated with time on deck and weight of the total catch.

Most of the halibut were tagged and the recovery rate of tags (1970 to 1973) was analyzed relative to the condition of the fish at the time of release. Condition did affect survival, but the criteria were not entirely accurate, as some of the fish that were judged dead were subsequently recovered.

The survival of fish immediately after release was estimated from the recovery of tags and from expected rates of fishing mortality and other losses. The percentage survival of fish over 80 cm long in each condition was:

<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>Dead</u>
92%	74%	50%	43%	18%

The average survival (weighted by the number in each condition) was 55%. The survival of halibut less than 80 cm could not be estimated precisely, but was probably close to 50%. These estimates indicate an annual loss in biomass of about 1,750,000 pounds during 1970-1972 due to the incidental capture by domestic trawlers. Because of the potential growth, the ultimate loss to the setline fishery was about 2,000,000 pounds. Several ways of reducing this loss have been examined, including restrictions on the trawl fishery to reduce the incidental catch and limited retention of halibut by trawls to convert some of the loss into production.

A reduction in effort during the summer would reduce the incidental catch of halibut, but would also affect the production of the domestic trawl fisheries. In 1970-1972, the trawlers took 50% of their groundfish catch from May to August, whereas about 90% of their halibut catch was taken in these months. The effect of reduced trawl effort during the summer on groundfish production is not known. The groundfish catch per unit of effort during September to April is similar to that during May to August, an indication that some species of groundfish can be harvested successfully during the winter.

The regulation that prohibits the retention of net-caught halibut is a source of controversy between domestic trawl and setline fishermen. Trawl fishermen contend that the regulation is wasteful because it requires that all halibut be released regardless of condition. On the other hand, setline fishermen argue that if retention by trawlers were allowed, trawl fishermen would direct their fishing toward halibut, thereby increasing the catch and mortality of halibut below the optimum harvesting size. Preliminary calculations indicate that a reduction in the yield loss might be achieved by allowing limited retention of trawl-caught halibut. Although such a change in regulations would increase the yield loss to the setline fishery, it would convert some of this loss to production by the trawl fishery. The net yield loss from retention by trawls is the difference between the loss to the setline fishery and the added production by the trawl fishery. If the present incidental catch by trawlers (3,500,000 pounds) were landed, the loss to the setline fishery would increase to about 4,000,000 pounds (3,500,000 + potential growth), but the net yield loss would be reduced to 500,000 pounds (4,000,000 - 3,500,000). This loss would be higher if the minimum legal size (81 cm) in the setline fishery were adopted in the trawl fishery because of the mortality on sub-legal halibut. There are at least two factors, however, that might reduce the benefits of allowing retention. First, if trawlers were allowed to retain halibut, they probably would fish for halibut, which sells for a price at least seven times that of most groundfish species. The shift of effort would increase the catch of halibut below optimum size, and the benefits from allowing retention would be

less than expected. Second, the enforcement of regulations would be complicated if retention by trawlers were allowed during periods when fishing was closed to setliners, and would be further complicated if size restrictions were different in the two fisheries. Solutions to the enforcement problem would probably require either uniform halibut regulations for the two fisheries or additional costs, which would reduce the benefits of allowing retention.

This examination suggests several alternative schemes of management that could reduce the loss from the incidental capture of halibut by domestic trawlers. Individually, schemes would adversely affect either the trawl or setline fisheries, but a combination of schemes could benefit both fisheries. Before such a scheme is proposed, further study of its effect on the trawl and setline fisheries is required. IPHC recommended that Canada and the United States increase their research efforts on the means of reducing the incidental catch of halibut and developing management regimes which permit the optimum catch of halibut and other groundfish.

JUVENILE HALIBUT STUDIES

IPHC chartered the *M/V Tordenskjold* to survey juvenile halibut in the southeastern Bering Sea and in the Gulf of Alaska from May 20 to August 20, 1974. Coincident with the high incidental catch by foreign trawlers, the CPUE (number per hour trawled) of juvenile halibut in the eastern Bering Sea has declined sharply since the mid-1960's and remained at a low level in 1974. In 1974, the abundance of all age groups, except 4-year-olds, was below average. The older juveniles (5-, 6-, and 7-year-olds) continued at the low level of abundance that has existed since 1969. The growth rate of juveniles has continued to decline; 7 years are now required for a halibut to reach a size of 65 cm. Considering the present levels of juvenile abundance and growth, the outlook for recovery of the Bering Sea stocks is poor.

Environmental factors may be responsible for the decrease in growth of the juvenile halibut in the southeastern Bering Sea. Water temperature near the bottom during early June ranged from -1.0° C to 3.6° C and averaged 1.1° C at the 34 index stations. In previous years, average bottom water temperatures in early June ranged from 1.0° C to 5.3° C. U.S. Navy Fleet Weather Facility charts of the Bering Sea show that the ice cover in March 1974 was near average, but persistent northerly winds and low spring temperatures slowed the retreat of the ice edge and retarded seasonal warming over the Bering Sea flats. A satellite photograph of the typical ice cover in March is shown in Figure 4.

In the Gulf of Alaska, the abundance of young halibut continued its gradual decline. The CPUE in the western Gulf was below average, but east of Kodiak Island it was slightly above average. The abundance of 1- and 2-year-old fish inhabiting the shallow inshore areas was below average at all locations. The CPUE of older juveniles, 5- and 6-year-olds, at the offshore stations was slightly above average. The size of juveniles from the Gulf of Alaska sampling areas in 1974 was at or below the long-term average.

TAGGING

Over 200 tags were returned to IPHC in 1974 — 190 recaptured during 1974 and 15 during 1973. Over 90% of these recoveries were from Area 2. Relatively few halibut have been tagged in Area 3 in recent years. One tagged fish released

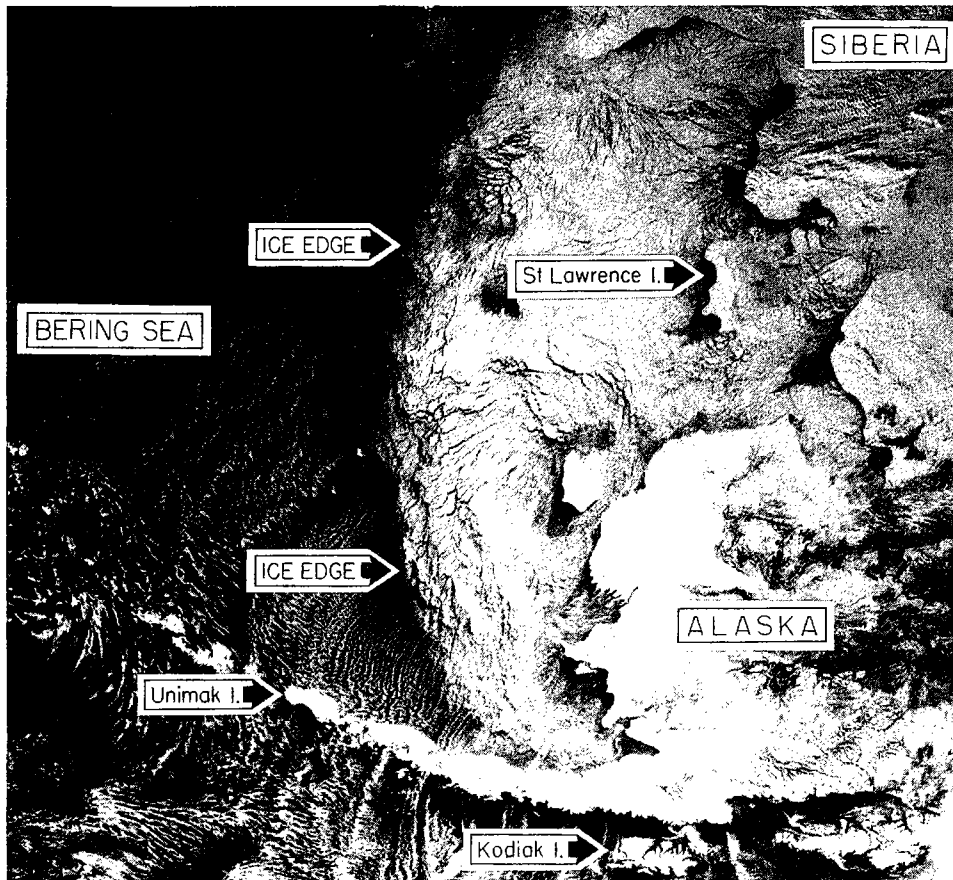


Figure 4. Satellite photograph of the Bering Sea showing typical ice cover in March.
Credit: U.S. National Environmental Satellite Service, NOAA.

by the Fisheries Agency of Japan was recaptured by a North American fisherman and the tag was forwarded to Japan.

Sixteen tags released during juvenile halibut surveys were returned in 1974. They include four fish released in the Bering Sea and recovered by Japanese trawlers during the spring of 1973 near the release location. Three tagged juveniles released near Chirikof Island were recaptured after 6, 7, and 8 years at liberty. All migrated in an easterly direction; two moved from Chirikof Island to Portlock Bank and the third fish was recaptured near Yakutat. In 1974, the trawler *M/V Tordenskjold* was chartered and 1,642 juvenile halibut were tagged in the vicinity of Cape Chiniak in July. This experiment will provide information on the recruitment of young fish to the commercial stock.

IPHC presently uses a plastic spaghetti tag with a wire insert to mark halibut. These tags are less likely to be shed and are more conspicuous than strap tags that were used in earlier tagging experiments. Because of these differences, IPHC has undertaken a review of past experiments to reevaluate the tagging data and the estimates of fishing mortality derived from these studies. Monel strap tags were used in nearly all the tagging experiments prior to 1960. Between 1964 and 1968, tests were conducted to compare the returns of monel and stainless steel strap tags. In 1964 and 1965, the fish were tagged with either a monel or a

stainless steel tag, whereas in 1968 both single-tagged and double-tagged fish were released. The results of the experiments are given in Table 6. The recovery of stainless steel tags was higher in all experiments and these tags are considered superior to monel strap tags for marking halibut. Overall, the recovery rate for monel tags was 20% less than for stainless tags. Monel tags corrode in sea water and fall off or are less conspicuous. Because of this low recovery of monel tags, the results of the earlier studies must be adjusted.

Table 6. Recovery of stainless steel and monel tags, 1964-1968.

Year	Stainless Steel			Monel		
	Released	Recovered	Percent	Released	Recovered	Percent
1964	272	50	18	572	55	10
1965	100	15	15	508	58	11
1968	1,243	490	39	1,314	450	34
1968	2,492	849	34	2,426	729	30
Total	4,107	1,404	34	4,820	1,292	27

BIOSTATISTICS

The Commission continued to study ways of improving CPUE estimates needed for the assesment of the stock. The effect of weighting CPUE by effort, catch, or area inhabited by the stock was examined during 1974. Preliminary work shows that weighting by fishing effort, catch, or bottom area results in nearly the same estimate of CPUE as weighting by the amount of log data collected, the method used in past years.

Catch Sampling

The Commission continued its systematic sampling of the landings in 1974. Port samplers were stationed at Seattle, Vancouver, Prince Rupert, Petersburg, Sitka, Kodiak, and Seward. Random samples were taken from every third landing over 5,000 pounds and every tenth landing between 1,000 and 5,000 pounds. Landings smaller than 1,000 pounds were not sampled. These small landings amounted to only 5% of the total catch, and their omission will not introduce a serious bias. This systematic sampling plan is designed to provide a representative sample of the landings.

Halibut from 255 commercial landings were sampled in 1974 by the sling sampling method, in which all fish in a specified sling were measured. Over 27,000 fish were measured and 13,000 otoliths (ear bones) were collected for age and growth studies. Observers on North American, Japanese, and Soviet vessels obtained more than 300 measurements of halibut from the Bering Sea and the Gulf of Alaska. An additional 8,900 measurements and 1,200 otoliths were collected from juvenile halibut during the *M/V Tordenskjold* charter.

Halibut Fleet

The North American halibut fleet has changed through the years. Fewer vessels and men now fish for halibut, and a greater share of the total catch is landed at central Alaskan ports. Setline gear and fishing methods have changed,

and the camp-fish landings in northern British Columbia and southeastern Alaska have been reduced considerably. Although the licensed halibut fleet (setline vessels 5 net tons and over) still produces the greatest poundage in both regulatory areas, the unlicensed fleet (vessels under 5 net tons) has become an increasingly important segment of the halibut fleet. A typical licensed vessel is depicted in Figure 5.

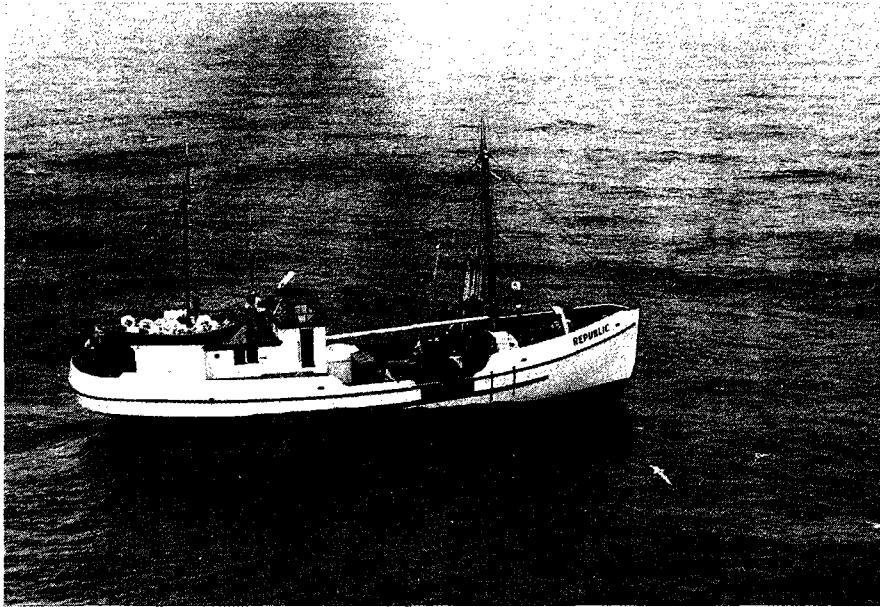


Figure 5. Halibut schooner, *M/V Republic* (Seattle), 51 net tons.
Credit: National Defense, Canada.

The licensed fleet produced about 75% of the landings in Area 2 and about 90% of the landings in Area 3 during the period from 1972 to 1974. In Area 2, 70% of the Canadian and U.S. vessels were in the 5 to 19 ton class and 25% were in the 20 to 39 ton class. There were no U.S. vessels and only seven Canadian vessels in the 40 ton or over category. In Area 3, most Canadian vessels (38%) were in the 20 to 39 ton class, but the greatest number of U.S. vessels (52%) were in the 5 to 19 ton class. The number of Canadian vessels in the 60+ ton class in Area 3 was four times greater than the number of U.S. vessels in this class. The catch per trip of Canadian vessels was higher in all categories than that of U.S. vessels, except those in the 40 to 59 ton class.

Unlicensed vessels accounted for approximately 25-30% of the catch in Area 2 during the last 3 years. The number of unlicensed Canadian setliners in Area 2 decreased from 816 in 1973 to 169 in 1974 because of the increased size limit, the later opening date, and a shift of vessels to the salmon fishery. In Area 3, only 8% of the catch was produced by unlicensed vessels in 1972 and about 14% in 1973 and 1974. Much of this increase in Area 3 is from a relatively new, small-vessel fleet in the Cook Inlet-Kodiak Island region.

In spite of the generally low stock levels throughout the range of the fishery, the catch per trip of unlicensed setliners was higher in 1974 than in 1973, perhaps due to a reduction in gear competition. A comparison of the number of vessels (licensed and unlicensed), trips, and catch is presented in Table 7.

Table 7. Comparison of catch per trip by the licensed and unlicensed vessels, 1974.

	Number Boats	Number Trips	Catch in Thousands of Pounds	
			Total	Per Trip
Unlicensed Vessels				
Trollers	2,541	7,708	978	0.13
Setliners	827	3,087	3,008	0.97
Licensed Vessels				
5-19 Tons	289	1,034	4,696	4.54
20-39 Tons	129	322	7,670	23.80
40-59 Tons	18	45	2,076	46.15
60+ Tons	16	34	1,918	56.40

EFFECT OF THE LARGER SIZE LIMIT

The minimum size limit was increased in 1973 from 26 to 32 inches, thereby eliminating most of the chicken halibut (5-10 pounds) from the catch. Halibut less than 32 inches must be released if caught. The growth of the released fish compensates for losses due to natural mortality and to mortality caused by their capture. If release mortalities are near 30%, the larger size limit will produce a small increase in yield. A larger increase will occur if vessels move away from

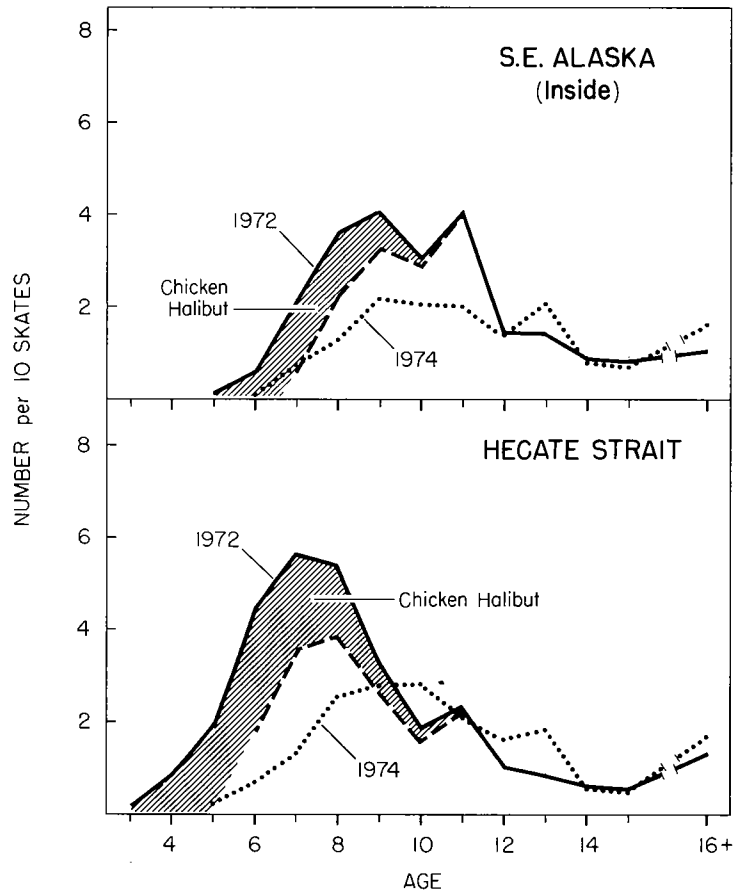


Figure 6. Effect of size limit change on age composition.

small fish grounds. Catch data for 1972-1974 were analyzed to determine if these expected results were realized. Figure 6 shows the number of fish per unit of effort at each age in 1972, the last year with the smaller size limit, and in 1974, when the larger size limit was in effect. The dashed line shows the age composition of the 1972 catch without chickens. The CPUE for older age groups was generally higher in 1974 than in 1972, suggesting that vessels changed grounds to avoid catching chicken halibut. Further evidence of this change was obtained by comparing the percentage of the Area 2 catch from "chicken grounds" (those that traditionally produce a high percentage of chickens) with the percentage from all other grounds in Area 2. During 1971 and 1972, the chicken grounds produced about 54% of the total catch; whereas in 1973 and 1974, after the size limit was increased, the percentage declined to 48% and 44% respectively.

Other factors, such as a reduction of recruitment and fishing mortality, may have influenced the size composition of the catch and must be evaluated before the effect of the change of size limit can be quantified.

SOAK-TIME AND CPUE

The soak-time of setline gear has changed during the course of the fishery. When the fleet changed from dory to longline fishing in the late 1920's, the average soak increased from about 4 hours to 8-12 hours. In recent years, the average soak has increased again, and soaks of more than 24 hours are not uncommon. This recent increase is apparently associated with the lower CPUE and with changes to more durable baits. These changes in soak-time may have an important effect on CPUE.

Data on length of soak and CPUE were recorded during research cruises in Areas 2 and 3 in 1963-1966. Soaks ranged from 2 to 34 hours (1,027 observations), but only 31 observations were longer than 16 hours. The data indicate that CPUE increases with soak, but the rate of increase (CPUE/hour soak) decreases as soak increases (Figure 7). The data were inadequate to determine the effect of soak-time beyond 16 hours and how different bait and bottom types might affect the relationship. IPHC intends to study the effect of longer soak-times on CPUE during the coming year.

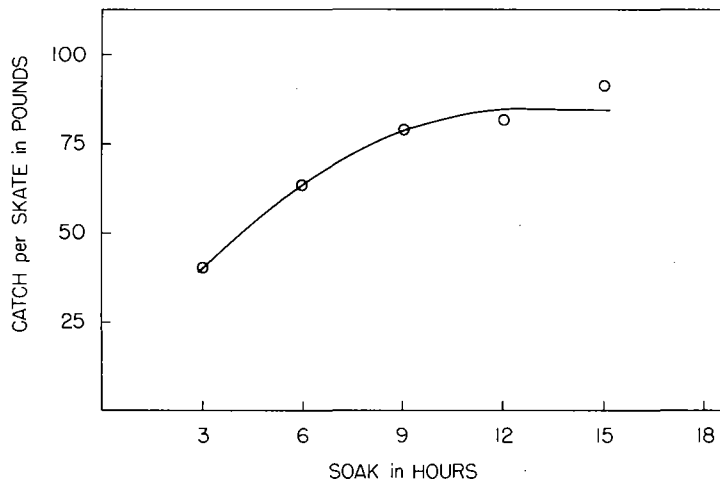


Figure 7. Effect of soak-time on catch per skate.

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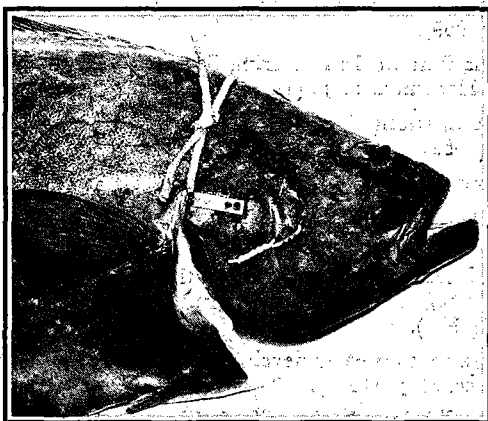
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5. Information on Japanese hooks. 1 p. (1974).
6. 1974 halibut regulations. 1 p. (1974).
7. Halibut catch in 1974. 1 p. (1974).
8. \$300 halibut landed in Seattle. 1 p. (1974).

TAGGED HALIBUT

The INTERNATIONAL PACIFIC HALIBUT COMMISSION tags halibut with plastic tags and metal strap tags attached to the cheek on the dark side of the fish. Some fish have two tags. Retain all tagged halibut regardless of size or gear used.



REWARD

\$2.00 WILL BE PAID FOR THE RETURN OF THE TAGS AND RECOVERY INFORMATION FROM EACH FISH. \$100.00 WILL BE PAID FOR SPECIAL PRESELECTED TAGS.

WHEN YOU CATCH A TAGGED HALIBUT:

1. Record Tag Numbers, Date, Location and Depth in your log book.
2. Leave Tags on the fish.
3. Mark the fish with a gangion.

WHEN YOU LAND A TAGGED HALIBUT:

1. Report fish to a Commission Representative or Government Officer
or
2. Forward tags to address below and enclose recovery information (see above), your name, address, boat name, gear, overall length of fish and, if possible, earstones from the fish.

FINDER WILL BE ADVISED OF MIGRATION AND GROWTH OF THE FISH.

International Pacific Halibut Commission

P.O. Box 5009

University Station

Seattle, Washington 98105

Tag Reward Poster.