ISSN: 0579-3920

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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

Technical Report No. 40

(Revision of Nos. 6, 16, and 22)

The Pacific Halibut: Biology, Fishery, and Management

by

The International Pacific Halibut Commission

**SEATTLE, WASHINGTON
1998**

The International Pacific Halibut Commission has three publications: Annual Reports (U.S. 0074-7238), Scientific Reports, and Technical Reports (U.S. ISSN 0579-3920). Until 1969, only one series was published (U.S. ISSN 0074-7426). The numbering of the original series has been continued with the Scientific Reports.

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

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Introduction

The International Pacific Halibut Commission (IPHC or Commission) has a long and storied tradition of successful fishery management. For 75 years, the IPHC has conducted research, assessed the Pacific halibut stock biomass of the north Pacific Ocean and Bering Sea, and regulated the commercial and sport fisheries. This report is a general review of the biology and management of Pacific halibut, and updates IPHC Technical Reports 6, 16, and 22.

Pacific halibut (*Hippoglossus stenolepis*) is a flatfish which inhabits the continental shelf of the United States and Canada, ranging from California to the Bering Sea, and extends into Russia and Japan. Because halibut can grow to be as much as 500 pounds, is firm textured, and has relatively few bones compared to other fishes, it is a popular food fish. In addition, sport fish enthusiasts find it a desirable quarry by virtue of its size and strength.

All weights discussed in this report are dressed, head-off, unless otherwise stated. Although the industry standard for other fisheries is to report weights in "round, head-on" units, the IPHC receives weights from the plants after the fish have been headed and gutted, and thus a net weight reporting is more accurate than an extrapolation back to round weight. Approximate round weight units can be figured by dividing the net weight by a factor of 0.75.

THE IPHC AND PACIFIC HALIBUT MANAGEMENT HISTORICAL REVIEW

Pacific halibut has been fished for hundreds of years by members of Indian tribes who inhabited what is now Alaska, British Columbia, and the U.S. west coast (Washington, Oregon, and California). The North American commercial fishery officially started in 1888 when halibut were landed in Tacoma, Washington by the sailing vessel *Oscar and Hattie* and were subsequently shipped to Boston. Two other vessels fished halibut that year, and halibut's popularity soon grew because the fish, if well iced, could be kept for an extended time without spoiling.

In the 1890s, an extensive fleet of sailing vessels fished with 2-man dories. The large, company-owned, steam powered vessels soon dominated the fishery and carried 10 to 12 dories and as many as 35 crew, compared to two or three dories on a smaller vessel. However, by the 1910s it became evident that the halibut stocks were suffering from over-fishing and industry asked the governments of both the U.S. and Canada for international management of the resource. The fleet itself was integrated since there were no international boundaries pertaining to fishing at the time.

An attempt at an international agreement failed in 1919. However, after further negotiation the U.S. and Canada signed a Convention in 1923, making it the first international treaty of any kind entered into by Canada independent of Great Britain. From that convention the International Fisheries Commission (later to become the International Pacific Halibut Commission) was formed. The Convention was modified a number of times in subsequent years.

The Commission began its management in 1924 with a 3-month winter closure. By 1932, it was evident that further action was needed and the first catch limit was set. Over the next two decades, the fleet grew and the fishers became more skilled, resulting in shorter and shorter seasons. Fish quality suffered, and the effort was often concentrated in one area and light in another. It became clear that further regulatory measures were needed. In 1953, a convention was signed allowing the establishment of separate seasons. This occurred in spite of an industry attempt at self-regulation, which included a 10-day lay-up between trips and individual vessel allocations based on crew size. The lay-up program was discontinued during World War II. By 1953, season length was less than two months, so the Convention was modified to allow the setting of seasons by area. Industry again established a voluntary program in 1956 which included 8 day lay-ups, and these management tools together were sufficient through the early 1970s. An increased number of vessels entered into the halibut fishery in the 1970s leading to a breakdown in the lay-up program, and in 1977 it was discontinued. Since seasons were so short, the Commission began setting multiple seasons for each area that year in an effort to spread the catch over a longer period of time.

Halibut being pulled over the roller aboard the *F/V Kristiana*.

The U.S. Magnuson Fishery Conservation and Management Act and the Canadian Coastal Fisheries Protection Act extended each countries' fishery jurisdiction to 200 miles from shore beginning in 1977. In 1979, the Protocol to the Convention of 1953 signed by the two countries brought an end to U.S. fishing in Canadian waters in 1979 and vice versa in 1981. The Protocol also enabled the individual governments to make regulations pertaining to its own fleet which did not interfere with Commission regulations.

Canada immediately limited entry into their halibut fishery in 1979 which helped to keep their seasons longer and eased the transition to an individual quota

system in 1991. The U.S. remained open access; the fleet expanded and the seasons grew shorter, intensifying the "derby" or race for the fish. As the need for allocative measures became clear, the individual governments began considering options for limiting access. The U.S. regional councils (the North Pacific Fishery Management Council (NPFMC) in Alaska and the Pacific Fishery Management Council (PFMC) on the west coast) were given the authority in 1982 to establish limited access regulations, and allocative authority was shifted from the Commission to the Councils in 1987. However, because of the controversy surrounding limited access it would take several more years to establish a limited access fishery in Alaska.

In 1987 the Commission used fishing period limits for the first time, which restricted the maximum pounds landed per vessel during a fishing period. The fishing period limits were evaluated by industry and, starting in 1988, were imposed by vessel length class during the "clean-up" fisheries ("clean-up fisheries" refers to openings where the remaining catch limit is small, and is likely to be exceeded if another unrestricted opening occurs. Therefore, more stringent regulations are required).

By 1994, season length was as short as 24 hours in the Gulf of Alaska, 12 hours in some parts of the Bering Sea, and 10 hours on the U.S. west coast. Fishing period limits were widely used in clean-up fisheries and in some cases were needed during the first fishing period as well. An individual quota system was implemented for Alaska by the U.S. government in 1995, putting an end to the derby-style fishery.

The U.S. west coast fishery continues today with the derby fishing of 10-hour seasons and fishing period limits. The total removals for this area are set by the Commission, but the PFMC allocates portions of the catch limit to user groups. Commercial non-Indian (incidental troll and directed), sport, and treaty Indian are the groups allocated part of the catch limit.

Attention given to the sport fishery in the past by both countries paled in comparison to that for the commercial fisheries. However, sport removals are quickly gaining in importance as effort increases to record levels. Only on the U.S. west coast does the recreational fishery have an overall catch limit. Elsewhere the total catch is unrestricted, governed only by daily bag and possession limits.

STOCK ASSESSMENT AND FLUCTUATIONS IN ABUNDANCE

The Commission staff has monitored change in the Pacific halibut stock since the 1930s to provide a scientific basis for setting catch limits. Three major methods have been utilized over the past 75 years; each set an example for the global fisheries community.

Period I began in the 1930s when the relative abundance of halibut was first estimated in order to set catch limits for the commercial fishery. Catch per unit of effort (CPUE) or the amount of fish caught per standard unit of fishing gear, was used to monitor changes in abundance. Abundance was thought to be primarily influenced by fishery removals. However, over the next 40 years, while programs to track removals by the directed commercial fishery were established, the incidental catch of halibut in other fisheries became a major removal from the resource. It was difficult to track this bycatch of halibut in other fisheries since the halibut were discarded and often went unreported. In the 1970s, halibut stock biomass hit a historical low.

Period II began in the 1980s, as the accuracy of using CPUE data as the root of the stock assessment was being questioned, and a new method based on catch and

age data was instituted. This method enabled the staff to estimate how much fish could be caught while still having enough left over to replenish the stock at the current level. In an attempt to rebuild the stock, the Commission set catch limits below this level, believing that this would allow surplus production to accumulate over time. This strategy proved successful in increasing the overall abundance. In 1985, upon achieving a significant buildup in the stock, the Commission set catch limits as a fixed proportion of the estimated exploitable biomass to achieve an optimal yield while preventing over-harvest of the stock.

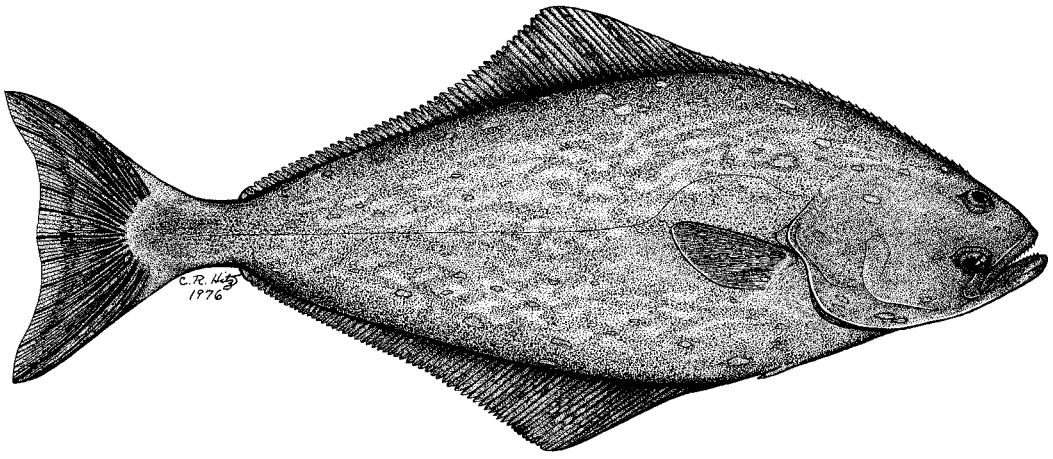
It became clear in the 1990s that there was a discrepancy in the catch-at-age model. Estimates of exploitable biomass for past years were consistently adjusted upwards in every successive assessment, as more years of data entered the analysis. The Commission staff recognized this as a potentially hazardous problem and in 1995 presented preliminary results obtained using an alternate assessment model. The Commission set catch limits at the same level as the previous year until further analysis could be done.

At the same time as these retrospective patterns in the assessment were being recognized, the staff began to note changes in the average length of halibut. By 1995, it was clear that the average length at age was 20% smaller than 10 years earlier, resulting in reduced catchability of fish that would normally be available to the commercial fishery. The staff accounted for this change in catchability and validated adjustments seen in previous assessments. In addition, estimates of legal-sized bycatch mortality and trends in survey indexes were folded into the new procedure. The revised assessment model was adopted for the 1997 season; thus commencing Period III.

Biology

INTRODUCTION

Pacific halibut are among the largest teleost fishes in the world with reported lengths up to 9 feet (2.7 meters). They can be found along the continental shelf in the North Pacific and Bering Sea. They have flat, diamond-shaped bodies and are able to migrate long distances. Most adult fish tend to remain on the same grounds year after year, making only a seasonal migration from the more shallow feeding grounds in summer to deeper spawning grounds in winter.



Adult Pacific Halibut, *Hippoglossus stenolepis*. (Drawing by Charles R. Hitz).

Halibut spawn in deep water, where the eggs are fertilized. As the eggs develop into larvae and grow, they drift slowly upward in the water column. During development, the larvae drift great distances with the ocean currents in a counter-clockwise direction around the northeast Pacific Ocean. By the time the young fish settle to the bottom in the shallow feeding areas, a significant journey awaits. Following two to three years in the nursery areas, young halibut tend to counter-migrate and move into more southerly and easterly waters.

The weight of a halibut at a certain age is not constant, but does tend to follow a cycle. The current trend is one of decline, and fish today are smaller than fish of the same age 10 years ago. Trends such as this are tracked each year as biologists collect age and length data to be incorporated into the halibut stock assessment.

DESCRIPTION AND SCIENTIFIC NAME

Halibut belong to a family of flounders called Pleuronectidae. The scientific name for Pacific halibut is *Hippoglossus stenolepis*, a name derived from the Greek *hippos* (horse), *glossa* (tongue), *steno* (narrow), and *lepis* (scale). The name was first proposed by a Russian scientist, P.J. Schmidt, in 1904 who distinguished Pacific halibut from its Atlantic counterpart (*Hippoglossus hippoglossus*) by anatomical differences such as the shape of the scales, length of the pectoral fin, and the shape of the body. Since the identification was made, it has been debated as to whether the two are indeed separate species.

Most fishes are torpedo-shaped and symmetrical, often with heavily pigmented backs and light, white bellies. Flounders are compressed laterally and, except in the larval stages, have both eyes on one side of the head; halibut usually are dextral, that is, both eyes are on the right side. On the eyed side, pigmentation varies from olive to dark brown or black with lighter, irregular blotches that are similar to the color pattern of the ocean floor. This protective coloration makes the fish less conspicuous to predators and prey. The left or blind side is white with occasional blotching and faces the ocean bottom.

Halibut are more elongate than most other flatfishes. The average width of the body is about one-third its length. The mouth is relatively large, extending to below the lower eye, and nearly symmetrical. The small, smooth scales are well buried in the skin and the lateral line has a pronounced arch above the pectoral fin. The tail or caudal fin is crescent-shaped or lunate.

***Left*: A Pacific halibut as seen from the right or eyed side. This particular fish has an IPHC tag attached. *Right*: The same halibut as seen from the left or white side.**

REPRODUCTION AND DEVELOPMENT

Maturity varies with sex, age, and size of the fish. Females grow faster but mature slower than males. Most males are mature by the time they are eight years old, whereas the average age of maturity for females is about 12 years. From November to March, mature halibut concentrate annually on spawning grounds along the edge of the continental shelf at depths from 600 to 1,500 feet (183 to 457 meters). The major spawning sites include Cape St. James, Langara Island (Whaleback), and Frederick Island in British Columbia; Yakutat, Cape Suckling - Yakataga ("W" grounds), Portlock Bank, and Chirikof Island in Alaska. Other reported spawning locations include Goose Islands, Hecate Strait, and Rose Spit in British Columbia and Cape Ommaney, Cape Spencer, and Cape St. Elias in Alaska. Spawning concentrations also occur in the Bering Sea. In addition to these major grounds, there is reason to conclude that spawning is widespread and occurs in many areas, although not in as dense concentrations as those mentioned above (Figure 1). Evidence to support this conclusion is based on the widespread distribution of sexually mature halibut during the winter months as indicated by research and commercial fishing.

The number of eggs produced by a female is related to its size. A 50-pound (23 kg) female will produce about 500,000 eggs, whereas a female over 250 pounds (113 kg) may produce 4 million eggs. The free-floating eggs are about 3 mm in diameter when released and fertilization takes place externally. Developing ova generally are found at depths of 300 to 600 feet (90 to 183 meters), but occur as deep as 1,500 feet (450 meters). The eggs hatch after 15 to 20 days at 5-6 degrees Celsius, and more quickly in warmer water (12 to 14 days at 7-8 degrees Celsius). The eggs and larvae are heavier than the surface sea water and drift passively in deep ocean currents. As the larvae grow, their specific gravity decreases and they gradually move

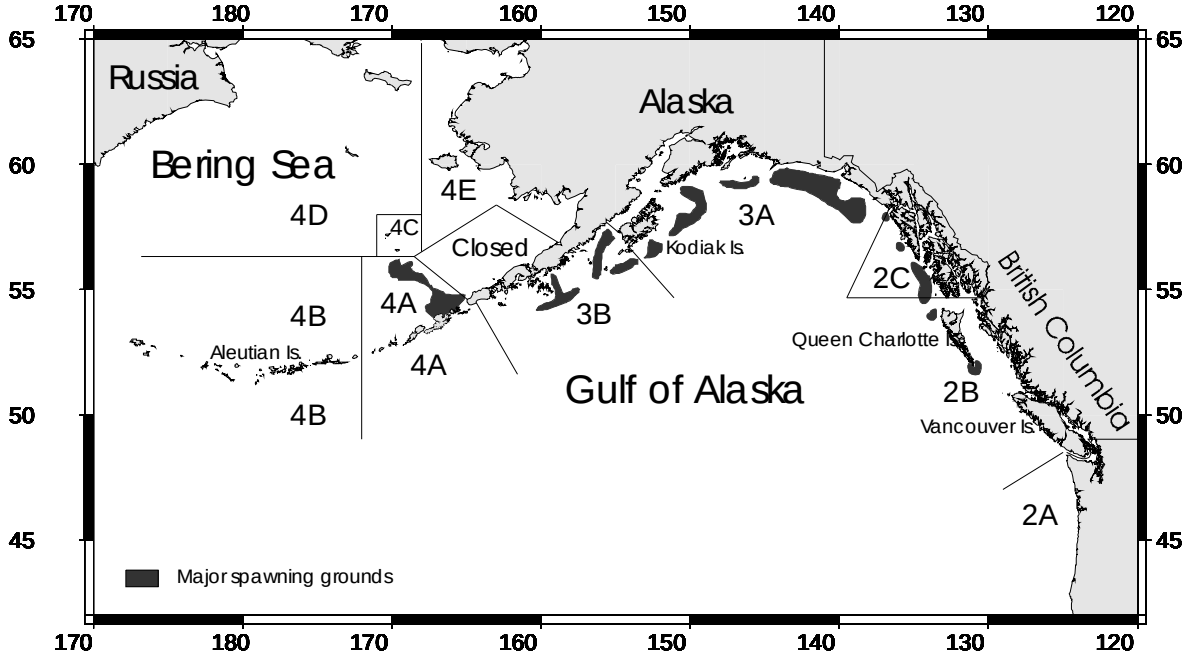


Figure 1. Major spawning grounds for Pacific halibut.

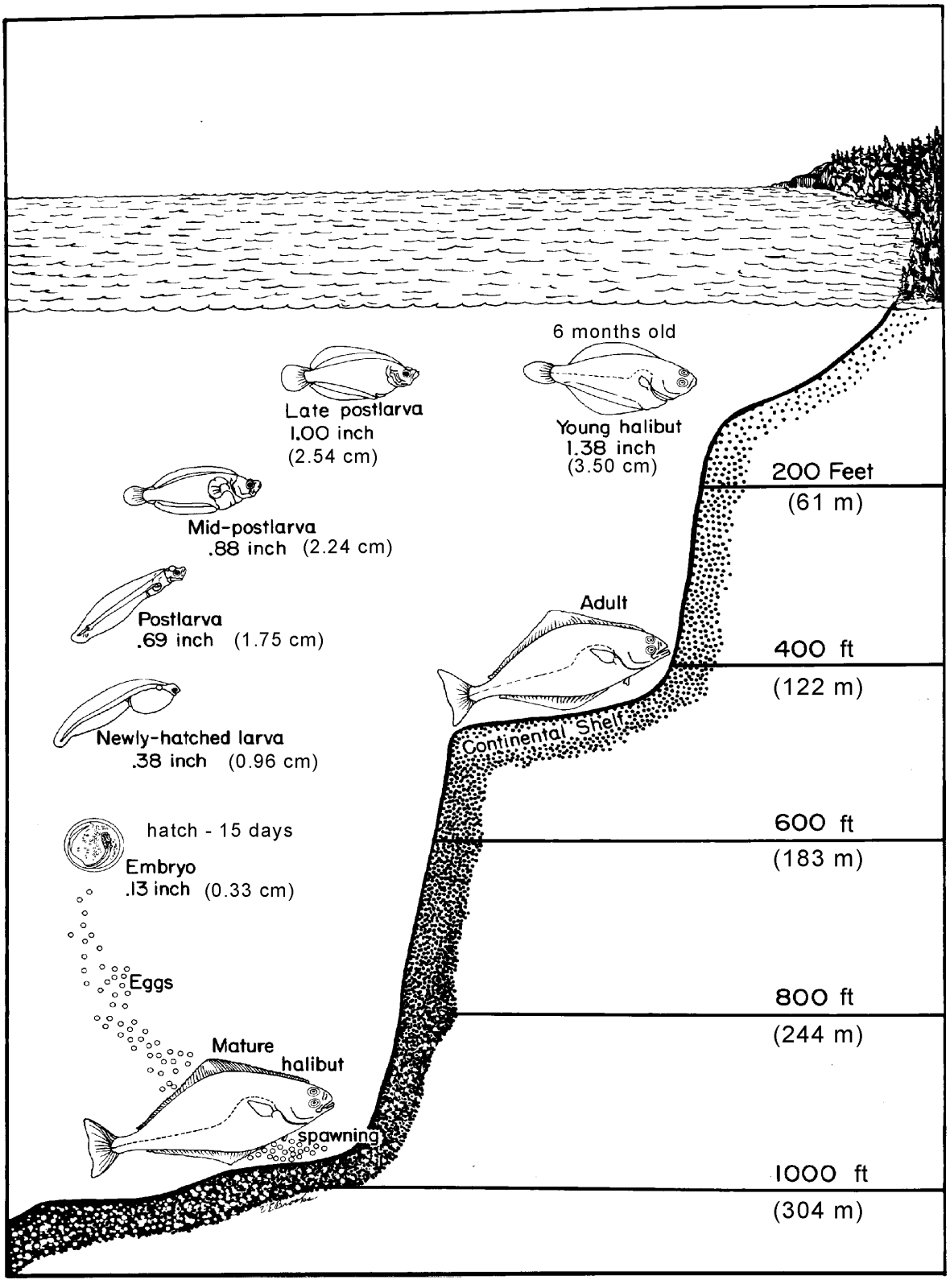


Figure 2. Life cycle of Pacific halibut.

towards the surface and drift to shallower waters on the continental shelf. Postlarvae may be transported many hundreds, even thousands of miles by the Alaskan Stream which flows counter-clockwise in the Gulf of Alaska and westward along the Alaska Peninsula and Aleutian Islands. Some of the larvae are carried into the Bering Sea. The velocity of this current may exceed a mile per hour in certain coastal areas, but overall speeds of 3 to 5 miles (5 to 8 km) per day are more typical.

Larvae begin life in an upright position with an eye on each side of the head. Nutrition is derived from a prominent yolk sac until it is absorbed during the early postlarval stage; then the young fish must begin feeding on small planktonic organisms. When the larvae are an inch long, an extraordinary transformation or metamorphosis occurs: the left eye moves over the snout to the right side of the head and pigmentation on the left side fades. When the young fish are about 6 months old, they have the characteristic adult form and settle to the bottom in shallow inshore areas (Figures 2 and 3). The survival of young halibut and the resulting reasons for varying strength of each year class is an ongoing investigation.

DISTRIBUTION AND MIGRATION

Pacific halibut are found on the continental shelf of the north Pacific Ocean and the Bering Sea. They have been recorded on the North American coast from Santa Barbara, California to Nome, Alaska and also occur along the Asiatic coast from the Gulf of Anadyr, Russia to Hokkaido, Japan. Halibut are demersal, living on or near the bottom, and prefer water temperature ranging from 3 to 8 degrees Celsius. Although halibut have been caught as deep as 1,800 feet (549 meters), they are most often caught between 90 and 900 feet (27 and 274 meters).

To counter the egg drift with counter-clockwise ocean currents, the young halibut migrate in a clockwise direction. One and two-year old Pacific halibut are commonly found in inshore areas of central and western Alaska, but are virtually missing from southeast Alaska and British Columbia. Juvenile halibut tend to move further offshore at age 2 or 3-years and can be found off southeast Alaska and British Columbia by age 4 and older.

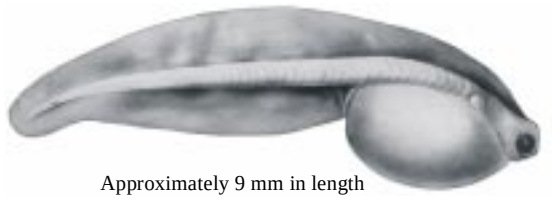
By the time Pacific halibut enter the commercial fishery (at about 8 years old) most of the extensive counter-migration to balance egg and larval drift has apparently taken place. However, adult halibut migrate annually, moving to deeper depths on the edge of the continental shelf during the winter for spawning, and into shallow coastal waters in the summer months for feeding.

Tagging studies

The IPHC has tagged almost 400,000 halibut since 1925 and over 46,000 tagged fish have been recovered. A reward is paid for tags that are returned (see reward poster, inside back cover). In 1986 the IPHC became the first agency on the coast to use a baseball cap as a tag reward. An increase in tag returns occurred and is attributed to the popularity of the tag reward. Most of the tagging experiments have been conducted in the summer and most of the recoveries occur during the summer when halibut fishing is usually permitted. Although extensive summer to summer movements have been recorded, most of the recoveries take place within 60 miles (37 kilometers) of the release area. Data from tagging experiments in which halibut were tagged or recovered in the winter are limited, but the results show that summer-winter movements

NEWLY-HATCHED LARVA (Stage 1)

Showing prominent yolk sac.



Approximately 9 mm in length

POSTLARVA (Stage 3)

Yolk sac has been absorbed.

Approximately 16 mm in length.

POSTLARVA (Stage 7)

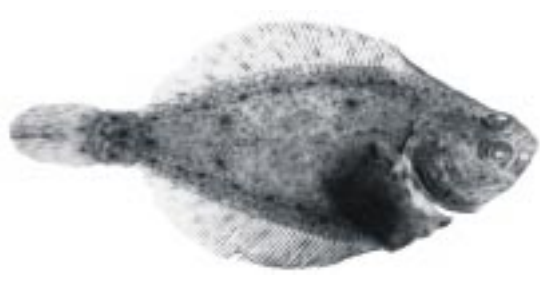
Approximately 21 mm in length.

POSTLARVA (Stage 9)

Showing the beginning of eye migration.

Approximately 25 mm in length.

YOUNG HALIBUT
Adapted to bottom life.



Approximately 35 mm in length.

Figure 3. Growth and early development of halibut.

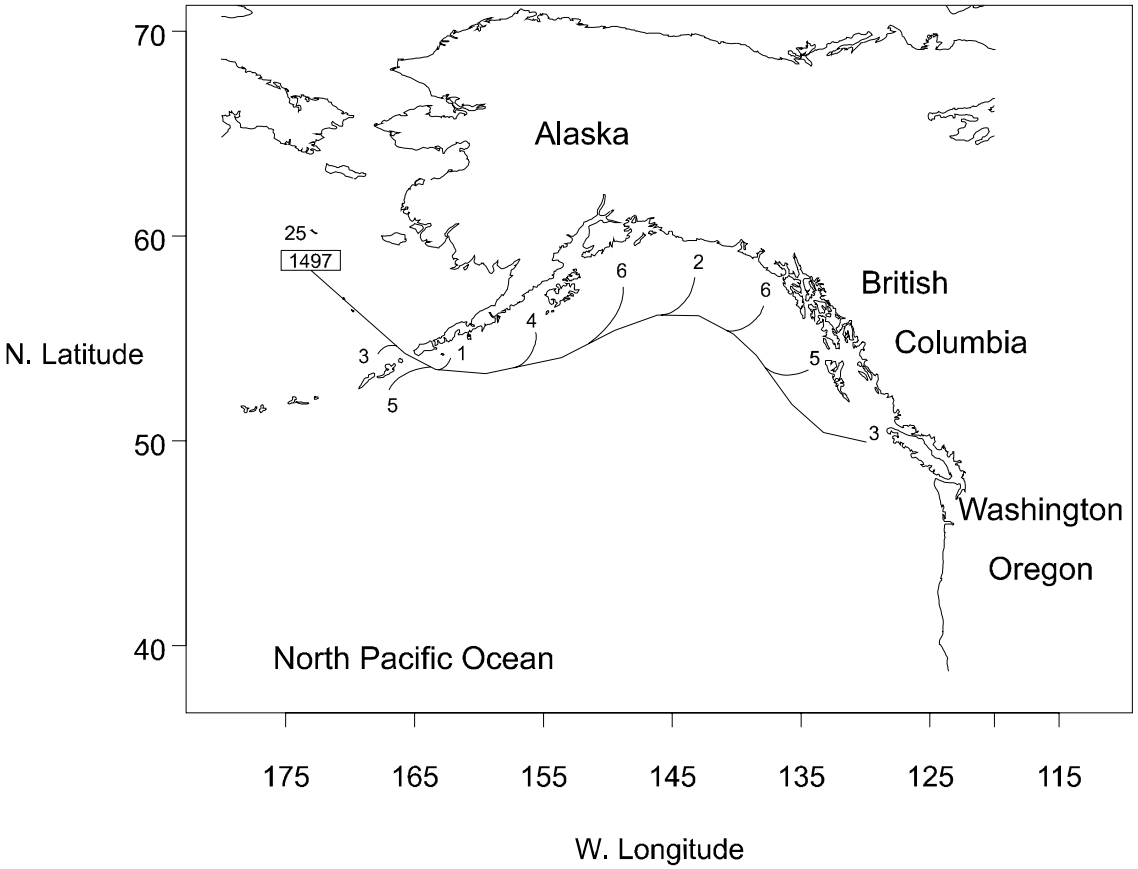


Figure 4. Distribution of tag recoveries from the 1984 Bering Sea experiment.

are more extensive than those between summers and the predominant direction of movement may differ substantially between the two seasons.

The distance and direction of the migrations also may differ with the size and age of the fish. Emigration has been observed from all regions, but few recoveries of adult halibut released in the Gulf of Alaska have been made in the Bering Sea. An example of the distribution of tag recoveries from the 1984 Bering Sea experiment is shown in Figure 4. In this experiment the fish were tagged near the Pribilof Islands in the Bering Sea and recovered as far south as the Queen Charlotte Islands and Vancouver Island, British Columbia. These fish were at large for 4 to 6 years. Halibut occasionally migrate great distances and several tags have been recovered over 2,000 miles from their point of release. The longest recorded migration was from a fish released near Atka Island in 1967 and recovered 2,500 miles south off Coos Bay, Oregon in 1972. Another halibut tagged off Newport, Oregon in 1989 was recovered just 5 months later near Cape Spencer in southeast Alaska. This fish traveled over 5 nautical miles a day to make the journey. Although tagging studies have shown that coastal migrations of hundreds of miles occur, adult halibut tend to return to the same feeding grounds each year.

Juvenile halibut, those under 7 years old, also migrate long distances, apparently counterbalancing the northwesterly drift of the eggs and larvae. These juvenile and adult movements result in the net migrations of an easterly and southerly direction in the Gulf of Alaska. This complex pattern of movements indicates that the halibut stocks are interrelated and that intermingling is extensive, a factor that complicates the management of the fishery.

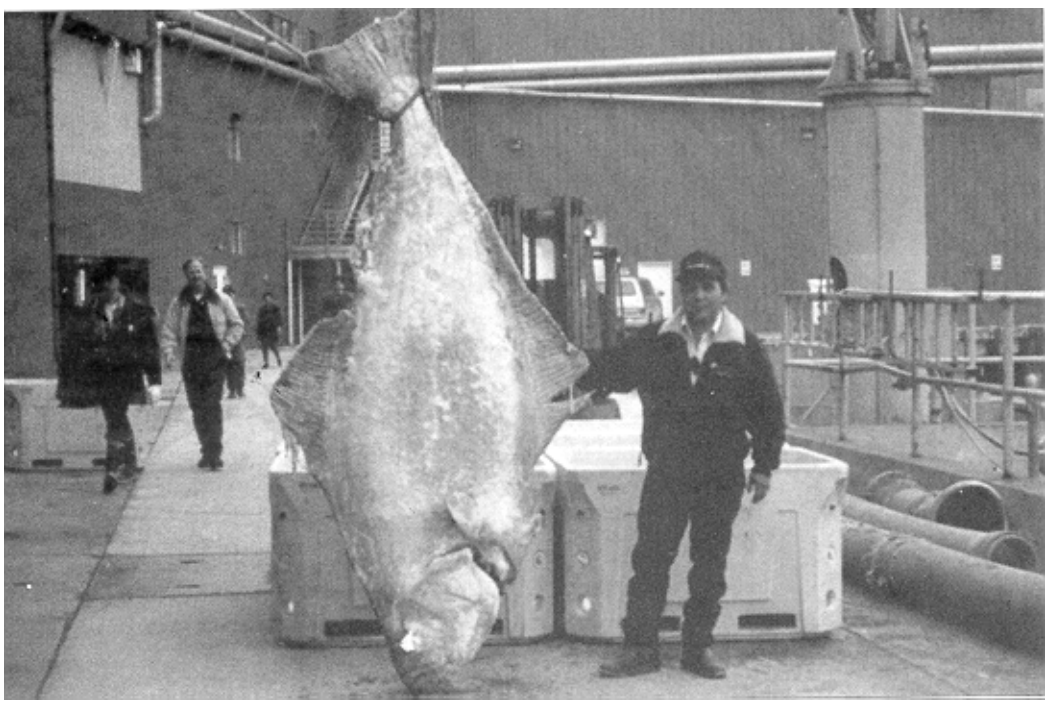
FOOD AND FEEDING

Halibut are strong swimmers and carnivorous feeders. Larval halibut feed on plankton. Halibut 1 to 3 years old are usually less than 12 inches (30 cm) in length and feed on small shrimp-like organisms and small fish. As halibut increase in size, fish become a more important part of the diet. The species of fish frequently observed in stomachs of large halibut include cod, sablefish, pollock, rockfish, sculpins, turbot, and other flatfish. Halibut often leave the bottom to feed on pelagic fish such as sand lance and herring. Octopus, crabs, and clams, and an occasional smaller halibut also contribute to their diet. Crabs with a carapace width of up to seven inches have been found in the stomachs of halibut, although halibut do not appear to be a primary predator of crab.

The size, active nature, and bottom dwelling habits make halibut less vulnerable to predation than other species. Halibut are occasionally eaten by marine mammals and are rarely found as prey for other fish.

AGE AND GROWTH

Halibut are the largest of all flatfish and are among the larger species of fish in the sea. The largest specimens in the Atlantic and Pacific are over 9 feet long (2.7 meters) and have been reported to weigh 700 pounds (318 kg), although these weights have not been thoroughly documented. Several Pacific halibut weighing 500 pounds (227 kg), live weight (375 pounds (170 kg), net weight) have been landed and



Al Mendoza from Unisea Seafoods stands beside a Pacific halibut estimated to weigh 500 pounds (round weight) (227 kg). The 99.5 inch (252 cm) fish was caught by the *F/V Trask* in the Bering Sea in 1994.

documented in Alaska and Russia. These fish are about 8 feet long (2.5 m) and age in their 30s. In the 1996 North American market, the fish would be worth about $851.00 (U.S. $).

The North American catch of Pacific halibut, caught mostly by longline gear, consists of individuals chiefly from 10 to 200 pounds (5 to 91 kg). Few males reach 80 pounds (36 kg) and nearly all halibut over 100 pounds (45 kg) are females. The average size in the commercial catch in 1996 was between 16 and 34 pounds (7 and 15 kg) depending on the area where caught. This is a decrease from 10 years ago when the average weights were 30 to 40 pounds (14 to 18 kg).

The growth of halibut has varied over the years and for the past 10 years, weight at a given age has been decreasing. In addition, the mean age of the commercial catch increased by 1.5 years between 1988 and 1994. (Table 1). The IPHC stock assessment underwent major changes in 1996 to compensate for the significant decrease in growth rates. Similar weight-at-age was seen in the 1920s, but subsequently increased to a maximum in the 1980s. Years of scientific studies have proven inconclusive in explaining these variations in annual growth, although variation occurs primarily in juvenile fish. This has led Commission scientists to conclude that environmental factors play a larger role than previously thought. In the past few years, there has been growing support throughout the scientific community for the concept of major environmental or "regime" shifts which effect the population abundance and growth of many fish species, including halibut. The IPHC is currently researching this subject.

Table 1. Mean age by area and average weight (net weight, pounds) of Pacific halibut, 1988-1996.

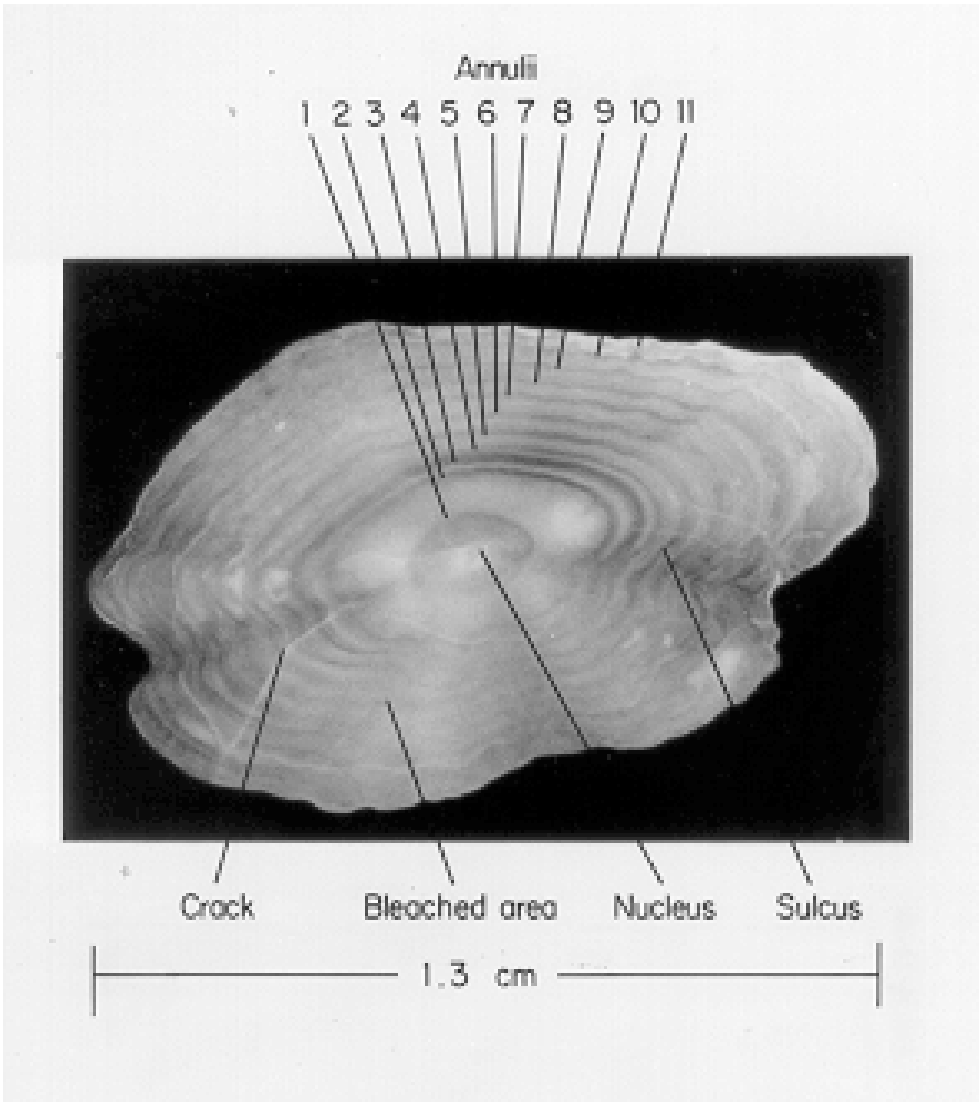
AREA	1988	1989	1990	1991	1992	1993	1994	1995	1996
2A	9.8	10.2	10.5	10.9	10.7	10.8	11.4	10.5	9.6
2B	10.6	11.0	10.8	11.2	11.5	11.9	12.4	11.9	11.6
2C	11.8	12.0	12.2	12.6	12.7	13.3	13.1	12.8	12.2
3A	10.9	11.3	11.7	12.0	12.1	12.8	13.3	13.0	13.0
3B	11.0	11.1	12.0	11.9	12.1	12.6	12.4	12.4	12.9
4	12.1	12.4	12.4	12.2	12.7	12.8	12.7	13.8	13.4
All Areas	11.1	11.5	11.6	11.9	12.1	12.5	12.7	12.6	12.3
Avg. weight	*	*	*	30.1	29.5	29.2	29.5	29.8	27.8

* In 1991, the IPHC reinstated the practice of taking fish length in order to estimate fish weight. Although estimates of average fish weight based on otolith weight exist for the other years, the accuracy is in question.

IPHC studies show that female halibut typically grow faster and live longer than males. However, the oldest halibut on record is a 55 year old male. The oldest female is 42 years old. The age of halibut is determined from the otolith, a calcareous or stone-like body in each internal ear, that serves as a hydrostatic or balancing organ. Each year, alternating opaque (summer) and translucent (winter) rings are deposited on the otolith. The annual growth rings are called annuli and are counted to determine the age of the fish. The average age of halibut in the commercial fishery was 12 years old in 1996. At one time, the IPHC staff considered the otolith weight to be proportional to the body weight of the fish and that this relationship was constant over time. However, more recent investigation has shown that the relationship in the

two measurements changes over time, making otolith weight an unreliable indicator of body weight.

The IPHC collects otoliths and growth information from a number of different sources. The commercial catch is sampled for otoliths and length when the fish are landed in port. In 1993, a scientific survey of standard stations was reinstated to collect otoliths and sex, maturity, and length information. Otoliths and length information from tagged fish caught in the commercial halibut, sport and other fisheries are also collected by port samplers, sport and commercial fishers as well as other fishery agencies, and then forwarded to the IPHC. In addition, the IPHC has placed a biologist aboard a National Marine Fisheries Service (NMFS) trawl survey vessel annually since 1996 to collect these data. The sport catch in Alaska is sampled for length and age by the Alaska Department of Fish and Game (ADF&G) and the information is forwarded to the IPHC office. All of this information is used to assess the condition of the resource.



Otolith from a halibut in its eleventh year. Photographed on a dark background, the wide, white bands are the opaque summer zones; the dark rings are the translucent winter zones.

The Fishery

INTRODUCTION

Pacific halibut is removed from the north Pacific and Bering Sea in a number of ways including through natural mortality. It is targeted commercially, for sport, and for personal use (includes both official and non-official subsistence fishing) as well as taken incidentally as bycatch in other commercial fisheries, and as waste from the halibut fishery. In 1996, an estimated 70 million pounds (31,752 metric tons) of directed and non-directed catch was removed from the population. This section deals with directed removals from the population.

Today's commercial fishing fleet is diverse, using various types of longline gear and strategies to obtain its quarry. Both Alaska and British Columbia have implemented an individual quota (IQ) system which enables a vessel to fish anytime during an eight-month season, and thus play the market to their advantage. In addition, the IQ fisheries have had ramifications on the fishers themselves, the fishing grounds, and the gear used. A complete description of the IQ fisheries can be found later in this report. In addition to its commercial appeal, halibut is one of the most popular sport fish targets, as seen by the still increasing charter boat industry.

As more people fight for a piece of the resource, the division of fish among various user groups and between countries has been of growing concern. In 1987, authority to allocate among user groups was transferred from the Commission to the individual governments. The Commission's decisions were restricted to conservation issues, but individual governmental regulations may not conflict with those set by the Commission.

THE COMMERCIAL FISHERY

A typical halibut fishing trip begins with the vessel taking on several tons of crushed ice so that the catch can be chilled near, but usually not below, the freezing point. Once the vessel reaches the fishing grounds, the gear is set, left to soak for several hours, then hauled back aboard. Halibut are dressed soon after capture by removing the viscera and gills. The body cavity or "poke" is scraped, washed, and filled with ice. The head is not removed until the catch is delivered at dockside. The fish are stored in the hold in layers separated with crushed ice. Many vessels now have refrigeration that reduces the amount of ice needed and maintains a lower and more uniform temperature in the hold. Some vessels have refrigerated sea water or an ice/sea water mixture in which to store the fish. The fish are then delivered to a dockside plant where they are headed, cleaned and either frozen or shipped fresh to buyers who then sell it to consumers.

The fleet

The initial impetus for expansion of the commercial fishery for halibut occurred in 1888 when three sailing vessels from New England began fishing off Cape Flattery, Washington. The catch was shipped from Tacoma to Boston on the newly-completed trans-continental railroad. By 1892, following completion of the

Halibut steamer *Independent* (circa 1900-1910) tying up dory to unload halibut. Photo courtesy of the Puget Sound Maritime Historical Society, Inc.

trans-Canada railroad, Vancouver, British Columbia became the major center for the fishery. At the outset, fishing was conducted from two-man dories that were carried to the fishing grounds by relatively small sailing vessels. The dories would be launched from the sailing vessel in the morning and retrieved at the end of the fishing day. This method was dangerous not only because the small dories were vulnerable to sea conditions, but because hauling halibut into small boats created a hazard if the fish was active. Larger sailing schooners and sloops joined the fishery during the next decade; however, by the late 1890s, the fishery was dominated by large company-owned steam-powered vessels that carried 10 to 12 dories. Over the years, these steamers declined in number because of their high operating costs, labor problems, and a reduction in the stocks of halibut. At the same time, smaller independently-owned vessels powered by gasoline engines began entering the fishery and several of these were two-masted schooners carrying from five to seven dories.

During the 1920s, the rising economy, the development of diesel engines, and the expansion of the fishery across the Gulf of Alaska as far west as Unimak Pass, led to a sharp increase in the number of owner-operated schooners. These diesel-powered schooners were designed to mechanically haul longline gear directly from the deck. This innovation quickly phased out the hand operations from dories. Most of the halibut schooners were built prior to 1930 and few have been built since that time. They ranged in size from 50 to 80 feet (15 to 24 meters) and were between 25-60 net tons. Most schooners still operating in the halibut fishery have been completely renovated. New propulsion systems, advanced navigation devices, communication equipment, hydraulic power and deck controls, cargo-hold modifications, refrigeration, new types of gear and bait, and other technological advances reduced the necessary manpower per vessel by 30 percent.

After 1930, most of the additions to the fleet were more versatile; the vessels could be used for trawling and purse seining in other fisheries as well as for longlining halibut. Small vessels, particularly salmon trollers and gillnetters, gradually entered the fishery during the 1930s and 1940s.

The composition of the fleet was relatively stable from 1950 through the 1960s. During the 1970s, there was a further influx of smaller vessels fishing relatively close to port and making short trips. In part, this influx was caused by a marked increase in

Halibut schooner *Sunset.* Note pilothouse aft.

the price of halibut, but also many fishers entered the halibut fishery because they were not eligible to fish salmon under several limited-entry programs. Most of these small vessels were between 40 and 50 feet (12 and 15 meters) in length. Many were designed originally for the salmon gillnet fishery and are equipped with a power-driven wheel for the storage of the gillnet. The gillnet can be readily replaced with halibut gear.

Canada limited the number of vessels in its British Columbia halibut fleet in 1979, but in the U.S. the number of large vessels increased sharply in the early 1980s. Many of these vessels had previously been used in the crab fishery, but switched to halibut in response to declining crab stocks and increasing halibut stocks. Most of these ex-crab vessels were over 70 feet (21 meters) in length and proved very efficient at catching halibut. By the late 1980s, the NPFMC, the Commission, and industry were discussing limited entry options for Alaska, which, along with high ex-vessel prices, seemed to inspire a further influx of vessels trying to establish a catch record. The number of commercial licenses issued in the U.S. peaked in 1991 at 6,711.

In 1991, Canada implemented an individual vessel quota system (IVQ) where each vessel was given a percentage of the area catch limit to harvest anytime over an extended fishing season. Because of the limited entry system already in place,

consolidation of the fleet was not an issue and the fleet remained at 435 vessels. In 1995, the U.S. established a similar program in Alaska, where individual fishers were given a percentage of the area catch limit based on an historical fishing record. Because the shares were issued to fishers and not vessels, as was the case in Canada, the fleet remains diverse. However, the number of vessels participating is expected to decline slowly over the next few years as quota shares are combined. On the U.S. west coast, entry into the commercial fishery remains unrestricted. However, starting in 1995, a non-treaty fisher had to choose either the sport charter industry or the commercial industry. If the commercial fishery was chosen, only one type of fishery could be selected; either target halibut during the directed fishery or take halibut incidental catch in the salmon troll fishery.

Seine-type vessel *Lualda*. Note pilothouse forward.

Fishers

The commercial halibut fishery was pioneered by fishers of Norwegian ancestry. Many of the original immigrants had fished halibut in Norway and came to North America intent on earning their living in the Pacific halibut fishery. Once established in the fishery, relatives followed and now there are many second and third generation Norwegians in the Canadian and United States fishery. Many Nova Scotians and Newfoundlanders also have participated in the west coast fishery.

Crew size on today's halibut vessels ranges from 1 to 8 people, depending on the size of the vessel and type of gear used. The larger longline vessels generally carry five crew and the skipper. Unique to the Seattle-based fleet is a longline fisherman's union which oversees work contracts on behalf of the vessel crew. Representation is only given to those crews working on board vessels belonging to

Crew of the *F/V Roosevelt* in the early days of the halibut fishery.

the local fishing vessel owner's association. The contracts specify the responsibilities of each party and establish the distribution of the gross proceeds from the trip between the vessel owner and the crew. A substantial portion of the owners of larger vessels based in Alaska also belong to various vessel owner's associations. Smaller vessel crews usually do not belong to longline unions, although they often belong to unions associated with salmon or other species.

Compensation is on a share basis and varies greatly among vessels. For example, on a larger vessel in the Seattle-based fleet about 31% of the gross proceeds from the sale of the catch is the "boat share" which goes to the owner of the vessel. In Alaska, this percentage is known to be as high as 45%. Lost gear, insurance, and other items also are deducted from the gross. From the remainder, the trip expenses (such as food, bait, fuel, and worn gear) are deducted. The net balance, or "crew share" is divided equally among all members, including the captain. If the captain is not the vessel owner, he usually receives an additional portion of the boat share. Apprentice fishers, or "in-breakers," are paid a part share until they can earn a full share. On most vessels, the cook also works on deck except when meals are being prepared.

As seasons became shorter and shorter in the 1980s and early 1990s (1 or 2 days), fishers often worked the entire opening without sleep. This, along with pressure to fish in even the worst weather or risk losing a large percentage of the year's income, was the cause of several mishaps at sea. With the advent of the IQ systems, fishers generally work shorter hours and do not fish in inclement weather. Trip length can be as long as 15 days in some Bering Sea areas where the commute from the fishing grounds to port is significant. However, most fishing trips range from 1 to 6 days depending on refrigeration facilities.

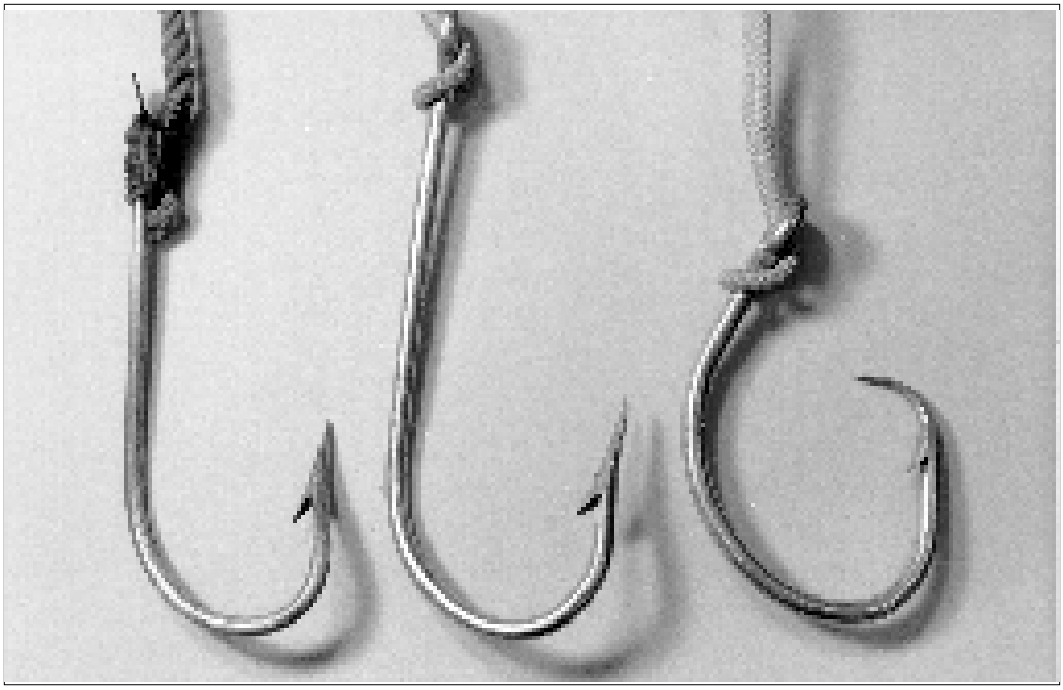
Fishing Grounds

Historically, most fishing occurred in specific areas or grounds where halibut tended to concentrate because of favorable conditions such as abundant food supply or preferred bottom type. These fishing grounds are located throughout the entire range of the species from northern California to the central Bering Sea. In the open access or "derby" style fisheries, the major grounds were often utilized beyond capacity during the short openings. However, in the limited entry fisheries, fishers tend to stay closer to port if they are fishing strictly for halibut, or take halibut at the same time that they are harvesting other species.

Successful halibut fishing depends on an intimate knowledge of the distribution of the species and the technique of setting gear with bait that will attract the fish. Experienced fishers often prefer to set their gear on hard bottom (rock or gravel) or areas of vertical relief. Electronic depth sounders and navigation devices (loran, global positioning satellite, plotters) assist the captain in locating the fishing grounds. Some grounds cannot be fished when tidal currents are strong; others are difficult to fish because rock outcrops tend to snag the gear and chafe the groundline.

Fishing gear

The type of gear used to fish for halibut has changed little over the years. From the 1880s to the 1920s, fishers hauled longlines from small two-person boats



Hooks used over the years in the halibut fishery. Left, the flattened off-set hook, common in the fishery for over 60 years. Much of the fisher's time running to the grounds was spent seizing the hooks to the gangions with ganging twine. The eyed off-set hook (center) replaced the ganged hook in the late 1960s. On the right, the modern circle hook, introduced in 1982-83.

***Top left*: hauling in a halibut. *Bottom left*: Coiling a skate of gear as it's hauled in by a power gurdy. *Right*: Baiting a skate of gear.**

called dories. In the 1920s, powered sheaves were introduced which could haul the longline directly back to the main vessel. The traditional longline gear is still used today (Figures 5 and 6). However, in the 1950s, with the influx of salmon seine boats into the fishery, snap-on gear was introduced. This gear is still used on many vessels which require multi-species layouts. Another change occurred in the 1990s when the individual quota systems were implemented. Halibut are often times fished in tandem with sablefish, and many fishers are choosing to use sablefish gear for both tasks.

In the early years, a number of lines, each 300 feet (92 meters) in length, were spliced end to end to form the groundline. The number of lines varied considerably, but the 6-line skate (1,800 feet or 549 meters) eventually was adopted by most. Now groundline is sold in 1,800 foot (549 meter) coils.

The interval between hooks or "rig" of the gear varies from 3 feet (.9 meters) if the gear is used to also fish sablefish, to as much as 42 feet (13 meters) depending on gear and fishing target. Most halibut gear today is rigged 12 to 18 feet (3.7 to 5.5 meters).

The lines of conventional setline gear were originally made of natural fibers such as hemp, cotton, manila, or sisal, depending on their availability, quality, and cost. These natural fibers now have largely been replaced with man-made materials, mainly nylon. In 1982 and 1983 fishers converted to circle-shaped hooks from the traditional J-shaped hooks. IPHC studies indicate that circle hooks are two to three times more efficient at catching halibut than its J-hook counterpart, depending on fish size. The reason for this is better hooking qualities, as well as lower escape rates

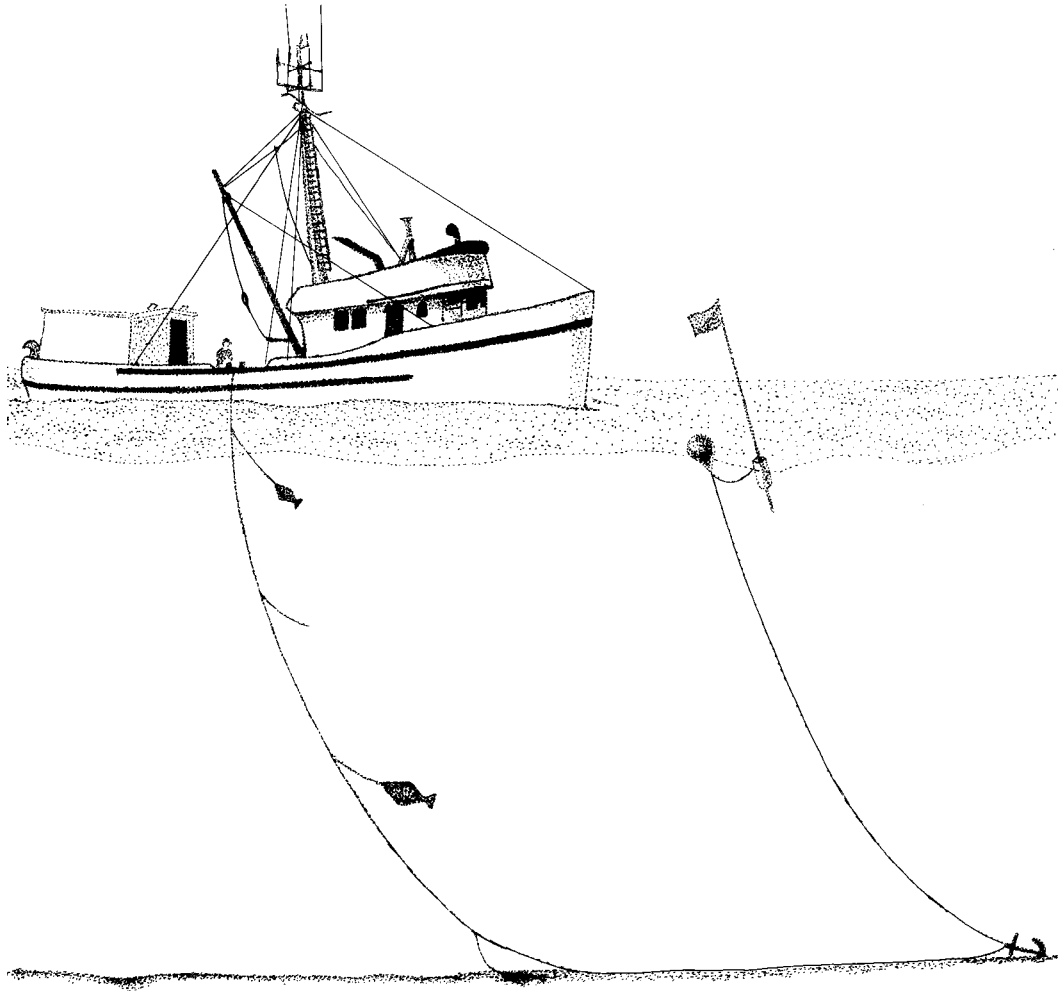


Figure 5. Halibut fishing gear.

once the fish are on the hooks. Large hooks are most commonly used when targeting halibut exclusively and smaller hooks are more common when targeting other species simultaneously, such as sablefish.

The skates are tied together and set in strings of 4 to 12 skates each. The number of skates per string depends on factors such as the size of the fishing ground and the likelihood of snagging on the bottom. Each end of the string is attached to an anchor and buoy line and marked at the surface with a buoy, flagpole, and flag. When fishing at night or in heavy fog, lights or radar reflectors are used on each flagpole to aid in locating the gear. Depending upon the grounds, time of year, and bait used, most of the gear is left in the water, or "soaked", for 4 to 48 hours, but the average soak for each skate is about 12 hours. Extensive soak times have been directly related to sand flea (a small amphipod) predation, which will kill the fish and make it unmarketable. Most fishing is conducted in depths ranging from 15 to 150 fathoms (27 to 274 meters); up to 300 fathoms (549 meters) if also fishing for sablefish.

Baits used in the halibut fishery are either fresh or frozen and include herring, octopus, salmon, and "shack" or "gurdy" bait which consists of species caught incidentally on the halibut gear.

Conventional gear. Traditionally, a unit (skate) of conventional setline gear or fixed gear consists of groundline, gangions, and hooks. Loops of light twine

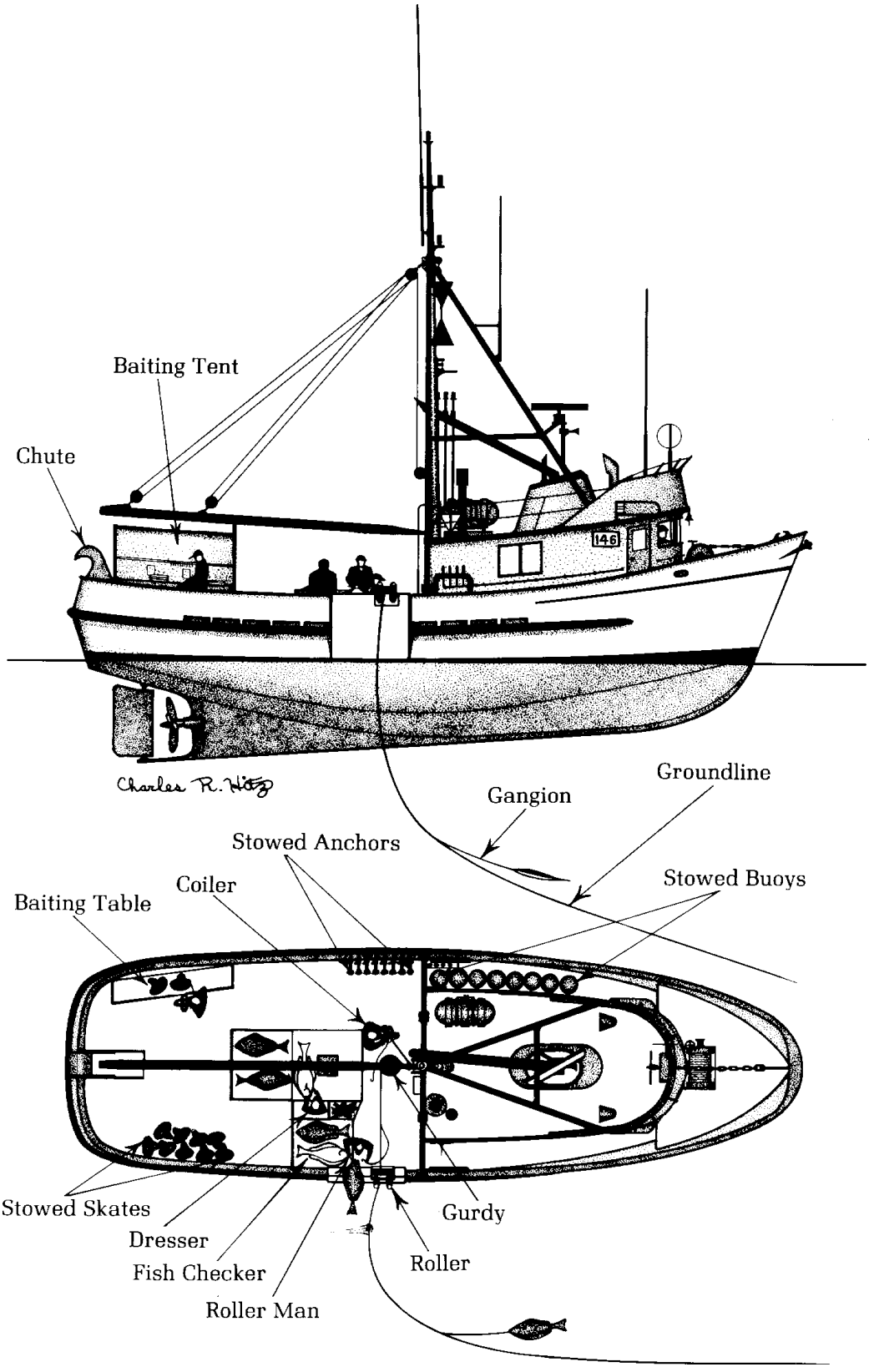


Figure 6. Deck layout of a vessel fishing with conventional gear.

(beckets) are attached at regular intervals to the groundline. Short branch lines (gangions) 3 to 4 feet (.9 to 1.2 meters) long are attached to the beckets and a hook is attached to the end of each gangion. The most common rigs have been 3, 9, 13, 18, 21, 24, and 26 feet, (.9, 2.7, 4, 5.5, 6.4, 7.3, and 7.9 meters) as those intervals facilitate baiting the hooks and coiling the lines. The skates with the baited hooks are set over a chute at the stern of the vessel.

The gear is retrieved on a power-driven wheel (gurdy). One person stands at the roller and one person coils the line after it passes the gurdy. The gear is then inspected for necessary repairs, baited, and recoiled in preparation for the next set.

Snap-on gear. Snap-on gear differs from traditional setline gear in that the branch lines (gangions) are attached to the groundline with metal snaps rather than being tied to the groundline with twine. Further, the groundline used for snap-on gear is one continuous line that is simply stored on a drum after the gangions are removed, instead of being coiled. The method of attaching the hooks to the gangions is the same for snap-on gear and traditional gear. Gangions and baited hooks are stored on racks, and a fisher snaps the gangions to the groundline as it unwinds from the drum during setting. Hook intervals can be changed with each set. When the gear is retrieved, the gangions are unsnapped as the groundline is rewound on the drum.

For small boats with only two or three fishers, snap-on gear has several advantages over traditional gear. First, storing the groundline on a drum eliminates the need for a person to coil gear and reduces the amount of storage space required. Although catch rates tend to be higher with traditional gear on a larger boat, more snap gear can usually be set by a small crew than it would be able to handle in the traditional manner. Another advantage is that the hooks can be widely spaced when prospecting for fish and more closely spaced when a concentration of fish is located. These advantages coupled with the relatively low capital investment for a small boat were some of the reasons for hundreds of new fishers entering the fishery in the 1970s.

Auto-line gear. Auto-line gear is a third type of gear used in the longline fishery. Although not ordinarily found on a halibut-only vessel, this type of gear is used frequently to fish for Pacific cod (*Gadus macrocephalus*) and sometimes sablefish. If a vessel is fishing for multiple species at one time, this gear may be used for halibut as well. As with conventional gear the gangions are tied to the groundline at fixed intervals, but is unique because the hooks are stored on a magazine and then automatically baited as the gear is set. Upon hauling, the hooks are automatically cleared and replaced on the magazine for the next set. The gangions are generally shorter and closer together than on conventional gear, and there is no need for crew members to coil during hauling or to bait the individual hooks. The disadvantage is that the system is costly to purchase and maintain, and outgoing hooks sometimes go unbaited.

Statistics of the Catch

The commercial catch of Pacific halibut first peaked in 1915 with 69 million pounds (31,298 metric tons) caught by both Canadian and U.S. fishers. For several years following that peak, catches decreased (Figure 7).

Catches hit a low of 44 million pounds (19,958 metric tons) in 1931 but then generally increased to over 70 million pounds (31,752 metric tons) in 1962. In the 1960s, the International North Pacific Fisheries Commission allowed Japanese vessels to fish directly for halibut in the eastern Bering Sea. In addition to the directed foreign

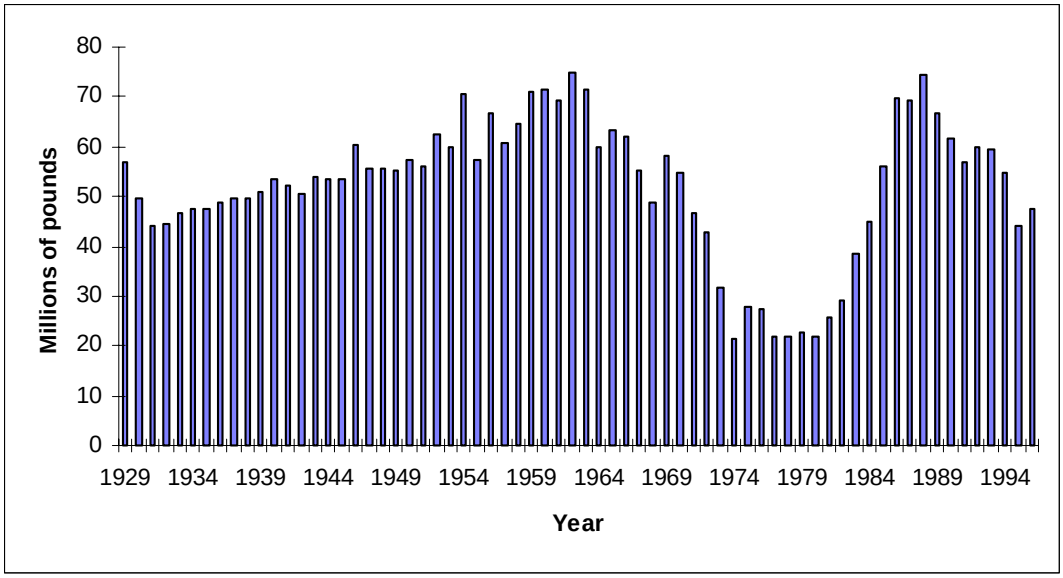


Figure 7. Commercial Pacific halibut removals for 1929-1996.

fishery, incidental catch of halibut in the groundfish fisheries was also high. Both of these factors along with a natural decline in halibut recruitment contributed to a decline in the population, and thus a decline in directed catches. By 1974, the total commercial catch was only 21 million pounds (9,526 metric tons). Catches remained low in the 1970s. During the late 1970s and early 1980s the IPHC intentionally set catch limits below what could have been safely harvested in order to help rebuild the population. This strategy coincided with increasing halibut recruitment, and continued until 1985, when it was clear that the stock population had recovered. The catch again peaked in 1988 at over 74 million pounds (33,566 metric tons), then steadily decreased in what IPHC biologists believe is a natural cycle of abundance. The catch limits increased again in 1995 because improvements in the IPHC stock assessment showed estimated biomass higher than previously thought. The actual abundance of the population, however, continues to decline. Figure 8 shows IPHC regulatory areas for 1996.

Landing Ports

In the early years of the fishery, most landings were made on the west coast either in Puget Sound or Vancouver, B. C., because the fish were then shipped by railroad to other parts of North America. As transportation improved, landings spread to Alaska and other parts of British Columbia. Prince Rupert, B.C. was termed "The Halibut Capital of the World" for sixty years, although in some of the years, Seattle, Washington had higher landings. In the late 1970s, Kodiak, Alaska and Seward, Alaska became important landing ports, and in 1981, surpassed Prince Rupert.

In 1996 the top ports in the U.S. (all in Alaska) were Kodiak with 19% of the U.S. landings and Homer with 11%. Other large landing ports included Dutch Harbor/ Unalaska, Seward, Sitka, and Petersburg. The top port in Canada was Prince Rupert with 39% of the Canadian landings and 2% of the U.S. landings (Table 2). The three major ports in Canada (Prince Rupert, Port Hardy, and Vancouver) together received 91% of the Canadian landings.

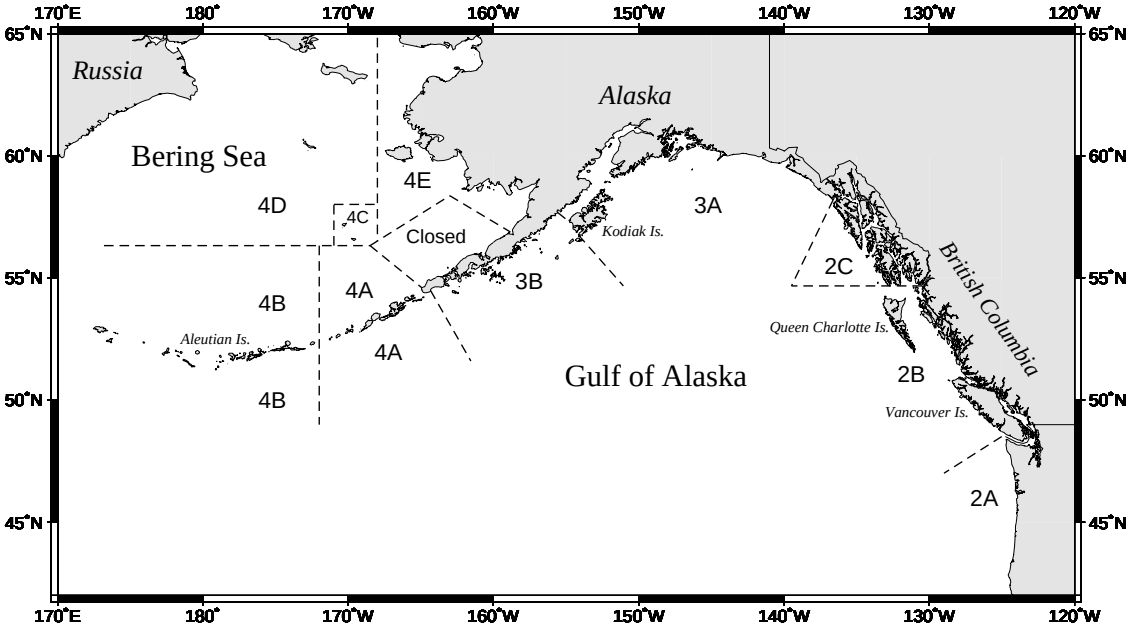


Figure 8. IPHC regulatory areas for 1996.

Value and Marketing

Pacific halibut is one of the most valuable fish species in the north Pacific. The value of the fish has increased since the 1930s. Before 1940, the average annual price per pound was usually less than $.10 (all values are U.S. dollars). Adjusting for inflation, $.10 in 1935 translates to approximately $1.30 in the 1996 market. During the 1940s through the 1960s the price varied from $.10 to $.38 per pound. The price steadily increased through the 1970s, with a high of $2.13 per pound in 1979 when the catch limit was fairly low. As abundance of halibut began to again increase in the early 1980s, price dropped back down to between $.89 and $1.13 per pound. During the late 1980s and early 1990s, fishing seasons were short and few, resulting in the majority of fish entering the frozen market. The average price during this period ranged from $1.28 to $2.12 per pound.

Halibut that has been cleaned and beheaded by the processing plant and is ready for freezing or shipping fresh.

In 1991, when Canada implemented the IQ system, most of the Canadian-caught fish went to the fresh market instead of frozen, and the price that Canadian fishers received jumped to as much as $2.70 per pound. A similar increase occurred when the U.S. implemented its IQ system in 1995. The average price per pound in 1996 was $2.27 in the U.S. (including Alaska, Washington, Oregon, and California) and $2.67 in Canada.

In the early years of the fishery, public auctions were a common way for fishers to sell their catch to processing plants. As seasons grew shorter and the number of deliveries that a plant had to accommodate grew, auctions became less frequent and fishers would sell directly to the processors. Often times processors would accommodate a vessel with ice and bait in return for their business, or the best price was negotiated from the fishing grounds prior to delivery. In the past few years there has been somewhat of a resurgence in the auction system as individual quotas were implemented, although direct negotiations with the processors are still more common.

Table 2. 1996 landings by port and country.

Ports	Canada	United States	Total
California & Oregon		244	244
Seattle		1,021	1,021
Bellingham	54	1,808	1,862
Misc. Washington		346	346
Vancouver	2,435		2,435
Port Hardy	2,560[1]	1[1]	2,561
Misc. Southern B.C.	714		714
Prince Rupert	3,748	767	4,515
Misc. Northern B.C.	43		43
Ketchikan, Craig, & Metlakatla		1,080	1,080
Petersburg, Kake		3,012	3,012
Juneau		928	928
Sitka	3[1]	2,958[1]	2,961
Hoonah, Excursion, & Pelican		2,004	2,004
Misc. Southeast Alaska		1,034	1,034
Cordova		917	917
Seward		3,296	3,296
Homer		3,983	3,983
Kenai		330	330
Kodiak		7,171	7,171
Chignik, King Cove, & Sand Point		1,230	1,230
Misc. Central Alaska		1,262	1,262
Akutan & Dutch Harbor		3,145	3,145
Misc. Bering Sea		1,248	1,248
Totals	**9,557**	**37,785**	**47,342**

[1]Canadian vessel landed research fish in Sitka and Port Hardy from both Regulatory Areas 2B and 2C.

After the sale, the halibut are unloaded from the vessel, beheaded, and graded into trade categories according to weight. In the earlier years of the fishery, the standard weight categories were “chickens” or “chix” (5-10 pounds; 2 to 4 kg), small (10-20 pounds; 4-9 kg), medium (20-60 pounds; 9-27 kg), and large (60+ pounds; 27+ kg), but by the late 1980s the weight categories varied greatly among the plants. In 1973 the legal size limit was increased from 24 to 32 inches (61 to 81.3 cm) and few fish under 10 pounds (4 kg) are now landed.

Processing the fish once it reaches the plant varies depending on the market. The fish is delivered to the plant with entrails removed. The plant then beheads the fish and completes the cleaning process. If prepared for the fresh market, the fish is packed in ice and shipped. If the fish is frozen, the process consists of freezing initially, then dipping several times in water to “glaze” or coat the body with ice to prevent dehydration in storage.

Following processing by the plant, the fish are shipped to retail markets. Halibut is a versatile species and is sold as steaks, fillets, or roasts. The “cheeks” of the halibut, a tender piece of meat found on the head, have been a delicacy enjoyed by fishers for many years, but only recently marketed commercially. Preparation for the table varies and includes poaching, frying, baking, steaming, and barbecuing.

THE SPORT FISHERY

Before 1973, fishing for halibut, including recreational, was governed by the commercial fishing regulations. Catching halibut during the closed commercial season was illegal, but sport-caught halibut frequently were taken out of season. Because the sport catch was not large and because the number of fish taken illegally by sport’s enthusiasts was small compared with the commercial catch, IPHC concluded that the problem was not a serious concern in the management of the fishery.

As the sport catch increased, federal and state agencies urged IPHC to officially recognize the sport fishery. Legal interpretations by the two federal governments indicated that the Halibut Convention provided the authority to regulate the sport fishery. After consultation with the Department of Fisheries and Oceans in Canada (DFO), the NMFS in the U.S., and the appropriate state agencies in Alaska, California, Oregon, and Washington, the Commission adopted sport regulations in 1973.

Prior to about 1975, taking of halibut by sport fishers was usually incidental to saltwater fishing for salmon. Over the past two decades, however, the popularity of bottom-fish has surged. Estimates of halibut catch are obtained through creel census and postal surveys in Alaska, and creel census and telephone interviews on the U.S. west coast. British Columbia estimates of catch are currently under scrutiny and DFO is working along with various interest groups to devise an accurate accounting system.

Alaska and British Columbia have no catch limits to govern the total take of sport fish; rather, removals are controlled by bag and possession limits. However, in recent years removals by the sport contingent have steadily increased and have gained the attention of commercial fishers, whose catch limits can be affected. In 1976, the Alaskan sport catch was 176,000 pounds (79,833 kg) compared to 6,263,000 pounds (2,840,878 kg) in 1995. Virtually all sport-caught halibut come from southeast Alaska waters or from the central Gulf of Alaska.

Oregon, Washington, and California have a much smaller population of halibut, and catch limits for commercial, sport, and subsistence fishing are necessary. The demand for sport halibut fishing is so high that closed seasons are utilized along with

The results of a successful sport charter fishing trip out of Homer, Alaska.

minimum size limits and bag and possession limits to keep the fishery within its quota and to extend the fishing season as long as possible.

Sport fishers have individual preferences for their halibut gear. Lines usually test from 40 to 80 pounds (18 to 36 kg) and circle or treble hooks, either 6/0 or 8/0 are used. Light or poorly-made hooks can be straightened out or bent by large halibut. A 10 to 32-ounce (.3 to .9 kg) sinker is used with baited hooks and spreader bars when fishing with bait, whereas jigs weigh from 17 to 28 ounces (.5 to .8 kg). Rods generally are heavy and stiff to handle the heavy sinkers and the potentially large halibut. Reels with a high gear ratio are desirable to reduce the effort in retrieving the gear from depths as great as 600 feet (182 meters). Jigging gear is used extensively in British Columbia and Alaska.

Because of their size, halibut are considered a trophy fish. All sport fishers should be aware of the dangers in handling a large fish in a small boat. Halibut are powerful and have been known to smash objects with their tails. A 459-pound, round-weight (head-on, not eviscerated) (207 kg) halibut caught on a rod and reel in 1996 holds the Alaska state record. The record in the state of Washington is 240 pounds (round weight) (109 kg). The record in British Columbia is 337 pounds (round weight) (153 kg) caught near Langara Island in 1993 by a guide fishing on his own.

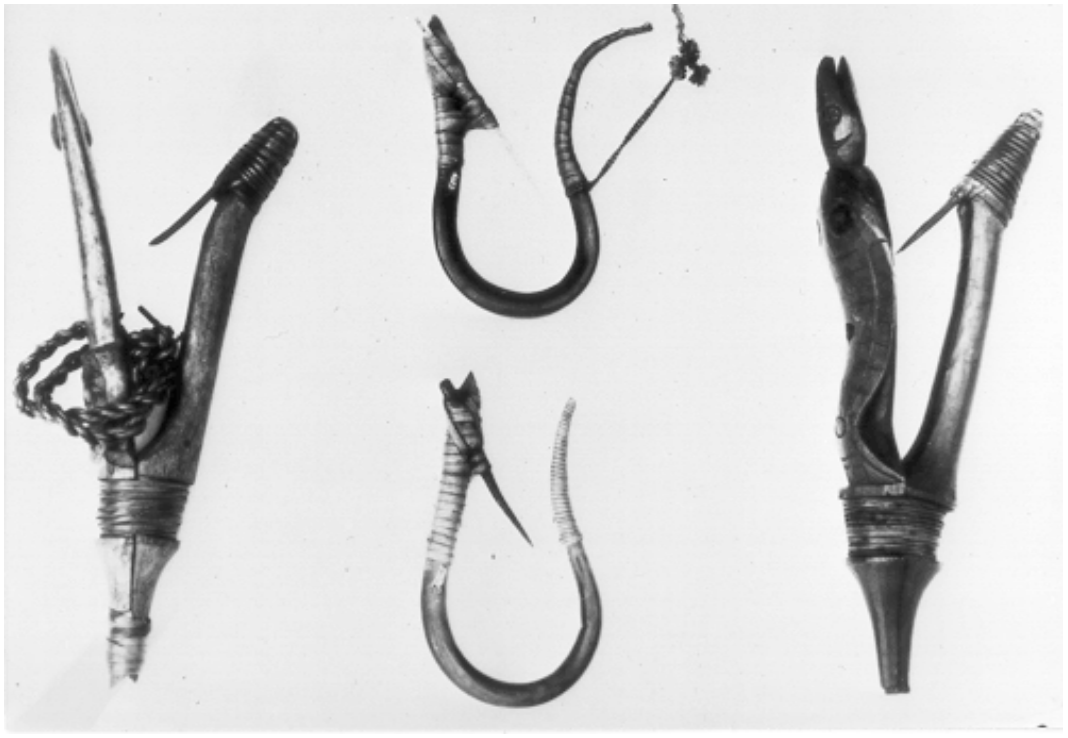
Each year, various activities center around halibut fishing. One of the most famous is the Homer Halibut Derby where numerous halibut are caught, tagged, and released. Sport fishers then try and recover these tagged fish and the largest tagged fish recovered wins a cash prize.

In 1993 the IPHC began a program whereby charter operators could encourage their clients to tag and release alive, captured halibut. The client initially receives a tagging certificate and subsequently receives information on migration and growth if the fish and the tag are ever recovered. This program is small, but popular with participants.

THE INDIAN FISHERY

Pacific halibut were fished historically by Indian tribes inhabiting land bordering the north Pacific. The robust fish was included in the diet of many tribes, who conducted their fishery by hook and line from large canoes which could venture as far as 20 miles from shore. The hooks were elaborately carved and were selective for large fish suitable for drying and smoking. The technique of these fishers was well developed and very efficient as the following excerpt by F. Boas (1910) explains:

Halibut are caught with hooks made of crooked branches of red or yellow cedar, attached to fishing-lines made of red cedar bark sixty fathoms long. The halibut hook is tied to the fishing line with split spruceroots. Devilfish (octopus) is used as bait. The fishing lines are taken out by the fishermen in their canoes and thrown overboard. After a while they are pulled up again. After the halibut hooks have been taken up, the fish are killed by clubbing. Then hooks are thrown back into the water. At this place it is said that there were two fishermen in the canoe, who distinguished the halibut they had caught by placing them with the head toward the owner. The fishermen had his knees covered with a mat.



An example of hooks used in the traditional Indian halibut fishery.

Indian catch of halibut at Neah Bay, Washington (circa 1910). Photographed by A.H. Barnes. Hillary Irving of the Makah Tribe identified the location.

Today, Pacific halibut is still an important part of tribal culture. Many tribal members participate in both the commercial and sport fisheries. Several tribes have specific allocations or boundaries for their usage only. In southeast Alaska, the Metlakatla Indians have a 3,000 foot (915 meter) reserve around Annette Island. Only the tribal fishers may commercially fish within the boundary and specific regulations, beyond those established by the Commission are made by the tribal Council. In 1996, the Metlakatla Indians caught over 126,000 pounds (57,153 kg). In Washington state, eleven tribes exercised treaty rights to obtain an allocation of the total halibut catch limit in Area 2A. In 1995, the U.S. government prohibited non-treaty commercial fishing north of Pt. Chehalis off the coast of Washington to achieve court-ordered allocation to the tribes.

COMMUNITY AND NON-TREATY SUBSISTENCE HARVEST

With the implementation of the IFQ in the U.S., came an allocation to some communities bordering the Bering Sea called a Community Development Quota (CDQ). The community councils submit proposals to the state of Alaska on how they would catch the allotted CDQ, how the money from the CDQs will be spent, and what education programs will be involved. The state then allocates the CDQ among the communities based on the proposals.

British Columbia has an Indian food fish policy which allows tribal subsistence use and is estimated to use about 300,000 pounds (136,079 kg) per year. In 1996, DFO issued some of the Native tribes “F” licenses, instead of the “L” licenses. The “F” license is fished as part of a Native communal commercial fishing program.

In addition, subsistence fisheries exist throughout the range of halibut. Some of the subsistence fisheries in the U.S. and Canada are recognized by the government as legitimate and some are not. The NPFMC is currently evaluating proposals to recognize subsistence harvest in Alaska. Possible options include allocations to Alaska natives only, rural communities only, or all Alaska residents.

Management of the Resource

INTRODUCTION

The Commission is responsible for the health of the Pacific halibut resource, and engages in extensive stock assessment activities to ensure that the population size is correctly estimated. The Commission is tasked with regulating total removals by the commercial fishery, and all allocative responsibility (including implementation of the individual quota systems), falls under the jurisdiction of the individual governments.

The staff works with numerous agencies and the two governments to account for all removals in the assessment, and provide accurate data. The methods to estimate removals and stock size have improved through the years. Today, age and length data from the commercial catch, standardized setline surveys, bycatch, and sport catch are included in the assessment.

ASSESSING THE POPULATION

The Commission stock assessment is based on biological data obtained through port sampling, surveys, and special projects. Since the 1930s, biologists have collected otoliths for aging, and lengths of fish. Logbook information is supplied by the fishers either through interviews by IPHC staff in the landing ports or via mail at the end of the year. The stock estimate is then presented at the IPHC Annual Meeting where fishers, industry and other interest groups can comment and make recommendations of their own.

In the 1980s it was believed that the length and weight of the otolith was proportional to that of the fish, and length sampling was discontinued. However, further research showed discrepancies in the relationship and so length sampling was resumed in 1991 and continues today.

Standardized setline surveys have been conducted intermittently throughout the history of the Commission. In 1996, the Commission developed a plan to survey all IPHC regulatory areas from 1997 through 2001. The data collected from each fish includes otolith, length, sex, and maturity. Catch data from standardized skates allows the calculation of catch-per-unit-of-effort (CPUE), the amount of fish caught per standard skate of gear. In addition, the NMFS conducts trawl surveys in various regions throughout the halibut range and data from those catches are used to detect strong and weak year-classes before they reach the commercial fishery.

Research projects have been conducted by the Commission staff since 1923 to answer questions regarding abundance, growth, migration, and life history of halibut. Information regarding the specific projects can be found in the IPHC report series (a complete listing of IPHC reports can be found at the back of this volume).

History of Assessment Methods

The 1923 Convention which established the Commission also launched the process of halibut stock management. By the 1930s, it was apparent that catch limits were needed to supplement closed seasons. The Commission staff began estimating

the size of the halibut population. From the 1930s through the 1970s, CPUE was thought to reflect the relative abundance of the population, and catch limits were set accordingly. It became clear in the 1970s that CPUE alone was not a fully accurate indicator and so a new system was put into place in the 1980s which used catch-at-age data to estimate the population. Each year, the size of each year-class was updated by integrating the current year's catch information, creating a dynamic model better suited to management.

By the early 1990s, the Commission staff began to suspect that the model was underestimating recruitment and total biomass. The reason was that weight-at-age had decreased dramatically, as much as 50% from the late 1970s to the mid-1990s, and length at age had decreased 20%, most dramatically in recent years. The assessment method at the time assumed that vulnerability at a certain age remained constant over time; an assumption that would be violated as changes in size would affect changes in catchability. Fishing practices also changed with the inception of the individual fishing quota systems, which made data interpretation more difficult.

In 1996, a new model was presented which takes into account a number of factors not included in the past models. The new model considers commercial fishery age composition, catch, and CPUE as the old model did, and added size-at-age of both the commercial catch and the setline surveys, and survey CPUE. The new model also accounts for legal size halibut which are caught incidentally in other fisheries. Adjustments can now be made annually when there are changes in individual growth.

Tagging studies have shown that juvenile halibut are highly migratory which presents a problem when accounting for incidentally-caught juveniles in individual area assessments. This problem is dealt with by adjusting the exploitation rate to account for the removals. Adult halibut, on the other hand, do not pose the same type of problem, as they tend to stay in the same general area from year to year.

Catch limits are set by first figuring out the total amount of fish (>32 inches or 81.3 cm) that are vulnerable to the commercial fishery, called the exploitable biomass. An exploitation (harvest) rate is then multiplied by the exploitable biomass. The resulting figure is the total amount of removals that can be allowed for the year including commercial, legal-size incidental catch, wastage, sport, personal use, and subsistence (Figure 9). Target exploitation rates have been as high as 35% and as low as 20%. Since the Commission controls only the total removals by commercial gear, all other removals must be subtracted first, and what is leftover is harvested by the commercial fishery. The U.S. west coast (Area 2A) provides the exception where the PFMC devises a catch sharing plan which includes commercial, sport, and subsistence removals.

Fluctuations in Population

The famous Thompson-Burkenroad debate of the 1950s revolved around the question of whether changes in halibut population size were driven by human removals to the stock or by the environment. Until recently, fluctuations in recruitment could be explained by cycles in the environment or by density dependence. Changes in environmental regimes have gained recognition in recent years and we now expect that recruitment may vary considerably from one decade to the next. Variation in the growth rates of halibut is another factor that may be driven by changes in the environment. The first dramatic decrease in growth was seen first in the 1920s, then in the 1970s to the present. Research has shown that most growth rate variation occurs in juvenile fish.

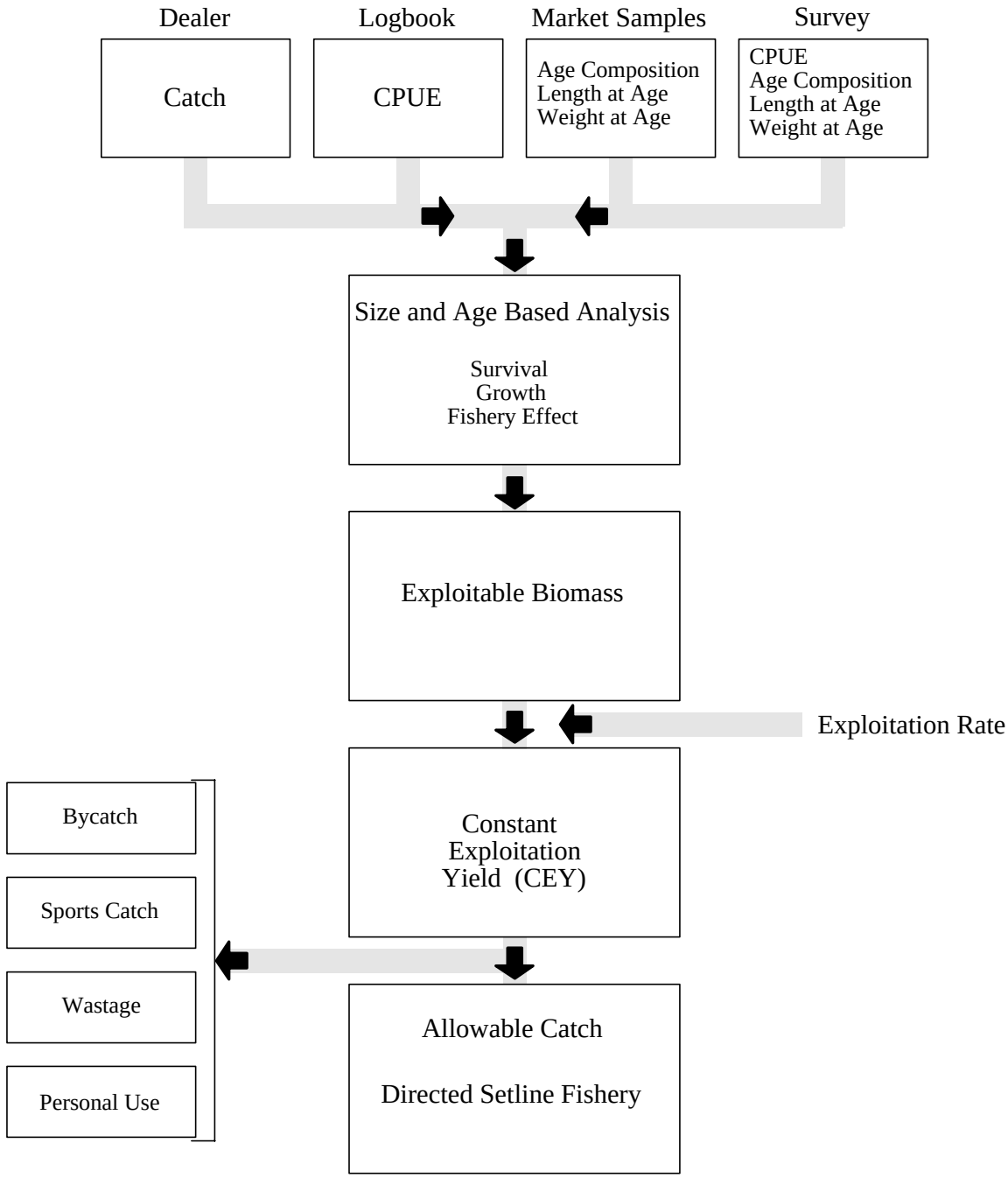


Figure 9. IPHC stock assessment.

Salinity, temperature, air pressure, competition for food, and a variety of other environmental factors could play a role in the growth and resulting abundance of halibut. In recent years, the theory that there are large environmental shifts called "regime shifts" which have a profound affect on marine environments, has gained momentum. The Commission plans to pursue this avenue, as the results could provide the answers needed to predict future fluctuations in stock abundance.

REGULATORY MEASURES

The Commission meets each January to set catch limits and pass other regulations. During that meeting, the staff presents reports on stock assessment, the commercial fishery, and other related topics. Although the Commission has the authority to establish policy on conservation matters, it has no enforcement jurisdiction and can not allocate fish among users. Instead, the individual governments enforce the regulations and set allocative policy. The regulations are enforced by the NMFS, Coast Guard, and the state police (southern states) in the U.S., and DFO in Canada.

Total removals from all sources beginning in 1962 are shown in Table 3. The IPHC staff calculated only commercial removals until 1962, when incidental catch was added. Subsequently, sport was calculated beginning in 1977, waste beginning in 1986, and personal use beginning in 1993.

Table 3. Total removals at 5-year intervals from 1962-1996. (Note: The dashed line indicates that the removal was not calculated for that year, although may still have occurred.)

	Year and Catch (thousands of pounds)							
Removals	**1962**	**1967**	**1972**	**1977**	**1982**	**1987**	**1992**	**1996**
Commercial	75,119	55,521	43,018	21,880	29,010	69,480	59,900	47,440
Incidental	8,609	16,337	19,280	11,776	12,373	11,279	20,282	13,362
Recreational	-	-	-	299	1,332	3,771	6,506	7,731*
Waste	-	-	-	-	-	4,187	2,449	1,306
Personal Use	-	-	-	-	-	-	-	542
Total	83,728	71,858	62,298	33,955	42,715	88,717	89,137	70,381

*preliminary

INDIVIDUAL QUOTA FISHERIES

In 1991, Canada's DFO implemented an individual vessel quota system. A percentage of the area quota was given to 435 "L" license holders depending on a combination of past fishing record and vessel length. The Commission approved a 7-month season for the area that year.

Access into the U.S. fishery remained unrestricted through the 1980s and early 1990s. Safety issues and unacceptably short seasons prompted the NPFMC to pass regulations for an individual fishing quota system for Alaska, which was implemented by the NMFS in 1995. The initial allocation was given to individuals instead of vessels as in Canada, and was based on past fishing record. A total of 5,000 fishers received quota share initially. Legal challenges to this program are expected to be ongoing for the next several years. A comparison of the Canadian and U.S. quota systems is outlined in Table 4.

Table 4. Comparison between the U.S. and British Columbia individual quota systems.

	CANADIAN IVQ FISHERY	ALASKAN IFQ FISHERY
Initial issuance	- by vessel	- by person
Who obtained quota shares and how	- "L" licensed vessels - by 30% vessel length & 70% vessel fishing history	- vessel owners from 1988 to 1990 - quota shares = by best 5 out of 7 years poundage
Ownership caps	- yes	- yes
Vessel caps	- yes	- yes
No. of regulatory areas	- one (2B)	- eight (2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E)
Allocation for community development and native communal programs	- yes	- yes, known as Community Development Quota (CDQ)
Port of landing	- specific ports	- anywhere inside AK, WA, OR, CA, and 3 Canadian ports - if leaving AK must check out
Unloading to tenders	- no	- yes, if tender is registered buyer
Hail-out prior to fishing	- yes	- no
Hail-in prior to unloading	- yes	- yes
Overage/underage program	- yes	- yes
Fishing multiple species	- halibut and sablefish = yes	- halibut and sablefish = yes

The result in both countries has been favorable from a consumer standpoint and for most fishers. Fishers with quota share are generally receiving more money per pound for their halibut and catches are spread over a 7-8 month season so that there is fresh fish available to the market most of the year. Quality has also improved because the race for fish no longer exists. A portion of the industry in both the U.S. and Canada are still opposed to the IQs for a variety of reasons.

Some of the processors do not like the IQ system because fishers have more control when selling fish. Another criticism comes from those who feel the initial allocation was unfair. Initial allocations were based on historical performance. This favored vessel owners with a long history in the fishery. New fishers and crew members were left out of the initial allocation and are now forced to buy quota share or work for others if they want to participate in the fishery.

The safety record has improved as well. It was not uncommon in the past to have multiple vessel losses and injuries on deck during the derby. With only a few short seasons a year, fishers felt intense pressure to fish even when common sense told them to stay in port or to get some sleep. For many, their yearly income was dependent on their halibut catch. Under the IQ systems, injuries have decreased, because fishing in adverse conditions is no longer necessary.

The Commission thinks that the IQ programs have been successful in accomplishing the goal of having a more safe, spread-out fishery, and will continue to evaluate the programs to ensure the conservation of the resource.

ANNETTE ISLAND RESERVE FISHERY

In Southeast Alaska, the Metlakatla Indian Community conducts a small independent commercial fishery within their Annette Island Reserve boundary (the area within 3000 feet of Annette Island). The Department of Indian Affairs approved the fishery which began in 1990; initially on a test basis. No total catch limit exists, but each season length is restricted to 48 hours. The Commission has no jurisdiction over the seasons and total catch, because the fishery is executed internally, but the vessels do submit catch and log information to the Commission for stock assessment purposes. If the Area 2C catch limit is reached, and the area is closed, however, the Metlakatla fishery closes as well. Table 5 shows total catch and number of fishing days for 1990 through 1996.

Table 5. Catch and total number of fishing days for the Metlakatla Indian community, 1990-1996.

Year	Fishing days	Catch (lbs)
1990	8	33,104
1991	20	61,080
1992	16	22,651
1993	16	21,464
1994	26	54,294
1995	26	51,812
1996	28	126,378

SPORT HARVEST

Sport fisheries are managed jointly by the IPHC, the U.S. fishery management councils and the individual states in the U.S., and cooperatively by IPHC and DFO in Canada.

There is no overall sport halibut catch limit for Alaska where the daily bag and possession limits were 2 and 4, respectively in 1996. Statistics are obtained through creel census and postal surveys conducted by the ADF&G. In Canada, the bag and possession limits were 2 per day and 3, respectively, in 1996 and statistics are provided by DFO. Figure 10 shows sport removals from 1977 to 1996.

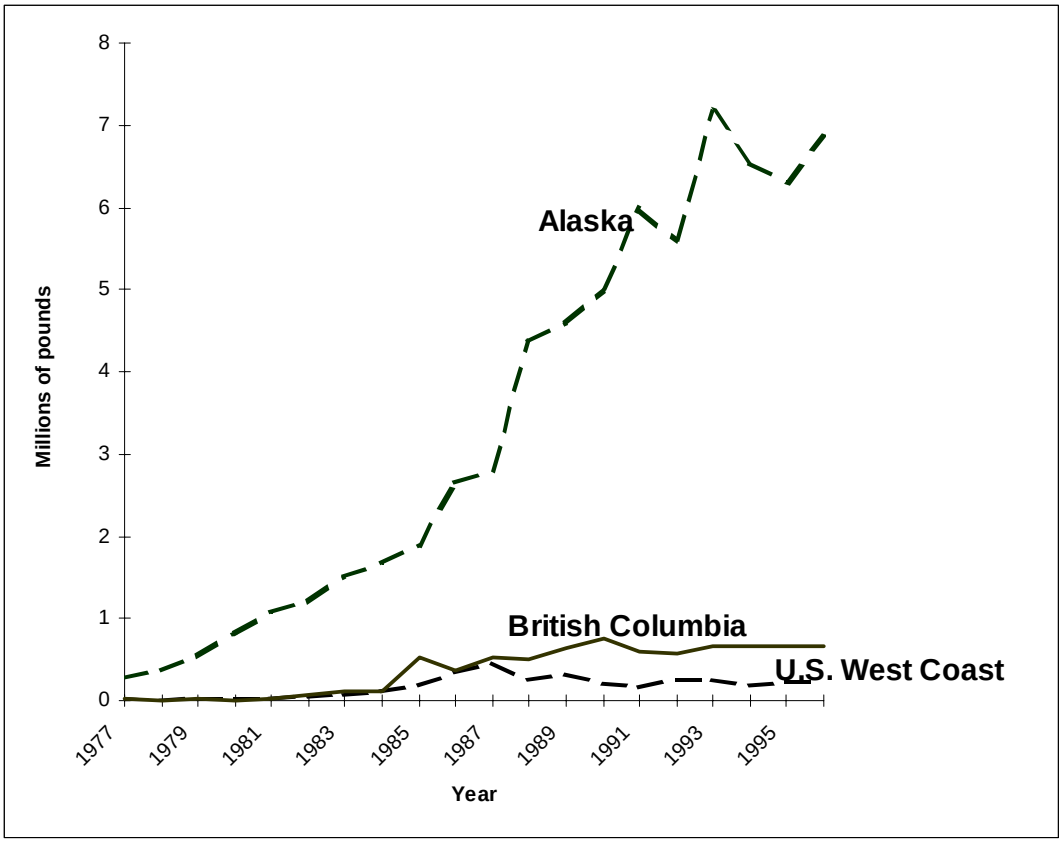


Figure 10. Sport harvest (millions of pounds) for Alaska, British Columbia, and the U.S. West Coast, 1977-1996. (Please note that 1996 values are preliminary).

The U. S. west coast is also managed by bag and possession limits, and is the only area in which there is an overall sport catch limit.

PERSONAL USE

In some cases, the personal use or subsistence fisheries are regulated by the individual states and province. For example, treaty tribes in Washington have a specific allocation for subsistence use. Also, the Canadian government has authorized an Indian Food Fishery and is working with tribes to improve estimates of catch. In Alaska, unreported subsistence fishing occurs, and the NPFMC is evaluating a proposal to recognize and estimate the removals. The Commission staff is currently working with other agencies to estimate these removals so they can be properly accounted for in the halibut stock assessment.

WASTE IN THE HALIBUT FISHERY

Waste refers to two categories of removals; 1) halibut that are caught during the halibut fishery and are left to perish on lost or abandoned gear; and 2) the mortality of the under-sized (sub-legal) halibut that are caught and released during a halibut

fishing trip. The IPHC staff estimates the removals of legal-sized waste through logbook interviews, and the removals of sublegal-sized waste from setline survey data.

Waste has decreased dramatically since the IQ program went into effect in Alaska with legal-sized waste decreasing 69% from 1994 to 1996, and sublegal-sized waste decreasing 33% in the same time period. The decrease occurred because fishers now set only as much gear as they can haul in a trip, they probably fish during better weather, they are more careful when hauling the gear, and there is a smaller fleet size.

INCIDENTAL CATCH

Pacific halibut are inadvertently captured by vessels fishing for other species, primarily with pot, trawl, and longline gear. Not all halibut caught will die from the injuries if the fish is discarded in a careful and timely manner. To this end, many groundfish regulations deal with proper discard procedures to ensure maximum survival of the fish. In many areas, NMFS-certified observers work onboard groundfish vessels and gather information regarding the condition of halibut at release. From these data, the IPHC is able to estimate both the total amount of halibut caught and killed in each fishery, and the discard mortality rate, or percentage that die. Because halibut are migratory, there is concern that incidental catches of juveniles in one area will have a downstream effect on the future adult population in another area.

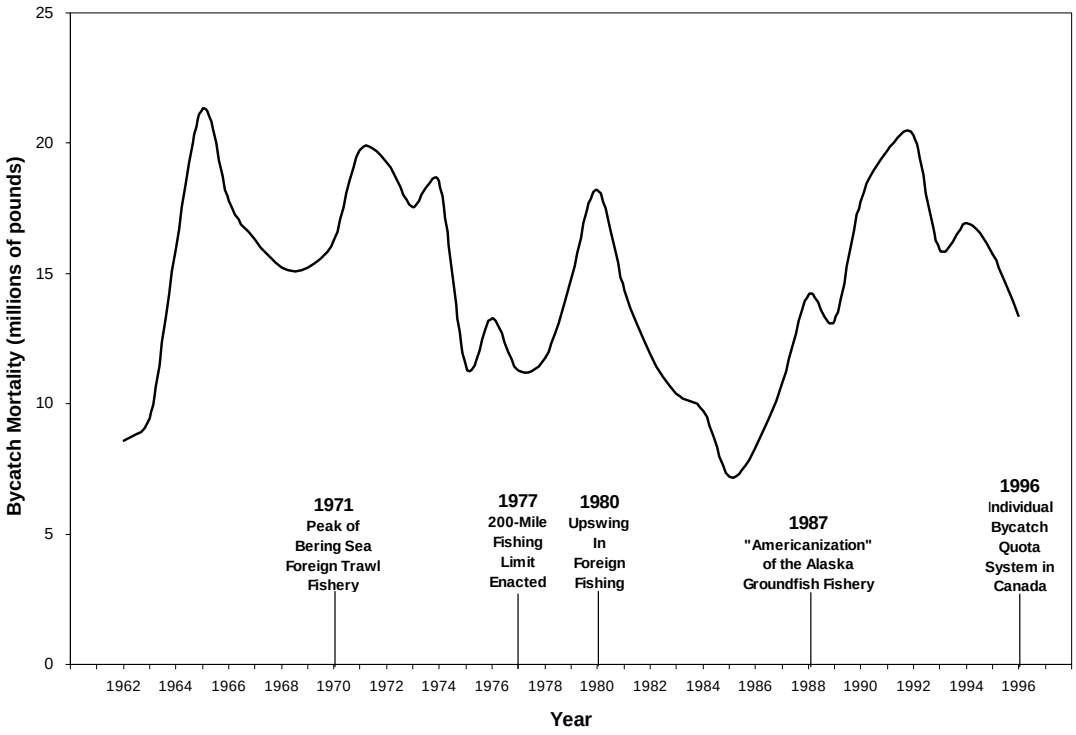


Figure 11. Bycatch mortality and major events affecting the catch for 1962-1996.

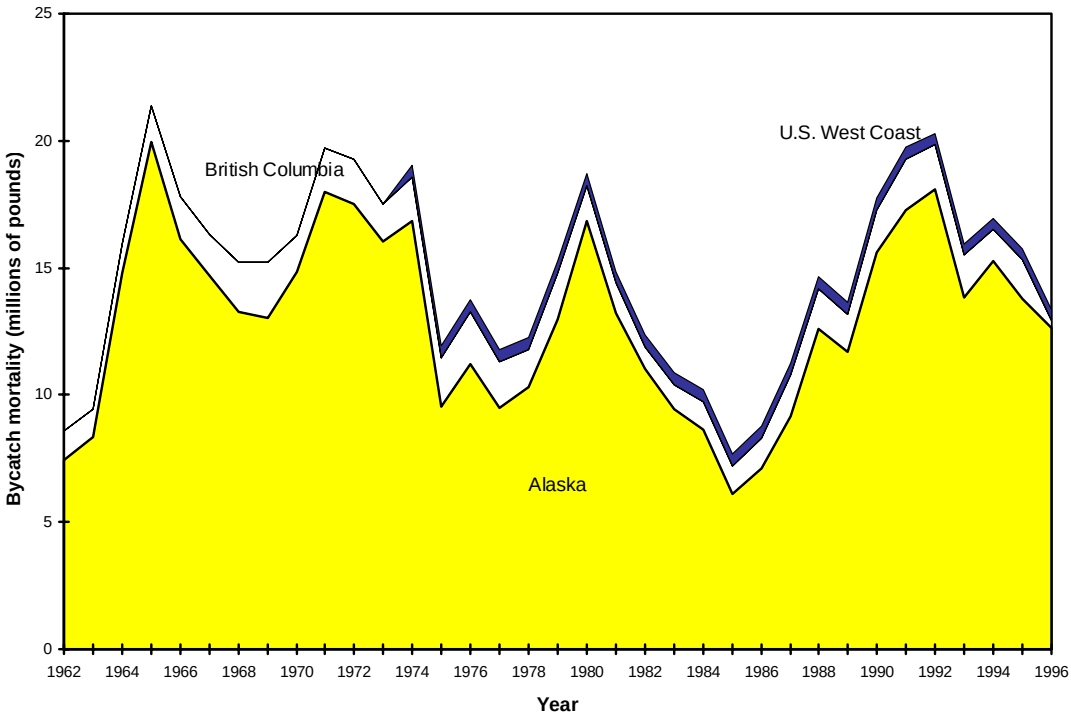


Figure 12. Bycatch mortality (millions of pounds) for Alaska, British Columbia, and the U.S. West Coast.

The Commission has no authority over incidental halibut catch because it occurs in fisheries which are not under its jurisdiction. However, far from silent, the Commission regularly makes policy recommendations and assists the governments in designing and analyzing bycatch reduction measures. In the United States, the regional fishery management councils are assigned the task of setting policy concerning bycatch, and the NMFS implements the policies and enforces the regulations. In Canada, the DFO makes and enforces policy.

Halibut bycatch is not a new problem. Historically, incidental catch of halibut was relatively minor until the early 1960s, when Japanese vessels began fishing for groundfish in the Bering Sea. Bycatch increased dramatically, peaking in 1965 at approximately 21 million pounds (9,526 metric tons) of dead halibut from all areas of the North Pacific. Bycatch levels have risen and fallen several times since then (Figure 11) in response to fishery development, increased bycatch management measures, and the level of halibut abundance. The history of halibut bycatch off the United States versus Canada is quite different as the following sections will describe (Figure 12).

United States

The foreign fleet continued throughout the 1960s and 1970s to harvest groundfish and catch substantial amounts of halibut in the process. In the 1980s, the U.S. government served an ultimatum to the foreign fleets in the Bering Sea, requiring

that they decrease bycatch rates, and therefore bycatch, or face exile from the area. The fleet responded and by 1985 achieved a record low of 6.1 million pounds (2,767 metric tons) of bycatch mortality in fisheries off Alaska. The foreign fleet was slowly phased out of U.S. waters in the late 1980s, replaced first by joint venture operations and then fully domestic vessels by 1990. With a rapidly growing and unregulated domestic groundfish fleet, especially off Alaska, incidental catch again rose quickly. The bycatch restrictions that the governments had placed upon the foreign fleets in the 1970s were not possible with the domestic groundfish fleet because of allocation and due-process legal issues.

With bycatch again on the rise, the first step was to organize a reliable accounting system. The NPFMC passed regulations to implement a mandatory observer program for the domestic fleet in 1990. All vessels over 125 feet (42 meters) in length carry an observer 100% of the time; vessels from 60-124 feet (18-41 meters) carry an observer 30% of the time; and those under 60 feet (18 meters) are exempt from observer requirements. Certified observers gather information regarding total catch composition, and prohibited species catch (such as halibut, salmon, and crab) among other things. Since the program was implemented, the NMFS and many other agencies including the Commission have worked to ensure that the observers obtain accurate data.

Once the observer program was in place, the NPFMC was able to set regulations which dealt with the problem of bycatch. All halibut, regardless of whether they are dead or alive upon release, are to be discarded. The type of gear being used, groundfish target, and handling practice all play a role in fish survival. Trawl vessels generally have a discard mortality rate of 40-90%, longline from 5-25%, and pot from 0-10%. Regulations and scientific studies center around lowering the overall bycatch or reducing the mortality of those that are caught and released.

A halibut bycatch mortality limit is the main tool currently used by the NPFMC to constrain bycatch. A limit on the amount of halibut that can be discarded dead is specified for each groundfish fishery or group of fisheries in both the Bering Sea and the Gulf of Alaska. During the season, a pre-determined mortality rate is applied to the estimated amount of halibut caught by each fishery and once the mortality limit is reached the fishery is shut down. Most fisheries have limits which are split among seasons to better spread the catch over the year. Gear restrictions are another tool used to help make sure that bycatch does not become excessive. The pollock fishery, for instance, is separated into two contingents, bottom trawl and pelagic trawl. Only bottom trawling is closed when the limit is reached; pelagic trawling, which catches very few halibut, is allowed to continue. Gear restrictions ensure that pelagic trawls are not fishing on-bottom where halibut bycatch occurs. Another mechanism being used is a vessel incentive program which stipulates that individual vessels must stay below a certain level of bycatch or risk prosecution. This program has met with limited success, however, due to lack of enforcement and legal resources.

Not only are there regulations to limit the total amount of halibut caught, but the Commission staff and some industry groups have worked for the past several years to find ways to lower the mortality of those fish that are caught. One such method, called “Careful Release,” pertains to hook-and-line vessels, and stipulates three ways that halibut must be released to minimize injury. A few fisheries also have voluntary industry controls. The Bering Sea Pacific cod hook-and-line fleet independently employs an analyst who tracks bycatch rates by vessel for each week of fishing. This enables the fleet to “police” itself and pressure those high rate vessels to lower their bycatch. The Bering Sea yellowfin sole trawl fishery has taken some responsibility to independently control their catch.

The NPFMC has managed to regulate the groundfish fleet to a point where bycatch mortality in the Alaska groundfish fisheries has averaged 13 million pounds (5,898 metric tons) during 1993 to 1996. At this rate, some fisheries are closed prematurely because of the halibut limits, leaving groundfish quota unharvested. The NPFMC is unwilling at this point to lower the caps because the cost to the groundfish fleet is already high. Although research continues on how best to lower bycatch and mortality, it has become clear that an individual incentive program is necessary to achieve substantial reductions. As a possible solution, the NPFMC is currently discussing individual vessel bycatch accounts (VBAs). Legal, financial, and political issues need to be addressed before the VBA system can be implemented in the groundfish fisheries off Alaska.

Although the PFMC, which manages groundfish fisheries off Washington, Oregon, and California, has not yet implemented any of the above restrictions on its groundfish fleet, there are measures being taken to increase awareness and educate fishers. In 1996, a video was produced and distributed to trawl vessels which shows how to minimize the mortality of halibut bycatch through proper handling. In addition there is a small volunteer observer program and volunteer usage of halibut avoidance devices in the shrimp trawl fishery. The PFMC has been asked by the Commission to formulate a bycatch reduction plan as soon as possible.

Canada

Incidental catch in groundfish trawl fisheries off Canada's western province of British Columbia, although lower than in Alaska, was still a problem, historically. Canada allowed fishing by foreign vessels until 1979. From 1979 to the present, only Canadian domestic vessels have prosecuted the fishery, with the exception of a joint venture operation using midwater trawls for Pacific whiting (*Merluccius productus*). Halibut bycatch mortality in the trawl fishery has been relatively stable, averaging 1.6 million pounds annually during 1990 to 1995.

Until 1995, virtually no regulations were in place to control bycatch. A small voluntary observer program had operated for several years providing the groundfish versus halibut ratio in observed catches by species, area, and season. These estimates were combined with total groundfish catch estimates to produce estimates of halibut bycatch. Then, in 1995, the DFO initiated a staged reduction of trawl bycatch mortality by first implementing mortality limits. The goal was to reduce halibut bycatch mortality to 1 million pounds (454 metric tons) by 1997.

In 1996, DFO implemented a ground-breaking system of individual vessel bycatch quotas (IVBQ), along with a 100% mandatory observer program for trawl vessels in all major groundfish fishing areas. The IVBQ system made individual fishers responsible for their own bycatch, thus providing incentive to keep it minimal. Fishers made dramatic changes to fishing operations, primarily through reduced towing time, improved handling of discarded fish, and increased area/time/depth selectivity by the trawl fleet. Other measures not directly targeted to halibut also had an effect, such as increased trawl mesh size, delayed openings, time/area closures originally directed at reducing crab bycatch, and a season-long closure of Pacific cod due to conservation concerns. In the end, Canada reduced its halibut bycatch mortality from 1.5 million pounds (680 metric tons) in 1995 to about 307,000 pounds (139 metric tons) in 1996, well below the 1997 goal. There are plans for the future to expand the program to other gear types.

Commission Organization

COMMISSIONERS

The Governor General of Canada and the President of the United States each appoint three commissioners who serve without remuneration. The commissioners appoint the Director who supervises the scientific staff, which collects and analyzes statistical and biological data needed to manage the halibut fishery. The commissioners annually review the regulatory proposals made by the scientific staff and consider proposals from the industry, the Conference Board, and the Processor Advisory Group. The regulatory measures adopted by the Commission are submitted to the two governments for approval and fishers of both nations are required to observe the approved regulations.

The average tenure of the commissioners since 1924 has been nine years, and the longest serving member thus far served for 24 years. The length of service and the overlapping terms of the members has had a stabilizing influence on the Commission and the management of the resource.

In recent years, one commissioner from each country has been an employee of the federal fisheries agency, one a fisher, and one either a buyer or processor. The chairmanship of the Commission alternates annually between countries. Initially, most of the Commission meetings were held in Seattle. Later a system was devised to hold every third meeting in either Canada or Alaska. In 1972, a policy was adopted to alternate the Annual Meetings between Canada and the U.S.

Commissioners conducting a public session at the 1998 Annual Meeting held in Anchorage, Alaska. *From left to right*: Andrew Scalzi, Ralph Hoard, Steven Pennoyer, Richard Beamish, Gregg Best, Rodney Pierce.

SCIENTIFIC ADVISORS

Each country appoints one scientific advisor who becomes involved in the more technical aspects of Commission research. This advisor has a scientific background and offers advice to the staff and guidance to the commissioners. These appointees generally work for the governmental fishery science and management agency in their respective country, becoming involved with Commission issues on a part-time basis. They receive no monetary compensation directly from the Commission for their services.

STAFF

The Commission staff of Canadian and U.S. employees consisted of four biologists and four supporting personnel in 1925. At present, the permanent staff consists of the Director, Assistant Director, nine biologists, three population assessment specialists, three computer support staff, and five administrative and support personnel. Fifteen are U.S. citizens and seven are Canadian. The staff is supervised by the Director who is responsible to the Commission for its research, regulatory, and administrative functions. The Commission headquarters have been on the campus of the University of Washington in Seattle since 1924 except for five years (1931-1936) when the staff was housed in a laboratory of the U.S. Bureau of Fisheries.

Several temporary employees currently work on a semi-permanent basis in the office. In addition, seasonal-temporary employees are engaged to collect data on the landings and the fishery, and to participate in vessel research. Temporary staff members live in the ports of Seattle, Vancouver, Port Hardy, Prince Rupert, Petersburg, Sitka, Hoonah, Seward, Homer, Kodiak, and Dutch Harbor at least 8 months out of the year to sample the commercial catch as it is landed.

ADMINISTRATION

The Convention specifies that expenses of the Commission are to be shared equally by the two governments. The Director submits a budget to the commissioners who approve and forward it to the Canadian DFO and to the U.S. State Department. The Commission budget in fiscal year 1924/1925 was $20,000(US). The combined Canadian and United States appropriations for fiscal year 1996/1997 were $1.6 million(US). Historically, the majority of appropriated funds has been used to cover staff salaries and research. Currently, funding for research is obtained primarily from selling fish which is caught and sampled during the IPHC stock assessment setline surveys.

Until the 1970s, all billings and salaries were paid by the Canadian government in Ottawa. Then, the United States government was billed and reimbursed Canada for one-half these payments. In 1971, the IPHC petitioned the governments for its own financial regulations. This request was approved and the Commission adopted its own fiscal year; thereafter, appropriated funds were deposited in a Commission account and billings were paid directly by the IPHC.

For the most part, the administrative policies and salaries are consistent with those of the U.S. Civil Service. The Commission has a pension plan under the auspices of the International Fisheries Commission's Pension Society.

Conventions and Treaties

The International Pacific Halibut Commission, originally called the International Fisheries Commission, was established in 1923 by a Convention between Canada and the United States. The abundance of halibut had been declining and industry representatives requested international control. The Convention was the first international agreement for joint management of a marine fishery and has been revised several times to extend the Commission's authority and to meet new conditions in the fishery.

This section presents a brief review of the several revisions of the Halibut Convention (Treaty) and other treaties relating to halibut.

THE HALIBUT CONVENTION OF 1923

Initial efforts to consummate a treaty in 1919 were unsuccessful, but the halibut industry persisted in advocating international control. In 1922, another convention was drafted that excluded sensitive provisions of port-use and tariffs, and Canada and the United States signed the Convention for the Preservation of the Halibut Fishery of the Northern Pacific Ocean on March 2, 1923. In the past, Canada and Great Britain both signed treaties that involved Canada, but Canada contended that it alone should sign the Halibut Convention because it dealt with domestic matters. Great Britain preferred to retain this right but finally agreed that the government of Canada could sign on behalf of His Majesty. This symbolic act was a first for Canada as a member of the British Commonwealth and for other Commonwealth nations of the British Empire.

The Convention went into effect on exchange of ratifications on October 23, 1924. It provided for a 3-month closed season during the winter and for regulations concerning halibut caught incidentally during the closed season. The Convention also created an International Fisheries Commission of four members. Each country was to pay the expenses of its two Commissioners, but expenses of the Commission and its staff were to be shared equally by the contracting parties. The Commission was charged with studying the life history of halibut and with recommending regulations for the preservation and development of the fishery.

THE HALIBUT CONVENTION OF 1930

In 1928, the Commission reported that the closed season alone could not protect the resource and requested authority to institute other conservation measures. A new Convention was signed in 1930 and ratified on May 9, 1931. The 1930 Convention empowered the Commission to establish regulatory areas, to limit the halibut catch from each area, to regulate the licensing and departure of vessels for halibut fishing, to collect statistics, to regulate the type of gear, and to prohibit fishing on nursery grounds where young fish are concentrated. Annual regulations were subject to the approval of the Governor General of Canada and the President of the United States. Enforcement of regulations was the responsibility of the individual governments. To provide an industry forum for the discussion of regulatory proposals, the Commission established a Conference Board of fishers and vessel owners on May 27, 1931.

THE HALIBUT CONVENTION OF 1937

As the catch increased, more vessels entered the fishery and the catch limits were taken more rapidly. The 1937 Convention permitted more effective control of vessels catching halibut incidentally while fishing for other species during the closed season.

THE HALIBUT CONVENTION OF 1953

The trend toward shorter fishing seasons continued and, by the end of World War II, fishing was concentrated on certain segments of the stock. Treaty changes were recommended by IPHC in 1946 to permit multiple seasons within a fishing area, but the new Convention was not signed until March 2, 1953, on the 30th anniversary of the signing of the first Halibut Convention. On exchange of ratifications, the new convention became effective on October 28, 1953.

The 1953 Convention contained several important changes. Multiple seasons were permitted to distribute fishing effort in accordance with seasonal availability of different stocks, the number of Commissioners was increased from four to six, three from each country, and the International Fisheries Commission was renamed the International Pacific Halibut Commission. In addition, the Commission was charged with developing and maintaining halibut stocks at a level which would permit the maximum sustainable yield. This directive was implied in earlier conventions but had not been explicitly stated.

In 1969, to expedite the approval of regulations in the United States, the presidential authority was delegated to the Secretary of State who was to consult with the Secretary of the Interior (now the Secretary of Commerce).

THE 1979 PROTOCOL TO THE HALIBUT CONVENTION OF 1953

The U.S. Magnuson Fisheries Conservation and Management Act of 1976 required renegotiation of all international fisheries treaties. As a result, Canada and the United States negotiated an amendment to the 1953 Halibut Convention during 1978 and early 1979. The amendment, termed a "protocol," was signed by both countries on March 29, 1979. The Commission's mandate was altered somewhat from managing on the basis of maximum sustained yield to that of optimum yield. The Protocol called for a two-year phase-out of reciprocal fishing privileges between the two countries and also required that 60 percent of the catch in Area 2 be taken in Canadian waters (Area 2B) and 40 percent in U.S. waters until 1981 (paragraph 3 of the Annex to the Protocol).

The amendment further stated that:

"By January 1, 1981, and thereafter as it considers appropriate, the Commission shall, on the basis of a review of pertinent information, recommend for the approval of the Parties any appropriate changes in the division of the annual total allowable catch set forth in paragraph 3 of this Annex. No such changes may take effect before April 1, 1981."

The required 60/40 division of the Area 2 catch had as its basis the average long term productivity of the stocks in the two areas. However, a fixed harvest ratio between areas presented management problems. Since the signing of the amendment in 1979, the distribution of the stocks in Area 2 departed from the long term average.

Southeast Alaska stocks became disproportionately more abundant than those in British Columbia. In 1985, the Commission recommended to the governments of both countries a departure from the 60/40 requirement and adopted a harvest strategy which takes a constant proportion of the exploitable biomass in each region. The resolution further stipulated that the catch will be optimized until such time that the stock returns to its long term average condition of a 60/40 proportion.

The U.S. required further legislation to give effect to the Protocol. However, no legislation was required in Canada.

NORTHERN PACIFIC HALIBUT ACT OF 1982

In the spring of 1982, the United States passed the necessary legislation to give effect to the 1979 protocol and to repeal the previous enabling legislation; the amended Northern Pacific Halibut Act of 1937. The Act provided for representation on the commission, for funding and enforcement and discussed the role of the regional fishery management councils. The councils were granted the authority to develop limited access regulations.

The NPFMC (the regional council for Alaska) passed regulations for an individual fishing quota system in 1994, which was implemented in 1995. Entry into the U.S. west coast fishery is still unrestricted as of 1997.

RECIPROCAL PORT PRIVILEGES

In 1897, Canada granted special port privileges to a United States firm, the New England Fish Company, that had established an office in Vancouver, British Columbia. Vessels owned by the company were permitted to land halibut and take on supplies in Vancouver. These privileges were renewed in subsequent years and in 1915 were extended to all United States flag vessels and included the port of Prince Rupert. This unilateral action was renewed each year by an Order-in-Council in Canada. In 1918, the United States reciprocated and permitted Canadian vessels to land and outfit in the United States.

In 1950, Canada and the United States signed a Convention for the Extension of Port Privileges to Halibut Fishing Vessels on the Pacific Coasts of the United States of America and Canada. The express purpose of this Convention was “to further the well-being” of halibut fishers and to permit landings without payment of duty other than that required by the customs agency. Fishers could trans-ship or sell their catch in bond for export and could obtain supplies, repairs, and equipment. The convention specifies that vessels of one country landing in a port of the other country shall comply “with applicable customs, navigation, and fisheries laws” of the host country. The agreement includes sablefish as well as halibut.

INTERNATIONAL NORTH PACIFIC FISHERIES COMMISSION

A convention was signed in 1952 and entered into force on June 12, 1953, which established the International North Pacific Fisheries Commission (INPFC). Canada, Japan, and the United States were members. This convention, like that for the preservation of halibut, was to “ensure the maximum sustained productivity of the fishery resources of the North Pacific.”

Included in the Annex of the Convention is an abstention provision under which member countries agreed to abstain from fishing specific stocks of fully utilized fish in waters of another country. Japan agreed to abstain from fishing halibut along the coast of North America, and the fishery east of 175 degrees W longitude remained under the jurisdiction of the IPHC. In 1962, the INPFC decided that the halibut in the Bering Sea east of 175 degrees W longitude no longer qualified for abstention, thereby allowing Japan to begin a directed fishery for halibut in 1963. This change was an unpopular decision among North American halibut fishers and was labeled "the Bering Sea halibut giveaway" by critics. After this decision, the condition of the halibut stocks in the eastern Bering Sea was reviewed and conservation measures were recommended annually by both the IPHC and the INPFC for adoption by the respective governments. Although Japan discontinued fishing after 1967, this procedure was followed until 1977 when Canada and the United States extended their fisheries jurisdiction, obviating the authority of the INPFC relative to halibut.

Industry Organizations

A number of organizations have been formed by people in the halibut industry to promote their respective interests. Some of these organizations have been in existence for several decades and represent hundreds of members. These organizations not only provide many services to their members, but also have contributed substantially to the management of the halibut fishery.

CONFERENCE BOARD

The Conference Board is an IPHC advisory panel representing Canadian and United States commercial and sport halibut fishers. The Board was created by the Commission in 1931 to obtain recommendations from the fishing fleet on conservation measures. Its members are designated by union and vessel owner organizations throughout the halibut range.

Following staff presentations and proposals at the IPHC Annual Meeting, the Board meets simultaneously with the Commission to discuss the proposals. Their recommendations are then presented to the Commission for consideration. In addition, three representatives of the Board from each country are invited to attend Commission interim meetings.

PROCESSOR ADVISORY GROUP

The Processor Advisory Group (PAG) is a recently formed advisory panel consisting exclusively of processors from both the United States and Canada. The group was formed in 1996 and although membership varies, a total of 15 processors were represented at the 1997 Annual Meeting. The Commission hears the PAG recommendations as well as the Conference Board recommendations at the Annual Meeting before setting regulations for the coming year.

FISHING UNIONS

Many halibut fishers are active union members. Some unions represent only halibut fishers, others represent members from several fisheries, and at least one also represents shore workers at fish processing plants. One of the primary functions of the unions is to negotiate financial arrangements for the fishers, particularly the share agreement of the net proceeds from the sale of the fish. The unions frequently maintain funds for the welfare of their members and may assist their members in filing tax returns. Fishing unions are interested in preventing accidents at sea and encourage the use of navigational and life saving equipment on vessels. Union and vessel owner associations jointly have adopted gear maintenance standards. The degree of union organization varies from port to port and tends to be stronger among the fishers who work on the larger vessels and who fish out of larger ports.

FISHING VESSEL OWNER'S ASSOCIATIONS

Many owners of halibut vessels belong to associations which provide a number of useful functions for their members. Some of the associations maintain an insurance pool and provide coverage for accidental loss of the fish catch, a type of insurance usually not offered by commercial companies. Many associations assist their members with tax returns and other accounting services. They may also participate in price negotiations on behalf of their members and in labor negotiations with fishing unions. Association spokespersons provide information to executive and legislative branches of the government and participate in national and international meetings.

HALIBUT ASSOCIATION OF NORTH AMERICA

Many of the fish processing companies that buy and sell halibut in Canada and the United States belong to this organization. Current membership includes 24 companies; 20 from the U.S., and 4 from Canada. The Association maintains a fund for promoting sales of halibut and works to maintain standards that provide a high quality product for the consumer. The Association frequently consults with the IPHC staff and commissioners on matters concerning the management of the fishery by retaining membership in the Commission's Processor Advisory Group.

Commission Publications 1930-1997

The IPHC publishes three serial publications - Annual Reports, Scientific reports , and Technical reports - and also prepares and distributes regulation pamphlets and information bulletins. A list of all Commission publications is shown on the following pages. Commission materials are available upon request free of charge.

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9. Laboratory observations on early development of the Pacific halibut. C.R. Forrester and D.G. Alderdice. 13 p. (1973).
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30. A Bibliography on Atlantic halibut (*Hippoglossus hippoglossus*) and Pacific halibut (*Hippoglossus stenolepis*) culture, with abstracts. Robert R. Stickney and Damon Seawright. 36 p. (1993).
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32. Changes in commercial catch sampling and age determination procedures for Pacific halibut 1982 to 1993. Heather L. Gilroy, Joan E. Forsberg, and William G. Clark. 44 p. (1995).
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