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Fisheries and Oceans
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Underwater World

Atlantic Halibut



Canada

Atlantic Halibut

While halibut is now the most highly prized flatfish in the northwest Atlantic, there was a time when it was in low demand and even considered a nuisance fish.

In 1634, an author by the name of Woode wrote: "*the plenty of better fish makes them [the halibut] of little esteem, except the head and finnes, which stewed or baked is very good; these halibuts be little set by when basse is in season.*"

Prior to the early part of the 19th century, halibut were very abundant in some areas of the northwest Atlantic. In these places the fishermen would often string all the halibut they had caught on a line and hang them over the stern to prevent them from stealing the bait from their hooks. The fish were usually thrown away when the vessel left for home.

However, the situation changed between 1820 and 1825 when a demand for halibut developed on the Boston market. Catch rates today average about 2,000 metric tons (t) per year.

General Description

The Atlantic halibut (*Hippoglossus hippoglossus*) is the largest of the flatfish, growing to a length of 2.5 meters and a weight exceeding 300 kilograms (Fig. 1). The halibut belongs to the family Pleuronectidae whose members usually have both eyes on the right side of their bodies with the left side being totally blind. They are strongly compressed (flattened from side to side) and swim with the left side facing the bot-

tom and the right or eyed side facing the surface. The halibut's coloration, which occurs only on the eyed side of the body, varies from greenish brown to very dark chestnut brown. The blind side is usually white in young fish but becomes mottled with grey or even cherry red in older, larger fish. The mouth has a very large gape extending to the midline of the eyes and is armed with numerous sharp curved teeth. Apart from its size, the Atlantic halibut can be distinguished from most other species of flatfish by its concave tail. The only other northwest Atlantic species to share this feature is the turbot (*Reinhardtius hippoglossoides*); however, the turbot has a straighter lateral line, a larger mouth, and stronger teeth. A very closely related species, the Pacific halibut (*Hippoglossus stenolepis*), occurs along the northwest coast of North America from southern California northwards to the Bering Sea, to the northeast of Sakhalin Island (USSR), the Okhotsk Sea, and north of northeastern Japan.

Distribution and Movements

Along the eastern coast of North America, the Atlantic halibut occurs from as far south as the waters off Virginia and New Jersey to its northern limit at the latitude of Disko Bay, Greenland, several degrees inside the Arctic circle. The numbers of specimens observed at these extreme latitudes are small and probably represent only a few stray fish. Most halibut are found between these limits, with notable concentrations occurring along the edges of Georges Bank, Sable Island Bank, Banquereau Bank, Grand Bank, the Flemish Cap, and Anticosti Island. Inshore concentrations are known to occur off Cape Sable Island (Nova Scotia), around Grand Manan Island in the mouth of the Bay of Fundy, and even in the Minas Basin at the head of the Bay of Fundy.

In the northeastern Atlantic, halibut occur from the Bay of Biscay in the south to as far north as Spitsbergen, Bear Island, and the Barents Sea. In these waters the richest halibut grounds are found around the Faroe Islands, the southwest coast of Iceland and in the cold waters off the coast of Norway.

Fig 1. Atlantic Halibut (*Hippoglossus hippoglossus*)

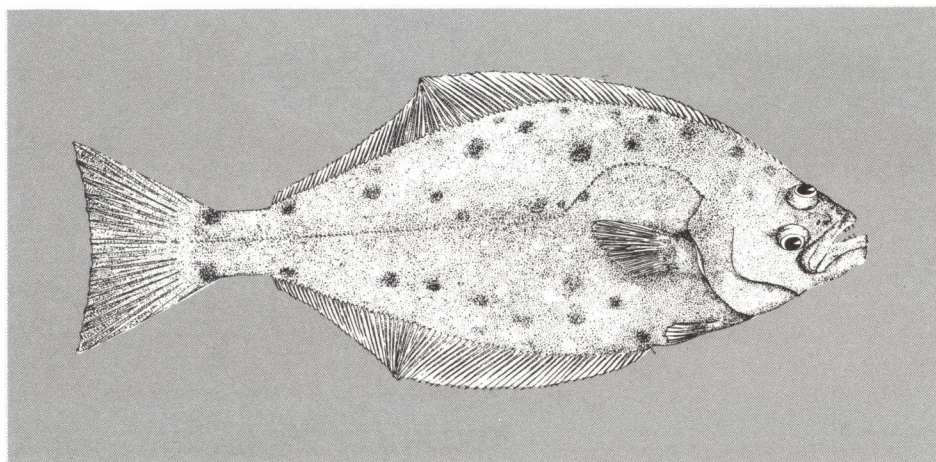
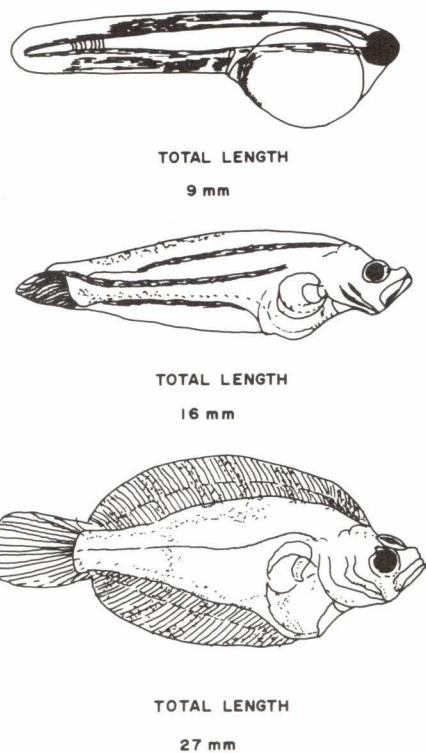


Fig 2. Larvae of the Atlantic halibut (after figures from Schmidt, T. 1904. *On pelagic post-larval halibut* (*Hippoglossus vulgaris* [Walbaum]). *Medd. Komm. Havunders. Ser. Fish.* 1(3): 1-13).



Investigations carried out in the northwest Atlantic indicate that halibut spend the winter months in deeper water and move to shallower waters during the summer. Studies carried out in the 1950s around Anticosti Island (Gulf of St. Lawrence) and in the waters off southwestern Nova Scotia found halibut to be more numerous in deep waters during the winter, with numbers increasing in shallow waters during the summer. Two fisheries research cruises, carried out in the deep waters along the edge of the Scotian Shelf in March and November of 1982, corroborate these earlier results. During the spring cruise, halibut were caught in far greater numbers than during the late fall cruise. These results again indicate that halibut move into and out of these deep waters on a seasonal basis. European investigations show similar migrations of halibut occurring in the northeastern Atlantic. Here the fish move into the deep fjords (300 to 700 m) with the approach of winter. There is some evidence to suggest that fish which spend the summer months in the North Sea, Barents Sea, and Bear Island area migrate into the deep fjords off the coast of Norway during the winter.

At all times of the year on both sides of the Atlantic, halibut prefer to inhabit areas of relatively hard bottom made up of rock, sand, clay, or gravel. They have been found in water ranging from less than 1°C to water as warm as 15°C but seem to prefer temperatures ranging

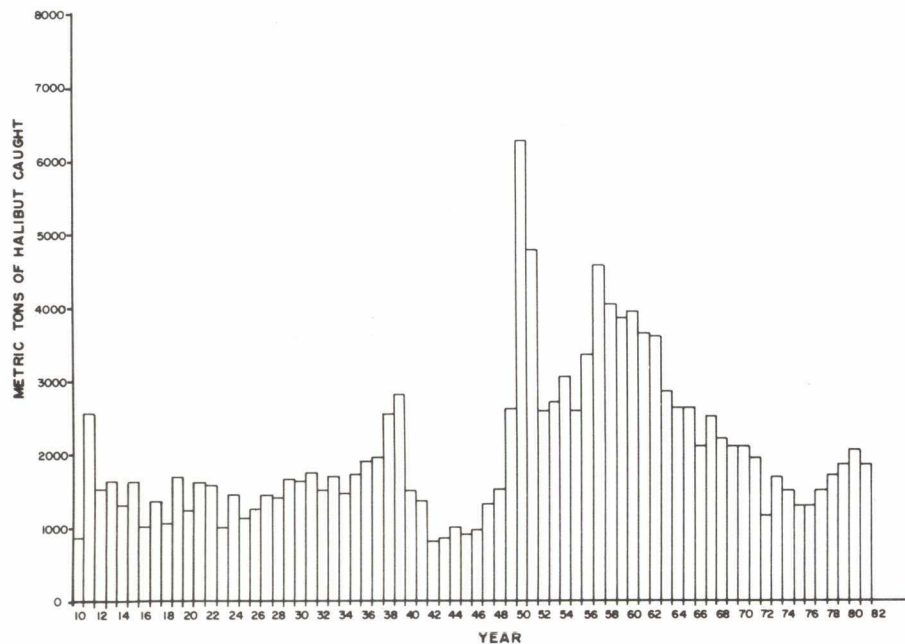
between 3°C and 9°C. Halibut which have been tagged, released, and subsequently recaptured indicate that they are capable of moving great distances. In several experiments, moves of 800 km occurred frequently; however, the record goes to a halibut tagged on June 24, 1946 near Anticosti Island. This fish was recaptured seven years later, on December 1, 1953 on the west coast of Iceland, after having travelled a distance of over 2,500 km.

Life History

Halibut spawn between February and May in water ranging from 700 to 1000 meters deep over bottom consisting of clay or soft mud. These depths and bottom types are usually found on the deep water edges of banks, the continental slopes, and in some fjords. Large mature females may release several million eggs during the spawning season. Estimates of fecundity (egg production) are not numerous but there are reports of a 91 kg female carrying more than 2 million eggs. The unfertilized eggs are 3 to 4 millimeters in diameter, pink, and contain a colourless yolk. When the eggs are fertilized they become slightly larger but retain the same general appearance. Actual details of spawning behaviour have not been observed. The fertilized and developing eggs float freely in the water and are most commonly encountered at depths of 300 to 400 m, although they have been collected from waters as shallow as 50 m and as deep as 700 m.

The eggs hatch in approximately 16 days (at an incubation temperature of 6°C) giving rise to larvae (newly hatched fish) which are between 6 and 7 mm long. As the larvae develop, they appear to move in a shoreward direction, with the eggs and smallest larvae found over depths of 400 to 1,600 meters and the larger larvae over the banks. At hatching, the larvae possess a very large yolk sac which provides them with a source of food until they begin feeding (Fig. 2). During this period, the larvae are colourless. The first structures to become pigmented are the eyes, usually when the fish reach a length of about 10 mm. Depending on the water temperature, the mouth does not open until two to three weeks after hatching and does not become functional (able to

Fig 3. Catches of Atlantic halibut by Canadian fishermen from 1910-1981. (Data from International Commission of the Northwest Atlantic Fisheries Statistical Bulletins.)



open and close) until a week or so later. Consequently, halibut larvae are not capable of feeding until they are four to five weeks old. All during this period they must rely solely on their stored yolk for food. Following this initial period of larval growth they begin feeding on small planktonic organisms.

Until the larvae are 16 to 20 mm long they are quite similar to the larvae of most other marine fish, that is, they swim with their bellies toward the bottom and have one eye on each side of their heads. At this point, however, the left eye begins to move over the top of the head towards the right side. This movement continues until the eye is completely relocated on the right side of the head, when the larvae are about 44 mm long. During this time of eye relocation, body pigmentation increases and also becomes more and more restricted to the right side of the body. When juveniles reach lengths of 50 mm or more, they appear to adopt the bottom-dwelling existence of the adult fish, swimming with their unpigmented blind side toward the bottom and the coloured, eyed side facing the surface. After they settle to the bottom they begin a slow migration from the shallow waters of the banks to the deeper waters of the continental slopes or fjords.

From the time they settle close to the bottom until they reach sexual maturity, halibut grow from less than 10 cm to lengths of about 1 m. During this period of relatively rapid growth they are known to go through several distinct

feeding phases. Fish up to 30 cm feed almost exclusively on worms and crustaceans. From there until they reach approximately 80 cm in length their diet is a mixture of invertebrates and fish. Halibut larger than 80 cm feed almost exclusively on other fish, including redfish, cod, haddock, and lumpfish. The types of fish consumed are probably related to season since they are known to inhabit different depths of water in different seasons. In Canadian waters, female halibut mature at lengths of 70 to 115 cm while males mature at 66-100 cm. These lengths correspond to ages of approximately 10 to 12 years for females and seven to 11 years for males.

History of the Fishery

Before the end of the 19th century the Atlantic halibut was not held in high esteem as a food fish by Canadian fishermen. Its exploitation prior to this time was carried out primarily by fishermen from the United States and even there it was not a popular food fish until the first quarter of the 19th century.

In response to the demand from the Boston market in the early 1820s, fishing for halibut began in earnest in the Massachusetts Bay – Cape Cod area. This fishery initially had very high catch rates, but by the 1830s the numbers of halibut caught in these areas declined rapidly. The 1830s thus saw the beginnings of the offshore halibut fishery which initially exploited Georges Bank and the Nantucket shoals until catches there began to dwindle in the 1850s. From there the fishery spread into Canadian waters, initially utilizing areas around Browns Bank and gradually moving into other areas. By the 1860s halibut fishermen from ports in the United States and Canada were fishing on various banks of the Scotian Shelf, the Grand Banks off Newfoundland, and the west Greenland Banks. In the 1870s halibut fishing was carried to the Gulf of St. Lawrence, particularly to the waters around the Magdalene Islands, and moved to Anticosti by the 1880s. By this time the fishery had also moved as far afield as Iceland.

Fig 4. Hauling and clubbing a large halibut by two dory men fishing off the schooner "Albert J. Lutz" in the Gulf of St. Lawrence. (From the Wallace collection, courtesy Maritime Museum of the Atlantic.)





Fig 5. Halibut in pens on the deck of the schooner "Albert J. Lutz" fishing in the Gulf of St. Lawrence 1913. (From the Wallace collection courtesy Maritime Museum of the Atlantic.)

These very early years of Canadian involvement in the halibut fishery are not well documented but records are available from the early 1900s to the present. Since 1910, catches of halibut by Canadian fishermen have averaged approximately 2,000 t per year (Fig. 3). During the 1940s these catches declined as a result of reduced effort. Some investigators think that this lull in the fishery allowed the stocks to rebuild, resulting in the high catches during the early 1950s. Since then, catches have declined to a point now where they are again equal to the historical average of approximately 2,000 t per year.

Methods of the Halibut Fishery

During the early years of the fishery, halibut were fished in relatively shallow waters (40 to 135 meters) using hand-lines. The lines were equipped with a single hook, weights to take it to the bottom, and baited with strips of herring, haddock or cod. Haddock was thought to be the best bait. The lines, fished over the side of the vessel, would be played along or just above the bottom in an attempt to make the thin strips of bait look like live fish. Some fishermen, who have observed halibut taking the bait while fishing in shallow water, report that when a halibut finds the bait it often retreats a short distance and appears to watch the bait before making

a lunge and swallowing it. Making the bait move was said to induce the fish to strike. Once the halibut was hooked it was often a difficult time to get it into the boat, with many fish breaking free. There is a report of one fisherman who hooked a large halibut and, after a long struggle, managed to bring the fish to the side of his boat. He thought that following such a lengthy battle, the fish would be exhausted enough to be gaffed and pulled aboard; however, when the fish was gaffed it moved with such strength that the gaff was pulled from the fisherman's hands and the combat began anew. When the fish was brought to the boat a second time (without the gaff) he used the hooks of his spare anchor to try to lift the fish. Again the fish lunged and tore the anchor out of his hands. This time the fish broke the line and escaped. From this account it is understandable that fishermen usually club the fish before pulling them aboard (Figure 4).

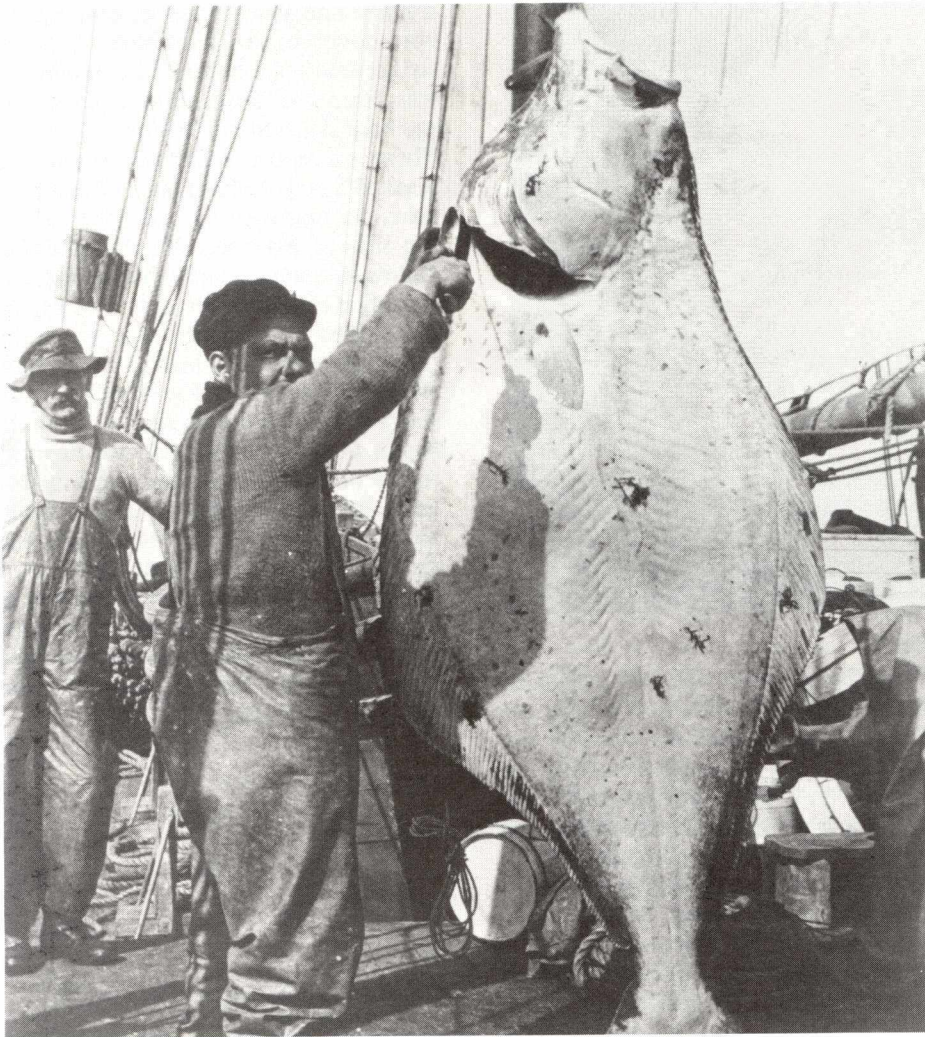


Fig 6. Dressing a large halibut (estimated weight about 150 kg.) aboard the schooner "Albert J. Lutz" fishing in the vicinity of Anticosti Island. (From the Wallace collection courtesy Maritime Museum of the Atlantic.)

When the halibut fishery became a more profitable venture, the handline method was replaced by longlining, the latter being a more efficient method of catching halibut. The basic method of halibut longlining has not changed much since its inception in the 1840s and 50s. The longline consists of a heavy groundline with slightly lighter sidelines or "gangings" (pronounced gainjings) attached at intervals of several meters. Each ganging is equipped with a large halibut hook and strips of bait. The baited gangings are either permanently attached to the groundline or clipped to swivels in the groundline as it is set out to fish. The entire longline, which consists of several sections, may be a mile or more long. When it is set out, each end is anchored and a marker buoy is

attached to one end. After the line has fished for several hours (or even days depending on the weather) the anchor at the marked end is lifted and the line hauled up. During the 1800s and early 1900s the setting and hauling of longlines was done by two men fishing in small dories away from the mother vessel and was done by hand. Each fish was hauled up from the bottom, often with a considerable struggle, dispatched with a killing club and stowed in the bottom of the dory. Considering that by the 1870s the fishery had moved to deeper (300 to 500 meters) offshore waters, one can appreciate the hard work involved in halibut fishing. When the fish were brought aboard the mother vessel, they were stored on deck in pens until they could be cleaned and put in the holds with ice (Fig. 5). Cleaning the fish consisted of removing the gills and internal organs, scrubbing out the body cavity with a specially designed broom, and filling it with crushed ice before storage below deck (Fig. 6). When the holds were filled to capacity, the vessels would run for port in an attempt to be the first vessel to unload its fish on the market. The reason for this is that the first vessels to land usually got the highest prices for their catch because there were enough buyers available. Vessels arriving later often found their fish in short demand due to the glut of fish landed by previous vessels. When the fish were landed they were removed from the holds using block and tackle arrangements, weighed, and graded according to size (Fig. 7). Next the heads were removed and each grade of fish was packed in wooden crates with ice and shipped to the various markets.

Present day longliners are equipped with machinery which reduces the amount of labour involved in setting and hauling the lines. Hydraulic winches have taken the place of muscles to haul the fish from the bottom and more durable and stronger synthetic materials have replaced the manila lines. However, the number of longliners now employed in a directed halibut fishery has dwindled. Only a small number of these vessels hailing from a few ports in the Maritimes actively pursue this fishery. Many halibut are now taken as by-

catch by vessels fishing with towed nets (otter trawls) for other species. There is concern among fishermen that these net fisheries are catching many small immature fish thus reducing the reproductive potential of the halibut stocks. Given that halibut is now the most highly prized flatfish in the northwest Atlantic, this is a real concern. At present there is no directed management scheme for the Canadian northwest Atlantic halibut stock. It is managed under the general category of flatfish which includes a number of different species for which one total allowable catch is determined each year. There are no restrictions on the size of halibut landed.

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Fig 7. Unloading a catch of halibut from the schooner "Jean and Shirley", skippered by Captain N. Wharton, at Lunenburg Sea Products Ltd., Lunenburg, Nova Scotia. (From the Wallace collection courtesy Maritime Museum of the Atlantic.)



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