

Atlantic Halibut

Hippoglossus hippoglossus (Linnaeus) 1758
[Jordan and Evermann, 1896-1900, p. 2661.]

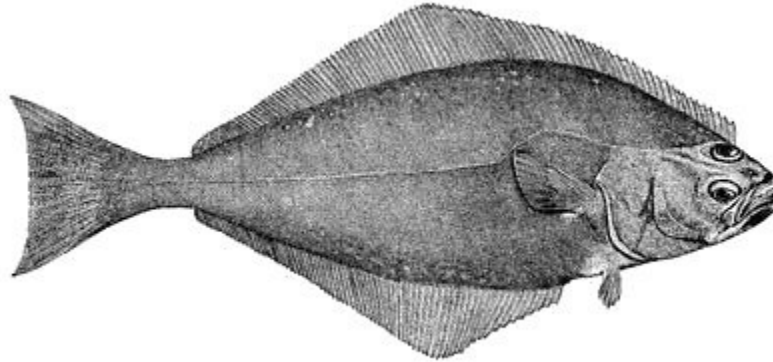


Figure 123 - Atlantic halibut (*Hippoglossus hippoglossus*),
Eastport, Maine. From Goode. Drawing by H. L. Todd.

Description

This is not only the largest of flatfishes, but is one of the best characterized; its most obvious distinctive characters, apart from its size, being the fact that it lies on the left side;[21] that its mouth gapes back as far as the eyes, and is armed with sharp curved teeth; that the rear edge of its tail fin is concave, not rounded; that its two ventral fins are alike; and that its lateral line is arched abreast of the pectoral fin. Furthermore it is a narrower fish, relatively, than most of our flatfishes (only about one-third as broad as it is long) but is very thick through, and its eyes are farther apart than they are in most of the other flounders.

The dorsal (long) fin (98 to 105 rays) commences abreast of the eye and runs back the whole length of the fish, broadening but slightly for the first third of its length and then abruptly, to narrow again toward the caudal peduncle. The anal fin is similar to the dorsal fin in shape but is shorter (73 to 79 rays), originates close behind the pectorals, and is preceded by a sharp spinelike extension of the post-abdominal bone, which projects in young fish but is hidden by the skin in old fish. The two pectoral fins are of different shapes, the one on the upper (eyed) side of the fish being obliquely pointed while the fin on the lower side is rounded. The rather small ventral fins, which are situated in front of the pectorals and are separated from the anal by a considerable space, are alike. Halibut, like other flatfishes are scaly on the whole head and body and they are very slimy with mucus.

Color

The halibut is chocolate to olive or slaty brown on the eyed (upper) side. Young fish are paler, and are more or less mottled, while large ones are more uniform and darker, sometimes almost black. The blind (lower) side usually is pure white in small fish, but large ones are often more or less blotched or clouded below with gray (known by fishermen as "grays"). Occasionally a halibut is taken the blind side of which is marked with patches of the same color as the eyed side. And we have seen one medium-sized fish in which the rear third of the lower surface was uniform dark brown.

Size

Only swordfish, tuna, and some of the larger sharks reach a greater size than the halibut, among Gulf of Maine fishes for while reports of specimens as large as 600 to 700 pounds have usually been looked on as exaggerations we are glad to be able to give at least one record of a Gulf of Maine halibut in this weight class. The [page 250] fish in question was taken in June 1917, by Capt. A. S. Ree, about 50 miles eastnortheast of Cape Ann, and since it weighed 615 pounds, eviscerated with the head still attached, when brought in to the Boston fish pier, it must have been as heavy as 700 pounds while alive.[22] Another halibut of 602 pounds is said to have been taken near Isle au Haut in 1902, but we cannot vouch for this one.

Halibut of 500 to 600 pounds are rumored almost every year, but the next largest of which we have definite knowledge was one of about 450 pounds caught on a hand line in the deep water between Browns and Georges Banks in 1908 by W. F. Clapp. Goode[23] likewise had records of a dozen fish of 350 to 400 pounds caught off the New England coast; the heaviest was one of 401 pounds taken near Race Point, Cape Cod, in July 1849. But a 410-pound halibut that was brought in to the Boston fish pier by the Dawn, March 27, 1941,[24] was spoken of as the largest that had been landed there in a "score of years," and it seems that halibut heavier than 300 pounds always were rarities anywhere in the North Atlantic.

Full-grown females average about 100 to 150 pounds. Males run smaller, and most of the "large" fish landed in New England ports weigh from 50 to 200 pounds. The largest we have caught, taken on Browns Bank, weighed exactly 100 pounds and was 5 feet long. Halibut between 7 and 8 feet long usually weigh 300 to 350 pounds, and the following table based on Icelandic fish measured by Jespersen,[25] and others from the Gulf of Maine, give the relationship of length to weight for the smaller sizes.

Iceland		Gulf of Maine	
Length in inches	Weight in pounds	Length in inches	Weight in pounds
74	215	63	120 ^[1]
70	168	42½	30
61	107	42	33
54 to 56	60½	41½	27½
40 to 42	29	31	12
36	11 to 12	20	2¾
30	9½		
27	6½		
24	5½		

^[1]This fish weighed 98 pounds dressed, the intestines accounting for 15 pounds and the ovaries (with immature eggs) for 7 pounds.

Habits

The halibut, like all the flatfish tribe, is normally a ground fish, once the young fry have taken to bottom. But it comes to the surface on occasion (p. 257), and it is a very powerful fish, when hooked. Halibut caught in shallow water are very active, usually starting off at great speed when they are hauled up from the bottom, often spinning the dory around in their attempts to escape.[26] they are usually found on sand, gravel, or clay, not on soft mud or on rock bottom; 400-500 fathoms may be set as the lower boundary to their existence in any numbers,[27] but their absolute depth limit is not known.

The young halibut, like the young of so many other ground fishes, drift helplessly with the current for some months after hatching (just how long is not known); not at the surface, however, but in the mid-depths (p. 253). During this period they tend both to rise in the water as they grow, and to be carried inshore, so that when they finally take to the bottom they do so in quite shallow water (p. 254). But the fry as a whole tend to work offshore again thereafter, and deeper, so that halibut caught in deep water are larger than those caught in shallow water. This fact was noticed early on Georges Bank, where most of the fish taken on the bank in depths of 30 to 40 fathoms or less ran from 125 to 180 pounds, whereas much larger ones were caught on the deeper slope to the southeast. Fishermen have also reported catching smaller fish on the inner ends of long lines set from shoal water out into deep, and larger fish on the outer ends.[28] And this rule holds equally for the other side of the Atlantic.

The halibut is a boreal, not an arctic fish, in its relationship to temperature. Thus, large catches are (and were) made only at times and places where the water is at least as warm as 36°-38° F. (about 3° C.). In the Grand Banks region, for instance, halibut are mostly caught either far enough down the slope to be below the icy touch of the Labrador Current, or at times and places where the latter does not reach bottom, if the fish are on the bank. But the lower limit to the temperature range of the halibut is not sharp-cut. We do, in fact, find record of at least one halibut [page 251] trawled on the southern part of the Newfoundland Bank in bottom water as cold as 33° F. (0.6° C.), while others reported from Bay Bulls, on the east coast of Newfoundland and from Cut-throat Harbor on the outer coast of Labrador (p. 254) doubtless were in water equally cold.

At the opposite extreme, it has been found that only a few halibut are taken in the parts of the North Sea where the bottom water is warmer than 46°-47° (8° C.), none at all where it is warmer than 59° F. (15° C.). And there is no reason to suppose that halibut ever were plentiful anywhere in the western side of the Atlantic in temperatures much higher than about 46°-47°, for while the bottom water warms locally to 50°-52° on Georges Bank in summer, and to 52°-59° on Nantucket Shoals, it was only during the winter and spring that there ever was any regular fishing for halibut on either of these grounds.

On the other hand, the halibut that summer on banks where the bottom chills below about 36° in winter have been described repeatedly as withdrawing to deeper (i. e., to warmer) water for the coldest part of the year. Perhaps the best known example is off west Greenland. Here the halibut work in over the banks regularly in summer, from the deeper waters of Davis Strait, as the temperature rises, but work out again, and deeper, in autumn, as the water cools again.[29] Thus it was only deeper than 350 fathoms that long liners, fishing there in 1926-28[30] found halibut in paying quantities at the beginning of June, when the bottom temperature on the banks was about 33°-37°. But good catches were made as shoal as 200 fathoms by the middle of the month when the temperature had risen to 35°-38°. And there was good fishing as shoal as 70 fathoms by mid-July, when the banks had warmed to 37°-39°, though many of the halibut were in deeper water still.

Halibut have been described as shifting ground in the same way in the coastal belt of the Gulf of Maine (p. 257) from season to season. On the other hand, we suspect that halibut finding themselves in water shoaler than 30 fathoms or so in the southernmost part of the range of the species, on the American side, at the onset of summer may withdraw to slightly deeper water for the time being, but definite information is lacking.

The seasonal movement of halibut in onto the Greenland Banks as early in the summer as temperature allows seems to be in search of food, as Jensen points out, for a much richer supply of small fish is available to them on these shoaler bottoms than deeper down the Davis Strait slope, where they must depend chiefly on large shrimps (p. 252). And we suspect that the food supply is equally important in influencing the seasonal movements of halibut in our Gulf.[31]

If the prevalent view is correct, the Atlantic halibut resort to rather definite and circumscribed ground to spawn, much as the Pacific halibut do.

Halibut have also been credited with extensive wanderings from bank to bank, for no evident reason. And recent tagging experiments carried out off Nova Scotia by the Fisheries Research Board of Canada,[32] have proved that some of them certainly do so, in American waters. Thus fish that were marked on German and Browns Banks have been recaptured as far to the eastward as Western Bank and in the general vicinity of Sable Island, while one that was tagged at Anticosti was recaptured at Seven Islands more than 100 miles to the westward. But most of the recaptures were made within a few miles of the places where the fish had been tagged. And available evidence as to halibut migrations in the Gulf of Maine and in Nova Scotian waters is so contradictory, and so greatly complicated by the local effects of hard fishing, that it is not worthwhile to attempt any further discussion here.

Food

The halibut is very voracious, preying chiefly on other fishes, a long list of which have been reported from their stomachs, including cod, cusk, haddock, rosefish, sculpins, grenadiers, silver hake, herring, lance on which they often gorge in northern seas,[33] capelin, flounders of various sorts (these seem to be their main dependence), skates, wolffish, and mackerel. Halibut are also known to eat crabs, lobsters, clams, and mussels; [page 252] even sea birds have been found in them.[34] Fishermen have reported finding in halibut the heads and backbones of cod thrown overboard, and a variety of indigestible objects such as pieces of wood or iron, and even fragments of drift ice.

The diet of the halibut in any particular locality depends chiefly on what other ground fish are most easily available. Thus they are reported as feeding chiefly on flatfish on Georges Bank, but on cod, haddock, cusk, and sculpins on other grounds.

Halibut, like other flounders, must be nearly invisible as they lie on bottom, capturing any fish that passes within reach by a sudden rush. On one occasion a halibut of about 70 pounds was seen at the surface trying to kill a small cod with blows of its tail. "We hove out a dory and two men went in her taking with them a pair of gaff hooks. They soon returned bringing not only the halibut but the cod." [35] And halibut are very destructive to smaller fish. We read, indeed, of half a bushel of flatfish taken from one halibut. And fishermen said the appearance of a school of halibut soon drove away the cod and haddock, in the days when halibut were still plentiful on the shoaler banks.

It appears that halibut do not eat many invertebrates at least in the Gulf of Maine, or in Nova Scotian waters. But a case is on record when 6 lobsters, 6 inches long, were found in the stomach of one. And Jensen found that halibut caught in deep water off west Greenland had fed chiefly on large shrimps (*Pandalus borealis*).[36]

According to fishermen who have watched them in clear shallow water, "the halibut will advance to the bait . . . Then retreat 4 or 5 feet from it . . . after repeating this performance several times—generally three or four—the fish seems to make up its mind to eat the bait, and, suddenly darting toward it, swallows it down at a gulp." [37]

Halibut, in their own turn, fall prey to seals, and especially to the Greenland shark, for which they are a staple article of diet.

Reproduction and growth

Large halibut are very prolific, the ovaries of an Atlantic female of about 200 pounds having been estimated as containing 2,182,773 eggs, while a female of the Pacific form of "140 pounds may have as many as 2,700,000." [38]

Very little is known about the breeding of the Atlantic halibut. In the eastern Atlantic halibut spawn chiefly in March, April, and May with the chief production of eggs in April, while a few females may ripen as early as the end of January, and some not until June. [39] Off west Greenland they spawn late in spring. [40] Off the American coast it seems that the spawning season continues through the summer, for fishermen have reported ripe fish, both male and female, in April, May, June, July, August, and early September at various localities from Georges Bank to the Grand Banks; [41] while the report that part of the eggs in the ovaries of a fish examined on Banquereau by representatives of the Bureau of Fisheries on September 13, 1878, were ripe, but others immature, is evidence (if correct) that individual halibut may spawn over a considerable period.

Presumably they spawn on bottom, like other flat-fishes, but definite information is lacking. The Pacific halibut is known to spawn at depths of 150 fathoms to about 225 fathoms; [42] and European students, generally, have believed that the Atlantic fish spawns deeper still, perhaps even outside the 400-500 fathom line; evidence is that naturally spawned eggs have been taken only where the depth was greater than about 550 fathoms (1000 meters), the drifting larvae less than 19 mm. long only over depths greater than about 220 fathoms (400 meters). [43] On the other hand, halibut spawn regularly in the aquarium at Trondhjem, Norway, where the eggs have been fertilized artificially and hatched successfully. [44] This, with fishermen reports of ripe fish, both females and males, on the slopes of all the offshore Banks east of Cape Cod and, with Cox's report of [page 253] two larval halibut, 20 and 21.5 mm. long, taken close in to the southern coast of Nova Scotia in shoal water, [45] suggests that the American fish may spawn at least as shoal as the Pacific fish does, and perhaps even shoaler.

The eggs are buoyant, drifting suspended in the water at depths greater than 30 to 50 fathoms, not at the surface. Usually they are 3 to 3.8 mm. in diameter, and they do not have any oil globule. [46]

The only other buoyant fish eggs equally large that are likely to be found in the Gulf of Maine are those of the Argentine (p. 140), but these have a large oil globule, so there is no danger of mistaking them for halibut eggs. The buoyant eggs of the Greenland halibut (p. 258) are larger still. [47]

In the Trondhjem aquarium the incubation of artificially fertilized eggs occupied 16 days at a temperature of about 43° (6° C.). The larvae were 6.5 to 7 mm. long at hatching, with very large yolk sac and no pigment, growing to about 8.5 mm. by the sixth day, and developing pigment by the 10th day. [48]

The smallest naturally hatched Atlantic halibut yet seen[49] was 13.5 mm. long, with the vertical fin rays appearing. The dorsal and anal fins are developed and the ventral fins are visible at about 22 mm. (fig. 125), by which time the left eye has moved upward until its margin is just visible above the contour of the head, forecasting that the fish is to be a right-handed flatfish. Fish of this size also show the large mouth characteristic of the species. Up to this stage there is little pigment. About one-fourth of the eye appears above the profile when the little halibut is about 27 mm. long, but even at 34 mm. (the largest pelagic stage yet found) the eye has not entirely completed its migration (fig. 126), though the pigmentation is stronger on the right side than on the left, and the caudal fin (previously rounded) has become square tipped.

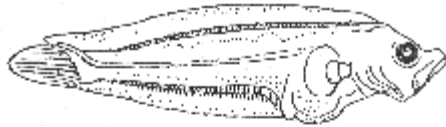


FIGURE 124. Larva, 16.2 mm. (European). After Schmidt.

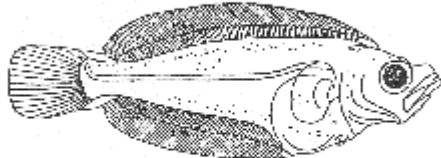


FIGURE 125.—Larva, 22 mm. (European). After Schmidt.



FIGURE 126.—Larva, 34 mm. (European). After Schmidt.

Figure 124. - Larva, 16.2 mm. (European) After Schmidt.

Figure 125. - Larva, 22 mm. (European) After Schmidt.

Figure 126. - Larva, 34 mm. (European) After Schmidt.

Halibut (*Hippoglossus hippoglossus*)

The younger larvae (up to about 25 mm. in length) are made recognizable as halibut by their curiously upturned snout. Older ones that are large enough to show that they belong to some right-handed large-mouthed flounder are separable from the American dab larvae (the only other common Gulf of Maine flatfish with which they agree in both these respects) by the outlines of the head and abdomen.

The early life history of the Pacific halibut has been worked out especially by Thompson and Van Cleve, who have given an excellent series of illustrations of successive stages from newly hatched larvae to young fry a little more than 1 inch long.[50] How long the young halibut lives adrift at the mercy of the currents, is not known. But the young fry, so small (47-64 mm. long) that they had evidently been spawned the preceding spring or [page 254] summer, have been trawled off Iceland during the last week of July. And the smallest bottom stages have so far been taken only in water shoaler than about 27 fathoms (50 meters), evidence that the larvae of the Atlantic halibut tend both to rise toward the surface, and to drift inshore during their pelagic stage, as is also true of the Pacific halibut.

Fry of 31/8 to 57/8 inches (80-150 mm.) such as have been taken in considerable numbers in Icelandic waters in June and July probably are in their second year. The average relationship between age and size is as follows according to Jespersen:[51]

Age (years)	Average length (inches)	Extremes of length (inches)	Age (years)	Average length (inches)	Extremes of length (inches)
1	3.9	3.1 - 5.9	6	25.6	20.9 - 34.3
2	9.1	7.1 - 12.6	7	27.6	21.7 - 40.9
3	13	8.3 - 18.9	8	29.1	22.8 - 40.6
4	18.5	11.8 - 24.4	9	33.9	26.8 - 42.1
5	22.4	16.1 - 28	10	37.4	29.5 - 55.5

Females averaged somewhat longer and heavier than males of the same age, and the fact that the oldest was a fish of 20 years, 68½ inches long, suggests that the immense fish of 400 pounds and more, and upward of 7 feet long, which are occasionally caught, may be half a century old, always assuming about the same rate of growth for the Gulf of Maine halibut as for those that are caught about Iceland.

According to Thompson[52] Pacific halibut grow at approximately the same rate for the first few years, more slowly after about the eighth year, though with wide differences in the rate of growth on different banks, probably caused by differences in the food supply.

It is probable that most of the female halibut do not mature sexually until they are 9 or 10 years old, some not until they are several years older still; males mature when they are somewhat younger.[53]

General Range

Boreal and subarctic Atlantic, in continental waters. The most southerly record of a halibut, in the western side of the Atlantic is of a 6-foot fish that was picked up in a pound net near Reedville, Va.[54] Stragglers have been reported off New Jersey and New York, and off Block Island. And halibut are caught in commercial quantities (or once were) from Nantucket Shoals, inner parts of the Gulf of Maine, Georges Bank, and the Nova Scotian Banks northward to the northern part of the Gulf of St. Lawrence (including the west coast of Newfoundland), the southern part of the Grand Bank, Flemish Cap and to the outer edge of the continental shelf off outer Labrador at depths of 70-90 fathoms or more. But stray specimens, only are reported in along the outer coast of Labrador, i. e., in the icy Labrador current.[55] And while the range of the halibut was said by Goode[56] to extend to Cumberland Gulf, we doubt whether there are any halibut in the icy waters along Baffins Land, for the halibut is not known off the Arctic coasts either of Asia or of America. Though the Greenland side of Davis Strait supports a regular halibut fishery as far north as Disco Bay.

In the eastern Atlantic, halibut have been reported doubtfully from the Gulf of Cadiz, and definitely from the Bay of Biscay.[57] Small catches are made regularly as far south as the Irish Sea and English Channel;[58] and they are more numerous around Northern Ireland and Scotland and in the northern part of the North Sea; in the Faroe-Shetland Region; around Iceland; along the Norwegian Coast; around Spitzbergen and Bear Island; also in Barent's Sea.

The Pacific halibut, an ally so close that it is hardly to be distinguishable to the untrained eye, is one of the most important food fishes of the northeastern Pacific.

Occurrence in the Gulf of Maine

The history of the halibut in the Gulf of Maine, like that of the salmon, must be written largely in the past tense, for their numbers have been sadly depleted there by over-fishing. In Colonial days the halibut was a familiar fish and seemingly a very abundant one on the coast of northern New England, but was considered hardly fit for food. Wood[59] for instance, writes "the plenty of better fish makes [page 255] these of little esteem, except the head and finnes, which stewed or baked is very good; these hallibuts be little set by while basse is in season." they seem to have maintained their numbers there down to the first quarter of the nineteenth century, when contemporary writers described them as extremely numerous in Massachusetts Bay and along Cape Cod, in fact around the whole coast line of the Gulf of Maine. And they were discovered in abundance on Nantucket Shoals, on Georges Bank, on Browns Bank, and on the Seal Island ground as soon as fishing was regularly undertaken offshore.

The cod fishermen of those days looked upon them as a nuisance, seldom worth bringing to market. And "It was the practice of the fishermen when halibut were troublesome to string them on a line and hang them over the stem of the vessel." [60] But a demand for halibut developed in the Boston market sometime between 1820 and 1825, and they have been pursued relentlessly ever since then, first inshore and then farther and farther afield.

The Massachusetts Bay-Cape Cod region yielded large numbers of these great fish during the early years of the fishery. Four men, for instance, are reported as having caught 400 in two days off Marblehead in 1837, while a party of equal size is said to have landed 13,000 pounds off Cape Cod in three weeks. And it was discovered some time prior to 1840 that halibut congregated in winter in the 25-30 fathom gully between the tip of Cape Cod and Stellwagen Bank. However, a shrinkage in the supply had been noticed along shore even before 1839, for we find halibut described in that year (in the Gloucester Telegraph) as "formerly" caught along Cape Cod and in Barnstable Bay. And they had been so nearly fished out in the Massachusetts Bay region by about 1850 that it no longer paid small boats to go there especially for them.

Halibut held out better in the northeastern corner of the Gulf where there was not as ready a market for them as there was in Boston; Perley wrote of them as plentiful enough to be a plague to the local fishermen off Brier Island as recently as 1852. But it was not long thereafter before their numbers were greatly reduced there also.

The offshore fishery for halibut began about 1830, when cod fishermen brought word to Gloucester of a great abundance of them on Georges Bank,[61] and they were caught there for a few years thereafter in numbers that seem almost unbelievable today. Thus we read of 250 caught in three hours; of vessels loaded in a couple of days; and of a single smack landing 20,000 pounds in a day. They were taken in great plenty on Nantucket Shoals, also, during this same period. But the supply seems to have dwindled suddenly, in the shoal waters both of Georges Bank and of Nantucket Shoals, and so permanently that few vessels went thither especially for halibut after 1850. Now forced to go further afield, the fishing fleet found that halibut were plentiful on the Seal Island ground; on Browns Bank; and in the Eastern Channel or gully that separates the latter from Georges Bank (localities which supplied the New York and Boston markets for the next decade). And in 1875 halibut fishing was extended to deeper water (100 to 200 fathoms) on the southeast slope of Georges Bank. But it was not long before all these grounds were fished out to the point where it was seldom possible to make paying trips to them for halibut alone. And for many years now, what few halibut have been caught in the Gulf of Maine have been taken incidentally.

The history, in short, of the halibut fishery leaves no doubt that this species shows the effect of hard fishing sooner than most sea fish, it being possible to catch the majority of the stock on any limited area in a few years. Long liners and otter trawlers search all the good ground-fish bottoms of the Gulf of Maine and its banks so thoroughly and constantly that the halibut never have a chance to reestablish themselves in any abundance on the shoaler grounds. They maintain their numbers better on the deeper slopes chiefly because they are subject to less intensive fishing there.

It was fortunate for the fishing industry that the depletion of the Gulf of Maine of halibut was counterbalanced by the discovery of halibut in abundance along the deeper slopes of the banks to the north and east. And halibut fisherman sailing from Gloucester had begun resorting to the Grand Banks region by 1864-1866; to the west Greenland Banks by 1866; to the Magdalens by [page 256] 1873; to the northern part of the Gulf of St. Lawrence near Anticosti by 1881; to Iceland by 1884.[62] And the Gloucester vessels continued sailing to the Greenland Banks for halibut until the early 1880's. But by 1889 practically all the salt halibut that was landed in Gloucester, was being brought from Iceland. With salt fish in less and less demand, it became unprofitable, next, to sail so far afield. And it is many years, now, since any halibut fisherman from Gloucester has outfitted for Iceland.

Long liners, out of New England ports, fished especially for halibut in the northern part of the Gulf of St. Lawrence until 1938; on the Grand Banks grounds until 1940 or 1941, when competition with frozen halibut from the northwest coast had become severe, while the majority of fishermen preferred to ship on otter trawlers, for comfort and safety. Vessels continued long lining for halibut down the slopes of the Nova Scotian banks, and in the deep gullies between these, until the middle of the 1940's, but we have not heard of a vessel making a special trip from any New England port for these great fish, during the past few years.

Although there is not one halibut in our Gulf today, where there were hundreds or even thousands of them during the first quarter of the nineteenth century, the geographical range of this noble fish is as extensive there as it ever was. Thus a few halibut are still caught along Cape Cod; in Massachusetts Bay (a few "chickens," 10 pounds and upward, are brought in every summer with some larger fish); along the Maine coast; and on all the offshore grounds. Rich, writing in 1929,[63] listed 25 named inshore grounds off the coasts of Massachusetts and of Maine as still yielding a few halibut. We have enjoyed the acquaintance of several fishermen, especially interested in halibut, who treasure to themselves a hard-gained knowledge of particular spots, not too far offshore, where they are likely to catch one, in a day's pleasure fishing. And small groups of halibut accumulate occasionally on suitable patches of bottom; soon to be decimated, however, when their presence is accidentally discovered. Thus, we knew of some 25 or 30 halibut, ranging from 40 to 110 pounds in weight, being caught within 1 to 3 miles of land, near Mount Desert Island, in 1930, in 10 to 15 fathoms of water. And one of 54 pounds was caught off Boston Harbor, from the steamer Westport, on June 24, 1951.[64]

A catch of 9,500 pounds, or perhaps about 135 fish (assuming an average weight of 70 pounds) was reported off the coast of Maine in 1947 on hand lines, while eleven fish (largest 125 pounds) had been caught inshore, off Casco Bay, by local fishermen, up to the last week in May 1951.[65] And many other instances of this sort might be quoted, no doubt, were our knowledge sufficient.

Halibut are also caught fairly regularly still, about Grand Manan (4,700 pounds reported thence in 1947), but only occasionally about Campobello and near St. Andrews, and not at all along the north (New Brunswick) shore of the Bay of Fundy east of St. John. Small numbers occur, however, right up to the head of the bay on the Nova Scotia side.[66] And there are enough of them off Brier Island at its mouth and on the fishing grounds along western Nova Scotia to have brought the landings for Digby County and for Yarmouth County to 108,300 pounds in the year in question.

The largest catches of halibut now made within the limits of the Gulf of Maine come from the Cape Sable-Browns Bank ground, from the deeper slopes of Browns Bank, from the deep gully that separates Browns from Georges, and from the eastern part and the deeper slopes of Georges, where otter trawlers are likely to pick up anywhere from 1 to 75 fish per trip. But not many are caught now on Nantucket Shoals where they were once so plentiful.

In 1945 (most recent year for which detailed information is readily available for the coasts of Maine and Massachusetts), landings for the different parts of the Gulf, by United States and Canadian fishermen, were about as follows: off eastern Massachusetts, about 31,000 pounds; off western Maine, about 800 pounds; off central Maine, about 10,000 pounds; small banks in the inner west central part of the Gulf (Cashes, Fippenies, Platts), about 2,500 pounds; off eastern [page 257] Maine about 2,000 pounds; mouth of Bay of Fundy on New Brunswick side, about 700 pounds; Nova Scotian side of Bay of Fundy, about 45,000 pounds; off western Nova Scotia and Browns Bank (Canadian and United States vessels combined), about 73,000 pounds plus an indeterminate part of the landings for Shelburne County, Nova Scotia, that may have come from Browns Bank; Georges Bank, about 65,000 pounds; South Channel, about 4,000 pounds; Nantucket Shoals, about 1,400 pounds; or a total of about 235,000 pounds that can be credited definitely to the Gulf.

For some unknown reason, 1945 was a poor year; the Georges catch alone, for example, was about 110,000 pounds in 1946, about 211,000 pounds in 1947.[67] And the yearly catch for the Gulf as a whole, by United States and Canadian fishermen combined, averaged about 316,000 pounds for the 6-year period 1941-1946, plus what fish may have been landed in Shelburne, Nova Scotia, from Browns Bank. Even so, the Gulf yields only about one-tenth as much halibut by weight today as it did, say, 30 years ago.[68]

We dare not guess in what degree this continued decrease has been a result of the progressive replacement of long-line fishing by otter trawling, of market conditions, or of a continuing decrease in the numbers of halibut.

Halibut may have maintained their numbers somewhat better on the outer Nova Scotian Banks and slopes, which yielded about 3,400,000 pounds in 1934 (with Browns Bank); about 1,350,000 pounds in 1946.[69]

In the early days of the fishery, halibut were common in the Gulf of Maine in water no deeper than they were farther north; near Anticosti in the Gulf of St. Lawrence for example, or near Miquelon, south of Newfoundland, where many were caught in 5 to 10 fathoms.[70] A case is on record, for example, of a catch of 5 halibut, made in 1849, on one set of a long line with only 37 hooks, in 7 fathoms, just off the mouth of Gloucester Harbor. A good many, too, were caught in those days on the southeastern part of Stellwagen Bank, where the depth (on the fishing grounds) ranges from 15 fathoms to about 30 fathoms. And many were reported as wintering in the gullies west of Stellwagen and between the latter and the tip of Cape Cod, in depths of 30 to 50 fathoms. Similarly, the early fishery also on Georges was on the shoaler parts of the bank in depths of 15 to 30 fathoms. And the early visitors to this ground describe the halibut, not only as schooling at the surface in pursuit of herring and launce (not an uncommon event in the Gulf of St. Lawrence and off Newfoundland when they are chasing capelin), but as often following their hooked companions up to the top of the water, so that more than one vessel made a good part of her fare by gaffing them alongside. The Nantucket Shoals halibut of old were likewise in less than 30 fathoms depth, and when the fleet first repaired to Browns Bank and to the Seal Island grounds they found halibut very plentiful in water but little deeper than that.

In fact, it was not until 1874 or 1875 that the presence of this fish was suspected in the deeper gullies or on the offshore slopes of the banks below 100 fathoms. But it did not require many years of hard fishing to catch most of the halibut that were living in very shallow water, and so thoroughly that very few are now taken shoaler than 25 to 40 fathoms in our Gulf, while most of the halibut that are caught still on the offshore banks are from water deeper than 75 fathoms.

All that has come down to us as to any general movements of the halibut in the Gulf of Maine during the days of their plenty there, beyond the prevailing tendency of the larger fish to work down deeper than the smaller (p. 250), is that some of them (though not all) worked inshore into shoaler waters for the winter, to work offshore again and deeper for the summer. But this offshore movement in winter may not have extended far, or very deep, if it was to avoid low temperatures, for halibut (or any other fish for that matter), that summer inshore in shoal water where they would be most subject to winter chilling, need never move out for more than 60 miles or so off any part of the coast line of the open Gulf, nor descend deeper than about 70 to 75 fathoms, to find water permanently warmer than 38°, except in the Bay of [page 258] Fundy in the coldest winters, or in the submarine embayment between Jeffreys Ledge and the coast.

We have nothing to contribute as to present-day spawning of halibut within the Gulf of Maine. Of old, ripe females were reported on Georges in May and June, and have been, repeatedly, on the deeper slopes of the Nova Scotian banks generally, to the eastward, as well as off the Grand Banks and in the Gulf of St. Lawrence. But halibut smaller than a couple of pounds are seldom caught in the inner parts of the Gulf though "chickens" of 10 to 20 pounds are not uncommon there, there being a sharp contrast in this respect between the Gulf of Maine and the waters around Iceland, where Jespersen found an abundance of little fish of 8 to 10 inches.

This, added to the fact that the inshore grounds were fished out so soon with little apparent tendency to recover when the fishery slackened, and that depletion by overfishing has not been accompanied by any corresponding decrease in the average size of the fish that are caught, suggests that the halibut population of the inner parts of our Gulf always depended more on immigration from east and north of Cape Sable for its maintenance than it did on local production. Fry may have been produced in greater numbers over the offshore slope of Georges Bank, where the Albatross III trawled two little halibut about 6 inches long, at 175 to 195 fathoms, on May 16, 1950.

Importance

The halibut, because of its present-day scarcity, is of only minor importance commercially in our Gulf; in 1947 the landings in New England, including what halibut were brought in from the Nova Scotian banks eastward from Cape Sable, amounted to only about 586,000 pounds, valued at \$144,680. But the demand is always so good that all that are brought in are readily salable, and (being so large) each one that is caught is well worth saving. In the year in question (representative of present-day conditions), about one-fifth of the total New England landings, were caught on long lines^[71] three-fourths by otter trawlers. The small remainder (10,000 pounds) were taken on hand lines, mostly by small-boat fishermen off the coast of Maine.

We can only regret that there are not enough halibut inshore in our Gulf today to be of any general concern to anglers, for this is a very "sporting" fish as well as welcome on the table.

[21] Left-handed halibut have been caught, occasionally.

- [22] An account of this fish was published in the Boston Globe, June 12, 1917. It was bought by the Shore Fish Co.
- [23] Fish. Ind. U. S., Sect. 1, 1884, p. 194.
- [24] Reported in the Boston Herald, March 28, 1941.
- [25] Meddelel. Kommis. Havundersøgelse, Ser-Fiskeri, vol. 5, No. 5, 1917.
- [26] Goode and Collins (Fish. Ind. U. S., Sect. 5, vol. 1, 1887, p. 17) give a readable account.
- [27] Capt. Baldersheim (Rapp. Cons. Internat. Explor. Mer, vol. 56, 1929, p. 25) reports good catches at that depth in Davis Strait off west Greenland.
- [28] Goode, Fish. Ind. U. S., Sect. 1, 1884, p. 195.
- [29] Jensen (Meddelelser, Dansk Komm. Havunders., Ser. Fiskeri vol. 7. No. 7, 1925, pp. 17-18) seems to have been the first to bring this to scientific attention.
- [30] Baldersheim, Rapp. Proc. Verb. Conseil Internat. Explor. Mer, vol. 56, pp. 25-28.
- [31] For a further discussion of the range and movements of the halibut in relation to temperature, with references, see Thompson and Van Cleve, Rept. Internat. Fish. Comm. No. 9, 1936, pp. 22-38.
- [32] Martin and McCracken, Fish. Res. Board Canada, Progress Rept., Atlantic Coast Station, No. 50, 1950, pp. 3-8.
- [33] Capt. Baldersheim described halibut off west Greenland as sometimes in schools, preying on lance (Rapp. Proc. Verb. Conseil Internat. Explor. Mer., vol. 56, 1929, p. 25).
- [34] Smitt (Scandinavian Fishes, vol. 1, 1892, p. 414) speaks of a halibut that had eaten a razor-billed auk; Good and Collins (Fish. Ind. U. S., Sect. 5, vol. 1, 1887, p. 35) record an "ice bird" (probably a dovekie) as taken from a halibut caught on Georges Bank; and Scudder (Fish. Ind. U. S., Sect. 5, vol. 1, 1887, p. 119) reports finding the skeleton of a gull in the stomach of another.
- [35] Goode, Fish. Ind. U. S., Sect. 1, 1884, p. 196.
- [36] Meddelelser, Dansk. Komm. Havunders., Ser. Fisk., vol. 7, No. 7, 1925, p. 18.
- [37] Goode and Collins, Fish. Ind. U.S., Sec. 5, vol. 1, 1887, p. 17.
- [38] Clemens and Wilby, Bull. No. 68, Fisheries Res. Board Canada, 1946, p. 312.
- [39] For a general survey of available information, see Tåning, Meddelelser Komm. Danmarks Fisk. Havunders., Ser. Fisk., vol. 10, No. 4, 1939, p. 14.
- [40] A larva 14.75 mm. long taken on June 19 and another 21 mm. long taken on July 7 are recorded by Jensen (Rapp. Proc. Verb. Cons. Intern. Explor. Mer, vol. 39, p. 96, 1926).

- [41] Goode (Fish and Fishery Industr. U. S., Sec. 1, 1884, pp. 196-197), mentions reports to this effect.
- [42] Clemens and Wilby, Bull. 68, Fish. Res. Bd. Canada, 1946, p. 312.
- [43] Tåning, Meddel. Komm. Danmarks Fisk. Havunders., Ser. Fiskeri, vol. 10, No. 4, 1936, p. 8.
- [44] Rollefsen, Kgl. Norske Vidensk. Selsk. Tronhjem, Forhand., vol. 7, No. 7, 1934.
- [45] Contrib. Canadian Biol., N. Ser., vol. 1, No. 21, 1924, pp. 409-412.
- [46] For description of eggs artificially fertilized in the Tronhjem aquarium, see Rollefsen, Kgl. Norske Vidensk. Selsk. Forh., vol. 7, No. 7, 1934, p. 20-23; for descriptions of naturally spawned eggs taken in tow nets in Icelandic waters, see Tåning, Meddel. Komm. Danmarks Fisk. Havunders. Ser. Fiskeri, vol. 10, No. 4, 1936, p. 5; for description of the eggs and larvae of the closely allied Pacific halibut, see Thompson and Van Cleve, Rept. No. 9, Internat. Fisheries Comm., 1936.
- [47] 4 to 4.5 mm. in diameter according to Jensen, Kgl. Dansk Vidensk. Selsk. Skr. Nat., afd. 9, R. 6, 1935, p. 4.
- [48] For illustration of these artificially fertilized eggs in incubation stages, and of the larvae hatched from them, see Rollefsen, Kgl. Norske Vidensk. Selsk. Forhand., vol. 7, No. 7, 1934.
- [49] What little we know of the early stages of the halibut is due to European students, chiefly to Schmidt (Meddel. Komm. Havundersøgelse, Ser. Fiskeri, vol. I, No. 3, 1904), to Jespersen (Ibid., vol. 5, No. 5, 1917), and to Tåning, (Meddel. Komm. Danmarks Fisk. Havundersøgelse, Ser. Fiskeri, vol. 10, No. 4, 1936.)
- [50] Rept. No. 9, International Fisheries Commission, 1936, figs. 38-49.
- [51] Meddelelser fra Komm. Havundersøgelse, Ser. Fiskeri, vol. 5, No. 5, 1917; based on a study of the otoliths of more than 2,000 fish caught around Iceland.
- [52] Report. Comm. Fish. British Columbia, (1914) 1916, pp. 76-99.
- [53] Females of the Pacific form may mature as young as 8 years, or not until as old as 16 years, with an average of 12; males considerably younger on the average.
- [54] Reported by Walford, Copeia, 1946, No. 2, p. 100.
- [55] One, about 20½ inches long, was reported to us by R. H. Backus as found dead in the water, in Cutthroat Harbor, August 5, 1950, by the Blue Dolphin.
- [56] Fish. Ind. U. S., Sect. 1, 1884, p. 190.
- [57] Moreau, Hist. Nat. Poissons France, vol. 3, 1881, p. 288.
- [58] 6,614 pounds, for example, were landed from the English Channel in 1932. For further details as to landings from the various statistical areas in the eastern Atlantic, see Thompson and Van Cleve, Rept. 9, International Fisheries Comm., 1936, p. 21.

[59] New Englands Prospect, 1634, p. 37.

[60] Goode and Collins, and Fish. Ind. U. S., Sect. 5. vol. 1, 1887, p. 29-30.

[61] Goode and Collins (Fish. Ind. U. S., Sect. 5, vol. 1, 1887, p. 3) have collected data on the Georges Bank halibut fishery and the former abundance of the fish there.

[62] See Collins, Fish. Ind. U. S., Sect. 5, vol. 1, 1887, pp. 43-89, and Scudder, Fish. Ind. U. S., Sect. 5, vol. 1, 1887, pp. 90-119, for historical surveys of the fresh and salt halibut fisheries from New England ports.

[63] Rept. U. S. Comm. Fish. (1929) 1930, pp. 85-86, 96.

[64] Reported in the Boston Globe, June 25, 1951.

[65] Reported in Salt Water Sportsman for May 29, 1951.

[66] 11,300 pounds reported for Annapolis and King's Counties, Nova Scotia, in 1947.

[67] the otter trawlers that carried on investigations for the Bureau of Fisheries in 1913 took halibut on more than half their trips to Georges. Contrast this with a catch of 570 halibut by a long-liner on a patch of rocky bottom there in one day, in the early years of the Georges fishery.

[68] the Gulf of Maine catch was nearly 3 million pounds in 1919.

[69] Catch, Cape Sable to Cape Breton in 1946, about 50,000 pounds by United States vessels, about 1,300,000 pounds by Canadian vessels. For a general survey of the catches of halibut in both sides of the Atlantic, for 1934, see Thompson and Van Cleve, Rept. No. 9, International Fisheries Commission, 1936, p. 21.

[70] Goode and Collins, Fish. Ind. U. S., Sec. 5, vol. 1, 1887, p. 17.

[71] Goode and Collins (Fish. Ind. U. S., Sec. 5, vol. 1, 1887, pp. 10-18) have given a readable account of the long-line fishery.

Fishes of the Gulf of Maine by Bigelow & Schroeder is the seminal work on North Atlantic fishes. It was originally published in 1925 with William Welsh, a Bureau of Fisheries scientist who often accompanied Henry Bigelow on his research cruises. In the late 1920's, Bigelow began a long association with William C. Schroeder, publishing a number of papers and reports on fishes of the North Atlantic, including the first revision of *Fishes of the Gulf of Maine*. This excerpt is from that 1953 edition.

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