Menhaden

Brevoortia tyrannus (Latrobe) 1802
[Jordan and Evermann, 1896-1900, p. 433.]

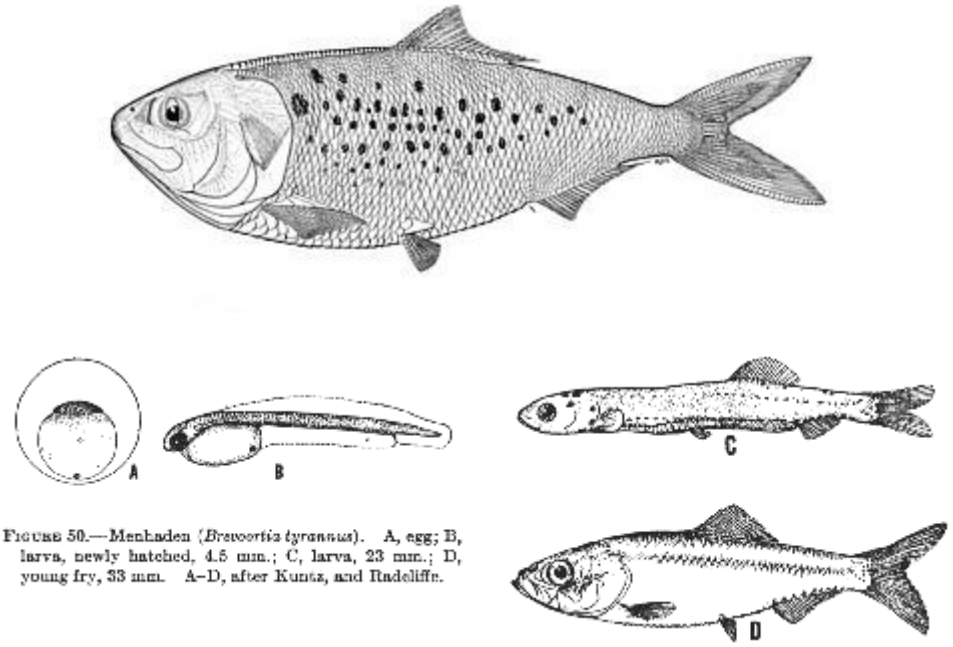

FIGURE 50.—Menhaden (*Brevoortia tyrannus*). A, egg; B, larva, newly hatched, 4.5 mm.; C, larva, 23 mm.; D, young fry, 33 mm. A–D, after Kuntz, and Radcliffe.

Figure 50 - Menhaden (*Brevoortia tyrannus*).

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C, larva, 23 mm.;
D, young fry, 33 mm. A-D,
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Description

This fish is universally called "pogy" in the Gulf of Maine but no less than 30 common names are in use south of Cape Cod. It is flattened sidewise like all our other herrings, has a sharp-edged belly, and is as deep proportionally as the shad (body about 3 times as deep as long), though the general form is altered when the fish are fat. The very large scaleless head, which occupies nearly one-third of the total length of the body, gives the menhaden an appearance so distinctive that it is not apt to be mistaken for any other Gulf of Maine fish. It is likewise distinguishable from all its local relatives by the fact that the rear margins of the scales are nearly vertical (not rounded), and are edged with long comb-like teeth instead of being smooth. The dorsal fin originates over the ventrals or very slightly behind them. We need only point out further that the pogy is toothless, its tail deeply forked, its ventral fins very small, its dorsal and anal of moderate size, its mouth large and gaping back as far as the hind margin of the eye, and that the tip of its lower jaw projects beyond the upper.

Color

Dark blue, green, blue gray, or blue brown above, with silvery sides, belly, and fins, and with a strong yellow or brassy luster. There is a conspicuous dusky spot on each side close behind the gill opening, with a varying number of smaller dark spots farther back, arranged in irregular rows.

Size

Adult menhaden average 12 to 15 inches in length, and from two-thirds to one pound in weight. One 18 inches long was taken at Woods Hole in 1876, and a fish 20 inches long has been reported. The heaviest of which we have heard was one of 1 pound 13 ounces, taken at Orient, N. Y.

Habits

The menhaden, like the herring, almost invariably travels in schools of hundreds or thousands of individuals, swimming closely side by side and tier above tier. In calm weather they often come to the surface where their identity can be recognized by the ripple they make, for pogies, like herring, make a much more compact disturbance than mackerel do, and "a much bluer and heavier commotion than herring, which hardly make more of a ripple than does a light breeze passing over the water," as W. F. Clapp has stated to us. Also, pogies as they feed frequently lift their snouts out of water, which we have never seen herring do, while they break the water with their dorsal fins, also with their tails. And the brassy hue of their sides catches the eye (as we have often seen), if one rows close to a school in calm weather.

It is chiefly on warm, still, sunny days that the menhaden come to the surface, sinking in bad weather; and they are said to come up more often on the flood tide than on the ebb. It is also said (this we cannot vouch for) that the fish work inshore on the flood tide and offshore on the ebb.

Food

The menhaden, formerly thought to subsist on mud, is now known to feed chiefly on microscopic plants (particularly diatoms) and on the smallest Crustacea.[30] It sifts these out of the water with a straining apparatus in the shape of successive layers of comb-like gill rakers as efficient as our finest tow nets. No other Gulf of Maine fish has a filtering apparatus comparable to that of the pogy, nor has it any rival in the [page 115] Gulf in its utilization of the planktonic vegetable pasture. Menhaden feed, as Peck described, by swimming with the mouth open and the gill openings spread. We have often seen specimens in the aquarium at Woods Hole doing this.[31] And we have watched small ones in Chesapeake Bay, swimming downward as they feed, then turning upward, to break the surface with their snouts, still with open mouths.

The mouth and pharyngeal sieve act exactly as a tow net, retaining whatever is large enough to enmesh, with no voluntary selection of particular plankton units. The prey thus captured (as appears from the stomach contents) includes small annelid worms, various minute Crustacea, schizopod and decapod larvae, and rotifers, but these are greatly outnumbered as a rule by the sundry unicellular plants, particularly by diatoms and by peridinians. And the food eaten at a given locality parallels the general plankton content of the water, except that none of the larger animals appear in the stomachs of the fish on the one hand, nor the very smallest organisms (infusoria, and certain others such as the coccolithophorids) on the other. The menhaden, in short, parallels the whalebone whales, the basking shark, and the giant devil rays in its mode of feeding, except that its diet is finer because its filter is closer meshed.

Peck has calculated from observations on the living fish that an adult menhaden is capable of filtering between 6 and 7 gallons (about 24 to 28 liters) of water per minute, and while the fish do not feed continuously this will give some measure of the tremendous amount of water sifted and of plankton required to maintain the hordes in which these fish congregate. The abundance of microscopic plants in the water of bays and estuaries, and along the coast has often been invoked to explain the concentration of menhaden close to shore.

Enemies

No wonder the fat oily menhaden, swimming in schools of closely ranked individuals, helpless to protect itself, is the prey of every predaceous animal. Whales and porpoises devour them in large numbers; sharks are often seen following the pogy schools; pollock, cod, silver hake, and swordfish all take their toll in the Gulf of Maine, as do weakfish south of Cape Cod. Tuna also kill great numbers. But the worst enemy of all is the bluefish, and this is true even in the Gulf of Maine during periods when both bluefish and menhaden are plentiful there (p. 384). Not only do these pirates devour millions of menhaden every summer, but they kill far more than they eat. Besides the toll taken by these natural enemies, menhaden often strand in myriads in shoal water, either in their attempt to escape their enemies or for other reasons, to perish and pollute the air for weeks with the stench of their decaying carcasses.

Breeding and growth

Very little is known about the breeding habits of the menhaden, except that it spawns at sea and that the chief production of eggs takes place south of our limits. According to observations at Woods Hole,[32] the main body of the fish off southern New England spawn in June, continuing through July and August; even into October as in 1915, when the Grampus collected eggs and larvae in Nantucket Sound and westward from Martha's Vineyard in that month. And reports of spent fish in the Gulf of Maine in July and August, with others approaching maturity, suggest that the menhaden is a summer spawner there also. We have found no eggs in our tow-nettings north of Cape Cod (young fry were taken in abundance in Casco Bay in October 1900), probably because our work there was carried on during a series of poor menhaden seasons. From Chesapeake Bay southward the spawning season appears to be late in the autumn, and in early winter.

Menhaden eggs are buoyant and resemble those of the European pilchard (Clupea pilchardus), but are easily distinguished from the eggs of any other Gulf of Maine fish by their large size (1.5 to 1.8 mm. in diameter), broad perivitelline space, small oil globule (0.15 to 0.17 mm.), and very long embryo. Incubation is rapid (less than 48 hours), as Welsh found by experiment. The newly hatched larvae are 4.5 mm. in length, growing to 5.7 mm. in 4 days after hatching. The dorsal and caudal fins first become visible at a length of 9 mm.; at 23 mm. all the fins are well developed; scales are present at 33 mm.; and at 41 mm. The fry show most of the characters of the adult, except that their eyes are much larger, proportionately. The youngest larvae much resemble young herring, but the fins are formed, the tail becomes forked, and [page 116] the body deepens at a much smaller size, a menhaden of 20 mm. being as far advanced in development as a herring of 35 mm., which makes it easy to distinguish the older larvae of the two fish.

Welsh concluded from examination of great numbers of fry and from measurements and scale studies of fish of various ages that menhaden hatched in summer (which would apply to any fry that might be produced in the Gulf of Maine) are 2¼ to 3¼ inches (6 to 8 cm.) long by their first winter; and average about 63/8 inches (16 cm.) by their second winter; fall-hatched fish are 1¼ inches (3 cm.) and about 5 inches (about 13 cm.) long, in their first and second winters, with every gradation between the two depending on the precise season when the fish are spawned.[33] Apparently sexual maturity is attained in the season following the third winter, and a few of the older fish that Welsh examined showed as many as 9 to 10 winter wings on their scales.

General range

Coastal waters along the Atlantic coast of America from Nova Scotia to eastern Florida; represented in the Gulf of Mexico, and southward to northern Argentina, by a series of named forms that differ from our northern menhaden in ways that would not be apparent to any one but to a trained student of fishes.[34]

Occurrence in the Gulf of Maine

The Gulf of Maine is the northerly limit for the menhaden; St. Mary Bay on the west coast of Nova Scotia is its most easterly known outpost. Prior to about 1850 the pogy seems to have been common at the mouth of the Bay of Fundy; it was, indeed, reported by Perley as far up the bay as St. John, and fishermen spoke of it as abundant near Eastport up to 1845-1850. But it seems to have abandoned Fundian waters altogether[35] since then except for an occasional straggler, and very few menhaden have been noticed east of Mount Desert and Jonesport of late years.

Perhaps the most interesting aspect of the occurrence of the menhaden in the Gulf of Maine is that it fluctuates tremendously in abundance there from year to year, periods of great plenty alternating with periods of scarcity or entire absence from our waters. Thus they were extremely abundant off the coasts of Massachusetts and Maine, every summer, for some years prior to 1875, when a considerable fishery developed for them in Maine. Very few, however, were taken in the Gulf during the cold summer of 1877 until September and October, when they were reported as about as abundant as normal; practically none appeared north of Cape Cod in the year 1879; and they were so scarce along the coast of Maine for the next six years that it caused comment when an occasional one was caught. In 1883, for instance, a few were reported to the U. S. Fish Commission though no schools were seen and many people thought they had gone permanently. But they were once more reported abundant off Maine and Massachusetts in 1886; they were so plentiful as far east as Frenchman Bay in 1888 that the menhaden fisheries were revived; they were as plentiful in Maine waters in 1889 as they had ever been (more than 10 million pounds taken there) and they were still so numerous in 1890 that four fertilizer factories were established, and nearly 90 million fish were taken during that season. But this period of abundance was short-lived, less than half as many fish being caught in Maine waters (about 41 million) in 1891 as the year before, while few menhaden were taken or seen north of Cape Cod in 1892. They were plentiful enough, however, in 1894, for a single steamer to seine about a million fish off the Kennebec during that summer, while 582,131 fish were taken in Boston Harbor in 10 days' fishing during the last half of that August.

Menhaden were scarce again in the Gulf during the period 1895-1897 but abundant again in 1898, when about 7 million pounds were taken along the Maine coast. They were scarce in 1902 (Maine catch about 300,000 lb.); reported as abundant again north of Cape Cod, in 1903, especially in Boston Harbor; rare north of Cape Cod from 1904 to 1921, when odd schools were seined along the Massachusetts and Maine coasts in some summers, while few or none were seen in others. They reappeared, however, in such abundance again in the southwest part of the Gulf in the summer of 1922 that 18 steamers fished for them successfully for some weeks in Massachusetts Bay, when upwards of 1,500,000 pounds were landed by the larger fishing vessels, besides what the small boats brought in. And they were so plentiful at [page 117] least as far north as Boothbay Harbor, that about 2,500 barrels were frozen there, though no large schools were reported east of that point.

The appearance of menhaden in such abundance in the Gulf after so many years' absence prompted the Bureau of Fisheries to send the steamer Halcyon to Massachusetts Bay that August, and her towings, indicated the presence of much greater quantities of diatoms than is usual at that season, evidence that the fish found a better pasture in Massachusetts Bay than in any summer since 1912. But we hesitate to assert that it was an unusually rich food supply that attracted them past Cape Cod.

However this may have been, there were not enough menhaden in the Gulf to be of any commercial importance from the middle 1920's to the middle 1940's. But so many visited Massachusetts Bay, in 1946 and 1947 that local boards of health were forced to clean some of the bathing beaches of the fish that drifted ashore from schools netted for lobster bait. There were a good many in Maine waters in 1948 (reported catch 145,000 pounds);[36] more still in 1949, when more than 5,000,000 pounds were taken there; and about 8,000,000 pounds off Gloucester,[37] and when small fry, 2-3¾ inches (52-95 mm.) were taken in the Sheepscot River, December 5-11, suggesting that some had been reared in the Gulf that year. But this peak of abundance lasted no longer than the peak had in the early 1920's, for there seem to have been far fewer menhaden in Maine waters in 1950 than in 1949, as there certainly were in Massachusetts Bay, where we did not chance to sight a single school, and very few were reported.

In the years when menhaden come, they appear in Massachusetts Bay about mid-May; off the Maine coast during the last half of May or first part of June. They are most abundant during July, August, and early September, and most of them depart from the coast of Maine by the middle of October, from the Massachusetts Bay region by early November; and it is unusual to find a single menhaden along these shores after the middle of that month, although small ones have been taken in the Sheepscot River as late as the first third of December.

The universal belief among fishermen, that the seasonal appearances and disappearances of menhaden in the Gulf of Maine result from a definite migration from the south around Cape Cod in the spring and a return journey in the autumn, probably is well founded.

The brevity of the peaks of abundance, the fact that they come at such long intervals, and especially the great local scarcity of young fish, are arguments against the possibility that menhaden are permanent inhabitants of our gulf, though a few fry may be produced there in favorable summers, as happened in 1949 (p. 117).

Menhaden are warm water fish, and our studies of the temperatures of the Gulf of Maine corroborate earlier observations to the effect that they never appear in spring until the coastwise water has warmed to 50° or more, or in abundance until the temperature is several degrees higher, which is in accord with Bean's[38] experience that menhaden will not survive in an aquarium if the water chills below 50°. No doubt, it is the falling temperature of autumn that forces the menhaden to leave the coasts of northern New Enngland.

In menhaden years the fish occur all along the shores of the Gulf of Maine from Cape Cod to Penobscot Bay, even to Mount Desert. Their chief centers of abundance always lie in Massachusetts Bay within a mile or so of land, particularly off Barnstable and in the mouths of Boston and Salem Harbors; in Casco Bay; and among the islands, thence to Penobscot Bay. But we have never heard of them entering water that is appreciably brackish, and in some years they may congregate as much as 40 to 50 miles offshore, as happened in 1878, for instance. But we have heard no report of menhaden in the central part of the Gulf or on the offshore Banks. The menhaden are thin when they arrive on our coasts in spring, but they put on fat so rapidly that while the average yield of oil per thousand Gulf of Maine fish was about 12 gallons for the whole summer season of 1894, it rose to 14½ gallons for Boston Harbor fish in August, and to 16 or 18 gallons in September. It is generally accepted, furthermore, that fish taken on the New England coast, south or north, always average larger and fatter than those caught farther south.

Commercial importance

The menhaden is one of the most important, commercially, of the fishes of the Atlantic Coast of the United States, being used for the manufacture of oil, fertilizer and fish [page 118] scrap.[39] In 1946, when the catch for the Gulf of Maine was only about 20,000 pounds, the total catch for the Atlantic and Gulf States was 851,129,000 pounds; the value of the catch to the fishermen was $7,439,573; the value of the products made from menhaden was $18,196,573. Considerable numbers are used locally on the Middle Atlantic coast for bait. But the menhaden is so oily that it is unlikely to become popular as a food fish. Practically the entire catch of menhaden is taken by purse seines and in pound nets; they never bite a baited hook.

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[30] For a detailed account of the food and of the branchial sieve of the menhaden. See Peck (Bull., U. S. Fish Comm., vol. 13, 1894, pp. 113-124, pls. 1-8.)

[31] Apparently Ehrenbaum (as quoted by Bullen, Jour., Mar. Biol. Assoc. United Kingdom, vol. 9, 1910-13, pp. 394-403) was not acquainted with the habits of menhaden when he wrote to the affect that no fish eat plankton indiscriminately, or swim about habitually with open mouth when feeding.

[32] By Kuntz and Radcliffe, Bull. U. S. Bur. Fish., vol. 35, 1918, p. 119, who describe the eggs and larvae.

[33] Young menhaden that we collected at Woods Hole on September 23, 1942 were 3½ to 4 inches (91-99 mm.) long; others taken in Salt Pond, Falmouth, Mass. on November 24, 1949, were 45/8 to 6 inches long.

[34] See Hildebrand (Smithsonian Misc. Coll., vol. 107, 1948. No. 18 for a revision of the genus Brevoortia). One named species, B. brevicaudata Goode 1878, is known only from Noank, Conn.; we doubt its validity.

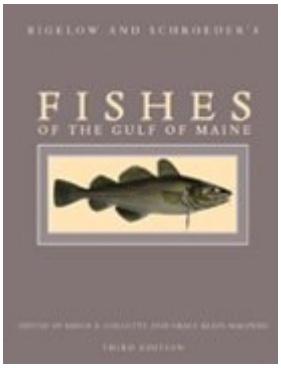
[35] According to Huntsman (Contr. Canad. Biol., (1921) 1922, p. 59) one was taken in St. John Harbor in August, 1919.

[36] Reported by Scattergood, and Trefethen, Copeia, 1951, pp. 93-94.

[37] Reported by Scattergood, Trefethen, and Coffin, Copeia, 1951, p. 298.

[38] Rept. New York State Mus., 60, Zool. 9, 1903, p. 213.

[39] For an account of the menhaden industry, see Harrison, Inv. Rept. No. 1. U. S. Bureau of Fisheries, 1931.



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.