

American Goosefish

Lophius americanus Cuvier and Valenciennes 1837
[*Jordan and Evermann*, 1896-1900, *Lophius piscatorius*
Linnaeus 1766 in part, p. 2713.]

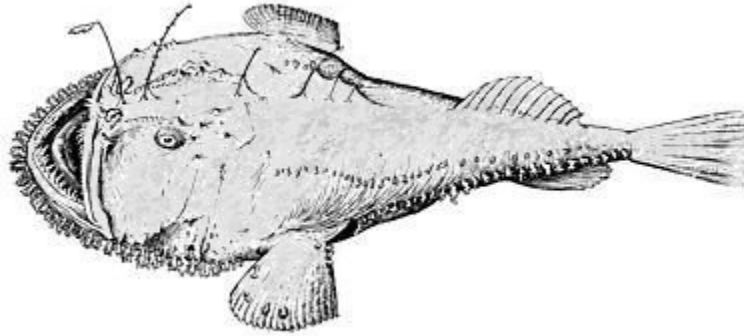


Figure 284 - Goosefish (*Lophius americanus*), oblique-dorsal view, Gulf of Maine specimen. From Bigelow and Welsh.

Description

The goosefish is so unlike all other Gulf of Maine fishes that there is no danger of mistaking it for any other once it is seen. It is so much flattened, dorso-ventrally, and so soft in texture that when one is left stranded on the [page 533] shore it collapses until it is hardly thicker than a skate. Its head is rounded as seen from above, about as broad as it is long, and enormous in comparison with the body, which is so narrow and tapering, back of the pectoral fins as to give the fish a tadpole-like appearance. The most noticeable feature is the enormous mouth, which is directed upward, with the lower jaw projecting so far beyond the upper jaw that most of the lower teeth are freely exposed even when the mouth is closed.

Both jaws are armed with long, slender, curved teeth, all alike in form but of various sizes, and very sharp, and all the teeth point inward toward the gullet. Some of them may be as much as an inch long in a large fish. The teeth in the lower jaw are in 1 to 3 rows, mostly large, while in the upper jaw the few teeth in the middle (there is a toothless space in the midline) are largest, with a single row of smaller ones flanking them. And there are several rows of thorn-like teeth on the roof of the mouth. The gill openings are behind the pectoral fins and they lack the gill covers that are to be seen in most of the bony fishes. The eyes are on the top of the head, and are directed upward.

The pectoral fins are exceedingly distinctive, for their bases have the form of thick fleshy arms as already described (p. 532) that bear the fins proper at their outer edge. The finlike parts are fanlike when spread, and so thick-skinned that the rays are hardly visible except in the scalloping of the margins.

The top of the head bears 3 stiff slender spines (representing the anterior part of the spiny dorsal fin) hardly thicker than bristles, the first standing close behind the tip of the snout, the second a little in front of the eyes, the third on the nape of the neck. And while the first and second are movable from recumbent to erect, the third slopes backward with its basal half imbedded in the skin. [36] the relative lengths of these spines vary, but the first two have been about equal in length on most of the fish we have seen, or the second a little the longer, with the third much the shortest of the three. The first spine bears an irregular leaflike flap of skin at its tip, which plays an important role in the daily life of the goosefish as a lure for its prey (p. 536) while the second and third spines have small triangular membranes at their bases, and one or both of them may be fringed with short lobes of skin. Besides these spines there are two well-developed dorsal fins, the first (of 3 spines) situated over the pectorals and the second (10 to 11 rays) on the rear part of the trunk.

The single anal fin (9 to 10 rays) stands below the second dorsal fin, and the ventral fins (about 5 thick rays) are situated on the lower surface of the head, well in front of the pectorals. The caudal fin is small and broom shaped. The dorsal fins have thin delicate membranes. But the caudal, anal, and ventral fins are thick and fleshy, like the pectorals. The skin is scaleless, very smooth and slippery to the touch, and there is a row of fleshy flaps of irregular shape running around the margin of the head and around the edge of the lower jaw, besides smaller tags that [page 534] fringe the sides of the trunk as far back as the base of the caudal fin. Furthermore, the upper side of the head bears several low conical tubercles which vary in prominence from fish to fish.

Color

The many goosefish we have seen (and this corroborates the published accounts) have been chocolate brown above, variously and finely mottled with pale and dark. The dorsal fins, the upper sides of the pectoral fins, and the caudal fin are of a darker shade of the same color as the back, except nearly black at the tips, while the whole lower surface of the fish is white or dirty white. Sometimes, it is said, the upper side is dotted with white spots but we have seen none that were marked in that way. Very small ones are described as mottled and speckled with green and brown. Wilson, who watched many in the aquarium at Plymouth, England, [37] writes that the European species is able to match both its color and its color pattern closely to the sand and gravel on which it lies.

Size

Adults run from 2 to 4 feet long, [38] weighing up to 50 pounds, and heavier ones have been reported. One 38 inches long, caught at Woods Hole on July 25, 1923, weighed 32 pounds alive.

Remarks

The goosefish of eastern North America has usually been thought identical with the widespread eastern Atlantic angler (*L. piscatorius* Linnaeus.) But as Tåning [39] has pointed out, the late larval stages of our fish do not resemble those of *L. piscatorius* as closely as they do those of the angler of the Mediterranean and of neighboring parts of the Atlantic that various authors regard as a separate species, *L. budegassa*, Spinosa 1807. [40] This suggests that the goosefish of the western Atlantic is a distinct species, for which Berrill [41] has revived the old name *L. americanus* Cuvier and Valenciennes 1837.

The adults of the three forms in question certainly resemble one another so closely that we have not found any external differences that seem significant to separate Gulf of Maine fish from two specimens from northern Europe, and others from the Mediterranean (all of about the same size) with which we have compared them. But it seems wisest to retain the separate name for our form until the larval differences can be investigated further (which we are not in a position to do), and until much larger series of grown fish have been compared.

Habits

The depth range inhabited by the goosefish extends from tide line down to at least 365 fathoms on the continental slope off southern New England, and very likely deeper still. The adults appear, for the most part, to hold to the sea floor, where many are taken by the otter trawlers. And they are found indifferently on hard sand, on pebbly bottom, on the gravel, sand, and broken shells of the good fishing grounds, and on soft mud, where we have trawled them in the deep basin of our Gulf.

Specimens of the closely allied European goosefish kept in the aquarium at Plymouth, England, spent most of the time resting quietly. [42] When they swam they did so slowly, and they used their paired fins for walking on the bottom. Wilson describes one as digging a small hollow in the bottom when it settled down, using its pelvic fins to shovel the sand and pebbles forwards-outwards, and using its pectorals, almost like webbed hands, to push the sand away to either side until its back was almost flush with the surrounding bottom. But the fact that goosefish have been known to seize and swallow hooked fish as the latter were being hauled up, and even to capture sea birds sitting on the surface, proves that while they ordinarily snap up their prey from ambush, or by a sudden short rush, they may make considerable excursions for a meal on occasion.

The American goosefish is at home through a very wide range of temperature. They have been trawled on the Newfoundland banks in water as cold as 32°, [43] and it is likely that those living shoalest in the Gulf of St. Lawrence are exposed to equally low temperatures, in late winter and in spring. But we doubt if they can survive much colder water, for many were seen floating dead in Narragansett Bay, and on the shore, during the [page 535] winter of 1904-1905, apparently killed by the unusually severe cold. [44]

At the other extreme, goosefish picked up by net fishermen near Cape Lookout, N. C., in shoal water (p. 540) are exposed to temperatures higher than 70° for part of the season, perhaps as high as 75°. But reports [45] that the inshore contingent of the goosefish population of Rhode Island waters works out (i. e., deeper) in July, to work inshore again in October suggest that they tend to avoid extreme summer heat, if they can do so by descending into deeper water.

They are tolerant to a wide range of salinity also, occurring as they do from estuarine situations out to the upper part of the continental slope. But we have never heard of one in brackish water.

The larvae of the goosefish, like those of most sea fishes, feed on various small pelagic animals such as copepods, crustacean larvae, and glass worms (*Sagitta*); and *Sagitta* is the chief diet of young goosefish in the Adriatic during the life of the latter near the surface, hence may serve this same purpose in the Gulf of Maine.

The goosefish becomes a fish eater in the main after it takes to the bottom, and the following Gulf of Maine species have been recorded from its stomach: spiny dogfish, skates of various kinds, eels, launce, herring, alewives, menhaden, smelts, mackerel, weakfish, cunners, tautog, sea bass, butterfly, puffers, various sculpins, sea ravens, sea robins, sea snails, silver hake, tomcod, cod, haddock, hake, witch flounders, American dab, yellowtail flounders, winter flounders, and various other species of flatfish unnamed, as well as its own kind. The goosefish often captures sea birds, as one of the vernacular names implies, cormorants, herring gulls, widgeons, scoters, loons, guillemots, and razor-billed auks are on its recorded dietary, while we have found grebes and other diving fowl, such as scaup ducks and mergansers, in goosefish in Pamlico Sound, N. C. It is questionable, however, whether even the largest of them would be able to master a live goose, as rumor has it, nor do the local fishermen believe it ever does so in Pamlico Sound, though the abundance of wild geese there in winter would afford it every opportunity. Goode, [46] however, tells of one which a fisherman saw struggling with a loon. Even a sea turtle has been found in one. [47]

Goosefish are also known to devour invertebrates such as lobsters, crabs of several species, hermit crabs, squids, annelid worms, shellfish, starfish, sand dollars, and even eelgrass. Linton's [48] report of one that was full of mud containing small shellfish, crustaceans, and worms is interesting. In short, nothing edible that strays within reach comes amiss to a goosefish. And examinations of stomachs have shown that the relative importance of various articles in its diet varies widely on different grounds, depending on what is available. Thus Field [49] found skates, flounders, and squid their chief dependence near Woods Hole. The 32-pounder from there, mentioned above, contained 2 menhaden, 1 spiny dogfish a foot long, and the vertebral columns of 6 others; while goosefish diet largely on hakes in the Bay of Fundy; [50] on haddock, flatfish, and on skates on Georges Bank.

The goosefish has often been cited for its remarkable appetite. We read, for instance, of one that had made a meal of 21 flounders and 1 dogfish, all of marketable size; of half a pailful of cunners, tomcod, and sea bass in another; of 75 herring in a third; and of one that had taken 7 wild ducks at one meal. In fact it is nothing unusual for one to contain at one time a mass of food half as heavy as the fish itself. And with its enormous mouth (one $3\frac{1}{2}$ feet long gapes about 9 inches horizontally and 8 inches vertically) it is able to swallow fish of almost its own size. Fulton, for instance, found a codling 23 inches long in a British goosefish of only 26 inches, while Field took a winter flounder almost as big as its captor from an American specimen. One that we once gaffed at the surface, on Nantucket Shoals, contained a haddock 31 inches long, weighing 12 pounds, while Captain Atwood long ago described seeing one attempting to swallow another as large as itself. Wilson's observations, however, indicate that they are no more gluttonous than any other rapacious fish, for those that he watched in the aquarium usually refused food for 2 or 3 days [page 536] after a meal. His observation that they evidently preferred small fish is in line with their normal habits, for they feed mostly on small fish, not on large, and even the largest of them take very small fry on occasion.

In Scottish waters, [51] where the habits of the local goosefish are better known than in the Gulf of Maine, their local abundance depends on the supply of small fish. And despite their poor ability as swimmers goosefish have been found to congregate near particular shoals of herring.

Goosefish, like most fish of prey, often swallow indigestible objects. They have even been credited (on how good evidence we cannot say) with pouching lobster-pot buoys. And the story of one whose mouth made a holding ground for the anchor of a small boat has been related repeatedly.

The most interesting habit of the goosefish is that it actually does use the flap of skin at the tip of its first dorsal spine as a bait to lure small fishes within seizing distance, much as Aristotle described. W. F. Clapp (only observer who has watched the American goosefish feeding, to our knowledge) has described them to us, in Duxbury Harbor as lying motionless among the eelgrass, with the "bait" at the tip of the first dorsal ray swaying to and fro over the mouth. When a tomcod (the only fish he saw them take) chances to approach, it usually swims close up to the "bait," but never (in his observation) actually touches the latter, for the goosefish opens its vast mouth as soon as the victim comes within a few inches and closes it again, engulfing its prey instantaneously.

Further details added by observations on European anglers in aquaria at Port Erin, Isle of Man, by Chadwick [52] and at Plymouth, England, by Wilson, [53] are that the first dorsal spine, with its terminal "bait" is held down along the top of the head, to be raised at the approach of a prospective victim; that the bait may be jerked to and fro quite actively in front of its owner's head; that the victim is usually taken in head first; that a fish swimming close enough may be snapped up without the bait being brought into play; and that some anglers use the bait often, others seldom. Wilson also made the interesting observation that touching the "bait" does not cause a reflex snapping of the jaws, showing that the angler feeds by sight. [54]

Adult goosefish cannot have many enemies. But small ones are no doubt picked up by various predaceous fishes. And Lebour's observation [55] that goosefish larvae in aquarium jars at Plymouth, England, were devoured by the larvae of the spiny lobster (*Palinurus*), by large copepods, by ctenophores, and by hydroids when they came close enough to the walls of the jar to be seized by the latter, is an interesting illustration of the hazards that larval fishes meet during their free-drifting stages.

Goosefish spawn in spring, summer, and early autumn, according to the latitude, and through a long season. Eggs and larvae have been taken near Cape Lookout, N. C., in March and April; [56] in May off Cape Hatteras; [57] and as early as May at Woods Hole. But spawning may not commence until early summer in the Gulf of Maine, for June 24 (Passamaquoddy Bay [58]) is the earliest date when eggs have been seen north of Cape Cod. September 18 (off Seguin Island, Maine) is the latest recorded date for American waters.

The floating egg-veils of the European angler have been reported as early as February 18 in Scottish waters and as late as July 23, [59] while Tåning [60] concludes from the sizes of larvae taken at different dates that March-June is the season of chief production to the west and southwest of the British Isles in general. In the Mediterranean (with higher temperatures), anglers spawn from December and January on, as shown by the presence of larvae. [61]

The locality of spawning has been the subject of discussion, whether inshore in shoal water, or offshore in deeper. The egg veils reported from the Bay of Fundy by Connolly; [62] from Passamaquoddy [page 537] Bay by Berrill; [63] and from Frenchman Bay near Mount Desert by Procter and others, [64] were in such early stages of incubation that they must have been spawned close at hand. And this also applies to some isolated eggs that were collected at about the 20-fathom contour line off northern North Carolina, [65] by the Dana. Neither is there any reason to suppose that veils farther advanced in incubation, that have been taken in the inner parts of the Gulf of Maine (p. 541); at Woods Hole; and at Newport (p. 537), had come from any great distance. Furthermore, large adult fish are present in abundance inshore throughout the spawning season, which would hardly be the case if they moved offshore or into deep water to spawn. On the other hand, veils that could not have been spawned long before have also been met with near the 1,000 to 1,100 fathom (2,000-meter) contour line over the continental slope off North Carolina [66] and at about the same relative position over the slope south of the Newfoundland Banks. [67]

It appears, in short, that the American goosefish spawns indifferently in shoal water and in deep. It differs in this respect from its European relative, which moves offshore and down the slope for the purpose, to near the 1,000-fathom contour, to judge from the localities where the newly hatched larvae have been collected in the eastern North Atlantic. [68]

The presence of egg veils off North Carolina; near Newport [69] and near Woods Hole along southern New England; in the Gulf of Maine (p. 541); and over the continental slope south of the Newfoundland Bank; with the capture of a very small (4-inch) specimen on the Grand Bank (p. 540) shows that the American goosefish breeds throughout its geographic range.

The eggs are shed in remarkable ribband-like veils of mucus, each probably the product of a single ovary, up to 25-36 feet long, and said sometimes to be as much as 2 to 3 feet broad, in which the eggs are arranged in a single layer, lying one to three or even four in separate hexagonal compartments, with the oil globule uppermost. In an egg veil found near St. Andrews, New Brunswick, between 32 and 36 feet long, about 8 inches wide, about 1/8 inch thick, and about 25 quarts (26½ liters) in volume, about 5 percent of the eggs were single, about 80 percent were in pairs, and about 5 percent were in threes, per compartment. This veil was estimated to contain about 1,320,000 eggs, [70] and Fulton estimated about the same numbers (1,345,848 and 1,317,587) in the ovaries of two in Scottish waters. [71]

The veils are light violet gray or purplish brown, made more or less blackish by the embryonic pigment of the eggs according to the stage of development attained by the latter. And they are so conspicuous when floating at the surface that fishermen have long been familiar with them, though it was not until about 1871 that Alexander Agassiz demonstrated their true parentage. [72] the eggs occasionally become isolated, perhaps when a storm shreds the mucous veil to pieces, and they float like any ordinary buoyant fish eggs when this happens. We have not actually found them in this condition in the Gulf of Maine, but Agassiz and Whitman saw isolated eggs at Newport, and Tåning has reported others from North Carolina waters.

The eggs themselves, large numbers of which have now been examined, are 1.61 to 1.84 mm. in longest diameter in the case of the American species, as they lie in their mucous compartments. [73] the yolk is straw-colored, and they have either one copper-colored or pinkish oil globule of 0.4 to 0.56 mm., or several smaller ones. Incubation proceeds normally at temperatures from as low as 41° to as high as 63°-64°, and probably in higher temperatures. The larvae, which float with the yolk uppermost at first, have been reported [page 538] as from about 2.5 mm. to about 4.5 mm. long when they hatch. [74]

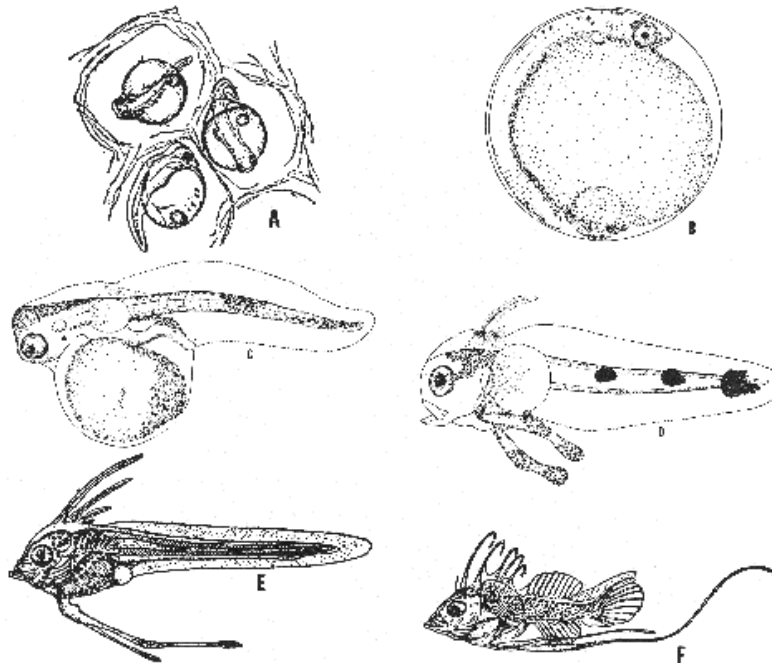


Figure 285. - Goosefish (*Lophius americanus*).

- A, eggs in veil;
- B, egg with advanced embryo;
- C, larva, about 5 days old;
- D, larva about 12 days old;
- E, older larva;
- F, larva, 30 mm.

A, E, and F, after A. Agassiz
 B, C, and D, from New England.

The first of the dorsal fin rays (which is to form the second head spine of the adult) appears within 4 days or so after hatching, as a lobe at the margin of the embryonic finfold on the nape of the neck. The pectorals are formed at about 7 days, when the larva is 5.5 mm. long, the ventral fins have now appeared as two long conical processes below and behind the pectorals (fig. 285D); and the pigment has become congregated in 3 or 4 masses behind the vent, the last being a very conspicuous feature that the larvae of the European species *L. piscatorius* do not share. The yolk has been absorbed at a length of 6-8 mm., a second dorsal ray has formed behind the first, and the ventral fins have become 2-rayed. The third and fourth dorsal rays or filaments appear while there are still only two [page 539] they do not do so in the European species until the third rays have developed, in the ventral fins. The Mediterranean larvae so far described have agreed with the American in this respect, which makes the situation puzzling.

A fifth dorsal ray next appears behind those that have developed already, and a sixth in front of these, all of them being interconnected with membrane at their bases but free at their tips. The pectoral fins assume a great breadth and fanlike outline; the second dorsal, the anal, and the caudal fins take definite form; the ventral rays become filamentous at their tips, streaming far out behind the tail; and a complete row of teeth appears in the lower jaw, with a few in the upper. The goosefish pictured at this stage by Agassiz (fig. 285F) was 30 mm. long, and one much like it taken off Brazil Rock, described by Connolly, was 27 mm. long, but the larvae of the Mediterranean goosefish attain this stage when they are only 13 to 18 mm. long, according to Stiasny.

The older post-larval stages of the American goosefish have not been seen yet. But development no doubt follows the same course for them as it does for the Mediterranean form; i. e., the foremost dorsal ray becomes bristlelike with the flap appearing at its tip; the last three of the free rays on the nape of the neck join together as the future first dorsal fin; the lappets of skin appear around the margin of the lower jaw and along the cheeks; and the head broadens and flattens while the young fish are still living pelagic, with enormous pectoral fins and with threadlike ventrals (fig. 286).

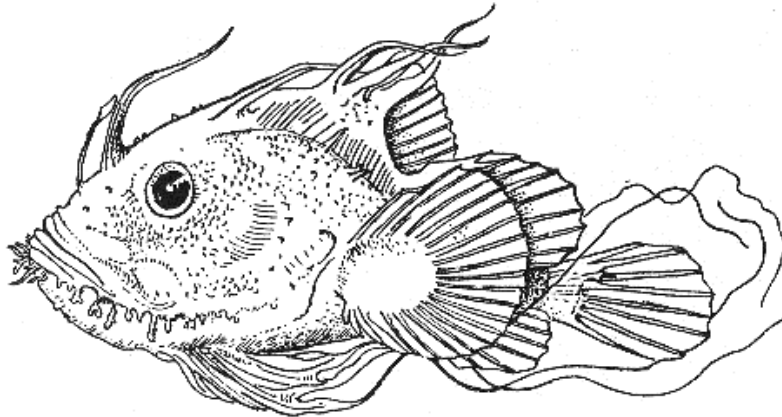


Figure 286 - Goosefish (*Lophius americanus*)
Larva, Mediterranean, 50 mm. After Stiasny.

The largest free-swimming Mediterranean larva seen by Stiasny was 2 inches (50 mm.) long. Probably the young take to the ground shortly after this stage, for Bowman describes European goosefish fry of about 2½ inches (65 mm.) that were trawled on the bottom, off Scotland, as of adult form, except that their pectorals were proportionately larger. To attain this state entails growth on the part of the head out of proportion to the rest of the body; enlargement of the mouth; shrinkage of all the fins (of the ventrals most of all); alteration of the second and third free dorsal rays into spines (they are soft previously); and a general flattening of the whole fish. Young of 3 inches taken at Halifax, one of 4½ inches from Campobello (both pictured by Connolly), and others as small as 4-4½ inches that we have trawled, were at about this stage in their development.

The capture of a 2½-inch specimen in October (presumably), in Halifax Harbor, and of another of 3 inches there (date not recorded), [75] suggests that the goosefish may be expected to reach about that length by the onset of their first winter in our northern waters. One 4½ inches long from Halifax, studied by Connolly, seemed, from the thickness of its otoliths, to have been in its second summer or autumn, i. e., one full year old, which probably applies to three others of 4-4½ inches, trawled in August, that we have seen. But it is not clear whether 14 others of 7½ inches in May, and of 6¾-9 inches in July, were early hatched fry in their second season, or late hatched specimens in their third season. [76]

One of the larger fish studied by Connolly showed 4 concentric rings in its vertebrae; one 31 inches long seemed to have 9 rings; one of 37 inches seemed to have 10 rings; and one of 40 inches seemed to have 12 rings. But it is not certain whether these vertebral rings are laid down regularly, one per year, or not.

Fulton's observations [77] show that the fry of the North European angler may be 5-5½ inches long by November off Scotland, where spawning commences in March or earlier; which is as large as the fry of the American species are in their second summer in our northern waters, where the first growing season is at least 3 to 4 months shorter. Fulton's measurements also point to more rapid growth by the larger Scottish fish than by the [page 540] American goosefish in the Bay of Fundy, namely to 9-16 inches at a year and a half; to 14½-18½ inches when 2½ years old; and to about 21 inches at 3 years of age.

Few goosefish mature on either side of the Atlantic until they are 30 inches long, or longer. [78]

General range

Coast of eastern North America from the southern and eastern parts of the Grand Banks of Newfoundland, and the northern side of the Gulf of St. Lawrence [79] southward to North Carolina, in shoal and moderately deep water; also reported (as *L. piscatorius*) off the Barbadoes at 209 fathoms, on the Yucatan Bank, southern part of the Gulf of Mexico, at 84 fathoms, [80] and off Cape Frio, Brazil, in lat. 22°56' S., [81] if these southern specimens actually belonged to the same species.

Occurrence in the Gulf of Maine

This is a familiar fish in the Gulf of Maine both along shore and on the outer fishing banks. It has been recorded in print from the west coast of Nova Scotia (St. Mary Bay) and from various localities in the Bay of Fundy, where, according to Huntsman, large ones are frequently taken on long lines, or found stranded on the beach. It is well known, if not abundant, all along the coast of Maine, and we once caught 8 (all large) in Ipswich Bay in one haul of a beam trawl only 8 feet wide. In Massachusetts Bay goosefish are the most common on the smooth bottom south of Boston; many enter Duxbury Bay (p. 536); and they are so numerous in Cape Cod Bay that one can hardly walk the beach for an afternoon without finding a jawbone bleaching on the sand, which applies equally all along the outer shores of Cape Cod. Fishermen speak of them as common on and about Stellwagen Bank, also. And we have trawled them in the deep basin of the Gulf.

Goosefish formed about 1 percent (in numbers of individuals) of the fishes of all kinds taken by certain otter trawlers in the South Channel and on Georges Bank in 1913. And most of the trawl hauls that we have seen made there subsequently in depths of 60 to 100 fathoms have brought in from 1 to 40 of them.

They do not show any evident preference for any particular depth zone in the inner parts of the Gulf between tide mark and 100 fathoms or so, and the Albatross III found them generally distributed from 22-30 fathoms down to at least as deep as 150-160 fathoms both on Georges Bank and off southern New England to the westward, in May 1950. [82] Our failure to take any in the bowl between Jeffreys Ledge and the coast suggests that they may avoid the very softest mud bottoms. And it is likely that a rather definite concentration of them in depths of 26 to 45 fathoms on the southwestern part of Georges Bank in June 1951, when the Eugene H caught an average of about 5 per haul there, but only 1 per haul at 46-65 fathoms, was a matter of the food supply, not of the depth.

Goosefish are said to be as common on Browns Bank as they are on Georges, also along the outer Nova Scotian coast and banks as far as Banquereau, though they may not be as common inshore there as they are in the Gulf of Maine. They must be generally distributed in the southern side of the Gulf of St. Lawrence also, to judge from the localities of record there, and they have been reported from Anse des Dunes and from near Mingan on the north shore. [83] they have also been trawled at a few localities on the southern and eastern part of the Grand Banks. [84] And a 4-inch specimen was brought back from the Grand Bank in 1856 [85] But this seems to be its northern limit in our side of the open Atlantic, for they have not been reported from the east coast of Newfoundland, or reliably from the outer coast of Labrador (see footnote 79, p. 540).

Goosefish are common westward and southward also, as far as North Carolina. We have seen many stranded in winter a few miles north of Cape Hatteras, both in Pamlico Sound and on the outside beach, and Smith [86] described it as so plentiful [page 541] near Cape Lookout that "as many as 20 large specimens are sometimes found in a sink net at one lift," though it has been seen less often of late years. [87]

Egg veils have been reported within the Gulf of Maine from Campobello Island at the entrance to the Bay of Fundy; from Passamaquoddy Bay (2 instances); [88] in Frenchman Bay, Maine; [89] about 15 miles off Seguin Island, Maine, September 18, 1925 (with eggs nearly ready to hatch, found by Capt. Greenleaf of the U. S. Bureau of Fisheries); and at Provincetown, where we found a veil within a few feet of the shore, on June 26, 1925. The captures of the pelagic larvae within the Gulf have been fewer, namely 3 taken near Brazil Rock off southwestern Nova Scotia, and two very small ones (5 and 6.5 mm. long) collected by us on the Grampus in Massachusetts Bay, one on July 12, 1912, the other September 29, 1915.

The question why the egg veils should have been encountered so seldom in our Gulf when they are so conspicuous in the water, and why so few larvae have been taken in our tow nets, when the parent fish are moderately plentiful and very generally distributed, is an intriguing one that we cannot answer from present information.

Importance

No regular commercial use has been made of the goosefish in America up to the present time. But it is an excellent food fish, white-meated, free of bones, and of pleasant flavor, as Dr. Connolly assures us from personal experience. In 1948, [90] English and Scottish vessels landed about 7 million pounds of the European species, as "monk" which fetched nearly as high a price as haddock in English markets, though it brings only about one-half as high a price as haddock in Scotch ports. [91] And some were sold in retail stores during the last year.

[36] Sometimes more than one-half is so imbedded.

[37] Jour. Marine Biol. Assoc. United Kingdom, vol. 21, Pt. 2, 1937, p. 485.

[38] Rumor has it that goosefish grow to 6 feet, but we find none definitely recorded (and have seen none) longer than 4 feet.

[39] Rept. Danish Oceanogr. Expeds. (1908-1910), No. 7, vol. 2, Biol. A. 10., 1923, p. 7-16.

[40] See Regan, Ann. Mag. Nat. Hist. Ser. 7, vol. 11, 1903, p. 283 for descriptions of *L. piscatorius*, of *L. budgegassa*, and of a new species, *vaillantii*, described by him from the Azores and from the Cape Verde Islands.

[41] Contrib. Canadian Biol. N. Ser., vol. 4, No. 12, 1929.

[42] Wilson (Jour. Mar. Biol. Assoc. United Kingdom, vol. 21, Pt. 2, 1937, pp. 486-490) has given a very interesting account of the habits of specimens in the aquarium at Plymouth, England, where some were kept for as long as 11 months.

[43] Rept., vol. 2, No. 1, Newfoundland Fish. Res. Comm., 1933, p. 127 sta. 97.

[44] Reported by Tracy, 36th Rept. Comm. Inland Fish. Rhode Island, 1906, p. 92.

[45] Tracy, 36 Rept. Comm. Inland Fish., Rhode Island 1906, p. 92.

[46] Fish. Ind. U. S., Sect. 1, 1884, p. 174.

[47] Schroeder, Copeia 1947, p. 201.

[48] Bull. U. S. Bur. Fish., vol. 19, 1901, p. 487.

[49] Rept. U. S. Comm. Fish., (1906) 1907, Doc. No. 622, p. 39.

[50] Connelly, Bull. 3, Biol. Board Canada, 1920, p. 16.

[51] Fulton (Ann. Report, Fish. Board Scotland, (1902) 1903, Pt. 3, p. 195) lists the stomach contents of 541 goosefish from various localities off Scotland.

[52] Nature, vol. 124, 1929, p. 337.

- [53] Jour. Marine Biol. Assoc. United Kingdom, vol. 21, pt. 2, 1937, p. 479
- [54] Gudger (Amer. Naturalist, vol. 79, 1945, p. 542), has given an interesting and readable survey of observations, at various hands, on the use of the bait.
- [55] Jour. Mar. Biol. Assoc. United Kingdom, vol. 13, 1925, p. 728.
- [56] Information supplied by the late S. F. Hildebrand.
- [57] Tåning, Rept. Danish Oceanogr. Expeds., 1908-1910, No. 7, vol. 2 (Biol.), A 10, 1923, p. 25.
- [58] Connolly, Contrib. Canadian Biol. (1921) 1922, p. 116.
- [59] See Bowman (Fish. Bd. Scotland, Sci. Invest. (1919, No. 2), 1920, p. 23) for records for angler eggs up to 1919.
- [60] Danish Oceanogr. Expeds., 1908-1910, No. 7, vol. 2 (Biol.), A 10, 1923, p. 23.
- [61] See Stiasny (Arbeit. Zool. Inst. Vienna, vol. 19, 1911, p. 70) for Mediterranean records, besides which an egg veil has been reported in January near Naples by Le Bianco (Mitth. Zool. Stat. Neapel., vol. 19, pt. 4, 1909, p. 725)
- [62] Contrib. Canadian Biol. (1921), No. 7, 1922, p. 116.
- [63] Contrib. Canadian Biol. Fish., N. Ser., vol. 4, No. 12, 1929, p. 145.
- [64] Biol. Surv. Mount Desert Region, Pt. 2, Fishes, 1928, p. 3.
- [65] Tåning, Rept. Danish Oceanogr. Expeds., 1908-1910, No. 7, vol. 2 (Biol.) A 10, 1923, p. 25.
- [66] Lat. 36°16' N., long. 74°33' W., see Tåning, Danish Oceanogr. Expeds., 1908-1910, vol. 2 (Biol.), A 10, 1923, p. 25.
- [67] Murray and Hjort, Depths of the Ocean, 1912, p. 108.
- [68] For further discussion, see Bowman (Fishery Bd. Scotland Sci. Invest. [1919], No. 2, 1920, p. 21) and Tåning (Rept. Danish Oceanogr. Expeds., 1908-1910, vol. 2 (Biol). No. 7, A 10, 1923).
- [69] It was at Newport that Agassiz, and Agassiz and Whitman, collected the veils and the larvae on which they based their accounts.
- [70] Berrill, Contrib. Canad. Biol. and Fish., N. Ser., vol. 4, No. 12, 1929, pp. 145, 147.
- [71] Sixteenth Annual Report, Fish. Bd. Scotland (1897) 1898, Pt. III, pp. 125-134, pls. 2-3.
- [72] Baird, American Naturalist, vol. 5, 1871, pp. 785-786.
- [73] the eggs of the European *L. piscatorius* are described as larger, averaging about 2.3 mm.

[74] Larval goosfish from New England, from the Bay of Fundy, and from Nova Scotian waters have been described and pictured by Agassiz (Proc. Amer. Acad. Arts, Sci., N. Ser., vol. 9, 1882, p. 280); by Agassiz and Whitman (Mem. Mus. Comp. Zool., vol. 14, No. 1, Pt. 1, 1885, p. 16, pl. 6, figs. 1-10); by Connolly (Contrib. Canadian Biol. [1921], No. 7, 1922); by Procter and others (Biol. Surv. Mt. Desert region, Pt. 2, Fishes, 1928); and by Berrill (Contrib. Canadian Biol. and Fish., N. Ser., vol. 4, No. 12, 1929, pp. 145-149). For accounts and illustrations of North European and Mediterranean *Lophius* larvae, see especially Lebour (Jour. Marine Biol. Assoc. United Kingdom, vol. 13, No. 3, 1925, pp. 721-728) who reared them from the eggs at Plymouth, England; also Bowman (Fishery Board for Scotland, Sci. Invest. [1919] 1920, No. 11), Stiasny (Arbeit, Zool. Inst. Vienna, vol. 19, 1911 p. 71), and Tåning (Report, Danish Oceanogr. Expeds., 1908-1910, No. 7, vol. 2 (Biol.), A 10, 1923).

[75] Connolly (Contrib. Canadian Biol. (1921), No. 7, 1922, pp. 119-120).

[76] Equal uncertainty applies to two of 10 inches, one of which was trawled in February, the other in April.

[77] 21st Ann. Rept. Fish. Bd. Scotland, Pt. 3 (1902) 1903, pp. 190-194.

[78] the smallest ripe males of the North European species seen by Fulton were 26-27 inches long, the smallest ripe females 30 inches.

[79] Pennant's (Arch. Zool., vol. 1, 1784, p. cxc) report of "the *Lophius piscatorius* or common angler" in Hudson Bay seems to have been based on a sculpin (for history of the case, see Connolly, Bull. 3, Biol. Bd. Canada, 1920, p. 7). And we think it likely that this applies also to the "*Lophius laevigatus*" reported by Weiz (Proc. Boston Soc. Nat. Hist., vol. 10, 1866, p. 269) from Okak, northern Labrador.

[80] Goode and Bean, Smithsonian Contrib. Knowl., vol. 30, 1895, p. 486.

[81] Regan, British Antarctic (Terra Nova) Exped. (1910), Zool., vol. 1, No. 1, 1914, p. 23.

[82] Catches of 1 to 34 per haul.

[83] See Cox (Contrib. Canadian Biol. [1902-1905], 1907, p. 90), Cornish (Contrib. Canadian Biol. [1906-1910], 1912, p. 81), and Connolly (Bull. 3, Biol. Bd. Canada, 1920, p. 7) for Nova Scotian and Gulf of St. Lawrence localities; the Annual Reports of the Newfoundland Fishery Research Commission, vol. 1, No. 4, 1932, p. 110, for additional records for the Nova Scotian Banks.

[84] Rept. Newfoundland Fish. Res. Comm., vol. 1, No. 4, 1932, p. 110, Sta. 17; vol. 2, No. 1, 1933, p. 127, Sta. 97; vol. 2, No. 2, 1935, p. 116, Sta. 204, 205, 274.

[85] Goode and Bean, Smithsonian Contrib. Knowl., vol. 30, 1895, p. 486.

[86] North Carolina Econ. Geol. Surv., vol. 2, 1907, p. 399.

[87] Information supplied by the late S. F. Hildebrand.

[88] Connolly, Contrib. Canadian Biol. (1921) 1922, No. 7, p. 116; Berrill Contrib. Canadian Biol. Fish. N. Ser., vol. 4, No. 12, 1929, p. 145.

[89] Procter and others, Biol. Surv. Mt. Desert, Pt. 2 Fishes, 1928, p. 3.

[90] Most recent year for which the International fisheries statistics are readily available.

[91] For catches and values, see Bull. Statist., Cons. Internat. Explor. Mer., vol. 33, 1951, pp. 14, 16-18.

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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