

THE SCULPIN AND ITS HABITS

BY THEODORE GILL

I

One of the commonest and most characteristic groups of fishes of all the cold northern waters is that represented by the common Sculpin of the New England coast. In no American work is there a full account of its habits. To fill this gap as much as possible, in the present state of our knowledge, is the object of the present article. The data are derived mainly from F. A. Smitt's *Scandinavian Fishes*, and works or memoirs by McIntosh, Masterman, Thomas Scott, Nordquist, Ehrenbaum, and the earlier ones of Fabricius, Van Beneden, Day, and A. Agassiz, in addition to personal observations in the field along the New England coast, Grand Manan, and Newfoundland, and in the aquarium. The language of the authors from whom information is derived is given as far as possible. The illustrations have been copied chiefly from the excellent contribution of Doctor Ehrenbaum.

II

The Sculpins of the American shore-men are representatives of a family rich in genera and species known as the *Cottidae*, or, as angli-

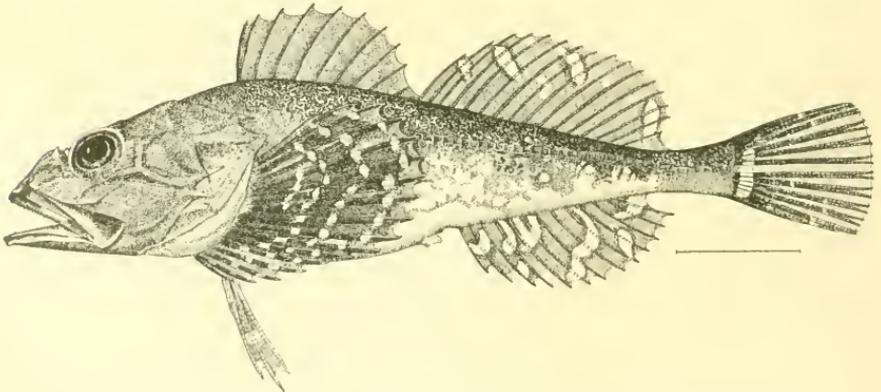


FIG. 45.—Common Sculpin (*Myoxocephalus scorpius*). After Jordan and Evermann.

cized, *Cottids*. The *Cottids* or *Sculpins* are elongated mail-cheeked fishes, contracted backward from the pectoral region, or long-conic,

but more or less swollen about the abdomen; the skin of most is naked, but in some incompletely scaled; the pectorals have expanded bases which curve forward and downward, and in one form (*Synchirus*) are even connected below, and the ventrals are imperfect, having a spine (closely joined to the next ray) and two to four (exceptionally five) simple rays.

The most distinctive characters, however, are furnished by the skeleton and especially by the shoulder girdle. The two bones, hypercoracoid and hypocoracoid, which in most mail-cheeked fishes, as in others, intervene between the great shoulder bone and the four bones at the base of the pectoral fin, are in the Cottids

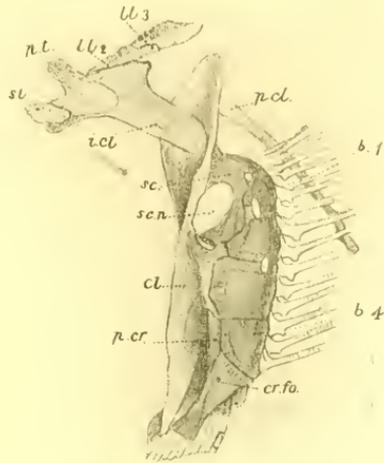


FIG. 46.—Shoulder girdle of the Sculpin (after Parker), showing the intervention of the second and third actinosts between the first and fourth actinosts (*b. 1* and *b. 4*) and the hypercoracoid (*sc*) and hypocoracoid (*cr*). *b.* brachials or actinosts; *cl.* clavicle; *cr. f.* coracoid (hypocoracoid) foramen; *i. cl.* interclavicle; *ll. 2, 3*, lateral line scutes; *p. cl.* postclavicle; *p. cr.* produced coracoid (hypocoracoid); *pt.* post-temporal; *sc.* scapula (hypercoracoid); *sc. n.* scapular notch; *st.* supratemporal.



FIG. 47.—Skull of Sculpin (after Girard).

so reduced and shoved out of place that the middle at least of the basal bones (actinosts) connect with the great shoulder bone.

Other important osteological characters are coincident with these and manifest in modifications of the vertebræ, relations of the ribs, and structure of the skull.

Most of the salt-water Cottids (*Myxoccephalines*) have large branchial apertures and narrow isthmus or none at all; the skull also differs notably from the fresh-water forms, the hinder portion being oblong and

semi-oval and gradually contracted into the moderately narrow inter-orbital area. The armature of the head is much more fully developed than that of the fresh-water species, as may be inferred from the specific name (*18-spinosus* or 18-spined) of the most common kind found along the coasts of middle and southern United States.

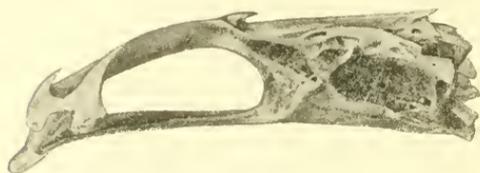


FIG. 48.—Skull of Sculpin (after Girard).

The genus *Myoxocephalus* is the largest of the marine genera of the family and comprises the species best known, at least to the dwellers around the northern Atlantic. Its principal distinctive characteristics are the naked body, wide gill-apertures and freedom of the gill-membranes below, the development on each side of three preopercular spines (the uppermost of which is straight and the lowermost turned downward), the presence of a single suprascapular spine, the projection of the upper jaw beyond the lower, and the absence of palatine teeth.

The name by which the common species, as well as others of the genus, is almost universally known along the entire coast of America is Sculpin, or Skulpin. The etymology of this word is generally indicated as unknown or doubtful. It has even been suggested that it was derived from skull and pin, the latter with the sense of spine, but, while quite apt and plausible, such a formation is not in accordance with verbal development.



FIG. 49.—Skull of Miller's-thumb (after Girard).

It is probably, if not certainly, a derivative of the old Latin *Scorpena* and *Scorpio*, and cognate with the modern modifications, amongst which is the French as well as the English *Scorpion*. *Scorpion* is still one of the names for it in France, although according to Moreau, one in more frequent use by the fishermen is *Diable de mer* or Sea Devil. *Scorpion* or *Sea Scorpion* is also applied to it in England. Now, the word *Sculpin* is employed in England for a Callionymid or Dragonet. At one time, however, it must have been used for Cottids, inasmuch as, besides its general use in North America, the name was taken to Barbados and aptly given to a near relative (*Scorpena plumicri*) of the *Scorpena* of the ancients and the modern inhabitants of the bor-



FIG. 50.—Skull of fresh-water Miller's-thumb.

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ders of the Mediterranean. It is also in limited use in California for another species of *Scorpana* (*S. guttata*).

In England, *Sculpin* is not recorded as a name of this fish, its principal vernacular names there being *Sea-scorpion* and *Sting-fish*; *Gundie* and *Sutor* are Scotch names. A distantly related species (*M. bubalis*) is called in England *Father-lasher* and in Scotland *Lucky-proach*.

III

The most common and longest known of the species is the *Myxoccephalus scorpio* of the North Atlantic. This is distinguished from its fellows by the moderate uppermost preopercular spine (which is about as long as the diameter of the eye and only about twice as long as the one next below), and the number of fin rays (generally D. X, 17; A. 14).

The sexes are strongly differentiated from each other when mature and especially during the breeding season; so trenchantly, indeed, that it was long before they were considered to belong to the same species, and fishermen even, notably in Sweden, "regard them as two distinct kinds of fishes."

The male has more developed fins, i. e., higher dorsal and anal and longer pectoral and ventral, and the pectoral and ventral are mucronated on their inner surfaces, a variable number of pectoral rays (from the fifth to the eleventh) being studded inside with minute spinous tubercles. The colors are bright and the belly is reddish or copper-colored and diversified with large, pure white spots, and the ventrals are white, banded with blackish or red on the rays.

The female has lower and shorter fins, i. e., comparatively low dorsal and anal and shorter pectoral and ventral fins, and the last are smooth on their inner surfaces. The lateral tubercles of the body are also sparse or almost wanting, thus contrasting with the many of the male. The colors are dull, the belly being dirty yellow and the ventral are also yellow, but banded with black.

Such are the typical characteristics, but there is much independent variation with age and condition in the species.

There is considerable variation in size, and, if the Greenland form is considered conspecific, it is remarkable. Its size may be said to increase roughly with the latitude. The Arctic or Greenland Sculpin is claimed sometimes to attain a length of more than three or even six feet.¹ The usual size of the Sea Scorpion in Scandinavian waters is

¹ Day, in *The Fishes of Great Britain* (1, 45), asserts that "the largest variety (*C. Granlandicus*) is reputed to attain to 6 feet in length." I know of no authority for such a statement and doubt whether the fish ever grows much or any more than 3 feet long.

between eight and ten inches, and in British waters it may reach sexual maturity when four inches long. The American form, along the New England and British colonial coast, is about as large as the Scandinavian fish.

IV

The species is one of the most abundant of fishes in the high northern seas. It enters most harbors and numbers may at almost any time during the summer be caught from the wharves. It is, Smitt declares, "one of those that may be called migratory," inasmuch as it "moves from one place to another along the coast of the sea which it inhabits, occurring in considerable quantities at a certain spot for some years and then suddenly diminishing in number, not to reappear in any abundance until after the lapse of ten or twenty years."

It is most abundant "in water of no great depth, where the bottom consists of clay or stones overgrown with seaweed," but is by no means confined to such places and may be found almost anywhere, and at considerable depths.

It is an unsocial fish and lives alone most of its life, although generally not far from its fellows.¹ That life is spent mostly near or on the bottom and its sluggishness is rarely relieved except when hunger is to be satisfied. According to Smitt, it often "passes the hours of daylight in dark crevices, awaiting the approach of some victim," but, on the other hand, it may be sometimes seen in high latitudes (as around Newfoundland and Grand Manan) in shallow water when the sun, in unclouded splendor, is at the zenith.² When impelled to move, "its movements in the water are speedy but not prolonged, and the winding curves," somewhat "like those of an Eel, in which the body moves, are apparently the result of considerable exertion. The great size of its fins does not contribute greatly to the speed of its movements, but seems rather intended to maintain the equilibrium of its bulky and unwieldy body." Otherwise it is so apathetic and "its timidity is so slight that, when touched, it only makes a leisurely movement to avoid the object that has disturbed it, and soon stops, as still as if nothing had happened." This apathy or want of sensitiveness sometimes astonishes a captor. "When drawn out of the water, it wriggles a few times in its efforts to get

¹ This statement is to contrast the species with schooling fishes.

² In a couple of hours before noon on a bright July day the writer caught 16 Sulpins from a small wharf in Grand Manan and found 10 females and 6 males; the collective sexual differences were for the first time pointed out in the *Proc. Acad. Nat. Sci. Phila.*, 1872, pp. 213, 214.

free, and, not succeeding in this, seems quite indifferent to its fate, seldom showing any marked sign of life, even though it is still alive." It is, however, "not remarkably tenacious of life."

The large open mouth betokens voracity, and appearances are not deceptive. "Rashness and voracity," declares Smitt, are among the "chief traits of its character. In the latter respect it is surpassed by few if any fishes. Three Roach, each nearly 100 mm. long, have been found in a Sea-Scorpion 220 mm. in length." The main food supply is derived from "other fishes, though, especially in winter, when the supply of fish is scanty, it does not despise crustaceans, worms and mollusks." In fact it is omnivorous, and "it always pays more attention to the quantity than to the quality of its food."

Such were the observations recorded by Smitt, but Thomas Scott (1902) and Van Beneden (1871) found chiefly crustaceans in the stomachs of those examined by themselves. Van Beneden found only a small Gurnard in one, but "otherwise the food consisted entirely of crustaceans," while Scott found that, "in the stomachs of seven specimens, all from the Bay of Nigg, near Aberdeen, the food observed consisted altogether of crustacea, and included larval Decapods, the fragments of a Hermit Crab, *Porcellana longicornis*, *Idothea baltica*, the *Cypris* stage of *Balanus*," etc. In fact the food apparently depends very much on what the omnivorous fish can secure. Inasmuch as the Sculpin is a sluggish animal, it is natural that crabs and the like should be found more frequently than more active creatures. It is remarkable, however, that mollusks and worms should rarely be found. To that extent it appears to show preference, for such can generally be easily secured by a fish.

Observations of American Sculpins have confirmed those of the European fishes. Girard (1850) "examined the contents of the stomach of many marine and fresh-water Cottoids and in the *Acanthocotti*" or Sculpins "of the Boston Bay found them to consist of crabs" (*Panopeus herbstii*). Linton (1901) found "annelids, copepods, shrimps, and young fish in the alimentary canals of young specimens" of the Little Sculpin (*M. aeneus*) and "many young flounders and shrimps" were "taken from alimentary tracts of young Sculpin from Katama Bay, April 28, 1900."

It is not entirely voiceless, for, when taken in the hand, it is apt to utter a grunbling or rather gurgling sound, or cry, and hence has been named in some places Grumbler or Growler (Grogneur) and Sea-Cock (Coq de mer).

These sounds were fully studied by Dufossé many years ago and the results published (1874) in an elaborate memoir (Ann. Sc. Nat.

Zool., (5,) xx, 91-103). He thought that if we pronounce in a subdued voice the diphthongs *ou! vous! ous!* as short consonant sounds, we may produce sounds which have a great analogy with the most common cries of the Sulpins. Their utterances are so instantaneous that we cannot observe the pitch. They are emitted at irregular intervals and with considerable irregularity in intensity and variations of timbre; their resemblance to the cries of several toad-like Batrachians is remarkable and they might easily be mistaken for such. On account of this similarity Dufossé designated their sounds as cries (*cris*) to distinguish them from those of other fishes.

The sounds are produced in water as well as in the open air and are the results of the vibratory contraction of some of the muscles round the mouth of the fish; especially those of the floor of the mouth and those connected with the branchial and hyoid apparatus. These muscles, Dufossé urges, are subject to the will of the fish and the sounds they cause are consequently voluntary. Furthermore, the buccal and respiratory cavities, when dilated, become capable of re-enforcing all the sonorous vibrations, like a resonant cavity on a musical instrument. The branchiostegal membrane becomes puffed out and gives the fish the appearance familiar to salt-water anglers and watermen.

V

The relations of the sexes to each other, and the armature of the inside surfaces of the pectorals and ventrals of the males, had long ago led some naturalists to infer that perhaps the males had connection with the females, but most had discredited the suggestion. McIntosh and Masterman indeed, in 1897, had urged "that it is evident that" the eggs "are not fertilized before deposition." Nevertheless, a year later, (in 1898,) Nordquist claimed that the eggs are so fertilized. The importance and interest of the alleged discovery entitles him to tell the story in his own way. His short article was published in the *Meddelanden* of the Societas pro Fauna et Flora Fennica (pt. 26. 1899-1900, pp. 31-32). It is here translated:

"When, on the 27th of last November [1898], I cut open some Sea-Scorpions from the neighborhood of Helsingfors for the purpose of determining the spawning time of this species, I found some eggs in the ovary of one of the individuals examined, near the genital aperture, which were considerably bigger than the rest and of a paler color. On looking more closely at one of the eggs, I found that it contained a rather far advanced embryo with two distinct pigmented eyes. On closer examination of the ovary, I could discover, here and there, several similar eggs at an advanced

stage of development. An examination of several individuals gave a similar result. In all were found some eggs in the ovaries bigger than the others, and paler in color (a few were as clear as water) and containing a distinct embryo which was not, however, in every case as fully developed as in the first mentioned eggs.

"Here then, for the first time, was certain evidence that in the Sea-Scorpions the spawn becomes fecundated while yet in the ovary, a condition known to exist only in a few exceptional cases in the class of fishes, as in the Sharks, the *Embiotocida* of the Pacific Ocean, several *Scorpanida* and some *Blenniida*, among others *Zoarces viviparus*, which also occurs on our coasts."

Viviparity is much more common among fishes than Nordquist was aware of. His observation, however, was of great interest. The facts in the case would at first seem to imply that internal fertilization takes place, but is speedily followed by oviposition and the subsequent assumption of care of the eggs by the male. But soon afterward, Nordquist's conclusion was called in question. E. Ehrenbaum, in the *Wissenschaftliche Meeresuntersuchungen* (Neue Folge, VI, Heft 2, Apr. 15, 1904, pp. 133-134) published the results of new studies of the same subject and his remarks are here translated:

"The conspicuous enlargement of the anal papilla in *Cottus scorpius* during the spawning-time suggests the question as to the occurrence of internal fecundation in that species. Nordquist (*Meddel. Societ. Fauna et Flora fenn.*, p. 26, 1900), confirming an earlier observation made by Ekstrom (*Die Fische in den Scheeren von Mörkö*, p. 176, 1835), did indeed find far advanced embryos with distinctly visible dark eyes in the ovary of mature females, so that consequently copulation must have taken place previously. In opposition to this McIntosh (*Fourteenth Ann. Rept. Fish. Board f. Scotld.*, pt. III, p. 181) has positively denied that such a condition could be admitted for the *Cottus* of the British coasts; and also in the German North-Sea I have found no support whatever for the assumption of internal fecundation. I have never found embryonate eggs in the ovary and have on the other hand in nature found recently deposited eggs at very early stages of development. I have also noted that the eggs deposited in the aquarium, which continued to develop normally and emitted larvæ subsequently, were completely undeveloped when dropped, and presented after twenty-four hours early stages of furrowing. Internal fecundation with following embryonic development within the maternal organism can therefore not be considered the rule. Agreeing with this, Nordquist has lately communicated to me, by letter, that he has also changed his view in the meantime; that internal fecundation does occur in *Cottus scorpius* (and *quadricornis*), but only as an exception, and that the isolated fecundated eggs in the ovary generally develop abnormally and probably die in the ovary. But the occurrence of internal fecundation even as an abnormality must be considered for the present as restricted to the extreme northeastern Baltic. But this very circumstance increases the interest of Nordquist's observation, as accordingly the northern *Cottus* appears as a transitional link with his Arctic relatives, such as *Gymnocanthus*.

Cottunculus, *Centridermichthys*, *Triglops*, and others, which all possess highly developed anal papillæ, and in which therefore copulation and internal fecundation of the female is probably the rule."

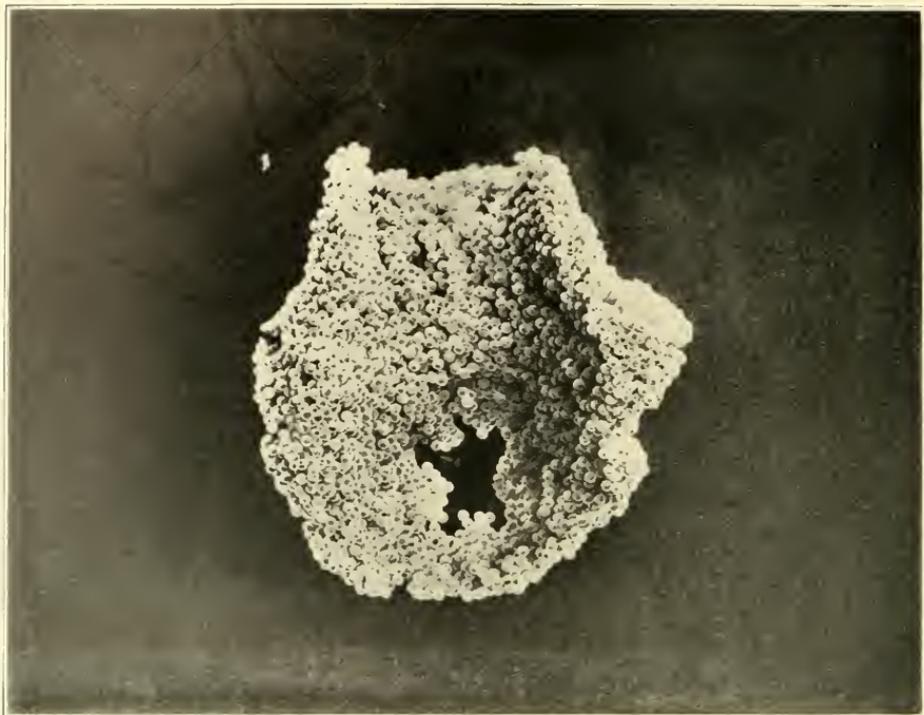
A legitimate inference from the facts so offered seems to be that when the sexual products are fully ripe, the sexes may come together and the ova are fertilized just before or during protrusion, but sometimes there may be some arrest or retardation in passage of the eggs and then there may be internal fertilization. The subject is certainly worthy of study by some one favorably situated for making the necessary observations and the data here given bring the literature up to date.

VI

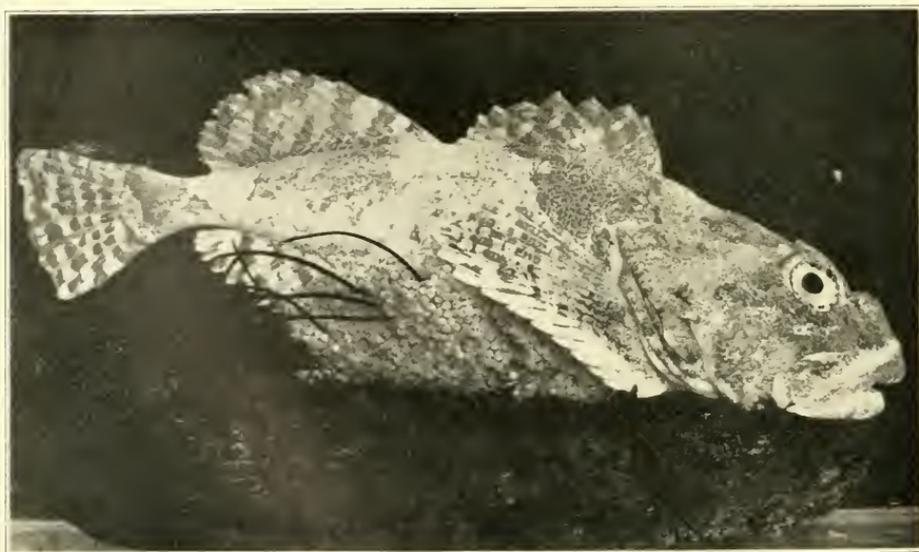
About the beginning or middle of winter, or, it may be, not before the beginning of spring, most of the adult Sculpins are ready to discharge their ripe eggs. They seek fitting places to deposit their burdens and generally discharge their eggs in masses which are "at first quite soft, though cohering together by a secretion," but "soon harden, the capsules adhering by facets to each other as in the Lump-sucker, so that the egg-mass resembles a spongy structure into which water freely enters, and is retained in considerable quantity, even though the eggs are uncovered by the tide, a provision of some importance." These egg-masses are extruded "in the sand or pools in the rocks," or attached to stones, tangle roots, sea-weed and, "indeed, almost anything convenient." If, perchance, discarded "old shoes" or "tin vessels" be lying around, they are apt to be utilized as nesting places. (See plate XLIX, I.)

A ripe female, "isolated in a glass vessel" at St. Andrews, was observed by McIntosh and Masterman. "This specimen, whose abdomen was distended," had been "observed to be somewhat restless the previous day, and on the first of March it rested quietly on the bottom of the vessel, and in a few seconds deposited a mass (as large as a duck egg) of faintly pinkish eggs, keeping its breast-fins in active motion during the process, and then it dashed through the water, sending some of the eggs over the edge of the vessel."

In a state of nature, the males are said to generally select the places for deposit severally, and "to make a nest of sea-weeds and pebbles for the reception of the spawn." The male also continues to keep watch over the deposit and may even brood over them, clasping the egg-mass with his pectoral and ventral fins, whose inner surfaces are provided with asperities or hooks which enable him to obtain a firmer hold of the mass. Doubtless, however, he often releases his



1. NEST OR EGG-MASS OF THE SCULPIN (AFTER EHRENBAUM)



2. MALE SCULPIN OVER EGG-MASS (AFTER EHRENBAUM)

hold and fans the eggs to secure aërication. Ehrenbaum has given a characteristic illustration (see plate XLIX, 2).

The extruded eggs vary from pink "to roseate, orange, straw-color, and deep red." Their diameter ranges from 1.5 to 2 millimeters. "The capsule is thick, tough, and resistant, and shows the facets or processes by which it adheres to surrounding eggs; it appears minutely punctured, under a high power, the punctures having as a rule, a more regular (linear) arrangement than in the Lump-sucker." The yolk has a variable number of oil-globules which ultimately coalesce into a single large one. The development depends on temperature and two or three months may elapse before any eggs are hatched.



FIG. 51.—Sculpin egg developing (after Ehrenbaum).

VII

The newly hatched larva is about a third of an inch (about 8 millimeters) long. "The yolk forms a comparatively small prominence ventrally, and the large oil-globule lies at its front inferiorly"; "the mouth is open, but the lower jaw is at first immovable." In about two days after hatching articulation for the jaw supervenes. The larvæ are soon carried to the surface of the water and "swarms" may be "occasionally captured in the surface tow-nets, as in the Forth" in Scotland in March and April. When six days old, the young fishes are about eight or nine millimeters long and "the yolk has diminished, while the oil-globule has been elevated to the gullet."



FIG. 52.—Sculpin egg with larva (after Ehrenbaum).

For some time the growth of the young is slow and the length may even diminish in the course of losing its larval and assuming its

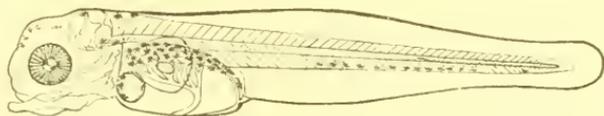


FIG. 53.—Sculpin larva just hatched (after Ehrenbaum).

post-larval condition. "On the seventh day" McIntosh found that they measured only "7.7" millimeters long and "during the two or three subsequent days the pigment made great progress." One, a

month old, figured by Ehrenbaum, was about $\frac{3}{8}$ of an inch (10 millimeters) long and still preserved the completely rayless and undivided fin membrane, but membranous pectorals had been de-

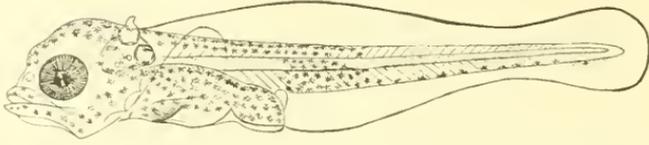


FIG. 54.—Sculpin larva four weeks old (after Ehrenbaum).

veloped (although no ventrals), pigmentation had farther advanced, the jaws had become better marked and prominent, and even the position of the future occipital spines was indicated. At a still more advanced stage, when about $\frac{3}{4}$ of an inch (18 millimeters) long, the fins had become differentiated and their rays partially developed, ventrals also had appeared, the head was well outlined, and even the



FIG. 55.—Young Sculpin, 18 mm. long (after Ehrenbaum).

spines had become manifest. In fine, a recognizable cottid was to be seen. McIntosh found some in June about an inch long, "with adult characters" and well developed rays. At such a stage the ground is resorted to. Growth continues; on the first anniversary they range from about a little more than two to three inches (57 to 75 millimeters) in length; on the second nearly four inches. Some may be sexually mature at that age; for a female, not quite four inches (98 millimeters) long, observed by McIntosh, "had almost ripe eggs," but most of them do not begin to propagate till they are about six inches long.

VIII

The Sculpin has little economical importance among the nations of Europe or in America. According to Day, it is "not used" in Britain; according to Moreau it is considered of no use in France. In Scandinavia, we learn from Smitt, "it is only the female . . . that is used for food by the poor, who prove the truth of the proverb: 'The Sculpin is the best of fishes when there is no other

to be got.' If carefully prepared, the flesh is eatable, but it always retains a rank flavour which is repulsive to most people. The liver, however, is one of the island delicacies, but if eaten in any quantity its flavour is also unpleasant. The male is considered poisonous by most of the islanders, and is therefore not eaten."