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17.—ON THE THREAD-BEARING EGGS OF THE SILVERSIDES (MENIDIA).

By JOHN A. RYDER.

Three years have elapsed since the writer was enabled to study the remarkable ova of the genus *Menidia*, on the night of July 3, 1880, in Mobjack Bay, Matthews County, Virginia, near New Point Comfort light-house, and he has delayed any further and fuller account of what was then observed, in the hope that additional material might be obtained in order that the embryological history of the genus might also be investigated. This delay has not yet enabled the author to get the desired material, and he therefore proposes to describe only what he has observed respecting the mature unimpregnated ova.

In earlier papers, published in this Bulletin, I have incidentally alluded to the eggs of *Menidia* under the name of *Chirostoma*, as then current, and in order to avoid misapprehension it will therefore be necessary to first consider the form in respect to its systematic place and synonymy. According to Jordan and Gilbert (Synopsis of the Fishes of North America), *Menidia* is the proper designation of a rather common type of Atherinoid fishes, of small size, the species of which have collectively received the name of "silversides," probably from the presence of a broad silvery band on the sides of the translucent greenish body. They resemble markedly the *Mugilidæ* or mullets in general appearance, and are allied to them. The species now included under *Menidia* have been placed in a number of genera by different authorities, such as *Chirostoma*, *Atherinicthys*, *Argyrea*, *Basilichthys*, &c., but the form in question which furnished the eggs for our study corresponded most nearly with that of *Chirostoma notata* of later writers, so that *Menidia notata*, Mitch. (J. & G.) is the now recognized name of the form here considered.

It may also be of interest to give some account of the circumstances under which the eggs were obtained. The steamer Lookout was lying at anchor after dark in about two or three fathoms of water; some of the crew while fishing for crabs noticed that a great many small fishes, four or five inches long, were being attracted by the lights which they held over the side of the vessel. Some of these were soon captured by Mr. William Hamlin and Mr. W. P. Sauerhoff, who upon pressing the specimens found that some of them were gravid females with ripe eggs in their roes. No mature males were obtainable at the time, and inasmuch as I was engaged during the rest of my stay upon the study of the development of two other species of valuable food-fishes, I had no

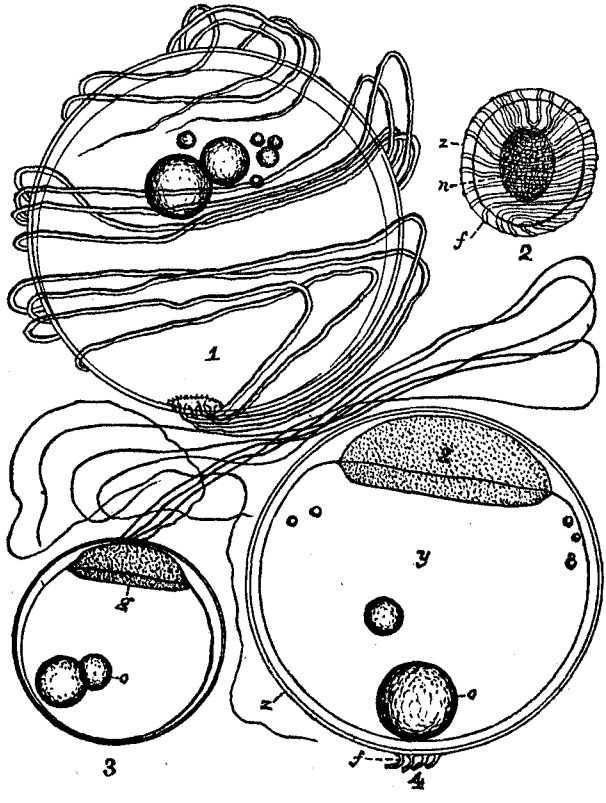
further opportunity to carry my researches any farther. The material which was obtained was however of such an interesting character that I immediately made a number of camera lucida sketches and a few notes, which I now reproduce.

The eggs being taken at night, renders it possible that the species is a nocturnal spawner, while the singular threads or filaments may be the means by which the parent fish is enabled to suspend its ova to some fixed support in the water as they are emitted from the oviduct. This might be accomplished by the female while the eggs were expelled by simply passing her body over the stems or leaves of marine plants in her vicinity. This affords an explanation of the remarkable threads which are attached to and at first encircle the eggs. We cannot escape the conclusion, at any rate, that these threads are of the nature of a protective contrivance either to suspend the eggs to foreign objects or else to entangle them together in masses; such as we find to be the case with the eggs of the silver-gar, where the filaments are, however, scattered over the whole surface of the egg. The eggs of the silver-gar are, moreover, actually found suspended in masses in the meshes of the pound-nets in which the adult females have been entrapped, but whether the fish themselves have been the means of suspending them there is uncertain. Possibly currents of water may waft them into the meshes of the nets, but this is to some extent improbable from the fact that the ova of the gar are much heavier than sea-water and immediately sink to the bottom. The eggs of *Menidia notata* are also heavier than water, and it is therefore very possible, as previously suggested, that this form, too, may, when spawning, avail itself of the threads on its ova to suspend them by, so as to keep them out of the mud and prevent them from being smothered and killed. The filaments of adjacent eggs in the gar have a tendency to twist spontaneously around each other, so that great masses are often formed in this manner and held together entirely by the tough fibers or filaments which are attached to the egg membrane. The same is true of the eggs of *Menidia*, but in this genus the eggs are not deposited in such numbers, because the ovary of a full-grown female would probably not yield more than 300 eggs during a single spawning season, while that of the female silver-gar would yield as many as 800 to 1,000 ova.

The mature eggs of *Menidia notata* measure about a line in diameter, and as shown in Fig. 1, in the accompanying cut, are covered with a thick, strong egg-membrane, *z*. When first taken from the parent fish, the germinal matter of the ovum is spread mainly over the surface of the vitellus, and in the latter a number of highly refringent oil globules of various sizes are embedded, as shown in Figs. 1, 3, and 4. In the space of ten hours the batch of ova studied by the writer had developed the germinal disk *g* independently of impregnation.

Probably the most striking peculiarity about the ova of *Menidia* is the garniture of threads which are attached to one pole of the egg, covering

a very small area of insertion on the outer surface of the egg-membrane. There are four of these filaments *f*, as indicated in Figs. 1, 3, and 4, and when the eggs are first emitted they are coiled around the egg-membrane externally in a spiral manner, as shown in Fig. 1. Very soon



after oviposition they commence to uncoil from around the egg, and when a number are stirred or shaken about in a small dish they soon become entangled together so as to hang together in bunches or strings. These threads are about eight times the length of the diameter of the ovum, and are apparently composed of the same tough material as that which enters into the formation of the egg-membrane itself. In the immature condition, and when the ovarian egg is still far from full-grown, I find the threads present on the outside of the zona or membrane, but closely adherent to the latter, as may be seen in Fig. 2, representing a young and immature ovarian egg. In this condition the membrane is relatively thicker than in more mature eggs, and the nucleus *n* is quite conspicuous at the center of the immature vitellus.

The filaments *f*, Fig. 4, at the point of attachment to the egg-membrane are somewhat enlarged, but have no bulbous base as in the case of those found on the ova of the silver-gar. The egg is heavier than sea-water, the oil-drops *o* embedded in the yelk *y* seeming to have no tendency to buoy them up.

It appears that the number of ova produced by various species of Teleostean fishes are in some way proportioned to the chances they may have of surviving. Viviparous forms like the Cyprinodonts have comparatively few ova, and the number may be as few as 15 or 20 in such a form as *Gambusia*. The sticklebacks, we find, may in some instances have quite as few. Anadromous and marine species, on the other hand, often exhibit the most surprising fecundity. The female shad, for instance, may have 250,000 ova in process of maturation at one time in her roes; the rock-fish or striped bass upwards of 3,000,000; the cod from 2,000,000 to 9,000,000; the pollock 4,000,000; the haddock not far from 2,000,000. These are significant figures, and doubtless indicate that there is some principle or law regnant in nature which determines these wide differences in the number of ova matured by one female in a single season. It may be a fact that the eggs of the cod and many other species have been gradually adapted to float, because, if they did not, the pressure of the water at great depths would prevent their development. In spite, however, of this admirable provision, it is doubtless a fact that one egg of a nest-building species, like the stickleback, has a thousand chances favorable to its survival as against one in favor of a single egg of the cod, left as it is floating in the open sea at the mercy of wind and waves. The species with thread-bearing eggs seem to a certain extent intermediate as regards the number of ova produced, and this is perhaps as strong an argument as can be produced, tending to show that the filaments are developed as protective contrivances, which suspend such ova in safe positions to fixed objects above the sea-bottom during their development.

WASHINGTON, D. C., *June* 11, 1883.

18.—DO SNAKES CATCH AND EAT FISH?

By WILLARD NYE, Jr.

[From letter to Prof. S. F. Baird.]

While up on Lost Creek, yesterday, I saw a snake coming out of the water with a fish in his mouth, that he had caught all by himself. The snake was one of these common kind seen around pounds, and about 30 inches in length, while the fish was about 4 inches long (but thick and bulky), being what they call out here a "bull-pout" (looks just like a toad-grunter from the salt water, and live under stones the same as they do). I killed the snake, and the fish being alive, put him back in the water, when he went off seemingly much pleased at the change.

A friend who was with me also found a snake which had swallowed one of the same kind of fish; that is, he had got him down as far as the gills, and the fish was still alive. The idea of a snake going in for a morning's fishing struck me as rather funny, so thought I would send you an account of it.

PARK CITY, *June* 25, 1883.