

AMERICAN CATFISH'S CARE OF YOUNG.

PROBABLY most persons who have visited rivers and streams which catfish inhabit have observed in the summer an old fish with a black cloud which proved to be of young swimming about. The old fish was the male, and the care of the young was assumed by him till they were old enough to take care of themselves. Several old observers have recorded their impressions of such concourses, and among them were the celebrated Agassiz and Girard.

Prof. Agassiz, in his notice of the *Glanis* of Aristotle, likewise noticed the habits of the common catfish of Massachusetts, the *Ameiurus nebulosus*, then generally known as *Pimelodus catus*. Says Prof. Agassiz: "I have had fewer opportunities to watch [this than the sunfish.] However, I have seen them in the spring, which, in the latitude they inhabit, does not fairly set in before the end of May, approach the shores of our ponds, like *Pomotis* [the common sunfish], in pairs, and clear also a space among the low water-grasses, *Scirpus* and the like, in very shallow water, not more than a foot or so in depth, and deposit its eggs in the same manner as *Pomotis*, and watch as carefully and vigilantly over its progeny. Yet I have not been able to ascertain how long the period of incubation lasts. But at different times I have seen the young already hatched, still hanging about within the area of the nest, protected by their watchful parent, sometimes the male and female remaining together with them; at other times, either one or the other of the old fish keeping watch alone. I have seen larger broods of young, already three-fourths of an inch, and even an inch long, remaining together like a flock, around one or the other of the parents; and sometimes both swimming slowly in the center or by the side of what, at some distance, would appear like a black cloud rolling slowly through the water in one or another direction, but which seen more closely, proves to be a flock of young fish. I have observed such flocking broods through the whole month of June, and noticed that in each the young were of larger and larger size in the latter part of the month, until they swim more loosely, and finally disperse half together; the parents standing near the flock, or even in its center, in proportion as the fish are smaller. When watching over the eggs which are not yet hatched, or when following the young brood, the old fish seem very solicitous for the safety of their progeny, and drive away with great fierceness any approaching enemy. I have even seen one dart at a little hand-net which I was dipping in the water, to secure the young which were still hovering over their nest." These observations were recorded in the Proceedings of the American Academy of Arts and Sciences of Boston.

Dr. Girard described a swarming (to borrow the language of apiarists) which he observed near Philadelphia in the following terms:

"In visiting a small pond, situated above Schuylkill Falls village, an innumerable quantity of small fish were seen along shore, near the surface of the water. On approaching them they all suddenly disappeared, and the water being muddy we could not tell where they went. A scoop-net brought to light a subspherical mass, composed exclusively of green confervæ, and which after examination proved to be a regular nest, constructed, as we suppose, by the parent fish, whose progeny it contained; for in it the small fishes seen a moment before near the surface had gone to seek shelter. In all probability the eggs were deposited in it, and when hatched, the young, instead of dispersing themselves, remain for some time congregated under the care of the parent who provides food for them.

"The number of young fish gathered around the nest was at least from 300 to 400 of different sizes. The largest were about 1 1/2 in. long and the smallest about 1/4 in. This difference in size seems to us as indicating that eggs had been deposited and fecundated at different periods in the nest.

"They all had the abdomen distended like full grown individuals before spawning. But this was owing to the stomach gorged with food. The skin of the belly was so tender that soon after death it was entirely decomposed, the intestine and stomach then appearing outside of the abdominal cavity.

"The structure of the nest was very simple, confervæ in strings were disposed circularly all around. The size of the entire structure was about 8 in. in its longest and 6 in. in its shortest diameter. There was at least one opening to get in and out, but this portion of the nest we could not examine thoroughly from want of clear water; and after having been kept for some time out of the water it was entirely deformed.

"The nest laid at the bottom of the pond, 1 1/2 ft. deep in that place, and protected by aquatic plants growing along shore. The water here is never subjected to any violent motion, and thus the soft materials of which it was constructed were resistant enough for that particular locality.

"We should think that under other circumstances, as, for instance, a current of water, catfish would construct their nests of a substance more capable of resisting a chance of destruction.

"Further observations will tell us more about this interesting subject, and it is with the hope that some one more favorably situated than we are will devote some attention to it, that we have brought before the Academy the very little it was our good fortune to observe on this occasion."

There is cause for doubt as to the correctness of Dr. Girard's views as to the nest, and in view of our present knowledge doubt is also provoked as to the care of the female for the young, but these observations of two eminent men are reproduced, not only for their intrinsic interest but to incite to observation of the facts in a state of nature.

In 1883 the present writer was fortunate enough to witness the incubation and care of the eggs and young exercised by a common catfish of Eastern America, occurring in the neighborhood of Washington and known as *Ameiurus albidus*. In the spring of 1883 a number of adults of this species were obtained from the Potomac River and put into aquaria in the building of the U. S. Fish Commission. Three of these were placed under Col. McDonald's supervision, in a tank, and of these one deposited eggs, which were taken charge of by another. The account of the doings of the fishes has been given by Prof. John A. Ryder in a "Preliminary Notice of the Development and Breeding Habits of the Potomac Catfish," published in the Bulletin of the U. S. Fish Commission (Vol. 3, pp. 225-230).

"On the morning of July 13," 1883, according to Prof. Ryder, "a little after 10 o'clock A. M., we noticed a mass of whitish eggs in one of our aquaria, inhabited by three adult specimens of *Ameiurus albidus*, two of which were unmistakably the parents of the brood, for the reason that they did not permit the third one to approach near the mass of eggs which one of them was watching vigilantly. One of the individuals remained constantly over the eggs, agitating the water over them with its anal, ventral and pectoral fins.

"The mass of ova deposited by the female in a corner and at one end of the slate bottom of the aquarium measured about eight inches in length and nearly four inches in width, and was nowhere much over one-half to three-fourths of an inch in thickness. The ova were covered with an adhesive, but not gelatinous, outer envelope; so that they were adherent to the bottom of the aquarium and to each other when their spherical surfaces came in contact, and consequently had intervening spaces for the free passage of water such as would be found in a submerged pile of shot or other spherical bodies. There were probably 2,000 ova in the whole mass, as nearly as could be estimated. The eggs themselves measured about one-sixth of an inch in diameter a short time after oviposition and the large water space had been formed about the vitellus, between the surface of the latter and the egg membrane. The vitellus measured one-eighth of an inch in diameter. Over the eggs thus deposited one of the fishes was to be constantly seen hovering. It was found that it was forcing fresh water through the mass by rapid vibrations of the anal, ventral and pectoral fins. Over these the parent fish kept zealous guard, constantly agitating the eggs day after day, and on the sixth the young commenced to be hatched, and came out in increasing numbers until the eighth day; they exhibited a tendency to bunch up or school together like young salmon. They also, like the young salmon, tended to face or swim against the currents in the aquarium, a habit common, in fact, to most of the young fishes recently hatched.

"The development of the fins of the new-born were somewhat similar in general character to that usually observed. On the second day the medial natatory fold began to grow out on the dorsal and ventral side and the end of the tail, but up to the fifth day no clearly marked differentiation of any of the unpaired fins had occurred. The first of the paired fins to appear were the pectorals, which began to show themselves on either side of the body on the third day a little way behind the ear, as a pair of low longitudinal folds. The first of the unpaired fins to be developed was the anterior dorsal, which was first marked off from the rest of the natatory fold on the fifth day by a slight emargination near the anterior end of the latter. Coincidentally with the development of the first dorsal the first rays of the caudal began to develop on the fifth day, just below the upturned caudal end of the notochord which terminated near the dorsal border of the tail, but no distinct embryonic caudal lobe was ever developed.

"On the fifteenth day after oviposition it was found that they would feed. While debating what should be provided for them, Mr. J. E. Brown threw some pieces of fresh liver into the aquarium, which they devoured with avidity. It was now evident that they were provided with teeth, as they would pull and tug at the fragments of liver with the most dogged perseverance and apparent ferocity. This experiment showed that the right kind of food had been supplied, and on this they flourished, none dying, until the 1st of August. It is worthy of note that when pieces of liver were thrown into the aquarium the parent fishes would apparently often swallow them, with numbers of young ones eating at and hanging to the fragments. I was soon agreeably surprised to find that the parent fishes seemed to swallow only the meat, and that they invariably ejected the young fish from the mouth uninjured, the parent fish seeming to be able to discriminate instinctively, before deglutition occurred, between what was its proper food and what were its own young. As soon as the young began to feed they commenced to disperse through the water and to all parts of the aquarium, and to manifest less desire to congregate in schools near the male, who also abated his habits of fanning the young with his fins, as was his wont during the early phases of development.

"The most interesting feature of the development and evolution of the young catfishes is the early appearance of the barbels. The first pair which is visible is the maxillary at the angles of the mouth of the embryo. This pair of barbels grows out at either angle of the mouth, on the third day, as a pair of flat lobes, continuous anteriorly with the upper and anterior border of the mouth. By the fifth day the maxillary barbel becomes much prolonged and cylindrical, while the two pairs of chin barbels appear at the same time a little behind the outer margin of the lower jaw as two pairs of low fleshy papillæ. By the seventh day these have grown considerably in length and become cylindrical. On the same day the nasal pair of barbels have been formed as papilliform outgrowths at the anterior margin of the posterior nostrils, the anterior and posterior nostrils being already separated by a pretty wide bridge of tissue. The early separation of the anterior and posterior nostrils by a bridge of tissue in the embryo catfish is a striking instance of the acceleration of precocious development of this structure, which is not usually formed so early. Thus the young continued to flourish until the 30th day of June, or about seventeen days after they had been hatched, when it was determined to solve the question of which sex it was that took charge of the young. The custodian of the aquarium had naturally called it the female, but the present writer recalled the fact that it was the male of most fishes that was the care-taker of eggs and young, and that it would be probably found that the male was the care-taker in this instance. The parent was dissected in the writer's presence by Prof. Ryder and it was found to be a male. "Upon cutting it open and removing a portion of the milt or testes, they were found as a lobulated paired organ on either side of the mesentery, depending from the dorsal wall of the abdomen. The lobes of the testes were digitate. Upon compressing fragments of the testes under the microscope active spermatozoa were pressed out."

The female was also examined. "The spent roe or ovary of the female was a paired organ, the right and left sacs of which were joined together posteriorly. The ovarian lobes or leaflets were disposed transversely in the sac."

Only selections have been made from Prof. Ryder's ac-

count, and for further details respecting the development of the young resort must be had to Prof. Ryder's memoir.

The catfish has now been followed from the egg to its development in the image of its parents. Exactly how long the father remains in charge is unknown, but doubtless before he leaves them the young have learned well how to forage for themselves. At this stage they have been examined by Prof. Forbes, who tells us that they live upon insect larvæ (chiefly represented by *Chironomus*) and the small crustaceans *Cyclops* and *Daphnia*.

THEO. GILL.

MASCALONGE TEETH AS TROPHIES.—Under date of Oct. 18 Mr. Gardner M. Skinner, of Clayton, N. Y., well-known as the maker of the popular Skinner spoons, writes as follows: "Have you ever extracted any of the large teeth from the lower jaw of a mascalonge? It may be done with a small pair of pliers, and they may be attached to a card bearing the record of weight, size, etc., of the fish. I have several of them, and to some they prove a curiosity. An important and large one would be quite a novelty mounted and used as a scarf pin. Don't you think so?"—E. HOUGH.

Fishculture.

HOLDING LARGE SPAWNING FISH.

THE handling of large fish without injury to them is a matter of great difficulty. Nets of any kind allow them to flounder about and rub off their scales and mucous coating and tear their fins. The use of the hands also is liable to injure them, as the grip must be a very secure one.

The writer in transferring large fish to aquaria has found nothing so useful and so little hurtful for the purpose as a square of wet cheese cloth or muslin. By passing it under the fish and grasping the upper corners or edges the fish is held firmly and securely by the soft and clinging



muslin. The idea occurred that it might also be made useful in spawning large fish by making of it a sort of bag with a strap for slinging it over the shoulders of the spawntaker, thus relieving his hands. This, while holding the fish securely, would allow a free use of both hands.

With several holes in the bottom of the bag, through which to squeeze the spawn or milt, one bag could be made to answer for fish of varying degrees of size. The soft, clinging nature of the muslin would allow the needed pressure to be made from the outside, or the hands could be inserted into the bag to clasp the fish. It is possible also that the pressure of the muslin alone would force out the spawn freely. A light oval iron frame at the top of the bag would probably be an advantage.

In some respects light canvas might be found preferable to muslin, especially if oiled or greased, to prevent harshness. It would not, however, allow such free access of air to the gills of the fish. The muslin should be wetted before using, and greasing might be still better, as it would prevent the adhesion of mucus. The accompanying illustration will give a general idea of the apparatus suggested.

W. P. SEAL.

THE TENCH IN MISSOURI.

WE are advised by the U. S. Commissioner of Fish and Fisheries, Col. M. McDonald, that the tench, which were transferred from Washington to the new station at Neosho, Mo., in the fall of 1889, promises to be a very prolific and valuable species in the waters of Missouri. Only twenty-three yearling fish were sent to Neosho, but the superintendent of the station now has from these a stock of 10,000 young fish. The tench has been given a fair trial in Washington City and vicinity, but has apparently made no impression in the streams in which it was planted. An occasional specimen has been caught in the Potomac or one of its tributaries, and found its way to the National Museum or the Fish Commission, as a species unknown to the fishermen; but so far as we are aware the tench has never been taken in sufficient numbers to make itself known in the markets. The same remark applies apparently to all eastern waters. It is gratifying, therefore, to find that this fish, which has a high reputation as a food fish in Europe, promises to thrive in some of our Western streams.

The Neosho waters appear to be peculiarly adapted to introduced fish of the carp family. Mr. Page, the superintendent of the station, has reason to believe that goldfish, which were hatched in April, 1890, have already matured and produced young.

THE AMERICAN FISHERIES SOCIETY.

THE "Transactions of the American Fisheries Society" at their 13th annual meeting, held at Put-in-Bay, Ohio, May 14, 1890, is one of the most attractive and valuable of its series. It contains the address of its president, Mr. E. G. Blackford, the record of the routine business of the meeting and the papers read before the Society. Mr. Fred Mather has papers on the "Eggs of the Pike-perch," "Danger to Fish Eggs in Transit" and an Index Review of the Proceedings of the Society, from the time of its origin to the end of its 18th annual meeting in 1889. The index of authors and subjects is exhaustive and can