

ARTICLE XIII.—*Notes on the Life History of Amblystoma opacum.*

By Colonel NICHOLAS PIKE.

WHEN I first began to study the life history of this species of *Amblystoma* I found but little had been written on the subject, and many of the facts given appeared to my mind very singular. In the "Ninth Annual Report of the Smithsonian Institution," Washington, page 294, is a letter from Gloucester, Virginia,* sent to the Secretary, with nest, eggs, etc. The account is so remarkable that I give the gist of it here. The writer says:

The localities in which the animals were found were the beds of small ponds in the woods, which in rainy weather have water in them, but were dry when he obtained the eggs. Later he visited the ponds and found water in them from recent rains, and saw only one pair, and they ran into the water. The writer speaks of sending their *nests*, with the specimens he procured from a hollow in the surface of the earth deeply covered with leaves, and under which were tunnels extending in various directions. In these hollows he found the animals curled up over their eggs. Under one he found one hundred and eight eggs in the month of December. The young in these eggs were so far advanced that they were in motion as soon as released from the embryonic covering. The specimens were taken twenty or thirty feet from the ponds, and tunnels were noticed, like those of moles, extending from the nest under leaves, as if they were for the animals to hunt along for food. The writer observes, however, that no small ones have ever been taken away from the water, except the very young ones sent, which came from the broken eggs.

The above account is so totally different from my own experience that I can only conclude some mistake was made. I cannot believe the eggs found under the animals were their own, as I can satisfactorily prove that (at least on Long Island) the *Amblystoma opacum* is hatched, and lives, in the water during its early life. It is utterly surprising to me how the young, said to have been sent from the broken eggs, could have been identified so early, and still more wonderful that there were shells that could be broken. Even an expert who has bred them can with difficulty identify the

* On the habits of a species of Salamander (*Amblystoma opacum* Bd.).—By the Rev. Charles Mann, Ninth Ann. Rep. Smith. Inst., 1854, pp. 294, 295.

[July, 1886.]

very young. The mistake has doubtless arisen in the same way that other statements relative to this genus have been given to the public, from conclusions too hastily made; and this is to be regretted, as it only leads the student astray.

The Marbled Salamander, like all of its genus, is mostly a night prowler, rarely seen abroad in the day, and it was some years before I could speak with precision of its life history. In the latter part of March, 1880, soon after the ice left the ponds, I noticed some very small larvæ of a Salamander swimming about, and succeeded in capturing a few, which I brought home alive. They were not more than one-half an inch long, with large heads for their size, and quite unknown to me. They only lived a few days, but I carefully preserved them in an alcoholic solution. I hunted for more in vain, till 1882, when I procured others still smaller, evidently only recently hatched. At the same time I fished up a bunch of eggs similarly enveloped in a glairy mass to that of *A. punctatum*, but the mass was not attached, but floating in the water, and appeared to have been deposited but a short time. I took the precaution to bring home a quantity of vegetable *débris* from the ponds with them, and placed the whole in a large tank; and at this time I really thought I had the young of *A. tigrinum*. The eggs appeared to me a little larger than those of *A. punctatum*, and the light pole of all was of a dingier hue; their development was similar, and they curled up in the embryonic sac much in the same way. In about fifteen days the young emerged, and were swimming about in the tank, keeping close to the remains of their late envelope, which for some time appeared to afford them food. When first hatched they are of a dingy brown above and whitish underneath, with a faint row of white dots bordering the abdomen, and another row half way between it and the dorsal fin. When a month old they were excessively active, darting about when I approached the tank, and hiding under leaves till I left.

I kept up a good supply of weeds and dead leaves from the ponds, and whenever I brought it home, the little creatures would dart about busily and evidently found abundant food; as some that died, and which I dissected, were full of insects, larvæ, minute monads, etc.; but they were nearly two months old before they took the small *Physas* I procured for them.

[July,

When barely an inch long the fringes of the gills are reddish, and the tail-fin is edged black, the rows of white spots prominent, and the head broader and flatter. The gills are full and feathery, generally carried erect, which gives the little creatures quite a fierce aspect. About the 5th of May, when half an inch long, the tail lost its fin and tapered to a point, the branchiæ were nearly absorbed, and it was so curiously marked even at this age as to be difficult to place it by any resemblance it has to any Salamander I know. The whole body becomes covered with white dots and spots, as if flour had been thrown over the animal. At this stage of growth it has the distinguishing mark of a large white patch on the junction of the fore-arm with the body. Very soon the lateral spots become faint, but the abdominal row very prominent, and the color underneath darkens.

As soon as the branchiæ are absorbed, the little creatures become restless, always trying to escape, and if not taken from the water they die; at least that is my experience in breeding them. I prepared for them a box filled with damp moss and dead leaves, wherein they soon curled down, to all appearances contentedly; but, shy as they seem, if the netting was not tied securely down, some would escape.

The changes are now curious and rapid. By July 4, the mass of white dottings began to break up, and a little black showed on the back, and especially on the tail, the latter flattening out. On the 22d, the dorsal bands were plainly visible; and by the 29th my little pets were perfect miniatures of the adults in color and markings, to my great delight. From the time of hatching the eggs to the well-developed, well-marked animal, about two and one-half inches long, it takes about four months and a half; a little more or less according to weather, food, and other circumstances. In October, I placed a number of young in a large glass jar partly filled with moss, and put it down in the cellar where they lived till the following spring, but their growth was scarcely perceptible.

I have in my cabinet a series of specimens from the egg up to the perfect animal, and at the present time (August, 1885), I have some lately developed that I have reared this season from some larvæ taken May 3, 1885, when about three and a quarter inches long. They have thrived well with me; in fact, better than most 1886.]

of the other Salamanders, for they are so vigorous and healthy.

The *A. opacum* is strictly a land animal, never going near water except to breed, and then mostly at night. I have never seen the impregnation and passage of the ova, but believe they are the same as with *A. punctatum*. I once saw a pair *in coitu* about sun-down, but they darted away so rapidly on my approach I could not capture them.

Like most batrachians, when the adults leave the water, they rest for some time, hiding away without food until their strength is restored, when they seek higher lands, and resume their terrestrial habits. I have often trapped them in deep holes, where I suppose they had fallen in their night prowlings, with just a slight covering of earth over them. In confinement they refuse food for some-time, and lie curled up head to tail, scarcely moving from their position for two or three weeks. I see my young act in the same way as the adults. No matter what time of the day I look at them, they are always curled up in the same corner of the box; yet I know they move about at night, for I see the small bivalves I put in for their food are always eaten, yet I never saw one taken. I think it takes over four years for this animal to mature. The adults are rather slow in their movements, so entirely different from the larval stage when in the water, as they are then the most active of their genus and not easy to catch. The old ones when caught are shy and quiet, and will curl up on the hand without trying to escape.

The *A. opacum* does not hibernate very early, but hides under leaves till the first sharp frost sets in, when it burrows down from twelve to twenty-five inches below the surface. Where the ground is very soft I have dug them out three feet down, but this is a rare occurrence. Where attainable, they prefer cavernous places for hibernation, and may be occasionally found under large stones, or buried deep in the *débris* of old tree stumps.

Some workmen who were removing the concrete covering, the stones of which formed the foundation of a roadway, found in a hole a number of *A. opacum* and *A. punctatum*, and a solitary *Spelerpes longicauda*. Old and young, all lay in a heap together, thus proving their gregarious habits. These animals had crawled under the concrete from the bank of a swampy pond that the road skirted.

[July,