

A NEW SPECIES OF CAVE SALAMANDER FROM THE CAVES OF THE OZARKS IN MISSOURI.

[Abstract.]

By C. H. EIGENMANN.

While collecting in the caves of Missouri I found a species of *Spelerpes* rather abundant. It was taken in Wilson's Cave, Rockhouse Cave, Fisher's Cave and also near Marble Cave. It proved to be a new species which is the fourth salamander known to inhabit the caves of North America. It is a twilight species rather than a strictly cave species, being found within a short distance from the entrance of the cave in all instances.

AN ADDITION TO THE FISHES OCCURRING IN INDIANA.

By L. J. RETTGER.

SOME OBSERVATIONS OF THE DAILY HABITS OF THE TOAD (*BUFO* *LENTIGINOSUS*).*

By J. ROLLIN SLONAKER.

Wishing to observe the daily habits of the toad and to see if it would hibernate if kept in a warm room during the winter months, a medium-sized female toad (*Bufo lentiginosus*) was secured October 8th. Not having a suitable place ready for her, she was placed temporarily in a running water aquarium. Here she could climb upon some bricks and be out of the water, but it was evidently too damp, for she showed signs of uneasiness.

On the 16th she was noticed to shed and swallow her skin. This I find is not an uncommon occurrence. October 19th she weighed 59.6 g., and was transferred to a dry earth aquarium. Here she made a hollow in the soft dirt under some leaves and seemed perfectly at home.

*These observations were made at Clark University during the year 1897-8.

It was interesting to see the way she made a hollow, or buried herself. She always used the same method, pushing the dirt to each side with her hind legs and shoving herself backward with her fore legs.

She was accurate in predicting changes in temperature, appearing very hungry, and after eating, burying herself completely before a decided fall in temperature. Before rising temperature she seemed less concerned about getting her food and would not cover herself completely, usually leaving her head out as though waiting for insects.

Plenty of grasshoppers and flies were kept in the aquarium, and she ate freely each day till November 1st, when a cold wave arrived and the room cooled off during the night. This time she buried herself completely. Neither did she again appear nor show signs of life till November 29th, when she slowly emerged. This may be spoken of as a short period of hibernation.

She was in and out almost every day after this, and on December 7th she ate three flies and 2.8 g. beefsteak. In regard to their eating, toads show the same peculiarity that frogs do, in that they will not attempt to take anything that is not in motion. In order to get the toad to eat meat I threaded a small piece on a string and twirled it before her. Her attention would first be attracted by the moving object, and after gazing at it for a few seconds she would quickly run out her tongue and take it. The whole process is almost instantaneous, and one can see but a flash of light red and hear the shutting of her mouth.

After eating this amount she refused to take any more, and buried herself, as I supposed, for another hibernation. But the next day she was out again and ate a fly. On the day following she ate 12 flies and 3 g. of meat. I continued feeding her every few days and, when hungry, she would eat frozen or stale meat and thrust her tongue at any near moving object. With the exception of cold "snaps," when she would remain covered up two or three days at a time, she showed no further signs of hibernation throughout the winter.

On February 14th she weighed 88.9 g. This shows that though there was a tendency to hibernate at first, it did not manifest itself again, for an animal loses weight during hibernation. February 20th she weighed 97 g., showing a gain of 8.5 g. in six days. This rapid increase in weight was probably due to the nutritive diet of beef and to the rapid secretion of eggs.

March 2d she remained several hours in the water, and I have no doubt that she would have deposited her eggs if she had had a mate. At this time her weight was 104.7 g. Her appetite always appeared good, and though I had only meat to give her for two months, she usually took some whenever it was offered her. She always knew when she had enough meat, in fact was never very eager to take it. But with flies she was gluttonous, became excited and eager, and always had room for one more, as shown by the following day's record.

I confined a large number of flies in the aquarium with her. When she heard and saw the flies buzzing about she became very much excited and nervous, and immediately began hopping about and catching them. When thus excited, the long toes of the hind feet always had a peculiar twitching, while the remainder of her body would be comparatively motionless. It was interesting to see how rarely she missed her aim and how rapidly she ate them. At first she averaged about four per minute. Being curious to know how many she would eat, I watched and counted. When she had eaten 40 her rate began to slacken, though she was still anxious and would approach nearer when a fly was beyond her reach. At 50 she showed less energy in the chase. When 60 had disappeared she simply waited till they came within reach of her tongue, while about every third or fourth fly swallowed she would squirm and twist as though making room for one more. When she had eaten 76 I was called away. When I returned about an hour later the remaining 15 or 20 flies had disappeared. Some of these, however, may have been eaten by two or three small frogs that were confined in the same aquarium. One would think she would not want anything more soon, but the next day she was ready for more, and averaged about 40 flies each day.

The greatest weight she reached was 111.5 g. on a diet of meat and flies. It was also interesting to note that if, when she had eaten all the meat that she wanted and had begun to back into the ground, a fly with clipped wing was put before her she would quickly take it, or, if it should run out of her reach, would eagerly give chase.

One day I placed a medium-sized garter snake in the aquarium to see the effect. The toad was out and happened to be close to the side of the aquarium. As the snake crawled slowly toward her seeking a means of escape, her sides began to swell out while she slowly turned her broad back toward the snake. This made her resemble a clod of dirt more than

a toad. Evidently she knew that flight was useless and, as a place of concealment was not at hand at that late moment, her safety lay in protective coloration and in resembling a toad as little as possible.

April 20th I placed a male of the same species in the aquarium, thinking she would lay her eggs, but she would have absolutely nothing to do with him. As there seemed to be no likelihood of further development I changed them to a small park which I had prepared in a sunny part of the yard. It was mainly composed of sod, but in one corner was an area of soft earth, while in the center was a large pan of water. Here they mated at once and spent the greater part of two days hopping about, resting part of the time in the water. May 12th they buried themselves completely in the soft dirt to await the passing of a cold wave. When the cold wave had passed they emerged and the mating ceased without the deposition of eggs.

Among the things the toad was observed to eat during her captivity were ants, flies, grasshoppers, bees, wasps and many other insects which found their way within her reach. The eating of bees and wasps was followed by no ill effects except a momentary twisting or wincing. By far the greater part of her food consisted of flies and ants. These are household pests, and since the toad will average 40 or more each day it is needless to say that it is a very useful animal and one that should be protected.

THE METHODS AND EXTENT OF THE ILLINOIS ICHTHYOLOGICAL SURVEY.

BY THOMAS LARGE.

At the present time the Natural History Survey of the Illinois State Laboratory of Natural History is working on an extensive report on the Fishes of Illinois. This is a continuation of the work begun in 1878 and carried on with many interruptions since that time by Prof. S. A. Forbes and his collaborators. It is the purpose to have every fish known to occur within the State accurately described, with complete statement of all that is known concerning food, habits and breeding, and to have the geographical distribution indicated on maps. In addition to this it is the purpose to illustrate each species with colored plates reproduced from water-color