

Additional Observations on the Salamanders of Putnam County and Vicinity

A. E. REYNOLDS, DePauw University

A year ago, an initial report on the area under consideration was made by presenting an account of the caudate Amphibia that occur in Putnam County (Reynolds and Black, 1936). Continued studies have not only included this county but have also been extended to include a wider territory. In addition to a corroboration of the previous report in all essential details, sufficient new information has been obtained to warrant presentation here.

I. *Eurycea lucifuga*, the "Cave Salamander" of Rafinesque

In the previous account, the data presented on *Eurycea lucifuga* were scant because of lack of material. Continued search failed to yield additional specimens from Putnam County. On account of its known preference for the cave habitat, it was sought, and found, in the "Sunken Cave" in McCormick's Creek State Park, Owen County. With the more abundant material from this cave at hand, more adequate data are offered here.

1. **Description.**—The animal presents a delicate and gracefully proportioned appearance. The tail is compressed, while the body is

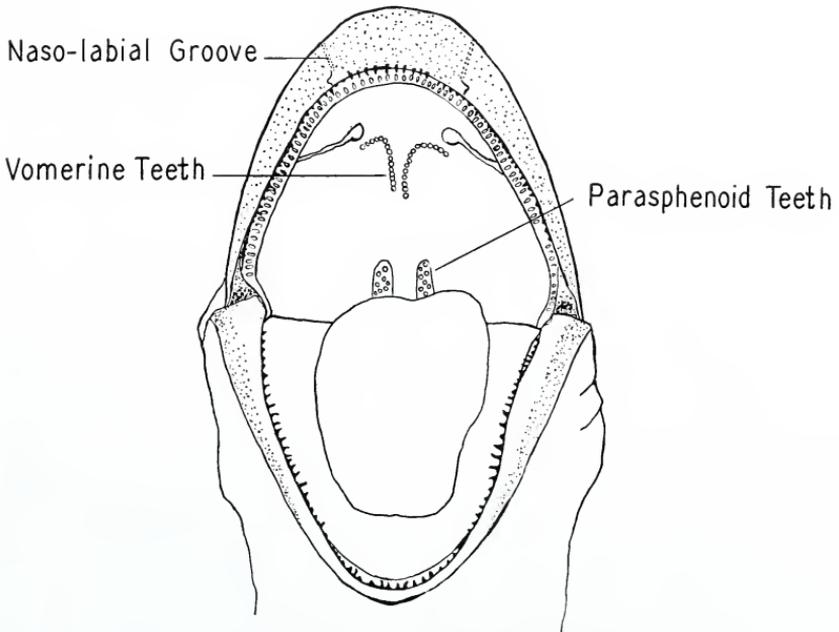


Fig. 1. Mouth cavity of *Eurycea lucifuga* (No. 145a) drawn from a ventral and slightly anterior view. ($\times 5$). Distance from tip of snout to angle of jaws, 8.0 mm.; width of head at angle of jaws: internal, 7.8 mm., external, 10.4 mm.; distance from posterior limit of vomerine teeth to anterior limit of parasphenoid teeth, 1.7 mm.; distance of internal nares apart, 3.4 mm.

somewhat depressed, and the head decidedly so. The head is the widest part of the entire body, being in width about one-sixth the length of the head and body. The legs are fairly long and the toes somewhat short and blunt. When pressed against the sides of the body, the toes of the front and hind legs overlap slightly. The toes are 4, 3, 2, 5, 1 in order of length; the fingers, 3, 2, 4, 1. The ground color is reddish or orange dorsally and laterally, pinkish white ventrally. The ventral side is immaculate, but the dorsal and lateral regions bear irregular black spots. In some specimens, especially adults, these spots tend to form a line from the level of the front limb to that of the anus, but for the most part the spots are arranged indiscriminately. The head is quite flat as viewed from the side, the eyes protruding conspicuously. Viewed dorsally, the head is oval in shape. The naso-labial grooves are swollen, and in males these are extended ventrally into a cirrus free of the upper lip. The length of the eye is as great as the distance of its anterior border from the tip of the snout. The angle of the jaw occurs at a point ventral to the posterior angle of the eye. A short groove runs from the angle of the jaw dorsally to the groove of the lower eyelid, and a groove extends from the eye along the sides of the neck to the gular fold. The vomerine teeth, about 15 in each bilateral series, form an obtuse angle, presenting a hook-shaped appearance. They are separated from the bilateral patches of parasphenoid teeth. Relations are shown in Figure 1.

2. Measurements.—These may be readily seen in Table I, in which all lengths are expressed in millimeters. The first ten animals are from the "Sunken Cave"; the eleventh, from another locality, is listed for comparative purposes.

3. Habits and Ecology.—Sunken Cave descends vertically for perhaps 20 feet before extending horizontally, by way of a short, narrow

TABLE I. MEASUREMENTS OF EURYCEA LUCIFUGA

	Head	Body	Tail	Total	Costal Grooves	Body Weight	Remarks
1	14.5	49.3	73.6	137.4	13	3.5 gm.	Living specimen etherized
2	13.0	42.0	69.0	124.0	13	1.9 gm.	Living specimen etherized
3	12.0	40.0	72.9	124.9	14	1.4 gm.	Living specimen etherized
4	10.9	34.0	60.0	104.9	14	0.9 gm.	Living specimen etherized
5	9.8	31.0	54.9	95.7	14	0.8 gm.	Living specimen etherized
6	9.8	31.5	49.6	90.9	14	0.6 gm.	Living specimen etherized
7	15.0	48.6	75.3	138.9	13	3.5 gm.	Preserved, D.P.U. #145a
8	12.5	47.9	67.0	127.4	14	2.0 gm.	Preserved, D.P.U. #145b
9	13.8	43.7	78.0	135.5	14	3.0 gm.	Preserved, D.P.U. #145c
10	10.8	37.0	67.8	115.6	14	1.5 gm.	Preserved, D.P.U. #145d
11	13.0	42.3	92.0	147.3	14	—	Preserved, D.P.U. #119, formerly F.M.N.H. #19226.

passage, into a chamber of no great size, though of considerable height. The specimens of *Eurycea lucifuga* were found from the completely dark chamber out into a "twilight zone" of definitely diminished light. None were found in the upper regions of the vertical shaft where the light was approximately normal. In the dark room, they were found clinging to the perpendicular or slanting moist rock wall, and in the "twilight" area they were found in crevices of the horizontally stratified rock which forms the sides of the vertical shaft.

In the laboratory, specimens placed in aquaria in ordinary light and temperature showed a high mortality, but no casualties resulted among specimens kept in a cool room and in a darkened container. I have never kept specimens in aquaria containing water. They seem to thrive in dark containers containing dead leaves that are barely moist. They are quite sensitive to light and will not remain still if placed in well-lighted situations.

4. **Discussion.**—It is of interest to note that this species was, in the early Indiana records, confused with a species of similar appearance, *Eurycea longicauda*. One of the charter members of the Indiana Academy who is still active, Mr. Amos W. Butler, had an active part in the establishment of the true relationships of the two.

On the occasion of the meeting of the Academy at Waveland in May, 1887, trips were made to two regions in Montgomery County. "The Shades" and "Pine Hills," for the study of the natural history of these regions. In the account of the amphibians and reptiles of these regions, Mr. Butler (1887) lists *Spelerpes* (now *Eurycea*) *longicauda* (Green) as being the more common at Pine Hills, further stating: "They are of a decided lemon color, thereby differing much from the form found in the southeastern part of the state, which approaches *S. ruber*." Later, speaking of this latter orange-colored salamander before the Academy at the meeting in 1888, Mr. Butler emphasized the desirability of obtaining a good series of specimens of this "Cave Salamander" as soon as possible in order that its relationship might be determined. He continues: "So far as I have learned, those of the western part of the state appear to be typical *longicauda*. But one of this kind has been found in the southeastern part of the state. The specimens from that region have the form of *longicauda*, but instead of the lemon-yellow coloring of that form, approach the reddish appearance of *S. ruber*, but lack the peculiar form of the latter" (Butler, 1892).

Following the meeting of the American Association for the Advancement of Science at Indianapolis in 1890, Prof. E. D. Cope visited Mr. Butler at Brookville and was given some of the reddish salamanders from that region. In the resulting description (Cope, 1890) the close resemblance to *S. longicauda* is recognized, but the form is assigned to the genus *Gyrinophilus* as a new species, *Gyrinophilus maculicauda*. A year later, Hay (1891a) published an account based on the examination of several specimens. In this he differs with Cope as to the premaxillaries, which he found ankylosed and not separated, as Cope had claimed, and on the basis of his findings Hay places the form in the genus *Spelerpes* as *Spelerpes maculicauda*. Both of these views are given in

Mr. Butler's paper of 1892 under a description of *Gyrinophilus maculicaudus*.

Inasmuch as this discussion took place a year or more after the publication of his "Batrachia," Cope (1889) does not mention this species in this work. Hay (1891b) however, lists it as *Spelerpes maculicaudus*, the "Hoosier Salamander," and differentiates rather carefully between its characteristics and those of *S. longicaudus* by stressing the color difference and the differences in vomero-palatine teeth, as well as the difference in arrangement of spots. Dunn (1926) mentions it as *Eurycea lucifuga*, the "Cave Salamander" of Rafinesque.

II. Relative Numbers of *Plethodon*

Plethodon cinereus exists in two color phases, the gray-backed or unstriped phase, and the red-backed or striped phase. Writing long ago, Blatchley (1891) found that these phases were approximately equal in Vigo County, Indiana. In Michigan, Blanchard (1928, p. 158) found them in the same relative numbers. However, Grant (1936, p. 323), reporting on northern Indiana, gives 30% red backs to 70% gray backs as the approximate ratio in the Valparaiso area. Our results, to date, indicate that in central Indiana a markedly different situation exists. Far from being the most numerous, or even equal in numbers, the gray-backed phase is definitely the less numerous. Results to date from Putnam County indicate that the gray-backed phase will not exceed 10% of the total numbers of *P. cinereus*. Typical results from short collecting trips made to favorable regions in Parke and Montgomery counties are summarized in Table II.

TABLE II. RESULTS OF SHORT COLLECTING TRIPS

	Bell's Wood Montgomery County	Turkey Run Parke County
<i>Plethodon cinereus</i> , red-backed or striped.....	9	52
<i>Plethodon cinereus</i> gray-backed or unstriped.....	1	12
<i>Plethodon glutinosus</i>	4	11
<i>Plethodon dorsalis</i>	14	25

Table II also reveals a relationship between comparative numbers of *P. cinereus* and *P. dorsalis* which differs from that in Putnam County, where *cinereus* outnumber *dorsalis* by about 25 to 1. The table shows *dorsalis* to be the most numerous in the Bell's Wood region, a result in harmony with a report on Montgomery County (Grave, 1931, p. 339) which included this region. In the Turkey Run region in Parke County, *cinereus* outnumbers *dorsalis*, but not in such a high ratio as in Putnam County. In connection with this high ratio of *cinereus* to *dorsalis* in Putnam County, it should be pointed out that a single exception to the

general rule was found in the "Oakalla" locality not far from Greencastle. In this locality, which was discovered by Mr. E. G. Black, *P. dorsalis* was abundant to the practical exclusion of all other salamanders.

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