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ON THE OCCURRENCE OF *BUFO FOWLERI* IN
MICHIGAN

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The similarity between *Bufo americanus* and *Bufo fowleri* has been referred to frequently in the literature of American herpetology. So closely do these forms resemble each other that they are often confused, and it has been suggested that hybridization occurs.¹ The distinguishing characters of *Bufo fowleri* that have been pointed out are: cranial crests usually parallel and considerably elevated, sometimes fusing posteriorly; muzzle projecting farther beyond the jaw; warts on dorsal surface smaller; granules of ventral surface smaller (occasionally absent);² parotoids elongate-oval in form; iris silvery; head narrow, higher and shorter; profile abruptly rounded; hind legs longer; color above yellowish or greenish gray, never rich yellow, orange or red-brown; dorsal spots

¹ Deckert, Richard. *Science*, N. S., XLV, pp. 113-114; and Miller, W. and Chapin, James. *Ibid.*, XXXII, pp. 315-317.

² Deckert, *loc. cit.*, p. 114.

large, distinct and arranged in pairs;³ an irregular pale band on the sides; ventral surface white and immaculate; song not distinctly vibrated.

As is well known, the structural and color characters are subject to considerable variations in both species, and Allard⁴ states that the characteristic song of *Bufo americanus* is occasionally given by *Bufo fowleri*, except that it is shorter. It is thus impossible always to distinguish the forms on the basis of any one character, but apparently this does not mean that *Bufo fowleri* has been based upon individual variations of *B. americanus* nor that it is a geographical race of the latter; for, the forms can be readily separated when the totality of characters is used in diagnosing specimens, the two species occur in the same regions, and specimens with the characters of *B. fowleri* do not occur at random in the range of *B. americanus*. The question of hybridization can only be determined with certainty by experiments.

The range of *Bufo fowleri* is given by Dickerson (*loc. cit.*, p. 95) as follows: "Danvers, Woods Hole, and Cuttyhunk Island, Massachusetts. Common throughout Rhode Island. Probably common in other parts of Massachusetts, and perhaps in still other New England States. Specimens are in the American Museum of Natural History, in a collection representing the Batrachia of the vicinity of New York City." In 1907 and 1908 Allard⁵ was able to show that the form extended as far south as northern Georgia, and in 1911 Hancock⁶ referred some western Michigan toads to this species. Han-

³ Dickerson (The Frog Book, p. 94) describes the arrangement of the dorsal spots as follows: "Six pairs along the vertebral streak—first pair, elongated spots placed obliquely on the eyelids and top of the head; second pair, rounded and small, between the anterior ends of the parotoids; third pair, greatly elongated, more or less pear-shaped, situated on the anterior part of the back; fourth, fifth, and sixth pairs irregular, the last often obscure."

⁴ Allard, H. A. Science, N. S., XXVIII, pp. 655-656; *Ibid.*, XLIV, pp. 463-464.

⁵ Science, N. S., XXVI, 383-384, and XXVIII, 655-656.

⁶ Hancock, J. L. Nature Sketches in Temperate America. Chicago, 1911.

cock's specimens were taken in the vicinity of Lakeside, Berrien County, in the southwestern part of the state. During the past summer the writer spent the greater part of the month of July in Berrien County, collecting only in the dune region between the towns of Lakeside and Sawyer, and obtained a large number of toads which apparently represent two forms.

In one form represented in the western Michigan material the warts on the dorsal surface are larger and conspicuously spinous; the parotoids are larger and tend to descend on the sides of the neck, so that they are generally twice as long as broad; the cranial crests are lower and distinctly divergent; the skin of the ventral surface is more coarsely granular, and the granules are often spinous. These specimens are clearly *Bufo americanus*. In the other form the warts on the dorsal surface are smaller and possess only minute spines,⁷ the warts on the hind legs being conspicuously smaller than in *Bufo americanus*;⁸ the parotoids are generally lower, distinctly elongate-oval in form and about twice as long as broad; the cranial crests are more elevated, and parallel or a little divergent; the skin of the ventral surface is finely granular, and the granules are never spinous. These specimens conform in structure to the descriptions of *Bufo fowleri*.

The two forms also differ strikingly and constantly in color. The specimens which are typically *Bufo americanus* in structure have the coloration of that species, the ground color being usually reddish or blackish brown; the dorsal spots less regularly disposed and constant, in many cases embracing but one wart; the abdomen generally yellowish or gray, in most specimens with dark spots. In the other form the general color above is light or dark gray; large white-edged black spots,

⁷ Deckert, *loc. cit.*, p. 114, describes the warts of *B. fowleri* as never spiny, but the original specimen examined, see p. 5, has small spines.

⁸ This has been noted for *B. fowleri* by Miller and Chapin, *loc. cit.*, p. 316.

arranged as in *Bufo fowleri*, are present and usually embrace several warts; a lateral pale streak occurs; the vertebral stripe is constantly present and generally broad, and the ventral surface of the body is silvery white and immaculate, except that in some specimens a few dark spots are present in the pectoral region.⁹

The two forms apparently do not differ in proportions, nor do those which resemble *B. fowleri* agree with the proportions of that species as given by Dickerson. The length of the head enters the total length a little less than 3.5 times, and the length of the hind leg to the heel equals the length of the body forward to some point on the parotoid. It should be noted, however, that the proportions just given are taken from preserved material; that while Miss Dickerson states in her key (*loc. cit.*, p. 45) that the total length is $4\frac{1}{2}$ times the head length in *B. fowleri* and 4 times the head length in *B. americanus*, in her descriptions of the species (*loc. cit.*, pp. 63 and 94) the head length is said to enter the total length about 4 times in *B. fowleri* and $4-4\frac{1}{2}$ times in *B. americanus*; and that Miller and Chapin (*loc. cit.*, p. 316) state that no differences in proportions between the species can be noted.

Miller and Chapin (*loc. cit.*, p. 316) state that the iris is bronze in color in *Bufo americanus*, and that it is silvery in *B. fowleri*; and Hancock (*loc. cit.*, p. 257, legend of figure) intimates that this is a distinguishing character of the Michigan specimens examined by him. Allard,¹⁰ however, says that this character cannot be relied upon to separate the two species, and the writer has failed to find any constant difference in the color of the iris in the Michigan specimens.

The breeding season was past when the toads were collected;

⁹ Miller and Chapin, *loc. cit.*, p. 316, state that the chest of *Bufo fowleri* may be spotted.

¹⁰ Science, N. S., XLIV, p. 464.

but two distinct songs were heard, the sustained trill of *B. americanus* and the "metallic droning sound, not conspicuously vibrated" (Dickerson, *loc. cit.*, p. 95) characteristic of *B. fowleri*. The latter was traced to a specimen of the form which resembles *B. fowleri*.

These studies apparently show that there are two forms of the genus *Bufo* in western Michigan; one with the characters of *Bufo americanus*; the other in structure, color and song indistinguishable from *Bufo fowleri*. Furthermore a comparison of specimens of the latter form with one of the original specimens¹¹ of *Bufo fowleri*, from Danvers, Massachusetts, reveals no differences except that the cranial crests in the eastern specimens are closer together. It is planned to study the forms in the breeding season to ascertain if there are differences in the breeding habits, and if the difference in the voice is constant.

¹¹ Cat. No. 50246, Museum of Zoology, University of Michigan; formerly Cat. No. 518, Museum of Comparative Zoology.



