

Description of the Larvae of *Pseudacris triseriata* and *Bufo woodhousii woodhousii* (Anura)

Karl A. Youngstrom and Hobart M. Smith

During the spring and summer of 1934 and 1935 the senior author undertook a study of the developmental behavior in some of the local forms of Anuran larvae and tadpoles. Two forms, little known in the tadpole stage, were reared successfully from the egg stage to transformation. They are *Pseudacris triseriata* (Wied) and *Bufo woodhousii woodhousii* (Girard).¹

The eggs were obtained either from clasping pairs breeding in the laboratory, or in the field, and positively identified later.² The descriptions of the larvae follow.

Pseudacris triseriata (Wied)

Figs. 1, 3, 5, 7

General Appearance.—Tadpole small, maximum total length before metamorphosis 30 to 32 mm.; tail tip obtuse, rounded; tail slightly attenuated toward tip; dorsal crest extended to about the vertical of the spiracle; spiracle sinistral, below lateral axis, directed backward and very slightly upward; spiracle opening round, the inner edge very slightly free from body; eye very slightly dorsal to lateral axis; anus dextral, opening about on the level of the ventral crest. Body uniformly and closely stippled with iridescent bronze; eyes closely stippled with bronze; body quite transparent; dorsal and ventral tail crests with finely scattered pigment areas, dark brown in color (preserved material); dorsal musculature of tail heavily pigmented, ventral musculature slightly less.

Mouthparts.—Labial teeth $\frac{2}{3}$. Entire mouth, except a median dorsal space about one-half the length of the upper row of teeth, surrounded by a continuous papillary fringe, which is doubled around the angles of the mouth; this doubled papillary fringe extends downward somewhat medial to the lateral edges of the outer row of lower labial teeth, and above to the lateral edges of the upper labial teeth; a few extra papillae inside fringe at the angles of the mouth; inner row of upper labial teeth divided medially, the two halves separated from each other by about one-half the length of either half; lateral edges

¹ So far as can be ascertained no previous descriptions of these tadpoles have been published. The most comprehensive treatise on the tadpoles of American Anura is that of A. H. Wright, 1929, *Synopsis and Description of American Tadpoles*, Proc. U. S. Nat. Mus. 74: 1-70.

² See Smith, Hobart M., Amer. Midl. Nat. 15(4), 1934, for descriptions of the eggs.

of the inner row on upper labium medial to those of the outer row; upper mandible broadly U-shaped, its external edge finely denticulated; length of upper mandible contained in upper row of teeth about one and one-half times; lower mandible V-shaped, its external edge finely denticulated; inner row of lower labial teeth slightly indented medially; and very slightly shorter than second row; outer row approximately one-half the length of the second row, and broadly concave toward the mandible; lateral edges of the two inner rows of the lower labium more or less coincide with the lateral edges of the upper labial rows.

Measurements of a Tadpole at Maximum Length

Total length, 30.0 mm.; body length, 10.0 mm.; body depth (max.), 6.5 mm.; body width (max.), 6.5 mm.; tail length, 20.0 mm.; tail depth (max.), 8.0 mm.; musculature of tail (max.), 2.75 mm.; spiracle to snout, 7.7 mm.; spiracle to vent, 4.8 mm.; spiracle to eye, 3.7 mm.; eye to snout, 2.9 mm.; eye to nostril, 1.6 mm.; nostril to snout, 1.0 mm.; mouth width, 3.0 mm.; interorbital distance, 4.1 mm.; internasal distance, 1.7 mm.

Remarks.—The eggs hatch in from three to five days into free-swimming larvae that are 4.5 to 5 mm. long. The hind legs bud when the tadpoles reach an average total length of 15 mm. The development of the labial teeth is not complete until the hind limbs become motile, at which stage the tadpole is usually 23 to 24.5 mm. long. The outer row of lower labial teeth is the last to appear, being occasionally incomplete at the 25 mm. stage.

Two larvae reared under presumably optimum conditions (room temperature variation from 16 to 30 degrees C. but usually about 22 to 25 degrees C., water temperature always one or two degrees lower; each larva kept in a separate container and supplied with an excess of food) attained a maximum total length of 30 mm. and 32 mm. in 44 and 38 days respectively. Under crowded conditions other larvae required almost twice as long.

Degeneration of labial teeth accompanies the decrease in total length which occurs during metamorphosis. Front limbs do not appear until three to six days after the time at which the tadpole begins to decrease in length.

Decrease in length, regardless of variations in age and size, occurs at about the same rate in all specimens; after the beginning of decrease in length metamorphosis requires about seven days. Successive measurements of one specimen on the fifth and sixth days after the decrease in length had been begun showed a period of extremely rapid decrease in length. At 11:30 a.m. on the fifth day the total length was 21.6 mm.; at 11:30 a.m. on the next day it was 14.5 mm. The length of the newly metamorphosed specimens is about 7.5 mm, from snout to tip of tail remnant.

Bufo woodhousii woodhousii (Girard)

Figs. 2, 4, 6

General Appearance.—Tadpole small, maximum total length 23 mm.; tip of tail rounded, obtuse, not attenuated; dorsal crest extended to a point less

than half-way between anus and the verticle of the spiracle; spiracle sinistral, below lateral axis, directed backward and upward at an angle of about 35 to 40 degrees; opening of spiracle round or slightly oval; inner edge very slightly free from body; eyes dorsal to lateral axis, slightly nearer to median dorsal line than to lateral outline when viewed from above; anus median, opening distinctly higher than the lower edge of the ventral crest. Body and hind limbs heavily pigmented with a very dark brown pigment or gray to slate (specimens preserved in formalin appear more brownish); dorsal musculature of the tail somewhat lighter than the body; ventral musculature immaculate; crests with a few scattered flecks of pigmentation, more numerous in the dorsal crest than in the ventral, the latter being almost immaculate.

Mouthparts.—Labial teeth $\frac{2}{3}$. Papillary fringe a single row confined to the angles of the mouth, sharply indented on each side, slightly below the middle; the medial edges of the dorsal papillary fringe extend on each side exactly to the lateral ends of the outer row of upper labial teeth; the medial edges of the ventral papillary fringe extend on each side to slightly medial of the lateral edges of the outer row of lower labial teeth; on each side the dorsal portion of the papillary fringe (i.e. the portion dorsal to the lateral indentation) is slightly shorter than the ventral portion; a few small papillae in the mouth disc above and below the lateral indentations; outer row of upper labial teeth continuous; inner row divided by a space about half the length of either half; lateral edges of the two rows coincide; length of outer row of upper labial teeth about one and one-third times the length of the upper mandible; latter broadly U-shaped, shallow, its external edge finely denticulated; lower mandible V-shaped, its external edge finely denticulated. Inner row of lower labial teeth slightly indented medially, outer neither indented nor broken; inner row the longest of the three, slightly longer than the second, about twice the length of the outer row; inner rows of upper and lower labia about equal in length.

Measurements of a Tadpole at Maximum Length

Total length, 23.0 mm.; body length, 9.4 mm.; body depth (max.), 4.6 mm.; body width (max.), 5.8 mm.; tail length, 13.0 mm.; tail depth (max.), 5.0 mm.; musculature of tail (max.), 2.0 mm.; spiracle to snout, 6.9 mm.; spiracle to vent, 6.1 mm.; spiracle to eye, 4.2 mm.; eye to snout, 2.6 mm.; eye to nostril, 1.0 mm.; nostril to snout, 1.8 mm.; mouth width, 2.5 mm.; interorbital distance, 2.2 mm.; inter-nasal distance, 2.0 mm.

Remarks.—Eggs hatch the third day after deposition; the larvae at hatching are in a premotile condition and measure 2.5 to 3.0 mm. They become free-swimming five to six days after oviposition, when they have attained a length of 6.5 to 7 mm., i.e., about three days after hatching. Hind legs bud at the 10 mm. stage, which represents an age of twelve days or more after oviposition, depending on the environmental conditions such as temperature, nutrition and crowding. Labial teeth are completely developed at the 16 mm. stage (minimum). The hind legs become motile with the attainment of a total length of 20 to 21 mm. The maximum total length of 23 mm. is reached in a min-

imum of thirty-five days; some specimens require nearly twice this period; this length is retained three or four days and then a rapid decrease begins, accompanied by a degeneration of the labial teeth. The front limbs appear about three days after the decrease in total length has begun.

EXPLANATION OF FIGURES

FIGURES

1. Mouthparts of *Pseudacris triseriata* tadpole, x 18.
2. Mouthparts of *Bufo woodhousii woodhousii* tadpole, x 18.
3. Lateral view of *Pseudacris triseriata* tadpole, x 3.
4. Lateral view of *Bufo woodhousii woodhousii* tadpole, x 3.
5. Lateral view of *Pseudacris triseriata* larva at hatching, x 3.
6. Lateral view of *Bufo woodhousii woodhousii* larva at hatching, x 3.
7. Dorsal view of transforming tadpole of *Pseudacris triseriata*, x 3.

DEPARTMENTS OF ANATOMY AND ZOOLOGY,
UNIVERSITY OF KANSAS,
LAWRENCE, KANSAS.

