



The Courtship and Egg Mass of *Ambystoma gracile* and *Ambystoma macrodactylum*

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cover of a pouch consists solely of exposed egg membrane. The incubation period may vary, in this case from 77 to 136 days, with 20 per cent survival from 96 eggs. Emerging young weigh more than twice as much as an entire egg. Young past the tadpole stage have a membranous structure protruding from the cloaca that may be used as an accessory respiratory organ, and perhaps the jaw flaps also aid in this respect. Emergence and late abortions may be related to skin shedding by the mother and/or young. The mother exerts pressure that may partly eject abortions and stimulate live young to emerge under their own power. Advanced young feed while in the pouches if given opportunity to do so. The mother appears to recognize the young as non-food items. These findings suggest features of hormonal control, metabolism, and behavior worth investigation.

LITERATURE CITED

- BARTLETT, A. D. 1896. Notes on the breeding of the Surinam water-toad (*Pipa americana*) in the Society's gardens. *Proc. Zool. Soc. London* 1896:595-97, 2 figs.
- BEDDARD, FRANK E. 1895. On some points in the anatomy of *Pipa americana*. *Proc. Zool. Soc. London* 1895:827-41, 5 figs.
- CARVALHO, ANTONOR L. 1939. Notas sobre *Hemipipa carvalhoi* Mir.-Rib., (Batrachia Anura: Pipidae). 1a. parte. *Bol. Biol. (São Paulo)*, n.s., 4(3):394-414, 4 pls., 25 text figs.
- DECKERT, RICHARD F. 1917. *Pipa americana* re-discovered on Trinidad. *Copeia* 1917 (2):49-50.
- DUNN, E. R. 1948. American frogs of the family Pipidae. *Amer. Mus. Novitates* 1384:1-13, 1 fig.
- FERMIN, P. H. 1765. Développement parfait du mystère de la génération du fameux crapaud de Surinam, nommé *Pipa*. Maastricht, Netherlands. [not seen]
- KERR, T. 1939. On the structure and function of the cloaca of the common frog (*Rana t. temporaria*). *Proc. Zool. Soc. London* 1939:63-73.
- VON KLINCKOWSTRÖM, A. 1894. Zur Anatomie der *Pipa americana*. I. Integument. *Zool. Jahrb., Anat. Abt.*, 7:609-28, 2 pls.
- MYERS, GEORGE S., AND ANTONOR L. DE CARVALHO. 1945. Notes on some new or little-known Brazilian amphibians, with an examination of the history of the Plata salamander, *Ensatina platensis*. *Bol. Mus. Nac. (Brazil)*, n.s., No. 35:1-24, 18 figs.
- NOBLE, G. KINGSLEY. 1927. The value of life history data in the study of the evolution of the Amphibia. *Ann. New York Acad. Sci.* 30:31-128, 1 pl, 30 text figs.
- ROSE, S. MERYL. 1959. Failure of survival of slowly growing members of a population. *Science* 129 (3355):1026.
- SCLATER, P. L. 1895. Note on the breeding of the Surinam water-toad (*Pipa surinamensis*) in the Society's reptile-house. *Proc. Zool. Soc. London* 1895:86-88.
- . 1896. [Note on Boulenger's examination of Bartlett's *Pipa*] *Ibid.* 1896:597.
- WYMAN, JEFFRIES. 1854. Observations on the development of the "Surinam Toad" (*Pipa americana*). *Amer. Jour. Sci.*, 2nd ser., 17:369-74, 5 figs.

CHICAGO ZOOLOGICAL PARK, BROOKFIELD, ILLINOIS.

Herpetological Notes

THE COURTSHIP AND EGG MASS OF *AMBYSTOMA GRACILE* AND *AMBYSTOMA MACRODACTYLUM*.—On January 19, 1959, shortly after the snow and freezing weather had abated, twelve *Ambystoma macrodactylum* were captured in a pond in Spanaway, Pierce Co., Washington, and six others were collected up to 300 feet from the pond. All of the aquatic individuals were taken under a single small log in the middle of the shallow pond, and were in the process of courting (water temperature was 6.0°C.). These animals continued courtship in the laboratory (also 6.0°C.) and began to deposit eggs the next day. Eggs deposited in the laboratory and in the field were either dropped singly or in loose tenuous masses of up to fifteen eggs. The egg masses were seldom attached to vegetation but rather were most often

deposited directly on the substratum. The egg masses of this species contrast greatly to those of *A. gracile* which are firm, containing a relatively large number of eggs, and are attached to vegetation.

On February 4, 1959, a courting pair, consisting of a neotenic female and an adult male, and a single adult male *Ambystoma gracile* were collected at the same Spanaway pond (water 4.5°C.). Several egg masses of this species were also observed attached to vegetation. These were probably deposited by neotenic females judging from the relatively low numbers of eggs (75-80). For several weeks only adult males and neotenic females were captured (always at night) in the pond. Later, when large egg masses with several hundred eggs were found, metamorphosed females were also collected. Thus, breeding prob-

ably begins with neotenic pairs, then with mixed neotenic and metamorphosed pairs, and finally with metamorphosed pairs.

The courtship of *Ambystoma gracile* has not been described in the literature to date. This phenomenon was twice observed by the writer in the field and once in the laboratory. A courting pair (metamorphosed male and neotenic female) was observed in an open pond at Spanaway, Pierce Co., Washington, in about 15 inches of water at 4.5°C. on a substratum fairly free of vegetation. The pair continued to court in a plastic field bucket for about one hour. A second observation was made of a metamorphosed pair in the laboratory when a female, collected by Mr. Jerry Olson from a rodent burrow about 150 feet from the Spanaway pond, was placed with several male specimens. A third brief observation of clasping was observed at a Fircrest, Pierce Co., Washington, pond in water of 6.0°C. (not 60.°C as given by Slater, *Copeia* 1936(4):234; or 60.°F. as "corrected" by Stebbins, *Amphibians of Western North America*, p. 34, 1951).

The male about to begin breeding activities may approach the female from either side of the body or tail, or from behind the tail. In any event the male slowly begins to straddle the female's body and then suddenly moves forward, clasping her behind the forelegs with his hind legs. The hind legs of the male are somewhat longer and the feet broader than those of the female, and are well suited for such clasping. If not ready for breeding, the female becomes quite active and with a few powerful strokes of her tail swims forward and through the clasping limbs of the male. Receptive females are very passive when clasped by a male. The cloaca of a non-breeding female was observed to become somewhat larger over a span of one day, before she entered a breeding state.

After clasping the female the male swims with her, dragging her around and often bumping her on the substratum or into sticks and other debris. At times, the male elects not to swim, but merely rests on the substratum with the female firmly clasped. Whether stationary or swimming the male moves its tail in a locomotor fashion at various rates of speed. Periodically the male will hold its tail straight and lash it back and forth, bending only at the base of the tail. Such activity results in rubbing the cloaca across the back of the female. This manipulation causes the male's cloaca to swell noticeably and finally causes the lips of the cloaca to spread far apart, greatly exposing the inner surfaces. These surfaces soon become very red and are presumably engorged with blood. After a few to many minutes of such activity the male may dismount and

press his engorged cloacal to the substrate in an attempt to deposit a spermatophore. Alternate clasping and dismounting may occur many times in quick succession at this point. Pectoral clasping is soon ignored in part for a new activity which becomes a common part of the final courting act. At this point the male strides over the female (anterior to posterior) and allows his cloaca to drag along her back and finally over the sharp dorsal edge of her tail. Here the male stops his progress, clasps the female's tail with his hind limbs, and forces the dorsal edge of her tail deeply between his cloacal folds by a series of contractions of his hind limbs. This activity is generally followed by the deposition of a spermatophore on the substratum or other objects. Tail clasping, and weak attempts at pectoral clasping may now follow many times in quick succession. Although the female was seen several times to move and press her cloaca to the substrate where the male had just attempted to deposit a spermatophore, the actual spermatophore transfer was not observed; though a successful transfer was evidenced by the fact that fertile eggs were deposited after four days time. The movements of the female suggest that the transfer is perfected in the act of moving over site of deposition, pressing the wide-spread cloaca to the substrate and then closing the lips over the spermatophore.

The courtship of *A. gracile* differs greatly from *A. macrodactylum*, a species which occurs in sympatry in Washington. Slater (*Copeia* 1936(4):234) records that the male *macrodactylum* clasps the female behind her forelimbs and gives "short shakes." Three courting pairs were observed in the laboratory by the present writer. In this species the male clasps the female pectorally with his front legs, in contrast to *gracile*. The male thus either swims or walks with the female, and with violent swimming action often succeeds in shaking the female. The male also rubs the snout of the female with the undersurface of his chin. Cloacal manipulation may be achieved as the male's body passes from side to side above the female. Spermatophore transfer was not observed.

Snyder (*Copeia* 1956(1):41-50) describes the egg masses of neotenic individuals of *A. gracile* as being greatly different from those of metamorphosed individuals. He states (p. 44) that masses were "without exception... of a loose tenuous consistency, not firm as in the case of the adult..." He continues to say that "A few bunches were attached to grass stems, but most lay free on the bottom." The evidence for these statements and the identification of the eggs is found in the 1) collection of large quantities of such

eggs (50 gallons) from a drained pond in which 2) no adult *Ambystoma* were found, but 3) in which 240 larvae, identified as *A. gracile*, were collected during a two day search (which began fully one day after the eggs were collected). Snyder's description of "larval" egg masses (p. 44) agrees with that of Slater (*Copeia* 1936(4):235) and with that of the present writer, but for *Ambystoma macrodactylum* and not for *A. gracile*. Furthermore, Slater gives the only published record of observing a neotenic form of *A. gracile* actually producing an egg mass, but makes no reference to a loose consistency of the egg mass. The present writer has collected two neotenic specimens of *A. gracile* (135 mm. and 165 mm.) which produced egg masses under field temperatures, of 72 and 103 eggs each. The egg masses were firm and indistinguishable from those of adults, except for numbers of eggs, and were attached to vegetation.

It is the writer's experience at the Spanaway pond that *A. macrodactylum* breeds before *A. gracile* and that the adults of both species remain in the pond for only a few days after breeding. It would seem plausible, therefore, that the egg masses attributed to "larval" *A. gracile* by Snyder were actually those of *A. macrodactylum* which subsequently left the pond, either after breeding, or in the interim between draining the Weiss pond and the search for salamanders. In any event, in view of the facts that 1) Snyder's description for *A. gracile* neotenic egg masses is identical with descriptions of adult *A. macrodactylum*, that 2) two positive *A. gracile* neotenic egg mass records published herein are indistinguishable from those of adults, that 3) *A. macrodactylum* deposit eggs earlier than *A. gracile* and both leave the pond shortly thereafter, and that 4) there is a recognized difference in the egg masses of the two ambystomid species, the present writer can find no ground to support the theory that says soft egg masses are produced by neotenic forms and firm masses are produced by adults of *A. gracile*.—JENS W. KNUDSEN, Department of Biology, Pacific Lutheran College, Parkland, Washington.

THE SLENDER GLASS LIZARD, *OPHISAURUS ATTENUATUS*, FROM THE PLEISTOCENE (ILLINOIAN GLACIAL) OF OKLAHOMA.—Among the succession of warm and cool faunas recovered from Pleistocene deposits of the southern Great Plains, the fossil remains of lizards have been previously identified only in those faunas which are correlated with interglacial stages (Etheridge, *Copeia* 1958(2):94-101). A single dentary of an unidentified species of *Eumeces* has now been recovered from the

Cudahy fauna (Kansan Glacial) of southwestern Kansas, and a single vertebra of *Ophisaurus* from the Doby Springs local fauna (Illinoian Glacial) of northwestern Oklahoma. These two fossils represent the only lizards yet obtained from Glacial deposits in this area.

The single caudal vertebra of *Ophisaurus* was recovered from the Doby Springs lake beds, located in the southwestern quarter of section 10, T. 27 N., R. 24 W., Harper County, Oklahoma. The Doby Springs local fauna is assigned to the third glacial interval (Illinoian) by Stephens (*unpublished thesis, University of Michigan, 1959*). The specimen was obtained by Dr. Claude Hibbard during the summer of 1958, and is now No. 40600 in the collection of the University of Michigan Museum of Paleontology.

The fossil vertebra is from the anterior part of the autotomic series of caudal vertebrae. In vertebrae from this region the ratio of length to width of the centrum in *ventralis* is about 2.2, in *attenuatus* about 2.6, and in the fossil 2.14. The ratio of length of the centrum to its anterior segment in *ventralis* is about 3.7, in *attenuatus* about 3.5, and in the fossil 3.27. The ratio of the length of the centrum to the width across the postzygapophyses in *ventralis* is about 2.2, in *attenuatus* about 1.1, and in the fossil 1.02. The angle of the posterior edge of the neural spine is somewhat less in the caudal vertebrae than in the body vertebrae. The figures given for this angle by Auffenberg (*Herpetologica* 11: 133-6, 1955) are therefore not applicable to caudal vertebrae. This angle in the caudal vertebrae of the anterior autotomic series is about 60° in *ventralis*, about 55° in *attenuatus*, and is 55° in the fossil. Measurements of the fossil, taken with an ocular micrometer, are as follows: total length of the centrum including the articular condyle, 4.31 mm.; narrowest width of the centrum, 1.58 mm.; length of the part of the centrum anterior to the plane of fracture, 1.22 mm.; and width across the postzygapophyses, 3.30 mm. In its meristic characters, the fossil vertebra shows closest correspondence with vertebrae from a corresponding region of the tail of *attenuatus*.

The anterior autotomic caudal vertebrae of *attenuatus* may be distinguished from those of *ventralis* and *compressus* by other features. The anterior border of the transverse processes form nearly a right angle with the longitudinal axis of the vertebra in *attenuatus*, whereas in *ventralis* and *compressus* the processes are directed forward. In addition, the processes are somewhat stouter and wider at their bases in *attenuatus* than in *ventralis* or *compressus*. In these features the fossil is identical with *attenuatus*. The dimensions of the fossil are slightly