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***Ambystoma annulatum* Cope**
Ringed salamander

Ambystoma annulatum Cope, 1886:525. Type-locality not stated; designated by Schmidt (1953:18) as "vicinity of Hot Springs, [Garland County], Arkansas." Holotype U.S. Natl. Mus. 11564; collector and date of collection unknown.

Linguaelapsus annulatus Cope, 1887:88. Transfer of *A. annulatum* Cope to *Linguaelapsus* Cope, new genus; type-species not stated, designated as *A. annulatum* by Schmidt (1953:18). Freytag, 1959:88.

Ambystoma annulatum: Stejneger & Barbour, 1917:8. *Linguaelapsus* treated as junior synonym of *Ambystoma*.

• CONTENT. No subspecies are recognized.

• DEFINITION. This species is a slender, elongate *Ambystoma* with 15 costal grooves and the tips of the adpressed limbs separated by 4 costal grooves. All teeth are in multiple rows, the vomerine series forming a wide V, the apex directed anteriorly. The plicae of the tongue branch from a median groove. The ground color is deep brown to black; narrow light bands or rings cross the body and tail above, but do not extend onto the ventral surfaces. In life, the rings vary from yellowish brown to bright sulfur-yellow.

• DESCRIPTIONS. Adults are described by Cope (1886, 1887, and 1889—type only), Noble & Marshall (1929:3), and Bishop (1943:115-119).

Some features of the osteology are described by Tihen (1942, 1958). Detailed descriptions of larvae are not available. Some early stages within the egg capsule are described by Noble & Marshall (1929:4-5). Advanced larvae are described briefly by Bishop (1943:119). Eggs and egg masses are described by Combs (in Strecker 1908, but see REMARKS), Noble & Marshall (1929:4-5), Bishop (1943:118-119), and Trapp (1956).

• ILLUSTRATIONS. Adults are figured by Bishop (1943:117), Conant (1958:259), and Freytag (1962:174). Noble & Marshall (1929) illustrate variations in annulations of the adult color pattern, (p. 3) as well as eggs (p. 4). Salthe (1963) diagrams the egg capsules. Cope (1887:87, fig. 3; 1889, pl. 24, figs. 10, 11) figures the hyoid; Tihen (1958:11, fig. 4F) the prevomers and parasphenoid. The head, details of mouth structures, and feet are illustrated by Cope (1889:115). Larvae have not been illustrated.

• DISTRIBUTION. *Ambystoma annulatum* is endemic to the Interior Highlands of the United States on the Ozark Plateau and in the Ouachita Mountains. Locality records are scattered in this region from Gasconade County, Missouri, through southwestern Missouri, western Arkansas, and eastern Oklahoma. It is known from these specific localities: ARKANSAS, *Garland Co.*: Hot Springs; *Adair Farm*, 3 mi. NW Buckville. *Madison Co.*: 2.3 mi. NW Hindesville (pond on Highway 68). *Polk Co.*: Mena. *Washington Co.*: 7 mi. NE Fayetteville; 8 mi. NE Fayetteville; 7 mi. NE Springdale (White River and Highway 68); 5 mi. E Mt. Gaylor. MISSOURI, *Camden Co.*: 5 mi. E Camdenton, near Lake of the Ozarks. *Gasconade Co.*: 3 mi. SW Owensville. *Stone Co.*: between Reed's Spring and Marvel Cave. OKLAHOMA, *Adair Co.*: 4 mi. S Stillwell. *Sequoyah Co.*: 9 mi. NE Sallisaw.

• FOSSIL RECORD. None.

• PERTINENT LITERATURE. Bishop (1943) summarizes knowledge of the species from early literature. The most comprehensive treatment of natural history is presented by Trapp (1956), of distribution by Trapp (1956), Dowling (1956, 1957), and Lindsay (1961). Relationships and certain anatomical features are discussed by Cope (1887), Tihen (1958), and Freytag (1959, 1962).

• REMARKS. Until recently *A. annulatum* was considered a rare species. Trapp (1956) shows that this species normally lays eggs in loose masses under water. Noble & Marshall (1929) and Trapp (1956) indicate that breeding occurs following the first heavy rains in the fall. An old report by Combs

(in Strecker 1908) describes terrestrial eggs laid singly during March, but this may be an aberrant condition.

• ETYMOLOGY. The specific name *annulatum* refers to the ringed pattern. It is derived from Latin *annulus*, "a ring," *annulatus* "furnished with rings." Though ringed salamander is the preferred common name, others used include banded and Combs' salamander.

COMMENTS

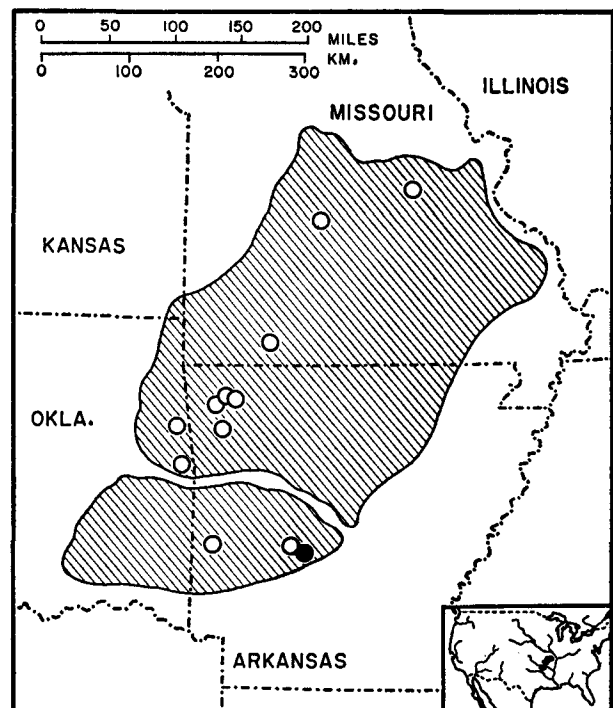
Variation has not been studied. Populations in the Ozark Plateau may be isolated from those in the Ouachita Mountains by the Arkansas River Valley (Dowling, 1956).

After originally describing *A. annulatum* as a species of *Ambystoma*, Cope (1887:88) transferred it to a new genus *Linguaelapsus*. More recent authors have followed Stejneger & Barbour (1917:8) in considering *Linguaelapsus* a synonym of *Ambystoma*. Tihen (1958) groups *A. annulatum* with the species *cingulatum*, *mabeei*, *schmidti*, and *texanum* as a subgenus (*Linguaelapsus*) of *Ambystoma*. Freytag (1959, 1962) prefers to establish *Linguaelapsus* at the generic level with the same content as the subgenus proposed by Tihen. The subgeneric designation proposed by Tihen seems the most reasonable and acceptable arrangement under existing knowledge.

Most aspects of life history and reproductive cycle are unknown. This distinctive and geographically restricted species needs much careful study.

LITERATURE CITED

- Bishop, Sherman C. 1943. Handbook of salamanders: the salamanders of the United States, of Canada, and of Lower California. Comstock Publ. Co., Ithaca, New York. xiv + 555 pp.
- Conant, Roger. 1958. A field guide to reptiles and amphibians of the United States and Canada east of the 100th meridian. Houghton Mifflin Co., Boston, xviii + 366 pp., 40 pls.
- Cope, Edward D[rinker]. 1886. Synonymic list of the North American species of *Bufo* and *Rana*, with descriptions of some new species of Batrachia, from specimens in the National Museum. Proc Amer. Philos. Soc., 23:514-526.



MAP. The solid circle marks the type-locality, open circles all published locality records. The shaded area delimits the presumed range of the species, approximating the Ozark Plateau and Ouachita Mountain physiographic provinces of the Interior Highland Division.

- 1887. The hyoid structure in the amblystomid salamanders. *Amer. Nat.*, 21:87-88.
- 1889. The Batrachia of North America. *Bull. U.S. Natl. Mus.*, (34):1-525, pls. 1-86.
- Dowling, Herndon G. 1956 [1958]. Geographic relations of Ozarkian amphibians and reptiles. *Southwestern Nat.*, 1:174-189.
- 1957. A review of the amphibians and reptiles of Arkansas. *Occas. Papers Univ. Arkansas Mus.*, (3):1-51.
- Freytag, Günther E. 1959. Zur Anatomie und systematischen Stellung von *Ambystoma schmidti* Taylor 1938 und verwandten Arten. *Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich*, 104:79-89.
- 1962. Der Genetzte Querschnitzmolch und seine Verwandten. *Aquarien und Terrarien*, 9:173-176.
- Lindsay, Hague L., Jr. 1961. Additional records of *Ambystoma annulatum* from Arkansas and Oklahoma. *Southwestern Nat.*, 6:199-200.
- Noble, G. K., & B. C. Marshall. 1929. The breeding habits of two salamanders. *Amer. Mus. Novitates*, (347):1-12, figs. 1-4.
- Salthe, Stanley N. 1963. The egg capsules in the Amphibia. *Jour. Morphol.*, 113:161-171.
- Schmidt, Karl P. 1953. A check list of North American amphibians and reptiles. Sixth edition. *Amer. Soc. Ichthyol. and Herpetol.* viii + 280 pp.
- Stejneger, Leonhard, & Thomas Barbour. 1917. A check list of North American amphibians and reptiles. Harvard Univ. Press, Cambridge, Massachusetts. iv + 125 pp.
- Strecker, John K., Jr. 1908. Notes on the habits of two Arkansas salamanders and a list of batrachians and reptiles collected at Hot Springs. *Proc. Biol. Soc. Washington*, 21: 85-89.
- Tihen, J[oseph] A. 1942. A sesamoid element in the shoulder region of *Ambystoma*. *Copeia*, 1942:255-256.
- 1958. Comments on the osteology and phylogeny of ambystomatid salamanders. *Bull. Florida State Mus.*, 3:1-50.
- Trapp, Myra M. 1956 [1957]. Range and natural history of the ringed salamander, *Ambystoma annulatum* Cope (*Ambystomidae*). *Southwestern Nat.*, 1:78-82.

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