Catalogue of American Amphibians and Reptiles.

DUNDEE, HAROLD A. 1971. *Cryptobranchus*, and *C. alleganiensis*.

Cryptobranchus Leuckart Hellbender

Cryptobranchus Leuckart, 1821:260. Type-species *Salamandra alleganiensis* Daudin, 1803, by monotypy.

Necturus Rafinesque, 1820:4. Regarded *Salamandra alleganiensis* as belonging to *Necturus*. No details given.

Urotropis Rafinesque, 1822:3. Type-species *U. mucronata*.

Protonopsis LeConte, 1824:57. Attributes this name to Barton, but Barton's writings do not have this usage (see species account).

Abranchus Harlan, 1825:233. Type-species *A. alleghaniensis-alleganiensis*; not of Van Hasselt, 1824, who used the name for a mollusk.

Menopoma Harlan, 1825:270. Substitute name for *Abranchus*.

Salamandrops Wagler, 1830:209. Type-species *Salamandra gigantea* (not seen).

• CONTENT: One species, *C. alleganiensis*, with two subspecies, is recognized.

• DEFINITION. A partially transformed aquatic salamander having a single pair of circular gill openings in the adult, sometimes reduced or lost on one side or the other. Four epibranchials are present in the adult. The eyelids are absent, and the dentition is limited to premaxillary, maxillary, prevomer, and dentary. The skull is semilarval, lacking lacrimal and septomaxillary bones. The vertebrae are amphicoelous. The costal grooves are poorly developed and are obscured by a wrinkled fleshy fold along each side of the trunk. The toes are 4,5. Chromosome number (2N) = 62. Fertilization is external. The size is large, to 75 cm or more in total length. The gilled, stream-type larvae reach 13 cm in total length.

• DESCRIPTIONS, ILLUSTRATIONS, DISTRIBUTION, FOSSIL RECORD, PERTINENT LITERATURE. See species account.

• ETYMOLOGY. *Cryptobranchus*, of masculine gender, is derived from the Greek words, *kryptos*, meaning hidden, covered, or secret, and *branchion*, a gill.

COMMENT

The Asian genus *Andrias* (= *Megalobatrachus* of authors) the only other genus in the family Cryptobranchidae, has often been allocated to *Cryptobranchus* or its synonyms.

Cryptobranchus alleganiensis (Daudin) Hellbender

Salamandra alleganiensis Daudin, 1803, 8:231. Type-locality, Allegheny Mountains in Virginia. Daudin indicated that Sonnini and Latreille, 1801, 2:253, pl. 54, gave the name, "La Salamandre des Monts Alleganis," but there was no technical proposal. Harper, 1940:721, restricted the type-locality to "the vicinity of Davenport's Plantation," North Toe River, Mitchell County, North Carolina, or about four miles ENE of the present-day town of Spruce Pine. See comment. No holotype is known to exist.

Salamandra horrida Barton, 1808:7–8. Type-locality, "the great lakes of our country, in the waters of the Ohio and Susquehanna, and other parts of the United States." Schmidt (1953) restricted the type-locality to the Muskingum River, Ohio, but see Comment.

Salamandra gigantea Barton, 1808:8. Substitute name for *S. horrida*.

Salamandra maxima Barton, 1808:8. Substitute name for *S. gigantea*.

Molge gigantea: Merrem, 1820:187. Transfer of *S. gigantea* Barton to *Molge*.

Cryptobranchus salamandroides Leuckart, 1821:260, pl. 9. Substitute name for *gigantea*. In Opinions Int. Cong. Zool. Nomen. 1956–7, ID: 365–388, direction 57, the name *gigantea* is regarded as a junior synonym of *alleganiensis* Daudin (1803), as published in comb. *Salamandra alleganiensis*.

Urotropis mucronata Rafinesque, 1822:3. See *Eurycea mucronata*, following. Description is based on animal found in the Kentucky River in 1821.

Abranchus alleghaniensis: Harlan, 1825:233. In Opinions Int. Cong. Zool. Nomen. 1956–7, ID:337–364, direction 56, the emendation of *alleghaniensis* is regarded as invalid although occupied.

Protonopsis horrida: Barnes, 1826:278. Credits this name to "Barton (LeConte)" but the name does not appear in Barton's writings of 1808 and 1812. The name *Protonopsis* was mentioned by LeConte, 1824:52–58, but not with an accompanying specific epithet.

Salamandrops gigantea: Wagler, 1830:209 (not seen).

Eurycea mucronata: Rafinesque, 1832:121. Description and locality suggests this is same animal described by Rafinesque in 1822 as *Urotropis mucronata*.

Cryptobranchus alleghaniensis: Van der Hoeven, 1837:384. First proper application of generic name and specific epithet, except for altered spelling of specific epithet.

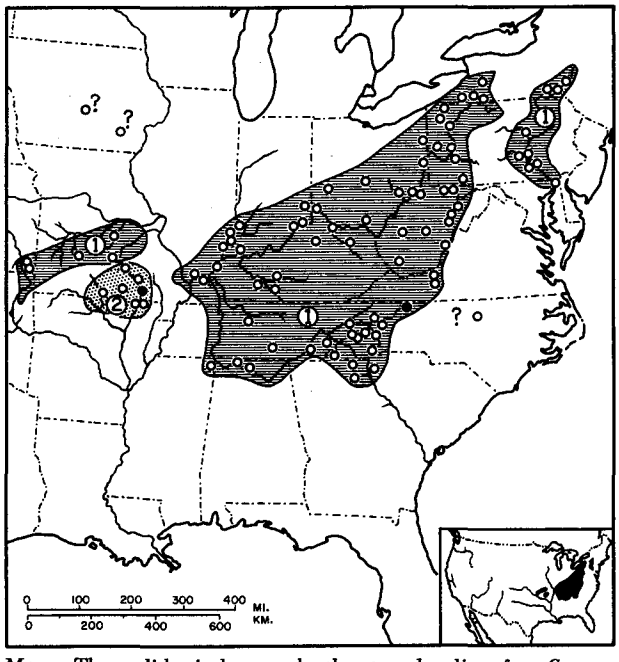
Menopoma fuscum Holbrook, 1842:99. A description based on a specimen from Knoxville, Tennessee.

Cryptobranchus fuscus: Cope, 1889:43.

Cryptobranchus alleghaniensis: Cope, 1889:43.

Cryptobranchus alleganiensis: Stejneger and Barbour, 1917:3. First correct combination spelling in current usuage.

Cryptobranchus terrasodactylus Wellborn, 1936:63. Based on an aberrant four-toed specimen. Type-locality "North America."



MAP. The solid circles mark the type-locality for *Cryptobranchus alleganiensis bishopi* and the recommended type-locality for *C. a. alleganiensis*. Open circles represent other known localities. Doubtful localities are indicated with a question mark.

• CONTENT. Two subspecies are recognized: *Cryptobranchus a. alleganiensis* (Daudin) and *C. a. bishopi* Grobman.

• DEFINITION. Same as for the genus. See subspecies for other characters.

• DESCRIPTIONS. Only the more accurate and explicit of the numerous papers are listed herein. The general features are described by Bishop (1941, 1943). Bishop also describes the larvae and larval stages; B. G. Smith (1912 a,b) gives explicit details of the larvae. Anatomical descriptions with profuse illustration are provided by Jollie (1962) and Reese (1906 a). A laboratory manual containing illustrations and references was prepared by Branch (1933). Osteological and skeletal features are give by Cope (1889), Parker (1876), Lucas (1886), Fischer (1864), and Hilton (1950). The vertebrae are described by Hilton (1948). Visceral anatomy is given by Cope (1889) and Wonderly (1963). Some more specific references for myology include Mivart (1869) and Fischer (1864). The nervous system is included by Fischer (1864), McGregor (1896) and Osborn (1884). Circulatory system features are mentioned in Baker (1949), Hilton (1952 a), and Craigie (1938). Erythrocyte size is listed by Altman and Dittmer (1961) and the erythrocyte nuclei are figured by Seifritz (1930). Kerr (1960) describes the teeth. Hilton (1952 b) briefly mentions the lungs, and Reese (1905) describes the eye. Anatomy of the nasal region is described by Wilder (1892). Details of the otic region are in Kingsbury and Reed (1909) and Dunn (1941). The lateral-line system is described by Chezar (1930), and comparative aspects of the system are discussed by Kingsbury (1896). Detailed structure of the urogenital system appears in Ratcliff (1966). The eggs are described by Bishop (1941, 1943), and Salthe (1963) compares the egg capsules with those of other salamanders. Spermatozoa are described by Reese (1904) and Baker (1963). Chromosome counts and description are given by Makino (1935).

• ILLUSTRATIONS. Photos of adults appear in Cochran (1961), Bishop (1941, 1943), and many popular books and articles. Sketches of the larvae are shown by B. G. Smith (1912 a, b) and Bishop (1941). Bishop (1941) provides photographs of the eggs, as does Surface (1913); drawings of the egg capsules are given by Bishop (1941) and Salthe (1963). Spermatozoa are shown by Reese (1904) and Baker (1963). Makino (1935) has photographs and sketches of the chromosomes. Ratcliff (1966) illustrates many aspects of the urogenital system. Numerous sketches of gross anatomy appear in Jollie (1962), Reese (1906 a), and Fischer (1864). Illustrations of musculature appear in Mivart (1869). Good illustrations of the nervous system and sensory structures include: brain, Osborn (1884) and McGregor (1896); eye, Reese (1905); nasal region, Wilder (1892); lateral-line system, Chezar (1930) and Kingsbury (1896); otic apparatus, Kingsbury and Reed (1909).

• DISTRIBUTION. This salamander inhabits rocky, clear, fast-flowing rivers and streams under 2500 feet in elevation (m.s.l.) from New York and Pennsylvania southwestward to northern Georgia and northeastern Mississippi, westward to southern Missouri and possibly southeastern Kansas. The range is principally associated with tributaries of the Ohio and Tennessee rivers west of the Appalachian Mountains, but disjunct populations occur in the Susquehanna River of New York and Pennsylvania, the upper Savannah River of Georgia, and tributaries of the Missouri and Black rivers in Missouri and northern Arkansas. The streams occupied may reach 25–30 degrees C, but in the warmer latitudes such as Missouri *Cryptobranchus* appears to remain close to large permanent springs where temperatures rarely exceed 20°C (Dundee and Dundee, 1965).

Two specimens recorded in southeastern Kansas from the Neosho and Spring rivers, tributaries of the Arkansas River (Hall and Smith, 1947), are questionable. The Neosho in Labette County, Kansas, is an unsuitable habitat from the standpoints of clarity, temperature, and general flow features, as well as being disjunct. Firschein (1951) discredited a Vernon County, Missouri, record given by Hall and Smith (1947).

Siltation, general pollution, and thermal pollution are probably eliminating *Cryptobranchus* from much of the Ohio River drainage, and from other industrialized regions. Firschein (1951) mentions an unverified record from the Skunk River of southeastern Iowa. An old record from Des Moines, Iowa, (Cope, 1889) also indicates that Iowa might be within the species range.

Recent locality records for various states are: Alabama (Chermock, 1952), Arkansas (Dowling, 1957; Dundee and Dundee, 1965), Georgia (Neill, 1957); Illinois (P. W. Smith, 1961), Indiana (Smith and Minton, 1957), Kentucky (Welter and Carr, 1939; Hibbard, 1936), Maryland (Fowler, 1915), Missouri (Grobman, 1943; Dundee and Dundee, 1965), Mississippi (Ferguson, 1961); North Carolina (Huheey and Stupka, 1967; Brimley, 1939), New York (Bishop, 1941), Ohio (Morse, 1904; Seibert and Brandon, 1960), Pennsylvania (Surface, 1913), Tennessee (Gentry, 1955), and West Virginia (Green, 1954).

• FOSSIL RECORD. According to Meszoely (1966), *Cryptobranchus* is a Recent form. Fossils previously identified as *Cryptobranchus mccalli* from the Miocene of Nebraska are now referred to *Andrias* (= *Megalobatrachus* of authors).

• PERTINENT LITERATURE. A detailed account of the habits and habitats is given by Bishop (1941, 1943); additional accounts are provided by Dundee and Dundee (1965), B. G. Smith (1907), Surface (1913), Barton (1808), Harlan (1825), Swanson (1948), and Hay (1892). Netting (1929) and Swanson (1948) comment on the food habits, and Firschein (1951) the zoogeography. B. G. Smith (1912 a, b, 1926, 1929) studied the embryology, and Sanders (1935) and Grenell (1939), investigated specific aspects of the development and morphogenesis. Endocrine mechanisms, genetics, and metamorphosis are considered by Noble (1927). Longevity records are given by Nigrelli (1954). The parasites are mentioned by Malewitz (1955), Walton (1942), and Dundee and Dundee (1965). The literature on physiology appears scant: Reese (1906 b) describes the light reactions, and Riss, Knapp, and Scalia (1963) have worked with optic physiology. McCutcheon and Hall (1937) give oxygen dissociation curves.

• REMARKS. The use of trinomials is based on similarities of the races; actual intergradation has not been demonstrated and presumably does not occur because of present isolation of drainages occupied by the subspecies.

There are many erroneous spellings of the specific epithet in older literature. Apparently some spelling variants of *alleganiensis* are due to transliteration from the French.

• ETYMOLOGY. The specific name *alleganiensis*, derived from the French spelling, refers to the Allegheny Mountains of eastern United States; *bishopi* honors the late Sherman C. Bishop.

1. *Cryptobranchus a. alleganiensis* (Daudin)

Salamandra alleganiensis Daudin, 1803, 8:231. See species account.

Cryptobranchus salamandroides Leuckart, 1821:260. See species account.

Cryptobranchus alleganiensis: Stejneger and Barbour, 1917:3. First use of combination with correct spelling of the specific name.

Cryptobranchus alleganiensis alleganiensis: Schmidt, 1953:11. First use of trinomial.

• DEFINITION. A race of *Cryptobranchus alleganiensis* occupying the species range except for the Black River system of Arkansas and Missouri. The spiracular openings are relatively large, their diameters contained in the internarial distance an average of 2.0 times. Lateral-line canals of the pectoral region contain papillate elevations. The dorsal surface is usually

spotted, and the lower labial region usually uniformly colored. Size to 75 cm, total length.

2. *Cryptobranchus a. bishopi* Grobman

Cryptobranchus bishopi Grobman, 1943:6. Type-locality, "Current River at Big Spring Park, Carter County, Missouri." Holotype University of Michigan Museum of Zoology 68930, collected by Edwin P. Creaser on 25 August, 1930.
Cryptobranchus alleganiensis bishopi: Schmidt, 1953:12. New combination.

• DEFINITION. A race of *Cryptobranchus alleganiensis* confined to the Black River system of Arkansas and Missouri The spiracular opening is relatively small, the diameter contained in the internarial distance an average of 3.8 times. The skin above lateral-line canals of the pectoral region is smooth. The dorsal markings usually are splotched rather than spotted and the lower labial region is mottled with dark areas. Size to 62 cm, total length.

COMMENT

The type-locality of *Cryptobranchus alleganiensis* is not clearly given in the literature. The term "Allegheny Mountains" used by Daudin (based on Sonnini and Latreille's "Monts Alleganis") was once very inclusive, even including all of the present-day Appalachians. Schmidt (1953) gave a restricted range of Muskingum River, Ohio, based on Barton (1808), but the actual reference to the Muskingum appeared in a later paper (Barton, 1812:15). Although Barton mentions the Muskingum River, a footnote indicates that he probably had not seen specimens from there. Barton mentions and illustrates a specimen from the Ohio River, 60 miles below Pittsburgh (river or land miles not stated). Since a precise locality cannot be determined for Barton's specimen and since another alternative exists, I recommend that Mitchell County, North Carolina, be accepted as the type-locality, as suggested by Harper (1940).

The Zoological Record contains two erroneous references to *Cryptobranchus*: in Z.R. 1963 the name *C. evansi* is alleged to be in a paper by Salthe—such a name does not appear; in Z.R. 1939 a mention of *C. juhrmanni* in a paper by Hellmich should read *Cryptobatrachus juhrmanni.*

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Published 7 March 1972 by the SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES.