

Catalogue of American Amphibians and Reptiles.

FROST, DARREL R. 1983. *Sonora semiannulata*.***Sonora semiannulata* Baird and Girard
Ground Snake**

Sonora semiannulata Baird and Girard, 1853:117. Type-locality, "Sonora, Mex." Restricted by Stickel (1943) to the "vicinity of the Santa Rita Mountains of [Pima and Santa Cruz counties] Arizona." Holotype, United States Nat. Mus. 2109, male, collected by J. D. Graham, date unknown (not examined by author).

Lamprosoma episcopum Kennicott, 1859:22. Type-locality, "Eagle Pass," Maverick Co., Texas, and "San Antonio to Rio Grande," Texas. Restricted by Stickel (1938) to "Eagle Pass, Maverick Co., Texas." Syntypes, United States Nat. Mus. 2042 and 2045; 2042 designated lectotype by Stickel (1943), female, collected by A. Schott, date unknown (not examined by author).

Contia episcopa: Cope, 1860:251.

Homalosoma episcopum: Jan, 1862:35.

Contia isoazona Cope, 1866:304. Type-locality not stated in original description. Data with holotype are "Arizona [Yavapai County], Ft. Whipple." Holotype not designated but United States Nat. Mus. 11417 is catalogued as holotype, male, collected by Elliot Coues, 1865 (not examined by author).

Contia episcopa episcopa: Cope, 1880:21.

Contia episcopa torquata Cope, 1880:21. Type-locality, "Northwestern Texas." Holotype not designated but Acad. Natur. Sci. Philadelphia 10995, male, and 10996, female, are recorded as syntypes, collected by J. Boll, 1880 (not examined by author).

Contia episcopa isoazona: Cope, 1880:21.



FIGURE. Left hemipenis of *Sonora semiannulata*, University of Kansas 186010 (Kiowa County, Kansas). Bar equals 2 mm.

Contia semiannulata: Garman, 1883:90.

Contia taylori Boulenger, 1894:265. Type-locality, "Duval Co., Texas, and Nuevo Leon, Mexico." Holotype not designated but British Mus. (Natur. Hist.) 1946.1.5.39 (Nuevo Leon), female, and 1946.1.5.57-59 (Duval Co., Texas), males, are recorded as syntypes. British Mus. (Natur. Hist.) 1946.1.5.57 is the specimen figured in the description and the one for which measurements are given (A. F. Stimson, BMNH, pers. comm.). Collected by Mr. W. Taylor, probably during 1880-1881 (not examined by author).

Contia torquatus: Boulenger, 1894:265.

Chionactis taylorii: Cope, 1900:936.

Chionactis episcopus: Cope, 1900:937.

Chionactis episcopus episcopus: Cope, 1900:938.

Chionactis episcopus torquatus: Cope, 1900:939.

Chionactis episcopus isoazonus: Cope, 1900:939.

Contia nuchalis Schenkel, 1901:162. Type-locality, "Fort Worth (Tex.)." Holotype, Basel Mus. 2117, male, collected by Dr. L. DeWette, 1879 (not examined by author).

Sonora episcopa: Van Denburgh and Slevin, 1913:412.

Chionactis isoazonus: Richardson, 1915:426.

Sonora taylori: Stejneger and Barbour, 1917:92.

Sonora semiannulata semiannulata: Stickel, 1938:185.

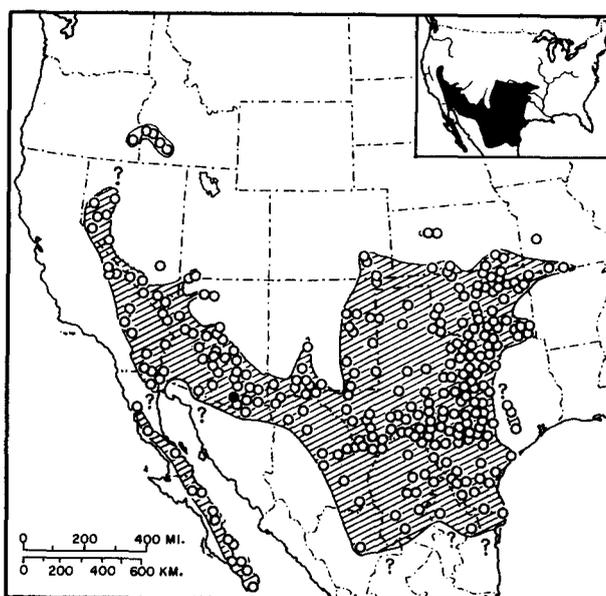
Sonora semiannulata blanchardi Stickel, 1938:185. Type-locality, "northeastern slopes of the Chisos Mountains, Brewster County, Texas." Holotype, Univ. Michigan Mus. Zool. 83122, female, collected by F. N. Blanchard and J. T. Carney, 28 September 1935 (not examined by author).

Sonora semiannulata gloydi Stickel, 1938:186. Type-locality, "Bright Angel Trail, Lower Sonoran level of the Grand Canyon, Grand Canyon National Park [Coconino County], Arizona." Holotype, Univ. Michigan Mus. Zool. 83754, female, collected by William Holzmark, 1936 (not examined by author).

Sonora miniata miniata Stickel, 1938:187. Type-locality, "2 miles northwest of Mesa [Maricopa County], Arizona." Holotype, Chicago Acad. Sci. 5139, female, collected by Earl Sanders, date unknown (not examined by author).

Sonora miniata linearis Stickel, 1938:189. Type-locality, "Seeley, Imperial County, California." Holotype, San Diego Mus. Natur. Hist. (formerly L. M. Klauber) 2013, female, collected by Chas. McHone, 15 July 1929 (not examined by author).

Sonora mosaueri Stickel, 1938:189. Type-locality, "Comondu, Lower California" (=San José Comondu, Baja California del Sur, México). Holotype, Univ. California Mus. Vert. Zool. 13772, male, collected by C. C. Lamb, 2 April 1931 (examined by author).



MAP. Solid circle marks the restricted type-locality; open circles indicate other localities. Question marks indicate uncertain range boundaries.

- Sonora semiannulata isozona*: Stickel, 1943:120.
Sonora semiannulata linearis: Stickel, 1943:121.
Sonora episcopa episcopa: Stickel, 1943:121.
Sonora episcopa taylori: Stickel, 1943:122.
Sonora bancroftae Klauber, 1943:69. Type-locality, "San Jorge, Lower California [Baja California Norte], Mexico." Holotype, San Diego Mus. Natur. Hist. (formerly L. M. Klauber) 3077, female, collected by Mrs. Griffing Bancroft, 10 April 1942 (examined by author).
Sonora semiannulata episcopa: Frost and Van Devender, 1979:6.
Sonora semiannulata taylori: Frost and Van Devender, 1979:6.

• **CONTENT.** *Sonora semiannulata* is a monotypic species (see COMMENT).

• **DIAGNOSIS AND DEFINITION.** *Sonora semiannulata* can be distinguished from other species in the genus (*S. aemula* and *S. michoacanensis*) in lacking caudal keeling (very heavy in *aemula* and lacking in *michoacanensis*), usually having an entire nasal scale (usually sutured in *michoacanensis* and entire in two specimens of *aemula*), having a color pattern that although variable is never composed of black, white, and red triads (usually some arrangement of triads in *michoacanensis* and *aemula*), having only one to two rows of spinose calyces on the hemipenes (several rows in *aemula* and *michoacanensis*), and in having 8–14 small to medium spines around the hemipenis at the level of the large basal spines (fewer in *aemula* and *michoacanensis*).

Most adults are 220–300 mm in total length; the maximum recorded length is 456 mm (371 mm snout–vent), a male from Santa Rosalía, Baja California Norte, México (NMNH 133181). Dorsal scale rows vary geographically from 13–13 to 15–15. No apical pits present. Ventrals vary geographically, 136–186 in females and 126–168 in males. Anal scale divided. Subcaudals vary geographically, 31–51 in females and 39–59 in males. Labial scales usually 7–7; temporal formula 1+1 (South Texas and northeastern México) or 1+2. Loreal present. Dorsal squamation of the head typically colubrid. Color pattern remarkably variable; ground colors range from olive to grey to red, yellow, or orange. Specimens may be black-headed, cross-banded with black, longitudinally striped with vermilion, or unicolored.

• **DESCRIPTIONS.** The best descriptions are found in Baird and Girard (1853), Stickel (1938), and Klauber (1943). Wright and Wright (1957) and Stebbins (1954) give good summary descriptions. Mexican specimens were described by Cliff (1954), Conant (1965), Savitzky and Collins (1971), Tanner and Robison (1960), and Thompson (1955). Other descriptions of specimens from the United States are found in Dowling (1958), Howes (1954), Mulaik (1935), Mulaik and Mulaik (1941), Van Denburgh (1912, 1922), Van Denburgh and Slevin (1913), and Webb (1970).

• **ILLUSTRATIONS.** Color photographs and/or illustrations are in Conant (1975), Coes (1875), Shaw and Campbell (1974), and Stebbins (1966). A good series of black and white photographs appears in Wright and Wright (1957). Other good photographs appear in Anderson (1965), Collins (1974), Pope (1955), Schmidt and Davis (1941), and Woodbury (1931). Black and white illustrations of some dorsal patterns are in Frost (1983). Line drawings are in Baird (1859), Cope (1900), and Stebbins (1954). Dowling and Duellman (1978) illustrated a vertebra, maxilla, and hemipenis.

• **DISTRIBUTION.** *Sonora semiannulata* occurs from the southern Great Plains region into the Chihuahuan Desert region from southwestern Missouri, southern Kansas, and southeastern Colorado south through eastern New Mexico, Oklahoma, and Texas to Chihuahua, Durango, Coahuila, Nuevo León, and Tamaulipas, México. From Chihuahua and southern New Mexico it extends into the northern Sonoran Desert region in northern Sonora (México) and Arizona, just penetrating into Utah along the Virgin River valley and into the Grand Canyon. Most of arid Baja California is occupied, as is desert southern California to western Nevada and extreme eastern Oregon and the Snake River Canyon of Idaho. *Sonora semiannulata* ranges from sea level to ca. 1600 m in elevation. It is invariably found associated with rocky, gravelly or sandy soils in Lower Sonoran and Upper Sonoran habitats such as open woodland, grassland, Tamaulipan thornscrub, or desert.

• **FOSSIL RECORD.** Late Pleistocene–Early Holocene material was reported by Van Devender et al. (1977), Van Devender and Worthington (1978) and Van Devender and Mead (1978).

• **PERTINENT LITERATURE.** General summaries of our knowl-

edge of *Sonora semiannulata* may be found in Conant (1975), Stebbins (1954, 1966), and Wright and Wright (1957). Pertinent taxonomic papers are those by Stickel (1938, 1943), Frost and Van Devender (1979), and Frost (1983). Stickel (1943) discussed maxillary dentition and hemipenes. Ricards (1961) studied the biogeography of western populations and geographic variation in squamation and coloration. Kassing (1961) provided a life history study containing information on morphological variation, habits, reproduction and habitat. Habitat data can be found in most papers mentioning *Sonora semiannulata*: Axtell (1959), Camp (1916), Cowles and Bogert (1936), Dowling (1958), Erwin (1925), Force (1930), Fouquette and Lindsay (1955), Gates (1957), Greene and Oliver (1965), Jameson and Flury (1949), Klauber (1931), Lewis (1949), Milstead et al. (1950), Mulaik and Mulaik (1941), Savitzky and Collins (1971), Strecker (1934), Thompson (1955), and Turner and Wauer (1963). Information on reproduction was summarized by Fitch (1970). Echternacht (1964) reported an albino. Food habits are mentioned by Carpenter (1958) and Howes (1954). *Sonora semiannulata* was reported as a food item in the diet of other animals by Cliff (1954), Funk (1965), Ruick (1948), Storm (1947), and Vitt and Hulse (1973). Kroll (1971) reported combat behavior. Gehlbach (1970) and Hillis (1977) reported death-feigning. Gehlbach et al. (1971) reported the absence of pheromone trailing behavior. A case of possible insecticide poisoning was mentioned by Woodin (1953). Hilman and Strandmann (1960) reported on the absence of the parasite *Hepatozoon serpentium*. Clark (1966) studied sexual dimorphism in tail length. Langebartel (1968) described and illustrated the hyoid. Echternacht (1971) and Savage (1960) peripherally discussed biogeography. Other than the review citations, Ortenburger (1923) and Strecker (1934) gave the best accounts of color pattern polymorphism. Ralston and Clark (1978) and Diller and Wallace (1981) reported on distribution records in Idaho.

• **ETYMOLOGY.** The name *semiannulata* is from the Latin meaning "half-ringed," in reference to body cross-bands that fail to cross the venter.

COMMENT

The taxonomic history of *Sonora semiannulata* is replete with synonyms due in large part to the extensive color polymorphism for which this species is well known. Much of the literature on this species mentions it as *Sonora episcopa*.

Although Frost and Van Devender (1979) and Frost (1983) considered this species to be monotypic they did not examine closely the putative intergradation zone in south-central Texas where the Great Plains population having 15–15 dorsal scale rows contacts the South Texas population (formerly *Sonora taylori*) having 13–13 dorsal scale rows. Stickel (1943) suggested that intergradation occurs but this conclusion needs to be more explicitly documented.

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