Catalogue of American Amphibians and Reptiles.

ROZE, JANIS A. 1974. *Micruroides, M. euryxanthus.*

Micruroides Schmidt
Western coral snake

Micruroides Schmidt, 1928:63. Type-species *Elaps euryxanthus* Kennicott, 1866, by original designation.

• CONTENT. A single polytypic species, *M. euryxanthus*, is recognized.

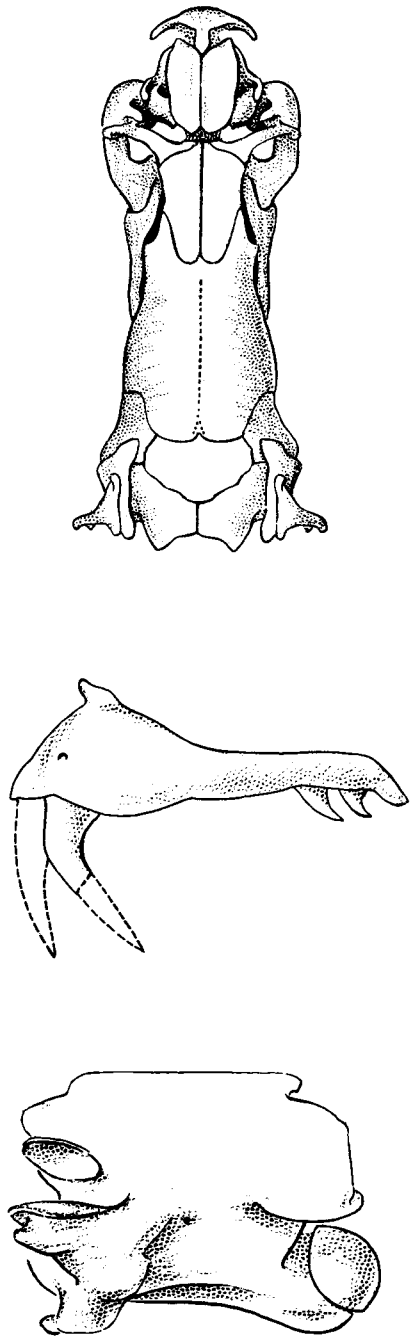


FIGURE 1. Upper, dorsal view of skull, × 5. Note prefrontal bones separated by frontals. Middle, left maxilla in labial view, × 17. Lower, mid-dorsal vertebra from left (anterior to left), × 17.

• DEFINITION AND DIAGNOSIS. A New World elapid snake that has the entire upper part of the head black. The body is ringed with complete red and black bands, which are separated by a yellow (sometimes white) band. The prefrontal bones are separated by the frontals (Fig. 1). The maxilla bears a pair of tubular fangs (with external grooves) at its anterior end; these are followed, after a diastema, by one or two solid teeth (Fig. 1). A single pair of chin shields is present which, with the solid maxillary teeth and the separation of the prefrontal bones, serves to distinguish this genus from the other New World elapid genera, *Micrurus* and *Leptomicrurus*.

• DESCRIPTION, DISTRIBUTION, FOSSIL RECORD, PERTINENT LITERATURE. See *Micruroides euryxanthus*.

• ILLUSTRATIONS. The skull, maxilla, dorsal vertebra, and hemipenis are illustrated here for the first time (Figs. 1–2). See *M. euryxanthus* for references to additional illustrations.

• ETYMOLOGY. The name refers to the taxon's similarity to the genus *Micrurus* by the Greek termination *-oides*, meaning like or in shape of; its gender is masculine.

Micruroides euryxanthus (Kennicott)

Elaps euryxanthus Kennicott, 1860:337. Type-locality is not given in the original description, but the National Museum of Natural History records show its provenience as "Sonora, Mexico." See Remarks. Holotype, U.S. Natl. Mus. 1122, adult male, received from T. Webb (examined by author).

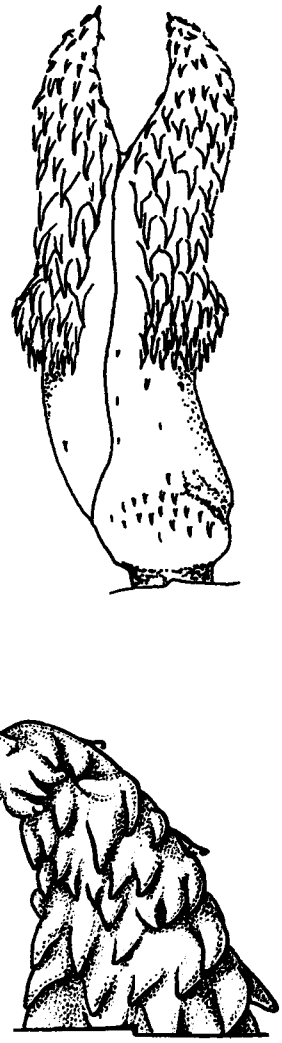


FIGURE 2. Upper, left hemipenis, × 8. Lower, right tip of left hemipenis, × 32.

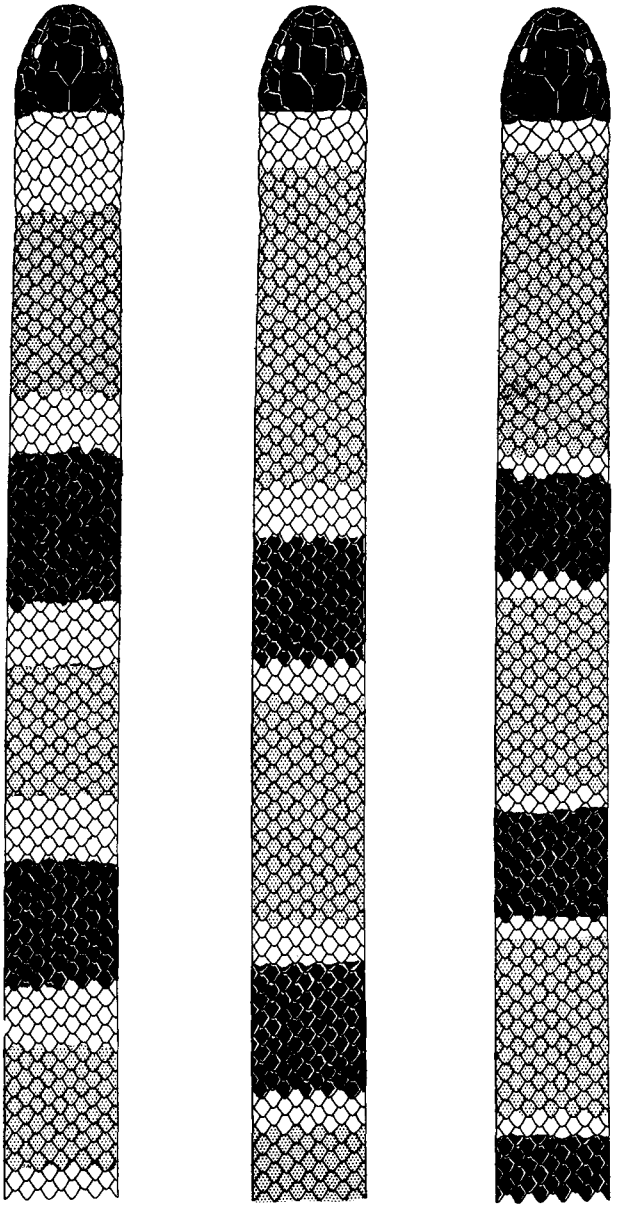


FIGURE 3. Color patterns of three subspecies of *M. euryxanthus*; left, *M. e. euryxanthus* (Cochise County, Arizona); middle, *M. e. australis* (holotype); right, *M. e. neglectus* (holotype). Stippled areas are red in life, black areas black, and white areas white or yellow (scales are outlined only for clarity).

Micrurus euryxanthus: Stejneger and Barbour, 1917:106. First use of combination.
Micruroides euryxanthus: Schmidt, 1928:63. First use of combination.

• CONTENT. Three subspecies are recognized: *australis*, *euryxanthus*, and *neglectus*.

• DEFINITION. A slender coral snake that averages 40 cm in length, with the head only slightly distinct from the body. There is a red-yellow-black-yellow-red sequence of body bands (Fig. 3). The head is uniformly black above, as are many of the infracephalic scales.

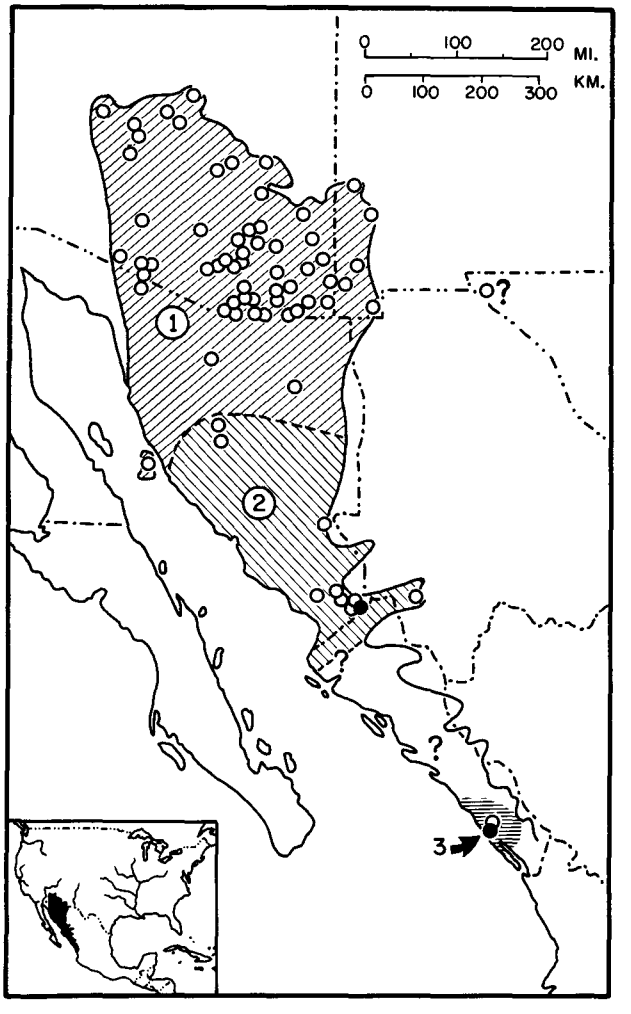
There is usually 1 preocular and 2 postoculars, 1 + 2 temporals, 7 supralabials, and 7 infralabials. The dorsal scales are in 15(17)-15-15 rows. There are 205–245 ventrals; the anal plate is divided, and there are 19 to 31 pairs of subcaudals. Sexual dimorphism is shown in the number of ventrals, subcaudals, and body bands.

The hemipenis (Fig. 2) is about 7 subcaudals in length. It is bifurcated with the *sulcus spermaticus* bifurcated as well. The organ approaches a capitate condition with the distal region where the spines begin expanded. The spines gradually diminish in size toward the apex. Each fork of the hemipenis ends in a minute papilla-like projection. A longitudinal naked fold starts at the base and runs approximately parallel to the *sulcus*. Small, sparsely distributed spines cover the zone between the fold and *sulcus*. A few scattered small spinules are present on the rest of the organ up to the zone of large spines.

• DESCRIPTIONS. General descriptions of the species appeared in Cope (1900), Van Denburgh (1922), Schmidt (1928), Schmidt and Davis (1941), Bogert and Oliver (1945), Hensley (1950), Stebbins (1954), Wright and Wright (1957), and Fowlie (1967). An adequate description of *M. e. australis* is given by Zweifel and Norris (1955), and of *M. e. neglectus* by Roze (1967) and Hardy and McDiarmid (1969).

• ILLUSTRATIONS. For color illustrations, see Ditmars (1908 and 1936), Zim and Smith (1953), Schmidt and Inger (1957), Klemmer (1963), East (1965), and Stebbins (1966); for head scutellation see Cope (1900), Ditmars (1908), Schmidt and Davis (1941), and Wright and Wright (1957). Black and white illustrations appear in Kennicott (1860), Stejneger (1895), Pope (1937), Stebbins (1954), Wright and Wright (1957), Fowlie (1965), and U.S. Department of Navy (1968). Zweifel and Norris (1955) offered illustrations of *M. e. euryxanthus* and of the holotype of *M. e. australis*. Roze (1967) illustrated the color pattern of the holotype of *M. e. neglectus*.

• DISTRIBUTION. The species is found in the southwestern United States from central Arizona and southwestern New Mexico southward into Mexico, and possibly eastward to extreme Texas (see Comment). The Mexican range extends from western Chihuahua and Sonora (including Isla Tiburón) south-



MAP. Solid symbols show type localities; hollow symbols indicate other known localities. The type-locality of *M. e. euryxanthus* is too inexact to be indicated.

ward to Mazatlán in southern Sinaloa. The altitudinal range is from sea level to 1,800 meters.

• Fossil Record. None.

• Pertinent Literature. Comments on diverse aspects of the species are found in Ruthven (1907), Schmidt and Davis (1941), Bogert and Oliver (1945), Stebbins (1954), Zweifel and Norris (1955), and Shaw (1971). Bogert and Oliver (1945) commented on the dentition and probable evolutionary history of the species. Underwood (1967) mentioned tubercles on the body scales. Stebbins (1954), Lowe (1948, 1967), Werler (1960), Howes (1954), Gates (1957), Bogert and Degenhardt (1961), Zweifel (1962), and Nickerson and Mays (1970) gave general descriptions of the habitat and data on distribution. General habits have been described by Gloyd (1937), Lowe (1948), Woodin (1953), Kauffeld (1957), Wright and Wright (1957), and Bellairs (1970). Vorhies (1929), Lindner (1962), and Vitt and Hulse (1973) described the food habits and food preferences. Funk (1964) described the eggs. Gates (1956) cited 551 mm as a record total length of the species.

The action of *M. euryxanthus* venom on animals is mentioned by Lowe (1948) and Woodin (1953); venom, immunological studies and snakebite are dealt with by Stickel (1952), Oliver (1958), Cohen and Seligmann (1966), Russell (1967), Stevan and Seligmann (1970), and Shaw (1971). The mimicry problem is described by Pope (1937), Hecht and Marien (1956), Mertens (1956), and Parker (1963), whereas defensive tail display related to mimicry is described by Woodin (1953), Stebbins (1966), Gehlbach (1972), and Greene (1973a, and 1973b). Bogert (1960) described the ability of *M. euryxanthus* to produce sound through vibration of the lips of the cloaca, and provided an audiospectrogram.

• Remarks. Smith and Taylor (1950) restricted the type locality of *M. euryxanthus* to "Guaymas, Sonora, Mexico," without substantiating their action. As Guaymas lies in an area where intergrades between *M. e. euryxanthus* and *M. e. australis* might be found, I reject their restriction of the type-locality, leaving it as it is given for the type-specimen deposited in the National Museum of Natural History and listed by Cochran (1961).

• Etymology. The specific name *euryxanthus* is derived from the Greek *eury-*, meaning wide or broad, and *xanthos*, yellow. It apparently alludes to the wide yellow dorsal bands. The subspecies name *australis* (Latin, southern) refers to its southern distribution, and *neglectus* (Latin, neglected) indicates the neglected status of this form.

1. *Micruroides euryxanthus euryxanthus* (Kennicott)

Elaps euryxanthus Kennicott. See species synonymy.
Micruroides euryxanthus euryxanthus: Zweifel and Norris, 1955:246. First use of trinomial.

• Definition. A subspecies of *M. euryxanthus* characterized by having 42 to 93 (mean 69.5) red scales in the vertebral row of the body, yellow bands 3 to 5½ scales long, 212–230 ventrals in males and 219 to 245 in females.

2. *Micruroides euryxanthus australis* Zweifel and Norris

Micruroides euryxanthus australis Zweifel and Norris, 1955: 246. Type-locality, "Guirocoba, Sonora, Mexico." Holotype, Mus. Vert. Zool. Univ. California 50839, adult male obtained by R. G. Zweifel and Kenneth Norris on 10 August 1950 (examined by author).

• Definition. A subspecies of *M. euryxanthus* characterized by having 93 to 107 (mean 102.5) red scales in the vertebral row of the body, the yellow bands are usually 2 to 4 scales long, 213 to 226 ventrals in males and 224 to 228 in females.

3. *Micruroides euryxanthus neglectus* Roze

Micruroides euryxanthus neglectus Roze, 1967:4. Type-locality, "Sixteen and three tenth miles north-northwest of Mazatlán, Sinaloa, Mexico." Holotype, Univ. Michigan Mus. Zool. 114637, adult male collected by William E. Duellman (examined by author).

• Definition. A subspecies of *M. euryxanthus* characterized by having 106 red scales in the vertebral row of the body, yellow bands from ½ to 2 scales long, 206 and 207 ventrals in the two known males (no females).

Comment

The limits of distribution of the subspecies are not yet clearly defined. *M. e. australis* apparently intergrades with *M. e. euryxanthus* in northern Sonora, but a specimen from Hermosillo, Sonora, considered by Zweifel and Norris (1955) to be an intergrade, displays characteristics typical of *M. e. australis*. A distance of nearly 400 kilometers separates the southernmost known locality for *M. e. australis* and the still more southern form, *M. e. neglectus*.

Old records of *M. euryxanthus* from Utah and Idaho are considered erroneous. No confirmatory records have been forthcoming, and the localities are far outside the known range of the species. Similarly, the validity of records for El Paso, Texas (Brown, 1950, and Mus. Comparative Zoology 22645) require confirmation with additional specimens. The El Paso locality is perhaps more reasonable than those for Utah and Idaho, but is well within the Chihuahuan Desert region and far outside the verified distribution of the species, which is largely within the Sonoran Desert.

The study of coral snakes has been aided in part by NIH Grant AC 00136, and by a grant from the Research Foundation of the City University of New York.

Literature Cited

Bellairs, Angus. 1970. The life of reptiles. 2 vols. Universe Books, New York. 590 p.
Bogert, Charles M. 1960. The influence of sound on the behavior of amphibians and reptiles. P. 137–320. *In* W. E. Lanyon and W. N. Tavolga, eds., Animal sounds and communication. Amer. Inst. Biol. Sci. Publ. (7):xiii + 443 p.
—, and W. G. Degenhardt. 1961. An addition to the fauna of the United States, the Chihuahua ridge-nosed rattlesnake in New Mexico. Amer. Mus. Novitates (2064):1–15.
—, and James A. Oliver. 1945. A preliminary analysis of the herpetofauna of Sonora. Bull. Amer. Mus. Nat. Hist. 83: 297–426.
Brown, Bryce C. 1950. An annotated checklist of the reptiles and amphibians of Texas. Baylor Univ. Press, Waco, Texas. xii + 259 p.
Cochran, Doris M. 1961. Type specimens of reptiles and amphibians in the United States National Museum. U. S. Natl. Mus. Bull. 220:xv + 291 p.
Cohen, P., and Edward B. Seligmann, Jr. 1966. Immunological studies of coral snake venom. Mem. Inst. Butantan 33:339–347.
Cope, Edward D. 1900. The crocodilians, lizards, and snakes of North America. Rept. U.S. Natl. Mus. for 1898:153–1294.
Ditmars, Raymond L. 1908. The reptile book. Doubleday, Page & Co., New York. 472 p.
— 1936. The reptiles of North America. New York. xvi + 476 p.
East, B. 1965. New facts on deadly snakes. Outdoor Life, 136(2):17–19, 124–130.
Fowlie, Jack A. 1965. The snakes of Arizona. Azul Quinta Press, Fallbrook, Calif. xxiii + 164 p.
Funk, Richard S. 1964. On the reproduction of *Micruroides euryxanthus* (Kennicott). Copeia 1964(1):219.
Gates, Gerald O. 1956. A record length for the Arizona coral snake. Herpetologica 12:155.
— 1957. A study of the herpetofauna in the vicinity of Wickenburg, Maricopa County, Arizona. Trans. Kansas Acad. Sci. 60:403–418.
Gehlbach, Frederick R. 1972. Coral snake mimicry reconsidered: the strategy of self-mimicry. Forma et Functio 5: 311–320.
Gloyd, Howard K. 1937. The Chicago Academy of Sciences Arizona expedition, April–June, 1937. Program activities of the Chicago Acad. Sciences 8(1–2):1–26.
Greene, Harry W. 1973a. Defensive tail display by snakes and amphisbaenians. J. Herp. 7(3):143–161.
— 1973b. Comments on aposematism and mimicry among coral snakes. Biologist 55(4):144–147.
Hardy, Laurence M., and Roy W. McDiarmid. 1969. The amphibians and reptiles of Sinaloa, Mexico. Univ. Kansas Publ. Mus. Nat. Hist. 18(3):39–252.

Hecht, Max K., and Daniel Marien. 1956. The coral snake mimic problem: a reinterpretation. J. Morph. 98(2):335–366.

Hensley, Max M. 1950. Results of a herpetological reconnaissance in extreme southwestern Arizona and adjacent Sonora, with a description of a new subspecies of the Sonoran whipsnake, *Masticophis bilineatus*. Trans. Kansas Acad. Sci. 53(2):270–288.

Howes, P. G. 1954. The giant cactus forest and its world. New York, xxx + 258 p.

Kauffeld, Carl. 1957. Snakes and snake hunting. Hanover House, Garden City, New York. 266 p.

Kennicott, Robert. 1860. Descriptions of new species of North American serpents in the museum of the Smithsonian Institution, Washington. Proc. Acad. Nat. Sci. Philadelphia 12:328–338.

Klemmer, Konrad. 1963. Liste der rezenten Giftschlangen. Elapidae, Hydropheidae, Viperidae, Crotalidae. P. 255–464. *In* Giftschlangen der Erde. Behringwerk-Mitteilungen, 464 p.

Lindner, Dale. 1962. Feeding observations of *Micruroides*. Bull. Philadelphia Herpetol. Soc. 10(2–3):31.

Lowe, Charles H. 1948. Effects of venom of *Micruroides* upon *Xantusia vigilis*. Herpetologica 4(4):136.

— 1967. The amphibians and reptiles of Arizona. P. 153–174. *In* Lowe, C. H. (ed.) The vertebrates of Arizona. Univ. Arizona Press, Tucson, 3rd. printing. 270 p.

Mertens, Robert. 1956. Das Problem der Mimicry bei Korallenschlangen. Zool. Jahrb. (Syst.) 84:541–576.

Nickerson, Max A., and Charles E. Mays. 1970. A preliminary herpetofaunal analysis of the Graham (Pinaleno) mountain region, Graham Co., Arizona, with ecological comments. Trans. Kansas Acad. Sci. 1969, 72(4):492–505.

Oliver, James A. 1958. Snakes in fact and fiction. Macmillan, New York, 199 p.

Parker, H. W. 1963. Snakes. W. W. Norton, New York, 191 p.

Pope, Clifford H. 1937. Snakes alive and how they live. Viking Press, New York. 238 p.

Roze, Janis A. 1967. A check list of the New World venomous coral snakes (Elapidae), with descriptions of new forms. Amer. Mus. Novitates (2287):1–60.

Russell, Findlay E. 1967. Bites by the Sonoran coral snake, *Micruroides euryxanthus*. Toxicon 5:39–42.

Ruthven, Alexander G. 1907. A collection of reptiles and amphibians from southern New Mexico and Arizona. Bull. Amer. Mus. Nat. Hist. 23(23):483–604.

Schmidt, Karl P. 1928. Notes on American coral snakes. Bull. Antivenin Inst. Amer. 2(3):63–64.

—, and D. Dwight Davis. 1944. Field book of snakes of the United States and Canada. G. P. Putnam's Sons, New York. xiii + 365 p.

—, and Robert F. Inger. 1957. Living reptiles of the world. Hanover House, Garden City, New York. 287 p.

Shaw, Charles E. 1971. The coral snakes, genera *Micrurus* and *Micruroides*, of the United States and northern Mexico. *In* Bucherl, W. and E. E. Buckley, Venomous animals and their venoms. vol. 2. Venomous vertebrates. P. 157–172.

Smith, Hobart M., and E. H. Taylor. 1950. Type localities of Mexican reptiles and amphibians. Univ. Kansas Sci. Bull. 33:313–380.

Stebbins, Robert C. 1954. Amphibians and reptiles of western North America. McGraw-Hill Co., New York. xxii + 529 p.

— 1966. A field guide of western reptiles and amphibians. Houghton Mifflin Co., New York. xxii + 529 p.

Stejneger, Leonard. 1895. The poisonous snakes of North America. U. S. Natl. Mus. Report for 1893 (pt. 2):337–487.

—, and Thomas Barbour. 1917. A check list of North American amphibians and reptiles. Harvard Univ. Press, Cambridge, Mass. 125 p.

Stevan, Lee J., and Edward B. Seligmann, Jr. 1970. Agar-gel and acrylamide-disc electrophoresis of coral snake venom. Toxicon 8:11–14.

Stickel, W. H. 1952. Venomous snakes of the United States and treatment of their bites. U. S. Dept. Interior Wildlife Leaflet (339):1–29.

Underwood, Garth. 1967. A contribution to the classification of snakes. British Mus. (Nat. Hist.), London. 179 p.

U. S. Dept. of Navy, Bureau of Medicine and Surgery. 1968. Poisonous snakes of the world, a manual for use by U. S. amphibious forces. Government Printing Office, Washington. 203 p.

Van Denburgh, John. 1922. The reptiles of western North America. Vol. 2. Snakes and turtles. Occas. Pap. California Acad. Sci. (10):615–1029.

Vitt, Laurie J., and Arthur C. Hulse. 1973. Observations on feeding habits and tail display of the Sonoran coral snake, *Micruroides euryxanthus*. Herpetologica 29:302–304.

Vorhies, C. T. 1929. Feeding of *Micrurus euryxanthus*, the Sonoran coral snake. Bull. Antivenin Inst. America 2(4):98.

Werler, John E. 1960. The poisonous snakes of Texas and the first aid treatment of their bites. Texas Game and Fish Bull. 31:1–40.

Woodin, W. H. 1953. Notes on some reptiles from the Huachuca area of southeastern Arizona. Bull. Chicago Acad. Sci. 9(5):285–296.

Wright, Albert H., and Anna A. Wright. 1957. Handbook of snakes of the United States and Canada. vol. 2. Comstock Publ. Co., Ithaca, New York. i–ix, 565–1105 p.

Zim, Herbert S., and Hobart M. Smith. 1953. Reptiles and amphibians, a guide to familiar American species. Simon and Shuster, New York. 160 p.

Zweifel, Richard G. 1962. Analysis of hybridization between two subspecies of the desert whiptail lizard, *Cnemidophorus tigris*. Copeia 1962(4):749–766.

—, and Kenneth S. Norris. 1955. Contribution to the herpetology of Sonora, Mexico: descriptions of new subspecies of snakes (*Micruroides euryxanthus* and *Lampropeltis getulus*) and miscellaneous collecting notes. Amer. Midland Nat. 54(1):230–249.

J. A. Roze, City College of the City University of New York, New York, New York 10031.

Primary editor for this account, Douglas A. Rossman.

Published December 23, 1974 by the Society for the Study of Amphibians and Reptiles.