Catalogue of American Amphibians and Reptiles.

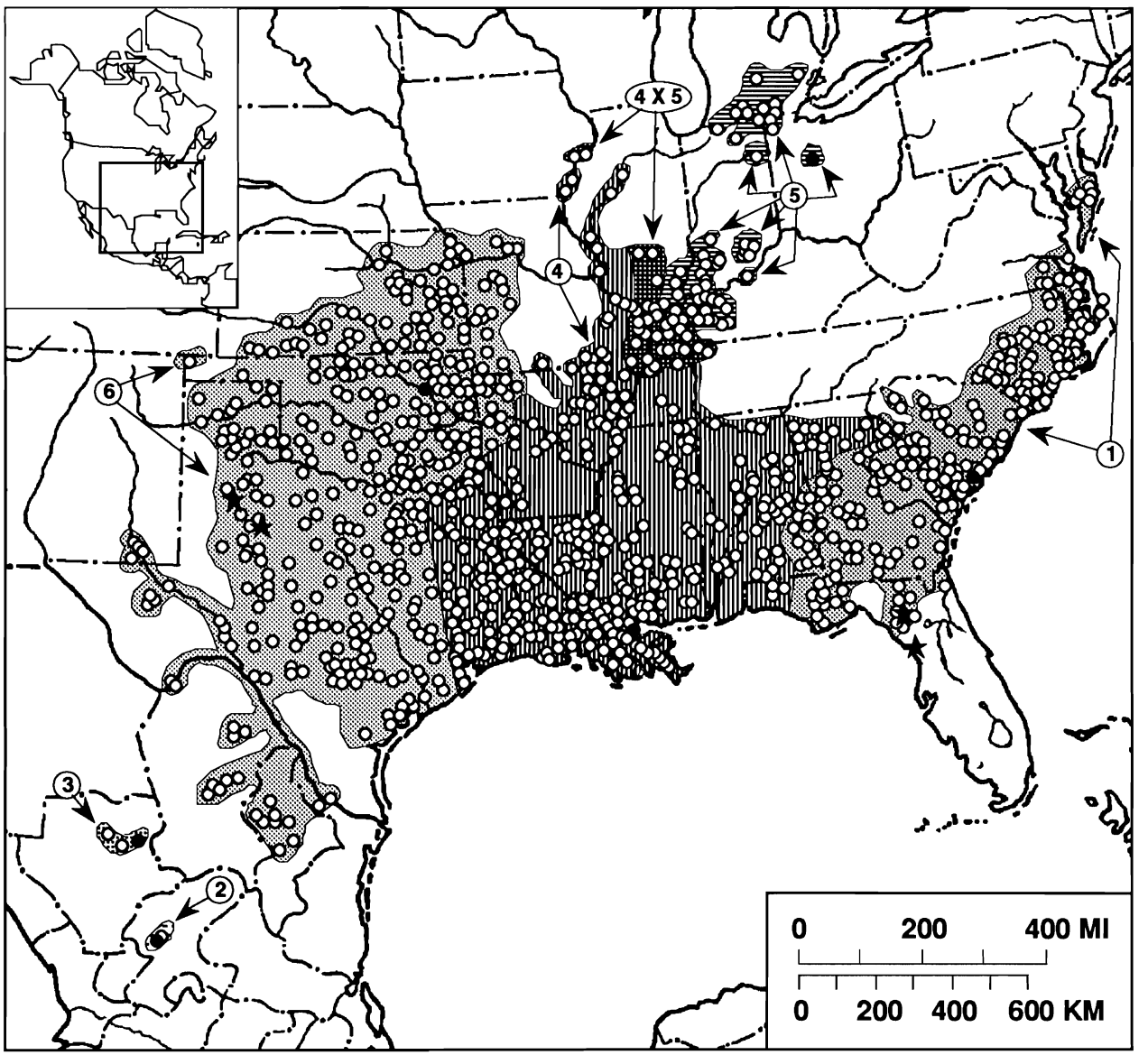
McCranie, James R. 1990. *Nerodia erythrogaster.*

Nerodia erythrogaster (Forster) Plainbelly Water Snake

Coluber erythrogaster Forster, 1771:364. Type-locality, not given, restricted to "near Parker's Ferry, Edisto River Swamp, Charleston County, South Carolina" by Conant, 1949:10. Neotype designated by Conant, 1949:10, National Museum of Natural History 126890, an adult female, collected by T. M. Beckett, 19 March 1948 (not examined by author).
Tropidonotus erythrogaster: Holbrook, 1842:33.
Nerodia erythrogaster: Baird and Girard, 1853:40.
Tropidonotus sipedon erythrogaster: Cope, 1875:43.
Nerodia sipedon Var. *erythrogaster:* Garman, 1892:271.
Natrix sipedon Var. *erythrogaster:* Hay, 1892:507.
Tropidonotus fasciatus Var. *erythrogaster:* Boulenger, 1893:244.
Natrix erythrogaster: Clark, 1903:22.
Natrix orythrogaster: Cole, 1951:241 (*lapsus*).
Natrix orthogaster: Cole, 1955:302 (*lapsus*).

• **Content.** Six subspecies are recognized: *erythrogaster, alta, bogerti, flavigaster, neglecta,* and *transversa.*

• **Definition.** A large, stout bodied (as an adult), semi-aquatic natricine snake ranging in size from 190-330 mm at birth to 1575 mm in the largest known specimen (adult males average significantly smaller than adult females). The head is wider posteriorly than anteriorly and is distinctly wider than the neck in mature adults. The rostral is wider than high, and visible from above. The nasals are divided. The parietals are widest anteriorly. The mental is triangular. Two pairs of chinshields are present, with the posterior pair not in contact medially. This species has 132-159 ventrals without any significant sexual dimorphism; 67-90 subcaudals in males, 59-79 in females; 20-27 (usually 23-25) scale rows (keeled throughout length of body and with 2 apical pits on most scales) at midbody and 16-21 (usually 17-19) anterior to base of tail; 7-10 (usually 8) supralabials, the 4th or 4th and 5th normally entering the orbit; 8-11 (usually 10)



Map. Solid circles mark type-localities, open circles indicate other localities, stars represent definite fossil localities. Subspecific ranges modified from Conant (1975). Cross-hatched patterns indicate known zones of intergradation (Conant, 1949; MacGregor, 1986; Moll, 1962; Smith, 1961). Precise subspecific ranges are poorly known in some areas as integradation occurs over broad areas along zones of contact (see Conant, 1949:9, 11-12, 14; Mount, 1975:212; Tennant, 1984:325). In addition, individual specimens or populations well within the defined range of one subspecies may show characteristics of another subspecies (see Conant, 1949:9 and Dundee and Rossman, 1989:243 for examples).

infralabials; 1-2 (usually 1) preoculars; 1-4 (usually 3) postoculars; 1 anterior temporal; usually 3 but often 2 posterior temporals; loreal single; anal plate usually divided, rarely single.

Coloration and pattern show marked ontogenetic variation. Juveniles are strongly patterned with a row of middorsal blotches in the form of saddles and a single row of smaller lateral blotches on each side. The lateral blotches usually alternate with the middorsal series but an irregular fusing occurs in some specimens. The blotches become paler and the ground color darker, with the pattern becoming progressively less conspicuous as the snakes increase in size and age, until all traces of pattern are lost in most specimens of some races (see subspecies definitions). Adult dorsal and ventral coloration is highly variable and is diagnostic in each subspecies. The dorsal ground color may be pinkish, pinkish brown, reddish brown, chocolate brown, olive brown, brownish gray or olive, pale gray, olive gray, greenish gray, or black. The ventral coloration may be reddish or yellowish, or a mixture of the two, and plain in some subspecies, or with darker pigment on bases and/or lateral edges of ventrals in some specimens of two other subspecies, or heavily invaded by dorsal color laterally and across anterior margins of each ventral scale in another subspecies.

Conant (1969:26) described the hemipenis: "Shaft subcylindrical and ornamented with spines and spinules that diminish in size distally; nude patches at the base adjacent to the basal and accessory hooks. Apex bilobed and nude. Sulcus simple and terminating at the junction of the two lobes. One large basal hook (the free edge 2.5 mm to 3.5 mm long in snakes measuring 750 mm to 1000 mm in total length) lateral to the sulcus and followed distally by several small spines. An accessory hook on the opposite side of the sulcus, more distal than and smaller than the large basal hook, and followed distally by several small spines."

• **Descriptions.** Cliburn (1960, 1961) and Conant (1949, 1969) provided the best morphological descriptions, including those of color and pattern. Auffenberg (1963) and Rogers (1976) described the vertebrae and Holman (1969) the basisphenoid-parasphenoid and mandible.

• **Illustrations**. Color illustrations of the species are in Ashton and Ashton (1981), Barbour (1971), Behler and King (1979), Conant (1949 [in original], 1969, 1975), Dundee and Rossman (1989), Ernst and Barbour (1989), Holman et al. (1989), Jackson (1983), Johnson (1987), Leviton (1972), Linzey and Clifford (1981), Martof et al. (1980), Schmidt and Inger (1957), Shaw and Campbell (1974), Sievert and Sievert (1988), Smith and Brodie (1982), Snyder (1972), Stebbins (1985), and Tennant (1984, 1985). Some of the better black and white photographs are in Anderson (1965), Collins (1982), Conant (1934, 1947, 1951, 1960, 1969), Ernst and Barbour (1989), Minton (1972), Mount (1975), Parker (1937), Pope (1955), Simmons (1973), and Smith (1956). Line drawings of scutellation are in Baird (1859), Cope (1900), and Jan and Sordelli (1868). Habitat photographs are in Conant (1934, 1951, 1969), Diener (1957), and Werler and McCallion (1951). Other illustrations include: amelanistic specimen (Freed, 1983); hemipenis (Dowling and Savage, 1960); precaudal vertebrae (Auffenberg, 1963); skull (Nakamura and Smith, 1960); cranial musculature (Varkey, 1979); microdermatoglyphic pattern (Chiasson and Lowe, 1989; Price, 1983); karyotypes (Baker et al., 1972; Eberle, 1972; Kilpatrick and Zimmerman, 1973); proposed phylogenetic position within *Nerodia* (Lawson, 1987).

• **Distribution.** *Nerodia erythrogaster* ranges from extreme southern Delaware southward to northern Florida, westward through all of Georgia and Alabama, except the extreme northern portions, to southeastern New Mexico and western Texas, thence northward to northeastern Kansas and western Missouri and southward to central Nuevo León, México. The species also ranges up the Mississippi and Ohio river systems to central Illinois and southern Indiana. Disjunct populations occur in Ohio, Michigan, Indiana, Iowa, and Illinois in the U.S. and Durango and Zacatecas in México. Vogt (1981) discussed and old Wisconsin record and Green and Pauley (1987) and Conant (1943) discussed erroneous records for West Virginia and Pennsylvania, respectively. Schwab and Fillio (1980) reported on a specimen collected in New Jersey that was most likely a result of human introduction. Habitat destruction and/or human contact has extirpated *N. erythrogaster* from parts of its former range (Conant, 1951, 1955a; Minton, 1972; Scudday, 1978; Sellers,1988b; Tinkle et al., 1979) while an apparent range expansion following impoundment of a river has been reported by Nickerson and Krager (1972). State records are listed or mapped for Alabama (Mount, 1975); Arkansas (Dellinger and Black, 1938; Dowling, 1957; Hanebrink and Byrd, 1986; Vance, 1985); Delaware (Conant, 1955b); Florida (Ashton and Ashton, 1981; Deckert, 1918); Georgia (Williamson and Moulis, 1979); Illinois (Moll, 1962; Morris et al., 1983; Sellers, 1988b; Smith, 1961); Indiana (Minton, 1972; Minton et al., 1983; Sellers, 1987a, 1987c, 1988b); Iowa (Christiansen and Burken, 1978; Minton, 1972; Roosa, 1977); Kansas (Collins, 1982, 1986, 1989); Kentucky (MacGregor, 1986; Sellers,1988b); Louisiana (Dundee and Rossman, 1989); Maryland (Grogan,1985; Harris, 1975); Michigan (Clark, 1903; Clay, 1934; Gillingham and Winn, 1987; Pentecost and Vogt, 1976; Sellers, 1985, 1986, 1987a, 1988a; Tinkle et al., 1979); Mississippi (Cook,1962); Missouri (Anderson, 1965; Johnson, 1987); New Mexico (Conant, 1955b, 1969, 1978a); Ohio (Conant, 1951, 1955a; Sellers, 1987b); Oklahoma (Secor and Carpenter, 1984; Webb,1970); Texas (Dixon, 1987; McCord and Dorcas, 1989; Vermersch and Kuntz, 1986); Virginia (Linzey and Clifford, 1981; Tobey, 1985); and México (Conant, 1969, 1978a). The species ranges from near sea level up to 2042 m on the Mexican Plateau and inhabits permanent or semipermanent aquatic habitats, although it may wander considerable distances from water. *Nerodia erythrogaster* is classified as endangered, threatened, or of special concern status in six U.S. states (Allen, 1988).

• **Fossil Record.** The species is known from the Upper Pliocene of Texas (Holman,1979; Rogers, 1976) and the Pleistocene of Texas (Holman,1969, 1981) and Florida (Auffenberg, 1963; Holman, 1981; Meylan,1982). Holman (1981) listed three literature records of *"Nerodia fasciata* or *Nerodia erythrogaster"* from the Pleistocene of Texas and Florida and Parmley (1988) recorded one vertebra from the Pleistocene of Texas as cf. *erythrogaster*.

• **Pertinent Literature.** Conant (1969) provided the most comprehensive review available on the biology of the species, although limited to the southwestern portion of the range. Ernst and Barbour (1989) reviewed the biology of the species in eastern North America (although their color description of *neglecta* is actually that of the subspecies *transversa*). Conant (1961) gave data on the occurrence of a single anal plate in some specimens. Wright and Wright (1957) summarized a lot of the literature on ecology and most of the papers cited in the distribution section above contain some ecological information. Other important ecological information is in Brown (1979), Byrd et al. (1988), Camp (1980), Clarke (1958), Collins (1980), Diener (1957), Freed and Neitman (1988), Gillingham and Rush (1974), Greding (1964), Hebrard and Mushinsky (1978), Keiser (1976), Kofron (1978), Laughlin (1959), Marvel (1972), Mushinsky (1987), Mushinsky and Hebrard (1977), Mushinsky and Lotz (1980), Mushinsky et al. (1982), and Preston (1970). Bibliographies are in Dixon (1987, Texas), Mitchell (1981, Virginia), Smith and Smith (1976, México), and Vance (1985, Arkansas). Other works and their topics are: historical biogeography, Adler (1963), Conant (1978b); relict distribution in Chihuahuan Desert, Milstead (1960); allozyme data and phylogeny, Lawson (1987); electrophoresis, serum proteins, and blood chemistry, Dessauer (1970), Garnett (1979), Gehrmann (1973), Minton and Salanitro (1972), and Rose and Selcer (1989); chromosomes, Baker et al. (1972), De Smet (1981), Eberle (1972), and Kilpatrick and Zimmerman (1973); sexual size differences, Fitch (1981); amelanistic specimen, Freed (1983); microdermatoglyphics, Chiasson and Lowe (1989) and Price (1983); osteology and/or dentition, Marx and Rabb (1972) and Nakamura and Smith (1960); cranial myology, Varkey (1979); hyoid, Langebartel (1968); visceral topography, Rossman et al. (1982); reproduction, Kofron (1979, detailed study), Fitch (1970, 1985, literature summaries), and Bousefield (1982), Laposha et al. (1985), and Smith (1983) gave additional information; growth, Gehrmann (1971b); ontogenetic habitat shifts, Scott et al. (1989); weight-length relationships, Kaufman and Gibbons (1975); physiology, Baeyens et al. (1979, 1980), Dantzler (1970, 1976),and Jacob and McDonald (1976); thermoregulation, Gehrmann (1971a), Gillingham and Winn (1987), Lillywhite (1987), and Mushinsky et at. (1980); histology, Cole (1951, 1955), and Taub (1967); immune response, Schram and Freidell (1981); pupillary response, Stovall and Kennedy (1979); antipredator mechanisms, Greene (1988); predation, Brown (1974), Burkett (1966), Hamilton and Pollack (1956), Hunsaker (1959), Parmley and Mulford (1985), Trowbridge (1937), and Tupacz (1985); parasites and disease, Baker (1987 literature summary of nematode infec-

tions), Brooks (1978, 1979), Collins (1969, 1973), Daly et al. (1980), Detterline et al. (1984), Hilman and Strandtmann (1960), Hoff and Trainer (1973), Jiménez and Caballero (1975), McDaniel et al. (1987), and McMickle (1970); pesticides, Ferguson (1963), Fleet et al. (1972), Fleet and Plapp (1978), and Stafford et al. (1976); longevity in captivity, Bowler (1977).

• **Etymology**. The name *erythrogaster* is derived from the Greek words *erythros* and *gaster* meaning red and belly, respectively; origins of other names are: *alta* (Latin, *altus*), meaning high, refers to the uplands where this subspecies occurs; *bogerti* honors Charles M. Bogert; *flavigaster* (Latin, *flavus;* Greek, *gaster*), meaning yellow and belly, respectively; *neglecta* (Latin, *neglectio*), meaning neglect, apparently in reference to the neglected status of this subspecies prior to its formal recognition; *transversa* (Latin prefix *trans*, meaning across; Latin, *versus*, meaning to turn), in reference to the dorsal crossbands retained in the adults of this subspecies.

• **Remarks.** Cochran (1961:222) erroneously stated that *Tropidonotus bisectus* Cope is a synonym of *N. e. transversa*, whereas in fact *bisectus* is a synonym of *Nerodia sipedon* (see Dunn and Allen, 1935:181) and Wright and Wright, 1957:511).

1. *Nerodia erythrogaster erythrogaster* (Forster) Redbelly Water Snake

Coluber erythrogaster Forster, 1771:364 (see species synonomy).
Natrix facsciata erythrogaster: Cope, 1888:392.
N[erodia]. e[rythrogaster]. erythrogaster: Collins et al., 1978:31.

• **Definition.** Adults with a normally plain brownish dorsum (pale reddish brown to chocolate brown to pale brownish gray), although occasional specimens have faint light crossbands in the middorsal region; lower sides of body often some what grayish or greenish; venter plain reddish (pale pinkish orange to orange-red); usually no light parietal spots or post-parietal streaks. Scutellation is as follows: ventrals 141-154; subcaudals 75-86 in males, 64-71 in females; usually 4th and 5th supralabials entering orbit; scale rows at midbody usually 23, often 25, rarely 21, 24, or 27.

2. *Nerodia erythrogaster alta* (Conant), new combination

Natrix erythrogaster alta Conant, 1963:169. Type-locality, "in the Río Trujillo (known locally as the Río Florido), at the village of Río Florido, approximately 15 miles NW of Fresnillo, Zacatecas." Holotype, Amer. Mus. Nat. Hist. 84152, a young adult male, collected by Roger Conant, 19 July 1959 (not examined by author).

• **Definition.** Adults with a light olive-brown to a brownish olive dorsum, usually with slightly darker middorsal blotches; lateral blotches usually evident, 1 or fewer scale rows wide; venter plain, pale yellow to pale yellowish-orange to dull orange; light parietal spots and post-parietal streaks sometimes present. Scutellation is as follows: ventrals 138-144; subcaudals 84-90 in males, 69-76 in females; only 4th supralabial entering orbit; scale rows at midbody usually 25, occasionally 26, rarely 24.

3. *Nerodia erythrogaster bogerti* (Conant)

Natrix erythrogaster bogerti Conant, 1953:1. Type-locality, "in the Río Nazas, near La Goma, approximately 15 miles southwest of Lerdo, Durango." Holotype, Amer. Mus. Nat. Hist. 73163, an adult female, collected by Roger Conant, 29 September 1949 (not examined by author).
Natrix bogerti: Smith and Smith, 1976:S-B-146 (combination was unsoundly attributed to Cliburn, 1961, by Smith and Smith).
Nerodia erythrogaster bogerti: Fitch, 1981:61

• **Definition.** Adults with a pale pinkish to pale pinkish brown dorsum, usually with slightly darker middorsal blotches; lateral blotches usually evident, 1 or fewer scale rows wide; venter plain yellowish-pinkish, temporal region reddish; light post-parietal streaks sometimes present. Scutellation is as follows: ventrals 141-148; subcaudals 82-85 in males, 68-76 in females; usually only 4th supralabial entering orbit; scale rows at midbody usually 24 or 25, rarely 23 or 26.

4. *Nerodia erythrogaster flavigaster* (Conant) Yellowbelly Water Snake

Natrix erythrogaster erythrogaster: Burt, 1935:333 (first use of this combination, although based on a specimen of *N. e. flavigaster*).
Natrix erythrogaster flavigaster Conant, 1949:2. Type-locality, "at Frenier Beach, St. John the Baptist Parish, Louisiana." Holotype, Field Mus. Nat. Hist. 54001, an adult male, collected by Fred R. Cagle and A. H. Chaney, 9 May 1947 (not examined by author).
N[erodia]. erythrogaster flavigaster: Mushinsky and Hebrard, 1977: 162.

• **Definition.** Adults with a usually plain grayish dorsum (pale gray to olive gray to greenish gray), although many specimens have traces of light crossbands in the middorsal region; venter plain yellow, often washed with orange, and occasionally with darker pigment on bases and/or lateral edges of ventral scales; occasionally with light parietal spots or post-parietal streaks. Scutellation is as follows: ventrals 137-156; subcaduals 67-88 in males, 59-77 in females; usually 4th and 5th supralabials entering orbit; scale rows at midbody usually 23, often 25, rarely 20-22, 24, or 26-27.

5. *Nerodia erythrogaster neglecta* (Conant) Copperbelly Water Snake

Natrix erythrogaster neglecta Conant, 1949:5. Type-locality, "approximately 3 miles east of Mount Victory, Hardin County, Ohio." Holotype, Amer. Mus. Nat. Hist. 68695, an adult female that was born in captivity on 30 September 1932 and raised to maturity (not examined by author).
N[erodia]. e[rythrogaster]. neglecta: Collins et al., 1978:31.

• **Definition**. Adults with a plain black or very dark brown dorsum, almost always without any traces of light crossbands; venter reddish (orange red to red to scarlet), often heavily invaded by dorsal ground color on lateral edges and across anterior margins of each ventral scale, especially towards posterior portion of body; almost always no light parietal spots or post-parietal streaks. Scutellation is as follows: ventrals 144-158; subcaudals 68-84 in males, 62-74 in females; usually 4th and 5th supralabials entering orbit; scale rows at midbody usually 23, rarely 21-22 or 25.

6. *Nerodia erythrogaster transversa* (Hallowell) Blotched Water Snake

Tropidonotus transversus Hallowell, 1852:177. Type-locality, "Creek boundary, found near the banks of the Arkansas and its tributaries", revised to "Arkansas River between Keystone and Tulsa, Tulsa County, Oklahoma" by Conant, 1969:27. Holotype, Acad. Nat. Sci. Philadelphia 5044, a young adult male, collected by Samuel Washington Woodhouse, date not given (Conant, 1969:26) (not examined by author).
Nerodia Woodhousii Baird and Girard, 1853:42. Type-locality, "Indianola, Btw. Ind[ianola] & San Antonio, Sabinal, Tex., New Braunfels, Tex.", restricted to "Indianola, Calhoun County, Texas" by Schmidt, 1953:160. No holotype designated, however 6 Syntypes in the National Museum of Natural History are listed by Cochran, 1961:201 (not examined by author).
Nerodia transversa: Baird and Girard, 1853:148.
Tropidonotus Woodhousii: Hallowell, 1853:208.
N[erodia]. Couchii Kennicott, 1860:335. Type-locality, "San Diego, New [=Nuevo] León [and] Santa Caterina [=Santa Catarina], New [=Nuevo] Leon", México, restricted to "Santa Caterina [=Santa Catarina], Nuevo Leon" by Smith and Taylor, 1950:337 (see Conant, 1969:27-28 for a further discussion of the two Kennicott localities). Holotype (designated by Cope, 1900:976, also see Conant, 1969:27), National Museum of Natural History 1314, sex not stated, collected by Darius Nash Couch, April 1853 (*fide* Conant, 1968:9) (not examined by author).

N[erodia]. Woodhousei: Kennicott, 1860:335.
Tropidonotus Woodhousei: Cope, 1860:342.
Tropidonotus Couchii: Cope, 1860:342.
Tropidonotus sipedon woodhousei: Cope, 1875:42.
Tropidonotus sipedon couchii: Cope, 1875:42.
Natrix fasciata transversa: Cope, 1892:672.
Natrix sipedon Var. *woodhouseii:* Hay, 1892:507.
Tropidonotus sipedon transversus: Brown, 1901: 37 (part).
Natrix sipedon transversa: Stone, 1903:541.
Tropidonotus fasciatus variety *transversus:* Ditmars, 1907:254.
T[ropidonotus]. f[asciatus]. transversa: Wright and Bishop, 1915: 175.
Natrix erythrogaster woodhousii: Viosca, 1924:12.
Natrix erythrogaster transversa: Taylor, 1929:58.
Natrix transversa: Burt and Burt, 1929:13.
Natrix erythrogaster traversa: Wauer, 1973:116 (*lapsus*).
Thamnophis erythrogaster transversa: Smith and Smith, 1976: S-B-205 (*lapsus*).
Nerodia e[rythrogaster]. transversa: Bernard and Brown, 1977:149.

• **Definition.** Adults with a highly variable dorsal coloration that can be almost any shade of gray or brown, normally with well-patterned light, dark-bordered crossbands in the middorsal region (large adults sometimes are almost uniformly dark); lateral blotches usually evident, 1 1/2 to 2 scale rows wide; venter plain yellow, often with an orangish tinge, and often with darker pigment on bases and/or lateral edges of ventral scales; light parietal spots and post-parietal streaks almost always present. Scutellation is as follows: ventrals 132-159; subcaudals 75-87 in males, 61-79 in females; usually 4th and 5th supralabials entering orbit; scale rows at midbody usually 25, often 23, sometimes 27, rarely 24 or 26.

• **Comment.** A thorough taxonomic study similar to that done for the Mexican portion of the range (Conant, 1969) is sorely needed for the U.S. populations of this wide-ranging species.

Literature Cited

Adler, Kraig K. 1963. An ecological study of the snake *Natrix erythrogaster,* with remarks on its postglacial dispersal. J. Ohio Herpetol. Soc. 4(1/2):61-62.

Allen, William B., Jr. 1988. State lists of endangered and threatened species of reptiles and amphibians and laws and regulations covering collecting of reptiles and amphibians in each state. Chicago Herpetol. Soc. iv + 86 p.

Anderson, Paul. 1965. The reptiles of Missouri. Univ. Missouri Press, Columbia. xxiii + 330 p.

Ashton, Ray E., Jr., and Patricia Sawyer Ashton. 1981. Handbook of reptiles and amphibians of Florida. Part one. The snakes. Windward Publ., Inc. Miami. 176 p.

Auffenberg, Walter. 1963. The fossil snakes of Florida. Tulane Stud. Zool. 10(3):131-216.

Baeyens, Dennnis A., M. W. Patterson, and Chris T. McAllister. 1979. Hematology as related to diving characteristics of *Elaphe obsoleta, Nerodia erythrogaster, Nerodia fasciata,* and *Nerodia rhombifera.* Proc. Arkansas Acad. Sci. 33(1):17-18.

———, ———, and ———. 1980. A comparative physiological study of diving in three species of *Nerodia* and *Elaphe obsoleta.* J. Herpetol. 14(1):65-70.

Baird, Spencer F. 1859. Reptiles. pp 9-16, *In* Explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean. Washington, D. C. Vol. 10.

——— and C. Girard. 1853. Catalogue of North American reptiles in the Museum of the Smithsonian Institution, Part 1. - Serpents. Smithsonian Inst., Washington, D. C. xvi + 172 p.

Baker, Michael R. 1987. Synopsis of the Nematoda parasitic in amphibians and reptiles. Memorial Univ. Newfoundland, Occ. Pap. Biol. (11):1-325.

Baker, Robert J., Greg A. Mengden, and James J. Bull. 1972. Karyotypic studies of thirty-eight species of North American snakes. Copeia 1972(2):257-265.

Barbour, Roger W. 1971. Amphibians and reptiles of Kentucky. Univ. Press of Kentucky. x +334 p.

Behler, John L., and F. Wayne King. 1979. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York. 719 p.

Bernard, Stephen R., and Kenneth F. Brown. 1977. Distribution of mammals, reptiles, and amphibians by BLM physiographic regions and A. W. Küchler's associations for the eleven western states. Tech. Note, U. S. Dept. Inter., Bureau Land Management. viii + 169 p.

Boulenger, George Albert. 1893. Catalogue of the snakes in the British Museum (Natural History). Vol. I. Taylor and Francis, London. xiii + 448 p.

Bousefield, S. 1982. Observations on the yellow-bellied watersnake *(Nerodia erythrogaster flavigaster).* Herptile 7(4):23-24.

Bowler, J. Kevin. 1977. Longevity of reptiles and amphibians in North American collections. SSAR Misc. Publ., Herpetol. Circ. (6):i-iv, 1-32.

Brooks, Daniel. R. 1978. Systematic status of proteocephalid cestodes from reptiles and amphibians in North America with descriptions of three new species. Proc. Helminth. Soc. Washington 45(1):1-28.

———. 1979. New records for amphibian and reptile trematodes. Proc. Helminth. Soc. Washington 46(2):286-289.

Brown, Arthur Erwin. 1901. A review of the genera and species of American snakes, north of Mexico. Proc. Acad. Nat. Sci. Philadelphia 53:10-110.

Brown, E. E. 1979. Some snake food records from the Carolinas. Brimleyana (1):113-124.

Brown, William S. 1974. Ecology of the aquatic box turtle, *Terrapene coahuila* (Chelonia, Emydidae), in northern México. Bull. Florida St. Mus., Biol. Sci. 19(1):1-67.

Burkett, Ray D. 1966. Natural history of cottonmouth moccasin, *Agkistrodon piscivorus* (Reptilia). Univ. Kansas Publ. Mus. Nat. Hist. 17(9):435-491.

Burt, Charles E. 1935. Further records of the ecology and distribution of amphibians and reptiles in the Middle West. Amer. Midl. Nat. 16(3):311-336.

——— and May Danheim Burt. 1929. A collection of amphibians and reptiles from the Mississippi Valley, with field observations. Amer. Mus. Nov. (381):1-14.

Byrd, William, Earl Hanebrink, and Walter Meshaka. 1988. Food, feeding behavior, sex ratios and measurements of three species of water snakes (*Nerodia* spp.) collected from northeastern Arkansas. Bull. Chicago Herpetol. Soc. 23(4):55-57.

Camp, Carlos Duane. 1980. Comparative ecology of three species of water snakes along Kinchafoonee Creek, Georgia. M. S. thesis, Auburn Univ., Auburn, Alabama. x + 62 p.

Chiasson, Robert B., and Charles H. Lowe. 1989. Ultrastructural scale patterns in *Nerodia* and *Thamnophis.* J. Herpetol. 23(2):109-118.

Christiansen, James L., and Russsell R. Burken. 1978. The endangered and uncommon reptiles and amphibians of Iowa. Special Issue Iowa Sci. Teachers J. 26 p.

Clark Hubert Lyman. 1903. The water snakes of southern Michigan. Amer. Naturalist 37(433):1-23.

Clarke, Robert F. 1958. An ecological study of reptiles and amphibians in Osage County, Kansas. Emporia St. Research Studies 7(1):1-52.

Clay, William M. 1934. Rediscovery of the red-bellied watersnake, *Natrix sipedon erythrogaster* (Forster), in Michigan. Copeia 1934(2):95-96.

Cliburn, Joseph William. 1960. The phylogeny and zoogeography of North American *Natrix.* Ph.D. thesis, Univ. of Alabama, Tuscaloosa. 319 p.

———. 1961. The phylogeny and zoogeography of North American *Natrix.* Diss. Abstr. 21(11):3561.

Cochran, Doris M. 1961. Type specimens of reptiles and amphibians in the United States National Museum. Bull. U. S. Nat. Mus. (220):i-xv + 1-291.

Cole, W. V. 1951. Some observations on the comparative histology of the motor end-plate. Trans. Amer. Microscop. Soc. 70(3): 239-244.

———.1955. The comparative morphology of sensory endings in striated muscle. Trans. Amer. Microscop. Soc. 74(3):302-311.

Collins, Joseph T. 1982. Amphibians and reptiles in Kansas. 2nd (revised) ed. Univ. Kansas Mus. Nat. Hist. Publ. Education Ser. (8):i-xiii + 1-356.

———. 1986. New records of amphibians and reptiles in Kansas for 1985. Kansas Herpetol. Soc. Newsl: (63):4-11.

———. 1989. New records of amphibians and reptiles in Kansas for 1988. Kansas Herpetol. Soc. Newsl. (75):15-18.

———, James E. Huheey, James L. Knight, and Hobart M. Smith.

1978. Standard common and scientific names for North American amphibians and reptiles. SSAR Misc. Publ., Herpetol. Circ. (7):i-iii + 1-36.

Collins, Richard F. 1969. The helminths of *Natrix* spp. and *Agkistrodon piscivorus piscivorus* (Reptilia: Ophidia) in eastern North Carolina. J. Elisha Mitchell Sci. Soc. 85:141-144.

———. 1973. New host and locality records for *Capillaria colubra* Pence, 1970. J. Parasitol. 59(6):1020.

———. 1980. Stomach contents of some snakes from eastern and central North Carolina. Brimleyana (4):157-159.

Conant, Roger. 1934. The red-bellied water snake, *Natrix sipedon erythrogaster* (Forster), in Ohio. Ohio J. Sci. 34(1):21-30.

———. 1943. *Natrix erythrogaster erythrogaster* in the northeastern part of its range. Herpetologica 2(5):83-86.

———. 1947. Reptiles and amphibians of the northeastern states. Zool. Soc. Philadelphia. 40 p.

———. 1949. Two new races of *Natrix erythrogaster*. Copeia 1949(1): 1-15.

———. 1951. The reptiles of Ohio. 2nd ed. Univ. Notre Dame Press, Notre Dame, Indiana. 284 p.

———. 1953. Three new water snakes of the genus *Natrix* from Mexico. Chicago Acad. Sci., Nat. Hist. Misc. (126):1-9.

———. 1955a. Two new Ohio localities for the red-bellied water snake. Ohio J. Sci. 55(1):61-62.

———. 1955b. Notes on *Natrix erythrogaster* from the eastern and western extremes of its range. Chicago Acad. Sci., Nat. Hist. Misc. (147):1-3.

———. 1960. Water snakes in the desert. America's First Zoo 12(4): 31-35.

———. 1961. A new water snake from Mexico, with notes on anal plates and apical pits in *Natrix* and *Thamnophis*. Amer. Mus. Nov. (2060):1-22.

———. 1963. Another new water snake of the genus *Natrix* from the Mexican Plateau. Proc. Biol. Soc. Washington 76:169-172.

———. 1968. Zoological exploration in Mexico - the route of Lieut. D. N. Couch in 1853. Amer. Mus. Novitates (2350):1-14.

———. 1969. A review of the water snakes of the genus *Natrix* in Mexico. Bull. Amer. Mus. Nat. Hist. 142(1):1-140.

———. 1975. A field guide to reptiles and amphibians of eastern and central North America. 2nd ed. Houghton Mifflin Co., Boston. xviii + 429 p.

———. 1978a. Semiaquatic reptiles and amphibians of the Chihuahuan Desert and their relationships to drainage patterns of the region. p. 455-491. *In* Roland H. Wauer and David H. Riskind (eds.). Transactions of the symposium on the biological resources of the Chihuahuan Desert region, United States and Mexico. Nat. Parks Serv., Trans. & Proc. (3):i-xxii, 1-658.

———. 1978b. Distributional patterns of North American snakes: Some examples of the effects of Pleistocene glaciation and subsequent climatic changes. Bull. Maryland Herpetol. Soc. 14(4): 241-259.

Cook, Fannye A. 1962. Snakes of Mississippi. Survey Bulletin. Mississippi Game & Fish Com., Wildl. Mus., Jackson. ii + 45 p.

Cope, Edward Drinker. 1860. Notes and descriptions of new and little known species of American reptiles. Proc. Acad. Nat. Sci. Philadelphia 12:339-345.

———. 1875. Check-list of North American Batrachia and Reptilia with a systematic list of the higher groups, and an essay on geographical distribution. Based on the specimens contained in the U. S. National Museum. Bull. U. S. Nat. Mus. (1):i-ii + 1-104.

———. 1888. On the snakes of Florida. Proc. U. S. Nat. Mus. 11:381-394.

———. 1892. A critical review of the characters and variations of the snakes of North America. Proc. U. S. Nat. Mus. 14:589-694.

———. 1900. The crocodilians, lizards, and snakes of North America. Ann. Rept. U. S. Nat. Mus. 1898:153-1294.

Daly, James J., Mark Mayhue, Jay H. Menna, and Charles H. Calhoun. 1980. Viruslike particles associated with *Pirhemocyton* inclusion bodies in the erythrocytes of a water snake, *Nerodia erythrogaster flavigaster*. J. Parasitol. 66(1):82-87.

Dantzler, William H. 1970. Comparison of renal tubular transport of urate and PAH in water snakes: Evidence for differences in mechanisms and sites of transport. Comp. Biochem. Physiol. 34:609-623.

———. 1976. Renal function (with special emphasis on nitrogen excretion). p. 447-503. *In* Carl Gans and William R. Dawson (eds.). Biology of the reptilia. Vol. 5. Physiology A. Academic Press, New York. xv + 556 p.

Deckert, Richard F. 1918. A list of reptiles from Jacksonville, Florida. Copeia (54):30-33.

Dellinger, Samuel C., and John D. Black. 1938. Herpetology of Arkansas. Part 1. The reptiles. Occ. Pap. Univ. Arkansas Mus. (1): 1-47.

De Smet, W. H. O. 1981. The nuclear Feulgen-DNA content of the vertebrates (especially reptiles), as measured by fluorescence cytophotometry, with notes on the cell and their chromosome size. Acta Zool. Pathol. Antverpiensia 76:119-167.

Dessauer, Herbert C. 1970. Blood chemistry of reptiles: Physiological and evolutionary aspects. p. 1-72. *In* Carl Gans and Thomas S. Parsons (eds). Biology of the reptilia. Vol. 3. Morphology C. Academic Press, New York. xiv + 385 p.

Detterline, James L., James J. Jacob, and Walter E. Wilhelm. 1984. A comparison of helminth endoparasites in the cottonmouth *(Agkistrodon piscivorus)* and three species of water snakes *(Nerodia)*. Trans. Amer. Microscop. Soc. 103(2):137-143.

Diener, Richard A. 1957. An ecological study of the plain-bellied water snake. Herpetologica 13(3):203-211.

Ditmars, Raymond Lee. 1907. The reptile book. Doubleday, Page & Co. xxxii + 472 p.

Dixon, James R. 1987. Amphibians and reptiles of Texas with keys, taxonomic synopses, bibliography, and distribution maps. Texas A & M Univ. Press, College Station. xii + 434 p.

Dowling, Herndon G. 1957. A review of the amphibians and reptiles of Arkansas. Occ. Pap. Univ. Arkansas Mus. (3):1-51.

——— and Jay M. Savage. 1960. A guide to the snake hemipenis: a survey of basic structure and systematic characteristics. Zoologica (NY) 45:17-28.

Dundee, Harold A., and Douglas A. Rossman. 1989. The amphibians and reptiles of Louisiana. Louisiana St. Univ. Press., Baton Rouge. xi + 300 p.

Dunn, E. R., and Robert Allen. 1935. The redbellied watersnake in Pennsylvania. Copeia 1935(4):180-181.

Eberle, W. Gary. 1972. Comparative chromosomal morphology of the New World natricine snake genera *Natrix* and *Regina*. Herpetologica 28(2):98-105.

Ernst, Carl H., and Roger W. Barbour. 1989. Snakes of eastern North America. George Mason Univ. Press. Fairfax, Virginia. 282 p.

Ferguson, Denzel E. 1963. Notes concerning the effects of heptachlor on certain poikilotherms. Copeia 1963(2):441-443.

Fitch, Henry S. 1970. Reproductive cycles in lizards and snakes. Univ. Kansas Mus. Nat. Hist., Misc. Publ. (52):1-247.

———. 1981. Sexual size differences in reptiles. Univ. Kansas Mus. Nat. Hist., Misc. Publ. (70):1-72.

———. 1985. Variation in clutch and litter size in New World reptiles. Univ. Kansas Mus. Nat. Hist., Misc. Publ. (76):1-76.

Fleet, Robert R., Donald R. Clark, Jr., and Frederick W. Plapp, Jr. 1972. Residues of DDT and dieldrin in snakes from two Texas agrosystems. Bio Science 22(11):664-665.

——— and Frederick W. Plapp, Jr. 1978. DDT residues in snakes decline since DDT ban. Bull. Environ. Contam. Toxicol. 19(4): 383-388.

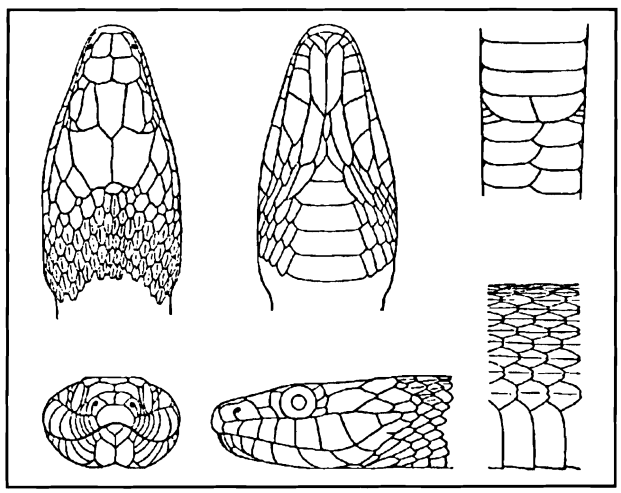


Figure. *Nerodia erythrogaster* from Jackson, North Carolina (USNM 1347) (from Cope, 1900).

Forster, John R. 1771. A catalogue of the animals of North America. *In* J. B. Bossu. Travels through that part of North America formerly called Louisiana. London. Vol. 1. vii + 407 p.

Freed, Paul S. 1983. Life history notes: *Nerodia erythrogaster flavigaster*. Herpetol. Rev. 14(3):75.

———and K. Neitman. 1988. Notes on predation on the endangered Houston toad, *Bufo houstonensis*. Texas J. Sci. 40(4):454-456.

Garman, Harrison. 1892. A synopsis of the reptiles and amphibians of Illinois. Bull Illinois St. Lab. Nat. Hist. 3(13):215-385.

Garnett, Phyliss J. 1979. Electrophoretic analysis of blood serum proteins in three species of water snakes (genus *Nerodia*). Proc. Arkansas Acad. Sci. 33(1):32-34.

Gehrmann, William H. 1971a. Influence of constant illumination on thermal preference in the immature water snake, *Natrix erythrogaster transversa*. Physiol. Zool. 44(2):84-89.

———. 1971b. Food consumption and growth in the immature water snake, *Natrix erythrogaster transversa*. Growth 35 (2):127-136.

———. 1973. Serum proteins and nutritional state in immature *Natrix erythrogaster transversa*. Copeia 1973(1):176-178.

Gillingham, James C., and Theodore Rush. 1974. Notes on the fishing behavior of water snakes. J. Herpetol. 8(4):384-385.

———and D. A. Winn. 1987. Seasonal movement and thermal regulation of the northern copperbelly water snake, *Nerodia erythrogaster neglecta*, Conant: Results of radiotelemetric tracking research at a Michigan site. Unpubl. Report to Michigan Dept. Nat. Res. 24 p.

Greding, Edward J., Jr. 1964. Food of *Natrix* in Hunt County, Texas. Southwestern Nat. 9(3):206.

Green, N. Bayard, and Thomas K. Pauley. 1987. Amphibians and reptiles in West Virginia. Univ. Pittsburgh Press, Pittsburgh, Pennsylvania. xi +241 p.

Greene, Harry W. 1988. Antipredator mechanisms in reptiles. p. 1-152. *In* Carl Gans and Raymond B. Huey (eds.). Biology of the reptilia. Vol. 16. Ecology B. Alan R. Liss, Inc., New York. xi + 659 p.

Grogan, William L., Jr. 1985. New distribution records for Maryland reptiles and amphibians. Bull. Maryland Herpetol. Soc. 21(2): 74-75.

Hallowell, Edward. 1852. Descriptions of new species of reptiles inhabiting North America. Proc. Acad. Nat. Sci. Philadelphia 6: 177-182.

———. 1853. On a new genus and three new species of reptiles inhabiting North America. Proc. Acad. Nat. Sci. Philadelphia 6: 206-208 (1852).

Hamilton, W. J. Jr., and Joseph A. Pollack. 1956. The food of some colubrid snakes from Fort Benning, Georgia. Ecology 37(3): 519-526.

Hanebrink, Earl, and William Byrd. 1986. Species composition and diversity of water snake (*Nerodia* sp.) populations in northeastern Arkansas. Bull. Chicago Herpetol. Soc. 21(3/4):72-78.

Harris, Herbert S., Jr. 1975. Distributional survey (Amphibia/Reptilia): Maryland and the District of Columbia. Bull. Maryland Herpetol. Soc. 11(3):73-167.

Hay, Oliver Perry. 1892. The batrachians and reptiles of the state of Indiana. Ann. Rept. Indiana Dept. Geol. & Nat. Resources 17: 412-602.

Hebrard, James J., and Henry R. Mushinsky. 1978. Habitat use by five sympatric water snakes in a Louisiana swamp. Herpetologica 34(3):306-311.

Hilman, Jessie Lee, and R. W. Strandtmann. 1960. The incidence of *Hepatozoon serpentium* in some Texas snakes. Southwestern Nat. 5(4):226-228.

Hoff, Gerald, and Daniel O. Trainer. 1973. Arboviruses in reptiles: isolation of a Bunyamwere group virus from a naturally infected turtle. J. Herpetol. 7(2):55-62.

Holbrook, John Edwards. 1842. North American herpetology; or, a description of the reptiles inhabiting the United States. Vol. IV. J. Dobson, Philadelpia. vi + 138 p.

Holman, J. Alan. 1969. Herpetofauna of the Slaton local fauna of Texas. Southwestern Nat.14(2):203-212.

———. 1979. A review of North American Tertiary snakes. Publ. Mus. Michigan St. Univ., Paleontol. Ser. 1(6):200-260.

———. 1981. A review of North American Pleistocene snakes. Publ. Mus. Michigan St. Univ., Paleontol. Ser. 1(7): 261-306.

———, James H. Harding, Marvin M. Hensley, and Glenn R. Dudderar. 1989. Michigan snakes. A field guide and pocket reference. Michigan St. Univ., East Lansing. 72 p.

Hunsaker, Don, II. 1959. Stomach contents of the American egret, *Casmerodius albus*, in Travis Co., Texas. Texas J. Sci. 11(4):454.

Jackson, Jeffrey J. 1983. Snakes of the southeastern United States. Cooperative Extension Service, Univ. Georgia College Agriculture MP(142):1-111.

Jacob, James S., and Harry S. McDonald. 1976. Diving bradycardia in four species of North American aquatic snakes. Comp. Biochem. Physiol. 53A(1):69-72.

Jan, Georges, and Ferdinand Sordelli. 1868. Iconographie générale des ophidiens. Tome Second. Livraison 26, Plate IV No. 1.

Jiménez, F. G., and E. Y. C. Caballero. 1975. Reptilian trematodes in Nuevo León, México. 1. *Ochestosoma chauhani* sp. n. and *O. aniarum* (Leidy, 1871). p. 159-163. *In* K. K. Tiwari and C. B. Srivastava (eds.). Dr. B. S. Chauhan Commemorative Volume. Zool. Soc. India, Orissa. viii + 439 p.

Johnson, Tom R. 1987. The amphibians and reptiles of Missouri. Missouri Dept. Conserv., Jefferson City. xi + 368 p.

Kaufman, Glennis A., and J. Whitfield Gibbons. 1975. Weight-length relationships in thirteen species of snakes in the southeastern United States. Herpetologica 31(1):31-37.

Keiser, Edmund D., Jr. 1976. Herpetofaunal survey of the Atchafalaya River Basin. Lafayette Nat. Hist. Mus. & Planetarium, Lafayette, Louisiana. 2 Vols. 811 p.

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

Kilpatrick, C. William, and Earl G. Zimmerman. 1973. Karyology of North American natricine snakes (Family Colubridae) of the genera *Natrix* and *Regina*. Canadian J. Genet. Cytol. 15(3):355-361.

Kofron, Christopher P. 1978. Foods and habits of aquatic snakes (Reptilia, Serpentes) in a Louisiana swamp. J. Herpetol. 12(4): 543-554.

———. 1979. Reproduction of aquatic snakes in south-central Louisiana. Herpetologica 35(1):44-50.

Langebartel, David A. 1968. The hyoid and its associated muscles in snakes. Illinois Biol. Monogr. (38):1-156.

Laposha, Nicholas A., John S. Parmerlee, Jr., Robert Powell, and Donald D. Smith. 1985. Life history notes: *Nerodia erythrogaster transversa*. Herpetol. Rev. 16(3):81.

Laughlin, Harold E. 1959. Stomach contents of some aquatic snakes from Lake McAlester, Pittsburgh County, Oklahoma. Texas J. Sci. 11(1):83-85.

Lawson, Robin. 1987. Molecular studies of Thamnophiine snakes: 1. The phylogeny of the genus *Nerodia*. J. Herpetol. 21(2):104-157.

Leviton, Alan E. 1972. Reptiles and amphibians of North America. Doubleday & Co., New York. 250 p.

Lillywhite, Harvey B. 1987. Temperature, energetics, and physiological ecology. p 422-477. *In* Richard A. Seigel, Joseph T. Collins, and Susan S. Novak. Snakes: ecology and evolutionary biology. MacMillan Publ. Co., New York. xiv + 529 p.

Linzey, Donald W., and Michael J. Clifford. 1981. Snakes of Virginia. Univ. Press of Virginia, Charlottesville. xiv + 159 p.

MacGregor, John. 1986. The distribution of *Nerodia erythrogaster* in Kentucky. Unpubl. Rept. to Kentucky Dept. Fish and Wildlife. 2 p. + maps.

Martof, Bernard S., William M. Palmer, Joseph R. Bailey, and Julian R. Harrison III. 1980. Amphibians and reptiles of the Carolinas and Virginia. Univ. North Carolina Press, Chapel Hill. 264. p.

Marvel, Bill. 1972. A feeding observation on the yellow-bellied water snake, *Natrix erythrogaster flavigaster*. Bull. Maryland Herpetol. Soc. 8(2):52.

Marx, Hymen, and George B. Rabb. 1972. Phyletic analysis of fifty characters of advanced snakes. Fieldiana Zool. 63:i-viii, 1-321.

McCord, John S., Jr., and Michael E. Dorcas. 1989. New Texas herpetological distribution records from the University of Texas at Arlington collection of vertebrates. Herpetol. Rev. 20(4):94-96.

McDaniel, Robert C., William A. Grunow, James J. Daly, and Michael V. Plummer. 1987. Thrombocyte phagocytosis in a yellow-bellied water snake *(Nerodia erythrogaster flavigaster)*. Trans. Amer. Microscop. Soc. 106(3):273-276.

McMickle, T. J. 1970. A study to determine the presence of encephalitis in reptiles in Harris County, Texas. TASCA 24(3):11-12,16.

Meylan, Peter A. 1982. The squamate reptiles of the Inglis IA Fauna (Irvingtonian: Citrus County, Florida). Bull. Florida St. Mus.,

Biol. Sci. 27(3):1-85.
Milstead, William M. 1960. Relict species of the Chihuahuan Desert. Southwestern Nat. 5(2):75-88.
Minton, Sherman, A., Jr. 1972. Amphibians and reptiles of Indiana. Indiana Acad. Sci. Monogr. (3):i-v, 1-346.
———, James C. List, and M. J. Lodato. 1983. Recent records and status of amphibians and reptiles in Indiana. Proc. Indiana Acad. Sci. 92:489-498.
——— and Sylvia Kendall Salanitro. 1972. Serological relationships among some colubrid snakes. Copeia 1972 (2):246-252.
Mitchell, Joseph C. 1981. A bibliography of Virginia amphibians and reptiles. Smithson. Herpetol. Infor. Serv. (50):1-51.
Moll, Edward O. 1962. Recent herpetological records for Illinois. Herpetologica 18(3):207-209.
Morris, Michael A., Richard S. Funk, and Philip W. Smith. 1983. An annotated bibliography of the Illinois herpetological literature 1960-1980, and an updated checklist of species of the state. Illinois Nat. Hist. Surv. Bull. 33(2):123-137.
Mount, Robert H. 1975. The reptiles and amphibians of Alabama. Auburn Univ. Agricultural Experiment Station, Auburn. vii + 347 p.
Mushinsky, Henry R. 1987. Foraging ecology. p. 302-334. *In* Richard A. Seigel, Joseph T. Collins, and Susan S. Novak (eds.). Snakes: ecology and evolutionary biology. MacMillan Publ. Co., New York. xiv + 529 p.
——— and James J. Hebrard. 1977. Food partitioning by five species of water snakes in Louisiana. Herpetologica 33(2):162-166.
———, ———, and Darrell S. Vodopich. 1982. Ontogeny of water snake foraging ecology. Ecology 63(6):1624-1629.
———, ———, and Mary G. Walley. 1980. The role of temperature on the behavioral and ecological associations of sympatric water snakes. Copeia 1980(4):744-754.
——— and K. H. Lotz. 1980. Chemoreceptive responses of two sympatric water snakes to extracts of commonly ingested prey species: Ontogenetic and ecological considerations. J. Chem. Ecol. 6:523-535.
Nakamura, Eugene L., and Hobart M. Smith. 1960. A comparative study of selected characters in certain American species of water snakes. Trans. Kansas Acad. Sci. 63(2):102-113.
Nickerson, Max A., and Robert Krager. 1972. Noteworthy records of Missouri reptiles. Trans. Kansas Acad. Sci. 74(1):99-101.
Parker, Malcolm V. 1937. Some amphibians and reptiles from Reelfoot Lake. J. Tennessee Acad. Sci. 12(1):60-86.
Parmley, Dennis. 1988. Additional Pleistocene amphibians and reptiles from the Seymour Formation, Texas. J. Herpetol. 22(1):82-87.
——— and C. Mulford. 1985. An instance of a largemouth bass, *Micropterus salmoides*, feeding on a water snake, *Nerodia erythrogaster transversa*. Texas J. Sci. 37(4):389.
Pentecost, Edwin D., and Richard C. Vogt. 1976. Environmental status of the Lake Michigan region. Vol. 16. Amphibians and reptiles of the Lake Michigan drainage basin. Argonne National Lab., Argonne, Illinois. 69 p.
Pope, Clifford H. 1955. The reptile world. Alfred A. Knopf, New York. xxv + 325 + xiii p.
Preston, W. B. 1970. The comparative ecology of two water snakes, *Natrix rhombifera* and *Natrix erythrogaster* in Oklahoma. Ph.D. thesis, Univ. of Oklahoma, Norman. 79 p.
Price, Robert. 1983. Microdermatoglyphics: The *Liodytes-Regina* problem. J. Herpetol. 17(3):292-294.
Rogers, Karel L. 1976. Herpetofauna of the Beck Ranch local fauna (Upper Pliocene: Blancan) of Texas. Publ. Mus. Michigan St. Univ., Paleontol. Ser. 1(5):163-200.
Roosa, Dean M. 1977. Endangered Iowa amphibians and reptiles (An annotated list of endangered and threatened amphibians and reptiles of Iowa). Iowa Conserv. Com., Spec. Rept. Preserves Board (3):1-20.
Rose, Francis L., and Kyle W. Selcer. 1989. Genetic divergence of the allopatric populations of *Nerodia harteri*. J. Herpetol. 22(3): 261-267.
Rossman, Nita J., Douglas A. Rossman, and Nancy K. Keith. 1982. Comparative visceral topography of the New World snake tribe Thamnophiini (Colubridae, Natricinae). Tulane Stud. Zool. Bot. 23(2):123-164.
Schmidt, Karl P. 1953. A check list of North American amphibians and reptiles. 6th ed. Univ. Chicago Press, Chicago, Illinois. viii + 280 p.
——— and Robert F. Inger. 1957. Living reptiles of the world. Doubleday & Co., Garden City, New York. 287 p.
Schram, Alfred C., and Brian D. Freidell. 1981. Immune response in the water snake, *Natrix erythrogaster transversa*. Comp. Biochem. Physiol. 70B(4):811-813.
Schwab, Don, and John L. Fillio. 1980. A possible copper-bellied watersnake (*Natrix erythrogaster neglecta*) from Great Swamp National Wildlife Refuge in Morris County, New Jersey. Bull. Philadelphia Herpetol. Soc. 27:19 (1979).
Scott, Norman J., Jr., Terry C. Maxwell, Okla W. Thornton, Jr., Lee A. Fitzgerald, and John W. Flury. 1989. Distribution, habitat, and future of Harter's water snake, *Nerodia harteri*, in Texas. J. Herpetol. 23(4):373-389.
Scudday, James F. 1978. Some recent changes in the herpetofauna of the northern Chihuahuan Desert, p. 513-522. *In* Roland H. Wauer and David H. Riskind (eds.). Transactions of the symposium on the biological resources of the Chihuahuan Desert region, United States and Mexico. Nat. Park Serv., Trans. & Proc. Ser. (3):i-xxii, 1-658.
Secor, Stephen M., and Charles C. Carpenter. 1984. Distribution maps of Oklahoma reptiles. Oklahoma Herpetol. Soc. Spec. Pub. (3):1-57.
Sellers, Mark Ashley, Jr. 1985. Final report of the state status study of the endangered northern copperbelly water snake, *Nerodia erythrogaster neglecta* (Conant). Unpubl. Rept. to Michigan Dept. Nat. Res. 11 p.
———. 1986. Final report summary of the 1986 status survey of historic and potential state sites for the northern copperbelly water snake and Kirtland's snake, Michigan endangered species. Unpubl. Rept. to Michigan Dept. Nat. Res. 3 p.
———. 1987a. Final report of the 1986 status and distribution survey of relict populations of the northern copperbelly water snake (*Nerodia erythrogaster neglecta*, Conant) in northern Indiana. Unpubl. Rept. to Indiana Dept. Nat. Res. 15 p.
———. 1987b. Final report of the 1986-87 status and distribution survey of relict populations of the northern copperbelly water snake in northwest Ohio. Unpubl. Rept. to Ohio Dept. Nat. Res. 9 p.
———. 1987c. Final report of the 1987 survey of relict populations of the northern copperbelly water snake (*Nerodia erythrogaster neglecta*, Conant). Unpubl. Rept. to Indiana Dept. Nat. Res. 8 p.
———. 1988a. Interim report of management/protection measures planned/implemented at confirmed state sites of the northern copperbelly water snake and the Kirtland's snake. Unpubl. Rept. to Michigan Dept. Nat. Res. 14 p.
———. 1988b. Final report of the 1988 survey of the Pigeon Creek watershed in Warrick and Gibson counties, Indiana for populations of the northern copperbelly water snake (*Nerodia erythrogaster neglecta*, Conant). Unpubl. Rept. to Indiana Dept. Nat. Res. 48 p.
Shaw, Charles E., and Sheldon Campbell. 1974. Snakes of the American West. Alfred A. Knopf, New York. xii + 331 p.
Sievert, Gregory, and Lynnette Sievert. 1988. A field guide to reptiles of Oklahoma. Oklahoma Dept. Wildl. Conserv., Oklahoma City. 96 p.
Simmons, Robert S. 1973. [Cover photograph]. Bull. Maryland Herpetol. Soc. 9(4).
Smith, Donald D. 1983. Life history notes: *Nerodia erythrogaster transversa*. Herpetol. Rev. 14(4):120-121.
Smith, Hobart M. 1956. Handbook of amphibians and reptiles of Kansas. 2nd ed. Univ. Kansas Mus. Nat. Hist. Misc. Publ. (9):1-356.
——— and Edmund D. Brodie, Jr. 1982. A guide to field identification. Reptiles of North America. Golden Press, New York. 240 p.
——— and Rozella B. Smith. 1976. Synopsis of the herpetofauna of Mexico. Vol. III. Source analysis and index for Mexican reptiles. John Johnson, North Bennington, Vermont. 991 p.
——— and Edward H. Taylor. 1950. Type localities of Mexican reptiles and amphibians. Univ. Kansas Sci. Bull. 33(8):313-380.
Smith, Philip W. 1961. The amphibians and reptiles of Illinois. Illinois Nat. Hist. Survey, Bull. 28(1):1-298.
Snyder, David H. 1972. Amphibians and reptiles of the land between the lakes. Tennessee Valley Authority. 90 p.
Stafford, D. P., Frederick W. Plapp, Jr., and Robert R. Fleet. 1976. Snakes as indicators of environmental contamination: Relation

of detoxifying enzymes and pesticide residues to species occurrence in three aquatic ecosystems. Arch. Environ. Contam. Toxicol. 5(1):15-27.
Stebbins, Robert C. 1985. A field guide to western reptiles and amphibians. 2nd ed. Houghton Mifflin Co., Boston. xiv + 336 p.
Stone, Witmer. 1903. A collection of reptiles and batrachians from Arkansas, Indian Territory and western Texas. Proc. Acad. Nat. Sci. Philadelphia 55:538-542.
Stovall, Randall H., and J. P. Kennedy. 1979. Pupillary responses in certain snakes (Colubridae). Southwestern Nat. 24(4):701-703.
Taub, Aaron M. 1967. Comparative histological studies on Duvernoy's gland of colubrid snakes. Bull. Amer. Mus. Nat. Hist. 138(1):1-50.
Taylor, Edward H. 1929. A revised checklist of the snakes of Kansas. Univ. Kansas Sci. Bull. 19(5):53-62.
Tennant, Alan. 1984. The snakes of Texas. Texas Monthly Press, Austin. 561 p.
———. 1985. A field guide to Texas snakes. Texas Monthly Press, Austin. 260 p.
Tinkle, Donald W., Paul E. Feaver, Robert Wayne Van Devender, and Laurie J. Vitt. 1979. A survey of the status, distribution and abundance of threatened and endangered species of reptiles and amphibians. Unpubl. Rept. to Michigan Dept. Nat. Res. 30 p.
Tobey, Franklin J. 1985. Virginia's amphibians and reptiles: A distributional survey. Virginia Herpetol. Soc. vi + 114 p.
Trowbridge, Albert H. 1937. Ecological observations on amphibians and reptiles collected in southeastern Oklahoma during the summer of 1934. Amer. Midl. Nat. 18(2):285-303.
Tupacz, Edward G. 1985. Field notes: *Nerodia erythrogaster* and *Buteo lineatus*. Catesbeiana 5(2):15.
Vance, Thomas L. 1985. Annotated checklist and bibliography of Arkansas reptiles. Smithson. Herpetol. Infor. Serv. (63):1-45.
Varkey, Alexander. 1979. Comparative cranial myology of North American natricine snakes. Milwaukee Pub. Mus., Publ. Biol. Geol. (4):i-iv, 1-76.
Vermersch, Thomas G., and Robert E. Kuntz. 1986. Snakes of south central Texas. Eakin Press, Austin, Texas. xiii + 137 p.
Viosca, Percy, Jr. 1924. A contribution to our knowledge of the water snakes. Copeia (126):3-13.
Vogt, Richard Carl. 1981. Natural history of amphibians and reptiles in Wisconsin. Milwaukee Pub. Mus., Milwaukee, Wisconsin. 205 p.
Wauer, Roland H. 1973. Naturalist's Big Bend. Peregrine Productions, Santa Fe, New Mexico. 159 p.
Webb, Robert G. 1970. Reptiles of Oklahoma. Univ. Oklahoma Press, Norman. xi + 370 p.
Werler, John E., and James McCallion. 1951. Notes on a collection of reptiles and amphibians from Princess Anne County, Virginia. Amer. Midl. Nat. 45(1):245-252.
Williamson, Gerald K., and R. A.Moulis. 1979. Distribution of Georgia amphibians and reptiles in the Savannah Science Museum collection. Savannah Sci. Mus. Spec. Publ. (1):1-8, 1-159 maps (unnumbered).
Wright, Albert H., and S. C. Bishop. 1915. A biological reconnaissance of the Okefinokee Swamp in Georgia. Proc. Acad. Nat. Sci. Philadelphia 67:107-192.
——— and Anna Allen Wright. 1957. Handbook of snakes of the United States and Canada. Comstock Publ. Assoc., Ithaca, New York. Vol. 1. xviii +564 p.

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