

REPTILIA: SERPENTES: COLUBRIDAE

CARPHOPHIS AMOENUS

Catalogue of American Amphibians and Reptiles.

Ernst, C.H., J.M. Orr, and T.R. Creque. 2003. *Carphophis amoenus*.

Carphophis amoenus (Say)
Eastern Wormsnake

Coluber amoenus Say 1825:237. Type locality, "Pennsylvania," restricted to "vicinity of Philadelphia [Pennsylvania]" by Schmidt, 1953:184. Syntypes, see **Remarks**.

Calamaria amoena: Schlegel 1837:31.

Brachyorrhos amoenus: Holbrook 1842:115.

Carphophis amoena: Gervais 1843:191.

Carphophiops vermiformis Gervais 1843:191. Type locality, "l'Amérique septentrionale" [North America]. Holotype not designated.

Celuta amoena: Baird and Girard 1853:129.

Carphophiops amoenus: Cope 1875:34.

Carphophis amoenus: Davis and Rice 1883:31. First use of present combination.

Carphophiops amoenus: Surface 1906:114. *Ex errore*.

Caryophis amoenus: Haltom 1931:iv. *Ex errore*.

Carphophis amoenus: Haltom 1931:14. *Ex errore*.

Carphophiops amoenus: Smith 1961:177. *Ex errore*.

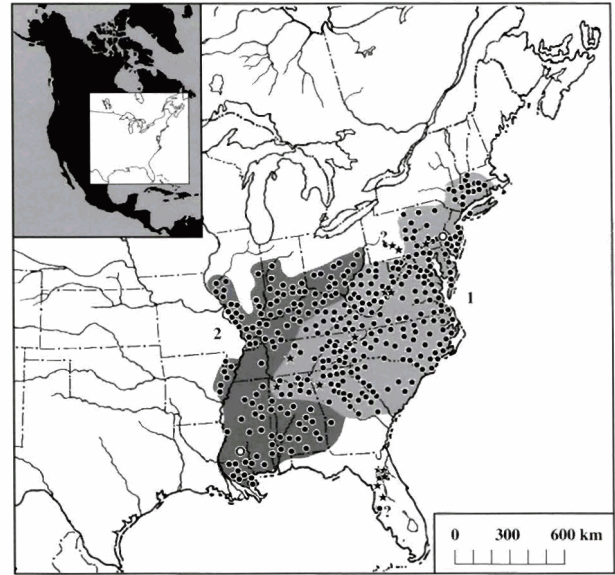
• **CONTENT.** Two subspecies are recognized: *Carphophis amoenus amoenus* and *C. a. helenae*.

• **DEFINITION.** This small colubrid snake has a maximum known total length of 35 cm. The body is cylindrical and unpatterned, with a tan to chestnut brown dorsum, a pinkish venter, a pointed head, and small black eyes. The pinkish ventral pigmentation extends dorsally onto body scale rows 1–2. The tail is short and ends in a blunt, spine-like scale. Dorsal body scales are smooth, pitless, opalescent, and occur in 13 rows throughout (rarely in 15 rows near the tail). Beneath are 109–145 ventrals, 22–41 subcaudals, and a divided cloacal scute. Laterally on the head are 1 nasal, 1 loreal, 0 preoculars (rarely 1), 1 postocular, 1 + 2–3(1) temporals, 5(6) supralabials, and 6 (5–7) infralabials. Dorsally, the internasals and prefrontals may be paired and free, or they may be fused into two large scales (see subspecies definitions). No gulars are present between the chin shields.

The single hemipenis is 5–7 subcaudals long when everted, and has a forked sulcus spermaticus, a calyculate crown, numerous small spines along the shaft, and three large basal hooks. Each maxilla has 10 (9–11) teeth; other tooth counts are as follows: dentary 16–17 (14–18), palatine 13–14 (10–17), and pterygoid 15–16 (13–19).

Males are shorter than females, and have 109–129 (mean 123) ventrals, 31–41 (mean 37) subcaudals, and tails that are 17–21% (mean 19%) of total length; the larger females have 117–145 (mean 133) ventrals, 22–34 (mean 28–29) subcaudals, and tails that are 11–16% (mean 13–14%) of total length. Adult males also have ridges on the body scales dorsal to the vent.

• **DESCRIPTIONS.** **General descriptions** are in Storer (1839), Bocourt (1883), S. Garman (1884), H. Garman (1892), Boulenger (1893), Cope (1892, 1900), Morse (1904), Surface (1906), Schmidt and Davis (1941), Smith and List (1955), Wright and Wright (1957), Smith (1961), Cagle (1968), Jordan et al. (1968), Cochran and Goin (1970), Mount (1972, 1975), Smith and Brodie (1982), Ernst and Barbour (1989), Dundee and Rossman (1989), Ernst et al. (1997), Conant and Collins (1998),



MAP. Distribution of *Carphophis amoenus*: circles mark type localities, dots indicate other selected records, and stars indicate fossil localities.



FIGURE 1. Adult *Carphophis amoenus amoenus*, Rowan County, Kentucky (photograph by Roger W. Barbour).



FIGURE 2. Adult *Carphophis amoenus helenae*, Jessamine County, Kentucky (photograph by Roger W. Barbour).

Palmer and Braswell (1995), Hulse et al. (2001), Meade (2002), and Ernst and Ernst (2003). Other descriptions are as follows: **color** (Clark 1970), **scutellation** (Clark 1970), **sexual dimorphism** (Blanchard 1931; Clark 1967, 1970), **dentition** (Clark 1970), **hemipenis** (Clark 1970), **diameter of eye** (Clark 1970), and **eggs** (Blanchard 1925).

• **ILLUSTRATIONS.** **Color illustrations** of adults are in Barbour (1971), Snyder (1972), Linzey (1979), Simon (1979), Martof et al. (1980), Smith and Brodie (1982), Jackson (1983), Green and Pauley (1987), Dundee and Rossman (1989), Ernst and Barbour (1989), Shaffer (1991), Klemens (1993), Palmer and Braswell (1995), Conant and Collins (1998), Tennant and Bartlett (2000), Hulse et al. (2001), Tilley and Huheey (2001), Denny (2002), Moore and Slone (2002), and Ernst and Ernst (2003). **Black and white illustrations** of adults are in Garman (1884), Surface (1906), Blanchard (1925), Roddy (1928), Haltom (1931), Lamson (1935), Ditmars (1936, 1939), Kelly (1936), Conant and Bridges (1939), Schmidt and Davis (1941), McCauley (1945), Conant (1951), Parmalee (1955), Wright and Wright (1957), Smith (1961), Huheey and Stupka (1967), Cochran and Goin (1970), Babbitt and Graham (1972), Minton (1972, 2001), Mount (1975), DeGraaf and Rudis (1981, 1983), Palmer and Braswell (1995). Other illustrations are as follows: **head scales** (Cope 1900, Haltom 1931, Barbour 1971, Linzey and Clifford 1981, Ernst and Barbour 1989, Palmer and Braswell 1995, Conant and Collins 1998, Meade 2002), **body scales** (Cope 1900, Haltom 1931, Trapido 1937, Palmer and Braswell 1995), **venter** (Cope 1900, Haltom 1931, Dundee and Rossman 1989, Palmer and Braswell 1995), **eggs** (Blanchard 1925), and **habitat** (Klemens 1993).

• **DISTRIBUTION.** *Carphophis amoenus* ranges from southern New England (Massachusetts southward), southeastern New York, eastern Pennsylvania, West Virginia, southern Ohio, southern Indiana and southern Illinois south to South Carolina, northern Georgia, Alabama, southeastern Louisiana, and eastern Arkansas.

Hulse et al. (2001) mapped a questionable record at the junction of Butler, Venango and Clarion counties west of the Allegheny Front of the Appalachian Mountains in Pennsylvania. In view of a recent valid record from Bolivar, Westmoreland County (Hulse et al. 2001), other scattered populations of *Carphophis amoenus* may be present in western Pennsylvania. A more interesting locality record is that of a specimen in the United States National Museum of Natural History (USNM10750) collected on 26 August 1879 by S.T. Walker at Clearwater, Pinellas County, Florida (identity verified by the authors). *Carphophis amoenus* does not occur in Florida today; the closest populations are several hundred kilometers north in central Georgia. However, Pleistocene fossils of *Carphophis amoenus* are known from nearby Sumter County (see **Fossil Record**), and this specimen may represent a relictual population extant in the 19th century, but since extirpated.

Publications discussing distribution include Yarrow (1882), Hay (1902), Morse (1904), Surface (1906), Bishop (1923), Blanchard (1925), Pickens (1927), Dury and Williams (1933), Conant and Bailey (1936), Green (1948), Barbour (1950b), Duellman (1951), Werler and McCallion (1951), Cooper (1953, 1956), Hoffman (1953), Endsley (1954), Neill (1954), Stein (1954), Prince et al. (1955), Smith and List (1955), Ferguson and Bancroft (1956), Hutchison (1956), Reed (1956, 1957a, 1957b, 1958), Bell (1957), Cliburn (1958), Bush (1959a), Rossman (1960), Adler (1961), Adler and Dennis (1961), Hirschfeld and Collins (1962), Seibert and Wood (1963), Collins (1964), Klimstra and Hutchinson (1965), Grant (1966), Cagle (1968), Latham (1969), Mount (1972), Ladato (1974), Gibbons and Coker (1978), McDaniel et al. (1978), Bayless (1979), Reilly and Rossi (1981), Winstel (1988), Eckerlin (1991), Pague and Mitchell (1991), Wright (1991), Brown (1992), Bauer and Witwer (1995), Krusling and Ferner (1999), Tennant and Bartlett (2000), and Meade (2002). **Distributional maps** are in McCauley (1945), Wright and Wright (1957), Reed (1958), Smith (1961), Clark (1970), Barbour (1971), Minton (1972,

2001), Mount (1972, 1975), Behler and King (1979), Simon (1979), Williamson and Moulis (1979), Martof et al. (1980), DeGraaf and Rudis (1981, 1983), Linzey and Clifford (1981), McCoy (1982), Smith and Brodie (1982), Jackson (1983), Tobey (1985), Green and Pauley (1987), Dundee and Rossman (1989), Ernst and Barbour (1989), Meade (1991, 2002), Shaffer (1991), Rossi (1992), Klemens (1993), Mitchell (1994), Bauer and Witwer (1995), Palmer and Braswell (1995), Conant and Collins (1998), Tennant and Bartlett (2000), Hulse et al. (2001), and Ernst and Ernst (2003).

• **FOSSIL RECORD.** Many Pleistocene fossils of *C. amoenus* have been found, and its fossil record is summarized in Holman (1995, 2000). Middle Pleistocene (Irvingtonian) fossils are known from Cumberland Cave, Allegany County, Maryland (Holman 1977), and the Hamilton Cave Fauna, Pendleton County, West Virginia (Holman and Grady 1989). Late Pleistocene (Rancholabrean) remains have been found in Bell Cave, Colbert County, Alabama (Holman et al. 1990); at the Coeman IIA Site, Sumter County, Florida (Holman 1958, Auffenberg 1963, Gut and Ray 1963); Kingston Saltpeter Cave and Ladds Quarry in Bartow County, Georgia (Holman 1967, 1985, 1995); at Bootlegger Sink, York County, Frankstown Cave, Blair County; the New Paris 4 Site, Bedford County, Pennsylvania (Guilday et al. 1964, 1966; Richmond 1964); in the Baker Bluff Cave Fauna, Sullivan County and Cheek Bend Cave Fauna, Maury County, Tennessee (Van Dam 1978, Holman 2000); in the Clark's Cave Local Fauna, Bush County and Natural Chimneys Local Fauna, Augusta County, Virginia (Holman 1986); and at New Trout and Worm Hole caves, Pendleton County, West Virginia (Holman and Grady 1987, 1994). Also, the Tennessee snake vertebrae identified only as *Carphophis?* sp. by Corgan (1976) and Holman (2000) are probably from this species. The Florida sites are well south of the present range of the species.

• **PERTINENT LITERATURE.** **General accounts** are in Hay (1892), Surface (1906), Roddy (1928), Haltom (1931), Lamson (1935), Ditmars (1936, 1939), Kelly (1936), Trapido (1937), Conant and Bridges (1939), Schmidt and Davis (1941), McCauley (1945), Conant (1951), Cochran (1954), Cook (1954), Parmalee (1955), Wright and Wright (1957), Barbour (1960, 1971), Smith (1961), Huheey and Stupka (1967), Babbitt and Graham (1972), Minton (1972, 2001), Snyder (1972), Mount (1975), Behler and King (1979), Linzey (1979), Martof et al. (1980), DeGraaf and Rudis (1981, 1983), Bartlett (1987), Green and Pauley (1987), Gibbons and Semlitsch (1991), Shaffer (1991), Rossi (1992), Seitz (1992), Klemens (1993), Mitchell (1994), Palmer and Braswell (1995), Ernst et al. (1997), Conant and Collins (1998), Hulse et al. (2001), and Ernst and Ernst (2003). Other topics are as follows: **systematics, taxonomy and evolution** (Rossman 1973; Dowling et al. 1983; Collins 1991; Meade 1991, 2002; Buckley et al. 2000; Crother 2000; Highton et al. 2002), **intergradation and hybridization** (Smith 1948; Barbour 1960; Pauley 1973; Rossman 1973; Collins 1991; Meade 1991, 2002), **zoogeography** (Meade 1991), **size** (Boundy 1995), **sexual dimorphism** (Clark 1967, Meade 2002), **lungs** (Wallach 1998), **digestive tract** (Skoczylas 1978), **skin energetics** (Blem and Zimmerman 1986), **water, lean and lipid weights** (Bush 1963), **reproduction** (Blanchard 1925, Simmons and Stine 1961, Brown 1992, Köhler 1997), **longevity** (Snider and Bowler 1992), **habitat or habitat loss** (Hay 1902, Wilson and Friddle 1950, Werler and McCallion 1951, Barbour 1952, Swanson 1952, Prince et al. 1955, Martof 1956, Harris 1967, DeGraaf and Rudis 1981, Van Devender and Nicoletto 1983, Pague and Mitchell 1991, Mitchell and Roble 1998, McLeod

and Gates 1998, Russell and Hanlin 1999, Metts et al. 2001, Russell et al. 2002), **daily activity and movements** (Harvey et al. 1968, Barbour et al. 1969, Russell and Hanlin 1999), **seasonal activity** (Barbour 1950a, Van Devender and Nicoletto 1983, Eckerlin 1991, Russell and Hanlin 1999), **winter activity and hibernation** (Neill 1948, Grizzell 1949, Mitchell and Kirk 1996), **populations** (Harris 1967, Phelps and Lancia 1995, Russell et al. 2002) **diet and feeding habits** (Surface 1906, Uhler et al. 1939, Barbour 1950a, Hamilton and Pollack 1956, Bush 1959b, Brown 1979), **stereotyped defensive behavior** (Carpenter and Ferguson 1977), **predation** (Wilson and Friddle 1946, Hamilton and Pollack 1956, Holman 1958, Mitchell and Beck 1992, Byrd and Jenkins 1996), **pesticide poisoning** (Ernst 1962), **structural abnormalities** (Simmons and Stine 1961), **color abnormalities** (Allard 1945, Simmons and Stine 1961, Harris 1968, Palmer and Braswell 1980, Dyrkacz 1981, Cook and Funderburk 1986), **husbandry** (Mehrtens 1987, Rossi 1992), and **common names** (Banks et al. 1987, Collins 1990, Crother 2000; Collins and Taggart 2002).

• **REMARKS.** Although no type specimens were designated by Say (1825), he listed and gave measurements of “four specimens belonging to the Philadelphia Museum,” and of a fifth “specimen in Mr. W.L. Stewart’s collection.” Thus, the original description was based on five specimens.

When Kennicott (1859) named *Celuta helena* (= *Carphophis amoenus helena*), the original description was based on several specimens in the collections of Northwestern University, Evanston, Illinois, and the Smithsonian Institution (USNM), Washington, D.C., from “Southern Illinois” collected by “Dr. H. McVean, Robt. Gow, C. Thomas, L. W. Ashley,” and “Monticello [Lawrence County], Miss.” collected by “Miss Helen Teunison.” Some of these specimens have since been transferred to other institutions or have been lost. Five wet *Celuta helena*, originally in the Northwestern University collection (collectively, number 233), supposedly collected by Kennicott (but see above) in Union County, Illinois, were deposited in the Chicago Academy of Sciences, (CHAS 350–354), after Kennicott’s death in 1866 (Steven M. Sullivan, *in litt.*); these specimens are apparently the Northwestern University syntypes. Cochran (1961) listed four wet “Cotypes” (= syntypes) in the collection of the Smithsonian Institution (USNM 2183 [three] and 131708) from southern Illinois, apparently collected by Kennicott. In addition, she stated that a fourth specimen of USNM 2183 had been exchanged with the Museum of Zoology, University of Michigan (UMMZ, see below). She failed to mention USNM 2182, the wet specimen collected by Teunison in Mississippi, which is now missing. A hand written notation in the USNM catalogue indicates that additional wet syntypes of *Celuta helena* were sent to the following collections: (1) Trowbridge College, later catalogued as UMMZ 3779 (Peters 1952, Kluge 1984); (2) Museum of Comparative Zoology, Harvard, MCZ-R-5848 (Jose Rosado, *in litt.*); (3) Philadelphia Academy of Natural Sciences, ANSP 3400, missing as of August 1993 (John Cadle, *in litt.*, to Steve W. Gotte); (4) The Natural History Museum, London, BMNH 1861.8.15.25, a female (Boulenger 1893; Colin McCarthy, *in litt.*); (5) Muséum National d’Histoire Naturelle, Paris (MNHN 93; Ivan Ineich, *in litt.*); (6) a specimen sent to the Hungarian Natural History Museum, Budapest, lost when the collection was largely destroyed in 1956 (Balazs Farkas, *in litt.*); and (7) an untraceable specimen sent to “Dronet” (spelling?). So, at present 13 syntypes exist, and four others are missing. The existing USNM specimens and that in the UMMZ were examined by the authors.

• **ETYMOLOGY.** The Latin name *amoenus* means pleasing or lovely, in reference to the snake’s smooth, neat appearance.

The feminine name *helena* honors Miss Helen Teunison, who collected one of the syntypes.

1. *Carphophis amoenus amoenus* (Say)

Coluber amoenus Say 1825:237. See species synonymy.

Carphophiops amoenus: Cope 1875:34.

Carphophis amoena amoena: Blanchard 1924:530.

Carphophis amoenus amoenus: Perkins 1949:7. First use of present combination.

• **DEFINITION.** Adults are 18.0–33.7 cm long, and have separate internasals and prefrontal scales. The subspecies is found from Rhode Island, southwestern Massachusetts and southeastern New York south to South Carolina, northern Georgia, and central Alabama.

2. *Carphophis amoenus helena* Kennicott

Celuta helena Kennicott 1859:100. Type locality, “Monticello, Miss. ... Southern Illinois (abundant in the woods),” restricted to “Monticello, Lawrence County, Mississippi” by Schmidt 1953:185. Thirteen syntypes exist, see **Remarks**.

Carphophiops helena: Cope 1875:34.

Carphophis helena: Garman 1884:100.

Carphophis amoena helena: Blanchard 1924:530.

Carphophis amoenus helena: Perkins 1949:7. First use of present combination.

• **DEFINITION.** Adults are 18.0–28.0 cm long, and have the internasal and prefrontal scales fused into one large plate-like scale. This subspecies is found from southern Ohio west to southern Illinois, and south to the Gulf Coast of Mississippi and southeastern Louisiana, and to eastern Arkansas.

A large area of intergradation occurs between the two subspecies in Ohio, eastern Kentucky, and West Virginia (Smith 1948, Barbour 1960, Pauley 1973), but is not indicated on the map.

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