

Catalogue of American Amphibians and Reptiles.

BLEM, CHARLES R. 1979. *Bufo terrestris*.***Bufo terrestris* (Bonnaterre)
Southern toad**

?*Rana musica* Linnaeus, 1766:354. Type-locality, "Surinami." No holotype known.

Rana terrestris Bonnaterre, 1759:8. Type-locality, "La Caroline"; restricted to Charleston, South Carolina, by Schmidt (1953:65). No holotype known.

Rana lentiginosa Shaw, 1802:173. Type-locality, ". . . Carolina and Virginia," restricted to Charleston, South Carolina, by Schmidt (1953:65). No holotype known.

Bufo musicus: Latreille in Sonnini and Latreille, 1802:127. See Nomenclatural History.

Bufo erythronotus Holbrook, 1838:99. Type-locality, "neighborhood of Charleston," South Carolina. No holotype known. Synonymy *vide* Adler, 1976:xxxvi.

Bufo lentiginosus: Holbrook, 1842:7.

Chilophryne lentiginosa: Cope, 1862:358.

Incilius. *lentiginosus*: Cope, 1863:50.

Bufo lentiginosus lentiginosus: Cope, 1875:29.

Bufo lentiginosus pachycephalus Cope, 1889:288. Type-locality, "Micanopy [Alachua County], Fla." Syntypes (2), U.S. Nat. Mus. 14681, collected by T. H. Bean (not examined by author).

Bufo terrestris: Stejneger and Barbour, 1917:29.

Bufo terrestris terrestris: Netting and Goin, 1946:107.

- CONTENT. No subspecies are currently recognized.

- DEFINITION. *Bufo terrestris* is a member of the *Bufo americanus* group (Blair, 1963a, 1972b; Tihen, 1962a). The cranial crests are posteriorly raised into clublike prominences or knobs and tend to approach each other anteriorly. Snout-vent lengths of adult males range from 42 to 82 mm; females range from 44 to 92 mm (Wright and Wright, 1949); the record length is 113 mm (Conant, 1975); see also Riemer (1959). Individuals collected from islands along the coasts of South Carolina, Georgia and Florida tend to average larger than those from the mainland (Mount, 1975). Dorsal coloration ranges from red to nearly black, but usually is some shade of brown. Dark spots enclosing one, two or often more warts are present. A light middorsal stripe is frequently visible.

- DESCRIPTIONS. Wright and Wright (1949), Conant (1975) and Mount (1975) provide descriptions of adults. Eggs are described by Livezey and Wright (1947) and Wright and Wright (1924, 1949); tadpoles by Altig (1970). Other descriptions include those of the call (Blair, 1956, 1958), call and vocal pouch (McAlister, 1961), release calls (Aronson, 1944; Brown and Littlejohn, 1972), and osteology (Tihen, 1962a; Martin, 1973).

- ILLUSTRATIONS. An excellent color photograph appears in Blair (1972a). Black and white illustrations or photographs may be found in Dickerson (1906), Wright and Wright (1949), Cochran and Goin (1970), Mount (1975) and Conant (1975). Photographs of *B. terrestris* in Breen (1974) appear to be *B. americanus*. Other illustrations include: eggs (Wright and Wright, 1924; Livezey and

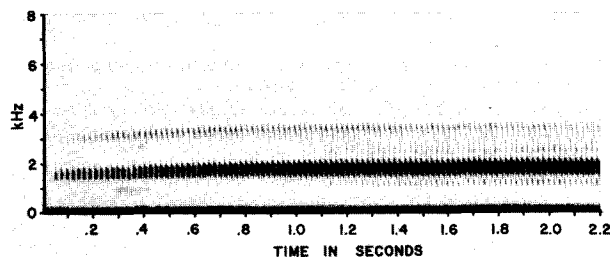


FIGURE. Audiospectrogram of mating call of *Bufo terrestris*: St. Catherines Island, Liberty County, Georgia, 17 April 1975, body temperature 18.9°C; wide band filter (300 Hz); Amer. Mus. Natur. Hist. Dept. Herpetology tape no. 201, specimen AMNH 92014.

Wright, 1947), audiospectrograms and oscillograms of release calls (Brown and Littlejohn, 1972), scanning electron photomicrographs of tadpole labial teeth (Altig and Pace, 1974), and karyotypes and ideograms (Bogart, 1972).

- DISTRIBUTION. *Bufo terrestris* occurs in the coastal plain from southeastern Virginia to the Florida Keys, and westward along the Gulf Coast through the Florida parishes of Louisiana. Important sources of distributional data include: Brimley (1910, 1927, 1940), Harper (1935), Brandt (1936, 1953), Chamberlain (1939), Carr (1940), Lewis (1946), Neill (1950, 1951), Werler and McCallion (1951), Telford (1952), Funderberg (1955), Smith and List (1955), Freeman (1956), Gosner and Black (1956), Duellman and Schwartz (1958), DePoe, Funderberg and Quay (1961), Ferguson (1961), Palmer and Whitehead (1961), Boyd and Vickers (1963), Martof (1963), Brothers (1965), Musick (1972), Mount (1975) and Gibbons and Coker (1978). H. A. Dundee, B. S. Martof, W. M. Palmer, A. E. Sanders, F. J. Tobey, Jr. and R. G. Zweifel (pers. comms.) provided additional distributional data. Many older published records confuse *Bufo terrestris* with *B. americanus* and records from areas outside of the coastal plain are sometimes questionable (Wright and Wright, 1949) and in some instances have been omitted.

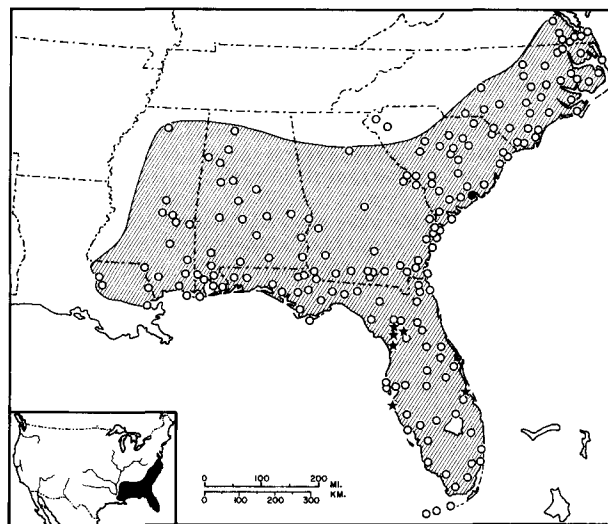
Bufo terrestris is generally abundant throughout its range and inhabits a wide variety of habitats. It is particularly common in areas having sandy soils. It may attempt to breed in almost any aquatic habitat, including some that are very transitory (Wright and Wright, 1949).

Under natural conditions, *Bufo terrestris* frequently hybridizes with *B. woodhousei fowleri* (Neill, 1949; Brown, 1969) and *B. americanus* (e.g., see Mount, 1975). The latter hybridization is particularly apparent locally at the northern edge of the range of *B. terrestris* and occasionally obscures the distributional limits of the species.

- FOSSIL RECORD. Pleistocene remains of *B. terrestris* (Illinoian to sub-Recent) have been recovered from several sites in Florida and are described by Holman (1958, 1959a, 1959b, 1962), Tihen (1962b), Gut and Ray (1963) and Lynch (1965).

- PERTINENT LITERATURE. Many investigations have utilized this species as experimental material. Most often these studies were directly concerned with the species, but a few investigators have used this anuran simply because it is a highly available experimental subject.

Investigations of aspects of the hybridization of *B. terrestris* with other *Bufo* have been made, including studies of viability of hybrids (A. P. Blair, 1941; Volpe, 1959a, 1959b; W. F. Blair, 1959, 1961, 1963b, 1972c), natural hybridization (Neill, 1949; Gosner and Black, 1958; Volpe, 1959b; Brown 1969), hybridization as a reinforcement of the isolating mechanism of call difference



MAP. The solid circle marks the restricted type-locality; open circles indicate other records; stars mark Pleistocene fossil sites.

(Blair, 1962), and the theoretical origin of *B. terrestris* as a *B. woodhousei fowleri* × *Bufo americanus* hybrid (Sanders, 1961). The biochemistry of skin (Porter and Porter, 1967; Cei, Espamer and Roseghini, 1968, 1972; Daly and Witkop, 1971), respiration of larvae (Starrett, 1973), parotid gland secretions (Witliff, 1963; Low, 1972), metamorphosis (Dolphin and Frieden, 1955), hemoglobin (Goin and Jackson, 1965), blood proteins (Hebard, 1964; Guttman, 1969, 1972), transferrins (Dessauer, Fox and Hartwig, 1962), and cellular DNA content (Goin, Goin and Bachmann, 1969; Bachmann, 1970, 1972; Olmo, 1973) have provided much additional evidence for the relationship of *B. terrestris* to other *Bufo* species and other vertebrates. Physiological topics are discussed in papers including: embryonic temperature adaptation and relationships with other *Bufo* (Volpe, 1953), ecological energetics (Smith, 1976), body size, surface area and gas exchange (Hutchison, Whitford and Kohl, 1968), body temperature (Brattstrom, 1963), critical thermal maximum of tadpoles (Davenport and Castle, 1895), phototactic responses (Jaeger and Hailman, 1973), ecology of tadpoles in a thermally-stressed ecosystem (Nelson, 1974), survival of loss of body water (Thorson and Svihla, 1943) and viability of adults submerged at different ambient temperatures (Hutchison and Dady, 1964). Behavioral studies involving food habits (Krakauer, 1968), community composition and activity patterns in relation to weather and season (Anderson, Liner and Etheridge, 1952; Goin and Goin, 1953; Einem and Ober, 1956; Gibbons and Bennett, 1974), release calls (Brown and Littlejohn, 1972), sexual behavior (Aronson, 1944), homing (Bogert, 1947), the effect of mating calls in attracting breeding assemblages (Bogert, 1960), pressure levels and radiation patterns of vocalizations (Gerhardt, 1975), the reaction of *B. terrestris* to aposematically colored insects and their mimics (Brower, Brower and Westcott, 1960; Brower and Brower, 1965), and defensive attitude (Tritt, 1964) have been published. Other studies involve osteology (Sanders, 1953; Tihen, 1962a; R. F. Martin, 1972, 1973), tonsil structure (Kingsbury, 1912), jumping ability and osteometrics (Zug, 1972, 1978), parasites (Walton, 1940; Harman, 1971), amelanosis (Kessler and O'Benar, 1977), evolutionary relationships (Blair, 1963a, 1972b), protein content (Boyd and Goodyear, 1971), visual fields (Fite, 1973), evolution of vocalization (W. F. Martin, 1972), mechanics of sound production (McAlister, 1961), testes structure (Blair, 1972d), egg capsules (Salthe, 1963), the response of males to human gonadotropic hormone (Knepton, 1952) and histology of the meninges (Palay, 1944). *Bufo terrestris* has even been used in the diagnosis of human pregnancy (Hansen, 1960)!

• **NOMENCLATURE HISTORY.** At least four species-level epithets have been applied to this species, and lack of agreement as to how many species should be recognized in the *americanus* species group has added to the taxonomic complexity. The name *terrestris* was overlooked for more than 100 years until revived by Stejneger and Barbour (1917). The earlier Linnean name *musica* was equated with *terrestris* (or its synonyms) by several authors, though on what grounds is not clear. Schmidt (1953) treated *Bufo musicus* as a new name by Sonnini and Latreille and restricted the type-locality to Charleston, South Carolina. With regard to Cope's (1889) *pachycephalus*, Burt (1938) wrote "The two U.S.N.M. cotypes . . . have been examined and they are typical *fowleri*." Yet the type-locality of *pachycephalus* is well outside the known range of *B. woodhousei fowleri*. I follow Gorham (1974) in listing *pachycephalus* as a synonym of *terrestris*. Netting and Goin (1946) considered *B. americanus* and *B. terrestris* as intergrading populations of a single species; later authors have treated them as species that occasionally hybridize.

• **ETYMOLOGY.** The name *terrestris* (Latin, pertaining to the earth) probably refers to the close association of this species with the soil.

COMMENT

Other than a few general descriptions (Wright, 1932; Wright and Wright, 1949; Mount, 1975), there are few available quantitative data on life history variables. Distributional records at the western extreme of the range and near the fall line, particularly in Georgia, are apparently scarce.

LITERATURE CITED

- Adler, Kraig. 1976. New genera and species described in Holbrook's "North American Herpetology," p. xxix-xlii. In J. E. Holbrook, North American Herpetology, Soc. Study Amphibians Reptiles reprint.
- Altig, Ronald. 1970. A key to the tadpoles of continental United States and Canada. *Herpetologica* 26(2):180-207.
- , and William L. Pace. 1974. Scanning electron photomicrographs of tadpole labial teeth. *J. Herpetol.* 8(3):247-251.
- Anderson, Paul K., Ernest A. Liner, and Richard E. Etheridge. 1952. Notes on amphibian and reptile populations in a Louisiana pineland area. *Ecology* 33(2):274-278.
- Aronson, L. R. 1944. The sexual behavior of Anura. 6. The mating pattern of *Bufo americanus*, *Bufo fowleri* and *Bufo terrestris*. *Amer. Mus. Novitates* (1250):1-15.
- Bachmann, Konrad. 1970. Specific nuclear DNA amounts in toads of the genus *Bufo*. *Chromosoma* 29:365-374.
- 1972. The nuclear DNA of *Polypterus palmas*. *Copeia* 1972(2):363-365.
- Blair, Albert P. 1941. Variation, isolating mechanisms, and hybridization in certain toads. *Genetics* 26:398-417.
- Blair, W. Frank. 1956. Call difference as an isolation mechanism in southwestern toads (genus *Bufo*). *Texas J. Sci.* 8(1):87-106.
- 1958. Mating call in the speciation of anuran amphibians. *Amer. Natur.* 92(862):27-51.
- 1959. Genetic compatibility and species groups in U.S. toads (*Bufo*). *Texas J. Sci.* 11(4):427-453.
- 1961. Further evidence bearing on intergroup and intragroup genetic compatibility in toads (genus *Bufo*). *Ibid.* 13(2):163-175.
- 1962. Non-morphological data in anuran classification. *Syst. Zool.* 11(2):72-84.
- 1963a. Evolutionary relationships of North American toads of the genus *Bufo*: a progress report. *Evolution* 17(1):1-16.
- 1963b. Intragroup genetic compatibility in the *Bufo americanus* species group of toads. *Texas J. Sci.* 15(1):15-34.
- (ed.) 1972a. Evolution in the genus *Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- 1972b. *Bufo* of North and Central America, p. 93-101. In W. F. Blair (ed.), op. cit.
- 1972c. Evidence from hybridization, p. 196-232. In W. F. Blair (ed.), op. cit.
- 1972d. Characteristics of the testes, p. 324-328. In W. F. Blair (ed.), op. cit.
- Bogart, James P. 1972. Karyotypes, p. 171-195. In W. F. Blair (ed.), op. cit.
- Bogert, Charles M. 1947. A field study of homing in *Bufo t. terrestris*. *Amer. Mus. Novitates* (1355):1-24.
- 1960. The influence of sound on the behavior of amphibians and reptiles, p. 137-320. In W. W. Lanyon and W. N. Tavalga (eds.), Animal sounds and communication. *Amer. Inst. Biol. Sci. Pub.* (7). xiii + 443 p.
- Bonnaterre, M. l'A. 1789. Tableau encyclopedique et methode des trois regnes de la nature. *Erpetologie*, Paris. 70 p.
- Boyd, Claude E., and C. P. Goodyear. 1971. The protein content of some common reptiles and amphibians. *Herpetologica* 27(3):317-320.
- , and D. H. Vickers. 1963. Distribution of some Mississippi amphibians and reptiles. *Herpetologica* 19(3):202-205.
- Brandt, B. B. 1936. The frogs and toads of eastern North Carolina. *Copeia* 1936(4):215-223.
- 1953. Saliencia of Bleckley County, Georgia, and vicinity. *Herpetologica* 9(3):141-145.
- Brattstrom, Bayard H. 1963. A preliminary review of the thermal requirements of amphibians. *Ecology* 44(2):238-255.
- Breen, J. F. 1974. Encyclopedia of reptiles and amphibians. T. F. H. Pub., Inc. 576 p.
- Brimley, C. S. 1910. Records of some reptiles and batrachians from the southeastern United States. *Proc. Biol. Soc. Washington* 23:9-18.
- 1927. Some records of amphibians and reptiles from North Carolina. *Copeia* (162):10-12.
- 1940. Reptiles and amphibians of North Carolina, installment no. 11. *Carolina Tips* 3(4):2 p.
- Brothers, Donald R. 1965. An annotated list of the amphibians and reptiles of northeastern North Carolina. *J. Elisha Mitchell Sci. Soc.* 81(2):119-124.
- Brower, J. van Z., and L. P. Brower. 1965. Experimental studies of mimicry. 6. The reaction of toads (*Bufo terrestris*) to honeybees (*Apis mellifera*) and their dronefly mimics (*Eristalis vinetorum*). *Amer. Midland Natur.* 96:297-307.
- Brower, L. P., J. van Z. Brower, and P. W. Westcott. 1960. Experimental studies of mimicry. 5. The reaction of toads (*Bufo terrestris*) to bumblebees (*Bombus americanorum*) and their robberfly mimics (*Mallophora bomboides*), with a discussion of aggressive mimicry. *Amer. Natur.* 94:343-355.

- Brown, Lauren E. 1969. Natural hybrids between two toad species in Alabama. *Quart. J. Florida Acad. Sci.* 32:285-290.
- , and M. J. Littlejohn. 1972. Male release call in the *americanus* group, p. 310-323. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- Burt, Charles E. 1938. The frogs and toads of the southeastern United States. *Trans. Kansas Acad. Sci.* 41:331-366.
- Carr, Archie F., Jr. 1940. A contribution to the herpetology of Florida. *Univ. Florida Publ. Biol. Sci. Ser.* 3(1):1-118.
- Cei, J. M., V. Ersamer, and M. Roseghini. 1968. Taxonomic and evolutionary significance of biogenic amines and polypeptides in amphibian skin. II. Toads of the genera *Bufo* and *Melanophryniscus*. *Syst. Zool.* 17(3):232-245.
- 1972. Biogenic amines, p. 233-243. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- Chamberlain, E. Burnham. 1939. Frogs and toads of South Carolina. *Charleston Mus. Leaflet* (12):1-38.
- Cochran, Doris M., and Coleman J. Goin. 1970. The new field book of reptiles and amphibians. G. P. Putnam's Sons, N.Y. xxii + 359 p.
- Conant, Roger. 1975. A field guide to reptiles and amphibians of eastern and central North America. Second Edition. Houghton Mifflin Co., Boston. xviii + 429 p.
- Cope, E. D. 1862. Catalogue of the reptiles obtained during the explorations of the Parana, Paraguay, Vermejo and Uruguay Rivers, by Capt. Thos. J. Page, U. S. N.; and of those procured by Lieut. N. Michler, U. S. Top. Eng., Commander of the expedition conducting the survey of the Atrato River. *Proc. Acad. Natur. Sci. Philadelphia* 14(9):346-359.
- 1863. On *Trachycephalus*, *Scaphiopus* and other American Batrachia. *Ibid.* 15:43-54.
- 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. *U.S. Nat. Mus. Bull.* (1):1-104.
- 1889. The Batrachia of North America. *Ibid.* (34):1-525.
- Daly, J. W., and B. Witkop. 1971. Chemistry and pharmacology of frog venom, p. 497-519. In W. Bücherl and E. Buckley (eds.), *Venomous animals and their venoms*. Vol. II. Academic Press, New York and London. 640 p.
- Davenport, C. B., and W. E. Castle. 1895. Studies on morphogenesis. III. On the acclimation of organisms to high temperature. *Arch. Ent. Mech. Org.* 2:227-249.
- DePoe, C. E., J. B. Funderberg, Jr., and T. L. Quay. 1961. The reptiles and amphibians of North Carolina: a preliminary check list and bibliography. *J. Elisha Mitchell Sci. Soc.* 77(2):125-136.
- Dessauer, Herbert C., Wade Fox, and Q. L. Hartwig. 1962. Comparative study of transferrins of Amphibia and Reptilia using starch-gel electrophoresis and autoradiography. *Comp. Biochem. Physiol.* 5:17-29.
- Dickerson, Mary C. 1906. The frog book. North American toads and frogs . . . Doubleday, Page and Co. xvii + 253 p.
- Dolphin, J. L. and E. Frieden. 1955. Biochemistry of amphibian metamorphosis. II. Arginase activity. *J. Biol. Chem.* 217:735-749.
- Duellman, William E., and A. Schwartz. 1958. Amphibians and reptiles of southern Florida. *Bull. Florida State Mus. Biol. Sci.* 3(5):181-324.
- Einem, G. E., and L. D. Ober. 1956. The seasonal behavior of certain Floridian Salientia. *Herpetologica* 12(3):205-212.
- Ferguson, D. E. 1961. The herpetofauna of Tishomingo County, Mississippi, with comments on its zoogeographic affinities. *Copeia* 1961(4):391-396.
- Fite, K. V. 1973. The visual fields of the frog and toad: a comparative study. *Behav. Biol.* 9:707-718.
- Freeman, Harry W. 1956. An ecological study of the fauna and flora of the Savannah River project area. Part V. The amphibians and reptiles of the Savannah River Project area. 4. Salientia. *Univ. South Carolina Publ. Ser. III, Biol.* 2(1):26-35.
- Funderberg, John B., Jr. 1955. The amphibians of New Hanover County, North Carolina. *J. Elisha Mitchell Sci. Soc.* 71(1):19-28.
- Gerhardt, H. Carl. 1975. Sound pressure levels and radiation patterns of the vocalizations of some North American frogs and toads. *J. Comp. Physiol.* 102(1):1-12.
- Gibbons, J. Whitfield, and J. W. Coker. 1978. Herpetofaunal colonization patterns of Atlantic Coast barrier islands. *Amer. Midland Natur.* 99(1):219-233.
- , and D. H. Bennett. 1974. Determination of anuran terrestrial activity patterns by a drift fence method. *Copeia* 1974(1):236-243.
- Goin, Coleman J., and Olive B. Goin. 1953. Temporal variation in a small community of amphibians and reptiles. *Ecology* 34(2):406-408.
- , and G. C. Jackson. 1965. Hemoglobin values of some amphibians and reptiles from Florida. *Herpetologica* 21(2):145-146.
- Goin, Olive B., Coleman J. Goin, and Konrad Bachmann. 1968. DNA and amphibian life history. *Copeia* 1968(3):532-540.
- Gorham, Stanley W. 1974. Checklist of world amphibians up to January 1, 1970. New Brunswick Museum, Saint John, New Brunswick. 172 p.
- Gosner, Kenneth L., and Irving H. Black. 1956. Notes on amphibians from the Upper Coastal Plain of North Carolina. *J. Elisha Mitchell Sci. Soc.* 72(1):40-47.
- 1958. Notes on larval toads in the eastern United States with special reference to natural hybridization. *Herpetologica* 14(1):133-140.
- Gut, H. James, and C. E. Ray. 1963. The Pleistocene vertebrate fauna of Reddick, Florida. *Quart. J. Florida Acad. Sci.* 26:315-328.
- Guttman, Sheldon I. 1969. Blood protein variation in the *Bufo americanus* species group of toads. *Copeia* 1969(2):243-249.
- 1972. Blood proteins, p. 265-278. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- Hansen, Keith L. 1960. The use of male southern toads and southern leopard frogs for pregnancy diagnosis. *Herpetologica* 16(1):33-38.
- Harman, W. J. 1971. A review of the subgenus *Allodero* (Oligochaeta: Naididae: *Dero*) with a description of *D. (A.) floridana* n.sp. from *Bufo terrestris*. *Trans. Amer. Microsc. Soc.* 90:225-228.
- Harper, F. 1935. Records of amphibians in the southeastern states. *Amer. Midland Natur.* 16(3):275-310.
- Hebard, W. B. 1964. Serum-protein electrophoretic patterns of the Amphibia, p. 649-657. In C. A. Leone (ed.), *Taxonomic biochemistry and serology*. Ronald Press, New York. x + 728 p.
- Holbrook, J. E. 1838. North American herpetology; or a description of the reptiles inhabiting the United States. Vol. 3. J. Dobson and Son, Philadelphia. iv + 122 p.
- 1842. North American herpetology; or a description of the reptiles inhabiting the United States. Vol. 5 (Second ed.). J. Dobson, Philadelphia. vi, 5-118 p.
- Holman, J. Alan. 1958. The Pleistocene herpetofauna of Sabertooth Cave, Citrus County, Florida. *Copeia* 1958(4):276-280.
- 1959a. Amphibians and reptiles from the Pleistocene (Illinoian) of Williston, Florida. *Ibid.* 1959(1):96-102.
- 1959b. A Pleistocene herpetofauna near Orange Lake, Florida. *Herpetologica* 15(1):121-125.
- 1962. Additional records of Florida Pleistocene amphibians and reptiles. *Ibid.* 18(2):115-119.
- Hutchison, Victor H., and M. J. Dady. 1964. The viability of *Rana pipiens* and *Bufo terrestris* submerged at different temperatures. *Herpetologica* 20(1):149-162.
- , Walter G. Whitford, and Margaret Kohl. 1968. Relation of body size and surface area to gas exchange in anurans. *Physiol. Zool* 41(1):65-85.
- Jaeger, Robert G., and Jack P. Hailman. 1973. Effects of intensity on the phototactic responses of adult anuran amphibians: a comparative study. *Z. Tierpsychol.* 33:352-407.
- Kessler, Matthew J., and John D. O'Benar. 1977. Amelanosis in a southern toad (*Bufo terrestris*). *Vet. Med. Small Animal Clinician* 72(4):638-639.
- Kingsbury, B. F. 1912. Amphibian tonsils. *Anat. Anz.* 42:593-613.
- Knepton, James C., Jr. "1951" (1952). The responses of male Salientia to human chorionic gonadotropic hormone. *Quart. J. Florida Acad. Sci.* 14(4):255-265.
- Krakauer, Thomas. 1968. The ecology of the neotropical toad, *Bufo marinus*, in south Florida. *Herpetologica* 24(2):214-221.
- Lewis, T. H. 1946. Reptiles and amphibians of Smith Island, N.C. *Amer. Midland Natur.* 36(3):682-684.
- Linnaeus, Carolus. 1766. *Systema naturae*. Editio Duodecima. Stockholm. 532 p.
- Livezey, R. L., and Albert H. Wright. 1947. A synoptic key to the salientia eggs of the United States. *Amer. Midland Natur.* 37(1):179-222.
- Low, Bobbi S. 1972. Evidence from parotid-gland secretions, p.

- 244–264. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- Lynch, John D. 1965. The Pleistocene amphibians of pit II, Arredondo, Florida. *Copeia* 1965(1):72–77.
- Martin, Robert F. 1972. Evidence from osteology, p. 37–70. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- 1973. Osteology of North American *Bufo*: The *americanus*, *cognatus*, and *boreas* species groups. *Herpetologica* 19(4):75–387.
- Martin, William F. 1972. Evolution of vocalization in the genus *Bufo*, p. 279–309. In W. F. Blair (ed.), *Evolution in the genus Bufo*. Univ. Texas Press, Austin. viii + 459 p.
- Martof, Bernard S. 1963. Some observations on the herpetofauna of Sapelo Island, Georgia. *Herpetologica* 19(1):70–72.
- McAlister, Wayne H. 1961. The mechanics of sound production in North American *Bufo*. *Copeia* 1961(1):86–95.
- Mount, Robert. 1975. The reptiles and amphibians of Alabama. Auburn Univ. Agr. Exp. Sta. vii + 347 p.
- Musick, J. A. 1972. Herptiles of the Maryland and Virginia Coastal Plain, p. 213–242. In Marvin L. Wass, et al. (eds.), *A check list of the biota of Lower Chesapeake Bay*. Virginia Inst. Marine Sci. Special Sci. Rep. (65):x + 290 p.
- Neill, Wilfred T. 1949. Hybrid toads in Georgia. *Herpetologica* 5(1): 30–32.
- 1950. Reptiles and amphibians in urban areas of Georgia. *Ibid.* 6(5):113–116.
- 1951. Amphibians and reptiles of a fifteen-acre tract in Georgia. *Amer. Midland Natur.* 45(1):241–244.
- Nelson, D. H. 1974. Ecology of anuran populations inhabiting thermally stressed aquatic ecosystems, with emphasis on larval *Rana pipiens* and *Bufo terrestris*. Ph.D. Dissertation, Michigan State Univ. 190 p.
- Netting, M. Graham, and Coleman J. Goin. 1946. The correct names of some toads from eastern United States. *Copeia* 1946(1):107.
- Olmo, E. 1973. Quantitative variations in the nuclear DNA and phylogenesis of the Amphibia. *Caryologia* 26(1):43–68.
- Palay, S. L. 1944. The histology of the meninges of the toad (*Bufo*). *Anat. Rec.* 88(3):257–270.
- Palmer, William M., and David E. Whitehead. 1961. Herpetological collections and observations in Hyde and Tyrrell counties, North Carolina. *J. Elisha Mitchell Sci. Soc.* 77(2):280–289.
- Porter, Kenneth R., and Wendy F. Porter. 1967. Venom comparisons and relationships of twenty species of New World toads (genus *Bufo*). *Copeia* 1967(2):298–307.
- Riemer, William J. 1958(1959). Giant toads of Florida. *Quart. J. Florida Acad. Sci.* 21(3):207–211.
- Salthe, S. N. 1953. The egg capsules in the Amphibia. *J. Morphol.* 113(2):161–171.
- Sanders, Ottys. 1953. A new species of toad, with a discussion of morphology of the bufonid skull. *Herpetologica* 9(1):25–47.
- 1961. Indications for the hybrid origin of *Bufo terrestris* Bonaterre. *Ibid.* 17(3):145–156.
- Schmidt, Karl P. 1953. A checklist of North American amphibians and reptiles. Sixth edition. *Amer. Soc. Ichthyol. Herpetol.* viii + 280 p.
- Shaw, George. 1802. *General zoology or systematic natural history*. Vol. 3, Pt. 1. G. Kearsley, London. vi + 312 p.
- Smith, Gary C. 1976. Ecological energetics of three species of ectothermic vertebrates. *Ecology* 57:252–264.
- Smith, Philip W., and J. C. List. 1955. Notes on Mississippi amphibians and reptiles. *Amer. Midland Natur.* 53(1):115–125.
- Sonnini, C. S., and P. A. Latreille. 1802. *Histoire naturelle des reptiles*. V. 2. Paris. 332 p.
- Starrett, Pricilla H. 1973. Evolutionary patterns in larval morphology, p. 251–271. In J. L. Vial (ed.), *Evolutionary biology of the anurans*. Univ. Missouri Press, Columbia. 470 p.
- Stejneger, Leonhard, and Thomas Barbour. 1917. *A check list of North American amphibians and reptiles*. Harvard Univ. Press, Cambridge. iv + 5–125 p.
- Telford, Sam R., Jr. 1952. A herpetological survey in the vicinity of Lake Shipp, Polk County, Florida. *Quart. J. Florida Acad. Sci.* 15(3):175–185.
- Thorson, Thomas, and A. Svihla. 1943. Correlation of the habits of amphibians with their ability to survive the loss of body water. *Ecology* 24(3):374–381.
- Tihen, Joseph A. 1962a. Osteological observations on New World *Bufo*. *Amer. Midland Natur.* 67(1):157–183.
- 1962b. A review of New World fossil bufonids. *Ibid.* 68(1):1–50.
- Truitt, John O. 1964. Observations on the defensive attitude of a southern toad (*Bufo terrestris*). *British J. Herpetol.* 3:167.
- Volpe, E. Peter. 1953. Embryonic temperature adaptations and relationships in toads. *Physiol. Zool.* 26:344–354.
- 1959a. Hybridization of *Bufo valliceps* with *Bufo americanus* and *Bufo terrestris*. *Texas J. Sci.* 11(3):335–342.
- 1959b. Experimental and natural hybridization between *Bufo terrestris* and *Bufo fowleri*. *Amer. Midland Natur.* 61:295–312.
- Walton, A. C. 1940. Notes on amphibian parasites. *Proc. Helminthol. Soc. Washington* 7(2):87–91.
- Werler, John E., and J. McCallion. 1951. Notes on a collection of reptiles and amphibians from Princess Anne County, Virginia. *Amer. Midland Natur.* 45(1):245–252.
- Witliff, J. L. 1963. Parotid gland secretions in two species groups of toads (genus *Bufo*). *Evolution* 16(2):143–153.
- Wright, Albert Hazen. 1932. *Life-histories of the frogs of Okefinokee Swamp, Georgia*. North American Salientia (Anura) No. 2. Macmillan Co., New York. xv + 497 p.
- , and Anna A. Wright. 1924. *A key to the eggs of the salientia east of the Mississippi River*. *Amer. Natur.* 58:375–381.
- , and — 1949. *Handbook of frogs and toads of the United States and Canada*. Third ed. Comstock Pub. Co., Ithaca, N.Y. xii + 640 p.
- Zug, George R. 1972. Anuran locomotion: structure and function. I. Preliminary observations on relation between jumping and osteometrics of appendicular and postaxial skeleton. *Copeia* 1972(4):613–624.
- 1978. Anuran locomotion: structure and function. II. Jumping performance of semiaquatic, terrestrial, and arboreal frogs. *Smithsonian Contrib. Zool.* (276):1–31.

CHARLES R. BLEM, VIRGINIA COMMONWEALTH UNIVERSITY, RICHMOND, VIRGINIA 23284.

Primary editor for this account, Richard G. Zweifel.

Published 6 September 1979 by the SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES.