Catalogue of American Amphibians and Reptiles.

WEBB, ROBERT G. 1973. *Trionyx ferox.*

Trionyx ferox (Schneider)
Florida softshell turtle

[*Testudo*] *ferox* Schneider, 1783:330. Type-locality, "Savannah and Altamaha rivers; and . . . rivers in east Florida" (Garden in Pennant, 1772); restricted to "Georgia" (Boulenger, 1889), to "Savannah river, Ga." (Baur, 1893), and to Savannah (Webb, 1962) as implied by Schwartz (1956). Holotype, stuffed adult female and skull, British Museum (Natur. Hist.) 53A (old number)/1947.3.6.17 (new number), received from Dr. Alexander Garden (not examined by author). See Comment.

T[*estudo*] *mollis* Lacépède, 1788:137. Substitute name for *Testudo ferox* Schneider, 1783.

Testudo (*ferox?*) *verrucosa* Schoepff, 1795:90. Type-locality, "the Halfway pond" (Bartram, 1791); restricted to "southwestern Putnam County... between the present Palatka and Gainesville, Fla." by Harper (1940). Type not known to exist; name based on Bartram's description of "the great soft-shelled tortoise" (1791). See Comment.

Testudo Bartrami Daudin, 1801:74. Substitute name for *Testudo* (*ferox?*) *verrucosa* Schoepff, 1795.

Trionyx Georgicus Geoffroy St.-Hilaire, 1809b:17. Substitute name for *Testudo ferox* Schneider, 1783. See Comment.

Trionyx ferox: Schweigger, 1812:285. First use of combination.

Amyda ferox: Oken, 1816:348. First use of combination, but unavailable for purposes of zoological nomenclature. See Comment.

Trionyx Bartrami: LeConte, 1830:96. First use of combination.

Mesodeca bartrami Rafinesque, 1832:64. Substitute name for *Testudo* (*ferox?*) *verrucosa* Schoepff, 1795.

Trionyx Harlani Harlan, 1835:159. Type-locality, "East Florida." Type not known to exist. See Comment.

Chelys Bartramii: Duméril and Bibron, 1835: 477. First use of combination (as synonym of *Gymnopus spiniferus*), but proposed earlier by Geoffroy St.-Hilaire (1809b).

Aspidonectes ferox: Duméril and Bibron, 1835:477. First use of combination (as synonym of *Gymnopus spiniferus*), but proposed earlier by Wagler (1830).

Platypelt. [is] *ferox:* Fitzinger, 1843:30. First use of combination, but proposed earlier by Fitzinger (1835).

Amyda ferox ferox: Neill, 1951:15. First use of trinomial.

Trionyx ferox ferox: Schmidt, 1953:108. Transfer to genus *Trionyx.*

• CONTENT. No subspecies are recognized.

• DEFINITION. *Trionyx ferox* is the largest softshell in North America, but the maximum size of both sexes is uncertain; the largest females probably have a carapace about two feet long. The known maximum size of the carapace in adult males is near 33 cm and of adult females 45 cm. A marginal ridge is present on the carapace, and ridges project on either side of the nasal septum. The anteriormost part and edge of the carapace are studded with blunt, rounded tubercles. The surface of the carapace is adorned with longitudinal rows of tubercles that resemble ridges in young turtles; in adults this longitudinal ridging of more widely spaced tubercles is less evident. The carapace of adult males is smooth (not gritty to the touch) with low, rounded tubercles, not spiny-tipped. The distinctive juvenile pattern on the carapace consists of large blackish (mostly circular) blotches (some with pale centers) on a pale background. Unlike other American species this juvenile carapace pattern is not distinct in large males, but consists at most of indistinct, large black blotches. The carapace of large adults of both sexes lacks any contrasting pattern and is mostly uniform dark grayish black. Adults of both sexes lack a pale marginal rim on the carapace. The plastron usually extends farther forward that the carapace in adults. The dark gray plastron and dark-marked underside of carapace in hatchlings both become uniformly whitish with increasing size. Contrasting pale markings on the head of hatchlings and small juveniles are evident in some large males but are mostly absent in large females.

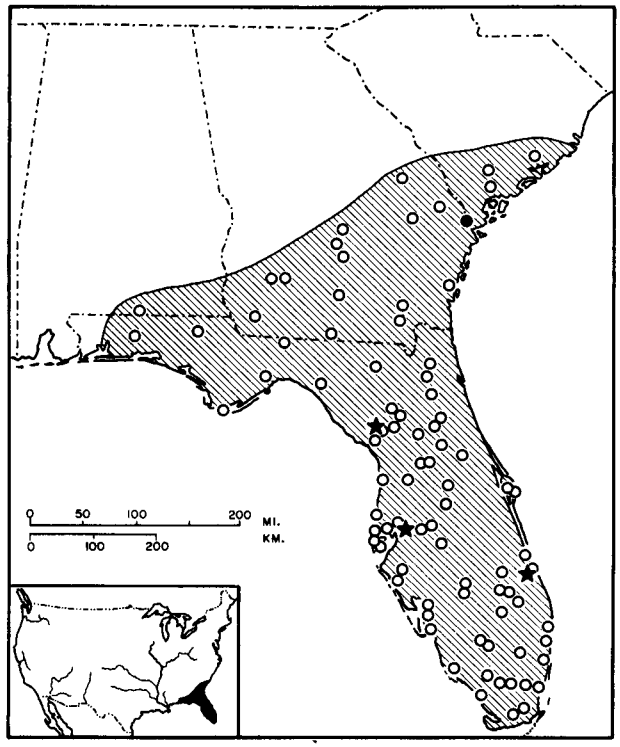
The greatest width of the skull is usually at the level of the quadratojugals. The skull usually lacks an opisthotic-exoccipital spur. Usually there are no callosities on the epiplastron and preplastra and often there is no suture between the hyo-hypoplastra. The number of both neurals and pairs of costals (= pleurals) is usually seven, occasionally eight. In other skeletal features *T. ferox* is not unlike *T. spiniferus.* Some large skulls of *T. ferox* have widened alveolar surfaces of the jaws.

• DESCRIPTIONS. Webb (1962) provided detailed descriptions of external morphology, color pattern, proportions, including individual and ontogenetic variation, and descriptions of skull, carapace and plastron.

• ILLUSTRATIONS. Photographs of hatchlings and an adult male and female, and line drawings of dorsal surface of snout, side of head, hind foot, and anterior edge of carapace appear in Webb (1962). Schwartz (1956) provides dorsal-view photographs of a juvenile, and an adult female with detail of the anterior part of the carapace. Conant (1958) provides photographs of an adult male and female as well as colored photographic prints of young turtles. A colored photograph of an adult is in Pritchard (1967). Aspects of the egg are illustrated by Agassiz (1857). Hatching turtles are photographed by Koschman (1967). Photographs of skulls (including that of holotype), some showing widened alveolar surfaces of jaws, and of juveniles and adults are in Stejneger (1944). Line drawings of the penis, anteroplastral elements, choanae and papillae, and of the nasal cavity are in Zug (1966), Williams and McDowell (1952), and Parsons (1968, 1970 and 1971), respectively. Other photographs of juveniles and adults are in regional studies and handbooks.

• DISTRIBUTION. *Trionyx ferox* has a relatively restricted geographic range in the southeastern United States, extending from southern South Carolina and Georgia, into southern Alabama, and including most of Florida except the Keys and the extreme western end of the panhandle. Records of occurrence depicted on the distribution map include those in Webb (1962; including the westernmost record from Okaloosa County, Florida), Mount and Folkerts (1968; Covington County, Alabama), and Blaney (1971; St. Vincent Is., Franklin County, Florida).

The species occurs in all kinds of freshwater habitats in Florida (Duellman and Schwartz, 1958). In the northern part of the range where *T. ferox* overlaps the range of *Trionyx spiniferus asper* the two species are mostly separated ecologically with *ferox* in lotic and *asper* in lentic habitats (Crenshaw and Hopkins, 1955). *Trionyx ferox* seems to frequent brackish-marine waters (Neill, 1958).



MAP. Solid circle marks type-locality; open circles indicate other records. Stars indicate fossil localities.

• FOSSIL RECORD. All records are from the Pleistocene of Florida; counties include Hillsborough (Hay, 1908), and St. Lucie and Levy (Gehlbach, 1965).

• PERTINENT LITERATURE. The most recent taxonomic treatment of *T. ferox* is by Webb (1962), who discusses relationships with other American species and summarizes life history information. Loveridge and Williams (1957) discuss *T. ferox* in their scheme of trionychid species relationships. Additional papers, not cited in Webb (1962), deal with dispersal barrier in Florida (Blaney, 1971), ecology (Koschman, 1966), egg-laying and hatching (Koschman, 1967), healing techniques (Bickel, 1960), bones associated with Indian sites (Wing, 1965), shell and sternum (Wyman, 1851), cervical vertebrae (Williams, 1950), cranial arteries and foramina (Albrecht, 1967), choanal papillae and nasal anatomy (Parsons, 1968 and 1971), penial morphology (Zug, 1966), pelvic girdle, buoyancy, and locomotion (Zug, 1971), diploid chromosome number of 66 (Becak, Becak, Nazareth, and Ohno, 1964), chromosomal DNA (Atkin, Mattinson, Becak, and Ohno, 1965), respiration (Hilber, 1932), anoxia and aquatic respiration (Belkin, 1963), body temperature (Brattstrom, 1965), critical thermal maximum (Hutchison, Vinegar, and Kosh, 1966), blood group studies (Frair, 1963), serological relationships (Frair, 1964 and 1972), transferrins (Dessauer, Fox and Hartwig, 1962), plasma electrolytes, organic constituents of plasma, and electrophoretic patterns of plasma proteins (Dessauer, 1970), and structure-histochemistry of adrenal gland (Hebard and Charipper, 1955). See Comment.

• ETYMOLOGY. The name *ferox* (Latin) means warlike or fierce, and alludes to the ferocious disposition attributed to the species (see footnote in Stejneger, 1944:25).

COMMENT

The original description of *Trionyx ferox* (quoted by Stejneger, 1944) was prepared by Dr. Alexander Garden, but was sent to and published by Thomas Pennant (1772), who failed to use binomial nomenclature. The early taxonomic history of *T. ferox* is discussed in detail by Stejneger (1944). Geoffroy employed *Trionyx georgicus* in his detailed formal description of the genus *Trionyx* published in August (1809b), but in a brief, preliminary account published earlier in July (1809a), Geoffroy used the name *Trionyx georgianus*. The name *Trionyx harlani*, first proposed by Thomas Bell, is discussed by Stejneger (1944). All other synonyms of *T. ferox* are discussed by Webb (1962). *Trionyx ferox* is the type-species of the genus *Platypeltis* by subsequent designation (Fitzinger, 1843). Smith and Smith (1963) discuss this type-species designation and mention the unavailability of Oken's work (1816) for purposes of zoological nomenclature.

Romer (1956:514) lists the genus *Chemelys* Rafinesque as a synonym of *Trionyx*. Rafinesque (1832) describes *Chemelys* only as having "Warty Scales, no valves 4 toes to all the feet. *T. verrucosa* &c." *T. verrucosa*, the type-species of the genus *Chemelys* by monotypy, is a synonym of *Trionyx ferox* but it is also a name that refers to *Geoemyda* (= *Rhinoclemmys*) *punctularia*. Wermuth (1956) discussed the homonymy of the two names. Rafinesque's description of warty scales (presumably alluding to ridged epidermal scutes on carapace), no valves (in context, referring to moveable anterior and posterior lobes of plastron), and four toes is considered applicable to *Geoemyda punctularia* and not to *Trionyx ferox*.

Many references to *T. ferox* prior to Webb (1962) may apply to *T. spiniferus*. The two species were confused until distinguished by Agassiz (1857), but he considered the young of *T. s. asper* to be the young of *T. ferox*, and the species *ferox* to range widely in the southeastern United States. This range misconception persisted through the years and was further complicated by Neill (1951) who considered *spiniferus* conspecific with *ferox*.

Trionyx ferox is more closely related to Asian members of the genus than to any American species (Webb, 1962).

LITERATURE CITED

Agassiz, Louis. 1857. Contributions to the natural history of the United States of America. Vol. 1 & 2. Little, Brown and Co., Boston. 643 p.

Albrecht, Philip W. 1967. The cranial arteries and cranial arterial foramina of the turtle genera *Chrysemys*, *Sternotherus*, and *Trionyx*. A comparative study with analysis of possible evolutionary implications. Tulane Stud. Zool. 14(3):81–89.

Atkin, N. B., Gail Mattinson, Willy Becak, and Susumu Ohno. 1965. The comparative DNA content of 19 species of placental mammals, reptiles, and birds. Chromosoma 17: 1–10.

Bartram, William. 1791. Travels through North and South Carolina, Georgia, east and west Florida, . . . [First edition] Philadelphia. xxxiv + 522 p.

Baur, G. 1893. Notes on the classification and taxonomy of the Testudinata. Proc. Amer. Philos. Soc. 31:210–225.

Becak, Willy, Maria Luiza Becak, H. R. S. Nazareth, and Susumu Ohno. 1964. Close karyological kinship between the reptilian suborder Serpentes and the class Aves. Chromosoma 15:606–617.

Belkin, Daniel A. 1963. Anoxia: Tolerance in reptiles. Science 139:492–493.

Bickel, C. 1960. Erfahrungen und Heilerfolge mit kranken Schildkröten. Aquar. Terrar. Z. 13(12):374–377.

Blaney, Richard M. 1971. An annotated check list and biogeographic analysis of the insular herpetofauna of the Apalachicola region, Florida. Herpetologica 27(4):406–430.

Boulenger, George Albert. 1889. Catalogue of the chelonians, rhynchocephalians, and crocodiles in the British Museum (Natural History). Taylor and Francis, London. x + 311 p.

Brattstrom, Bayard H. 1965. Body temperatures of reptiles. Amer. Midland Nat. 73(2):376–422.

Conant, Roger. 1958. A field guide to reptiles and amphibians of eastern North America. Houghton Mifflin Co., Boston. xviii + 366 p.

Crenshaw, John W., Jr. and Milton N. Hopkins, Jr. 1955. The relationships of the soft-shelled turtles *Trionyx ferox ferox* and *Trionyx ferox aspera*. Copeia 1955(1):13–23.

Daudin, F. M. 1801. Histoire naturelle, générale et particulière des reptiles. Vol. 2. F. Dufart, Paris. 432 p.

Dessauer, Herbert C. 1970. Blood chemistry of reptiles: Physiological and evolutionary aspects. P. 1–72. *In* Carl Gans and Thomas S. Parsons (ed.), Biology of the Reptilia, Morphology C, Vol. 3. Academic Press, New York.

—, Wade Fox, and Quentin L. Hartwig. 1962. Comparative study of transferrins of Amphibia and Reptilia using starch-gel electrophoresis and autoradiography. Comp. Biochem. Physiol. 5(1):17–29.

Duellman, William E. and Albert Schwartz. 1958. Amphibians and reptiles of southern Florida. Bull. Florida State Mus. 3(5):81–324.

Duméril, A. M. C. and G. Bibron. 1835. Erpétologie générale ou histoire naturelle complète des reptiles. Vol. 2. Librairie Encyclopédique de Roret, Paris. iv + 682 p.

Fitzinger, Leopoldo. 1835. Entwurf einer systematischen Anordnung der Schildkröten nach den Grundsätzen der natürlichen Methode. Ann. Mus. Wien 1:102–128.

—. 1843. Systema reptilium. Fasciculus primus, Amblyglossae. Vindobonae, Braumüller et Seidel, Vienna. vi + 106 + [3] p.

Frair, Wayne. 1963. Blood group studies with turtles. Science 140:1412–1414. [Reprinted in Intern. Turtle Tortoise Soc. J. 1(2):30–32, 1967.]

—. 1964. Turtle family relationships as determined by serological tests. P. 535–544. *In* Charles A. Leone (ed.), Taxonomic biochemistry and serology. Ronald Press Co., New York. [Reprinted in Intern. Turtle Tortoise Soc. J. 1(5):12–18, 1967.]

—. 1972. Taxonomic relations among chelydrid and kinosternid turtles elucidated by serological tests. Copeia 1972 (1):97–108.

Gehlbach, Frederick R. 1965. Amphibians and reptiles from the Pliocene and Pleistocene of North America: A chronological summary and selected bibliography. Texas J. Sci. 17(1):56–70.

Geoffroy Saint-Hilaire, E. 1809a. Memoire sur les tortues molles. Nouv. Bull. Sci. Philom. Paris 1(22):363–367.

—. 1809b. Memoire sur les tortues molles, nouveau genre sous le nom de *Trionyx*, et sur la formation des carapaces. Ann. Mus. Hist. Nat. Paris 14:1–20.

Harlan, R. 1835. Genera of North American Reptilia, and a synopsis of the species. P. 84–160. *In* Medical and physical researches: or original memoirs in medicine, surgery, physiology, geology, zoology, and comparative anatomy. Privately published, Philadelphia.

Harper, Francis. 1940. Some works of Bartram, Daudin, Latreille, and Sonnini, and their bearing upon North American herpetological nomenclature. Amer. Midland Nat. 23(3):692–723.

Hay, O. P. 1908. The fossil turtles of North America. Publ. Carnegie Inst. Washington (75):1–568.

Hebard, W. B. and H. A. Charipper. 1955. A comparative study of the morphology and histochemistry of the reptilian adrenal gland. Zoologica 40:101–123.
Hilber, Hermann. 1932. Der formative Einfluss der Luft auf die Atemorgane. Vergleichende Untersuchung über Bau und Entwicklung von Reptilien- und Säugerlunger. Gegenbaurs Morph. Jahrb. Mikrosk. Anat. Abt. I. 71(1/2):184–265.
Hutchison, Victor H., Allen Vinegar, and Richard J. Kosh. 1966. Critical thermal maxima in turtles. Herpetologica 22(1):32–41.
Koschman, Gale. 1966. Turtles and the Everglades water problem. Intern. Turtle Tortoise Soc. J. 1(1):21–22, 36, 47.
—. 1967. A softshell comes to life. *Ibid.* 1(6):9.
Lacépède, B. G. E. 1788. Histoire naturelle des quadrupèdes ovipares et des serpens. Vol. 1. Paris. 668 p.
LeConte, J. 1830. Description of the species of North American tortoises. Ann. Lyceum Nat. Hist. New York 8:91–131.
Loveridge, Arthur and Ernest E. Williams. 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. Bull. Mus. Comp. Zool. 115(6):163–557.
Mount, Robert H. and George W. Folkerts. 1968. Distribution of some Alabama reptiles and amphibians. Herpetologica 24(3):259–262.
Neill, Wilfred T. 1951. Taxonomy of North American softshelled turtles, genus *Amyda*. Publ. Res. Div. Ross Allen's Rept. Inst. 1(2):7–24.
—. 1958. The occurrence of amphibians and reptiles in saltwater areas, and a bibliography. Bull. Marine Sci. Gulf Caribbean 8(1):1–97.
Oken, L. 1816. Lehrbuch zoologie (Naturgeschichte III, 2). Leipzig. xvi + 1270 p.
Parsons, Thomas S. 1968. Variation in the choanal structure of Recent turtles. Canadian J. Zool. 46(6):1235–1263.
—. 1970. The nose and Jacobson's Organ. P. 99–191. *In* Carl Gans and Thomas S. Parsons (ed.), Biology of the Reptilia, Morphology B, Vol. 2. Academic Press, New York.
—. 1971. Nasal anatomy of trionychid turtles. J. Morph. 135 (3):323–334.
Pennant, Thomas. 1772. An account of two new tortoises: in a letter to Matthew Maty. M.D. Sci. R.S. Philos. Trans. London (1771) 61:266–273.
Pritchard, Peter C. H. 1967. Living turtles of the world. T. F. H. Publ. Inc., Jersey City. 288 p.
Rafinesque, C. S. 1832. Description of two new genera of softshell turtles of North America. Atlantic J. Friend Knowledge, Philadelphia 1(2):64–65.
Romer, Alfred S. 1956. Osteology of the reptiles. Univ. Chicago Press, Chicago. xxi + 772 p.
Schmidt, Karl P. 1953. A check list of North American amphibians and reptiles. Sixth edition. Amer. Soc. Ichthyol. Herpetol., Chicago. vii + 280 p.
Schneider, J. G. 1783. Allgemeine Naturgeschichte der Schildkröten, nebst einem System. Verzeichnisse der einzelnen Arten. Leipzig. 364 p.
Schoepff, J. D. 1792–1801. Historia testudinum iconibus illustrata. Erlangae, Io. Iac. Palmii, xii + 136 p.
Schwartz, Albert. 1956. The relationships and nomenclature of the soft-shelled turtles (genus *Trionyx*) of the south eastern United States. Charleston Mus. Leaflet (26):1–21.
Schweigger, A. F. 1812. Prodromous Monographiae Cheloniorum. Konigsberger Archiv. Naturwiss. Math. 1:271–368, 406–458.
Smith, Hobart M. and Philip W. Smith. 1963. *Amyda* Fitzinger, 1843 (Reptilia, Testudines): Proposed suppression under the plenary powers Z.N.(S.)229. Bull. Zool. Nomencl. 20(2):121–127.
Stejneger, Leonhard. 1944. Notes on the American soft-shell turtles, with special reference to *Amyda agassizii*. Bull. Mus. Comp. Zool. 94(1):1–75.
Wagler, Joh. 1830. Natürliches System der Amphibien, mit vorangehender Classification der Säugethiere und Vögel. J. G. Cotta'sche Buchhandl., München, Stuttgart, Tübingen. vi + 354 p.
Webb, Robert G. 1962. North American Recent soft-shelled turtles (family Trionychidae). Univ. Kansas Publ. Mus. Natur. Hist. 13(10):429–611.
Wermuth, Heinz. 1956. Versuch der Deutung einiger bisher ubersehener Schildkröten-namen. Zool. Beitrage, N. F. 2 (2–3):399–423.
Williams, Ernest Edward. 1950. Variation and selection in the cervical central articulations of living turtles. Bull. Amer. Mus. Nat. Hist. 94:505–562.
— and Samuel B. McDowell. 1952. The plastron of softshelled turtles (Testudinata, Trionychidae): A new interpretation. J. Morph. 90(2):263–275.
Wing, Elizabeth. 1965. Animal bones associated with two Indian sites on Marco Island, Florida. Florida Anthropol. 18(1):21–28.
Wyman, J. 1851. On the shell and sternum of *Trionyx ferox*. Proc. Boston Soc. Natur. Hist. 4:10.
Zug, George R. 1966. The penial morphology and the relationships of cryptodiran turtles. Occ. Pap. Mus. Zool. Univ. Michigan (647):1–24.
—. 1971. Buoyancy, locomotion, morphology of the pelvic girdle and hindlimb, and systematics of cryptodiran turtles. Misc. Publ. Mus. Zool. Univ. Michigan (142):1–98.

R. G. Webb, University of Texas at El Paso, El Paso, Texas 79968.

Primary editor for this account, George R. Zug.

Published 25 October 1973 by the Society for the Study of Amphibians and Reptiles.