

Catalogue of American Amphibians and Reptiles.

Ernst, Carl H. 1988. *Chrysemys*.

***Chrysemys* Gray
Painted Turtles**

Chrysemys Gray, 1844: 27. Type-species, *Chrysemys picta* Schweigger (= *Testudo picta* Schneider, 1783), designated by Hay, 1908: 345.

Clemmys: Fitzinger, 1835:124. In part.

Emys: Gray, 1855:33. In part.

Chrysemis: Kallert, 1927:372. Ex errore.

Chrysema: Chan and Cohen, 1964:336. Ex errore.

• **Content.** One living species, *C. picta*, with four subspecies (*picta*, *bellii*, *marginata*, *dorsalis*), and one extinct species, *C. timida*, are recognized (Mlynarski, 1976).

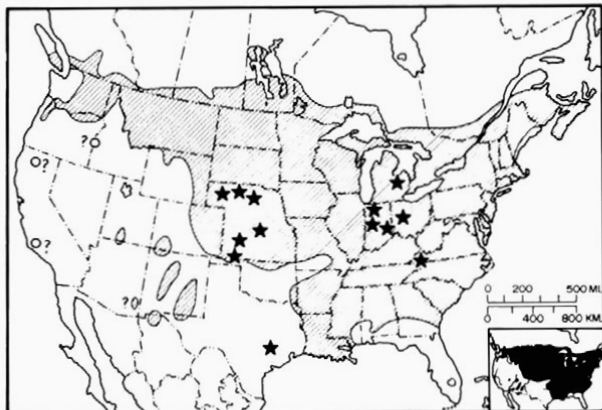
• **Definition.** Adults reach 252 mm in carapace length; females grow larger than males. The oval carapace is smooth, flattened, keelless, with an unserrated posterior rim, and centrally highest and widest. It is olive to black with patterns of red and yellow; marginals always have red marks. The plastron is hingeless, with a slight posterior notch, and yellow, often with a variable black or red-brown blotch. The entoplastron lies anterior to the humeropectoral seam. Axillary and inguinal buttresses are moderate. The moderate-sized head has a slightly projecting snout, and the upper jaw is anteriorly notched with a toothlike projection on each side. The upper alveolar surface is narrow and has a weak medial ridge. Both palatines and pterygoids contribute to the alveolar surface. The temporal arch is complete, and the nasopalatine foramen is larger than the posterior palatine foramen. The lower parietal process does not always contact the palatine, and the pterygoid does not extend backward to the level of the exoccipital. The quadrate does not enclose the stapes. Skin is olive to black with yellow or red stripes. A yellow stripe extends backward from below the orbit and may meet a similar stripe from the lower jaw. A large, dorsolateral spot and a yellow streak lie on each side of the head behind the eye. Two biconvex vertebrae occur in the neck; neck vertebrae are not elongated, and the 2nd to 8th are shortest. Dorsal rib heads are normal. The fifth toe has only two phalanges; toes are webbed.

• **Descriptions.** General descriptions are in Ernst and Barbour (1972, 1988; Conant (1975), Pritchard (1979), and Obst (1983). Detailed anatomical and histological descriptions are in Haines (1969), Northcutt (1970), Ernst (1971b), Walker (1971, 1972, 1973), Zug (1971), Mahmoud et al. (1973), Dantzer (1976), Moll (1979), and Powers and Reiner (1980). Other descriptions are listed in Ernst (1971d).

• **Illustrations.** Color photographs of adults or juveniles are in Ernst and Barbour (1972), Conant (1975), and Pritchard (1979); for other photographs see Smith and Smith (1979) and Ernst and Barbour (1988). Other illustrations: skull (Ernst and Barbour, 1972), epiphyses and sesamoid bones (Haines, 1969); kyphosis (Ernst, 1971f); brain (Northcutt, 1970; Powers and Reiner, 1980); nephrons (Dantzer, 1976); spermatogenesis (Ernst, 1971b; Moll, 1979); and extraembryonic membranes (Ewert, 1985). Other illustrations are listed in Ernst (1971d).

• **Distribution.** *Chrysemys* is the only North American turtle genus to range across the continent. It occurs across southern Canada, from Nova Scotia and New Brunswick to British Columbia, and south to Georgia, Alabama, Mississippi, Louisiana, north-eastern Texas, Oklahoma, eastern Colorado and Wyoming, Idaho and Oregon. It is also found in scattered localities in south-western Colorado, New Mexico, western Texas, Arizona, Utah, and Chihuahua, Mexico.

• **Fossil Record.** Late Miocene (Barstovian) fossils of



Map. Distribution of the genus *Chrysemys*. Stars indicate fossil localities.

Chrysemys picta are from Brown and Cherry counties, Nebraska (Holman, 1976; Holman and Sullivan, 1981). Pleistocene records are from Hancock, La Porte, and Pulaski counties, Indiana (Ernst, 1971d; Teller and Bardack, 1975; Graham et al., 1983); Jewell and Meade counties, Kansas (Schultz, 1965; Rogers, 1982; Holman, 1987); Oakland County, Michigan (Wilson, 1967); Darke County, Ohio (Holman, 1986); and there is a Late Pleistocene-Holocene fossil from Smyth County, Virginia (Holman and McDonald, 1986). The Pleistocene species *Chrysemys timida* Hay, 1908 was discovered in Sheridan County, Nebraska. Other fossils that may represent either of these species have been reported from the lower Pliocene, Trego County, Kansas (Wilson, 1968).

• **Pertinent Literature.** A summary of the pertinent papers on *Chrysemys picta* not included in Ernst (1971d) is presented. General accounts are by Ernst and Barbour (1972, 1988), Pritchard (1979b), Smith and Smith (1979), Caldwell and Collins (1981), and Obst (1983). Other important references are listed below by topics. Taxonomy: Ernst (1971d), Holman (1977), Ernst and Ernst (1980), Vogt and McCoy (1980), and Obst (1983). Distribution and Zoogeography: Ernst and Ernst (1971), Ernst (1973), Degenhardt and Christiansen (1974), Ernst and Fowler (1977), Cliburn (1979), Pritchard (1979a), Hulse (1980), Groves (1983), Iverson (1986), McAlpine and Godin (1986), and King (1987). Karyotype: Stock (1972), Killebrew (1977), and Bickham (1981). Electrophoresis and blood chemistry: Frair (1963, 1964), Dessauer (1970), and Dugoy (1970). Reproduction: Evans (1940a, b), Furieri (1969), Gemmill (1970), Ernst (1971b, f), Licht (1972, 1982), Christiansen and Moll (1973), Grogan and Williams (1973), Moll (1973, 1979), Callard, I. P. et al. (1976), Quay (1976), Callard, G. V. and Ryan (1977), Carpenter and Ferguson (1977), Klicka and Mahmoud (1977, 1978), Lance et al. (1977), Mason (1977), Callard, I. P. and Hirsch (1978), Callard, I. P. et al. (1978), Lance and Callard (1978a, b), Tracy et al. (1978), Tucker (1978), Tucker et al. (1978), Ehrenfeld (1979), Mitchell (1979, 1985a, b), Ho et al. (1980, 1981, 1982), Snow (1980), Packard, G. C. et al. (1981), Congdon and Tinkle (1982), Koob and Callard (1982), Feldman (1983), Breitenbach et al. (1984), Lance (1984), Ackerman et al. (1985), Congdon and Gibbons (1985, 1987), Dubois and Callard (1985), Licht and Porter (1985), Licht et al. (1985), Yaron (1985), Schwarzkopf and Brooks (1986), and Christens and Bider (1987). Sex determination: Bull and Vogt (1981), Diamond (1983), Gutzke and Bull (1986), Gutzke and Paukstis (1983, 1984), Paukstis et al. (1984), Schwarzkopf and Brooks (1985, 1987), Vogt and Bull (1984), and Gutzke et al. (1987). Embryology: Warren (1911), Krabbe (1935), Mahmoud et al. (1973), Fallon and Cameron (1977), Ewert (1979, 1985), Senn (1979), Raynaud and Pieau (1985), Gutzke and Packard (1986), and Packard and Packard (1986). Growth: Nicol (1970), Ernst (1971c), Quinn and Christiansen (1972), Wilbur (1975), Tucker (1978), Andrews (1982), Hart (1982), Iverson (1982), MacCulloch and Secoy (1983), and Webb and Cashatt (1985). Immunity: Coe (1972) and Cooper et al. (1985). Morphology: Albrecht (1967), Zangerl (1969), Baird (1970), Bockman (1970), Clark (1970), Gabe

(1970), Green (1970), Lynn (1970), Northcutt (1970), Parsons (1970), Underwood (1970), Khairallah and Clark (1971), Walker (1971, 1972, 1973), Zug (1971), Schumacher (1973), Winokur and Legler (1974, 1975), Fox (1977), Luppia (1977), Ottaviani and Tazzi (1977), Parsons and Cameron (1977), Berger and Burnstock (1979), Kusuma et al. (1979), Miller and Kasahara (1979), Parent (1979), Schwab (1979), Stock (1979), ten Donkelaar and Nieuwenhuys (1979), Powers and Reiner (1980), and Bellairs and Kamal (1981). Physiology: Burdick (1968), Butler and Knox (1970), Kupchella and Jacques (1970), Trobec and Stanley (1971), Serrane et al. (1972), Spray and May (1972), Bosler and Delahayer (1973), Kepenis and McManus (1974), Barone and Jacques (1975), Callard (1975), Bennett and Dawson (1976), Bentley (1976), Dantzler (1976), Howell and Rahn (1976), Misom and Jones (1976), Scoczylas (1978), Belehkova (1979), Mahmoud and Klicka (1979), Brewer and Ensor (1980), Langille and Crisp (1980), Gatten (1981), Parmeter (1981), Costanzo (1982), Jackson and Ultsch (1982), Lilywhite and Maderson (1982), Minnich (1982), Seymour (1982), Ultsch and Jackson (1982), Maginniss et al. (1983), Packard, G. C. et al. (1983), Stockard and Gatten (1983), Jackson and Heisler (1984), Jackson et al. (1984), Ultsch et al. (1984), Glass et al. (1985), Herbert and Jackson (1985), Ultsch (1985), and Ultsch et al. (1985). Thermoregulation: Brattstrom and Collins (1973), Ernst (1972), Graham and Hutchison (1978, 1979), Gourley (1979), Hutchison (1979), Bartholomew (1982), Firth and Turner (1982), Sturbaum (1982), Schwarzkopf and Brooks (1985), and Peterson (1987). Ecology: Bider and Hoek (1971), Ernst (1971e, 1972, 1974), Quinn and Christiansen (1972), Bayless (1975), Wilbur (1975), Whillans and Crossman (1977), Gibbons and Nelson (1978), Bury (1979), Mitchell (1979), Petokus (1981), Tinkle et al. (1981), Avery (1982), Congdon et al. (1982), Gregory (1982), Snow (1982), Tracy (1982), MacCulloch and Secoy (1983b), Breitenbach et al. (1984), Packard, G. C. and Packard (1984), Gutzke and Packard (1985), Christens and Bider (1986), and Balcombe and Licht (1987). Feeding: MacCulloch and Secoy (1983b). Movements: Ernst (1970b), McAuliffe (1978), Walker (1979), and MacCulloch and Secoy (1983a). Pesticides: Owen and Wells (1976), Reeves et al. (1977), and Punzo et al. (1979), and Hall (1980). Behavior: Spigel and Ellis (1965), Hurlbert (1970), Pert and Bitterman (1970), Spigel and Seggie (1970), Fraser and Spigel (1971), Goodwin (1971), Graf and Tighe (1971), Graf (1972, 1974), Morlock (1972, 1979), Moll (1974), Pert and Gonzalez (1974), Ashe et al. (1975), Burghardt (1977), Hall et al. (1977), Lennard and Stein (1977), DeRosa and Taylor (1978, 1982), Reiner and Powers (1978, 1983), Bury et al. (1979), Gourley (1979), Granda (1979), Harless (1979), Spigel (1979), Zipko (1982), and Feder (1983). Parasites and Disease: Ernst (1970a, 1971a), Botzler et al. (1973), Martin (1973), Ernst and Ernst (1975, 1977, 1979, 1980), McAuliffe (1977), Platt (1977, 1983), Timmers and Lewis (1979), Cox et al. (1980), Smith and Anderson (1980), MacCulloch (1981), Strohlein and Christiansen (1984), and Baker (1986). Shell abnormalities: Ernst (1971f), Whillans and Crossman (1977), MacCulloch (1981), and Schueler (1983).

• **Nomenclatural History.** The painted turtles were first assigned to the genus *Testudo*, a "catch-all" grouping of turtles (Schneider, 1783), and later placed with other freshwater emydid turtles in the nebulous genus *Emys* by Gray (1831). In 1844, Gray proposed the name *Chrysemys* solely for the races *picta* and *belli* to separate them from other North American sliders and cooters, which he retained in *Emys*. Painted turtles, sliders and cooters were assigned to separate genera until Boulenger (1889) combined them under the name *Chrysemys*. This designation was not readily accepted, and the previous popular placement of the sliders and cooters in the genus *Pseudemys* by Cope (1875) prevailed until 1964 when McDowell revised the genus *Chrysemys* on the basis of skull and foot morphology. He included in *Chrysemys*, *C. picta* and the sliders and cooters of the genus *Pseudemys*, and suggested that three subgenera were involved (*Chrysemys*, painted turtles; *Pseudemys*, cooters; and *Trachemys*, sliders). Similarities in the choanal and penial structures of these turtles upheld these designations (Parsons, 1968; Zug, 1966). Weaver and Rose (1967) concurred with the inclusion of the cooters and sliders in *Chrysemys*, but showed the subgenera to be invalid, based on further examination of skull and shell characters. Ernst and Barbour (1972) and Conant (1975)

accepted *Chrysemys* as the genus of all these turtles. However, there remained much disagreement about the generic arrangement of these turtles and many experts still maintained *Pseudemys* as a separate genus (Holman, 1977; Pritchard, 1979b; Smith and Smith, 1980). Holman (1977) expressed doubts about the status of McDowell's (1964) all-inclusive genus *Chrysemys*. Holman pointed out that under McDowell's concept as many as four species may occur in the same water body in the southeastern United States, but there are no records of hybridization between *Chrysemys picta* and other species of *Chrysemys* (sensu McDowell, 1964). However, hybrids have been reported within the subgenus *Pseudemys*: *C. floridana* x *C. concinna* (Smith, 1961; Mount, 1975; Fahey, 1980) and *C. floridana* x *C. rubriventris* (Crenshaw, 1965). Recent studies on host-parasite relationships by Ernst and Ernst (1980) and protein electrophoresis by Vogt and McCoy (1980) indicate that *Chrysemys picta* and the species of *Pseudemys* (sensu Cope, 1875) represent separate evolutionary lineages. Ward (1984), Seidel and Incháustegui (1984), and Seidel and Smith (1986) have returned to the three genus arrangement of Agassiz (1857): *Chrysemys*, *Trachemys*, and *Pseudemys*.

Seidel and Smith (1986) presented as evidence supporting partitioning of *Pseudemys* (sensu Cope, 1875) into the genera *Pseudemys* (cooters) and *Trachemys* (sliders) a survey table of shared-unshared character states in *Graptemys* (including *Malaclemys*), *Trachemys*, *Chrysemys*, *Pseudemys* and *Deirochelys*. Many of the shared characters which have been cited as evidence for recognition of an all-inclusive *Chrysemys* and *Pseudemys* are also present in *Graptemys*. *Chrysemys* and *Pseudemys* share only nine character states, and *Graptemys* and *Trachemys* share 19. When all available data sets are considered, divergence among *Chrysemys*, *Trachemys*, and *Pseudemys*, appears to be as great as their collective distance from *Graptemys*. Also the apparently complete reproductive isolation between those groups concludes the evidence.

• **Etymology.** The name *Chrysemys* is derived from the Greek *chrysos*, gold, and *emys*, a freshwater turtle, and refers to the yellow head and shell markings. The gender is male.

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