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An Anomalous Specimen of *Pelusios sinuatus* Lacking Mesoplastra

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The pleurodiran turtle family Pelomedusidae is partially characterized by the presence of mesoplastral bones. Of the two African genera, *Pelomedusa* has small lateral mesoplastra and *Pelusios* has large mesoplastra in broad median contact. The only previous record of a pelomedusid lacking mesoplastra concerned a *Pelomedusa subrufa* from Uganda (Williams, 1954).

Pelusios sinuatus is the largest species in its genus, attaining a maximum carapace length of 485 mm in Lake Tanganyika (Broadley, 1981). It also has a long fossil record, extending back to the upper Miocene (Broin, 1988) and contributed 98% of the fossilized chelonian fragments from the Pleistocene deposits of Olduvai Gorge (Auffenberg, 1981). The present range of the species extends through East Africa from Somalia south to South Africa and west to the upper Zambezi, where it is the common species in large rivers and lakes. In the Plio-Pleistocene it extended as far west as Tchad (Broin, 1969).

During examination of an extensive series of skeletal shells of *P. sinuatus*, I discovered one large specimen lacking mesoplastra and having the first six pleurals on both sides fused into single bones. The specimen in question, NMZB 7589, was caught as an adult in Lake Kariba, Zimbabwe, and lived in captivity for many years before it died.

In life the specimen looked like a deformed *P. sinuatus* and it keyed out to that species (Broadley, 1981), i.e., axillary scute present, posterior width of first pair of marginals 102% of anterior width of first vertebral, posterior margin of carapace serrated, and plastron yellow with a symmetrical black angular peripheral pattern. The carapace measured 245 mm long by 245 mm wide, the anterior lobe was 100 mm long, and the shell 115 mm deep. The number of scutes was normal, although the median vertebrals and costals were strongly compressed (Fig. 1).

The prepared skeletal shell showed striking abnormalities for a species in which the only bones usually variable in number are the four to seven neurals (Broadley, 1983). The specimen has four anterior neurals, but only three pleurals on each side, numbers one to six being fused. There are the usual 11 peripherals on each side. The striking feature of the plastron is the absence of mesoplastra, the anterior lobe being hinged directly onto the hypoplastra, which are partially fused to the xiphiplastra (Fig. 1).

The numerous anomalous fusions in the shell suggest fusion occurring early in life and perhaps representing fusion rather than absense of the mesoplastra. Support for

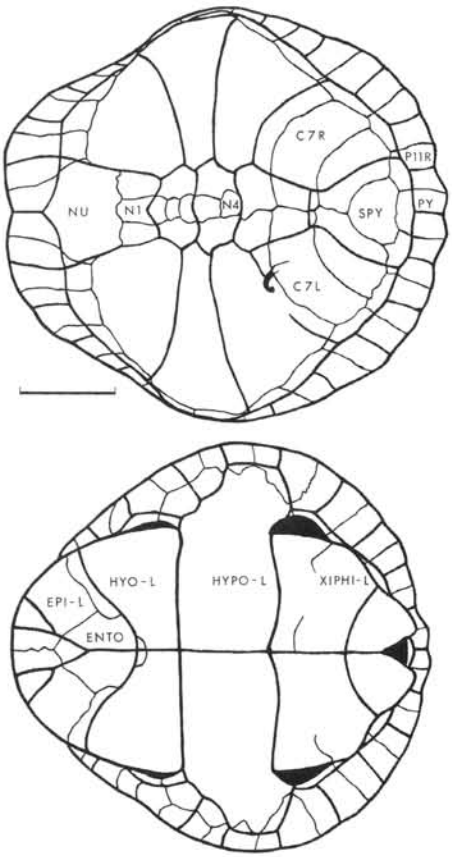

Figure 1. Dorsal and ventral views of the anomalous shell of *Pelusios sinuatus* NMZB 7589 from Lake Kariba, Zimbabwe. Thick lines indicate sulci between scutes, thin lines are sutures between bones. The line indicates 1 cm to scale.

this theory comes from the shape of the peripheral bones where the suture should have been.

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Characteristics of Hibernacula Use by Spotted Turtles, *Clemmys guttata*, in Ohio

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Adaptations to cold stress of reptiles living in regions subject to seasonally cold environments may be either physiological or behavioral (Hutchison, 1979). Due to their ectothermic metabolism, these reptiles generally adapt to long-term or seasonal cooling rather than resist it physiologically. Supercooling can be found in all reptiles found in temperate climates, at least over limited periods of time (Lowe et al., 1971; Storey and Storey, 1992). Freeze tolerance has been found in box turtles (*Terrapene carolina*), eastern garter snakes (*Thamnophis sirtalis sirtalis*) and hatchling painted turtles (*Chrysemys picta*), with mechanisms allowing up to half of all body water to freeze without causing injury (Costanzo et al., 1988; Costanzo and Claussen, 1990; Churchill and Storey, 1992). Actual physiological mechanisms that allow this freeze tolerance in reptiles are poorly understood, but include increases in tissue glucose, dehydration of some organs and sequestering of ice crystals outside the organs, temporary cessation of cardiac function when high body-ice is present, and cellular mechanisms to stabilize surface proteins (Storey and Storey, 1992; Costanzo et al., 1993).

Behavioral adaptations to seasonally cold temperatures by over-wintering ectotherms include the use of hibernacula (Storey and Storey, 1992). These habitats, which include specific repeatedly used retreats and general thermally protected areas, provide relatively stable thermal environments that minimize the exposure to sub-freezing temperatures. For semiaquatic species, such as the Emydidae, these locations are often under water, below the depth of ice formation in mud (Ultsch, 1989; Crawford, 1991). Dormant turtles in these hypoxic environments have additional physiological adaptations allowing increased tolerances for anoxia (Lutz, 1992).

General characteristics of winter dormancy sites and associated behaviors have been noted for many turtles such as painted turtles (*C. picta*) and snapping turtles (*Chelydra serpentina*) (e.g., Peterson, 1987; Meeks and Ultsch, 1990; Crawford, 1991; Brown and Brooks, 1994). Furthermore, Ultsch (1989) reviewed general ecological parameters of hibernacula sites in freshwater turtles. Detailed, repeated observations of the same hibernaculum are rare and hibernation specifics are lacking for most species.

Spotted turtles (*Clemmys guttata*) remain active in waters as cold as 3°C, even beneath ice (Ernst, 1982) and are reported at the far northern range of cold tolerance for freshwater turtles (Ultsch, 1989). Spotted turtles can be found from Maine, USA, west to Ontario, Canada, south to northeastern Illinois, east to northeastern Virginia, and south again along the coastal plain into Georgia and Florida (Ernst et al., 1994). In Ohio they are found with few exceptions only in the previously-glaciated northern parts of the state, having been abundant in the first half of this century in swamps, bogs, ditches, and ponds (Conant, 1951). Spotted turtle hibernacula are typically aquatic beneath a layer of ice and mud (Ward et al., 1976; Ernst, 1976; Ernst, 1982; Ultsch, 1989). Sometimes summer sites used for aestivation are continuously occupied through the following spring (Ernst, 1976; Lovich, 1988).

The objective of our study was to examine long-term hibernacula use by spotted turtles in a fen in Ohio and to determine the characteristics of winter dormancy sites used repeatedly over several winters.

Study Site. — Prairie Road Fen (PRF) is the largest of 40 remaining fens in Ohio. It is located in Moorefield township in northern Clark County along Buck Creek (39°59'N, 83°42'W). There are approximately 5 ha of fen habitat which have been protected in a 39.29 ha preserve owned by the Army Corps of Engineers and managed by the Division of Natural Areas and Preserves (DNAP), Ohio Department of