Fossil Turtle Eggshells From Infratrappean Beds of Duddukuru, Andhra Pradesh

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Chelonian fossil eggshell fragments are reported from the Late Cretaceous infratrappean beds near Duddukuru, West Godavari District, Andhra Pradesh.

Introduction: Turtle eggshells are scarce in the fossil record in comparison to other groups such as birds and dinosaurs. The crystalline layer in turtle eggshells is composed of aragonite in contrast to all other amniote eggshells which consist of calcite. Aragonite is a meta-stable form of calcium carbonate whose lower preservation rate may partly explain the relative scarcity of fossil turtle eggshells. When preserved, they may retain the original aragonitic structure, or may be wholly or partially replaced by calcite (Hirsch, 1983).

This note records the occurrence of well preserved turtle eggshell fragments in sediments below the Deccan volcanics (i.e. infratrappean beds) at a quarry about 1500 m SSW of Duddukuru village, West Godavari District, A.P. (Fig.1). This find is not only the first such record from India, but is also one of the few pre-Tertiary occurrences of chelonian eggshells across the world (Hirsch and Packard, 1987 and Hirsch, 1989). An earlier record of a fossil turtle egg from the marine Cenomanian rocks of South India (Sahni, 1957) needs to be confirmed on the basis of shell characteristics.

![Fig.1. Sample location and measured section of infratrappean beds at Duddukuru quarry.](image)

Stratigraphic Position and Age: The eggshell-bearing unit, a 20 cm thick shale, is part of a dominantly calcareous infratrappean sequence (Fig.1) comprising yellowish limestone.
rich in molluscs, foraminifers and ostracods. It is reasonable to infer a Late Cretaceous (Maastrichtian) age for this sequence because the overlying intertrappeans have recently been dated at Late Maastrichtian/Danian based on planktonic foraminifera and ostracods (Raju et al. 1991). These intertrappeans are also known to produce fossil fishes including pycnodontids and trigonodontids (Bhalla, 1974; Prasad, 1987).

Fig. 2a-d. Turtle eggshells. a) Outer Surface; b) Enlarged outer surface; c) Inner surface; d) Enlarged inner surface. Bar = 100 μm for a&c; 10 μm for b&d. Abbreviation, P-pore.
Description of Eggshells: Of about 30 specimens recovered by screenwashing of green shales, the largest measures nearly 1.5 mm x 1.5 mm. The eggshell thickness ranges from 190 to 260 μm with an average of 220 μm.

Fig. 3a-c. Turtle eggshells, radial views: Bar = 100 μm.
The outer shell surface is smooth but does not show limits of individual shell units (Fig.2a). Only a few pores, 3-5 μm across, can be observed on shell surface. High magnifications (Fig.2b) show densely packed spicules of aragonite, but XRD analysis is needed to confirm this.

The inner surface (Fig.2 c-d) has well preserved mammillae (=central cores) with radiating, needle-like aragonite crystals. These are polygonal to sub-circular and are tightly packed except in some instances where open spaces (? pores) exist at the junction of 3-4 central cores. Some of the central cores are as large as about 160μm in diameter.

Radial views (Fig.3 a-c) show excellently preserved radiating, acicular (needle-like) crystallites of aragonite characteristic of chelonian eggs. The shell units are discrete, mostly conical, and tightly interlocking. In some cases (Fig.3c), however, individual shell units are not obvious so that their lateral borders are not discernible. In general, the shell units are twice as high as they are wide. Their diameter ranges from 100-120 μm. Long, narrow pore canals can be observed along the junction of shell units but these are relatively few.

Discussion: Contemporary turtle eggshells have been described by several workers (Erben, 1970; Packard, 1980; Hirsch, 1983; Packard et al. 1984; Schleich and Kastle, 1988). The last work illustrates the eggshell structure of a number of modern turtle species. However, the taxonomic utility of shell structure at lower levels has not been demonstrated as yet, though familial assignment is possible in some cases.

The Duddukuru eggshells clearly cannot be assigned to sea turtles (Cheloniidae and Dermochelyidae) because the latter lay eggs with thin, highly flexible shell in which the units are minute, indiscrete, loosely organized and wider than high. The second category of eggs, laid by chelydrid and emydid turtles, consists of flexible shell in which the units are distinct, as high as wide, but with conspicuous spaces between them. Our specimens clearly differ from them in being more than twice as high as wide, and in lacking intervening spaces between shell units.

The Duddukuru specimens compare most closely with rigid eggshells characterizing modern testudinid turtles (Schleich and Käsle, 1988). In particular, Testudo graeca has closely similar shell units, especially as seen in radial views. The diameter of shell units (35-120 μm) falls well within the range exhibited by our specimens, and the shell thickness (160-170 μm) is also comparable. However, as the taxonomic value of turtle eggshell structure is not yet established at species level, the present specimens are best assigned to the family Testudinidae.

References

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