

## COMPARISON OF MODERN AND FOSSIL CROCODYLOMORPHA EGGS AND CONTRIBUTION TO THE OOPHYLOGENY OF AMNIOTA

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Eggshells from three extant crocodylian species – *Crocodylus mindorensis*, *Paleosuchus palpebrosus*, and *Alligator mississippiensis* – has been analyzed and described. A comparison between these and other extant and fossil crocodylian eggs showed that the egg external surface ornamentation may vary between the anastomo- and the ramotuberculate (*sensu* Carpenter 1999) types, and the newly described rugosocavate type, characterized by an irregularly rugose surface scattered by subcircular pits that not always correspond to pore openings (Marzola *et al.* 2014). On the pore canals system, Crocodylomorpha are characterized and pooled with some dinosaurian and avian groups by the angusticaniculate type, made of single, straight and subcircular pores with a diameter, in our samples, between 100 and 130 nm and a relative low area percentage of 0.08–0.22% per cm<sup>2</sup> on the eggshell total area (Ribeiro *et al.* 2013; Marzola *et al.* 2014). A diagnostic evidence of incubation in crocodylian eggs is the presence of pits and stepped concentric erosion rings around the pore openings, due to the microbiological degradation of the outer eggshell surface during the incubation and appreciable on our *P. palpebrosus* sample. Although Crocodylomorpha exhibits a stable and well defined eggshell morphology, with slight structural variations throughout the entire clade, we reported for the first time a unique organization and morphology of the eggshell ultrastructure in *P. palpebrosus*, with a thin middle layer showing a dense and compact tabular microtabular horizontal lamination, in opposition to the sparse lamination present on the outer layer.

The Monotremata stays at the base of the Amniota oophylogenetic tree, with a primitive eggshell condition of a leathery, parchment-like, flexible, thin, proteic membrane enveloping the egg (Stewart 1997). A hardly mineralized eggshell is synapomorphic of the Sauropsida, which also presents a trend in hardening through further mineralization. An aragonitic amniotic eggshell is synapomorphic of the clade Chelonia, while all other amniotes are characterized by a calcium carbonate eggshell (Carpenter 1999; Kohring 1995). In the Archosauria, Pterosauria is characterized by an unusual eggshell morphology, made by a leathery, thin, and low mineralized eggshell, with low degrees of variation throughout the entire clade (Unwin & Deeming 2008). Crocodylomorpha, Dinosauria and Aves have a hardly mineralized, rigid eggshells, an organic core at the base of each eggshell unit, and a higher porosity, although the Dinosauria show a greater variability in the eggshell structure (Carpenter 1999).

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