

Osteology of the sauropod embryos from the Upper Cretaceous of Patagonia

Leonardo Salgado, Rodolfo A. Coria, and Luis M. Chiappe

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Exceptionally well-preserved embryonic skulls of Upper Cretaceous (Campanian Anacleto Formation) sauropods from Auca Mahuevo (Neuquén Province, Argentina) provide important insights into the ontogeny and evolution of titanosaurian neosauropods. The most important cranial modifications occurring during titanosaurian ontogeny appear to be centered on the infraorbital and narial regions, which exhibit a substantial degree of 'mosaic' evolution. On one hand, the Auca Mahuevo embryos show a large jugal that forms part of the lower margin of the skull and unretracted external nares, as indicated by the position and orientation of the lacrimals as well as the anterior extension of the frontals. Both of these features are ancestral for neosauropods, being present in prosauropods. On the other hand, the embryonic skull exhibits a large ventral notch, tentatively interpreted as homologous to the neosauropod preantorbital fenestra, that opens ventral to the jugal and between the maxilla and the quadratojugal, and a temporal region that closely resembles the adult neosauropod condition. This mosaic of character states indicates that different regions of the skull of titanosaurian neosauropods acquired their characteristic morphology at substantially different rates during their ontogenetic development.

Key words: Titanosauria, sauropod embryos, cranial anatomy, ontogenetic development, Anacleto Formation, Upper Cretaceous, Auca Mahuevo, Patagonia.

Leonardo Salgado [lsalgado@uncoma.edu.ar]. Museo de Geología y Paleontología, Universidad Nacional del Comahue–CONICET, Buenos Aires 1400, 8300 Neuquén, Argentina; Rodolfo A. Coria [coriarod@copelnet.com.ar]. Museo Municipal “Carmen Funes”, 8318 Plaza Huinca, Neuquén, Argentina; Luis M. Chiappe [chiappe@nhm.org]. Department of Vertebrate Paleontology, Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007, USA.

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