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Filling the Olson's Gap? A re-appraisal of Raranimus dashankouensis (Synapsida, Therapsida) using CT scanning technologies.

Content

Non-mammalian Therapsida is a paraphyletic group of Permian-Jurassic amniotes closely related to mammals. Understanding the origin of Therapsida is complicated by the existence of a phylogenetic gap in the fossil record termed Olson's gap. Because of its assumed low stratigraphic occurrence and basal phylogenetic position, Raranimus dashankouensis, from the Dashankou fauna, Qingtoushan Formation, China, is the best candidate to fill this gap. However, its phylogenetic position as the basal-most therapsid is the subject of debate. In addition, the age of the Qingtoushan Formation is poorly constrained.

Enhancement of CT scanning technology offers new ways to investigate the skull of extinct species and provides access to characters which were previously out of reach (e.g. internal cranial features such as cranial nerves) which can be useful for phylogenetic analysis. Our results show that Raranimus has five therapsid synapomorphies, the most obvious being the short contact between the maxilla and the prefrontal. However the presence of plesiomorphic characters, such as the presence of a precanine caniniform tooth, manifest retention of typical "pelycosaur" grade features. The maxillary canal morphology of Raranimus is comparable to that of the "pelycosaur" Varanosaurus and the biarmosuchian Herpetoskylax. Overall, this suggests a very basal position for Raranimus in the therapsid phylogenetic tree. New data on the age of the Qingtoushan Formation indicates a Roadian age for Rarianimus, hence filling the Olson's gap and confirming that the genus is an important taxon for understanding the evolutionary origin of therapsids.

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