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Tapinocephalid dinocephalians, the first large terrestrial tetrapods – Potential for refined Middle Permian Biostratigraphy?

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Dinocephalians particularly the herbivorous tapinocephalids, form an important component of Middle Permian basal therapsid faunas of Pangaea as they are known from Brazil, Russia, South Africa, Tanzania, Zimbabwe and Zambia [1]. The majority of described species are found in the 2800m-thick Abrahamskraal Formation of South African (Lower Beaufort Group, Karoo Supergroup), the focus of recent geological and palaeontological research attention [2]. Radiometric ages for volcanic ash horizons have produced reliable temporal constraints for the upper part of the Abrahamskraal Formation [3,4], the stratigraphic ranges of tetrapod taxa have been elucidated, and refined biostratigraphic resolution has aided in preliminary quantification of the terrestrial Capitanian mass extinction [4].

The tetrapod fauna of the Abrahamskraal Formation comprises temnospondyls, parareptiles, and non-mammalian synapsids, including varanopids, dinocephalians, dicynodonts, gorgonopsians and therocephalians [5]. Dicynodonts and dinocephalians are the most abundant, each comprising a third of the total fauna [6]. All the Permian biozones of the Beaufort Group are named after dicynodonts, except for the *Tapinocephalus* Assemblage Zone. Amongst Abrahamskraal Formation dinocephalians there are only two anteosaurid genera, two titanosuchids, one styraocephalid and our research suggests 12 valid tapinocephalid genera. A problem with research on tapinocephalid dinocephalians is their fragmentary nature but an exception to this is earliest and most basal member of the clade, *Tapinocaninus*, which is known from well preserved skull, and almost completely articulated postcranial material. Although demonstrating several apomorphic characters, the skeleton of *Tapinocaninus* retains plesiomorphic anatomical features previously known only in “pelycosaur”-grade synapsids. *Tapinocaninus* has a stratigraphic range extending through the lowermost 400 m of the Abrahamskraal Formation. The next recorded tapinocephalid, *Struthiocephalus*, only appears much later, with a range from 1600m to 2600m above the base of the Abrahamskraal Formation. Most dinocephalian genera disappear in a somewhat staggered fashion near the top of the Abrahamskraal Formation, with *Criocephalosaurus* being the last occurring dinocephalian in the Karoo [7]. Current evidence thus shows a stratigraphic gap of dinocephalians between 400m and 1600m into the Abrahamskraal Formation. The presence of a dicynodonts in this “barren” interval suggests that they should rather be used as biostratigraphic indicator species for the Abrahamskraal Formation.

References:

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