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The *Pristerognathus* AZ and the aftermath of the Capitanian extinction event in the main Karoo Basin

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With its wide exposures, thick sedimentary sequences of long duration and rich abundance of fossils, the Beaufort Group of the main Karoo Basin represents an important resource for palaeontologists wishing to study evolutionary trends in terrestrial tetrapods from the middle Permian to early Triassic. It is especially useful as it records two extinction events, namely those in the Capitanian and at the end of the Permian [1,2]. Both of these have been linked to contemporaneous marine extinctions but only the end-Permian extinction has been extensively studied in the Karoo [3,4,5].

The Capitanian extinction in the Karoo occurs at the top of the *Tapinocephalus* Assemblage Zone (AZ), close to 260 million years ago [2]. This biozone contains a high diversity of early therapsids and parareptiles that has expanded in recent years as a result of intensive collecting efforts and numerous taxonomic revisions. Conversely, the overlying *Pristerognathus* AZ records the transition from a Guadalupian fauna to a Lopingian one, consisting of a very low diversity lower part and a higher diversity, early recovery fauna in its upper half.

Our dataset of 1,953 stratigraphic occurrences of tetrapod fossils spanning the Middle Permian Karoo constrains the timing of the end-Capitanian extinction in the Karoo Basin and the pace of subsequent recovery. Furthermore, combined with the targeted stratigraphic collection of new fossils, this has allowed refinement of the regional biostratigraphic framework. Current occurrences are sufficiently abundant to provide robust estimates of regional origination and extinction rates in the upper *Tapinocephalus* AZ and the *Pristerognathus* AZ, using quantitative methods to correct for differences in sampling intensity through time (e.g. [6]). These confirm the occurrence of high extinction rates at the top of the Abrahamskraal Formation. However, post-extinction origination rates remained low through the *Pristerognathus* AZ, perhaps for 1 million years or more, indicating delayed recovery of Karoo Basin ecosystems. As fossil occurrence data is improved for younger strata of the Beaufort sequence, the application of quantitative methods stands to clarify patterns of extinction, origination and diversity among tetrapods through the Permian and Early Triassic.

References:

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