

THE PERMO-TRIASSIC BOUNDARY IN THE NORTHWEST KAROO BASIN.
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The Karoo Basin of South Africa is a retro-foreland that accumulated sediment from Carboniferous to Jurassic times in southwestern Gondwana. The sequence is highly asymmetrical in nature, being thickest in the south (proximal sector) and thinning dramatically to the north (distal sector). The exact placement of the Permo-Triassic boundary within this sequence is still a matter of some debate, however at present the contact is placed at the terrestrial, time equivalent extinction event of the marine faunal crisis. In the Karoo Basin this event is marked by a major extinction of herbivorous dicynodonts[1] and large amphibians. In the south of the basin it co-incides with an overlap zone which includes the last appearance datum (LAD) of *Dicynodon* and the first appearance datum (FAD) of *Lystrosaurus*. Lithostratigraphically this occurs within the predominantly fluvial Palingkloof Member of the Balfour Formation (Beaufort Group; Karoo Supergroup). Sedimentologically these strata reflect a change from high sinuosity suspended load dominated deposits, to low sinuosity, bedload dominated systems[2] and this sequence has recently been the focus of renewed activity and research in terms of its stratigraphy, palaeontology[2,3], palaeomagnetism[4] and stable carbon and oxygen isotope signatures [5,6].

The boundary in the north of the basin is not however as well known, with Kitching[7] and Smith *et al.*[8] placing it at the base of the Tarkastad Subgroup. Lithostratigraphically this is marked by the contact between the Balfour (Normandien) and Katberg (Verkykerskop) Formations[9,10] and occurs just above a level of brown weathering calcareous nodules and concretionary structures[7]. This sequence is well exposed above the town of Senekal in the northwestern Free State and is presently the focus of stratigraphic, palaeontological, palaeomagnetic (Kirschvink *pers.comm*) and geochemical (Brandt *pers.comm*) studies.

Fossils are scarce in this section however *Dicynodon* fossils are known from the basal and upper quarries. To date *Lystrosaurus* is not known from this section however to the east of Senekal the uppermost sandstone of the Katberg Formation produces fossils of the Triassic captorhinid reptile *Procolophon*. This sandstone lies some 50-80m beneath a mudstone sequence (Burgersdorp or Driekoppen Formation) that contains *Cynognathus* Assemblage Zone (subzone A[11]) fossils of late Early Triassic (Olenekian) age. Bamford[12] has erected a preliminary biostratigraphy for the Permian and Triassic in the Karoo Basin based on the ranges of fossil wood and as silicified wood occurs throughout the section, this has been studied to try and aid in identifying the correct placement of the contact. This data is at present slightly ambiguous, but suggests that the lower part of the Katberg in the northwest may be of Permian age, and that the boundary has been placed too low in the sequence. The resolution is however still fairly poor and further material is being analyzed for biostratigraphic purposes.

This finding may be in line with recent modelling of the Karoo Basin[13] which has shown that the basin has two distinct tectonic settings, a proximal (foredeep) and a distal (foresag) sector. The two sectors have reciprocal stratigraphies, and as such, if the sequence in the south is temporally complete, with continuous sedimentation across the boundary, then in the north of the basin, the sequence would be expected to be represented by either an unconformity, condensed section or palaeosol. Although at present the exact placement and nature of the boundary in the northwest of

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the basin is therefore not as well understood as that in the south, ongoing studies will hopefully identify the correct nature and stratigraphic placement of the contact, which in turn will allow for better resolution of biotic turnover across the boundary, as well as aiding basin development studies.

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