

Early Jurassic dinosaur ecosystems in southwestern Gondwana: steps towards refining its palaeoecology

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Abstract

The Triassic-Jurassic transition records a pivotal phase in terrestrial vertebrate evolution. During this time, dinosaurs emerged as the preeminent terrestrial species, and continued their dominance for ~135 Ma. This rapid radiation allowed dinosaurs to occupy a variety of ecological niches and populate diverse habitats around the world.

In southern Africa, this dynamic period in dinosaur evolution is best recorded in the red-beds of the Elliot Formation and the overlying sandstone-dominated Clarens Formation. These units collectively document the Late Triassic-Early Jurassic palaeolandscape and habitat changes of a semi-arid to arid southwestern Gondwana. Although vertebrate tracks are abundant, palaeontological focus has been placed on the body fossils recovered from these strata. As a result, relatively little is known about vertebrate behaviour, and habitat preferences. Contrastingly, vertebrate trace fossils are preserved in situ and therefore present an independent proxy on the environment, climate, ecology.

We herein present high resolution sedimentological and ichnological findings of five dinosaur track sites, consisting of *Eubrontes*-like and *Anomoepus*-like tracks, from the transition of the Elliot and Clarens formations. Our reconstructions show that during this aridifying period in the late Sinemurian, these theropod and ornithischian communities inhabited a mosaic of fluvial, lacustrine and aeolian environments. Within these continental strata, theropod footprints are distinctly prevalent, suggesting that these animals were an essential component of this ecosystem despite their heavy underrepresentation in the body fossil record. Furthermore, our study highlights the importance of integrating ichnofossils with body fossils and sedimentological data in order to obtain a refined view of ancient ecosystems.

Keywords: vertebrate ichnology, dinosaurs, ecosystems, Triassic-Jurassic, southern Gondwana