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## **Taphonomy and palaeoecology of a monospecific microvertebrate bonebed: behavioural implications for the late Permian parareptile *Owenetta* revealed synchrotron X-ray microcomputed tomography**

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Sociality in the vertebrate fossil record is a dynamic and fast-expanding area of research. Natural history observations of living animals are crucial for understanding and categorising sociality, but these observations are not feasible for extinct species. Some monotaxic bonebeds may provide unique opportunities to conceptualise the social behaviours of these extinct animals. An unusual bonebed (SAM-PK-K11289) discovered in the uppermost Permian strata of the Balfour Formation, Karoo Supergroup, in the Eastern Cape presents a window into the sociality of a Late Permian parareptile. The entire bonebed SAM-PK-K11289 is dish-shaped, 160 mm long, 85 mm wide and 55 mm thick with an elliptical planimetric shape. We used propagation phase-contrast synchrotron X-ray micro-computed tomography to three-dimensionally reconstruct skeletal elements in SAM-PK-K11289, allowing the taxonomic identification of the individuals in the bonebed as most likely belonging to *Owenetta rubidgei*. This is the largest aggregation of *Owenetta* individuals known to date, with a minimum number of 31, based on 314 limb bones. The ontogenetic profile of SAM-PK-K11289 was interpreted by analysing the size distribution of duplicate elements and by making comparisons with other *Owenetta* and procolophonid specimens. The specimens in the bonebed are all similar in body size and osteologically immature, indicating that they are juveniles. The bonebed occurs in a pedogenically modified ripple cross-laminated siltstone deposited by overbank flooding on a fluvial floodplain that likely contributed to the modification, disturbance and disarticulation of many but not all elements before the bonebed was buried at or very close to the death site. This bonebed provides novel information that directly challenges the popular belief that reptiles and their ancestors are non-social or asocial. Considering the overall circumstances of the bonebed, we hypothesize that *Owenetta rubidgei* juveniles were socially gregarious and this behaviour may have been induced or influenced by environmental changes during the early extinction phase of the end-Permian mass extinction in the Karoo Basin.

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