Inter-element variation in the bone histology of *Anteosaurus* (Dinocephalia, Anteosauridae) from the *Tapinocephalus* Assemblage Zone of the Karoo Basin of South Africa

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ABSTRACT

Despite its abundance in the Permian fossil record of South Africa, little is known about the life history of *Anteosaurus*. Here we examine the bone microstructure of multiple skeletal elements of *Anteosaurus* from the *Tapinocephalus* Assemblage Zone of the Karoo Basin. The bone histology of *Anteosaurus magnificus* reveals that the cortex is composed of highly vascularized, uninterrupted fibrolamellar bone tissue surrounding the inner spongy medullary region. However, the histology of two ribs and a previously described femur of another *Anteosaurus* taxon revealed an interrupted growth pattern with lines of arrested growth and peripheral rest lines occurring in the compacta, indicating periodic pauses in growth possibly linked to the slowing down of growth during maturity. Given that the fibula of the same individual has well-vascularised fibrolamellar bone tissue without any growth marks in the cortex; this suggests variation in skeletal growth. Based on our histological results, three growth dynamic stages are deduced for the genus *Anteosaurus*: (i) the earliest growth stage is represented by the predominance of highly vascularized, uninterrupted fibrolamellar bone tissue in the inner cortex, which suggests rapid periosteal bone deposition during early ontogeny; (ii) the next stage of growth shows periodic interruptions in the bone deposition as indicated by the deposition of lines of arrested growth; (iii) the third stage shows the development of lamellar bone tissue with rest lines in the peripheral part of the cortex suggesting a slowing down of growth prior to death. Most of the skeletal elements are characterized by thick bone walls, extensive secondary reconstruction and the complete infilling of the medullary cavity. However, the radius and a previously studied femur have open medullary cavities with struts of bony trabeculae. Based on histologic structures and comparisons with extant taxa, it is likely that *Anteosaurus* may have been more terrestrial as its osteology point towards terrestriality, but it may have occasionally inhabited ephemeral pools like modern semi-aquatic *Hippopotamus*.

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