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The osteohistology of Orthosuchus stormbergi using synchrotron radiation microcomputed tomography

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Orthosuchus stormbergi was a small bodied, Early Jurassic crocodyliform. It is a representative of a diverse assemblage of early branching crocodylomorph taxa from the upper Elliot Formation of South Africa. The life history of these early branching taxa remains poorly understood, with only sparse investigations into their osteohistology, yet species like *Orthosuchus* have potential to inform about origins of slow growth on the stem leading to crown crocodilians. In order to elucidate the growth patterns of *Orthosuchus*, we used propagation phase contrast X-ray synchrotron micro-computed tomography to virtually image the osteohistology of the postcrania of two specimens, the type (SAM-PK-K409) and a referred specimen (BP/1/4242). In total, we scanned nine mid-diaphyseal sections of the humerus, radius, ulna, radiale, femur, tibia, fibula, and a rib. We then compared our results to a broad set of histological sections of crocodylomorph taxa from the published literature. The most predominant bone tissue type was lamellar-zonal with a few patches of woven and parallel-fibred bone. Four to five lines of arrested growth were seen in the type specimen and six to seven were observed in the referred specimen. All the elements were generally thick walled and compact, most notably the radius and ulna. Our virtual osteohistological sections are the first for an early branching crocodyliform, and the broad sample of skeletal elements makes Orthosuchus a key anchor point for understanding the plesiomorphic life history traits of the clade. We show that early branching Crocodyliformes had slow growth and that the relatively thick cortices of *Orthosuchus* potentially indicate differing habitual behaviours from the co-occurring *Sphenosuchus acutus*.

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