

## Comparative skull biomechanics in *Varanus* and *Salvator 'Tupinambis'*

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The lizard species *Salvator 'Tupinambis' merianae* and *Varanus ornatus* evolved independently in South America and Africa but share similar ecology and feeding behaviour, despite having notable differences in their skull structure. *Tupinambis* has a compact, relatively short and wide snout, whereas that of *Varanus* is more slender and narrow. In addition, a postorbital bar (POB) is present in *Tupinambis* but absent in *Varanus*, and the former lacks the mid-frontal suture that is present in the latter. Here, we explore the biomechanical significance of these differences using 3D computer-based mechanical simulations based on micro-computed tomography, detailed muscle dissections, and in vivo data. First, we simulated muscle activity and joint-reaction forces during biting using Multibody Dynamics Analysis. Then, the forces calculated from these models were used as an input for Finite Element Analysis, to investigate and compare the strains of the skull in these two species. The effects of the presence/absence of structures, such as the POB, were investigated by constructing artificial models which geometry was altered. Our results indicate that strains in the skull bones are lower in *Tupinambis* than in *Varanus*, in particular at the back of the skull. The presence of a POB clearly reduces the strains in the bones during posterior biting in *Tupinambis*, but not in *Varanus*. Our results hence highlight how the morphological differences between these two taxa affect the mechanical behaviour of their respective skulls during feeding.

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