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Biomechanical analysis and new trophic hypothesis for *Riojasuchus tenuisceps*, a bizarre-snouted Late Triassic pseudosuchian from Argentina

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Ornithosuchids are a Late Triassic pseudosuchian archosaur group, consisting of four species (three from South America, and one from Scotland). All of them have triangular skulls with a protruding premaxilla, large nostrils, an extensive diastema in their narrow snout, a short jaw that does not reach the anterior end of the skull, and serrated posteriorly curved teeth. For this clade, carnivorous and scavenger habits have been previously proposed. Within the Ornithosuchidae, *Riojasuchus tenuisceps* (from Argentina) has the most morphologically extreme characteristics. Based on CT scans of the preserved skulls we generated a 3D model, and over this, we estimated the volumes of the adductors and abductor muscles and the force exerted by each. From these data we built the finite element model and measured the bite force (1.8–2.3 kN). Lateral, tractive, and torsional forces were applied to the end of the snout to evaluate the structural response of the skull during feeding. The results show that *R. tenuisceps* could resist tractive and torsional stresses better than lateral stress. Additionally, we analysed the peculiar morphological characteristics of the skull and their functional implications. We observed that the upper and lower dental rows were laterally separated from each other, preventing the generation of a cutting line during occlusion, and therefore, *R. tenuisceps* would have fed on small-sized prey that it could swallow whole. The curved premaxilla and the short mandible would not allow it to bite with the tip of the snout (ruling out the scavenging hypothesis), but were instead more adequate to capturing prey suspended in a fluid. This set of results allows us to propose that *R. tenuisceps* could have had a zoophagous diet and a wading habit, being able to feed on fish, amphibians, or any small animals that they could catch from the shoreline.

Key words: Archosauria, biomechanics, feeding habits, finite element model, bite force estimation.

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