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Reconstructed masticatory biomechanics of *Peligrotherium tropicalis*, a non-therian mammal from the Paleocene of Argentina

Tony Harper, Caleb F. Adkins, and Guillermo W. Rougier
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The large, bunodont, mammal *Peligrotherium tropicalis* is an enigmatic member of the earliest Paleocene fauna of Punta Peligro, Argentina. While being a contemporary of many of the earliest large-bodied "archaic ungulates" in the Northern Hemisphere, *P. tropicalis* is a remnant of an endemic Mesozoic non-therian lineage. The interpretation of *P. tropicalis* as an omnivore/herbivore has therefore been difficult to evaluate, given its phylogenetic placement outside of the therian clade, and lack of many of the molar characteristics thought to be essential for the forms of mastication seen in marsupials and placentals. Here we present a three-dimensional generalization of the classical "bifulcral" biomechanical model of bite force and joint force estimation, which is capable of accommodating the wide range of mediolateral force orientations generated by the muscles of mastication, as estimated by the geometry of their rigid attachment surfaces. Using this analysis, we demonstrate that *P. tropicalis* is more herbivorously adapted (viz. shows a greater Group 2 relative to Group 1 jaw adductor advantage for producing postcanine orthal bite forces) than even the hypocarnivorous carnivorans *Procyon lotor* and *Ursus arctos*, and is similar to the ungulates *Sus scrofa* and *Diceros bicornis*. This similarity also extends to the mediolateral distribution of relative muscle group advantage, with Group 1 muscles (responsible for effecting the initial adduction of the working-side hemimandible into centric occlusion) having greater orthal bite forces labially; and Group 2 muscles (those responsible for producing occlusal grinding motions) being more powerful lingually. Finally, we show that *P. tropicalis* preserves relatively little of its orthal bite force magnitude at high gape, suggesting that large-object durophagy would not have been a likely feeding strategy.

Key words: Mammalia, Meridiolestida, *Peligrotherium*, bifulcral, mastication, vertical kinematic phase.

Tony Harper [anthony.harper@lmunet.edu] and Caleb F. Adkins [caleb.adkins@lmunet.edu], Lincoln Memorial University, DeBusk College of Osteopathic Medicine, 9737 Cogdill Rd., Knoxville, TN 37932, USA. Guillermo W. Rougier [guillermo.rougier@louisville.edu] (corresponding author), University of Louisville, Department of Anatomical Sciences and Neurobiology, 511 S Floyd St, Louisville, KY 40202, USA.

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