

## New Mesotheriidae (Mammalia, Notoungulata, Typotheria), geochronology and tectonics of the Caragua area, northernmost Chile

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### Abstract

Few mammal fossils were known from the Altiplano or adjoining parts of northern Chile until recently. We report a partial mesotheriid palate from the vicinity of Caragua (Huaylas Formation) in northernmost Chile. The new material helps resolve contradictory taxonomic assignments (and age implications) of the two mesotheriid specimens previously reported from the area. Herein we refer all three mesotheriid specimens to a new taxon, *Caraguatypotherium munozi*, which is closely related to *Plesiotypotherium*, *Typotheriopsis*, *Pseudotypotherium*, and *Mesotherium*. This phylogenetic placement permits a revised biochronologic estimate of a post-Friasian/pre-Huayquerian (~15–9 Ma) age for the Huaylas Formation, consistent with new radioisotopic dates from the upper Huaylas Formation and its bracketing stratigraphic units. Improved geochronologic control for the Huaylas Formation has important implications for the timing of tectonic events in the Precordillera/Altiplano of northern Chile. Structural, stratigraphic, and temporal data suggest the onset of rapid, progressive deformation shortly after the deposition of the older Zapahuira Formation, continuing at least partly through deposition of the Huaylas Formation. Deposition of the Huaylas Formation was short lived (between ~10–12 Ma), possibly stemming from activity on the Copaquilla-Tignámar Fault in the eastern Precordillera. This deformation is associated with the development of the Oxaya Anticline and activity of the Ausipar Fault west of the study region on the frontal limb of the anticline in the westernmost Precordillera. Faulting and folding occurred rapidly, beginning at ~11.4 Ma (shortly after deposition of the youngest extrusives of the Zapahuira Formation) and before ~10.7 Ma (the age of the gently dipping horizons within the upper Huaylas Formation that overlie the mammal fossils and an intraformational unconformity). Mesotheriids are the only Tertiary fossil mammals known from the Precordillera of northernmost Chile thus far; the group is common and diverse in faunas from the Altiplano of Bolivia (and a fauna recently recovered from the Chilean Altiplano), in contrast to most higher-latitude and tropical assemblages. This distinctiveness indicates that intermediate latitudes may have been biogeographically distinct and served as a center of diversification for mesotheriids and other groups of indigenous South American mammals.

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### Resumen

Damos a conocer el hallazgo de un resto parcial de un paladar de mesotérido en la Formación Huaylas en la cercanía de Caragua, en la Precordillera del norte de Chile, el cual complementa el escaso conocimiento que se disponía hasta hace poco sobre restos fósiles de

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