

# Gregariousness among non-avian theropods: a case study from a Patagonian dinosaur tracksite, Candeleros Formation (Cenomanian), Argentina

ARTURO MIGUEL HEREDIA<sup>1\*</sup>, IGNACIO DÍAZ-MARTÍNEZ<sup>2</sup>, PABLO JOSÉ PAZOS<sup>1</sup>, MARCOS COMERIO<sup>3</sup>, DIANA ELIZABETH FERNÁNDEZ<sup>1</sup>

*1 CONICET - Universidad de Buenos Aires. Instituto de Estudios Andinos Don Pablo Groeber (IDEAN). Buenos Aires, Argentina*

*2 CONICET - Universidad Nacional de Río Negro. Instituto de Investigación en Paleobiología y Geología (IIPG). General Roca, Río Negro, Argentina*

*3 Centro de Tecnología de Recursos Minerales y Cerámica (CETMIC). Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Argentina*

\*presenting author, heredia@gl.fcen.uba.ar

## **Abstract:**

Gregarious behaviour is an important aspect of dinosaur paleoecology and has been inferred from several evidences: monospecific bonebeds, skeletal morphology, phylogenetic inferences, comparison with modern ecosystems and parallel trackways. Nevertheless, it is relatively poorly documented and understood among non-avian theropods. In the Cenomanian Candeleros Formation (northwestern Patagonia) several parallel tridactyl trackways were recorded, including five theropod trackways of medium track size (average length of 28 cm). These trackways possess similar stride, speed estimation, preservational features, uniform depth, and the same direction as non-overlapping tracks. They are preserved as shallow under tracks in a medium-grained sandstone bed interpreted as floodplain deposits. The tracking surface would have been an immediately overlying thin layer of muddy-siltstone containing a minor percentage of expandable clays (smectite). The latter gave a certain degree of coherence and plasticity to the substrate, sufficient to preserve several anatomical track features. Considering the theropod taxa documented in the same unit as well as the size and track morphology, abelisaurid or carcharodontosaurid theropods are suggested as track-makers. Physical barriers (i.e., large fluvial channels or perennial lakes) that could control the moving direction of the theropods were not recognized in the track-bearing level, nor were revealed by the analysed interval. Taking into account that there are no evidences of physical constraints and that all parallel trackways possess similar features such as stride, speed, preservation, depth, and direction, a gregarious behaviour of their producers can be suggested.

**Keywords:** theropod footprints, gregarious behaviour, Upper Cretaceous, Neuquén Basin