

Osteology of the Late Cretaceous alvarezsauroid *Linhenykus monodactylus* from China and comments on alvarezsauroid biogeography

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The alvarezsauroid theropod *Linhenykus monodactylus* from the Upper Cretaceous of Inner Mongolia, China is the first known monodactyl non-avian dinosaur, providing important information on the complex patterns of manual evolution seen in alvarezsauroids. Here we provide a detailed description of the osteology of this taxon. *Linhenykus* shows a number of features that are transitional between parvicursorine and non-parvicursorine alvarezsauroids, but detailed comparisons also reveal that some characters had a more complex distribution. We also use event-based tree-fitting to perform a quantitative analysis of alvarezsauroid biogeography incorporating several recently discovered taxa. The results suggest that there is no statistical support for previous biogeographic hypotheses that favour pure vicariance or pure dispersal scenarios as explanations for the distributions of alvarezsauroids across South America, North America and Asia. Instead, statistically significant biogeographic reconstructions suggest a dominant role for sympatric (or “within area”) events, combined with a mix of vicariance, dispersal and regional extinction. At present the alvarezsauroid data set is too small to completely resolve the biogeographic history of this group: future studies will need to create larger data sets that encompass additional clades.

Key words: Dinosauria, Theropoda, Parvicursorinae, alvarezsauroid biogeography, Treefitter, dispersal, vicariance, sympatry, Cretaceous, Wulansuhai Formation, Inner Mongolia, China.

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