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Allometric growth in the frontals of the Mongolian theropod dinosaur *Tarbosaurus bataar*

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Tarbosaurus bataar is a sister taxon of the well-studied theropod dinosaur *Tyrannosaurus rex* , and numerous fossils of this tyrannosaurid have been discovered in the Upper Cretaceous Nemegt Formation of Mongolia. Although specimens of different sizes of *Tarbosaurus bataar* have been discovered since its initial description, few rigorous studies on its growth changes have been done. Here we examine growth changes in the frontal bones of seven *Tarbosaurus bataar* specimens using bivariate analyses and the Björk superimposition method to demonstrate trends in their ontogenetic allometry. The width and depth of the frontal undergoes positive allometry during growth, whereas the length shows a trend of negative allometry. The details of growth changes in *Tarbosaurus bataar* frontals are largely similar to those of *Tyrannosaurus rex* . Furthermore, generic allometric trends of tyrannosaurid frontals, including those of *Tarbosaurus bataar*, are shared with other large-bodied theropod clades and may represent a consequence of strengthening parts of the braincase as an anchor for the jaw musculature.

Key words: Dinosauria, Theropoda, Tyrannosauridae, *Tarbosaurus bataar, Tyrannosaurus rex* , frontal, ontogeny, allometry.

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