ACTA PALAEONTOLOGICA POLONICA

# Palaeoneurology and palaeobiology of the dinocephalian therapsid *Anteosaurus magnificus*

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*Acta Palaeontologica Polonica* 66 (1), 2021: 29-39 doi:https://doi.org/10.4202/app.00800.2020

Dinocephalians (Therapsida), some of the earliest amniotes to have evolved large body size, include the carnivorous Anteosauria and mostly herbivorous Tapinocephalia. Whilst the palaeoneurology of the Tapinocephalia has been investigated in *Moschognathus whaitsi*, that of the Anteosauria remains completely unknown. Here we used X-ray micro-Computed Tomography to study, for the first time, the palaeoneurology of *Anteosaurus magnificus*. Compared to *Moschognathus*, we reconstruct *Anteosaurus* as an agile terrestrial predator based on the enlarged fossa for the floccular lobe of the cerebellum and semicircular canals of the inner ear. A major difference between the two genera resides in the orientation of the braincase, as indicated by the angle between the long axis of the skull and the plane of the lateral semicircular canal. This angle is 25° in *Anteosaurus*, whereas it is 65° in *Moschognathus*, which suggests that the braincase of the latter was remodelled as an adaptation to head-butting. This is consistent with less cranial pachyostosis and the retention of a large canine in Anteosauria, which suggests that dentition may have been used for intraspecific fighting and display in addition to trophic interactions. The evolution of a thick skull, horns, and bosses in tapinocephalids parallels the evolutionary reduction of the canine, which lead to a shift of the agonistic function from the mouth to the skull roof, as observed in extant social ungulates. Similarly, tapinocephalians may have developed complex social behaviour.

**Key words:** Therapsida, Dinocephalia, head-butting, carnivory, trigeminal nerve, bony labyrinth.

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