ACTA PALAEONTOLOGICA POLONICA

A novel form of postcranial skeletal pneumaticity in a sauropod dinosaur: Implications for the paleobiology of Rebbachisauridae

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Acta Palaeontologica Polonica 62 (2), 2017: 221-236 doi:https://doi.org/10.4202/app.00316.2016

In dinosaurs and other archosaurs, the presence of foramina connected with internal chambers in axial and appendicular bones is regarded as a robust indicator of postcranial skeletal pneumaticity (PSP). Here we analyze PSP and its paleobiological implications in rebbachisaurid diplodocoid sauropod dinosaurs based primarily on the dorsal vertebrae of *Katepensaurus goicoecheai*, a rebbachisaurid from the Cenomanian–Turonian (Upper Cretaceous) Bajo Barreal Formation of Patagonia, Argentina. We document a complex of interconnected pneumatic foramina and internal chambers within the dorsal vertebral transverse processes of *Katepensaurus*. Collectively, these structures constitute a form of PSP that has not previously been observed in sauropods, though it is closely comparable to morphologies seen in selected birds and non-avian theropods. Parts of the skeletons of *Katepensaurus* and other rebbachisaurid taxa such as *Amazonsaurus maranhensis* and *Tataouinea hannibalis* exhibit an elevated degree of pneumaticity relative to the conditions in many other sauropods. We interpret this extensive PSP as an adaptation for lowering the density of the skeleton, and tentatively propose that this reduced skeletal density may also have decreased the muscle energy required to move the body and the heat generated in so doing. Given that several rebbachisaurids inhabited tropical to subtropical paleolatitudes during the extreme warmth of the mid-Cretaceous, increased PSP may have better enabled these sauropods to cope with extraordinarily high temperatures. Extensive skeletal pneumaticity may have been an important innovation in Rebbachisauridae, and perhaps also in saltasaurine titanosaurs, which evolved an even greater degree of PSP. This may in turn have contributed to the evolutionary success of rebbachisaurids, which were the only diplodocoids to survive into the Late Cretaceous.

Key words: Dinosauria, Rebbachisauridae, *Katepensaurus*, air sac system, postcranial skeletal pneumaticity, pulmonary system, Cretaceous, Bajo Barreal Formation, Argentina.

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