

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

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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.

Lucio M. Ibiricu [ibiricu@cenpat-conicet.gob.ar], Instituto Patagónico de Geología y Paleontología (CCT CONICET-CENPAT), Boulevard Almirante Brown 2915, 9120 Puerto Madryn, Chubut, Argentina. Matthew C. Lamanna [lamannam@carnegiemnh.org], Section of Vertebrate Paleontology, Carnegie Museum of Natural History, 4400 Forbes Avenue,

Pittsburgh, Pennsylvania, 15213 USA. Rubén D.F. Martínez [rudaframartinez@gmail.com] and Gabriel A. Casal [paleogac@yahoo.com.ar], Laboratorio de
Paleovertebrados, Universidad Nacional de la Patagonia San Juan Bosco,
C.C. 360, 9000 Comodoro Rivadavia, Chubut, Argentina. Ignacio A. Cerda
[nachocerda6@yahoo.com.ar] and Leonardo Salgado [lsalgado@unrn.edu.ar],
CONICET, Instituto de Investigación en Paleobiología y Geología,
Universidad Nacional de Río Negro, Avenida General Roca 1242, 8332
General Roca, Río Negro, Argentina. Gastón Martínez [gmartinezpsf@gmail.com], Facultad de Ciencias
Exactas, Físicas y Naturales, Universidad Nacional de Córdoba, Avenida Vélez Sarsfield 299, 5000
Córdoba, Argentina.

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