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Small-sized abelisaurid (Theropoda: Ceratosauria) remains from the Upper Cretaceous of northwest Patagonia, Argentina

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ABSTRACT

A new abelisaurid theropod from the Cenomanian of Candeleros Formation (Neuquén Province, NW Patagonia, Argentina) is described. It includes an isolated frontal, partial pelvis, two fused sacral centra, femoral shaft, rib fragments, partial metatarsal II and shaft of metatarsal III. A paleohistological analysis shows that MMCh-PV 69 was somatically mature at time of death. The prevalence of relatively ordered intrinsic fibers in the primary bone indicates a relatively lower growth rate of MMCh-PV 69 compared with other abelisauroids, such as *Aucasaurus garridoi*. Phylogenetic analysis found MMCh-PV 69 as a basal abelisaurid, sister group of the node formed by Majungasaurinae and Brachyrostra. We estimated the body mass of MMCh-PV 69 in 240 kg, which makes it one of the smallest abelisaurids recorded. This new form adds to the extensive theropod fauna of the Candeleros Formation, probably the most diverse association of meat-eating dinosaurs recorded in a Cretaceous Formation from South America.

1. Introduction

The abelisaurid theropods are probably the best-represented group of carnivorous dinosaurs in the continents that constituted Gondwana during the Cretaceous (Novas et al., 2013). In Patagonia particularly, the Neuquén Group outcrops have yielded a good sample of different species, some of them represented by almost complete specimens, as well as several isolated remains assigned to this theropod group. Abelisaurids reported from beds of the Neuquén Group includes *Ekrixinatosaurus novasi* (Calvo et al., 2004) from the Cenomanian Candeleros Formation, *Skorpiovenator bustingorryi* (Canale et al., 2009) and *Ilokelesia aguadagrandensis* (Coria and Salgado, 1998) from the upper Cenomanian Huincul Formation, *Aucasaurus garridoi* (Coria et al., 2002) and from the Campanian Anacleto Formation. There are some doubts about the stratigraphical provenance of the type specimen of *Abelisaurus comahuensis* (Bonaparte and Novas, 1985) originally described from the Maastrichtian Allen Formation (Malargüe Group), and more recently reinterpreted from the Campanian Anacleto Formation of the Neuquén Group (Garrido, 2010) (but see Gianechini et al., 2014).

In the present contribution we describe the osteology and paleohistology of a new small to medium-sized abelisaurid setting the first paleohistological analysis of an abelisaurid theropod and adding information to our knowledge about the dinosaur diversity for the early Late Cretaceous in this region of Patagonia.

Institutional abbreviations. MACN-CH, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina; MCF-PVPH, Museo Carmen Funes, Plaza Huincul, Neuquén, Argentina; MMCh-PV, Museo Paleontológico "Ernesto Bachmann", Villa El Chocón, Neuquén, Argentina; MUCPv, Museo de la Universidad Nacional del Comahue, Centro Paleontológico "Lago Barreales", Neuquén, Argentina,

2. Systematic paleontology

THEROPODA Marsh, 1881
CERATOSAURIA Marsh, 1884

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ABELISAUROIDEA Bonaparte, 1991
ABELISAURIDAE Bonaparte and Novas, 1985

Gen. et sp. indet.

2.1. Materials

MMCh-PV 69: isolated left frontal, partial pelvis including right ilium, right pubis and distal part of left pubis, two fused sacral centra, right femur lacking both ends, fragments of dorsal ribs, distal end of metatarsal II, shaft fragment of metatarsal III. (Measurements given in Appendix A).

2.2. Locality and horizon

"Mupaleo" Site, Barda Atravesada de las Campanas, 25 km southwest from Villa El Chocón, Neuquén Province, Patagonia, Argentina (Fig. 1). Candeleros Formation (Cenomanian), Río Limay Subgroup, Neuquén Group. The fossil level is a massive, fine to medium grained reddish sandstone, located 15 to 20 meters below the limit with Huincul Formation. The remains of the specimen were collected in close association, in an excavation of two square meters. From the same fossiliferous level, but 5 to 6 meters far from MMCh-PV 69, a small-sized semiarticulated rebbachisaurid sauropod was found (Haluza and Canale, 2011). Other remains were found from the same level, but in other site located around 50 meters far from MMCh-PV 69, which includes a big-sized rebbachisaurid, a chelid turtle and fragments of a sphendontian lizard.

3. Description

3.1. Frontal

Available left frontal lacks the entire medial margin, being devoid of the medial border of the supratemporal fossa, sagittal crest, and longitudinal impression of the olfactory tract. Because this, we ignore if both frontals were fused to each other. Also, the rostral end for articulation with the nasals is broken. As a result, the preserved portion of frontal seems to be equivalent to the posterolateral corner of other abelisaurid frontals, such as *Abelisaurus*, *Aucasaurus* or *Ekrixinatosaurus*. (Figs. 2–3). The dorsal surface is smooth, without the ornamentation present in other abelisaurids (e.g., *Aucasaurus*, *Abelisaurus*, and in lesser degree *Carnotaurus*) which is composed by a small rugosities and corpuscular protuberances of different size separated by small grooves; (Paulina Carabajal, 2011a,b), neither evidence of swells as in *Ekrixinatosaurus* (MUCPv 294) or horns observed in *Carnotaurus* (Bonaparte et al., 1990). In ventral view the lateral margin is occupied by a rounded fossa, which corresponds to part of the orbital vault (Figs. 2B, 3A). As is typical of most Abelisauridae the frontal is greatly thickened, with its greatest dorsoventral width observable in the medial and rostral borders (Fig. 2D, F). The supratemporal fossa is well demarcated, with the outer border straight and running transversely over the bone. In dorsal aspect, the supratemporal fossa is well developed, occupying nearly the caudal third of the frontal, as in most abelisaurids like *Ekrixinatosaurus* (MUCPv 294), *Majungasaurus* (Sampson and Witmer, 2007) or *Abelisaurus* (Bonaparte and Novas, 1985; Paulina Carabajal, 2011b). On the medial sector of the posterior border of the supratemporal fossa it can be seen a shallow and rounded scar, which corresponds to a point of articulation with the parietal (Fig. 2A, C). Over the anterodorsal sector of the lateral border there are two separated depressions, which are interpreted as the articulation to the lacrimal/prefrontal (anterior) and postorbital (posterior), respectively (Fig. 2E). Under this interpretation, the frontal was excluded for the orbital rim by the postorbital and lacrimal, as is common in Abelisauridae and Carcharodontosauridae.

3.2. Dorsal rib

Two fragments of a dorsal rib shaft were recovered. As it can be observed in *Skorpiovenator* (MMCh-PV 48) its cross-section has a "T"-shaped outline, with a widened lateral part and a sharp median keel.

3.3. Sacral vertebrae

Two fused centra lacking their neural arches are preserved (Fig. 4). There are no characters to recognize if they correspond to the first and part of the second centra or the last two sacral centra.

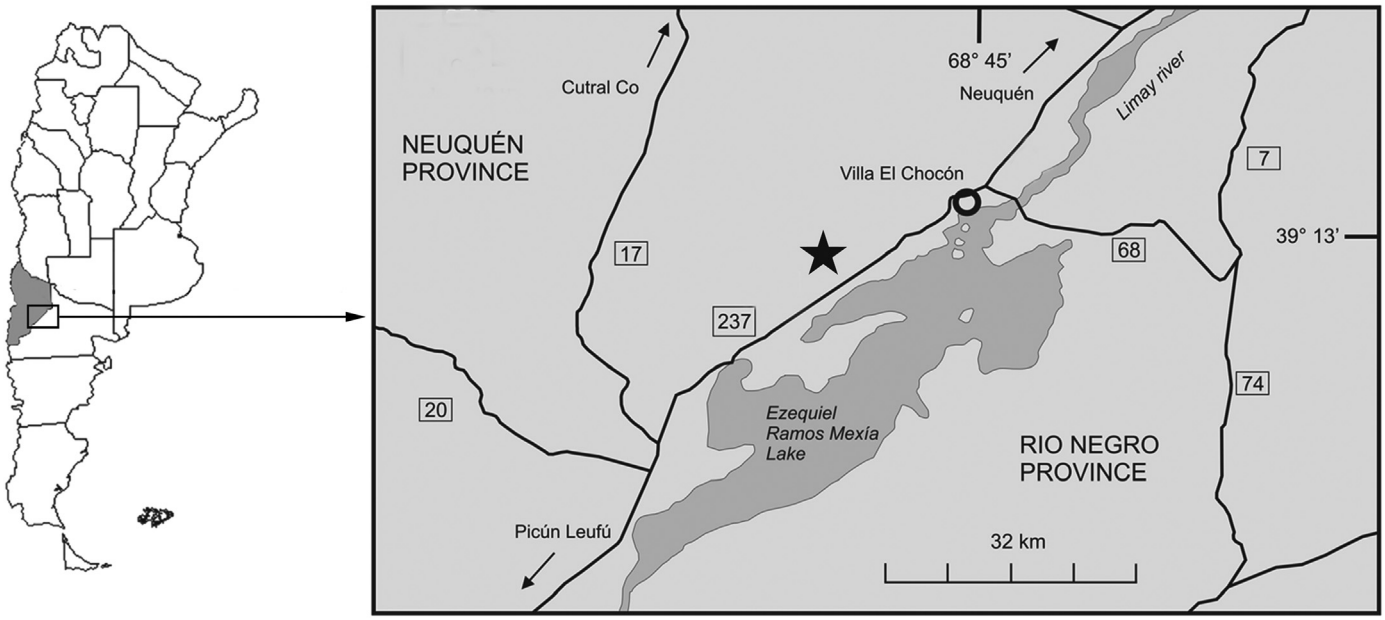

Fig. 1. Location of the "Mupaleo" fossiliferous quarry (indicated by a black star).