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Abelisaurid dinosaurs from the Upper Cretaceous Laño site (Iberian Peninsula)

Dinosaurios abelisáuridos del yacimiento del Cretácico Superior de Laño (península ibérica)

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Abstract

The upper Campanian Laño vertebrate site (north of Iberian Peninsula) has yielded several remains that belong to a mid- to large-sized abelisaurid theropod. This material consists of isolated teeth, a caudal vertebrae and a pair of femora. Some of these remains are described here for the first time. Abelisaurid remains have been found in the Cretaceous deposits of Europe, especially in the Campanian and Maastrichtian deposits of the Ibero-Armorican Domain. Further studies of the material may, therefore, shed light on the relationship of the Laño abelisaurid with other European taxa.

Keywords: Abelidauridae, teeth, vertebra, femur, Late Cretaceous.

1. Introduction

Abelisaurids are medium-large sized ceratosaurian theropods with deep skulls and reduced forearms (Carrano & Sampson, 2008; Tortosa *et al.*, 2014). Abelisaurids are mainly reported in the Cretaceous of Gondwana (e.g. Canale *et al.*, 2009; Carrano & Sampson, 2008). Nonetheless, they are also known in the Cretaceous of Europe (e.g. Le Loeuff & Buffetaut, 1991; Tortosa *et al.,* 2014). In the Campanian site of Laño (Treviño Country), a pair of fragmentary femora has been attributed to a *Tarascosaurus*-like abelisaurid (Le Loeuff & Buffetaut, 1991; Le Loeuff, 1992). Furthermore, isolated teeth from the site attributed to Theropoda indet. (Torices *et al.*, 2015) may belong to Abelisauridae; and postcranial (vertebral) remains from the Laño collection may also have abelisaurid affinities.

The aim of this study is to review the abelisaurid material of Laño in the context of the European archipelago during the Late Cretaceous.

2. Geographical and Geological setting

The Laño site is located about 30 km south of the city of Vitoria/Gasteiz in an abandoned sand quarry, between the towns of Albaina and Laño (Treviño Country) in the north of Iberian Peninsula.

Geologically, the Laño site is located in the southern limb of the Miranda-Treviño Basin, situated in the southern margin of the South-Cantabrian Synclinorium (Astibia *et al.*, 1999). The upper Campanian equivalent deposits of the Sedano Formation (Floquet *et al.*, 1982) are 22 m thick in the Laño quarry (Corral *et al.*, 2016). Two vertebrate fossil-bearing horizons, called L1 and L2, are exposed in the quarry. These levels were formed in an intertropical braided river system with channels, sandbars and pools, which was situated next to the coast (Astibia *et al.*, 1999; Pereda-Suberbiola *et al.*, 2000). The fossiliferous beds have yielded a very diverse vertebrate fauna, including several groups of dinosaurs, among which theropods are found (Pereda-Suberbiola *et al.*, 2015; Torices *et al.*, 2015).

3. Results

Theropod material here referred to Abelisauridae consists of twelve isolated teeth and twenty teeth fragments, a vertebra and a pair of femora. The

material (except the femora) is held in the Museo de Ciencias Naturales de Alava/Arabako Natur Zientzien Museoa (MCNA) of Vitoria-Gasteiz.

Teeth (MCNA 1852, 1853, 1855, 2205, 2206, 4520, 8589, 8600, 10082, 14067, 14073, 14074, 14520-14522, 22051, UPVLP 3-8, 170-179): Some of these teeth were previously attributed to Theropoda indet. by Torices *et al*., (2015). These teeth are ziphodont and show a quite straight distal margin. The mesial carina does not reach the cervix whereas the distal one does it. Both carinae are serrated with subrectangular denticles. Abelisaurid teeth show straight distal margins, or somewhat convex or straight. Their distal carina is centrally positioned or labially displaced, as in the teeth from Laño (see Hendrickx *et al*., 2020). Furthermore, teeth of the abelisaurid *Arcovenator* show a mesial carina that does not reach the cervix (Tortosa *et al*., 2014). The teeth from the Abelisauridae of Laño resemble those of *Arcovenator*.

Caudal vertebra (MCNA 14077): it only preserves the centrum and the proximal parts of the transverse processes. The centum is amphicoelous, spool-shaped, laterally compressed and slightly elongated. The articular surfaces of the centra are elliptical. The ventral surface exhibits a well developed longitudinal groove bounded by two parallel ridges. The centrum is not pneumatized. The transverse processes are positioned at the level of the neural canal and in the middle part of the centrum, being almost horizontal. The ventral surface of abelisaurid vertebrae may exhibit a longitudinal groove (Méndez, 2014; Tortosa *et al*., 2014). However, other non-ceratosaurid theropods do also show a ventral groove (Ortega *et al*., 2010; Rauhut, 2011; Cuesta *et al*., 2019). The shape of the anterior and posterior surfaces of the centrum does highly resemble those of abelisaurids (e.g. *Arcovenator, Majungasaurus*; see Méndez, 2014; Tortosa *et al*., 2014). Therefore, the centrum is tentatively assigned to Abelisauridae indet.

Femora: One femur is almost complete and the other is fragmentary (see Le Loeuff & Buffetaut, 1991; Le Loeuff, 1992). The current whereabouts of these fossils is unknown, and only a drawing of Le Loeuff (1992) is so far available. The complete femur is 37 cm in length and slender. The head of the femur is directed anteromedially. There is a foramen under the lesser trochanter on the anterior face. The lesser trochanter is quite proximally positioned. Furthermore, the medial distal crest is well developed as in Abelisauroidea (Carrano & Sampson, 2008). This is less developed in the Laño specimen than in noasaurids as *Masiakasaurus* (Carrano *et al.,* 2002). Indeed, this crest much resembles those of other abelisaurids. Le Loeuff & Buffetaut (1991) compared the femora of Laño to that of *Tarascosaurus*, a taxon with abelisauroid affinities (Carrano & Sampson, 2008).

4. Discussion and conclusions

European abelisaurid remains are mainly found in the Ibero-Armorican Domain (France and Spain), but they have also been reported in Hungary and the Netherlands (Csiki-Sava *et al*., 2015). However, European remains are quite fragmentary (Tortosa *et al*., 2014). In Europe, Cretaceous ceratosaurs are known from the Albian (Accarie *et al*., 1995) to the Maastrichtian (e.g. Valentin *et al*., 2012). The Albian record of ceratosaurs is represented by *Genusaurus sisteronis* from Provence, France (Accarie *et al*., 1995), which is regarded as a noasaurid (Carrano & Sampson, 2008). Santonian abelisaurid remains are known in Iharkút (Hungary) on the basis of fragmentary appendicular material (Ösi & Buffetaut, 2011). *Tarascosaurus salluvicus* was found in the early Campanian of Provence (Le Loeuff & Buffetaut, 1991) and it was considered to be an abelisaurid (Tortosa *et al.,* 2014). In the middle-upper Campanian deposits, abelisaurid fossils are more frequent. *Arcovenator escotae* (Tortosa *et al*., 2014), the Porcieux specimen, tentatively assigned to *Arcovenator* by Tortosa *et al.* (2014), and the Trets-La Boucharde specimen (Allain & Pereda-Suberbiola, 2003), attributed to Abelisauridae (Carrano & Sampson, 2008; Tortosa *et al*., 2014) have been found in Provence formations. Abelisaurid isolated teeth are known from the Spanish upper Campanian site of Armuña, in Segovia (Pérez-García *et al.,* 2016). Abelisaurids also occur at several other sites of late Campanian to early Maastrichtian age, for instance, at Cruzy in Languedoc, France (see Tortosa *et al*., 2014). Maastrichtian abelisaurids are mainly represented by limb bones (Valentin *et al*., 2012). *Betasuchus bredai* from Limburg in the Netherlands was described on the basis of a proximal femur and it has ceratosaurian affinities (e.g. Le Loeuff & Buffetaut, 1991; Carrano & Sampson, 2008).

In conclusion, some cranial (isolated teeth) and postcranial remains (caudal vertebra, femora) from

the Laño site can be assigned to a mid- to large-sized member of Abelisauridae. The abelisaurid fossil record from Laño is, hence, congruent with the European abelisaurid record.

These results represent a new contribution to the knowledge of European abelisaurid theropods. Nevertheless, it is not yet possible to establish the relationship of the Laño taxon with other European abelisaurids. Further study of these materials and other ceratosaurian remains can help to clarify their affinities.

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