

Short communication

Pelvic elements of the giant bird *Gargantuavis* from the Upper Cretaceous of Cruzy (southern France), with remarks on pneumatization

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ABSTRACT

A synsacrum fragment and an incomplete ilium of the giant bird *Gargantuavis philoinos* are described from the upper Campanian/lower Maastrichtian Montplo-Nord locality at Cruzy (Hérault, southern France). The ilium provides new information about the pelvic morphology of *Gargantuavis*. Both the synsacrum and ilium are extensively pneumatized. This extensive pneumatization may be a plesiomorphic feature, but may also have had a weight-reduction function in a large flightless bird.

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1. Introduction

The giant bird *Gargantuavis philoinos* Buffetaut and Le Loeuff, 1998 is known from a limited number of skeletal elements from a small number of localities in southern France (Buffetaut et al., 2015a) and northern Spain (Buffetaut et al., 2015b). One of these localities is Montplo-Nord, near the village of Cruzy (Hérault), which has yielded a cervical vertebra (Buffetaut & Angst, 2013). In the present paper, we describe additional *Gargantuavis* material from Montplo-Nord, consisting of an incomplete left ilium and a synsacrum fragment. Despite their fragmentary nature, they can clearly be attributed to *Gargantuavis philoinos* because of their similarity with previously described specimens. They complement our knowledge of the osteology of this still poorly known giant bird, by notably providing new information about the advanced pneumatization of its pelvis.

Institutional abbreviations: MC: Museum of the Association Culturelle, Archéologique et Paléontologique de l'Ouest Biterrois, Cruzy (Hérault). BN: Mechin collection, Vitrolles (Bouches-du-Rhône). MDE: Musée des Dinosaures d'Espérasa, Espérasa, (Aude).

2. Geographical and geological setting

The faunal assemblage from Montplo-Nord includes freshwater bivalves, fish (lepisosteids), turtles (the bothremydid *Foxemys*, a solemydid and a dortokid), crocodylians, pterosaurs (azhdarchids) and dinosaurs (titanosaurid sauropods, dromaeosaurid and abelisaurid theropods, nodosaurid ankylosaurs, rhabdodontid ornithopods). This is the kind of assemblage usually found at localities of late Campanian – early Maastrichtian age in southern France and in Spain. This age assessment is supported by magnetostratigraphic evidence concerning other sites where *Gargantuavis* has been found. The type locality of *Gargantuavis philoinos*, the Bellevue site at Campagne-sur-Aude (Aude), is placed by Fondevilla et al. (2016) close to the C32n.1n–C31r reversal, indicating an earliest Maastrichtian age. According to Corral et al. (2016), the Laño locality in the Basque-Cantabrian basin, which has yielded a *Gargantuavis* synsacrum (Buffetaut et al., 2015b), falls within Chron C32n

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(72–73.5 Ma) and is therefore latest Campanian in age. There is every reason to suppose that the Montplo-Nord locality is also close to the Campanian–Maastrichtian boundary.

Although no detailed sedimentological and taphonomic study of the deposits at Montplo-Nord has yet been carried out, the red marls alternating with sandstone layers are generally similar to those found at the nearby Masecaps locality, which yields a fairly similar faunal assemblage. According to Smektala et al. (2014, p. 567), the fossil-bearing beds at Masecaps were deposited 'during brief flood episodes affecting a braided river system, under a "tropical" type of climate with alternating dry and wet seasons'.

3. Description

The anatomical nomenclature follows Baumel and Witmer (1993).

3.1. *Synsacrum fragment*

The specimen (MC-MN, Fig. 1) is a small part of the synsacrum of a large bird (total length as preserved: 42 mm). Although the ventral part is fairly well preserved, the dorsal part, consisting of thin bony lamellae, is badly crushed and broken. The exact position of the fragment within the synsacrum is not easy to determine, as it is broken at both ends and only the inceptions of the transverse processes are preserved. Comparison with the holotype specimen from Campagne-sur-Aude (MDEC3-525) suggests that it belongs to

a relatively cranial part of the synsacrum, possibly at the level of the second, third and fourth transverse processes. As on other *Gargantuavis* synsacra (Buffetaut et al., 2015a), the vertebral centra are so completely fused that no boundaries between them can be recognised. The ventral face of the synsacrum is strongly convex transversally, giving it a D-shaped cross-section. The lateral faces are steep. Little is left of the transverse processes, which are relatively broad craniocaudally and project laterally. The most remarkable point about them is that they are hollow, with extremely thin bony walls (only a fraction of a millimetre in thickness), the inner space being filled with matrix. In caudal view, the broken synsacrum can be seen to be hollow, with the D-shaped vertebral centrum occupied by a large matrix-filled pneumatic space, the bony walls of which are very thin (at most 1 mm thick). Some bony trabeculae can be seen within that space, notably near the lateral margins. Dorsal to this, the floor of the neural canal is slightly concave. Its roof cannot clearly be seen, because the dorsal part of the synsacrum has collapsed and only a mass of crushed bony lamellae remains (a similar condition is seen on the original synsacrum fragment from Fox-Amphoux: Buffetaut et al., 1995). The cranial end of the fragment is not well preserved, but, like the caudal end, it shows a vast ventral matrix-filled pneumatic space with bony walls that are even thinner than in the caudal region, and a neural canal with a concave floor.

The synsacrum fragment from Montplo-Nord is thus very reminiscent of the more complete synsacra from Fox-Amphoux (Buffetaut et al., 2015a), where a vast pneumatic canal runs along

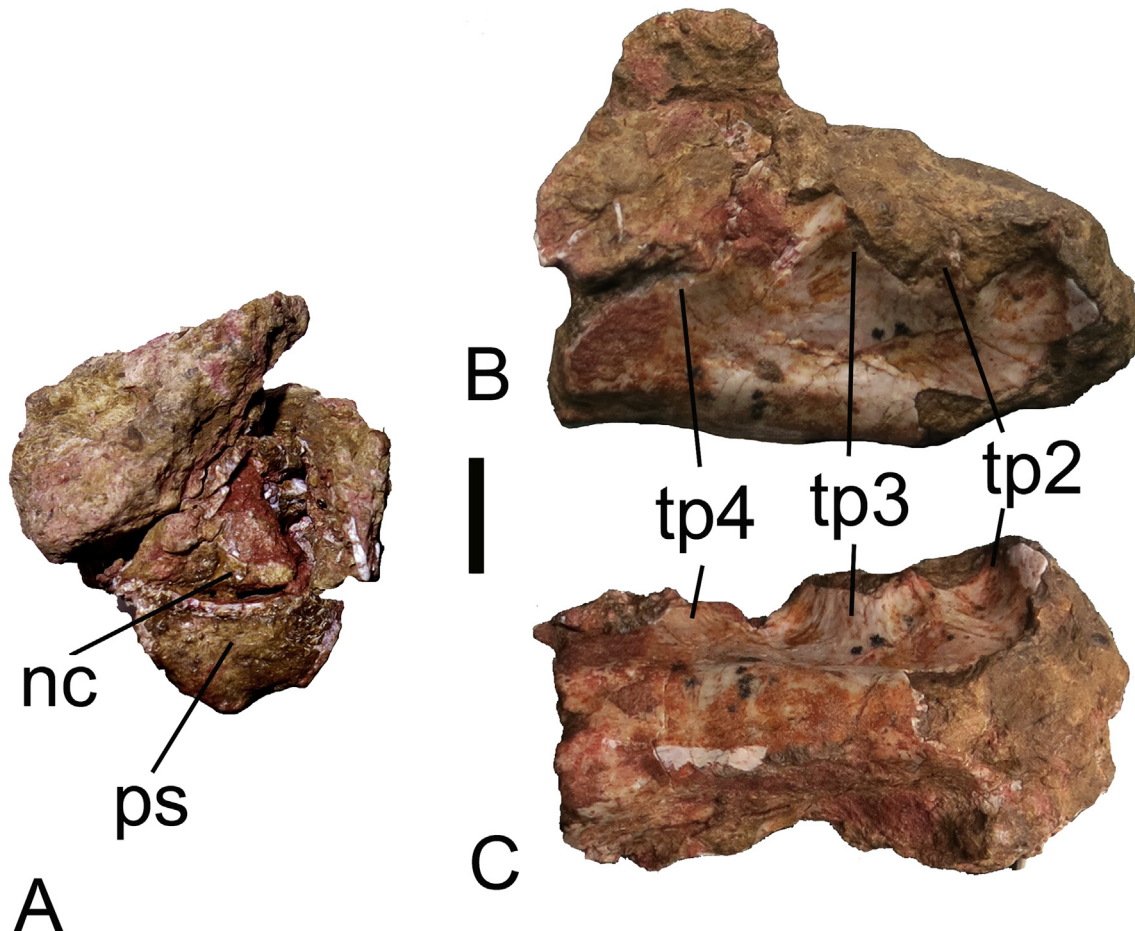


Fig. 1. *Gargantuavis philoinos* synsacrum fragment (MC-MN 1165) from the Upper Cretaceous of Montplo-Nord in caudal (A), right lateral (B) and ventral (C) views. nc: neural canal; ps: matrix-filled pneumatic space; tp2, tp3, tp4: second to fourth transverse processes. Scale bar: 10 mm.

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