

# On the presence of a sauropod dinosaur (Saurischia) in the Albian of Aube (France)

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## ABSTRACT

### KEY WORDS

Sauropoda,  
Albian,  
Aube.

A sauropod caudal vertebra from the lower Albian of Mesnil-Saint-Père (Aube, northern France) is described. The specimen is incomplete and therefore a convincing systematic determination is difficult. Sauropod diversity during the middle part of the Cretaceous in Europe is discussed.

## RÉSUMÉ

*De la présence d'un dinosaure sauropode (Saurischia) dans l'Albien de l'Aube (France).*

### MOTS CLÉS

Sauropoda,  
Albien,  
Aube.

Une vertèbre caudale de dinosaure sauropode provenant de l'Albien inférieur de Mesnil-Saint-Père (Aube) est décrite. Le spécimen est incomplet si bien qu'une détermination systématique convaincante est difficile. La diversité du groupe des sauropodes pendant la partie moyenne du Crétacé en Europe est discutée.

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## STRATIGRAPHICAL POSITION

The specimen, which is the subject of this paper, was discovered by one of us (J.-L. P.), in the Mesnil-Saint-Père district (Aube). It was about 300 m east of the mouth of the channel which transports water into the “barrage-réservoir Seine”. It was not *in situ*, but accompanied by a macrofauna of ammonites (*inter alia* *Douvilleiceras* Grossouvre, 1894; *Otohoplites* Steinmann, 1925; *Isohoplites* Casey, 1954; *Hoplites* Neumayr, 1875; *Lyelliceras* Spath, 1922), lamellibranches, crustaceans, gastropods, etc. (Matrion & Touch 1997). These originate from the clayey layers, succeeding the “Sables verts” (present under the channel outlet), that are assigned to the lower Albian (Amédéo *et al.* 1995), so this probably reflects the age of the specimen.

## SYSTEMATIC DESCRIPTION

Order SAURISCHIA Seeley, 1888

Suborder SAUROPODOMORPHA Huene, 1932

Infraorder SAUROPODA Marsh, 1878

Family indet.

The specimen belongs to the Petit collection (Troyes, Aube). Casts of it are kept in the collections of the Laboratoire de Paléontologie, Muséum national d'Histoire naturelle (Paris), under the number of entry 2000 - 1, and at the seat of the Association géologique auboise (Sainte-Savine, Aube).

The specimen (Fig. 1) is an incomplete vertebra, as a matter of fact the neural arch appears to be missing together with a caudo-dorsal part of the centrum. It is massive with a relatively low length/height ratio (< 0.8). The cranial articular surface is roughly flat, the ventral half of its contour is circular but the dorsal one has two weak opposite concavities. The caudal articular surface is weakly concave, its contour shows a weak ventral flattening. The lateral faces have no pleurocoels, they are cranio-caudally concave. The dorsal face

shows the pedicels for the articulation of the neural arch, emerging very close to the cranial side. The ventral face is cranio-caudally concave too, its caudal side is distinctly more outstanding in lateral view than the cranial one and it does not show hemapophysial facets. It is therefore a very proximal caudal vertebra, probably the first one. The median axis of the specimen is 107 mm long, the cranial face is dorso-ventrally 138 mm and transversely 140 mm.

## SYSTEMATIC POSITION

The characteristics of the sauropod vertebrae have been the subject of several studies (see, for instance, Salgado *et al.* 1997). Comparisons of our specimens have been done with the Diplodocoidea *Dicraeosaurus* Janensch, 1914, *Diplodocus* Marsh, 1878 and *Rayososaurus* Bonaparte, 1996; the Titanosauria in general; the Camarasauridae *Camarasaurus* Cope, 1877; the Brachiosauridae *Brachiosaurus* Riggs, 1903, *Pelorosaurus* Mantell, 1850 and *Pleurocoelus* Marsh, 1888.

The proximal caudal vertebrae of *Dicraeosaurus* (Janensch 1929) are (weakly) procoelous. Moreover, the distal extremity of the centrum does not widen like that of Mesnil-Saint-Père.

The proximal caudal vertebrae of *Diplodocus* (Osborn 1899; Hatcher 1901) also appear lightly procoelous. They are proportionally shorter than our specimen and pierced by important pleurocoels. Furthermore, on the ventral face of the centra, there are two parallel grooves, separated by a central crest (McIntosh 1990b).

The sauropod remains from Neuquén Province (Argentina) referred to *Rebbachisaurus* Lavocat, 1954 by Calvo & Salgado (1995) were suggested to be referred to *Rayososaurus* by Wilson & Sereno (1998). However this suggestion is not fully convincing, moreover the validity of *Rayososaurus* is questionable (McIntosh pers. comm. 1999). Be that as it may, according to Calvo & Salgado (1995), the proximal caudal vertebrae of this taxon bear hemal arches, they have a pleurocoelic cavity (Calvo & Salgado

1995: fig. 10B) and the ventral surface is flat, with a wide longitudinal groove.

According to Wilson & Sereno (1998), the Titanosauria have caudal vertebrae with an eminently convex (hemispheric) caudal face. This group comprises a number of representatives, such as *Alamosaurus sanjuanensis* Gilmore, 1922 (Gilmore 1946: fig. 1, pl. 5), that possesses a biconvex first caudal vertebra.

The centrum of the proximal caudal vertebrae of *Camarasaurus* (Osborn & Mook 1921: pls 74-77) has a lower length/height ratio, the ventral face is often more curved cranio-caudally and the aretes of the articular faces with the centrum body are blunter.

The vertebra of Mesnil-Saint-Père strongly evokes the proximal caudal vertebrae of the Brachiosauridae. Compared to the caudal vertebrae of *Brachiosaurus brancai* Janensch, 1914 (Janensch 1950a), the resemblance is very strong with the first one (Janensch 1950a: fig. 1a-c, pl. 2). The two centra have some dissimilarities indeed but in minor points doubtless subject to individual variation (or deformation). Thus, in *Brachiosaurus brancai*, the cranial face is a little bite more oval, possesses a less keen ventral border and is more concave in lateral view (this last trait totally disappears on the second caudal). In the same way, in this last taxon the constriction of the vertebral body seems slightly more pronounced than that of the French specimen and the ventral border of the caudal face more distinct in comparison with it. Due to the absence of the neural arch, it is unfortunately not possible to verify the emplacement of the transverse processes among other anatomical characteristics.

The genus *Pelorosaurus* was created by Mantell (1850) for a humerus, type species *Pelorosaurus conybeari* (Melville, 1849), and referred material. For McIntosh (1990b), there is no reason to believe that the caudal vertebrae described by Mantell with the humerus do not belong to the same species. Those comprise, in particular, proximal caudal vertebrae (Mantell 1850: pl. 22, figs 5-7; pls 24-25). These, compared to the vertebra of Mesnil-Saint-Père, have deeper excavated lateral faces in ventral view. Other differences in

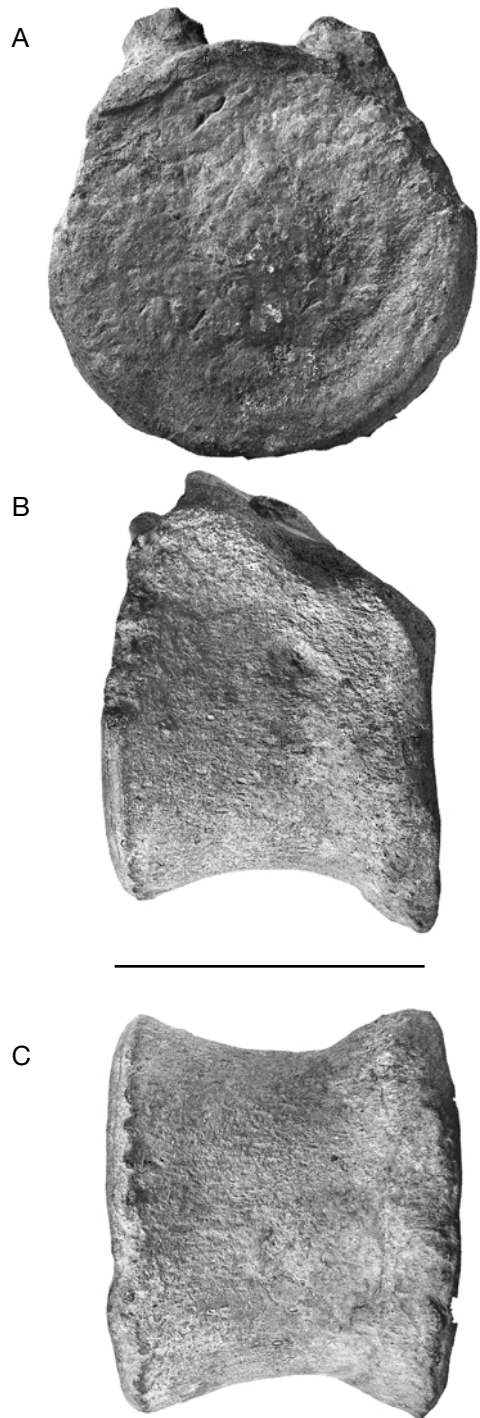


FIG. 1. — Caudal vertebra of a Sauropoda from the Albian of Mesnil-Saint-Père (Aube, France), J.-L. Petit collection (Troyes). Photographs by C. Abrial. **A**, cranial view; **B**, left lateral view; **C**, ventral view. Scale bar: 10 cm.

the length/width ratio or the aspect of the ventral border of the articular faces are perfectly remarkable, but the most distinct difference concerns the contour of the articular faces. These are, in fact, roughly quadrangular and not circular as that of the specimen we are studying.

The type species of the genus *Pleurocoelus*, *Pleurocoelus nanus* Marsh, 1888, is based on remains of several individuals from the Lower Cretaceous of Maryland (Marsh 1888). The proximal caudals (Marsh 1896: figs 38-41) are very short, the ventral border of the articular faces have about the same extension and, above all, they are procoelous (even if their distal convexity is weak).

The vertebra of Mesnil-Saint-Père has therefore more affinities with the genus *Brachiosaurus* than with *Pelorosaurus* or the small *Pleurocoelus*. Our specimen is possibly a representative of the Brachiosauridae, the first to be described from the Albian of Europe. It is also important to point out that, assuming the veracity of the above, it would be thus one of the latest Brachiosauridae brought to light (cf. Sereno 1999). This group has already been signalled in the so-called "Continental intercalaire" of northern Africa (Lapparent 1960) with the taxa *Brachiosaurus nougaredi* Lapparent, 1960 in Algeria and *Pleurocoelus* sp. in Niger. This last genus has notably also been reported in the Lower Cretaceous of Europe, as well as *Pelorosaurus* (Hunt *et al.* 1994). The type specimen of *B. nougaredi* does not include caudal vertebrae, moreover the generic determination of the specimen cannot be affirmed (McIntosh 1990a). Australia has also revealed the presence of the Brachiosauridae in the Albian (Hunt *et al.* 1994), an incomplete sauropod forelimb attributed to *Brachiosaurus* sp. has been recovered in this country (Molnar pers. comm. 1997). An extremely tentative estimation, by extrapolation from *Brachiosaurus brancai* (Janensch 1950a, b), would give the Mesnil-Saint-Père individual a height of about 7.5 m and a length of a little more than 14 m.

This previous identification may be improved by the study of unpublished material such as the sauropod from the lower Aptian of Peñarroya de

Tastavins (Teruel, Spain). This sauropod (Royo-Torres 1999), identified so far as a possible titanosauriforme, shares some characters with *Brachiosaurus*.

## REMARKS

Hence, in the realm of sauropods the French Albian has delivered, in addition to the vertebra described above: a humerus (type specimen of *Aepisaurus elephantinus* Gervais, 1852 of doubtful systematic allocation) in the surroundings of Bédoin, Vaucluse (Gervais 1848-1852); a batch of ten caudal vertebrae at Villers-Saint-Barthélemy, Oise (Lapparent 1946); a caudal vertebra at Bléville, Seine-Maritime (Buffetaut 1984); a batch of nine caudal vertebrae at Pargny-sur-Saulx, Marne (Martin *et al.* 1993); a certain number of bones, particularly two caudal vertebrae, at Bléville (Buffetaut 1995).

On a European scale, the remains found in the Cambridge Greensand of the Cambridgeshire (Seeley 1869, 1876; Lydekker 1888) have to be added to this list and which are, at present, considered reworked from the Albian (Rawson *et al.* 1978). These, a certain number of caudal vertebrae and five associated metatarsals, have all been ascribed to *Macrurosaurus semnus* Seeley, 1869. But, according to Le Loeuff (1993), the type series, itself, of this species is based on composite material including remains of at least two different sauropods (including a Titanosauridae).

Despite our very imperfect knowledge of the sauropod fauna during the middle part of the Cretaceous in Europe, it appears rather diversified. Apart from representatives possibly close to well known mainly Jurassic groups (cf. our specimen and, maybe, the vertebrae of the Pays de Bray and the isolated vertebra of Bléville), there would be others (of uncertain affinities) peculiar to this period (cf. the vertebrae of Pargny-sur-Saulx, the most recent discovery of Bléville, and, maybe, the non titanosaurid material of "*Macrurosaurus*") and the Titanosauria which would know a great success in the Upper Cretaceous (cf. "*M. semnus*" *pro parte* and maybe the humerus of Bédoin). This

data well illustrate Upchurch's remark (1995) about the passage from an Upper Jurassic type sauropod fauna to a titanosauriforme dominated one during the Cretaceous.

A sauropod radiation has thus been suggested. Hunt *et al.* (1994) certainly consider the Albian stage as one of the three major peaks of sauropod diversity. A major floral evolution during this period could be linked to this phenomenon; only sauropods with rather weak and cylindrical (or weakly spatulate) teeth survived in the Upper Cretaceous (Upchurch 1995). But a "taphonomic bias", prevailing conditions more favourable to the fossilisation process and related to a rise in sea level, should be taken into account (Haubold 1990).

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