

AN IGUANODON JAW (DINOSAURIA, ORNITHOPODA) FROM THE LOWER CRETACEOUS OF AUBE (EASTERN PARIS BASIN, FRANCE)

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Abstract : A dentary fragment in the collections of the Troyes Natural History Museum is described and identified as *Iguanodon* sp. The specimen was found sometime during the nineteenth century at Bernon, a village in the “Champagne humide” about 36 km south of Troyes. The matrix shows that this jaw fragment comes from the Hauterivian Calcaire à Spatangues, a shallow marine limestone which has yielded *Iguanodon* remains at other places in the eastern Paris Basin. The specimen is interpreted as an element of a floating carcass originating from a nearby land mass.

Key words : Dinosauria, Iguanodon, Dentary, Cretaceous, Hauterivian, Paris Basin.

Une mâchoire d'*Iguanodon* (Dinosauria, Ornithopoda) dans le Crétacé inférieur de l'Aube (partie orientale du Bassin de Paris, France)

Résumé : Un fragment de dentaire trouvé dans les collections du Muséum d'Histoire Naturelle de Troyes est décrit et identifié comme *Iguanodon* sp. Le spécimen fut trouvé au 19^e siècle à Bernon, un village de la Champagne humide à environ 36 km au sud de Troyes. La gangue montre que ce fossile provient du Calcaire à Spatangues (Hauterivien), un dépôt de mer peu profonde qui a livré des restes d'*Iguanodon* en d'autres points du Bassin de Paris oriental. Ce spécimen est interprété comme un élément d'une carcasse flottée provenant d'une zone émergée voisine.

Mots clés : Dinosauria, Iguanodon, Dentaire, Crétacé, Hauterivien, Bassin de Paris.

INTRODUCTION

Although Cornuel reported bones later assigned to *Iguanodon* from the Lower Cretaceous of the eastern Paris Basin as early as 1850, he misinterpreted his finds (Martin & Buffetaut, 1992), and Corroy (1922) was the first to correctly identify such material. In 1968, a longer list of *Iguanodon* finds from that area was published by Lapparent and Stchepinsky, and in 1992 most of the available material was described by Martin and Buffetaut, an additional specimen from the Barremian of Wassy (in the museum at Châlons-en-Champagne) being recorded by Buffetaut (1995).

Since then, there have been few new reports of *Iguanodon* material from the eastern Paris Basin. The proximal end of a large fibula from the Barremian of

Unienville (Aube) has been described as *Iguanodon* cf. *bernissartensis* (Buffetaut *et al.*, 2003). The specimen described in the present paper, like several of those previously described, is an old find which remained unrecognised for a long time in a regional collection.

The fragmentary *Iguanodon* dentary described below was found in the palaeontological collection of the Natural History Museum at Troyes (Aube), which includes the collection of a local learned society, the Société Académique de l'Aube, put together mainly during the nineteenth century. Its interest lies in the fact that the *Iguanodon* material hitherto reported from the eastern Paris Basin consisted of post-cranial elements. This is apparently the first record of *Iguanodon* jaw material from that area.

GEOGRAPHICAL AND GEOLOGICAL SETTING

The specimen, which is part of the old collection of the Société Académique de l'Aube, bears a small nineteenth-century label, with a simple mention of geographical origin, indicating that it was found at Bernon. Bernon is a small village in the southwestern part of Aube (in the "Champagne humide" region), some 36 km S of the city of Troyes (see map in Colleté *et al.*, 1995). The exact circumstances and date of the find are unknown, as well as the name of the finder. Although the label does not mention any geological origin, the 1/50 000 geological map of the area (Chaource sheet, 1968) shows that rocks on both sides of the valley where Bernon lies are Early Cretaceous in age. According to Leymerie (1846), the hillsides around Bernon show two main geological formations :

- the Hauterivian Calcaire à Spatangues (or *Toxaster* Limestone).
- the Barremian Argiles ostréennes.

Iguanodon remains have been found in both formations in other parts of the eastern Paris Basin. Martin and Buffetaut (1992) described a partial skeleton of *Iguanodon atherfieldensis* from the Calcaire à Spatangues of Wassy (Haute-Marne) and a small cervical rib from the Argiles ostréennes of Baudonvilliers (Meuse), and Buffetaut *et al.* (2003) have referred the proximal end of a large fibula from the Argiles ostréennes of Unienville (Aube) to *Iguanodon* cf. *bernissartensis*. The only evidence about the exact stratigraphical origin of the jaw from Bernon is its matrix, which is a yellowish-grey limestone. This corresponds perfectly well with the appearance of the matrix of vertebrate fossils from the Calcaire à Spatangues from other localities in the eastern Paris Basin (in particular, comparisons have been made with specimens in the collections of the Saint-Dizier Museum). The type of preservation of the jaw fragment, with its yellowish-brown colour, also compares well with that of bones from the Calcaire à Spatangues. In contrast, the *Iguanodon* fibula from the grey Argiles ostréennes of Unienville is quite different in appearance, being very dark grey in colour and somewhat pyritised. The Calcaire à Spatangues in the vicinity of Bernon is described by

Pietresson de Saint-Aubin (1966) as being soft and clayey, which is in good agreement with the matrix of the *Iguanodon* jaw. There seems to be no doubt, therefore, that the jaw from Bernon was found in the Calcaire à Spatangues and is Hauterivian in age.

The Calcaire à Spatangues is a marine limestone, containing abundant fossils (see Fricot *et al.*, 1995, for a recent review), which was deposited on a vast shallow platform opening to the south-east toward the Tethys Sea (Magnez-Jannin, 1984).

Palaeogeographical reconstructions show an extensive land area to the north and west (Fricot *et al.*, 1995). Remains of terrestrial organisms, including the *Iguanodon* jaw from Bernon, must have been derived from this land mass, which was not far distant from the depositional area of the limestone. The jaw from Bernon is probably an element of a floating carcass (see Buffetaut, 1994, for considerations on the significance of dinosaur remains in marine sediments).

DESCRIPTION

The specimen from Bernon is a piece of a right dentary, missing both ends (Fig.1). The anterior portion is very incomplete, lacking all its dorsal (alveolar) region. More posteriorly, the alveolar region is preserved. Seven alveoli can thus be distinguished, the thick interalveolar walls being partly preserved labially. Lingually, the interalveolar partitions are not present, and remains of six teeth are visible. The teeth are poorly preserved, the crowns being incomplete, and their enamel covering usually damaged. The second tooth from the front shows only the hollow base of the crown, which expands toward the apex. In cross section, it shows a convex labial side, and a lingual side which bears two well-marked ridges. It closely resembles worn *Iguanodon* teeth from the Wealden of England figured by Mantell (1848). More posterior teeth are not fully erupted, and what is seen of their crowns is not well preserved. However, enamel ridges of the kind usually seen on *Iguanodon* teeth can clearly be seen on the lingual face of the fourth tooth from the front. In dorsal view, what is left of the alveolar row shows a distinct sigmoid curvature, the alveoli becoming gradually more labial in position towards the front of the jaw. This is the usual condition in *Iguanodon*, as described and figured by

Mantell as early as 1848. Comparison with complete *Iguanodon* dentaries suggests that the Bernon specimen corresponds to the middle part of the toothed region of the bone (Fig.2).

Near its ventral edge, the lingual face shows a Meckelian groove which is very deep posteriorly and becomes much shallower anteriorly. The prearticular and splenial bones, which in life covered this groove, are not preserved and must have been only weakly attached to the dentary. The attachment area for the prearticular is apparently shown by weak longitudinal ridges dorsal to the Meckelian groove. More dorsally, the thin bony plate which forms the lingual rim of the alveolar row in well-preserved *Iguanodon* jaws (termed the "alveolar parapet" by Hooley, 1925) is not preserved.

The labial face of the bone is slightly concave dorsally, and strongly convex ventrally, so that it forms an incipient dorsal shelf in its posterior part, as usual in *Iguanodon*. Close to the inflexion between the concave and convex parts, two large oval vascular foramina can be seen. Such a row of foramina on the labial surface of the dentary has been described in *Iguanodon* by various authors (Mantell, 1848; Hooley, 1925; Norman, 1980, 1986). The alveolar edge is scalloped.

The posterior break (Fig.3) shows the very deep Meckelian groove, which enters the dentary up to its midline. Dorsally, a deep alveolus contains the poorly preserved root of a tooth. Labial to the Meckelian groove, the dentary contains a system of matrix-filled vacuities. At the anterior end of the fragment, where the Meckelian groove is very shallow, the dentary shows in cross-section a vast oval matrix-filled space.

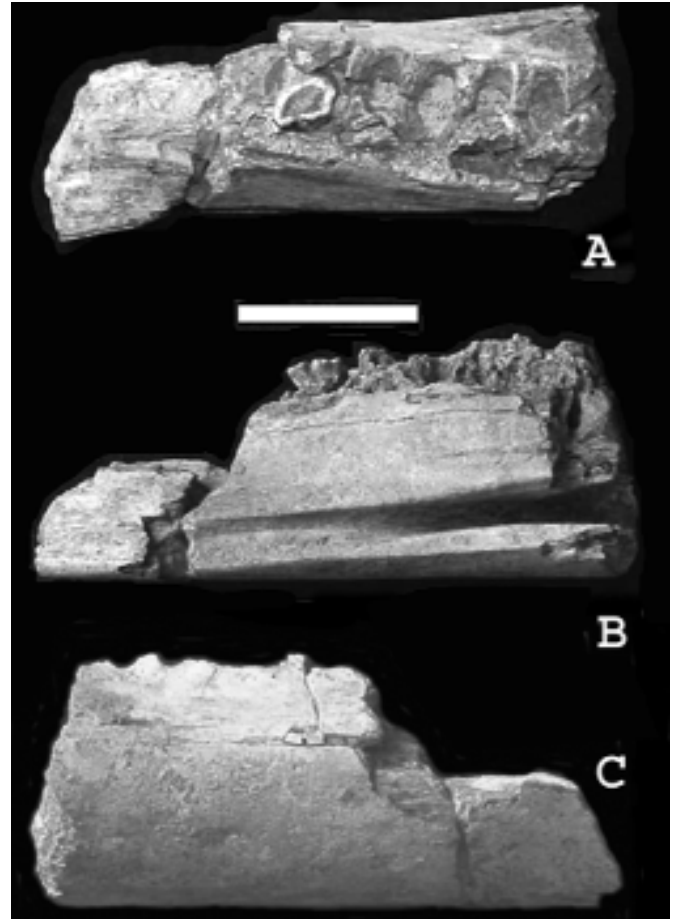


Figure 1. Incomplete right dentary of *Iguanodon* sp. from the Hauterivian of Bernon (Aube), Muséum d'Histoire Naturelle de Troyes, n° PV300, in dorsal (A), lingual (B) and labial (C) views. Scale bar: 50 mm.

Measurements

Length of specimen as preserved: 154 mm.
 Maximum height of dentary bone (at the level of the posterior break) : 59 mm.
 Maximum width of dentary bone (at the level of the posterior break) : 50 mm.

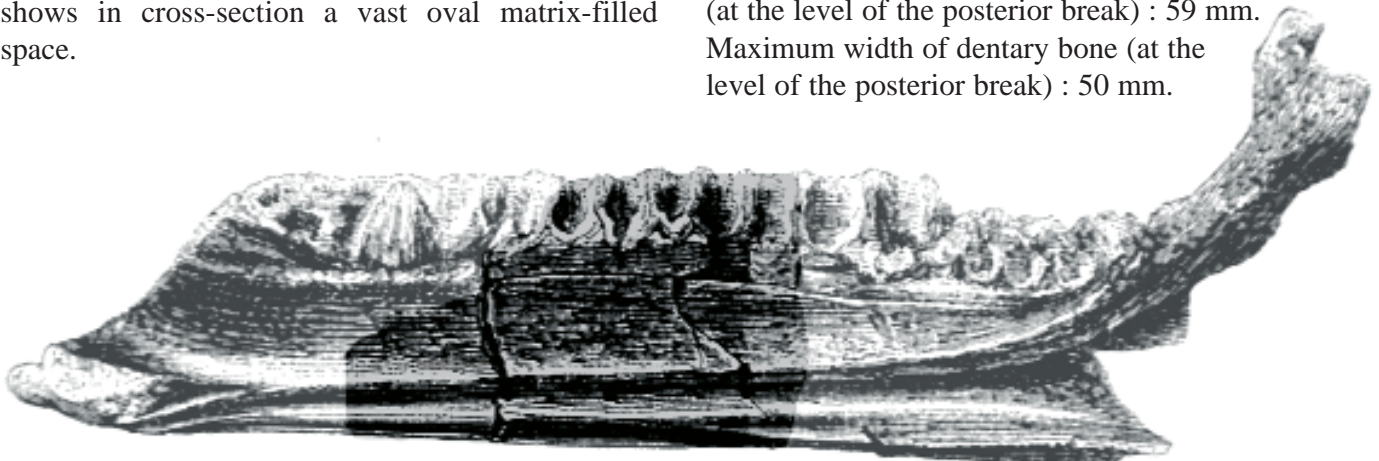


Figure 2. Probable position of the jaw fragment from Bernon, as superimposed (dark area) on a right dentary of *Iguanodon* from the Wealden of Tilgate Forest, Sussex (England), as figured by Mantell (1851).

DISCUSSION

As shown by the above description, all the characters of the jaw fragment from Bernon are in agreement with an assignment to the genus *Iguanodon*, a taxon which has already been reported from the Hauterivian Calcaire à Spatangues of the eastern Paris Basin (Corroy, 1922; Lapparent & Stchepinsky, 1968; Martin & Buffetaut, 1992). An identification at the specific level is more difficult because of the fragmentary nature of the specimen. Several species of *Iguanodon* have been described from the Early Cretaceous of Europe. The forms from the lower Wealden (Hastings Sands, late Berriasian to end of Valanginian) of southern England (such as *Iguanodon fittoni* and *I. dawsoni*: see Norman, 1987) are not well known and, following the reassignment of the Berriasian “*Iguanodon*” *hoggii* to the genus *Camptosaurus* (Norman & Barrett, 2002), they are in need of revision (Norman & Barrett, 2002). The later species *Iguanodon bernissartensis* and *I. atherfieldensis*, which are known from the upper Wealden of England (Weald Clay, Hauterivian to Barremian) and from Bernissart in Belgium (Barremian-Lower Aptian), are much better known, and it is mainly with them that the Bernon jaw can be compared. However, these species are distinguished principally by osteological features and proportions of the postcranial skeleton (Norman, 1986; see also Naish and Martill, 2001), which cannot be used in the present case. *Iguanodon atherfieldensis* is smaller (6-7 metres in length) and more slenderly built than *I. bernissartensis* (up to 11 metres in length). To judge from the height of its dentary, the *Iguanodon* from Bernon was about the size of the type specimen of *Iguanodon atherfieldensis* from the Weald Clay of the Isle of Wight (Hooley, 1925), and probably significantly smaller than most specimens of *Iguanodon bernissartensis*. However, size alone may be of limited significance, since it cannot be judged whether the *Iguanodon* from Bernon was a fully grown specimen or not. The difficulty of identifying isolated *Iguanodon* dentaries is illustrated by the fact that the dentaries from the Aptian karstic locality at Nehden (Germany), where both *I. bernissartensis* and *I. atherfieldensis* occur, could not be identified at the species level (Norman *et al.*, 1987). It should also be mentioned that the only *Iguanodon* species hitherto

recorded from the Calcaire à Spatangues is *I. atherfieldensis* (Martin & Buffetaut, 1992), but this is based on a single specimen, the partial skeleton from Wassy in the Saint-Dizier Museum.

Because of the various uncertainties linked to the incompleteness of the specimen and the difficulty of separating *Iguanodon* species on the basis of isolated dentaries, the jaw fragment from Bernon is referred to here as *Iguanodon* sp.

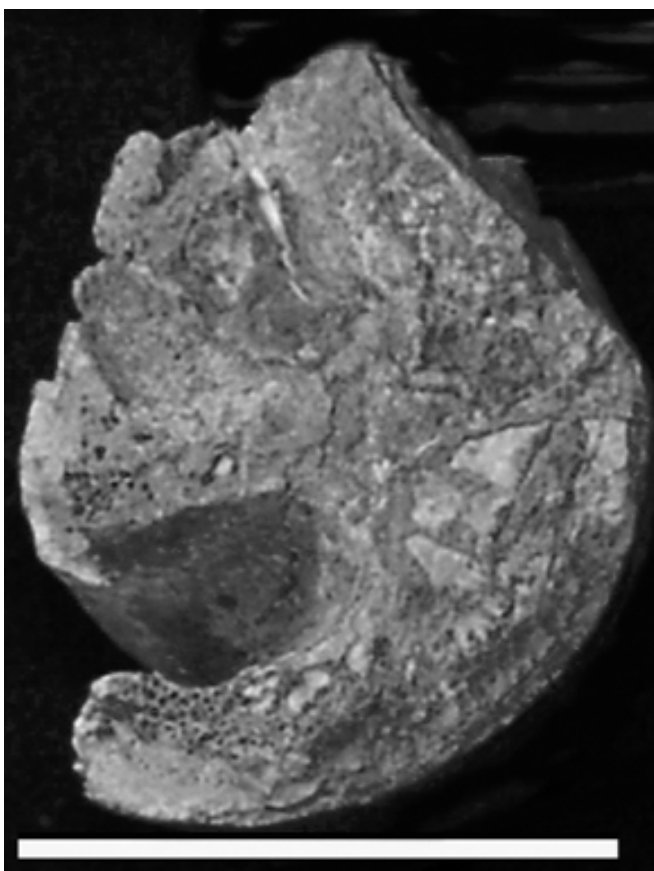


Figure 3. Cross-section of the incomplete *Iguanodon* dentary from Bernon (Aube) at the level of the posterior break. Scale bar: 50 mm.

CONCLUSIONS

The jaw from Bernon is an addition to the record of the dinosaur *Iguanodon* in the Early Cretaceous of the eastern Paris Basin, where it is known to occur from the Hauterivian to the Aptian (Martin & Buffetaut, 1992). There is so far no evidence of it in later deposits in that area; although the Albian Grès Verts of Meuse and Ardennes have yielded remains of various dinosaurs (Sauvage, 1882; Buffetaut, 2002), none can be referred to *Iguanodon*. One of the interests of the *Iguanodon* material from the Paris Basin is that it comes from marine sediments, or from non-marine sediments intercalated in marine sequences, so that its stratigraphic age can be ascertained with great precision. In this way, it complements usefully the often better preserved finds from more continental areas in southern England and Belgium, the age of which is sometimes more uncertain.

The Calcaire à Spatangues, although deposited in a marine environment, appears as an interesting potential source of non-marine vertebrates, with finds of *Iguanodon* at Bernon (this paper) and Wassy (Haute-Marne; Martin & Buffetaut, 1992), and of pterosaurs at Attancourt (Haute-Marne; Buffetaut & Wellnhofer, 1983; Buffetaut, in prep.). However, since there are now only few outcrops of Calcaire à Spatangues (Pietresson de Saint-Aubin, 1966), old collections in local museums are likely to be the main source of “new” finds – the discovery of the *Iguanodon* jaw from Bernon in the collections of the Troyes Natural History Museum being a good example.

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