

A NODOSAURID ANKYLOSAUR FROM THE LOWER CRETACEOUS  
OF SALAS DE LOS INFANTES (PROVINCE OF BURGOS, SPAIN)

by

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ABSTRACT

This note reports the discovery of a new dinosaurs outcrop in Salas de los Infantes (province of Burgos, Spain), belonging to the Lower Cretaceous (Barremian - Albian). The main piece found up to date is a dermal spike from an ankylosaur dinosaur. The ratio between the maximum basal dimension to the height and the outline of the cross-section of the blade seem to indicate it belongs to the *Nodosauridae*. Several structural (and perhaps textural too) characteristics (as the disposition and morphology of the spike's base) seem to indicate that this Spanish nodosaurid could be close to *Hylaeosaurus*.

RÉSUMÉ

Cette note rapporte la découverte d'un nouveau gisement à dinosauriens dans le Crétacé Inférieur (Barrémien-Albien) de Salas de los Infantes (province de Burgos, Espagne). La pièce principale trouvée pour le moment est une épine dermique appartenant à un dinosaurien ankylosaurien. Le rapport entre la plus grande dimension de la base et la hauteur, ainsi que le contour de la section de l'épine, semblent indiquer son appartenance aux *Nodosauridae*. Diverses caractéristiques structurales (et peut être aussi de la texture) comme la disposition et la morphologie de la base de l'épine, semblent indiquer que ce nodosauridé espagnol est probablement proche de *Hylaeosaurus*.

KEY-WORDS : *NODOSAURIDAE* (*ANKYLOSAURIA*), LOWER CRETACEOUS, DERMAL SPIKE, PROVINCE OF BURGOS, SPAIN.

MOTS-CLÉS : *NODOSAURIDAE* (*ANKYLOSAURIA*), CRÉTACÉ INFÉRIEUR, ÉPINE DERMIQUE, PROVINCE DE BURGOS, ESPAGNE.

A dinosaur outcrop has been found in Salas de los Infantes (some 70 kms SE from Burgos, North Central Spain) by a local archaeological group. It belongs to the Lower Cretaceous (Barremian-Albian) (1). The main piece of the several remains found up to date is a dermal spike of an ankylosaur dinosaur. Sanz & *alii* (2) report a nodosaurid ankylosaur from similar stratigraphic level in Morella (Castellón, Spain). The

scarcity of remains renders impossible the comparison of both forms. This new outcrop will probably aid to the knowledge of the Spanish Lower Cretaceous dinosaur fauna (2, 3, 4, 5).

The several taxa are here considered *sensu* Coombs (6). All cited genera in inverted commas refers to a Synonym proposed by Coombs (6).

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## DESCRIPTION

The piece is composed of a basal region (attaching zone) and a stout spike. The basal plane cuts across the axis of the spine at an angle of about 30 degrees (plate 1 A). The maximum transverse length of the base is 140 mm. The total height is 200 mm, 1,4 times the greatest basal dimension. The base has a minimum dimension (parallel to the largest axis of the outline of the spine cross-section) of 80 mm.

The basal inner zone is hollow, especially under the ventral part of the spike (I consider the keel of the blade as dorsal, see later). From that region the attaching surface gradually becomes flatter. Its outline is roughly rhombic, the dorsal contour having a large region, more or less straight. While the most of the edges of the basal outline are rounded, this dorsal zone is more or less flat, somewhat like an articular facet. The attaching zone is covered by a characteristic textural surface made of crossing fibers or trabeculae. The crossing angle is quite constant (of some 50 degrees) (plate 1 D).

The spike has an oval cross-section. All its surface is rugose, covered of small pits and grooves, probably of vascular origin. These structures are more conspicuous on the keel region. The later is clearly asymmetrical especially near the attaching zone, where it reaches the greatest width (plate 1 B). The keel gradually disappears towards the tip of the spine. The outline of the keel in lateral view is convex, with a basal zone slightly concave. The ventral lateral outline of the spine is somewhat straight, its surface without keel, rounded. Its disposition is asymmetrical near the attaching zone (plate 1 C). The direction of twist in the dorsal keel and the rounded ventral edge of the spike are opposite. (Compare figs. B and C, plate 1).

#### TOPOGRAPHIC POSITION. ORIENTATION

Most proposals for the osteoderm distribution in ankylosaurs are based on incomplete material or are hypothetical (6). The asymmetry of the Spanish piece seems to indicate that it is not from an axial position. In *Palaeoscincus* (7, 8) spikes of similar characteristics are disposed along the flanks of the body, much as it is reported by Galton (9) in the probably nodosaurid *Dracopelta zbyszewskii*. So, it is likely that the spike from Salas had a lateral position. The flat surface (facet) in this base (see description) seems to indicate its connexion with another osteoderm, perhaps a lateral element of one of the rings of plates (taking *Palaeoscincus* as model). The structural relation between the attaching zone and the axis of the blade in the Spanish piece suggests a position coming more or less straight out of the flank of the animal.

According to Gilmore (8), in *Palaeoscincus* the keel of the spike has a dorsal position. That indication has been taken to establish the orientation of the specimen from Salas, from which, nevertheless, it is not possible to point out whether it is a left or right piece.

#### DISCUSSION

The general morphology of the dermal spine is characteristic of a nodosaurid ankylosaur (6). This assessment is based on two main traits : the ratio between the height of the spine in relation to the maximum basal dimension, and the outline of the spine cross-section. In fact, the following ankylosauridae genera have been considered : *Euoplocephalus* (10), « *Dyoplosaurus* » (11), *Ankylosaurus* (12), *Pinacosaurus* (13), « *Scolosaurus* » (14). All these taxa,

according to present knowledge, have different scutes from the morphotype present in the specimen of Salas de los Infantes.

Among the nodosaurid genera that have been compared only *Acanthopholis* and *Hylaeosaurus*, both of the English Wealden, seem to present a similar morphology. *Palaeoscincus* (7, 8), *Struthiosaurus* (15), « *Hierosaurus* » (16), « *Edmontonia* » (17), *Nodosaurus* (18) and *Sauropelta* (19) have been eliminated.

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The specimen from Salas differs from the spine figured and described by Huxley (20, plate V, fig. 1) belonging to *Acanthopholis* especially in the morphology of its base and the lateral ventral outline near the basal zone. The Spanish piece seems akin to the «  $\gamma$  » spines of « *Polacanthus* » (*Hylaeosaurus*) (21). Its base is very similar in outline and shape in the attaching zone. Nevertheless, it differs in the outline of the blade in lateral view (21, plate 71, fig. 4 and plate 76, fig. 1). The blade of the piece from Salas seems stouter than that of « *Polacanthus* » described and figured by Nopcsa (22, fig. 7), but the general morphology is very akin.

In the attaching zone of the Spanish piece one can see a characteristic trabecular interwoven meshwork. Something analogous is reported by Marsh (23, plate 75, fig. 5) in *Nodosaurus textilis*. The only difference between these cases is in the crossing-angle, of some 90 degrees in the American ankylosaur. The spine published by Mantell (24), belonging to *Hylaeosaurus*, though relatively higher, has similar general morphology and external texture. Even the crossing-angle

of fibres (24, plate 27, fig. 3) of the internal structure is similar.

In conclusion, the differences between the Spanish spine and those published of *Hylaeosaurus* could be considered under the view of morphologic divergences corresponding to a different topographic position. So, I propose the Spanish specimen as cf. *Hylaeosaurus* sp.

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#### REFERENCES

- (1) SALOMON J. - *in* : El Cretácico de España Univ. Complutense edit., Madrid, 1982, p. 345-387.
- (2) SANZ J.L., CASANOVAS M.L. & SANTAFE J.V. - *in* : Geología y Paleontología (Dinosaurios) de las Capas Rojas de Morella (Castellón, España). *Diputación provincial de Castellón, Diputación provincial de Barcelona*. Castellón. Barcelona, 1982, p. 71-169.
- (3) SANZ J.L. - *Geobios*, Lyon, 15(6), 1982, p. 943-949.
- (4) SANZ J.L., SANTAFE J.V. & CASANOVAS M.L. - *J. Vert. Paleont.*, Norman, Oklahoma, 3(1), 1983, p. 39-42.
- (5) LAPPARENT A.F. de - *Teruel*, Teruel, 24, 1960, p. 177-197.
- (6) COOMBS W.P. Jr. - *Paleontology*, London, 21(1), 1978, p. 143-170.
- (7) MATTHEW W.D. - *Nat. Hist.*, N.Y., 22, 1922, p. 333-342.
- (8) GILMORE C.W. - *Proc. U.S. natn. Mus.*, Washington, 77(16), 1930, p. 1-39.

- (9) GALTON P.M. - *Geobios*, Lyon, 13(3), 1980, p. 451-457.
- (10) CARPENTER K. - *Canad. J. Earth Sci.*, Ottawa, 19(4), 1982, p. 689-697.
- (11) MARYAŃSKA T. - *Palaeont. pol.*, Warszawa, 21, 1969, p. 23-32.
- (12) BROWN B. - *Bull. Am. Mus. nat. Hist.*, N.Y., 24, 1908, p. 187-201.
- (13) YOUNG C.C. - *Palaeont. Sinica*, Peking, 11(1), 1935, p. 1-28.
- (14) NOPCSA F. - *Geolog. Hungar.*, Budapest, 1(1), 1928, p. 1-84.
- (15) NOPCSA F. - *Geolog. Hungar.*, Budapest, 4, 1929, p. 1-76.
- (16) WIELAND G.R. - *Am. J. Sci.*, New Haven, Conn., 27, 1909, p. 250-252.
- (17) RUSSELL L.S. - *Univ. Toronto Stud.*, Geol. Ser., Toronto, 43, 1940, p. 1-28.

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(18) LULL R.S. - *Am. J. Sci.*, New Haven, Conn., 1(2), 1921, p. 97-126.

(19) OSTROM J. - *Peabody Mus. Nat. Hist. Bull.*, New Haven, Conn., 35, 1970, p. 1-234.

(20) HUXLEY T.H. - *Geol. Mag.*, London, 4, 1867, p. 65-67.

(21) HULKE J.W. - *Phil. Trans. R. Soc.*, London, 172, 1881, p. 653-662.

(22) NOPCSA F. - *Geol. Mag.*, London, 6, 1905, p. 241-250.

(23) MARSH O.C. - *The Dinosaurs of North America*, Washington, 1896, p. 133-244.

(24) MANTELL G.A. - *Phil. Trans. R. Soc.*, London, 1850, p. 391-392.

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## PLATE

### PLATE 1

Dermal spike of cf. *Hylaeosaurus* sp. from Salas de los Infantes

Épine dermique de cf. *Hylaeosaurus* sp. de Salas de los Infantes

1A — Lateral view. Vue latérale

2B — Dorsal view. Vue dorsale

1C — Ventral view. Vue ventrale

1D — Crossing fibers in the basal region. Fibres croisées dans la région basale

