A LOWER DEVONIAN (EMSIAN) SPECIES OF THE GENUS *Bactrocrinites* (CRINOIDEA): *Bactrocrinites robustus* n. sp. (CANTABRIAN MOUNTAINS, NW SPAIN)

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ABSTRACT

The only previous reference to Spanish bactrocrinitids (Crinoids) is found in Breimer (1962), who reports a specimen catalogued as TB73 on show at the museum of the Instituto Geológico y Minero de España (IGME) in Madrid. This specimen was found in the locality of Colle, León (Cantabrian Mountains) in rocks of the La Vid Group (Emsian). It was classified as *Bactrocrinites* sp., and was considered to be related to *B. fusiformis* (Roemer, 1844) and to *B. muelleri* (Jaeckel, 1895). New and exhaustive search in the locality of Colle have led to the discovery of two new specimens of the genus whose characteristics allow a new species to be defined: *B. robustus* n. sp., with a much more robust calyx than the other known species of the genus.

Keywords: Crinoidea, Inadunata, *Bactrocrinites*, Emsian, La Vid Group, Cantabrian Mountains, Spain.

RESUMEN

La única referencia previa a los bactrocrinos (Crinoideos) españoles se debe a Breimer (1962) y se refiere a un espécimen expuesto en el museo del Instituto Geológico y Minero de España (IGME) catalogado como TB73. Dicho espécimen fue recogido en la localidad leonesa de Colle (Cordillera Cantábrica) en rocas del Grupo La Vid (Emsiense). El ejemplar fue clasificado como *Bactrocrinites* sp., y considerado afín a *B. fusiformis* (Roemer, 1844) y a *B. muelleri* (Jaeckel, 1895). Nuevas campañas de búsqueda exhaustiva en la localidad de Colle culminaron con el hallazgo de dos nuevos ejemplares del género cuyas características permiten definir una nueva especie: *B. robustus* n. sp., con cáliz mucho más masivo que el de las demás especies conocidas del género.

Palabras clave: Crinoideos, Inadunata, *Bactrocrinites*, Emsiense, Grupo La Vid, Cordillera Cantábrica, España.

INTRODUCTION

To date, the first and only reference of bactrocrinitids in Spain is to be found in the famous monograph on Spanish crinoids by A. Breimer (1962). This study reports the existence of a specimen catalogued as TB73, from the Emsian period of the La Vid Formation in the locality of Colle, León (Fig. 1), Level Crin 1 (probably equal to Interval 27 of García-Alcalde, 1996: Fig. 2), stored in the collection of the Instituto Geológico y Minero de España (IGME), in Madrid. Breimer described and classified this example as *Bactrocrinites* sp., pointing to the possibility of its being a new species, related to *B. fusiformis* (Roemer, 1844) or to *B. muelleri* (Jaeckel, 1895). The discovery of additional examples of the genus at the same locality in León, possibly from the same level as Breimer's specimen, enable us to both broaden and refine our knowledge of Spanish bactrocrinitids via the description of a new species, *Bactrocrinites robustus* n. sp. From a palaeoecological viewpoint, the individuals of the species, which are completely benthonic, must have lived in a shallow, neritic environment, in keeping with the characteristics of the rocks in which they are to be found (Álvarez, 1990; Álvarez & Brime, 1982; García-Alcalde, 1996, 1998; García-Alcalde *et al*., 2002).

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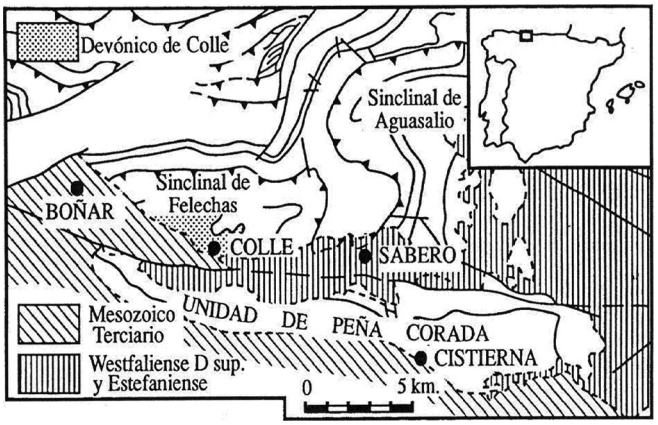

Figure 1. Geographical and Geological situation of Colle (from García-Alcalde, 1998).

The material of the new species is stored at the Museum of the Department of Geology (Section Paleontology) (DPO) of the Oviedo University (Asturias, Spain).

SYSTEMATIC PALAEONTOLOGY

Class CRINOIDEA Miller, 1821
Subclass INADUNATA Moore & Laudon, 1943
Suborder CYATHOCRININA Bather, 1899
Family **Bactrocrinitidae** Jaekel, 1918

Genus *Bactrocrinites* Schnur, 1849

Type species: *Bactrocrinites fusiformis* Roemer, 1844.

Bactrocrinites robustus n. sp.

Fig. 3. Table 1

Derivatio nominis: Indicates the robust, thick calyx of the type material, an unusual peculiarity in *Bactrocrinites*.

Material: The Holotype, DPO 113601, and another fragmentary example, Paratype DPO 113602, from the locus and stratum typicum. Both with evident signs of dissolution.

Locus and stratum typicum: Both the holotype as well as the paratype come from argillaceous limestones from Level 27 (Fig. 2), possibly coincident with Breimer's CRIN 1 (1962), cropping out in the locality of Colle, in León (Fig. 1) in the La Vid Group (Emsian).

Diagnosis: Dicyclic calyx, with a conical-globular longitudinal profile, somewhat flattened at the base; robust, highly convex plates; appreciably reduced radianal with respect to the anal X; very strong arms and a relatively thin stem.

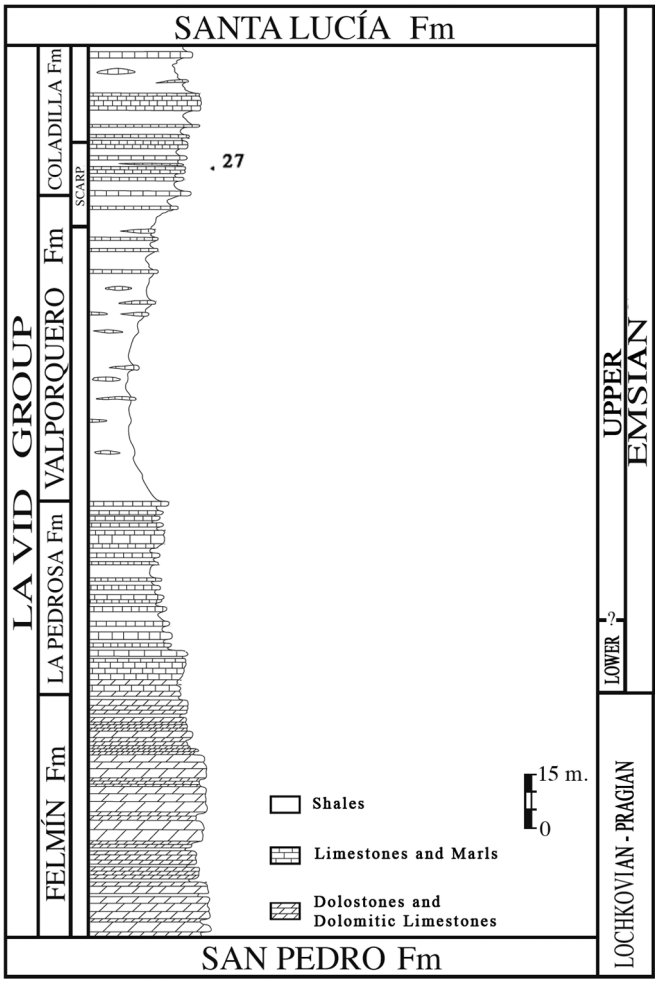

Figure 2. Stratigraphic column of the Lower Devonian at Colle, indicating Level 27, characterized by abundant crinoid and blastoid fauna, the locus and stratum typicum of *Bactrocrinites robustus* n. sp. (modified from García-Alcalde, 1998)

Description based mainly on the holotype: Dicyclic calyx, with a conical-globular longitudinal profile and approximate dimensions: height, 23 mm and maximum width, 23 mm, made up of large, robust, convex plates, including the radianals. The (incomplete) tegmen appears to possess a reduced number of plates. No ornamentation is observed (Fig. 3 a, b, c, d, e and Table 1).

Infrabasal circle is made up of five equally sized pentagonal plates, forming a small concavity at the base, just in the area of the connection with the stem. These plates respectively measure 7 and 6.5 mm along the mean vertical axis (MVA) and mean transversal axis (MTA). Aborally, the infrabasal set presents a weakly five-lobed contour. The anteroposterior axis (APA) measures 8 mm. The set limits distally with the basal plates. Circular stem scar with a diameter of 3.5 mm. Axial canal is not conserved.

Five basal plates: two heptagonal, the posterior and right posterior (the seventh side being developed to better accommodate the anal area) and three hexagonal. The plates measure 10 and 8.5 mm, respectively, along the usual axes. The right posterior basal plate bears the radianal, and the posterior the radianal and the anal X.

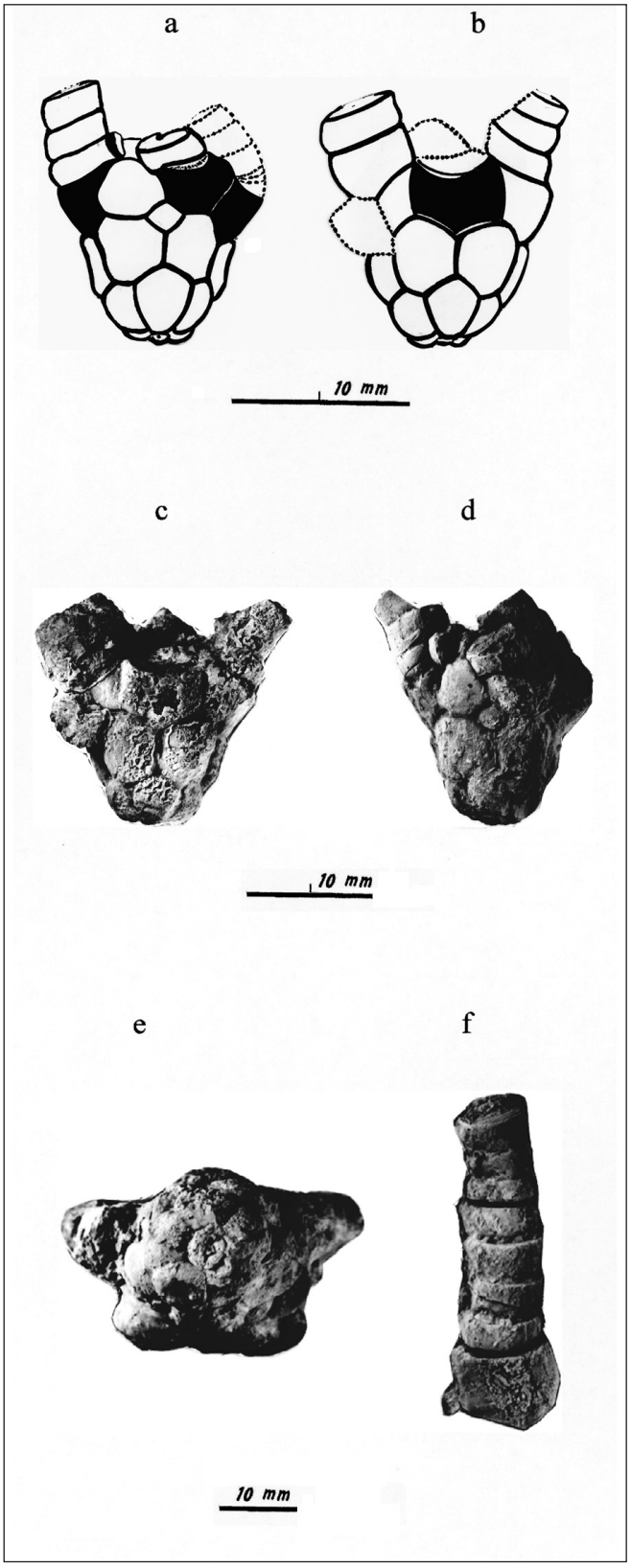

Figure 3. Organization of the calyx of *Bactrocrinites robustus* n. sp. **a**) holotype DPO 113601, posterior view, radial in black, and **b**) anterior view (camera lucida drawings); **c**) holotype DPO 113601, anterior view; **d**) posterior view; **e**) aboral view; **f**) paratype DPO 113602, showing one radial and seven contiguous brachial plates.

The radial cycle is composed of five plates: four pentagonal, and the somewhat smaller right posterior, which is hexagonal. The upper side of all the plates is markedly concave. The pentagonal plates measure 7 and 10 mm, respectively, along the MVA and MTA, and the hexagonal, 5 and 10 mm. The radial cycle limits proximally with the basal, but the right posterior radial also does so with the radianal and with the anal X, and the left posterior with the anal X. They are distally arranged in net contact with the brachial series.

The begining of an anal area is observed in the calyx, made up of two plates of different sizes: the radianal and the anal X. The former, a typical quadrangle, with sides measuring 3 mm, is obliquely arranged with respect to the right posterior radial and limits proximally with two basal plates, the posterior and right posterior, and distally with the aforementioned radial and with the anal X. The anal X is an irregular pentagon and is considerably larger than the radianal, measuring 7 mm along the mean vertical axis; it is laterally in contact with the right posterior and left posterior radials, and rests proximally on the posterior basal and the radianal. The anal series appears to continue in the tegmen, where an additional plate can be observed that is longer than it is wide, 4 and 2 mm, respectively.

The tegmen is poorly preserved, not allowing a reliable description.

Calyx with five arms, of which only the first plates are conserved. These are equidimensional and strong, and are wider than high, 7 and 3 mm, respectively; its transversal section is roughly horseshoe in shape. The food groove is narrow and extends until almost the centre of the plates. Crenulation is not observed on the articular surface. The thick arms occupy practically all the oral area, and so it appears unlikely that this was made up of a large number of plates.

A maximum of only four primibrachials are conserved, in some series, in the holotype. Thus the total length of the arms is unknown, as is the answer to the question as to whether they branched or not. In the paratype, DPO 113602 (Fig. 3 f and Table 1), only two pentagonal radials are observed, measuring 8 and 11 mm, respectively (Table I), along the usual axes, and a series of seven primibrachials continuing on from one of the radials, which are wider than high, that respectively measure 7 and 3 mm.

Among the material adhering to the holotype, two kind of pieces have been identified: brachial and columnar, both in a poor state of conservation, resulting in their description being tentative. The brachial pieces appear to be characteristic of the ends of the arms, in this case, *B. robustus* n. sp. would possess considerably long brachial appendices. The pieces identified as columnar are thin. Their diameter varies between 3 and 3.5 mm, or even less. These dimensions coincide with those of the basal insertion. The columnar pieces have a circular to slightly five-lobed contour. The crenularium, which is petaloid in appearance, is perpendicular to the external edge of the columnal and occupies a major part of the articular facet; the areola and axial canal are star-shaped, whereas the articulation appears to be of the "symplexy" type.

To indicate that, though the above mentioned material seems to belong to the holotype, we cannot assure it for the present time. It will be necessary to hope that future finds confirm it.

No ornamentation is observed.

Discussion: Provisionally, the classificatory scheme adopted is that of Moore and Teichert in the "Treatise on Inver-

Specimen	Total height	Maximum width	Index Th/Mw	IBB MVA MTA	BB MVA MTA	RR MVA MTA	Brr Width and Height	Radianal	Anal X
Bactrocrinites sp. TB73 of Breimer	22	15	1.47	9 5	8.5 6	4.5 6.5		4	4
Bactrocrinites robustus n. sp. 113601 Holotype	23	23	1	7 6.5	10 8.5	7 10	7 3	3	7
113602 Paratype						8 11	7 3		

Table 1. Measurements (in mm) of the *Bactrocrinites* specimens found in Colle (León), La Vid Group, Emsian. Th/Mw, total height/maximum width and MVA and MTA, mean vertical axis and mean transversal axis, respectively.

tebrate Paleontology" (1978). In fact, although Simms & Sevastopulo (1993) and Ausich (1998) proposed substantial changes in such scheme, many doubts continue to exist with respect to bactrocrinitids (see, for example, McIntosh, 1979, and McIntosh & Brett, 1988). We have therefore chosen to maintain the old scheme of the "Treatise".

The attribution of a new species to the genus *Bactrocrinites* is justified by the existence of morphological affinities with the type species *B. fusiformis*: a tall conical dorsal cup, two anal plates in the cup: a quadrangular radianal and a pentagonal anal X, the latter in line with the radials; radials that are significantly wider than high; basals that are higher than wide; infrabasals that are always laterally visible, generally higher than wide; etc. However, *B. robustus* is differentiated from *B. fusiformis* by the presence of a globular calyx, as high as wide, with prominent, markedly convex plates that confer it a characteristically robust appearance, in clear contrast to that of *B. fusiformis*, much more graceful and slim, made up of smooth plates that are barely convex.

Another important distinctive characteristic of *B. robustus* n. sp. is the presence in the calyx of a radianal that is unusually smaller than the anal X. This aspect justifies the separation of the new species not only from the type species of the genus, but also from all the known forms of *Bactrocrinites*.

In particular, the new species is separated from the form classified by Breimer (1962) as *Bactrocrinites* sp. in the possession of a globular calyx, as tall as wide, made up of markedly convex plates. This aspect contrasts especially with that of Breimer's very slim specimen, longer than wide and with flattened plates.

As regards the radial plates, those of *B. robustus* expand noticeably, while those of *Bactrocrinites* sp. incline inward. Likewise, those of *B. robustus* show the equal values as the axis MTA, both at the top level as in de lower, while in Breimer's specimen the maximum width is at the lower level. As to the radianal and anal X, *B. robustus* presents a much smaller radianal than anal X. This contrasts not only with what occurs in *Bactrocrinites* sp., where the measurements of both plates are similar, but also with the rest of the known species of *Bactrocrinites*.

In keeping with its calyx, the arms of *B. robustus* n. sp. are powerful, whereas in Breimer's specimen, according to the conserved primibrachial, they must have been more delicate.

The general characteristics of Breimer's specimen situate it closer above all to *Bactrocrinites muelleri*.

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