

Records of new species of Duvaliidae Pavlow, 1914

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Three new species of belemnite, *Duvalia hispanica* sp. nov. (late early Valanginian), *Castellanibelus? bonti* sp. nov. (earliest late Valanginian) and *Pseudoduvalia nana* sp. nov. (late Hauterivian), belonging to the family Duvaliidae Pavlow are described from sedimentary rocks in southeast Spain (Tornajo Mountain). *Castellanibelus? bonti* represents an unusual, very depressed species, whereas *Pd. nana* represents the smallest belemnite species so far described. These new species originate from outer platform deposits.

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Introduction

Three new species of belemnite are described from outer platform sedimentary rocks in the Tornajo Mountain, municipal of Lorca, about 16 km south of Caravaca, southeast Spain (Fig. 1). This mountain is a block in a tectonic melange of Triassic to Tertiary sedimentary rocks (de Smet, 1984; cf. Janssen, 2003, text-fig. 2, pp. 134-136). Overturned late Berriasian to Barremian sedimentary rocks are exposed.

A new belemnite species of striking morphology is described, on the basis of a single specimen, from early late Valanginian sedimentary rocks (Fig. 2a-e). Due to its distinctive form, the single specimen is classified as a new species herein. It is not a teratological morph. Most probably, the new species belongs to the genus *Castellanibelus* Combémoré, 1973. Its morphology (quadrangular cross-sections of the alveolar area, lateral expulsions) resembles the latest Berriasian-earliest Valanginian *Castellanibelus? triquetrus* (Weiss, 1991, *loc. cit.* Janssen, 2003, pp. 143-144, pl. 4, figs. 3-5). The new species suggests that *Castellanibelus* is more complex than previously believed. The species occurs together with typical late early to early late Valanginian Duvaliidae and was derived from a bed yielding the ammonite *Saynoceras verrucosum*. Two sections (B and E) have been investigated that cover the sedimentary rocks that represent the boundary between the early and late Valanginian (Fig. 3). The latter boundary correlates approximately to a colour change in the rocks. Early Valanginian sedimentary rocks are characterized by whitish rocks, while the late Valanginian is characterized by yellowish sedimentary rocks. Moreover, the latter sedimentary rocks are apparently condensed, yielding large numbers of cephalopods, notably ammonites, and representing the top of the Verrucosum Zone and the base of the succeeding Peregrinus

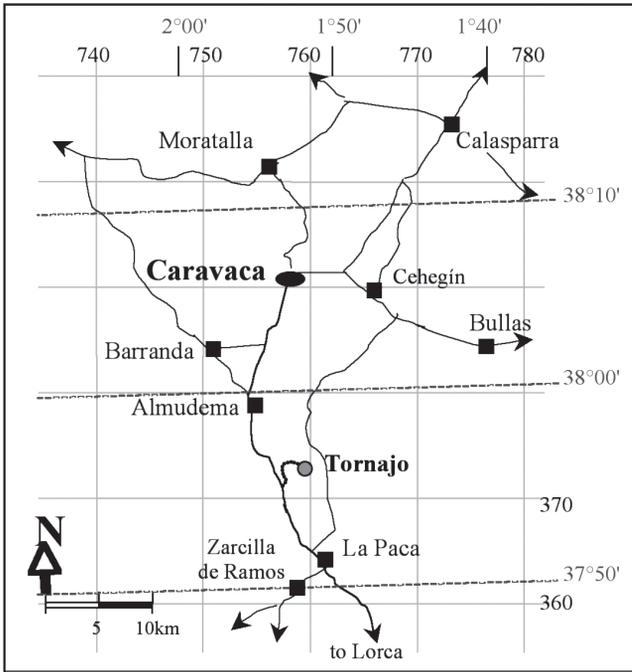
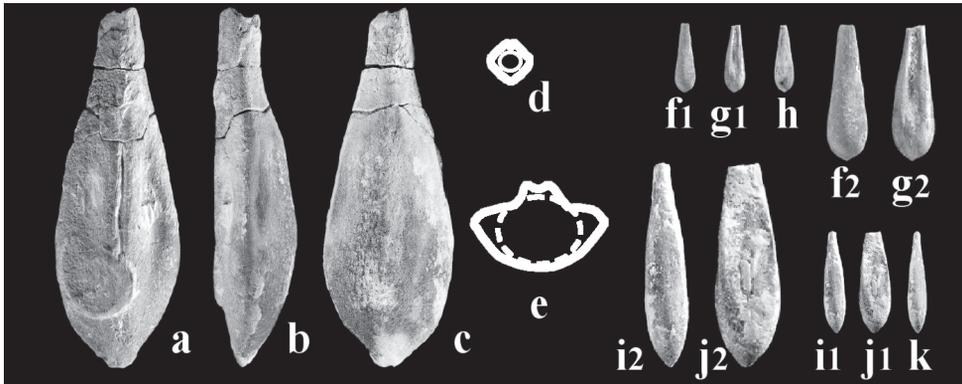


Fig. 1. Geographical position of Tornajo Mountain (37° 56' 30" N, 1° 51' 50" W), municipal of Lorca, southeast Spain.

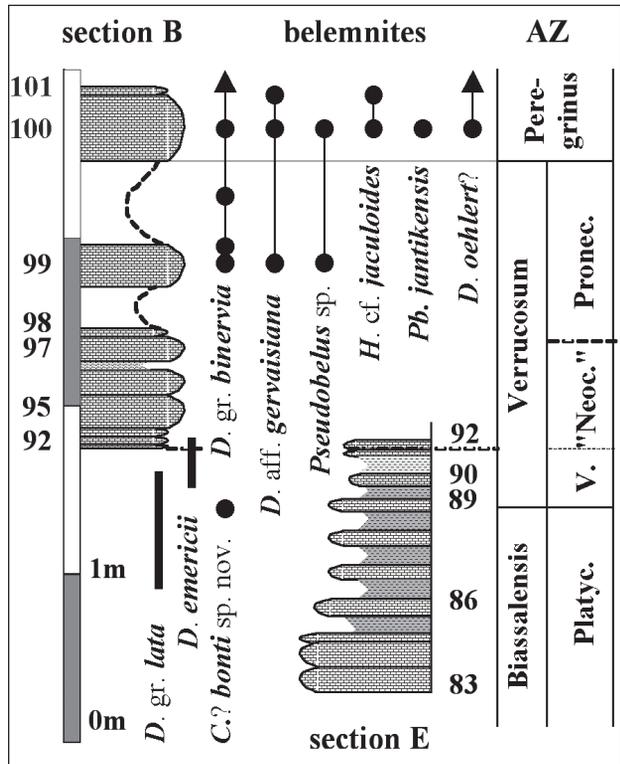
Fig. 2. (a-e) *Castellanibelus? bonti* sp. nov., RGM 361 611, holotype. (a) Dorsal view. (b) Right lateral view. (c) Ventral view. (d) Cross-section in alveolar opening. (e) Cross-section in mid-part of rostrum (dashed oval indicates castellanoid-rostrum without lateral extensions). (f-k) *Pseudoduvalia nana* sp. nov. (f-h) RGM 361 740, paratype. (f1) Dorsal view. (f2) Dorsal view (× 4). (g1) Right lateral view. (g2) Right lateral view (× 4). (h) Ventral view. (i-k) RGM 361 733, holotype. (i1) Dorsal view. (i2) Dorsal view (× 4). (j1) Right lateral view. (j2) Right lateral view (× 4). (k) Ventral view. All figures × 1 unless otherwise stated. ▼



Zone. The association of belemnites from these yellow beds is characteristic for the early late Valanginian, being dominated by *Hibolithes* cf. *jaculoides* Swinnerton, 1937, and *Duvalia* gr. *binervia* (Raspail, 1829) (Fig. 3).

From early Valanginian sedimentary rocks a new species of belemnite is described that belongs to *Duvalia* gr. *lata* (de Blainville, 1827). Whitish calcareous rocks dominate the lithology in this part of section B (Fig. 4) and marlstones are largely subordinated. Ammonites (*Valanginites* spp. (B69-B89), *Luppovella superba* (B71-74), *Busnardoites campylotoxus* (B74-75 and B79) and *Valanginites wilfridi* (B73-B75)) are fairly abundant, but belemnites are rare, being dominated by *Castellanibelus orbignyianus* (Duval-Jouve, 1841).

Fig. 3. Lithological columns of two sections in the Tornajo Mountains. Section B (only the relevant part is figured) shows yellow-coloured beds B92 to B101 (top Verrucosum Subzone to base Peregrinus Subzone), and section E, beds E83 to E89 (white) and E90 to E92 (yellow-coloured), representing the top of the Biassalensis Zone to the base of the Verrucosum Zone. Both sections include parts that are poorly exposed. Below bed B92, some whitish chalks are exposed in a largely marlstone dominated succession with beds that contained the ammonites (det. J. Klein) *Saynoceras verrucosum* (B89) and *Saynoceras contestanum* (B87). These beds are tentatively correlated with section E based on the colour change in the beds from whitish in E89 to yellowish in bed E90. Below bed B92 part of the succession is not well exposed; therefore, it might be possible that bed E92 correlates with B94. Bed E91 contains the ammonite *Osterella fascigera* and bed B89 contains *Valanginites*. The following abbreviations are used: AZ = ammonite zonation (cf. Reboulet & Hoedemaeker *et al.*, 2006); C. = *Castellanibelus*; D. = *Duvalia*; H. = *Hibolithes*; "Neoc." = "Neocomiensis"; Pb. = *Pseudobelus*; Platyc. = *Platycostatum*; Pronec. = *Pronecostatum*; V. = *Verrucosum*.



Another new species is described from Hauterivian rocks dominated by marlstones (section α ; cf. Janssen, 2003, text-fig. 2 for geographical position). The top as well as the base of the section are covered by barranco debris. Calcareous sedimentary rocks are exposed at the lowerpart of the section, yielding *Hibolithes gr. subfusiformis* (Raspail, 1829), *Pseudobelus brevis* Paquier, 1900, and abundant *Duvalia dilatata* (de Blainville, 1827). This calcareous part is succeeded by marlstone-dominated sedimentary rocks that yield many cephalopods and brachiopods. The association of belemnites is typical for the latest early Hauterivian to late Hauterivian, and dominated by *Hibolithes*, *Duvalia dilatata*, *Pseudoduvalia* and *Pseudobelus* (Fig. 5).

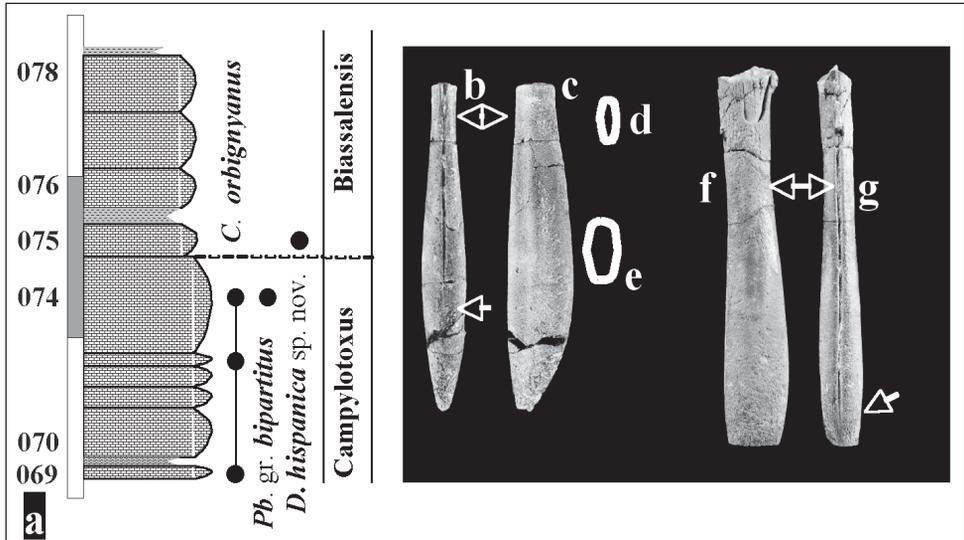
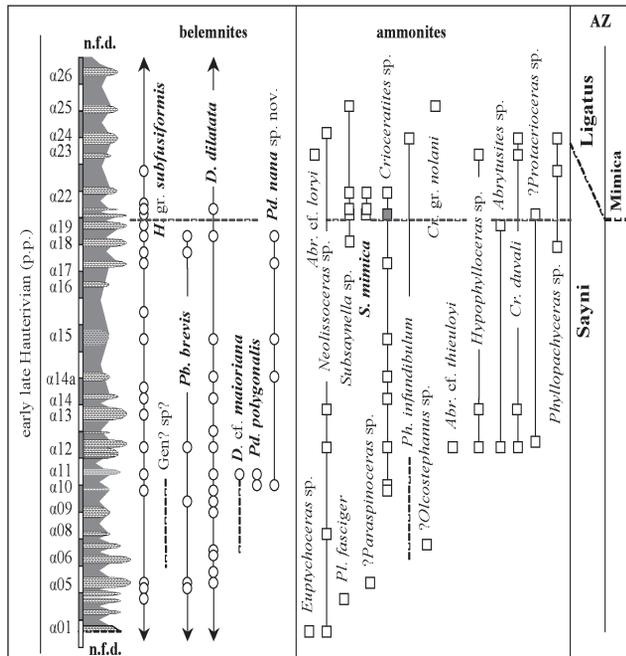


Fig. 4. (a) Part of section B with beds B69 to B78, representing the top of the Campylotoxus Zone and the base of the Biassalensis Zone. Note 3 m scale, on left. (b-e) *Duvalia hispanica* sp. nov., RGM 361 608, holotype. (b) Dorsal view. (c) Lateral view. (d) Cross-section in alveolar area. (e) Cross-section in median part of rostrum. (f-g) *Duvalia hispanica* sp. nov., RGM 361 609, paratype. (f) Lateral view. (g) Dorsal view (single pointed arrow indicates extension of alveolar groove; double pointed arrow indicates base of protoconch). Ammonite zonation after Reboulet & Hoedemaeker *et al.* (2006). The following abbreviations are used: C. = *Castellanibelus*; D. = *Duvalia*; Pb. = *Pseudobelus*. All specimens are of natural size.

Fig. 5. Section α , showing sedimentary rock of the Sayni Zone (earliest late Hauterivian) to Ligatus Zone (late Hauterivian), with the distribution of belemnites and ammonites (det. J. Klein). Indicated is the Mimica Subzone *sensu* Vermeulen *et al.*, 1999 (not recognized by Reboulet & Hoedemaeker *et al.*, 2006). Above the bed $\alpha 26$ a loose specimen of *Plesiospitidiscus ligatus* was found in marls in part covered by barranco-debris. Key: Abr. = *Abrytusites*; AZ = ammonite zonation; Cr. = *Crioceratites*; D. = *Duvalia*; Gen? sp? = Genus? species?; H. = *Hibolithes*; Pb. = *Pseudobelus*; Pd. = *Pseudoduvalia*; Ph. = *Phyllopacchyceras*; Pl. = *Plesiospitidiscus*; S. = *Subsaynella*. Note 22 m scale.



Systematic palaeontology

Family Duvaliidae Pavlow, 1914 Genus *Castellanibelus* Combémoré, 1973

Castellanibelus? bonti sp. nov.

Fig. 2a-e.

Holotype – RGM 361 611 (monotypic), section E (bed E86) in the Tornajo Mountain, earliest late Valanginian (Verrucosum Zone).

Derivatio nominis – Named after Willem Bont of Amsterdam (Dutch ammonite collector).

Diagnosis – Medium sized rostrum, dorso-ventrally depressed, with prominent alveolar groove. Marked lateral extensions give way to a leaf-like outline in dorsal view. In lateral view the dorsal side is flattened, while the ventral side is curved. The apex is mucronate (typical in *Castellanibelus*). The alveolus is very shallow.

Description – Strongly dorso-ventrally depressed rostrum with a prominent dorsal groove that extends almost from the alveolus to the apex (in Fig. 1, partially obscured by an attached bivalve (in apical part) and by some lithified calcareous rock (in anti-apical part)). The apex is slightly weathered, but a mucron is present. The cross-section of the alveolar region is quadrangular with clear lateral extensions due to the well-developed lateral sides. In lateral view, the dorsal side is almost straight and, except for the apical region, appears to stay throughout the alveolar region (as far as it is preserved). The ventral side is strongly curved. The alveolus is shallow and penetrates approximately 5 mm into the rostrum.

Remarks – The drop-like shape, in dorsal or ventral view, is atypical for the genus *Castellanibelus*, as is the strongly expanded lateral area. The latter is atypical for any known belemnite genus or species. The duvaloid-aspect, combined with the strongly depressed rostrum, at least points to a close relation with the genus *Castellanibelus*.

Genus *Duvalia* Bayle, 1878

Duvalia hispanica sp. nov.

Fig. 4b-g.

Holotype – RGM 361 608, from section B (bed B75; Fig. 4a) in the Tornajo Mountain (southeast Spain), late early Valanginian, base of the Biassalensis Zone.

Paratype – RGM 361 609, originates from the same bed as the holotype.

Diagnosis – Medium sized rostrum, strong laterally compressed, with a marked dorsal alveolar groove. The apex is pointed and the straight alveolar area is constricted

with a shallow alveolus. Cross-sections are rounded, but show a tendency to become hexagonal towards the alveolar area.

Derivatio nominis – Named after Spain.

Description – Strongly compressed rostrum with relatively long dorsal groove, extending from the alveolar region into the apical region. The alveolar region is well constricted and the apical region is pointed. The dorsal side shows an almost straight outline while the ventral side is strongly curved, the apex being displaced to the dorsal side. A small, but clearly visible lateral expulsion occurs more or less in the median part of the lateral sides of the rostrum. As a result, cross-sections are not rounded, but show some faint lateral extensions, more or less along the whole rostrum. The alveolus is relatively shallow, especially when compared to the length of the alveolar groove. In dorsal or ventral view the rostrum appears to be fusiform. The holotype lacks part of the alveolar region. The paratype lacks part of the apical region due to weathering.

Remarks – The combination of the long dorsal groove, the strong alveolar restriction, the clearly dorsally shifted apex and the slender fusiform outline separates the new species from taxa in the *Duvalia lata* group.

Stratigraphical distribution – This species occurs in a single bed, with abundant species of the ammonite *Busnardoites campylotoxus* that indicates the base of the Biassalensis Zone.

Genus *Pseudoduvalia* Naef, 1922

Pseudoduvalia nana sp. nov.

Fig. 2f-k.

Holotype – RGM 361 733, from section α (bed α 14a; Fig. 5) in the Tornajo Mountain, earliest late Hauterivian (Sayni Zone).

Paratypes – RGM 361 713-361 714 (α 10-(11); Sayni Zone), RGM 361 734 (α 14a; Sayni Zone), RGM 361 735 (α 15; Sayni Zone), RGM 361 740 (α 17; Sayni Zone) and RGM 361 746 (α 18-19; top of Sayni Zone).

Diagnosis – Very small hastate rostrum with angular to rounded cross-sections. The lateral sides are concave (typical in *Pseudoduvalia*), except for the apical most part of the rostrum. The apex is more or less mammillate.

Derivatio nominis – Named for its small size.

Description – Very small (<10 mm) pseudoduvaloid rostrum with rounded cross-section in the apical part, and typical pseudoduvaloid-type cross-sections in the apical part. In lateral view the species is teardrop-shaped. The apex is more or less mam-

millate. Lateral depressions are clearly visible in the anti-apical part of the rostrum. Eventually, a weak dorsal depression may be present. All specimens are devoid of an alveolus.

Remarks – Unlike other species assigned to *Pseudoduvalia*, *Pseudoduvalia nana* has a teardrop-shaped form. Moreover, the small size clearly distinguishes this species from others of the genus. It differs from juvenile *Pseudoduvalia* gr. *polygonalis* (de Blainville, 1827) in its short, teardrop-shape with rounded cross-sections. Juvenile specimens of *Pd.* gr. *polygonalis* are more strongly elongated and have angular cross-section.

Stratigraphical distribution – top Sayni Zone.

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