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Barremian invertebrates from Serre de Bleyton (Drôme, SE France): Belemnites

By Nico M.M. JANSSEN¹

(With 2 figures)

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Summary

A considerable amount of invertebrate fossils, among which are about 100 belemnites, were collected by Gero MOOSLEITNER (G.M) from Barremian sediments near Serre de Bleyton (Drôme, southeast of France). These belemnites indicate the presence of sediments that span the boundary between the Tethyan Lower and Upper Barremian. The fauna consists of *Conohibolites*, *Curtohibolites*, “*Mesohibolites*” and few *Duvalia*.

Keywords: Barremian, Belemnites, Coleoidea, Vocontian Basin

Zusammenfassung

Eine große Menge von invertebrate Fossilien, inklusive 100 Belemniten, wurden von Herrn Gero MOOSLEITNER (G.M.) aus Barrême Sedimenten in der Nähe von Serre de Bleyton (Drôme, süd-östlich Frankreich) aufgesammelt. Die Belemniten stammen aus dem Grenzbereich des tethyalen Unter- und Oberbarrême. Die größte Anzahl der Belemniten gehört zu Mesohibolitidae (*Conohibolites*, *Curtohibolites*, und „*Mesohibolites*“). Andere Belemniten (*Duvaliidae*) treten nur vereinzelt auf.

Schlüsselwörter: Barrême, Belemniten, Coleoidea, Vocontisches Becken

Introduction

Additional to the other invertebrate fauna described in this volume, 100 belemnites originated from three Barremian outcrops near Serre de Bleyton (Drôme, southeast of France). At least one outcrop (outcrop 3) delivered abundant material that appears to originate from one layer (pers. com. G.M.). The belemnites from this level can be attributed to the “mid”-Barremian, most probably representing a level close to the Lower-Upper Barremian boundary.

¹ Geertekerkhof 14 bis, NL-3511XC Utrecht, The Netherlands; e-mail: hibolites@hotmail.com

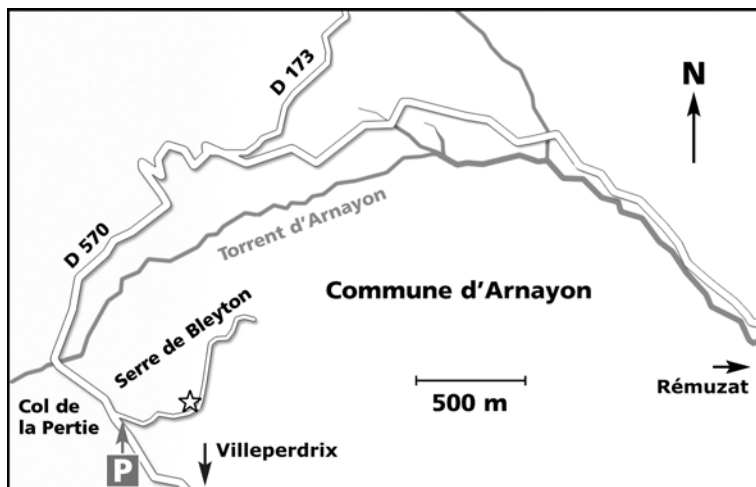


Fig. 1. Study area. The star indicates the position of the studied section.

At present, there is almost no stratigraphic information published on the distribution of Barremian belemnites in the Vocontian Basin (CLÉMENT 2000; JANSSEN & FÖZY 2005, Fig. 3). For that reason, part of the ranges of the belemnites is based on yet unpublished material from the Barremian Stratotype Section near Angles.

Study Area and Geological Settings

The material originates from three outcrops in a little hill called Serre de Bleyton, commune d'Arnayon, department Drôme, southeast of France ($44^{\circ}29' \text{ N}$ and $05^{\circ}18' \text{ E}$, coordinates provided by G.M.), near the Col de Perty (Fig. 1). The outcrops are situated close to the western talus of the Vocontian Basin (*sensu* ARNAUD 2005). This basin is bordered by the Ardeche platform to the west and the Provencal platform to the south.

Both plant-growth and small scale faulting hamper interpretation of the lithology. Moreover, typically so called “coulées boueuses” (here as “channelled” large scaled slumping phenomena) are known to occur just to the east of Col de Perty (FERRY & FLANDRIN 1979; FERRY 1989, 2005). These channels shedded bioclastic and neritic fauna into the “deeper” parts of the basin, and resulted from type-1 sequences. Moreover, these deposits often include re-worked latest Hauterivian to Early Barremian sedimentary rocks and fossils.

Regarding the palaeodepth of the basin, only speculative estimates exist. MAGNIEZ-JANNIN (1992: 248) indicated depths for the Lower Barremian of Angles, at 600-1000 m or deeper, which appears to be over-estimated. The relative small scale of the basin, the lithology and the relative abundance of well diversified marine faunas and floras suggest (much) lesser depths (DE BOER 1983; WILPSHAAR & LEEREVELD 1994; SAVARY *et al.* 2004).

Material and Methods

The larger part of the material (which was not collected *in situ*), was apparently weathered out from a belemnite-rich layer between thick calcareous beds (“outcrop 3”; pers. com. G.M.). Consequently, only few belemnites are well preserved. Moreover, some specimens are deformed by calcareous strike-slip marks. A large part of the material (about 30%) consists of juvenile to immature Mesohibolitidae. The fauna consists mostly of *Conohibolites* (50% of which 80% is indeterminable), with subordinary *Curtohibolites* and “*Mesohibolites*”. Additionally, some *Duvalia* occur.

One single, juvenile belemnite originates from “outcrop 1”, while “outcrop 2” delivered only 7 belemnites (a.o. *Hibolites*). The geographical distribution of the species is based on the list of synonymy in JANSSEN & FÖZY (2005 and references therein) unless otherwise stated.

The material will be stored at the Museum of Natural History “Naturalis”, Leiden (The Netherlands). The storage numbers are: RGM 543.035-543.060.

Systematic Palaeontology

Subclass Coleoidea BATHER, 1888

Order Belemnitida ZITTEL, 1895

Suborder Pachybelemnopseina RIEGRAF *in* RIEGRAF et al., 1998

Family Mesohibolitidae NERODENKO, 1983

Genus *Conohibolites* JANSSEN & FÖZY, 2005

Conohibolites cf. *escragnollensis* (DELATTRE, 1952)

Text-Figs 2.25-26

- * 1952 *Belemnites* (*Hibolites*?) *escragnollensis* n. sp. DELATTRE, pp. 283-285, pl. XIVa, figs 1-3[HT by MT].
- 2005 *Conohibolites escragnollensis* (DELATTRE): JANSSEN & FÖZY, pp. 70, 72, pl. IV, figs 1-2; pl. V, figs 6-7 (cum syn.).

Material: One largely incomplete specimen (RGM 543.035), and one apical part of an immature specimen (RGM 543.036) from outcrop 3.

Description: In ventral view, the specimen shows the characteristic sudden narrowing of the rostrum towards the apical part. It has a rounded dorsal side and a flattened

ventral side with a well developed alveolar groove. As a result, the rostrum is extremely conohibolitid with a deep alveolar cavity (not visible in depicted specimen). In lateral view, the ventral side is near flat. Cross-sections are heart-shaped in the alveolar part and become rounded in the apical part.

Stratigraphic occurrence: earliest Late Barremian.

Geographic distribution: Bulgaria, France, Hungary, and Romania.

***Conohibolites garshini* (STOYANOVA-VERGILOVA, 1965)**

Text-Figs 2.1-2, 3-4

- * 1965 *Mesohibolites garshini* sp. nov. STOYANOVA-VERGILOVA, p. 157, pl. III, figs 4[HT]-6.
- 2005 *Conohibolites garshini* (STOYANOVA-VERGILOVA): JANSSEN & FÖZY, p. 72, pl. III, figs 36-37; pl. IV, figs 3-4 (cum syn.).

Material: One near complete mature specimen (Text-Figs 2.1-2; RGM 543.037) and two immature specimens (RGM 543.038a-b) from outcrop 3.

Description: Moderately robust medium sized species, with a characteristic well developed alveolar groove. From lateral view, both dorsal as well as ventral sides are near parallel, except for the apical part. The latter area tapers down gradually towards a more or less centrally to ventrally placed apex. The alveolar opening is well rounded.

Stratigraphic occurrence: Earliest Late Barremian.

Geographic distribution: Bulgaria, France, Georgia, Hungary, and Slovakia (?).

***Conohibolites cf. gladiiformis* (UHLIG, 1883)**

Text-Fig. 2.24

- * 1883 *Belemnites gladiiformis* n. sp. UHLIG, p. 176, pl. I, fig. 2[HT by MT].
- 2005 *Conohibolites gladiiformis* (UHLIG): JANSSEN & FÖZY, p. 74, pl. IV, figs 5-6, 7-8, 9-9b, 10-11; pl. V, fig. 22 (cum syn.).

Material: One tectonically deformed alveolar part, and 5 alveolar parts from outcrop 3 (RGM 543.039a-f).

Remarks: Characterized by an extremely elongated rostrum, with a (very) long alveolar groove. The alveolar area is rounded but towards the apical part the rostrum becomes more and more dorso-ventrally compressed. Overall, the rostrum gradually tapers down to the apex.

Stratigraphic occurrence: Latest Early Barremian – earliest Late Barremian (= “mid”-Barremian).

Geographic distribution: Bulgaria, France, Georgia, Hungary, Slovakia, and Switzerland (?; cf. FICHTER 1934).

***Conohibolites ex gr. gladiiformis* (UHLIG, 1883)**

Text-Figs 2.9-10

Material: One near complete mature (?) specimen from outcrop 3 (RGM 543.040).

Remarks: Differs from the previous described material by its short alveolar groove. Eventually these differences (different morphe-types) are due to sexual-dimorphism. However, this remains speculative for the moment.

Conohibolites sp. A

Text-Figs 2.22-23

- | | | |
|---|------|---|
| ? | 1994 | <i>Mesohibolites ex gr. minaret</i> (RASPAIL): VAŠÍČEK et al., p. 83, pl. 26, figs 6-7. |
| | 2005 | <i>Conohibolites aff. gladiiformis</i> (UHLIG): JANSSEN & FÖZY, p. 74, pl. IV, figs 12-13 (partially cum syn.). |

Material: One tectonically deformed specimen, and one alveolar fragment from outcrop 3 (RGM 543.041a-b).

Description: A rather robust, depressed specimen with a well developed alveolar groove. The apical part is elongated. The alveolus is not preserved in the figured specimen.

Stratigraphic occurrence: Earliest Late Barremian.

Geographic distribution: France, Hungary and Slovakia (?).

Genus *Curtohibolites* STOYANOVA-VERGILOVA, 1963

***Curtohibolites aff. pinguis* (SHVETSOV, 1913)**

Text-Figs 2.16-17

- | | | |
|------|------|--|
| aff. | 1913 | <i>Hibolites pinguis</i> n. sp. Shvetsov, pp. 56, 69, pl. IV, figs 2a-c[LT], b-d, e. |
| | 2005 | <i>Curtohibolites aff. pinguis</i> (SHVETSOV): JANSSEN & FÖZY, p. 79, pl. IV, figs 30-31; pl. V, figs 20-21. |

Material: One mature specimen (Text-Fig. 2.16-17; RGM543.042), and one juvenile specimen (RGM543.043) from outcrop 3.

Description: A relative small dorso-ventral flattened specimen with a distinctive alveolar groove. The alveolar area is laterally compressed and the alveolar cavity is more or less as deep as the alveolar groove is long.



Fig. 2. “Mid”-Barremian belemnites from Serre de Bleyton; depicted are ventral (alveolar side; except for *Duvalia*, here it is the dorsal one) and lateral sides (scale bar graduates 1 cm).

- 1-2: *Conohibolites garshini* STOYANOVA-VERGILOVA, 1965 (RGM543.037)
 3-4: *Conohibolites garshini* STOYANOVA-VERGILOVA, 1965 (imm.; RGM543.038a)
 5-6: “*Mesohibolites*” ex gr. *minaret* AUCT. non RASPAIL, 1829 (RGM543.047a)
 7-8: *Curtohibolites* (?) *wernsdorfensis* STOYANOVA-VERGILOVA, 1963 (RGM543.044)
 9-10: *Conohibolites* ex gr. *gladiiformis* (UHLIG, 1883) (RGM543.040)
 11-12: *Hibolithes jaculiformis* SHVETSOV, 1913 (imm.; RGM543.045)
 13-14: “*Mesohibolites*” ex gr. *minaret* AUCT. non RASPAIL, 1829 (RGM543.047b)
 15: juvenile *Conohibolites* or “*Mesohibolites*” (RGM543.049)
 16-17: *Curtohibolites* aff. *punguis* (SHVETSOV, 1913) (RGM543.042)
 18-19: “*Mesohibolites*” ex gr. *varians* (SHVETSOV, 1913) (RGM543.048a)
 20-21: *Duvalia* ex gr. *grasiana* (DUVAL-JOUVE, 1841) (RGM543.053)
 22-23: *Conohibolites* sp. A (RGM543.041a)
 24: *Conohibolites* cf. *gladiiformis* (UHLIG, 1883) (RGM543.039a)
 25-26: *Conohibolites* cf. *escragnollensis* (DELATTRE, 1952) (RGM543.035)

Remarks: *Curtohibolites* occurs abundantly in shallow marine “outer platform” sediments of the Vocontian Basin. Only sporadically, the genus occurs in the *Coronites darsi* to *Holcodiscus uhligi* Ammonite Zones of the Barremian stratotype of Angles.

Stratigraphic occurrence: Late Early Barremian (*Macroscaphites tirolensis* Ammonite Zone).

Geographic distribution: France and Hungary.

***Curtohibolites* (?) *wernsdorfensis* STOYANOVA-VERGILOVA, 1963**

Text-Figs 2.7-8

- 1883 *Belemnites* aff. *extinctorius* RASPAIL: UHLIG, p. 175, pl. I, fig. 12.
 * 1963 *Curtohibolites wernsdorfensis* sp. nov. STOYANOVA-VERGILOVA, pp. 216-217, pl. II, fig. 7[HT by MT].
 1970 *Curtohibolites wernsdorfensis* STOYANOVA-VERGILOVA: STOYANOVA-VERGILOVA, p. 24, pl. VII, figs 6[= 1963]-7.
 1975 *Mesohibolites garschini* [sic] STOYANOVA-VERGILOVA: KVANTALIANI & NAZARISHVILI, pp. 140-141, pl. I, fig. 2.
 pars 2002 *Mesohibolites garshini* STOYANOVA-VERGILOVA: TOPCHISHVILI et al., pl. IX, fig. 4.

Material: One mature (gerontic; RGM543.044), partially tectonically deformed, specimen from outcrop 3.

Remarks: This species shows characteristics that could indicate ancestry to the *Conohibolites* stock, or it should be included in *Conohibolites*. For the moment, it appears to be the most robust *Curtohibolites*, with a conical to cylindro-conical outline. The flattened ventral area is typical in *Conohibolites*, and it is well possible that it belongs to the species group around *Conohibolites platyurus* (DUVAL-JOUE, 1841).

Stratigraphic occurrence: “Mid”-Barremian.

Geographic distribution: Bulgaria (STOYANOVA-VERGILOVA 1963), France, Georgia (KVANTALIANI & NAZARISHVILI 1975), and Slovakia (UHLIG 1883).

Genus *Hibolites* DENYS DE MONTFORT, 1808

***Hibolites jaculiformis* SHVETSOV, 1913**

Text-Figs 2.11-12

- 1913 *Hibolites jaculiformis* n. sp. SHVETSOV, pp. 52-53, 68, pl. II, figs 5-6; pl. III, figs 4, 6, 11-14.
 2004 *Hibolites* gr. *jaculiformis* SHVETSOV: JANSSEN & FÖZY, p. 44, pl. III, figs 6, 24-25.
 2005 *Hibolites jaculiformis*? SHVETSOV: JANSSEN & FÖZY, p. 65, pl. III, figs 3-4.

Material: One immature specimen from outcrop 2 (RGM543.045).

Description: A spindle-shaped, slightly dorso-ventrally flattened, specimen with a pointed apical part. The alveolar part bears a well-developed alveolar groove. The onset of the alveolar cavity is just visible and appears to be very shallow. The alveolar line is centrally placed.

Remarks: Additionally, «outcrop 2» delivered three apical parts of immature *Hibolithes* sp. indet.

Stratigraphic occurrence: Earliest Barremian.

Geographic occurrence: France, Georgia, and Hungary.

Genus “*Mesohibolites*” AUCT. non STOLLEY, 1919 *sensu* JANSSEN & FÖZY, 2005

“*Mesohibolites*” ex gr. *minaret* AUCT. non RASPAIL, 1829

Text-Figs 2.5-6(immature), 13-14

Material: Four partially preserved immature specimens, and one more mature specimen from outcrop 3 (RGM543.046a-c; RGM543.047a-b).

Description: Dorso-ventrally flattened rostrum sollidum with well-rounded alveolar and apical areas. A sharp alveolar groove defines the alveolar area.

Remarks: Species-group regarded as off-shoot from *Hibolithes* gr. *jaculiformis* (SHVETSOV, 1913). They are characterized by spindle-shaped, weakly to strong dorso-ventrally flattened specimens, with a clear but short alveolar groove and a shallow alveolar cavity. The apex is never centrally placed, like in *Hibolithes*, but shifted slightly to the dorsal side.

Stratigraphic occurrence: Late Early Barremian.

Geographic distribution: Mediterranean Tethys.

“*Mesohibolites*” (?) ex gr. *varians* (SHVETSOV, 1913)

Text-Figs 2.18-19

Material: One (im)mature specimen (RGM543.048a), and one juvenile specimen (RGM543.048b) from outcrop 2.

Description: A specimen with a well-developed alveolar groove, a shallow alveolar cavity, and a pointed apex (not visible in the figured specimen). The rostrum sollidum is in dorso-ventral view slightly flattened. In lateral view is the ventral side more flattened as compared to the dorsal side. The alveolar area is more or less rounded while the apical area is well rounded.

Stratigraphic occurrence: Late Early Barremian.

Geographic distribution: Bulgaria (?), Crimea (?), France, Georgia, and Hungary.

Genus indet.

juvenile Mesohibolitidae (*Conohibolites* or “*Mesohibolites*”)

Text-Fig. 2.15

Material: 26 specimens from outcrop 3, and 2 specimens from the other outcrops (RGM543.049-052).

Description: A subhastate, well-rounded rostrum, which tapers towards the alveolar region. The apical area is short and the apex is pointed.

Remarks: These juvenile specimens that occur throughout the late Early to Late Barremian (also among typical *Mesohibolites*) are morphologically comparable to *Neohibolites*, and possibly indicate the latter genus to have been evolved by way of neoteny. In general, juvenile to very immature Mesohibolitidae are overall morphologically comparable.

Family Duvaliidae PAVLOW, 1914

Genus *Duvalia* BAYLE, 1878

***Duvalia* ex gr. *grasiana* (DUVAL-JOUE, 1841)**

Text-Figs 2.20-21

Material: Five immature incomplete specimens and one incomplete mature specimen (RGM543.053-057) from outcrop 3.

Description: Specimens which are laterally well flattened, with clear rhomboidal cross-sections, and with almost parallel dorsal and ventral sides. The latter gives it a more elongated appearance compared to the typical species.

Remarks: Gerontic duvaliid rostra have a tendency to become bulged, giving rise to irregular side views and cross-sections.

Stratigraphic occurrence: The *grasiana*-group first occurs in the late Early Barremian (*Kotetishvilia compressissima* Ammonite Zone) of the Barremian type section (pers. obs.). However, typical *grasiana*-specimens appear not until the earliest Late Barremian (*Ancyloceras vandenheckii* – *Gerhardtia sartousiana* Ammonite Zones) and disappear in the Aptian.

Geographic distribution: All over the Mediterranean Province of the Tethyan Realm, former east coast of Africa (CIVITELLI 1988), and northern Germany (Boreal-Atlantic Province; EWALD 1850; STOLLEY 1911; KEMPER 1976 (as *Duvalia* aff. *lata*); MUTTERLOSE 1987). Recently it has been recorded from northern Egypt (ABU-ZIED 2008) and Mexico (SEIBERTZ & SPAETH 2008). The record from the North Sea by RAWSON & JEREMIAH (2001) is in my opinion a teratological Mesohibolitidae or Oxyteuthidae.

Results

The belemnite fauna herein described, especially from outcrop 3, represents species and genera that belong to the Barremian belemnite associations 2 and/or 3 (BaBA 2 resp. BaBA 3; cf. JANSSEN & FÖZY 2005). The first association is characteristic for the late Early Barremian, while the latter characterizes the early Late Barremian (together the so-called “mid”-Barremian).

Although there is almost no information published on the Barremian belemnites of the Vocontian Basin, the occurrence of *Curtohibolites* and the relative abundance of juvenile specimens suggest that the fauna is at least partially from a more shallow provenance.

Besides the above mentioned species, “outcrop 2” delivered some *Hibolithes*, pointing to slightly older sediments, i.e. early Early Barremian (pre-*Kotetishvilia compressissima* Ammonite Zone).

Conclusions

The larger part of the fauna described herein points either to the late Early Barremian or to the early Late Barremian (Tethyan “mid”-Barremian). At least a large part of the fauna point to an outer platform origin (*Curtohibolites*, many juvenile specimens, and *Conohibolites escragnollensis*).

Due to a lack of ontogenetic information and intraspecific variation, the fauna could not be characterized very well. It could well be possible, that very elongated (“epistrotrum-like”) species indicate sexual-dimorphism among the *Conohibolites*. Besides, “*Mesohibolites*” and its species-groups are not yet well known, but for their stratigraphical occurrence.

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