

SHORT COMMUNICATION

A Tethyan belemnite, *Duvalia*, and associated nannofossils from the Upper Barremian (Lower Cretaceous) of the Central North Sea

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RAWSON, P. F. & JEREMIAH, J. 2001. A Tethyan belemnite, *Duvalia*, and associated nannofossils from the Upper Barremian (Lower Cretaceous) of the Central North Sea. *Proceedings of the Geologists' Association*, **112**, 55–58. A single *Duvalia* sp. is recorded from Shell well 22/26a-2 in the Central North Sea. Both the belemnite and some of the associated nannofossils indicate a Tethyan immigration horizon dated as early Late Barremian. The immigration route may have been via a North Atlantic seaway lying to the west of Britain.

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1. INTRODUCTION

Duvalia is a distinctive belemnite genus of Mid Jurassic to Early Cretaceous age, characteristic of the Tethyan Realm where it is commonly found with Belemnopseidae (Mutterlose, 1988; Doyle, 1992). Whereas the belemnopseid genus *Hibolithes* periodically migrated northward to penetrate into the Boreal Realm the Duvaliidae normally remained restricted to Tethyan areas, and have been recorded from only two levels in the Lower Cretaceous sequences of NW Europe. Three specimens are known from about the middle of the Hauterivian (Mutterlose, 1979): a single *Berriasibelus extinctorius* (Raspail) from the middle of the *Simbirskites staffi* ammonite zone in the Moorberg brickpit at Sarstedt, near Hannover; one example of the same species from low in the C beds (probably *Endemoceras regale* ammonite Zone) of the Speeton Clay at Speeton, eastern England; and one *Duvalia lata* (Blainville) from bed C7 (*Simbirskites* (*Speetonicerus*) *inversum* ammonite Zone) at Speeton. There is a mass occurrence of *Duvalia grasiana* (Duval-Jouve) in the north German *inflexus* Marl (*Parahoplites nutfieldensis* ammonite Zone, Upper Aptian) (Mutterlose, 1987).

The discovery of a single *Duvalia* in an Upper Barremian core from the Central North Sea may indicate another immigration level, for it occurs at a distinctive nannofossil marker horizon characterized by a brief influx of Tethyan-derived forms.

2. LOCATION AND HORIZON

The *Duvalia* was obtained from Shell well 22/26a-2 in the Central North Sea (Fig. 1), at a depth of 11 236' 2" (3424.8 m). It came from an argillaceous limestone

sequence assigned to the Valhall Formation. The associated nannoflora is characterized by an influx (>1 specimen per 150 µm field of view) of *Isocrystallithus dispar*, a stratigraphically restricted event in the North Sea dated as Late Barremian and probably equating to the *Simancyloceras pingue* ammonite zone (J. Jeremiah, unpublished). There are also abundant (>1 specimen per 3 fields of view) *Nannoconus abundans* and abundant *Micrantholithus obtusus* associated with rare *Conusphaera rothii* (Zone NLK 12; Jakubowski, 1987).

The horizon is 97 ft (29.6 m) above the Munk Marl Member. The latter can be dated confidently as late Early Barremian as it is the lateral equivalent of the well-dated (upper *Hoplocrioceras fissicostatum*–lower *Paracrioceras elegans* ammonite Zones) Blatterton anoxic horizon of North Germany and Speeton.

Some 84 ft (26 m) above the *Duvalia* level, and still within the Valhall Formation, is a horizon (11 152 ft; 3399.1 m) with flattened Late Barremian heteromorph ammonites that probably indicate the *Simancyloceras stolleyi* ammonite Zone.

3. PALAEOONTOLOGY

Order BELEMNITIDA Gray, 1849
Suborder BELEMNOPSEINA Jeletzky, 1965
Family DUVALIIDAE Pavlow, 1914
Genus DUVALIA Bayle, 1878

Remarks

Duvalia is common in European Tethyan areas. It is a distinctive genus characterized by lateral compression and a well-marked dorsal alveolar groove. The morphology and stratigraphical ranges of French (Combemorel, 1973)

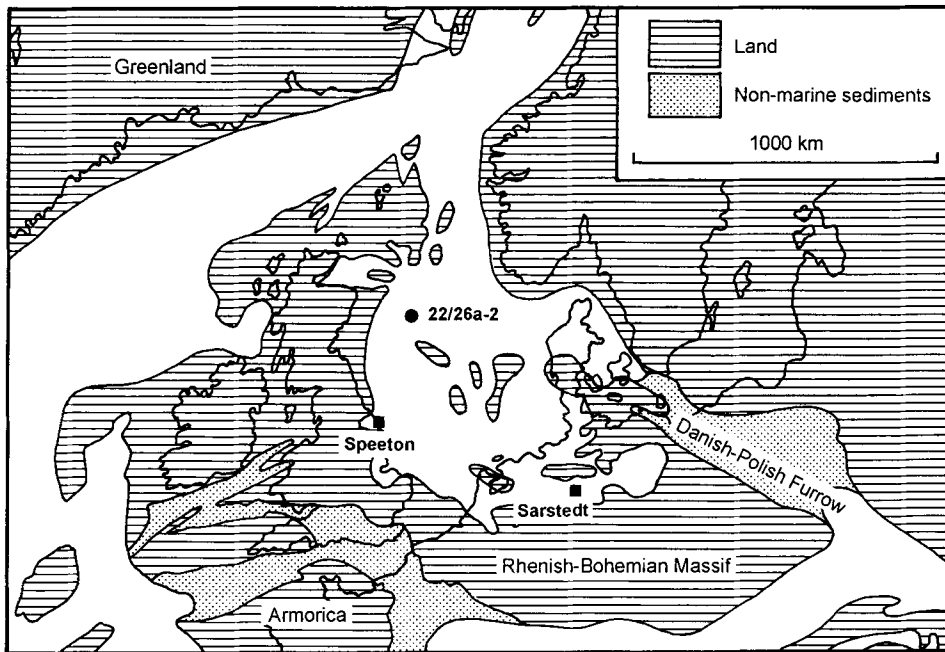


Fig. 1. Palaeogeographical setting of the North Sea Basin, showing the position of well 22/26a-2 (map modified from Rawson 1995a, fig. 1).

and Caucasian/Crimean (Kabanov, 1960) Early Cretaceous forms are known in detail, and Mutterlose (1990) has given a general summary of the range of Early Cretaceous species in Europe.

Duvalia sp.
(Fig. 2)

Material

One specimen, Natural History Museum, London, no. C.59620.

Remarks

The specimen is slightly compressed with a long dorsal groove that extends to the beginning of the very bluntly rounded apical region. This combination of characteristics does not match exactly with any described *Duvalia* species but most closely approaches the morphology of *D. lata* (Valanginian–earliest Hauterivian), especially in degree of lateral compression – other *Duvalia* are more strongly compressed. *D. lata* also has a groove of comparable length to that of *D. sp.*, but its apex is less blunt (see Combemorel, 1973, pl. 1, figs 1–8). Some varieties of *D. dilatata* (Blainville) (Early Valanginian–Late Hauterivian) have an equally blunt apex (e.g. Combemorel, 1973, pl. 3, figs 3–4) but this species is a much more compressed form in which the dorsal groove is short, essentially limited to the alveolar region. *D.*

grasiana (Duval-Jouve) (Late Early Barremian to Albian) has a long groove but a less blunt, often sharp, apex, and is more compressed (e.g. Combemorel, 1973, pl. 4, figs 4–5; Mutterlose, 1987, pl. 2, figs 1, 2, 6).

Family CALYPTROSPHAERACEAE Boudreaux & Hay, 1969

Genus *ISOCRYSTALLITHUS* Verbeek, 1976
Isocrystallithus dispar (Varol, 1990) n. comb.
(Figs 3a–d)

1990 *Calculites dispar* Varol in Al-Rifaiy *et al.*, pp. 192–193, pl. 3, figs 13–20.

Material

Sample material is held in the micropalaeontology collections at University College London.

Diagnosis

A small, elliptical holococcolith with a thin rim. The central perforation is crossed by an arched, bifurcated bridge with a stem.

Remarks

Varol (in Al-Rifaiy *et al.*, 1990) did not recognize a central perforation crossed by an arched, bifurcated bridge with a spine when he described the type material from Sierra de Sapello, Mexico. This was a result of overgrowth in the

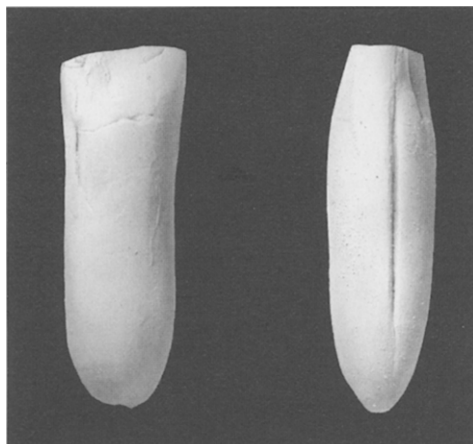


Fig. 2. *Duvalia* sp. lateral (left) and dorsal (right) views. Vallhall Formation, well 22/26a-2, 11 236 ft. NHM C.59620, x 1.

original material (O. Varol, pers. comm.). In the Late Barremian material from well 22/26a-2 the central perforation is also obscured by overgrowth. In side views, however, the spines are readily observed.

Isocrystallithus dispar has a recorded age range in Tethyan areas of Late Barremian to Early Cenomanian.

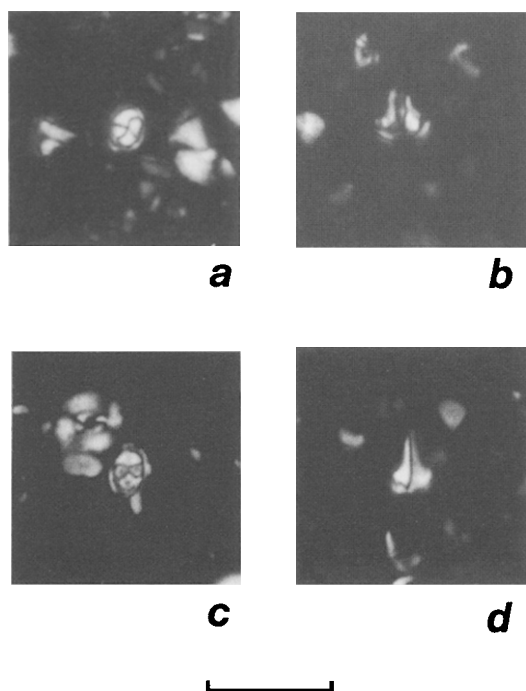


Fig. 3. *Isocrystallithus dispar* (Varol, 1990) n. comb. (a–b) Valhall Formation, well 22/26a-2, 11 236 ft; (c) Valhall Formation, well 22/26a-2, 11 239 ft; (d) Bed A2, Speeton Clay Formation, Speeton, Yorkshire (all specimens photographed under cross-nicols). The scale bar is 10 μ m.

Varol (in Al-Rifaiy *et al.*, 1990) originally described this form from the Albian of Mexico, and Upper Albian to Lower Cenomanian sediments of Ecuador, Peru and Colombia, but it has since been found in the highest Barremian of the Rio Argos section, southern Spain (J. Jeremiah, unpublished), the Aptian of Venezuela (Crux, pers. comm. 1994), the Lower Aptian Atherfield Clay of southern England (J. Jeremiah, unpublished) and the Middle Aptian of the Vocontian Trough of SE France (J. Jeremiah, unpublished).

4. DISCUSSION

The Barremian belemnite and microfossil sequences of the NW European Province are overwhelmingly boreal, while most of the ammonites are apparently endemic derivatives of Tethyan Hauterivian genera (Rawson, 1995b). The Barremian was an interval when the North Sea and North German basins are believed to have become isolated from Mediterranean Tethys by closure of the Polish–Danish Furrow at about the end of the Hauterivian. But there is ammonite evidence to suggest that the North Sea Basin remained open to intermittent Tethyan influence, probably via a North Atlantic seaway (Fig. 1). Two invasions of Tethyan ammonites occurred (Rawson, 1995b). The first was in the mid Barremian (Table 1), not long before the *Duvalia* specimen and associated nannofossils migrated here. It was characterized by the appearance of desmoceratid ammonites in Germany and Speeton, essentially in the *Paracrioceras elegans* and *Paracrioceras denckmanni* Zones. Then, very late in the Barremian (*Parancyloceras bidentatum* Zone), *Aconeceras* appeared in abundance. This ammonite is not known from rocks of this age in Mediterranean Europe and may have been derived from the eastern Pacific (Rawson, 1995b). In addition, a distinctive, short-ranged Tethyan heteromorph, *Heteroceras*, occurs at the *Aconeceras* level in eastern England.

The discovery of a Tethyan *Duvalia* at the same horizon as a significant influx of Tethyan-derived nannofossils provides further evidence for a Tethyan link. In the North Sea Basin this is the only level where *Isocrystallithus*

Table 1. Zonation of the NW European Barremian, showing the main immigration horizons

	<i>Parancyloceras bidentatum</i> ^c
UPPER	<i>Simancyloceras stolleyi</i>
BARREMIAN	<i>Simancyloceras pingue</i> ^b
	<i>Paracrioceras denckmanni</i> ^a
- - ? - -	
	<i>Paracrioceras elegans</i> ^a
LOWER	' <i>Hoplocrioceras</i> ' <i>fissicostatum</i>
BARREMIAN	' <i>Hoplocrioceras</i> ' <i>rarocinctum</i>
	<i>Simbirskites</i> (<i>Craspedodiscus</i>) <i>variabilis</i>

^amid Barremian (Rawson, 1995b)

^bthe *Duvalia* horizon

^clatest Barremian (Rawson, 1995b).

dispar is at all common, though it is recorded sporadically through the highest Barremian sediments. It reappears in the Albian. Its first appearance datum (FAD) in the Upper Barremian of the North Sea, before any Tethyan records, may suggest a FAD in the Boreal Realm and a later migration into Tethys. However, the fact that its main occurrence is at the same level as a Tethyan belemnite suggests that the *I. dispar* event in the North Sea represents a northward migration of a typically Tethyan

form and that earlier records of *I. dispar* will be found in Tethyan localities.

ACKNOWLEDGEMENTS

Figure 1 was drawn by Janet Baker. We thank Shell UK for making the material available for study and permission to publish, and two anonymous referees for their helpful comments.

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Manuscript received 26 March 1999; revised typescript accepted 10 February 2000