

Dentaliids (Mollusca, Scaphopoda) from the type Maastrichtian, the Netherlands and Belgium

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Scaphopods remain poorly known from the type area of the Maastrichtian Stage in northeast Belgium and the southeast Netherlands. At least three species appear to be represented, but incomplete preservation (i.e., lack of shell material) hampers a detailed systematic treatment of most specimens. In museum collections, the name *Dentalium nysti* Binkhorst van den Binkhorst, 1861 (= *D. binkhorsti* Pilsbry & Sharp, 1898; non *D. nysti* d'Orbigny, 1852) is often used rather indiscriminately for both genuine scaphopods and internal moulds of serpulid worm tubes. Here, we describe and illustrate *Antalis?* *binkhorsti*, *Fissidentalium?* sp. 1 and Dentaliidae sp. indet., all of Maastrichtian age, as well as a late Campanian form, *Fissidentalium?* sp. 2.

Contents

Introduction	83
Systematic palaeontology	84
Acknowledgements	87
References	87

Introduction

Members of the class Scaphopoda or 'elephant tusk shells' are a rare, or at least poorly known, component of molluscan faunas from the Upper Cretaceous of north-west Europe and fossil dentaliids, in general, are poorly understood molluscs (Engeser *et al.*, 1993). In the Maastrichtian type area, scaphopods have been virtually ignored since the second half of the nineteenth century. On the basis of a single internal mould, it was Binkhorst van den Binkhorst (1861, p. 61, pl. 6, fig. 2a-c) who erected *Dentalium nysti*, yet failed to provide provenance data (locality and stratigraphic level). Subsequently, Pilsbry & Sharp (1898, p. 220) noted that the name *nysti* was preoccupied by *D. nysti* d'Orbigny, 1852, an Oligocene species from Belgium, and suggested *D. binkhorsti* as a fitting replacement name.

Kaunhowen (1898, p. 12) restudied the type specimen of *D. nysti* (= *D. binkhorsti*), noting that the sole ornament visible consisted of weak traces of closely spaced ribs near the apical end which measured 2.5 mm in diameter, and that the carina referred to by Binkhorst van den Binkhorst (1861, p. 61) was an artefact of abrasion. Kaunhowen also remarked that this species was reminiscent of *D. nutans* Kner, 1848, from the lower Maastrichtian of Nagoryanĭ (Ukraine), but differed from that by its lesser curvature, more rapid growth anteriorly and ribs being confined to the apical end.

Also recorded by Kaunhowen (1898, pp. 12, 13) are *Dentalium sexcarinatum* (= *Pyrgopolon* (*Hamulus*) *sexcarinatus* (Goldfuss, 1841), a serpulid worm; see Jäger, 2012), *D. alternans* de Ryckholt, 1847 [*sic* = 1852], *D. angulare* Kaunhowen, 1898, and *D. hexapleuron* Kaunhowen, 1898. Of these, *D. angulare* is based on two, barely curved specimens from indurated, bivalve-rich coquina beds in the upper part of the Kunrade limestone facies (Maastricht Formation) near Kunrade. These have 8-10, equally strong longitudinal ribs, separated by wide interspaces, and fine, close-set transverse riblets. Steiner & Kabat (2004, p. 562) expressed doubts over their scaphopod nature. The other species, *D. hexapleuron*, is also weakly curved, has strong ribs, and fine, close-set and undulate transverse riblets. It is based on three specimens, two from the same level as *D. angulare* and one either from the base of the Nekum Member or the top of the Meerssen Member. Steiner & Kabat (2004, p. 599) appear to have accepted this as a valid species. We have found no match in the scaphopod material available to us.

From the above it is clear that a revision of the Maastrichtian scaphopods is long overdue. This is beyond the scope of the present note, in which we merely wish to draw attention to the presence of these understudied, micro-carnivorous molluscs, some of which are found either silicified in the lower part of the Maastricht Formation or at indurated levels in the upper part of that unit.

General introductions to the scaphopods include Ludbrook (1960), Pojeta (1987) and Donovan (1990); the supraspecific systematics were clarified by Emerson (1962), Palmer (1974) and Steiner & Kabat (2001). Late Cretaceous material from elsewhere has been described and illustrated by, amongst others, Kutscher (1984), Abdel-Gawad (1986), Darragh & Kendrick (1994) and Reich & Frenzel (2002).

All specimens illustrated herein are deposited in the Natuurhistorisch Museum Maastricht (NHMM), with individual subsets indicated by letters, as follows: JJ, J.W.M. Jagt Collection; MK, W.M. Felder Collection; PK, P. van Knippenberg Collection.

Systematic palaeontology

Class Scaphopoda Bronn, 1862
Order Dentaliida Da Costa, 1776
Family Dentaliidae Children, 1834

Remarks – Nominal scaphopods from the type Maastrichtian all possess a dentaloid shell and a fairly prominent longitudinal sculpture, indicating they are members of the family Dentaliidae (Palmer, 1974, p. 117). Other features of systematic importance, such as the shape of the cross section of the aperture, shell structure and the morphology of the apex (Engeser & Riedel, 1992; Engeser *et al.*, 1993), remain imperfectly known due to compaction and incomplete preservation, that is, fragmentation and aragonite dissolution.

***Antalis? binkhorsti* (Pilsbry & Sharp, 1898)**

Pl. 1, fig. 1; Pl. 2, figs. 1-3, 5-7; Pl. 3.

Description – Medium- to large-sized dentaliid, up to at least 65-70 mm in total length. Weakly curved, but with rapidly expanding diameter; greatest apertural diameter c. 11

mm. Internal mould completely smooth; external moulds of apical shell portions with 10-12 thin, longitudinal ribs at a diameter of > 1 mm; with growth rib number increases to 15-18 (?20) at a diameter of 3 mm; interspaces equalling 2.0-2.5 times the width of the ribs. No transverse sculpture seen, but that may be induced by preservation. In silicified material, ribs appear to be sharper, but ribbing style is otherwise similar to that seen in external moulds. In later growth stages, at shell lengths of 30-40 mm, ribbing apparently effaces and the adult shell is completely smooth.

Discussion – Material available to us falls into two size classes; NHMM 001115 (Pl. 2, figs. 6, 7) links these, which is why we here consider them conspecific. Most museum collections are skewed towards the large-sized specimen (compare Pl. 3) and, to make matters worse, in many cases, only the smooth internal mould is available. Binkhorst van den Binkhorst (1861, p. 61, pl. 6, fig. 2a-c) erected *Dentalium nysti* for such an internal mould, but he must have had (part of) the external mould as well, to allow him to note and illustrate the ornament of longitudinal ribs in the apical portion. In size and proportion, the type specimen matches the larger moulds illustrated here (Pl. 2, fig. 6; Pl. 3); the type was described (translated from French) as ‘rounded, slightly curved and preserving traces of longitudinal ribs, amongst which there is one pronounced, forming a carina on the convex part of the shell’. Despite the fact the only one specimen was described and illustrated by Binkhorst van den Binkhorst, material belonging to this form must have been represented in various collections in the area for Kaunhowen (1898, p. 12) to indicate that it was typical of the ‘obere[n] Maestrichter Kreide’, that is, the upper part of the Maastricht Formation (Nekum and Meerssen members) in current terminology.

The present form is not uncommon in the basal Nekum Member, amongst tens of thousands of serpulid worms. In fact, in the older literature, the term ‘Dentaliumbank’ for the basal portion of this unit indicates that such worms were often confused with dentaliid scaphopods. In fact, this is not uncommon elsewhere either (e.g., Palmer, 2001; Palmer *et al.*, 2004; Steiner & Kabat, 2004). Most decalcified tubes in the type Maastrichtian represent either *Pyrgopolon (P.) mosae mosae* de Montfort, 1808, or *P. (Hamulus) sexcarinatus* (Goldfuss, 1841), as demonstrated by Jäger (1998, 2005, 2012).

In view of details of ornament of the apical shell and of the fact that longitudinal ribs efface in later growth stages, the present species appears more closely related to the genus *Antalis* H. Adams & A. Adams, 1854, rather than to *Dentalium* Linnaeus, 1758, although the more or less flared aperture is atypical, hence the use of open nomenclature herein.

Occurrence – Fairly common in the Nekum and Meerssen members (Maastricht Formation) throughout the study area; silicified material is known from the Emael Member (Maastricht Formation) in the Eben Emael area (Liège, Belgium).

Fissidentalium? sp. 1

Pl. 1, fig. 2.

Description – Medium-sized dentaliid, up to at least 55 mm in total length. Gently curved, but with rapidly expanding diameter; greatest apertural diameter *c.* 8 mm.

Composite mould with at least 35-40 thin, low longitudinal ribs, of equal strength, continuing to the aperture; interspaces equal 50 % (or less) of rib width. Growth lines very faint, regularly spaced, perpendicular to ribs. Cross section indeterminate, but probably circular.

Discussion – Dentaliids are particularly rare in the Vijlen Member (Gulpen Formation), with only two specimens from interval 6 of that unit known to date, NHMM JJ 6297 and NHMM JJ 11858a, b. On account of sculpture, this form is probably best accommodated in the genus *Fissidentalium* Fischer, 1885, but poor preservation precludes formal assignment. The present taxon is probably conspecific with, or at least closely related to, 'sp. 1' of Kutscher (1984, p. 55, pl. 1, fig. 1; see also Reich & Frenzel, 2002, pl. 21, fig. 4). No scaphopods have been recorded from deeper levels within the Vijlen Member (compare Jagt *et al.*, 1995; Keutgen, 1996).

Occurrence – Apparently restricted to interval 6 of the Vijlen Member, in the Haccourt-Lixhe area (former CPL SA and CBR-Lixhe quarries), province of Liège, Belgium.

***Fissidentalium?* sp. 2**

Pl. 1, fig. 3.

Description – Medium- to large-sized dentaliid, up to 70 mm (or more) in total length. Very gently curved and regularly expanding in diameter; greatest apertural diameter *c.* 6 mm. Internal mould smooth; composite mould with at least ten thin, low longitudinal ribs in the apical portion, of equal strength; interspaces equalling four times rib width. In later growth stages, other thinner ribs intercalate, in an off-centre position, occasionally two ribs; transverse riblets conspicuous and close set, continuing to aperture, close to which ribs tend to efface. Cross section circular.

Remarks – Although of mid-late Campanian (*Belemnitella woodi* Zone) age, this form is here included to illustrate the presence of fairly well-preserved dentaliids in indurated portions of the Cretaceous sequence in the area. The ribbing style differentiates it from *Fissidentalium?* sp. 1.

Dentaliidae sp. indet.

Pl. 2, fig. 4.

Description – Silicified apical portion only, gently curved; sculpture of *c.* 15 thin, longitudinal ribs at a shell diameter of 0.6 mm, with interspaces equalling rib width, to up to 18 ribs at a diameter of 2.4 mm with slightly wider interspaces; no transverse elements seen.

Discussion – This form co-occurs with *Antalis? binkhorsti*, but can be differentiated by the higher number of ribs. More material is needed to determine its systematic position in greater detail.

Occurrence – So far known exclusively from the middle Emael Member (Lava Horizon) at Eben Emael (Liège, Belgium).

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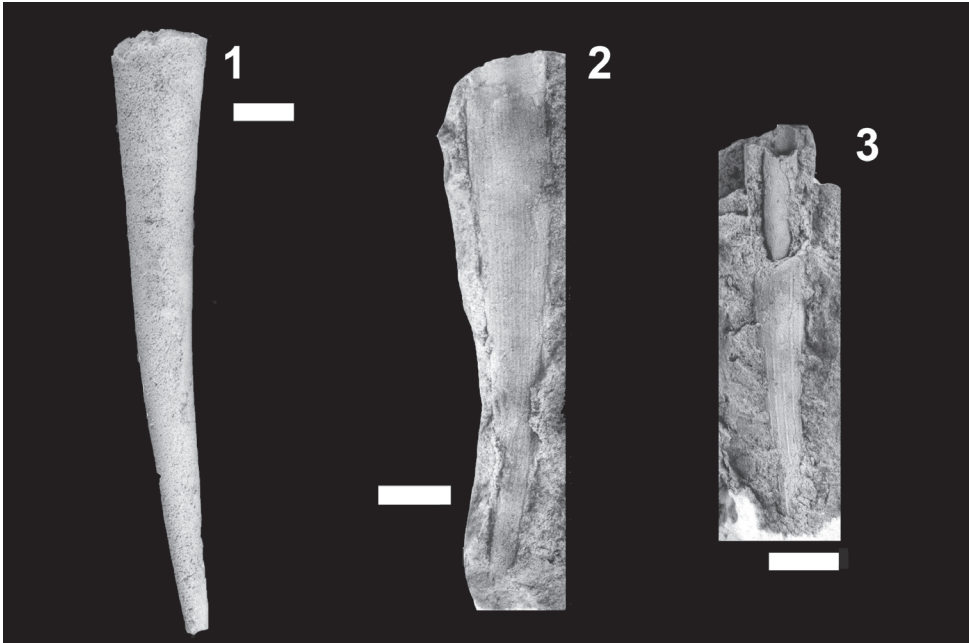


Plate 1

Fig. 1. *Antalis? binkhorsti* (Pilsbry & Sharp, 1898), NHMM MK 62a, internal mould (see also Pl. 3). Ankerpoort-'t Rooth quarry (Bemelen), Maastricht Formation, basal Nekum Member.

Fig. 2. *Fissidentalium?* sp. 1, NHMM JJ 11858a, composite mould, CBR-Lixhe quarry (Lixhe, Liège), Gulpen Formation, Vijlen Member (interval 6).

Fig. 3. *Fissidentalium?* sp. 2, NHMM JJ 7411, partially silicified shell, broken closer to the aperture to expose internal mould, Bois Moreau (Roclenge-sur-Geer, Liège), Gulpen Formation, top Zeven Wegen Member (mid-late Campanian).

Specimens whitened with ammonium chloride; all are of Maastrichtian age except where indicated otherwise. Scale bars represent 10 mm.



Plate 2

Antalis? binkhorsti (Pilsbry & Sharp, 1898)

Fig. 1. NHMM PK M 2955, internal and external mould. Former Ankerpoort-Curfs quarry (Geulhem), Maastricht Formation, top Meerssen Member (IVf-6). $\times 1$.

Figs. 2, 3, 5. NHMM PK M 223a-c, silicified shells. Marnebel quarry, Eben Emael (Liège), Maastricht Formation, middle Emael Member (Lava Horizon). $\times 1.5$.

Figs. 6, 7. NHMM 001115 (Boetzkes Collection), associated on a bedding plane with the serpulid *Pyrgopolon mosae mosae* de Montfort, 1808 and a rubber peel of the smaller specimen, showing ribbing, respectively. St Pietersberg area (Maastricht), Maastricht Formation, (?basal) Meerssen Member. Both $\times 1$.

Dentaliidae indet.

Fig. 4. NHMM PK M 223d, silicified shell, Marnebel quarry, Eben Emael (Liège), Maastricht Formation, middle Emael Member (Lava Horizon). $\times 1.5$.

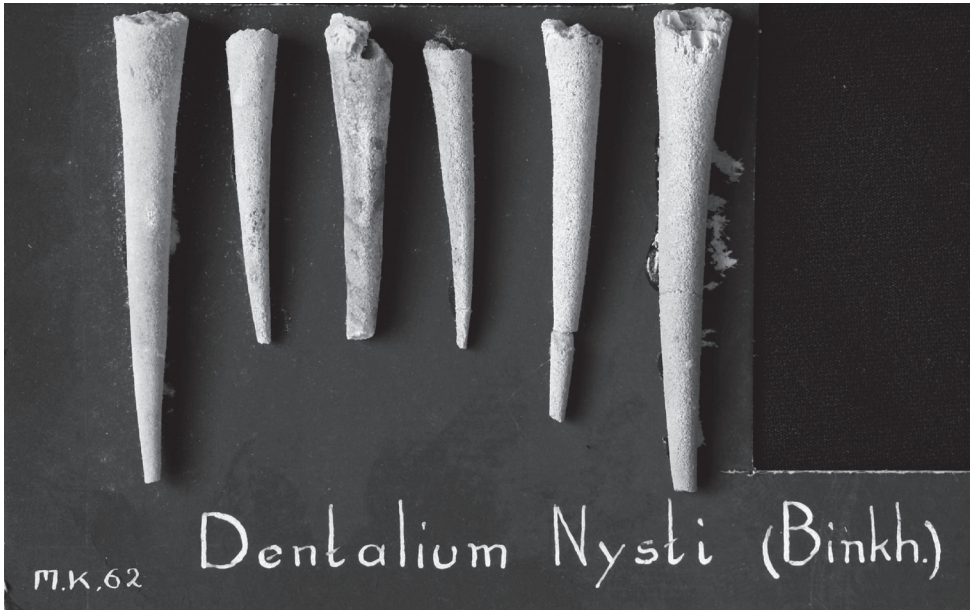


Plate 3

Antalis? binkhorsti (Pilsbry & Sharp, 1898), NHMM MK 62b-e, internal moulds (see also Pl. 1, fig. 1). Ankerpoort-'t Rooth quarry (Bemelen), Maastricht Formation, basal Nekum Member. $\times 1$.

