

## First record of *Pachydiscus noetlingi* Kennedy, 1999 (Ammonoidea) from the Maastrichtian type area (the Netherlands)

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### Abstract

Two specimens of a pachydiscid ammonite, a fragmentary silicified phragmocone from the Kunrade Limestone facies at Kunrade (Schunck), and a partial external mould preserved in flint from the Nekum Member (both Maastricht Formation, *Belemnitella junior* Zone of authors) at the former Blom quarry (Berg en Terblijt), are identified as *Pachydiscus (P.) noetlingi* Kennedy, 1999, a species previously known only from the Upper Maastrichtian of Baluchistan (Pakistan). This new record underscores the proposal of incursions of Tethyan biota into the type area of the Maastrichtian Stage, previously documented for other groups, including echinoderms and bivalves, as well.

**Keywords:** ammonites, Maastrichtian, Late Cretaceous, the Netherlands, faunal incursions

### Introduction

To date, 55 species of ammonite have been recorded from the extended type area of the Maastrichtian Stage (Fig. 1) (for details see Jagt, 2002), and amongst these pachydiscids are the best represented group, with at least 12 named species. The Vaals Formation (lower Lower-lower Upper Campanian) contains *Pachydiscus (P.) duelmensis* (Schlüter, 1872), *P. (P.) launayi* de Grossouvre, 1894, *Eupachydiscus levyi* (de Grossouvre, 1894), *P. (P.) subrobustus* Seunes, 1892, and *P. (P.) colligatus* (Binkhorst, 1861), as documented by Jagt (1989), Jagt *et al.* (1995) and Kennedy & Jagt (1998).

The Zeven Wegen Member (Gulpen Formation, lower/middle Upper Campanian) has yielded *P. (P.) haldensis* (Schlüter, 1867), while the Vijlen Member (Gulpen Formation, upper Lower-lower Upper Maastrichtian) contains *P. (P.) neubergicus* (von Hauer, 1858), *P. (P.) aff. armenicus* Atabekian &

Akopian, 1969, and *P. (P.) sp. sensu* Jagt (*in* Jagt *et al.*, 1995), as discussed by Jagt (2001) and Jagt & Felder (2002).

Within the Maastricht Formation, the Kunrade Limestone facies and the Emael, Nekum and Meerssen members (lower-upper Upper Maastrichtian) have yielded *P. (P.) gollevillensis* (d'Orbigny, 1850), *P. (P.) j. jacquoti* Seunes, 1890, '*Menuites*' *fresvillensis* (Seunes, 1890), and '*M.*' *terminus* (Ward & Kennedy, 1993). To this list is added the present record of *P. (P.) noetlingi*.

### Geographic and stratigraphic setting

The best preserved specimen (Fig. 2B, C), a fragmentary phragmocone remarkable for being entirely silicified, is from the so-called Kunrade Limestone facies (Maastricht Formation) at the disused Schunck quarry (see W.M. Felder, 1978), along the Bergseweg at Kunrade (southern Limburg, the Netherlands, out-



Fig. 1. Map of southern Limburg, showing localities mentioned in the text, and an outline of local lithostratigraphy.

crop 62B-11; Fig. 1). It was collected from a scree slope in November 1964 by a Mr Schidlovski. P.J. Felder & Bless (1989, fig. 3) noted that in the Kunrade area the uppermost part of the Kunrade Limestone unit was exposed, which corresponded to the upper part of their Ecozone V, of early Late Maastrichtian age. This would correlate with benthic foram zone H (sensu Hofker, 1966), or the lower half of the Maastricht Formation up to the base of the Emael Member, as developed in the Maastricht area (ENCI-Maastricht bv quarry) (see Fig. 1).

NHMM 2001 083 (Fig. 2A) is a silicone rubber cast of an external mould of a partial phragmocone preserved in flint, from unit IVe-2 of the lower Nekum Member (Maastricht Formation) at the former Blom quarry (Berg en Terblijt; Fig. 1), collected by Martin Blom on March 17, 1983. The Nekum Member equates with Hofker's (1966) benthic foram zone K, and is of early Late Maastrichtian age (*Belemnitella junior* Zone of authors) as well.

### Systematic palaeontology

Repositories of specimens are as follows:

GSP - Geological Survey of Pakistan, Islamabad;

NHMM - Natuurhistorisch Museum Maastricht, Maastricht;

RGM - Nationaal Natuurhistorisch Museum/Naturalis, Leiden (formerly Rijksmuseum van Geologie en Mineralogie) (NITG-Jongmans Collection).

All dimensions are given in millimetres: D, diameter; Wb, whorl breadth; Wh, whorl height; U, umbilical diameter. Figures in parentheses are dimensions as a percentage of the diameter.

Order Ammonoidea von Zittel, 1884

Suborder Ammonitina Hyatt, 1889

Superfamily Desmocerataceae von Zittel, 1895

Family Pachydiscidae Spath, 1922

Genus and subgenus *Pachydiscus* (*Pachydiscus*) von Zittel, 1884

*Type species* - *Ammonites neubergicus* von Hauer 1858, p. 12, pl. 2, figs 1-3; pl. 3, figs 1, 2, by subsequent designation of de Grossouvre, 1894, p. 177.

*Pachydiscus* (*Pachydiscus*) *noetlingi* Kennedy, 1999

?1861 *Ammonites colligatus* Binkhorst, p. 25 (*partim*), pl. 8a, fig. 3 only.

?1987 *Pachydiscus* (*Pachydiscus*) cf. *jacquoti* Seunes, 1890; Kennedy, p. 163 (*partim*), pl. 15, figs 1-3 only (*Anapachydiscus* cf. *jacquoti* in caption).

\*1999 *Pachydiscus* (*Pachydiscus*) *noetlingi* Kennedy, p. 648, figs 4.9, 4.10, 7.4-7.6, 8.4-8.7, 9.1-9.6, 14.4, 15.4.

*Material* - Holotype is GSP 1047 (Fig. 2D, E), of which NHMM 1999 040 is a plaster cast; paratypes are GSP 1048-1051, all from the Upper Maastrichtian Korara Shale of Goth Haji Ismail (southern Pab Range, Pakistan). Material from the Maastrichtian type area is registered under numbers RGM NITG P.244 and NHMM 2001 083.

### Dimensions

	D	Wh	Wb	Wb:Wh	U
GSP 1047	118.7 (100)	50.1 (42.2)	47.3 (39.8)	0.85	29.2 (24.6)
GSP 1050	109.0 (100)	50.4 (46.2)	43.4 (39.8)	0.94	28.3 (26.0)
RGM NITG P.244	84.0 (100)	35.8 (42.6)	35.6 (42.4)	0.99	23.5 (27.9)
NHMM 2001 083	c. 77.5 (100)	c. 33.0 (42.6)	-	-	24.2 (31.2)

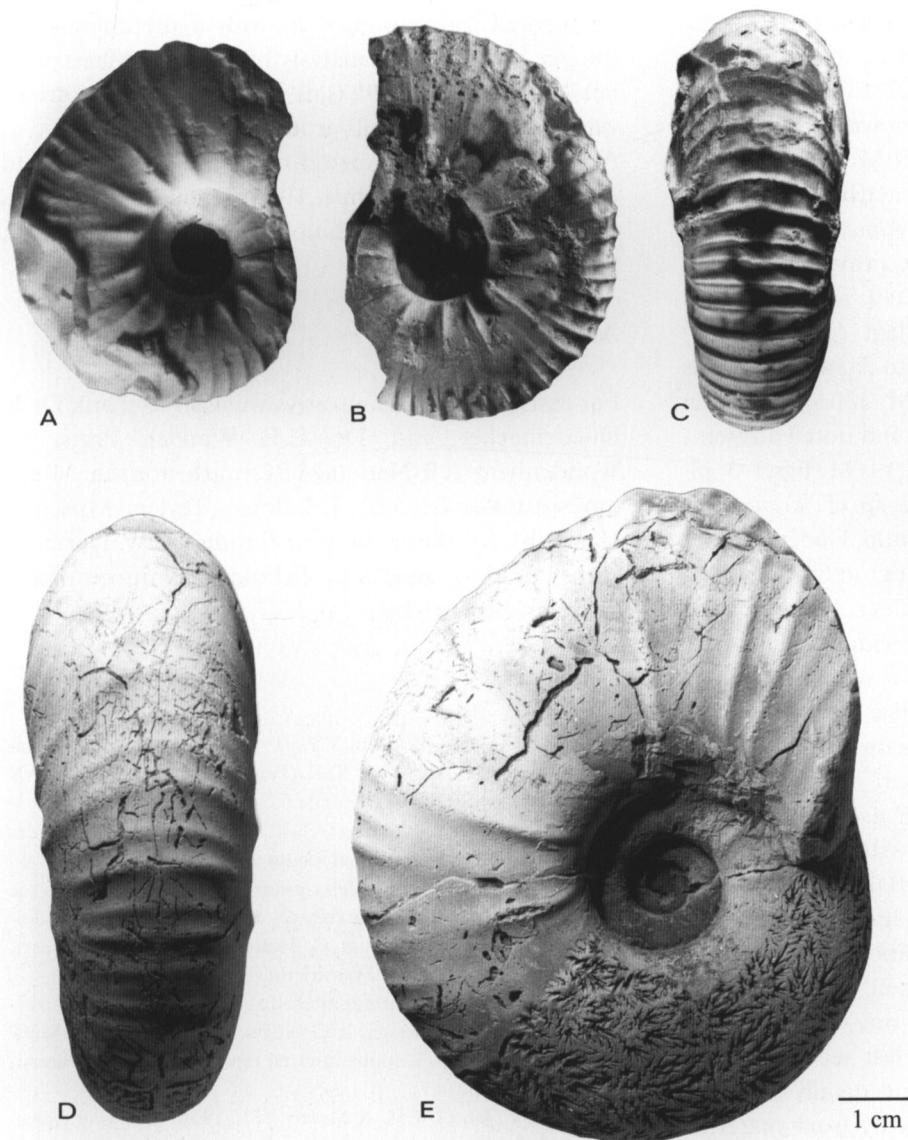


Fig. 2. *Pachydiscus (P.) noetlingi* Kennedy, 1999. A. NHMM 2001 083, silicone rubber cast of external mould of phragmocone, former Blom quarry (Berg en Terblijt), Maastricht Formation, basal Nekum Member (unit IVE-2); B, C - RGM NITG P.244, former Schunck quarry (Bergseweg at Kunrade, outcrop 62B-11), Maastricht Formation, upper part of Kunrade Limestone facies; D, E - GSP 1047 (holotype), from the Upper Maas-trichtian Korara Shale of Goth Haji Ismail (southern Pab Range, Pakistan).

### Description

Although both fragmentary, the present specimens show this species to be moderately involute, with a slightly compressed, oval whorl section (Fig. 3). The umbilicus is moderately deep, with a convex wall merging with the umbilical shoulder; the early phragmocone whorls are smooth; distant inner flank ribs occur, these are straight or slightly prorsiradiate, develop at the second growth stage, and efface on the outer flanks. Later phragmocone whorls have 13-14 primary ribs per whorl, arising at umbilical seam, flexing back across umbilical shoulder, where they are concave; straight or feebly prorsiradiate on flanks and transverse to feebly convex on venter; separated by 2-5 short intercalated mid- to outer flank ribs, of (sub)equal strength across venter; primary ribs strengthen progressively and become incipiently bul-

late. Body chambers not preserved; neither specimen shows the suture.

### Discussion

As discussed by Kennedy (1999, p. 651), *P. noetlingi* is close to *P. jacquoti*, differing from the nominate subspecies, *P. j. jacquoti* (see Kennedy, 1986, 1987; Ward

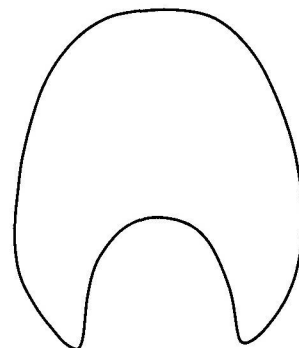


Fig. 3. Whorl section of RGM NITG P.244 at D = 79.5 mm.

& Kennedy, 1993) in retaining crowded ribs and numerous secondaries, which persist to the adult body chamber. The retention of one or two intercalated ribs to the largest diameters known distinguishes *Pachydiscus j. australis* Henderson & McNamara, 1985 from the nominate subspecies, rib density and coarseness being quite distinct from *P. noetlingi*.

Collignon (1966) was the first to provide a description of specimen RGM NITG P.244, and referred it to *P. neubergicus*. Subsequently, Jagt (1995, p. 25) commented on the close alliance to *P. jacquoti* of this and the other specimen (NHMM 2001 083) then traced in the M. Blom Collection, and noted a resemblance to what Usher (1952, p. 72, pl. 11, figs 1-3; pl. 31, fig. 1) referred to as *Pachydiscus* sp. cf. *jacquoti* Senes, 1890, from the Nanaimo Group, Ceder District Formation, of Sucia Island (Washington State, USA). That material, however, is much older, being of Late Campanian age, as dated on other evidence (Haggart, 1989; Haggart & Ward, 1989), and whorl section is more depressed and ornament coarser.

Although neither of the specimens before us preserve portions of the body chamber, there is a close match with the type material of *P. noetlingi* in ornament and whorl proportions of growth stages 1 and 2. Primary and secondary ribs in the Baluchistan material appear stronger (compare e.g. Fig. 3D, E with 3B, C), but this is a matter of preservation, the Kunrade specimen retaining a silicified shell. RGM NITG P.244 shows two adnate oysters, one on the outer flank, the other (bivalved) on the last septal wall, as preserved. In whorl proportions and details of ornament, both specimens differ markedly from material referred to *P. j. jacquoti* from the same area (see e.g. Kennedy, 1987). A fragmentary phragmocone described and illustrated by Binkhorst (1861, p. 29, pl. 8a, fig. 3), a paralectotype of *P. (P.) colligatus* (see Kennedy, 1987, p. 163), is stated to be from '... notre craie jaune supérieure de Benzeraad près de Kunraed, et [...] dans la carrière de cette dernière localité [...]'. This specimen, which was refigured by Kennedy (1987, pl. 15, figs 1-3), is from the Kunrade Limestone facies; whorl section, style of ribbing and dimensions suggest it may be referable to *P. noetlingi* as well.

#### Occurrence

Upper Maastrichtian of Baluchistan, and lower Upper Maastrichtian (*Belemnitella junior* Zone of authors) of southern Limburg (the Netherlands). The present record substantiates earlier interpretations of faunal immigration events during deposition of the Maastricht Formation. Although details still need to

be worked out, and tied in with a preliminary sequence-stratigraphic analysis of the type Maastrichtian (Schiøler *et al.*, 1997), it is of note that various invertebrate macrofossil groups contain elements of Afro-Arabic and/or Austral origin, e.g. trigoniid and ostreid bivalves (Malchus, 1990; Dhondt *et al.*, 1996, work under way) and echinoids (Jagt *et al.*, 1999; Jagt, 2000).

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