LATE CRETACEOUS MACROFAUNA FROM THE HAUTES FAGNES AREA
(NE BELGIUM)

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(1 figure, 1 table & 2 plates)

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ABSTRACT. Flints with fossil external and internal moulds have been collected from the Hautes Fagnes area (Liège, Belgium). The fauna studied yielded 18 bivalve taxa (all pteriomorphs), two brachiopods and three echinoids. The age of this fauna has been determined as Maastrichtian.

KEYWORDS: Upper Cretaceous, macrofauna, Belgium, Hautes Fagnes.

RESUME. Sur le plateau des Hautes Fagnes (Liège, Belgique) des silex avec des empreintes externes et internes de fossiles ont été récoltés. Dans cette faune, on a reconnu 18 espèces de bivalves (tous ptéromorphes), deux espèces de brachiopodes et trois d’échinides. Ce matériel est d’âge Maastrichtien.

MOTS-CLES: Crétacé Supérieur, macrofaune, Belgique, Hautes Fagnes.

1. INTRODUCTION

The Upper Cretaceous strata of the Hautes Fagnes (Liège, NE Belgium) were first recorded in the last century. Some outcrops were then already described in detail, e.g. the railway cutting at Hockai (Dewalque, 1886). Some fossils found in flints scattered over the peat bogs, were deposited in the Institut royal des Sciences naturelles de Belgique in Brussels around 1890.

Subsequent to their discovery the actual conditions of deposition of these flints have been debated extensively. Lately several authors (W. M. Felder & Albers, 1980; Gullentops, 1987; Blass et al., 1991; Blass & Felder, 1989, Blass & Fernandez Narvaiza, 1993) have discussed aspects of the Late Cretaceous (Campanian-Maastrichtian) of the Hautes Fagnes.

For macrofossils, after Dewalque (1888) only Blass et al. (1991) published a preliminary list of Maastrichtian taxa from Beleu (Hautes Fagnes). In the present paper macrofossils preserved in flints found over the entire Hautes Fagnes area (Figure 1), are discussed. This has become possible thanks to Armand Petit and several friends, who have regularly roamed the moors and collected all the fossil-bearing flints - mainly along man-made drains in the peat bogs. The fossils found in these flints are generally preserved as composite moulds, showing a remarkably detailed ornamentation, often better preserved than on specimens from the coeval chalks and calcarenites from Liège and southern Limburg. A few of the macrofossils are good stratigraphic indicators. The material is assigned a Maastrichtian age mainly on the account of the faunal similarity with the Schreibkreide fauna of NW Europe, *Microchlamys pulchella* being the commonest bivalve.
Fig. 1. Map of the Hautes Fagnes area with indications of the localities mentioned in the text.
Carte d'une partie des Hautes Fagnes avec indication des localités mentionnées dans le texte.
species in this assemblage. In the Maastrichtian type area acmes of this species are known from the lower third of the "Vijlen" Member (Gulpen Formation) at Haccourt and Lixhe (Liège), top of Lixhe 1 Member and locally in the Lanaye Member (both Gulpen Formation), all of early Late Maastrichtian age. The co-occurrence of echinoids of the genera Echinocorys and Diplododus if typical for the "Vijlen" Member at Haccourt, although rare representatives of the latter genus are known to accompany Echinocorys in the underlying Late Campanian Zeven Wegen Member. Finally, the cranid brachiopods from the Hautes Fagnes assemblage bear a strong resemblance to costata-group members from the Late Maastrichtian Lanaye Member and the basal part of the overlying Maastricht Formation.

Below (2.1.), the extension of the taxa recognised in other outcrops in the Maastrichtian type area (s.l.) is shown. Faunal diversification is limited since only bivalves with calcitic shells have been preserved.

2. DISTRIBUTION OF THE BIVALVES AND BRACHIOPOD SPECIES FROM THE HAUTES FAGNES STUDIED HEREIN

2.1. DETERMINATION TABLE

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Table 1. 1. Sint Pietersberg-Maastricht, late Late Maastrichtian; 2. "Vijlen" Member, early Late Maastrichtian; 3. Schneeberg, Aachen-Vaals, Maastrichtian; 4. Ciply (Hainaut, Belgium), Craie phosphatée, Early Maastrichtian; 5. Rügen, GFR, Early Maastrichtian; 6. Hemmoor, GFR, Late Maastrichtian; 7. Nagorzany - Lwow, Ukraine, Early Maastrichtian; 8. Paris Basin, France, Late Campanian.

2.2. COMPARISON OF THE BIVALVE TAXA FROM THE HAUTES FAGNES

17 species recognised, of which:
- 14 occur in type Maastrichtian, at the Sint Pietersberg.
- 9 occur in the "Vijlen" Member, at Hallembeaye.
- 6 occur at the Schneeberg, near Vaals,
- 9 occur in the Craie phosphatée of Ciply, Hainaut
- 13 occur in the Lower Maastrichtian of Rügen, Germany
- 11 occur in the Upper Maastrichtian of Hemmoor, Germany
- 12 occur in Lwow-Nagorzany, Lower Maastrichtian, Ukraine
- 8 occur in the Paris Basin, Upper Campanian.

The closest affinities of the Hautes Fagnes bivalve fauna are, outside of the Liège-Limburg basin, mainly with the NW European Schreibkreide fauna and its extension onto the Russian Platform. The northern extension of the Paris Basin as found in the Hainaut or in the Champagne has fewer taxa in common with the Hautes Fagnes.

3. SYSTEMATIC PALAEOONTOLOGY

The taxonomy largely follows that of Moore (1969, 1970) for bivalves but some changes introduced by Waller (1978) have been adopted; for brachiopods Steinich (1965), Johansen and Surlyk (1990), and Ernst (1984) and for echinoids mainly Smith and Wright (1989) have been followed.

3.1. BIVALVES

3.1.1. Abbreviations used for bivalves

H: height; UPD: umbo pallial diameter (used for pectinaceans and limids); W: width; S: side (= valve).

3.1.2. Phylum Mollusca

Class Bivalvia Linné, 1758
Subclass Autobranchia Grobben, 1894
Order Mytiloida Féussac, 1822
Superfamily Mytilacea Rafinesque, 1815
Family Mytilidae Rafinesque, 1815
Genus Botuloides Freneix, 1960

**Botuloides cf intermedius** (d'Orbigny, 1845).

(Pl. 1, Fig. 1)

Compare:

v 1845 Lithodomus intermedius d'Orbigny: 296, pl. 345, figs. 9, 10.
1960 Botuloides intermedius (d'Orbigny); Freneix: 202.
1976 Lithophaga intermedia (Orbigny); Pojakova: 94, pl. 48, figs. 4, 5.

Material. A single incomplete bivalved composite mould from Drain des Fiancés, H: (23 mm).
Remarks. Ornamentation is restricted to growth lines on the thin shell, some of which are more strongly developed and indicate growth interruptions. Although incomplete, this specimen is tentatively assigned to Botuloides intermedius. The specimens in the Paris Museum (d'Orbigny Coll.) from the Campanian of Royan (Charente-Maritime, France), which can be considered as the type material of B. intermedius, agree well with our specimen.

Distribution. Cenomanian to Maastrichtian, often in rudist-associated faunas.

Order Limoidea Waller, 1978
Superfamily Limacea Rafinesque, 1815
Family Limidae Rafinesque, 1815
Genus Lima Bruguieré, 1797

Lima cf. canalisera Goldfuss, 1835

Compare:
* 1835 Lima canalisera Goldfuss: 89, pl. 104, fig. 1.
  v. 1904 Lima canalisera, Goldfuss; Woods: 1, pl. 1 (cum syn.).
  v. 1934 Lima canalisera Goldf.; Andert: 145, pl. 8, fig. 6.

Material. A single incomplete right valve, partial steinkern, from Borne 150, Dolne; UPD 14.5 mm.

Distinctive feature. Strongly developed straight ribs.

Distribution. Lima canalisera is a long-ranging species:
Cenomanian - Campanian, and probably also Maastrichtian from the present record. Generally the specimens are found in sandy deposits, but the species has not to our knowledge been recorded from the stratotypical Maastrichtian.

Genus Lima Wood, 1839

Lima decussata (Münster in Goldfuss, 1835).
(Pl. 1, Figs. 2, 3)

* 1835 Lima decussata Münster; Goldfuss: 91, pl. 104, fig. 5.
  v. 1904 Lima (Lima) decussata, Goldfuss; Woods: 50, pl. 7, figs. 18-20 (cum syn.).
  v. 1968 Lima (Lima) decussata (Münster); Pasternak et al. 84, pl. 37, figs. 13, 15, 16; pl. 38, fig. 1 (cum syn.).
  v? 1977 Lima decussata (Goldfuss); Sobetski: 111, pl. 7, fig. 7.
  v. 1982 Lima decussata (Goldfuss); Dchodt: 90 (cum syn.).
  v. 1982 Lima decussata (Goldfuss); Sobetski et al.: 125, pl. 12, fig. 10.

v. 1987 Lima decussata (Goldfuss); Dchodt and Jagt: 84, fig. 4-3.

v. 1987 Lima decussata (Goldfuss); Cleevely and Morris: 98, pl. 19, fig. 5.

Material. Excellent composite moulds from Drain Marquet and Drain des Fiancés, and a fragmentary composite mould from Drain Marquet.

Dimensions. UPD 16 mm, 17 mm; W 10 mm; 12 mm.

Remarks. Keeled, radial ribs are distributed over the complete shell, but are more strongly developed on the central part. On the areas, the comm marginal ornamentation is equally or even more strongly developed than the radial.

Distribution. Lima decussata is generally only known from white chalk facies, mainly in northern Europe, but reaching the Russian platform.

Lima cf. semisulcata (Nilsson, 1827)

A few poor moulds undoubtedly belong to Lima sp. Their smooth areas and centrally placed ribs differentiate them from L. decussata; their poor preservation does not show neither the number nor the precise shape of their ribs, and therefore it is not possible to determine whether they belong to L. semisulcata (Nilsson, 1827: 25, pl. 9, fig. 2a-c) or to L. kunradensis Marquet, 1982 (13, pl. 1, fig. 1a-d).

Genus Lima Bronn, 1831
Subgenus Pseudolima Arkell, 1832

Lima (Pseudolima) sp.

An incomplete composite mould from D15. H: 7.8 mm. Rib ornamentation is invisible and therefore it cannot be decided whether the specimen belongs to Lima (Pseudolima) denticulata (Nilsson, 1827) or to L. (Ps.) granulata (Nilsson, 1827). Both species are known from the Maastrichtian stratotypical area (Dchodt, 1990).

Genus Plagiostoma J. Sowerby, 1814

Plagiostoma cretaceum (Woods, 1904)

Plagiostoma cretaceum (Woods, 1904)

v* 1904 Lima (Plagiostoma) cretacea Woods: 22, pl. 4, figs. 13-15, pl. 5, figs. 1-4.

A single small incomplete right valve from drain, Borne 150. UPD 15 mm.

The differences described by Woods (1904) between Plagiostoma cretaceum and Pl. hoper/Mantell, 1822 apply.
Plagiotoma hoperi Mantell, 1822

* 1822 Plagiotoma Hoperi Mantell: 204, pl. 26, figs. 2, 3, 15.
  v.1904 Lima (Plagiotoma) Hoperi, Mantell; Woods: 17, pl. 4, figs. 7-12 (cum syn.).
  v.1968 Lima (Plagiotoma) hoperi hoperi (Mantell); Pasternak et al.: 179, pl. 37, figs. 3-5.
  .1974 Lima hoperi Mantell; Savczinkska: 95, pl. 28, fig. 11.
  v.1985 Plagiotoma hoperi Mantell; Dhondt: 49.
  v.1987 Plagiotoma hoperi Mantell; Cleevelly and Morris: 93, pl. 18, fig. 6,7.

A single incomplete valve interior, from Vivier Marquet, W: 17.5 mm.

Distribution. Plagiotoma hoperi is a typical white chalk species known from Campanian to Maastrichtian; it attains large sizes especially in the Campanian of Aquitaine (Dhondt, 1985).

Order Ostreoida Férussac, 1822
Suborder Ostreina Férussac, 1822
Superfamily Ostreaeae Rafinesque, 1815
Family Gryphaeidae Vialov, 1936
Genus Pycnodonte Fischer de Waldheim, 1835

Pycnodonte vesicularis (Lamarck, 1806)

Material. Composite internal mould of right valve from Vivier Marquet, small left valves from Dolne, B 151, from 23 and 25.

Remarks. Pycnodonte vesicularis is a highly variable species, and, depending on the species concept of authors, it is subdivided into subspecies or even species or considered as one long-ranging taxon. We prefer this latter approach, which is also that of Woods (1913: 360-374, text-figs. 143-182, pl. 55, figs. 4-9). The specimens from the Hautes Fagnes are small for the species (H less than 30 mm).

Distribution. Pycnodonte vesicularis is a widely distributed (virtually world-wide) species known from Albian (?) to Maastrichtian.

Superfamily Dimyacea P. Fischer, 1886
Family Terqueumiidae Cox, 1964
Genus Placunopsis Morris and Lycett, 1853

? Placunopsis granulosa (Roemer, 1841)

Compare:
* 1841 Anomia granulosa Roemer: 49, pl. 8, fig. 4.
  . 1966 Placunopsis granulosa (Roemer); Abdel-Gawad: 158, pl. 36, figs. 4-7 (cum syn.).

Material. A single, slightly worn specimen from Drain Vequée.

Dimensions. UPD 16.1 mm, W 14.5 mm.

Remarks. This specimen is tentatively identified as Placunopsis granulosa, because of the unusual placement of the umbo (which differs from Dimyodon and Anomia) and because of the fine diverging stria best visible near the margin.

Distribution. Campanian-Maastrichtian of northern Europe, including The Netherlands.

Superfamily Dimyacea Fischer, 1886
Family Dimyidae Fischer, 1886
Genus Atreta Etallon, 1862

Atreta nilssonii (von Hagenow, 1842)

  . 1986 Atreta nilssonii (v. Hagenow); Abdel-Gawad: 158, pl. 36, figs. 1-3 (cum syn.).
  v.1987 Atreta nilssonii (von Hagenow); Dhondt and Jagt: 82, fig. 4-8.
  .1997 Atreta nilssonii (Hagenow); Cleevelly and Morris: 92, pl. 20, fig. 11.

Material. A single, well-preserved internal mould from Drain des Fiancés (8).

Remarks. This specimen clearly shows the internal, raised ventral margin and the internal radial ribs. Other specimens from the «Vijlen» Member (Maastrichtian) at Hallembeaye show more characteristics confirming that the genus Atreta Etallon reached the Maastrichtian and that the species A. nilssonii (von Hagenow) lived attached not only to echinoids but also to other bivalves. This is an extension to what was stated by Hodges (1991).

Distribution. Albian to Maastrichtian, mainly in fine-grained sediments.

Suborder Pectinina Waller, 1978
Superfamily Pectinacea Rafinesque, 1815
Family Pectinidae Rafinesque, 1815
Genus Entolium Meek, 1865

Entolium membranaceum (Nilsson, 1827)
(Pl. 1, Fig. 10)

* 1827 Pecten membranaceus Nilsson: 23, pl. 9, fig. 16.
  v.1971 Entolium membranaceum (Nilsson); Dhondt: 27, pl. 1, fig. 2 (cum syn.).
v. 1977 *Entolium membranaceum* (Nilsson); Sobetski: 37, pl. 2, figs. 16-17.

v? 1982 *Entolium membranaceum* (Nilsson); Sobetski: 99, pl. 6, fig. 22, pl. 31, figs. 3-4.

v? 1982 *Entolium transcapicum* Sobetski: 100, pl. 6, fig. 23.

v. 1982 *Entolium membranaceum* (Nilsson); Dhoncht: 80.

. 1986 *Entolium membranaceum* (Nilsson); Abdel-Gawad: 149, pl. 33, fig. 10.

v. 1987 *Entolium membranaceum* (Nilsson); Dhoncht and Jagt: 81, fig. 3.3.

v. 1987 *Entolium membranaceum* (Nilsson); Cleeverly and Morris: 91, pl. 19, fig. 2.

**Material.** A single complete composite mould, from B. 151 at Dolne, one incomplete composite mould from Drain Croix des Fiançes, one questionable fragment from Drain des Fiançes.

**Dimensions.** UPD 31.8 mm, W (30) mm.

**Remarks.** Although generally poorly preserved the complete specimen has well-preserved auricles which permit definite specific identification.

**Distribution.** Cenomanian to latest Maastrichtian; also in the Maastrichtian stratotype.

Genus *Camptonectes* Agassiz in Meek, 1864

*Camptonectes virgatus* (Nilsson, 1827)

(Pl. 2, Fig. 1)

v* 1847 *Pecten campaniensis* d'Orbigny: 620, pl. 440, figs. 12-16.

v. 1902 *Pecten (Aequipecten) campaniensis* d'Orbigny; Woods: 192, pl. 37, figs. 4-8 (cum syn.).

v. 1902 *Pecten fenestratus* Ravn: 85, pl. 1, figs. 14-16.

v. 1908 *Pecten Puggaardi* Ravn: 72.

v. 1972b *Lyropecten (Aequipecten) campaniensis* (A. d'Orbigny); Dhoncht: 9, pl. 1, fig. 1 (cum syn.).

v? 1974 *Chlamys campaniensis* (Orbigny); Savczinska: 90, pl. 26, figs. 8-10.

v. 1977 *Chlamys (Microchlamys) puggaardi* (Ravn); Sobetski: 61, pl. 4, fig. 12.

v. 1982 *Lyropecten (Aequipecten) campaniensis* (d'Orbigny); Dhoncht: 81, pl. 3, figs. 4-7.

. 1986 *Lyropecten (Aequipecten) campaniensis* (d'Orbigny); Abdel-Gawad: 153, pl. 33, figs. 6-7.

. 1986 *Lyropecten (Aequipecten) wisniowskii* (Pasternak); Abdel-Gawad: 153, pl. 32, figs. 1, 2.

v. 1987 *Lyropecten (Aequipecten) campaniensis* (d'Orbigny); Cleeverly and Morris: 84, text-fig. 5.3a, pl. 17, fig. 5.

**Material.** Several incomplete composite moulds from the Drain des Fiançes, Drain Vequée and from Vier Marquet.

**Dimensions.** UPD 11 mm; W 11 mm.

**Remarks.** The specimens assigned here to *Microchlamys campaniensis* have fewer, more irregular ribs than those belonging to *M. pulchella*. The commarginal striation typical of *M. campaniensis* is not clearly visible on the moulds.

**Distribution.** Turonian to latest Maastrichtian, mainly in white chalk facies, but also found in the Maastrichtian stratotype.

*Microchlamys pulchella* (Nilsson, 1827).

(Pl. 1, Figs. 4-8)

* 1827 *Pecten pulchellus* Nilsson: 22, pl. 9, fig. 12.

v. 1902 *Pecten (Aequipecten) pulchellus* Nilsson; Woods: 194, pl. 37, figs. 12-15 (cum syn.).

v. 1972b *Lyropecten (Aequipecten) pulchellus* (S. Nilsson); Dhoncht: 16, pl. 1, fig. 2 (cum syn.).
v. 1982 *Lyropecten* (Aequipecten) pulchellus (Nilsson); D Hondt: 82, pl. 3, figs. 8, 9.

v. 1982 *Chlamys* (Microchlamys) pulchella (Nilsson); Sobetski: 110, pl. 11, figs. 13, 14.

. 1986 *Lyropecten* (Aequipecten) pulchellus (Nilsson); Abdel-Gawad: 152, pl. 33, figs. 8, 9 (cum syn.).

v. 1987 *Lyropecten* (Aequipecten) pulchellus (Nilsson); D Hondt & Jagt: 81, figs. 4: 4, 5.

**Material.** Moulds and composite moulds from Drain Vequée, Croix des Fiancés, Drain des Fiancés, Dolne (Borne 151 and 152), Helle, Herbofayee, Hoegne, Drain Marquet; perfect composite mould of right valve from Drain Vivier Marquet. Very common.

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<td></td>
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<tr>
<td>F. Dolne, B.152</td>
<td>13.7</td>
<td>12.8</td>
<td>R</td>
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<tr>
<td>Hoegne</td>
<td>18.8</td>
<td>19.0</td>
<td>R</td>
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<tr>
<td>Hoegne</td>
<td>17.6</td>
<td>17.8</td>
<td>R</td>
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**Remarks.** These specimens are identical with those described from the Campanian white chalks in England (Woods, 1902) and from Orp-le-Grand (D Hondt, 1972b). On the well-preserved moulds the typical diverging camptonectid microstriae are beautifully visible, much more clearly than on most specimens from the Maastrichtian Fm. near Maastricht.

**Distribution.** *Microchlamys pulchella* is known from Turonian to latest Maastrichtian, also from the Maastrichtian stratotype.

Genus *Mimachlamys* Iredale, 1928

**Mimachlamys cretosa** (Defrance, 1822)

*1822 *Pecten* cretosus* Defrance in Brongniart: 251, 598, pl. 3, figs. 7a, b.*

v. 1990 *Pecten* (Chlamys) cretosus Defrance; Woods: 174, pl. 32, figs. 4-6; pl. 33, figs. 1-12 (cum syn.).

v. 1973a *Mimachlamys cretosa* (M. Defrance in A. Brongniart);

D Hondt: 77, pl. 5, fig. 2; pl. 7, fig. 1 (cum syn.).

. 1974 *Chlamys* cretosus (Defrance); Savczinskaja: 90, pl. 26, figs. 5, 6.

v. 1977 *Chlamys* (Chlamys) marrotiana (Orbigny);

Sobetski: 43, pl. 3, fig. 5.

v. 1977 *Chlamys* (Chlamys) cretosa (Defrance);

Sobetski: 44, pl. 3, fig. 6.

. 1981 *Chlamys* (Chlamys) cretosa (Defrance in Brongniart); Tzankov: 103, pl. 45, fig. 6.

v. 1982 *Chlamys* (Chlamys) nitida (Mantell); Sobetski: 103, pl. 6, fig. 28.

v. 1982 *Chlamys* (Chlamys) cretosa (Defrance); Sobetski: 104, pl. 11, figs. 1-2; pl. 31, fig. 6.

v. 1982 *Chlamys* (Chlamys) undulata (Nilsson);

Sobetski: 104, pl. 11, fig. 3.

v. 1982 *Chlamys* (Chlamys) serrata (Nilsson);

Sobetski: 105, pl. 11, fig. 5.

v. 1984 *Mimachlamys cretosa* (Defrance); D Hondt: 39.

. 1986 *Mimachlamys cretosa* (Defrance in A. Brongniart); Abdel-Gawad: 154, pl. 34, figs. 1, 2.

v. 1987 *Mimachlamys cretosa* (Defrance); Cleevy and Morris: 80, pl. 17, figs. 7, 8; text-figs. 5.1e, 5.2a.

**Material.** Small, somewhat worn, slightly silicified, left valve from Drain Croix des Fiancés and small inside of right valve from Vivier Marquet.

**Dimensions.** Drain Fiancés: UPD 14.3 mm; W 12.7 mm, LV

Vivier Marquet: UPD 11.2 mm; W 8.3 mm, RV

**Remarks.** The Vivier Marquet specimen shows an unusual ornamentation of commarginal growth lines and radial riblets of the same development, giving a cancellated aspect. A similar ornamentation is figured by Woods (1902, pl. 33, fig. 12) for English specimens from the Lower Maastrichtian at Trimingham, Norfolk.

**Distribution.** Turonian to Maastrichtian, virtually worldwide; known from the Maastrichtian stratotype.

Genus *Merklinia* Sobetski, 1960

**Merklinia variabilis** (von Hagenow, 1842) (Pl. 1, Fig. 12)

*1842 *Pecten* variabilis* von Hagenow: 552.

v. 1976 *Merklinia* variabilis (F. von Hagenow); D Hondt: 18, pl. 1, fig. 2; pl. 2, fig. 1 (cum syn.).

v. 1977 *Chlamys* (Merklinia) triformis Sobetski: 56, pl. 4, fig. 6.

v. 1982 *Merklinia* variabilis (von Hagenow); D Hondt: 84, pl. 2, fig. 12.

v. 1982 *Chlamys* (Chlamys) trisulca (Hagenow);

Sobetski: 106, pl. 11, fig. 6.

v. 1982 *Chlamys* (Chlamys) armata (Grieppenkerl);

Sobetski: 106, pl. 11, fig. 7.

v. 1982 *Merklinia pexata* (Woods, 1903); Sobetski: 112, pl. 11, fig. 17.

. 1986 *Merklinia variabilis* (v. Hagenow); Abdel-Gawad: 155, pl. 32, fig. 15.
v. 1987 Merkiinia variabilis (von Hagenow); Cleevely and Morris: 83, text-fig. 5.1a, pl. 17, figs. 13, 14.

Material. Composite moulds from Drain Croix des Fiancés, B. 151 at Dolne, Hautes Fagnes (unspecified).

Dimensions. UPD 18.7 mm, 23.5 mm; W 14.5 mm, 19 mm.

Remarks. This small pectinid is relatively common in the Hautes Fagnes area, and even as a mould it can be recognised by its specific subdivided trifid rib structure and oblique habitus.

Distribution. Turonian to Maastrichtian of Eurasia (temperate seas, not found in Tethys), occurs in the stratotypical Maastrichtian.

Genus Neithea Drouet, 1824

Neithea sexcostata (Woodward, 1833) (Pl. 1, Fig. 11)

* 1833 Pecten sexcostatus Woodward: 48, pl. 5, fig. 9.

v. 1903 Pecten (Neithea) sexcostatus Woodward; Woods: 214, pl. 40, figs. 10-12, pl. 41, figs. 1-10.

v. 1973b Neithea (Neithea) sexcostata (Woodward); Dhoudt: 44, pl. 5, figs. 2a, b (cum syn.).

v. 1986 Neithea (Neithea) sexcostata (Woodward); Abdel-Gawad: 156, pl. 32, figs. 3-4 (cum syn.).

v. 1987 Neithea (Neithea) sexcostata (S. Woodward); Cleevely and Morris: 86, pl. 19, fig. 7-9.

Material. A single incomplete, but clear composite mould of a left valve (24 AP), and an incomplete composite mould of an attached valve from Drain Vivier Marquet.

Dimensions. UPD (25)mm, 23.5 mm; W 18.5 mm, (20) mm.

Remarks. The specimens from the Hautes Fagnes agree with the detailed description of Dhoudt and Dieni (1990).

Distribution. Cenomanian to Maastrichtian, widely distributed, but mainly in chalk facies, rare in the Maastrichtian stratotype.

3.2. BRACHIOPODA

Phylum Brachiopoda

Order Acroterida Kuhn, 1949

Suborder Craniidina Waagen, 1885

Superfamily Craniacea Menke, 1828

Family Craniidae Menke, 1828

Genus Isocrinia Jaekel, 1902

Isocrinia gr. costata (J. de C. Sowerby, 1823). (Pl. 2, Fig. 2)
Compare:
* 1823 **Crania costata** J. de C. Sowerby; pl. 35, fig. 6.
1859 **Crania Egnabergensis var. paucicostata** Bouquet: 15, pl. 1, figs. 5, 6.
1969 **Crania ignabergensis** Retzius; Kruyter: 30, figs. 12, 13.
1973 **Isocrania costata** (Sowerby 1823); Sylvyk: 233, text-figs. 1, 2, 5-10, 12; pl. 1, figs. 1-11, 16-19; pls. 3, 4; pl. 6, fig. 2.
1979 **Isocrania costata** (Sowerby, 1823); Bitner and Pilsen: 70, fig. 2.
1984 **Isocrania costata** (Sowerby); Ernst: 65, pl. 6, figs. 3, 4; pl. 7, figs. 1-6; pl. 8, figs. 1, 2, 9-11.
1987 **Isocrania paucicostata** (Bouquet); Owen in Smith and Owen: 51, pl. 9, figs. 1a, b.
1990 **Isocrania costata** (J. de C. Sowerby, 1823); Johansen and Sylvyk: 836, pl. 1, figs. 3, 4.

**Material.** Two moulds of the external surface of ventral valves, one of them incomplete, from Drain Vequée.

**Discussion.** **Isocrania costata** is a long-ranging species; Sylvyk (1973) recorded a range from the Late Campanian to the Late Maastrichtian. The specimens at hand were compared with material of Kruyter's (1969) **I. egnabergensis** (non Retzius, 1781) from the Late Maastrichtian (Gulp Formation, Lanaye Member) of Eben-Emael-Bassenge (Liège). Kruyter's form appears to occur first in the Lanaye Member, although he recorded a single specimen from the Late Campanian Zeven Wegen Member at Haccourt (Liège); this latter specimen is better referred to as **I. campaniensis** H. Ernst, 1984, for the time being. The Hauts Fagnes specimens clearly belong in the **costata** group (sensu H. Ernst, 1984), and correspond well with Maastrichtian specimens illustrated by Ernst. Only careful analyses of populations with strong stratigraphic control along Ernst's lines promises reliable results. Ernst (1984) described a lineage from **I. campaniensis** (late Late Campanian) over **I. praecostata** (Early Maastrichtian, *pseudobiusa* and *obtusa* Zones) to **I. costata** (Early to Late Maastrichtian, *sumensis* to junior Zones).

Genus **Carneithyris** Sahni, 1925

**Carneithyris gr. subcardinalis** Sahni, 1925

**Material.** Two internal moulds from Drain Vivier Marquet and Drain des Fiancés.

**Discussion.** These specimens are assigned to a group of terebratulid brachiopods which is widely distributed throughout NW and NE Europe and which has been recorded from Upper Campanian and Maastrichtian strata (Asgaard, 1975; Steinich, 1965; Johansen & Sylvyk, 1990).

Although poorly preserved, the specimens compare well with material known from the lower Upper Maastrichtian "Vijlen" Member and the upper Upper Maastrichtian Lanaye Member of the Gulpen Formation, as exposed in the Maastrichtian type area.

**Distribution.** Upper Campanian and Maastrichtian of Denmark, northern Germany, Poland, eastern England, and the stratotypical Maastrichtian.

### 3.3. ECHINOIDS

**Phylum Echinodermata**

Order **Cidaroida Clauss**, 1880

Family **Cidaridae Gray**, 1825

? Subfamily **Cidarinae Gray**, 1825

? Tribe **Stereocidarini Mortensen**, 1928

**Cidaroida indet.**

(Pl. 2, Fig. 3)

**Material.** A single incomplete primary spine, external mould, from B. 150 at Vequée.

**Description.** Length preserved 15 mm, greatest preserved diameter 6.4 mm. Its fusiform shape recalls that of representatives of the genus **Balanocidaris** Lambert, 1910, but these normally have less well-developed rows of tubercles, and rather isolated patches of tubercles of various sizes. Other fusiform primary spines are found in representatives of the genus **Hirudocidaris** Smith & Wright, 1989, especially the type species, **H. hirudo** (Sorignet, 1850), but in these the ribs are clearer and generally less tuberculate. Cidarid echinoids from the Campanian Maastrichtian of the Maastrichtian type area comprise representatives of the genera **Tennociocidaris** Cotteau, 1863 and **Tennociocidaris** (Stereocidaris) Pomel, 1883; **Hirudocidaris** being unknown.

Because of the poor preservation and lack of comparative material from the area, the present specimen will have to remain indeterminate.

Order **Holasteroida Durham and Melville**, 1957

Family **Holasteridae Pictet**, 1857

Genus **Echinoconys Leske**, 1778

**Echinoconys** sp.

(Pl. 2, Fig. 4)

**Material.** External and internal moulds of fragmentary test material from Croix des Fiancés and from B. 152 near Gayetay.

**Discussion.** The main interest of this material lies in the fact that it shows that the strata yielding it predate deposition of the Lanaye Member (Gulpen...
Formation of the Maastrichtian type-area. In that unit, the typically boreal/temperate members of the genus *Echinocorys* are replaced by the Tethyan genus *Hemipneustes* Agassiz, 1836. The numerous *Echinocorys* species of Early Campanian to Late Maastrichtian age that occur in the Maastrichtian type area are in need of revision. The present form is of moderate size for the genus and has a thick test.

Order Spatangoidea Claus, 1876
Family Brissidae Gray, 1847
Genus *Diplodetus* Schlüter, 1900

*Diplodetus* sp.
(Pl. 2, fig. 5)

Material. A fragmentary internal mould preserving part of an ambulacrum from Croix des Fiancés at B. 151.

Discussion. Because of the poor preservation, this specimen cannot be referred to a species and, in fact, is assigned to the genus *Diplodetus* with a query. The only spatangoid echinoids of *Micraster*-habitus to occur in the Maastrichtian of the type-area are species of *Diplodetus*, and various species have been recorded from the different lithostratigraphic units. In the Lanaye Member of the Guipon Formation and its correlatives, *Diplodetus* is particularly well represented (van der Ham et al., 1987).

4. ACKNOWLEDGMENTS

We express our sincere gratitude to Professor Maurice Streef and to Ing. Sjeuf Felder for having encouraged us to undertake and to conclude the present research.

Our special thanks go to Armand Petit, Marc Chignesse, Laurent Dessard, Frédéric and Patrick Dolne and a group of young girls and boys from Stembert who with endurance and enthusiasm collected the bulk of the material during their walks across the Hautes Fagnes. Fossils do not occur frequently on the flints of the Hautes Fagnes and Armand Petit and his friends succeeded in assembling a very interesting collection which extends our knowledge on the Maastrichtian faunas of the Hautes Fagnes widely beyond what was known previously. Very generously this collection was further presented to the IRSchNB.

A Monsieur Armand Petit de Stembert et à ses amis un très grand merci!

For technical assistance, photography and drafting we are grateful to Dirk Anne, Wilfried Miseur and An Wauters (all from the IRSchNB).

5. REFERENCES


PLATE 1

Fig. 1. *Botuloides cf. intermedia* (d'Orbigny, 1845)
Drain des Filancés, Hautes Fagnes, Liège
TCMI IRScNB 10650, x 2.5

Fig. 2. *Limatula decussata* (Münster in Goldfuss, 1835)
Drain des Filancés, Hautes Fagnes, Liège
TCMI IRScNB 10651, silicone cast, x 2.5

Fig. 3. *Limatula decussata* (Münster in Goldfuss, 1835)
Drain Vivier Marquet, Hautes Fagnes, Liège
TCMI IRScNB 10652, silicone cast, x 2.5

Fig. 4. *Microchlamys pulchella* (Nilsson, 1827)
Drain Vequée, Hautes Fagnes, Liège
TCMI IRScNB 10653, external cast of left valve, x 2

Fig. 5. *Microchlamys pulchella* (Nilsson, 1827)
Helle, Hautes Fagnes, Liège
TCMI IRScNB 10654, silicone cast of right valve, x 3.
(the small pits are casting artifacts)

Fig. 6. *Microchlamys pulchella* (Nilsson, 1827)
Drain Vivier Marquet, Hautes Fagnes, Liège
TCMI IRScNB 10655, silicone cast of left valve, x 3

Fig. 7. *Microchlamys pulchella* (Nilsson, 1827)
Drain Vivier Marquet, Hautes Fagnes, Liège
TCMI IRScNB 10656, silicone cast of left valve, x 3

Fig. 8. *Microchlamys pulchella* (Nilsson, 1827)
Drain Vivier Marquet, Hautes Fagnes, Liège
TCMI IRScNB 10657, silicone cast of right valves, x 4

Fig. 9. *Microchlamys campaniensis* (d'Orbigny, 1847)
Drain Croix des Filancés, Hautes Fagnes, Liège
TCMI IRScNB 10658, silicone cast, x 4

Fig. 10. *Entolium membranaceum* (Nilsson, 1827)
B 151, Hautes Fagnes, Liège
TCMI IRScNB 10659, x 2

Fig. 11. *Neithia sexcostata* (Woodward, 1833)
Drain Vivier Marquet, Hautes Fagnes, Liège
TCMI IRScNB 10660, flat valve, external cast, x 2

Fig. 12. *Merklinia variabilis* (von Hagenow, 1842)
Drain Croix des Filancés, Hautes Fagnes, Liège
TCMI IRScNB 10661, right valve, external cast, x 3
PLATE 2

Fig. 1. *Camptonectes virgatus* (Nilsson, 1827)  
Drain Vequée, Hautes Fagnes, Liège  
TCM IRScNB 10662 left valve, external cast, x 7

Fig. 2. *Isocrania gr. costata* (J. de C. Sowerby, 1823)  
Drain Vequée, Hautes Fagnes, Liège  
TCM IRScNB 10663, ventral valve, external surface,  
silicone cast, x 6

Fig. 3. cidaroid spine  
B. 150 at Vequée, Hautes Fagnes, Liège.  
IRScNB TCMI 10664, incomplete primary spine, sili-  
cone cast, x 6

Fig. 4. *Echinocorys* sp.  
Croix des Fiancés, Hautes Fagnes, Liège.  
IRScNB TCMI 10665, external mould, fragmentary  
test material, x 1.5

Fig. 5. *Diplodetus* sp.  
Croix des Fiancés at B. 151, Hautes Fagnes, Liège.  
IRScNB TCMI 10666, silicone cast, x 7.