

A new Pliocene cancrid crab from Oelegem, province of Antwerpen (NW Belgium)

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A new cancrid crab, *Cancer vancalsteri* n. sp., preserved in a partially decalcified concretionary nodule, is described from the Lower/Middle Pliocene of Oelegem, province of Antwerpen (NW Belgium), and compared with fossil and extant congeners (*C. parvidens* from Liessel, Noord-Brabant, the Netherlands, and *C. pagurus*, North Sea and Atlantic). In an Appendix (by F.P. Wesselingh), the associated molluscan faunules are discussed in an attempt to determine the stratigraphic provenance of the concretionary nodules.

KEY WORDS: Crustacea, Decapoda, Cancridae, Belgium, Pliocene, new species.

Introduction

Recent fieldwork in the province of Antwerpen (NW Belgium), and in the Kallo area in particular, has shown decapod crustacean remains in Pliocene strata as exposed in temporary outcrops to be fairly common locally. However, previous systematic work on these faunules is scant. The most diverse assemblage known to date is from the Oorderen Member (Lillo Formation; van Bakel *et al.*, 2000); this comprises two cancrid taxa, *Cancer* cf. *pagurus* Linné, 1758 and *Cancer* n. sp. The latter species, reminiscent of the extant *C. borealis* Stimpson, 1859, will be described elsewhere (van Bakel *et al.*, in press).

As far as we are aware, the only fossil cancrid crab to have been described from NW Belgium is *Tasadia carniolica* (Bittner, 1884), which turned out to be fairly common at Ramsel. In a recent re-evaluation of the Cancridae, Schweitzer & Feldmann (2000) placed the monospecific genus *Tasadia* in the subfamily Lobocarcininae Beurlen, 1930. The reworked phosphoritic concretions which yielded *T. carniolica* and an associated calappid, *Mursia lienharti* (Bachmayer, 1962), are of Miocene ('Hemmoorian-latest Oxlundian'= Langhian, see Janssen, 2001) age. Müller (*in* Janssen and Müller, 1984) noted that these two species are also known from 'Badenian' strata (= Langhian and early Serravallian; see Harzhauser *et al.*, 2002, fig. 1) of the central Paratethys.

That no cancrids have yet been formally named from Pliocene strata in NW Belgium is surprising, especially since from coeval deposits on neighbouring Dutch territory, Holthuis (1949, pl. 1, figs 2-9) illustrated *Cancer pagurus*

from Lower Pleistocene sequences penetrated in boreholes at Dordrecht, Dubbeldam-Prinseneuvel, Dongen and Roosendaal, and *C. deshayesii* (A. Milne-Edwards, 1862) from correlative levels at Schouwen. The latter species was also recorded by Holthuis from the Miocene of Winterswijk-Stemerdink (Gelderland), the Peel district (Noord-Brabant, Limburg) and Beringe (Limburg) in the Netherlands. Various authors (*e.g.*, Glaessner, 1929; Bonfiglio & Donadeo, 1982) have considered *C. deshayesii* to be synonymous with *C. sismondai* von Meyer, 1843, which is a widely distributed species in the Middle Pliocene of the Mediterranean (Beschlin & Santi, 1997). Garassino & Fornaciari (2000) extended its stratigraphic range into the Lower Pleistocene, and pointed out that the status of the extant *C. bellianus* (eastern Atlantic Ocean) should be reassessed in the light of this range extension of *C. sismondai*. However, the latter species has recently been transferred to the genus *Lobocarcinus* Reuss, 1857 by Schweitzer & Feldmann (2000). This matter will be addressed in more detail elsewhere (van Bakel *et al.*, in press).

In the present paper a new Pliocene species of *Cancer* is described from a temporary outcrop at Oelegem. Comparisons are made with the close relatives, the Miocene *C. parvidens* Collins & Fraaye, 1991, and the Pliocene-Recent *C. pagurus*.

Locality and stratigraphy

The set of nodules, including the one that has yielded the type specimen of *Cancer vancalsteri* n. sp., were collected in

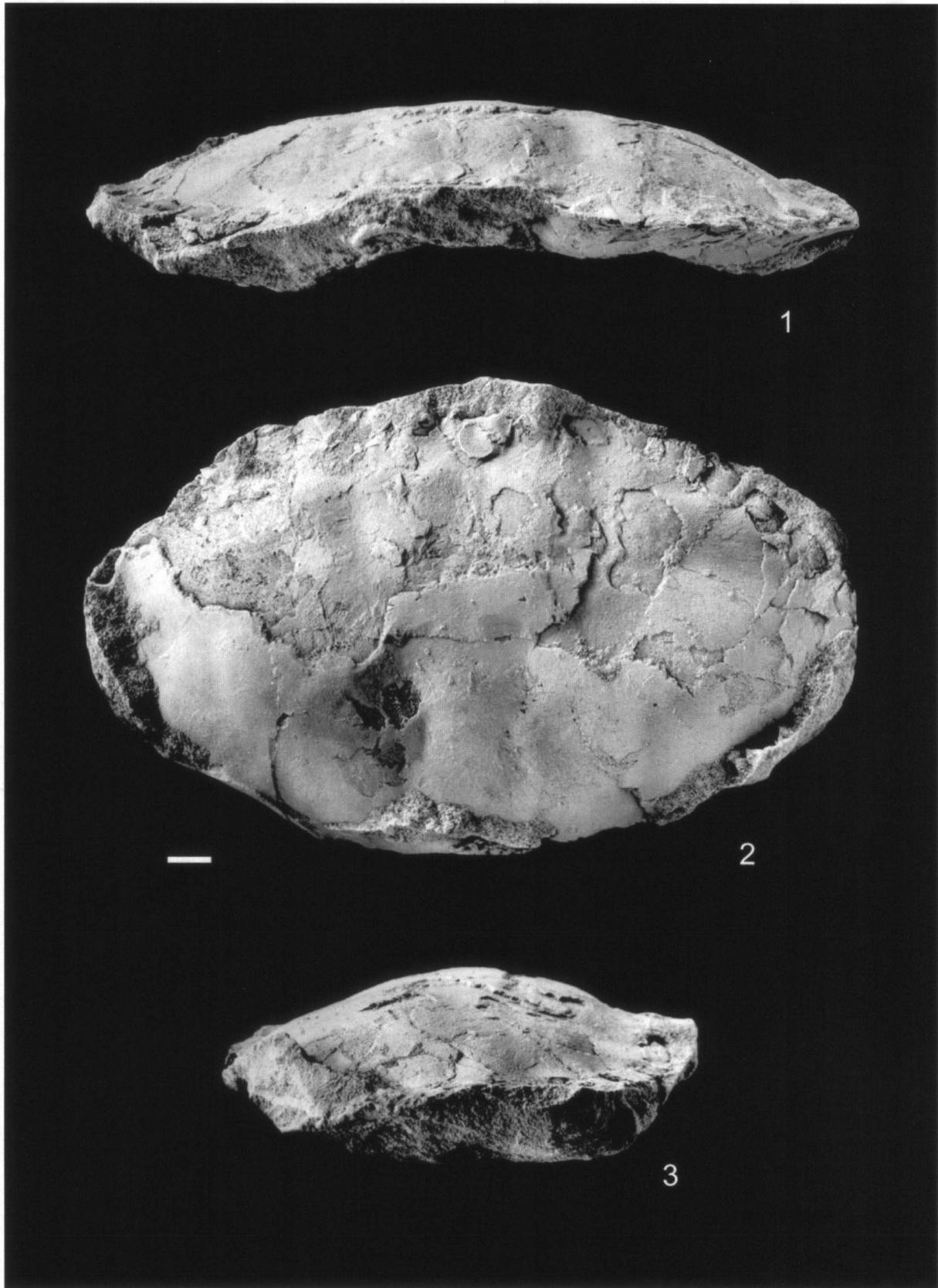
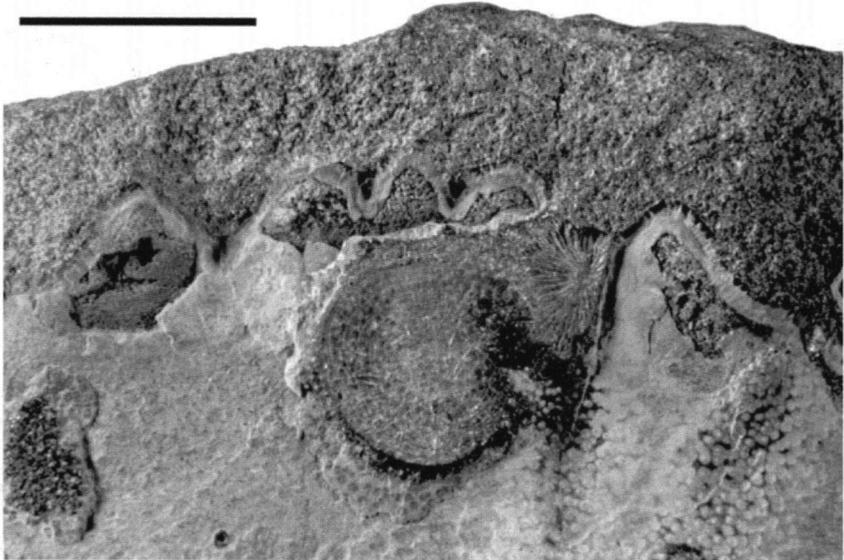
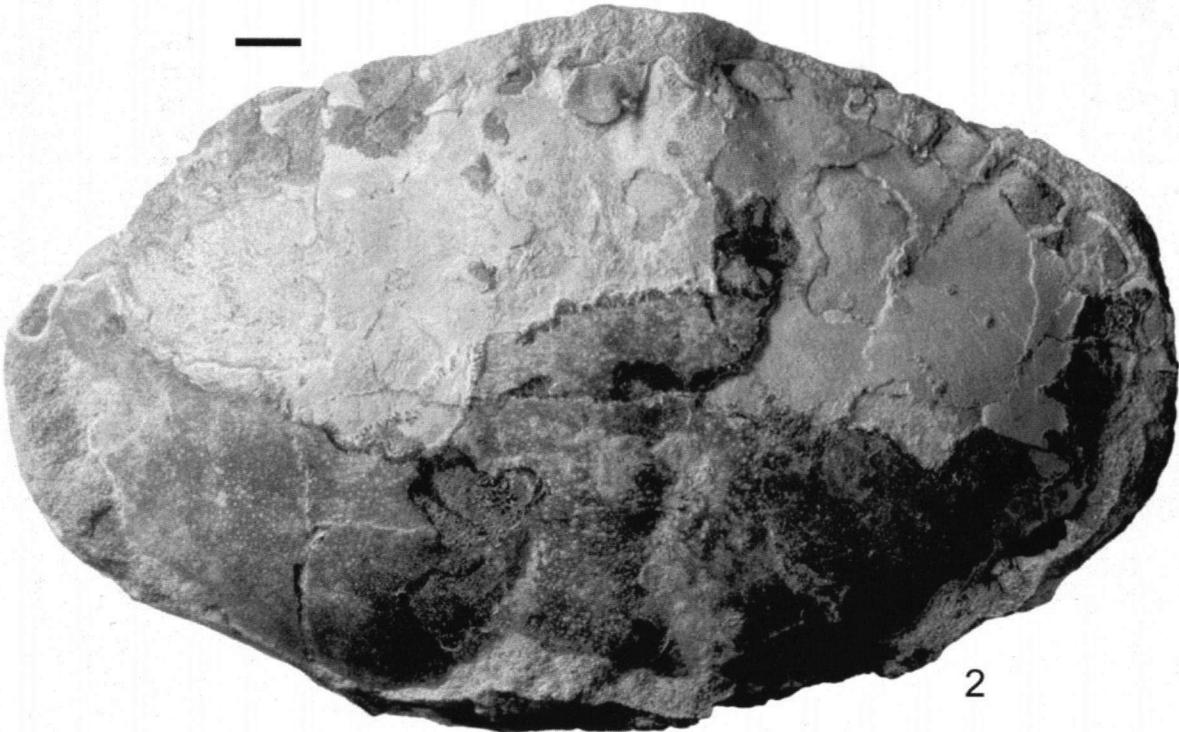


Figure 1. *Cancer vancalsteri* n. sp., **holotype** (NHMM 2000 108), Lower/Middle Pliocene (Kattendijk Formation equivalents), temporary outcrop south of Oelegem (Broechem, province of Antwerpen, NW Belgium), in frontal (1), dorsal (2) and right lateral (3) views; scale bar equals 10 mm (photographs by W. Miseur; specimen coated with ammonium chloride prior to photography).



1



2

Figure 2. *Cancer vancaisteri* n. sp., holotype (NHMM 2000 108), as Figure 1. Details of frontal carapace region (1) and dorsal view of carapace (2, unwhitened); scale bars equal 10 mm (photographs by R.W. Dortangs).

1979 by Roland Meuris and Frans Van Calster from a temporary outcrop, for which Frederik Mollen (pers. comm., October 2002) supplied the following data. South of Oelegem, in the municipality of Broechem (Lambert coordinates, x - 166.60, y - 210.10), a new water reservoir of the Antwerpse Waterwerken (AWW) was constructed between September 1975 and September 1982. During construction, Pliocene strata were temporarily exposed, and collection efforts concentrated on fossiliferous nodules of the type described in the present note.

Marquet (1980, fig. 2) supplied two sections, presented faunal lists (molluscs), and interpreted the stratigraphy of the section exposed. Although not recorded at the time of collection, the nodules described in the present note appear to have originated from level 'b' in Marquet's (1980, p. 59, fig. 2A) section A. This is a 0.1 m thick interval of gravel and grey sand, with sandstone nodules and phosphoritic concretions which occasionally contain fossils, as well as some bones, in part articulated, isolated lingulid brachiopods and sporadic 'ghosts' of large bivalves (*Arctica islandica*). The boundary between this level and the underlying level 'a' is undulating, and coarse elements are often concentrated in pockets. Most of the bones collected here originate from the gravelly level.

Marquet (1980, p. 61, table 2) considered this gravel ('basisgrind') to represent the base of the Kattendijk Formation, mainly on selachian and molluscan evidence; it probably also contains remanié elements from the underlying glauconitic coarse sands, which appear correlative with the Deurne Member. From level 'b', Marquet (1980, p. 63) recorded the following bivalve and gastropod species (compare Appendix here; taxa in common are indicated with an asterisk):

Glycymeris glycymeris, *Chlamys* sp., *Glossus humanus**, *Acanthocardia* cf. *tuberculata**, *Laevicardium parkinsoni*, *Angulus* sp., *Arctica islandica**, *Pygocardia r. rustica*, cf. *Callista chione**, *Cyrtodaria angusta**, *Panopea faujasi*, *Thracia* sp., *Natica multipunctata*, *Galeodea bicatenata*, *Hinia reticosa**, *Scaphella lamberti** and *Conus dujardini*.

Although there still are uncertainties, in particular on the lower boundary of this unit, the larger portion of the Kattendijk Formation appears to be of Early Pliocene (Zanclean) age (see Louwey & Laga, 1998; Vandenberghe *et al.*, 1998; Louwey *et al.*, 1999; Buffel *et al.*, 2001). The molluscan fauna contained in the nodules (see Appendix) suggests an Early to Middle Pliocene age.

Systematic description

Abbreviations — The following abbreviations are used in the text to denote the repositories of specimens:

MAB Oertijdmuseum de Groene Poort, Boxtel
(formerly Museum de 'Ammonietenhoeve');
NHMM Natuurhistorisch Museum Maastricht.

Section Heterotremata Guinot, 1977
Family Cancridae Latreille, 1802
Subfamily Cancrinae Latreille, 1802
Genus *Cancer* Linné, 1758

Type species — *Cancer pagurus* Linné, 1758, p. 627, by subsequent designation of Latreille (1810).

Cancer vancalsteri n. sp.

Figures 1, 2, 3/1

Type — Holotype, and sole specimen known, is NHMM 2000 108.

Diagnosis — Large-sized cancrinid, carapace subovate in outline, wider than long, marginal lobes subtruncate to quadrate, front adorned with five well-differentiated teeth, inner orbital teeth sharp, triangular, carapace regions not well defined.

Derivation of name — Named after Frans Van Calster (Hallaar, Heist-op-den-Berg, Belgium), who collected the specimen and entrusted it to us for description.

Description — Carapace large, transversely broadly oval, length approximately 60% of maximum carapace width, which is situated at the eighth anterolateral lobe; tumid in longitudinal and transverse sections with vaulted median portion and flattened borders.

Fronto-orbital border 22% of total carapace width. Orbits small, elliptical, slightly directed outwardly and indented. Supraorbital margins with two deep, closed fissures; inner fissure at deepest point of orbits; outer one proximal to outer orbital corners, fissures axially strongly convergent. Front bears five teeth, inclusive of inner orbital teeth; inner three distinctly separated by deep, bluntly V-shaped emarginations from sharply triangular inner orbital teeth which are not projected beyond the outer orbital angles. Submedian teeth bluntly rounded, median tooth sharper than submedian ones, slightly projecting, separated from adjacent pair by deep V-shaped incisions. Orbital margin and inner orbital teeth upraised.

Anterolateral margins gently rounded towards maximum carapace width from outer orbital corners, bearing nine marginal teeth including outer orbital tooth. Anterolateral teeth subtruncate to quadrate, becoming noded posteriorly, near-equal in width, separated from each other by deep, closed, axially directed fissures. Posterolateral margins posteriorly concave, convergent, with distinct, smooth rim; anteriorly bearing two less differentiated lobes; posterior margin not well preserved.

Protogastric lobes longitudinally ovate, long, bounding the narrow, weakly differentiated anterior mesogastric process, and separated from hepatic regions by broad, shallow depressions. Mesogastric region broadened posteriorly, merging into median elevation of carapace.

Posterior lateral sides of urogastric region and anterior lateral sides of cardiac region concave, fused, forming distinct, paired longitudinally curved depressions.

Branchial regions vaulted, undifferentiated, with convex margin adjacent to median carapace regions. Dorsal surface of the carapace covered with numerous small to minute pits.

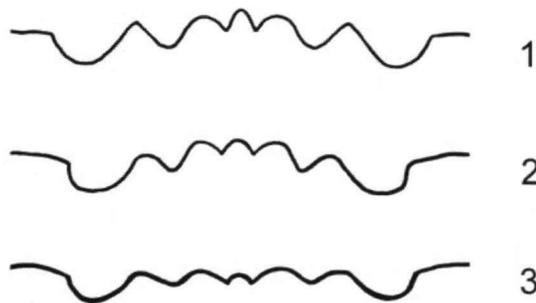


Figure 3. Comparison of frontal carapace features of:
1 - *Cancer vancalsteri* n. sp. (holotype, NHMM 2000 108)
2 - *C. pagurus* Linné, 1758 (Recent)
3 - *C. parvidens* Collins & Fraaye, 1991 (holotype, MAB k.0025).

Remarks — In overall carapace outline, placement of orbitofrontal lobes and length/width and orbitofrontal width ratios, *C. vancalsteri* n. sp. compares well with both the (? Middle) Pliocene-Recent *C. pagurus* (see Nations, 1975, p. 46, figs 8, 41-1, 41-2; Adema, 1991, fig. 53) and the (? Late) Miocene *C. parvidens* Collins & Fraaye, 1991 (p. 3, pl. 1), and may be included in the *C. parvidens*-*C. pagurus* lineage.

On frontal characters of the carapace, *C. vancalsteri* n. sp. may immediately be distinguished from *C. parvidens* (Figure 3/3) in the absence of a diminutive median lobe, and from *C. pagurus* (Figure 3/2) in showing a sharper median frontal lobe separated distinctly from its adjacent pair by deep V-shaped incisions. *Cancer vancalsteri* n. sp. has much sharper inner orbital teeth and more tumid protogastric lobes than seen in either *C. parvidens* or *C. pagurus*. In addition, its carapace surface is covered with rather widely spaced small to minute pits, not with closely spaced tubercles as in *C. pagurus*.

Both *C. parvidens* and *C. pagurus* have a more convex anterolateral margin, evenly inflated anteriorly, which in *C. vancalsteri* n. sp. lacks. The front in the new species is more projected anteriorly than that of *C. pagurus* and *C. parvidens* (Figure 3).

With the present record of *C. vancalsteri* n. sp., the number of (? Late) Miocene to Middle Pliocene species of this genus from NW Belgium and the SE Netherlands comes to four. Two of these, *C. parvidens* and the present species, originate from concretionary nodules and for that reason are comparatively less well constrained stratigraphically. *Cancer* cf. *pagurus* and *Cancer* n. sp., both from the Lillo Formation (Pliocene, Piacenzian) will be described elsewhere (van Bakel *et al.*, in press). For these taxa, stratigraphic ranges, possible immigration events and phylogenetic relationships need to be worked out in detail as fieldwork continues.

Extant *C. pagurus* (see Adema, 1991) ranges from the tidal zone to depths of 300 metres, prefers sandy and/or rocky bottoms, and is sensitive to low temperatures. The species is carnivorous, mainly active at night and feeds in particular on molluscs and echinoderms. A comparable mode of life may be assumed for the new species.

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APPENDIX

(by Frank P. Wesselingh; adapted from Wesselingh, 2002).

The nodule containing the type specimen of *C. vancalsteri* n. sp. is part of a set of concretions collected at Oelegem by Roland Meuris (Beerzel) and Frans Van Calster (Hallaar) in 1979, now contained in the collections of the Natuurhistorisch Museum Maastricht (NHMM). Comparable material, collected from the construction pit for the 'Spaarbekken', is deposited at the Nationaal Natuurhistorisch Museum, Leiden (RGM, leg. J. De Ceuster).

Material collected by Meuris and Van Calster comprises eight molluscan species as well as a bulla (NHMM 2002 153) and two vertebrae of cetaceans (NHMM 2002 151, 2002 152) and an indeterminate selachian vertebra (NHMM 2002 154). In the RGM collection an additional four molluscan species have been recognised, inclusive of a large species of the bivalve *Acanthocardia*. Shells are preserved as internal and external moulds in dark grey to brownish phosphoritic sandstone concretions, 5 to 10 cm in overall size. Molluscan species identified are as follows:

- 1- *Acanthocardia* aff. *aculeata* (Linné, 1758) (RGM: 1/1 + 5/2 casts, unregistered; NHMM 2002 150a, b)

This represents one of the few records of this genus from the Pliocene of the North Sea Basin; shell relatively tall (height 52-53 mm, length 50-54 mm), with about 14 to 15 well-defined, evenly spaced ribs, which are about 1.5 times wider than the interspaces. Ribs are flat and straight sided, bearing regularly spaced, rather robust knobs at centre. Posterior margin well defined, separated by a rounded ridge from the remainder of shell, with about 9 low and thin ribs with comparatively large, rounded knobs.

Although in outline resembling *A. paucicostatum* (G.B. Sowerby, 1839) from the Pliocene of the

Mediterranean, the structure of the ribs appears to differ. These specimens most closely resemble *A. aculeata*, an extant species, from which they differ in having more ribs (c. 12 vs 14-15); *A. tuberculata* (Linné, 1758) has more robust ribs of variable strength than the Oelegem specimen.

- 2- *Cardiidae* indet. (RGM: 2 casts, unregistered)
Large (height c. 50 mm) cardiid with numerous, regular, well-defined small ribs; somewhat resembling *Dinocardium parkinsoni* (J. Sowerby, 1814).
- 3- *Spisula* sp. indet. (RGM: 14/2, casts in a single piece of matrix, unregistered)
- 4- *Angulus* cf. *benedeni* (Nyst & Westendorp, 1839) (RGM: 1/2 cast, unregistered; NHMM 2002 146a, b)
A typically Pliocene species from NW Europe.
- 5- *Arctica islandica* (Linné, 1767) (RGM: 1/1, 2/2, unregistered; NHMM 2002 147, internal mould)
NHMM 2002 147 is a single pair, with slightly dislocated valves and numerous external casts of barnacles; species ranging from the ?Oligocene to Recent in the North Sea Basin.
- 6- *Glossus humanus* (Linné, 1758) (NHMM 2002 149, internal mould)
The lack of a carina along the anterodorsal margin precludes confusion with the Miocene *G. lunulatus* (Nyst, 1835); in NW Europe, *G. humanus* is known from the Pliocene onwards.
- 7- *Pygocardia rustica tumida* (Nyst, 1836) (RGM: 1/2 cast, unregistered)
In the North Sea Basin, this subspecies ranges from the Lower to lower Middle Pliocene.
- 8- *Callista chione* (Linné, 1758) (RGM: 1/2 cast, unregistered). Known from the Middle Pliocene of the North Sea Basin (Coralline Crag Formation, UK), extant in southwest and southern Europe.
- 9- ?*Dosinia* sp. (RGM: 1/1, unregistered).
- 10- *Cyrtodaria angusta* (Nyst & Westendorp, 1839) (RGM: 1/1 + 1/2, unregistered; NHMM 2002 148a, b)
NHMM 2002 148a,b is a slightly distorted pair; species ranges from the Miocene to the Lower Pliocene in NW Europe.
- 11- *Natica* sp. (NHMM 2002 150a, b)
A single, specifically indeterminate, internal mould and cast, rather wide and with a deep umbilicus.
- 12- *Hinia reticosa* (J. Sowerby, 1815) (NHMM 2002 145a, b)
A single internal mould, typically Pliocene in the North Sea Basin and English Channel.
- 13- *Scaphella lamberti* (J. Sowerby, 1816) (NHMM 2002 145a, b)
A single internal mould and cast, heavily encrusted by balanid barnacles; a Pliocene species in the North Sea Basin.

Discussion — In this lot, two species indicate an Early or Middle Pliocene age, namely *Pygocardia rustica tumida* and *Callista chione*. In addition, *Glossus humanus* is indicative

of post-Miocene age, whereas *Hinia reticosa* is a definite indicator of Pliocene. The occurrence of articulated bivalves, albeit slightly displaced, together with common barnacle encrustation suggests a low depositional rate, a sandy bottom substrate and some bioturbation. Jan-Johan ter Poorten is thanked for his help in tackling material of *Acanthocardia* in this faunule.

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