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CANCER PARVIDENS, A NEW CRAB (CRUSTACEA, DECAPODA) FROM THE MIOCENE OF THE NETHERLANDS

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A new species of crab, *Cancer parvidens*, closely related to the extant species, *Cancer pagurus* Linné, 1758, is described from the Miocene of The Netherlands.

Key words — Crustacea, Decapoda, Miocene, The Netherlands, new taxon.

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INTRODUCTION

In the summer of 1986 a large, heavily crushed crab carapace, preserved in a concretion of glauconitic sand, was found near the 'De Hoogdonk' brickyard at Liessel, province of Noord Brabant, The Netherlands. Unfortunately, the orbitofrontal area was missing; the specimen was therefore tentatively identified as *Cancer* cf. *pagurus* Linné, 1758. Intensive collecting by Mr L. Stolzenbach, his son O. Stolzenbach and others yielded another much better preserved carapace, as well as two propodi and a dactylus. The purpose of this paper is to describe a new species on the basis of this material and to discuss the historical background of Miocene *Cancer* Linné, 1758.

STRATIGRAPHY

In the sand and clay pit near the 'De Hoogdonk' brickyard at Liessel, sands are excavated to a maximum depth of 40 metres with the help of a floating crane. At a depth of *c.* 25 metres, glauconitic sands and sandy clays rich in fossils occur. Due to the underwater quarrying it is not possible to collect material *in situ*. The excavated sediment is provisionally accumulated on deck, then passed through a sieve after which the fine-grained material is conveyed by pipeline to the brickyard. The fossils described here were collected from the coarse-grained material on deck of the floating crane.

The glauconitic sands and sandy clays are assigned to the marine Miocene part of the Breda Formation (van Staalduinen *et al.*, 1979). In the Lower Rhine Embayment (the area in Germany bordering on the southeastern part of The Netherlands) is found a non-marine sedimentary sequence of considerable thickness consisting of sands, clays and several lignite horizons. These terrestrial sediments are of Late Oligocene, Middle and Late Mio-

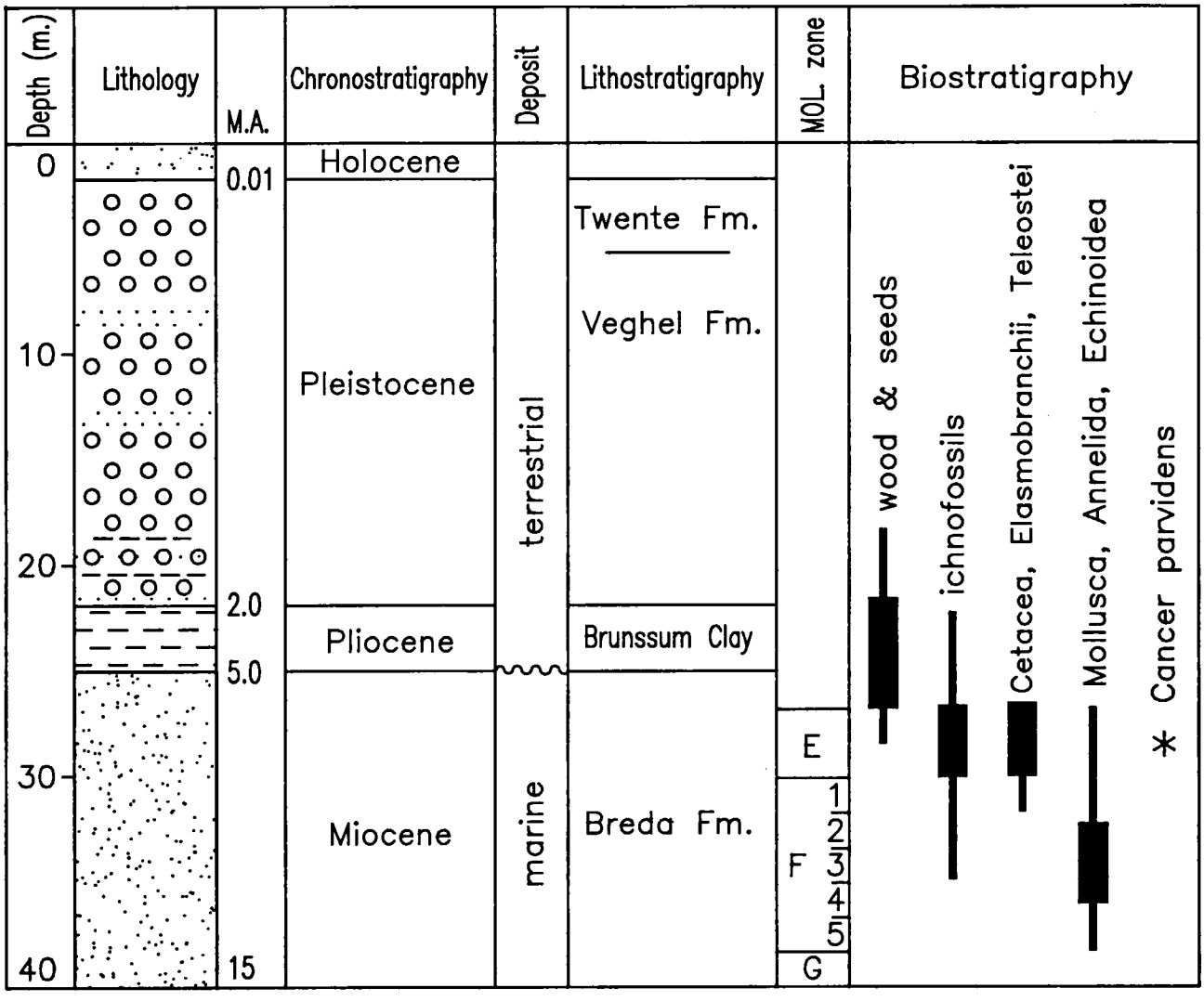

Fig. 1 Simplified lithological log, stratigraphic interpretation and indication of the assumed provenance of macrofossils collected at the Liessel locality. Plant macrofossils typical of the Inden Beds are found remanié at the base of the Brunssum Clay Member.

cene age and interfingering with marine strata of the Breda Formation occurs (van Staalduinen *et al.*, 1979).

A considerable number of fragments of lignite and even amber have been collected from the glauconitic beds. In addition to the crab material described below these beds have so far yielded a diverse fauna of bivalves, gastropods, serpulids, echinoids, vertebrates (*e.g.* shark teeth, teleost bones, bird and whale bones), the ichnofossil *Ophiomorpha* sp. and other ichnotaxa (? sturgeon coprolites, Radwanski & Fraaye, in prep.). All of these biota indicate a nearshore environment (Brouwer, 1963).

The molluscan fauna includes amongst other species the bivalves *Arctica islandica islandica* (Linné, 1758), *Glossus lunulatus* (Nyst, 1835), *Glycymeris obovata baldii* Glibert & van de Poel, 1965, and the gastropods *Conus* sp., *Scaphella bolli* (Koch, 1862), and *Semicassis bicoronata* (Beyrich, 1854), which suggests a Middle-Late Miocene age (Moll. F3 Zone; see Sliggers & van Leeuwen, 1987; Zagwijn & Hager, 1987). The Dutch Geological Survey has recently started to drill a borehole near the brickyard in order to obtain more detailed stratigraphic data for the Liessel area. It is hoped that the results of that borehole will allow a more accurate stratigraphic age assignment of the new crab species described herein. Because of the fact that the type material has not been collected *in situ*, indication of its provenance in Figure 1 is provisional at best.

History of the genus *Cancer*

Although some sixteen species of *Cancer* from the Cretaceous and early Tertiary were listed by Glaessner (1929), all have since been assigned to other genera or regarded as indeterminate and Glaessner (1969) and Nations (1975) in his admirable work on the genus, accepted the earliest occurrence of *Cancer* to be Miocene. Nations (1975) listed the fossil species from Glaessner (1929) and from the fossil record up to 1969; the Miocene species are:

4 *Cancer bittneri* Toula, 1904
4 *Cancer carniolicus* Bittner, 1883
4 *Cancer* cf. *carniolicus*
5 *Cancer deshayesii* A. Milne Edwards, 1861
4 *Cancer illyricus* Bittner, 1883
4 *Cancer nodosulus* (Reuss, 1867)
4 *Cancer rietmanni* Mayer, 1872 *nomen nudum* (*Cancer* in brackets in Glaessner (1929) signifying doubt on his part)
4 *Cancer sismondai* von Meyer, 1843
4 *Cancer* cf. *sismondai*
4 *Cancer styriacus* Bittner, 1883
4 *Cancer szontaghi* Lőrenthey, 1898
4 *Cancer* sp.
4 *Cancer* ? sp.
4 *Cancerites molassicus* Quenstedt, 1867

The numbers are Nations's (1975) and signify: 4, species unverified by him, and 5, those acceptable to him.

Cancer nodosulus is a misprint for *Cancer nodulosus* (Reuss, 1867); this species was referred to *Cancer* by Glaessner (1929), but has subsequently been returned to *Microdium* Reuss, 1867 by Müller (1984a), who stated that, "Reuss's description and figures well represent the species but it is prudent not to fuse the genera *Microdium* and *Cancer* in spite of all similarities until the holotype or new specimens are found." The present authors concur. *Cancer sismondai* is well documented and figured by Bonfiglio & Donadeo (1982a, b), who consider (1982a) that the var. *antiatina* of Maxia (1946) is a junior synonym of *C. sismondai.*

Müller (1984b) erected a new genus, *Iasadia*, for *C. carniolicus* as the type species, and included *C. szontaghi* as a junior synonym. While still in press this paper was preceded by Müller's work (1984a) on the decapod Crustacea of the Badenian and in an addendum (p. 112) he relegated *C. bittneri* Toula also to the synonymy of *I. carniolica.* Although he dealt with them separately Müller (1984a) considered that there is no difference between *C. illyricus* and *C. sismondai.*

Cancerites [*sic* Glaessner (1929) and Nations (1975)] = *Cancerides* Latreille, 1803: The material of *Cancerides molassicus* consists of limb fragments which were compared by Quenstedt (1867) with *Palaeocarpilius ignotus* A. Milne Edwards, 1862 from the Auversian (Eocene) of the Paris Basin. The figure (Quenstedt, 1867) is of a fragmentary dactylus; its affinity to *Cancer* remains doubtful.

The palaeobiogeography of *Cancer* has been discussed at length by Nations (1975), who considered that the widespread distribution and diversity of form achieved by Miocene times indicate earlier origins, possibly in any of western or eastern North American, Japanese or Javanese provinces. The new species does not affect this opinion.

Hitherto, *Cancer* from the Miocene of The Netherlands has been limited to *C. deshayesii*: dactyli and fixed fingers of chelae were described by Holthuis (1949) from boreholes at Stemerdink near Winterswijk, province of Gelderland; at Beringe, near Venlo, province of Limburg and from the Peel district on the borders of the provinces of Limburg and Noord Brabant. Holthuis (1949) refuted Glaessner's (1929) identification of this species with *Cancer sismondai* on the grounds of differences in the ornament and shape of the chelae. Bonfiglio & Donadeo (1982a) placed *C. deshayesii* in the synonymy of *C. sismondai* and Gomez-Alba (1988) drew attention to the doubt some authors have over the identity of these two species. *Cancer deshayesii* is figured in Glaessner (1969: R509) and is recognised by Solé & Via (1989).

Systematic description

Section	Brachyrhyncha Borradaile, 1907
Family	Cancridae Latreille, 1803
Genus	*Cancer* Linné, 1758

Type species — *Cancer pagurus* Linné, 1758, by subsequent designation of Latreille (1810).
Stratigraphic range — Miocene to Recent.

Cancer parvidens sp. nov.

Pl. 1; text-figs 2, 3

Derivation of name — With reference to the small median frontal lobe.
Diagnosis — Carapace broadly ovate with the anterolateral margin slightly concave anteriorly, marginal lobes broadly rounded to truncate; frontal median lobe much reduced.

Material — Holotype, a carapace (MAB k.0025); paratypes, a carapace (MAB k.0026a-b), a propodus (MAB k.0027) and a dactylus (MAB k.0028), all from the Miocene of Liessel (Noord Brabant), and in the collections of the GeoCentrum Brabant, Boxtel.

Description — The carapace is transversely ovate, about one third wider than long, widest between the 6th anterolateral margin lobes; gently arched longitudinally and in transverse section it is gently arched medially becoming compressed at the margins. The broadly curved anterolateral margins are slightly concave before the orbitofrontal margin and divided by grooves into seven broadly rounded to truncate, almost equal-sized lobes; the posterolateral margins are strongly convergent with two anterior lobes, they form a distinct concave ridge extending towards the posterior angles. Deep grooves leading back to a median sulcus, separate a very small, barely projecting median (rostral) lobe from broad, gently curved submedian lobes, themselves separated by a groove from rounded inner orbital spines on the same level. The upper orbital margins are thickened and upraised medially and subdued before reaching the outer orbital angle; the marginal notches are obscure, but the inner one apparently occurs on the lateral half of the margin. Small, ovate epigastric lobes are set behind the first of the anterolateral marginal lobes and a broad hepatic furrow separates them from fairly large subtriangular hepatic lobes which are divided into three low coalescing tumidities. The apex of a short anterior mesogastric process lies at the base of a postfrontal depression, shallow grooves separate the process from the protogastric lobes and a triangular mesogastric lobe is only vaguely distinguished from subtriangular, somewhat bilobed protogastric lobes. The epibranchial lobes are subdivided into two low, but distinct rounded lobes. Details of the median-posterior areas are not well preserved.

The dorsal surface is crowded with minute flat tubercles. Vague indentations shortly behind the first marginal lobes mark the position of the antennar extensor muscles; median dorsoventral muscle scars occur more or less level with the 6th marginal lobe, while the attachment for the internal mandible adductor muscles lie closer to the midline opposite the 7th marginal lobes.

A somewhat crushed propodus and a dactylus, both 'left-handed', are essentially cancroid and almost certainly belong to this species. The propodus slightly increases in height distally, its upper margin is weakly convex; the lower margin is convex proximally, becoming concave towards the distal third. The straight interdigital margin recedes postero-ventrally. Only three of the four ridges ordinarily present on the outer surface of *Cancer* propodi are discernible; the uppermost (= 2nd), at about

Fig. 2. *Cancer parvidens* sp. nov., Miocene of Liessel, paratype propodus (MAB k.0027), Collection GeoCentrum Brabant, Boxtel. Approximately natural size.

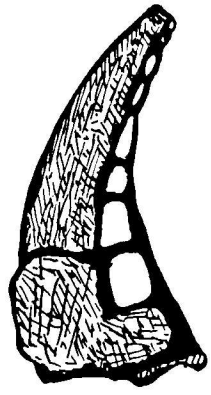

Fig. 3. *Cancer parvidens* sp. nov., Miocene of Liessel, paratype dactylus (MAB k.0028) with eight teeth, partially covered with cemented glauconitic sand proximally, Collection GeoCentrum Brabant, Boxtel. Natural size.

midlength, follows the curvature of the upper margin, the median one curves from the lower carpal articulation facet towards the fixed finger and the lowermost lies close to the lower margin.

The dactylus which appears to belong to the crushing claw has a smoothly rounded upper surface, the upper margin is boldly curved proximally, but flattens distally. The flattened outer surface has a shallow median depression bounded by a row of pits which suddenly increase in size and become linear distally and a more widely spaced row runs just above the teeth; small, regular-sized pits crowd the depression and the area towards the opposing margin. On the inner surface a row of widely spaced pits follows the curvature of the upper margin and finer pits are randomly scattered. Of the 8 flattened teeth lining the opposing margin the 3rd is smaller than those on either side and the 5th/6th and the 7th/8th are half the size of the preceding ones.

Discussion — The carapace outline, the orbitofrontal width/carapace width ratios, the arrangements of the dorsal lobes and lobation of the anterolateral margins (as far as preservation allows comparison) compare favourably with *Cancer pagurus* Linné, 1758. *Cancer parvidens* differs markedly in the diminutive size of the median frontal lobe with the well-developed sulcus behind; in *C. pagurus* the median lobe is only marginally narrower than those on either side which are well rounded, and no median sulcus is developed. The tumid areas on the hepatic regions are similarly developed, but those on the epibranchial lobes of *C. pagurus* tend to run together.

The anterolateral margins of *C. deshayesii* A. Milne Edwards form a regular curve with the front; the marginal lobes are spinulated and no evidence of these, even as basal scars, can be seen on *C. parvidens*. The arrangement of the frontal lobes is similar to *C. parvidens*, but the orbitofrontal margin/carapace width ratio of *C. deshayesii* is comparatively wider (*c.* 38). *Cancer deshayesii* has narrower epibranchial lobes more distinctly separated from the mesobranchial lobes and the surface ornament is generally coarser than in *C. parvidens*.

The upper ridge on the outer surface of the propodus is sometimes faint to obsolete in *C. pagurus*, the 2nd and 4th ridges are positioned similarly to those of *C. parvidens*, but the 3rd is more regularly bowed, also the interdigital margin is more vertical in *C. pagurus*. The smoothly rounded upper margin of the dactylus of *C. parvidens* agrees with that of *C. pagurus* and readily distinguishes it from *C. deshayesii*, which is granulated proximally. *Cancer pagurus* has fewer - about five - teeth lining the opposing margin.

It would appear that *C. parvidens*, while having some frontal characters in common with *C. deshayesii*, developed on a different line towards *C. pagurus*.

Measurements — Holotype carapace: width 150 mm, length 94 mm, orbitofrontal width 32 mm, height not measurable.

Propodus: length 115 mm, height 78 mm.

Dactylus: length 43 mm, height 12 mm.

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PLATE 1

Figs 1, 2. *Cancer parvidens* sp. nov., holotype carapace (MAB k.0025), Collection GeoCentrum Brabant, Boxtel. Slightly reduced (1, x 0.8) and enlargement of the orbitofrontal area (2), respectively.

PLATE 1

1

2