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Early Paleocene crabs (Crustacea, Decapoda) from the Middle Vistula Valley, Central Poland

ABSTRACT: For the first time decapod crustaceans are recorded from the Danian of Nasitów, Middle Vistula Valley, Central Poland. The presence of the species *Necrocarcinus senonensis* SCHLÜTER, 1868, and the genus *Titanocarcinus* extends the known paleogeographic distribution of these taxa. A possible phylogeny of the genus *Necrocarcinus* BELL, 1863, is discussed.

INTRODUCTION

Paleocene crabs have not been reported from Poland previously. There are only a few studies on Miocene and Lower Cretaceous decapod crustaceans of Poland. From Miocene strata there are records by REUSS (1867) and FÖRSTER (1979a,b) and from the early Cretaceous by COLLINS (1969) and MARCINOWSKI & RADWAŃSKI (1983). The present record concerns species of Danian age. The section exposed at Nasitów, just at the border of the river Vistula, has been described in detail by RADWAŃSKI (1985), MACHALSKI & WALASZCZYK (1987), and HANSEN & *al.* (1989).

Within a layer of up to 0.5m thick glauconitic marl, known as the Greensand, a phosphatic nodule bed marks the K/T boundary. Above the nodule bed the Danian strata comprise alternating hard and soft layers of marly gaizes, known locally as "Siwak". The Siwak is relatively rich in fossils but, unfortunately, most are heavily decalcified.

KRACH (1981) described 70 species of bivalve and 60 species of gastropod from the Siwak as exposed in the Middle Vistula Valley. According to this data, the lowest part of the Siwak was deposited in a shallow sublittoral basin with a maximum depth of 30–60 m. During deposition of the Siwak a relative deepening of up to about 100 m occurred. The mollusk fauna is indicative of water temperatures of 17–18° C. Other faunal elements and the paleoecology of the Siwak were discussed by MACHALSKI & WALASZCZYK (1987). The Greensand together with the underlying siliceous chalk, locally known as "Opoka", are of latest Maastrichtian age. The malacofauna and paleoecology of the Opoka and the Greensand were discussed in detail by ABDEL-GAWAD (1986).

Biostratigraphic and magnetostratigraphic studies by HANSEN & *al.* (1989) show the hiatus thought to be by most authors to comprise the early and middle Danian is in fact much less extensive and probably comprises but a minor part of the early Danian.

There is an increasing interest in the evolution of decapod crustaceans across the K/T boundary (COLLINS & RASMUSSEN 1992; FELDMANN, TSHUDY & THOMSON 1993; JAGT, COLLINS & FRAAYE 1993). The decapod crustaceans do not seem to have been affected so drastically by the massive extinction event as many other groups (*e.g.* ZINSMEISTER & *al.* 1989; T.A. HANSEN & *al.* 1993). On the contrary, they are one of the frequently overlooked groups with a rapid evolutionary radiation during the Late Maastrichtian and Early Paleocene (TAYLOR 1981).

Other groups with a comparable diversification pattern during K/T times are gastropods (VERMEIJ 1977, TAYLOR 1981, ABDEL-GAWAD 1986, MACHALSKI & WALASZCZYK 1987) and probably ostracodes (DAMOTTE 1993). Moreover, VERMEIJ (1977) documented the relatively rapid evolution of predatory and grazing gastropods and the parallel diversification of hermit crabs (Paguroidea) at the end of the Mesozoic.

More detailed evolutionary studies of decapod crustaceans should lead to a better insight into the paleobiological processes of ecosystems in nearshore environments during Maastrichtian and Danian times. The decapod data do not appear to underscore the model of an extraterrestrial impact event at the K/T boundary, and FELDMANN'S (1990) plea for more paleobiological data is valid.

SYSTEMATIC ACCOUNT

Order **Decapoda** LATREILLE, 1803 Infraorder **Brachyura** LATREILLE, 1803

Section **Heterotremata** GUINOT, 1977

Family **Calappidae** DE HAAN, 1833

Subfamily **Necrocarcininae** FÖRSTER, 1968

Genus **Necrocarcinus** BELL, 1863

Necrocarcinus senonensis SCHLÜTER, 1868

(Pl. 1, Figs 1-2)

MATERIAL: A single internal mould with a fragment of the original carapace preserved centrally. The specimen is deposited in the Geological Museum Ammonietenhoeve Boxtel, The Netherlands (Catalogue Number *MAB k0016*).

LOCALITY AND STRATIGRAPHIC POSITION: The specimen was collected at Nasiłów Quarry, Middle Vistula Valley, Central Poland, about 1 meter above the Opoka/Greensand boundary during a fieldtrip of the University of Warsaw staff in the spring of 1993.

MEASUREMENTS: Carapace length 18 mm, width 20 mm.

DESCRIPTION: Subcircular carapace of average size for the genus, slightly wider than long, widest at mid-length, strongly convex transversely and longitudinally. Front broad with produced, not entirely preserved, rostrum. Forward facing orbits relatively deep, marginal fissures are not preserved. The posterior margin is slightly narrower than the orbitofrontal margin and bounded by a rim. Relatively deep arcuate cervical furrow, cardiac region concave longitudinally. Anterolateral margin with one prominent conical spine, posterolateral margin with two prominent spines. A ridge of four very pronounced spines defines the midline of the carapace, the largest lying in the cardiac region, and size of the spines decreasing anteriorly. Mesobranchial, metabranchial, epibranchial and hepatic regions ornamented with one spine, those on the mesobranchial regions being the largest, those on the hepatic regions being the smallest. The spine on the metabranchial region nearly reaches the posterolateral margin. Two posterior gastric pits and one spine are preserved in the central carapace fragment.

REMARKS: The taxonomic position of the genus was discussed in detail by FÖRSTER (1968). The diagnostic features of *Necrocarcinus* BELL, 1863, are well displayed in *N. senonensis* SCHLÜTER, 1868, which is easily distinguishable from all congeners by the number and arrangement of spines, and is known from the Santonian/Late Campanian of Germany, and ranges into the Danian of Denmark (SCHLÜTER 1868, FÖRSTER 1968). The Danian species *N. insignis* SEGERBERG, 1900, is considered to be a junior synonym of *N. senonensis* SCHLÜTER, 1868, its diagnostic features falling within the ontogenetic variation of that species. With *N. senonensis* the Early Campanian *N. davisi* BISHOP, 1985, and Late Campanian/Early Maastrichtian *N. pierrensis* (RATHBUN, 1917), both from the Pierre Shale of North America; *N. wrightii* FELDMANN, TSHUDY & THOMSON, 1993, from the ?Late Santonian/Middle Campanian Santa Marta Formation of Antarctica;

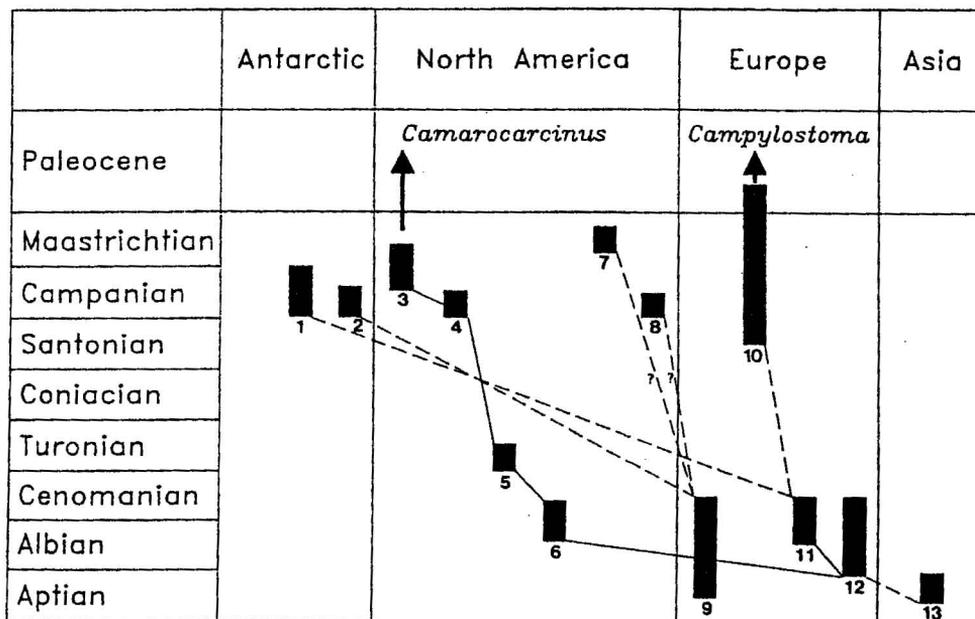


Fig. 1. Range chart with possible phylogenetic relationships of the necrocarcinid crabs

1 — *N. wrightii*, 2 — *N. carinatus*, 3 — *N. pierrensis*, 4 — *N. davisi*, 5 — *N. olsonorum*, 6 — *N. texensis*, 7 — *N. siouxensis*, 8 — *N. rathbunae*, 9 — *N. tricarinatus*, 10 — *N. senonensis*, 11 — *N. woodwardi*, 12 — *N. labeschii*, 13 — *N. undecimtuberculatus*

N. olsonorum BISHOP, 1991, from the Turonian Carlile Shale of North America; *N. labeschii* (DESLONGCHAMPS, 1835) and *N. woodwardi* BELL, 1863, from the Albian and Cenomanian of England (*N. labeschii* also from the Albian of Poland, reported by MARCINOWSKI & RADWAŃSKI 1983, Pl. 3, Figs 7–8), they all belong to the same group of Necrocarcininae with a subcircular, coarsely spinose carapace. The species *N. undecimtuberculatus* TAKEDO & FUJIYAMA, 1983, from the Late Aptian Miyako Group of northern Japan is thought to be a possible ancestor of this group. Another group of the Necrocarcininae, distinguished by an axial keel, is filled by the Early Campanian *N. carinatus* FELDMANN, TSHUDY & THOMSON, 1993, from Antarctica and the Late Aptian to Cenomanian *N. tricarinatus* BELL, 1863, from Europe. The positions of the Maastrichtian *N. siouxensis* FELDMANN, AWOTUA & WELSENBAUGH, 1976, and Lower Campanian *N. rathbunae* ROBERTS, 1962, both from North America are uncertain.

BISHOP (1991) placed the Cretaceous necrocarcinids of North America in a stratigraphic and geographic context. BISHOP's results combined with all other known occurrences of necrocarcinids and their possible descendants are herein plotted in a diagram (Text-fig. 1).

PALEOECOLOGY: In North America, *Necrocarcinus siouxensis* FELDMANN, AWOTUA & WELSENBAUGH, 1976, occurs in medium-grained limonitic sandstone, the material of which was deposited in a relatively high-energy, shallow-water environment (FELDMANN & *al.* 1976) and *N. davisii* BISHOP, 1985, occurs in silty shales of the Pierre Shale (BISHOP 1985).

In England, *N. labeschii* (DESLONGCHAMPS, 1835) and *N. woodwardi* BELL, 1863, are both found in the Cambridge Greensand and sandy Cenomanian limestones (WRIGHT & COLLINS 1972). The species *N. wrightii* FELDMANN, TSHUDY & THOMSON, 1993, from Antarctica occurs in massive, very fine- to medium-grained sandstones and silty sandstones (FELDMANN & *al.* 1993).

These occurrences together with the present record of *N. senonensis* SCHLÜTER, 1868, from Poland indicate an important part of the Necrocarcininae preferred littoral to sublittoral environments.

Section *Brachyrhynchia* BORRADAILE, 1907

Superfamily *Xanthoidea* DANA, 1851

Family *Xanthidae* DANA, 1851

Genus *Titanocarcinus* A. MILNE-EDWARDS, 1863

Titanocarcinus? polonicus sp. n.

(Pl. 2, Figs 1-2)

HOLOTYPE: The specimen No. *MAB k0015*, presented in Pl. 2, Fig. 1.

TYPE LOCALITY: Nasiłów Quarry, Middle Vistula Valley, Central Poland.

TYPE HORIZON: Danian.

DERIVATION OF THE NAME: Named after its occurrence in Poland.

DIAGNOSIS: Xanthid carapace apparently wider than long, regions well differentiated by grooves, granular ornamentation, coarsest granules in the mesogastric region; small orbits; long anterior process of the mesogastric lobe.

MATERIAL: The holotype, an incomplete frontal part of the carapace, is deposited in the Geological Museum Ammonietenhoeve Boxtel, The Netherlands (Catalogue Number *MAB k0015*). The sole specimen was collected by the Author at Nasiłów Quarry, Middle Vistula Valley, Central Poland, about 3.5 meters above the Opoka/Greensand boundary, during a fieldtrip in the spring of 1991.

MEASUREMENTS: Preserved carapace length 9 mm, width 16 mm.

DESCRIPTION: Carapace ovoid, wider than long, longitudinally convex, ornamented by granules. Coarsest granulation on swollen mesogastric lobe, protogastric and branchial regions. Flattened granules on posterolateral part, those on anterolateral part pointed slightly forwards.

Very long anterior process of the mesogastric lobe. Cervical furrow deep, hepatic and branchiocardiacal furrows weakly developed. Furrows smooth or very finely granulated. Reconstructed width of orbitofrontal margin about one third of carapace width.

DISCUSSION: Because of the poor preservation of the specimen the assignment to a genus proved very difficult. Its overall morphology indicates xanthid affinities. The single incomplete specimen resembles *Titanocarcinus reisi* BÖHM, 1891, which according to FÖRSTER (1970) ranges from Early Maastrichtian (southern Germany) to Paleocene (Austria). The species *Titanocarcinus? polonicus* sp. n. differs from *T. reisi* BÖHM, 1891, in having a longer anterior process of the mesogastric lobe, a more finely granulated surface and less pronounced grooves.

Acknowledgements

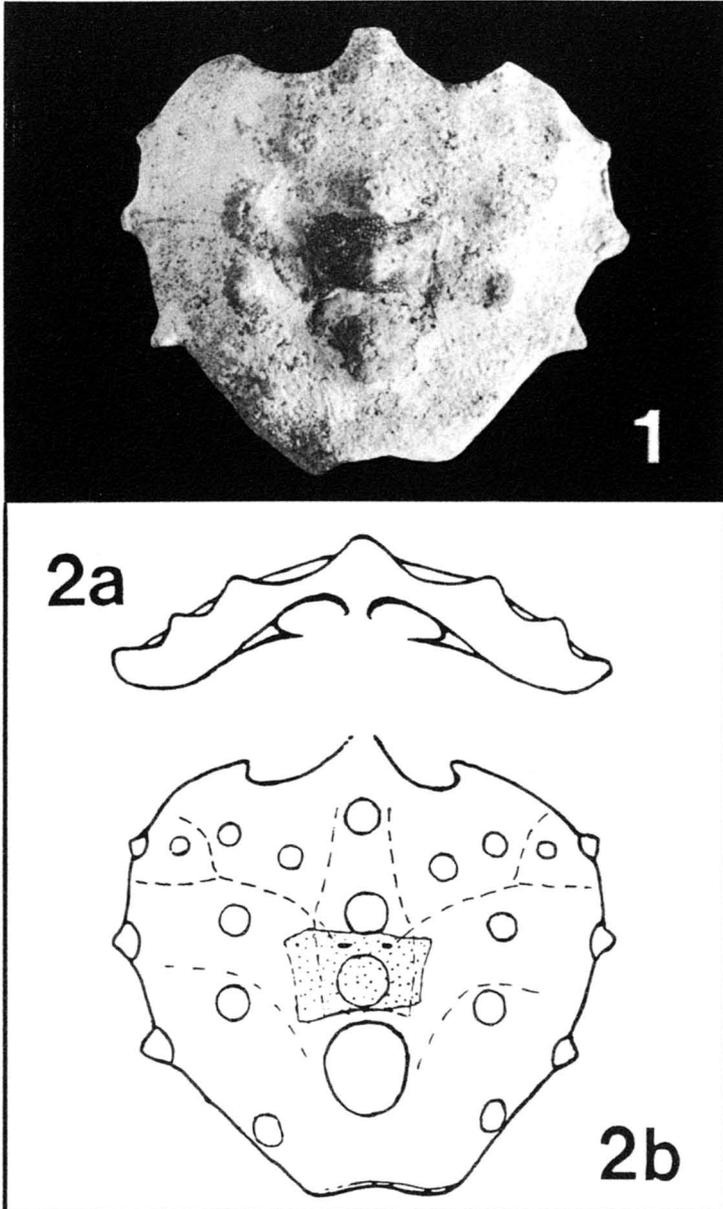
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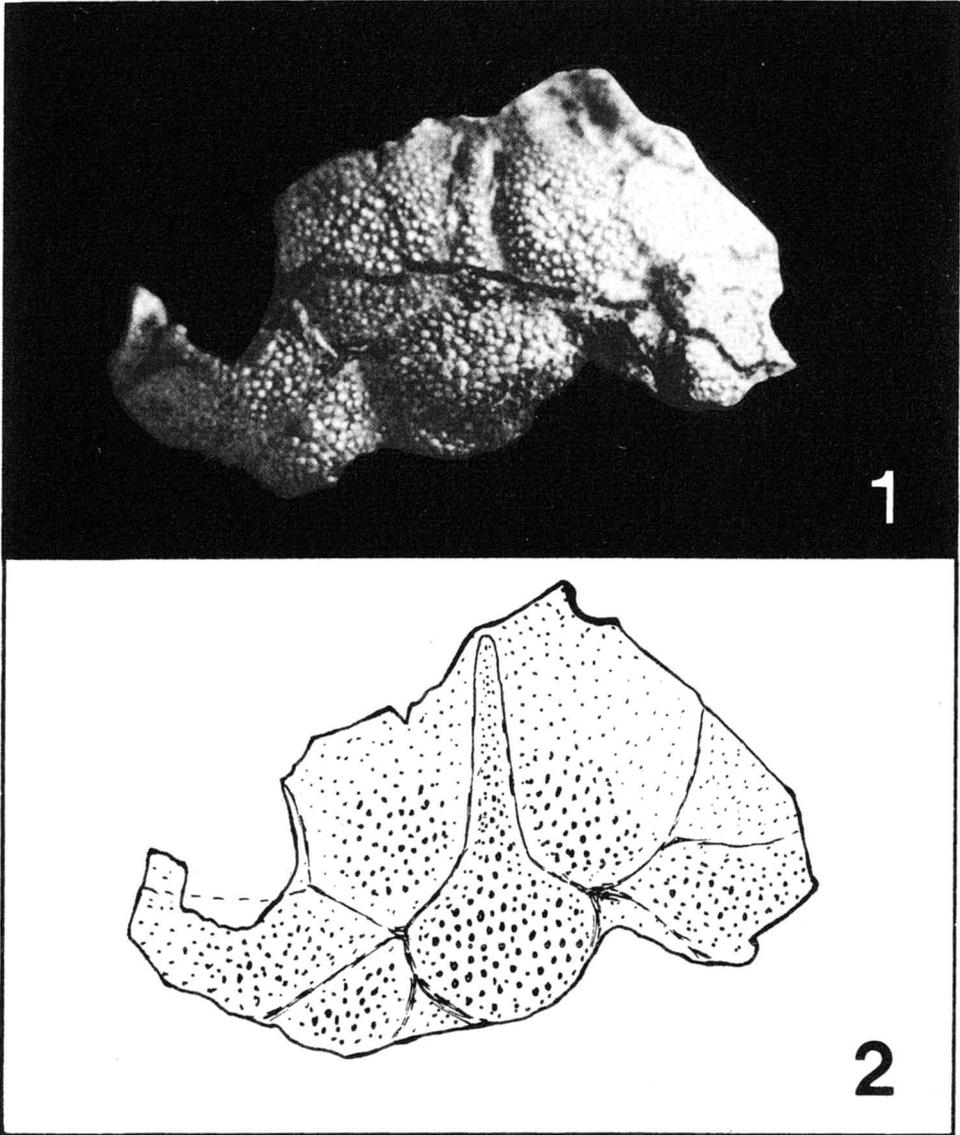
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Necrocarcinus senonensis SCHLÜTER, 1868

1 — Dorsal view of the studied specimen, $\times 3.5$; 2a-2b — Line drawing, to show: 2a — anterior view, 2b — dorsal shield



Titanocarcinus? polonicus sp. n.

1 — Dorsal view of the studied specimen, 2 — Line drawing of preserved part of the dorsal shield;
both $\times 6$