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Reevaluation of *Thelecarcinus* Böhm, 1891 (Decapoda: Brachyura: Raninoidea: Paranecrocarcinidae)

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Abstract

Thelecarcinus Böhm is removed from Xanthoidea *sensu lato* and placed within the raninoidan family Paranecrocarcinidae Förster. Placement of the genus within the family confirms the North Atlantic and Tethyan range of the family in the Late Cretaceous and its occurrence in predominantly marl and carbonate environments.

Key words: Decapoda, Brachyura, Raninoidea, *Thelecarcinus*

1. Introduction

Böhm (1891) erected the monotypic genus *Thelecarcinus* with *T. guembeli* Böhm, 1891, as the type species, from the Upper Cretaceous of Germany. Most recent workers (i.e., De Grave et al., 2009; Schweitzer et al., 2010) have placed the genus within Xanthoidea incertae sedis. The systematic position of *Thelecarcinus* is herein reevaluated, based upon examination of the type material.

2. Systematic paleontology

Abbreviations: ANSP, Academy of Natural Sciences of Philadelphia, Academy of Natural Sciences of Drexel University, Philadelphia, PA, USA; BSP, Bavarian State Collection of Palaeontology and Geology, Munich, Germany; KSU D, Kent State University Decapod Comparative Collection, Kent, Ohio, USA.

Infraorder Brachyura Linnaeus, 1758

Section Raninoidea Ahyong, Lai, Sharkey,

Colgan, and Ng, 2007

Superfamily Necrocarcinoidea Förster, 1968

Family Paranecrocarcinidae Fraaije, van Bakel,

Jagt, and Artal, 2008

Included genera: *Paranecrocarcinus* Van Straelen, 1936; *Protonecrocarcinus* Förster, 1968; *Pseudonecrocarcinus* Förster, 1968; *Thelecarcinus* Böhm, 1891 new family placement.

Diagnosis: Carapace hexagonal or ovate, slightly wider than long, widest at position of last anterolateral spine (about 40 to 50 percent of the posterior distance), moderately vaulted longitudinally and transversely or flattened; regions defined as broad swellings, ornamented with large, broad tubercles or numerous, small tubercles and granules; rostrum broad and sulcate and/or spatulate; orbits with two

fissures, directed forward; outer-orbital spine may be well developed; inner-orbital spine positioned anteriorly; fronto-orbital width about 40 to 55 percent of maximum carapace width; infra-orbital lobe (*sensu* Van Bakel et al., 2012) present; two or four longitudinal depressions (slits) not penetrating through cuticle may be present on epigastric regions but not in all genera; anterolateral margins long, with numerous, small spines; posterolateral margin entire or fringed with small spines; cervical groove weak, appearing to possess weak secondary groove anterior to cervical groove starting about halfway along anterolateral margin and extending straight onto carapace before making a nearly 90° turn posteriorly to meet cervical groove; branchiocardiac and postcervical grooves absent; epibranchial region developed as broad, arcuate swelling or not differentiated; axial regions moderately inflated to flattened, consisting of depressed mesogastric, short metagastric, and short cardiac regions, and, if present, short urogastric regions; protogastric regions inflated; hepatic regions depressed (Schweitzer et al., 2018, p. 12).

Discussion: Schweitzer et al. (2016, 2018) provided diagnoses for Paranecrocarcinidae and all of the genera embraced within the family at the time. The family ranged from the Early to Late Cretaceous and displayed a North Atlantic and Tethyan distribution (Schweitzer et al., 2016).

Genus *Thelecarcinus* Böhm, 1891

Type species: *Thelecarcinus guembeli* Böhm, 1891, by monotypy.

Diagnosis: Carapace wider than long, length about 82 percent maximum width; front with four spines; orbits projected forward; anterolateral margins with numerous small spines; posterolateral margin weakly concave; posterior margin narrow, concave; protogastric region with two tubercles; branchial regions with tubercles roughly arranged into rows.

Material examined: *Thelecarcinus guembeli* Böhm, 1891, KSUD 581, cast of holotype BSP 1873 III F503, Maastrichtian, Germany (Fig. 1.2); *Pseudonecrocarcinus gamma* (Roberts, 1962), holotype ANSP 20031, Santonian, New Jersey (Fig. 1.3); *Paranecrocarcinus mozambiquensis* Förster, 1970, holotype BSP 1969 I 182, Cenomanian, Mozambique (Fig. 1.4).

Discussion: Böhm (1891) placed *Thelecarcinus* in the Tribe Cancridae, which Glaessner (1929) interpreted as Xanthidae *sensu lato*. Beurlen (1930)

placed the genus under Xanthidae, while Glaessner (1969) retained the genus in Xanthidae *sensu lato*. Karasawa and Schweitzer (2006), De Grave et al. (2009), and Schweitzer et al. (2010) placed it within Xanthoidea incertae sedis. Examination of a cast of the holotype and the original illustration of *T. guembeli* suggests that the genus is better placed within Paranecrocarcinidae. *Thelecarcinus guembeli* possesses a rounded-hexagonal carapace slightly wider than long; a granular carapace with distinct swellings on the protogastric and branchial regions; and well-defined axial regions, all diagnostic for Paranecrocarcinidae. It is quite similar to other genera in the family in these regards, but differs from *Pseudonecrocarcinus* and most *Paranecrocarcinus* in lacking epigastric slits. *Protonecrocarcinus* is more ovate and more distinctly wider than long as compared with *Thelecarcinus*. The carapace swellings on the branchial and protogastric regions are better developed and larger than those seen in *Pseudonecrocarcinus*. Thus, *Thelecarcinus* occupies a distinct morphology within the family.

Thelecarcinus guembeli Böhm, 1891

(Figs. 1.1, 1.2)

Thelecarcinus gümbeli [sic] Böhm, 1891, p. 43, pl. 1, fig. 3.

Thelecarcinus guembeli Böhm; Glaessner, 1929, p. 384; Beurlen, 1930, p. 358; Förster, 1968, p. 189; Glaessner, 1969, p. R522; Karasawa and Schweitzer, 2006, p. 50; De Grave et al., 2009, p. 42; Schweitzer et al., 2010, p. 130.

Diagnosis: as for genus.

Description (translated from Böhm, 1891, p. 43): Carapace broadly oval, almost round, slightly wider than long, evenly and weakly vaulted longitudinally and transversely. Frontal margin formed from 4 broadly rounded teeth. Eye cavity deeply excavated, with steep outer and inner edge, delimited by a small outer pointed orbital tooth. Supraorbital margin with 2 fissures. Anterolateral margin with a short radius, strongly curved and divided into 8 teeth. Posterolateral margin shorter than that, straight, thick, steeply sloping inward and contracted. Posterior margin inwardly curved, slightly wider than the frontal margin. The surface on the regions and in the furrows is covered with tubercles, between which finer granules are scattered, densely packed. Regions clearly separated; lobes protruding in the form of coarse, rounded elevations. Grooves between the lobes shallow and wide with the exception of the cervical

groove, which is deep and distinctly pronounced from the fourth tooth of the anterolateral margin and extends posteriorly in a sharp arc.

Frontal margin extended, flat, granular. Pentagonal gastric region. The protogastric lobes form an isosceles triangle, the apex of which is directed posteriorly and in the two anterior corners arise rounded inflations. Between the protogastric regions, the narrow mesogastric lobe, widened posteriorly extends and is delimited by lateral furrows. It adjoins the fused hypogastric and urogastric lobes, which form an equilateral triangle bordered by the broad, deep cervical furrow, with a wrinkled pro-

tuberance in each corner. Cardiac region large, of trapezoidal shape, highest anteriorly, forming a transverse elevation, and sloping gently laterally and posteriorly to a furrow, between which and the posterior margin the intestinal region rises in two narrow, low, lateral lobes. Hepatic region flat, small. Branchial region strongly developed; the epibranchial lobe is raised and without any decoration. In the cervical groove, between the urogastric lobe and the rearmost epigastric lobe, linear, sinuous inflations lie as narrow ridges.

Material examined: KSU D 581, cast of holotype BSP 1873 III F503.

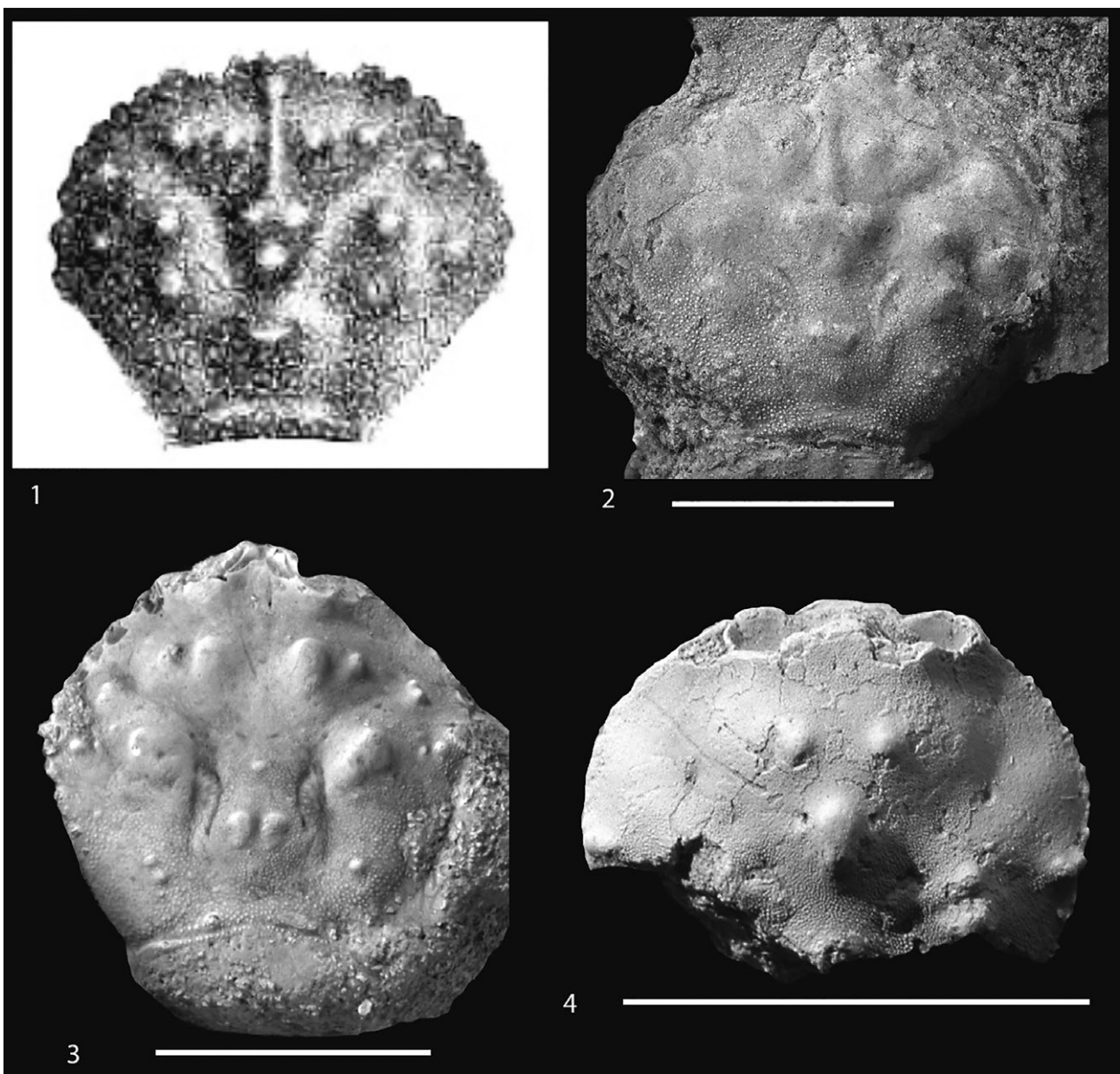


Fig. 1. Paranecrocarcinidae. 1, line drawing of *Thelecarcinus guembeli* (Böhm, 1891, pl. 1, fig. 3), scale unknown; 2, *T. guembeli*, KSU D 581, cast of holotype BSP 1873 III F503; 3, *Pseudonecrocarcinus gamma* (Roberts, 1962), holotype ANSP 20031; 4, *Paranecrocarcinus mozambiquensis* Förster, 1970, holotype BSP 1969 I 182. Scale bars = 1 cm.

Occurrence: Type locality of the Gerhardsreit Formation, southeast of Munich, in black-gray, fine sandy marls, Upper Cretaceous (Maastrichtian), Germany (Reich, 2017; Umwelt Atlas Bayern).

Discussion: Böhm's (1891) description includes details of the frontal margin, anterolateral margins, and orbits, which cannot be seen in the cast of the holotype at hand. The specimen was collected at the type locality for the Maastrichtian Gerhardsreit Formation, southeast of Munich, which is composed of black-gray sandy marls deposited on a continental shelf in the northwestern Tethys (Reich, 2017). This occurrence changes neither the geologic range, nor the geographic range, nor the paleoenvironments associated with the family as it was previously known from the Cretaceous of Europe, primarily from marls and carbonate environments.

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