

Studies on Eumalacostraca: a homage to Masatsune Takeda

By

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(Editors)

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MITHRACITES TAKEDAI, A NEW HOMOLOID CRAB (DECAPODA,
BRACHYURA) FROM THE LOWER CRETACEOUS (APTIAN)
OF COLOMBIA

BY

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ABSTRACT

A new homoloid crab, *Mithracites takedai*, is described on the basis of two specimens from Colombia, preserved in a limestone nodule of early Aptian (Early Cretaceous) age, as dated by co-occurring ammonite species. The new species differs from the type species, *M. vectensis*, by a distinctly sulcate front, a narrower anterior mesogastric process, and a differently shaped cardiac region. The status of the family Mithracitidae Štefvić, 2005, is revised and an emended diagnosis is provided; the appearance of the linea homolica in extinct homoloids is discussed.

INTRODUCTION

During a recent survey of fossil decapod crustaceans housed in the collections of the Nederlands Centrum voor Biodiversiteit (Naturalis, Leiden), a new species of homoloid crab was discovered in limestone nodules from the Paja Formation at Santander, Colombia. The associated ammonite fauna (Kakabadze & Hoedemaeker, 1997; Hoedemaeker, 2004; Kakabadze et al., 2004)

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dates this material as Aptian (Early Cretaceous). One subspecies in particular, *Chelonicerias crassum crassum* Spath, 1930, found in the same piece of matrix as the crab material, is known from the lower Aptian (c. 125–120 Ma) of southern England, Georgia, Bulgaria and Colombia (Kakabadze et al., 2004: 528).

Previously, only a single species of crab has been recorded from the Paja Formation. *Dakoticancer olssoni* Rathbun, 1937, originally described from the Barremian of Santander (Colombia), was transferred to *Necrocarcinus* by Feldmann et al. (1999: 91) and synonymised with *Orithopsis tricarinata* by Vega et al. (2010: 275). The latter authors pointed out that the type specimen was from the Paja Formation, which they inconsistently noted to be of late Aptian or late Albian age (Vega et al., 2010: 276). Examination of the original illustration (Rathbun, 1937: pl. 5 fig. 6) clearly shows that this specimen cannot be attributed either to *Orithopsis tricarinata* or to the Orithopsidae as already stated by Schweitzer & Feldmann (2011a: 5); we prefer placing it in *Paranecrocarcinus* Van Straelen, 1936.

Mithracites takedai n. sp. constitutes the second formally named species of a genus which hitherto was known solely from one species from southern England. The taxonomic status of *Mithracites* has recently been the subject of discussion. A historical account was presented by Guinot & Tavares (2001), and Števčić (2005) subsequently erected a new family, Mithracitidae, for it. Karasawa et al. (2011) and Schweitzer & Feldmann (2011b) provided new diagnoses, but neither of these contains a good synapomorphy for the alleged family. The possible absence of a linea homolica could be an important feature of the family, and to verify the appearance of this in the fossil state, extant material should be screened for new insights.

SYSTEMATIC PART

Abbreviations used in the text are as follows: P1–P5: pereopods 1 to 5; mxp3: third maxilliped; MAB: Oertijdmuseum De Groene Poort, Boxtel, The Netherlands; MNHN: Muséum national d’Histoire naturelle, Paris, France; RGM: Nederlands Centrum voor Biodiversiteit (Naturalis; formerly Rijksmuseum van Geologie en Mineralogie), Leiden, the Netherlands.

Section PODOTREMATA Guinot, 1977
Superfamily HOMOLOIDEA De Haan, 1839
Family ?MITHRACITIDAE Števčić, 2005

Included genera. — *Mithracites* Gould, 1859; *Enodicarcinus* Schweitzer & Feldmann, 2011.

Diagnosis. — Carapace suboval, width equalling length or slightly longer than wide, widest in posterior third. Dorsal surface areolated; cervical and branchial grooves well marked. Rostrum single, deflexed, connecting epistome through narrow proepistome. Anterolateral margin short, straight, distinct; posterolateral margin long, convex, indistinct, blunt with few tubercles. Posterior margin wide, convex to weakly concave. Linea homolica absent (see Remarks). False orbits large, in contact with cervical groove; extraorbital tooth robust. Buccal cavern widened anteriorly; mxp3 operculiform, longitudinally grooved. Chelipeds slightly unequal, fingers short; P2–P4 elongated; P5 reduced, subdorsal. Abdomen with six somites plus telson; male abdomen large, completely covering thoracic sternum; female abdomen slightly larger, fixed anteriorly between P1–P3 coxae, telson entering between mxp3 coxae; somites 1 and 2 narrow, exposed dorsally. Thoracic sternum with sterno-coxal depressions. Thoracic sternite 4 with homoloid press-button; uropods of abdominal somite 6 transformed into sockets.

Remarks. — Guinot and Tavares (2001), who discussed at length the status of *Mithracites*, suggested affiliation with Homoloidea, mainly based on a typical suite of characters associated with the homoloid abdominal locking system (Bouchard, 2000: fig. 27B). Števcíć (2005: 23) subsequently erected the Mithracitidae for the genus, but his diagnosis does not provide any synapomorphy or unique character set for this new family. An assumed absence of a linea homolica in *Mithracites* is not mentioned; instead, the author stated, ‘lateral margins distinct’. Schweitzer & Feldmann (2011a: 2) did not include the absence of a linea homolica in their diagnosis either, but mentioned it in their discussion, and stated that Števcíć (2005) referred *Mithracites* to its own family ‘based upon its unique features’, while nearly all characters used are those of the Homolidae De Haan, 1839. In contrast, Karasawa et al. (2011: 547) did include the absence of a linea homolica in their characterisation of the family. Here we refine previous diagnoses (Števcíć, 2005; Karasawa et al., 2011; Schweitzer & Feldmann, 2011a), based on our observations of the type species, *Mithracites vectensis* Gould, 1859, and the present new Colombian species.

The absence of a linea homolica in the Mithracitidae requires discussion. In homoloids in which the posterior carapace does not expand ventrally and envelop the cephalothorax, as in the Poupiniidae Guinot, 1991, and Latreilliidae Stimpson, 1858, a linea homolica is absent (a lateral linea is partially present in Latreilliidae, being only at the level of the long ‘neck’). Among homoloids, only homolids possess a (paired) dorsal linea homolica; and, this would be a

significant difference between the Mithracitidae and Homolidae. No linea homolica is observed in the two specimens of the new Colombian species. It has not been reported or illustrated in all previously described individuals of *M. vectensis* (cf. Withers, 1951: pl. 17 figs. 1-5; Wright & Collins, 1972: pl. 5 figs. 1-7; Guinot & Tavares, 2001: fig. 19; Schweitzer & Feldmann, 2011a: figs. 1.2, 1.3), of *M. vectensis*? sensu Schweitzer & Feldmann (2011a: fig. 1.1) and is also absent in a newly collected specimen of *M. vectensis* (MAB k.2376) examined for the present study.

A survey of the linea homolica in extant Homolidae housed in the MNHN collections has shown that there is quite some variation in the appearance of this moulting line, ranging from wide to attenuated, even obsolete. The linea homolica is sometimes undifferentiated in the anterior carapace, but visible in the surface of the false orbit. In most cases the linea homolica is well defined particularly along the large branchial area as a thin line, semi-transparent, along which cuticle granulation is interrupted. However, this condition was found to be inconsistent; the linea homolica varies markedly, being occasionally very thin, and is sometimes virtually imperceptible (Guinot & Richer de Forges, 1995: 299).

To test what the linea homolica would look like in the fossil state (in those cases where cuticle is preserved), a piece of modelling clay was used to produce imprints of the branchial area of several homolids. In *Homolochunia valdiviae* Doflein, 1904, a linea homolica is practically invisible; only a weakly transparent line is discernible at carapace mid-length (Guinot & Richer de Forges, 1995: fig. 50d). In *Lamoha inflata* (Guinot & Richer de Forges, 1981), the linea homolica is recognisable as a faintly transparent line, while in *Homologenus levii* Guinot & Richer de Forges, 1995, it can be seen as a thin, transparent line but as it is lined with numerous small granules (Guinot & Richer de Forges, 1995: figs. 60b, 67f), the linea would not be visible in the fossil state. Thus, there may be considerable difference in the appearance of the linea homolica in fossil members of the family Homolidae. Some have a clearly differentiated linea homolica, while in others it may appear obsolete. In addition, preservational issues need to be considered as well. The outer layer of the cuticle may either be preserved intact, or became peeled, and as such, the cuticle may be modified. Extinct homolid carapaces are occasionally also found to be disarticulated at the level of the lineae (see Crawford, 2008), and as such, the extralinear portions of the carapace are not preserved in some material (see e.g., Beschin et al., 2009: fig. 5). These preliminary observations on the poorly studied linea homolica indicate that caution needs to be exercised before conclusions can be drawn and more studies are needed.

Schweitzer & Feldmann (2011a: 2) stated that the Mithracitidae also differed from other homoloids in probably having a subdorsal P4, while Karasawa et al. (2011: 547) affirmed that a subdorsal P4 was a characteristic feature of the family. After a detailed comparison with numerous different members of the Homoloidea, we have found the disposition of the pereopods in *Mithracites* to be similar to that of extant homoloids. The P1–P5 coxae are not in the same plane, in accordance with the posterior curvature of the thoracic sternites (see illustrations in Garassino, 2009). On account of the width and curvature of the thoracic sternum, the P2–P4 coxae may be visible in dorsal view, but the legs are not ‘subdorsal’; these function as normal walking legs (in contrast to P5, used for carrying behaviour).

For the time being, we maintain the Mithracitidae, but with a query. In view of the fact that none of the specimens of the two known *Mithracites* species known to date display any trace of a moulting line, a linea homolica appears to be absent in the Mithracitidae. In addition, the carapace is very short for a homoloid (although some homoloids do have an equally short carapace, e.g., *Paromolopsis boasi* Wood-Mason & Alcock, 1891). It is hoped that additional material of *Mithracites* will become available for study, in order to determine the status of this genus.

Several taxa that are known in particular from carapace material have been assigned to the Glaessneropsoidea Patrulius, 1959, and Homolodromioidea Alcock, 1900, based solely on the absence of a linea homolica. These may turn out to be members of the Homoloidea. Examples include *Palehomola* Rathbun, 1926 (see Schweitzer et al., 2004: fig. 7) and several species assigned to *Glaessnerella* Wright & Collins, 1975 (see e.g., Schweitzer & Feldmann, 2011b). We must await the discovery of specimens retaining ventral characters to identify their taxonomic position in more detail.

Genus **Mithracites** Gould, 1859

Type species. — *Mithracites vectensis* Gould, 1859, by monotypy, from the Aptian of the Isle of Wight, southern England.

Mithracites takedai n. sp.

(fig. 1)

Types. — The holotype, a carapace of a presumably adult specimen with partial left and right chelipeds preserved, is RGM M988/C-1 (ex P. H. Creutzberg Collection); a single paratype (RGM M988/C-2) is available; this probably is a juvenile. Both specimens are preserved in the same piece of matrix and associated with an unidentified gastropod and the ammonite

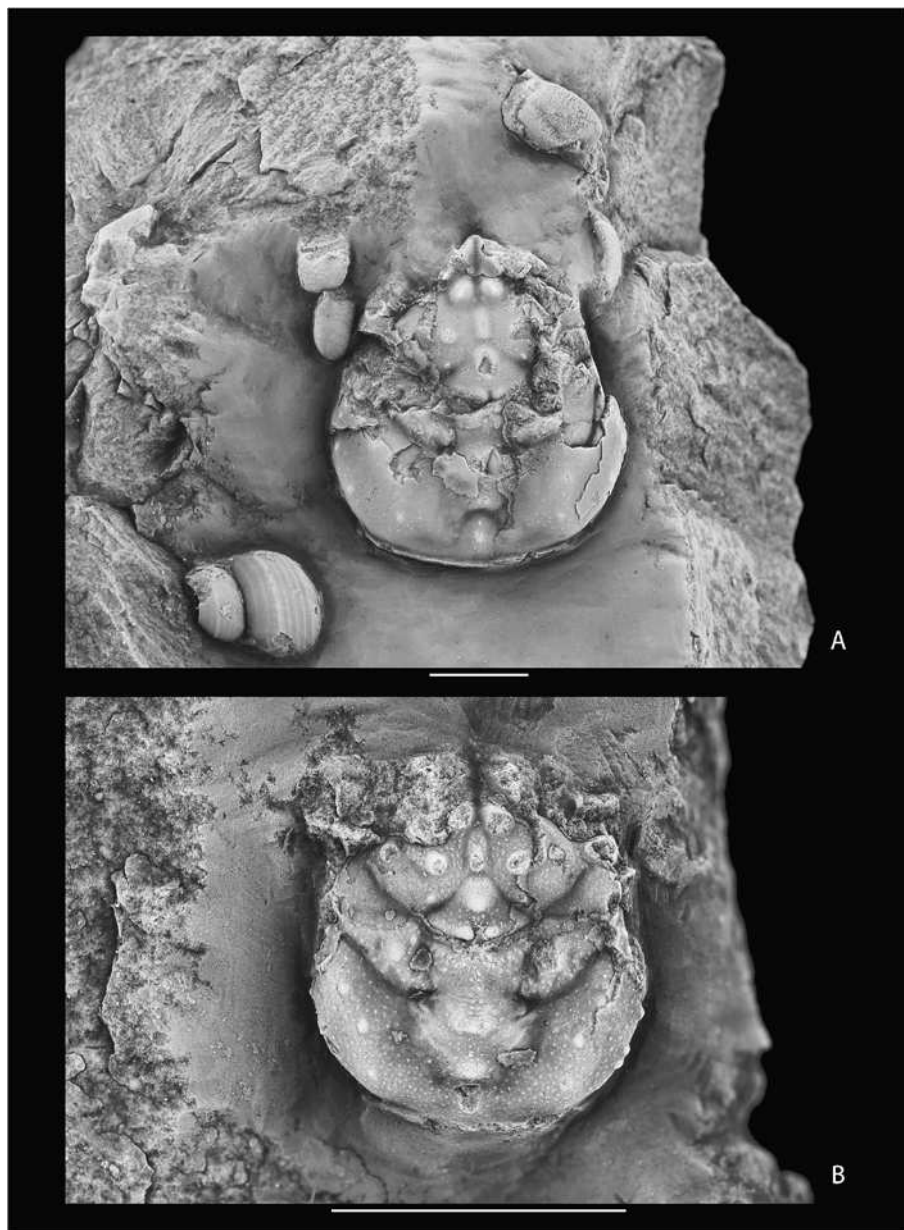


Fig. 1. *Mithracites takedai* n. sp. A, Holotype, RGM M988/C-1, presumably adult; B, Paratype, RGM M988/C-2, a probable juvenile. Scale bars equal 5 mm.

Chelonicerus crassum crassum (RGM 282 770 M988/B). The type locality is 'along the road near house of fam. Rivera', near Guane (Santander, northwest Colombia), and the stratigraphic level is the Paja Formation of Aptian age.

Etymology. — The species name honours Masatsune Takeda in recognition of his valuable contributions to our knowledge of Brachyura.

Diagnosis. — *Mithracites* with distinctly sulcate front, narrow anterior mesogastric process, and triangular cardiac region.

Description. — Carapace small, suboval, longer than wide, widest in posterior half, convex in transverse cross section, gently arched in longitudinal cross section. Carapace regions inflated, well defined by distinct grooves, tuberculate. Orbitofrontal margin wide. Front triangular, long, projected, slightly downturned, distinctly sulcate up to tip. Orbits large, anteriorly directed, with blunt, sinuous supraorbital margin. Exorbital tooth strong. Anterolateral margin short, straight. Posterolateral margin long, continuous, convex, with rounded edge and three small tubercles. Posterior carapace margin very wide, convex, with subtle, acute rim. Epigastric regions small, well defined, inflated, oval. Anterior mesogastric process narrow, anteriorly restricted by epigastric swellings, posteriorly with tubercle. Posterior mesogastric region wide, triangular, anteriorly with central tubercle, posteriorly with short axial sulcus, posterior margin arched. Protogastric region large, with outwardly-directed groove, anteriorly with two large tubercles, posteriorly with single, small, acute tubercle. Hepatic region small, triangular, without tubercle. Urogastric lobe short, weakly inflated. Cardiac region subtriangular with apex downwards, anteriorly and posteriorly with tubercle. Intestinal region small, with central tubercle. Branchial region large, posteriorly with three tubercles arranged in an outwardly-directed arc. Cervical groove distinct, continuous, arched, reaching exorbital teeth. Branchiocardiac grooves shallow, short. Branchial grooves distinct, deep, parallel to cervical groove, notching carapace margins. Linea homolica apparently not present. Carapace surface covered entirely with small, evenly spaced granules (juvenile), or only granular on posterior branchial region (adult). P1 merus elongate, curved; carpus short, stout; right cheliped short, outer surface tumid, with subtle groove, fixed finger slender.

Remarks. — *Mithracites takedai* n. sp. is similar to the type species, *M. vectensis*, in carapace shape and curvature, shape of orbits, and division of regions and tuberculation. The new species differs in having a front that is distinctly sulcate up to the apex; in having a narrower anterior mesogastric process, and a more triangular cardiac region that is narrow posteriorly.

The branchial groove is continuous in *M. takedai* whereas it is sinuous in *M. vectensis*. In addition, in the adult specimen of *M. takedai*, the dorsal granulation is nearly obsolete, while adult specimens of *M. vectensis* have a clearly granular dorsal surface.

Mithracites takedai differs from *M. vectensis*? sensu Schweitzer & Feldmann (2011a: 2) in having a convex, rather than concave, posterior carapace margin, and in having tubercular axial and branchial regions.

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