



A new xanthid crab, *Neoliomera zovoensis* sp. nov. (Decapoda, Brachyura), from the Lower Eocene beds of Zovo (Vestenanova, Verona, northeast Italy)

Neoliomera zovoensis sp. nov. (Decapoda, Brachyura), nova vrsta rakovice iz spodnjeeocenskih plasti nahajališča Zovo (Vestenanova, Verona, severovzhodna Italija)

Antonio DE ANGELI¹ & Alessandro GARASSINO²

¹Museo Civico “G. Zannato”, Montecchio Maggiore, Vicenza, Italia; antonio.deangeli@alice.it

²Research Adjunct, Department of Earth and Biological Sciences, Loma Linda University, Loma Linda, California, USA; e-mail: alegarassino@gmail.com

Prejeto / Received 4. 11. 2019; Sprejeto / Accepted 2. 4. 2020; Objavljeno na spletu / Published online 22. 4. 2020

Key words: Crustacea, Xanthidae, taxonomy, Paleogene, Italy

Ključne besede: Crustacea, Xanthidae, taksonomija, paleogen, Italija

Abstract

A new species of *Neoliomera* Odhner, 1925, *Neoliomera zovoensis* sp. nov. from the Lower Eocene (Ypresian) of Zovo (Vestenanova, Verona), which co-occurs with other decapod crustacean species in a richly fossiliferous coral-algal-reef in the Monti Lessini (Verona area, northeast Italy) is herein described.

Izvleček

V prispevku opisujemo novo vrsto rodu *Neoliomera* Odhner, 1925, *Neoliomera zovoensis* sp. nov. iz spodnjega eocena (Ipresij) iz nahajališča v Zovu (Vestenanova, Verona). Nova vrsta se pojavlja v združbi z drugimi deseternožci v fosilno bogatem grebenskem apnencu s koralami in algami v regiji Monti Lessini (območje Verone, severovzhodna Italija).

Introduction

The rich arthropod fauna from the Paleogene levels in the Veneto region, which includes mysidaceans, isopods, stomatopods, and decapod crustaceans, has been recorded over the last two centuries. The decapod crustacean assemblage is rich in genera and species (see Fabiani, 1910; De Angeli & Beschin, 2001). Recent fieldwork has yielded numerous new decapod species in association with a bioherm or a small-sized coral reef (for a checklist of species and complete references see De Angeli & Garassino, 2006; De Angeli et al., 2019).

Geological and stratigraphical setting

The Bolca area (Verona, northeast Italy; Fig. 1) with fossil-rich deposits of “Pesciara” and Monte Postale, is renowned for the exceptional preser-

vation of plants, invertebrates, and vertebrates, chiefly fishes. For a detailed description of the local geology and stratigraphy, see Fabiani (1914, 1915), Barbieri & Medizza (1969), Medizza (1980a, b), and Pasini et al. (2019).

Above the Scaglia Rossa (Late Cretaceous, Campanian) follows the so-called “Calcari di Spilecco” (late Paleocene-early Eocene), which is in turn overlain by *Lithothamnium* and *Nummulites* limestones, the fish-bearing strata of Pescara and Monte Postale, and the *Alveolina* limestones, plus marine, brackish, and terrestrial limestones of Monte Postale. Higher upsection, *Alveolina* and *Nummulites* limestones are exposed (hamlet of Brusaferrì), a thick volcanic mass, containing terrestrial plants and freshwater molluscs (Monte Vegroni), shales with *Cypris* ostracod shells, and a coal bed with crocodylian and turtle remains (Monte Purga). The uppermost unit, at the

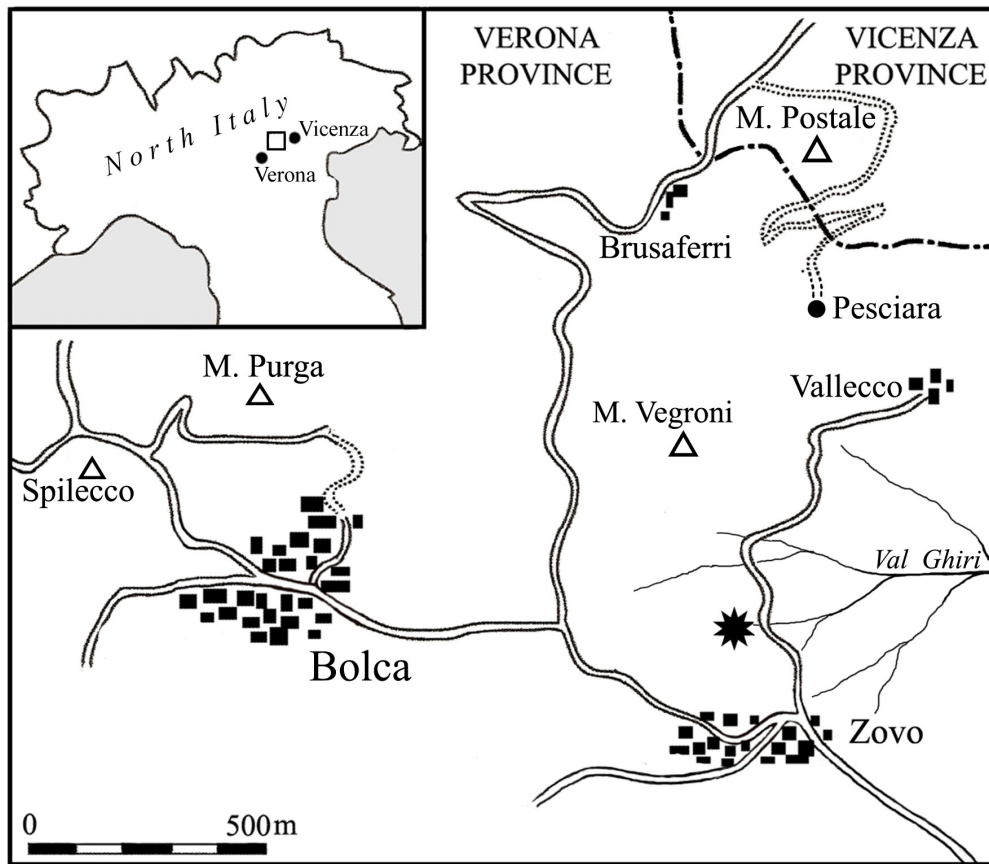


Fig. 1. Map of the Bolca area; the asterisk denotes the locality where the type specimen of *Neoliomera zovoensis* sp. nov. was collected (modified after De Angeli & Garassino, 2014).

top of Monte Purga, comprises columnar basalts. The uppermost stratified limestones along the northern side of Purga di Bolca are dated as late Ypresian (Barbieri & Medizza, 1969). The age of the reptile-bearing coal beds is still uncertain, but could possibly be Lutetian (middle Eocene).

The studied specimen was collected from white crystalline limestones with alveolinid and nummulitid foraminifera (Brusaferrì Limestones), which also contain volcanic material, to the southeast of Bolca, along the road connecting Zovo and the hamlet of Vallecco (Fig. 1). The fossiliferous level at Zovo, containing coralligenous algae, corals, microforaminifera, scarce molluscan internal moulds, and exuviae of small-sized decapod crustaceans, was associated with a bioherm or a small-sized coral reef, which originated within the Alpone-Agno graben. Formations such as this have been recorded from the Valle del Chiampo between Mussolino and Zovo di Castelvecchio (De Zanche, 1965) and along the eastern margin of Monti Lessini (Beschin et al., 2007; De Angeli & Garassino, 2002; De Angeli & Ceccon, 2012). Currently, the decapod crustacean assemblage from Zovo includes 24 species (for complete references see Beschin et al. 2016; De Angeli et al., 2019).

Material

One carapace preserving its entire cuticle within a small piece of coralligenous rock. It is housed in the palaeontological collection of the Museo Civico “D. Dal Lago” of Valdagno, Vicenza (MCV).

Abbreviations – lcxp: carapace length, wcxp: carapace width, wf: front width, wof: orbito-frontal width;

Systematic palaeontology

For the higher-level classification, we follow the arrangement proposed by Schweitzer et al. (2010).

Order Decapoda Latreille, 1802

Infraorder Brachyura Latreille, 1802

Section Eubrachyura de Saint Laurent, 1980

Subsection Heterotremata Guinot, 1977

Superfamily Xanthoidea MacLeay, 1838

Family Xanthidae MacLeay, 1838

Subfamily Liomerinae Sakai, 1976

Genus *Neoliomera* Odhner, 1925

Type species: *Zozymus pubescens* H.Milne Edwards, 1834, by original designation.

Included fossil species: *Neoliomera interme-*

dia Odhner, 1925 (fossil and extant), *N. kuohwai* Hu, 1981 (fossil), *N. minuta* Beschin, Busulini & Tessier, 2015 (fossil), *N. paleogenica* Beschin, Busulini, De Angeli & Tessier, 2007 (fossil), *N. pubescens* (H. Milne Edwards, 1834) (fossil and extant), *N. richteroides* Sakai, 1969 (fossil and extant); *N. zovoensis* sp. nov. (herein).

***Neoliomera zovoensis* sp. nov.**
(Figs. 2.1a, 1b)

Diagnosis: Subhexagonal carapace, convex longitudinally, broader than long; bilobed front; small suboval orbits; raised, granulate supraorbital margin; elongate, convex anterolateral

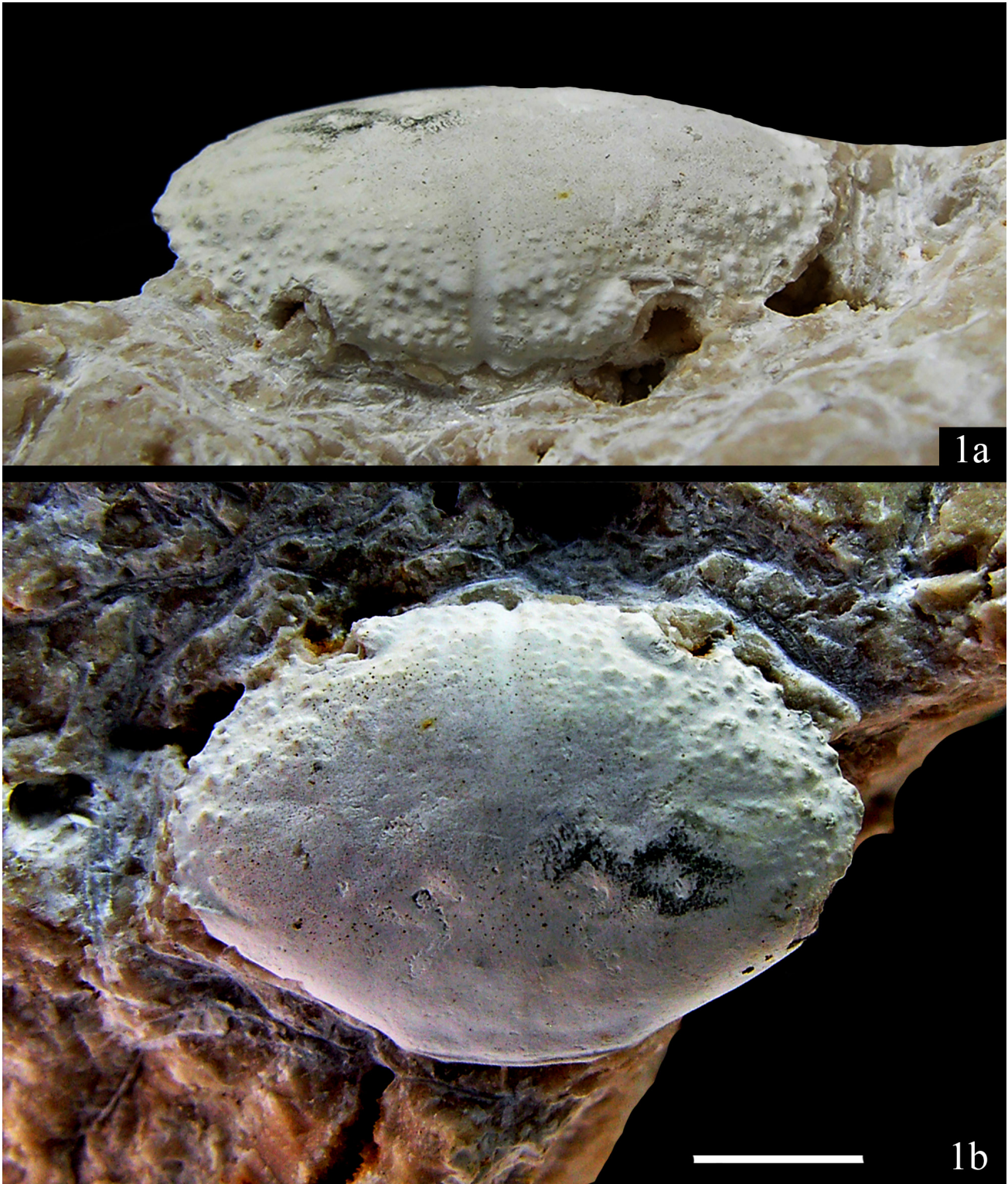


Fig. 2. *Neoliomera zovoensis* sp. nov., Holotype, MCV 19/09. 1a - carapace in frontal view; 1b - carapace in dorsal view. Scale bar equals 5 mm.

margins, with four short spiny lobes; fourth anterolateral lobe with granulate ridge extending on branchial region; short, convergent posterolateral margins; undifferentiated dorsal regions; one longitudinal median groove in frontal region; cervical groove dividing hepatic region from branchial ones; smooth dorsal carapace surface, except for some tubercles uniformly arranged in frontal region and in the outer parts of hepatic and epibranchial regions.

Etymology: after Zovo where the studied specimen was discovered.

Holotype: MCV 19/09.

Type locality: Zovo (Vestenanova, Verona, northeast Italy).

Measurements: MCV 19/09 – lcxp: 13.3 mm; wcxp: 29.5 mm; wof: 11.5 mm; wf: 8 mm.

Description: Subhexagonal carapace, convex longitudinally, broader than long (lcxp/wc xp = 0.45); orbito-frontal margin moderately wide (wof/wc xp = 0.38); bilobed front grooved medially and downturned; frontal margin with small tubercles arranged uniformly; small subround orbits with raised, granulate supraorbital margin; convex inner orbital angle well distinct from the front by an indentation; elongate, convex anterolateral margins, with two or three small spines, close each other, forming four short convex spiny lobes, divided by weak fissures: first with two small spines (excluding the extra-orbital tooth), second and third with three spines, and fourth, at level of anterolateral angle, with one spine and one granulate ridge (branchial ridge) extending on the branchial region; shorter posterolateral margins, strongly converging to the posterior margin; posterior margin as wide as the front, weakly convex and rimmed; undifferentiated dorsal regions; one deep longitudinal median groove in the frontal region; cervical groove dividing hepatic region from the branchial ones; weak transverse depression in the cardiac region; weak branchiocardiac grooves, more evident along the cardiac region margins; smooth dorsal carapace surface, except some tubercles uniformly arranged in the frontal region and in the outer parts of hepatic and epibranchial regions; small pits arranged uniformly on dorsal surface, richer in frontal and hepatic regions.

Discussion: Based upon Sakai (1976) and Serène (1984), the studied specimen shows the main morphological characters of the extant *Neoliomera* in having a carapace broader than long; anterolateral margins crested and entire, although marked with three to four demarcated, rounded lobes; and poorly defined regions. *Neoli-*

omera is currently widely distributed in the Indo-West Pacific area with 17 species inhabiting rocky beach, under stones or in coral reef, and shallow waters (Ho & Ng, 2014).

Neoliomera is known in the fossil record of northern Italy with two species, *N. paleogenica* Beschin, Busulini, De Angeli & Tessier, 2007, from the early Eocene of contrada Gecchelina (Monte di Malo, Vicenza) and *N. minuta* Beschin, Busulini & Tessier, 2015 from the early Eocene of Cava Braggi (Vestenanova, Verona). The former differs from *N. zovoensis* sp. nov. in having meso-, metagastric, and cardiac regions that are well differentiated by grooves and thick tuberculate ornamentation uniformly arranged on the whole dorsal surface (Beschin et al., 2007). The latter differs from the new species in having a more oval carapace outline, dorsal surface of carapace with randomly arranged small tubercles, an anterior mesogastric process that does not reach the front, a carapace that is not marked by a cervical groove, an anterolateral margin with four smooth lobes, and an anterolateral angle without branchial ridge (Beschin et al., 2015).

Neoliomera zovoensis sp. nov. has a shallow cervical groove and a weak granulate ridge on the branchial regions, as in the extant *N. themisto* (De Man, 1889), widespread in the Persian Gulf (see Guinot, 1964). This extant species differs, however, from the fossil one in having more distinct hepatic and branchial regions with larger and more numerous tubercles.

Acknowledgements

We wish to thank Bernardetta Pallozzi (Museo Civico “D. Dal Lago”, Valdagno, Vicenza) for making the specimen available for study, and Rodney M. Feldmann, (Kent State University, Ohio, USA) and Matúš Hyžný (Comenius University, Bratislava, Slovakia) for careful review and criticism.

References

- Barbieri, G. & Medizza, F. 1969: Contributo alla conoscenza geologica della regione di Bolca (Monti Lessini). Memorie Istituto Geologico Mineralogico dell’Università di Padova, 27: 1-36.
- Beschin, C., Busulini, A., De Angeli, A. & Tessier, G. 2007: I Decapodi dell’Eocene inferiore di Contrada Gecchelina (Vicenza - Italia settentrionale) (Anomura e Brachyura). Museo di Archeologia e Scienze Naturali “G. Zannato”, Montecchio Maggiore (Vicenza): 76 p.

- Beschin, C., Busulini, A. & Tessier, G. 2015: Nuova segnalazione di crostacei associati a coralli nell'Eocene inferiore dei Lessini orientali (Vestenanova - Verona). *Lavori, Società Veneziana di Scienze Naturali*, 40: 47-109.
- Beschin, C., Busulini, A., Tessier, G. & Zorzin, R. 2016: I crostacei associati a coralli nell'Eocene inferiore dell'area di Bolca (Verona e Vicenza, Italia nordorientale). *Memorie Museo Civico di Storia Naturale di Verona*, 2. Ser., Sezione Scienze della Terra, Verona, 9: 1-190.
- De Angeli, A. & Beschin, C. 2001: I Crostacei fossili del territorio Vicentino. *Natura Vicentina*, 5: 5-54.
- De Angeli, A. & Ceccon, L. 2012: *Eouropytychus montemagrensis* n. gen., n. sp. (Crustacea, Decapoda, Anomura, Chirostyliidae) dell'Eocene inferiore (Ypresiano) di Monte Magrè (Vicenza, Italia settentrionale). *Società Veneziana di Scienze Naturali*, 37: 19-24.
- De Angeli, A. & Garassino, A. 2002: Galatheid, chirostyliid and porcellanid decapods (Crustacea, Decapoda, Anomura) from the Eocene and Oligocene of Vicenza (N Italy). *Memorie della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano*, 30/3: 1-40. <https://doi.org/10.1163/18759866-0720203006>
- De Angeli, A. & Garassino, A. 2006: Catalog and bibliography of the fossil Stomatopoda and Decapoda from Italy. *Memorie della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano*, 35/1: 1-95.
- De Angeli, A. & Garassino, A. 2014: A new genus and species of panopeid crab, *Zovocarcinus muelleri* (Decapoda, Brachyura) from the Eocene of Zovo di Bolca, Verona (northeast Italy). In: Fraaije, R.H.B., Hyžný, M., Jagt, J.W.M., Krobicki M. & Van Bakel, B.W.M. (eds.), *Proceedings of the 5th Symposium on Mesozoic and Cenozoic Decapod Crustaceans*, Krakow, Poland, 2013: A tribute to Pál Mihály Müller. *Scripta Geologica*, 147: 185-191.
- De Angeli, A., Garassino, A. & Pasini, G. 2019: Catalog and bibliography of fossil Stomatopoda and Decapoda from Italy (2007-2018). *Memorie della Società italiana di Scienze naturali e del Museo civico di Storia naturale di Milano*, 45: 3-70.
- De Zanche, V. 1965: Le microfacies eoceniche nella Valle del Chiampo tra Arzignano e Mussolino (Lessini orientali). *Rivista Italiana di Paleontologia e Stratigrafia*, 71/3: 925-948.
- Fabiani, R. 1910: I crostacei terziari del Vicentino. *Bollettino del Museo Civico di Vicenza*, 1/1: 1-40.
- Fabiani, R. 1914: La serie stratigrafica del Monte Bolca e dei suoi dintorni. *Memorie dell'Istituto Geologico della Reale Università di Padova*, 2: 223-235.
- Fabiani, R. 1915: Il Paleogene del Veneto. *Memorie dell'Istituto Geologico della Reale Università di Padova*, 3: 1-336.
- Guinot, D. 1964: Crustacés Décapodes Brachyours (Xanthidae) des Campagnes de la Calypso en Mer Rouge (1952), dans le Golfe Persique et a l'Ile Aldabra (1954). *Mémoires du Muséum national d'Histoire naturelle*, 32/1: 1-108.
- Guinot, D. 1977: Proposition pour une nouvelle classification des Crustacés Décapodes Brachyours. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, (D), 285: 1049-1052.
- Ho, P.-H. & Ng, P.K.L. 2014: A new species of *Neoliomera* Odhner, 1925, from the western Pacific, and the first record of *N. demani* Forest & Guinot, 1961, from Taiwan (Crustacea: Decapoda: Brachyura: Xanthidae). *Zootaxa*, 3826/3: 579-590. <https://doi.org/10.11646/zootaxa.3826.3.8>
- Hu, C.-H. 1981: Studies on Cenozoic fossil crabs from Taiwan Island. *Proceedings of the Geological Society of China*, 24: 56-74.
- Latreille, P.A. 1802-1803: Histoire naturelle générale et particulière, des Crustacés et des Insectes. Ouvrage faisant suite aux uvres de Leclerc de Buffon, et partie du Cours complet d'Histoire naturelle rédigé par C.S. Sonnini, membre de plusieurs Société savantes. 5: 1-407, 6: 1-391; Paris (Dufart).
- MacLeay, W.S. 1838: On the Brachyurous Decapod Crustacea. Brought from the Cape by Dr. Smith. *Illustrations of the Zoology of South Africa; consisting chiefly of figures and descriptions of the objects of natural history collected during an expedition into the interior of South Africa, in the years 1834, 1835, and 1836; fitted out by "The Cape of Good Hope Association for Exploring Central Africa:" together with a summary of African Zoology, and an inquiry into the geographical ranges of species in that quarter of the globe*, published under the Authority of the Lords Commissioners of Her Majesty's Treasury, Invertebratae. IV (1849), London (Smith, Elder & Co.): 53-71.
- Man, J. G. de 1889: Über einige neue oder seltene indo-pacifische Brachyuren. *Zoologische Jahrbücher, Iena, (Systematik)* 4: 409-452. <https://doi.org/10.5962/bhl.part.18727>

- Medizza, F. 1980a: Il giacimento di Spilecco (Verona). In: I vertebrati fossili italiani. Catalogo della Mostra, Verona, 139-141.
- Medizza, F. 1980b: Il giacimento della Purga di Bolca (Verona). In: I vertebrati fossili italiani. Catalogo della Mostra, Verona, 147-148.
- Milne Edwards, H. 1834-1837: Histoire naturelle des Crustacés comprenant l'anatomie, la physiologie et la classification de ces animaux. Paris. Librairie Encyclopédique de Roret. 1: 1-468, 2: 1-531, 3: 1-638.
- Odhner, T. 1925: Monographierte Gattungen der Krabbenfamilie Xanthidae. I. Göteborgs Kungliga Vetenskaps-och Vitterhets-Samhälles Handlingar, ser. 4, 29/1: 1-92.
- Pasini, G., Garassino, A., De Angeli, A., Hyžný, M., Giusberti, L. & Zorzin, R. 2019: Eocene decapod faunas from the Konservat-Lagerstätten laminites of "Pesciara" (Bolca, Verona) and Monte Postale (Altissimo, Vicenza) in northeast Italy: a review and update. *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen* 293/3: 233-270. <https://doi.org/10.1127/njgpa/2019/0840>
- Sakai, T. 1969: Two new genera and twenty-two new species of crabs from Japan. *Proceedings of the Biological Society of Washington*, 82: 243-280.
- Sakai, T. 1976: Crabs of Japan and the Adjacent Seas. In three volumes; Kodansha Ltd., Tokyo; English Text, 773 pp., Japanese Text, 461 pp.
- Saint Laurent, M. de 1980: Sur la classification et la phylogénie des Crustacés Décapodes brachyours. I. Podotremata Guinot, 1977, et Eubrachyura sect. nov. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences, (D)*, 290: 1265-1268.
- Serène, R. 1984: Crustacés Décapodes Brachyours de l'Océan Indien Occidentale et de la Mer Rouge. Xanthoidea: Xanthidae et Trapeziidae. Addendum Carpiliidae et Menippidae. *A. Crosnier. Faune Tropicale*, 24: 1-400.
- Schweitzer, C.E., Feldmann, R.M., Garassino, A., Karasawa, H. & Schweigert, G. 2010: Systematic list of fossil decapod crustacean species. *Crustaceana Monographs*, 10: 1-222.