



Revision of *Xanthopsis bodracus* Makarenko, 1956 (Crustacea: Decapoda) from the Palaeogene of Ukraine

Revizija *Xanthopsis bodracus* Makarenko, 1956 (Crustacea: Decapoda) iz paleogena Ukrajine

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Abstract

The present article constitutes a revision of the decapod crustacean species *Xanthopsis bodracus* Makarenko, 1956 from the early Lutetian (Eocene, Palaeogene) of the Crimean Peninsula, southern Ukraine. The distinctive morphological characteristics of *Xanthopsis bodracus* enable its classification within the genus *Harpactoxanthopsis* Via Boada, 1959, as the type series of *Xanthopsis bodracus* precisely aligns with the diagnostic criteria of this genus. Of the five species in the genus *Harpactoxanthopsis*, *Xanthopsis bodracus* is morphologically closest to *Harpactoxanthopsis quadrilobatus* (Desmarest, 1822). However, there are currently insufficient grounds to confidently synonymise *Xanthopsis bodracus* with *Harpactoxanthopsis quadrilobatus*, as the poorly preserved type material, of which only a part has been preserved, does not allow this. In view of this, *Xanthopsis bodracus* has been revised as *Harpactoxanthopsis* sp. The Palaeogene decapod assemblages of Crimea consist of five genera including *Coeloma* A. Milne-Edwards, 1865, *Protocallianassa* Beurlen, 1930, *Arcticocarcinus* Schweitzer et al., 2016, *Xanthopsis* M'Coy, 1849, and *Harpactoxanthopsis* Via Boada, 1959.

Izvleček

Pričujoči članek predstavlja revizijo vrste deseteronožcev *Xanthopsis bodracus* Makarenko, 1956 iz zgodnjega lutecija (eocen, paleogen) Krimskega polotoka v južni Ukrajini. Izrazite morfološke značilnosti vrste *Xanthopsis bodracus* omogočajo njeno uvrstitev v rod *Harpactoxanthopsis* Via Boada, 1959, saj se tipska serija vrste *Xanthopsis bodracus* natančno ujema z diagnostičnimi znaki tega rodu. Od petih vrst v rodu *Harpactoxanthopsis* je *Xanthopsis bodracus* morfološko najbližje *Harpactoxanthopsis quadrilobatus* (Desmarest, 1822). Vendar trenutno ni dovolj razlogov za zanesljivo sinonimizacijo *Xanthopsis bodracus* s *Harpactoxanthopsis quadrilobatus*, saj slabo ohranjen tipski material, od katerega se je ohranil le del, tega ne omogoča. Glede na to je bil *Xanthopsis bodracus* revidiran kot *Harpactoxanthopsis* sp. Paleogensko dekapodno združbo Krima sestavlja pet rodov. Med njimi so *Coeloma* A. Milne-Edwards, 1865, *Protocallianassa* Beurlen, 1930, *Arcticocarcinus* Schweitzer et al., 2016, *Xanthopsis* M'Coy, 1849, in *Harpactoxanthopsis* Via Boada, 1959.

Introduction

In Ukraine, Palaeogene decapod crustaceans (order Decapoda Latreille, 1802) occur in the Kaniivian (Ypresian) and Kyivian (late Lutetian–Bartonian) regional stages of the Dnipro River basin (Radkevich, 1900; Chernyshev, 1949), the Kyivian regional stage in the Donets Basin (Likharev, 1917; Chernyshev, 1949), the Danian, Thanetian, Ypresian, Lutetian, and Rupelian of the Crimean

Peninsula (Makarenko, 1956; Birshtein, 1960; Levitsky, 1974; Korobkov, 1975; Ilyin, 2005; Dervnov & Udovychenko, 2023), the Oligocene of the Ukrainian Carpathians (Gorbach, 1956; Hyžný et al., 2022), and the Nikopol Basin (Griaznov, 1956; Selin, 1964). However, recently this group has not attracted much attention of Ukrainian palaeontologists, despite the fact that its study is of great palaeogeographic importance.

The most diverse assemblages of Ukrainian Palaeogene decapods were recorded from Crimea and consists of at least five genera, *Coeloma* A. Milne-Edwards, 1865, *Protocallianassa* Beurlen, 1930, *Arcticocarcinus* Shweitzer et al., 2016, *Xanthopsis* M'Coy, 1849, and *Harpactoxanthopsis* Via Boada, 1959 (Levitsky, 1974; Ilyin, 2005; Dernov & Udovychenko, 2023).

In 1956, Ukrainian palaeontologist Dr. Dmytro Yelyseyovych Makarenko (1925–2008) described a new crab species, *Xanthopsis bodracus*, from the “crab horizon”, a local marker stratigraphic level containing decapod remains, which occurs in the early Lutetian limestone succession (Vassilenko, 1952; Muratov & Nemkov, 1960; Zernetsky, 1962; Ilyin, 2005; Zernetsky et al., 2015). Unfortunately, Makarenko (1956) did not define the holotype of this species and the place of storage of the examined material. This work is devoted to the revision of the surviving part of the type material

of *Xanthopsis bodracus* Makarenko, 1956, which was found by the present author in the collections of late Dr. Makarenko.

Material and methods

The study is based on a small collection (NMNH-G 8607) of moderately preserved remains of *Xanthopsis bodracus* Makarenko, 1956, consisting of six carapace fragments and their inner moulds preserved in limestone. Of the four specimens of *Xanthopsis bodracus* carapaces figured by Makarenko (1956: figs 1–4; see also Fig. 1), only one specimen (NMNH-G 8607/11) was found in the collection NMNH-G 8607. The carapace mould figured by Makarenko (1956: Fig. 1), the carapace mould with a right claw (Fig. 2 in Makarenko, 1956), and an isolated claw (Fig. 3 in Makarenko, 1956) are absent (probably lost). The images provided by Makarenko (1956) are the only feature that allows us to identify the type series of

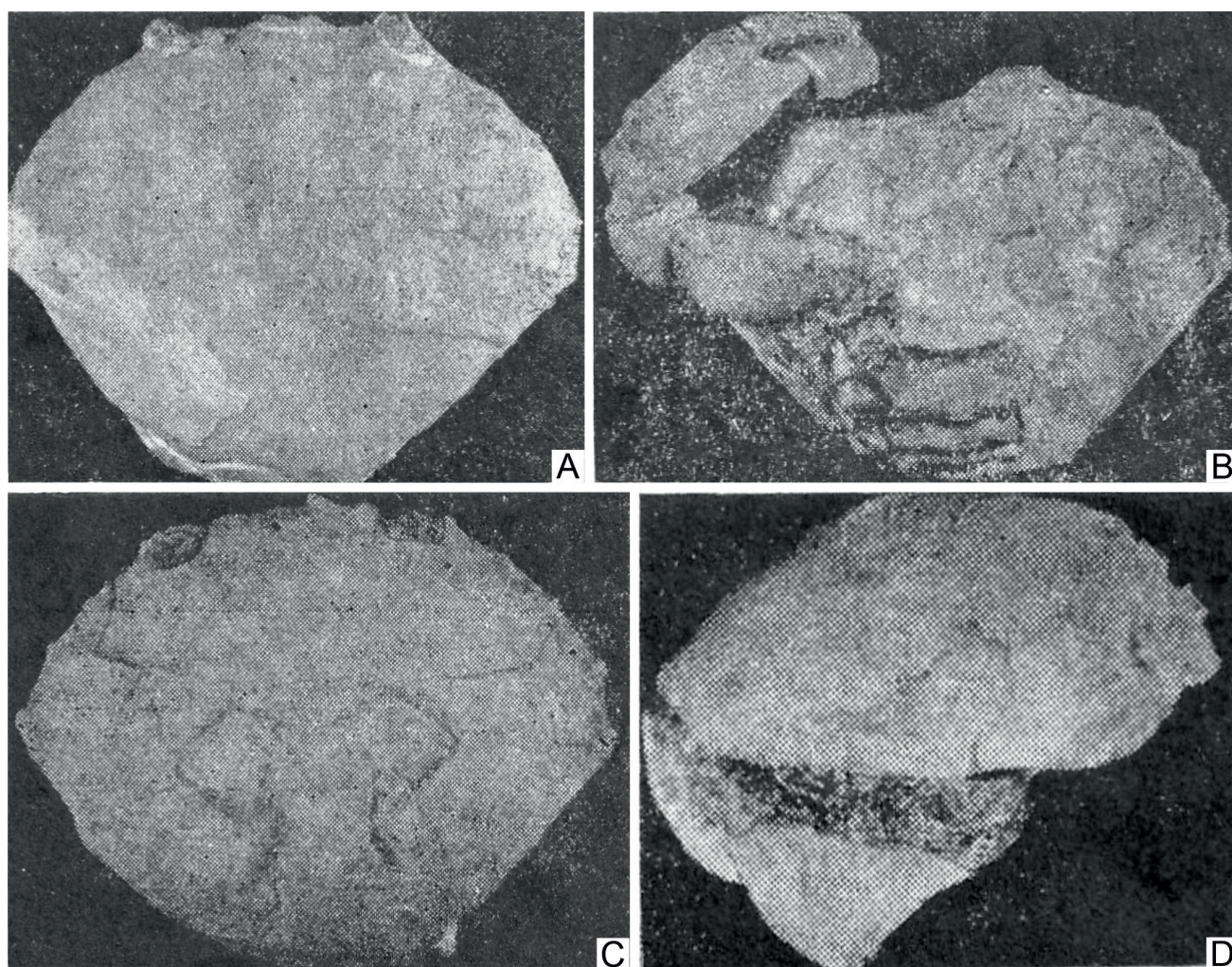


Fig. 1. Specimens of the type series of *Xanthopsis bodracus* Makarenko, 1956, as figured in the protologue (Makarenko, 1956: Figs. 1–4). A – “The mould of the carapace of an adult male (dorsal view)” (Makarenko, 1956: Fig. 1); hereinafter translated from Ukrainian by the author. B – “The mould of the carapace with the right claw and abdomen pressed to the ventral surface; ventral view” (Makarenko, 1956: Fig. 2). C – “The cephalothorax mould, which well showing the ornamentation; female individual in dorsal view” (Makarenko, 1956: Fig. 4). D – “The damaged right claw of a large crab specimen; ventral view” (Makarenko, 1956: Fig. 3). Remark: Makarenko (1956) did not indicate the specimen numbers and did not provide data that would allow to determine their size.

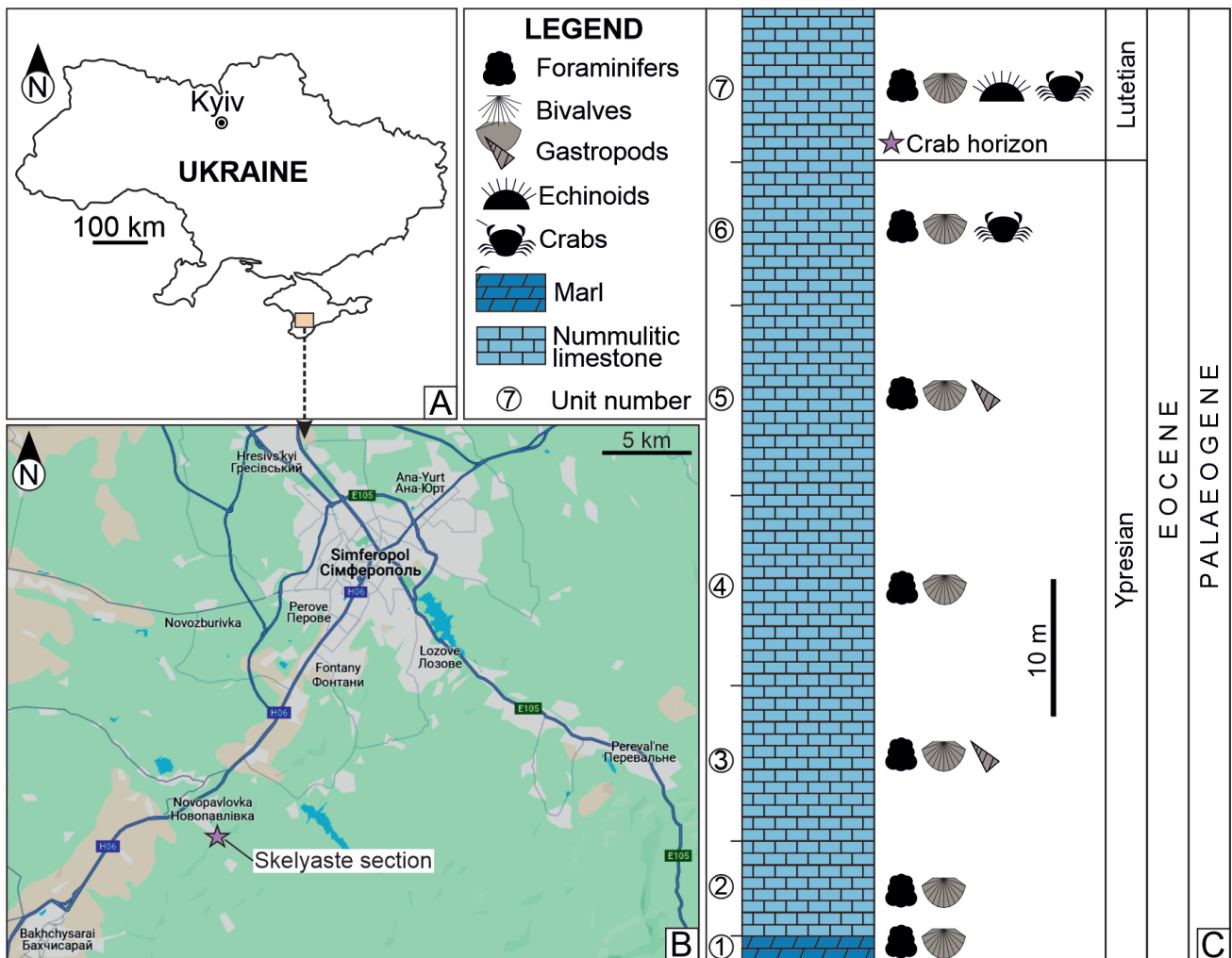


Fig. 2. Geographical location (A, B) and stratigraphic position (C) of the type locality of *Xanthopsis bodracus* Makarenko, 1956 (marked with a purple asterisk). Lithological column of the Skelyaste section (Fig. 2C) modified after Zernetsky (1962: p. 196).

Xanthopsis bodracus, since the total amount of the studied material and a holotype are not specified in the protologue.

The material examined was collected by the Dr. Makarenko from the lower Lutetian (Eocene) limestones exposed as a steep cliff on the right bank of the Bodrak River near the village of Skelyaste, Autonomous Republic of Crimea, Ukraine (Fig. 2) during an excursion of a meeting on the Palaeogene stratigraphy of the southern part of the former USSR in 1955.

In 1956, these decapod remains, represented by at least seven specimens, were described as a new species *Xanthopsis bodracus* Makarenko, 1956. The type material of *Xanthopsis bodracus* was considered lost until it was found in November 2023 in the Makarenko's collection stored in the Department of Stratigraphy and Palaeontology of Cenozoic Sediments, Institute of Geological Sciences, National Academy of Sciences of Ukraine, Kyiv. The research was also greatly aided by Dr. Makarenko's notes taken during the 1955 excursion. Now, the studied collection (NMNH-G

8607) is stored in the Department of Geology, National Museum of Natural History, National Academy of Sciences of Ukraine, Kyiv.

The collection NMNH-G 8607 consists of 15 specimens (NMNH-G 8607/01 to NMNH-G 8607/15). The fossil-bearing rock is a white limestone with small shell debris. In addition to decapod remains, the collection NMNH-G 8607 contains tests of unidentified nummulitids, steinkerns of the bivalves *Thracia* sp. and *Chlamys* sp., burrows ?*Palaeophycus* isp., and a fragment of the steinkern of the nautiloid *Aturia* sp. bearing a poorly preserved external mould of a serpulid tube and burrows.

The specimen NMNH-G 8607/07 bears the trace fossils assigned to the ichnogenus *Arachnos-tega* Bertling, 1992, preserved on the surface of the crab carapace inner mould (see Fig. 4A, C). This ichnogenus is usually interpreted as a domichnia or feeding structure in a consolidated soft- to firmground substrate, produced by detritus- or deposit-feeding polychaetes (Bertling, 1992; Fatka et al., 2011; Zatoń, 2020; Dernov, 2023).

This paper uses the decapod taxonomy proposed by Schweitzer et al. (2010) and morphological terminology and methods of describing fossil decapods summarized by Schweitzer et al. (2024).

Geological setting

The Skelyaste section is represented by a sequence of predominantly white and grey nummulitic non-laminated limestones of the Bakhchisarai and Simferopol formations ascribed to the Ypresian and lower Lutetian (Zernetsky et al., 2015) (see Fig. 2C). Based on foraminifer studies, the Ypresian/Lutetian boundary in this section is located at the base of Unit 7 (personal communication of Dr. Tamara S. Ryabokon, Institute of Geological Sciences of the NAS of Ukraine, February 2024).

Numerous foraminifers, such as *Nummulites distans* Deshayes, 1838, *N. atacicus* Leymerie, 1846, *Discocyclus archiaci* (Schlumberger, 1903), *D. sella* (d'Archiac, 1850), *Assilina spira* (Roissy, 1805), *A. exponens* (Sowerby, 1840), *Operculina gigantea* Mayer, 1876, as well as bivalves *Pycnodonta rarilamella* (Deshayes, 1864), *Spondylus* cf. *tenuispina* Sandberger, 1863, *Chlamys* cf. *opia* Vassilenko, 1952, *Cardium* cf. *gigas* Defrance, 1817, *Chama calcarata* Lamarck, 1806, gastropods *Strombus* sp., *Cerithium* sp., *Rostellaria ampla* Rutot, 1876, and echinoids *Conoclypeus conoides* Agassiz, 1839 occur in the Ypresian part of the limestone succession (Units 1 to 6 – see Fig. 2C) (Zernetsky, 1962; Vyalov, 1975).

The foraminifers *Nummulites polygyratus* Deshayes, 1838, *N. distans* Deshayes, 1838, *Assilina exponens* (Sowerby in Sykes, 1840), *A. irregularis* Carter, 1853, bivalves *Spondylus* cf. *eichwaldi* Fuchs, 1870, *Pseudamussium solea* (Deshayes, 1830), and echinoids *Conoclypeus conoides* Agassiz, 1839 were found in Unit 7, i.e. in the Lutetian part of the limestone succession (Zernetsky, 1962; Vyalov, 1975).

According to Makarenko (1956), the specimens of *Xanthopsis bodracus* was found in a limestone interlayer, about 0.4-m-thick, which lies in the lower part of Unit 7 (Fig. 2C). Numerous foraminifers, shells of bivalves, and moulds of the gastropods, up to 0.45 m long, as well as trace fossils co-occurring with crabs (Makarenko, 1956).

The lower part of the Lutetian in some sections of the Crimea contains the so-called “crab horizon”, which is a local correlation marker (Vassilenko, 1952; Muratov & Nemkov, 1960). In addition to *Xanthopsis bodracus*, *Harpactoxanthopsis lutugini* (Likharev, 1917) and *H. cf. lutugini* (Likharev, 1917) also occur in the “crab horizon”

(Ilyin, 2005). It should be noted, however, that in the Ypresian–Lutetian interval of Crimea, crabs are known both in the highest part of the Ypresian and in the lowest part of the Lutetian (Vassilenko, 1952; Zernetsky, 1962; Vyalov, 1975), but the specimens described by Makarenko (1956: p. 74) come from the basal part of the Lutetian.

The Ypresian–Lutetian nummulitic limestone sequence in the Crimea probably accumulated in the distal part of the inner ramp above the base of wind waves at fast sedimentation rates and high hydrodynamics (Lygina et al., 2010; Zernetsky et al., 2015). Similar environmental conditions have been recorded for the genus *Harpactoxanthopsis* Via Boada, 1959, to which *Xanthopsis bodracus* belongs (see the section “Systematics”), in the Eocene of Croatia and Slovenia (Mikuz, 2002; Gašparič et al., 2015; Križnar & Gašparič, 2019).

Systematics

Makarenko (1956) did not provide a formal diagnosis of *Xanthopsis bodracus*, but briefly described the morphology of the type specimens in detail. Makarenko (1956: p. 75–76; translated from Ukrainian by the author) notes, that “The posterior part of the carapace resembles a trap-ezoid, the lateral sides of which converge at an angle of 80–83° outside the small base. The posterolateral margins are almost straight, rounded. The abdomen is small, flattened, consists of four segments, bent under the cephalothorax and is located in the longitudinal depression of the ventral surface. The dorsal side of the finger is wedge-shaped. The cutting edge of the pollex bears small teeth. The surface of the carpus is rounded and smooth below; above, on the keel projection, there are 5–6 small pointed tubercles. Other four pairs of pereopods are not preserved. The surface of the carapace is evenly convex and no separate regions are distinguished. The carapace is evenly covered with dense, small, round pits. The same pits are present on the claws. Symmetrically arranged diamond-shaped depressions with branches extending posteriorly are present in the most convex part of the carapace. An adult specimen is 41 mm long, 50 mm wide, and has a maximum height of 18 mm”.

Only the material figured by Makarenko (1956: Figs. 1–4) allows us to get an idea of the morphology of *Xanthopsis bodracus*, since the unfigured specimens from the collection NMNH-G 8607 (Fig. 4), although referred to *Xanthopsis bodracus* here, are not part of the type series.

Specimen NMNH-G 8607/11 (Fig. 3A–C) is a moderately-preserved carapace inner mould in

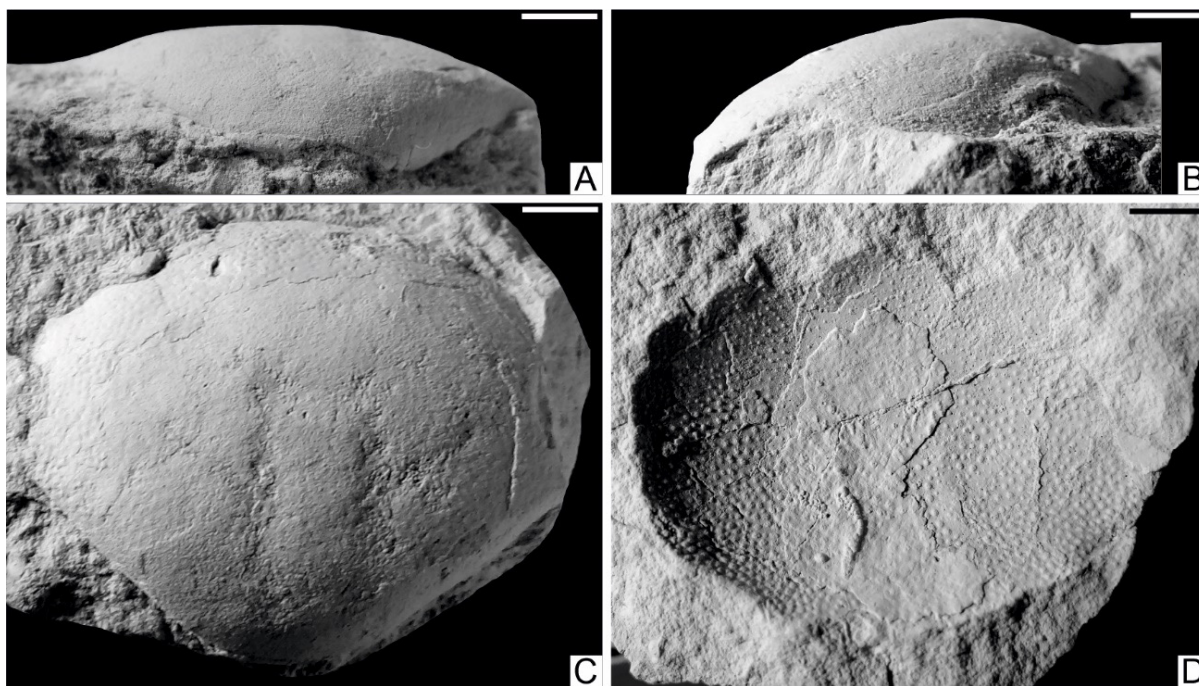


Fig. 3. Specimens of *Xanthopsis bodracus* Makarenko, 1956 of the type series. A–C – specimen NMNH-G 8607/11 (A – posterior view, B – lateral view, C – dorsal view). D – specimen NMNH-G 8607/12 (counterpart of NMNH-G 8607/11) in dorsal view. Scale bars = 5 mm.

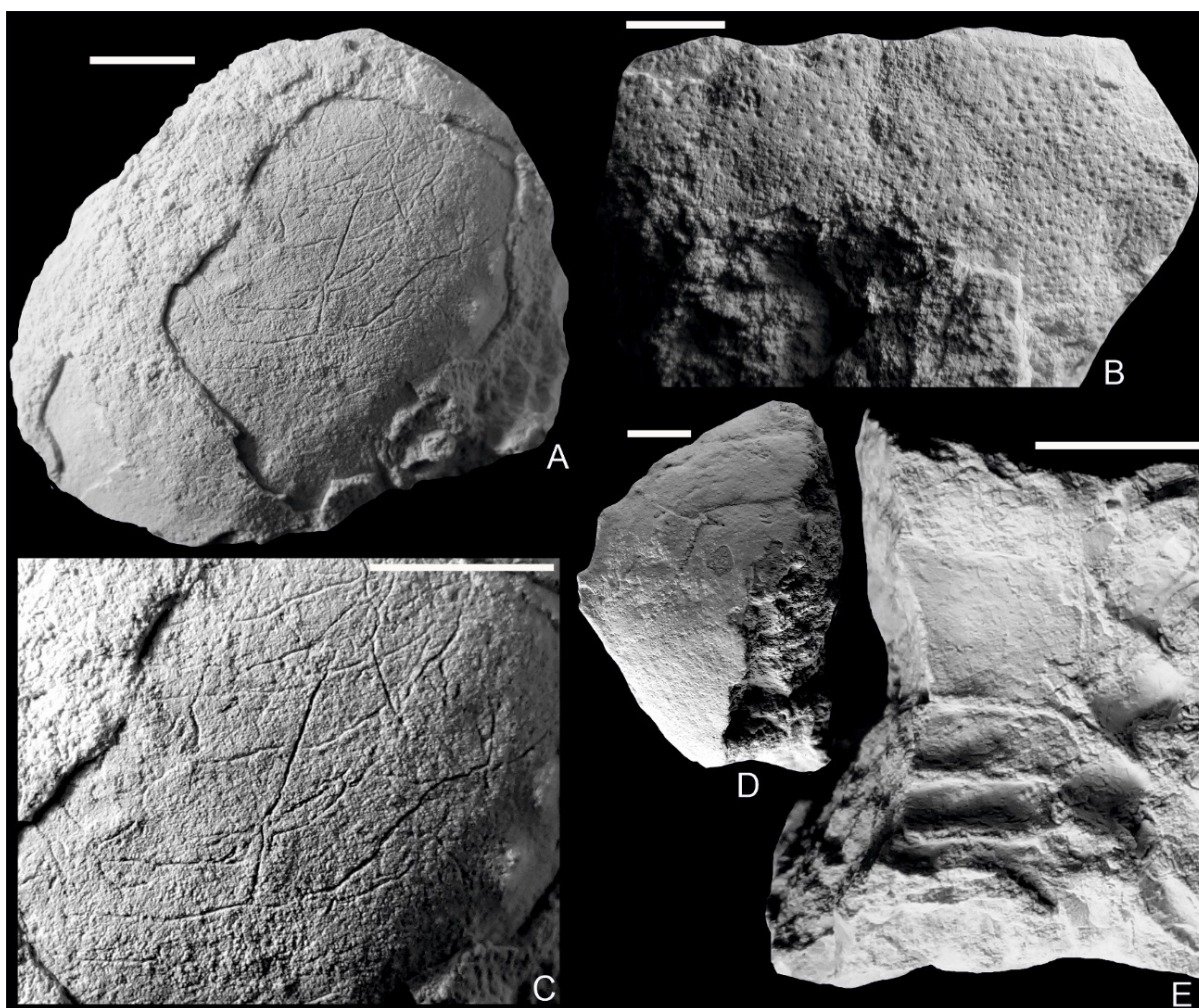


Fig. 4. Decapod specimens from the collection NMNH-G 8607. A, C – carapace fragment of *Xanthopsis bodracus* bearing trace fossils *Arachnostega* (specimen NMNH-G 8607/07: A – general view, C – enlarged part of the carapace with *Arachnostega* burrows). B – carapace fragment of *Xanthopsis bodracus* in dorsal view (specimen NMNH-G 8607/08). D – carapace fragment of *Xanthopsis bodracus* in dorsal view (specimen NMNH-G 8607/09). E – carapace fragment of *Xanthopsis bodracus* in ventral view (specimen NMNH-G 8607/10). Scale bars = 5 mm

the dorsal aspect. Specimen NMNH-G 8607/12 is a counterpart impression of the dorsal surface of NMNH-G 8607/11 with a preserved cuticle. The carapace is rounded-hexagonal almost ovate in outline (Fig. 3C), narrowing considerably posteriorly with poorly defined regions, strongly convex longitudinally (Fig. 3B) and moderately convex transversely (Fig. 3A), 34 mm wide and 27 mm long, and almost as wide as long (length/width = 0.79). The greatest width of the carapace is approximately in the middle of its length. The front is slightly convex, almost straight, approximately 12 mm wide (about 33 % of the total carapace width); fronto-orbital width is 23 mm. Almost circular orbits, 4 mm wide and 2.5 mm deep, are poorly preserved (see Figs. 3B, C). The anterolateral margins are not preserved. The posterolateral margins are very slightly convex, almost straight; the posterior margin is narrow, straight, 10 mm wide. The base of a low spine is preserved on the right posterolateral margin in the specimen NMNH-G 8607/11.

On the dorsal surface of the carapace mould, there are weak branchiocardial shallow grooves, which limit the slightly convex cardiac region in the transverse aspect. The ventral surface and pereopods in NMNH-G 8607/11 and NMNH-G 8607/12 are not preserved.

The dorsal surface of the carapace NMNH-G 8607/11 is poorly preserved; only in front, near the frontal margin, small pits occur. Numerous rounded pits are present on the carapace counterpart with a partially preserved cuticle (NMNH-G 8607/12).

Discussion and concluding remarks

The morphological description of *Xanthopsis bodracus* given above does not contradict its description presented by Makarenko (1956). However, he noted some morphological details that cannot be observed on the specimen NMNH-G 8607/11, although their reliability is not in doubt, as they are confirmed by the images (Makarenko,

1956: figs. 1–4). For example, Makarenko (1956: p. 75) reports that the carapace front is divided by four spines, of which the two outer ones form the inner orbital spines; three spines are present on each of the anterolateral margins (see Fig. 1).

The characteristic morphological features of *Xanthopsis bodracus* allow to place it to the genus *Harpactoxanthopsis* Via Boada, 1959 (type species: *Cancer quadrilobatus* Desmarest, 1822). The material described above, as well as the images of the type series of *Xanthopsis bodracus* given by Makarenko (1956), fully correspond to the diagnosis of this genus given by Schweitzer (2003: p. 1119), namely: “Carapace about 80 percent as long as wide, ovate; regions poorly defined; branchiocardiac groove usually well-defined along lateral margins of urogastric region. Front with four blunt spines including inner orbital spine; anterolateral margin convex, with five spines excluding outer orbital spine”.

According to Schweitzer et al. (2010), the genus *Harpactoxanthopsis* includes five species, *H. bittneri* (Lörenthey, 1898), *H. lutugini* (Likharev, 1917), *H. quadrilobatus* (Desmarest, 1822), *H. souverbei* (A. Milne-Edwards, 1862), and *H. villaltae* Via Boada, 1959. Of all these species, *H. lutugini* and *H. quadrilobatus* are the most morphologically similar to *Xanthopsis bodracus*.

No morphological differences were found between the crabs described by Makarenko (1956) and *H. quadrilobatus* described from other localities (e.g., Desmarest, 1822; A. Milne Edwards, 1862; Bittner, 1875; Lörenthey and Beurlen, 1929; Vía, 1969; Beschin et al., 1994; Hyžný, 2014; Gašparič et al., 2015). In Ukraine, *Harpactoxanthopsis quadrilobatus* previously was recorded by Chernyshev (1949) from the Kyiv Formation (late Lutetian–Bartonian) of the vicinity of the city of Kyiv. However, there are currently insufficient grounds to confidently synonymise *Xanthopsis bodracus* with *Harpactoxanthopsis quadrilobatus*, as the poorly preserved type material, of which only a part has been preserved, does not

Table 1. Palaeogene decapods of Crimea (modified after Dernov and Udovychenko, 2023, table 1).

Taxa	Age	References
<i>Coeloma vigil</i> Milne-Edwards, 1865	Rupelian	Ilyin, 2005
<i>Harpactoxanthopsis</i> sp.	Early Lutetian	This study
<i>Harpactoxanthopsis</i> cf. <i>lutugini</i> (Likharev, 1917)	Late Lutetian	Ilyin, 2005
	Ypresian	
<i>Harpactoxanthopsis lutugini</i> (Likharev, 1917)	Late Ypresian or early Lutetian	Levitsky, 1974
<i>Xanthopsis nodosa</i> McCoy, 1849	Early Ypresian	Ilyin, 2005
<i>Protocallianassa</i> sp.	Danian	Levitsky, 1974
<i>Arcticocarcinus</i> cf. <i>insignis</i> (Segerberg, 1900)	Early Danian	Dernov & Udovychenko, 2023

allow this. In view of this, *Xanthopsis bodracus* has been revised as *Harpactoxanthopsis* sp. Thus, taking into account the data obtained, the Palaeogene decapod assemblages of Crimea consist of five genera (Table 1). These records often have an unclear stratigraphic position and therefore it is difficult to analyse the stratigraphic distribution of taxa.

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