

Albunea turritellacola, a new sand crab (Anomura, Albuneidae) from the lower Miocene of southwest France

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Abstract

A new albuneid crab, *Albunea turritellacola*, collected from the sediment infill of a large-sized turritellid gastropod from the so-called ‘Falun de Léognan’ of early Miocene age, as exposed at Pas-de-Barreau (Martillac, département Gironde, southwest France), is described. It constitutes the eighth fossil member of the subfamily Albuneinae Stimpson, 1858, and the second species of Miocene age known to date. *Albunea turritellacola* sp. nov. appears to be closely related to *A. asymmetrica* (Müller, 1979) from the middle Miocene of Budapest (Hungary), and probably is part of the lineage which led to the extant *A. carabus* (Linnaeus, 1758).

Key words: Crustacea, Decapoda, Anomura, Albuneidae, Miocene, France, new species.

Introduction

The most comprehensive revision of both fossil and extant sand crabs of the families Albuneidae and Blepharipodidae is that of Boyko (2002). At the time, within the subfamily Albuneinae, that author considered thirty-one species (in six genera) to be valid, twenty-seven of these being extant forms. Fossil taxa listed by Boyko (2002) are *Albunea asymmetrica*, *A. cuisiana*, *A. hahnae* and *Italialbunea lutetiana*, from the Eocene and Miocene of South Carolina (USA) and Europe (see Table 1). Subsequently described taxa include the first Cretaceous albuneid record, from the upper Maastrichtian of the Netherlands (*Praealbunea rickorum*), as well as new species from the Eocene and Oligocene of northern Italy (*Paralbunea galantensis*, subsequently transferred to *Harryhausen* by Boyko, 2004b, and *Stemonopa prisca*) (see Table 1). Here we add the second Miocene member of the genus *Albunea* which appears to be closely related to the slightly younger *A. asymmetrica* from Budapest (Hungary), and part of the lineage leading to the extant *A. carabus*.

To denote the repositories of material referred to below, the following institutional abbreviations are used: MAB, Oertijdmuseum De Groene Poort, Boxtel, the Netherlands; MCZ, Museo Civico ‘G. Zannato’, Montecchio Maggiore, Italy; MGY, Természettudományi Múzeum, Föld- és Őslénytár, Budapest, Hungary; MSNV, Museo Civico di Storia Naturale di Venezia, Venice, Italy; USNM, National Museum of Natural History, Washington DC, USA.

Table 1. Fossil representatives of the subfamily Albuneinae known to date, arranged according to stratigraphic age and holotype data (compiled from Müller, 1979; Beschin & De Angeli, 1984; Blow & Manning, 1996; De Angeli, 1998; De Angeli & Beschin, 2001; De Angeli & Marangon, 2001, 2003a, b; Fraaije, 2002; Boyko, 2002, 2004b; De Angeli et al., 2005).

Late Cretaceous

Praealbunea rickorum Fraaije, 2002

upper Maastrichtian, Maastricht Formation, Nekum Member; Bemelen, southern Limburg, the Netherlands (MAB k.1031)

Eocene

Albunea cuisiana Beschin & De Angeli, 1984

middle Eocene (lower Lutetian), ‘Chiampo Inferiore Member’; Chiampo, northern Italy (MSNV 10439)

Albunea hahnae Blow & Manning, 1996

middle Eocene, Santee Limestone; Berkeley County, South Carolina, USA (USNM 484530)

Italialbunea lutetiana (Beschin & De Angeli, 1984)

middle Eocene (upper lower/middle Lutetian), ‘Chiampo Superiore Member’; Arzignano, Nogarole Vicentino and Alonte, northern Italy (MSNV 10440)

Stemonopa prisca De Angeli, Beschin & Checchi, 2005

middle Eocene (middle Lutetian), ‘Chiampo Superiore Member’; Arzignano, northern Italy (MCZ 2404)

Oligocene

Harryhausen galantensis (De Angeli & Marangon, 2001)

lower Oligocene, Belforte Monferrato Formation, Cassinelle Member; Galanti, northwest Italy (IG 286339)

Miocene

Albunea asymmetrica (Müller, 1979)

middle Miocene (‘Badenian’); Budapest, Hungary (MGY-2-1)

Albunea turritellacola sp. nov.

lower Miocene (Burdigalian), Falun de Léognan; Pas-de-Barreau, Martillac, France (MAB k.2451)

Systematic palaeontology

Order Decapoda Latreille, 1802
 Superfamily Hippoidea Latreille, 1825
 Family Albuneidae Stimpson, 1858
 Subfamily Albuneinae Stimpson, 1858
 Genus *Albunea* Weber, 1795
 (= *Mioranina* Müller, 1979)

Type species: Cancer symmysta Linnaeus, 1758, by subsequent designation of Holthuis (1956).

Albunea turritellacola sp. nov.

(Fig. 2; Pl. 1)

Diagnosis: Carapace longer than wide, covered with crenulated grooves. Anterior margin with about ten spines on either side of ocular sinus. Relatively large setal field with undulating posterior and curved anterior margins. Rostrum small. CG1 with separate postero-lateral, curved elements. CG2 absent. CG4 with six short curved medial elements between longer supralateral elements. CG 5 two short oblique elements. CG6 and 7 separate. CG8 present. Dactylus of pereopod I slender and strongly curved. Pereopod II dactylus with heel, produced and rounded.

Description: Carapace longer than wide (Fig. 2; Pl. 1, fig. G), almost flat on longitudinal axis, convex in transverse section. Rostrum small, triangular. Strongly receded smooth, concave orbital region. Anterior margin concave on either side of orbital region, becoming broadly convex laterally, covered with about ten more or less equal-sized spines directed anteriorly. Frontal carapace region smooth. Setal field broad posteriorly, narrowing

anteriorly; posterior lateral elements with relatively large setal areas and concave margins. Strongly crenulated CG1 running parallel to anterior margin of carapace. Mesogastric region smooth; CG2 absent; CG3 consisting of two lateral rows just posteriorly of separated, curved lateral elements of CG1 and running parallel to CG1; CG4 with six short medial elements between longer supralateral elements. Hepatic, cardiac and triangular epibranchial regions smooth. CG5 present as two small curved, posteriorly concave, elements medially between CG4 and CG6. Continuous, strongly crenulated CG6 medially convex posteriorly, and sloping out to convex lateral thirds. CG7 elements straight and slightly



Fig. 1. Map of France showing location of the Pas-de-Barreau outcrop, near Martillac (département Gironde, Aquitaine).

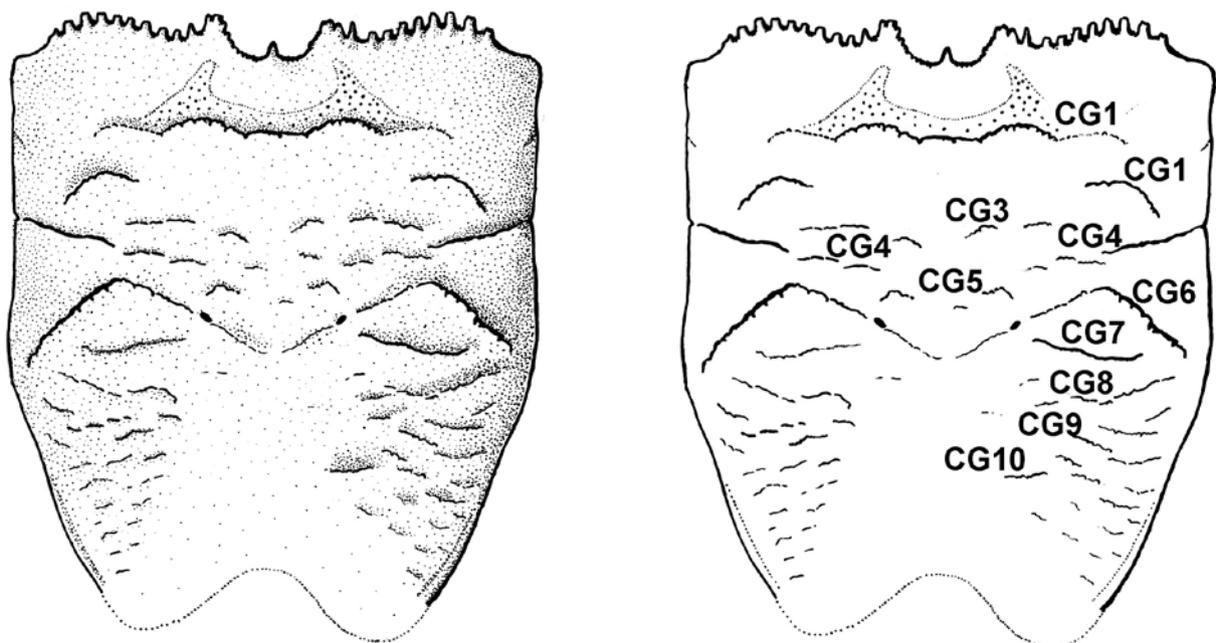


Fig. 2. Schematic drawing of carapace of *Albunea turritellacola* sp. nov. showing numbering of setose carapace grooves after Boyko (2002).

oblique, not reaching central or lateral margins of CG6. CG8, CG9 and CG10 present, running parallel to CG7 but only partially preserved. CG11 not preserved. Posterior branchial regions covered with numerous short, transverse rows of setae and surrounded by a lateral rim extending as high as CG6. Branchiostegite (Pl. 1, fig. E) densely and regularly covered by tubercles and with short, anterior submarginal, stout spine. Pereopod I (Pl. 1, figs. A–D) dactylus smooth, gently curved and tapering. Propodal lateral surface covered with numerous short transverse rows of setose rugae; dorsal margin unarmed, curved; ventral margin rimmed and distally produced into acute, dorsally curved spine; cutting edge lacking teeth and bordered with small setose area; symmetrical propodus-carpus joint ca. 135°. Pereopod II dactylus (Pl. 1, fig. F) lateral surface, except for a short transverse setose row on distal part of heel, smooth; posterior half from base to heel convex, anterior half concave, heel subcircular changing with narrow acute indent to acute tip, tip to base broadly convex. Cutting edge almost straight and bordered by single setal row.

Derivation of name: The trivial name alludes to the fact that the new species was found in the sediment fill of a large-sized turritellid gastropod.

Material: Holotype, and sole specimen known, is a near-complete carapace (MAB k. 2451) associated with disarticulated pereopod remains and portions of the ventral carapace, collected from the sediment fill of a turritellid gastropod (see ‘Occurrence’ below).

Remarks: The general arrangement of carapace grooves as well as the morphology of the carapace front and of pereopods of *A. turritellacola* sp. nov. indicate a close link to the *carabus* group of *Albunea* (sensu Boyko, 2002). Until now, this group comprised three extant species, *A. carabus*, *A. danai* Boyko, 1999 and *A. bulla* Boyko, 2002, and a single fossil representative, *A. asymmetrica* (Müller, 1979). The estimated maximum length/width ratios for these species are as follows:

<i>A. asymmetrica</i>	1.04
<i>A. danai</i>	1.09
<i>A. carabus</i>	1.10
<i>A. turritellacola</i>	1.15
<i>A. bulla</i>	1.17.

The carapace of *A. turritellacola* sp. nov. differs from that of *A. asymmetrica* in being considerably longer, in having a more sinuous CG1, a much less continuous CG4; in addition, carapace grooves CG6 and CG7 are separated, not fused. The new species can also be distinguished from *A. carabus* in being longer, in having a straighter CG1, strongly curved setal lateral elements; moreover, the distance between the lateral CG1 elements and CG4 is considerably greater and CG4 is less straight and continuous. It differs from *A. danai* and *A. bulla* in having a wider CG1 with smaller, more oblique posterior lateral elements, a more homogeneous spinose front and a more symmetric propodus-carpus

joint in pereopod I.

Occurrence: The holotype is from the sediment infill of a comparatively large-sized specimen of a turritellid gastropod, collected in 1985 by B.G. Roest from the so-called ‘Falun de Léognan’ as exposed in a small brook at Pas-de-Barreau near Martillac (sheet XV-37 Pessac, co-ordinates 369.250/271.250), in the département Gironde (Aquitaine, southwest France). Outcropping at that locality are sandy, bluish grey marls of Burdigalian (early Miocene) age; of note is a level with numerous large-sized turritellid gastropods, comprising at least two species. This appears to have a rather irregular distribution, being surrounded by barren clays (see Janssen, 1985, p. 93).

Discussion

Fossil albuneids are comparatively scant. In contrast to isolated occurrences of Eocene and late Pleistocene age in North America and the Caribbean, respectively (Morris, 1993; Blow & Manning, 1996; Schweitzer & Boyko, 2000; Donovan et al., 2003), there is a fairly solid record, especially of members of the Albuneinae, in western Europe with species of late Maastrichtian, Eocene, Oligocene and Miocene age having been documented (see Table 1). The only putative Asian record of an albuneid (lower Miocene of Taiwan; Hu & Tao, 1996) has subsequently been shown by Boyko (2004a) to have been based on material assignable to two species of raninid crabs.

The new species is of note in constituting only the second Miocene record of the genus *Albunea* and in view of its preservation within a turritellid gastropod from a sandy, shell-rich deposit. As far as other members of the *carabus* group (sensu Boyko, 2002) are concerned, *A. carabus* has been recorded from depths up to 40 metres, from Lebanon westwards throughout the Mediterranean and from the Azores and Madeira southwards to Dahomey (Boyko, 2002). Müller (1984, p. 62) noted that extant albuneids, similar to raninids, dig into various kinds of substrate, mainly sands, and that there was a striking grade of convergence between members of these families on account of the similarity between their modes of life. For *Albunea asymmetrica*, originally interpreted as a raninid (Müller, 1979; holotype is MGY-2-1), Müller (1984, p. 62, pl. 28, figs. 4–6) remarked that, in the type area, it apparently was restricted to sandy sediments, without too much shell debris or other coarser particules which could preclude easy burrowing, and absent from limestones.

Extant marine decapod crustaceans have developed highly diverse types of partnerships (Zann, 1980; Morton, 1989), many of which are based on protection for and/or transport of the decapod and on removal of host-parasites by that decapod. Numerous taxa, e.g. various species of shrimp and members of the crab genera *Charybdis* de Haan, 1833 and *Cancer* Linnaeus, 1758, have been reported hitchhiking within several types of jellyfish (Morton, 1989; Debelius, 1999). Decapods have even been observed hiding inside the cloaca of holothurians (R. H. B. Fraaije, pers. obs.); live

specimens are also frequently found inside molluscan shells. Well-known examples include pea crabs (genus *Pinnotheres* Bosc, 1802) within bivalve molluscs such as oysters and mussels, but also in lacqueid and cancellothyridid brachiopods (Feldmann et al., 1996; Tanaka et al., 1996). Shells of pinnid bivalves may serve as hosts to several genera of watchman shrimps (e.g. Morton, 1989). The use of empty nautiloid shells, presumably for hiding, by crabs has recently been noted from the upper Paleocene of northern Spain (Fraaije & Pennings, 2006), and similar instances of lobsters preserved within ammonite conchs are known from Jurassic and Cretaceous strata, mainly in Europe (Fraaye & Jäger, 1995). Hermit crabs (Paguroidea), of course, present the best-known example of occupancy of empty gastropod shells, for protection. From the fossil record a handful of records of paguroids preserved within gastropods of Late Cretaceous to Miocene age, and within Early Jurassic and Early Cretaceous ammonite shells are reported (Jagt et al., 2006).

The present example of *Albunea turritellacola* sp. nov. appears comparable to recent records of several species of small-sized crabs in the sediment fill of larger gastropods from the Pliocene of Belgium (van Bakel et al., 2004). In view of the fact that, although entirely disarticulated, almost all parts of the currently described crab (carapace and appendages) were present in the sediment infill, this was most likely a complete mould. Albuneids would prefer not to remain too long within a gastropod shell in view of their preferred burrowing mode of life, with a long respiratory funnel. A large, empty gastropod shell would seem to be the perfect place to safely moult for all kinds of comparatively small decapod crustaceans.

More data are needed to unravel the evolutionary history of the Albuneidae, the oldest record of which to date is from the uppermost Cretaceous of the Netherlands. In Europe, there is a distinct acme during the Eocene, and the best records are from northern Italy. As a final observation, we suggest measuring maximum carapace length (CL) of albuneid crabs between the midpoints of the anterior and concave posterior margins (compare Boyko & Harvey, 1999; Boyko, 2002). This is necessary in order to obtain a more realistic overall impression of carapace morphology and more reliable length/width ratios.

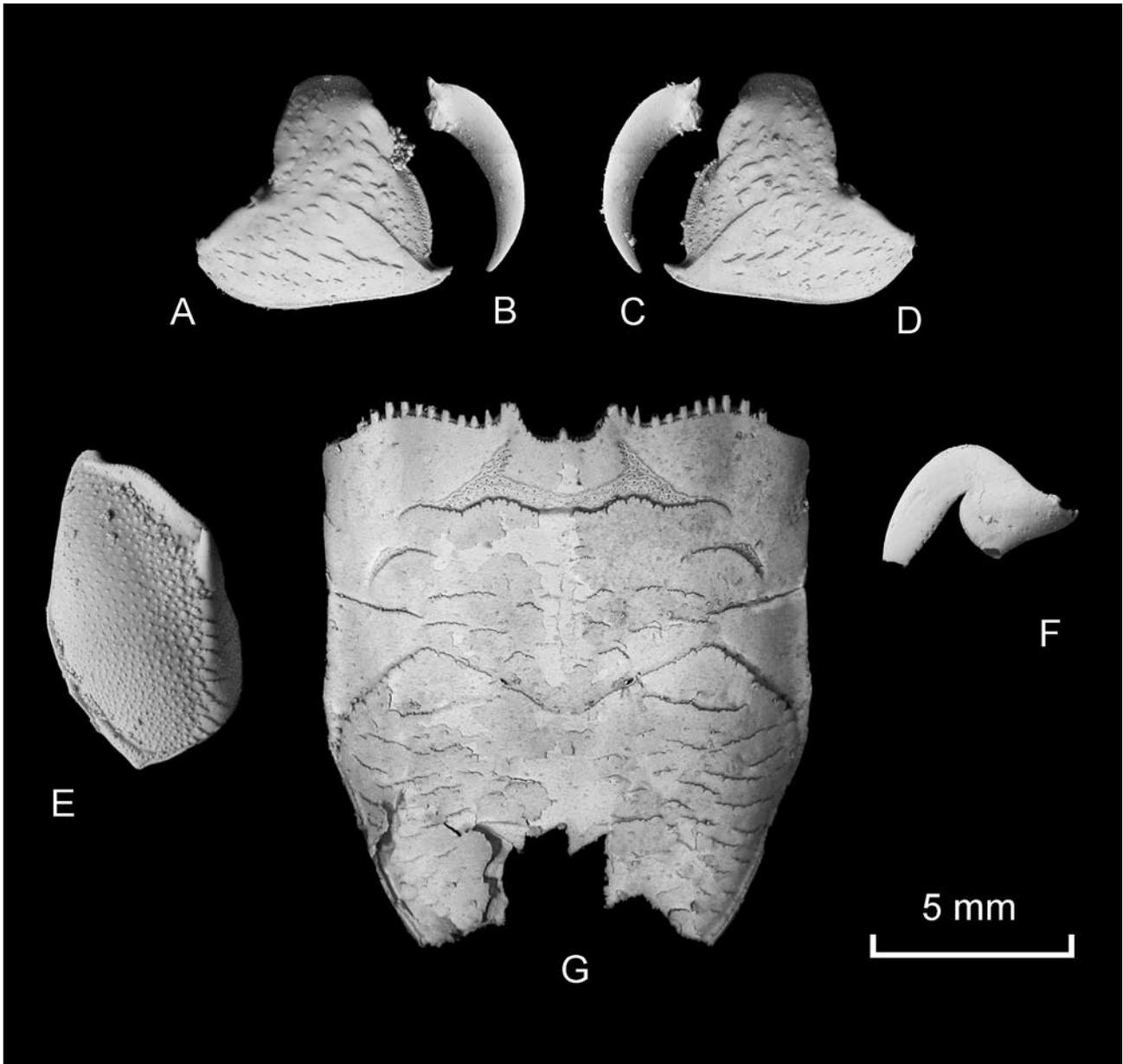
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Albunea turritellacola sp. nov., holotype (MAB k. 2451), from the lower Miocene Falun de L'éognan at Pas-de-Barreau, Martillac, southwest France. A, B. right chela and dactylus, in lateral view; C, D. left chela and dactylus, in lateral view; E. left branchiostegite; F. right pereopod II dactylus; G. carapace. Scale bar equals 5 mm.