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Additions to *Palaeocarpilius rugifer* Stoliczka from the Oligocene of Kutch, western India

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Abstract

Specimens of *Palaeocarpilius rugifer* Stoliczka, from the Oligocene of Kutch, northwest India, are reported and illustrated. The species has not been illustrated since its original publication in 1871. The specimens provide information on the range of size for this species, as well as morphologic details to complete the original description.

Key words: Crustacea, Carpiliidae, Oligocene, India

Introduction

Crabs of the genus *Palaeocarpilius* (A. Milne-Edwards, 1862) are a relatively common element of Eocene to Miocene assemblages around the world, but most particularly in Europe (Satsangi and Changkakoti, 1989; Portell, 2004; Beschin *et al*., 2005; De Angeli *et al*., 2007; Marangon and De Angeli, 2007; De Angeli and Beschin, 2008). Of the 14 species known for the genus (Schweitzer, 2003; Beschin and De Angeli, 2006), the type species, *P. macrocheilus* (Desmarest, 1822) is probably the best known and profusely illustrated of all the species of the genus (Beschin *et al*., 1996; Beschin *et al*., 2001; De Angeli and Beschin, 2001; Beschin *et al*., 2006). Since the original and very complete description of *Palaeocarpilius rugifer* Stoliczka, 1871, no other occurrences have been reported, except for a mention in Sastry and Mathur (1970), and in a more recent document on Miocene decapods from East India (Ralte *et al*., 2009), in which one of two specimens identified as *P. rugifer* is illustrated, with unclear features that related it to the species; if the identification is correct, the species would then have an Oligocene to Miocene stratigraphic range; however, the size of the figured specimen (about 4 × 4 cm, Ralte *et al*., 2009, p. 205) is rather small for the mean size of the species, which is rather large, and therefore the affinity of those specimens is questionable. As the final part of their remarks on *P. rugifer*, Ralte *et al*. (2009, p. 205) stated: "Though other characters could not be deciphered due to poor preservation, we feel that above similarities are enough to merge these specimens with that of Noetling's (1901). Hence, the specimens are assigned to *Palaeocarpilius rugifer* Stoliczka." This statement is somewhat confusing, as Noetling (1901) did not mention *P. rugifer* in his work.

In their list of fossil decapods from Paleogene and Neogene localities of southern Pakistan and western India, Schweitzer *et al*. (2004, table 1) omitted mention of *Palaeocarpilius rugifer*, and included *P. macrocheilus* as listed by Sastry and Mathur (1970), but these authors just mentioned *P. rugifer* instead.

The specimens here reported include the morphological details described by Stoliczka (1871), and some additional features that are commented on the discussion of the species.

Geological background and location of samples

The Kutch (also spelt Kachchh or Cutch) region of Gujarat, western India preserves one of the best developed, fossiliferous marine Tertiary sequences in the Indian subcontinent. The exposures occur in a crescentic belt above the Deccan Traps volcanics of and are about 900m thick (Biswas, 1992). Since the first detailed work by Wynne (1872), the Kutch Tertiary has attracted considerable attention because of the wealth of its fauna, both and macro. Important contributions on

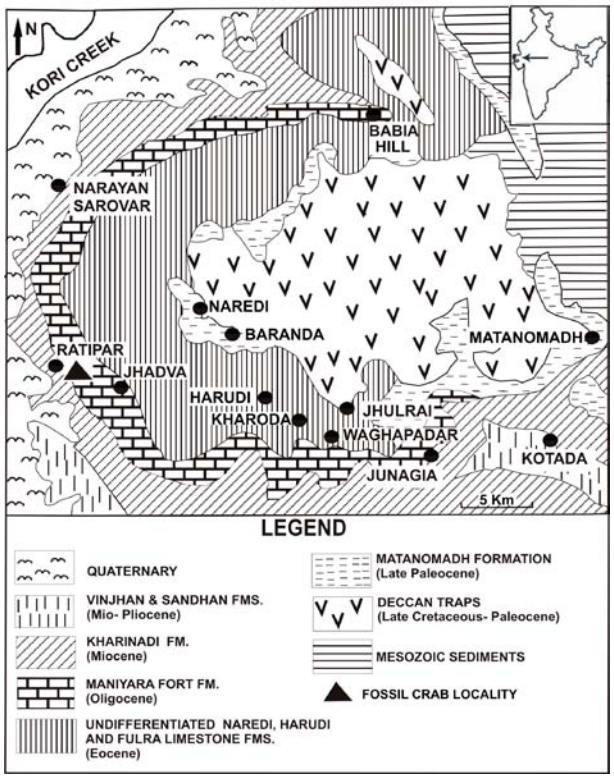

Fig. 1. Location map of fossiliferous outcrop near Ratipar, northeast India, with main lithostratigraphic units.

the geology and paleontology include those by Tewari (1857), Biswas and Raju (1973), Mohan and Soodan (1970), Raju (1974) and Biswas (1992). The last work provides a useful summary of the litho-, bio- and chronostratigraphy of the Kutch Tertiary succession.

This small collection of fossil crabs described in this paper was made by one of us (JKT) from a dry river bed in the Ratipar Reserved Forest near Sanghipuram Cement Plant, Abdasa Taluka, District Kutch (Fig. 1). The fossils apparently come from blocks eroded away from the Oligocene Maniyara Fort Formation which is extensively exposed in the area. This formation has been dated as Oligocene based on foraminifers including *Nummulites* and *Miogypsina* (Biswas, 1992). Preliminary investigations indicate that the larger benthic foraminifers present some of the crab-bearing blocks including *Nummulites* cf. *N. fichteli*, a characteristic taxon found in the Maniyara Fort Formation.

The specimens illustrated here are housed in the Paleontology Laboratory, Department of Earth Sciences, Indian Institute of Technology, Roorkee, India, under the acronym VPL/SB/KC.

Systematic Paleontology

Infraorder Brachyura Linnaeus, 1758

Section Eubrachyura Saint Laurent, 1980

Subsection Heterotremata Guinot, 1977

Superfamily Carpilioidea Ortmann, 1893

Family Carpiliidae Ortmann, 1893

Genus *Palaeocarpilius* A. Milne-Edwards, 1862

Type species: *Cancer macrocheilus* Desmarest, 1822, by subsequent designation (= *P. macrocheilus* var. *coronata* Bittner, 1886).

***Palaeocarpilius rugifer* Stoliczka, 1871**

(Pl. 1, Figs. 1–12)

Palaeocarpilius rugifer Stoliczka, 1871, p. 8–10, pl. IV, figs. 1–6, pl. V, figs. 1–5.

Description of material: Carapace of large size, subovate transversely, one-third wider than long, widest at lower third; dorsal surface covered by evenly-spaced, fine tubercles, transverse ridges on posterior third of carapace reach posterior tubercle of anterolateral margin, font deflected; anterior margin slightly curved, half the maximum carapace width, orbits circular, inclined 45° respect transversal axis, margin rimmed, outer orbital spine a strong tubercle; anterolateral margin curved, three-fourths the maximum carapace length, with seven strong rounded tubercles, the three anterior tubercles more rounded and less prominent, remainder tubercles become longer, most posterior tubercle being stronger and acute; posterolateral margin smooth, one-third the maximum carapace width, inclined 45° respect transversal axis; posterior margin slightly concave, one-fourth the maximum carapace width. Sternum subtriangular, sternite 3 short, subtriangular, suture between sternites 3 and 4 well defined; sternite 4 subrectangular, elongated, one fifth the maximum carapace length and one-fourth the maximum carapace width, condylus of cheliped coxa articulated on lower fourth of sternite; sternite 5 subsquare, one-fifth the length of sternite 4, condylus of second pereiopod articultated on anterolateral margin; sternite 3 inverted subtapezoidal, one-fifth te length of sternite 4, condylus of third pereiopod articulated on anterolateral margin; remainder sternites not seen. Male abdomen triangular, telson plus somites 6 and 5 nearly half the maximum carapace length; telson triangular, one-seventh the maximum carapace length, one-eight the maximum carapace width; somite 6 subrectangular elongated, nearly as long and wide as telson; somite 5 subtrapezoidal, slightly longer but twice the width of telson; somite 4 rectangular, narrow, one-third as long as somite 5; somite 3 similar to somite 4, slightly shorter; somite 2 rectangular, similar in size and shape to somite 3; somite 1 not seen. Female abdomen subovate elongated, telson plus somites 6 to 3 reach half the maximum carapace length, width is one-third the maximum carapace width; telson subtriangular, lateral margins broadly rounded, one fifth the maximum carapace length, one-sixth the maximum carapace width; somite 6 rectangular, slightly wider but shorter than telson; somite 5 rectangular, as wide as somite 6 but half its length; somite 4 similar to somite 5 but slightly shorter; somite 3 very similar in size and shape to somite 4; remainder somites not seen. Chelipeds robust, right cheliped stronger, more massive than left cheliped; coxae subrectangular, strong and acute condylus on proximal and distal articulations; merus subrectangular, robust, one-third maximum carapace width, wider at junction with carpus, with strong condylus; carpus robust, slightly curved, one-third the maximum carapace length, ventral margin with two tubercles; right propodus robust, subtriangular, twice its height at distal margin than at proximal margin, its length half the maximum carapace width, outer and inner surfaces smooth, dorsal margin bears at least three, evenly-spaced strong tubercles, ventral margin straight, rimmed at distal portion; fixed finger short, triangular;

movable finger curved, subtriangular, slightly longer than fixed finger; left propodus height two-thirds that of right propodus, subtriangular, dorsal margin with at least four, evenly-spaced tubercles, ventral margin rimmed at distal portion; fixed finger short, triangular; movable finger curved, subtriangular, slightly longer than fixed finger; only subovate coxae of remainder pereiopods were preserved.

Material and occurrence: Four nearly complete carapaces. Hypotypes VPL/SB/KC 1 to VPL/SB/KC 4. Oligocene Maniyara Fort Formation, Kutch, northwest India.

Measurements (*in mm*): Hypotypes VPL/SB/KC 1, carapace length = 55, width = 75; VPL/SB/KC 2, carapace length = 72, width = 85; VPL/SB/KC 3, carapace length = 59, width = 78; VPL/SB/KC 4, carapace length = 110, width = 200.

Discussion: The specimens from the Oligocene of Kutch are similar in shape and size to those reported by Stoliczka (1871). However, the diagnosis for the species indicate presence of eight tubercles on anterolateral margins, but in counting, Stoliczka included the outer orbital spine as one of the eight counted for the anterolateral margin, and therefore, the number of tubercles should be seven. The female abdomen illustrated by Stoliczka (1871, pl. IV, figs.1, 4) seems to be more slender than that observed in the female specimen of this report, in which the widest segment is abdominal segment 6, while in Stoliczka specimens, segments 4 and 3 are the widest of all. Comparison with female abdomen from other species, such as *P. aquitanicus* A. Milne Edwards, 1862 (see Beschin and De Angeli, 2006, tavola 2, fig. 1; tavola 3, fig. 3) reveals that the shape of the abdomen is more similar to the one observed in the specimen from Kutch. The male abdomen illustrated by Stoliczka (1871, pl. IV, fig. 5) is very similar to the one observed in our specimens, except for abdominal segment 5, which seems to be longer than on the original drawing of Stoliczka.

Satsangi nd Changkakoti (1989) described *Palaeocarpilius bispinosus*, based on a single, large specimen (length of carapace = 7.8 cm, width = 10.0 cm) from the Middle Eocene of Jaintia Hills, Meghalaya, East India. The original illustration of the holotype is not clear, and as the main feature in which the authors based erection of a new species was presence of only two tubercles on the anterolateral margins, it would be interesting to confirm if the specimen had only two tubercles indeed, or if the remainder tubercles are broken. A large male specimen of similar size is here reported (Figs. 10–12, hypotype VPL/SB/KC 4, carapace length = 110 mm, width = 200 mm). The morphological features of this large specimen indicate hat it should be classified as *P. rugifer*, as it has seven large tubercles on anterolateral margins and carapace shape as well as front is similar to the observed in the other specimens of this species.

Small differences between *P. rugifer* and *P. aquilinus* Collins and Morris, 1973 from the Middle Eocene of Lybia were discussed by Collins and Morris (1973, p. 290), but the species from Lybia is very similar to *P. rugifer*.

The present note was intended to contribute to the knowledge of a species which was originally described more than 100 years ago, with no other specimens reported in this lapse of time. First specimens of *Palaeocarpilius rugifer* were collected from several localities near our study area, some found transported on streams (Stoliczka, F. 1871; Wynne, 1872) in a region where rocks of the Maniyara Fort Formation of Oligocene age crop out. Foraminifers associated with the decapod specimens described in this note also suggest an Oligocene age for *Palaeocarpilius rugifer*.

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Plate 1

Figs. 1–11. *Palaeocarpilius rugifer* Stoliczka, 1871. 1, Dorsal view of male carapace, hypotype VPL/SB/KC 1; 2, Ventral view of carapace, same specimen; 3, Posterior view of carapace, same specimen; 4, Dorsal view of female carapace, hypotype VPL/SB/KC 2; 5, Ventral view of carapace same specimen; 6, Dorsal view of male carapace, hypotype VPL/SB/KC 3; 7, Ventral view of carapace, same specimen; 8, Detail of female abdomen, hypotype VPL/SB/KC 2; 9, Detail of male abdomen, hypotype VPL/SB/KC 3, A = abdominal segment, St = sternite, Te = telson; 10, Dorsal view of large male carapace, VPL/SB/KC 4; 11, Ventral view of carapace, same specimen; 12, Frontal view of carapace, same specimen. Scale bars = 1 cm.

Plate 1