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## First record of cirolanids (Crustacea, Isopoda, Cirolanidae) from the Middle Pliocene of Parma and Reggio Emilia Province (Emilia Romagna, N Italy)

**Abstract** – We report two new forms of cirolanid isopods ascribed to *Palaega* sp. and *P. steatopigia* n. sp. (Cirolanidae) from the Middle Pliocene of Campore (Salsomaggiore Terme, Parma) and Monticelli di Quattro Castella (Reggio Emilia), Emilia Romagna, N Italy. This is the first record of *Palaega* Woodward, 1870, reported from the Middle Pliocene of Emilia Romagna and in the paleo-Adriatic Gulf. *Palaega steatopigia* n. sp. represents the third species described in Italy and in the Mediterranean area.

**Key words:** Crustacea, Isopoda, Cirolanidae, Pliocene, Italy.

**Riassunto** – Prima segnalazione di cirolanidi (Crustacea, Isopoda, Cirolanidae) nel Pliocene medio delle Province di Parma e Reggio Emilia (Emilia Romagna, Italia settentrionale). Sono descritte due nuove forme di isopodi cirolanidi attribuite a *Palaega* sp. e *P. steatopigia* n. sp. (Cirolanidae) del Pliocene medio di Campore (Salsomaggiore Terme, Parma) e Monticelli di Quattro Castella (Reggio Emilia), Emilia Romagna, Italia settentrionale. Si tratta della prima segnalazione di *Palaega* Woodward, 1870 nel Pliocene inferiore dell'Emilia Romagna e nel golfo paleo-Adriatico. *Palaega steatopigia* n. sp. rappresenta la terza specie descritta in Italia e nell'area Mediterranea.

**Parole chiave:** Crustacea, Isopoda, Cirolanidae, Pliocene, Italia.

### Introduction

Previous reports of fossil isopods from the Pliocene of Italy are very scarce, limited to two species from Toscana (Central Italy). Ristori (1891) described briefly a single posterior mould of a cirolanid isopod ascribed to *Palaega sismondai* Ristori, 1891, from the Pliocene clays of Mucigliani, Siena (Toscana); recently Pasini & Garassino (2011) reported two specimens ascribed to *Palaega pisana* Pasini & Garassino, 2011, from the Early Pliocene of Orciano Pisano, Siena (Toscana).

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The studied specimens have been ascribed to *Palaega* sp. and *P. steatopigia* n. sp. They represent the first cirolanid isopods from the Pliocene of the paleo-Adriatic gulf and *P. steatopigia* n. sp. is the third species of the genus described in the Mediterranean Basin, increasing the knowledge on presence and distribution of the genus.

### Geological setting

The studied specimens were discovered in Campore (Salsomaggiore Terme, Parma) and Monticelli di Quattro Castella (Reggio Emilia), both located in the Emilia Romagna Region, northern Italy.

Campore is located a few kilometers north of Salsomaggiore Terme (Parma), where clayey beds crop out (Bertolaso & Garilli, 2009). Here a quarry exposes in the Middle Pliocene (Piacentian) clays known for the rich lower circalittoral to epibathyal molluscan fauna (Ceregato *et al.*, 2007). Dolphin remains were also discovered in this deep marine assemblage (Biancucci, 1997). Moreover, Garassino & De Angeli (2004) reported the brachyurans *Lobocarcinus sismondae* (Meyer, 1843) and *Carcinus* sp. from the same quarry; Pasini & Garassino (2010) reported also an *in situ* paguroid hermit crab ascribed to the Diogenidae Ortmann, 1892.

Monticelli di Quattro Castella, close to Reggio Emilia, is located among the last hills of the Appennino mountains toward the Pianura Padana. The specimen MSNM i27548 comes from a little block of blue clay detached by natural erosion along a gully located in front of an old disused quarry (Cava Moja). Lacking detailed stratigraphic data for this locality, the only geo-paleontological reports useful are those related to the studied section of the nearby Cava Moja (Marasti & Raffi, 1977; Monegatti & Raffi, 2001: Fig. 1), where the malacofaunal assemblage includes also forms of deep water referred to the Middle Pliocene (Piacentian) (Bertolaso pers. comm., 2009). On the basis of these data we ascribe the studied specimens to the Piacentian (Middle Pliocene).

### Material

Two incomplete specimens consisting of three-dimensional posterior moulds, preserved dorso-ventrally in two little blocks of blue clay; the specimen MSNM i27548 is in part and counterpart. The specimens are housed in the Paleontological Collections of the Museo di Storia Naturale di Milano (MSNM).

The specimens are fixed with a film of polyvinyl acetate for study and preservation. The systematic arrangement used in this paper follows the classification proposed by Brandt and Poore (2003).

### Systematic Palaeontology

Order Isopoda Latreille, 1817  
Suborder Cymothoida Wägele, 1989  
Family Cirolanidae Dana, 1852  
Genus *Palaega* Woodward, 1870

**Type species:** *Palaega carteri* Woodward, 1870, by original designation.

**Fossil species:** for an updated list see Feldmann & Goolaerts (2005), Feldmann & Rust (2006) and Poltz *et al.* (2006).

**Discussion.** The attribution of fossil isopods to the different families and genera is very difficult or impossible when based only on incomplete parts. Among fossil isopods, *Palaega* Woodward, 1870, is still subject of discussion (Feldmann & Goolaert, 2005; Poltz *et al.*, 2006). Since the studied specimens have apparent affinities with Cirolanidae and strictly with *Palaega* Woodward, 1870 (Feldmann pers. comm., 2010), we assign them confidently to this genus. The Pliocene species reported to date include *P. kakathai*, Feldmann & Rust, 2006, from New Zealand; *P. pisana* Pasini & Garassino, 2011, and *P. sismondai* Ristori, 1891, from Italy.

Moreover we point out that also *Bathynomus* sp. aff. *B. doderleini* Ortman, 1894, from the Late Pliocene of W Japan, reported by Karasawa (1997: figs. 4-6, Pl. 3) and the unnamed and poorly preserved *Bathynomus* sp., reported by Karasawa & Nobuhara (2007: 27, figs. 3, 10-12) from the Pliocene of Japan, would be ascribed to *Palaega* on the basis of the diagnostic characters of the genus as it is now constituted (Feldmann & Goolaerts, 2005).

*Palaega* sp.

Fig. 1

**Geological age:** Piacentian (Middle Pliocene).

**Locality:** Campore (Parma, Reggio Emilia, N Italy).

**Occurrence and measurements:** one specimen, crushed and poorly preserved. MSNM i27547 – length: 52 mm; width: 41 mm, at pleonite 3

**Description.** Medium sized body for genus, subrectangular, dorsally convex in transverse section. Pereonite 6 and 7 partially preserved but incomplete and crushed (about 8 mm in length), fragmentary, disarticulate pereonite 5 (or part of 6) is also present. Five pleonites preserved well exposed on the right lateral margin, pleonites 1-5 apparently equals in width, smaller in length (4.5 mm) than pereonites, ranged sub-parallel to one another enough straight medially, becoming convex on pleura. Epimeres long, not distinctly separate from the pleura and terminating as long spines directed slightly laterally, pointed posteriorly, slightly divergent to the axis. Epimeres 1-4 covered laterally one to another. Pleonite 5 partially covered distally, shorter in length than others with shorter lateral spine. Left epimeres of pleonites 3-5 preserved only as a cast, bearing a costa along all distal anterior margin. Pleotelson poorly preserved compressed and incomplete, lacking the posterior border; probably broader than long (width about 30 mm), moderately convex in section with an expanded inflated central bulge; medial ridge not observable or absent. The right uropod, broken distally, partially exposed. Surface of cuticle, where preserved, ornamented by some transversely irregular, corrugated wrinkles more evident laterally, alternating with small, smooth pustulate, distinct pits.

**Discussion.** Due to the incomplete preservation of the specimen, lacking some important diagnostic character of the pleotelson which is poorly preserved, we do not make any specific assignment, limiting the observations to the most distinctive characters of the new specimen and comparison with the type species and the others species from the Pliocene.

*Palaega* sp. differs from *P. carteri* in having more elongate epimeres sub-parallel to the median axis of the body, in lacking the transverse line dividing the pleonites in two parts; the medial ridge on the pleotelson and the raised plicae along the lateral border.



Fig. 1 - *Palaega* sp., MSNM i27547 (x 2.2).

*Palaega* sp. differs from *P. sismondai* in the pleonites not being short than peronites and in lacking the lateral spines and the medial ridge on the pleotelson.

*Palaega* sp. differs from *P. pisana* in having more elongate and pointed epimeres overlapped one to another, slightly divergent to the medial axis of the body; different ornamentation on the epicuticle; lacking the medial ridge on the pleotelson and the raised plicae along the lateral border.

*Palaega* sp. differs from *P. steatopigia* n. sp. (see below in this paper) in lacking the transverse line dividing the peronites into two parts, in the longer pointed epimeres directed slightly divergent to the axis of the body; lacking the transverse line dividing the peronites into two parts; the medial ridge on the pleotelson; the raised plicae along the lateral border and in the different ornamentation.

Finally, *Palaega* sp. differs from *P. kakatahi* in having a more convex body, shorter spines on the pleonites, slightly divergent to the median axis; and lacking the medial ridge on pleotelson.

*Palaega steatopigia* n. sp.

Fig. 2

**Diagnosis:** Pereonites divided in two parts by a transverse midline ending as robust, short triangular spines directed laterally and pointed toward posterior part. Pleonites more compressed with triangular robust spines pointed laterally, pleonite 1 and 5 slightly compressed and shorter; posterior margin of pleonites straight medially, with two small convex lateral shoulders at the link with the pleurae. Pleotelson vaulted in transverse section; broad, subtrapezoidal to rounded; semicircular large central bulge; smooth complete medial ridge; plicae along the lateral border.

**Etymology:** the trivial name alludes to the notably inflated, convex and rounded form of the central bulge of the pleotelson, alluding to the steatopygian condition in humans.

**Holotype:** MSNM i27548.

**Geological age:** Piacentian (Middle Pliocene).

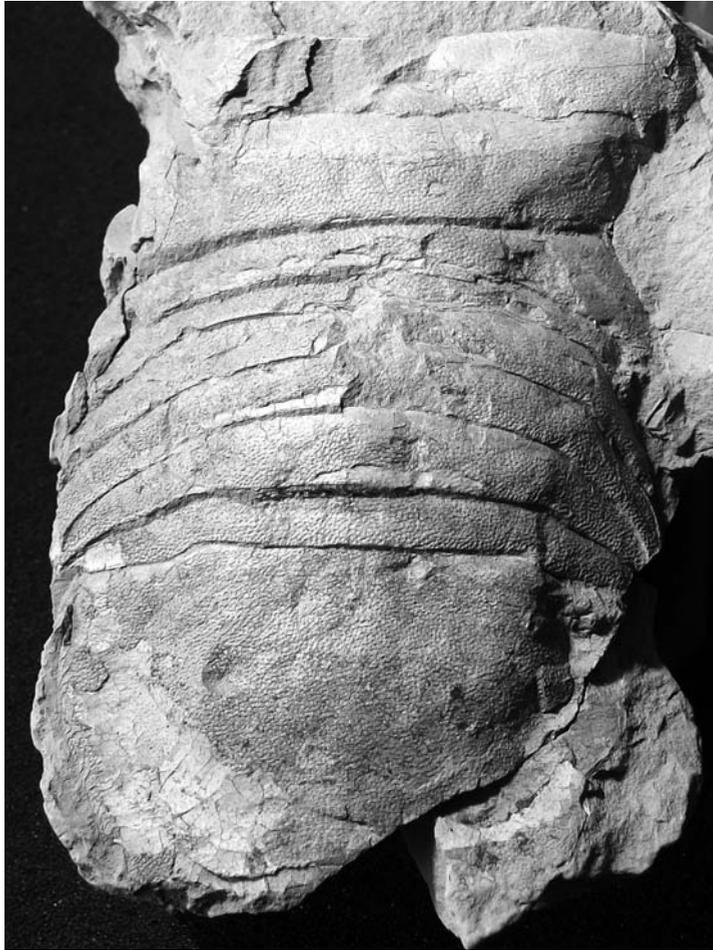


Fig. 2 - *Palaega steatopigia* n. sp. Holotype/Olotipo, MSNM i27548 (x 1.2).

**Type locality:** Monticelli di Quattro Castella (Reggio Emilia, Emilia Romagna, N Italy).

**Occurrence and measurements:** one specimen in part and counterpart.

MSNM i27548 – length: 90 mm; width: 65 mm

**Description.** Large sized body, subrectangular, convex in transverse section. Pereonite 5-7 preserved (length: 7.2 mm) and articulated, a transverse midline divides the pereonites in two nearly equal parts with anterior part more or less smooth. Pleonites 2-4 articulated, similar in size (length: 6 mm; width: 6.5 mm) exposed dorsally; pleonite 1 less wide than others; pleonites 1 and 5 more compressed (length: 5 mm) and slightly shorter, sub-parallel to one another, posterior margin straight medially but with two lateral, small convex shoulders at the link with epimeres, more marked on pleonites 4 and 5. Epimeres not distinctly separated from the pleurae, ending as a robust triangular medium sized lateral spine curved backward. Pleotelson incomplete, broken on the distal margin where the basis of a possible broken lateral spine parallel to the axis is present. Subtrapezoidal outline, broad, with a large central semicircular bulge convex in section; smooth complete median ridge. Distinct raised plicae along the lateral margin. Dense pustulate and regular ornamentation on the epicuticle, well preserved along all the body.

**Discussion.** Even though the specimen lacks the posterior central distal part of the pleotelson and we are unable to establish if the margin was originally adorned by one or more spines, *Palaega steatopigia* n. sp. differs in important diagnostic characters from the others species from the Pliocene, justifying its specific assignment.

*Palaega steatopigia* n. sp. differs from *P. sismondai* in having shorter, robust epimeres on pleonites, pereonites not distinctly larger than pleonites; complete flattened ridge on the pleotelson; lacking the lateral spines on the pleotelson.

*Palaega steatopigia* n. sp. differs from *P. pisana* in having shorter robust epimeres not overlapped one another and in lacking a distal medial ridge; different posterior arrangement of the pleonites, as well as differences in ornamentation on the epicuticle, and in having the raised plicae along the lateral border of the pleotelson.

*Palaega steatopigia* n. sp. differs from *P. kakatahi* in length and form of pleonites and in having a larger, broad pleotelson with raised plicae along the lateral border.

*Palaega steatopigia* n. sp. shows some affinities with the type species *P. carteri* from the Cretaceous of England, differing in size, having a more convex enlarged body; bearing an arrangement of the more laterally pointed pleurae of the pleonites; having serrate regular ornamentation and flattened central ridge on pleotelson.

*Palaega steatopigia* differs from *P. sp.* for the characters reported page 95.

Finally, we note that for the general external characters (form of pereonites and pleonites, lateral border of the pleotelson, ornamentation of the body), *P. steatopigia* n. sp. is very similar also with the extant cirrolanid *Bathynomus doderleini* Ortmann, 1894, living in deep waters of the Indo-Pacific Ocean (Fig. 3).

### **Paleoecology and environment**

Pasini & Garassino (2011) pointed out that the specimens of the Pliocene of Toscana have been discovered in deposits of deep water (Ceregato *et al.*, 2007) including marine mammals, as whales and dolphins (Bianucci & Landini, 2005), suggesting, in speculative way, a “whale fall community” in the outcrops as a favourable food-environment for scavenging isopods. This opportunistic association is strengthened by the similar epibathyal assemblage from Campore (Parma), where dolphin remains were discovered (Bianucci, 1997) even though the exact stratigraphic

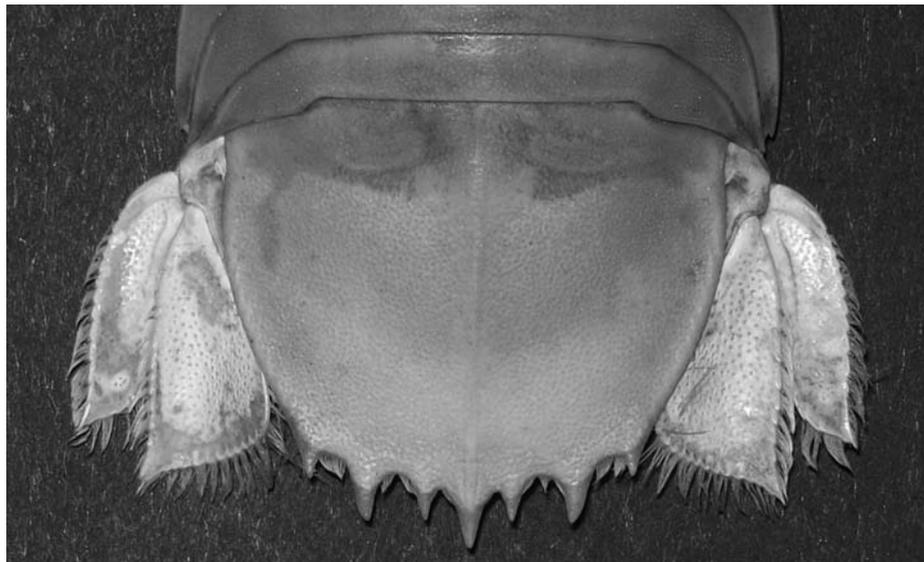


Fig. 3 - *Bathynomus doderleini* Ortmann, 1894. Detail of pleotelson. / Dettaglio del pleotelson (x 2).

position in the depositional sequence of *Palaega* sp. is uncertain. Instead no marine mammals have been reported from Monticelli di Quattro Castella (Reggio Emilia), because it is too poorly known and investigated (Bertolaso pers. comm., 2009).

The four species described from the Pliocene seem to indicate the presence of two different morphotypes; one characterized by slender more elongate pointed epimeres on pleonites (*Palaega sismondai*, *P. kakatahi*, *P. sp.*) and a second having shorter, more robust ones reported to date only for the Mediterranean area (*P. pisana* and *P. steatopigia* n. sp.).

This morphological evidence may be due to different stages of growth of individuals, to sexual dimorphism (well known in extant isopods), or to a different ecological environment and style of life. We prefer this last possibility, waiting for more complete paleontological evidences and new useful data.

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