

Alessandro Garassino*, Giovanni Pasini** & Federico Marini***

Bathypiuma pliocenica n. sp.
(Decapoda, Brachyura, Retroplumidae)
from the Zanclean (Early Pliocene)
of Volterra (Pisa, Toscana, Italy)

Abstract - We report *Bathypiuma pliocenica* n. sp. (Retroplumidae Gill, 1894), discovered from the Zanclean (Early Pliocene) clays near Volterra (Pisa, Toscana, Central Italy). This discovery is very important because it is the first report of *Bathypiuma* in the worldwide fossil record, enlarging the knowledge on its distribution and antedating the presence of the genus, known only from the Indo-Pacific area, to the Early Pliocene of the paleo-Mediterranean basin.

Key words: Crustacea, Decapoda, Retroplumidae, Early Pliocene, Italy.

Riassunto - *Bathypiuma pliocenica* n. sp. (Decapoda, Brachyura, Retroplumidae) dello Zancleano (Pliocene inferiore) di Volterra (Pisa, Toscana, Italia).

Viene segnalata *Bathypiuma pliocenica* n. sp. (Retroplumidae Gill, 1894) rinvenuta nelle argille plioceniche nei pressi di Volterra (Pisa, Toscana, Italia centrale). Questo ritrovamento è di grande importanza in quanto costituisce la prima segnalazione di *Bathypiuma* nel record fossile mondiale, ampliando notevolmente le conoscenze sulla sua distribuzione areale e retrodatando la presenza del genere, attualmente presente solo nell'area Indo-Ovest Pacifica, sino al Pliocene inferiore del bacino paleo-Mediterraneo.

Parole chiave: Crustacea, Decapoda, Retroplumidae, Pliocene inferiore, Italia.

Introduction and geological setting

The fossil representatives of Retroplumidae are usually uncommon in the Pliocene of Italy. Indeed the only record is limited to the single species *Retropluma craverii* (Crema, 1895), reported from Piemonte and Emilia Romagna (N Italy) (Crema, 1895; De Angeli *et al.*, 2011), although some complete specimens assi-

* Museo di Storia Naturale, Corso Venezia 55, I-20121 Milano, Italy;
e-mail: alessandro.garassino@comune.milano.it; alegarassino@gmail.com

** Via Alessandro Volta 16, I-22070 Appiano Gentile (Como), Italy;
e-mail: juanaldopasini@tiscali.it

*** Dipartimento di Scienze della Terra, Università di Firenze, Via La Pira 4, I-50121 Firenze, Italy;
e-mail: federico.marini.87@gmail.com

gned to this species have been also reported from Toscana (Garassino & Pasini, work in progress). The studied specimen has been discovered along the “strada Provinciale Monte Volterrano”, around 5 km west of Volterra (Pisa) in the nearby of Podere dell’Infrascato, where crop out the Pliocene fossiliferous clays and silty-marly clays (Marini, pers. com., 2011) (Fig. 1). The clays enveloping the studied specimen are referred to the central part of the “Argille azzurre Formation”, forming the basis of the Pliocene succession in the distal areas of Volterra basin. These clays have a palaeontological assemblage reflecting an environment of outer shelf (Bossio *et al.*, 1993). Indeed they are located in the distal areas of the basin in conformable contact with the underlying sediment of the upper Messinian (Upper Miocene) of sea-lagoon environment, testifying a fast deepening of the sedimentation environment due to the post-evaporitic marine transgression (Martini & Sagri, 1993). This event is linked on a mediterranean scale to the re-opening of the Straits of Gibraltar (Hsu *et al.*, 1973) and on a local scale to the reactivation of the distensive post-orogenic tectonics. In the other areas of the basin instead, these clays overlay Poggio Riparossa calcarenites and Ugnano conglomerates (see Sheet 285 Volterra of CARG Regional Project) of Pliocene age. The San Cipriano silty clays (Fig. 2), Pliocene in age, are present at the top of the “Argille azzurre Formation”. Sarti & Testa (1994) reported that the lower part of the “Argille azzurre Formation” is referable to the *Sphaeroidinellopsis seminulina* Zone, of the Zanclean time interval (Lower Pliocene).

The upper part of the unit is instead referable to the *Globorotalia puncticulata* Zone, while the overlying San Cipriano silty clays are referable to the Upper Pliocene *Globorotalia aemiliana* Zone (Giannelli *et al.*, 1981). The clays including the studied specimen are so Zanclean in age [LO (= last occurrence) of *Globorotalia puncticulata* in mediterranean area is at 3.38 Ma, according to Sprovieri, 1992].



Fig. 1 - The fossiliferous locality of Podere dell’Infrascato close to Volterra (Toscana). / La località fossilifera del Podere dell’Infrascato in prossimità di Volterra (Toscana).

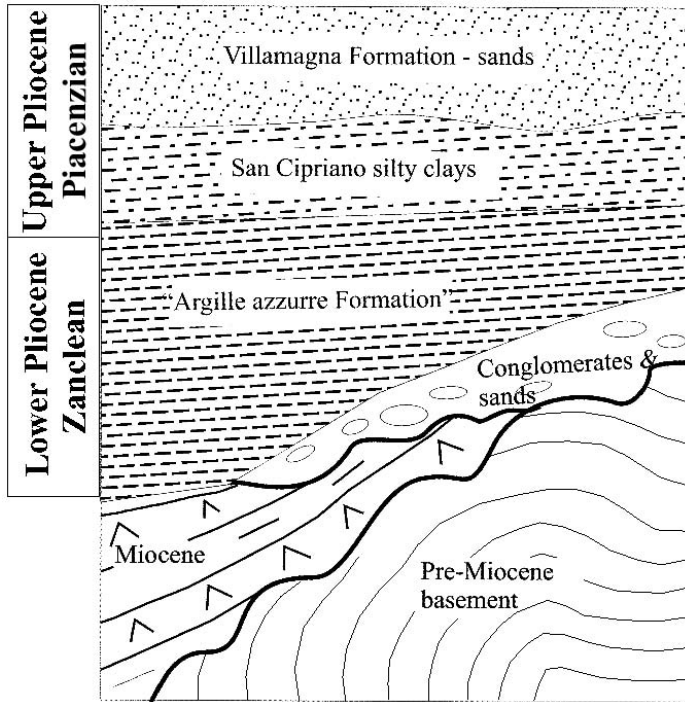


Fig. 2 - Lithostratigraphic sketch of Volterra basin/schema litostratigrafico del bacino di Volterra.

As far as the sedimentation environment, according to Bossio *et al.* (1991, 1993), the pelitic sediments of the *G. puncticulata* Zone in the close neogenic basins of Casciana Terme and Pomarance are referable respectively to an upper epibathyal depth and to the lower part of the outer neritic zone. Many fragments of retroplumids (probably belonging to *Retropluma craverii*), indeterminate brachyurans remains, irregular sea urchins, disarticulated bivalves and fish remains (otoliths, teeth, and isolated scales) have also been discovered in the outcrop.

Material

One complete carapace three-dimensionally preserved in a block of grey clay. The studied specimen, assigned to *Bathypiuma pliocenica* n. sp. (Retroplumidae Gill, 1894), is housed in the Palaeontological Collections of the Museo di Storia Naturale di Milano (MSNM).

For higher-level classification, we follow the recent arrangements proposed by Ng *et al.* (2008).

Abbreviations

l_{exp}: length of the carapace

l_r: length of the rostrum

w_{exp}: width of the carapace

Systematic Palaeontology

Infraorder Brachyura Linnaeus, 1758
 Section Eubrachyura de Saint Laurent, 1980
 Superfamily Retroplumoidea Gill, 1894
 Family Retroplumidae Gill, 1894
 Genus *Bathypluma* de Saint Laurent, 1989

Type species: *Bathypluma spinifer* de Saint Laurent, 1989, by original designation.

Included fossil species: *Bathypluma pliocenica* n. sp. (this work).

Bathypluma pliocenica n. sp.
 Figs. 3, 4

Diagnosis: subrectangular carapace; orbitofrontal margin notably broad; wide orbits; elongate, narrow, spatulate rostrum; straight transverse anterior and posterior uninterrupted, narrow ridges, crossing entire carapace surface; median transverse ridge absent; short supraorbital spine dividing orbitofrontal margin into two sinuses, different in size; elongate frontolateral spine; elongate anterolateral spine, delimiting straight anterolateral margin; posterolateral margin with one short, median spine; raised urogastric region; shallow cervical and branchiocardiac grooves, delimiting raised epibranchial and mesobranchial regions; flattened meta-branchial, cardiac, and intestinal regions.

Etymology: the trivial name alludes to the Pliocene, geological age of the studied specimen.

Holotype: MSNM i27769.

Geological age: Zanclean (Early Pliocene).

Type locality: Volterra (Pisa, Toscana, central Italy).

Material and measurements: one nearly complete carapace in dorsal view, three-dimensionally preserved [MSNM i27769 - lcxp (excluding rostrum): 15 mm; wcxp: 18 mm; lr: 3 mm].

Description. Subrectangular carapace, slightly wider than long (length/width ratio *ca.* 0.8), with lateral, posterior margins gently arched; broad orbitofrontal margin; orbital margin divided in two sinuses, different in size, by a short forwardly directed supraorbital spine; orbitofrontal margin ending with elongate forwardly directed frontolateral spine; front protruded anteriorly, restricted at base, enlarging slightly in spatulate rostrum; short, straight anterolateral margin with elongate outwardly directed anterolateral spine; posterolateral margin gently arched, with outwardly directed short, median spine; posterior margin gently arched, wider than orbitofrontal margin; dorsal regions weakly defined; dorsal surface transversely ridged; straight, uninterrupted transverse anterior, posterior ridges, crossing entire carapace surface; median ridge absent; posterior ridge not divided by shallow branchiocardiac groove; gastric pits visible as short, convergent slits; wide urogastric region gently inflated, marked only by subtle depressions; large cardiac region, entirely crossed by median portion of posterior ridge; suboval intestinal region slightly inflated, extending toward posterior margin; epibranchial, mesobranchial regions distinctly inflated; shallow cervical, branchiocardiac grooves, delimiting

inflated epibranchial, mesobranchial regions; flat metabranchial region; dorsal surface covered with delicate, small granules uniformly distributed.

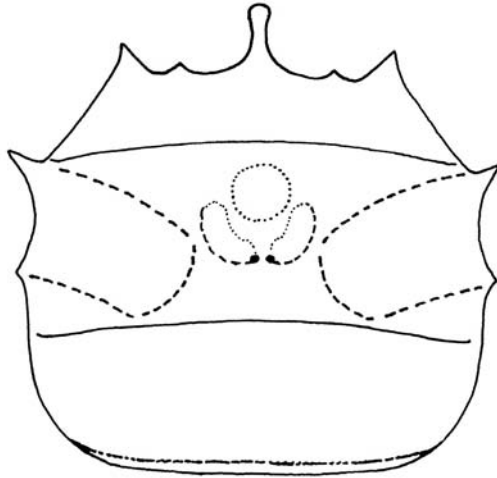


Fig. 3 - *Bathypluma pliocenica* n. sp., carapace, line drawing/disegno al tratto.

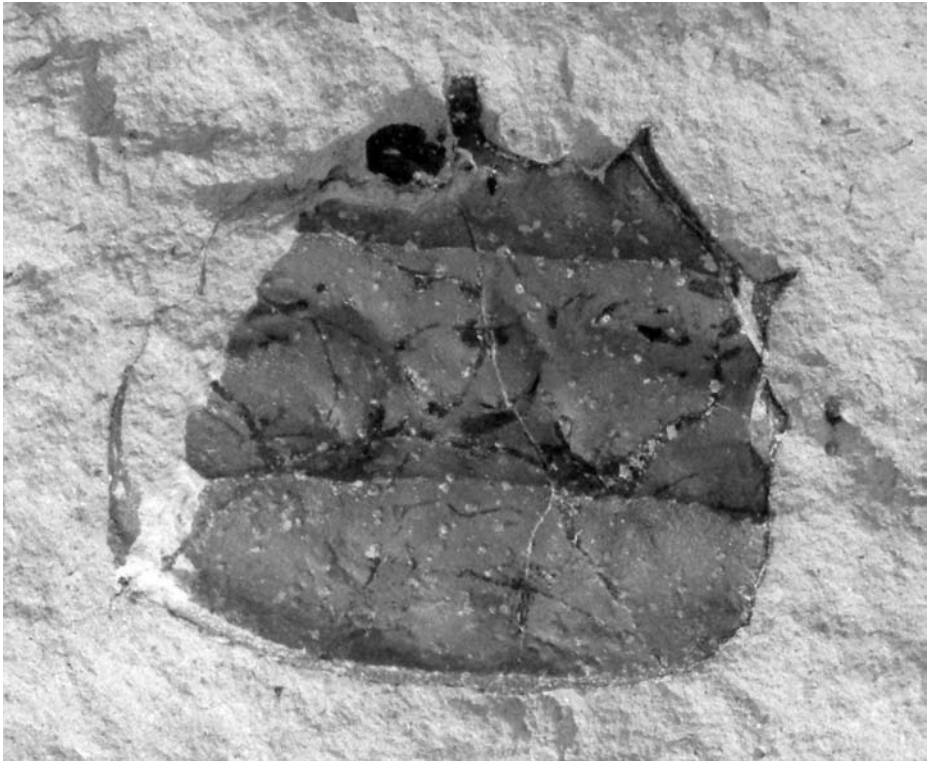


Fig. 4 - *Bathypluma pliocenica* n. sp., MSNM i27769 (x 5.5).

Discussion. De Saint Laurent (1989) erected the new extant *Bathypiuma* de Saint Laurent, 1989, differing from the extant and fossil *Retropluma* Gill, 1894, because *Bathypiuma* has one well-developed supraorbital spine, dividing the orbitofrontal margin in two sinuses; one elongate frontolateral spine well developed, delimiting the broad orbit; one elongate anterolateral spine; one elongate lateral spine; median ridge absent. The studied specimen reflects these characters, permitting its assignment to *Bathypiuma*. Indeed, as reported by Schweitzer *et al.* (2010) the seven fossil genera known to date have usually three transverse ridges, dorsal regions of carapace more inflated, orbitofrontal margin without supraorbital spine, and anterolateral and posterolateral margins without spines.

Bathypiuma pliocenica n. sp. represents the first report in the fossil record of this genus, extending the stratigraphic range for the genus back to the Pliocene. Indeed, as reported by McLay (2006) and Ng *et al.* (2008), *Bathypiuma* includes exclusively three extant species, *B. chuni* (Doflein, 1904) (= *Retropluma dentata* MacGilchrist, 1905) from the Indian Ocean; *B. forficula* de Saint Laurent, 1989, from Indonesia; and *B. spinifer* de Saint Laurent, 1989, from the Philippines Islands, between 300 m and 614 m depth. The new species doesn't show close morphological affinities with the Indo-WPacifc species based upon temporal and geographical differences, but specially for the shape of the supraorbital and posterolateral spines less developed than those of the extant species.

De Saint Laurent (1989) remarked that the presence of *Retropluma craverii* (Crema, 1895) from the Pliocene of northern Italy poses a paleo-biostratigraphic problem in the reconstruction of the fossil distribution of Retroplumidae (de Saint Laurent, 1989: 150). Later MacLay (2006) re-discussed the fossil retroplumids and their distribution based upon new fossil species from Americas, Africa, and Europe, pointing out that “the picture for *Bathypiuma* remains unchanged as it has no known fossil species”. The first fossil record of *Bathypiuma*, restricted to the Indo-WPacifc area, points out the need of a revalue of the palaeontological history and distribution of Retroplumidae in the paleo-Mediterranean basin. Moreover, we point out that the studied specimen has been discovered in sediments of deep water, the same environment of the extant species, attesting that this behaviour persists for this genus since the Early Pliocene.

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