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Preliminary note: alpheid shrimp (Decapoda, Caridea, Alpheididae) snapping claw fingertips from the early Pliocene of Tuscany (central Italy)

GIOVANNI PASINI & ALESSANDRO GARASSINO

Abstract

We briefly report fossil small-sized major chelae of alpheid snapping shrimps from the early Pliocene of Tuscany (central Italy). The studied specimens have been compared with the morphologically strictly similar fossil structures, recorded from worldwide Cenozoic sediments. This report represents the first record of alpheid shrimp snapping claw fingertips from the Pliocene of Italy.

Key words: Decapoda, Caridea, Alpheididae, systematics, early Pliocene, Italy.

1. Introduction

Isolated fossil elements similar to the studied specimens were previously reported from the worldwide Cenozoic, and assigned to remains of different marine organisms, such as cephalopods or other decapod groups by various authors (see MÜLLER 1998; CIAMPAGLIO & WEAVER 2008; CLUZAUD et al. 2014, among others), but never supported by substantial examinations to justify their assignment. The Pliocene sediments of Italy are rich of this kind of structures, but their palaeontological significance was misinterpreted or undervalued for many years due to the lack of adequate analyses and closer comparisons.

Some authors (KOBAYASHI et al. 2008; KARASAWA et al. 2014; JAGT et al. 2015, 2016; ANDO et al. 2015, 2016; ANDO & KAWANO 2017) supposed that the strongly calcified isolated small triangular and hooked structures could represent the strongly calcified claw fingertips of the alpheid snapping shrimps' major chela.

Recently, HYŽNÝ et al. (2017) carried out a rigorous multidisciplinary and exhaustive analysis to support this hypothesis, revising the specimens previously reported from the worldwide Cenozoic. Based on these new multidisciplinary observations, we report several specimens from the early Pliocene of three localities in Tuscany (central Italy), herein interpreted as alpheid snapping shrimps' fingertips.

2. Material

The studied sample includes 11 selected small-sized (< 4 mm in length) subtriangular hooked isolated calcareous claw fingertips (dactyli), three-dimensionally preserved, recovered by washing and sieving the fossil-

iferous yellow-sands from Pietrafitta and Terre Rosse (43° 29' 39.71" N, 11° 18' 14.61" E) localities (Siena) (9 specimens) and from the grey blue clayey sands of "La Serra" quarry (43° 41' N, 10° 51' E) (Pisa) (2 specimens) (Tuscany, central Italy). According to DE ANGELI et al. (2009) and GARASSINO et al. (2012), the studied specimens must be related to the early Pliocene. The specimens were collected from sediments interpreted as being deposited in shallow marine environments (GARASSINO et al. 2012: 47), based upon the accompanying molluscan assemblage and nannofossils (GARASSINO et al. 2012: table 1). The studied specimens show different kinds of preservation and wear, mainly due to the burial events and typology of the sediments. The studied specimens have been divided into two morphotypes, each having one catalogue number. This means that each catalogue number represents the morphotypes and not each studied specimen.

The studied material is housed in the Invertebrate Palaeontological collections of the Museo di Storia Naturale di Milano (MSNM). Moreover, a larger sample of additional similar specimens (about seventy) from the same localities and not included in this study has been deposited in the Naturhistorisches Museum of Wien (Austria) and that material will be part of a next comprehensive and comparative study (G. PASINI, pers. comm. 2019).

3. Description

Morphotype 1 of Alpheididae gen. et sp. indet. (eight specimens, MSNM i29303a, b) (Fig. 1): an elongated pointed claw fingertip represents a triangular structure with an embayment on proximal portion tracing the boundary of strong calcification of the fingertip. Two setal pores are located on the lateral surfaces. Occlusal margin

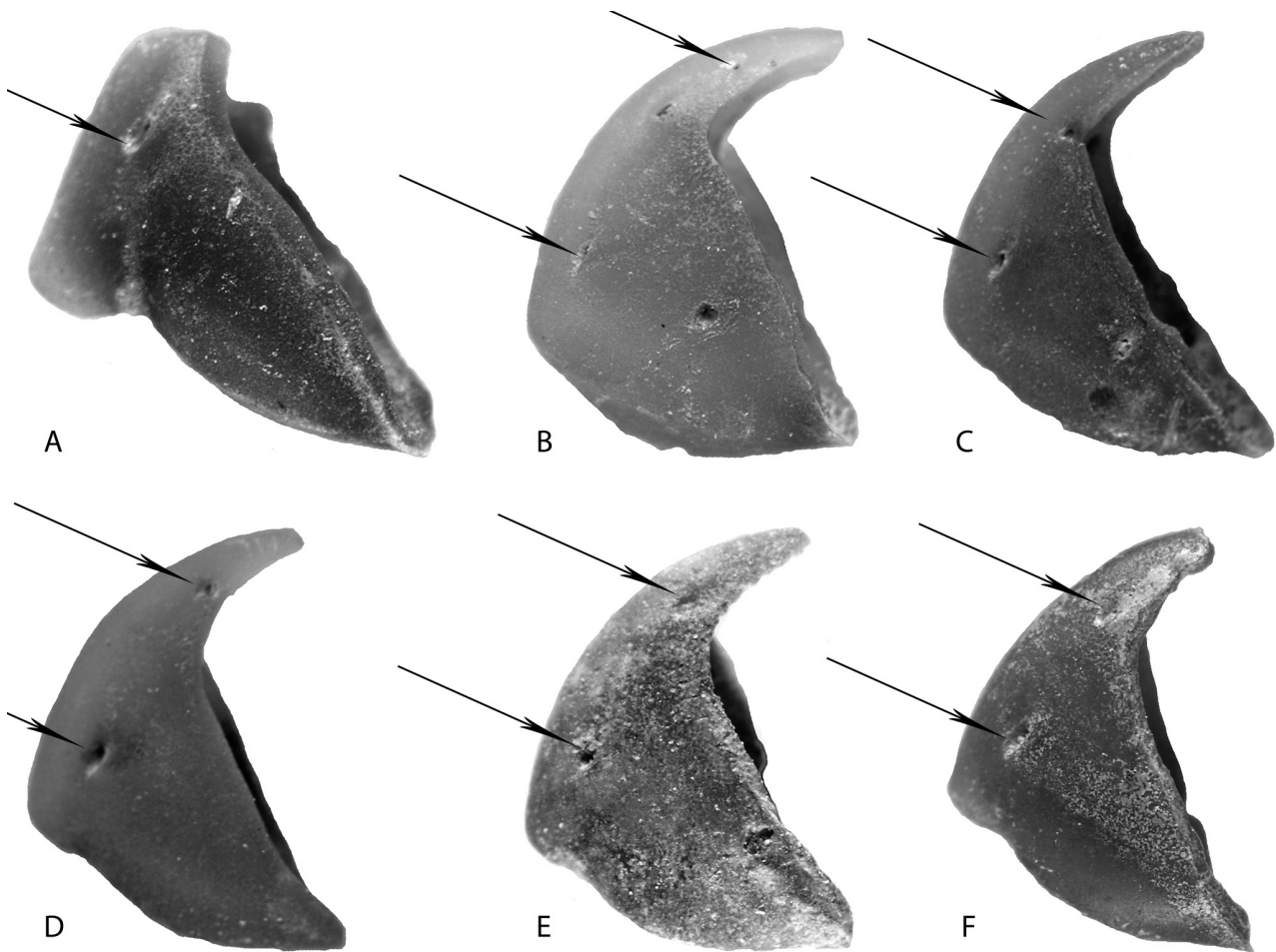


Fig. 1. Morphotype 1 of Alpheidae gen. et sp. indet., lateral view. **A–C** (MSNM i29303a); **D–F** (MSNM i29303b). The incomplete specimen A is figured magnified and slightly turned-up, showing the inner occlusal margin. Arrows indicate the setal pores.

of dactylus forms a strongly blunt rounded tip followed by a concavity passing into a flat plunger, preserved only in some specimens.

Morphotype 2 of Alpheidae gen. et sp. indet. (three specimens, MSNM i29340) (Fig. 2): an elongated slightly pointed claw fingertip represents a triangular structure with an embayment similar to that present in the morphotype 1. One setal pore is located on the lateral surfaces. Occlusal margin of dactylus forms a short rounded tip followed by a concavity passing into a flat plunger, preserved in all specimens.

The specimens of both morphotypes have sizes ranging from 1.8 to 3.5 mm long and from 2.9 to 4.5 mm height, respectively.

4. Interpretation

Based upon morphological and chemical analyses of the fossil record of the Alpheidae by HYŽNÝ et al. (2017,

2018), the studied specimens are herein interpreted as belonging to the strongly calcified claw fingertips of major chela of some representatives of alpheid snapping shrimps. According to HYŽNÝ et al. (2017, 2018) the studied claw fingertips exhibit the “*triangular morphotype with a short hook*”, suggesting that they are most likely movable fingertips.

Alpheid records are quite scarce in the fossil record, due to the difficulties to recognise their small and poorly preserved possible body remains among those of others shrimp taxa. Indeed, the family includes small-sized species with a poorly mineralized body cuticle and low fossilisation potential, and the only body structure usually common in the fossil record is the strong, well-calcified fingertip. The most typical character of Alpheidae RAFINESQUE, 1815 is the highly specialized major snapping claw with strong fingertips, having different microstructures and chemical compositions, as for instance in *Alpheus* FABRICIUS, 1798 and *Synalpheus* SPENCE BATE, 1888 (HYŽNÝ et al. 2017) (Fig. 3).

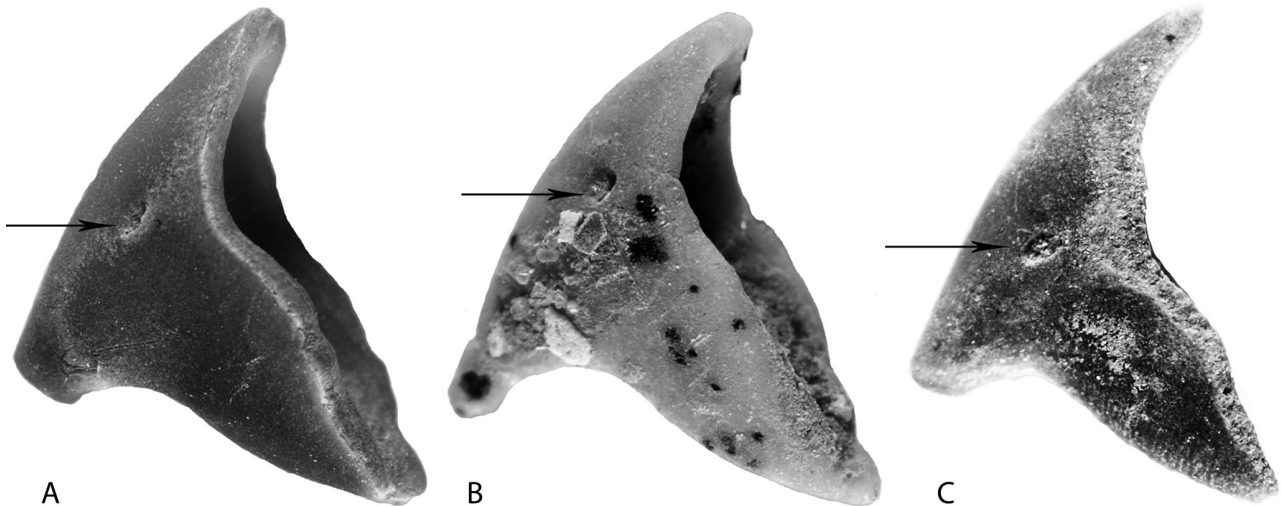


Fig. 2. Morphotype 2 of Alpheidae gen. et sp. indet., lateral view. A-C (MSNM i29304). Arrows indicate the setal pore.

According to FELDMANN et al. (2019), Alpheidae are represented in the fossil record with three genera: *Alpheus* FABRICIUS, 1798 (fossil and recent); *Oligorostra* CIAMPAGLIO & WEAVER, 2008 (fossil); and *Oligosella* CIAMPAGLIO & WEAVER, 2008 (fossil). As pointed out by FELDMANN et al. (2019: 283), *Oligorostra* (fixed finger tips) and *Oligosella* (movable finger tips), both coming from the same locality, could represent the same species. The shape of the fingertip and the presence of only one or two setal pores on the lateral surfaces exclude the belonging of the studied specimens to the above-mentioned genera having a row of setal pores on the distal margin, alternate in size between small and large in *Alpheus* and regular in size in *Oligosella* and with just one large setal pore near the distal end in *Oligorostra* (CIAMPAGLIO & WEAVER 2008; HYŽNÝ et al. 2017, 2018;

FELDMANN et al. 2019). We cannot exclude, however, the possible belonging of the studied strongly calcified claw fingertips to the fossil and extant genus *Alpheus*, based upon the results reported by HYŽNÝ et al. (2017: table 1) that all samples from the Cenozoic (late Oligocene, Miocene, and Pleistocene) of United States (Alabama), Europe (France, The Netherlands, Austria, Poland, Slovakia, and Czech Republic), Africa (Egypt), and Asia (Japan) have been assigned to *Alpheus sensu stricto*. Anyway, more detailed analyses of additional material are essential in order to better clarify their real significance, since the areal distribution of these mesofossils is actually undervalued in the Pliocene of Italy (G. PASINI, pers. obs. 2018), based on previous misidentifications or the lack of formal reports.



Fig. 3. **A** – Left major cheliped of an extant *Alpheus* sp., from the Cortez Sea, Puerto Peñasco (Mexico). **B** – Close-up of the left major cheliped of the previous extant specimen, showing the strong hardened distal tips of the dactylus (white arrow), with the posterior sinuous margin (black arrows).

In conclusion, this is the first report of alpheid snapping shrimps from the Pliocene of Italy.

5. Discussion

The studied specimens share strictly morphological characters and shape with the selected sample reported and illustrated by HYŽNÝ et al. (2017), mainly with the morphotypes reported as “*triangular with a short hook and convex margin*” (HYŽNÝ et al. 2017, fig. 3a–c); “*triangular with a long hook and convex margin*” (HYŽNÝ et al. 2017, fig. 3d–f); and “*triangular with a long hook and concave margin*” (HYŽNÝ et al. 2017, fig. 3g–i), respectively.

However, the studied specimens differ from the morphotypes illustrated by HYŽNÝ et al. (2017: fig. 3), lacking the rows of small setal pores on the distal margin and in showing one or two distinct setal pores on the lateral surfaces. This kind of arrangement seems closer to that present in specimen NHMW 2016/0154/002, from the Middle Miocene of Bad Vöslau (Baden, Austria), and photographed within the Morphobank project 2524, images number M430814-1 (for more references see HYŽNÝ et al. 2017).

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