J. Paleont., 77(3), 2003, pp. 589–592

0022-3360/03/0077-589$03.00

PALAEMON ANTONELLAE NEW SPECIES (CRUSTACEA, DECAPODA, CARIDEA) FROM THE LOWER CRETACEOUS ''PLATYDOLOMITE'' OF PROFETI (CASERTA, ITALY)

ALESSANDRO GARASSINO AND SERGIO BRAVI

Invertebrate Paleontology Department, Natural History Museum, Corso Venezia, 55, 20121, Milan, Italy, <a.garassino@tin.it> and Geology Department, University ''Federico II,'' Via Largo Marcellino, 10, 80138, Naples, Italy, <sergiobravi@libero.it>

INTRODUCTION

THE PURPOSE of this study is to describe a new decapod crustacean from the Profeti region, Italy, and to interpret its palaeontological significance. Further, we include a taxonomic summary of fossil carideans. Macruran decapod crustaceans of Profeti occur flattened on bedding plane surfaces of light-brown lithographic limestone. Surrounding rock is poorly lithified, making preparation easy. The material examined, housed in the Geology Department of the University of Naples, consists of 53 specimens ascribed to *Palaemon antonellae* n. sp. (Infraorder Caridea Dana, 1852; family Palaemonidae Rafinesque, 1815). All specimens are exuviae, with thin and fragile carapaces and abdomens and fragmentary bodies and appendages.

This is part of a research program on the lithographic limestones of Campania being conducted by the Geology Department of the University of Naples. This study also is part of a research program on Mesozoic macruran decapod crustaceans that the Invertebrate Paleontology Department of the Natural History Museum of Milan is conducting.

''PLATYDOLOMITE'' OF PROFETI, ITALY

The studied succession is part of the Mesozoic carbonate platform stratigraphic sequence cropping out in the Monte Maggiore Mountains (1,037 m), bounded to the northeast and southwest by a wide bend formed in the Volturno River and by the Roccamonfina volcano. These mountains belong to the Abruzzi-Campania carbonate platform and are comprised of three ridges, each with monoclinal structure, generally parallel the Apennine front. The studied area is located in the central ridge between Monte S. Angelo (867 m) and Monte Etna (676 m). The Monte Maggiore Mountains consist of a 1,500 m thick carbonate series, ranging in age from Lower Jurassic to Upper Cretaceous. It is capped by an unconformity marked by a bauxite horizon, corresponding to the Upper Albian-Lower Turonian interval. A Miocene sequence of the carbonate ''Cusano'' facies overlies the Mesozoic rocks (Ogniben, 1957, 1958), changing upward to clay-marl and arenaceous facies.

LOCATION AND GEOLOGICAL SETTING

A 100 m thick sequence of the lower Aptian and lower-middle Albian Platydolomite was examined. This sequence crops out about 500 m northwest from the village of Profeti (I.G.M. Sheet 172—I—S.O.—Formicola), along the southern slope of a small hill (606 m). The average strike of the strata is N 35° E, dipping 25° SE. In spite of normal faulting, the stratigraphic sequence is well exposed. The upper portion of the Platydolomite strata are exposed, although the lower part of this unit is covered. A few plattenkalk strata crop out beneath this covered unit, passing downward to a few meters of poorly stratified grey dolomite without fossils. Massive dolomite and dolomitic breccias are separated by a normal fault from the upper part of the sequence. These dolomites are about 30 m thick and contain horizons of grainstones and packstones rich in microfossils such as ''*Pseudonummoloculina*'' sp., Orbitolinidae (*Paracoskinolina tunesiana* Peybernes and *Orbitolinopsis* cfr. *O. reticulata* Moullade and Peybernes).

PALAEOECOLOGICAL AND TAPHONOMIC OBSERVATIONS

Both body and trace fossils are present on a great number of bedding planes and lamina surfaces of the Platydolomite. These fossil remains contribute significantly to a detailed picture of the depositional environment of the plattenkalk. Traces fossils are common. Especially common are linear traces by large, 4–7 mm wide, worms (sipunculids?). These traces chiefly occupy a single lamina that probably was at the sediment-water interface when the traces were formed.

Elongate coprolites of variable size (5–20 cm in length and 1–5 mm in width) also are abundant. These coprolites form accumulations of bone masses of small fishes. They are very different from coprolites produced by fishes and, on the basis of their size, are probably formed by scavenging worms. In addition, scales and small disarticulated bones of fishes are common to abundant on lamina surfaces.

Thin, elongate fish bones show no preferred orientation, suggesting a low energy setting. Sedimentary structures formed by currents, such as small-sized ripples with about 1 cm wave length, also are rare. Therefore, deposition and accumulation of small bones seems attributable to deposition from suspension of decomposing whole and fragmented fish carcasses followed in some cases by bioturbation. Evidence of flotation of some carcasses is shown by their degree of incompleteness (Tintori, 1992).

The facies sequence, including the Platydolomite of Profeti *sensu stricto* and the overlying stromatolitic horizons represents a 10 m thick peritidal cycle that shallows upward. This sequence was deposited in a shallow and protected depression on a tidal flat. Periodically, anoxic conditions prevailed. The anoxia probably prevented active and continuous bioturbation of the sediment. This facies evolves upwards into a shallower and low energy lagoonal setting. Conditions were dysaerobic and sediments are laminated and varved (probably seasonal). Recurrent storm layers also occur within the lagoonal facies.

SYSTEMATIC PALEONTOLOGY

Infraorder CARIDEA Dana, 1852
Family PALAEMONIDAE Rafinesque, 1815
Genus PALAEMON Weber, 1795
PALAEMON ANTONELLAE new species
Figures 1, 2

Diagnosis.—Subrectangular carapace; long rostrum with 11 suprarostral teeth protruding forward and six subrostral teeth; somite II with subround pleura partly overlapping those of somite I and III; pereiopods I-II with strong, elongate chelae; telson with two pairs of spines on dorsal surface and one pair of spines on the distal extremity; exopodite with diaeresis.

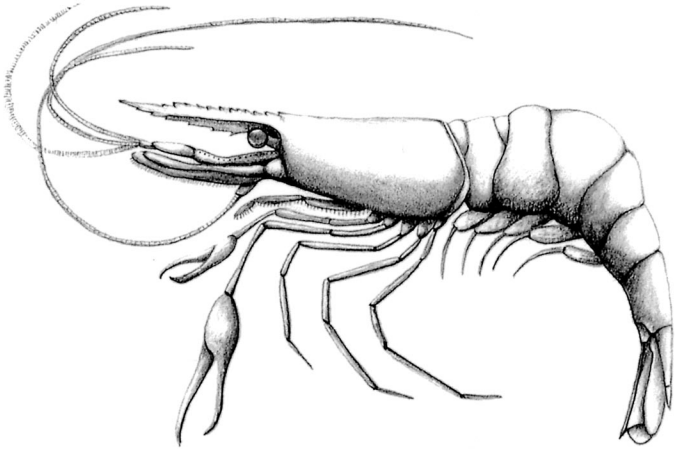

FIGURE *1*—*Palaemon antonellae* n. sp., reconstruction.

Description.—Medium-sized caridean with thin, smooth exoskeleton. Total length unknown because of fragmentary nature of specimens. Carapace subrectangular in lateral view, narrows slightly along anterior margin due to slight curvature of ventral margin. Dorsal margin straight; posterior margin with thin marginal carina, slightly sinuous, with slight concavity in lower third. Ventral margin curvilinear. Dorsal margin extends into long rostrum, with pointed distal extremity and thin longitudinal median carina extending entire length. Rostrum bears 11 identical, forward directed suprarostral teeth and six subrostral teeth. Ocular incision narrow, shallow; antennal and pterygostomial angles not well marked. No traces of grooves, carinae, or spines on carapace surface. Abdomen with somites I, III, and IV subrectangular and of uniform length. Somite II with subrounded pleura partly overlapping those of somite I and III. Somite VI subrectangular and slightly longer than others. Posterior margin of somite III slightly sinuous; those of somites IV–V posteriorly projecting. Telson triangular, with pointed distal extremity, two pairs of spines on dorsal surface, and one pair of long, thin spines at distal extremity. Uropods about one-third longer than telson. Protopodite, subrectangular, supports expodite. Exopodite, with rounded diaeresis, crossed by thin longitudinal carina extending parallel to outside lateral margin and ending in small spine. Endopodite lacks ornamentation. Cephalic appendages incomplete. Flagella of antennulae and antennae and laminar scaphocerite present. Thin, elongate, spine articles form 3rd maxilliped. Pereiopods I–II bear strong and elongate chelae with dactylus longer than index. Pereiopods III–V have terminal dactylus; articles thin, strongly elongate. Pleopods with subrectangular sympodite to which two elongate multiarticulate flagella articulate.

Etymology.—The trivial name is dedicated to Antonella, wife of one of the authors (A. Garassino).

Types.—The holotype, PrC24 (Geology Department of the University of Naples), an incomplete specimen (Fig. 2.1) from the Platydolomite of Profeti (Caserta, S Italy); and paratypes, PrC1, PrC2, PrC7, PrC13 (Fig. 2.2, 2.3, 2.4, 2.5) from the same locality, are housed in the Geology Department of the University of Naples.

Occurrence.—Fifty-three specimens collected from Platydolomite of Profeti (Caserta, S Italy), Aptian (Lower Cretaceous).

Discussion.—Carideans are very rare in the fossil record and their morphological features are not easily recognized because of their frequent poor state of preservation. The oldest genera known to date, *Acanthinopus* Pinna, 1974 and *Leithorax* Pinna, 1974, were discovered in the Zorzino Limestone (Norian, Upper Triassic) of Bergamo Pre-alps (Cene, Seriana Valley—Bergamo, N Italy) (Pinna, 1974). Another form, *Pinnacaris* Garassino and Teruzzi, 1993, was described in the Argilliti di Riva di Solto (Sevatian, Upper Norian-Lower Rhaetian, Upper Triassic—depending upon the authors) of Ponte Giurino (Imagna Valley—Bergamo, N Italy) (Garassino and Teruzzi, 1993).

Glaessner (1969) ascribed to the carideans the Jurassic genus *Udorella* Oppel, 1862 (Udorellidae Van Straelen, 1924), and he also noted three additional Jurassic genera as *incertae sedis* to the carideans: *Blaculla* Münster, 1839, *Hefriga* Münster, 1839, and *Udora* Münster, 1839. We now recognize seven genera of Cretaceous carideans. Martins-Neto and Mezzalira (1991a) found a few specimens of carideans in the Crato Member of the Santana Formation (Lower Cretaceous) of Brazil. The perfect state of preservation of these specimens allowed the authors to describe *Beurlenia* (Palaemonidae Rafinesque, 1815) with *B. araripensis* Martins-Neto and Mezzalira, 1991a as the type species. Roger (1946) described *Notostomus cretaceus* in a sample of five specimens found in the Santonian (Upper Cretaceous) of Sahel Alma (Lebanon). However, this species was the subject of a review by Garassino (1994), who assigned Roger's species to *Odontochelion* nov. (Oplophoridae Dana, 1852). Rabadà (1993) described *Delclosia* based upon *D. martinelli* Rabadà, 1993, based upon a sample of 60 specimens from the lower Barremian (Lower Cretaceous) of Las Hoyas (Cuenca, Spain). This genus was the subject of a recent review by Garassino (1997). Bravi and Garassino (1998a, 1998b) described *Parvocaris* based upon *P. samnitica* Bravi and Garassino, 1998b (indeterminate family) from 14 specimens in the lower Albian (Lower Cretaceous) of Pietraroia (Benevento, S Italy) and *Alburnia* based upon *A. petinensis* Bravi and Garassino, 1998a (Palaemonidae Rafinesque, 1815) from a sample of three specimens from the middle Albian (Lower Cretaceous) of Petina (Salerno, S Italy). Garassino (1998) described three specimens from the Lower Cretaceous of the Valley of the Cornappo River (Udine, NE Italy), and named *Tonellocaris* based upon *T. brevirostrata* Garassino, 1998 (Oplophoridae Dana, 1852). Finally, Bravi et al. (1999) described *Palaemon vesolensis* (Palaemonidae Rafinesque, 1815) from a sample of 93 fragmentary and complete specimens from the Campanian-Maastrichtian (Upper Cretaceous) of Vesole Mount (Salerno, S Italy). In addition to these named taxa, Garassino and Ferrari (1992) reported the presence of a single specimen of caridean in the Senonian (Upper Cretaceous) of Trebiciano (Trieste, NE Italy) without ascribing it to a known family, genus, or species. Garassino and Teruzzi (1995) reported the probable presence of a new caridean in the upper Hauterivian-lower Barremian (Lower Cretaceous) of Vernasso (Udine, NE Italy). Only five genera of carideans are presently known from Tertiary deposits. Four species belong to *Bechleja* Houša, 1956, a typical form of freshwater deposits: *B. rostrata* Feldmann, Grande, Birkheimer, Hannibal, and McCoy, 1981, from the Eocene of the Green River Formation (Wyoming, USA); *B. inopinata* Houša, 1956, from the Oligocene of the Czech Republic; *B. bahiaensis* (Beurlen, 1950), and *B. robusta* Martins-Neto and Mezzalira, 1991b, from the Oligocene of Brazil. Martins-Neto and Mezzalira (1991b) ascribed to *Propalaeomon* Woodward, 1903, the new species *P. longispinata* (Palaemonidae Rafinesque, 1815). Finally, in the Miocene deposits of N. Caucasus (Russia) three genera are known: *Palaemon* Weber, 1795; *Pasiphaea* Savigny, 1816; and *Bannikovia* Garassino and Teruzzi, 1996. These have been described with *P. mortuus* Smirnov, 1929; *P. mortua* Smirnov, 1929; and *B. maikopensis* Garassino and Teruzzi, 1996, respectively. Recently, Garassino and Teruzzi (2001) reviewed *Bannikovia* Garassino and Teruzzi, 1996, assigned it to the living genus *Crangon* Fabricius, 1798 (Crangonidae Haworth, 1825). This is the first report of the family Crangonidae Haworth, 1825, in the fossil record. Based upon what has been described, *A. petinensis*, *P. samnitica*, *T. brevirostrata*, *P. vesolensis*, and

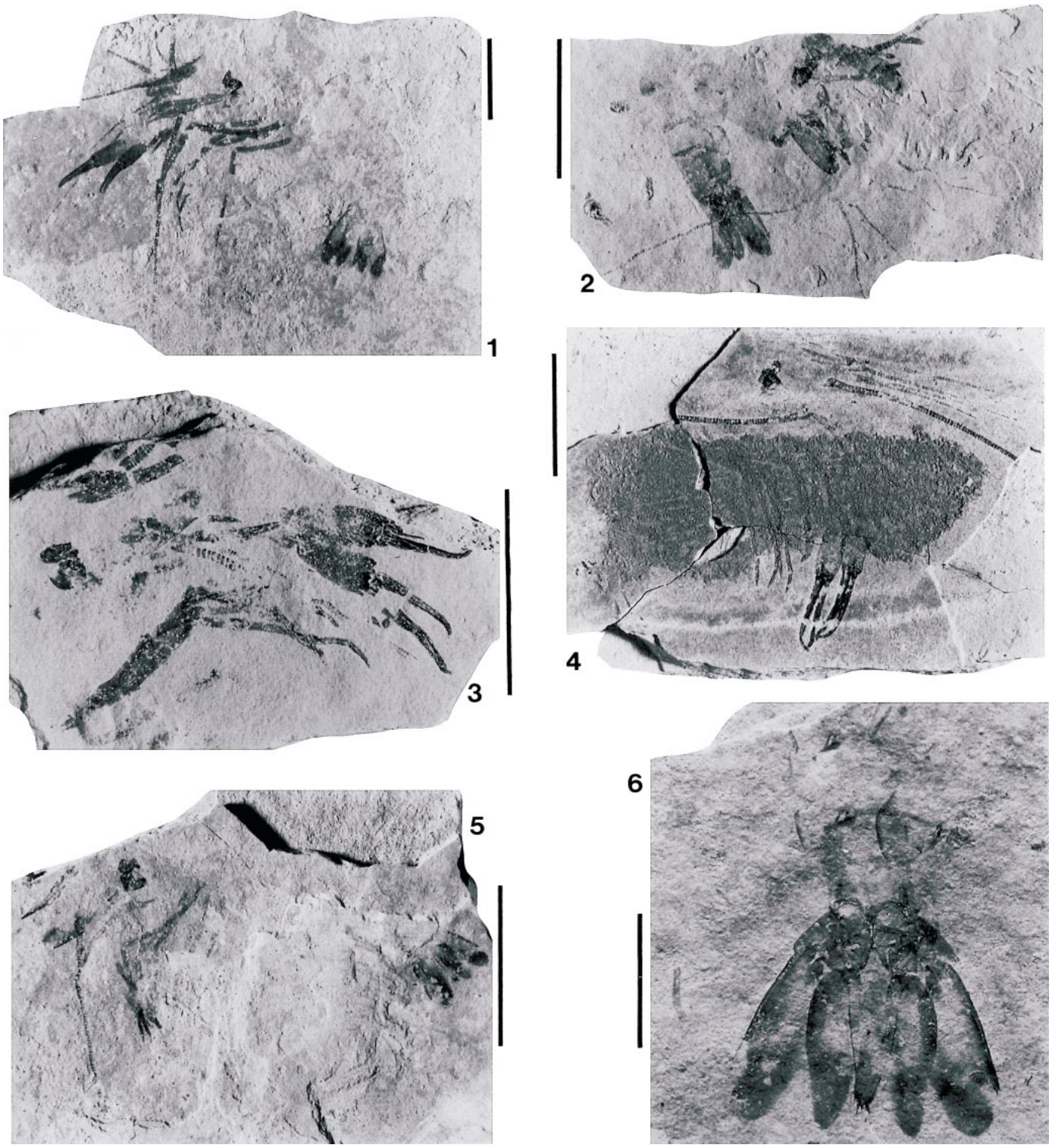

FIGURE *2—1–5 Palaemon antonellae* n. sp. from Aptian age of Profeti (Caserta, S Italy). *1*, Lateral view of holotype, PrC24; *2*, lateral view of paratype, PrC1; *3*, lateral view of paratype with well preserved chelae of pereiopod I, PrC2; *4*, lateral view of paratype with well preserved pereiopods I–V, PrC7; *5*, lateral view of paratype with well preserved rostrum and tail fan, PrC13; *6*, lateral view of well preserved tail fan, PrC25. Scale bars equal 1 cm.

Palaemon antonellae n. sp. represent the only five species of Italian Cretaceous carideans known to date of which *P. antonellae* n. sp.; *A. petinensis*; and *P. vesolensis* belong to the same family, the Palaemonidae Rafinesque, 1815. Moreover, *P. antonellae* n. sp. is one of the few fossil species of carideans known that can be ascribed with certainty to a known family by definite characters. Characters, such as the rostrum with many suprarostral teeth and some subrostral teeth, pereiopods I–II with merus and carpus elongate and pereiopod II with chela stronger and longer than that of pereiopod I, and telson with two pairs of spines on dorsal surface, permit confident placement of *P. antonellae* n. sp. in the Palaemonidae.

ACKNOWLEDGMENTS

We wish to thank G. Casertani who discovered and donated the studied specimens, thus contributing to expanding out knowledge of Cretaceous decapod crustaceans of southern Italy. Moreover, we thank R. M. Feldmann, Geology Department, Kent State University, for useful advice, careful review, and criticism of the manuscript. Last, we thank F. Nodo for line drawings and L. Spezia for photography.

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ACCEPTED 4 SEPTEMBER 2002