

# First record of a representative of the subfamily Paradiaptominae (Copepoda Calanoida Diaptomidae) in Italy: *Metadiaptomus chevreuxi* (Guerne & Richard, 1894)

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## ABSTRACT

*Metadiaptomus chevreuxi* (Guerne & Richard 1894), a diaptomid calanoid copepod belonging to the subfamily Paradiaptominae, has been found in two neighbouring temporary pools in the Egadi Archipelago (Sicily, southern Italy). This finding constitutes the first record of a representative of this subfamily in Italy and the second known European record for this species. *M. chevreuxi*, commonly found in the arid areas of Maghreb, has already been reported to occur in Mallorca Island (Balearic Archipelago, Spain), while it seems to be rare in the eastern quadrants of the Mediterranean basin. The characteristics of the new Italian site are briefly described and drawings of morphological details of adult specimens are provided. The occurrence of *M. chevreuxi* in Western Sicily is in accordance with the supposed merging of North-eastern and South-western freshwater calanoid faunas in this area. Additional information on the distribution of calanoid species in the island and its biogeographic significance is also offered.

Key-words: Calanoida, Paradiaptominae, Mediterranean basin, Sicily, distribution

## 1. INTRODUCTION

The Paradiaptominae (Copepoda, Calanoida) is a small group of Gondwanian origin belonging to the large family Diaptomidae. About 24 species, mainly confined in temporary or semi-permanent water bodies of arid regions, belong to this subfamily. *Metadiaptomus* Methuen, 1910 is the most speciose genus of the subfamily, with 10 described species, followed by *Paradiaptomus* Sars, 1895, with 9 species. Most of these species have a Sub-Saharan distribution (Rayner 2000).

Only four Paradiaptominae species are known to occur also outside Africa: *Metadiaptomus asiaticus* (Ul'yanin, 1875), *M. chevreuxi* (Guerne & Richard 1894), *Paradiaptomus greeni* (Gurney 1906), and *Neolovenula alluaudi* (Guerne & Richard 1890). Two of these species, *N. alluaudi* and *M. chevreuxi*, are also known from Europe (Jaume 1989; Dussart & Defaye 2002) but they were never recorded in Italy up to now. The present note reports the finding of *Metadiaptomus chevreuxi* in Sicily (southern Italy), which thus represents the first finding of a representative of the whole subfamily Paradiaptominae in Italy.

*M. chevreuxi* is common in areas characterized by low precipitation values (<500 mm y<sup>-1</sup>) and becomes rarer and rarer along a humidity gradient to disappear at precipitation values higher than 500 mm y<sup>-1</sup> (Kiefer 1978a; Dumont *et al.* 1979; Ramdani 1988; Turki & El Abed 1999). It is typical of the steppic and substeppic areas of Maghreb and Middle East (Rayner 2000). The

occurrence of *M. chevreuxi* in Middle East (Iran and Iraq) is reported by Gurney (1921), whereas Dumont (1979) found it in two sites in Jordan. According to our knowledge, no further reports of this species are available for that area and, in spite of the presence of suitable habitats, its occurrence has not been reported for Egypt (Kiefer 1978b) and Israel (Dimentman & Por 1985). Moreover, the distribution of a calanoid species, especially if it occurs in temporary waters may be easily overlooked. Also, especially in Africa, collection of freshwater invertebrates is not easy. Distances are great and some areas in drier regions are just not easily accessible (Rayner, pers. comm.).

Actually, in spite of recent contributes and reviews (e.g. Mouehli *et al.* 2000; Dussart & Defaye 2002), the freshwater calanoid faunas from Western Mediterranean countries is far from being adequately known, and many areas still remain unexplored. This situation prevents from establishing a clear picture of the distribution patterns of several species and, as a consequence, of the affinities and mutual influences among the faunas of circum-Mediterranean countries. To fill this gap, more numerous and detailed studies are desirable.

## 2. MATERIAL AND METHODS

The study material was collected on January 22, 2005 in Favignana Island (Egadi Archipelago, Western Sicily, Southern Italy) in two neighbouring, a few centimetres deep, temporary pools close to the seashore (Pozze dell'Ucceria: UTM WGS84 coordinates 4203663 N, 33 262890 E; altitude 3 m a.s.l.).

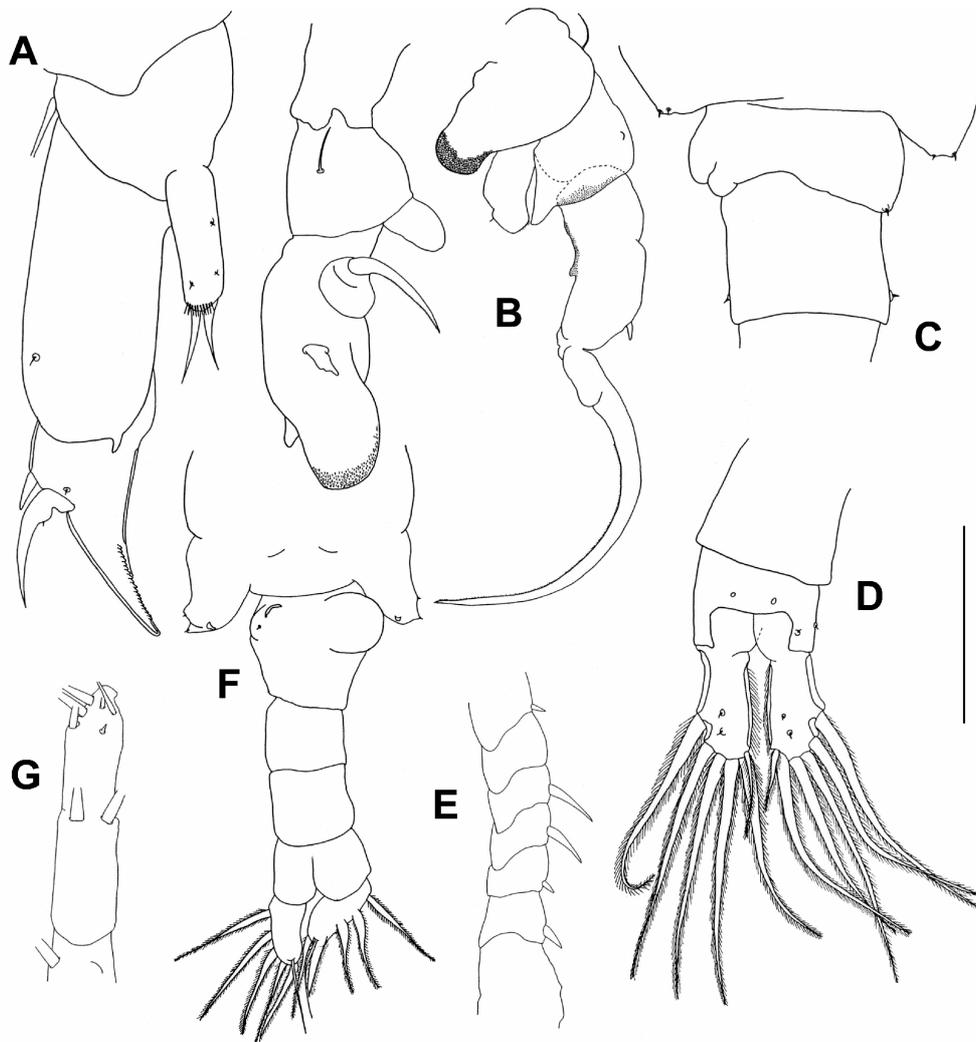


Fig. 1. A, F: *Metadiaptomus chevreuxi*, female. A: P5; F: somites 4, 5 and urosome, dorsal view. B, C, D, E, G: *M. chevreuxi*, male. B: P5; C: somite 5 and urosomites 1, 2; D: furca; E: right antennula, segments 8-14; G: right antennula, segments 19-21. Scale bar, A: 125  $\mu$ m; B, C, D, E: 250  $\mu$ m; F: 500  $\mu$ m; G: 100  $\mu$ m.

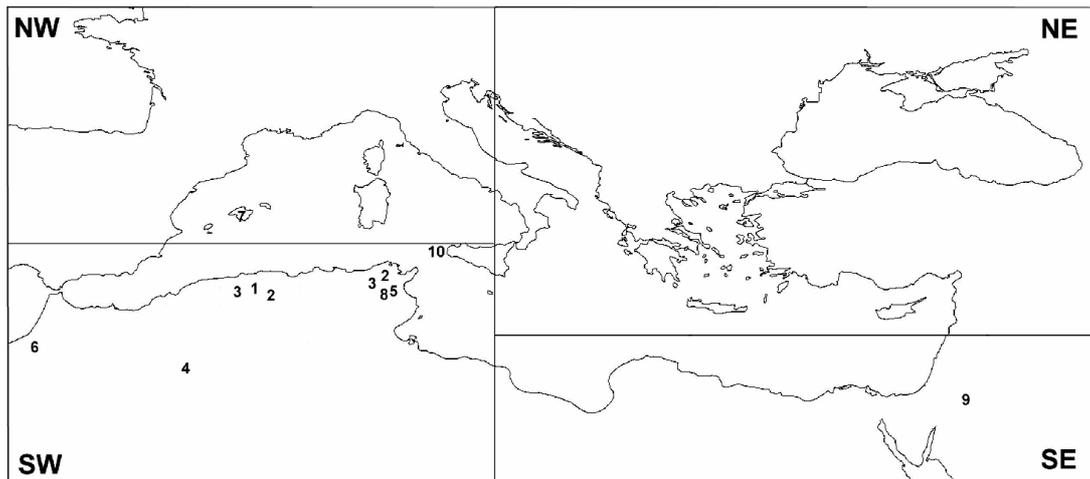


Fig. 2. Distribution of *Metadiaptomus chevreuxi* in the circum-Mediterranean area. 1: Gurney 1909; 2: Roy & Gauthier 1927; 3: Gauthier 1928; 4: Gauthier 1931; 5: Dumont *et al.* 1979; 6: Ramdani 1988; 7: Jaume 1989; 8: Turki & El Abed 1999; 9: Dumont 1979; 10: Present paper. The Mediterranean Sea is divided in four biological quadrants according to Blondel & Aronson (1999).

Indeed the site, at its maximum holding, is formed by only one pond with a surface of about 3.5 ha which divides into several smaller ponds when its surface reduces.

In Trapani meteorological station, located on Sicilian mainland 15 km far from Favignana Island, the average annual rainfall is 483 mm and the average temperature is 18 °C (Zampino *et al.* 1997). Thus, Favignana Island can be considered as a substeppic zone according to Gauthier (1928) and Turki & El Abed (1999).

Water temperature, conductivity and pH were registered with an Hanna Instruments HI 13110 multiprobe.

Microcrustacean samples were collected by means of a 200 µm hand net and fixed *in situ* with 4% buffered formaldehyde. Calanoid copepods were sorted and dissected under an Optika dissecting microscope and identified to the species level according to Kiefer (1978a), Dussart (1989) and Rayner (1999). Drawings of selected specimens were realized with an Olympus CX41 microscope equipped with a camera lucida after tissue clearing in hot lactic acid. Preserved specimens are stored in the authors' collection.

### 3. RESULTS AND DISCUSSION

In the frame of a faunal survey aimed at getting a better knowledge of the entomostracan fauna of Sicily (southern Italy), a thriving population of the Paradiaptominae *Metadiaptomus chevreuxi* was found on Favignana Island (Egadi Island, western Sicily).

At the sampling date, the pond was divided into two basins, both characterised by extremely turbid waters due to suspended clay. Electric conductivity, pH and water temperature had similar values in both the ponds (920-915 µS cm<sup>-1</sup>, 8.07-8.10, 19.3-19.5 °C, respectively).

In the sample, both adult and immature specimens of *M. chevreuxi* co-occurred with adult specimens of *Triops cancriformis cancriformis* (Bosc, 1802), *Branchipus schaefferi* Fischer, 1834, *Daphnia (Ctenodaphnia) atkinsoni* Baird, 1859 (Branchiopoda), *Ilyocypris decipiens* Masi, 1905, *Eucypris virens* (Jurine 1820), *Tonnacypris lutaria* (Koch 1838), *Heterocypris incongruens* (Ramdohr 1808) (Ostracoda), unidentified copepodids of cyclopoid copepods and heteropteran insects belonging to the genera *Corixa* and *Notonecta*. No other calanoid species were found in the Favignana island nor in the other islands of the Egadi Archipelago.

Rayner (1999) stressed that the representatives of the Paradiaptominae are morphologically very stable, with well defined taxonomic characters. Adults from Favignana (Fig. 1) can undoubtedly be attributed to the species *Metadiaptomus chevreuxi* according to the drawings by Kiefer (1978a) and to the descriptions also reported by Dussart (1989) and Rayner (1999), but differ in the number of setae on the furca from those represented in the figure 5A in the paper by Jaume (1989).

The occurrence of *M. chevreuxi* in Favignana is in agreement with the supposed merging of North-eastern and South-western Mediterranean freshwater calanoid faunas in Sicily (Marrone *et al.* in press) due to the island location in the middle of the basin, in between the SW and NE quadrants (Fig. 2) as described by Blondel & Aronson (1999). Recent faunal surveys, aimed at getting a better knowledge of the microcrustacean fauna of this nodal point for the faunal interchange in the basin (e.g. Naselli-Flores *et al.* 1998; Marrone 2003; Marrone & Naselli-Flores 2004), show that freshwater calanoid copepods distribution clearly reflects the rather complex geological history of the Mediterranean basin. As well as for the flora of the island, several south-western and north-eastern influences can be highlighted strictly depending on historical and ecological factors (Francini & Messeri 1956). As partially described in a previous note (Marrone & Naselli-Flores 2004), the typically North-African and West-Mediterranean taxa *Hemidiaptomus ingens* and *M. chevreuxi* inhabit only the dryer areas of the western part of Sicily. Conversely, the temperate and eastern-gravitating *Diaptomus serbicus* Gjorgjewič, 1907, *Arctodiaptomus kerkyrensis* (Pesta 1935) and, secondarily, *Arctodiaptomus stephanidesi* (Pesta 1935) show an east-west gradient which follows the mesic siliceous outcrops of the Nebrodi and Sicani Mountains, where these species are found only at an altitude above 800 m a.s.l., often along with *Mixodiaptomus kupelwieseri* (Brehm 1907) and *Hemidiaptomus gurneyi* (Roy 1927). Other calanoid species, like *Diaptomus cyaneus* Gurney 1909, *Copidodiaptomus numidicus* (Gurney 1909), *Arctodiaptomus salinus* (Daday 1885) and *Calanipeda aquaedulcis* Kritschagin, 1873 are widespread in the region (Marrone *et al.* 2005), as well as in all the circum-Mediterranean countries, and their even distribution in the island is linked to some environmental characteristic as salinity, hydroperiod and depth.

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