



A rare mediterranean cumacean, *Fontainella mediterranea* (Crustacea), at the threshold of the Atlantic Ocean

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Abstract : During a study of the cumacean fauna from the coast of the Strait of Gibraltar and nearby areas some specimens of a rare cumacean, *Fontainella mediterranea*, were collected in coarse sand at 15-25 metres depth. This is the first record since its original description from the Libyan coast of El Hania. A careful examination of these cumaceans revealed some differences with the original description, mainly the structure and armature of oral appendages, maxillipeds in the female and pereopods in the male. In addition, the structure of the first maxilla is shown for the first time in this genus. The present paper provides a redescription of *Fontainella mediterranea* and new biological and zoogeographical data on this species.

Résumé : Au cours d'une étude de la faune de Cumacés de la côte du Déroit de Gibraltar et de ses environs, quelques spécimens d'une espèce rare, *Fontainella mediterranea*, ont été récoltés dans des sables grossiers de 15 à 25 mètres de profondeur. Ceci représente la première signalisation de l'espèce depuis sa description originale sur la côte Libyenne d'El Hania. Un examen attentif de ces cumacés a révélé quelques différences avec la description originale, principalement dans la structure et l'armature des appendices oraux, des maxillipèdes chez la femelle et des péréiopodes chez le mâle. De plus la structure de la première maxille est montrée pour la première fois dans ce genre. Cet article apporte une redescription de *Fontainella mediterranea* ainsi que de nouvelles données biologiques et zoogéographiques sur cette espèce.

Keywords : Cumacea, *Fontainella mediterranea*, Strait of Gibraltar, redescription.

Introduction

The family Pseudocumatidae Sars, 1878 comprises hitherto twenty seven species and four subspecies, included in eleven genera and two subgenera (Bacescu, 1992). Most of the species are distributed in the Eastern Mediterranean and NE Atlantic, and are usually found between 0 and 200 metres depth (Jones, 1969a, b; Ledoyer, 1988), only some species of *Petalosarsia* Stebbing, 1893 and *Pseudocuma* Sars, 1865 have been collected below the sublittoral zone (Bacescu, 1992). With regard to the ecology of the genera

included in Pseudocumatidae, most of them occur only in water of reduced salinity in the Black Sea, the Caspian Sea and the rivers running into them (Jones, 1969b).

Recently, the study of the Cumacean fauna of the Southern Iberian Peninsula have been carried out by two scientific expeditions, Balgim and Fauna-I. The Balgim cruise (May-June 1984) prospected deep bottoms between the Atlantic and the Mediterranean through the Strait of Gibraltar. The Mediterranean phase was studied by Ledoyer (1988), between 100 and more than 1000 metres depth, and the Atlantic phase by Jones (1990), between 100 and more than 2000 metres depth. The Spanish expedition Fauna-I was carried out within the Iberic project "Fauna Iberica I" (DGICYT PB87-0397), and prospected the same

geographical area as the Balgim cruise in July 1989, but principally between 30 and 300 metres depth (see Templado, *et al.*, 1993 for more data); the results of the Spanish expedition will be treated in a separate work. However, the infralittoral zones have been poorly prospected with respect to the sublittoral and deep bottom of the Strait of Gibraltar.

During November 1993, some specimens of *Fontainella mediterranea* Bacescu and Muradian, 1978 were collected by SCUBA diving in Tarifa Island (Southern Spain). After the morphological study of these specimens, some disagreements were observed with the original description. These differences do not justify the description of a new infraspecific taxon, but they may be discussed in order to complete the knowledge of this species. In addition, the report of *F. mediterranea* in the Strait of Gibraltar is the first record since its original description from the Libyan coast.

This paper presents a redescription of the adult female and male of *Fontainella mediterranea*. Furthermore, new morphological features are compared and discussed with the original description of this very interesting species and with other genera of Pseudocumatidae. Finally, some new biological and zoogeographical data are provided.

Material and methods

The specimens of *Fontainella mediterranea* were collected by SCUBA diving in coarse sand at 15-25 metres depth, at Tarifa Island, (Southern Spain) (Fig. 1) in November 1993. The samples were fixed using formalin 4% in sea-water with Bengal Rose for two weeks. After having stirred the fauna and sand in the sea water mixture, this was poured through a 0.5 mm sieve which retained the cumaceans, which were then placed in ethyl alcohol 70%.

The cumaceans were stained with cotton blue and dissected under a stereomicroscope; permanent mounts were made in lactophenol and sealed using entellan. All figures have been drawn with the aid of a camera lucida. In the figures captions the capitals (A, B, etc.) refer to the scale at which the figures were drawn.

Results

Fontainella mediterranea Bacescu & Muradian, 1978 (Figs. 2-4)

Material examined: 5 adult females and 4 adult males at Tarifa Island, Cádiz (36° 48.00' N; 5° 36.00' W), Southern Spain, 15-25 m, November 1993.

Description

Adult female

Length: 4.05 mm (from tip of pseudostrum to end of telson). Carapace (Fig. 2b) slightly more than one fourth total length, as long as wide, slightly depressed

dorsoventrally with a marginal carina. Pseudostrum lobe short. Antennal notch deeply excavated (Fig. 2a, b). Anterolateral angle rounded. Eye lobe small, lacking eyes.

Thorax (Fig. 2b) with 5 pedigerous segments free, combined lengths slightly shorter than carapace.

Abdomen (Fig. 2a) as long as carapace and thorax combined.

Telson (Fig. 2c) more or less semicircular, slightly wider than long, unarmed.

First antenna (Fig. 2e). Peduncle, first article slightly shorter than second and third combined, with rows of spinules and two small setae. Second article longer than third, with scaly surface, four small setae and four distal long setae. Main flagellum 2-articulate, with 2 aesthetascs, 2 long setae and two small setae; accessory flagellum of 1 article.

Second antenna (Fig. 2f) developed, without clear limits of segments, with a distal plumose seta.

Mandible (Fig. 2g, h) with 5 serrate spines between the incisor and molar processes, and three or four terminal teeth.

First and second maxilla as shown (Fig. 2i, j).

First maxilliped (Fig. 2k) as illustrated. Basal process with four broad-based seta. Ischium with 1 inner plumose seta. Merus with 2 inner plumose seta. Carpus, inner margin with numerous spine-like setae, some rows of characteristic spines, curved rows of spinules, and a row of setae.

Second maxilliped (Fig. 2l) basis robust, about one fifth longer than combined lengths of other articles; inner distal margin with one stout plumose seta, one small plumose seta and a group of setules, outer distal margin with one plumose seta. Ischium short and unarmed. Merus robust with one inner distal plumose seta. Carpus shorter than combined length of propodus and dactylus, with approximately six inner plumose setae. Propodus longer than dactylus, with seven inner plumose setae and one outer plumose seta. Dactylus with one stout distal spine and approximately four naked setae.

Third maxilliped (Fig. 3a) very similar to the first and second pereopods. Basis shorter than combined length of other articles, inner margin unarmed; external distal process not developed. Ischium and merus each with one plumose seta on inner margin. Carpus with a distal plumose inner seta, four outer naked setae and one distal plumose seta. Propodus and dactylus with some plumose and naked setae, each with one dense brush of setules. Dactylus with one stout distal spine.

First pereopod (= fourth thoracic appendage) (Fig. 3b) reaching the tip of pseudostrum. Basis approximately as long as combined lengths of other articles; inner margin with some plumose setae; one seta on the distal outer region. Ischium and merus, combined lengths approximately equal to propodus; ischium, merus, carpus and propodus with



Figure 1. Distribution of *Fontainella mediterranea*: 1. El Hania, Libyan coast (Bacescu & Muradian, 1978); 2. Tarifa Island, Strait of Gibraltar (present study).

Figure 1. Distribution de *Fontainella mediterranea* : 1. El Hania, côte libyenne (Bacescu & Muradian, 1978) ; 2. Ile de Tarifa, Déroit de Gibraltar (présente étude).

some naked setae. Carpus slightly longer than propodus. Dactylus not elongate, one third as long as propodus, bearing naked setae and one stout spine.

Second pereopod (Fig. 3c) : basis about 0.6 times of combined lengths of other articles, inner margin with some groups of setules and 1 distal plumose seta. Ischium short, with 1 distal plumose seta on inner margin. Merus twice as long as ischium, with 1 distal plumose seta on inner margin. Carpus slightly longer than combined lengths of ischium and merus, with some naked setae on inner and outer margin, and 1 stout spine on the distal inner margin. Propodus and dactylus with simple setae, combined length about 1.3 times

longer than carpus. Dactylus about 1.4 times longer than propodus, bearing distally three seta-spines and 1 stout spine.

Third pereopod (Fig. 3d) : basis about 1.6 times of combined lengths of other articles, with four small setae. Ischium short, with three distal naked setae and one proximal. Merus 1.8 times longer than ischium, with 1 outer seta. Carpus shorter than merus, bearing distally some small setae and 2 long characteristic setae. Propodus 0.8 times longer than carpus, with 1 distal characteristic seta. Dactylus slightly shorter than propodus, with 1 short stout spine and 1-3 small setae.

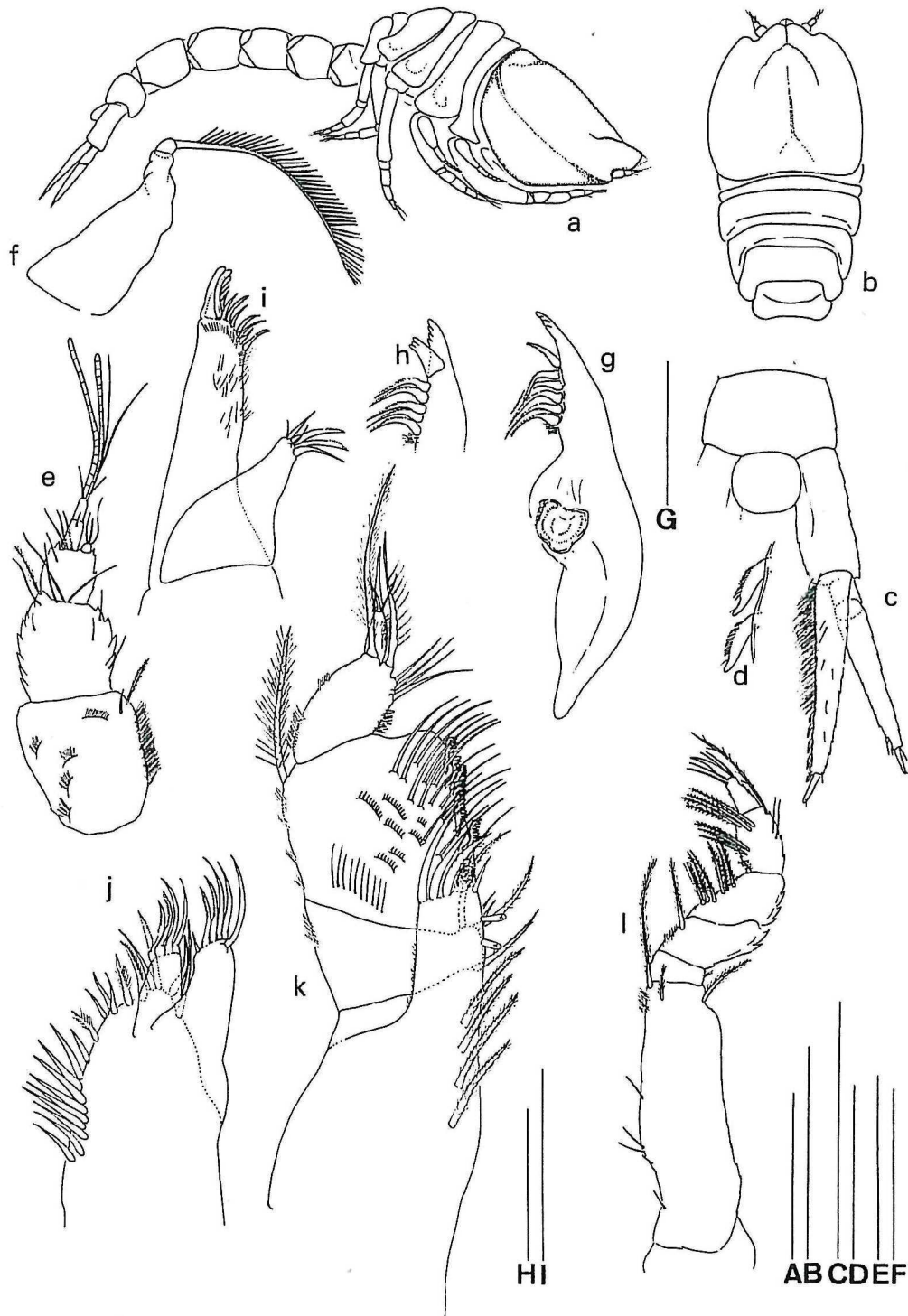


Figure 2. *Fontainella mediterranea*, adult female. a, habitus, lateral view (Scale A); b, carapace and thoracic segments, dorsal view (A); c, anal segment, telson and uropods (B); d, spines of the inner ramus of the uropod (C); e, first antenna (D); f, second antenna (D); g, right mandible (E); h, distal portion of left mandible (E); i, first maxilla (F); j, second maxilla (G); k, first maxilliped (H); l, second maxilliped (I). Scale bars: A 1 mm; B 500 μ m; C G H 100 μ m; D E I 250 μ m; F 150 μ m.

Figure 2. *Fontainella mediterranea*, femelle adulte. a, habitus vue latérale (Echelle A); b, carapace et segments thoraciques, vue dorsale (A); c, segment anal, telson et uropodes (B); d, épines de la rame interne de l'uropode (C); e, antennule (D); f, antenne (D); g, mandibule droite (E); h, portion distale de la mandibule gauche (E); i, première maxille (F); j, deuxième maxille (G); k, premier maxillipède (H); l, deuxième maxillipède (I). Echelles: A 1 mm; B 500 μ m; C G H 100 μ m; D E I 250 μ m; F 150 μ m.

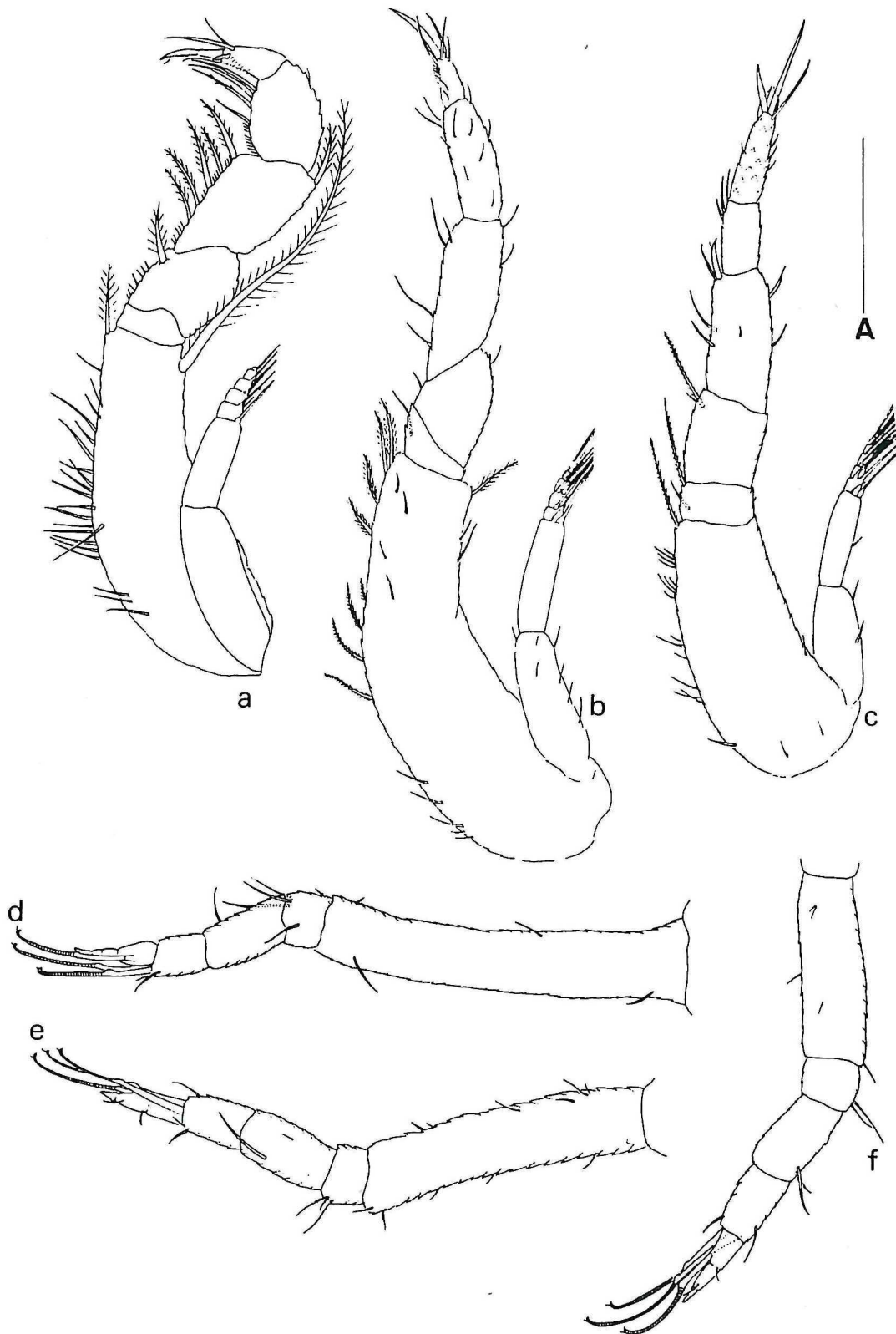


Figure 3. *Fontainella mediterranea*, adult female. a, third maxilliped (Scale A); b, first pereopod (A); c, second pereopod (A); d, third pereopod (A); e, fourth pereopod (A); f, fifth pereopod (A). Scale bar: A 250 μ m.

Figure 3. *Fontainella mediterranea*, femelle adulte. a, troisième maxillipède (Echelle A) ; b, premier péréiopode (A) ; c, deuxième péréiopode (A) ; d, troisième péréiopode (A) ; e, quatrième péréiopode (A) ; f, cinquième péréiopode (A). Échelle: A 250 μ m.

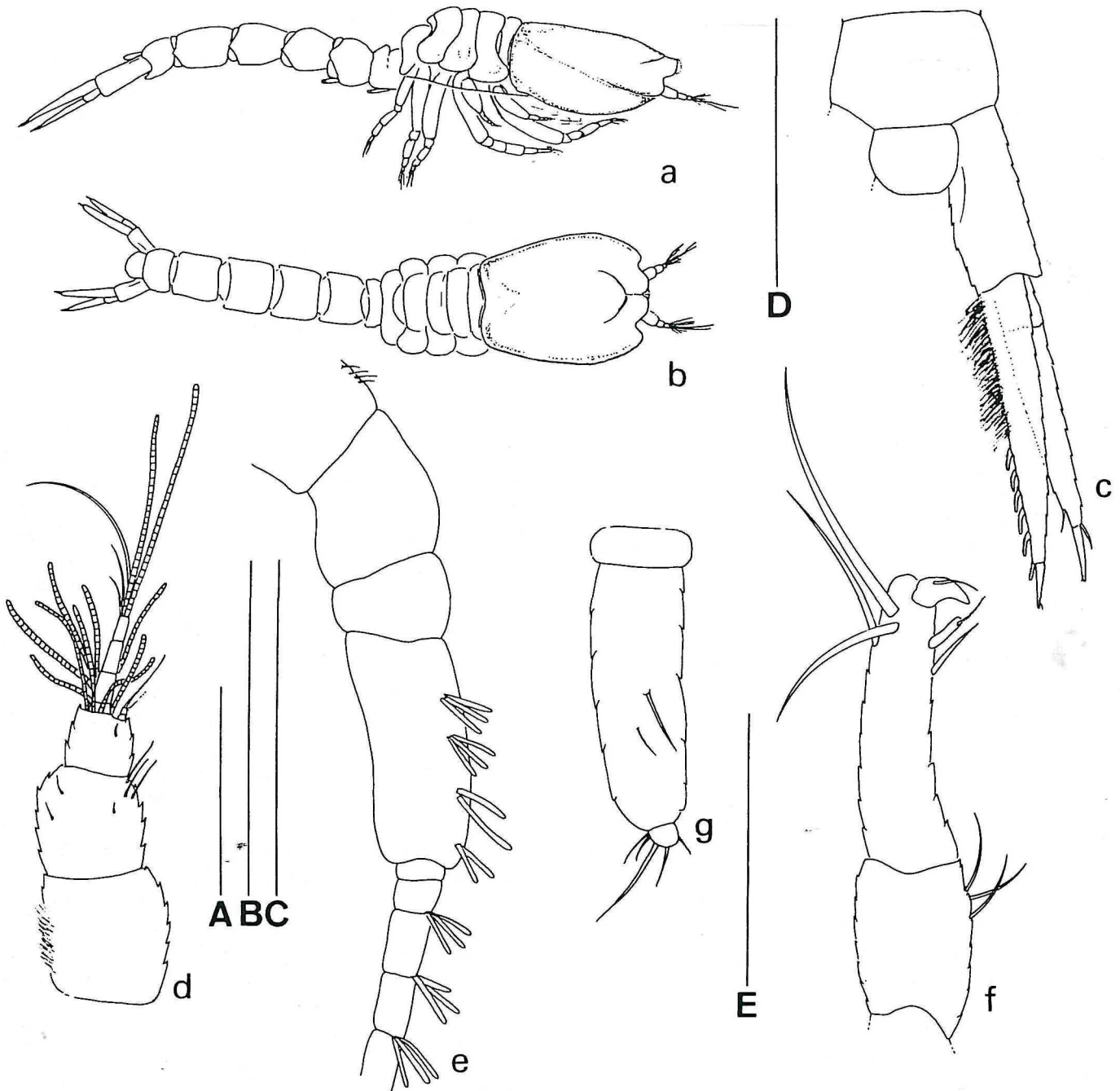


Figure 4. *Fontainella mediterranea*, adult male. a, habitus, lateral view (Scale A); b, habitus, dorsal view (A); c, anal segment, telson and uropod (B); d, first antenna (C); e, second antenna (D); f, distal article of second pereopod (E); g, pleopod (E). Scale bars: A 1 mm; B 500 μ m; C 250 μ m; D 150 μ m; E 100 μ m.

Figure 4. *Fontainella mediterranea*, mâle adulte. a, habitus vue latérale (Echelle A) ; b, habitus vue dorsale (A) ; c, segment anal, telson et uropodes (B) ; d, antennule (C) ; e, antenne (D) ; f, article distal du deuxième péréiopode (E) ; g, pléopode (E). Echelles : A 1 mm ; B 500 μ m ; C 250 μ m ; D 150 μ m ; E 100 μ m.

Fourth pereopod (Fig. 3e) similar to third except basis as long as combined lengths of other articles. Carpus with scaly surface. Some slight differences in setation.

Fifth pereopod (Fig. 3f) similar to third and fourth except basis 0.6 times of combined lengths of other articles. Some

slight differences in setation.

Uropod (Fig. 2c, d). Peduncle longer than telson, inner margin with a distal setule. Rami subequal (outer ramus slightly shorter) about 1.5-1.3 times as long as peduncle. Endopod with the proximal two third of the article furnished

with a dense row of setules; distal third with four characteristic spines (see spine enlarged in illustration); one stout spine, another small spine and one small seta distally. Exopod, first article short and unarmed, second article with one stout spine and one small seta distally, plus one subdistal small seta.

Adult male

Length: 2.5 mm (from tip of pseudorostrum to end of telson). In addition to sexual differences in the development of the second antenna and pleopods, the adult male differs from the adult female by the following characters:

Carapace (Fig. 4a, b) approximately one third total length, 1.2 times longer than wide, anterior part wider in dorsal view.

First antenna (Fig. 4d). Third article of peduncle with numerous (10-12) aesthetascs. Main flagellum 3-articulate, accessory flagellum of 2 articles.

Second antenna (Fig. 4e) fairly short, reaching beyond posterior edge of third thoracic segment.

Thorax approximately two thirds as long as carapace.

Second pereopod (Fig. 4f). Dactylus with one stout distal claw-like spine plus one subdistal spine, both with one ancillary seta.

Abdomen with 2 very rudimentary pairs of pleopods. Only one ramus is found, represented by one small article with some long and short setae.

Uropod (Fig. 4c) endopod with five characteristic spines on the inner side, one stout spine and one small spine distally.

Discussion

The family Pseudocumatidae Sars, 1878 was characterized by having a semicircular telson; exopodites present on the third maxillipeds and on the first four pairs of pereopods in the male, present on the third maxillipeds and well developed on the first two pairs of pereopods, rudimentary on the third and fourth pairs in the female (Jones, 1976). However, when Bacescu and Muradian described the genus *Fontainella* in 1978, the diagnosis of this family had to be modified to include the characteristics features of this new genus.

Fontainella may be easily distinguished from all other genera of the family by lacking the exopodites on third and fourth pairs of pereopods in both sexes (Bacescu & Muradian, 1978).

The description of *Fontainella mediterranea* was based only on one adult male, one adult female, one juvenile male and another juvenile (Bacescu & Muradian, 1978). The examination of a higher number of specimens allowed us to complete the original description mainly the structure and armature of oral appendages, of maxillipeds in the female and pereopods in the male. The structure of the first maxilla

is shown for the first time in this genus. The structures of the second maxilla and first maxilliped are clarified, since some details of the original drawings were not well defined, due to the absence of some setae or the breakage of others.

One of the most interesting features observed in our material is the sexual dimorphism of the armature of the second pereopod. Bacescu & Muradian (1978, Fig. 2i) illustrated a second pereopod of the male rather similar to that of the female. However, in our material, the armature of dactylus is quite different in both sexes: in the male there are two short stout claw-like spines distally with ancillary setule, in addition to some long to moderate naked setae, while in the female several long and medium size naked setae are present. This sexual dimorphism has also been observed, reaching different degrees, in other pseudocumatid species. Sars (1894) commented and illustrated *Pterocuma pectinatum* (Sowinsky, 1893) and *Schizorhamphus bilamellatus* (Sars, 1894) with a row of five stout claws; while *Pseudocuma gracile* Sars, 1894, *P. tenuicauda* Sars, 1894 and *P. graciloides* Sars, 1894 possessed three short claws. Sars (1900) in *Pseudocuma longicorne longicorne* (cited as *P. cercaria* (v. Beneden, 1861) after Bacescu, 1992) found a single claw, while in *P. similis* three claws were cited. Gilson (1906) compared two *Pseudocuma* species, *P. gilsoni* (studied by Gilson in part as *P. longicornis* Bate, 1858) and *P. similis* G.O. Sars, 1900, and observed a similar sexual dimorphism in both species; however, the distal armature of the dactylus of *P. gilsoni* (with two stout short spines with ancillary seta) was slightly different from that of *P. similis* (with three stout short spines with ancillary seta) (see Gilson, 1906, Figs. 2, 9). While there was no description of a sexual dimorphism in the dactylus of the second pereopod of the male, in *Pseudocuma cercaroides* Sars (1894), the author wrote "the outer joint of the 2nd pair does not differ in structure from those in the female". Moreover, the males of some pseudocumatid species are still unknown.

The specimens from the Libyan coasts were collected between 5 and 7 metres (Bacescu, 1992), although in the original description the citation was at "57 metres". The present redescription is based on specimens collected in the Strait of Gibraltar from 15 to 25 metres. Therefore, the bathymetric distribution of *Fontainella mediterranea* is extended down to 25 metres. This species may be considered an inhabitant of shallow waters and has never been recorded in deeper sites in the Strait of Gibraltar. Concerning the habitat, Bacescu and Muradian (1978) mentioned that the species is living on rocks covered with algae. However, in Tarifa Island, *F. mediterranea* have been found associated with soft biodetritric bottoms placed in little pools near rocky substrata.

The original description of *F. mediterranea* was based on specimens from El Hania (Libya), which were considered to

be an endemic species of the Mediterranean sea as are most of the genera and species belonging to this family (Bacescu, 1992). Nevertheless, the new record from the Strait of Gibraltar enlarges the distribution area of the species which, may probably be collected on the nearby Atlantic coast.

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