

José Manuel Guerra-García

A new species of *Caprellinoides* (Crustacea: Amphipoda: Phtisicidae) from the Antarctic

Received: 20 September 2000 / Received in revised form: 4 June 2001 / Accepted: 13 June 2001 / Published online: 31 July 2001
© Springer-Verlag and AWI 2001

Abstract A new caprellid species, *Caprellinoides singularis*, is described and illustrated based on the material collected on the *Polarstern* Cruise ANT XVII/3 from the Branfield Strait. The most striking characteristic of this species is the presence of bilobed gills on pereonites 3 and 4. The genus *Caprellinoides* is revised. *Caprellinoides antarctica* Schellenberg, 1926 and *Caprellinoides spinosus* Barnard, 1930 are considered junior synonyms of *Caprellinoides tristanensis* Stebbing, 1888 and *Caprellinoides mayeri* (Pfeffer, 1888), respectively. The new species, *C. singularis*, is compared with the remaining species in the genus *Caprellinoides*: *C. tristanensis* and *C. mayeri*, which are illustrated in detail.

Keywords Caprellidean amphipods · *Caprellinoides singularis* · *Caprellinoides tristanensis* · *Caprellinoides mayeri* · Antarctic

Introduction

The Antarctic areas have traditionally been too inaccessible to permit the development of large marine research programmes. Nevertheless, the Antarctic fauna is of great interest due, in part, to the high level of endemism observed in certain groups. This appears to be attributable to a process of speciation as a consequence of the protracted period of isolation of the fauna inhabiting the oceanic environment around Antarctica (Clarke and Crame 1992). The recent *Polarstern* surveys, carried out within the framework of the international EASIZ (Ecology of the Antarctic Shelf Ice Zone) Programme, represent a signifi-

cant effort to improve our understanding of certain, as yet poorly known, groups in the Southern Ocean.

The caprellids, although very important as secondary and tertiary producers in ecosystems, have not been sufficiently studied. As Takeuchi and Takeda (1992) pointed out, the caprellidean amphipods of the Antarctic and Subantarctic Seas were first studied by Pfeffer (1888) and also by Stebbing (1883, 1888) in his general reports on the 'Challenger' Expeditions. Mayer (1903) studied the Caprellidea collected from the Siboga Expedition. Additional work on Antarctic caprellids was carried out by Schellenberg (1926, 1931), Barnard (1930, 1931, 1932) and Stephensen (1947). Arimoto (1970) re-described *Protellopsis kergueleni* Stebbing 1888 and *Caprellinoides mayeri* (Pfeffer, 1888), based on the material collected by the T/S *Umitaka-Maru* in the Antarctic Sea. McCain and Gray (1971) reviewed the taxonomy of the Antarctic and Subantarctic Caprellidea and listed 21 valid species of 11 genera including six new species. McCain (1972) studied the Caprellidea collected by the 12th and 15th French Antarctic Expeditions. Vassilenko (1972) resurrected two species of the genus *Caprellinoides* (i.e. *Caprellinoides antarctica* Schellenberg, 1926 and *Caprellinoides spinosus* Barnard, 1930, which had been considered junior synonyms of *C. mayeri* (Pfeffer, 1888) by McCain and Gray (1971). Since the works of Thurston (1972, 1974) no additional information on the Antarctic caprellids was published until Laubitz (1991), who studied the collection of caprellids from the French expeditions to Adélie Land (Antarctica) and islands of the Southern Indian Ocean, and from the Chilean expeditions to the South Shetlands islands. All the identified taxa (seven species in six genera) were previously recorded from these waters but new localities were given and some of the taxa were reillustrated in detail. Takeuchi and Takeda (1992) redescribed two species of the Antarctic Caprellidea, *Aeginoides gausi* Schellenberg, 1926 and *Dodecasella elegans* Barnard, 1931 from Breid and Lützw-Holm Bays, Antarctica, collected during the Japanese Antarctic Research Expedition (JARE-26 Cruise).

Communicated by: H.-D. Franke

J.M. Guerra-García (✉)
Laboratorio de Biología Marina,
Departamento de Fisiología y Biología Animal,
Facultad de Biología, Universidad de Sevilla,
Apdo 1095, 41080, Seville, Spain
e-mail: jmguerra@cica.es
Fax: +34-954-233480

A striking specimen of an undescribed caprellid species was collected on the last *Polarstern* cruise and is described and illustrated in the present paper. Additional material from Museum collections has been consulted to clarify the genus *Caprellinoides*.

Materials and methods

Caprellinoides singularis sp. nov. was collected on the *Polarstern* Cruise ANT XVII/3, sponsored by the Alfred Wegener Institute für Polar- und Meeresforschung, Bremerhaven, during the austral summer of 2000. The caprellid was fixed in 10% formalin on board ship and preserved in 70% ethanol. The specimen was photographed, then dissected under microscope, and illustrations were made with the aid of a *camera lucida*. Permanent mounts of the mouthparts were made in polyvinyl lactophenol. Type material (holotype) has been deposited at the Zoologisches Institut und Zoologisches Museum, Hamburg, Germany (ZIZMH) with the identification number k-39816.

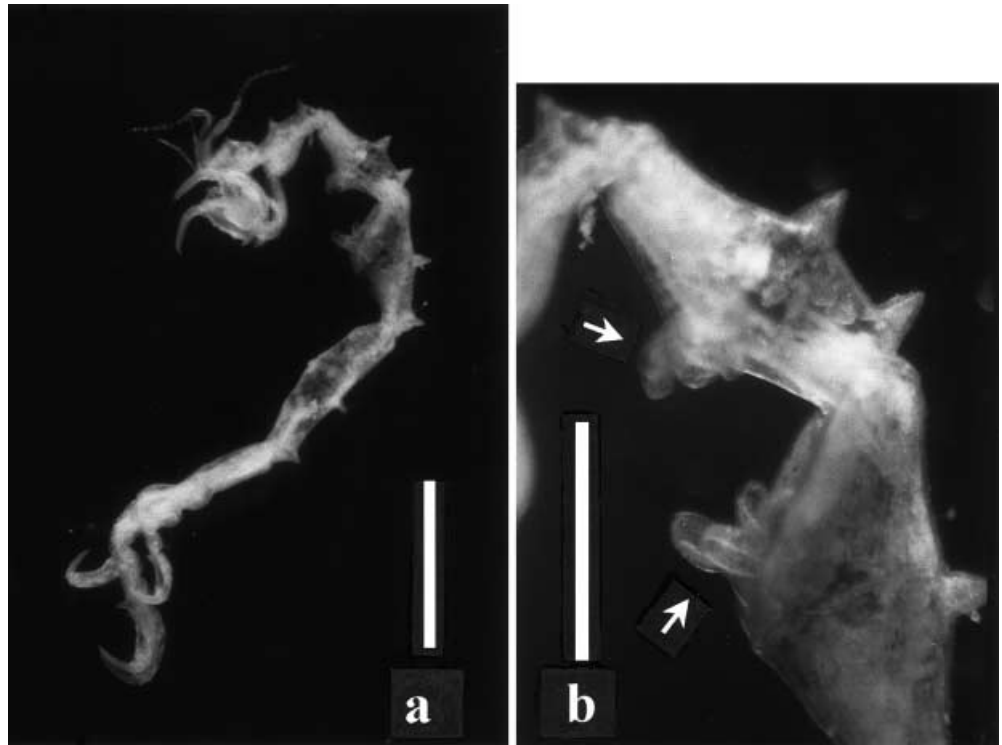
The location of the additional specimens of *Caprellinoides* examined is indicated by the following abbreviations:

- BMNH, British Museum of Natural History, London
- CMNC, Canadian Museum of Nature
- MNB, Museum für Naturkunde, Berlin
- MNHN, Muséum National D'Histoire Naturelle, Paris
- ZIZMH, Zoologisches Institut und Zoologisches Museum, Hamburg
- JMGG, Private collection of José M. Guerra-García.

The following material has been consulted:

- *Caprellinoides antarctica* Schellenberg, 1926 (type material): one male, two females, two juveniles, MNB 20419
- *Caprellinoides mayeri* (Pfeffer, 1888) (type material): two males, five females, ZIZMH 21899

Fig. 1a, b *Caprellinoides singularis* sp. nov. Holotype: **a** lateral view; **b** pereonites 3 and 4 showing the bilobed gills (arrows). Scale bars: 2 mm (**a**), 1 mm (**b**)



- *Caprellinoides spinosus* Barnard, 1930 (non-type material): one male collected from *Polarstern* ANT XVII/3, JMGG; one male, one female collected from *Polarstern* ANT XIV/2, MNB uncatalogued
- *Caprellinoides tristanensis* Stebbing, 1888 (non-type material): one male BMNH 3418; three males, one female, CMNC 2001–0003, one male MNHN Am4852.

Results

- Order Amphipoda
- Suborder Caprellidea
- Family Phtisicidae
- Genus *Caprellinoides* Stebbing, 1888
- *Caprellinoides singularis* sp. nov.

Type material

Holotype: ZIZMH k-39816, one male specimen, *Polarstern* ANT XVII/3, Stn. 56/158, Branfield Strait, 63°4.42'S 57°31.36'W, depth 94–95 m, 26 April 2000, Agassiz trawl.

Description

Holotype male (ZIZMH k-39816).

Body length: 7.9 mm.

Lateral view (Figs. 1a, 2). Head regularly convex with a rounded projection. Eyes reduced to 6 ocelli. Suture between head and pereonite 1 present. Pleura widened in pereonites 3 and 4. Pereonite 5 the longest.



Fig. 2 *Caprellinoides singularis* sp. nov. Holotype male, lateral view. Scale bar: 1 mm

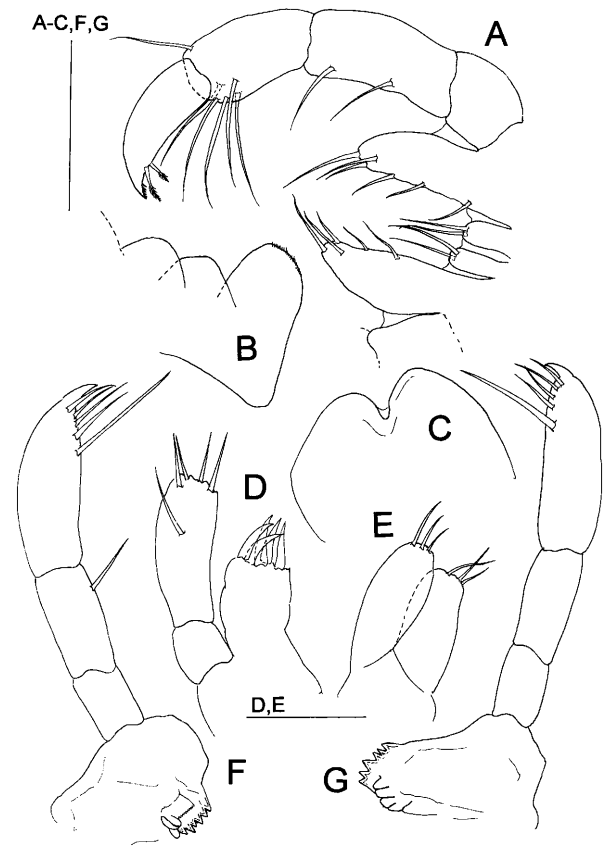


Fig. 3 *Caprellinoides singularis* sp. nov. Holotype male: A, maxilliped; B, lower lip; C, upper lip; D, maxilla 1; E, maxilla 2; F, right mandible; G, left mandible. Scale bars: A-C, F, G: 0.1 mm; D, E: 0.05 mm

Pereonites 2–5 each carrying a mid-dorsal and a posterior blunt projection. Gills bilobed, oval and subequal (Fig. 1b).

Mouthparts (Fig. 3). Upper lip symmetrically bilobed, smooth. Mandibles with palp; mandibular molar absent; right mandible with an incisor divided into 6 teeth and lacinia mobilis serrated and provided with 2 teeth; left mandible with incisor also divided into 6 teeth but lacinia mobilis 4-toothed not serrated; palp 3-articulate, article 2 of left mandible with 1 seta, lacking in right mandible; setal formula 1-3-1 on apical article. Lower lip with inner lobes slightly demarcated; outer lobes with small setulae apically. Maxilla 1 outer lobe with 5 simple teeth; distal article of the palp with 4 spine on apical end and a setae medially. Maxilla 2 outer and inner lobe subequal, carrying on each one 3 setae distally. Maxilliped inner plate small and slender, carrying 2 setae on end; inner and outer plate almost fused; outer plate about three times larger than inner plate carrying 3 setae distally and 2 medially; article 4 of the palp serrated distally, provided with a pair of distal plumose setae.

Antenna 1 short, about one-fifth of body length (Fig. 4). Article 2 of the peduncle the longest. Flagellum composed of 8 articles.

Antenna 2 as long as peduncle of antenna 1 (Fig. 4). Swimming setae absent. Proximal article of the pedun-

cle carrying an acute projection distally. Flagellum 3-articulate.

Gnathopod 1 basis as long as ischium to carpus combined (Fig. 4). Propodus triangular, carrying two proximal acute spines. Palm smooth. Dactylus not serrated, distally bifurcate, carrying 8 setae.

Gnathopod 2 inserted in the anterior half of pereonite 2 (Fig. 4). Basis a little shorter than pereonite 2. Merus expanded ventrally, carpus very short. Propodus slender, length about twice width. A proximal projection carrying a single grasping spine. Two more projections medially in the palm. Dactylus smooth.

Pereopod 5 reduced, 12 times shorter than pereonite 5, with 3 articles (Fig. 5). Proximal article and penultimate article subequal in length; distal article short, about half the length of penultimate article. Proximal and penultimate article each carrying 1 seta, distal article with 5 setae.

Pereopod 6 with 6 articles (Fig. 5). Propodus with a proximal projection carrying a grasping spine.

Pereopod 7 larger than pereopod 6 (Fig. 5). Basis with a pair of ventral acute teeth situated distally. Carpus with a pair of ventral rounded teeth situated proximally. Propodus with a proximal projection carrying a single grasping spine apically and several strong short spines along the palm.

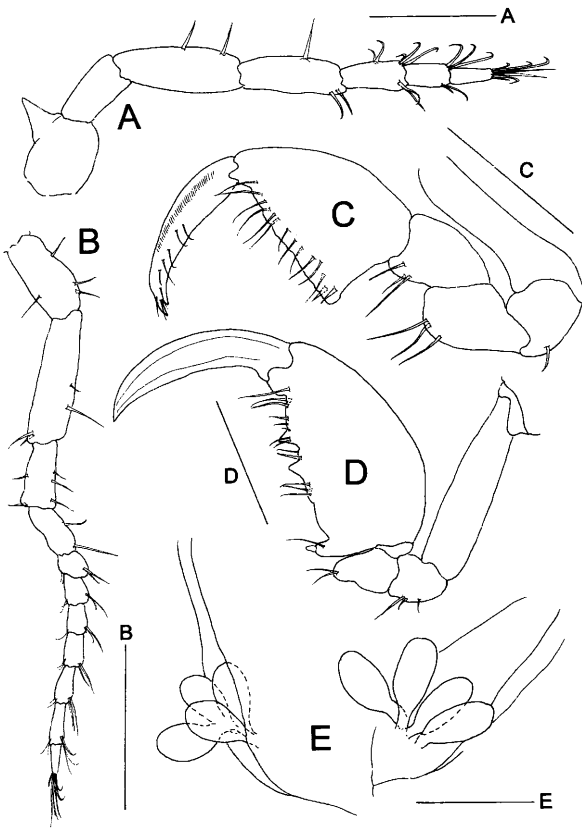


Fig. 4 *Caprellinoides singularis* sp. nov. Holotype male: A, antenna 2; B, antenna 1; C, gnathopod 1, D, gnathopod 2. E, detail of the bilobed gills on pereonite 4. Lateral and ventral views. Scale bars: A, D, E: 0.5 mm; B: 0.2 mm; C: 1 mm

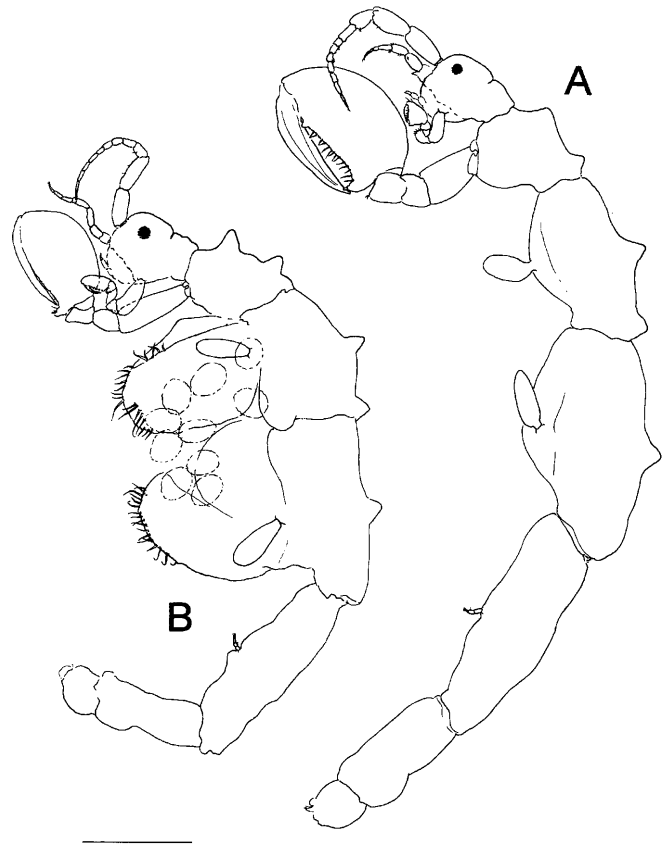


Fig. 6 *Caprellinoides mayeri* (Pfeffer, 1888). Lateral view: A, male; B, female. Scale bar: 1 mm

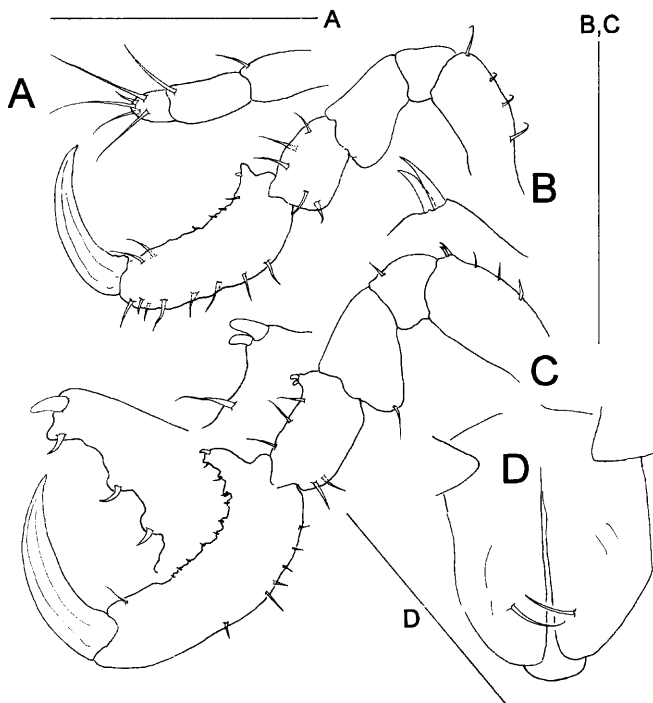


Fig. 5 *Caprellinoides singularis* sp. nov. Holotype male: A, pereopod 5; B, pereopod 6; C, pereopod 7; D, abdomen. Scale bars: A, D: 0.2 mm; B, C: 1 mm

Abdomen with a pair of lobes carrying a setae and a single dorsal lobe (Fig. 5). Penes small situated laterally.

Etymology

The species name refers to the singularity of the species, which possesses bilobed gills, a unique characteristic in the Caprellidea.

Geographic and depth distribution

At present, *C. singularis* is known only from the Branfield Strait, depth 94–95 m.

Remarks

The new species, *C. singularis* sp. nov., is closest to *C. mayeri* (Pfeffer, 1888). The type material of *C. mayeri* is illustrated here in detail for the purpose of comparison (cf. Fig. 6 with Fig. 2, Fig. 7 with Fig. 3, Fig. 8 with Fig. 4 and Fig. 9 with Fig. 5). After a careful examination of the specimens of *C. spinosus* and after consulting the literature and figures included in Vassilenko (1972) and Laubitz (1991) the author can state that *C. spinosus* is a junior synonym of *C. mayeri*.

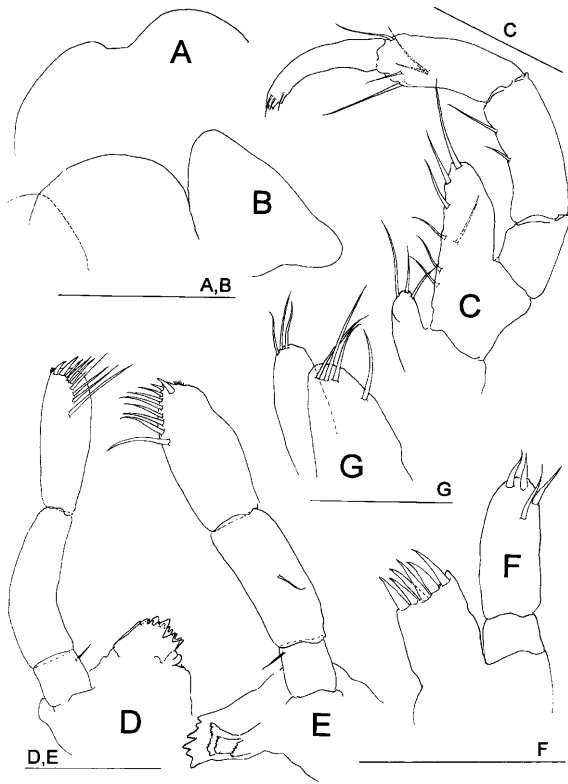


Fig. 7 *Caprellinoides mayeri* (Pfeffer, 1888). Male: A, upper lip; B, lower lip; C, maxilliped; D, right mandible; E, left mandible; F, maxilla 1; G, maxilla 2. Scale bars: A–F: 0.1 mm; G: 0.05 mm

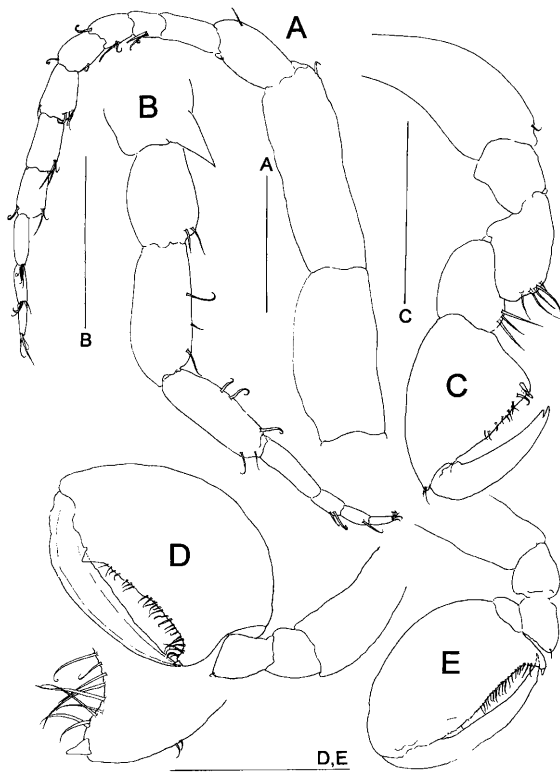


Fig. 8 *Caprellinoides mayeri* (Pfeffer, 1888). A–D, male: A, antenna 1; B, antenna 2; C, gnathopod 1; D, gnathopod 2. E, female gnathopod 2. Scale bars: A–C: 0.3 mm; D, E: 1 mm

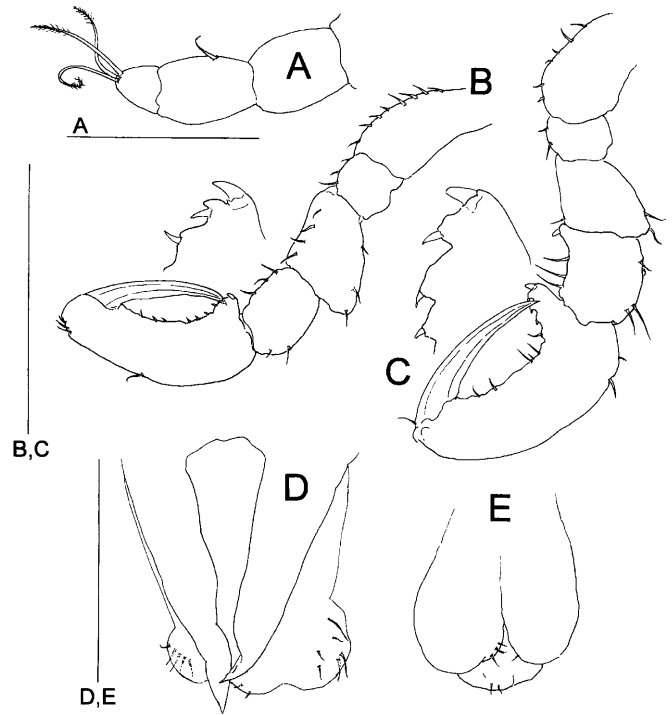


Fig. 9 *Caprellinoides mayeri* (Pfeffer, 1888). A–D, male: A, pereopod 5; B, pereopod 6; C, pereopod 7; D, abdomen. E, female abdomen. Scale bars: A: 0.1 mm; B, C: 1 mm; D, E: 0.2 mm

A further revision of type material and non-type material of *C. antarctica* and *C. tristanensis* revealed that all the specimens belonged to the same species and, therefore, *C. antarctica* is really a junior synonym of *C. tristanensis*, which is also illustrated in detail here (cf. Fig. 10 with Fig. 2, Fig. 11 with Fig. 3, Fig. 12 with Fig. 4 and Fig. 13 with Fig. 5). Consequently, we can consider three valid species in the genus *Caprellinoides*: *C. mayeri*, *C. singularis* and *C. tristanensis*. A comparison of selected characteristics between the three species is presented in Table 1.

Discussion

Stebbing (1888) established the genus *Caprellinoides* based on *C. tristanensis* Stebbing, 1888, which was collected from the ocean off Nightingale Island, Tristan da Cunha, at 201 m depth. Three additional species have been described: *C. mayeri* (Pfeffer, 1888) described primarily as *Caprellina mayeri* Pfeffer, 1888 from South Georgia; *C. antarctica* Schellenberg, 1926, collected during the Deutsche Südpolar-Expedition, and *C. spinosus* Barnard, 1930, collected from the British Antarctic Expedition. The four species in *Caprellinoides* were synonymised by McCain and Gray (1971) as *C. mayeri*. Vassilenko (1972) resurrected *C. antarctica* Schellenberg, 1926 and *C. spinosus* Barnard, 1930. Recently, Laubitz (1991), using material from French expeditions to Adélie Land (Antarctica) and islands of the Southern Indian Ocean, and from Chilean expeditions to the South

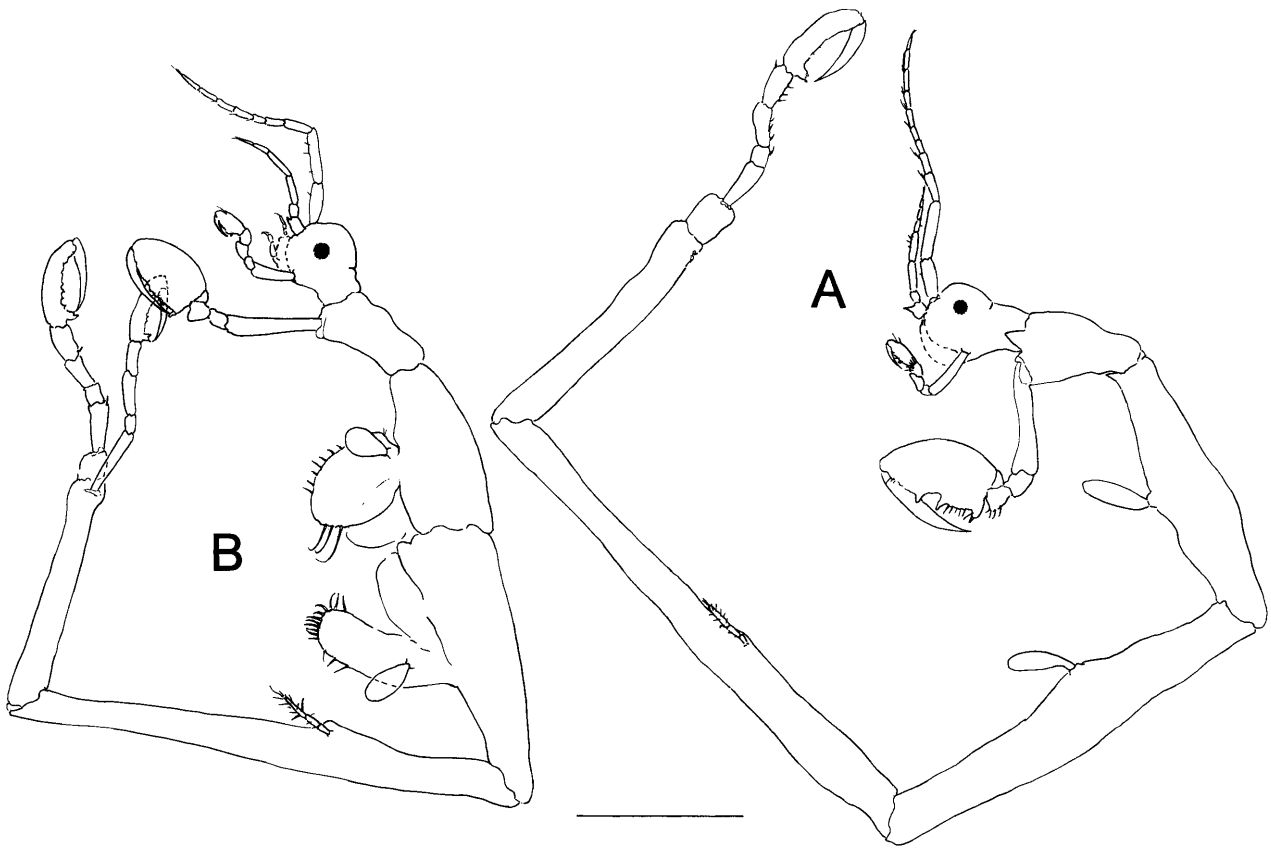
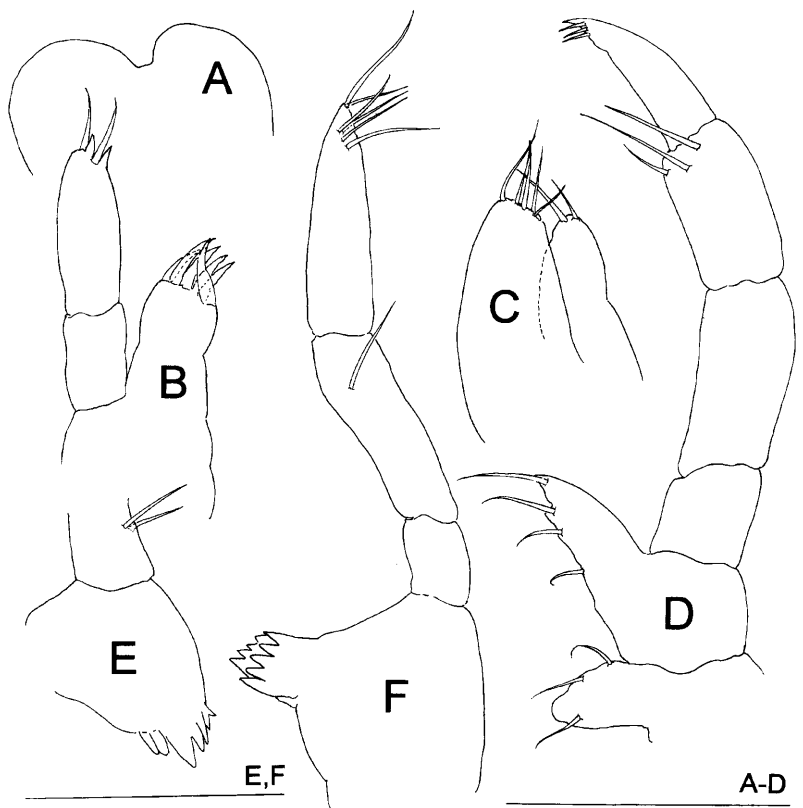


Fig. 10 *Caprellinoides tristanensis* Stebbing, 1888. Lateral view: A, male; B, female. Scale bar: 1 mm

Fig. 11 *Caprellinoides tristanensis* Stebbing, 1888. Male: A, upper lip; B, maxilla 1; C, maxilla 2; D, maxilliped; E, right mandible; F, left mandible. Scale bars: 0.1 mm (lower lip missing)



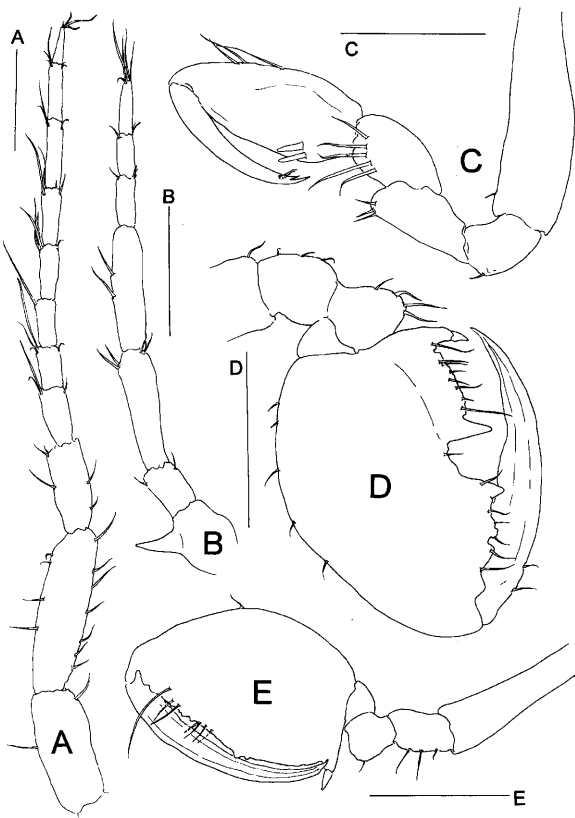


Fig. 12 *Caprellinoides tristanensis* Stebbing, 1888. A–D, male: A, antenna 1; B, antenna 2; C, gnathopod 1; D, gnathopod 2. E, female gnathopod 2. Scale bars: A–C: 0.2 mm, D,E: 0.3 mm

Shetlands island, figured in detail *C. mayeri* and *C. tristanensis*. A detailed comparison between them revealed that both species were valid, reinstating *C. tristanensis* as a distinct species.

Although Laubitz (1991) did not figure *C. antarctica* and *C. spinosus*, she reported the presence of slight differences in the abdomen, pereopods, male gnathopod 2 and body proportions based on previous literature, indicating that both species were probably valid. Laubitz (1991) also reported that although *C. antarctica* was very similar to *C. tristanensis*, minor differences in body lateral ornamentation and proportions in the propodus of male gnathopod 2 would make it probable that both species were also valid. Therefore, until the present paper, the genus *Caprellinoides* was composed of four species: *C. antarctica*, *C. mayeri*, *C. spinosus* and *C. tristanensis*.

After consulting the literature and material from different Museums, the author agrees with Laubitz (1991) that *C. mayeri* and *C. tristanensis* are valid species (see Table 1). However, *C. antarctica* and *C. spinosus* are considered synonyms of *C. tristanensis* and *C. mayeri*, respectively, as no constant differences could be established between *C. antarctica* and *C. tristanensis* on the one hand and between *C. mayeri* and *C. spinosus* on the other.

Apart from the unique presence of bilobed gills, *C. singularis* differs from *C. mayeri* and *C. tristanensis* mainly by the presence of reduced ocelli, the presence of 5 teeth in the maxilla 1 outer lobe and the penes reduced and rounded (Table 1).

Fig. 13 *Caprellinoides tristanensis* Stebbing, 1888. A–C, male: A, pereopod 5; B, pereopod 6; C, abdomen. D, female abdomen. Scale bars: A: 0.2 mm; B, 0.1 mm; C,D: 0.05 mm (pereopod 7 missing)

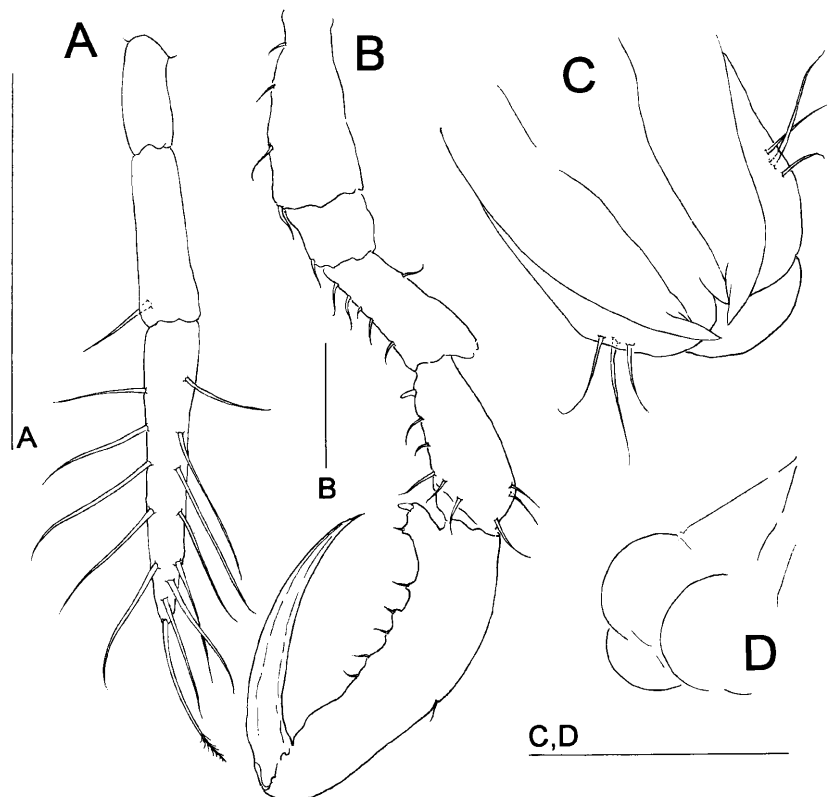


Table 1 Comparison of selected characteristics between *Caprellinoides mayeri* (Pfeffer, 1888), *Caprellinoides tristanensis*Stebbing, 1888 and *Caprellinoides singularis* sp. nov. (comparison is based on male specimens)

| | <i>C. mayeri</i> (= <i>C. spinosus</i>) | <i>C. tristanensis</i> (= <i>C. antarctica</i>) | <i>C. singularis</i> |
|---|--|---|--|
| Length (mm) | 8–12 | 4.5–9 | 8 |
| Eyes | Not reduced | Not reduced | Reduced to 6 ocelli |
| Body | With dorsal projections Pereonites not elongate | Smooth to slightly knobbed Pereonites elongate | With dorsal projections Pereonites not elongate |
| Gills | Normal | Normal | Bilobed |
| Antenna 2 flagellum | 4–6 articles | 2–3 articles | 3 articles |
| Mandibular palp apical setation (1-x-1) | x=7–10 | x=2–4 | x=3 |
| Maxilla 1 outer lobe | 6 teeth | 6 teeth | 5 teeth |
| Pleura in pereonites 3 and 4 | Well developed | Not well developed | Well developed |
| Propodus palm of gnathopod 2 | 1 distal projection | 2 medial projections | 2 medial projections |
| Length pereopod 5/pereonite 5 | 1:12 | 1:7 | 1:12 |
| Pereopod 5 articles length (proximal to distal) | 2:2:1 | 1:2:3 | 2:2:1 |
| Penes | Large, slender, apically pointed | Large, slender, apically blunt | Reduced and rounded |

The most striking characteristic in *C. singularis* is, without doubt, the presence of bilobed gills. This characteristic is unique, so far, in the Caprellidea. Takeuchi (1993) reported the *Pseudoprotomina*–*Perotripus* species group to have three pairs of gills on pereonites 2–4 (six gills in total). Seventeen of the 23 genera included in the family Phtisicidae possess three pairs of gills, but these are non-bilobed. All other Caprellidea have gills that are unilobed and simple, never bilobed as in *C. singularis*.

However, Steele and Steele (1991) have studied the structure and organisation of the gills in the gammaridean Amphipoda and reported that bilobed coxal gills are found on *Gammaracanthus* spp., Lysianassoidea and a few other species. The brackish amphipod family Ansiogammaridae has been characterised by the presence of sternal gills.

Although the arrangement of thoracic gills has been studied intensively in decapods and has contributed substantially to their classification, there is little detailed information available for the other Malacostracans which also have thoracic gills (stomatopod, syncarid, lophogastrid, amphipod and euphasiacean orders). Although most of the gammaridean amphipods possess only a single, simple gill on each pereopod, the presence of bilobed gills in *Gammaracanthus* and lysianassoids suggests that this is the plesiomorphic state and that in most amphipods the outer lobe has been lost. As Steele and Steele (1991) pointed out, in the uristid and lysianassid lysianassoideans the outer lobe is confined almost exclusively to pereopods 5 and 6, whereas in the more primitive *Eurythenes* and *Alicella* the outer lobe is also found on the anterior gills (pereopods 2–4). The outer lobes are evidently being lost through regressive evolution in the more advanced lysianassoids.

Acknowledgements Special thanks to my colleagues P.J. López-González and M. Conradi for placing at my disposal the striking specimen of *Caprellinoides singularis*. Support for this work was provided by the CICYT projects ANT98–1739-E and ANT99–1608-E.

References

- Arimoto I (1970) Caprellids (Crustacea: Amphipoda) collected by the T/S Umitaka-Marui in the Antarctic Sea, 1967. *Antarct Res* 38:10–15
- Barnard KH (1930) Crustacea. Part XI. Amphipoda. *Br Antarct (Terra Nova) Exped Nat Hist Rep Zool* 8:307–454
- Barnard KH (1931) Diagnosis of new genera and species of amphipod Crustacea collected during the 'Discovery' Investigations, 1925–1927. *Ann Mag Nat Hist (Ser 10)* 7:425–430
- Barnard KH (1932) Amphipoda. *Discovery Rep* 5:1–326
- Clarke A, Crame JA (1992) The Southern Ocean benthic fauna and climate change: a historical perspective. *Philos Trans R Soc Lond B* 338:299–309
- Laubitz D (1991) New records of Antarctic and Subantarctic caprellids (Crustacea, Amphipoda). *Mésogée* 51:29–39
- Mayer P (1903) Die Caprelliden der Siboga-Expedition. *Siboga-Expedition* 34:1–160
- McCain JC (1972) Marine invertebrates from Adelie Land, collected by the XIIth and XVth French Antarctic Expeditions. 11. Amphipoda, Caprellidea. *Tethys [Suppl]* 4:239–242
- McCain JC, Gray WS Jr (1971) Antarctic and Subantarctic Caprellidae (Crustacea: Amphipoda). *Antarct Res Ser* 17: 111–139
- Pfeffer G (1888) Die Krebse von Süd-Georgien nach der Ausbeute der Deutschen Station 1882–1883. 2 Teil. Die Amphipoden. *Jahrb Wiss Anst Hamburg* 5:77–142
- Schellenberg A (1926) Die Caprelliden und *Neoxenodice caprellinoides* n. g. n. sp. der Deutschen Südpolar-Expedition 1901–1903. *Dtsch Südpolar-Exped* 18:465–476
- Schellenberg A (1931) Gammariden und Caprelliden des Magellangebietes, Südgeorgiens und der Westantarktis. Further Zoological Results of the Swedish Antarctic Expedition 1901–1903, vol 2. PA Nordstedt & Soner, Stockholm
- Stebbing TRR (1883) The 'Challenger' Amphipoda. *Ann Mag Nat Hist (Ser 5)* 11:203–207

- Stebbing TRR (1888) Report on the Amphipoda collected by HMS Challenger during the years of 1873–76. Great Britain, Reports on the scientific results of the voyage of HMS Challenger during the years 1873–76. Zoology, vol 29
- Steele DH, Steele VJ (1991) The structure and organization of the gills of gammaridean Amphipoda. *J Nat Hist* 25:1247–1258
- Stephensen K (1947) Tanaidacea, Isopoda, Amphipoda and Pycnogonida. Scientific results of the Norwegian Antarctic Expedition 1927–1928, vol 27. Oslo
- Takeuchi I (1993) Is the Caprellidea a monophyletic group? *J Nat Hist* 27:947–964
- Takeuchi I, Takeda M (1992) Three species of amphipod crustaceans collected from Breid and Lützow-Holm Bays, Antarctica, during the JARE-26 Cruise. *Proc NIPR Symp Polar Biol* 5:65–83
- Thurston MH (1972) The Crustacea Amphipoda of Signy Island, South Orkney Islands. *Br Antarct Surv Sci Rep* 71:1–133
- Thurston MH (1974) Crustacea Amphipoda from Graham Land and the Scotia Arc, collected by Operation Tabarin and the Falkland Islands Dependencies Survey, 1944–59. *Br Antarct Surv Sci Rep* 85:1–89
- Vassilenko SV (1972) Caprellidae (Amphipoda) from Antarctica and Subantarctica. *Issled Fauny Morei* 11(19):345–357