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Redescriptions of *Cymodocella tubicauda* Pfeffer 1887 and *Exosphaeroma gigas* (Leach 1818) (Crustacea, Isopoda, Sphaeromatidae)

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Abstract: Detailed redescriptions of the poorly known isopods *Cymodocella tubicauda* Pfeffer 1887 and *Exosphaeroma gigas* (Leach 1818) are presented in order to allow easier identification of these two species. Similarities to and differences from other species of the genus are discussed.

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Key words: Antarctica, marine invertebrates, Southern Ocean, Subantarctic, taxonomy.

Introduction

Specimens of two poorly known species of sphaeromatid isopods — *Cymodocella tubicauda* Pfeffer 1887 and *Exosphaeroma gigas* (Leach 1818) — were discovered in collections of isopods from the Antarctic Peninsula and off Punta Arenas (Chile). The existing descriptions of these two species are brief with illustrations of only the dorsal view. Only some of the mouthparts and appendages have been illustrated using very small figures without any detailed setation (compare Schultz 1978). This last feature is important both for taxonomy and phylogeny (Brandt 1988). *Cymodocella tubicauda* has often been found in subantarctic areas and around the Antarctic Peninsula; *Exosphaeroma gigas* is normally found around South America, Australia and New Zealand, but detailed descriptions of all appendages are still lacking (Pfeffer 1887, Hodgson 1902, Hurley & Jansen 1977, Schultz 1978).

Species belonging to the genus *Cymodocella* have been reviewed by Harrison & Holdich (1982) and comments about the genus *Exosphaeroma* have been made by Harrison & Holdich (1984) and Jacobs (1987).

Material and methods

Exosphaeroma gigas was found in February 1987 on the beach near Punta Arenas and *Cymodocella tubicauda* was caught during the cruise of RV *Polarstern* in 1983/84 by Agassiz trawl and in 1987/88 by diving in Admiralty Bay. The animals were sorted, fixed in formalin (4%), and later transferred into alcohol (70%). The drawings were prepared with the help of a camera lucida. The specimens are in the collection of the authors.

The following abbreviations are used in text and figures: A1 = antennula, A2 = antenna, lMd = left mandible, Mx1 = maxillula, Mx2 = maxilla, Mxp = maxilliped, P1–7 = pereopod 1–7, Plp1–5 = pleopod 1–5, rMd = right mandible, Urp = uropod.

Systematics

Cymodocella tubicauda Pfeffer 1887 = *Sphaeroma egregium* Chilton 1892; *Cymodocea antarctica* Hodgson 1902.

Type material

New Zealand Museum of Natural History: N.Z.O.I.: Z.1795.

Material

Three males, 7–10.5 mm long, two females, 6–7 mm long, King George Island, near Dragon Glacier, opposite of Ferraz, 500 m south of Port Hennequin in a depth of 12 m. Habitat: on sand, mud and under stones (caught by diving). *Polarstern* samples: 53°22.6'S 42°43.6'W, 347 m (1 specimen); 62°59'S 57°05'W, 70 m (1 specimen).

Distribution

Subantarctic, circumpolar: South Georgia, South Sandwich Islands, South Shetland Islands, Booth Island, Anvers Island, Antarctic Peninsula, Drygalski Island, Davis Sea, Adélie Land, Cape Adare, at depths ranging from 3–245 m (Hodgson 1910, Richardson 1911, Stephensen 1947, Kussakin 1967, Hurley & Jansen 1977) and at South Orkney Islands (M.G. White, personal communication 1988).

Redescription of male

Head smooth, with small round black eyes, situated on small

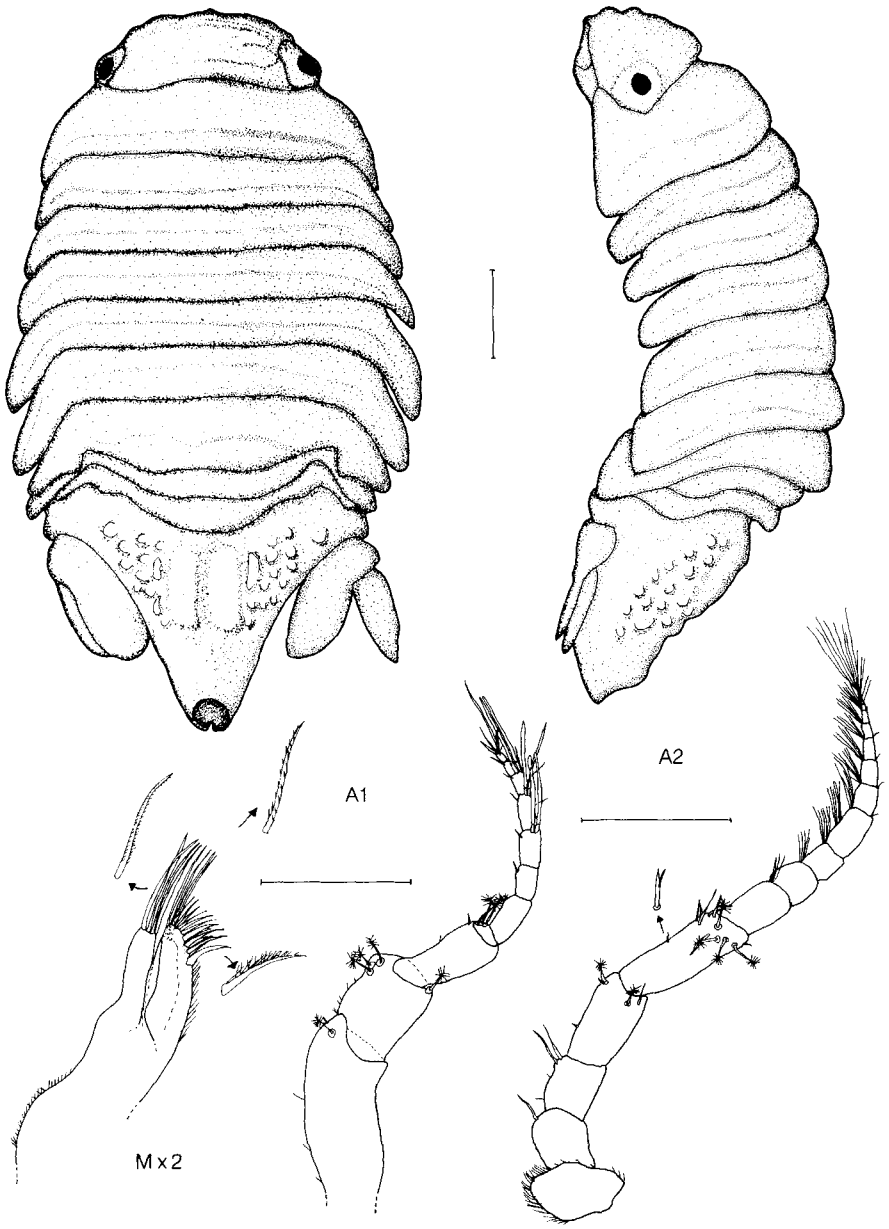

Fig. 1. *Cymodocella tubicauda* Pfeffer 1887, male in dorsal and lateral view (scale bar 1 mm), antennula, antenna and maxilla (scale bars 250 μm), with details of setation.

round elevations. Pereonite 1 longest, not fused with cephalothorax (Fig. 1). Pereonites 2–4 shortest and smallest; pereonites 5 and 6 largest and subequal in size, pereonite 7 less wide, about half as short as pereonite 1. All pereonites smooth, with an horizontal shallow ridge only on the dorsal side. All pleonites fused with pleotelson, but pleonites one and two indicated by deep sutures. Pleotelson broadest anteriorly, with two mediodorsal longitudinal elevations and several small tubercles on both sides of the elevations (Fig. 1). Pleotelson narrowing posteriorly, tip tube-like, with a caudal invagination opening into the respiratory chamber. Uropods inserted after the first quarter of pleotelson length.

A1 (Fig. 1) with three peduncular and eight flagellar articles. First peduncular article longest, with an apical feather-like bristle. Second article about half as long as first, with three apical feather-like bristles. Last peduncular article about as long as second, with a short simple distolateral bristle. First flagellar article forming a very short ring, with three feather-like bristles. Second flagellar article without setation and much longer than first. Third flagellar article with a short distolateral bristle; fourth, fifth and sixth articles each with two long distal aesthetascs, a long simple seta and a distolateral short bristle. Penultimate article with one simple bristle and last article smallest, with four apical setae, one of which is elongated.

A2 (Fig. 1) with five peduncular and 11 flagellar articles. First peduncular article shortest, but broadest, covered with short hairs. Second article with a simple apical seta, third article slightly longer than second, with two simple setae, fourth article with two feather-like distal and three small bristles; last peduncular article longest, with four distal feather-like bristles and some sensory spines. First flagellar

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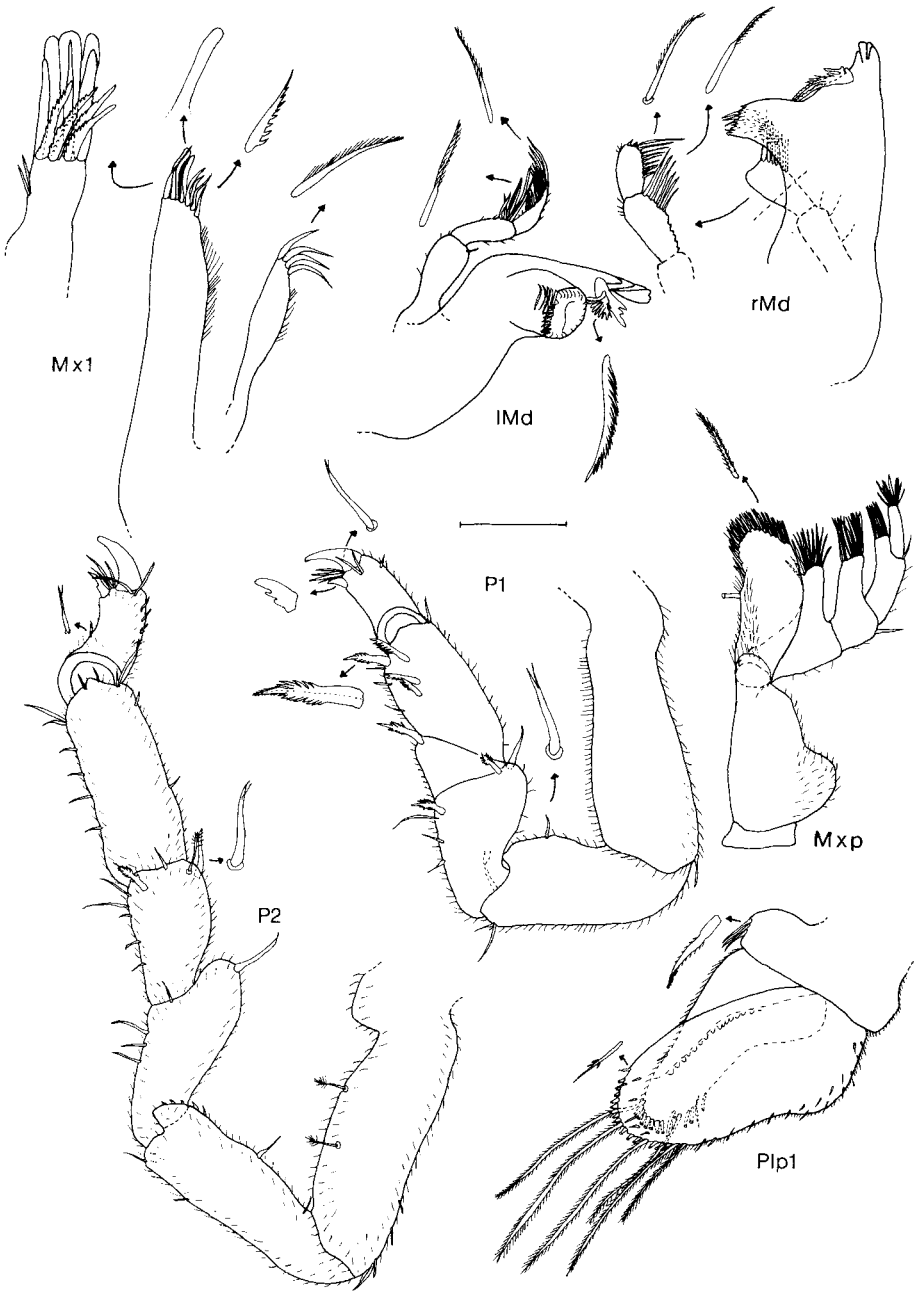

Fig. 2. *Cymodocella tubicauda* Pfeffer 1887, male maxillula, both mandibles, maxilliped, pereopods 1 and 2 and pleopod 1 (scale bar 250 μm), with details of setation.

article longest and broadest with four simple apical bristles. Following flagellar articles narrowing and shortening, except the fourth article, which is almost as long as the first and bears two groups of simple distolateral bristles. Last flagellar article with the most and the longest bristles.

Mandibles (Fig. 2) both asymmetrical and with a palp of three articles. Pars incisiva of rMd narrower than left, with four short strong teeth. Lacinia mobilis with two short teeth and four seta-like structures, two of these are quite long. Pars molaris stout, with long simple mediolateral setae, broad grinding surface and indented lower margin. First palpal article longest, without special setation, second article slightly shorter, with six long setae, distal half setaceous. Last article smallest, with nine setae, setaceous at the distal two thirds and two short apical setae. Pars incisiva of lMd also with four teeth, but longer and stronger. Lacinia mobilis with three teeth and nine seta-like structures, densely setulated. Pars molaris and palp as in rMd.

Mx1 (Fig. 2) of two endites, lateral one narrowing distally, bearing nine strong spines of a different shape. Medial endite shorter, with four strong curved spines, densely setose.

Mx2 (Fig. 1) with three endites, inner one covered with 14 slender setae, arranged in two rows, outer lateral setae longest and densely setose. Medial endite with four subequal long setose setae, but less setose than those of the inner endite. Outer endite also with four setae of similar length, covered with setules.

Mxp (Fig. 2) without epipodite, strong endite and a five

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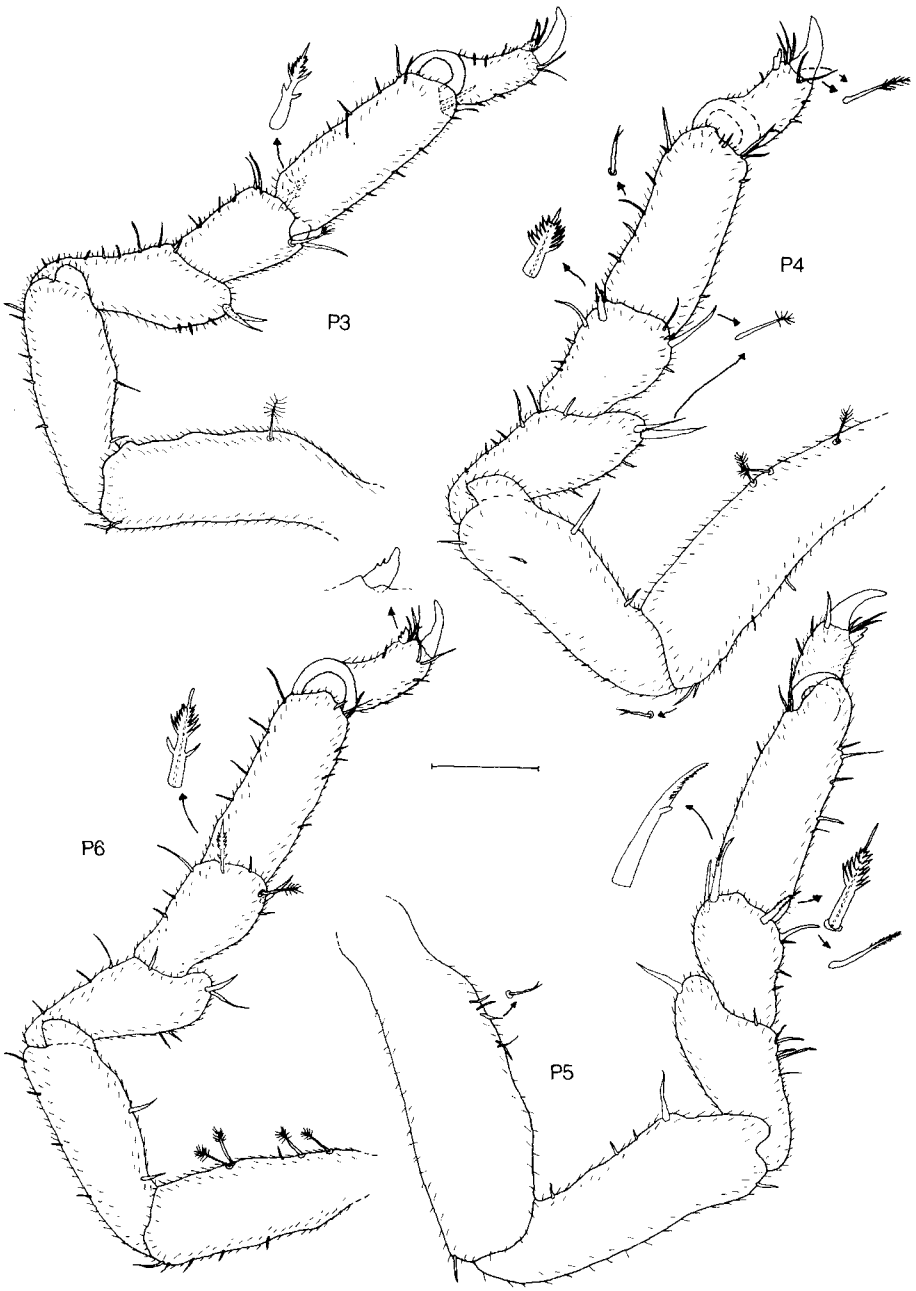

Fig. 3. *Cymodocella tubicauda* Pfeffer 1887, male pereopods 3–5 (scale bar 250μm), with details of setation.

segmented palp. Endite on distal margin with two dorsal rows of long setose setae. One coupling hook medially on endite. First palpal article shortest and almost round. Second article longest and broadest, all following articles decreasing in length and breath. Second, third and fourth articles disto-medially extremely produced, with a dense medial brush of long simple setae. Tip of last article also with long setae.

P1–7 (Figs 2–4) similar in shape and setation. P1 shortest, but with strongest sensory spines. Basipodite always longest, with or without some dorsal feather-like bristles or sensory spines. Ischium increasing in length from first to seventh pereopod. Carpus and propodus with varying number of ventral and lateral sensory spines, most prominent on P1. Sensory spines either smooth, with a distal sensory bristle or laterally saw-like in the upper half, proximally with the longest and most distally curved protrusions. Propodus about subequal in length to ischium, in P1 only with a number of strong serrated sensory spines. Sensory spines of this article much smaller in P2–7. Dactylus with one strong smooth dorsal claw and a shorter ventral claw, which bears some tooth-like protrusions (see detail in Figs 2, 3). Between these claws 3–4 simple bristles. Distodorsally of this article two long setae, with small distal setules.

Plp1 (Fig. 2) of male with short sympodite, bearing three long lateral coupling setae. Exopodite of male with a transverse ridge of small blunt pegs. Endopodite larger, both exopodite and endopodite with long marginal plumose setae on distal margin (exopodite: 13; endopodite: 17).

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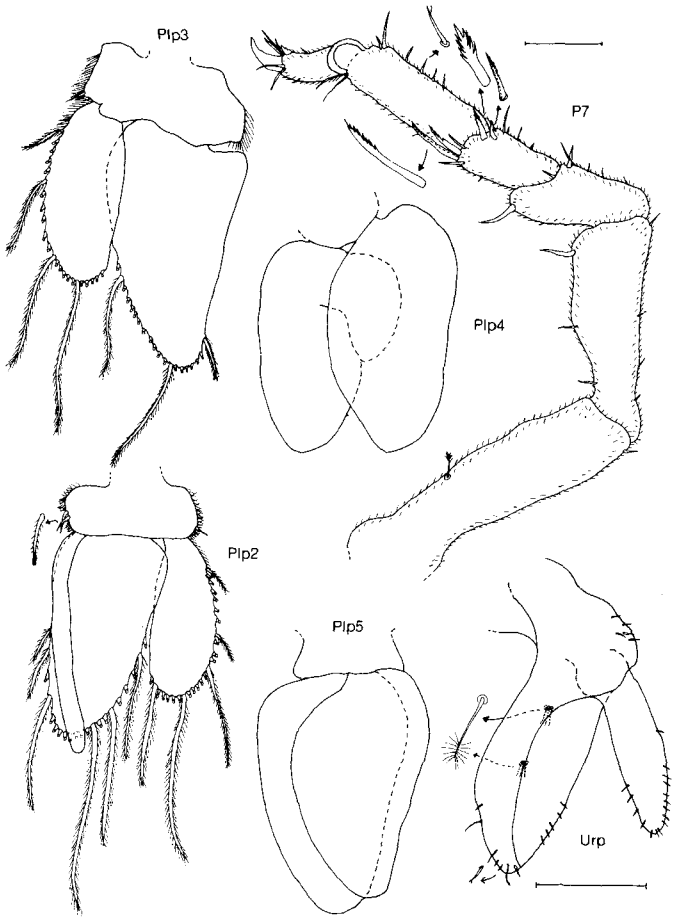

Fig. 4. *Cymodocella tubicauda* Pfeffer 1887, male pereopod 7 (scale bar 250 μm), pleopods 2–5 and uropod (for all scale bar 500 μm), with details of setation.

Plp2 (Fig. 4) also with short sympodite, bearing two lateral setae. Endopodite larger than exopodite, with broad appendix masculina, inserting laterally and having a round tip, only slightly longer than the endopodite itself. Both with long marginal plumose setae.

Plp3 (Fig. 4) similar to Plp2, with short sympodite bearing one lateral seta. Endopodite longer than exopodite, with long marginal plumose setae.

Plp4 and 5 (Fig. 4) both about subequal in size, with smooth endo- and exopodite both about subequal in length, without any setae.

Urp (Fig. 4) with fused sympodite and endopodite, these stout and broad, exopodite shorter and more slender. Both rami with some short bristles or sensory spines.

Remarks

Unfortunately nearly all species of the genus have been described in a very superficial way. Harrison & Holdich (1982) have transferred a number of species from this genus to *Dynamenella* and *Ischyromene*. For this reason *Cymodocella tubicauda* Pfeffer 1887 and *C. georgiana* Pfeffer 1887 are the only Antarctic species known of this genus. *C. tubicauda* can be easily distinguished by the tube-like tip of the pleotelson, which is more strongly developed than in any other species of the genus. Of the non-Antarctic species, *C. capra* Hurley & Jansen (1977) is most similar to *C. tubicauda*, but can be distinguished by a broader pleotelson, less tubercles and the lack of the longitudinal ridges. Instead this species bears two strong medial blunt spines, which look like short hooks in lateral view. *C. guaraparíensis* Loyola e Silva (1965) can be distinguished from *C. tubicauda* by a more tubercular pleotelson and by four big pleotelsonic blunt dorsomedial spines. Males and females of *C. tubicauda* are not sexually dimorphic (compare with data of Buss & Iverson 1981, who describe a protogynous hermaphroditism for Sphaeromatidae). The female is lacking the appendix masculina on the pleopod 2 and the small differences in setation and number of flagellar articles of both antennae are either due to size (smaller animals have less flagellar articles) or normal population variability.

Exosphaeroma gigas (Leach 1818) = *Sphaeroma gigas* Leach 1818; *Sphaeroma juvenii* Kraus 1843; *Sphaeroma propinqua* Nicolet 1849; *Sphaeroma chilensis* Dana 1853; *Sphaeroma obtusa* Hutton 1879 (*in* Chilton 1909).

Type material

British Museum(NH) 1979:420:1 Syntype, locality unknown. Pres.: Sir Joseph Banks Collection (via the Linnean Society of London).

Material used for redescription

Six adult males, 19–28 mm long, 58 immature specimens and females 5–19 mm long, beach of Punta Arenas (South Chile). Habitat: intertidal on stony beach.

Distribution

Circum-Antarctic: Peru, Magellan Region, Tierra Del Fuego, Chile, Falkland Islands, Iles Crozet, Iles Kerguelen, South Africa, Macquarie Island, Tasmania, South Australia, Campbell Island, Auckland Islands, New Zealand, Chatham Rise, depth ranging from 0–270 m (e.g. Dana 1853, Vanhöffen 1914, Tattersall 1914, Kussakin 1967).

Redescription of male

Head smooth, with small oval black eyes, situated on small longitudinal elevations. Pereonite 1 longest, not fused with cephalothorax (Fig. 5). Pereonites 2 and 3 shortest and smallest; pereonites 4 and 5 largest and subequal in size,

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pereonites 6 and 7 little shorter than pereonites 4 and 5, but longer than pereonites 1–3 together. All pereonites smooth, only laterally indicated by shallow small incisions. All pleonites fused with pleotelson, but pleonites 1 and 2 indicated by deep sutures; in dorsal view pleonites 1 and 2 are covered by the last pereonite. Pleotelson broadest anteriorly, narrowing caudally, tip round. With some mediofrontal white furrows. Uropods inserted frontolaterally of pleotelson.

A1 (Fig. 6) with three peduncular and 19 flagellar articles. First peduncular article longest and broadest, with a lateral feather-like bristle and a short apical simple bristle. Second article about half as long and more narrow, with two apical feather-like bristles. Last peduncular article longer than second, without setation. First flagellar article forming a very short ring with two small feather-like bristles. Second flagellar article much longer than first, without setation, following flagellar articles all with two short lateral aesthetascs, three simple short setae and another short simple bristle on opposite side, except the last flagellar article which bears a simple seta, a small feather-like bristle and four simple bristles.

A2 (Fig. 6) with five peduncular and 18 flagellar articles. (First peduncular article not shown in Fig. 6.) Second article with some proximal short bristles, third article slightly longer than second, with two simple apical setae, penultimate article about as long as third, also with two apical setae, last article longest, with three distal feather-like and three simple bristles. First flagellar article longest and broadest with two lateral groups of many simple setae and some simple bristles on opposite side. Second and third flagellar article constructed

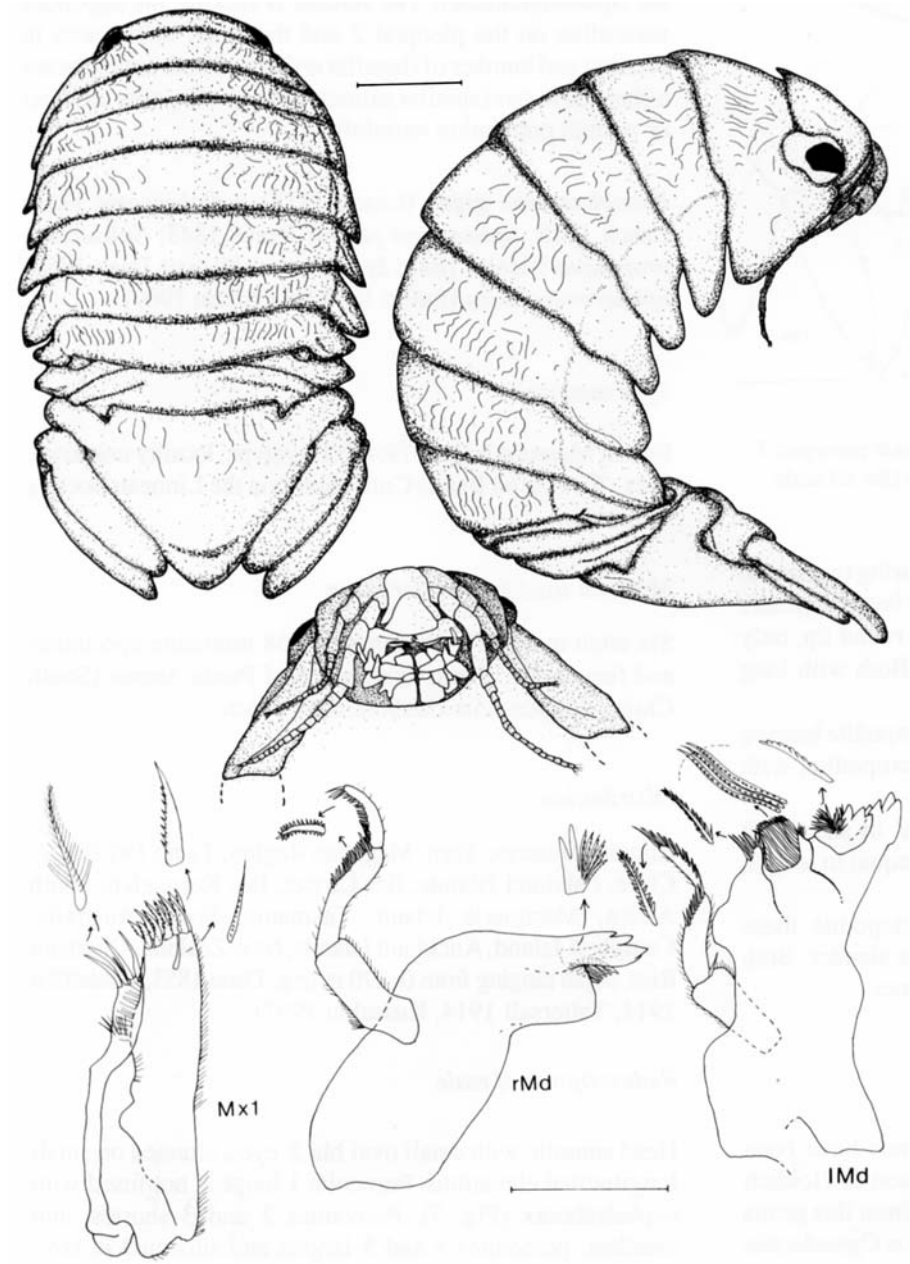

Fig. 5. *Exosphaeroma gigas* (Leach 1818), male in dorsal and lateral view (scale bar 5 mm), frontoventral view of head, maxillula and both mandibles (scale bar 1 mm), with details of setation.

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like the first, but all following flagellar articles except the last only with one lateral group of simple setae. Last flagellar article with the most and longest simple setae.

Mandibles (Fig. 5) both asymmetrical and with a three-segmented palp. Pars incisiva of rMd narrower than left, with four short strong teeth. Lacinia mobilis with two short teeth and many setae-like structures. Pars molaris stout, triturative, with broad grinding surface and indented lower margin. First palpal article broadest, without special setation, second article slightly shorter and narrower, with a row of several strong setose setae. Last article smallest, also with setose setae. Pars incisiva of lMd also with four teeth, but stronger. Lacinia mobilis with three teeth and many seta-like structures. Indented lower margin of pars molaris with several rows of small teeth, palp as in rMd.

Mx1 (Fig. 5) of two endites, lateral one distally little narrowing, bearing 11 strong spines and a smaller more proximal one of a different shape. Medial endite shorter, with four strong curved spines, densely spinulated and two shorter simple setae.

Mx2 (Fig. 6) with three endites, inner one covered with 26 slender setae in two rows, outer lateral setae longest and most densely setulated. Medial endite with 11 subequal long setose setae, less setose than those of the inner endite, but with stronger setules. Outer endite with 14 setulated setae of similar length.

Mxp (Fig. 6) without epipodite, strong endite and a five segmented palp. Endite on distal margin with two dorsal rows of long setose setae. Between these rows the endite is concave. One coupling hook medially on endite. First palpal

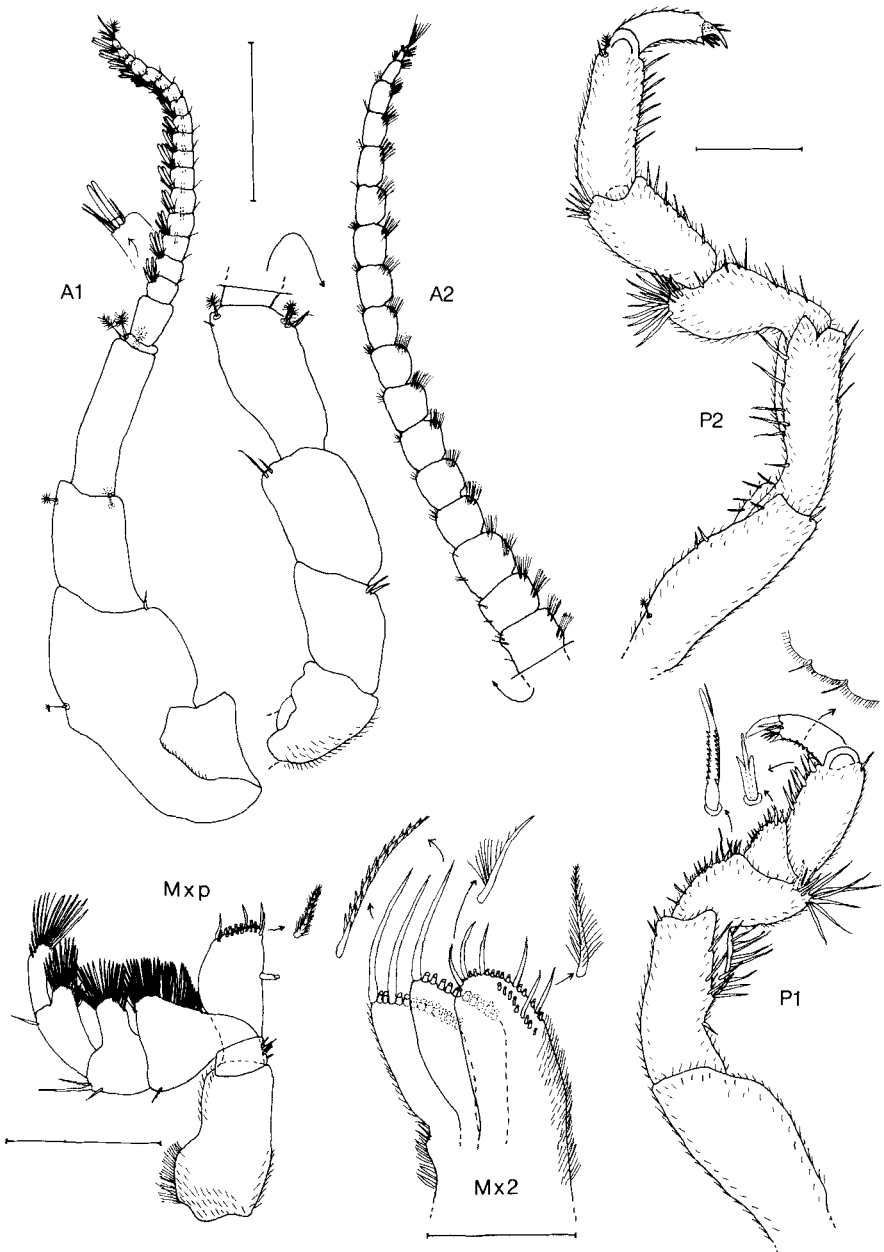

Fig. 6. *Exosphaeroma gigas* (Leach 1818), male antennula, antenna (scale bar 1 mm), maxilla (scale bar 500 μm), maxilliped, pereopods 1 and 2 (scale bars 1 mm), with details of setation.

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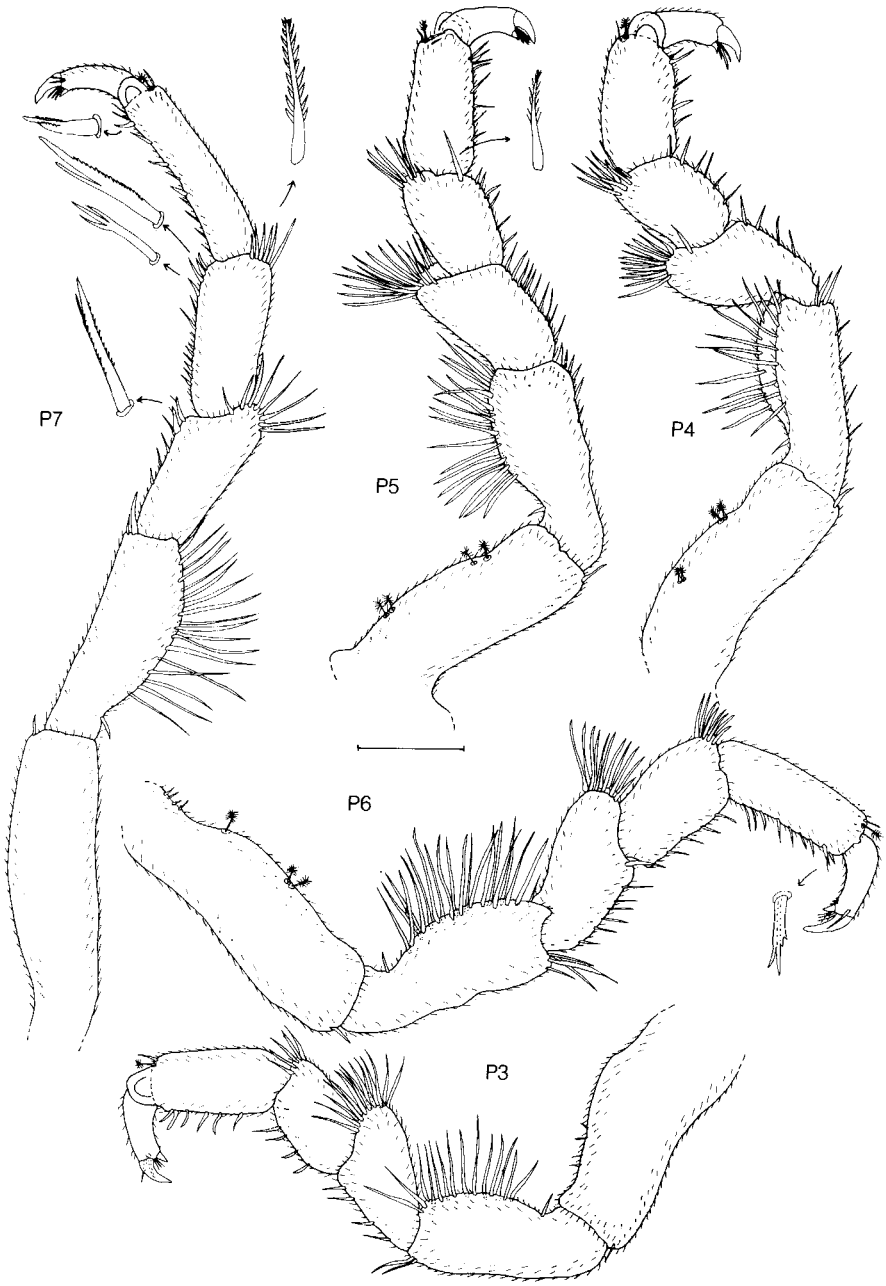

Fig. 7. *Exosphaeroma gigas* (Leach 1818), male pereopods 3–7 (scale bar 1 mm), with details of setation.

article shortest and almost round, with some medial short simple bristles. Second article longest and broadest, all following articles decreasing in length and breadth. Second to fourth article distomedially extremely prolonged, with a dense brush of long simple setae and 1–3 simple distolateral setae. Tip of last article also with long setae.

P1–7 (Figs 6, 7) similar in shape and setation. P1 shortest, the longest article always the basipodite, with some dorsal feather-like or simple bristles or without setation. Ischium increasing in length from the first to the seventh pereopod, with many dorsal long simple setae. Merus slightly shorter than ischium, distodorsally prolonged and with many long simple setae. Ventrally on merus some shorter simple setae or bristles, distoventrally of some pereopods different kinds of sensory spines occur. Carpus of P1 triangular in shape, in all following pereopods only slightly shorter than merus, distodorsally with some simple long setae and ventrally with some sensory spines of a different shape. Propodus slightly shorter than ischium, with a varying number of ventral sensory spines and simple setae. Sensory spines are either smooth, with a distal sensory bristle or with claw-like structures on one side or with a sensillum medially subdividing the spine. Dactylus with one strong smooth dorsal claw and a shorter ventral claw. Between these claws three simple bristles occur and laterally of the long claw one or two longer simple setae.

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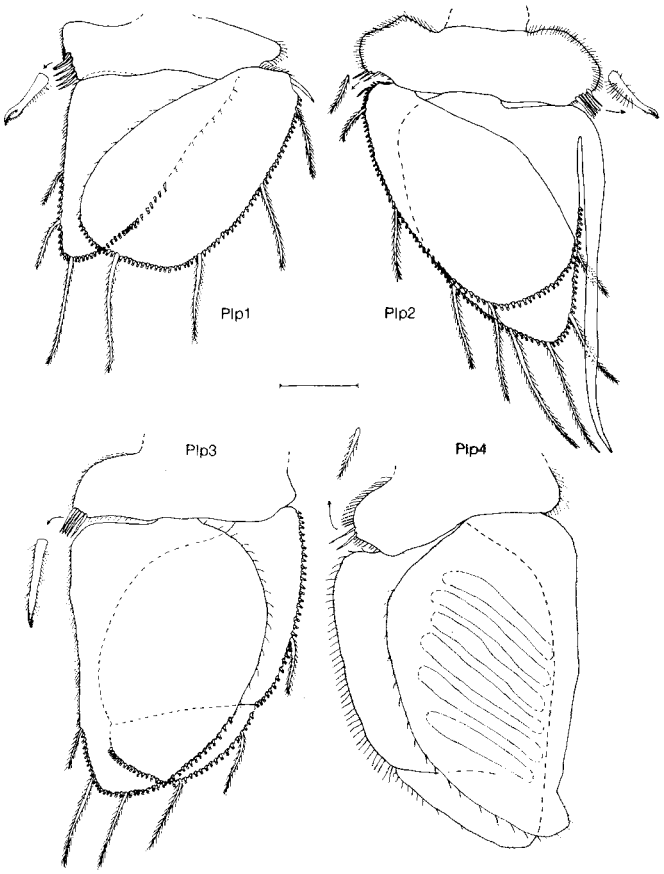

Fig. 8. *Exosphaeroma gigas* (Leach 1818), male pleopods 1–4 (scale bar 1 mm),with details of setation.

Plp1 (Fig. 8) of this male with short sympodite, covered with 6 long lateral setae. Exopodite slightly smaller than endopodite, endopodite larger and laterally with a short strong spine. Both exopodite and endopodite with many long distal marginal plumose setae, more on endopodite.

Plp2 (Fig. 8) also with short sympodite, bearing five lateral setae. Endopodite larger than exopodite, with broad appendix masculina, inserted laterally with a very acute tip, much longer than the endopodite itself. This Plp also with long marginal plumose setae.

Plp 3 (Fig. 8) with short sympodite, also with 5 lateral setae, but more setulated. Exo- and endopodite slightly larger than in Plp2, exopodite with a shallow distal suture.

Plp 4 (Fig. 8) with a short sympodite, but broader than in Plp 5, laterally only with 2 setae. Exo- and endopodite with many marginal, simple, short bristles, endopodite with 6 transverse chambers.

Plp5 (Fig. 9) with short sympodite and short endo- and exopodite, about subequal in length and marginally with many simple bristles. Endopodite as in Plp 4, but distally with two lobes. It is possible that these lobes are artifacts.

Urp (Fig. 9) with fused sympodite and endopodite, but very stout and broad developed and slender exopodite, a little shorter than endopodite. Both rami without setation.

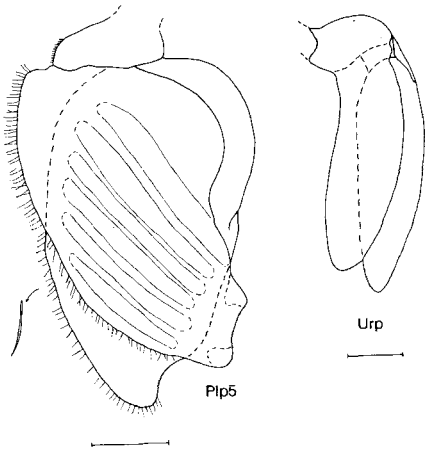

Fig. 9. *Exosphaeroma gigas* (Leach 1818), male pleopod 5 and uropod (scale bars 1 mm).

Remarks

Exosphaeroma gigas is the type species of the genus and was described by Leach (1818). That description only presented a dorsal view of the animal with few details. Stebbing (1900) has drawings of some appendages and even one pereopod is shown, but as the drawings are very small and incomplete, the species cannot be considered to have been adequately described.

Comparison of the present specimens with the syntype material shows that the only difference is the longer dorsal setae on the ischium of the Punta Arenas specimens.

Exosphaeroma gigas can be easily distinguished from other species of the genus, such as *E. obtusam* (Dana 1853) and *E. lanceolatum* (White 1843), by the dorsal cuticle, which has several shallow white furrows laterally on all pereonites in *E. gigas*. The caudal tip of the pleotelson is round in *E. gigas*, whereas in *E. obtusam* it is a little more acute. Moreover in *E. gigas* the lateral margins of the pereonites are little caudally prolonged and bent, whereas in *E. obtusam* these margins are quite smooth and do not reach further caudally than the lateral tip of preceeding pereonite. *E. lanceolatum* is most similar to *E. gigas*, but the dorsal white furrows seem to be represented by shallow flat tuberculous elevations, which are lacking in *E. gigas*. The pereopods of *E. gigas* cannot be compared to the other species, because drawings do not yet exist or are too small or incomplete. The mouthparts are quite similar to those of other species within the genus. Males and females of *E. gigas* show no sexual dimorphism, only some size-related variability in setation. The long and slender setae on pereopods 1–7 are generally shorter, stronger and fewer in number in smaller and younger specimens. Younger specimens also bear fewer flagellar articles on antennula and antenna.

Specimens of *Iais pubescens* (Dana 1853) were found on all specimens of *E. gigas* from Punta Arenas. These small

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asellote isopods, 1–3 mm long, usually hide between mouthparts and pereopod 1, under the base of pereopods 1–7 or between the pleopods. They are rarely attached to the tergum of *Exosphaeroma*. Verhoeff (1949) found specimens of *Jaera hopeana* on *Sphaeroma serratum* and Rotramel (1975) observed specimens of *Iais californica* holding on the maxillipeds, the last pereopods and sometimes even between the last pleopods on the ventral side of *Sphaeroma quoyanum*. These small asellote isopods feed on detritus and are able to exchange hosts, when two species of *Sphaeroma* meet.

Acknowledgements

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