



Two new phoxocephalids (Crustacea: Amphipoda: Phoxocephalidae) from the south-west Atlantic

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A new genus and species, *Parafoxiphalus longicarpus*, and a new species, *Metharpinia protuberantis* belonging to the family Phoxocephalidae, are described from the Argentine Sea. Both taxa were collected from sandy substrata in the intertidal and subtidal regions. *Parafoxiphalus longicarpus* is related to *Foxiphalus* Barnard, 1979 and they share many characters, most of them in plesiomorphic condition. *Metharpinia protuberantis* is an intermediate species between *Metharpinia* Schellenberg, 1931 and *Microphoxus* Barnard, 1960, and its assignation to the first genus is discussed.

KEYWORDS: *Parafoxiphalus* new genus, *Metharpinia* new species, Amphipoda, taxonomy, Argentina.

Introduction

The purpose of this study is to describe and illustrate two new taxa of Phoxocephaloidea (Phoxocephalidae), *Parafoxiphalus longicarpus* and *Metharpinia protuberantis*, from the south-west coast of the Atlantic Ocean, in the Argentine Chubut province.

Barnard and Drummond (1978) developed an extensive work on Australian phoxocephalids, in which they proposed a new format for describing subfamilies, genera and species. Other later works of Barnard (1979, 1980), Barnard and Barnard (1982) and Barnard and Karaman (1991) modernized the taxonomy of the group with the discovery of new entities from the Americas, always under the same scheme established in 1978. Jarret and Bousfield (1994), as a part of a study of the family Phoxocephalidae from the Pacific coast of North America, attempted to establish phyletic relationships between genera in the new subfamily Metharpiniinae erected by them; thus, some novelties related to character states were added, contributing to a deeper knowledge of this fauna.

The south-west Atlantic Ocean, particularly the Argentine Sea, is far from having been explored minutely in relation to the phoxocephalid group. This is due to the lack of frequent or extensive field expeditions and certainly to improper sample techniques.

The genus *Metharpinia* Schellenberg, 1931 together with *Microphoxus* Barnard, 1960 have only two records in South America. The new species *Metharpinia protuberantis* displays character states intermediate between both genera. The new genus and species *Parafoxiphalus longicarpus* is similar in many morphological features to *Foxiphalus* Barnard, 1979 described from North America.

The relationships of the new taxa with the genera mentioned above are discussed in the present contribution.

Materials and methods

This study is based on benthic material collected from sandy substrata in the Argentine Chubut province, primarily in Golfo Nuevo and secondarily in Golfo San José.

The samples taken in Punta Pardelas and Colombo beach (Golfo Nuevo) were collected with a small dredge during low and mid-tides from depths ranging from 2 to 5 m. The samples from Golfito (Golfo Nuevo) were extracted with a cylinder of 20 cm diameter during low tide from 8 to 10 m water depth. The specimens from Golfo San José were obtained with a Van Veen grab from a depth of 4 m at low tide during a cruise carried out by the R/V *El Austral* (Zaixso *et al.*, 1998). The penetration depth of the corer was about 10 cm.

The diagnosis and description of the new taxa follow the style used by Barnard and Drummond (1978) for phoxocephalids.

The right side of the specimens was dissected; generally, the figures present a right lateral view, unless otherwise specified in the figure captions. The illustrations of the entire examples present a left lateral view, with the mouthparts and sometimes the pleopods removed. The spines and setae of the maxillipedal outer and inner plates were omitted from the maxilliped figure, but the plates were fully illustrated apart, each plate individually or joined together. The flagella of antenna 1 (figure 6h) show only the number of articles, the setae and aesthetascs being omitted. The first pair of pleopods was illustrated without its setae. Some setae drawn with a transverse line affixed to the distal part indicate broken setae at that length.

The abbreviation MACN stands for Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Buenos Aires, where the studied material is deposited.

Parafoxiphalus, new genus

Diagnosis

Female. Eyes medium, subovate, occluded with pigment. Antennae 1 and 2, flagella not reduced. Antenna 1, peduncle article 2 shorter than 1, ventral setae sparse. Antenna 2, peduncle article 1 simple, without any process; peduncle article 3 with one long lateral seta and three setules; peduncle article 4, facial spines in four rows; peduncle article 5 shorter than 4, facial spines in one group. Mandible, right incisor with three teeth; molar not triturrative, medium size, elongate, plaque-shaped, bearing six spines and pubescence. Maxilla 1, palp biarticulate; inner plate with four setae. Maxilla 2, outer plate broader than inner. Maxilliped, inner plate with two apical spines; dactylus elongate, slender, bearing distinct, long apical nail.

Gnathopods similar, small; article 5 elongate; article 6 stout, longer than 5, poorly setose anteriorly, palms slightly oblique, almost transverse. Peraeopod 5, article 2 of broad form. Peraeopods 5 and 6, articles 4 and 5 of medium width.

Peraeopod 7, article 2 posteriorly serrate. Peraeopods 5–7, dactylus with sharp acclivity.

Gills present on coxae 2–7. Oostegites on coxae 2–5.

Epimera 1 and 2 without posterior long setae.

Urosomite 1 with ventral group of setae. Urosomite 3 without special process. Uropod 1, peduncle medium length, shorter than rami, with basofacial setae and displaced enlarged apicomedial spine; rami with marginal spines. Uropod 2, peduncle strongly spinose dorsally; rami elongate, longer than peduncle, both with marginal spines. Uropods 1 and 2, peduncular apices without comb. Uropod 3 elongate; outer ramus, article 2 carrying two apical plumose setae, one short and one medium length; inner ramus shorter than article 1 of outer ramus; rami apically and marginally with plumose setae. Telson, each lobe with apical and dorsolateral spines.

Male. Eyes large, ovate. Antenna 1, peduncle article 1 medially with sensory brush of setae; primary flagellum elongate, longer than peduncle, with calceoli. Antenna 2, peduncle articles 3 and 4 dorsomedially with sensory brushes of setae; peduncle article 5 longer than 4, bearing numerous calceoli; flagellum very long, exceeding body length, calceolate.

Peraeopod 7, article 5 with two copulating spines, slender, long and straight.

Epimera 1 and 2, posterior margin without long setae.

Uropod 3, rami subequal in length, profusely plumose setose. Telson elongate.

Description

Rostrum fully developed, unstricted. Upper lip, epistome unproduced. Mandible, right lacinia mobilis four-dentate and left bearing five teeth; palp, article 1 short, article 2 scarcely setose, article 3 with oblique apex bearing cluster of spine-setae. Lower lip, outer lobes bearing cone. Maxilla 1, outer plate with 11 apical spines, one spine especially thickened. Maxilliped, inner plate thick, plumose setose; outer plate narrow, short, not reaching half of palp article 2.

Coxae 1–3, increasing in size posteriorly. Coxa 4 large, margins divergent. Peraeopods 3 and 4, article 6 with all spines medium width, widely spread in distal two-thirds of article and bearing mid-apical shorter spine.

Uropod 1, peduncle with dorsolateral spines confined apically. Uropods 1 and 2, rami with articulate apical spines. Telson with ordinary pair of dorsal plumose setules on each lobe.

Type species. *Parafoxiphalus longicarpus* n. sp.

Etymology

The generic name is derived from its resemblance to species of *Foxiphalus*. The specific name refers to the elongate condition of carpi on gnathopods 1 and 2.

Parafoxiphalus longicarpus n. sp.

(figures 1–6)

Material examined

ALLOTYPE, ovig. ♀ approx. 7.5 mm, Chubut: Golfo Nuevo, Península Valdés, Punta Pardelas (42°37'S, 64°16'W), 2–5 m depth, 31 October 1995, MACN No. 34175.

HOLOTYPE, ♂ ca 7 mm, same data, MACN No. 34176. PARATYPES, same data, one ovig. ♀ ca 6 mm, MACN No. 34177; two ♀♀ (with setose oostegites) ca 6 mm,

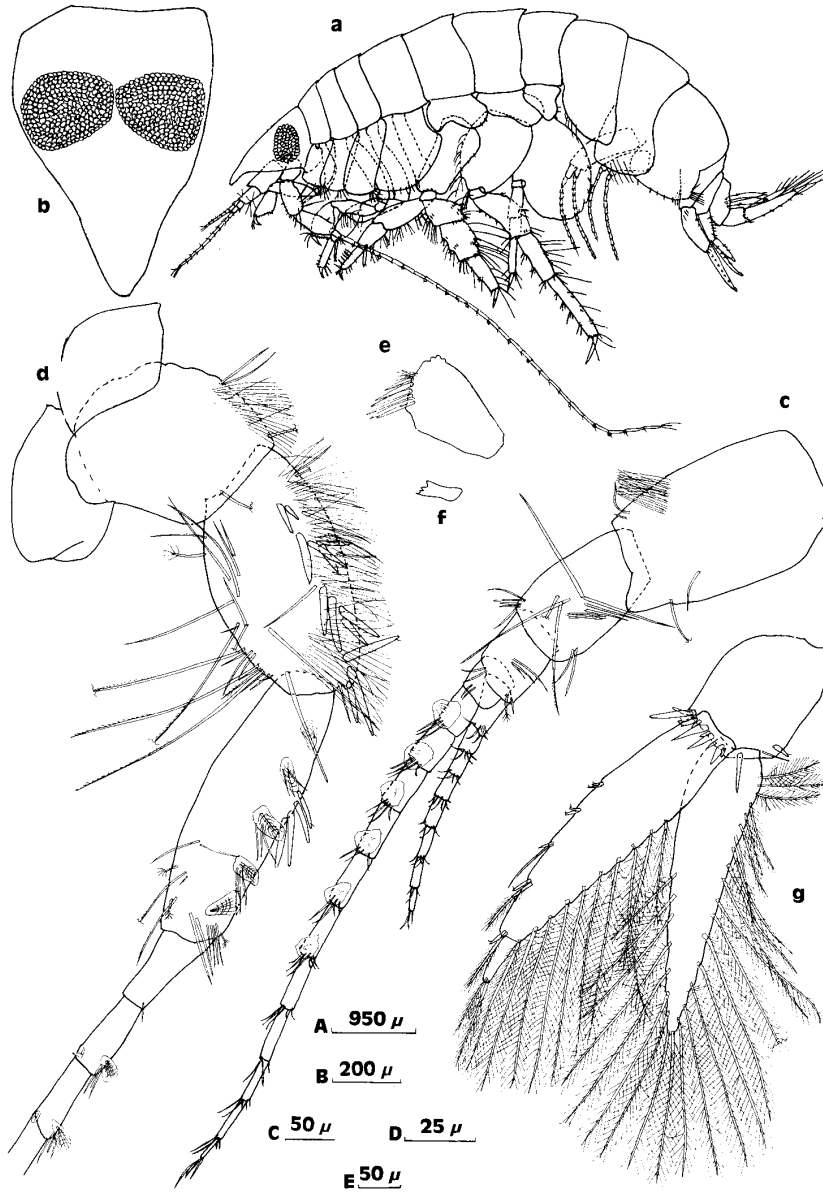


FIG. 1. *Parafoxiphalus longicarpus* n. gen., n. sp. Holotype, male: (a) lateral view; (b) head, dorsal view; (c, d) antennae 1, 2; (e) right molar; (f) right lacinia mobilis; (g) uropod 3. Scales (μm). A: (a); B: (b); C: (c, d); D: (e, f); E: (g).

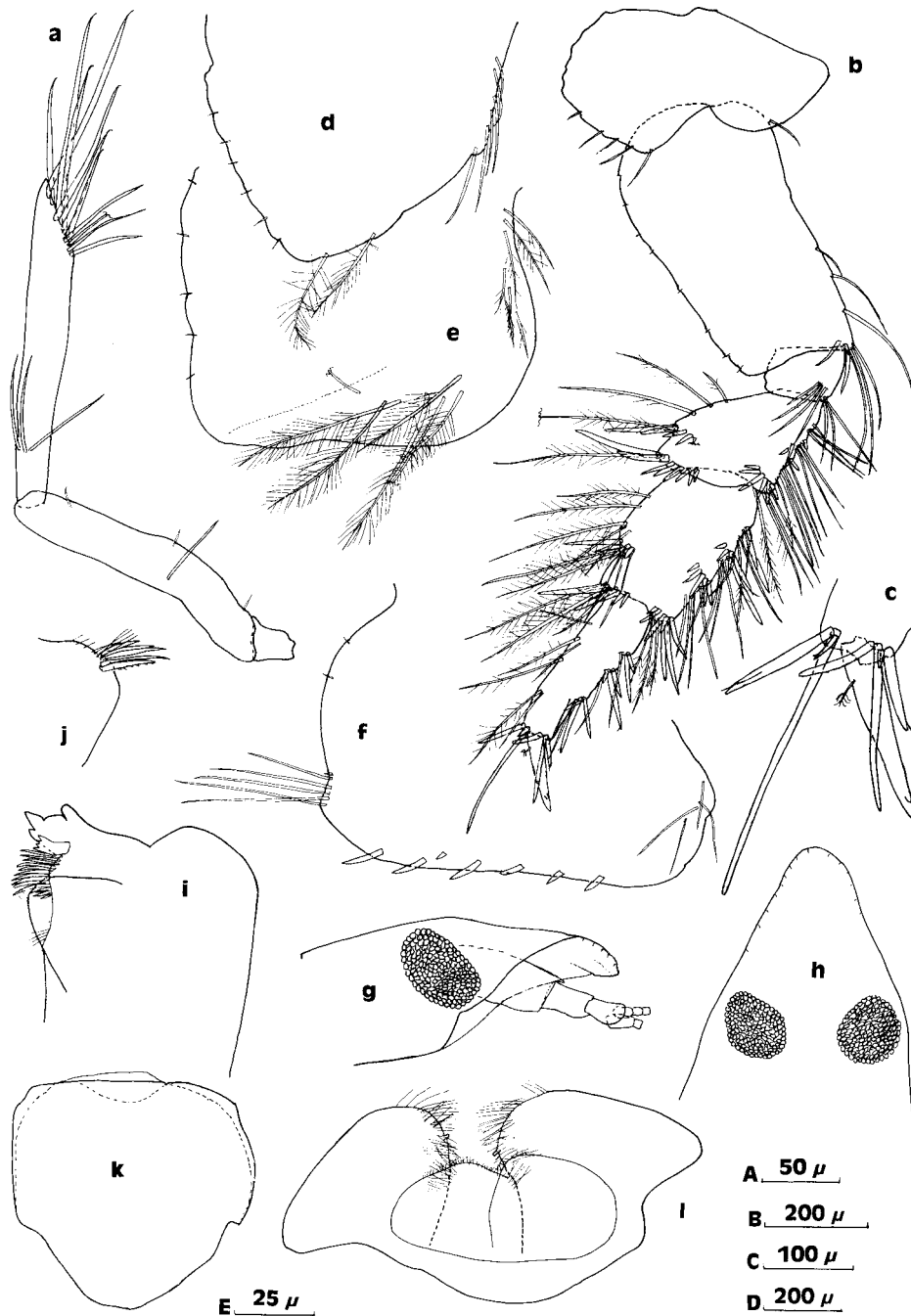


FIG. 2. *Parafoxiphalus longicarpus* n. gen., n. sp. Holotype, male: (a) mandibular palp; (b) pereopod 5; (c) dactylus of pereopod 5; (d-f) epimera 1-3. Allotype, ovig. female: (g) head, lateral view; (h) head, dorsal view; (i) right mandible; (j) right molar; (k) upper lip; (l) lower lip. Scales (μm). A: (a, c, i, k, l); B: (b); C: (d-f); D: (g, h); E: (j).

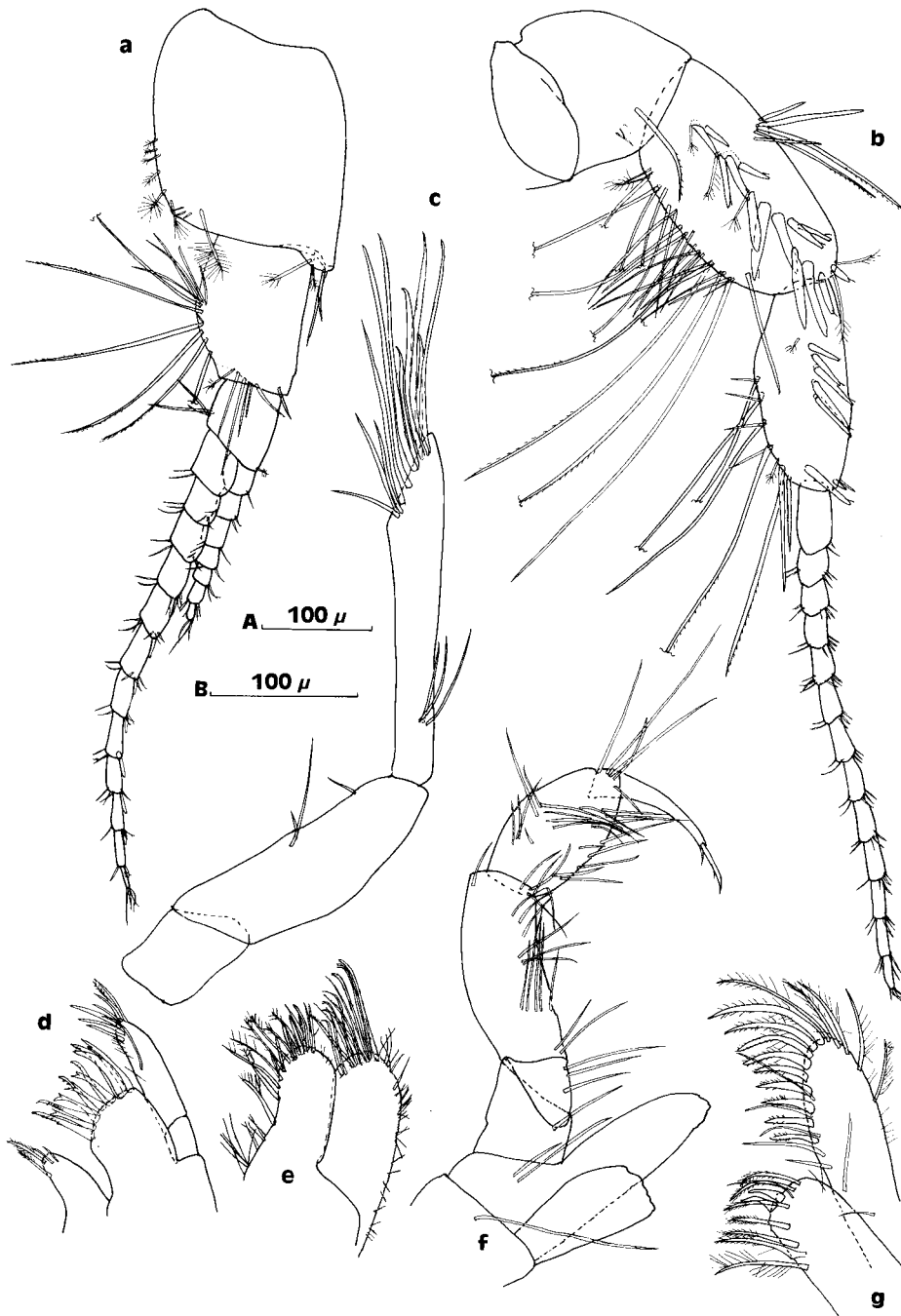


FIG. 3. *Parafoxiphalus longicarpus* n. gen., n. sp. Allotype, ovig. female: (a, b) antennae 1, 2; (c) mandibular palp; (d, e) maxillae 1, 2; (f) maxilliped; (g) left outer and inner plates of maxilliped. Scales (μm). A: (a, b); B: (c-g).



FIG. 4. *Parafoxiphalus longicarpus* n. gen., n. sp. Allotype, ovig. female: (a) gnathopod 1; (b) propodus and dactylus of gnathopod 1; (c) gnathopod 2; (d) propodus and dactylus of gnathopod 2; (e) peraeopod 3; (f) propodus and dactylus of peraeopod 3; (g) coxa 4; (h) propodus and dactylus of peraeopod 4; (i, j) dactylus of peraeopods 6, 7. Scales (μm). A: (a, c, e, g); B: (b, d, f, h, i); C: (j).

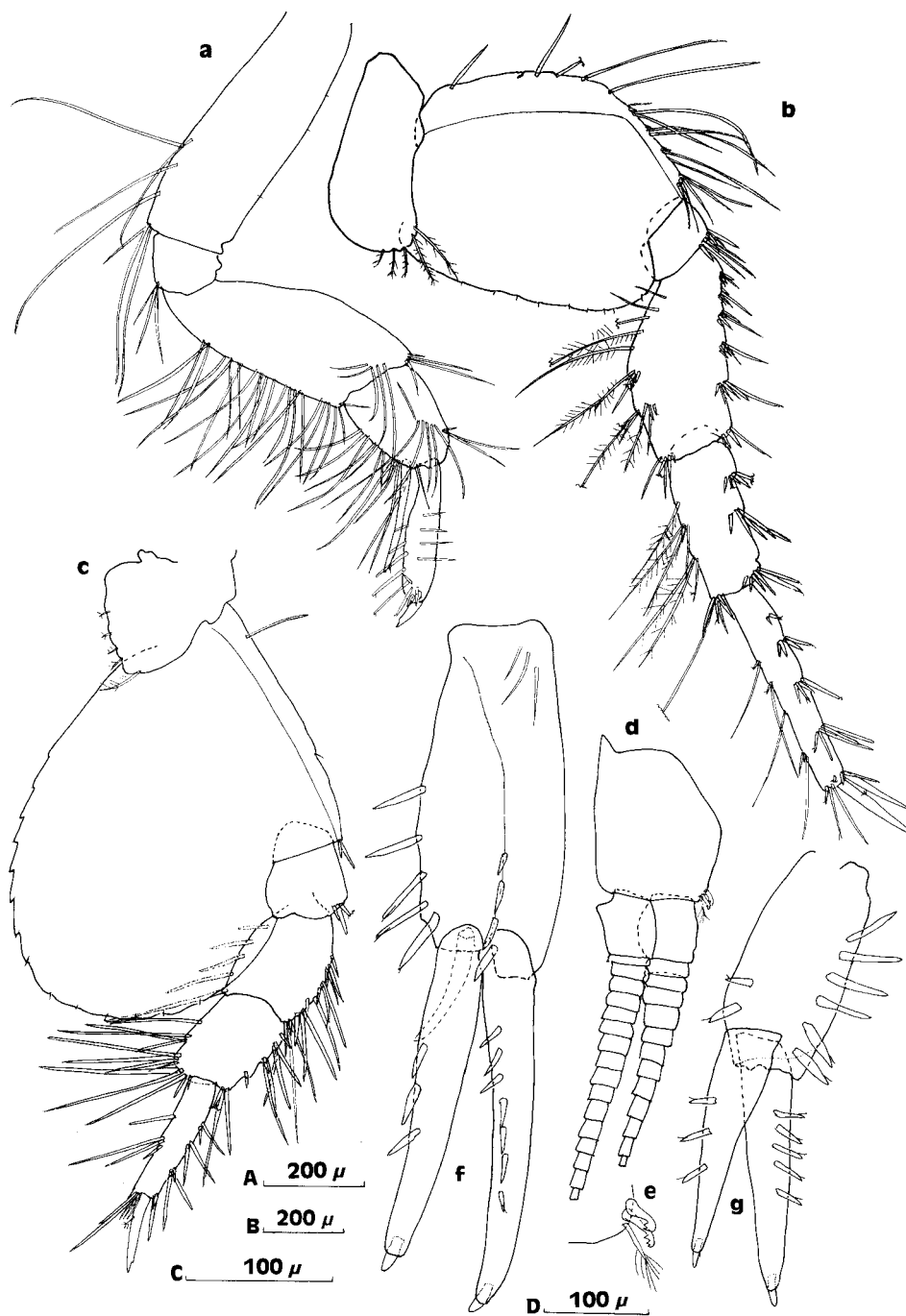


FIG. 5. *Parafoxiphalus longicarpus* n. gen., n. sp. Allotype, ovig. female: (a-c) peraeopods 4, 6, 7; (d) pleopod 1; (e) coupling spines of pleopod 1; (f, g) uropods 1, 2. Scales (μm). A: (a, c, d); B: (b); C: (e); D: (f, g).

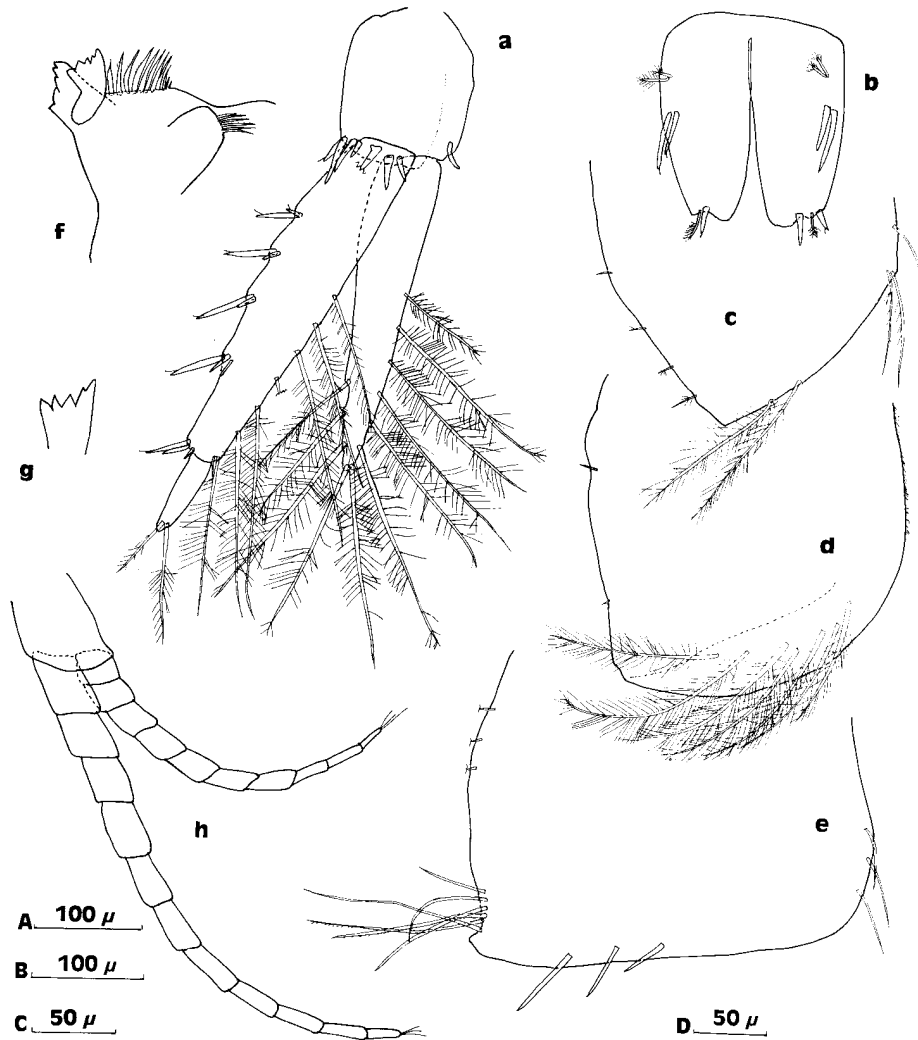


FIG. 6. *Parafoxiphalus longicarpus* n. gen., n. sp. Allotype, ovig. female: (a) uropod 3; (b) telson; (c-e) epimera 1-3. Paratype ovig. female: (f) left mandible; (g) left lacinia mobilis; (h) flagella of antenna 1. Scales (μm). A: (a, c-e); B: (b); C: (f, g); D: (h).

MACN No. 34178; seven subadult ♀♀ 3.2-4.3 mm, MACN No. 34179. Collectors: Meijide and Ianovski, donor: D. Roccatagliata. Bahía Nueva, Golfo (approx. 42°46'S, 65°02'W), 8-10 m depth, 6 August 1992, one subadult ♀ ca 4.5 mm, MACN No. 34180. Collector and donor: G. Pagnoni.

Description

Allotype, ovigerous female (body length approximately 7.5 mm). Head about 17% of total body length, greatest width about 75% of length, rostrum unstricted, broad, elongate, exceeding apex of article 2 on antenna 1. Eyes medium, subovate, intensely pigmented, brownish red in alcohol. Antenna 1, peduncle article 1 about 1.4 times as long as wide, about 1.8 times as wide as article 2, ventral margin with

about seven plumose setules and three apicofacial setules, produced dorsal apex with two plumose setules and two setae of different length; article 2 about 0.6 times as long as article 1, with ventral spread crescent of 11 setae, five shorter apical setae and one plumose setule, dorsal apex with one short seta; primary flagellum with 12 articles, about as long as peduncle, bearing one aesthetasc on each of articles 4–11; accessory flagellum with seven articles. Antenna 2, article 1 simple; article 3 with three apicofacial setules and one long seta; spine formula of article 4 = 4-5-3-2, dorsal margin with notch bearing five setae, ventral margin with seven groups of three to four long to medium setae, one long ventrodorsal spine set facially; article 5 about 0.7 times as long as article 4, facial spine formula = 5, dorsal margin bearing two small apical setae, ventral margin with four sets of two long to short setae, four ventrodorsal long to medium spines, one of these facial; flagellum about 1.1 times as long as peduncle articles 4 and 5 combined, with 13 articles.

Upper lip, epistome flat, not produced. Mandibles, right incisor with three defined teeth, left incisor with four teeth and weak hump between them; right lacinia mobilis with four teeth, left lacinia mobilis with five teeth; right rakers about 13, three of these short, left rakers nine plus about two very small; molars composed of elongate plaques bearing six long spines closely disposed, with pubescence; palp article 1 short, article 2 with one short inner apical seta and two other short and long inner setae, article 3 about 1.35 times as long as article 2, oblique apex with 11 spine-setae, basofacial formula = 0-3. Lower lip, each outer lobe with one cone, mandibular processes broad. Maxilla 1, inner plate ordinary, bearing one apicofacial plumose seta, one similar apicomедial plumose seta and two much shorter apicolateral simple setae; outer plate with 11 spines, outer apical spine enlarged; palp article 2 with about eight apical spines. Maxilla 2, both setose plates extending subequally; outer plate slightly broader than inner, outer with one apicolateral seta; inner with three or four medial plumose setae. Maxilliped, inner plate with two large thick apical spines, three apicofacial setae and four medial setae, all plumose; outer plate with nine medial masticatory spines and five lateral plumose setae; palp article 1 without apicolateral seta, article 2 with one apicolateral seta and medial margin moderately setose, article 3 with facial and lateral setae, article 4 slender carrying a long nail about 0.45 times as long as dactylus, with two accessory setules.

Coxae 1 and 2 weakly expanded anteriorly, anterior margin almost straight. Coxa 3 rectangular. Coxa 4, anterior and posterior margins divergent, posterior margin oblique, straight, posterodorsal corner rounded, posterodorsal margin concave, width-length ratio = 1:1. Coxae 1–4, main ventral setae = 7-8-8-8, posteriormost seta of coxae 1–3 shortest. Gnathopods similar, small, second pair slightly larger than first pair; width ratios on articles 5 and 6 of both pairs of gnathopods = 23:30 and 25:30, length ratios = 55:60 and 50:60. Gnathopod 1, article 5 elongate, ovate, posterior margin rounded, long. Gnathopod 2, article 5 medium length, shorter than in first pair, posterior margin evenly rounded, medium in length. Gnathopods 1 and 2, palmar humps large, palms oblique.

Peraeopod 4 slightly stouter than peraeopod 3 especially on articles 4 and 5. Peraeopods 3 and 4, facial setal formula on article 4 = 5 and 5, parallel to apex, on article 5 = 7 and 8; main spine of article 5 extending 80% on article 6; article 5 without proximoposterior spines; spine formula of article 6 = 5+8 and 5+9 plus mid-distal smaller spine, some spines long; dactylus with weak acclivity, apparently with a fully immersed nail, mid-facial plumose setule placed distally. Coxae 5–7, posteroventral seta formula = 6-5-5. Peraeopods 5 and 6, articles 4 and 5 of medium

width, facial spine rows sparse. Peraeopods 5–7, facial ridge formula of article 2 = 0-1-1; width ratios of articles 2, 4, 5, 6 of peraeopod 5 = 70:40:32:16, of peraeopod 6 = 110:49:32:18, of peraeopod 7 = 130:34:30:13; length ratios of peraeopod 5 = 122:52:46:41 (right side) and 58:65:70 (articles 4, 5, 6 of left side), of peraeopod 6 = 138:98:70:105, of peraeopod 7 = 152:43:36:49. Peraeopod 7, article 2 reaching middle of article 5, posterior margin with about nine small serrations, medial apex of article 6 with three digital processes (extremely difficult to observe). Peraeopods 5–7, dactylus slender, long, with sharp acclivity, mid-facial plumose setule placed proximally and posteriorly.

Gills on coxae 2–7, those of coxae 6 and 7 small. Oostegites thin, long and setose, present on coxae 2–5.

Pleopods ordinary, as illustrated. Epimeron 1, posteroventral corner acute, subquadrate, posterior margin almost straight, weakly undulate, with four setules, anteroventral margin with three setae medium in length, two of these plumose, posteroventral margin with two long plumose setae. Epimeron 2, posteroventral corner obtuse, posterior margin almost straight, with two setules, facially with seven plumose setae, posteriormost seta set vertically. Epimeron 3, posteroventral corner produced, posterior margin convex bearing three setules and distal cluster of six long setae, anteroventral margin with three setae medium in length, ventral margin with three short spines widely spread, situated on its posterior half.

Urosomite 1 with lateral setule at base of uropod 1 and mid-ventral group of setae, articulation line complete. Urosomite 3 not protuberant dorsally. Uropod 1, peduncle with three basofacial setae, four apicolateral spines, medially five marginal spines and strong displaced spine; inner and outer rami with three and seven dorsomedial spines, respectively. Uropod 2, peduncle with six stout dorsal spines and two apical short spines medially; inner and outer rami with three and five dorsomedial spines, respectively. Uropods 1 and 2, peduncle apicolateral corners without comb; rami with articulate but tightly fixed apical nails. Uropod 3, peduncle with seven ventral spines and one medial spine; rami unequal in length, inner extending 80% on article 1 of outer ramus, apex carrying two long plumose setae, medial and lateral margins plumose setose apically; article 2 of outer ramus elongate, 0.25, bearing two plumose setae short and medium, medial margin of article 1 setose, lateral margin with four acclivities, spine formula = 2-2-2-3-3, no seta present. Telson medium length, length-ratio = 105:93, almost fully cleft, each apex wide, medially rounded, shallowly excavate, with short lateral spine and medial longer spine separated by plumose setule, except left lobe with one spine and setule, dorsal surface of each lobe with two long spines medially and two plumose setules proximally.

Additional observations

Paratype, ovigerous female (body length *ca* 6 mm). Antenna 1, primary flagellum with 11 articles; accessory flagellum with 10 articles. Mandible, left incisor with four teeth and hump.

Holotype, male (body length approximately 7 mm). Rostrum almost reaching end of article 2 on antenna 1. Pigmented eyes large, ovate. Antenna 1, article 1 with distal patch of sensory setae medially; article 2, with nine ventral setae; primary flagellum with 12 articles, bearing one calceolus each on articles 2–7; accessory flagellum with eight articles. Antenna 2, articles 3 and 4 with dense brushes of sensory fine setae dorsomedially; article 4, facial spine formula = 3-4-4-2, dorsal margin with a few short spread setae hidden by pubescence, ventral margin with

long and short setae, and one ventrodistal medium spine; article 5 much longer than article 4, with fewer and shorter setae than in female, with four dorsal sets of male setae and five calceoli, ventrodistal apex with two thin spines, facial spine formula = 4; flagellum elongate, broken at article 31, bearing calceoli. Mandible, palp article 3 about 1.1 times as long as article 2; article 2 with three small inner setae and one longer inner seta medially.

Coxa 4 longer than wide. Peraeopod 5, article 2 narrower than in female; width ratios of articles 2, 4, 5, 6 = 61:44:40:20, length ratios = 100:45:60:62. Peraeopod 7, article 5 with two copulatory spines, slender, straight, subequal, slightly longer than article 6.

Epimera 1–3 broadened. Epimeron 1, posterior margin slightly convex, undulate, with six setules, anterior margin with six setae, decreasing in length anteriorly, posteroventral margin with two medium plumose setae. Epimeron 2, posterior margin almost straight, with large undulations and five setules, facially as in female, anterior face and margin bearing seven medium plumose setae. Epimeron 3, posteroventral corner rounded, not produced, posterior margin strongly convex bearing two setules and distal cluster of five long setae and one very short spine set proximally to this group, anteroventral face with four medium setae, ventral margin with seven short spines widely spread.

Uropod 1, peduncle with seven apicolateral spines, medially as in female, but stout displaced spine shorter; inner ramus ornamented with the same number of spines as in female and outer ramus bearing six spines. Uropod 2, peduncle with 10 longer dorsal spines; outer ramus with four dorsomedial spines. Uropod 3, peduncle with 10 ventral spines and laterally with spine and setule; inner ramus the same length of article 1 of outer ramus; spine formula on article 1 of outer ramus = 2-2-1-1-1, setal formula = 0-0-1-1-1; medial and lateral margins of both rami plumose setose. Telson much longer than in female, each apex with three spines besides plumose setule; distal and lateral spines shorter than in female, and plumose setules near the base.

Relationships

Parafoxiphalus n. gen. resembles *Foxiphalus* Barnard, 1979 in the general aspect of the body, the unstricted rostrum and the shape of the appendages, but exhibits many important features to justify the erection of a new genus for the southern hemisphere. Thus, the new taxon presents a particular facial armament on peduncle article 4 of antenna 2, the spines being organized in four groups, whereas in *Foxiphalus* the number of clusters is fewer; it has abundant calceoli distributed on the whole dorsal margin of peduncle article 5 of antenna 2 (in the male) versus one or two distal calceoli; it shows much longer carpi on gnathopods 1 and 2 in terms of relative length; article 6 or propodus of peraeopods 3 and 4 displays a spinose ornamentation covering almost all the article sparsely, contrary to *Foxiphalus* in which the spines are distally confined; it is characterized by epimera 1 and 2 with posterior margin bearing only setules versus long posterior setae; there are more marginal spines on the rami of uropods 1 and 2, especially with regard to the inner ramus of uropod 2 which mostly is naked in *Foxiphalus*. There are other features distinguishing the genera, such as the apical nail much longer, although fused, on article 4 of maxilliped palp and the lacinia mobilis on the right mandible with four teeth instead of being bifid or simple.

Parafoxiphalus longicarpus n. gen. n. sp. resembles some species of *Foxiphalus* in

many character states. Jarrett and Bousfield (1994) noted that the members of this latter genus, 11 species described for the North and Central American Pacific Ocean, exhibit the most extensive combinations of apomorphic character states related to spine reductions and some modifications of the mouthparts and/or appendages. Hence the taxon described herein shares with *F. major* (Barnard, 1960) the high number of calceoli on antenna 2 peduncle article 5 in the male; with *F. aleuti* Barnard, 1982 the two apical spines on the inner plate of the maxilliped, since all the other species carry only one spine; with *F. xiximeus* Barnard, 1982 the lack of long setae on the posterior margin of epimera 1 and 2, and with *F. similis* (Barnard, 1960) the spinose uropod 2 inner ramus.

Metharpinia protuberantis n. sp.
(figures 7–11)

Material examined

ALLOTYPE, ovig. ♀ approx. 5.5 mm, Chubut: Golfo Nuevo, Península Valdés, Punta Pardelas (42°37'S, 64°16'W), 2–5 m depth, 31 October 1995, MACN No. 34181. HOLOTYPE, ♂ 5 mm, same data, MACN No. 34182. PARATYPES, same data, one ♀ (with setose oostegites) approx. 6.5 mm, MACN No. 34183; one ♀ (with setose oostegites) ca 6.7 mm, MACN No. 34184; three ♀♀ 5.6–6.7 mm, MACN No. 34185; two ♂♂ 4.8 and 5.5 mm, MACN No. 34186. 2–4 m depth, three ♀♀ 3.2(subadult)–6.7 mm, MACN No. 34187; one ♂ 4.8 mm, MACN No. 34188. Colombo beach (near Punta Pardelas), 2 m depth, 2 November 1995, five ♀♀ 2.8(subadult)–5.35 mm, MACN No. 34189; two ♂♂ 4.8 and 5 mm, MACN No. 34190. Collectors: Meijide and Ianovski, donor: D. Roccatagliata. Bahía Nueva, Golfito (approx. 42°46'S, 65°02'W), 8–10 m depth, 6 August 1992, three ♀♀ 5–5.25 mm, MACN No. 34191. Collector and donor: G. Pagnoni. Golfo San José (42°20'S, 64°20'W), 4 m depth, 12 September 1986, two ♂♂ and two ♀♀ (damaged), MACN No. 34192. Collectors: Z. Lizarralde and H. Zaixso, donors: E. Gómez Simes and C. Pastor.

Description

Allotype, ovigerous female (body length approximately 5.5 mm). Head about 20% of total body length, greatest width 61% of length, rostrum constricted, narrow, spatulate, elongate, reaching middle of article 2 on antenna 1. Eyes medium, subovate, with dark pigment, near lateral margins. Antenna 1, peduncle article 1 about 1.5 times as long as wide, about 1.8 times as wide as article 2, ventral margin with about three plumose setules, produced dorsal apex with one long seta; article 2 about 0.7 times as long as article 1, with ventral crescent of four setae placed proximally, one apicolateral plumose setule and two apical medium setae; primary flagellum with 11 articles, about 0.7 times as long as peduncle, bearing one short aesthetasc each on articles 5–10; accessory flagellum with nine articles. Antenna 2, article 1 simple, without any process; article 3 with short and much longer setules; article 4, dorsal margin with proximal notch bearing one short spine and one long seta, ventral margin with four groups of two to three long to medium setae, three ventrodistal long setae, facial spine formula = 1-3-4-3; article 5 about 0.8 times as long as article 4, facial spine formula = 3, dorsal margin bearing one set of small setae, ventral margin with four medial small setae, one of these plumose, one long

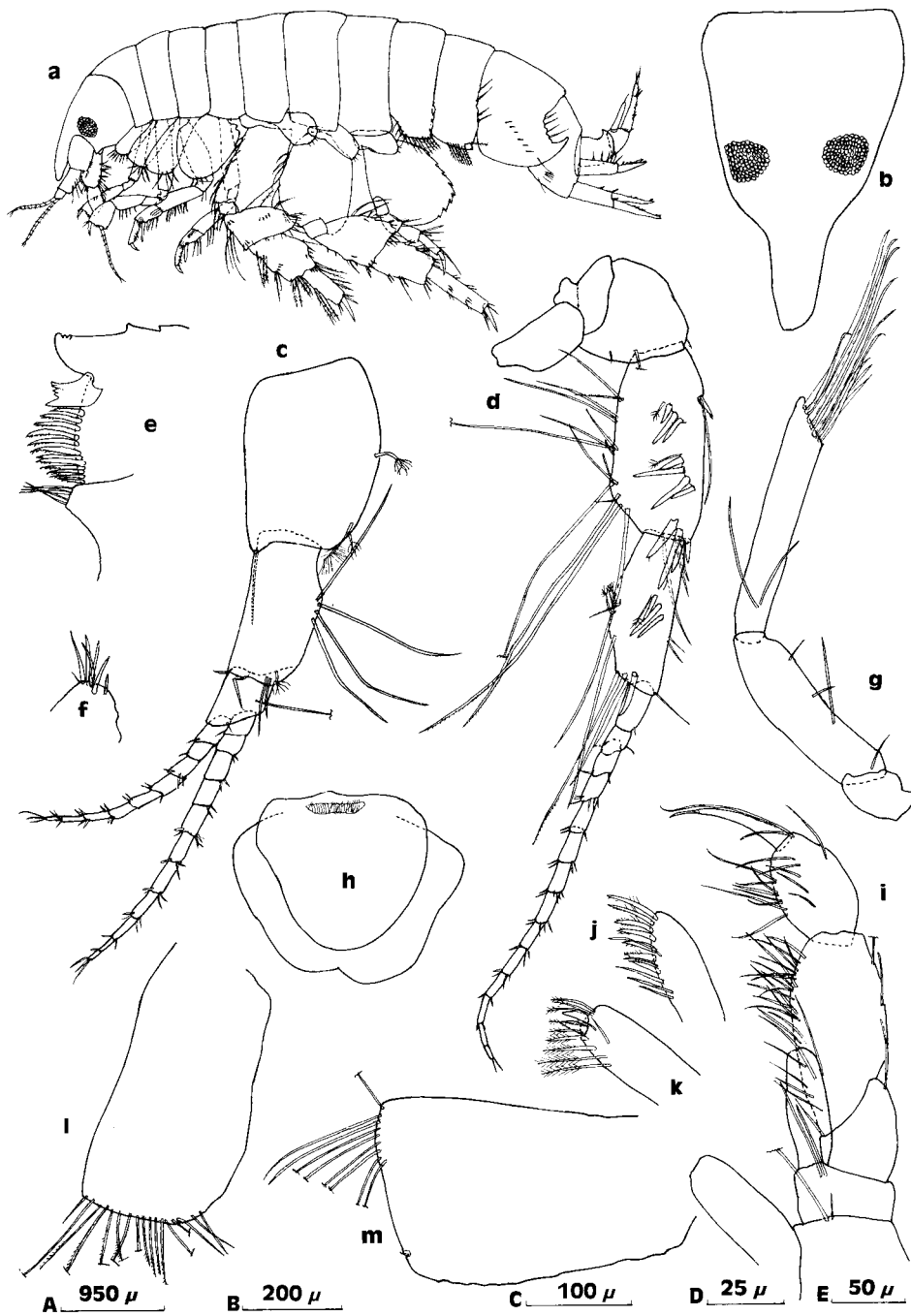


FIG. 7. *Metharpinia protuberantis* n. s. Allotype, ovig. female: (a) lateral view; (b) head, dorsal view; (c, d) antennae 1, 2; (e) left mandible; (f) left molar; (g) mandibular palp; (h) upper lip; (i) maxilliped; (j, k) outer and inner plates of maxilliped; (l, m) coxae 1, 2. Scales (μm). A: (a); B: (b); C: (c, d, l, m); D: (e, f); E: (g-k).



FIG. 8. *Metharpinia protuberantis* n. sp. Allotype, ovig. female: (a, b) gnathopods 1, 2; (c) peraeopod 3; (d) carpus, propodus and dactylus of peraeopod 3; (e) peraeopod 4; (f) coxa 4; (g) carpus, propodus and dactylus of peraeopod 4; (h-j) dactylus of peraeopods 5-7; (k, l) uropods 1, 2; (m) telson. Scales (μm). A: (a, b, d, g, k-m); B: (c, e, f); C: (h-j).



FIG. 9. *Metharpinia protuberantis* n. sp. Allotype, ovig. female: (a-c) peraeopods 5-7; (d) uropod 3. Paratype, female 6.5 mm: (e) right mandible; (f) left incisor and lacinia mobilis; (g-i) epimera 1-3. Scales (μm). A: (a, b); B: (c); C: (d, g-i); D: (e, f).

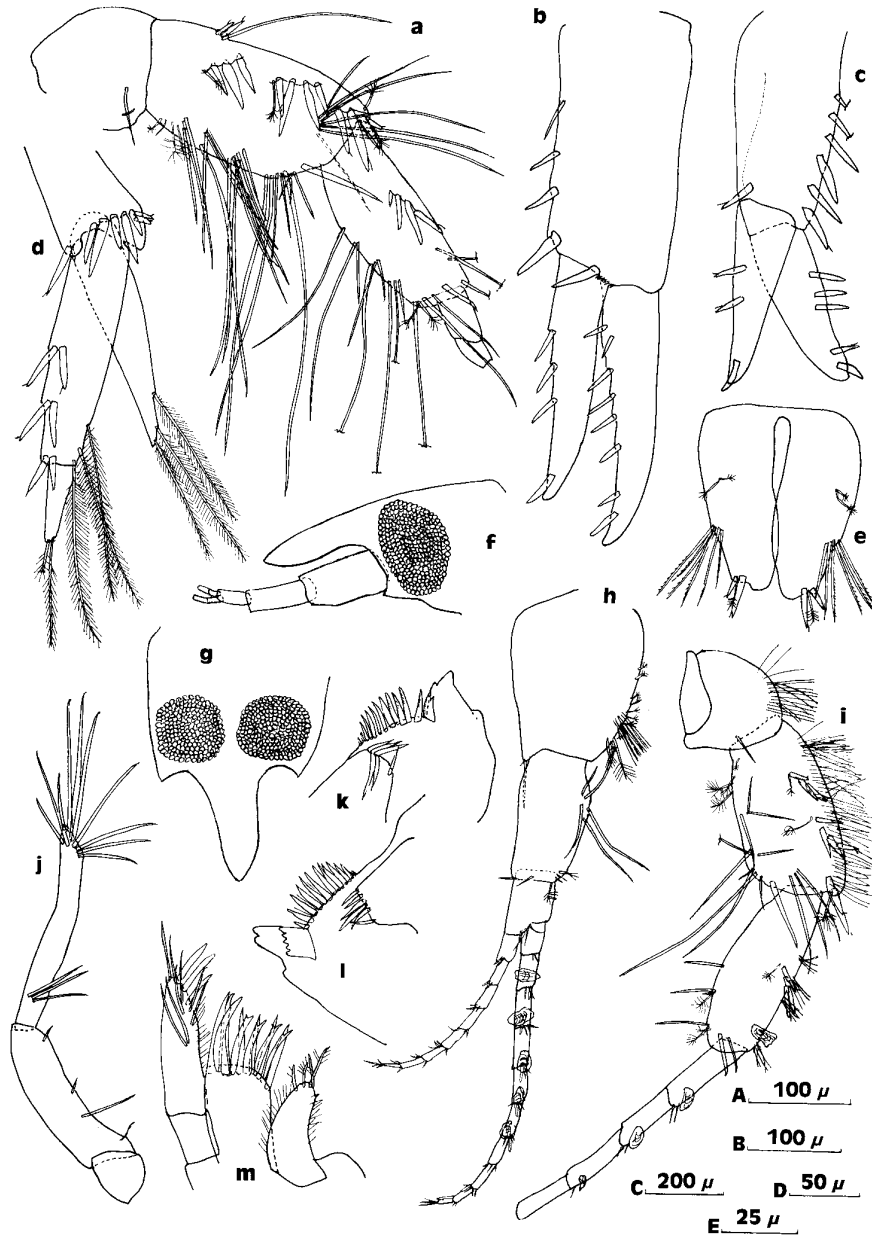


FIG. 10. *Metharpinia protuberantis* n. sp. Paratype, female 6.7 mm: (a) antenna 2; (b-d) uropods 1-3; (e) telson. Holotype, male: (f) head, lateral view; (g) head, dorsal view; (h, i) antennae 1, 2; (j) mandibular palp; (k, l) right and left mandibles; (m) maxilla 1. Scales (μm). A: (a-c, h, i); B: (d, e); C: (f, g); D: (j); E: (k-m).

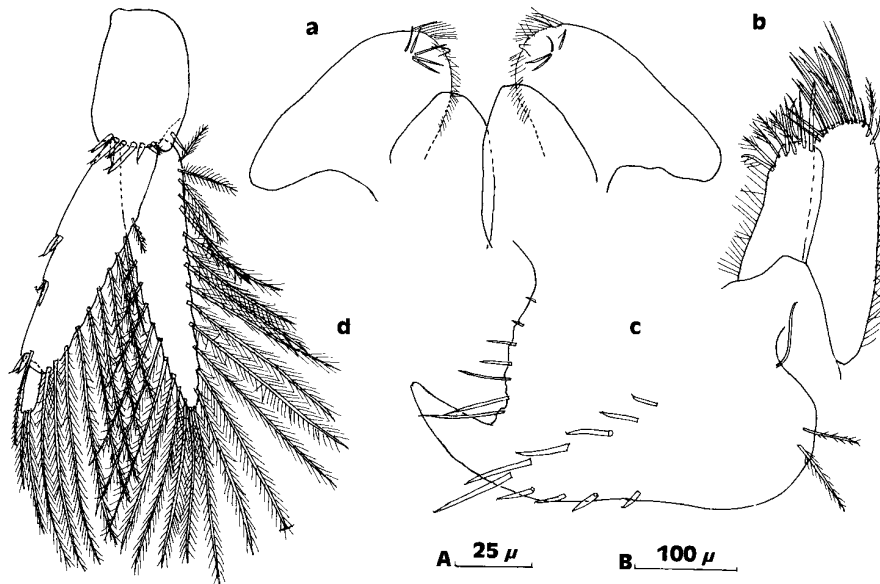


FIG. 11. *Metharpinia protuberantis* n. sp. Holotype, male: (a) lower lip; (b) maxilla 2; (c) epimeron 3; (d) uropod 3. Scales (μm). A: (a, b); B: (c, d).

subdistal seta, three ventrodistal long setae and one short facial spine; flagellum slightly longer than peduncle articles 4 and 5 combined, with 14 articles.

Upper lip, epistome rounded. Mandibles, right incisor with three teeth rather poorly developed, left incisor with three small apical teeth and irregular tooting distally; right lacinia mobilis bifid, distal branch shorter than proximal, left lacinia mobilis with five teeth, one of these small, flat; right rakers 13 plus one rudimentary, left rakers 12 plus one rudimentary; molar composed of bulbous plaques with five long stout spines plus one shorter and thinner disjunct spine; palp, article 1 short, article 2 with one short inner apical seta, one long inner seta medially and two other short inner setae, article 3 about 1.4 times as long as article 2, oblique apex with 10 spine-setae, basofacial formula = 0-2. Lower lip, each outer lobe with one cone. Maxilla 1, inner plate large, broad, bearing one medium apical seta, one similar apicomедial seta and two apicolateral much shorter setae, all plumose; outer plate with 11 apical spines, outer spine enlarged; palp, article 2 with one apical spine, two apicolateral spines, about three apicomедial setae and about three submarginal setae. Maxilla 2, inner plate slightly shorter than outer; outer plate broader than inner, with two apicolateral setae; inner plate with three medial setae. Maxilliped, inner plate bearing two large thick apical spines, four apicofacial setae and four medial setae, all plumose; outer plate with seven masticatory spines; palp, article 1 with one apicolateral seta, article 2 with two lateral setae, medial margin strongly setose, article 3 bearing one lateral seta and about five facial setae, article 4 narrow, bearing medium nail almost fully fused.

Coxae 1 and 2 not expanded anteriorly, anterior margin almost straight. Coxa 3 rectangular. Coxa 4 elongate, anterior and posterior margins divergent, posterior margin oblique, convex, width-length ratio = 60:85. Coxae 1-4, main ventral setae = 17-9-7-6. Coxae 1-3, setae long except posteriormost seta. Coxa 1, setae ornamenting

the whole ventral margin. Coxae 2 and 3, setae confined to posteroventral margin. Gnathopods similar, small, article 6 stout; gnathopod 2 slightly larger than gnathopod 1; width ratios of articles 5 and 6 of both pairs of gnathopods = 19:24 and 19:24, length ratios = 48:42 and 45:44. Gnathopod 1, article 5 elongate, ovate, posterior margin rounded-flat, long. Gnathopod 2, article 5 elongate, ovate, posterior margin rounded, shorter than in first pair. Gnathopods 1 and 2, palmar humps large, ornamented, palms oblique, almost transverse.

Peraeopods 3 and 4 similar (except in coxae), the latter appendage a little stouter especially on article 5. Peraeopods 3 and 4, facial setal formula on article 4 = 5 and 6 almost parallel to apex, on article 5 = 6 and 6; main spine of article 5 extending 75% on article 6; article 5 of peraeopod 3 without proximoposterior spines and no proximal setae, of peraeopod 4 without proximoposterior setae and with one spine-seta separated from regular posterior setae; spine formula of article 6 = 4 + 7 plus large mid-distal spine, some spines long; dactylus with sharp acclivity, produced as tooth, mid-facial plumose setule placed proximal and posteriorly. Coxae 5–7, posteroventral seta formula = 4-8-3, mostly short. Peraeopod 5, articles 4 and 5 broad. Peraeopod 6, article 4 broad and article 5 medium width. Peraeopods 5 and 6, facial spine rows dense to sparse. Peraeopods 5–7, facial ridge formula of article 2 = 0-1-1; width ratios of articles 2, 4, 5, 6 of peraeopod 5 = 62:66:48:21, of peraeopod 6 = 91:63:33:14, of peraeopod 7 = 101:21:16:10; length ratios of peraeopod 5 = 111:65:59:56, of peraeopod 6 = 125:87:54:76, of peraeopod 7 = 120:25:25:33. Peraeopod 7, article 2 reaching apex of article 4, posterior margin with about 11 small serrations, medial apex of article 6 finely combed, bearing four to five digital processes (difficult to individualize the exact number).

Gills on coxae 2–7, those of coxae 6 and 7 smaller. Oostegites on coxae 2–5.

Pleopods ordinary. Epimera 1–3 somewhat damaged, especially posterior margins.

Urosomite 1 with ventral brush of setae emerging on to lateral surface proximally, articulation line incomplete. Urosomite 3 produced upwards, into a triangular process with vertex pointing up. Uropod 1, peduncle without basofacial setae, medially with one small proximal marginal spine and two longer spines, apical larger, displaced spine weak; inner and outer rami with two and four dorsal spines, respectively. Uropod 2, peduncle with four long dorsal spines, distal-most thick, medially with two marginal spines; inner and outer rami with one and three dorsal spines, respectively. Uropods 1 and 2, peduncle apical corners coarsely combed; outer rami bearing two subapical nails and inner rami one, both rami without apical nails. Uropod 3, peduncle with six ventral spines, dorsally with one lateral spine, medially with one spine; rami unequal in length, inner extending 82% on article 1 of outer ramus, apex carrying one seta, medial and lateral margins naked; article 2 of outer ramus elongate, 0.40, bearing two setae of different length, the longest one shorter than article 2, medial margin of article 1 naked, lateral margin with two acclivities, spine formula = 2-2-2, without setae. Telson medium length, length-width ratio = 100:79, almost fully cleft, each apex of medium width, produced medially but protrusion rounded, apex subtruncate, bearing short lateral and long medial spines separated by short plumose setule, each side with cluster of three long setae and proximally two small mid-lateral plumose setules of different length.

Additional observations

Paratype, female with setose oostegites (body length *ca* 6.5 mm). Antenna 2, article 4 with dorsal notch bearing two short spines (one of these hidden by the

other) and long seta. Left mandible, lacinia mobilis with five defined teeth. Right mandible as in allotype.

Peraeopods 3 and 4, article 5 with proximoposterior edge naked and bearing spine-setae disjunct from rest of setae.

Epimeron 1, posteroventral corner produced, posterior margin convex, weakly undulate, with one proximal setule, three long setae increasing in length towards posteroventral corner and then one shorter seta, anterior face bearing six medium setae with short plumosity, ventral margin with nine plumose setae increasing in length posteriorly. Epimeron 2, posteroventral corner acutely produced, posterior margin serrate, bearing three sets of long and very short setae and a broken seta above posteroventral corner, anterior face with two medium setae, facially with 10 plumose setae, two posteriormost setae set vertically. Epimeron 3, posteroventral corner strongly produced into a large tooth, posterior margin almost straight, serrate, bearing one setule proximally and five spread long setae increasing in length towards posteroventral corner, anterior margin and face with four setae, ventral face with oblique row of seven spine-setae, posteriormost longest.

Paratype, female with setose oostegites (body length approximately 6.7 mm). Antenna 2, article 4 with dorsal notch bearing two short spines and one long seta, ventral margin more setose than in allotype; article 5 facial spine formula = 4, ventral margin with many groups of long to short setae.

Uropod 1, peduncle with one proximal slender spine and three longer spines medially; inner and outer rami with three and six dorsal spines, respectively. Uropod 2, peduncle with six dorsal spines and medially one spine; inner ramus bearing two dorsomedial spines. Uropod 3, peduncle with seven ventral spines, one lateral spine and dorsal setule; inner ramus, lateral margin with three plumose setae; outer ramus article 1, medial margin bearing three plumose setae. Telson, each lobe with cluster of six spine-setae.

Holotype, male (body length approximately 5 mm). Pigmented eyes very large, extending from lower margin almost to mid-dorsal line. Antenna 1, article 1 with medial patch of fine setae distally and about 13 plumose setules; article 2 with five ventral setae proximally; primary flagellum with 11 articles, bearing one calceolus each on articles 2–6 and one aesthetasc each on articles 2–9; accessory flagellum with eight articles. Antenna 2, articles 3 and 4 with dorsomedial margins bearing brushes of sensory fine setae; article 4, facial spine formula = 2-4-3, apparently dorsodistal spine forming first group, missing (socket not clearly evident), article 4 of left antenna 2 with spine formula = 1-2-4-3, ventral margin bearing three plumose setules proximally and three sets of three long and short setae, one ventrodistal medium spine, three medium facial setae apically and one marginal plumose setule; article 5 about as long as article 4, bearing fewer and shorter setae than in female, dorsal margin with four sets of male setae and one distal calceolus, ventral margin with three medium setae on distal half and three plumose setules, apex with two thin submarginal spines, facial spine formula = 3; flagellum elongate, with 32 articles, bearing one calceolus each on every other article: 1, 3, ..., 31. Left mandible, incisor with three humps in two branches; lacinia mobilis with five teeth; palp article 3 about 1.1 times as long as article 2, basofacial formula = 0-3. Maxilla 1, inner plate elongate, almost as long as outer plate, narrow. Maxilla 2, inner plate shorter than outer plate.

Peraeopods 3 and 4, article 5 posteroproximal edge naked for shorter distance than in female, bearing two disjunct spine-setae from regular posterior setae.

Peraeopod 4, article 6 spine formula = 4 + 8 plus mid-distal spine shorter than in female. Peraeopod 7, article 5 with two elongate copulating spines.

Epimera 1 and 2 less setose, posterior margin with more attenuated serrations, and posteroventral corner weakly produced. Epimeron 3, posterior margin with shorter setae, anterior margin and face with three setae, two of these plumose, ventral face with more oblique row of six spine-setae, ventral margin bearing four short spines placed almost posteriorly but spread.

Uropod 2, peduncle with seven dorsal spines, medially with one apical spine. Uropod 3, peduncle with more ventral spines; inner ramus as long as outer ramus article 1; outer ramus article 1 spine formula = 2-2-2, setal formula = 0-0-1; medial and lateral margins of both rami profusely plumose setose; article 2 of outer ramus shorter than in female, 0.20, apex with longer plumose setae. Telson much longer than in the allotype, length-width ratio = 110:84, apical spines shorter and apical plumose setule longer, lateral plumose setules situated more proximally.

Etymology

The specific name refers to the protuberance on urosomite 3.

Relationships

Metharpinia Schellenberg, 1931 is composed of five species distributed in North and South America, with only one species described for the southern hemisphere, in the magellanic region and coast of Buenos Aires province (Schellenberg, 1931; Barnard, 1980). *Metharpinia protuberantis* n. sp. is closely related to *Microphoxus* Barnard, 1960, with two species, one known for Costa Rica (Barnard, 1960) and the other for South America, in the magellanic region (Schellenberg, 1931; Barnard, 1980).

The assignment of the new species to one genus or the other is problematic because it exhibits generic features, or a combination of characters, found in both genera. Barnard (1979) anticipated the probability of discovering in South America species intermediate between *Metharpinia* and *Microphoxus*, since the large dorsal hook on urosomite 3 and the dactylar articulate apical nail on the maxilliped proper of *Microphoxus* did not seem to be strong characters to separate it from *Metharpinia*. That is confirmed with the new taxon. Although it does not have an articulate nail on the maxilliped palp, it displays a special process on urosomite 3.

Metharpinia protuberantis is assigned to *Metharpinia* according to the diagnoses of both genera by Barnard and Karaman (1991) and the revised literature mentioned in this paper. The general aspect of the individuals, with their long rostrum, bring them close to *Metharpinia longirostris* Schellenberg, 1931, the type species, and the other species of the genus. The rostrum presents a length gradation in *Microphoxus*, being short in *M. cornutus* (Schellenberg, 1931) and very short in the type species, *M. minimus* Barnard, 1960. Other resemblances with *Metharpinia* are the ventral setae proximally placed on article 2 of antenna 1, which in *Microphoxus* are widely spread and situated more distally. The molars look alike with regard to the primary spines and the smaller disjunct spine, whereas in *Microphoxus* there is no disjunct spine or this spine is vestigial and weakly disjunct. The inner plate of the maxilliped has two apical spines as in some species of *Metharpinia* instead of one as in *Microphoxus*. The maxillipedal nail on the dactylus is fused in the new species as well as in other genus members, versus articulate as mentioned above. The propodus of gnathopods 1 and 2 is poorly setose anteriorly instead of heavily setose.

Peraeopods 3 and 4, article 6 has spines all the same width whereas in *Microphoxus* these are thin and thick; article 5 posteroproximal spines on these latter appendages could be a variable feature, less useful due to the interpretation given to the character. This kind of spine is absent in *Microphoxus* and can be seen in *Metharpinia*, with the exception of *M. oripacifica* Barnard, 1980, while in the new species, according to the author's interpretation, they have been observed on peraeopod 4 in the allotype, on both peraeopods 3 and 4 in the paratype female (6.5 mm) and on both pairs of appendages in the male. The displaced spine on peduncle uropod 1 is lacking in *Microphoxus* but is present and remarkably enlarged in all species of *Metharpinia*. In *M. protuberantis* this spine is weak if the apicomedial spine is correctly interpreted as a displaced spine. The peduncular apical corners of uropods 1 and 2 have been described as not combed in both genera, except in *Metharpinia floridana* (Shoemaker, 1933) where the combed condition is weak or absent; the new species has the peduncular apicolateral corners coarsely combed. The uropod 3 inner ramus is naked laterally with its apex bearing a seta in the allotype. In the paratype female (6.7 mm) the inner ramus, besides its apical seta, has lateral plumose setae. The condition displayed by the allotype is found in *Microphoxus* species, although Barnard (1980) remarked that the holotype of *M. minimus* has two setae on the apex and the rest of the ramus naked. All known species of *Metharpinia* show the apex with two setae and the ramus setose. Urosomite 3 is produced into a special process, a character typical of *Microphoxus* used provisionally by Barnard (1979) to separate it from *Metharpinia*. Although the urosomite 3 process is like a hook in the first genus, in the new species it is a wide and triangular process.

Metharpinia protuberantis n. sp. exhibits, in addition to the characteristic urosomite 3 not found in any species of *Metharpinia*, and the conspicuous combed peduncular apicolateral corners of uropods 1 and 2, a particular epimeron 3 with posteroventral corner strongly produced. Only *Metharpinia jonesi* (Barnard, 1963) has a similar epimeron 3 although the spination scheme is completely different since in the new species the ventral surface is armed with an oblique row of spines and in the other species the face is naked.

Remarks

Barnard and Karaman (1991) had included the genus *Foxiphalus* in both artificial keys for the subfamilies Brolginae and Birubiinae, and *Metharpinia* as well as *Microphoxus* were incorporated in the latter subfamily. Jarrett and Bousfield (1994) erected a new subfamily, Metharpiniinae, to encompass these taxa, and four more genera, and also separated the new subfamily from Birubiinae through a character table. However, Jarrett and Bousfield (1994) recognized that *Metharpinia longirostris*, the South American type of Metharpiniinae, was rather atypical of most northern hemisphere components. For the time being, *Parafoxiphalus longicarpus* n. gen. n. sp. and *Metharpinia protuberantis* n. sp. are included in the subfamily Metharpiniinae until more material of related taxa can be collected in the area of study and more character states analysed.

Conclusions

Parafoxiphalus longicarpus, a new genus and species, is related to *Foxiphalus* Barnard, 1979. Both genera are separated, in combination, mainly by the facial armaments of antenna 2 peduncle article 4, number of calceoli on male antenna 2 peduncle article 5, relative length of carpi on gnathopods 1 and 2, spine and seta

patterns of pereopods 3 and 4 article 6, epimera 1 and 2, and uropods 1 and 2, and to a lesser extent by the maxillipedal nail of palp article 4 and right mandible lacinia mobilis.

Metharpinia protuberantis is a new species that shares many morphological characters with *Microphoxus* Barnard, 1960. Although it is considered herein to be an intermediate species between that genus and *Metharpinia* Schellenberg, 1931 it is assigned to the latter because it shares many more characters with other species of this genus. The new species is characterized by the special process on urosomite 3, and the shape and ornamentation of epimera, uropods and telson, among other attributes.

Biogeographical note

The area of research, where the new taxa were reported, has biogeographical interest because it represents the faunistic ecotone between the Magellanic and Argentine biogeographic provinces, where cold-temperate and warm-temperate waters mix (Balech, 1954).

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