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## Two new Artotrogids (Copepoda: Siphonostomatoida) from Madeira Island, Portugal

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**Key words:** Copepoda, Siphonostomatoida, Artotrogidae, *Cryptopontius*, *Dyspontius*, Madeira Island

### Abstract

Two new artotrogids are recorded from Madeira Island. A new species of *Cryptopontius*, associated with algae, differs from its congeners in the number of antennular segments, setation of the antennal exopod, setation and length of the maxillule lobes, and setation of both rami of the first and fourth legs. The second new artotrogid belongs to *Dyspontius*. It was associated with *Gerardia savagliae* Lacaze-Duthiers, 1864 (Cnidaria: Zoanthidea) and differs from its congeners in cephalothorax shape, siphon length and setation of the maxillule lobes.

### Introduction

Our knowledge of the copepod fauna of Madeira Island is restricted to the work done more than a century ago by I. C. Thompson. Thompson (1888) recorded 64 copepod species, 22 of them also known from British waters. It is difficult to estimate from this single work whether the fauna has associations with that of the North Atlantic, the Mediterranean area or the Caribbean region, or if the Madeira Island fauna is in any way unique.

The present report deals with two samples of copepods taken respectively from algae and cnidarians. These samples provided new species of Artotrogidae belonging to the genera *Cryptopontius* and *Dyspontius*. This is the first record of the family from Madeira Island. All measurements reported below are from holotypes and allotypes.

### Results

#### Taxonomy

*Cryptopontius* Giesbrecht, 1895

*Cryptopontius madeirensis* n. sp.

(Figs 1–3)

**Material examined:** Holotype female; allotype male; and paratype female deposited on Museu

Nacional/Universidade Federal do Rio de Janeiro (MNRJ 14020–14022) on algae from Reis Magos Beach, Madeira Island, Portugal, collected by P. S. Young and P. Wirtz on 25 October 1997.

#### Description

**Female:** Body length (excluding caudal setae) 856  $\mu\text{m}$  (855–857  $\mu\text{m}$ ), greatest width 440  $\mu\text{m}$  (440–441  $\mu\text{m}$ ), and 1.9 times longer than wide. First pediger (Fig. 1a) with moderately pointed epimera. Second pediger with pointed epimera; third pediger with slightly pointed epimera; pleura extending slightly posteriorly. Ratio of length–width of prosome 1.5:1. Ratio of length of prosome to that of urosome 2.8:1.

Genital double-somite (Fig. 1b) 119  $\times$  163  $\mu\text{m}$ , ratio of length – width 0.7:1, rounded anteriorly and armed with 2 setae near genital aperture; posterior corners of genital somite not produced. First abdominal somite 31  $\times$  79  $\mu\text{m}$ , ratio of length – width 0.4:1. Second abdominal somite 35  $\times$  73  $\mu\text{m}$ , ratio of length – width 0.5:1. Anal somite 44  $\times$  61  $\mu\text{m}$ , ratio of length to width 0.7:1. Caudal rami 37  $\times$  26  $\mu\text{m}$ , armed with 6 setae. Seta I absent. Lengths of setae II–VII, 34, 58, 157, 335, 54, and 23  $\mu\text{m}$  respectively. Setae III to VI plumose, setae II and VII naked.

Antennule (Fig. 1c) 261  $\mu\text{m}$  long, 9-segmented. Lengths of segments 1–9, measured along their posterior margin: 68 (38 along anterior margin), 49, 12, 20, 11, 29, 17, 17 and 37  $\mu\text{m}$ , respectively. Armature

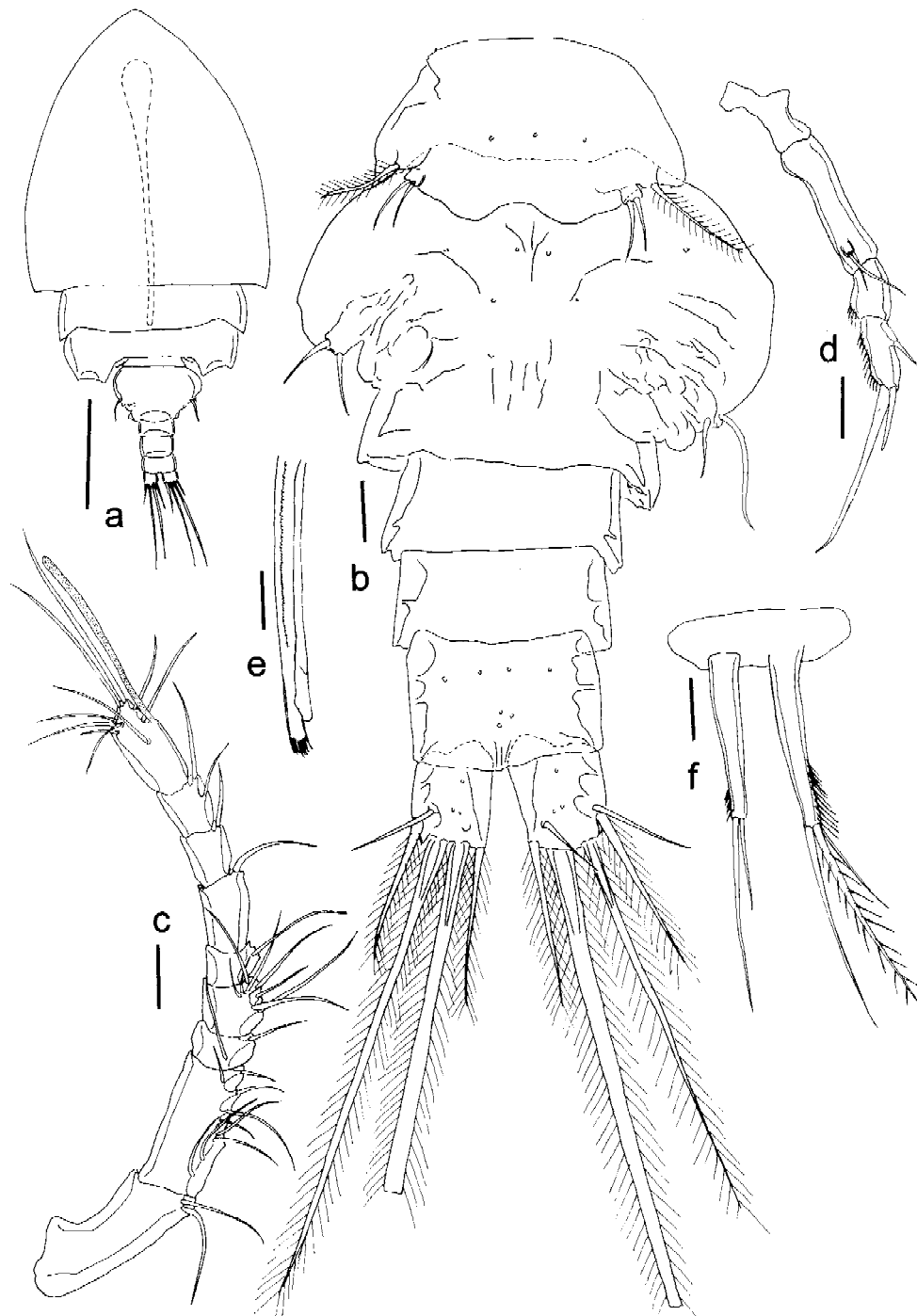


Figure 1. *Cryptopontius madeirensis* n. sp.; female holotype, (a) habitus dorsal, (b) urosome ventral, (c) antennule, (d) antenna, (e) distal part of mandible, (f) maxillule. Scale bars: (a) 200  $\mu\text{m}$ ; (b–f) 20  $\mu\text{m}$ .

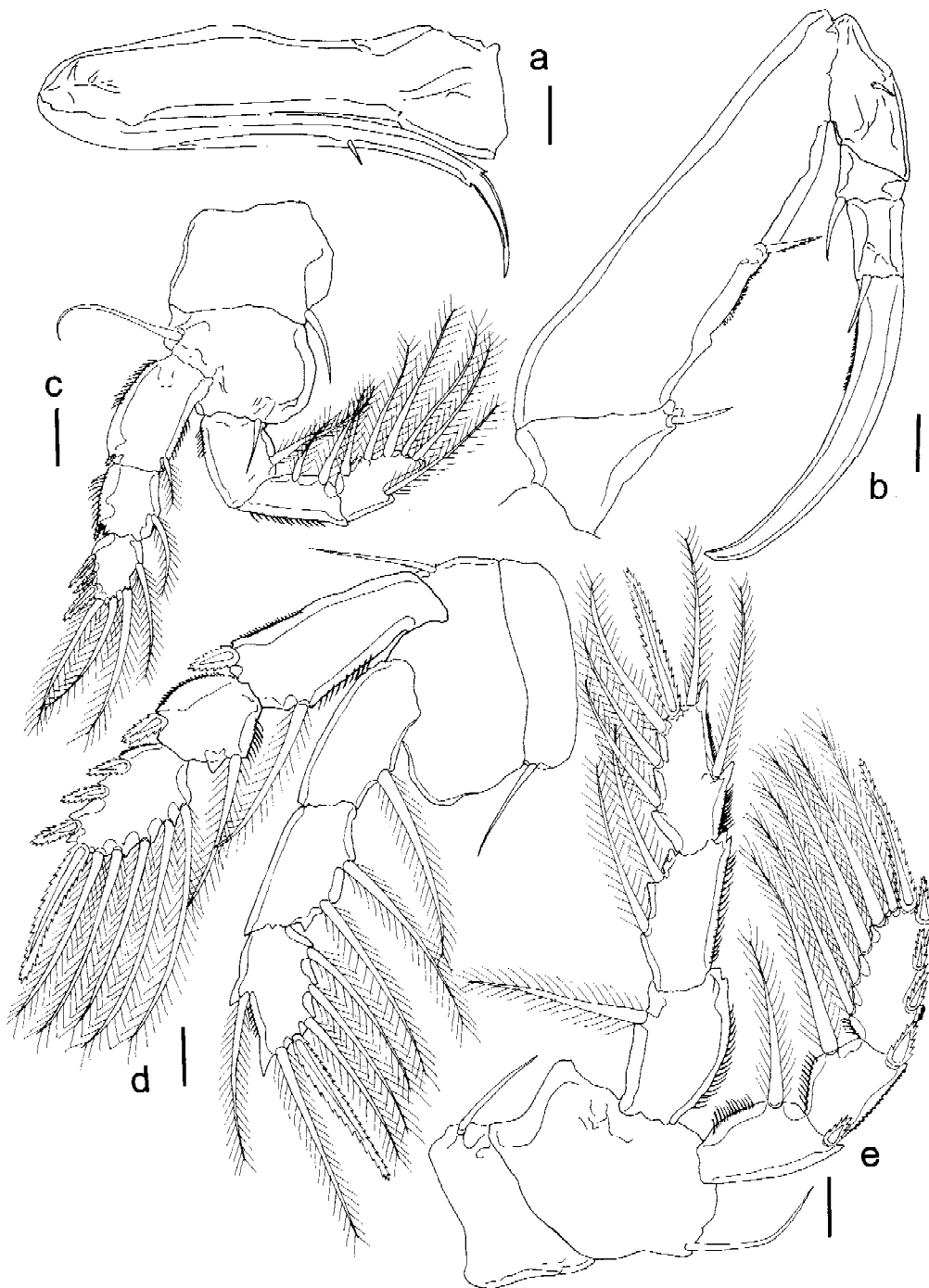


Figure 2. *Cryptopontius madeirensis* n. sp.; female holotype, (a) maxilla, (b) maxilliped, (c) leg 1, (d) leg 2, (e) leg 3. Scale bars: 20  $\mu$ m.

formula: 2, 9, 2, 5, 1, 1, 1, 2, and 9 + ae. All setae simple. Aesthetasc 70  $\mu\text{m}$  long.

Antenna (Fig. 1d) 177  $\mu\text{m}$  long; coxa and basis 25 and 41  $\mu\text{m}$  long respectively. Exopod 4  $\mu\text{m}$  long, with 2 apical setae. Endopod 2-segmented; first segment 21  $\mu\text{m}$  long, unarmed; second segment 26  $\mu\text{m}$  long, with 1 short lateral seta, 1 stout apical seta, and a 63- $\mu\text{m}$ -long claw-like element slightly curved distally.

Siphon (Fig. 1a) 479  $\mu\text{m}$  long, reaching between insertion of legs 2 and 3. Mandible (Fig. 1e) with 7 apical teeth. Maxillule (Fig. 1f) bilobed, both lobes thin and nearly equal in size. Outer lobe 61  $\mu\text{m}$  long, with 2 unequal, simple setae. Inner lobe 73  $\mu\text{m}$  long, armed apically with 2 simple setae and 1 plumose seta, inner margin of inner lobe covered with setules.

Maxilla (Fig. 2a) syncoxa 158  $\mu\text{m}$  long; claw 191  $\mu\text{m}$  long, curved distally and with a small medial seta. Maxilliped (Fig. 2b) 418  $\mu\text{m}$  long and 5-segmented; syncoxa 57  $\mu\text{m}$  long and bearing a short seta on inner margin; basis 142  $\mu\text{m}$  long, also bearing a short subapical seta on inner margin. Endopod 3-segmented, segments 1 to 3 measuring 63, 11 and 29  $\mu\text{m}$  long, respectively. First endopod segment with short seta on outer margin; second and third segments with short seta distally on inner margin. Third segment with curved claw, 117  $\mu\text{m}$  long.

Legs 1–3 (Figs 2c–e) biramous, with 3-segmented rami. Leg 4 (Fig. 3a) without endopod; exopod 3-segmented. Armature formula of legs 1–4 shown in Table 1.

Table 1. *Cryptopontius madeirensis* n. sp. Armature formula of legs 1–4

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	I-1; I-1; III,1,3	0-1; 0-2; 1,2,3
Leg 2	0-1	1-0	I-1; I-1; III,1,5	0-1; 0-2; 1,1+1,3
Leg 3	0-1	1-0	I-1; I-1; III,1,5	0-1; 0-2; 1,1+1,3
Leg 4	0-0	1-0	I-1; I-1; III,1,5	–

Fifth leg (Fig. 1b) with plumose seta near insertion of small free segment which is tipped with 2 setae.

*Male*: Body length (excluding caudal setae) 742  $\mu\text{m}$ ; width 396  $\mu\text{m}$ , 1.9 times longer than wide. First pediger (Fig. 3b) with moderately pointed epimera. Second and third pedigers with pointed epimera; pleura on third pediger extending slightly posteriorly. Ratio of length–width of prosome 1.5:1. Ratio of length of prosome to that of urosome 2.8:1.

Urosome 6-segmented. Genital somite (Fig. 3c) 61  $\times$  115  $\mu\text{m}$ , ratio of length–width 0.5:1, rounded anteriorly and armed with 3 setae posteriorly. Four abdominal somites measuring 25  $\times$  67; 31  $\times$  63; 34  $\times$  57 and 31  $\times$  53  $\mu\text{m}$ , respectively. Ratios of length–width, respectively, being: 0.4:1; 0.5:1; 0.6:1 and 0.6:1. Caudal rami 26  $\times$  27  $\mu\text{m}$ , bearing 6 setae. Seta I absent. Lengths of setae II–VII, 16, 43, 132, 265, 51 and 11  $\mu\text{m}$ , respectively. Setae III–VI plumose, setae II and VII simple. No setules on margin.

Antennule (Fig. 3d) 241  $\mu\text{m}$  long, 10-segmented. Lengths of segments 1–10, measured along their posterior margin 47 (33  $\mu\text{m}$  along anterior margin), 44, 11, 13, 17, 13, 37, 21, 26 and 11  $\mu\text{m}$ , respectively. Formula of armature: 3+ae, 5+5ae, 1+ae, 1+ae, 5+4ae, 1+ae, 2+ae, 1+ae, 1+ae and 7+ae. All setae simple. Other characteristics as in female.

#### Etymology

The specific name '*madeirensis*' refers to the type locality of this species, Madeira Island.

#### Remarks

*Cryptopontius madeirensis* n. sp. is characteristic in having its leg 4 lacking the endopod, bearing 9 elements in the third exopodal segment; the antennule being 9-segmented; and the second endopodal segment of leg 1 armed with 2 setae. These features are also present in *C. brevifurcatus* (Giesbrecht, 1899) (based on Giesbrecht, 1899; and Sars, 1915); *C. paracapitalis* Nicholls, 1944; *C. gracilioides* Ummerkutty, 1962; and *C. brevicaudatus* (Brady, 1899) (based on Eiselt, 1961).

*Cryptopontius brevifurcatus* has an armature formula of I-0; I-1; III-5 on the exopod of leg 1 while that of the new species is I-1; I-1; III-4. Both *C. brevicaudatus* and *C. gracilioides* have the third exopodal segment of leg 1 with 8 elements (III-5) instead of 7 (III-4). *Cryptopontius paracapitalis* has a short siphon (not reaching the insertion of leg 1) and unarmed exopod; the new species has its siphon reaching between the insertion of legs 2 and 3, and the exopod of the antenna with 2 setae.

The new species has the maxillule armed with 3 and 2 setae on the inner and outer lobes, respectively, and the inner lobe is slightly longer than the outer. *Cryptopontius brevifurcatus* has 3 setae on the outer lobe, *C. paracapitalis* has 1 and 2 setae on the inner and outer lobes, respectively, and *C. gracilioides* has 2 setae on each lobe. *Cryptopontius brevicaudatus* has the same number of setae on each lobe as the new

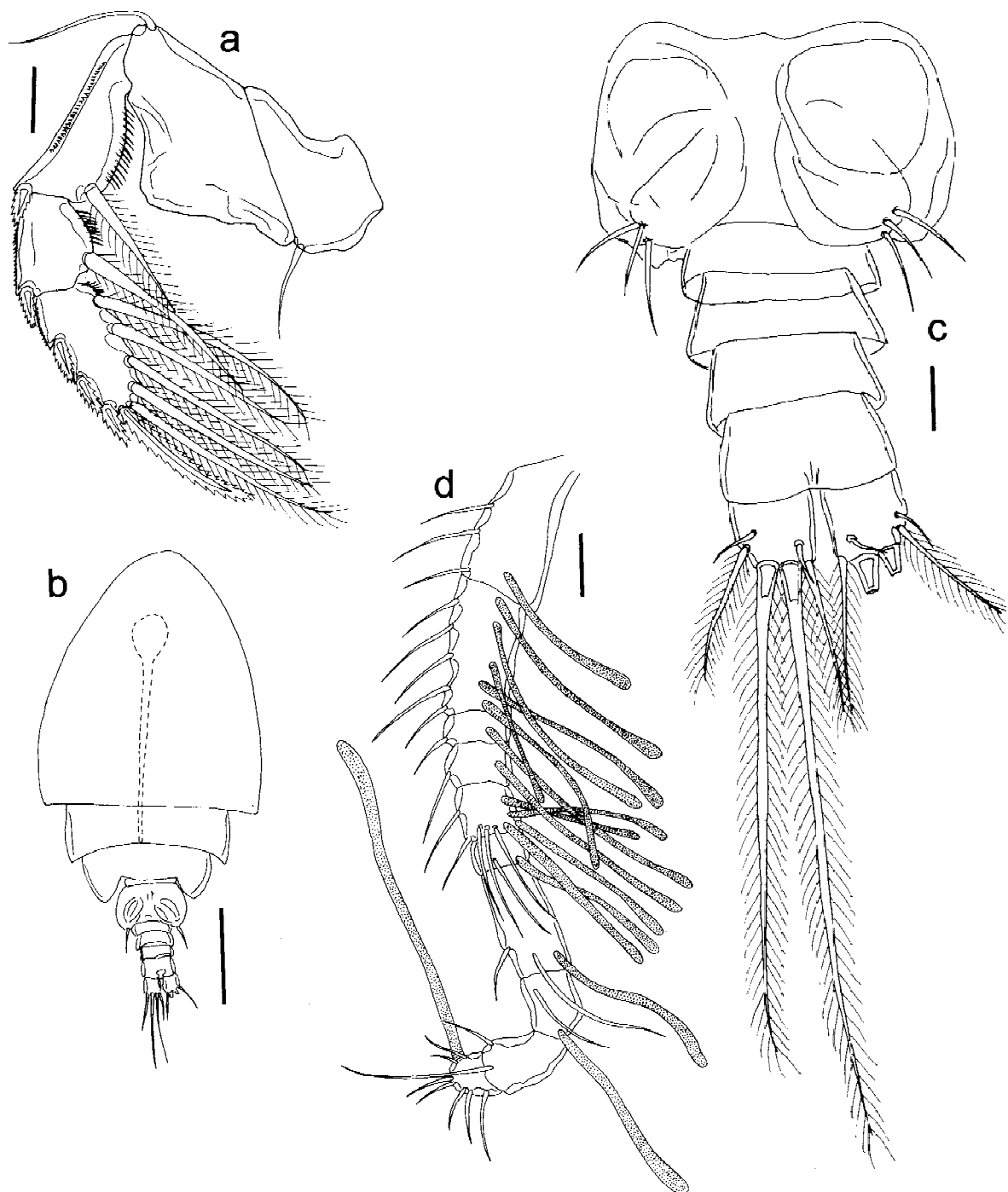


Figure 3. *Cryptopontius madeirensis* n. sp.; female holotype, (a) leg 4; male allotype, (b) habitus dorsal showing siphon (dotted line), (c) urosome (not showing first somite), ventral, (d) antennule. Scale bars: (a, c–d) 20  $\mu\text{m}$ ; b: 200  $\mu\text{m}$ .

species, but its inner lobe is much longer than the outer one.

*Dyspontius* Thorell, 1859

*Dyspontius gerardius* n. sp.

(Figs 4–6)

*Material examined.* Holotype female; allotype male; 2 paratypes female and male (MNRJ 14023–14025), in *Gerardia savagliae* Lacaze-Duthiers, 1864 (Cnidaria: Zoanthidea), from Porto Novo, Madeira Island, Portugal, collected by P. S. Young and P. Wirtz on 27 October 1997.

### Description

*Female:* Body length (excluding caudal setae) 810  $\mu\text{m}$  (808–812  $\mu\text{m}$ ), greatest width 345  $\mu\text{m}$  (344–346  $\mu\text{m}$ ), 2.3 times longer than wide. First pediger (Fig. 4a) with acute epimera. Second and third pedigers with slightly pointed epimera, pleura extending slightly posteriorly. Ratio of length–width of prosome 1.4:1. Ratio of length of prosome to that of urosome 3.2:1.

Genital double-somite (Fig. 4b) 87  $\times$  164  $\mu\text{m}$ , ratio of length to width 0.5:1, rounded anteriorly, with acute posterior corners bearing 1 seta near genital aperture. First abdominal somite 37  $\times$  91  $\mu\text{m}$ , ratio of length to width 0.4:1. Second abdominal somite 36  $\times$  80  $\mu\text{m}$ , ratio of length to width 0.4:1. Anal somite 46  $\times$  71  $\mu\text{m}$ , ratio of length to width 0.6:1. Caudal rami 41  $\times$  30  $\mu\text{m}$ , ratio of length–width 1.3:1, bearing 6 setae. Seta I absent. Lengths of setae II to VII, 37, 52, 143, 246, 70 and 32  $\mu\text{m}$ , respectively. Setae III–VI plumose. Setae II and VII naked.

Antennule (Fig. 4c) 255  $\mu\text{m}$  long and 9-segmented. Length of segments 1–9, measured along posterior margin: 66 (37  $\mu\text{m}$  along anterior margin), 53, 11, 17, 12, 27, 16, 20 and 34  $\mu\text{m}$  respectively. Armature formula: 3, 10, 3, 4, 1, 1, 2, 2 and 8+ae. Aesthetasc 97  $\mu\text{m}$  long. Antenna (Fig. 4d) 185  $\mu\text{m}$  long; coxa and basis 27 and 46  $\mu\text{m}$  long, respectively. Exopod small, 6  $\mu\text{m}$  long, with 2 distal setae. Endopod 2-segmented; first segment 22  $\mu\text{m}$  long, with small seta on mid-lateral margin; second segment 27  $\mu\text{m}$  long, with 1 lateral seta and 1 distal seta, near a 63- $\mu\text{m}$ -long, straight, claw-like element.

Siphon (Fig. 4a) 451  $\mu\text{m}$  long, reaching insertion of leg 2. Mandible (Fig. 4e) with 7 apical teeth. Maxillule (Fig. 4f) with two thin lobes. Outer lobe 48  $\mu\text{m}$  long, with 2 unequal, simple seta. Inner lobe 61  $\mu\text{m}$  long, with 2 plumose setae and 1 very short naked seta. Inner margin of both lobes covered with setules.

Maxilla (Fig. 4g) with syncoxa 165  $\mu\text{m}$  long, and distally curved claw, 193  $\mu\text{m}$  long, with seta on mid-lateral margin. Maxilliped (Fig. 4h) 457  $\mu\text{m}$  long and 5-segmented, comprised of syncoxa, 61  $\mu\text{m}$  long, and with 1 seta on its inner margin; basis 176  $\mu\text{m}$  long, with 1 seta on its mid-lateral margin. Endopod 3-segmented; segments 1 to 3, 58, 11 and 29  $\mu\text{m}$  long, respectively. First and second segments with seta. Third endopodal segment with 2 distal setae, and curved claw, 123  $\mu\text{m}$  long.

Legs 1 to 3 (Figs 5a–c) biramous, with 3-segmented rami. Leg 4 (Fig. 5d) without endopod and exopod 3-segmented. Each coxa with 1 inner seta and each basis with 1 outer seta. Basis of first leg with inner seta. Armature formula of legs 1 to 4 as in Table 2.

Table 2. *Dyspontius gerardius* n. sp. Armature formula of legs 1–4

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	1-1	I-1; I-1; II,2,2	0-1; 0-2; 1,2,3
Leg 2	0-1	1-0	I-1; I-1; III,1,5	0-1; 0-2; 1,1+1,3
Leg 3	0-1	1-0	I-1; I-1; III,1,5	0-1; 0-2; 1,1+1,3
Leg 4	0-1	1-0	I-1; I-1; III,1,5	–

Fifth leg (Fig. 4b) with simple seta near insertion of free segment, segment tipped with 2 simple setae.

*Male:* Body (Fig. 6a) length (excluding caudal setae) 760  $\mu\text{m}$  (756–763  $\mu\text{m}$ ), greatest width 330  $\mu\text{m}$  (325–335  $\mu\text{m}$ ); 2.3 times longer than wide. First pediger with moderately pointed epimera, pleura extending slightly posteriorly. Ratio of length to width of prosome 1.4:1. Ratio of length of prosome to that of urosome 2.7:1. Urosome 6-segmented. Genital somite (Fig. 6b) 50  $\times$  111  $\mu\text{m}$  wider than long, ratio of length to width 0.4:1, rounded anteriorly and posteriorly, armed with 3 setae posteriorly. Lengths and widths of 4 abdominal somites, 28  $\times$  64; 25  $\times$  58; 23  $\times$  56 and 39  $\times$  57  $\mu\text{m}$  respectively. First 3 somites with ratio of length to width 0.4:1; anal somite 0.7 times as long as wide. Caudal rami 33  $\times$  27  $\mu\text{m}$ , ratio of length to width 1.2:1; each ramus bearing 6 setae. Seta I absent. Lengths of setae II to VII, 25, 41, 122, 297, 52 and 29  $\mu\text{m}$  respectively. Setae III to VI plumose, setae II and VII simple.

Antennule (Fig. 6c) 209  $\mu\text{m}$  long, 11-segmented. Lengths of segments 1–11, measured along their posterior margins 54 (42  $\mu\text{m}$  along anterior margin), 38, 9, 10, 10, 7, 8, 23, 9, 7 and 35  $\mu\text{m}$  respectively. Arma-

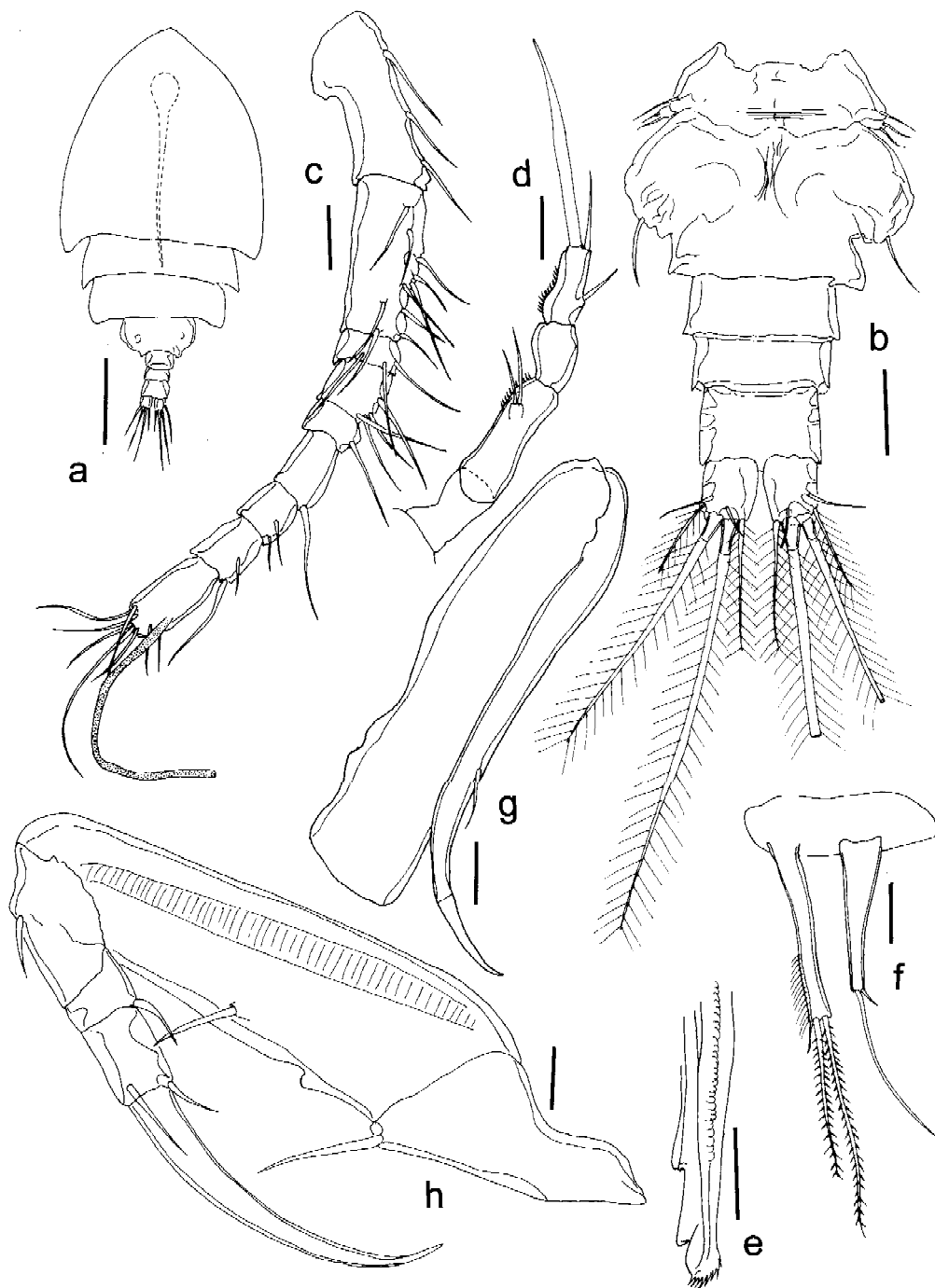


Figure 4. *Dyspontius gerardius* n. sp.; female holotype, (a) habitus dorsal showing siphon (dotted line), (b) urosome ventral, (c) antennule, (d) antenna, (e) distal part of mandible, (f) maxillule, (g) maxilla, (h) maxilliped. Scale bars: (a) 200  $\mu\text{m}$ ; (b) 50  $\mu\text{m}$ ; (c–h) 20  $\mu\text{m}$ .



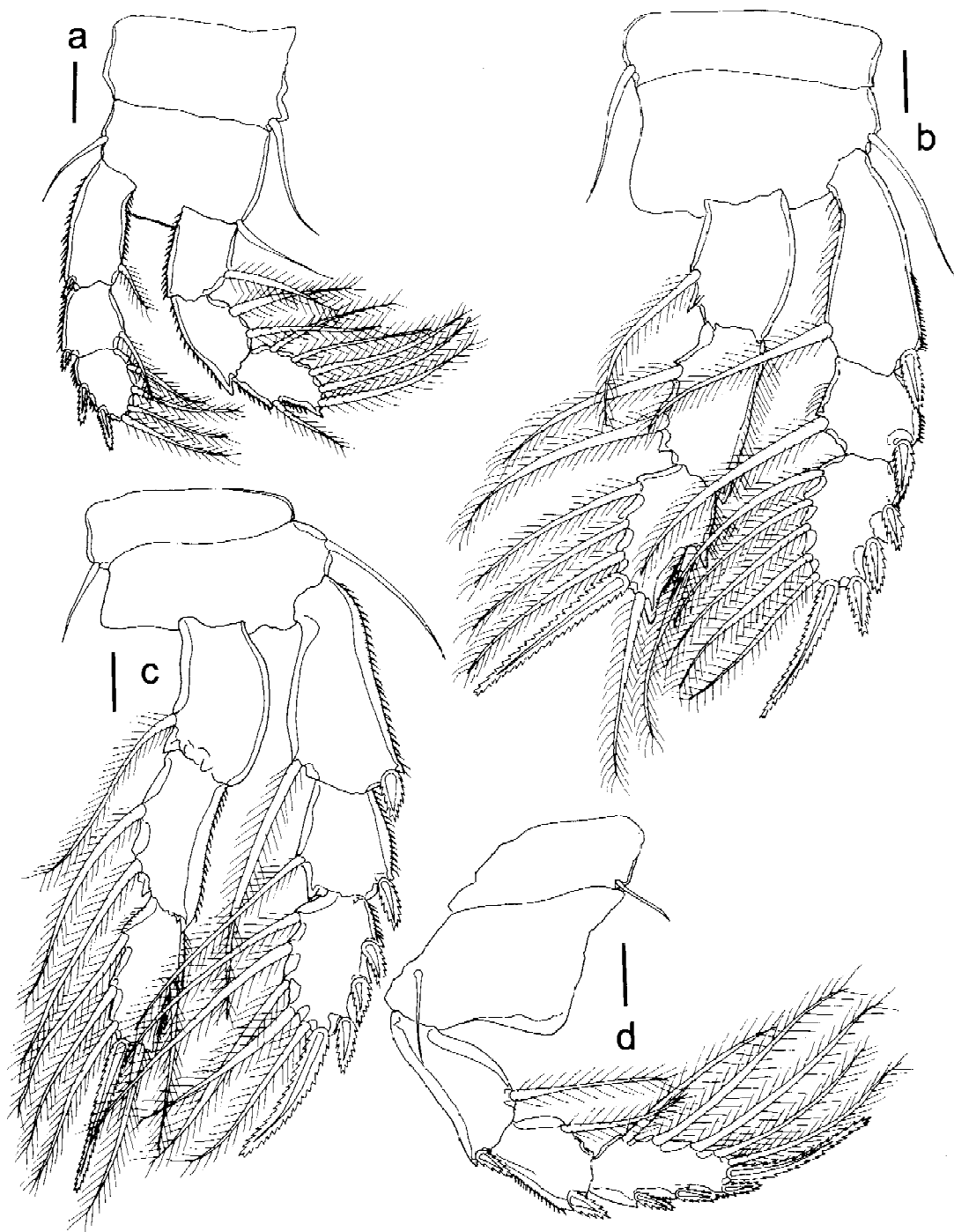


Figure 5. *Dyspontius gerardius* n. sp.; female holotype, (a) leg 1, (b) leg 2, (c) leg 3, (d) leg 4. Scale bars: 20  $\mu$ m.

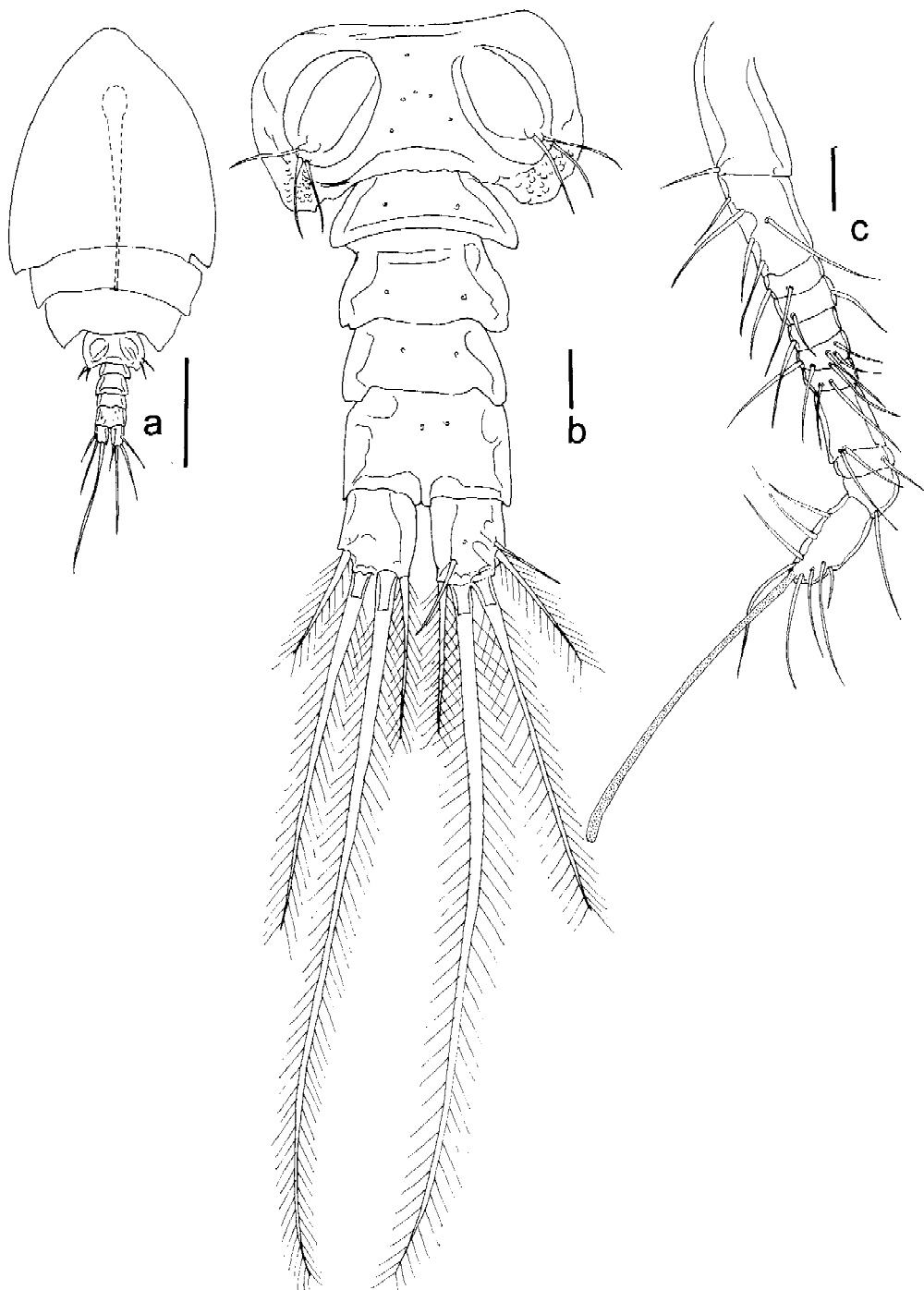


Figure 6. *Dyspontius gerardius* n. sp.; male allotype. (a) habitus dorsal showing siphon (dotted line), (b) urosome (not showing first somite), ventral, (c) antennule. Scale bars: (a) 200  $\mu\text{m}$ ; (b-c) 20  $\mu\text{m}$ .

ture formula: 1, 5, 2, 2, 1, 5, 2, 2, 1, 1 and 8+ae. Aesthetasc 116  $\mu\text{m}$  long. Other characteristics as in female.

#### Etymology

The specific name '*gerardius*' refers to the host, *Gerardia savagliae* Lacaze-Duthiers, 1864.

#### Remarks

The genus *Dyspontius* contains 3 species: *D. fringilla* (Giesbrecht, 1899), *D. passer* (Giesbrecht, 1899), and *D. striatus* Thorell, 1859 (based on Giesbrecht, 1899; Sars, 1915).

Both *D. fringilla* and *D. passer* have triangular cephalosome, with a dorsal crest. The new species and *D. striatus* do not have these characteristics. In *D. gerardius* n. sp., the siphon reaches the insertion of leg 2, while in *D. fringilla* it reaches the genital double-somite. According to Giesbrecht (1899), *D. striatus* has the siphon reaching the insertion of leg 3 but it was shown to reach the insertion of leg 1 in Sars' (1915) report.

The new species has the cephalosome with acute posterior corners, and the third pediger extends only slightly posteriorly; while in *D. striatus*, the third pleura reaches the genital apertures, and the cephalosome is not produced. *Dyspontius gerardius* n. sp. also differs from *D. striatus* in the maxillule, with 2 long setae on the inner lobe, and 2 unequal setae on the outer lobe as oppose to only 1 long seta on the inner lobe, and 2 long setae on the outer lobe.

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