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The genera of Santiidae Kussakin, 1988, with the description of a new genus and species (Crustacea, Isopoda, Asellota)

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The asellote isopod family Pleurocopidae Fresi & Schiecke, 1972 has hitherto included a heterogeneous assortment of genera. A review of these revealed that the family should be restricted to the type genus, *Pleurocope* Walker, 1901, and that the other genera should be referred elsewhere. The family Santiidae Kussakin, 1988 (new name for Antiadidae Menzies, 1962) is redefined and rediagnosed; included genera are *Santia* Sivertsen & Holthuis, 1980, *Prethura* Kensley, 1982, *Kuphomunna* Barnard, 1914, *Halacarsantia* n.gen., and a yet undescribed genus. The genera are diagnosed and keyed out; keys to the species of *Santia* and *Halacarsantia* are given; the type species of *Halacarsantia*, *H. justii* n.sp., is described, and *Antias uniramea* Menzies & Miller, 1955, is transferred to *Halacarsantia*. The status of *Mexicope* Hooker, 1985, not yet assigned to any family, is discussed.

Key words: Isopoda, Asellota, Pleurocopidae, Santiidae, *Pleurocope*, *Prethura*, *Kuphomunna*, *Santia*, *Halacarsantia* n.gen., *Mexicope*, systematics.

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INTRODUCTION

When collecting siphonocetine amphipods at Phuket, Thailand, in 1982, Dr. Jean Just of the Copenhagen Zoological Museum came across a remarkable minute isopod closely related to *Santia uniramea* (Menzies & Miller, 1955).

He later undertook a preliminary study of the species, but this was interrupted due to other commitments. At his suggestion I agreed to take over the study, including a description of the species. This led to an evaluation of the relationship of the genera recently referred to the rather heterogeneous family Pleurocopidae.

Just before I had finished the manuscript, Dr. Hans-Georg Müller, Zoologisches Institut, Giessen, F.R.G., asked permission to borrow a *Gnathia* type from this museum, in connection with his study of an isopod collection from the Caribbean coast of Colombia. In addition to a drawing of his new species of *Gnathia* he included in his letter drawings of two new species of *Santia*, one of which is also very close to *Santia uniramea*. This is a remarkable coincidence, as he knew nothing of my just-completed study of the genus!

Dr. Müller has very kindly allowed me to see his preliminary manuscript and illustrations. so

that I have been able to include references to these two species and a third species, *Mexicope* n.sp., in relevant places in this paper.

While the completed manuscript was still awaiting printing Dr. Oleg Kussakin sent me a copy of his new book on cold and temperate water isopods from the northern hemisphere (Kussakin 1988). It includes *Santia hirsuta* which Kussakin refers to the family Santidae nom.n. His book thus predates the present paper on the same family, but fortunately a revision of my manuscript was still possible.

I wish to thank Dr. Müller for his cooperation and Dr. Just for helpful comments on the manuscript. I am also grateful to Dr. George Wilson, Scripps Institution of Oceanography, La Jolla, California, for information on the genera *Pleurocope* and *Mexicope* and for comments on the manuscript. Dr. Elizabeth Louw, South African Museum, Cape Town, is thanked for information about a species of *Santia*, Dr. Sergei Golovatch, Moscow, for translation of a Russian text, and Dr. Mary E. Petersen, Zoological Museum, Copenhagen, for valuable comments and correction of my English.

SYSTEMATICS

Pleurocopidae Fresi & Schiecke, 1972, emended and restricted

Pleurocopidae Fresi & Schiecke, 1972: 207; Kensley 1982: 255; Hooker 1985: 257; Wilson 1987: 272; Wägele 1987: 91; Kussakin 1988: 230.

Type genus: Pleurocope Walker, 1901.

Remarks

Previously considered to include 4 genera, the family is herein emended. For further comments, see below.

***Pleurocope* Walker, 1901**

Hooker (1985) recorded the many family assignments of this genus: Munnidae (Walker 1901), ?Dendrotiidae (Wolff 1962), Antiadidae (Wilson 1980), its own family (Pleurocopidae,

Fresi & Schiecke 1972), and Pleurocopidae in a broader sense (Kensley 1982, Hooker 1985).

Fresi & Schiecke (1972) redescribed *Pleurocope dasyura* Walker, 1901, at the time the only known species, correcting errors and misinterpretations in Walker's original description. They erected the family Pleurocopidae based on the relative size of the antennae and the modified mandible and maxilla 1. Wilson (1980: 224) regarded these characters as specializations without familial significance and referred the genus to Antiadidae because of several characters in common: antenna 1 with six articles; male pleopod I broad at base and narrow distally; uropod normal, biramous; similarity in shape of pereon; eyes on lateral extensions.

However, in the Antiadidae/Pleurocopidae the usual number of articles in antenna 1 is five (six in only two species of *Santia*); the male pleopod may be almost rectangular (*S. milleri*) and is very different in the more recently described genus *Prethura*; the uropod may not be typically biramous (*Prethura* and *Halacarsantia* n.gen.). In addition to the number of articles in antenna 1, *Pleurocope* also differs in several other characters: the pleotelson is not truncate but with an elongated extension; the relative size of the antennae is reversed; the third article of peduncle of antenna 2 has a large median extension with a row of setae; the flagellum of antenna 2 is provided with aesthetasc(s) distally; the coxae and mandibles are aberrant; maxilla 1 has a reduced inner lobe; the maxilliped epipod is distally broadly rounded instead of acute or subacute; the protopod of male pleopod II has a whiplike extension distally; and the uropods are inserted subdorsally and near the anterior end of the pleotelson instead of laterally on the posterolateral part of the pleotelson.

Finally, Fresi & Schiecke (1972) described and illustrated an inconspicuous second pleonite in *Pleurocope dasyura*. Neither Walker (1901) nor Stebbing (1905) mentioned or figured two pleonites in this species, and Hooker (1985) who described *Pleurocope floridensis* could find no pleonite in front of the pleotelson. It seems, however, strange that a signifi-

cant character as the number of pleonites should differ between species which are otherwise quite similar. Dr. George Wilson is describing a third species from southern California and has informed me that there is definitely no first pleonite. Nor is this the case in another new species from Lizard Island, northern Great Barrier Reef (Jean Just, pers.comm.). Wilson (in litt.) believes that Fresi & Schiecke in their study of this minute species probably mistook a ridge (possibly a remnant of pleonite 1) as a suture line. If so, *Pleurocope* agrees with *Halacarsantia* in having one pleonite only.

On account of the many differences pointed out above I was reluctant to include *Pleurocope* in the same family as particularly *Santia* and *Halacarsantia*. My doubt was confirmed by George Wilson who after a further study of his new species has informed me about his discovery of a number of significant characters separating *Pleurocope* on the family level: e.g., dorsal position of the cuticular organ instead of ventral, midgut convoluted instead of straight, and anus inside pleopodal cavity instead of outside. In a forthcoming paper Wilson will describe the new species and further discuss the relationship of *Pleurocope*; giving a revised diagnosis here has thus been considered premature.

Also Kussakin (1988) found that *Pleurocope* and *Santia* could not belong to the same family because of difference »in body shape and structure of mandibles and maxillae I«.

Family Santiidae Kussakin, 1988

Abyssianiridae Menzies, 1956: 12 (part); Sivertsen & Holthuis, 1980: 88.

Antiasidae Menzies, 1962: 59; Wolff 1962: 69; Wilson 1980: 223.

Pleurocopidae Fresi & Schiecke, 1972: see above.

Antiadidae Sivertsen & Holthuis, 1980: 88 (part).

Santidae Kussakin 1988: 228 (incorrect spelling).

Type genus: *Antias* Richardson, 1906 (preoccupied, replaced by *Santia* Sivertsen & Holthuis, 1980).

Family name

The replacement of *Antias* with *Santia* involves a change of the family name, since *Antias* is a

junior homonym (Article 39, ICZN). Thus, the correct new name of the family is Santiidae.

Diagnosis

Janiroidea of small size, with body oval, rather flattened (except *Prethura*), rarely with subparallel margins. Head and all pereonites free. Head broader than long. Pereonites 5-7 reduced in size. One pleonite in front of pleotelson (except in *Halacarsantia* n.gen. and perhaps *Kuphomunna*). Opening of cuticular organ ventral¹. Eyes present and situated on lateral processes or rounded protuberances (except in *Halacarsantia justii* n.sp.). Antenna 1 short, with two stout articles in peduncle and three articles in flagellum (four in *Santia hofsteni* and *S. bicornis*); one to three long aesthetascs distally. Antenna 2 shorter than body, with four short proximal and two long distal articles in peduncle² and no aesthetascs distally on flagellum; antennal scale rarely present. Molar process of mandible subcylindrical, truncate. Maxillipedal palp narrow, less than half the width of endite; two (rarely three) coupling hooks; epipodite pointed distally. Coxae visible from above on at least pereonites 5-7 (those on 7 not visible in *Santia charcoti*³). Pereopod I prehensile, with opposition between dactylus and propodus; pereopods II-VII ambulatory, with two claws on dactylus. Pleopod I in male broadest at base and more or less truncate distally (except in *Prethura* and *Kuphomunna*). Uropods at least one-fourth as long as pleotelson (except in *Prethura*) and situated on posterolateral margin of pleotelson, with protopod and two rami (uniramous in *Halacarsantia* and either uniramous or with endopod fused with protopod in *Prethura*). Anus terminally exposed (not ascertained in *Kuphomunna*).

1. Studied in *Santia* only (Wilson 1986).

2. Barnard (1914) and Hodgson (1910) recorded three proximal articles in *Kuphomunna* and *Santia charcoti*, respectively. Considering the difficulty in distinguishing the separation of these articles in such minute animals it is likely that the number is actually four.

3. Wilson 1980, fig. 4C.

Remarks

Kensley (1982) gave an emended diagnosis of the Pleurocopidae, and Kussakin (1988) provided a diagnosis for the Santiidae (including *Santia* and *Kuphomunna*). Both have been substituted by the above, more detailed diagnosis which excludes *Pleurocope*, includes *Prethura*, accounts for notorious exceptions, and corrects minor inconsistencies.

Hooker (1985) provided a useful tabular comparison between a number of characters in *Mexicope*, *Pleurocope*, *Prethura*, *Santia*, *Kuphomunna*, *Abyssianira*, and *Janira*. Most data are correct, but discrepancies are found in the following cases: *Pleurocope*: antenna 1 aesthetascs - there are two in *dasyura*, one in *floridensis*; antenna 2 flagellum - six articles in both species; antenna 2 aesthetascs - two in *dasyura*; maxilla 1 - bilobed, although inner lobe reduced. *Prethura*: all coxae visible, although barely. *Santia*: antenna 1 peduncle - two articles throughout; antenna 1 flagellum - never more than four articles; antenna 2 peduncle - six articles (cf. footnote 2 p. 179) and scale present in 1-2 species; coxae are visible from above in 12 species: on pereonites 1-7 in one, on 2-7 in three, on 3-7 in one, on 5-6 in one, on 5-7 in six, unknown in one species. *Kuphomunna*: antenna 1 aesthetascs - probably two; exposure of anus unknown. *Abyssianira*: antenna 1 peduncle and flagellum - most likely with two articles in the former and four in the latter which has one aesthetasc; antenna 2 peduncle and flagellum - two and seven articles, respectively (Wilson 1980, fig. 2 B), and no peduncular scale; antenna 1 a little longer than antenna 2; shape of maxilla 1 and claws on pereopods II-VII unknown. *Janira biunguiculus*: antenna 1 peduncle and flagellum - two and four articles, respectively (according to Hooker's text, 1985: 269).

Wilson (1987) regards the Santiidae (Pleurocopidae) and the Munnidae as sister groups because of (1) the ventral opening of the cuticular organ, adjacent to the opening of the oviduct, (2) the exposed anus and (3) the eyes being situated on short, thick stalks and generally well

developed with many ocelli. The first two characters clearly separate the two families from the other munnoid families, viz., the Paramunnidae and the Abyssianiridae. The Paramunnidae also have pedunculate eyes, although with few ocelli, but since a number of other characters show that the Paramunnidae were derived separately from the Munnidae (Wilson 1980), the stalked eyes are considered as a convergence (Wilson 1987). However, all three species of *Halacarsantia* have only 6-7 ocelli, and *H. justii* n.sp. has not even an eye bulge. All species of *Santia* have eyes on rounded protuberances, but at least in *S. hispida* and *S. dimorphis* there are less than 10 ocelli. *Kuphomunna* and *Prethura* have a fair number of ocelli.

Also Wägele (1987) discusses the relationship between munnoid genera and families. He considers the Munnidae and the Paramunnidae as sister groups (dendrogram fig. 36) because of the absence of developing oostegites (Wolff 1962: 60) and the minute uropods with reduced sympod. He relates the Santiidae (Pleurocopidae) with the Dendrotiidae and Haplomunnidae because of the well developed, biramous uropods. He separates the santiids from the other two families (1) by their short mandibular palp with one article only and (2) a maximum of 3 articles in the flagellum of antenna 1. However, (1) the status of the mandibular palp is differing greatly in santiids: it is absent in *Kuphomunna* and *Prethura* and absent in two species of *Halacarsantia* and 3-articulated in the third; in *Santia* the palp is unknown in two species, absent in two species, 3-articulated in eight species (although short in two), 2-articulated with a terminal spine in *S. charcoti* and short and 1-articulated in only one species, *S. bicornis*. (2) The number of articles in the flagellum of antenna 1 is four in *Santia hofsteni* and *S. dimorphis*.

Having seen my discussion below of the genera *Halacarsantia* and *Santia*, Dr. Müller has agreed that one of his two yet undescribed new species belongs to the former genus and that the other differs from *Santia* in so many important

characters that it will have to be referred to a new genus. Some of these characters are given in the key to genera below.

All the nineteen members of the family are extremely small. Only five species exceed 2 mm in length, and only one species (*Santia bicornis*) exceeds 3 mm (max. length 3.8 mm).

Distribution

There is a total of 40 records of species of Santiidae: *Prethura* 1 (Kensley 1982); *Kuphomunna* 1 (Barnard 1914, 1920); *Santia* 35 (Richardson 1906, 1908, 1913, Hodgson 1910, Vanhöfen 1914, Stephensen 1927, Nordenstam 1933, Monod 1933 (*Munna* sp.), Hale 1937, Menzies 1951, 1962, Barnard 1955, Menzies & Glynn 1968, Cléret 1971, Amar & Roman 1973, Kensley 1976, Carvacho 1977, Sivertsen & Holthuis 1980, Pires 1981, Menzies & Kruczynski 1983, Müller in litt.); *Halacarsantia* 3 (Menzies & Miller 1955, Müller in litt., this paper).

According to our present knowledge, the family has a pronounced southern distribution. Only five species (*Santia hirsuta*, *S.* sp., *Halacarsantia justii* n.sp., and Müller's two new species) are found north of the equator, while *S. milleri* is recorded from central Brazil and the Caribbean area. Of the 40 records, 32 are from south of 30°S. More detailed investigations may, however, disclose more representatives of these minute asellotes in tropical waters.

Almost half the species are intertidal, the remainder occurring at depths of less than 100 m, except *Santia carvacho* (max. depth 270 m).

Key to the genera of Santiidae

1. Body considerably vaulted. Pleotelson elongated, almost triangular and rounded distally. Male pleopods I distally with double twist, pleopods II strongly inflated and extending laterally well beyond the margins of pleotelson *Prethura* Kensley, 1982
- Body flattened. Pleotelson oval or somewhat pyriform or with a truncate distal margin. Male pleopods I not twisted and pleopods II not extending laterally beyond pleotelson 2
2. Epistome strongly projecting, longer than head.

- Pereopod I with one claw *Kuphomunna* Barnard, 1914
- No projecting epistome. Pereopod I with two claws 3
- 3. Front margin of head with large, broadly rounded lobe with fringe of spines. Pleon consisting of pleotelson only. Uropods uniramous *Halacarsantia* n.gen.
- Front margin of head usually straight or partly so, occasionally with two rounded lobes. One short pleonite in front of pleotelson. Uropods biramous 4
- 4. Distal end of pleotelson rounded. First article of antenna I rounded distally *Santia* Sivertsen & Holthuis, 1980
- Pleotelson hexagonal, distal margin being almost straight. First article of antenna I with distal, anterolateral extension furnished with strong spine new genus, Müller

Prethura Kensley, 1982

Type species: P. hutchingsae Kensley, 1982 (by monotypy).

Diagnosis

See Kensley 1982: 255, although the following familial characters should be left out: presence of eyes, antenna 1 with five articles, mandible with truncate molar process, maxillipedal palp narrow, pereopod I prehensile, pereopods II-VII biunguiculate. Moreover, an 8-articulated flagellum in antenna 2 can hardly be regarded as a generic character. On the other hand, the subtriangular shape of the pleotelson, and the pyriform shape of the female operculum should be included in the diagnosis.

Remarks

The structure of the twisted pleopod I and of the uropod is, as far as I am aware, unique within the Asellota. The genus also differs from all other santiids in having an inflated male pleopod II and the reticulate sculpture of the body. However, for the time being I prefer to include *Prethura* in the Santiidae.

Kuphomunna Barnard, 1914

Type species: K. rostrata Barnard, 1914 (by monotypy).

Diagnosis

Epistome elongated in male, distally rounded,

about 1.5 times as long as head; epistome only slightly projecting in female. Pereonite 1 in male twice as long as the succeeding ones, in female scarcely as long as pereonite 2. Flagellum of antenna 1 with all articles nearly equally long. Pereopod I considerably stouter in male than in female, with one claw. Male pleopod I diverging distally, with acute apex. Operculum longer than broad, somewhat pyriform.

Remarks

Kuphomunna resembles *Prethura* in lacking the mandibular palp and in having only one claw on the dactylus of pereopod I. As in male *Santia dimorphis*, the first pereonite is twice as long as the succeeding ones, and pereopod I is correspondingly broad and heavy. The strongly projecting epistome (Kensley 1978, fig. 53B) is unique within the family.

Santia Sivertsen & Holthuis, 1980

Antias Richardson, 1906: 16; Nordenstam 1933: 200; Menzies & Miller 1955: 383; Wolff 1962: 70. Type species: *Antias charcoti* Richardson, 1906. Preoccupied by *Antias Distant*, 1884 (Insecta, Hemiptera).

Santia Sivertsen & Holthuis, 1980: 89 (replacement name for *Antias* Richardson, 1906); Kussakin 1988: 230.

Diagnosis

Antennae inserted in an excavation on the anterolateral margin of the head. An inwards-curved tooth in front of the eye process (not mentioned or illustrated in *S. bicornis*). Pleotelson evenly rounded posteriorly. Antenna 1 with last article in flagellum elongated (not elongated in at least adult of *S. compacta*; subdivided into one long and one short, terminal article in *S. hofsteni* and *S. bicornis*). Mandibular palp normally present (unknown in *S. uncinata* and *S. concavata*, reduced in *S. bicornis* and absent in *S. compacta* and *S. hirsuta*). Pereopod I with two claws. Female operculum described in only five species: longer than broad and generally pyriform (oval in *S. bicornis*). Uropods biramous.

Remarks

The diagnosis provided by Kussakin (1988) is substituted by the above, more detailed one which excludes family characters.

Wilson (1980) regarded the genus as rather diverse, probably containing several genera. *Santia uniramea* is referred to a new genus below. According to our present knowledge, the only three other species which might differ sufficiently to represent separate genera are *S. charcoti* (the type species!), *S. dimorphis* and *S. bicornis*.

S. charcoti (Richardson, 1906) (Hodgson 1910; Wilson 1980, fig. 4C) is unique in having a projecting, bilobed frontal margin furnished with stiff setae (frontal margin otherwise slightly convex, straight or slightly concave), five short articles in the peduncle of antenna 2 (otherwise only four) and coxae on pereonites 7 not visible from above (Wilson loc.cit.).

S. dimorphis (Menzies, 1962) differs in the coxae on pereonite 1 being visible from above (at least in the male) and the strongly developed male first pereonite and pereopod I (otherwise found only in *Kuphomunna*). The latter feature has not been described for any other *Santia* male, but in males of *S. hirsuta*, *S. bicornis* and *S. hofsteni* the first pereonite appears to be slightly longer than the succeeding ones.

S. bicornis (Cléret, 1971) differs greatly in the extraordinary and asymmetrical, digitiform projections on the male mandibles, comparable only (right mandible) to similar mandibular outgrowths in males of the very distantly related asellote genus *Gnathostenetroides* Amar, 1957 (*Gnathostenetroidoidea*) in which they also project in front of the head (Amar 1957, Hooker 1985). It also differs in apparent lack of the tooth in front of the eye process, four articles in flagellum of antenna 1 (like *S. hofsteni*), and an oval female operculum. - However, since all three species otherwise are typical representatives of *Santia* I do not consider the above characters of generic significance.

Santia concavata (Carvacho, 1977) is very close to, if not identical with, *S. marmorata* (Vanhöffen, 1914). Carvacho had only one fe-

male available; he did not describe the mandibles, and the second antennae were missing. The general body shape, the length of the uropods and the shape of maxillipeds and pereopod I are identical. In *S. concavata* the exopod of the uropods is two-thirds as long as the endopod; Nordenstam (1933) described and illustrated the rami in *S. marmorata* as fairly equal in length, but Vanhöffen (1914) described the exopod as shorter than the endopod. The only obvious differences are found in *S. concavata* being more slender than *S. marmorata* (according to Carvacho's fig. 3a versus Nordenstam's pl. II, 17) and the three distal articles of antenna 1 being more slender (see key below). Carvacho does not mention the colour of his specimen; in case it is marmorated there can hardly be any doubt that the two species are identical.

In their additional description of *S. hispida*, Sivertsen & Holthuis (1980) suggested that Nordenstam (1933: 201) and Menzies & Miller (1955: 385) had included the projecting part of the upper lip (not lower lip, as stated) when they described the frontal margin as »convex«. The same may be the case in *S. mawsoni* (Hale 1937, fig. 10), where Menzies (1962: 60) describes the frontal border as »convex, evenly rounded«, and in *S. hofsteni* where the frontal margin may well be the »two fairly parallel and transverse lines«, dividing the front part into »one proximal, trapezoidal part and one anterior lobe with distal margin convex« (Nordenstam 1933: 206).

This uncertainty makes it inadvisable to use the shape of the frontal margin as the principal dividing character in the key to species, as done by Wolff (1962: 70). Thus, another key has been prepared, including more recently described species. Dr. Elizabeth Louw has kindly checked the length of the uropods in *S. hofsteni*, deposited in the South African Museum, Cape Town; they were figured but not described by Kensley (1976).

Key to the species of *Santia*

1. Frontal border produced into two stout, rounded tubercles. Head and body with rows of transversal

- and marginal setae. Uropods at least as long as pleon *S. charcoti* (Richardson, 1906)
- Frontal border at most slightly concave 2
- 2. Pleotelson with 5-6 backwards curved, hooked spines along each margin. Body with numerous stiff setae laterally. Eye lobes distinct, at least as long as broad *S. uncinata* (Vanhöffen, 1914)
- Pleotelson differently armed with spines or setae or lacking them entirely 3
- 3. Uropods half as long as pleon or less 4
- Uropods almost as long as pleon or longer 8
- 4. Coxae on pereonites 2-7 visible from above 5
- Only coxae on pereonites 5-7 visible from above 6
- 5. Eyes situated centrally on eye process. Antenna 1 with six articles. Mandibular palp with one small article *S. bicornis* (Cléret, 1971)
- Eyes situated laterally on eye process. Antenna 1 with five articles. Mandibular palp with three articles *S. laevifrons* (Menzies, 1962)
- 6. Body with setae throughout. Uropods half as long as pleon. Mandibular palp absent *S. hirsuta* (Menzies, 1951)
- Body with few scattered setae laterally only. Uropods maximally one-third as long as pleon. Mandibular palp present or absent 7
- 7. Body 1.9 times as long as greatest width. Articles 3-4 of antenna 1 twice as long as broad; article 5 nearly twice as long as broad *S. marmorata* (Vanhöffen, 1914)
- Body 2.3 times as long as greatest width. Articles 3-4 of antenna 1 four times as long as broad; article 5 almost six times as long as broad *S. concavata* (Carvacho, 1977)
- 8. Coxae on at least pereonites 3-7 visible from above 9
- Only coxae on pereonites 5-7 visible from above 11
- 9. Body elongated, more than three times as long as greatest width. Article 1 of antenna 1 about twice as wide as article 2. Pereonite 1 in male about 1.5 times longer than pereonite 2 medially *S. dimorphis* (Menzies, 1962)
- Body oval, only a little more than twice as long as greatest width. Article 1 of antenna 1 less than 1.5 times as wide as article 2. Pereonite 1 in male at most as long as pereonite 2 10
- 10. Mandibular palp with three articles. Maxilliped with three coupling hooks. Pleotelson with one pair of curved median spines *S. mawsoni* (Hale, 1937)
- Mandibular palp absent. Maxilliped with two coupling hooks. Pleotelson with two pairs of median setae *S. compacta* Sivertsen & Holthuis, 1980
- 11. Body profusely covered with setae *S. hispida* (Vanhöffen, 1914)
- Body at most with scattered, short setae 12
- 12. Body with short, scattered setae laterally and dorsally. Antenna 1 with six articles. Rami of uropods subequal in length . *S. hofsteni* (Nordenstam, 1933)

- Body without setae, except on coxae of pereonites 5-7 and on uropods. Antenna 1 with five articles. Exopod of uropods two-thirds as long as endopod *S. milleri* (Menzies & Glynn, 1968)

Halacarsantia n.gen.

Etymology: The generic name reflects the resemblance to marine mites, Halacaridae, combined with the name of the related genus *Santia*. Gender feminine.

Type species: *Halacarsantia justi* n.sp.

Diagnosis

Body depressed, lanceolate, broadest at pereonite 3 and furnished with fringe of erect spine-like setae on or near lateral margins of head, pereonites and pleotelson. Head with large, broadly rounded, frontal lobe. Eye lobes obsolete or small, without anterior hook. No pleonite visible in front of pleotelson. Second article of antenna 1 with dorsolateral projection; distal article of flagellum more than twice as long as two proximal articles, bearing one aesthetasc. Third article of peduncle of antenna 2 with outer projection, furnished with a spine-like seta. All coxae visible from above. Pereopods short, very robust and with strong, spine-like setae, particularly on carpus. Pereopod I with two claws. Female operculum broader than long. Uropods uniramous.

Key to the species of Halacarsantia

1. Pereopods V-VII broader than preceding pereopods and modified for grasping. Mandible with (reduced) palp. Apex of male pleopod I with inner corner projecting farther than outer corner
 *H. uniramea* (Menzies & Miller, 1955), n.comb.
- Pereopods V-VII similar to preceding pereopods. Mandible without palp. Apex of male pleopod I with outer corner projecting farther than inner corner 2
2. Anterolateral corners of head evenly rounded. Fringe of spinelike setae on body and pleotelson si-

- tuated somewhat inside lateral margin. Female operculum nearly circular *H. justi* n.sp.
- Anterolateral corners of head with distinct, semicircular lobe. Setae on body and pleotelson situated on lateral margins. Female operculum subtriangular, almost one-third broader than long
 *H. n.sp.*, Müller

Halacarsantia uniramea (Menzies & Miller, 1955), n.comb.

Diagnosis

Eyes on bulging processes. Mandible with 3-articulated, reduced palp. Pereopods II-IV broader than pereopod I, pereopods V-VII still broader, modified, curving up around body. Carpus of pereopods II-VII rectangular, longer than broad. Female operculum two-thirds as long as broad. Male pleopod I truncate and trilobate apically, with inner corner projecting.

Remarks

The drawing of the peduncle of antenna 2 (Menzies & Miller 1955, fig. 1c) clearly shows that it is article 3 (not article 4) which bears an outward projection with a stout seta.

Halacarsantia justi n.sp.

Material. Holotype: Brooding female. Paratypes: One female, two males.

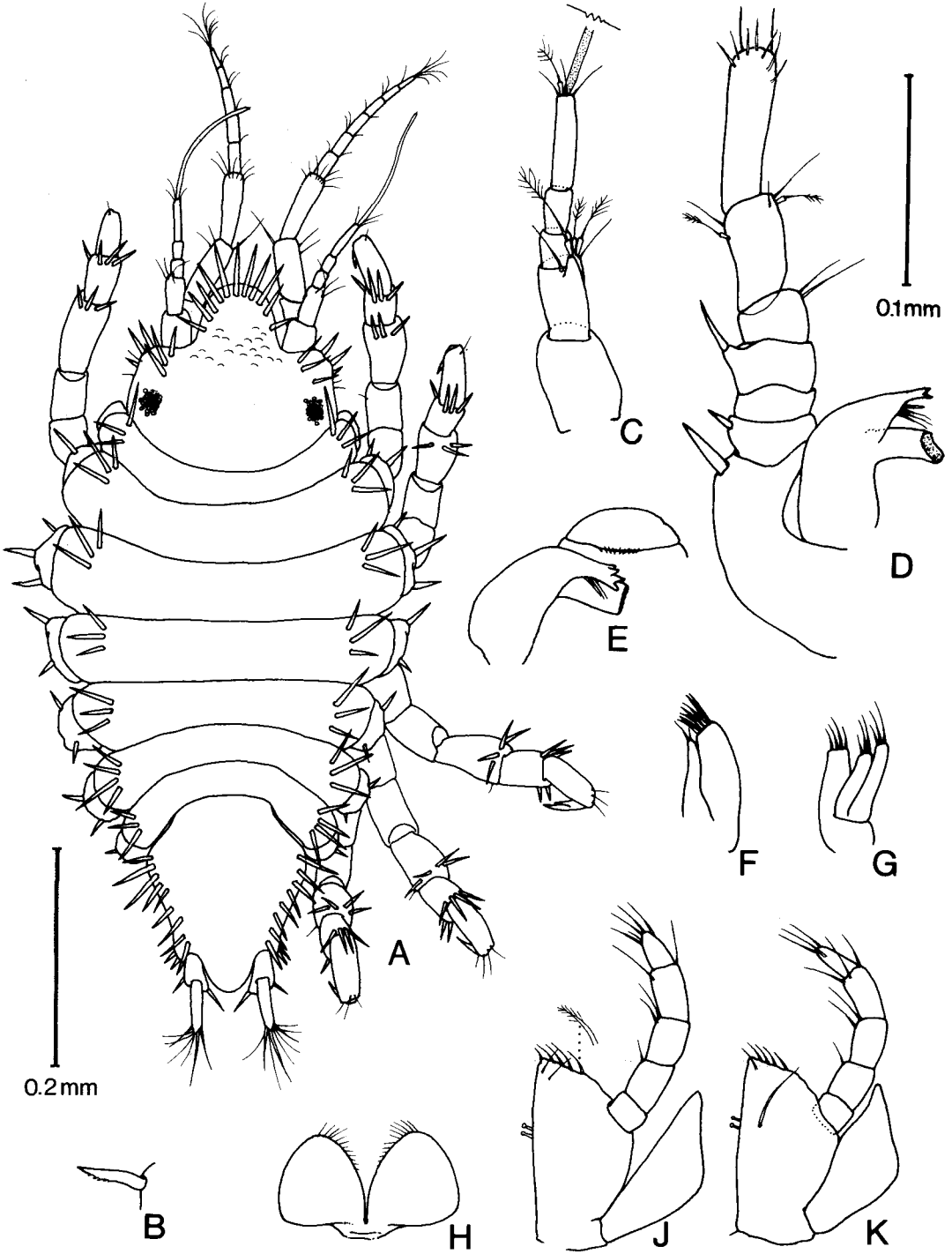
Locality. Andaman Sea: Marine Biological Center, Phuket Island, Thailand. St. 1, jetty; depth ca. 8 m, dead corals and barnacles, with growth of low hydroids, 10 Feb. 1982. J. Just leg.

Etymology: The species is named after Dr. Jean Just, Zoological Museum, Copenhagen, who collected this minute isopod, initiated the study of it and prepared most of the illustrations.

Diagnosis

No eye bulge present, lateral margin of head being straight. Mandible without palp. Pereo-

Fig. 1. *Halacarsantia justi* n.gen., n.sp. A-C, female holotype; D-K, male paratype. A, dorsal view. B, spine-like seta on coxa of pereopod III. C, right antenna 1, dorsal view. D, peduncle of right antenna 2 and mandible, slightly oblique ventral view. E, labrum and right mandible, ventral view. F, maxilla 1. G, maxilla 2. H, labium. J, right maxilliped, dorsal view. K, left maxilliped, ventral view.



pods II-VII of similar shape; carpus of pereopod II broader than long due to a stout lower projection. Female operculum circular, about as long as broad. Apex of male pleopod I truncate, with outer corner slightly projecting.

Description of female holotype

Length 0.73 mm, maximum width (pereonite 3) 0.37 mm.

Head and pleotelson equally long and three-fifths as long as pereon (Fig. 1A). Head one-seventh broader than long, pleon one-fifth longer than broad. Pereonites 2-4 equal in length medially, each twice as long as pereonite 1. Pereonites 5-7 shorter than preceding pereonites and decreasing in length posteriorly. Anterolateral corners of head evenly rounded. Eleven spinelike setae in fringe on frontal lobe of head, three additional setae on each anterolateral corner and another three near it. Three, occasionally four stout setae near lateral margin of each pereonite. In addition to the dorsal row of setae on pleotelson, groups of shorter setae ventrally at base of uropods.

Article 1 of antenna 1 1.7 times as broad as article 2 (Fig. 1C); article 2 with dorsolateral projection reaching less than half as far as article 3. Articles 3 and 4 subequal in length. Articles 2 and 5 with plumose and non-plumose setae and article 5 with an unusually long aesthetasc.

Antenna 2 (Fig. 1D) with four proximal articles of peduncle subequal in length, and combined about two-thirds of two distal articles.

Pereopod I (Fig. 2A) shorter than the other legs. Merus distally with one long upper seta and carpus with one long and two short lower setae. Propodus with four long and slender setae. Dactylus two-thirds as long as propodus, upper claw twice as long as lower claw.

Pereopod II (Fig. 2B-C). Distal part of merus with three upper setae. Carpus with two equally long and strong, spinelike setae on the lower projection; one short, stout seta medially and three additional, upper, bifid setae distally. Dactylus less than one-fourth as long as propodus, with two claws of subequal length.

Pereopods III-VII (Fig. 2D) differ from pereopod II in having a stout seta situated on the lower margin of carpus, proximally to the two long and strong setae. The said seta is a little stouter in pereopod IV than in the other legs.

The number of oostegites could not be ascertained but seems to be three, as in *H. uniramea*. Five large eggs (Fig. 2E).

Operculum (Fig. 3C) with two short setae distally.

Uropod (Fig. 2G) with first article two-thirds as long as second and up to twice as wide. First article with two terminal setae, second with five plumose, one comb-shaped and two simple setae terminally.

Description of male paratype (mouthparts and pleopods)

Mandible (Fig. 1D-E). Right incisor with four teeth, lacinia simple, setal row with three setae. Molar process cylindrical, apex truncate. Maxilla 1 (Fig. 1F) with seven setae on outer lobe.

Maxilliped (Fig. 1J-K). Basis and endite almost twice as long as broad, with four plumose setae distally and two coupling hooks. Epipod triangular, about two-fifths as broad as long.

Pleopod I (Fig. 3A-B) about eight times as long as narrowest width, which is about two-fifths the maximum width. One long seta a little more than two-thirds from base and three short terminal setae.

Pleopod II (Fig. 3B) with sympod three times as long as broad and with two distal setae. Endopod reaching well beyond apex of sympod.

Pleopod III (Fig. 2F) with three plumose setae on endopod and probably one on exopod.

No significant differences between the four specimens could be detected.

Comparison with H. uniramea

The two species are very similar in general habitus and armament with spinelike setae on head and body; furthermore in shape of the antennae, mouthparts (except mandibles), pereopods and uropods.

The major differences are given in the diag-

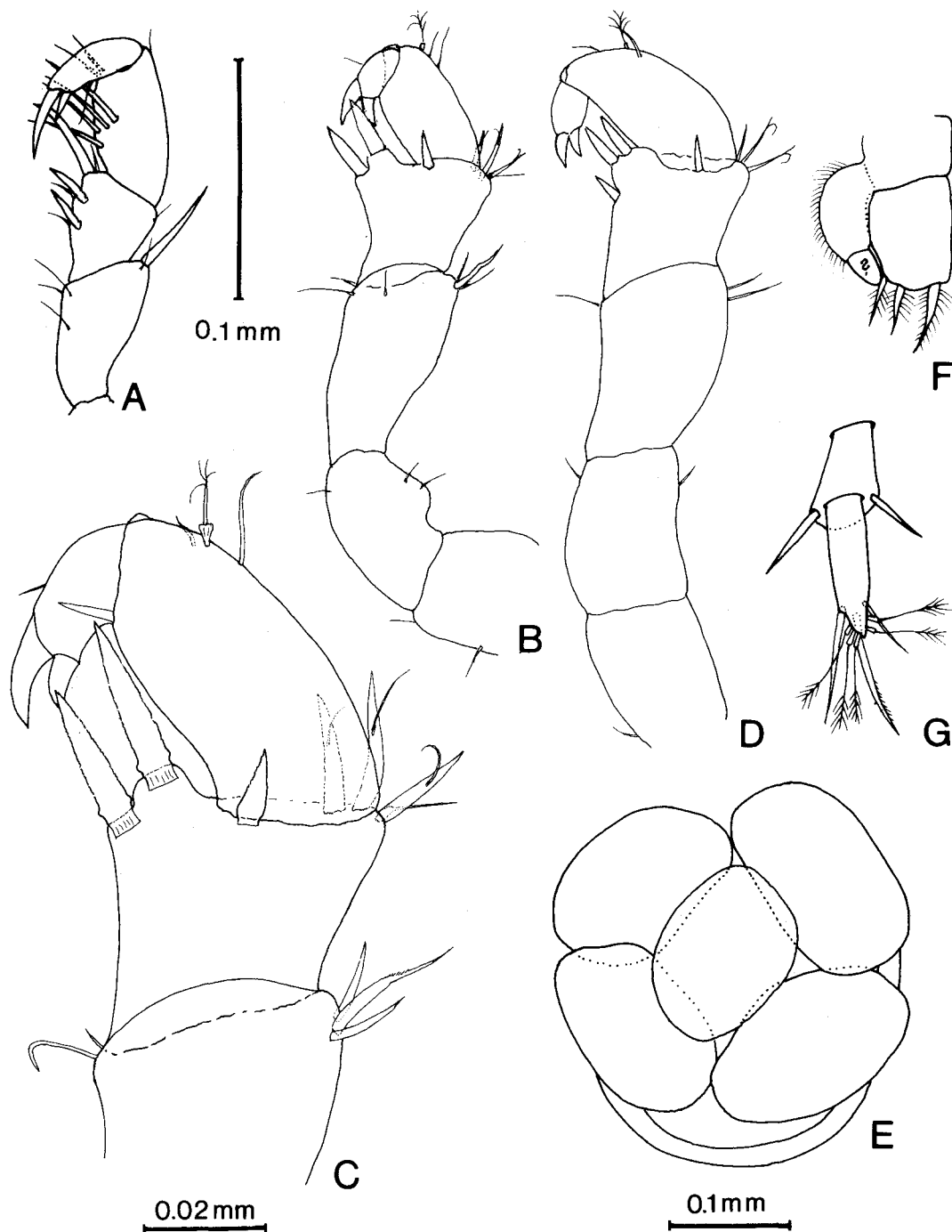


Fig. 2. *Halacarsantia justi* n.gen., n.sp. A,B,E and G, female holotype; C,D and F, male paratype. A, pereopod I. B, pereopod II. C, terminal articles of pereopod II. D, pereopod IV. E, eggs; oostegites left out. F, pleopod III; exact shape of exopod and presence of distal seta doubtful. G, uropod, dorsal view.

noses: *H. justi* lacks the eye bulge and the mandibular palp, pereopods II-VII are similarly shaped and have a strong lower projection on the carpus, the female operculum is circular (not considerably broader than wide), and the male pleopods project laterally (not medially).

In addition, there are several minor differences: *H. justi* has fewer lateral setae on the frontal projection and the body; the projection on article 2 of antenna 1 is less conspicuous; the armament with setae on the carpus and propodus of pereopod I is different and its second claw is longer; the armament with setae on the merus and carpus of succeeding pereopods is also different; the endopod of male pleopod II is distinctly longer than the sympod; and article 1 of the uropod is comparatively longer relative to article 2.

There is also a major ecological difference. *H. uniramea* was found as an apparent commensal on the sea cucumber *Stichopus mollis* (Hutton) and has the three last pairs of legs modified for this mode of life, a feature which is unique in asellote isopods¹. *H. justi* was retrieved from a sediment of dead corals and barnacles, and the lack of modification of the posterior legs suggests that it roams freely.

Mexicope Hooker, 1985

Type species: M. kensleyi Hooker, 1985 (by monotypy).

Mexicope kensleyi was described from the northeastern Gulf of Mexico. H.-G. Müller has collected a species of *Mexicope* on the Carib-

bean coast of Colombia; according to the illustrations he sent me it is closely related to *M. kensleyi*.

Hooker (1985) did not assign *Mexicope* to a family but recognized its affinity with the Santiidae/Pleurocopidae. He listed the following significant differences: (1) presence of a scale on article 3 of antenna 2 in *Mexicope*; (2) a conical, setiferous molar process; (3) pereopod I ambulatory. My comments are as follows: (1) a similar, prominent scale is also found in *Santia mawsoni* (Menzies 1962: 60) and perhaps *S. compacta* (Sivertsen & Holthuis 1980, fig. 30), and in, e.g., Munnidae scales may be present or absent; (2) the molar process is also rather aberrant in *Santia milleri*, not to mention the greatly extended terminal end of the male mandible in *S. bicornis*; (3) a pronounced difference is found in pereopod I being ambulatory in *Mexicope*; it resembles that of higher Janiroidea, with a short dactylus, and with restricted articulation between dactylus and propodus preventing participation in grasping; it thus differs from the prehensile pereopod I in all santiids, with opposition between the long dactylus and propodus, occurring also in other lower Janiroidea (Wilson 1987).

Hooker does not comment on two additional differences included in his Table 1 (1985: 257): (4) the presence of seven articles in the flagellum of antenna 1 instead of 3 (rarely 4) articles; (5) the anus is covered by the opercular pleopods while it is exposed in all santiids (unknown in *Kuphomunna*). Finally, (6) the apex of the male pleopod I is bilobed in *Mexicope*, which seems to be unique. On the other hand *Mexicope* agrees with santiids in several other characters, such as general shape of body, eyes on processes and a conspicuous spine in front of these, antennae similar (except the number of articles in flagellum of antenna 1) and maxillipedal palp narrow.

I agree with Hooker that *Mexicope* cannot be referred to the Santiidae, particularly because of the leg-like pereopod I and the covered anus. Wilson (in litt.) regards it as intermediate between *Ianthopsis* and the Acanthaspidiidae.

1. *Jaera hopeana* and related species are found commensally on species of *Sphaeroma* (particularly *S. serratum*) (e.g., Arcangeli 1934, Verhoeff 1949, Haahtela & Naylor 1965, Pantoustier & Prunus 1977), *Iais pubescens*, *I. californica* and *I. singaporensis* on several species of Sphaeromatidae (Menzies & Barnard 1951, Hurley 1956, Rotramel 1972, 1975, Marsden 1982), species of *Caecijaera* on *Limnoria* (Kussakin 1962, 1989, Svavarsson 1982), and *Janirata solasteri* on the starfish *Solaster stimpsoni* (Hatch 1947), but in none of these cases are there any morphological adaptations.

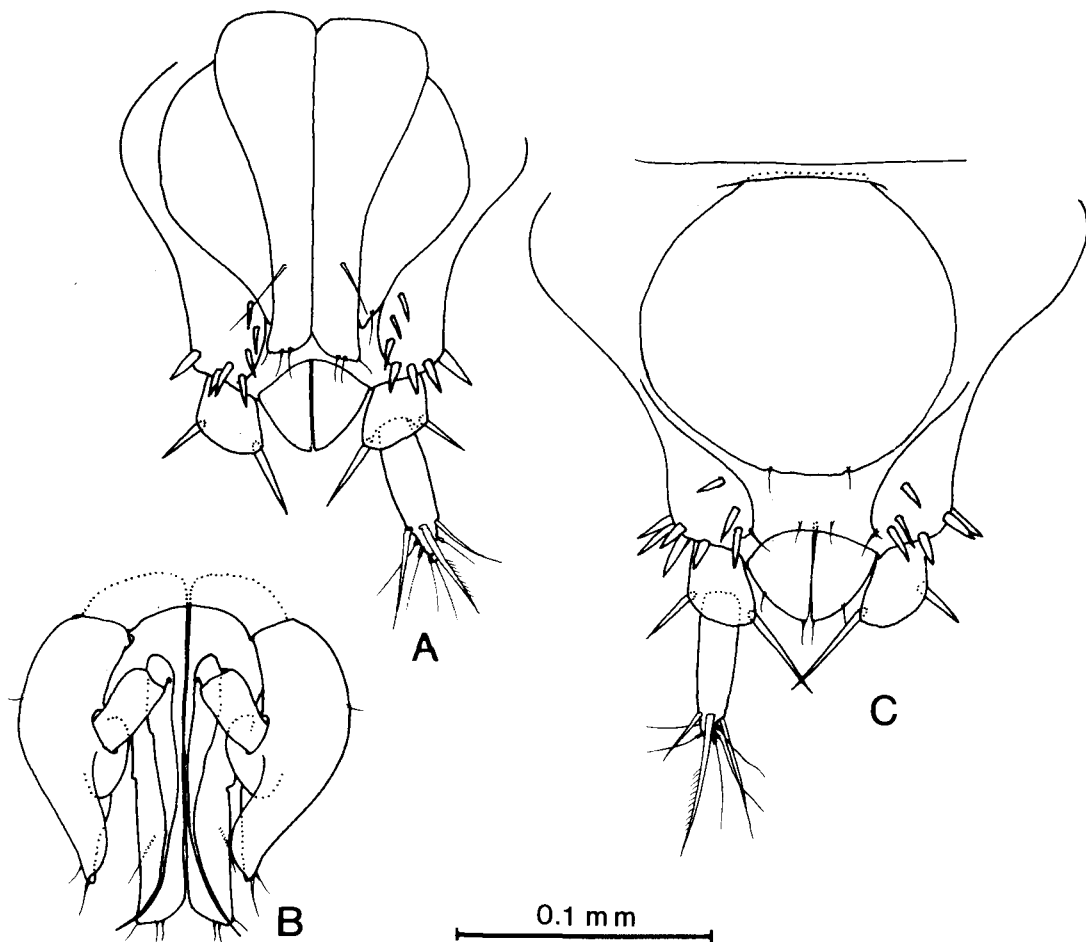


Fig. 3. *Halacarsantia justii* n.gen., n.sp. A,B, male paratype; C, female holotype. A, pleon in ventral view. B, pleopods I and II, dorsal view. C, pleon in ventral view, slightly foreshortened.

Diagnosis

See Hooker 1985:261, but the following generic characters should be included: flagellum of antenna 1 with six or seven articles, pereopod I

with two claws, male pleopod I with bilobed apex, female operculum pyriform, and anus covered.

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