

Attheyella (Canthosella) mervini sp.n. (Canthocamptidae, Harpacticoida) from Jamaican bromeliads

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Abstract

In phytotelmata of Jamaican bromeliads the harpacticoid copepods *Epactophanes richardi* Mrázek, 1893, *Phyllognathopus viguieri* (Maupas, 1892) and *Attheyella (Canthosella) mervini* sp. n. occurred. The new species conforms to the diagnosis of the subgenus, despite the fact that the endopods of legs 2–4 have retained more setae than in the species known for the Asian region. *Attheyella (Canthosella) mervini* lacks setae on the baseoendopod of leg 5, which is characteristic for neotropical *Canthosella*-species. We propose that *Attheyella (Chappuisiella) kalima* (Delachaux, 1924), *Attheyella (Ch.) aliena* Noodt, 1956, *Elaphoidella siolii* Kiefer, 1967, and *Canthocamptus (Elaphoidella) sriblingi* Reid, 1990 be included in the subgenus *Attheyella (Canthosella)*. Additionally, *Attheyella (Chappuisiella) kalima* of Dussart & Frutos, 1986 is included in this subgenus, but we propose the name *Attheyella (Canthosella) pilagaensis* sp.n., because the species as described differs from the original description of *A. (C.) kalima* (Delachaux, 1924).

Introduction

Studying harpacticoid copepods from Indonesia, Chappuis (1931) described the subgenus *Attheyella (Canthosella)*, including *A. (C.) muscicola* (Chappuis, 1928), found in moss collected at Tjibodas in Java, together with two new species, viz *A. (C.) lacustris* found in Lake Toba and *A. (C.) fluviatilis* caught in a waterfall near Lake Singkarak and in algal mats in Lake Danau di Atas, Sumatra. Later, Borutzky (1967) described *A. (C.) vietnamica* from a cave water reservoir in North Vietnam and Löffler (1973) added *A. (C.) silvicola* found in a brook on Mt. Kinabalu, Borneo. The first record of *Canthosella* for the Neotropical region was given by Petkovski (1973), who described *Attheyella (Canthosella) antillanca* in subterranean waters of Cuba. Ebert (1976) added three new species [*A. (C.) bromelicola*, *A. (C.) goeldii*, *A. (C.) montana*], which have to be treated as *nomen nudum*, because the descriptions are not published.

The second published record of the subgenus in the neotropics was by Por & Hadel (1986), who described *A. (C.) vera* associated with phytotelmata in bromeliads.

The term 'phytotelmata' was given by Varga (1928) for liquid held in plant structures such as tree holes or leaf axils, which can be found in at least 1500 plant species (Fish, 1983). In karst landscapes like the Jamaican Cockpit Country, phytotelmata form the sole permanent aquatic habitats and are colonized by a variety of organisms including harpacticoid copepods.

While studying phytotelmic fauna in Jamaican bromeliads, we noted the presence of *Phyllognathopus viguieri*, *Epactophanes richardi* and *Attheyella (Canthosella) mervini* sp.n. The latter species is described in this paper.

Materials and methods

Samples were collected from phytotelmata of the terrestrial bromeliads *Aechmea paniculigera* (Swartz) Grisebach, 1864 and *Hohenbergia* spp. in the understory of the Wet Limestone Forest near Windsor (approx. 18° 21'N, 77° 39'W), Trelawny Parish, Jamaica (Janetzky & Vareschi 1993).

Water temperature, pH-values and electrical conductivity were measured with temperature-compensated gauges (Wissenschaftlich-Technische Werkstätten: pH 91 and LF 92) before collection. Water contained in phytotelmata was sucked out of leaf axils with a syringe, after debris was removed. After being drained, leaf axils were rinsed with water to remove remaining material. Both fractions were filtered (mesh size 118 µm) and fixed with formol (final concentration approx. 5%). Later, samples were hand-sorted using a stereomicroscope and copepods were transferred to 70% ethanol.

Determinations and drawings of holo- and allotype were made under a compound microscope (LEITZ Laborlux) fitted with a drawing tube at magnifications of 400× or 1000× oil immersion. Type material was deposited in the National Museum of Natural History, Washington (USNM), and the Museum für Naturkunde, Berlin (ZMB).

Results

In phytotelmata of Jamaican bromeliads, *Phyllognathopus viguieri*, *Epactophanes richardi* and *Attheyella (Canthosella) mervini* were found in 37, 2 and 5 samples, respectively. In general, individual numbers were low: In 30 samples *P. viguieri* occurred with 1 to 10 individuals, in five samples with 11–30 and in two sample with 46 and 52 individuals, respectively. *E. richardi* was found with 1 and 23 individuals. Single individuals of *A. (C.) mervini* occurred in 3 samples, in one sample 3 and in a further sample 10 specimens were found.

Attheyella (Canthosella) mervini occurred only in phytotelmata of *Aechmea paniculigera*. Type material was collected in phytotelmata with water temperature of 24.2 °C, pH 6.3 and conductivity 78 µS cm⁻¹ (sample no. TP3-KA6/10), 24.2 °C, pH 5.8 and 24 µS cm⁻¹ (NsH-KA6/6) and 24.7 °C, pH 6.2 and 37.8 µS cm⁻¹ (TP2-AA2/3). Data are not available for sample NsH-A101/5.

Taxonomic description

Family CANTHOCAMPTIDAE

Genus *Attheyella* Brady, 1880

Subgenus *Canthosella* Chappuis, 1931

Attheyella (Canthosella) mervini sp.n. (Figures 1–7)

Holotype: USNM 282 637. Female, dissected on 6 slides (TP3-KA6/10, collected 06 May 1993), from phytotelmata of *Aechmea paniculigera* near Windsor, Trelawny Parish, Jamaica (approx. 18° 21'N, 77° 39'W).

Allotype: USNM 282638. Male, dissected on 3 slides, from same sample as holotype.

Paratypes: USNM 278 084: 2 females, USNM 274 631: 4 females and 1 male on slides from same sample as holotype. ZMB Pröp. 4373–4375: 3 females on slides from same locality as holotype, but different *Aechmea paniculigera* (NsH-KA6/6, NsH-A101/5, TP-AA2/3).

Other material: 1 female from same sample as holotype and 3 females from same locality as holotype, but different *Aechmea paniculigera* in collection of WJ.

Etymology: The species is dedicated to Mr Mervin Hollness, Windsor, for his friendship and company during the past few years.

Description of female: Length of holotype in glycerin 550 µm, exclusive of furcal setae. Mean length of paratypes 470 µm ($n=9$, range 400–570 µm).

Body (Figure 1A, 1B) cylindrical, slightly tapering toward posterior end. Cephalothorax with dorsal hyaline window. Body somites posterodorsally smooth, dorsally and laterally with sensilla. Genital double somite laterally with internal chitinous ridge corresponding to former segmentation, posterolaterally and posteroventrally with short rows of spinules separated from each other. Genital field as in Figure 4A. Copulatory pore located at the medioventral surface near the posterior margin of genital double somite. Copulatory tube leads into cruciform seminal receptacles, on each side of seminal receptacles short row of fine spinules. Fourth and fifth urosomites posterolaterally and posteroventrally with continuous row of spinules as in male (Figure 7C). Telson (Figure 2A, 2B) posteroventrally with short rows of spinules at base of furca, laterally with 3 spinules near posterior margin. Anal operculum (Figure 2A) convex, with three strongly developed triangular marginal teeth.

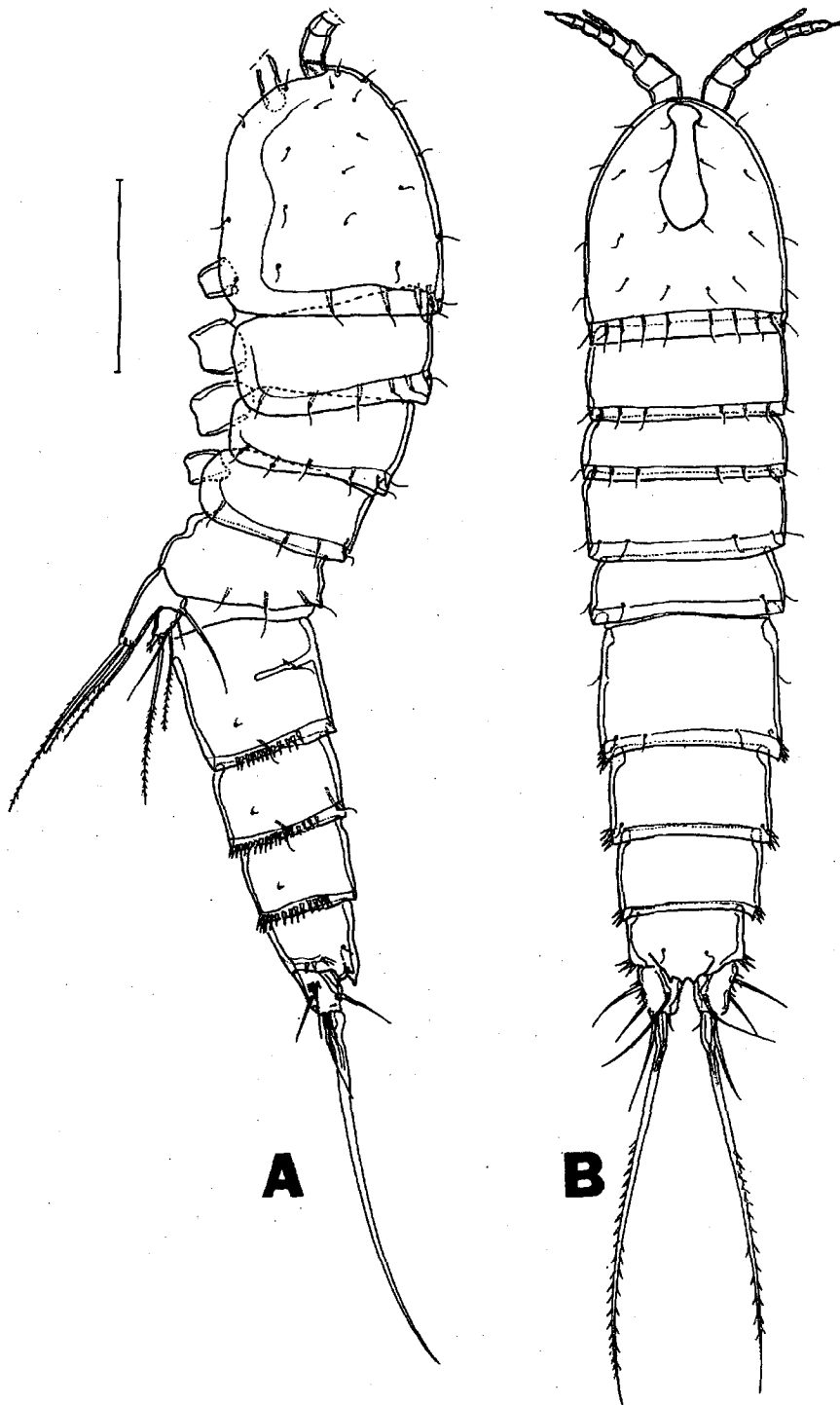


Figure 1. *Attheyella (Canthosella) mervini*, female. Habitus in lateral (A) and dorsal view (B). Scale bar 100 μm .

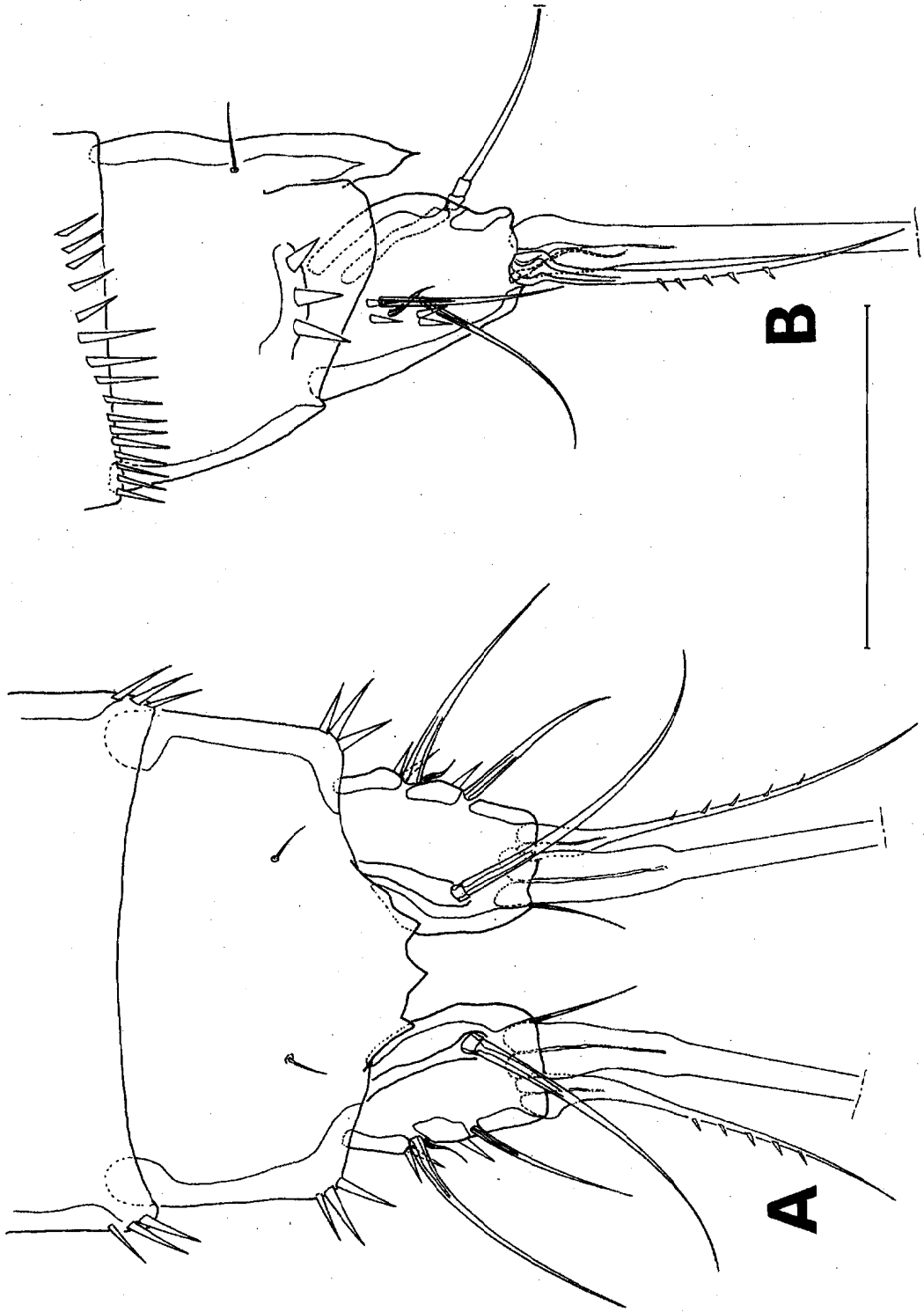


Figure 2. *Artheyella (Carithosella) mervini*, female. Telson and furca in dorsal (A) and lateral view (B). Scale bar 50 μ m.

Furca (Figure 2A, 2B) conical, inner margin smooth, outer margin with 3 setae: 2 (one large and one tiny) at proximal part, accompanied by 2 spinules, 1 seta at distal part accompanied by 2 spinules; dorsally with longitudinal lamella, bearing 1 seta on posterior end; apically with 3 setae: middle seta well developed, middle and outer setae broadened at base, inner seta tiny.

Antennule (Figure 3A) 8-segmented, setation formula beginning at proximal segment: 1, 9, 5, 2 + aesthetasc, 1, 3, 2, 7 + aesthetasc.

Allobasis of antenna (Figure 3B) with 1 seta and spinules on inner margin. Endopod 1-segmented, inner margin with 2 spines and spinules, apically 2 spines, spinules and 4 setae, the outer one tiny; outer margin with 2 hyaline frills. Exopod 1-segmented, with 2 inner and 2 apical setae.

Coxa of mandible (Figure 4B) with knob on outer surface, gnathobase with strong teeth, inner edge with small teeth and 1 setule, inner margin with group of fine spinules. Palp 1-segmented, bearing 3 setae.

Praecoxa of maxillule (Figure 4C) with arthritis bearing 6 apical spines and 1 surface seta. Coxal endite with 1 spine and 1 seta. Basal endite with 1 spine and 2 setae, inner margin with 3 setae.

Syncoxa of maxilla (Figure 4D) with 2 endites, proximal endite with short row of fine spinules and 3 apical setae, distal endite with 3 apical setae. Basis ending in spiniform tip, with 3 setae.

Coxa of maxilliped (Figure 4E) with groups of spinules and 1 setula on inner margin. Basis with groups of spinules on inner and outer margin. Basis and endopod connected by 1 sclerite. Endopod 1-segmented, bearing 1 clawlike and 1 slender seta.

Leg 1 coxa (Figure 5A) with outer spinules. Basis with 1 outer spine and 1 inner seta, with short rows of spinules terminally and subterminally. Exopod 3-segmented; first segment with 1 spine and row of spinules on outer margin; armament of second segment as in first; third segment with 1 spine and row of spinules on outer margin, with 1 spine and 2 setae apically. Endopod 2-segmented, reaching middle of third segment of exopod; first segment with 1 inner spine, with row of spinules on outer margin and terminally; second segment with 1 inner seta, with 1 spine and 1 seta apically, with row of spinules on outer margin.

Leg 2 coxa (Figure 5B) smooth on surface, outer margin with spinules. Basis with 1 spine and 2 spinules on outer margin. Exopod 3-segmented; first segment with hyaline frill on inner edge, with 1 spine and short rows of spinules on outer margin; second segment with

1 seta and group of small spinules on inner margin, with 1 spine and short rows of spinules on outer margin; third segment with 1 inner seta, with 1 setae and 2 spines apically, with 1 spine and rows of spinules on outer margin. Endopod 2-segmented, first segment stout, without armament; second segment with 1 inner seta, with 2 setae and 1 spine apically, with row of spinules on outer margin.

Leg 3 coxa (Figure 6A) as in leg 2. Basis with 1 seta and spinule on outer margin. Exopod 3-segmented, armament of first segment as in leg 2; second segment with 1 inner spine, with 1 spine and rows of spinules on outer margin; third segment with 2 inner setae, with 1 seta and 2 spines apically, with 1 spine and rows of spinules on outer margin. Endopod 2-segmented, armament as in leg 2.

Leg 4 coxa (Figure 6B) as in leg 2. Basis with 1 seta and spinules on outer margin. Exopod 3-segmented, armament of first segment as in Leg 2; second segment with 1 spine and group of spinules on inner margin, with 1 spine and rows of spinules on outer margin; armament of third segment as in leg 3. Endopod 2-segmented, first segment small and without armament; second segment with 1 seta and 1 spine apically.

Leg 1–leg 4 with following formula of spines (Roman letters) and setae (Arabic):

	Exopod	Endopod
P1	0.I/0.I/0.2+I.I	1.0/1.1+I.0
P2	0.I/1.I/1.1+II.I	0.0/1.2+I.0
P3	0.I/I.I/2.1+II.I	0.0/1.2+I.0
P4	0.1/I.I/2.1+II.I	0.0/0.1+I.0

Baseoendopod of leg 5 (Figure 7B) separated at base, bearing 6 setae, the outer one and two inner spiniform. Exopod distinct, bearing 4 setae and 1 spine.

Leg 6 (Figure 4A) each reduced to a small plate covering the genital opening and bearing 1 seta.

Description of male: Length of allotype 430 μm , paratype 440 μm exclusive of furcal setae. Sexually dimorphic in following characteristics:

Third urosomite (Figure 7A, 7C) posteroventrally and posterolaterally with continuous row of spinules. Telson (Figure 7C) with 2 lateral spines near posterior margin.

Antennule (Figure 3C) 8-segmented, geniculate between second and fourth segment, setation formula beginning with proximal segment: 1, 9, 6, 8 + aesthetasc, 0, 0, 0, 9 + aesthetasc.

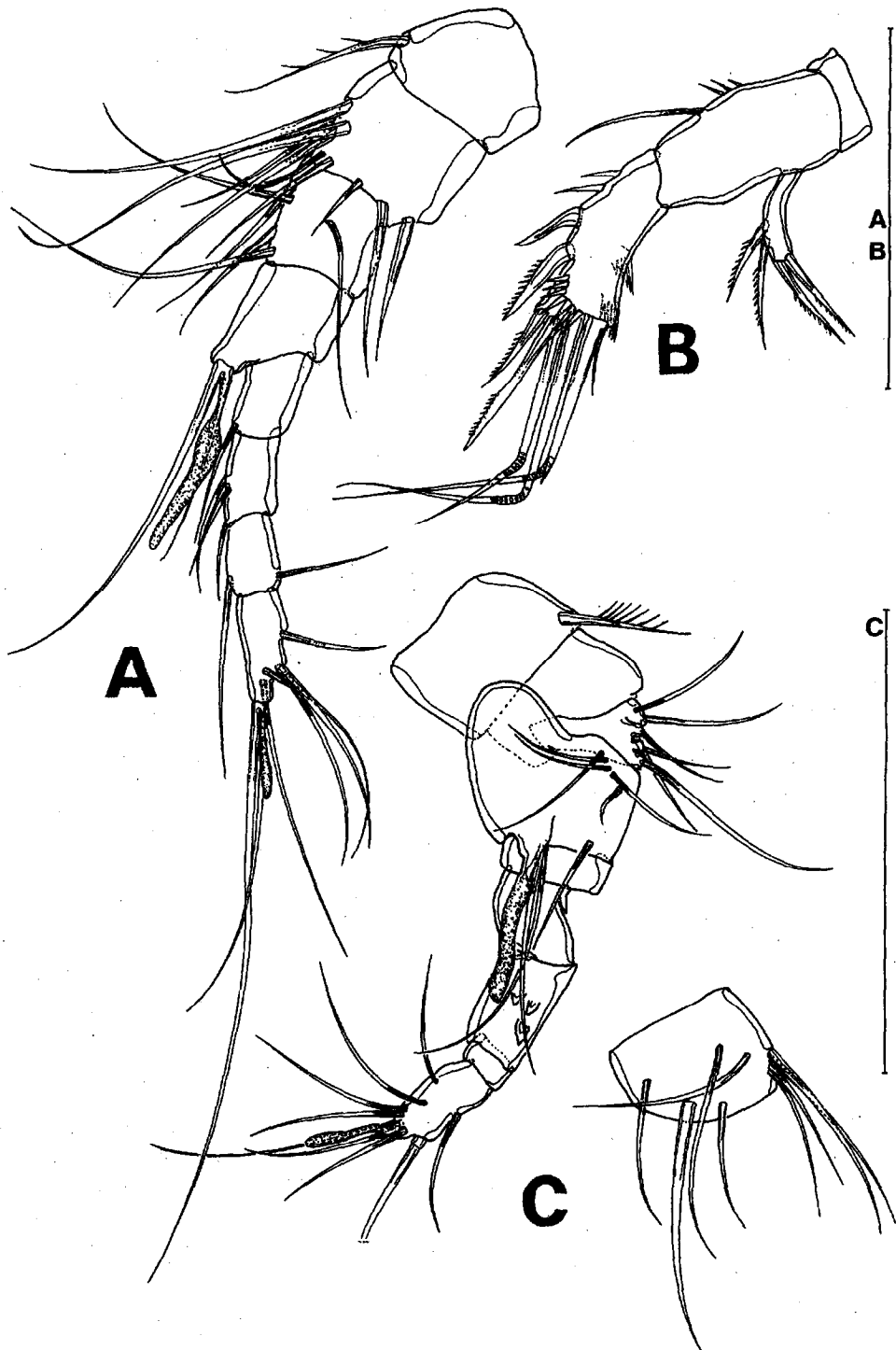


Figure 3. *Attheyella* (*Canthosella*) *mervini*. Antennule (A) and antenna (B) of female. Antennule (C) of male, second segment separately drawn to show armament. Scale bars 50 μm .

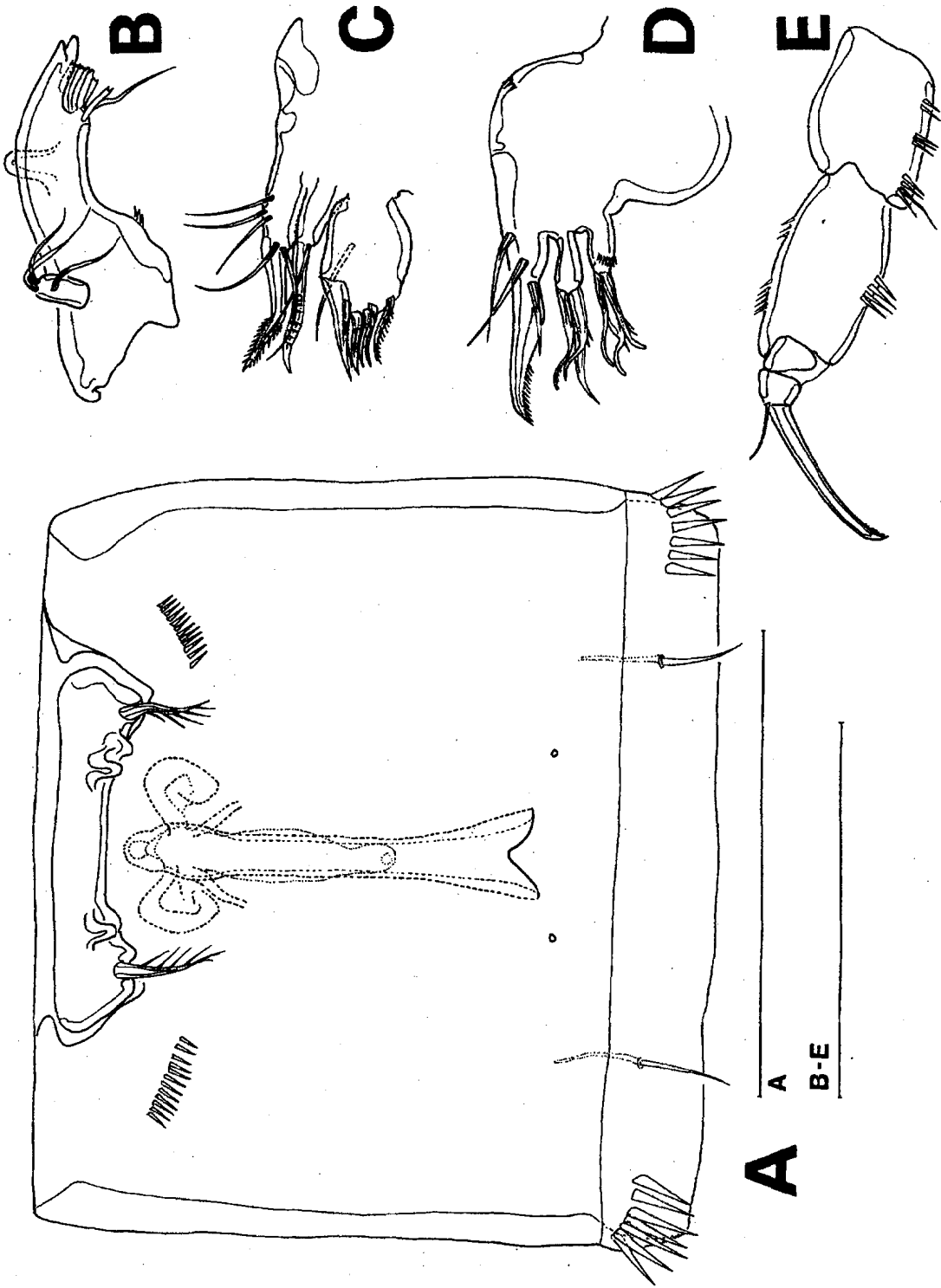


Figure 4. *Attheyella* (*Canthosella*) *mervini*, female. Genital field (A) in ventral view. Oral appendages: Mandible (B), Maxillule (C), Maxilla (D) and Maxilliped (E). Scale bars 50 μ m.

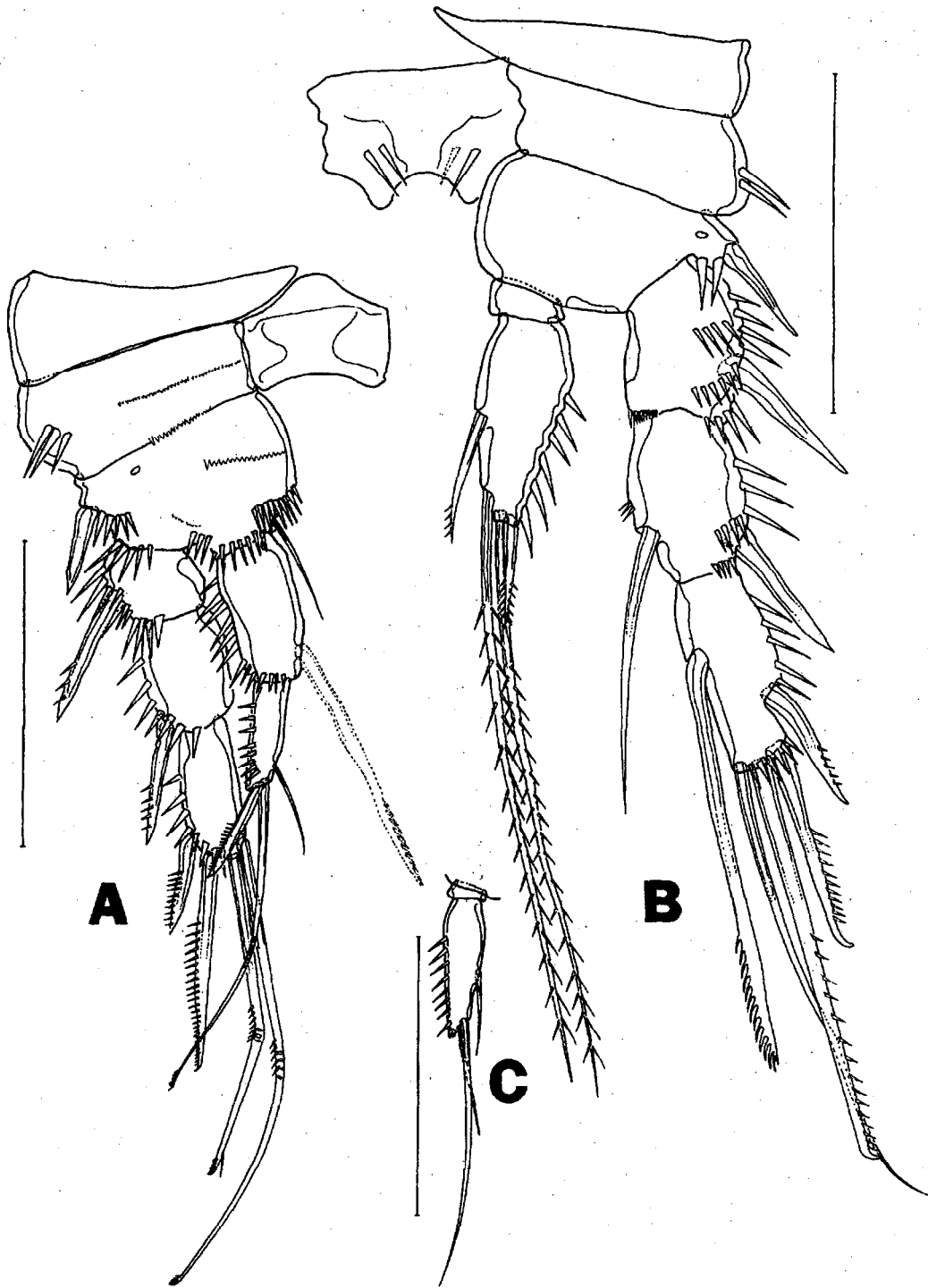


Figure 5. *Attheyella* (*Canthosella*) *mervini*. Leg 1 (A, dotted spine broken, but present in opposite endopod) and leg 2 (B) of female. Endopod of leg 2 (C) of male. Scale bars 50 μ m.

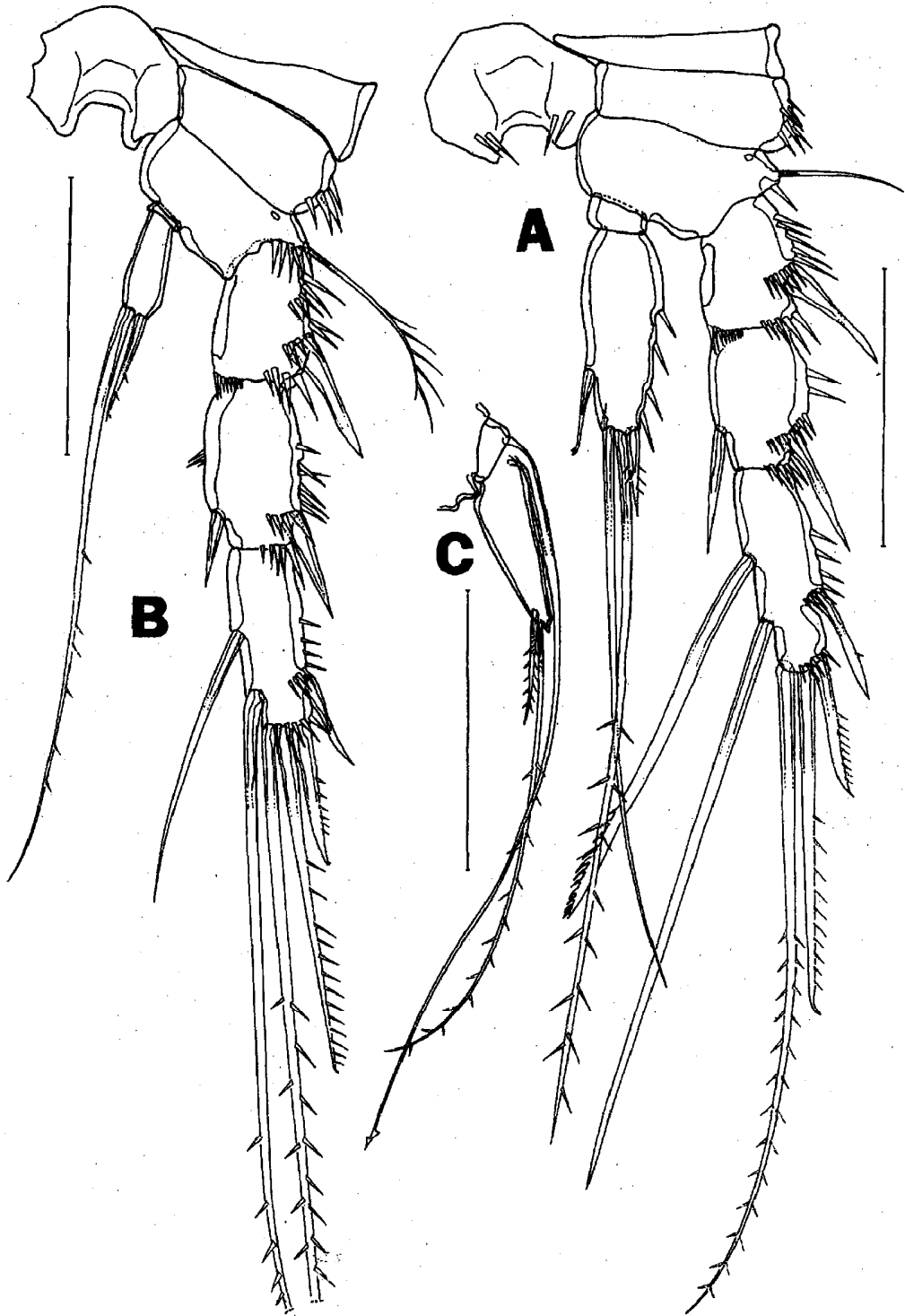


Figure 6. *Attheyella (Canthosella) mervini*. Leg 3 (A) and leg 4 (B) of female. Endopod (C) of male. Scale bars 50 μ m.

Endopod of leg 2 (Figure 5C) 2-segmented, second segment with 1 inner seta, 2 subapical setae and 2 apical tiny humps on outer edge.

Endopod of leg 3 (Figure 6C) 2-segmented, second segment with long inner apophysis ending in small barb, 2 subapical setae and ending apically in small tooth.

Baseoendopod of leg 5 (Figure 7A) fused at base, without setae or spines. Exopod distinct, bearing 4 setae, the outermost one tiny and slender, the innermost one short and stout with a spinule.

Leg 6 (Figure 7A) represented as protruding lobes without setae.

Discussion

Hamond (1988) argued that among other superspecific taxa in Canthocamptidae, *Canthosella* should be treated as a subgenus of *Canthocamptus* s. lat., because the description of the type material does not meet modern standards. We agree with the criticism of incomplete descriptions, but revision should proceed by improving on the systematic organisation proposed by Lang (1948) instead of including most taxa in the genus *Canthocamptus*, which is well defined at present.

Attheyella (*Canthosella*) *mervini* differs from the diagnosis of the subgenus given by Chappuis (1931) for the Asian species by having an endopod of leg 4 bearing 1 seta and 1 spine apically instead of only 1 seta. Additionally, in males of *A. (C.) mervini* the fourth segment of antennule is thickened, the endopod of leg 3 is 2-segmented, bearing 2 apical setae, and the baseoendopod of leg 5 lacks inner setae. Lang (1948) mentioned in his diagnosis of *Canthosella* a furca bearing a short row of spinules on the inner margin and a chitinous lamella ending in a tooth. Despite the fact that Chappuis (1931) described rows of spinules on the inner furcal margin only in *A. (C.) fluviatilis* and females of *A. (C.) muscicola*, *Attheyella* (*Canthosella*) *mervini* lacks these characters.

In males of *Attheyella* (*Canthosella*) *mervini*, we observed a fine borderline on one side of endopod of leg 3 above the apophysis, which might have been interpreted as separation between segments by Chappuis (1931). Since no type material could be studied for comparison, we are not able to give a final statement regarding the nature of this structure in other species. However, Borutzky (1967), Löffler (1973), Petkovski (1973) and Por & Hadel (1986) described an endopod of leg 3 consisting of three segments.

Comparing *Attheyella* (*Canthosella*) *mervini* with *A. (C.) vietnamica* Borutzky, 1967, and *A. (C.) silvicola* Löffler, 1973, differences can be observed in the armament of the urosome and the form of the anal operculum. Additionally, *A. (C.) mervini* has less reduced armament of endopods of leg 2 to leg 4, but lacks setae on baseoendopod of leg 5. In general, Asian species differs from american ones in having the baseoendopod of leg 5 in males with 2 setae.

Ebert (1976) described males of *Attheyella* (*Canthosella*) *bromelicola* and females *A. (C.) goeldii*, as well as both sexes of *A. (C.) montana*. Despite the fact that Ebert's species have to be treated as *nomina nuda*, a comparison of *A. (C.) mervini* with the descriptions given by Ebert (1976) has shown that different species were studied. Dussart & Frutos (1987) suggested that *A. (C.) bromelicola* and *A. (C.) goeldii* are synonyms of *A. (Chappuisiella) kalima* (Delachaux, 1924). Without going in detail, since Ebert's species need redescription, the females of *Attheyella* (*Canthosella*) *goeldii* differ in the armament of the anal operculum and endopod of leg 4 from the description of *A. (Chappuisiella) kalima* given by Dussart & Frutos (1986). Additionally, there are differences between the descriptions given by Delachaux (1924, syn.: *Canthocamptus kalima*) and Dussart & Frutos (1986) for *A. (Chappuisiella) kalima*, e.g. the position of the lateral furcal setae and the armament of the distal segment exopod of leg 3, which makes it doubtful if the same species was studied. Because both descriptions fit the diagnosis given for the subgenus *Attheyella* (*Canthosella*), we include *A. (C.) kalima* (Delachaux, 1924) and the species described by Dussart & Frutos (1986) in this group. We propose the name *Attheyella* (*Canthosella*) *pilagaensis* for the taxon described by Dussart & Frutos (1986). This species has the lateral furcal setae inserted close together in the distal half of the furca; a longer furcal ramus than *A. (C.) kalima*; and differs in the relative lengths of several setae of the swimming legs, for instance the inner seta of the second segment of exopod of leg 3 is short in *A. (C.) kalima*, and longer than the length of the third segment in *A. (C.) pilagaensis*.

Reviewing the literature to compare *Attheyella* (*Canthosella*) *mervini* with other species described so far, we found that males of *Elaphoidella siolii* Kiefer, 1967 are close to our species, but differ in having a row of spinules on the inner furcal margin. Furthermore, *Attheyella* (*Canthosella*) *mervini* resembles *Attheyella* (*Chappuisiella*) *aliena* Noodt, 1956, a species found in bromeliads in a greenhouse in Göttingen, Germany,

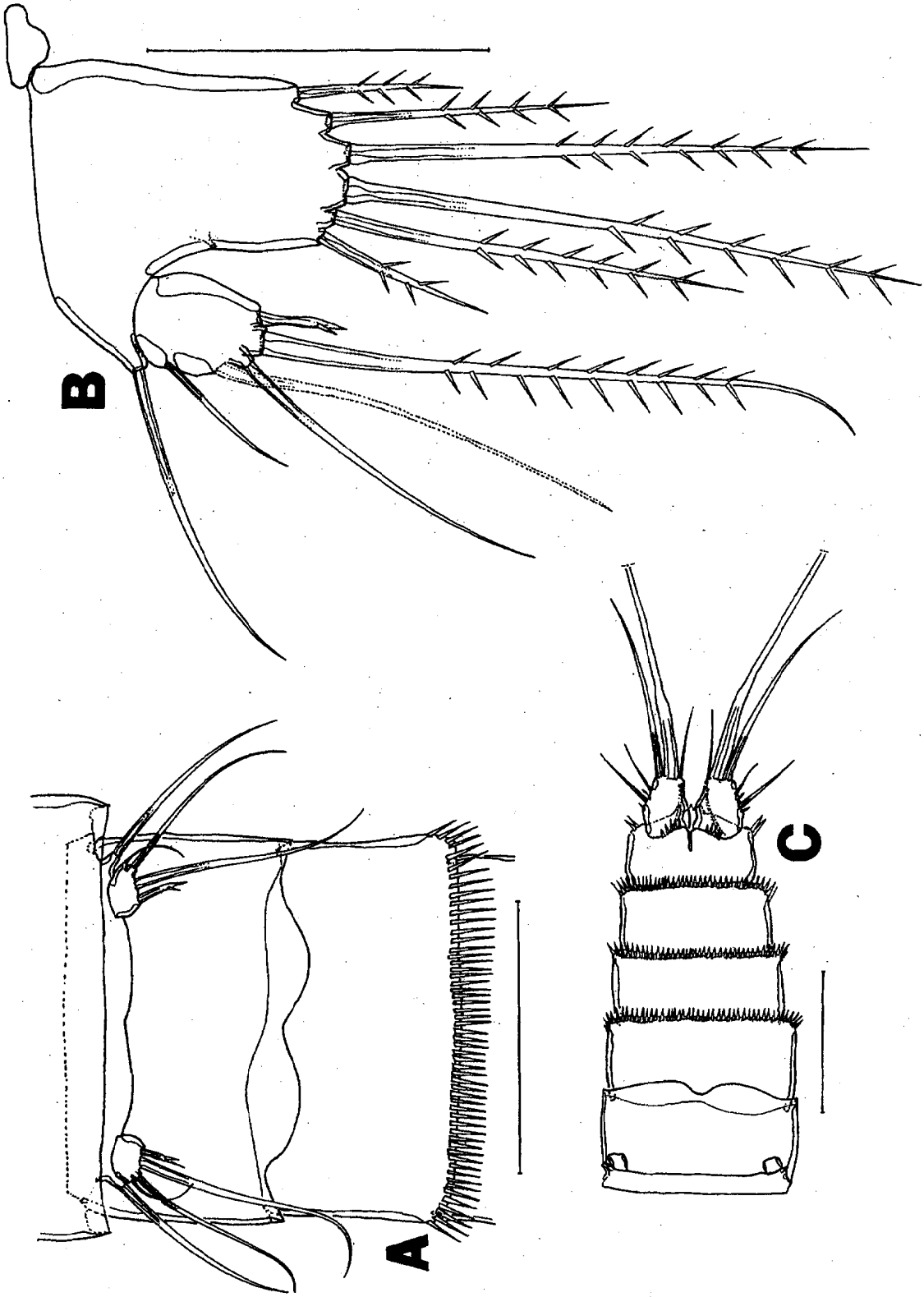


Figure 7. *Attheyella (Canthosella) mervini*. Leg 5 (A) and leg 6 (B) of male. Leg 5 of female (C, dotted seta lost, but present in opposite exopod). Urosome of male (D) in ventral view. Scale bars 50 μm .

Table 1. Differences between Neotropical species of *Attheyella* (*Canthosella*).

Character	<i>Attheyella</i> (<i>Canthosella</i>) <i>mervini</i> sp. n.	<i>antillica</i> Petkovski, 1973	<i>striblingi</i> Reid, 1990
	Female		unknown
Ornamentation of urosome	Genital double somite posteroventrally and posterolaterally with rows of spinules separated from each other 4.-5. urosomite posterolaterally and posteroventrally with continuous row of spinules	Urosomites laterally with short rows of spinules	
Anal operculum	3 triangular teeth	10 short and stout teeth	
2. segment of endopods of leg 2 and leg 3	2 setae and 1 spine apically, 1 inner seta	3-4 appendages	
2. segment of endopod of leg 4	1 seta and 1 spine apically	1 apical seta	
	Male		
Ornamentation of urosome	3.-5. urosomite posterolaterally and posteroventrally with continuous row of spinules	3.-5. urosomite with row of spinules ventrally	3.-5. urosomite posterolaterally and posteroventrally with continuous row of spinules
Anal operculum	3 triangular teeth	10 short and stout teeth	4 large and irregular teeth
Furca	scarcely longer than broad	longer than broad	2 times longer than broad
Endopod of leg 3	2-segmented, distal segment with lateral apophysis and 2 apical setae	transformed	3-segmented, second segment with apophysis, distal segment with 2 apical setae
Endopod of leg 4	2-segmented, distal segment 1 seta and 1 spine apically	1-segmented (?), 1 apical seta	2-segmented, distal segment with 2 apical setae

which was very probably carried together with the plants from South America. Differences occur in the armament of the distal segment of endopod of leg 3 and the lack of a row of spinules on the inner furcal margin in *Attheyella* (*Canthosella*) *mervini*. We propose that *Elaphoidella* *siolii* and *Attheyella* (*Chappuisiella*) *aliena* be included in the subgenus *Attheyella* (*Canthosella*).

Attheyella (*Canthosella*) *aliena*, *A. (C.) kalima*, *A. (C.) pilagaensis* and *A. (C.) siolii*, together with *A. (C.) vera* Por & Hadel, 1986 can be regarded as a subgroup of American *Canthosella*-species, possessing a transverse row of small spines on the dorsal

or dorsomedial surface of the furca. Species of a second subgroup, lacking this row of small spines, include *Attheyella* (*Canthosella*) *antillica* Petkovski, 1973, *A. (C.) mervini* and *A. (C.) striblingi* (Reid, 1990; syn.: *Canthocamptus* (*Elaphoidella*) *striblingi*). Morphological differences within this subgroup are summarized in Table 1. Concerning the oral appendages, Löffler (1973) described a mandibular palp bearing 4 setae in *Attheyella* (*Canthosella*) *silvicola*, whereas in *A. (C.) mervini* the palp bears only 3 setae. In *A. (C.) vera*, the palp is reduced to a knob with 2 setules (Por & Hadel, 1986). Comparing *A. (C.) mervini* with descriptions given by Por & Hadel (1986) for *A. (C.) vera*,

the latter shows in general more reduced mouth parts (maxillule with reduced palp as in mandible, maxilla with 2 endites, maxilliped weak, cf. Por & Hadel, 1986). In contrast to this, only minor differences in oral appendages, especially in number of setae, occur between *A. (C.) mervini* and *A. (C.) sriblingi*.

The proposed distinction between Asian and American species groups, the latter one consisting of two subgroups, is based on descriptions given so far. For further revision of *Canthosella*, redescription of most of its species is necessary.

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