

Two new species of *Halacarsantia* WOLFF, 1989 (Crustacea: Isopoda: Asellota: Santiidae) from Japan

Michitaka SHIMOMURA¹ and Hiroyuki ARIYAMA²

¹Kitakyushu Museum of Natural History and Human History, Kitakyushu 805-0071, Japan

²Osaka Prefectural Fisheries Experimental Station, Tanagawa, Misaki, Osaka 599-0311, Japan

(Received October 1, 2003 ; accepted February 19, 2004)

ABSTRACT — Two new species of *Halacarsantia* are described, as the first record of this genus from Japan. *Halacarsantia ovata* sp. nov. differs from its congeners in having coxal plates hidden in dorsal view on pereonites 1, 2 and 4-7, dorsal-laterally situated eyes on head, without conspicuous bulging processes, pleopod 1 bearing 2 long ventral and 6 short apical setae, and sympod of pleopod 2 about three times as long as broad. *Halacarsantia setosa* is distinguishable from its congeners in having many dorsal robust setae on head, pereonites and pleotelson.

INTRODUCTION

Santiidae is a small family in the suborder Asellota. It includes 25 species of five genera, all from marine benthic habitats (WOLFF 1989 ; MÜLLER 1992 ; SHIMOMURA & MAWATARI 2000, 2001 ; WOLFF & BRANDT 2000 ; KENSLEY & SCHOTTE 2002 ; KENSLEY 2003). *Halacarsantia* WOLFF, 1989, being a small genus in the family, includes 4 species : *H. uniramea* (MENZIES & MILLER, 1955) from Wellington, New Zealand, *H. justi* WOLFF, 1989 from the Phuket Island, Thailand, *H. kussakini* MÜLLER, 1992 from the Society Islands, French Polynesia, *H. colombiensis* WOLFF & BRANDT, 2000 from Santa Marta, Colombia.

Our recent investigation yielded two undescribed species of *Halacarsantia* from the subtidal zone of Hikigawa coast of Wakayama Prefecture as the first record of the genus from Japan.

MATERIALS AND METHODS

Specimens obtained by hand sorting from sponges, fixed with 10% neutralized formalin solution diluted with seawater and preserved in 70% ethanol. Each individual was dissected and prepared for observation using a light microscope equipped with a differential interference contrast optics (SHIMOMURA & MAWATARI 1999). Total length as indicated in "Material examined" was measured from the tip of the head to the end of the pleotelson.

The type series is deposited in the Kitakyushu Museum of Natural History and Human History (KMNH). The new species were compared with the original descriptions of its close relatives.

TAXONOMY

Halacarsantia ovata sp. nov.

(Figs. 1-3)

Material examined. Hikigawa-cho, Nishimuro-gun, Wakayama Prefecture, Japan, snorkeling, 3 m depth, on sponges [*Clatharia* (*Clatharia*) *fasciculata* (WILSON, 1925)], 2 August 2003 : holotype, male, 0.62 mm (KMNH IvR 700,001) ; paratype, ovig. female, 0.85 mm (KMNH IvR 700,002).

Description of the holotype male.

Body (Fig. 1A) about 1.7 times as long as maximum width. Head about 1.2 times as broad as long, slightly narrower than pereonite 1, with 4 dorsal short setae ; frontal lobe broad and long, with 22 long serrated setae on anterior margin ; posterior margin of head convex. Preocular lobes obsolete, each with 5 long serrated setae apically. Eyes dorsal-lateral, each with 7 ommatidia. Pereonites laterally rounded : pereonites 1-4, with few short setae and 4-6 long serrated setae each on lateral margin, dorsally with some short setae ; pereonites 5-7 with 6-8 long serrated setae each on lateral margin, dorsally with some short setae. Pereonites 1 to 3 increasing in length ; pereonites 3 and 4 subequal in length ; pereonite 5 shortest ; pereonite 6 longer than pereonite 5 ; pereonite 7 slightly shorter than pereonite 5. Pereonites 1 to 3 increasing in width ; pereonite 4 slightly narrower than pereonite 3 ; pereonite 5 slightly wider than pereonite 4 ; pereonites 4-7 decreasing in width. Coxal plates dorsally visible on pereonite 3, laterally rounded, each with 1 long serrated seta. Pleotelson (Fig. 1A) pentagonal, widest at middle, about as long as broad, with 12 to 13 long serrated setae laterally and 2 fine setae

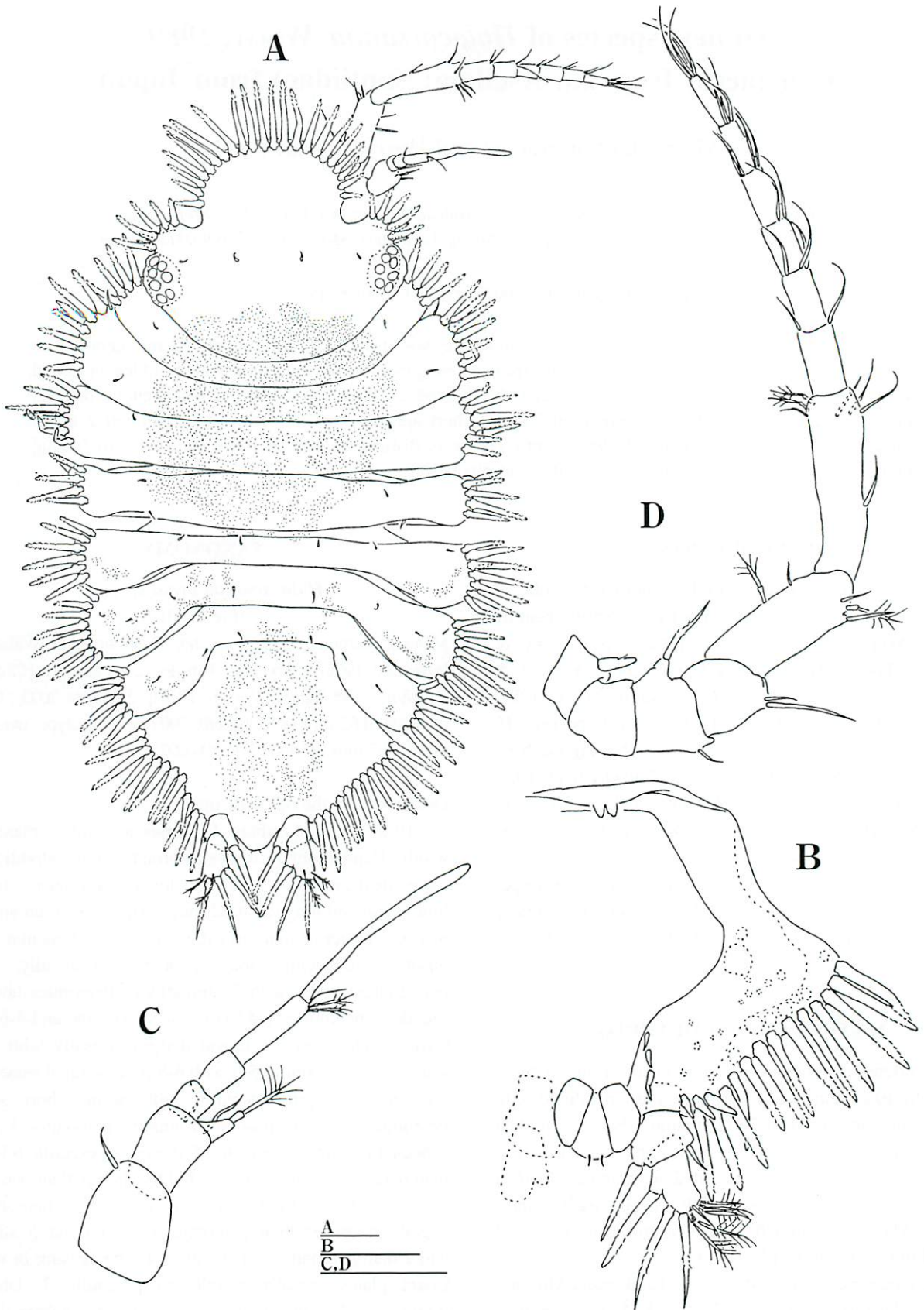


Fig. 1. *Halacarsantia ovata* sp. nov. A-D, holotype male (KMNH IvR 700,001) : A, habitus, dorsal ; B, pleotelson, ventral ; C, right antenna 1, dorsal ; D, right antenna 2, ventral. Scales = 0.05 mm.

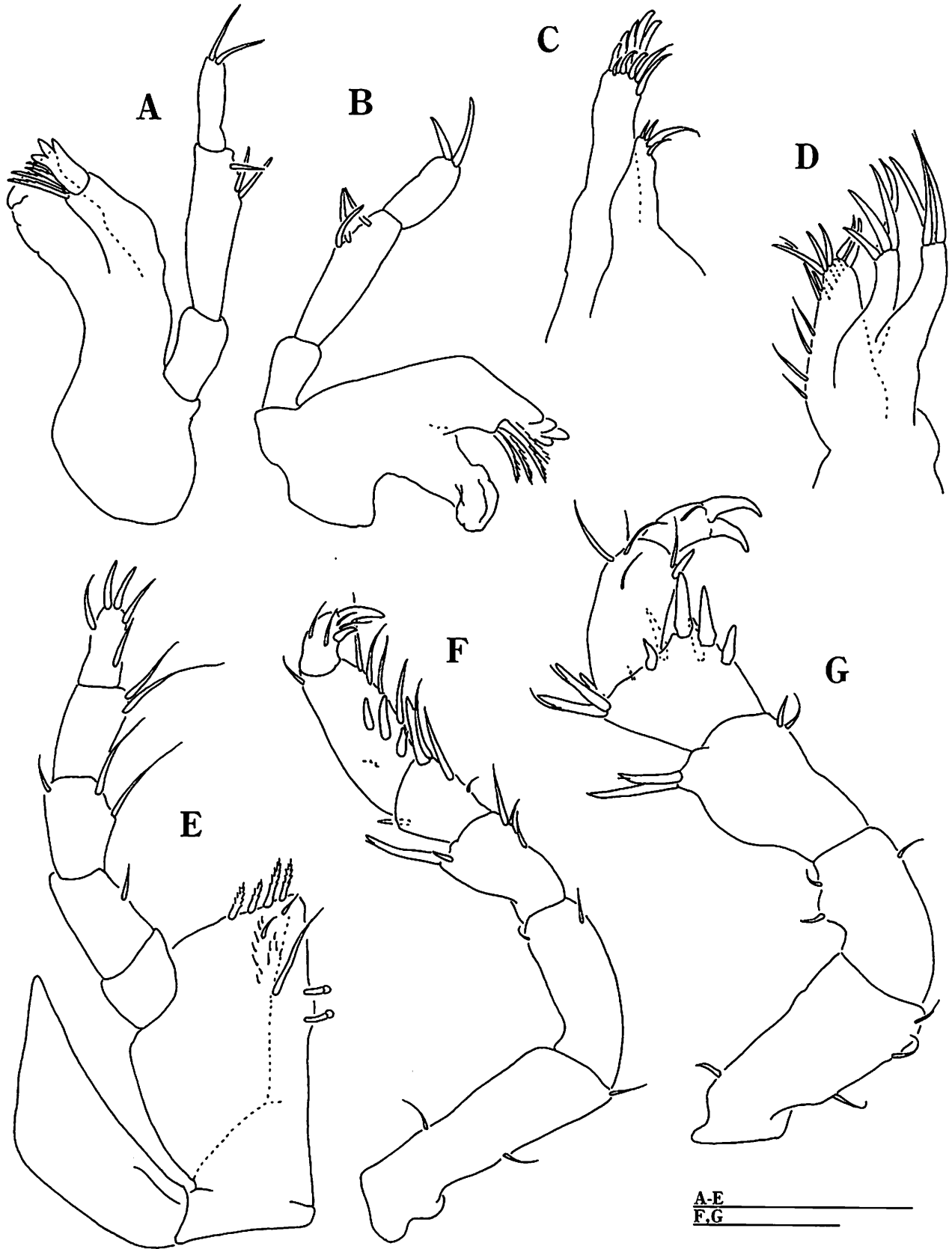


Fig. 2. *Halacarsantia ovata* sp. nov. A-G, holotype male (KMNH IvR 700,001) : A, left mandible, ventral ; B, right mandible, ventral ; C, right maxilla 1, ventral ; D, left maxilla 2, ventral ; E, right maxilliped, ventral ; F, left pereopod 1, medial ; G, left pereopod 7, medial. Scales = 0.05 mm.

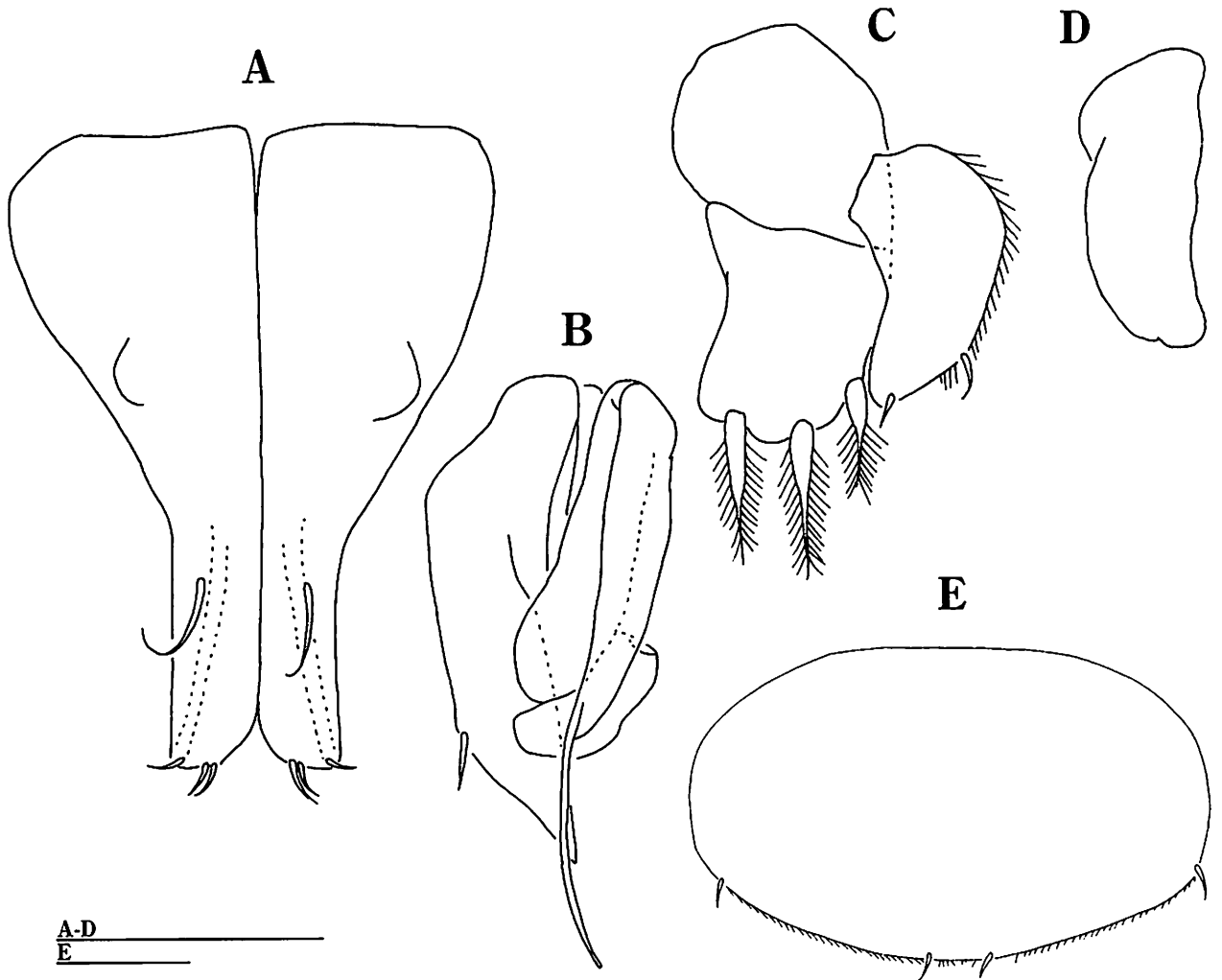


Fig. 3. *Halacarsantia ovata* sp. nov. A-D, holotype male (KMNH IvR 700,001) ; E, paratype female (KMNH IvR 700,002) : A, pleopod 1, ventral ; B, left pleopod 2, dorsal ; C, left pleopod 3, ventral ; D, right pleopod 5, ventral ; E, operculum, ventral. Scales = 0.05 mm.

apically. Uropod (Fig. 1B) stout, uniramous, directed posteriorly, about 1/3 as long as pleotelson : sympod wide posteriorly, slightly shorter than ramus, with 1 long serrated seta medially and 1 short simple seta laterally ; ramus narrower than sympod, with 1 medial and 2 terminal long serrated setae, distally with 2 short simple and 4 filoplume-like setae.

Antenna 1 (Fig. 1C) composed of 5 articles. Article 1 broadest, with 1 distal-medial seta ; article 2 shorter than article 1, with convex distal-lateral protrusion bearing with 1 filoplume-like seta, distally with 2 simple setae ; article 3 shortest, without setae ; article 4 slightly longer than article 3, without setae ; article 5 about 1.9 times as long as article 4, apically with 1 aesthetasc and 1 simple, 2 filoplume-like setae.

Antenna 2 (Fig. 1D) composed of 6 stout articles and 6 thin flagellar articles. Article 1 with 1 long robust sensory seta laterally ; article 2 as broad as article 1, without setae ; article 3 slightly longer than article 2, with convex protrusion

bearing with 1 long serrated seta, with 1 distal-medial simple seta ; article 4 as long as article 3, with 2 distal-medial setae ; article 5 twice as long as article 4, laterally with 1 simple and 1 filoplume-like setae, distal-medially with 1 simple and 2 filoplume-like setae ; article 6 longer than article 5, 2 distal-ventral, 1 distal-lateral and 2 medial simple setae, distal-laterally with 2 filoplume-like setae. Flagellum about 1.5 times as long as article 6, each with some simple setae.

Left mandible (Fig. 2A) consisting of palp, molar process, lacinia mobilis and spine row. Palp 3-articulated : article 1 without setae ; article 2 longest, laterally with 3 setae ; article 3 half as long as article 2, with 2 apical setae. Molar process stout, without setae ; lacinia mobilis with 3 teeth ; setal row with 4 setae. Right mandible (Fig. 2B) consisting of palp, incisor, molar processes, lacinia mobilis and spine row. Palp 3-articulated : article 1 without setae ; article 2 longest, laterally with 3 setae ; article 3 half as long as arti-

cle 2, with 2 apical setae. Incisor with 4 cusps ; setal row with 4 setae ; molar process stout, without setae.

Maxilla 1 (Fig. 2C) with inner lobe bearing 4 apical setae ; outer lobe with 10 apical setae. Maxilla 2 (Fig. 2D) with inner lobe bearing 6 medial and 5 apical setae ; outer 2 lobes each with 4 apical setae.

Maxilliped (Fig. 2E) with broad palp composed of 5 articles : article 1 shortest, trapezoidal, without setae ; article 2 about 1.6 times as long as article 1, with 1 medial seta ; article 3 shorter than article 2, with 1 distal-lateral and 2 medial setae ; article 4 as long as article 3, with 2 distal-medial setae ; article 5 narrowest, with 1 lateral, 2 medial and 2 apical setae ; endite quadrate, bearing 1 long, 2 short simple setae ventrally, with 4 distal pectinate setae and many ventral fine setae, and 2 coupling hooks medially ; epipod lanceolate, moderately broad, about half as long as endite, with acute apex.

Pereopod 1 (Fig. 2F) narrowest : basis the longest article, with 2 ventral and 1 dorsal setae ; ischium 3/5 as long as basis, bearing 1 ventral and 1 dorsal setae ; merus trapezoidal, with 3 ventral and 1 dorsal simple setae, with 1 long robust sensory seta distal-dorsally ; carpus trapezoidal, narrower than merus, ventrally with 3 long and 1 short setae, dorsally with 1 short seta ; propodus ovate, with 7 ventral, 1 dorsal and 1 lateral simple setae ; dactylus shorter than propodus, narrowest of all articles, with 1 dorsal, 1 medial and 2 subapical setae, 1 curved unguis, and 1 short accessory spine.

Pereopod 7 (Fig. 2G) robust, as long as pereopods 2-6 : basis with 3 ventral and 1 dorsal setae ; ischium shorter than basis, with 1 ventral and 2 dorsal setae ; merus trapezoidal, with 2 short setae ventrally and 2 long robust sensory setae dorsal-distally ; carpus trapezoidal, with 3 ventral, 2 lateral and 1 medial robust setae and 1 short lateral seta, dorsal-distally with 3 robust sensory setae ; propodus about slightly longer than carpus, with 2 ventral, 3 dorsal and 1 medial simple setae ; dactylus the narrowest article ; with 1 medial seta, 1 curved unguis, and 1 stout accessory spine.

Pleopod 1 (Fig. 3A) truncate, about 1.3 times as long as maximum width, distally separate, with 2 long ventral and 6 short apical setae. Pleopod 2 (Fig. 3B) with narrow protopod, tapering to pointed apex, lateral margin convex, bearing 1 lateral seta ; endopod surpassing tip of protopod, with slender second article ; exopod narrow. Pleopod 3 (Fig. 3C) with endopod bearing 3 stout, plumose setae distally ; exopod uniramous, narrower than endopod, bearing 1 lateral, 1 apical long simple setae, and many fine setae on convex lateral margin. Pleopod 4 broken off. Pleopod 5 (Fig. 3D) ovate, uniramous, about 2.7 times as long as broad, without setae.

Description of the paratype female.

Similar to male in morphology of all pereonal appendages. Body about 1.7 times as long as maximum width. Operculum (Fig. 3E) about 1.6 times as broad as long, with 2 lateral, 2 subapical setae, and many fine marginal setae.

Remarks. The following features displayed by the new species indicate that it belongs to *Halacarsantia* WOLFF, 1989 : depressed body, pereonite 3 the broadest of all pereonites, head having large, broadly rounded frontal lobe, obsolete eye lobes, dorsally invisible pleonite, article 2 of antenna 1 having lateral projection, article 3 of antenna 2 having lateral projection with single seta, very robust short pereopods, pereopod 1 having 2 claws, operculum broader than long, and uniramous uropods.

The well-projected frontal lobe of the head links the new species to *Halacarsantia colombiensis* WOLFF & BRANDT, 2000 from the Caribbean coast of northern Colombia (type locality). *Halacarsantia ovata* is distinguished from *H. colombiensis* by the following features (those of *H. colombiensis* in parentheses) : coxal plates of pereonites 1, 2 and 4-7 dorsally invisible (all coxal plates of pereonites 1-7 dorsally visible), eyes on head dorsal-laterally, without conspicuous bulging processes (eyes on bulging processes), serrated setae on body long (moderately short), pleopod 1 bearing 2 long ventral and 6 short apical setae (with 9 short apical setae), and sympod of pleopod 2 about three times as long as broad (twice as long as broad).

Etymology. The specific name refers to the ovate form of the body.

Halacarsantia setosa sp. nov.

(Figs. 4-6)

Material examined. The same data as the specimens of *H. ovata* : holotype, ovig. female, 0.85 mm (KMNH IvR 700,003) ; paratype, non-ovig. female, 0.71 mm (KMNH IvR 700,004).

Description of the holotype female.

Body (Fig. 4A) about 2.1 times as long as maximum width. Head about 1.3 times as broad as long, slightly narrower than pereonite 1, with 21 dorsal robust setae ; frontal lobe narrow and short, with 2 robust setae on anterior margin ; posterior margin of head convex. Preocular lobes obsolete, each with 1 robust seta apically. Eyes dorsal-lateral, each with 10 ommatidia. Pereonites laterally rounded : pereonite 1 with 5 robust setae dorsally ; pereonites 2-4, dorsally with 18-25 robust setae ; pereonites 5-7, dorsally with 16-20 robust setae. Pereonite 1 short ; pereonite 2 longest ; pereonites 2 to 5 decreasing in length ; pereonite 6 as long as pereonite 5 ; pereonite 7 slightly longer than pereonite 6. Pereonites 1 to 3 increasing in width ; pereonite 4 slightly narrower than pereonite 3 ; pereonites 4

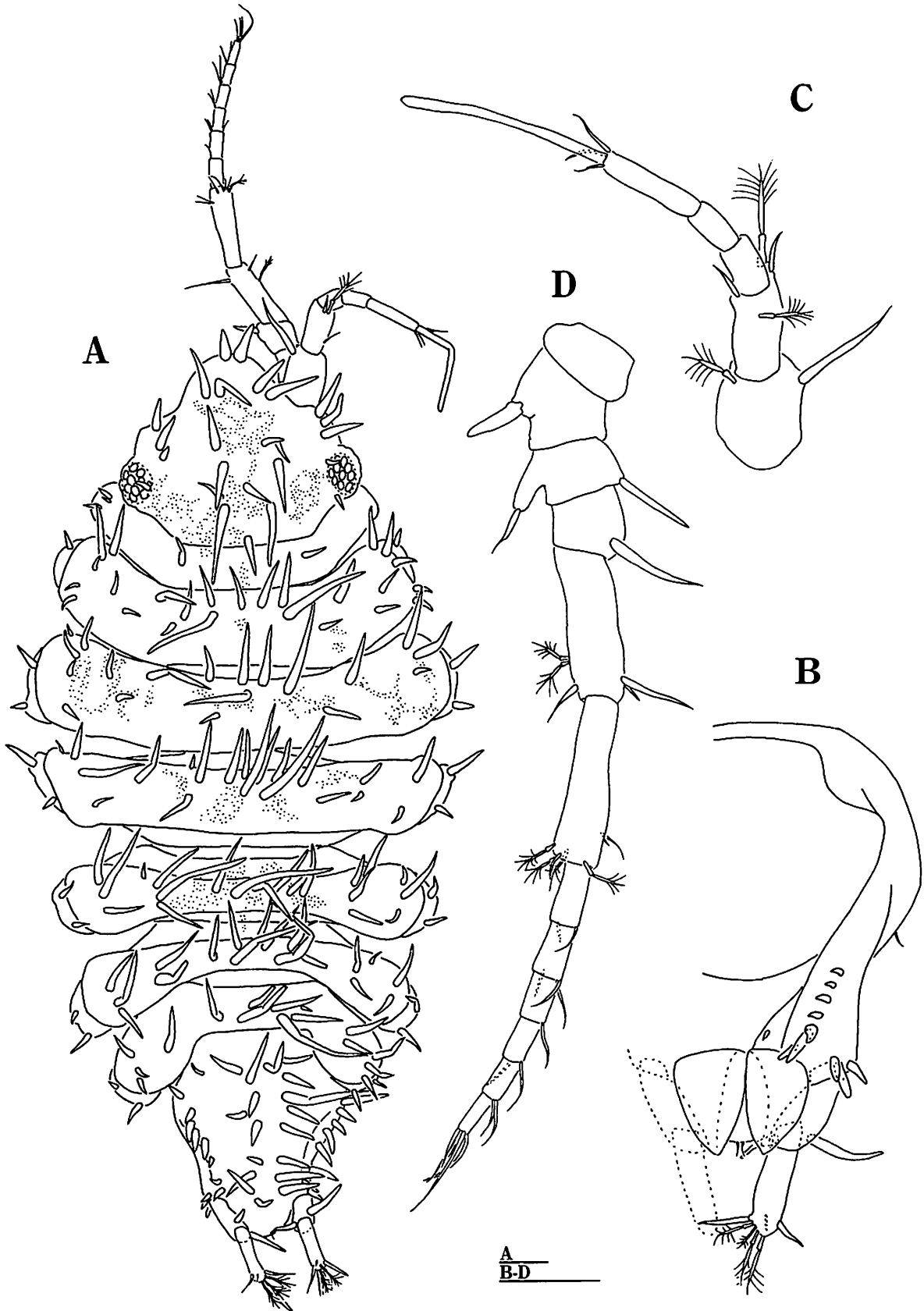


Fig. 4. *Halacarsantia setosa* sp. nov. A-D, holotype female (KMNH IvR 700,003) : A, habitus, dorsal ; B, pleotelson, ventral ; C, right antenna 1, medial ; D, right antenna 2, dorsal. Scales = 0.05 mm.

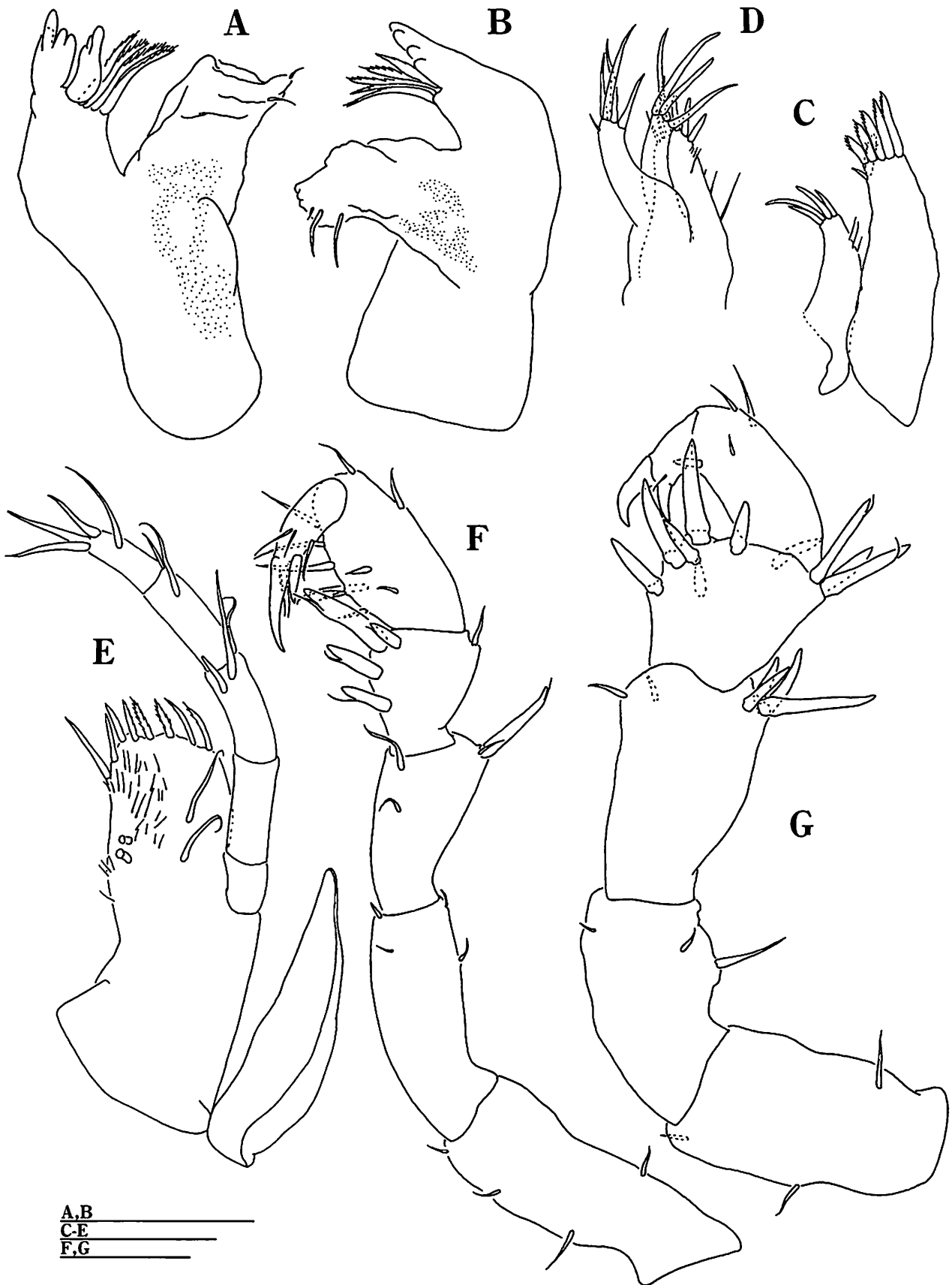


Fig. 5. *Halacarsantia setosa* sp. nov. A-G, holotype female (KMNH IvR 700,003) : A, left mandible, dorsal ; B, right mandible, dorsal ; C, right maxilla 1, dorsal ; D, left maxilla 2, dorsal ; E, right maxilliped, dorsal ; F, right pereopod 1, medial ; G, right pereopod 7, medial. Scales = 0.05 mm.

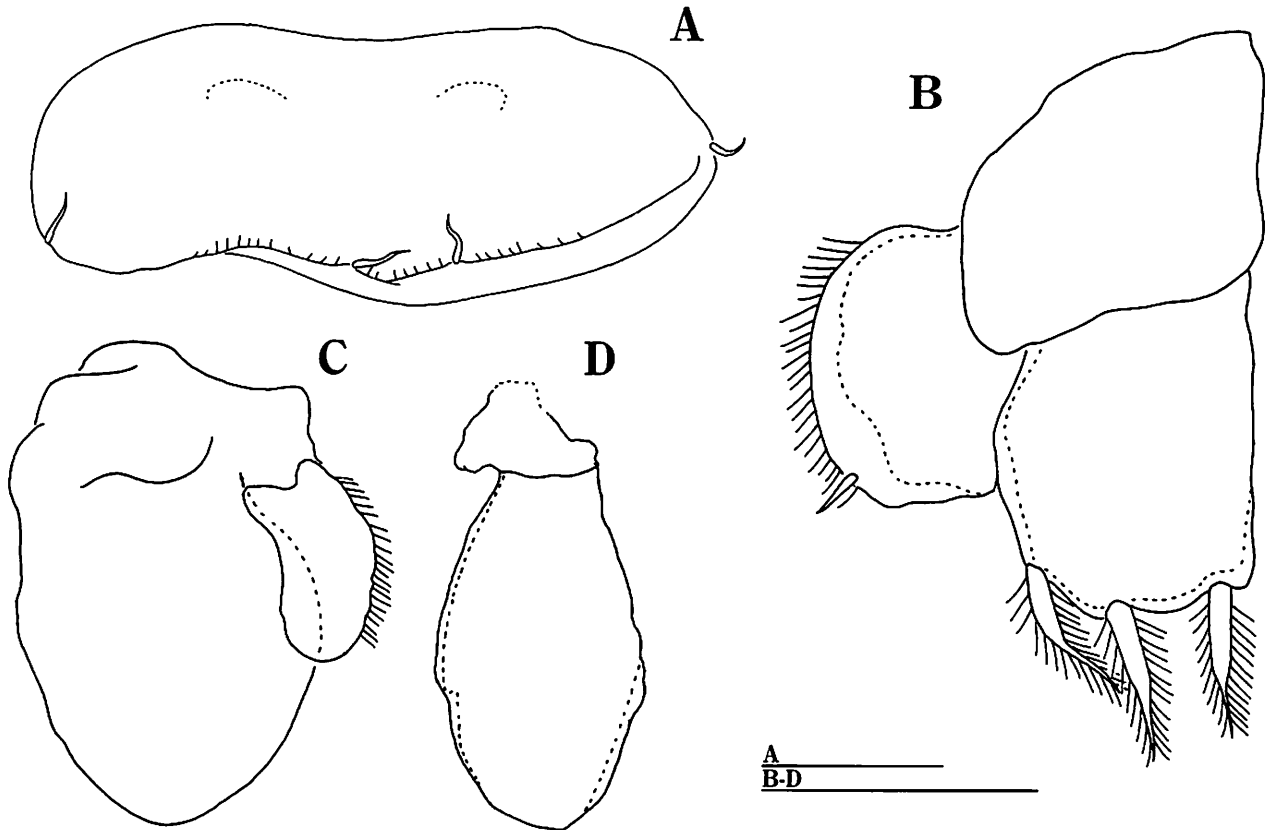


Fig. 6. *Halacarsantia setosa* sp. nov. A-D, holotype female (KMNH IvR 700,003) : A, operculum, ventral ; B, left pleopod 3, dorsal ; C, left pleopod 4, ventral ; D, left pleopod 5, ventral. Scales = 0.05 mm.

to 7 decreasing in width. Coxal plates dorsally visible on pereonites 2-7, laterally rounded, each with 1 or 2 robust setae. Pleotelson (Fig. 4A) pear-shaped, widest near anterior margin, about 1.1 times as long as broad, with 16 lateral, 19 dorsal robust setae, with 2 fine setae apically. Uropod (Figs. 4A, B) slender, uniramous, directed posteriorly, about 3/7 as long as pleotelson : sympod narrow, as long as ramus, with 1 distal-lateral and 1 distal-medial robust setae ; ramus slightly narrower than sympod, apically with 2 long, 1 short simple setae and 4 filoplume-like setae.

Antenna 1 (Fig. 4C) composed of 5 articles. Article 1 broadest, with 1 distal-dorsal long seta and 1 distal-medial filoplume-like seta ; article 2 slightly shorter than article 1, with convex distal-lateral protrusion bearing with 1 filoplume-like seta, with 2 distal simple setae and 1 medial filoplume-like seta ; article 3 narrower than article 2, without setae ; article 4 as long as article 3, without setae ; article 5 twice as long as article 4, apically with 1 aesthetasc and 3 simple setae.

Antenna 2 (Fig. 4D) composed of 6 stout articles and 6 thin flagellar articles. Article 1 short, without setae ; article 2 as broad as article 1, laterally with 1 long robust seta ; article 3 shorter than article 2, with convex protrusion bearing 1 simple seta ; article 4 as long as article 3, with 1 distal-

medial seta ; article 5 about 2.4 times as long as article 4, with 1 lateral, 2 distal-medial simple setae and 2 lateral filoplume-like setae ; article 6 slightly longer than article 5, distal-laterally with 1 simple seta and 3 filoplume-like setae, distal-medially with 2 simple setae and 1 filoplume-like seta. Flagellum about 1.7 times as long as article 6, each with some simple setae.

Left mandible (Fig. 5A) consisting of incisor, molar process, lacinia mobilis and spine row. Incisor with 4 cusps ; molar process stout, with 2 simple setae ; lacinia mobilis with 3 teeth ; setal row with 4 setae. Right mandible (Fig. 5B) lacking lacinia mobilis. Incisor with 4 cusps ; setal row with 5 setae ; molar process stout, with 3 simple setae.

Maxilla 1 (Fig. 5C) with inner lobe bearing few lateral and 4 apical setae ; outer lobe with 1 distal-medial and 6 apical setae. Maxilla 2 (Fig. 5D) with inner lobe bearing some medial and 6 apical setae ; outer 2 lobes each with 4 apical setae.

Maxilliped (Fig. 5E) with narrow palp composed of 5 articles : article 1 shortest, without setae ; article 2 about twice as long as article 1, without setae ; article 3 shorter than article 2, with 2 distal-dorsal and 1 distal-lateral setae ; article 4 as long as article 3, with 1 distal-dorsal and 1 distal-

-lateral setae ; article 6 narrowest, with 1 distal-dorsal and 3 apical setae ; endite quadrate, bearing 6 distal and 2 medial setae, and with 2 long setae and many fine setae ventrally, and 2 coupling hooks medially ; epipod lanceolate, moderately broad, about half as long as endite, with acute apex.

Pereopod 1 (Fig. 5F) narrower than pereopods 2-7 : basis the longest article, with 3 ventral and 1 dorsal setae ; ischium 3/4 as long as basis, bearing 1 ventral, 1 dorsal and 1 medial setae ; merus trapezoidal, medially with 2 simple setae, dorsal-distally with 1 short simple seta and 1 long robust sensory seta ; carpus trapezoidal, as broad as merus, ventrally with 3 robust sensory setae, with 1 distal-medial robust sensory seta and 1 dorsal seta ; propodus ovate, with 5 ventral, 2 dorsal, 1 lateral and 2 medial simple setae ; dactylus shorter than propodus, narrowest of all articles, with 3 medial, 2 subapical short setae, 1 curved unguis, and 1 short accessory spine.

Pereopod 7 (Fig. 5G) as long as pereopods 2-6, robust : basis with 2 ventral and 1 dorsal setae ; ischium shorter than basis, with 1 ventral, 1 dorsal and 1 medial setae ; merus trapezoidal, dorsal-distally with 4 robust setae, with 1 ventral and 1 lateral simple setae ; carpus trapezoidal, with 3 ventral, 2 lateral and 2 medial robust setae, dorsal-distally with 3 robust sensory setae ; propodus slightly longer than carpus, with 2 ventral, 1 medial simple setae and 1 distal-ventral robust seta ; dactylus the narrowest article, with 1 medial seta, 1 curved unguis, and 1 stout accessory spine.

Operculum (Fig. 6A) about 2.4 times as broad as long, with 2 lateral and 2 subapical setae, and many fine marginal setae. Pleopod 3 (Fig. 6B) with endopod bearing 3 stout, plumose setae distally ; exopod uniramous, narrower than endopod, bearing 1 apical simple seta, and many fine setae on convex lateral margin. Pleopod 4 (Fig. 6C) with ovate endopod ; exopod uniramous, bearing many fine setae on lateral margin. Pleopod 5 (Fig. 6D) ovate, uniramous, about 1.7 times as long as broad, without setae.

Remarks. The present new species is assigned to *Halacarsantia* WOLFF, 1989 because it has the following characters : large frontal lobe of head, obsolete eye lobes, pleonite invisible in dorsal view, article 2 of antenna 1 having lateral projection, article 3 of antenna 2 having lateral projection with single seta, very robust and short pereopods, pereopod 1 having 2 claws, operculum broader than long, and uniramous uropods.

Halacarsantia setosa is distinguishable from its congeners in having many dorsal robust setae on head, pereonites and pleotelson. The pear-shaped pleotelson links *Halacarsantia setosa*, to *H. justii* (WOLFF, 1989) from the Phuket Island, Thailand (type locality) and *H. kussakini* (MÜLLER, 1992) from the Society Islands, French Polynesia (type lo-

cality). The present new species is distinguished from *H. justii* by the following features (those of *H. justii* in parentheses) : the head, pereonites and pleotelson are armed with many robust setae on its dorsum (no dorsal setae), the frontal lobe of head has 2 robust setae (with many long marginal setae), operculum is short (moderately long). *Halacarsantia kussakini* differs from the present new species in having the body lacking dorsal robust setae, the frontal lobe bearing 6 marginal setae, the long antenna 2, pleopod 1 with 8 apical setae, the broad sympod and the short second article of pleopod 2, the long ramus of uropods and the presence of mandibular palp.

Etymology. The specific name refers to many dorsal setae on the head, pereonites and pleotelson.

ACKNOWLEDGMENTS

We express our sincere thanks to Dr. Kazunari OGAWA of Z. Nakai Laboratory for his identification of the sponges. This research was supported in part by the Ministry of Education, Science, Sports and Culture, Grant-in-Aid for Young Scientists (B), No.15770062 for 2003-2005, and research grants from Research Institute of Marine Invertebrates Foundation and Showa Seitoku Memorial Foundation.

REFERENCES

- KENSLEY, B., 2003. Marine isopod crustaceans from Easter Island. *Pacific Science*, **57** (3) : 287-317.
- KENSLEY, B. & SCHOTTE, M., 2002. New species and records of Asellota from the Indian Ocean (Crustacea : Peracarida : Isopoda). *Journal of Natural History*, **36** : 1421-1461.
- MENZIES, R. J. & MILLER, M. A., 1955. Marine asellote isopods of the genus *Antias* with the description of a new species from New Zealand. *Transactions of the Royal Society of New Zealand*, **83** (2) : 383-389.
- MÜLLER, H. G., 1992. *Halacarsantia kussakini* n. sp. from a coral reef in French Polynesia (Isopoda : Asellota : Santiidae). *Cahiers de Biologie Marine*, **33** : 263-267.
- SHIMOMURA, M. & MAWATARI, S. F., 1999. *Paramunna rhipis*, a new species of asellote isopod (Paramunnidae) from Japan. *Crustacean Research*, **28** : 153-159.
- SHIMOMURA, M. & MAWATARI S. F., 2000. *Santia katoi* sp. nov., a new isopod crustacean from Shirahama, Japan (Asellota : Santiidae). *Publications of the Seto Marine Biological Laboratory*, **39** (1) : 29-34.
- SHIMOMURA, M. & MAWATARI, S. F., 2001. A new isopod of the genus *Santia* SIVERTSEN & HOLTHUIS, 1980 (Crustacea : Isopoda : Asellota : Santiidae) from Japan. *Proceedings of the Biological Society of Washington*, **114** (4) : 929-937.
- WINKLER, H., 1993. Remarks on the Santiidae KUSSAKIN, 1988, and on the genus *Santia* SIVERTSEN and HOLTHUIS, 1980, with two redescriptions (Isopoda, Asellota). *Crustaceana*, **64** (1) : 94-113.
- WOLFF, T., 1989. The genera of Santiidae KUSSAKIN, 1988, with the description of a new genus and species (Crustacea, Isopoda, Asellota). *Steenstrupia*, **15** (7) : 177-191.
- WOLFF, T. & BRANDT, A., 2000. Caribbean species of Munnidae, Paramunnidae and Santiidae (Isopoda : Asellota) *Steenstrupia*. **25** (1) : 121-146.